Northern Pacific Railway Company. Engineering Department Records.

Copyright Notice:

Version 3
August 20, 2018

N. P. 1757
6-24

OFFICE OF BRIDGE ENGINEER

FILE NO. 684

SUBJECT:

AUBURN CONCRETE PLANT

1924 TO

PART 2

684

JUN 15 1932

Seattle, Washington,
June 11, 1932.

Mr. E. J. Myers:

Auburn Concrete Plant - Shipment of 24" RCP to Idaho Divn. AFS Order 14221.

I sent you a copy of my letter of June 10, 1932, to Mr. Newton regarding shipment of 8 pcs. 24" RCP from Auburn Concrete Plant to Mr. Robinson at Parkwater to apply on RTT requisition 122, AFS Order #14221.

I have now received copy of LFN requisition #1587 covering 7 pcs. of 24" RCP shipped May 21st. from Auburn for Tacoma Division work, therefore, we have but 7 pcs. of 24" RCP on hand and will only be able to ship this amount. Please cancel one piece of 24" RCP on AFS Order #14221.

Our supply of 24" RCP at Auburn is now exhausted and no more orders for this size pipe should be placed with us. We have, however, a good supply of 36" RCP still on hand.

ANE/w

cc LFN
A.H.
MFC

(Signed) A. F. STOTLER

MFC

Saint Paul, December 16, 1930.

Mr. Bernard Blum:

Referring to your letter of December 8 in regard to equipment from Auburn concrete plant, now in stock at South Tacoma.

The pipe in stock at Auburn is as follows:

2096 feet of 24" concrete pipe
3952 " " 36" " "

Form 134 of 1931, west of Helena, calls for the following:

1658 feet of 24" concrete pipe
1764 " " 36" " "

Surplus at the end of 1931:

438 feet of 24" concrete pipe
2188 " " 36" " "

If shipment of pipe from Darling be continued on the Rocky Mountain Division the pipe at Auburn will supply the west end for 1931 and 1932.

Our annual report for 1929 shows approximately 30,000 feet of wood box culverts which will require concrete pipe for replacement and this will be increased by the breakage in tile pipe culverts. It is apparent that we will find it necessary to provide a source for additional pipe after 1932 and we should make a contract with some

western pipe company to supply our needs. I would suggest that the Auburn pipe forms be held in stock with the thought that we should turn them over to a manufacturer or again establish a concrete plant for the manufacture of pipe.

All the equipment from Auburn, other than the forms and that taken by the supervisor, should be scrapped.

Mr. Myers' letter returned.

Bridge Engineer.

Encl.

St. Paul, December 8, 1930.

Mr. M. F. Clements:

Please note attached from Mr. Myers about material in the Auburn concrete plant, especially in regard to the pipe forms.

It is my understanding that circular concrete pipe was made at Auburn and possibly these forms may be of value at Darling to make the new type tongue and groove pipe. Will you kindly advise.

Chief Engineer.

684

NOV 10 1930

Seattle, Washington
November 6, 1930.

1003-8

Mr. M. F. Clements
Bridge Engineer
St.Paul, Minn.

Auburn Concrete Plant

In accordance with verbal conversation of November 5, please find attached hereto, in duplicate, statement of reinforced concrete pipe manufactured and shipped from Auburn Concrete Plant, 1916 to and including October 31, 1930. Statement also shows quantity of 24" and 36" R.C.P. on hand as of October 31, 1930.

ANB-K

A. S. Stoller
P

AUBURN CONCRETE PLANT

Statement of Reinforced Comcrete Pipe Manufactured, Shipped and On Hand.

Years 1916 to 1930

Year	Manufactured				Shipped				Balance			
	24	36	48	Total	24	36	48	Total	24	36	48	Total
1916									130	57	17	204
1917	804	290	39		874	315	46		60	32	10	102
1918	814	400			662	244	2		212	188	8	408
1919	768	166			471	161	8		509	193		702
1920					498	166			11	27		38
1921	894	256			575	179			330	104		434
1922	978	372			778	322			530	154		684
1923	700	380			678	334			552	200		752
1924	128	76			384	162			296	114		410
1925	737	327			290	114			743	327		1070
1926	571	525			366	92			948	760		1708
1927	582	388			391	186			1139	962		2101
1928					367	113			772	849		1621
1929					365	133			407	716		1123
1930 to 7/21					133	180			274	536		810
Total to 7/21/1930	6976	3180	39	10195	6832	2701	56	9589	274	536		810
7/21/30 to 1931/30					12	42		54	262	494		756
Totals	6976	3180	39	10195	6844	2743	56	9643	262	494		756

Seattle, Wash.,
November 6, 1930.

1003-8

Mr. G. I. Hayward,
District Engineer,
Seattle, Washington.

Re: Material shipped from abandoned Concrete Plant at Auburn, Wash. to South Tacoma, Wash. store.

I am herewith attaching one copy of inventory of equipment and material shipped from the Auburn Concrete Plant to the South Tacoma store, which you made a check of and submitted. I understand the Store Dept. is unloading at South Tacoma so that all items may be checked on the ground for the ourpose of determining what is to be held and what is to be scrapped.

I note there are several concrete pipe forms, dump car with steel frame and hopper and stiff legged derrick equipment and there may be other items of value and I suggest that you have a representative go to South Tacoma with Supervisor Campbell and meet with a Store Dept. representative and go over the material and equipment to ascertain just what is to be scrapped. It may be that Mr. Campbell can use the derrick and steel dump car and in no case should the steel concrete pipe forms be scrapped.

(Signed) A. F. STOTLER

AFS:L
Encl
MFC
cc SHR

Mr. Clements - Please advise if you have any use for these forms at any other location. If not we will hold at South Tacoma. AFS

684

NOV 19 1928

Seattle, Washington,
November 16th, 1928

Re: Auburn Concrete Plant
material carried in stock
and taken thru 1928 Annual
Inventory.

0-276

Mr. B. Blum,
Chief Engineer,
St. Paul, Minn.

Please find attached herewith in duplicate, inventory covering material carried in Material and Supplies, Auburn Concrete Plant, as of October 31st, 1928.

Yours truly,

Cy: MFC
CCK
SHR
CES

WBB

N.P. 317
5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO. _____

LISTER'S SHEET NO. _____

ARITHMETIC _____
ARITH. CHECKED _____
GEN. VERIFICATION _____
RECAP. _____
RECAP. CHECKED _____
RECAP VERIFIED _____

Concrete culvert pipe on hand at Auburn Concrete Plant
Property of N.P.R. charged to M & S Class #3.

LISTED BY _____
CALLED BY C.E.Springer, Office Eng'r
LOCATION OF MATERIALS _____

_____ STORE. _____ 192 ___ DIVISION Auburn Concrete Plant. Seattle Division.

October 31 3

	DESCRIPTION	NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1	Number Pcs		Wt. Lin.Ft.Per Pc								
2	24" Reinforced Concrete Culv.										
3	Pipe 776	New	6224	325#				1.35	8402 40	3	
4	36" Reinforced Concrete Culv.										
5	Pipe 856	"	6848	4700#				1.83	12531 84	3	
6											
7								$	20934 24		
8											
9	Note:-										
10	Included in above are following:										
11	1 pc 24" R.C.Pipe included in Auburn Yard.										
12	2 " 24" RC. Pipe slightly damaged but suitable for end pieces										
13	1 " 36" " " " " " " " " "										
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											

3-5/16" - R. H. 10" C. TO C. OUTSIDE HOLES

684

Seattle, Washington,
November 11th, 1927.

NOV 14 1927
ST. PAUL

Re: Inventory of Auburn Concrete Plant. Reinforced Concrete Pipe, Oct. 31st, 1927.

1003-8

Mr. H.H.Stevens,
Chief Engineer,
St.Paul, Minn.

Dear Sir:

Please find attached herewith in duplicate, form 317-Inventory sheet covering reinforced concrete pipe on hand as of October 31st, 1927 at Auburn Concrete Plant, covering Northern Pacific Railway Co's stock.

Also, I am attaching herewith ARC Entry # 229 covering transfer of reinforced concrete pipe made during the year 1927, from D.A.S. # 10, to Material & Supplies.

Yours truly
(Signed) A.R. COOK

Cy to: M.F.Clements-St.Paul with form 317
S.H.Robson-So.Tacoma " " 317
C.E.Springer,Bldg. " " 317

ANB

N.P. 317
5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO. _____

LISTER'S SHEET NO. _____

ARITH. CHECKED _____
GEN. VERIFICATION _____
RECAP. _____
RECAP. CHECKED _____
RECAP VERIFIED _____

Manufactured Product on hand at Auburn Concrete Plant.

LISTED BY C. E. Springer
CALLED BY _____
LOCATION OF MATERIALS Auburn, Wash.
STORE, Oct. 31 192 7 DIVISION Seattle

	DESCRIPTION	NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1	Charged to M & S. Class #3		Lin.ft.								
2	24"RCP 576 pcs. 1926 product		4608	3255#				1.35	6220 80		
3	36"RCP 575 " " "		4600	6112#				1.83	8418 00		
4	30' RC Piles 18 pcs.		540	6600#				1.90	1026 00		
5	15' " " 2 "		30	3500#				1.90	57 00		
6	10' " 32 "		320	2100#				1.90	608 00		
7	Total charged to M & S Class #3								16329 80		
8											
9	Charged to Das. #10										
10	24" RC Pipe 582 pcs(1927 Prod)		4656					1.35	6285 60		
11	36" RC Pipe 388 " (1927 Prod)		3104					1.83	5680 32		
12	Total charged to Das. #10								11965 92		
13	11,965.92 Transferred to M & S in										
14	Nov. 1927 Accts. ARC Entry #229										
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											

3-3/16" - R. H. 10" C. TO C. OUTSIDE HOLES

Form 4189 10-28-25 2500 RP

NORTHERN PACIFIC RAILWAY COMPANY

684

OFFICE OF ENGINEER OF TESTS.

Report No. 387.

St. Paul, Minn., Laurel, June. 7. 1927. 19

To Mr. W. H. Farmer. Plant Supt. Auburn. Wash.

CONCRETE COMPRESSION SPECIMENS.

Sent in by W. H. F. Representing Work at Auburn Concrete Plant.

Test Request No. 182 On See below.

RESULTS OF COMPRESSION TESTS:

Test No.	Size	Area	Age	Mix	Maximum Load in Lbs.	Ultimate Strength Per Sq. In. in Lbs.
1	6 x 12	28.274	37 days.	1:2:4	71750	2537
2	"	"	37 days	"	80250	2838
3	"	"	37 days		69500	2458

REMARKS: No. 1. rep. concrete as poured for slabs for Br. 21 Idaho Div. No. 2 the same. No. 3. concrete blocks for for Br. 100-1 Seattle Div. Evidently three different batches, poured April 30th. rec'd in Laurel June 6th. Specimens made from Olympic cement, 1" gravel and evidence of texture very fine sand. Water ratio six gallons.

A. S. Glasgow, Jr.

Cy:-HES.-ARC.-LFC.-AFS.

Engineer of Tests.

Form 4189 10-28-25 2500 RP

NORTHERN PACIFIC RAILWAY COMPANY

OFFICE OF ENGINEER OF TESTS.

Report No. 386.

St. Paul, Minn., Laurel, June. 7. 1927 19

To Mr. W. H. Farmer, Plant Supt. Auburn, Wash.

CONCRETE COMPRESSION SPECIMENS.

Sent in by W. H. F. Representing Work at Auburn Concrete Plant.

Test Request No. 175 On Concrete slabs & pipe.

RESULTS OF COMPRESSION TESTS:

Test No.	Size	Area	Age	Mix	Maximum Load in Lbs.	Ultimate Strength Per Sq. In. in Lbs.
1	6 x 12	28.274	28 days	1:2:4.	58750	2077
2			60 days		97750	3457
3			90 days		97750	3457

REMARKS: Concrete poured Mch. 2. 1927. Olympic cement. Water ratio seven gallons. One inch gravel and down with fine sand.

A. Holmgren

Cy:-HES.-ARC.-MFC.-AFS.

Asst. Engr.

Engineer of Tests.

684

NORTHERN PACIFIC RAILWAY COMPANY

CEMENT REPORT

CEMENT TESTING LABORATORY

Spokane, Wash. ~~XXXXXXXXX~~ Laurel, May. 4. 1927. 19

Request No. 176.
Report No. 367.

Report of Test for Auburn Concrete Plant. Mr. W. H. Farmer. Supt.

Brand Olympic.

Car Initial and No. N.P. 27642 — Number of Bbls. ?

Received Mch. 29. 1927 — Briquettes Made March. 29. 1927

Specific Gravity — Fineness

Constancy of Volume — % Passing No. 100 Sieve

Accelerated Test — % Passing No. 200 Sieve 84.3

Boiling Test O. K. — Time of Setting: Hours Minutes

Hot Test — Initial 3.40

Normal Pat Test — Final 5.55

Air Pats — Per Cent of Water Used

28 Day Pats O. K. — Neat 23 % 1:3 10.3 %

TENSILE STRENGTH IN POUNDS PER SQUARE INCH AT THE AGE OF

TEST NO.	NEAT CEMENT			1 PART CEMENT, 3 PARTS SAND		
	24 Hours	7 Days	28 Days	3 Days	7 Days	28 Days
				232	287	330
363				227	305	325
MEAN				230	296	327
				230	294	327

Remarks: Cement O. K.

Cy:-HES.-ARC.-MFC.-AFS.

A. J. Holtzman
Asst. Engr.
Cement Inspector
XXXXXXXXXX

Form 4189 10-28-25 2500 RP

NORTHERN PACIFIC RAILWAY COMPANY

OFFICE OF ENGINEER OF TESTS.

6 84

Report No. 364.

St. Paul, Minn., Laurel, May. 4. 1927 19—

To Mr. W. H. Farmer, Supt. Auburn Concrete Plant.

CONCRETE COMPRESSION SPECIMENS.

Sent in by W. H. F. Representing Work at Auburn Concrete Plant

Test Request No. 173 On Pipes and slabs.

RESULTS OF COMPRESSION TESTS:

Test No.	Size	Area	Age	Mix	Maximum Load in Lbs.	Ultimate Strength Per Sq. In. in Lbs.
1a	6 x 12	28.274	28 days	1:2:4	68250	2414
b			60 days		97750	3457
c			90 days		115250	4077

REMARKS: Olympic cement, Sand and gravel from Auburn, rather fine sand, 1" and down gravel. Water ratio 7 gallons.

Cy:-NPE.-ARC.-NPC.-AFS.

A. J. Atkinson

Engineer of Tests.

684

Saint Paul, April 26, 1927.

Mr. A. R. Cook:

Your letter of the 23rd about reinforcing rods in stock at Auburn:

I do not think we should turn these rods over to Mr. Dillon at less than a fair price; on the other hand, if he can use cheaper material in his work he ought not to be penalized by being required to provide a higher quality of material.

I think, therefore, you had better ship the rods in to South Tacoma and turn them over to the Store Department for applying on current requisitions. You should furnish Mr. Clements with a copy of the inventory so that we may fit our designs into the stock available so far as possible.

H. E. STEVENS,
Chief Engineer.

cc Mr. M. F. Clements

684

MFC

Saint Paul, April 27, 1927

Mr. H. E. Stevens:

Referring to your notation on Mr. Cook's letter of April 23rd in regard to reinforcing rods at the Auburn Concrete Plant.

In order to avoid any difficulty with Mr. Dillon, it seems to me advisable to ship these rods to South Tacoma and turn them over to the Store Department. We have been shipping rods from this point when required on special work and we can continue to do so by shipping from South Tacoma.

Mr. Cook's letter returned herewith.

Bridge Engineer.

Encl.

Form 4189 10-28-25 2500 RP

NORTHERN PACIFIC RAILWAY COMPANY

OFFICE OF ENGINEER OF TESTS.

684

Report No. 356.

St. Paul, Minn., Laurel, Apr. 19. 1927 19

To Mr. W. H. Farmer. Supt. Auburn Concrete Plant.

CONCRETE COMPRESSION SPECIMENS.

Sent in by W. H. F. Representing Work at Auburn Concrete Plant.

Test Request No. 171 On Concrete pipe.

RESULTS OF COMPRESSION TESTS:

Test No.	Size	Area	Age	Mix	Maximum Load in Lbs.	Ultimate Strength Per Sq. In. in Lbs.
1 a	6 x 12	28.274	28 days	1:2:4.	62500	2210
b			60 days		98750	3492
c			90 days		114000	4032

REMARKS: Pipes cast Jan. 12th. 1927. Olympic cement. 1" gravel and down, fine sand, water ratio 7 gal. pr. sax.cem.

A. D. Holmgren

Cy:-HFS.-ARC.-HFC.-AFS.

Asst. Engr.

Engineer of Tests.

NORTHERN PACIFIC RAILWAY COMPANY

CEMENT REPORT

CEMENT TESTING LABORATORY

Spokane, Wash. Laurel, Apr. 20. 1927. 19

Request No. 174.

Report No. 361.

Report of Test for Auburn Concrete Plant. Mr. W. H. Farmer. Supt.

Brand Olympic.

Car Initial and No. N.P. 47877 — Number of Bbls. ?

Received Mch. 20. 1927. — Briquettes Made Mch. 21. 1927.

Specific Gravity — Fineness

Constancy of Volume — % Passing No. 100 Sieve

Accelerated Test — % Passing No. 200 Sieve 82.9

Boiling Test O. K. — Time of Setting: Hours — Minutes

Hot Test — Initial 3.50

Normal Pat Test — Final 6.25

Air Pats — Per Cent of Water Used

28 Day Pats O. K. — Neat 23 % 1:3 10.3 %

TENSILE STRENGTH IN POUNDS PER SQUARE INCH AT THE AGE OF

TEST NO.	NEAT CEMENT			1 PART CEMENT, 3 PARTS SAND		
	24 Hours	7 Days	28 Days	3 Days	7 Days	28 Days
				240	275	397
362				245	287	420
				240	260	405
MEAN				242	281	407

Remarks:

Cement O. K.

Cy:-MEE.-ARC.-MFC.-AFS.

A. Holmes
Asst. Engr.
Cement Inspector

Re: Reinforcing rods for concrete slabs for Idaho Division bridges.

689

Seattle, Wash.,
March 30, 1927.

1003-30

Mr. M. F. Clements,
Bridge Engineer,
Saint Paul, Minn.

The reinforcing rods for the Idaho Division bridge slabs were received yesterday. I will arrange with the Dillon Concrete Company to make the slabs under the contract which we have with that Company covering the lease of the Auburn Gravel Pit.

A. R. Cook

ARC:L

689

RRB

Saint Paul, March 12, 1927

Mr. E. N. Hull,
Supervisor,
Pasco, Wash.

Dear Sir:-

Referring to your letter of March ninth relative to reinforcing rods ordered on requisition BD-18, ED-230.

My letter of the seventh takes care of the 1-1/4" and 1-1/8" and 1/2" rods mentioned in your letter.

There should be 72 - 1-1/8" x 15'-6" rods instead of 36 as mentioned in your letter and only 80 - 1/2"ø x 4'-2" rods instead of 306. The high ballast stop is only for the slab on the outside of the curve at Bridge 107-2.

It will not be necessary to use the galvanized iron pipe unless you prefer. Instead of using galvanized iron pipe, the usual method of making holes is to use a tapering wood plug, turning it occasionally while the concrete is setting so that it may be removed.

We have not made requisition for the other material you mention and you should order it.

Yours truly,

Bridge Engineer.

Concrete slabs:

Pasco, washington
March 9th, 1927.

Mr. M. F. Clements
Bridge Engineer
St. Paul, Minn.

Dear Sir:-

I have the copy of your letter of March 5 to Mr. Myers relative to re-inforcing rods ordered on requisition BD-18, ED-230:

I am also in receipt of letter from Mr. A. R. Cook stating that Drawing No. 151025 had been revised to provide 4 additional rods, 1-1/8" x 15'4" long to be placed in the top of the slab. I will require 36 of these rods at Pasco.

In addition to these I find that your letter makes no mention of the following which will be required:

36 pcs 1-1/4" rods 6'9" bent as detailed (for stirups) cook
36 " 2" galv. pipe 1'11-1/2" omit
36 Lbs No. 16 annealed wire
50 Gals. Heavy asphalt paint
8 Rolls tarred felt paper
230 Bbls. Portland cement

80 306 Pcs 1/2" re-inforcing rods, 4'2", bent as per detail, for high ballast stop (On hand at Brainerd)

Please advise if any part of the above has already been ordered, or if I shall submit requisition.

Yours truly,

E. H. Hees

Supervisor

copy E. J. Myers

Re: Rods for use at Brgs.
77 and 107-2, Pasco Divn.

6

Seattle, Wash.,
March 12, 1927.

Mr. L. F. Newton,
Superintendent,
Pasco, Washington.

As per Mr. Clement's letter of March 5, there was shipped from Auburn Concrete Plant on March 11, consigned to the Northern Pacific, care of E. N. Hull, Supervisor, Pasco, Washington, in N.P. car #66378 -

72 pcs. 1-1/8" round rods 15' 4" long

36 pcs. 1-1/4" round rods 6' 9" long

These for use in constructing slabs for bridges 77 and 107-2.

(Signed) A.R. COOK

MJW:c

cc - MFC
EMH

689

MFC

Saint Paul, March 5, 1927

Mr. A. R. Cook,
Asst. Chief Engineer,
Seattle, Washington.

Dear Sir:-

I have changed our requisition for reinforcing rods, shipping to Pasco the rods required for Pasco Division slabs and shipping to Auburn the rods required for Idaho and Seattle Divisions.

Mr. Hull will require the following rods from Auburn Plant:

72 Straight round deformed bars 15'-6"
36-1¼" round plain rods 6'-9"
bent as shown on sheet 151025, or if straight rods are in stock, ship unbent.

Yours truly,

Bridge Engineer.

RRB

Saint Paul, March 5, 1927

Mr. E. J. Myers:

Will you please arrange to have rods on requisition BD-18, ED-230 shipped as follows:

To A. R. Cook, Assistant Chief Engineer at Auburn, Wash. (Concrete Plant) the following:

1.	72	- 7/8"ø	16'-6"
2.	168	"	15'-6"
3.	84	"	13'-6"
4.	60	1/2"ø	15'-6"
5.	192	"	6'-9"
6.	24	"	13'-0"
7.	528	"	4'-0"

To E. N. Hull, Supervisor at Pasco, Washington, the following:

1.	108	- 7/8"ø	16'-6"
2.	252	"	15'-6"
3.	126	"	13'-6"
4.	90	1/2"ø	15'-6"
5.	288	"	6'-9"
6.	36	"	13'-0"
7.	792	"	4'-0"

Bridge Engineer.

Cy-Mr.A.R.C.
Mr.E.N.Hull

N. P. 1386
12-24
107 PA SX

TELEGRAM—BE BRIEF

TIME FILED 9 M.

Pasco 2/28/27

M F Clements

St Paul

Estimates for AFE 152-27 Bridge 77 and 245-27 bridge 107-2, First district provide that slabs are to be made at Auburn. I should like to make these at Pasco Slabs for this division for seasons 1925 and 1926 were made here at less final cost than those obtained from Auburn. This plant is fully equipped and in good considition Half the investment cost is already charged in slabs made, Am writing you today, Please advise B-281

E N Huhl

924 pm

684

MFC

Saint Paul, February 19, 1927

Mr. A. R. Cook,
Asst. Chief Engineer,
Seattle, Washington.

Dear Sir:-

Referring to your letter of February 15th in regard to concrete piling for bridge work.

After checking over the list of piling required for reinforced concrete trestles I find that we will have sufficient to take care of 1927 work provided the ten foot piles you have on hand will be suitable for Bridge 4-1, First District, Seattle Division. We will, however, require 30 slabs 7' x 16' for the bridges on the Idaho and Pasco Divisions and will use the present 6½' x 16' slabs which you have on hand, at Bridge 4-1, Seattle Division.

I will make requisition for the rods to be used in the manufacture of the 30 slabs. These slabs will not be required until the middle of the summer so that you will have ample time to get them out.

The slabs for Bridges 12 and 13, First District, Montana Division, will be furnished from the Darling plant.

Yours truly,

Bridge Engineer.

Re: Concrete piling for
bridge work.

Seattle, Wash.,
February 15, 1927

1003-8

M. F. Clements,
Bridge Engineer,
Saint Paul, Minn.

Referring to your telegram A-15 of even date, in reply to my L-9 of yesterday, in re concrete piles for Bridges 12 and 13, First District, Montana Division.

I trust that you will not find it necessary for us to manufacture any additional piling at Auburn, Wash. I was figuring that possibly, if satisfactory to everyone, we would be able to turn the plant over to the Dillon Concrete Company about April 1.

Survey has been made and inventory taken and draft of lease prepared and now in the hands of Mr. Dillon for approval, he to let me know next Friday what changes, if any, he wishes to make in the draft of lease.

The lease will provide that the Dillon Company will manufacture for us concrete products at actual cost plus 10%, not including overhead.

After filling your order for Bridge 12 and substituting one 15-ft. pile for one 19-ft., we will have in stock 18 piles 30 ft. long; two piles 15 ft. long and 32 piles 10 ft. long.

I note what you have to say regarding the 1 1/8" rods and will await further advice. I would suggest, however, that if we are to make any considerable number of slabs that reinforcing be ordered immediately.

Referring to my suggestion that order be placed with Pacific Coast Steel Company in Seattle, I now assume that reinforcing rods manufactured at that plant will not be satisfactory, therefore suggest that you make the necessary requisition and send me copy of same.

ARC:L

A. R. Cook

N. P. 1386 12-24

TELEGRAM—BE BRIEF

M.

FEB 15 1927 ST PAUL, MINN.

234cfe

Seattle Feb 14 1927 M F Clements

St Paul

In re your requisitions bridge department twelve and thirteen we have only nineteen of the twenty foot piles at Auburn could ship one additional fifteen foot or one thirty foot pile in place of one of the twenty foot piles short please advise L-9

A R Cook

538pm

N. P. 1386 12-24

TELEGRAM—BE BRIEF

TIME FILED 684 M.

MFC

Saint Paul, Feb 15, 1927

A R Cook
Seattle Wash

L-8 Cannot use 1-1/8 inch reinforcing rods in slabs. These rods were purchased during the war from Great Northern Railway and are made of rerolled scrap material. They are O K for piles but not slabs. You should make requisition for new slab rods required. Suggest you defer this until you have all requisitions for 1927 work which will probably be in next three or four weeks. A-14

M F CLEMENTS

N. P. 1386 12-24

TELEGRAM—BE BRIEF

TIME FILED M.

168cfe

Seattle Feb 14 1927

M F Clemente

FEB 19 1927 Paul MINN

Find on looking over inventory of reinforcing material at Auburn that we have no seven eighths and one half inch reinforcing rods

would it be too much trouble to revise slab plans to use one and one eighth inch rods which we have carried in stock for ten years

in place of seven eighths rods using three eighths in place of one half inch if you cannot so arrange it will be necessary to

place reqns for rods conforming to your plan recommend that these requisitions be placed with Pacific Coast Steel Co in Seattle to

secure early delivery Please advise L-8

A R Cook

338pm

N. P. 1386 12-24

TELEGRAM—BE BRIEF

TIME FILED 684 M.

MFC

Saint Paul Feb 15 1927

A R Cook
Seattle Wash

L-9 Suggest you substitute one 15 foot pile for one 20 foot Bridges 12 and 13. You will probably have additional requisitions for piles. A-15

M F CLEMENTS

684

Re: Broken slabs at Auburn
Concrete Plant.

Seattle, Wash.,
February 25, 1927.

1003-8

Mr. M. F. Clements,
Bridge Engineer,
Saint Paul, Minn.

Replying to your letter of February 21, referring to my letter of February 17, regarding broken slabs at Auburn Concrete Plant.

We have had, so far as I have any knowledge, only two broken slabs, and in each case the slabs have been set out in such a way as to put the top of the slab in tension, the main support being at the center on the under side of the slab.

A. P. Cook

ARC:L

Ref. SD ED 1-27

1⅛" x 15-4" for 1922 slabs auburn

noted RBB

Form 4189 10-28-25 2500 RP

NORTHERN PACIFIC RAILWAY COMPANY

684

OFFICE OF ENGINEER OF TESTS.

Report No. 347.

St. Paul, Minn., 19—

To xxxxxxxxx Laurel, Mch. 31. 1927.

Mr. W. H. Farmer. Supt. Auburn Concrete Plant.

CONCRETE COMPRESSION SPECIMENS.

Sent in by W. H. F. Representing Work at Auburn Concrete Plant

Test Request No. 175 On Concrete slabs and Pipe.

RESULTS OF COMPRESSION TESTS.

Test No.	Size	Area	Age	Mix	Maximum Load in Lbs.	Ultimate Strength Per Sq. In. in Lbs.
1	6 x 12	28.274	28 days	1:2:4	58750	2077

REMARKS:

Concrete poured Mch. 2. 1927. Olympic cement, Water ratio seven gallons, one inch gravel and down with fine sand. (Evidently pit run, shows excess sand.)

Cy:-HES.-ARC.-MTC.-AFS.

Engineer of Tests.

xxxxxxxxxx

Form 4189 10-28-25 2500 RP

NORTHERN PACIFIC RAILWAY COMPANY

OFFICE OF ENGINEER OF TESTS.

Report No. 348.

St. Paul, Minn., Laurel, Mch. 31. 1926

To Mr. W. H. Farmer. Supt. Auburn Concrete Plant.

CONCRETE COMPRESSION SPECIMENS.

Sent in by W. H. F. Representing Work at Auburn Concrete Plant.

Test Request No. 167. On ?/

RESULTS OF COMPRESSION TESTS:

Test No.	Size	Area	Age	Mix	Maximum Load in Lbs.	Ultimate Strength Per Sq. In. in Lbs.
1	6 x 12,	28.274	28 days	1:2:4.	70250	2483
			60 days		111750	3952
			90 days		105500	3731

REMARKS: Concrete poured Dec. 29. 1925
Olympic cement, Water ratio 4½ gallons.
Fine sand and gravel 1" down.

Cy:-HES.-ARC.-MFC.-AFS.

Engineer of Tests.

NORTHERN PACIFIC RAILWAY COMPANY

CEMENT REPORT

CEMENT TESTING LABORATORY

Spokane, Wash. Laurel, Mch. 31. 1927. 19

Request No. 172.

Report No. 353.

Report of Test for Auburn Concrete Plant. Mr. W. H. Farmer. Supt.

Brand Olympic.

Car Initial and No. N. P. 17657 — Number of Bbls. ?

Received Mch. 1. 1927. — Briquettes Made Mch. 1. 1927.

Specific Gravity — Fineness

Constancy of Volume — % Passing No. 100 Sieve

Accelerated Test — % Passing No. 200 Sieve 87.0

Boiling Test O. K. — Time of Setting: Hours Minutes

Hot Test — Initial 2.35

Normal Pat Test — Final 5.45

Air Pats — Per Cent of Water Used

28 Day Pats O. K. — Neat % 1:3 %

TENSILE STRENGTH IN POUNDS PER SQUARE INCH AT THE AGE OF

TEST NO.	NEAT CEMENT			1 PART CEMENT, 3 PARTS SAND		
	24 Hours	7 Days	28 Days	3 Days	7 Days	28 Days
				242	260	340
360				245	275	337
				240	265	335
MEAN				242	260	337

Remarks: Cement O. K.

Cy:-HEC.-ARC.-HPC.-APC.

A. J. Klingen.

Cement Inspector

NORTHERN PACIFIC RAILWAY COMPANY

CEMENT REPORT

CEMENT TESTING LABORATORY

Spokane, Wash. xxxxxxxxxx Laurel, Mon. 31.1927. 19___

Request No. 172.

Report No. 354.

Report of Test for Auburn Concrete Plant. Mr. W. A. Farmer. Supt.

Brand Olympic.

Car Initial and No. N. P. 41719 Number of Bbls. 7

Received Mch. 1. 1927. Briquettes Made March. 1. 1927.

Specific Gravity ____ Fineness ____

Constancy of Volume ____ % Passing No. 100 Sieve ____

Accelerated Test ____ % Passing No. 200 Sieve 87.2

Boiling Test O. K. Time of Setting: Hours ____ Minutes ____

Hot Test ____ Initial 3.20

Normal Pat Test ____ Final 5.40

Air Pats ____ Per Cent of Water Used ____

28 Day Pats O. K. Neat 23 % 1:3 10.3 %

TENSILE STRENGTH IN POUNDS PER SQUARE INCH AT THE AGE OF

TEST NO.	NEAT CEMENT			1 PART CEMENT, 3 PARTS SAND		
	24 Hours	7 Days	28 Days	3 Days	7 Days	28 Days
				240	280	390
361				240	265	377
				240	265	385
MEAN				240	267	384

Remarks:

Cement O. K.

Cy:-HES.-ARC.-MFC.-AFS.

A. Johnson.

Cement Inspector

xxxxxxxxxx

N. P. 1386 12-24
148 cf x

TELEGRAM—BE BRIEF

TIME FILED 684 M.

Seattle Mar 10 1927

RRBrockway

St Paul

MAR 10 1927 ST. PAUL, MINN.

Have Beach ship thirty six paper molds for concrete testing purposes to A R Cook Seattle

MFClements

231p

Phoned message to Beach 3/11/27.

684

MFC

Saint Paul, March 19, 1927.

Mr. H. E. Stevens:

Referring to your notation on Mr. Kyle's letter of March 18th in regard to concrete products manufactured at Darling and Auburn in 1926.

I attach two copies of a statement showing the concrete products manufactured by Foley Brothers, amounting to $20,063 and a statement of concrete pipe and slabs manufactured at Auburn, amounting to $11,157.

Mr. Kyle's letter returned herewith.

Bridge Engineer.

Encl.

N O R T H E R N P A C I F I C R A I L W A Y C O M P A N Y

S T A T E M E N T

Showing the Concrete Products manufactured at
Darling Concrete Plant by Foley Brothers,
Contractors during the
Season 1926.

24" Reinforced Concrete Pipe	1928'	at $ 2.70		$ 5,205.60
36" " " "	504'	" 3.40		1,713.60
48" " " "	368'	" 5.15		1,895.20
Reinforced Concrete Cattle Troughs	80	" 21.00		1,680.00
" " Hog "	28	" 13.00		364.00
" " Chimneys	3	" 10.50		31.50
" " Bridge Slabs	40	" 150.00		6,000.00
Concrete Building Blocks 8x8-16	3465	" .10		346.50
" " " 8x12-16	2968	" .14		415.52
Concrete Sidewalk Tile 12x18-2	220	" .25		55.00
Reinforced Concrete Piles	1570'	" 1.50		2,355.00
		Total:-		$20,062.92

Office of Bridge Engineer,
Saint Paul, March 19, 1927.

NORTHERN PACIFIC RAILWAY COMPANY

STATEMENT

Showing the Concrete Products manufactured at Auburn Concrete Plant by Company Forces during The Season 1926.

24" Concrete Pipe	3132'	at $2.30	$ 7,204
36" " "	804'	at 3.30	2,653
16' Concrete Bridge Slabs	10	at $130.00	1,300
		Total:-	$11,157

Office of Bridge Engineer,
Saint Paul, March 19, 1927.

Statement
showing the
Concrete products manufactured at Auburn
Concrete plant by Company Forces
Season 1926

24" Concrete Pipe	3132'	@ $2.30	7204
36" " "	804	@ 3.30	2653
16' Concrete Bridge Slabs	10	@ 130	1300
			11157

Statement showing the manufactured

CONCRETE PRODUCTS ~~PRODUCED~~ AT DARLING CONCRETE PLANT
BY
FOLEY BROTHERS CONTRACTORS
SEASON
1926

24" reinforced concrete pipe	1928'	@ 2.70	5205.60
36" " " "	504'	3.40	1713.60
48" " " "	368'	5.15	1895.20
Reinforced concrete cattle troughs	80	21.00	1680.00
" " " hog "	28	13.00	364.00
" " chimneys	3	10.50	31.50
" " Bridge slabs	40	150.00	6000.00
Concrete building blocks 8x8-16	3465	.10	346.50
" " " 8x12-16	2968	.14	415.52
Concrete sidewalk tile 18x18-2	220	.25	55.00
Reinforced concrete piles	1570'	1.50	2355.00
Extra bill C-1 Lintels & Sills			~~20062.92~~ 20220.50
" " C-2 " "			60.97
			~~20343.39~~ 20062.92

20343.39
281.47
20061.92

Office of Chief Engineer
March 19, 1927.

684

Minneapolis, Minn., March 11th, 1927.

Mr. A. R. Cook,

Asst. Chief Engineer,

Seattle, Wash.

Dear Sir:

As per instructions from Mr. Clements I am shipping to you today by express 36 paper molds for making concrete test cylinders.

Yours truly,

MWB/FS

Assistant Engineer

cc-M.F.Clements.

684

M-F Clements

Auburn Concrete Plant.

June 1-1926 - Oct. 31-1926

M. F. Clemans

AUBURN CONCRETE PLANT

REPORT OF OPERATION

JUNE 1, 1926 TO

OCT. 31, 1926

OFFICE OF ASST. CHIEF ENGR.
SEATTLE, WASHINGTON,
OCTOBER 31, 1926.

AUBURN CONCRETE PLANT

SUMMARY OF COST OF OPERATION 6/1/26 to 10/31/1926.

			Debit	Credit
Auditor's Balance 1/1/1926				$4500.45
Inventory 1/1/1926				
Raw Material (Reinforcing)	3062.29			
Supplies	54.68			
Tools	171.86		$3288.83	
1926 Product shipped out and credited to DAS #10				
311 Pcs. 24" RCP 2488 lin.ft. 1.90		4727.20		
47 Pcs. 36" RCP 376 " " 2.80		1052.80		5780.00
1926 Product on hand 10/31/26 Charged to M&S Class #3 and credited to DAS #10 (on ARC #210 Nov. a/c)				
571 Pcs. 24" RCP 4568 lin.ft. 1.50		6852.00		
525 " 36" " 4200 " " 2.00		8400.00		15252.00
1926 Book a/c (exclusive of above)			23718.96	720.41
Inventory 10/31/1926				
Reinforcing	5194.91			
Mesh	1194.02			
Wire	45.76			
Cement & empty sacks	1570.66	8005.35		
Tools		234.97		
Supplies		209.69		8450.01
Balance 10/31/1926			7695.08	
			$ 34,702.87	$ 34,702.87

Office of Asst. Chief Engr.
Seattle, Washington.
October 31, 1926.

AUBURN CONCRETE PLANT

PRODUCT SOLD 1/1/1926 to 10/31/1926. From stock made prior to 1926.

Credited to M & S Cl. #3

Concrete Piles

3 - 30' piles	90	lin.ft.	1.90	$171.00	
62- 25' "	1550	"	1.90	2945.00	
14 - 20' "	280	"	1.90	532.00	
14 - 15' "	210	"	1.90	399.00	
10 - 10' "	100	"	1.90	190.00	
					$4237.00

Concrete Pipe

6 pcs. 24" RCP	48	lin.ft.	1.90	91.20	$4328.20

1926 Product sold 6/1/1926 to 10/31/1926

Credited to DAS #10 Auburn Concrete Plant

Operation a/c

Concrete Pipe

311 pcs. 24" RCP	2488	lin.ft.	1.90	$4727.20		
47 " 36" "	376	"	"	2.80	1052.80	$5780.00

Concrete Pipe on hand 10/31/26. Charged to M & S Cl. #3 and credited to DAS #10 (ARC #210 November account)

571 pcs. 24" RCP	4568	lin.ft.	1.50	6852.00		
525 " 36" "	4200	"	"	2.00	8400.00	$15252.00

Statement of output 6/1/26 to 10/31/1926.

	RCP		Piles					Slabs
	24"	36"	30'	25'	20'	15'	10'	Double Tr.
On hand 1/1/26	6	-	21	62	33	37	42	10
Made 1926	882	572	--	-	-	-	-	-
Shipped 1926	317	47	3	62	14	14	10	-
On hand 10/31 1926	571	525	18	-	19	23	32	10

Office of Asst. Chief Engr.,
Seattle, Washington,
October 31, 1926.

AUBURN CONCRETE PLANT

Inventory Manufactured Product on hand Oct. 31, 1926.

1926 Product charged to M&S Class #3 and credited to DAS #10 (ARC #210, November account)

	No.pcs.	lin.ft.	Price		Amount
24" RC Pipe	571	4568	1.50	$6852.00	
36" " "	525	4200	2.00	8400.00	
					$15,252.00

Product made prior to 1926.

Charged to M&S Cl. #3 (ARC S-580 and S-76)

Concrete Piles	No.Pcs.	Lin.ft.	Price		
30' Piles	18	540	1.90	$1026.00	
20' "	19	380	1.90	722.00	
15' "	23	345	1.90	655.50	
10' "	32	320	1.90	608.00	
D.T. Slabs	10	-	130.00	1300.00	
Concrete fence posts	5			No charge	
Concrete Pile end	26			No charge	$ 4311.50
					$19563.50

Office of Asst. Chief Engr.,
Seattle, Washington,
October 31, 1926.

AUBURN CONCRETE PLANT
Inventory Oct. 31, 1926.

Reinforcing rods

	Lin.ft.	Unit Wt.	Weight	Price per Cwt.	Amount	
1-1/8" Rod	1327'-2"	3.38	4486	3.7511	168.27	
" "	18580'-8"	"	62802	3.12	1959.42	
1-1/4" "	4179'-3"	4.173	17440	2.94	512.73	
1" Sqr.	8'-6"	3.4	29	2.09	.61	
Pile Plates 2-1/8"x1/8"x15-3/4" 2 hole 1.25 ea.			6836	5.13	350.68	2991.71
3/8" Rod	44136'-4"	0.38	16772	2.91438	488.80	
1/4" "			300	2.8469	8.54	497.34

Reinforcing rods ARC #201

3/8" Rod	155409'-10"	0.38	59055	2.7134	1602.39	
1/4" "	18000'	0.17333	3120	3.3164	103.47	1705.86

Total reinforcing	5194.91
Mesh	1194.02
Wire	45.76
Cement and empty sacks	1570.66
Tools	234.97
Supplies	209.69
	8450.01

Office of Asst. Chief Engr.,
Seattle, Washington,
October 31, 1926.

AUBURN CONCRETE PLANT

COST OF MANUFACTURING PIPE, PER LINEAL FOOT
JUNE 1, 1926 to OCT. 31, 1926
INCLUSIVE.

		24" RCP 882 pcs. 7056 lin.ft.		36" RCP 572 pcs. 4576 linft.
	Rate	Cost per lin.ft.	Rate	Cost per lin.ft.
Screening Sand & Gravel	.54175 cy	.060194	.54175 cy.	.090332
Cement	2.249428 bbl.	.386621	2.249428 bbl.	.502355
Rods	2.916283 cwt.	.093506	2.911041 cwt.	.132797
Wire	3.5891 "	.003086	3.5891 "	.003085
Mesh	0.029495 sq.ft.	.230082	0.029495 sq.ft.	.306009
Labor		.316288		.367961
General Expense		.143862		.207725
Repairs		.112364		.162246
Total Manufacturers cost		$1.346003		$1.832510

Office of Asst. Chief Engr.,
Seattle, Washington.
October 31, 1926.

AUBURN CONCRETE PLANT

SUMMARY OF OPERATION JUNE 1, 1926 to OCT. 31, 1926
INCLUSIVE

	24" RCP 882 pcs. 7056 lin.ft. Cost	36" RCP 572 pcs. 4576 lin.ft. Cost	Total Cost
Screening Sand & Gravel	424.73	413.36	838.09
Cement	2728.00	2573.34	5301.34
Rods	659.78	607.68	1267.46
Wire	21.78	14.11	35.89
Mesh	1623.46	1400.30	3023.76
Labor	2231.72	1683.79	3915.51
General Expense	1015.09	950.55	1965.64
Repairs	792.84	742.44	1535.28
Total Manufacturers Cost	$9497.40	$8385.57	$17882.97

Office of Asst. Chief Engr.,
Seattle, Washington,
October 31, 1926.

MFC

684

Saint Paul, March 2nd., 1927

Mr. A. R. Cook:

I hand you herewith five copies of drawing 151025 concrete slabs. I have shown an addition of 4 rods in the top of the slab to prevent breakage. These rods are now in stock at Auburn and this is a good place to use them. Any slabs you manufacture this year should be provided with the additional rods.

Bridge Engineer.

2-¼" R. H. 2¾" C. TOC.

684

N.P. 7233-B.
6-24

Seattle, Wn. 2-23-27 19

DEPARTMENT INVOICE

FROM Engineering Dept. DEPARTMENT DIVISION TO Montana Div. DEPARTMENT DIVISION

MONTH OF February 1927 19 DEPT. NO. F-6-47 FILE NO.

DESCRIPTION			
For: Value of reinforced concrete piles shipped to your Division from Auburn Concrete plant Feb 21st, 1927 in car NP 62490 to apply on Reqn # BD-12 BD 193 Order ARC 3852 for use in connection with the following AFE:-			
AFE 149-27 BD 32-27 Montanan Div. 3rd Dist. Bridge # 12. (12)			
11 Concrete piles 15' long	165 LF	1.90LF	313.50
9 " " 20' "	180 LF	1.90LF	342.00
			655.50
Cy to M.F.Clements-St.Paul			
C.E.S.			

DISTRIBUTION

DEBIT		CREDIT	
		Div. Accts.. Engr. Dept. M & S.	655.50
		Class # 3	655.50

INSTRUCTIONS:—THIS FORM IS TO BE USED IN TRANSFERRING MISCELLANEOUS CHARGES FROM ONE DEPARTMENT TO ANOTHER. A COPY OF THE INVOICE MUST BE RETAINED BY THE DEPARTMENT MAKING IT.

ANB

CORRECT: A.D.A.
(TITLE)

2-1/4" R. H. 2 3/4" C. TOC.

NP. 7233-B.
6-24

Seattle, Wn. 2-23-27 19

DEPARTMENT INVOICE

FROM Engineering Dept. DEPARTMENT DIVISION TO Montana Div. DEPARTMENT DIVISION

MONTH OF February 1927 19 DEPT. NO. E-6-46 FILE NO.

DESCRIPTION					
For: Value of reinforced concrete piles shipped to your Division from Auburn Concrete Plant, Feb. 21st, 1927, in car NP 68786 to apply on Reqn BD 13 ED 194, ARC Order 3853 for use in connection with following AFE on your Division:-					
AFE ED 32-27 Montana Div. 3rd District:- Bridge # 13.					
10 Pcs Concrete piles	15' long	150 LF	1.90 LF	285.00	
10 " " "	20' "	200. LF	1.90 "	380.00	665.00
Cy to M.F.Clements-St.Paul C.E.S.					

DISTRIBUTION

DEBIT			CREDIT		
			Div. Accts., Engr. Dept. M & S.		665.00
			Class # 3	665.00	

INSTRUCTIONS:—THIS FORM IS TO BE USED IN TRANSFERRING MISCELLANEOUS CHARGES FROM ONE DEPARTMENT TO ANOTHER. A COPY OF THE INVOICE MUST BE RETAINED BY THE DEPARTMENT MAKING IT.

ANR

CORRECT: A.D.A.

(TITLE)

Re: Annual inventory of
Auburn Concrete Plant.

684
684

Seattle, Wash.,
January 21, 1927

Mr. H. E. Stevens,
Chief Engineer,
St. Paul, Minn.

Enclose herewith annual inventory of manufactured product, raw material, tools and supplies on hand, Auburn Concrete Plant, December 31, 1926,

CES:c

cc / MFC
~~EJM~~
~~SHR~~

(Signed) A. R. COOK

Broadway
Keep these tools in mind in making reqns
1/27
Copy of tools taken off RRB 1/27

N.P. 317
5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO.
LISTER'S SHEET NO. 1

ARITHMETIC
ARITH. CHECKED
GEN. VERIFICATION
RECAP.
RECAP. CHECKED
RECAP VERIFIED

Manufactured Product on hand at Auburn Concrete Plant, charged to M & S Class #3.

LISTED BY C. E. Springer
CALLED BY
LOCATION OF MATERIALS Auburn, Wn.
STORE, December 31 1926 DIVISION Seattle

	DESCRIPTION	NEW OR S. H.	QUANTITY OR NUMBER	UNIT Wt.	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
			Lin.Ft.								
1	24" RCP 948 pcs.(1926 Product)		7584	3255#				1.35	$ 10238.40		
2	36" " 764 " " "		6112	4700#				1.83	11184.96		
3	30' RC Piles 18 pcs.		540	6600#				1.90	1026.00		
4	20' " " 19 "		380	4300#				1.90	722.00		
5	15' " " 23 "		345	3500#				1.90	655.50		
6	10' " " 32 "		320	2100#				1.90	608.00		
7	Double track slabs 10 pcs 6'6"x15'11"			30900#				130.00	1300.00		
8	Concrete Pile end 26 pcs.								No Chg.		
9									$25734.86		
10											
11	**Note:**										
12	RC Pipe charged to M&S Class #3										
13	on ARC #11 and adjustment on										
14	ARC #10 are included above.										
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											

3-5/16" - R. H. 10" C. TO C. OUTSIDE HOLES

N.P. 317 5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO.

LISTER'S SHEET NO. 1

ARI[illegible]IC
ARITH. CHECKED
GEN. VERIFICATION
RECAP.
RECAP. CHECKED
RECAP VERIFIED

Raw Material charged to DAS #10

Auburn Concrete Plant

LISTED BY C. E. Springer

CALLED BY W.H. Farmer

LOCATION OF MATERIALS Auburn, Wn.

STORE. December 31, 192 6 DIVISION Seattle

	DESCRIPTION	NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1	Reinforcing Rods Size Length No.Pcs.		Lin.ft.		per ft.		per cwt.				
2	1-1/8 rd. 48'-10" 11		537'2"		3.38		1816	3.7511	68.12		
3	" " 19'- 9" 22		434'-6"		"		1469		55.10		
4	" " 29'-0" 13		377		"		1274	3.12	39.75		
5	" " 28'-4" 3		85		"		287	"	8.95		
6	" " 24'-4" 355		8638'-4"		"		29198		910.98		
7	" " 20' 124		2480'		"		8383		261.55		
8	" " 19' 58		1102		"		3725		116.22		
9	" " 15'4" 339		5198		"		17569		548.15		
10	" " 5'-6" 2		11		"		37		1.15		
11	" " 3'-6" 11		38'-6"		"		130		4.06		
12	" " 3'-0" 2		6'		"		20		.62		
13	" " 2'-6" 12		30'				101		3.15		
14			18937'6"				64009		$2017.80		
15											
16	1½ rd. plain 33'-9" 115		3881'-3"								
17	" " " 27'-2" 6		163								
18			4044'-3"		4.173		16876	$ 2.94	$ 496.15		
19											
20	1" sq. 2'-10" 3		8'-6"		3.4		29	2.09	.61		
21											
22	Forward						80914		$2514.56		
23											
24											
25											
26											
27											

3-3/16" - R. H. 10" C. TO C. OUTSIDE HOLES

N.P. 317 5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO.

LISTER'S SHEET NO. 2

ARITHMETIC
ARITH. CHECKED
GEN. VERIFICATION
RECAP.
RECAP. CHECKED
RECAP VERIFIED

Raw material charged to DAS #10
Auburn Concrete Plant

LISTED BY C. E. Springer
CALLED BY W. H. Farmer
LOCATION OF MATERIALS Auburn, Wn.
STORE, December 31 192 6 DIVISION Seattle

	DESCRIPTION		NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1	Size	Lin.ft. No.pcs.		lin.ft.	Wt.per ft.				per cwt.			
		Forward						80914		2514.56		
2	3/8" Rd.	31'-4" 1457		45652'	8"							
3	" "	30' 835		25050'								
4	" "	26'-8" 241		6426'								
5	" "	21'-4" 1209		25792'								
6	" "	13'-4" 52		693'	-4"							
7	" "	10'-8" 1170		12480'								
8	" "	7'-10" 3811		29852'	-10"							
9	" "	2' 141		282'								
10	in 3-36" cages @ 91'-4"			274'								
11	in 7-24" " " 62'-8"			438'	-8"							
12				146942'	2"	0.38		55838	2.8124	1570.39		
13	1/4" Ø	3 rolls						300#	2.8469	8.54		
14	"	16' 956 pcs.		15296'		.17333		2651#	3.3164	87.92		
15												
16	Pile Plates 2-1/8x1/8"x15-3/4"											
17	2 hole	5469 pcs.				1.25# ea		6836#	5.13	350.68		
18												
19	Total reinforcing							146539#		4532.09		
20												
21												
22												
23												
24												
25												
26												
27												

3-3/16" - R. H. 10" C. TO C. OUTSIDE HOLES

N.P. 317
5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO. _____

LISTER'S SHEET NO. 3

ARITHMETIC _____
ARITH. CHECKED _____
GEN. VERIFICATION _____
RECAP. _____
RECAP. CHECKED _____
RECAP VERIFIED _____

Raw material charged to DAS #10
Auburn Concfete Plant

LISTED BY C. E. Springer
CALLED BY W. H. Farmer
LOCATION OF MATERIALS Auburn, Wn.

STORE, December 31 192 6 DIVISION Seattle

	DESCRIPTION	NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1	Forward								4532.09		
2	Wire mesh American Steel Wire Co.										
3	44" wide 300 lin.ft. per roll Style #153										
4	122 rolls @1100 sq.ft. per roll	134,200 sq.ft.									
5	in 25 - 24" cages @ 61#	1,525									
6	in 15 - 36" " " 84-1/3	1,265									
7		136,990					.02939425		4026.72		
8											
9	Wire #16						800#	3.5891	28.71		
10											
11	Cement		354	sacks				.638375	225.98		
12	Cement sacks empty on hand		1485	"				10	148.50		
13	Cement sks. returned credit)										
14	Not yet allowed)		5976					10	597.60		
15									9559.60		
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											

3-3/16" - R. H. 10" C. TO C. OUTSIDE HOLES

N.P. 317 5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO.

LISTER'S SHEET NO. 4

ARITHMETIC
ARITH. CHECKED
GEN. VERIFICATION
RECAP.
RECAP. CHECKED
RECAP VERIFIED

Tools charged to DAS #10
Auburn Concrete Plant

LISTED BY C. E. Springer
CALLED BY W. H. Farmer
LOCATION OF MATERIALS Auburn, Wn.

STORE, Dec. 31 192 6 DIVISION Seattle

	DESCRIPTION		NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1		Date	Cost Book	Record page		Value new		% of value	orig.	Present Value		
2	1 Anvil	1915	1	38		7.98		50%		3.99		
3	1 #3 New Easy Bolt Cutter	1916	1	54		5.40		50%		2.70		
4	1 Grindstone	1918	1	157		2.91		50%		1.45		
5	1 set pipe dies ½" to 2" with stock		1	11		18.68		50%		9.34		
6	1 set pipe dies 2½"											
7	2 pipe cutters 1" to 2½"	1914	1	11		3.69		50%		1.85		
8	Saunders #2 and #3											
9	1 Ratchet drill		1	11		10.00		25%		2.50		
10	1 - 3/4" - 1 - 1" bit											
11	2 - 36" Stillson wrenches									6.75		
12	1 - 14" Monkey wrench									.75		
13	1 - 24" Monkey wrench	1915	1	29		1.43		50%		.72		
14	1 - Hacksaw frame	1914	1	11		.65		50%		.32		
15	2 Ball Pean hammers					1.20		50%		.60		
16	1 - 6# sledge	1917	1	93		.37		50%		.18		
17	1 - 4# sledge	1922		2		1.46		25%		.36		
18	1 - Blacksmith hammer		1	195		5		50%		.26		
19	1 Cold chisel		1	6		25		50%		.12		
20	2 Cold chisels									.25		
21	1 set bolt taps and dies	1914	1	11		9.56		50%		4.78		
22	¼" to 3/4" with stock Green Riv.#103											
23	2 pinch bars	1914	1	11		1.75		50%		.87		
24	1 Claw bar									.50		
25	1 Peavy handled	1923		14		.75		50%		.37		
26	3 picks No handles	1917	1	109		.80		50%		.40		
27	Forward									39.06		

3-3/16" - R. H. 10" C. TO C. OUTSIDE HOLES

N.P. 317 5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO.

LISTER'S SHEET NO. 5

ARITHMETIC
ARITH. CHECKED
GEN. VERIFICATION
RECAP.
RECAP. CHECKED
RECAP VERIFIED

Tools charged to DAS #10
Auburn Concrete Plant

LISTED BY C. E. Springer
CALLED BY W. H. Farmer
LOCATION OF MATERIALS Auburn, Wn

STORE, December 31 192 6 DIVISION Seattle

	DESCRIPTION		NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1		Date	Cost Book	Record Page		Value new		% of orig. cost		Present Value		
2	Forward									39.06		
3	2 Coal scoops #2	1923		2		3.88		50%		1.94		
4	4 #2 shovel	"		2		5.26		50%		2.68		
5	1 Ax S.B.	1914	1	4		1.90		50%		.95		
6	1 " S.B.	1921	2	156		1.45		50%		.72		
7	1 Mortar hoe	"	2	137		1.10		50%		.55		
8	1 poker for donkey engine	1914	1	11		.55		50%		.28		
9	2 wheel barrows	1914	1	11		10.50		50%		5.25		
10	3 concrete carts	1914	1	9		45.00		50%		22.50		
11	3 concrete carts (AFE 1018-1918)	1917	1	96		58.31		50%		29.15		
12	2 Lug hooks	1914	1	11		5.00		50%		2.50		
13	1 Comb bench & Pipe vise	1914	1	11		2.75		50%		1.37		
14	1 Plaster Trowel	1921		137		1.53		50%		.76		
15	1 #7 Marvel Rod Cutter	1923		13		27.15		50%		13.57		
16	1 Machine Vise #104½	1924				9.79		50%		4.90		
17	1 hand ax									.75		
18	1 - 50 ft. tape line									.50		
19	2 Form picks									.30		
20	Form Wrenches		1	11		2.10		50%		1.05		
21	1 Push car		1	11		74.00		20%		14.80		
22	1 - 3/4" hose nozzle		1	11		.25		50%		.12		
23	10-12" hack saw blades.	1926		5		.34		100%		.34		
24	6 - 8 lever padlocks	"		5		2.91		100%		2.91		
25	2 Brooms	"		5		1.32		50%		.66		
26	100 ft. 3/4" manilla rope	"		6		3.53		50%		1.76		
27	Forward									149.37		

3-3/16" - R. H. 10" C. TO C. OUTSIDE HOLES

N.P. 317
5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO. _____

LISTER'S SHEET NO. 6

ARITHMETIC _____
ARITH. CHECKED _____
GEN. VERIFICATION _____
RECAP. _____
RECAP. CHECKED _____
RECAP VERIFIED _____

Tools charged to DAS #10
Auburn Concrete Plant

LISTED BY C. E. Springer
CALLED BY W. H. Farmer
LOCATION OF MATERIALS Auburn, Wn
STORE, December 31 192 6 DIVISION Seattle

DESCRIPTION	NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1 Date	Cost	Record Page		Value new		% of Orig. Cost		Present Value		
2 Forward								149.37		
3 100 ft. 3/4" wire covered hose 1926		8		18.80		75%		14.10		
4 1 Mortar hoe "		8		1.20		75%		.90		
5 20' 1½" Water hose "		17		9.22		75%		6.91		
6 1-3/4" hose nozzle "		19		.19		75%		.56		
7 2 sets cutters for New Easy #3 "		19		3.21		75%		2.40		
8 1 - 3/4" ship auger 13/16" "		19		.77		75%		.58		
9 2 flat files 12" "		19		.62		50%		.31		
10 15 ft. 1" steam hose "		19		6.80		75%		5.10		
11 1 qt. Engineers oil can "		19		1.00		75%		.75		
12 1 car repairers lantern "		19		1.32		75%		.99		
13 2 - 12 qt. Galv.Water pail "		19		.90		50%		.45		
14 1 peavy with handle "				2.35		75%		1.76		
15 5 pick handles "				.94		75%		.70		
16 2 - 36" sledge handles "				.36		75%		.27		
17 1 spike maul handle "				.16		75%		.12		
18 4 pcs. 6" stove pipe SH "				.23		75%		.18		
19 1 spike maul "				1.11		75%		.83		
20 2 track chisels "				3.37		75%		2.53		
21 1-5 ft. lance tooth saw "				2.28		50%		1.14		
22 1 pr. handles for above "				.30		50%		.15		
23 3 -8" White Wash Brushes "		95		6.20		100%		6.20		
24 1 Broom		35		.44		50%		.22		
25 7 pump springs		59		.98		100%		.98		
26 2 Ruber Pump valves		69		.45		100%		.45		
27 Forward								197.95		

3-3/16" - R. H. 10" C. TO C. OUTSIDE HOLES

N.P. 317
5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO.

LISTER'S SHEET NO. 7

ARITH. STIC
ARITH. CHECKED
GEN. VERIFICATION
RECAP.
RECAP. CHECKED
RECAP VERIFIED

Tools and supplies charged to
DAS #10
Auburn Concrete Plant

LISTED BY C. E. Springer
CALLED BY W. H. Farmer
LOCATION OF MATERIALS Auburn, Wn
STORE, December 31 192 6 DIVISION Seattle

	DESCRIPTION	NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1					Value new		% of cost	orig.	Present Value		
2	Forward								197.95		
3	1-18" Stillson Wrench (P 70)	1926				1.11	75%		.84		
4	1-8" flat file (P 86)	1926				.09	100%		.09		
5	Total Tools								198.88		
6	Supplies						weight				
7	Sheet iron 24"x8"x1/8" 7-Sheets						378#	4.82 sheet	33.74		
8	382 pcs. 4"x4"x16"		8150	FBM				16.83 M	137.16		
9	13 pcs. 2"x12"-16'		416	"				17.82 M	7.41		
10	2 pcs. 3"x10"-16' 80 FBM										
11	11 " 3"x8"-16' 352 "										
12	5 " 4"x6"-16' 160 "										
13	5 " 3"x8"-10' 100 "		692	FBM				17.32M	11.98		
14	9 " 1"x8"-16'		96	"				21.04M	2.02		
15	13 pcs. 1"x6"-20'		130	"				44.31M	5.76		
16	Engine oil		10	gals.				.34	3.40		
17	Fortnite Oil		2	"				.11	.22		
18	Car oil		110	"				.29	31.90		
19	Valve oil		5	"				.61	3.05		
20	Arctic cup grease		2½#					.73	1.82		
21	3-100 gal. drums								No chg.		
22	3 -40 gal drums								" "		
23	1 -10 Gal. oil can								1.77		
24	Rainbow packing		4#					.33	1.32		
25	60 d Nails		110#					3.28	3.61		
26	20 d "		80#					3.75	3.00		
27	8 d "		10#					3.26	.33		
	Forward								248.49		

3-3/16" - R. H. 10" C. TO C. OUTSIDE HOLES

N.P. 317 5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO.

LISTER'S SHEET NO. 8

ARITHMETIC
ARITH. CHECKED
GEN. VERIFICATION
RECAP.
RECAP. CHECKED
RECAP VERIFIED

Supplies charged to DAS #10

Auburn Concrete Plant

LISTED BY C. E. Springer

CALLED BY W. H. Farmer

LOCATION OF MATERIALS Auburn, Wn

STORE, December 31 192 6 DIVISION Seattle

	DESCRIPTION	NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1	Forward (Supplies)								248.49		
2	Coal		20	Tons				3.75	75.00		
3	Pipe and fittings										
4	1" Wrt. pipe 1/15' 2/20'		55	lin.ft.				6.950	3.82		
5	½" Tees		3						.11		
6	½" Unions		1						.09		
7	½" Couplings		2					.04	.08		
8	½" Plugs		2						.02		
9	3/4" Couplings		10					.05	.50		
10	3/4" Plugs		2						.03		
11	1" Tees		2						.13		
12	1" Union		1						.13		
13	1" Couplings		2					.07	.14		
14	1" Plugs	New	1	)					.04		
15	1" "	SH	1	)							
16	2½" - 2" Bushing	SH	2						.12		
17	2" -1½" "	SH	1						.06		
18	3/4" - 1½" "		1						.06		
19	1½" Elbow - 90°		1						.14		
20	1½" Tee		1						.09		
21	1½" Coupling		1						.11		
22	1½" Union		1						.23		
23	2" Elbows		3					.46	1.38		
24	2" Plug		1						.03		
25	2" Union Galv.		1						.40		
26	2" Couplings		9					.16	1.44		
27	1½" - 2½" Reducers		2						.43		
	Forward								333.07		

3-3/16" - R. H. 10" C. TO C. OUTSIDE HOLES

N.P. 317
5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO. _____

LISTER'S SHEET NO. 9

ARITHMETIC _____
ARITH. CHECKED _____
GEN. VERIFICATION _____
RECAP. _____
RECAP. CHECKED _____
RECAP VERIFIED _____

Supplies charged to DAS #10
Auburn Concrete Plant

LISTED BY C. E. Springer
CALLED BY W. H. Farmer
LOCATION OF MATERIALS Auburn, Wn.

_____ STORE, December 31 192 6 DIVISION Seattle

	DESCRIPTION	NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1	Forward								333.07		
2	2½" Couplings		1						.15		
3	2½" Cap		1						.07		
4	2½" Elbow		2						.30		
5	2½" Wrt. Pipe 1/12' 1/18'	SH	30	ft.				.15	4.50		
6	2" " "	"	20	"				.23	4.60		
7	2½" Pipe Line bunker to pit	SH	330	ft.				.15	49.50		
8	(including riser at bunker)										
9	1 - 2½" gate valve								3.00		
10	1 caboose stove	SH	1						6.50		
11	Total supplies								401.69		
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											

2-3/16" - R. H. 10" C. TO C. OUTSIDE HOLES

N.P. 317 5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO.

LISTER'S SHEET NO. 10

ARITHMETIC
ARITH. CHECKED
GEN. VERIFICATION
RECAP.
RECAP. CHECKED
RECAP VERIFIED

Summary M&S Class #3 and DAS #10

Auburn Concrete Plant

LISTED BY C. E. Springer

CALLED BY W. H. Farmer

LOCATION OF MATERIALS Auburn, Wn.

STORE, December 31 192 6 DIVISION Seattle

	DESCRIPTION	NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1	Summary										
2	Manufactured product charged to M&S Class #3										
3	Product made prior to 1926										
4	Concrete Piles and Slabs								$4311.50		
5	1926 Product										
6	24" Concrete pipe		10238.40								
7	36" " "		11184.96						$21423.36		
8	Total								$25734.86		
9											
10											
11	Raw Material, tools and supplies										
12	Charged to DAS #10										
13	Raw Material										
14	Reinforcing		4532.09								
15	Mesh		4026.72								
16	Wire		28.71								
17	Cement and empty sacks		972.08						$ 9559.60		
18	Tools								$ 198.88		
19	Supplies, pipe and fittings								$ 401.69		
20	Total								$10160.17		
21											
22											
23											
24											
25											
26											
27											

3-3/16" - R. H. 10" C. TO C. OUTSIDE HOLES

Form 823 (Rev.) 7-24-22 25 Bks. RP

NORTHERN PACIFIC RAILWAY COMPANY

684

REQUEST FOR EXAMINATION OF MATERIAL

TEST REQUEST NO. 171

MR. A. T. Holmgren, Asst Engr. (Engineer of Tests.) Seattle, Wash (Station) Feb 3rd (Date) 1927

PLEASE EXAMINE Test Cylinders

RECEIVED AT _____ IN CAR NO. _____ INITIALS _____

FIRM RECEIVED FROM _____

TO BE USED FOR _____ AT _____

TO APPLY ON G. S. K. REQUISITION NO. _____ ORDER NO. _____

NUMBER OF SAMPLES SENT	TAG NUMBER IDENTIFYING SAMPLES	NUMBER OF LBS., BBLS., PIECES., ETC., REPRESENTED BY SAMPLES	SPECIFICATION NUMBER ORDERED TO
3	Concrete	Test Cylinders	
M.F.C. ✓			

REMARKS: Test cylinders made at Auburn Concrete Plant January 12th 1927, and are of 1-2-4 mixture Olympic Portland Cement used. For each sack of cement one using 7 gals. of water. Gravel runs from ¼" to 1" in size, and sand is very fine. Please send results of tests to.

D. K. Cook
SIGNATURE

TITLE

PRELIMINARY {TELEPHONE / TELEGRAPH} ADVISE GIVEN BY _____ TO _____ DATE _____

CONFIRMED BY REPORT NO. _____ TO _____ DATE _____

MATERIAL {ACCEPTED / REJECTED} REASON FOR REJECTION _____

NOTE: A COPY OF THIS FORM PROPERLY MADE OUT MUST BE FURNISHED FOR EACH SHIPMENT OF MATERIAL UPON WHICH TEST IS DESIRED.

684

NORTHERN PACIFIC RAILWAY COMPANY

CEMENT REPORT

CEMENT TESTING LABORATORY

Spokane, Wash. Laurel, Jan. 27. 1927. 19

Report No. 271.

Report of Test for Auburn Concrete Plant. Mr. W.H.Farmer. Supt. Auburn. Wash.

Brand Olympic.

Car Initial and No. N. P. 42388 Number of Bbls. ?

Received Dec. 16. 1926. Briquettes Made Dec. 17. 1926.

Specific Gravity Fineness

Constancy of Volume % Passing No. 100 Sieve

Accelerated Test % Passing No. 200 Sieve 84.1

Boiling Test O. K. Time of Setting: Hours Minutes

Hot Test Initial 4.10

Normal Pat Test Final 7.15

Air Pats Per Cent of Water Used

28 Day Pats O. K. Neat 23 % 1:3 10.3 %

TENSILE STRENGTH IN POUNDS PER SQUARE INCH AT THE AGE OF

TEST NO.	NEAT CEMENT			1 PART CEMENT, 3 PARTS SAND		
	24 Hours	7 Days	28 Days	3 Days	7 Days	28 Days
				280	327	380
346				280	340	400
				285	335	382
MEAN				282	334	387

Remarks: Cemet O. K.

Cy:-HES.-ARC.-MFC.-AFS.

A. J. Holmgren.
Asst. Engr.
Cement Inspector

NORTHERN PACIFIC RAILWAY COMPANY

CEMENT REPORT

CEMENT TESTING LABORATORY

Spokane, Wash. XXXXXXXXXX Laurel, Jun.27.1927. 19

Report No. 270.

Report of Test for Auburn Concrete Plant. Mr. W.H.Farmer. Supt. Auburn. Wash.

Brand Olympic.

Car Initial and No. N. P. 41678 Number of Bbls. ?

Received Dec.16.1926. Briquettes Made Dec.17.1926.

Specific Gravity Fineness

Constancy of Volume % Passing No. 100 Sieve

Accelerated Test % Passing No. 200 Sieve 82.7

Boiling Test O. K. Time of Setting: Hours Minutes

Hot Test Initial 3.45

Normal Pat Test Final 6.20

Air Pats Per Cent of Water Used

28 Day Pats O. K. Neat 23 % 1:3 10.3 %

TENSILE STRENGTH IN POUNDS PER SQUARE INCH AT THE AGE OF

TEST NO.	NEAT CEMENT			1 PART CEMENT, 3 PARTS SAND		
	24 Hours	7 Days	28 Days	3 Days	7 Days	28 Days
				275	325	375
345				280	340	390
MEAN				292	333	375
				282	333	380

Remarks:

Cement O. K.

Cy:-HES.-ARC.-MFC.-AFS.

A. D. Holmgren.

Asst. Engr.

Cement Inspector

684

NORTHERN PACIFIC RAILWAY COMPANY

CEMENT REPORT

CEMENT TESTING LABORATORY

Spokane, Wash. 19
XXXXXXXXX Laurel, Dec.22.1926.

Report No. 223.

Report of Test for Auburn Concrete Plant, Mr.A.N.Cook, Asst. Chief Engr.

Brand Olympic.

Car Initial and No. N. P. 22283 — Number of Bbls. 1

Received Nov.21.1926 — Briquettes Made Nov.22.1926.

Specific Gravity — Fineness

Constancy of Volume — % Passing No. 100 Sieve

Accelerated Test — % Passing No. 200 Sieve

Boiling Test O. K. — Time of Setting: Hours 24.9 Minutes

Hot Test — Initial 4.10

Normal Pat Test — Final 6.50

Air Pats — Per Cent of Water Used

28 Day Pats O. K. — Neat 23 % 1:3 10.3 %

TENSILE STRENGTH IN POUNDS PER SQUARE INCH AT THE AGE OF

TEST NO.	NEAT CEMENT			1 PART CEMENT, 3 PARTS SAND		
	24 Hours	7 Days	28 Days	3 Days	7 Days	28 Days
				250	360	392
329				243	333	415
MEAN				250	352	367
				248	356	398

Remarks: Cement O. K.

Cy:-HES.-MFC.-WHF.

A. J. Holmgren,
Cement Inspector
Asst. Engr.
XXXXXXXXXX

NORTHERN PACIFIC RAILWAY COMPANY

CEMENT REPORT

CEMENT TESTING LABORATORY

Spokane, Wash. ~~XXXXXXXXXX~~ Laurel. Dec.22.1926. 19

Report No. 224.

Report of Test for Auburn Concrete Plant. Mr.A.R.Cook. Asst. Chief Engr.

Brand Olympic.

Car Initial and No. N.P. 24615 Number of Bbls. ?

Received Nov.21.1926. Briquettes Made Nov.22.1926.

Specific Gravity Fineness

Constancy of Volume % Passing No. 100 Sieve

Accelerated Test % Passing No. 200 Sieve 92.5

Boiling Test O. K. Time of Setting: Hours Minutes

Hot Test Initial 4.00

Normal Pat Test Final 7.10

Air Pats Per Cent of Water Used

28 Day Pats O. K. Neat 23 % 1:3 10.3 %

TENSILE STRENGTH IN POUNDS PER SQUARE INCH AT THE AGE OF

TEST NO.	NEAT CEMENT			1 PART CEMENT, 3 PARTS SAND		
	24 Hours	7 Days	28 Days	3 Days	7 Days	28 Days
				270	370	420
330				245	355	397
				245	350	410
MEAN				253	358	409

Remarks: Cement O. K.

Cy:-HES.-HFC.-WHF.

A. J. Holmgren,
Asst. Engr.
Cement Inspector
XXXXXXXXXX

684

MFC

Saint Paul, December 20, 1926

Mr. H. E. Stevens:

Referring to your notation of December 14th attached to the file in regard to prices for concrete pipe at Auburn.

It is practically impossible to determine what prices have been charged for concrete pipe in the past. The price of manufactured products has changed each year and until the past year there has always been a stock carried over which makes various prices for stock on hand.

In order to arrive at the prices charged, I checked up on various AFE's from 1914 to date and have made a tabulation showing the cost of manufacture for various years and prices charged. The manufacturing cost on Mr. Cook's reports does not include loading and I found that in some cases loading has been charged and in others, not charged.

I have averaged the cost and prices charged and applied the average overhead and loading cost to labor and material cost, plus loading for 1926. As I stated, the loading cost has not always been charged on the Auditor's books but as near as I can determine, the average price today is 12 cents per foot.

The average overhead which has been charged on the books is 33.5 cents for 24 inch pipe and 53.8 cents for 36 inch pipe.

I am told by the Accounting Department that the listed prices have been charged on the books for Northern Pacific and joint lines. If pipe is sold to outside parties, 15 percent is added to the bill.

On the basis of this statement the prices for 1926 f.o.b. cars Auburn should be:

	Inside	Joint	Outside Sale
24" pipe	$1.47	$1.81	$2.08
36" "	1.95	2.49	2.86

Since the last period of operation the Accounting Department has charged off to Profit and Loss an amount equal to the profits on the plant after the original cost of the plant had been absorbed. In previous years we have used inside and outside prices of equal amount and the prices given in Mr. Gemmell's memo to you should not be called inside prices. The time has now come when we should charge ourselves an inside price and still maintain an overhead charge for joint work.

The prices arrived at from the attached tabulation are different from those of my letter of December first but it is practically impossible to make a closer check from the information at hand. I think the prices compare favorably with the outside prices of 1924.

File returned.

Encl. Bridge Engineer.

MFC

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File returned.

Encl. Bridge Engineer.

N O R T H E R N P A C I F I C R A I L W A Y C O M P A N Y

Statement showing cost of Manufacture and Prices Charged for Concrete at Auburn Plant.

Year	Labor	Material	Repairs	Total L&M&R Cost	Overhead	Total With Overhead	Prices Charged Plus Loading Inside	Outside
				24" Pipe				
1914	.301	.738	.04	1.079	.241	1.32	1.32	1.32
1915	.272	.646	.03	.948	.292	1.24	1.36	1.36
1916	.192	.872	.02	1.084	.180	1.26	1.34	1.34
1917	.199	.823	.06	1.082	.238	1.32	1.32	1.36
1918	.337	.984	.08	1.401	.199	1.62	1.60	1.77
1921	.438	1.062	.06	1.560	.320	1.88	2.00	2.35
1922	.363	.949	.008	1.320	.910	2.23	2.35	2.35
1924	.403	1.154	.043	1.600	.300	1.90	1.90	1.90
Average	.313	.878	.043	1.259	.335	1.59	1.62	1.72
1926	.316	.922	.112	1.350	0	1.35	1.47	1.81
Add 15%								2.08
				36" Pipe				
1914	.396	.976	.041	1.414	.316	1.73	1.73	1.72
1915	.351	.880	.040	1.271	.392	1.66	1.66	1.77
1916	.227	1.334	.030	1.447	.243	1.69	1.69	1.69
1917	.230	1.137	.080	1.447	.323	1.77	1.77	1.77
1918	.433	1.346	.120	1.899	.181	2.08	2.10	2.10
1921	.588	1.516	.086	2.190	.700	2.89	3.00	3.45
1922	.528	1.369	.013	1.910	1.400	3.31	3.45	3.45
1924	.512	1.676	.062	2.250	.550	2.80	2.80	2.80
Average	.408	1.254	.059	1.728	.538	2.24	2.27	2.34
1926	.368	1.300	.162	1.830	0	1.83	1.95	2.49
Add 15%								2.86

Office of Bridge Engineer,
Saint Paul, December 20, 1926

684

MFC

Saint Paul, December 1, 1926.

Mr. H. E. Stevens:

Referring to your notation on Mr. Cook's letter of November 18th in regard to the price at which concrete pipe manufactured at Auburn should be charged out to the Northern Pacific and to foreign lines.

Mr. Cook's report of October 31st, 1926 shows that 24" pipe is costing $1.35 and 36" pipe $1.83 per foot and he has recommended a price of $1.50 for 24" and $2.00 per foot for 36" pipe.

The average overhead expense which has been charged out against pipe for the years 1922, 1923 and 1924 is 55 cents per foot for the 24" pipe and 85 cents for the 36" pipe and I think we should still maintain the same overhead charge per foot for the pipe manufactured in 1926, or the price per lineal foot for joint operated track should be $2.05 for 24" pipe and $2.85 for 36" pipe.

Mr. Cook's letter and report returned herewith.

Bridge Engineer.

Encl.

NORTHERN PACIFIC RAILWAY COMPANY

CEMENT REPORT

684

CEMENT TESTING LABORATORY

Spokane, Wash. Laurel, Nov. 30. 1926. 19

Report No. 210.

Report of Test for Auburn Concrete Phart. Mr. W. E. Farmer. Supt.

Brand Olympic.

Car Initial and No. N.P. 22510 Number of Bbls. ?

Received Oct. 28. 1926 Briquettes Made Oct. 28. 1926

Specific Gravity -- Fineness

Constancy of Volume % Passing No. 100 Sieve --

Accelerated Test % Passing No. 200 Sieve 83.9

Boiling Test O. K. Time of Setting: Hours Minutes

Hot Test Initial 3.10

Normal Pat Test Final 6.00

Air Pats Per Cent of Water Used

28 Day Pats O. K. Neat 24 % 1:3 10.5 %

TENSILE STRENGTH IN POUNDS PER SQUARE INCH AT THE AGE OF

TEST NO.	NEAT CEMENT			1 PART CEMENT, 3 PARTS SAND		
	24 Hours	7 Days	28 Days	3 Days	7 Days	28 Days
				237	272	427
309				220	280	415
				225	267	422
MEAN				227	273	421

Remarks: Cement O. K.

Cy:-HES.-ARC.-EFC.-WHF.

A. S. Hollingsworth.
Asst. Engr.
Cement Inspector

NORTHERN PACIFIC RAILWAY COMPANY

CEMENT REPORT

CEMENT TESTING LABORATORY

Spokane, Wash. Laurel, Nov.30.1926. 19

Report No. 209.

Report of Test for Auburn Concrete Plant. Mr. W. H. Farmer. Supt.

Brand Olympic.

Car Initial and No. N.P. 39597 — Number of Bbls. ?

Received Oct.28.1926. — Briquettes Made Oct.28.1926

Specific Gravity -- — Fineness

Constancy of Volume — % Passing No. 100 Sieve --

Accelerated Test — % Passing No. 200 Sieve 84.7

Boiling Test O. K. — Time of Setting: Hours — Minutes

Hot Test — Initial 3.25

Normal Pat Test — Final 6.10

Air Pats — Per Cent of Water Used

28 Day Pats O. K. — Neat 24 % 1:3 10.5 %

TENSILE STRENGTH IN POUNDS PER SQUARE INCH AT THE AGE OF

TEST NO.	NEAT CEMENT			1 PART CEMENT, 3 PARTS SAND		
	24 Hours	7 Days	28 Days	3 Days	7 Days	28 Days
				240	280	407
308				252	280	405
				230	275	400
MEAN				244	278	404

Remarks: Cement O. K.

Cy:-HES.-MFC.-ARC.-WHF.

H. L. Bingen
Asst. Engr.
Cement Inspector

Form 823 (Rev.) 7-24-22 25 Bks. RP

NORTHERN PACIFIC RAILWAY COMPANY

REQUEST FOR EXAMINATION OF MATERIAL

684

TEST REQUEST NO. 161

MR. A. T. Holmgren Asst Engr
Engineer of Tests. _____ (Station) _____ (Date) 19____

PLEASE EXAMINE _____

RECEIVED AT _____ IN CAR NO. _____ INITIALS _____

FIRM RECEIVED FROM _____

TO BE USED FOR _____ AT _____

TO APPLY ON G. S. K. REQUISITION NO. _____ ORDER NO. _____

NUMBER OF SAMPLES SENT	TAG NUMBER IDENTIFYING SAMPLES	NUMBER OF LBS., BBLS., PIECES., ETC., REPRESENTED BY SAMPLES	SPECIFICATION NUMBER ORDERED TO
3	6"x12"	Test cylinders.	
	✓		
M.F.C.			

REMARKS: Test cylinders made at Auburn Concrete Plant November 13th 1926. One of 1-2-4 Mixture and Olympic Portland Cement used. To each sack of cement 18⅔ quarts of water were used.
Please send results of tests to
A. K. Cox

_____ SIGNATURE

_____ TITLE

PRELIMINARY {TELEPHONE / TELEGRAPH} ADVISE GIVEN BY _____ TO _____ DATE _____

CONFIRMED BY REPORT NO. _____ TO _____ DATE _____

MATERIAL {ACCEPTED / REJECTED} REASON FOR REJECTION _____

NOTE: A COPY OF THIS FORM PROPERLY MADE OUT MUST BE FURNISHED FOR EACH SHIPMENT OF MATERIAL UPON WHICH TEST IS DESIRED.

N. P. 1386 12-24

TELEGRAM—BE BRIEF

TIME FILED 684 M.

MFC

Saint Paul, Nov. 27, 1926

A R Cook
Seattle

In order to relieve congestion at Auburn Concrete Plant will you direct Superintendents west of Paradise to make requisitions for pipe requirements in 1927 and make immediate shipment to culvert locations. A-25

M F CLEMENTS

Saint Paul, November 26th, 1926.

Mr. M. F. Clements:

Your letter of the 24th about delivery of pipe from Auburn for 1927 requirements:

You may arrange through Mr. Cook to have requisitions prepared.

Chief Engineer.

HES:h

684

MFC

Saint Paul, November 24, 1926

Mr. H. E. Stevens:

While in Seattle Mr. Cook complained to me about the storage of concrete pipe at the Auburn concrete plant.

As you know, we have started on a program to make a total of 25,000 lineal feet of pipe and it is evident that this pipe must be stored in some other way in order to find room in the pit for that purpose. I think if Mr. Cook could be provided with a locomotive crane for a short period, the pipe could be placed on end and stacked one above another.

In order to relieve the situation temporarily I think it would be advisable for the Supervisors west of Paradise to make requisitions for the pipe required for 1927 so that Mr. Cook could make immediate shipment. The pipe could be delivered at the bridge site just as well now as next year.

Bridge Engineer.

MFC

Saint Paul, November 24, 1926

Mr. H. E. Stevens:

On a copy of your letter to Mr. Cook dated October 23rd, you made a note to me asking that I get in touch with Mr. Cook and Mr. Dillon in Seattle and discuss the possibility of leasing the Auburn Concrete Plant to Mr. Dillon for the manufacture of concrete products.

At the time I was in Seattle Mr. Dillon was in California and the question of leasing the plant could not be discussed with him. I have nothing to add to what Mr. Cook has already told you in regard to the operation of the plant.

I did state to Mr. Cook that I thought such an arrangement would be all right if we had a contract with a man on whom we could depend, with an arrangement similar to the one we have at Darling, but if Mr. Dillon was not a reliable party, we would make a mistake to lease the plant to him.

Bridge Engineer.

St. Paul, October 23, 1926.

Mr. A. R. Cook:

Your letter of the 19th about negotiations with Mr. H. E. Dillon for taking over and operating the Auburn Gravel Plant:

Very few Companies have been able to develop a field sufficiently large to make a success of the manufacture of such articles as described by Mr. Dillon, and my views are still as expressed in my letter to you of September 26.

If, however, Mr. Dillon is able to make a success of his venture there would undoubtedly be some advantages to us from a traffic standpoint, and there would also be some advantage if he would be willing to take over the making up of concrete pipe for us from year to year as our requirements develop, thereby relieving us of the necessity of making up at this time the three years requirements of 35,000 ft. which our present plan contemplates.

Your report of October 16 shows we have made to date 10,433 ft. of pipe, of which 7,576 ft. is held on hand at Auburn Pit. This is less than one-third of the estimated requirements and as our convenient storage space is more than filled, it is evident that storage of the balance of the pipe required on our program will necessitate considerable rehandling.

I presume if Mr. Dillon's plans develop as he expects, he will also require a considerable storage area for concrete

products; necessitating a complete re-arrangement of the plant as well as the storage yard and tracks serving same.

I assume the Operating Department would also wish us to reserve a track and sufficient space to permit loading of pit run gravel in case same was required for filling or emergency purposes, so that altogether, it occurs to me, there would be quite a little problem to work out in the way of rearrangement and division of expense and the Railway Company might be involved in more expense than could be justified by the probable success of the venture.

I think, however, so far as turning over the plant itself is concerned that could be easily arranged if Mr. Dillon is willing, as above suggested, to take over the making of our pipe requirements currently, thereby permitting us to immediately close down the company operation of the plant.

I think, therefore you had better continue negotiations with Mr. Dillon and if you can work out a satisfactory arrangement which will fully protect the Railway Company's interests, I will submit same for approval.

Mr. Clements is now on his way to Orofino, where he will be for a few days, and I am sending him copy of this letter with request that he go to Seattle and confer with you and Mr. Dillon about the details of the proposed arrangements. Mr. Clements will be able to judge to some extent the value of

Mr. A. R. Cook #3

Mr. Dillon's various patented articles and assist you in arriving at a conclusion as to the probability of the success of his contemplated venture.

Chief Engineer.

HES:h

cc Mr. M. F. Clements

I am enclosing you my file about this matter. Wish you would arrange to meet Mr. Cook and Mr. Dillon in Seattle and discuss this matter in detail for the purpose of getting a better idea as to just what Mr. Dillon proposes to manufacture; probable market for same and other details of the arrangement.

H.E.Stevens

Re: Inventory Auburn
Concrete Plant.

434

Seattle, Wash.,
November 16, 1926.

Mr. H. E. Stevens,
Chief Engineer,
St. Paul, Minn.

Enclosing herewith inventory of concrete pipe, piles and slabs, raw material supplies and tools on hand at Auburn Concrete Plant as of October 31, 1926.

CES:C

encl.

cc - MFC
~~COK~~
~~SHR~~

Signed) A. R. COOK

N.P. 317
5-24

INVENTORY OF MATERIALS AND SUPPLIES

M.F.Clements

NO. _____

LISTER'S SHEET NO. 1

ARITHMETIC
ARITH. CHECKED
GEN. VERIFICATION
RECAP.
RECAP. CHECKED
RECAP VERIFIED

Material charged to M&S Class #3 ARC S-580 S-76 and 210.
Manufactured product on hand at Auburn Concrete Plant

LISTED BY C. E. Springer
CALLED BY W. H. Farmer
LOCATION OF MATERIALS Auburn, Wash.
STORE, October 31, 1926 DIVISION Seattle

	DESCRIPTION		NEW OR S. H.	QUANTITY OR NUMBER	UNIT	Unit LOT WEIGHT PCS.	LBS.	Unit TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
				Lin.ft.								
1	30' RC Piles	18 pcs.	new	540			6600#		1.90LF	1026.00		
2	20' RC Piles	19 pcs.	"	380			4300#		1.90LF	722.00		
3	15' RCPiles	23 pcs.	"	345			3500#		1.90LF	655.50		
4	10' RC Pile	32 pcs.	"	320			2100#		1.90LF	608.00		
5	Double track slabs 10 pcs.	6'-6"x 15'-11"					30900#		130.00 ea.	1300.00		
6												
7	Concrete fence Posts	5 pcs.								No Chg.		
8	Concrete pile ends	26 pcs.								No Chg.		
9	(1926 Product)									$4311.50		
10	24" RC Pipe	571 pcs.		4568			3255#		1.50	6852.00		
11	36" RC Pipe	525 pcs.		4200			4700#		2.00	8400.00		
12										$19563.50		
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												

3-5/16" - R. H. 10" C. TO C. OUTSIDE HOLES

N.P. 317
5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO. _____

LISTER'S SHEET NO. 1

ARITHMETIC _____
ARITH. CHECKED _____
GEN. VERIFICATION _____
RECAP. _____
RECAP. CHECKED _____
RECAP VERIFIED _____

Raw Material charged to DAS #10

Auburn Concrete Plant

LISTED BY C. E. Springer
CALLED BY W. H. Farmer
LOCATION OF MATERIALS Auburn, Wn.
STORE, October 31 1926 DIVISION Seattle

	DESCRIPTION	NEW OR S.H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE per cwt.	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1	Reinforcing Rods Size / length / No.Pcs.		lin. ft.		per ft.						
2	1-1/8" rd 48'-10" 11		537'-2"		3.38		1816	3.7511	68.12		
3	" " 19'-9" 40		790		"		2670	"	100.15		
4	* " " 29'-0" 17		493		"		1666	3.12	51.98		
5	" " 28'-4" 3		85		"		287	"	8.95		
6	" " 24'-4" 363		8833		"		29856	"	931.51		
7	* " " 20' 128		2560		"		8653	"	269.97		
8	" " 19' 58		1102		"		3725	"	116.22		
9	" " 15'-4" 349		5351'-4"		"		18087	"	564.31		
10	" " 9'-4" 7		65'-4"		"		221	"	6.90		
11	" " 5'-6" 3		16'-6"		"		56	"	1.75		
12	" " 3'-6" 11		38'-6"		"		130	"	4.06		
13	" " 3'-0" 2		6'		"		20	"	.62		
14	" " 2'-6" 12		30		"		101	"	3.15		
15	Total 1-1/8" rods		19907-10"				67288#		$2127.69		
16											
17	* 1¼" rd. Plain 33'-9" 119		4016'-3"								
18	" " " 27'-2" 6		163'								
19			4179'-3"		4.173		17440#	2.94	512.73		
20	1" sq. 2'-10" 3		8'-6"		3.4		29#	2.09	.61		
21	Pile Plates 2-1/8"x1/8"x15-3/4" -2 hole		5469	pcs.	1.25 ea.		6836#	5.13	350.68		
22											
23	Forward								$2991.71		
24	* Following bars used in Kirkland Grade Separation- 4 bars 1⅛" ϕ x 29'-0"										
25	4 " 1⅛" ϕ x20'-0" 4 " 1¼" ϕ x33'-9"										
26											
27											

3-3/16" - R. H. 10" C. TO C. OUTSIDE HOLES

N.P. 317
5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO. _____

LISTER'S SHEET NO. 2

ARITH. [illegible]IC _____
ARITH. CHECKED _____
GEN. VERIFICATION _____
RECAP. _____
RECAP. CHECKED _____
RECAP VERIFIED _____

Raw Material charged to DAS #10

LISTED BY C. E. Springer
CALLED BY W.H. Farmer
LOCATION OF MATERIALS Auburn, Wn.

Auburn Concrete Plant STORE, October 31 192 6 DIVISION Seattle

	DESCRIPTION			NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1	Forward										2991.71		
2	Size	length	No pcs.		lin.ft.	Wt.per ft.							
3	3/8"	31'-4"	446		13974'-8"								
4	"	30'-0"	242		7260'								
5	"	21'-4"	514		10965'-4"								
6	"	13'-4"	55		733'-4"								
7	"	10'-8"	36		384'								
8	"	7'-10"	354		2773'								
9	"	2'	132		264'								
10	"	in 79 - 24" cages @ 62'-8"			4950'-8"								
11	"	" 31 - 36" cages @ 91'-4"			2831' 4"								
12					44136'-4"			0.38	16772	2.91438	488.80		
13	½"	rd.							300	2.8469	8.54		
14											3489.05		
15	Reinforcing rods charged on ARC #201 (Nov. a/c)												
16	3/8"	rd. 31'-4"	1844		57778'-8"								
17	"	" 30'-0"	618		18540'								
18	"	" 26'-8"	333		8880'								
19	"	" 21'-4"	1167		24896'								
20	"	" 13'-4"	333		4440'								
21	"	" 10'-8"	1167		12448'								
22	"	" 7'-10"	3629		28427'-2"								
23					155409'-10"			0.38	59055	2.7134	1602.39		
24	½"	rd. 16'-0"	1125		18000'			0.17333	3120	3.3164	103.47		
25	Forward (Total Renforcing)										$5194.91		
26													
27													

3-3/16" - R. H. 10" C. TO OUTSIDE HOLES

N.P. 317
5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO. _____

LISTER'S SHEET NO. 3

ARITHMETIC _____
ARITH. CHECKED _____
GEN. VERIFICATION _____
RECAP. _____
RECAP. CHECKED _____
RECAP VERIFIED _____

Raw Material charged to DAS #10

Auburn Concrete Plant

LISTED BY C. E. Springer
CALLED BY W. H. Farmer
LOCATION OF MATERIALS Auburn, Wn.
STORE, October 31 192 26 DIVISION Seattle

	DESCRIPTION	NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1	Forward								$5194.91		
2	Wire Mesh American Steel Wire Co.										
3	44" Wide 300 lin.ft. per roll Style #153										
4	29 rolls @ 1100 sq.ft. per roll		31900	sq.ft.							
5	in 79 - 24" cages		4930	" "							
6	"44 - 36" "		3652	" "							
7			40482	" "				.029495	1194.02		
8	Wire #16						100#	3.59 cwt	3.59		
9	" " (ARC #201 Nov. a/c)						1200	3.51417	42.17		
10	Cement		1773	sks				.5623571	997.06		
11	1636 empty sks.								163.60		
12	4100 empty sks. shipped out (adjustment not yet made)								410.00		
13	Total Raw Material								$8005.35		
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											

3-3/16" - R. H. 10" C. TO OUTSIDE HOLES

N.P. 317
5-24

NO.

INVENTORY OF MATERIALS AND SUPPLIES

LISTER'S SHEET NO. 4

ARITHMETIC
ARITH. CHECKED
GEN. VERIFICATION
RECAP.
RECAP. CHECKED
RECAP VERIFIED

Tools charged to DAS #10

LISTED BY C. E. Springer
CALLED BY W.H. Farmer
LOCATION OF MATERIALS Auburn, Wn.

Auburn Concrete Plant STORE, Oct. 31 192 6 DIVISION Seattle

DESCRIPTION	Date	NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1	Cost Book		Record Page		Value new		% of orig. Value		Present Value		
2 1 anvil	1915	1	38		7.98		50%		3.99		
3 1 #3 New Easy Bolt Cutter	1916	1	54		5.40		50%		2.70		
4 1 Grindstone	1918	1	157		2.91		50%		1.45		
5 1 set pipe dies ¼" to 2" with stock		1	11		18.68		50%		9.34		
6 1 set pipe dies 2½"											
7 2 pipe cutter 1" to 2½"	1914	1	11		3.69		50%		1.85		
8 Saunders #2 and 3											
9 1 Ratchet Drill		1	11		10.00		25%		2.50		
10 1 - 3/4" bit											
11 2 - 36" Stillson Wrenches									6.75		
12 1 - 14" Monkey Wrench									.75		
13 1 - 24" Monkey Wrench	1915	1	29		1.43		50%		.72		
14 1 Hack Saw frame	1914	1	11		.65		50%		.32		
15 2 Ball Pean Hammers					1.20		50%		.60		
16 1 - 6# sledge	1917	1	93		.37		50%		.18		
17 1 - 4# sledge	1922		2		1.46		25%		.36		
18 1 Blacksmith Hammer		1	195		.52		50%		.26		
19 1 Cold Chisel		1	6		.25		50%		.12		
20 2 Cold Chisel									.25		
21 1 set bolt taps and dies ¼" to 3/4" with stock	1914	1	11		9.56		50%		4.78		
22 Green River #103											
23 2 Pinch bars	1914	1	11		1.75		50%		.87		
24 1 Claw bar									.50		
25 1 peavy handled	1923		14		.75		50%		.37		
26 3 picks No handle	1917	1	109		.80		50%		.40		
27 Forward									39.06		

3-3/16" - R. H. 10" C. TO OUTSIDE HOLES

N.P. 317
5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO. _____

LISTER'S SHEET NO. 5

ARITHMETIC _____
ARITH. CHECKED _____
GEN. VERIFICATION _____
RECAP. _____
RECAP. CHECKED _____
RECAP VERIFIED _____

Tools charged to BAS #10

Auburn Concrete Plant

LISTED BY C. E. Springer
CALLED BY W. H. Farmer
LOCATION OF MATERIALS Auburn, Wn.
STORE, October 31 192 6 DIVISION Seattle

	DESCRIPTION	Date	NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1		Cost Book	Record Page			Value % New		of original Cost		Present Value		
2	Forward									39.06		
3	2 Coal Scoops #2	1923		2		3.88		50%		1.94		
4	4 #2 Shovels	"		2		5.26		50%		2.68		
5	1 Ax S.B.	1914	1	4		1.90		50%		.95		
6	1 Ax S.B.	1921	2	156		1.45		50%		.72		
7	1 Mortar hoe	"	2	137		1.10		50%		.55		
8	1 Poker for donkey engine	1914	1	11		.55		50%		.28		
9	2 Wheel barrows	1914	1	11		10.50		50%		5.25		
10	3 Concrete carts	1914	1	9		45.00		50%		22.50		
11	3 Concrete carts (AFE 1018 1918)	1917	1	96		58.31		50%		29.15		
12	2 lug hooks	1914	1	11		5.00		50%		2.50		
13	1 Comb bench and pipe vise	1914	1	11		2.75		50%		1.37		
14	1 plaster trowel	1921		137		1.53		50%		.76		
15	1 #7 Marvel Rod Cutter	1923		13		27.15		50%		13.57		
16	1 Machine Vise 104½	1924				9.79		50%		4.90		
17	1 Hand ax									.75		
18	1 - 50 ft. tape line									.50		
19	S.H. pipe & fittings various sizes									20.00		
20	2 Form Picks									.30		
21	Form wrenches		1	11		2.10		50%		1.05		
22	1 Push car		1	11		74.00		20%		14.80		
23	2 - 3/4" hose nozzles		1	11		.25		50%		.12		
24	Forward									163.70		
25												
26												
27												

3-3/16" - R. H. 10" C. T. OUTSIDE HOLES

N.P. 317
5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO. _____

LISTER'S SHEET NO. 6

ARITHMETIC _____
ARITH. CHECKED _____
GEN. VERIFICATION _____
RECAP. _____
RECAP. CHECKED _____
RECAP VERIFIED _____

Tools charged to DAS #10

LISTED BY C. E. Springer
CALLED BY W. H. Farmer
LOCATION OF MATERIALS Auburn, Wn.

Auburn Concrete Plant STORE, October 31 1926 DIVISION Seattle

	DESCRIPTION	NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1	Forward Date	Cost Record Page			Value New		% of Orig. Cost.		Present 163.70		Value
2	8-12" Hacksaw Blades 1926		5			.30	100%		.30		
3	6-8 lever Padlocks "		"			2.91	100%		2.91		
4	2 Brooms "		"			1.32	100%		1.32		
5	200 lin.ft. 3/4" Manilla Rope "		6			7.06	75%		5.30		
6	Pipe and fittings Misc. "		7			15.28	75%		11.46		
7	100' 3/4" Wire covered hose "		8			18.80	75%		14.10		
8	1 Mortar hoe "		8			1.20	75%		.90		
9	20' -1½" Water Hose "		17			9.22	75%		6.91		
10	1- 3/4" hose nozzle "		19			.75	75%		.56		
11	2 sets cutters for New Easy #3 "		19			3.21	75%		2.40		
12	1 -3/4" ship auger 13/16" "		19			.77	75%		.58		
13	2 flat files 12" "		19			.62	50%		.31		
14	15 ft. 1" Steam hose "		19			6.80	75%		5.10		
15	1 qt. Engrs. oil can "		19			1.00	75%		.75		
16	1 Car repairers lantern "		19			1.32	75%		.99		
17	2 -12 qt. Galv. water pails "		19			.90	50%		.45		
18	1 Peavy with handle "					2.35	75%		1.76		
19	5 pick handles "					.94	75%		.70		
20	2 -36" sledge handles "					.36	75%		.27		
21	1 Spike maul handle "					.16	75%		.12		
22	4 pcs. 6" stove pipe S.H. "					.23	75%		.18		
23	1 Spike maul "					1.11	75%		.83		
24	2 track chisels "					3.37	75%		2.53		
25	1 -5 ft. lance tooth saw "					2.28	50%		1.14		
26	1 Pr. handles for above "					.30	50%		.15		
27	Forward								225.72		

3-3/16" - R. H. 10" C. TO OUTSIDE HOLES

N.P. 317 5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO.

LISTER'S SHEET NO. 7

ARITHMETIC
ARITH. CHECKED
GEN. VERIFICATION
RECAP.
RECAP. CHECKED
RECAP VERIFIED

Tools & supplies charged to DAS #10

LISTED BY C. E. Springer
CALLED BY W. H. Farmer
LOCATION OF MATERIALS Auburn, Wn.

Auburn Concrete Plant STORE, October 31 1926 DIVISION Seattle

DESCRIPTION	NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1 Date		Cost Record Page		Value New		% of Orig. Cost		Present Values		
2 Forward								225.72		
3 2- 8" White Wash brushes 1926		35		4.18		100%		4.18		
4 1 Broom "		"		.44		50%		.22		
5 8 Pump Springs "		59		1.13		100%		1.13		
6 1 -18" Stillson Wrench "		69		1.11		"		1.11		
7 8 Rubber pump valves "		70		2.61		"		2.61		
8 Supplies Sheet Iron 24"x8"x1/8"-8 sheets						432#	4.82 sheet	$234.97 38.56		
9 Lumber										
10 15 pcs. 2"x12"-16' - 480'							17.82 M	8.55		
11 4 pcs. 3"x10"-16' 160										
12 11 pcs. 3"x8"-16' 352										
13 5 pcs. 4"x6"-16' 160										
14 3 pcs. 3"x8"-12' 72 744							17.32 M	12.89		
15 220 pcs. 4"x4"-16' 4693							17.32	81.28		
16 Engine oil		20 gal.					.34 ea	6.80		
17 Fortnite oil		5 "					.13 gal.	.65		
18 Car oil		100 "					28.84 c.gal.	28.84		
19 Valve oil		15 "					.61 gal	9.15		
20 Aretic cup grease		5 lbs.					.73	3.65		
21 60 d nails		400#					3.28 cwt	13.12		
22 8 d nails		25#					3.26 "	.81		
23 Rainbow packing		5#					.331b.	1.65		
24 3- 10 gal. oil cans								3.74		
25 2 empty 100 gal. drums								No charge		
26 Total Supplies								$ 209.69		
27										

3-3/16" - R. H. 10" C. TO C. OUTSIDE HOLES

N.P. 317
5-24

INVENTORY OF MATERIALS AND SUPPLIES

NO. _____

LISTER'S SHEET NO. 8

ARITHMETIC _____
ARITH. CHECKED _____
GEN. VERIFICATION _____
RECAP. _____
RECAP. CHECKED _____
RECAP VERIFIED _____

SUMMARY M & S Class #3 and DAS #10

LISTED BY C. E. Springer
CALLED BY W. H. Farmer
LOCATION OF MATERIALS Auburn, Wn.
Auburn Concrete Plant STORE, October 31 192 26 DIVISION Seattle

	DESCRIPTION	NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1	SUMMARY										
2	Manufactured Product charged to M&S Class #3										
3	Product made prior to 1926										
4	Concrete Piles and Slabs								4311.50		
5	1926 Product										
6	24" Concrete Pipe		6852.00								
7	36" Concrete Pipe		8400.00						15252.00		
8	Total								$19563.50		
9											
10	Raw Material Supplies Tools & Equipment										
11	Charged to DAS #10										
12	Raw Material										
13	Reinforcing							$5194.91			
14	Mesh							1194.02			
15	Wire							45.76			
16	Cement and empty sacks							1570.66	8005.35		
17	Tools								234.97		
18	Supplies								209.69		
19	Total								8450.01		
20											
21											
22											
23											
24											
25											
26											
27											

3-3/16" - R. H. 10" C. TO OUTSIDE HOLES

787 684

OCT 27 1926

NORTHERN PACIFIC RAILWAY COMPANY

CEMENT REPORT

CEMENT TESTING LABORATORY

Spokane, Wash. XXXXXXXXX Laurel, Oct.22.1926. 19

Report No. 192.

Report of Test for Auburn Concrete Plant. Mr. A. R. Cook. Asst. Chief Engr.

Brand ?.

Car Initial and No. N.P. 31355

Number of Bbls. ?

Received ?

Briquettes Made Oct.15.1926.

Specific Gravity --

Fineness --

Constancy of Volume

% Passing No. 100 Sieve

Accelerated Test

% Passing No. 200 Sieve 81.7

Boiling Test O.K.

Time of Setting: Hours Minutes

Hot Test --

Initial 2 55

Normal Pat Test

Final 4 45

Air Pats O.K.

Per Cent of Water Used

28 Day Pats

Neat 24 % 1:3 10.5 %

TENSILE STRENGTH IN POUNDS PER SQUARE INCH AT THE AGE OF

TEST NO.	NEAT CEMENT			1 PART CEMENT, 3 PARTS SAND		
	24 Hours	7 Days	28 Days	3 Days	7 Days	28 Days
				210	267	
302				205	270	
				215	255	
MEAN				210	264	

Remarks:

Cy:-HES.-MFC.

A. Holmgren.
Asst. Engr.

XXXXXXXXX
Cement Inspector

NORTHERN PACIFIC RAILWAY COMPANY

CEMENT REPORT

CEMENT TESTING LABORATORY

Spokane, Wash. ~~XXXXXXXXXX~~ Laurel, Oct.22.1926. 19

Report No. 191.

Report of Test for Auburn Concrete Plant. Mr. A. R. Cook. Asst. Chief Engr.

Brand ?.

Car Initial and No. N.P. 47651 Number of Bbls. ?

Received ? Briquettes Made Oct.15.1926.

Specific Gravity --- Fineness

Constancy of Volume % Passing No. 100 Sieve ---

Accelerated Test % Passing No. 200 Sieve 82.1

Boiling Test O. K. Time of Setting: Hours Minutes

Hot Test --- Initial 3 00

Normal Pat Test Final 4 50

Air Pats O. K. Per Cent of Water Used

28 Day Pats Neat 24 % 1:3 10.5 %

TENSILE STRENGTH IN POUNDS PER SQUARE INCH AT THE AGE OF

TEST NO.	NEAT CEMENT			1 PART CEMENT, 3 PARTS SAND		
	24 Hours	7 Days	28 Days	3 Days	7 Days	28 Days
				222	252	
301				215	277	
				220	275	
MEAN				219	268	

Remarks:

Cy:-HES.-MFC.

A. L. Johnson.

Asst. ~~Engr.~~ Cement Inspector

Form 823 (Rev.) 7-24-22 25 Bks. RP

NORTHERN PACIFIC RAILWAY COMPANY

REQUEST FOR EXAMINATION OF MATERIAL

TEST REQUEST NO. 156

MR. August Holmgren, Engineer of Tests — Seattle Wash (Station) Oct. 26th (Date) 1926

PLEASE EXAMINE Test Cubes

RECEIVED AT _____ IN CAR NO. _____ INITIALS _____

FIRM RECEIVED FROM _____

TO BE USED FOR _____ AT _____

TO APPLY ON G. S. K. REQUISITION NO. _____ ORDER NO. _____

NUMBER OF SAMPLES SENT	TAG NUMBER IDENTIFYING SAMPLES	NUMBER OF LBS., BBLS., PIECES., ETC., REPRESENTED BY SAMPLES	SPECIFICATION NUMBER ORDERED TO
3	6" x 6"	Test Cubes	
M. F. C.			

REMARKS: Cubes made at Auburn Concrete Plant Oct 7th 1926, and are of 1-2-4 Mixture, Made from washed sand and gravel, using 18 2/3 Quarts of water to one sack of cement. Please send report of tests to.

A. K. Cook
SIGNATURE

TITLE

PRELIMINARY {TELEPHONE / TELEGRAPH} ADVISE GIVEN BY _____ TO _____ DATE _____

CONFIRMED BY REPORT NO. _____ TO _____ DATE _____

MATERIAL {ACCEPTED / REJECTED} REASON FOR REJECTION _____

NOTE: A COPY OF THIS FORM PROPERLY MADE OUT MUST BE FURNISHED FOR EACH SHIPMENT OF MATERIAL UPON WHICH TEST IS DESIRED.

684

At Seattle, Sept. 26, 1926.

Mr. A. R. Cook:

Your letter of the 8th about proposition of H. E. Dillon for lease of Auburn gravel pit and concrete plant:

Next attached is copy of Mr. Clements' letter of September 16th, and as I explained to you personally, it does not seem at all likely that there would be any substantial advantage to us in accepting Mr. Dillon's proposition. I doubt very much if Mr. Dillon could make a success of the venture under the conditions he has named, and even though he may show substantial backing, I believe we would be letting ourselves in for a lot of trouble if we entered into such an arrangement.

I have no objection, however, to your looking up his standing and finances and making further report.

Chief Engineer.

HES:h
enc

cc Mr. M. F. Clements

684

Saint Paul, September 18, 1926.

Mr. A. R. Cook,
Assistant Chief Engineer,
Seattle, Wash.

Dear Sir:

The Store Department have lately shipped concrete piles from Auburn to Minneapolis in order to reduce your stock and request that we do not make additional piles except those to meet actual requirements.

Yours truly,

MFC/FS

Bridge Engineer.

Saint Paul, September 16, 1926.

Mr. H. E. Stevens:

Referring to your notation on Mr. Cook's letter of September 8th in which he submitted a proposition from Mr. H. E. Dillon, Construction Engineer, for the lease of a part or the whole of the Auburn gravel pit for the purpose of manufacturing concrete products.

The question of leasing the Auburn pit has been pretty well thrashed out during the past year and in the early part of May of this year, you instructed Mr. Cook to open up the plant and operate it with company forces. It was understood at the time the plant was opened up that it would be operated continuously until approximately 35,000 lineal feet of concrete pipe had been made. This amount of pipe would take care of the existing temporary culverts on the west end of the line and after those culverts had been replaced, pipe requirements will really decrease and in all probability special pipe which is required from time to time can be supplied from our Darling plant.

The prices submitted by Mr. Dillon are attractive and are less than our cost of manufacturing pipe if we consider the overhead cost of the plant. Our labor and material cost will be less than Mr. Dillon's price and according to our system of bookkeeping the charges for pipe manufactured by the Railway Company will be less than those submitted by Mr. Dillon.

I think it would be well for the Railway Company to continue the operation of the plant as it exists until 35,000 feet of pipe has been manufactured. According to Mr. Cook's report of September 4th there had been manufactured in 1926 5,400 feet of concrete pipe and it will probably require twenty months to complete a total of 35,000 feet.

Mr. Cook's letter is returned herewith.

MFC/FS
Encl.

Bridge Engineer

Spa 65

Saint Paul, June 29, 1926.

Mr. C. C. Kyle:

JUN 30 1926

Your letter of the 24th, file P-776, about concrete pipe requisitions for west end requirements:

On June 5th I advised Mr. Elliott that we would want to purchase a small amount of pipe to keep the bridge crews going until we could get our own product coming from the Auburn plant. Subsequently Mr. Cook submitted requisition for 120 ft. of 24" pipe, and a little later Mr. Craver wired you requesting purchase of 32 ft. of 24" pipe for bridge 72-1 and 24 ft. of 24" pipe for bridge 77, Pasco Division.

Considering the small amount of pipe required it was not thought advisable to make outside purchases and all three of these orders were placed with Mr. Perrig on the Darling plant and pipe has been shipped from that point.

The remaining pipe will be furnished from Auburn and requisitions covering same may be placed by you on Mr. Cook, who will make shipments from that plant.

H. E. STEVENS
Chief Engineer.

HES:h

cc Mr. A.R. Cook
Mr. M.F. Clements

Form 317 25M 9-18-22 W

Bu 65

M.T. Comm.

Arithmetic	
Arith. checked	
Gen. verification	
Recap.	
Recap. checked	
Recap. verified	

Northern Pacific Railway Company

No.

Lister's Sheet No. 1

INVENTORY

Material charged to M & S, Class #3 (ARC S-580 and S-76)

Listed by C. E. Springer

Called by

Location of Material Auburn, Wn.

Manufactured product on hand at Auburn Concrete Plant.

Store, June 8 1926 Division Seattle

Unit

	DESCRIPTION		New or S. H.	Quantity or Number	LOT WEIGHT Pcs.	LOT WEIGHT Lbs	Total Weight	Price	Unit	Amount	Class'n No.
1	30' R.C. Piles	21 pcs.	New	Lin. Ft. 630		6600#		1.90	lin. ft.	1197 00	
2	25' R.C. Piles	9 "	"	225		5260#		1.90	"	427 50	
3	25' R.C. Piles (1924 product)	33 pcs.	"	825		5260#		1.15	"	948 75	
4	20' R.C. Piles	23 "	"	460		4300#		1.90	"	874 00	
5	15' R.C. Piles	33 "	"	495		3500#		1.90	"	940 50	
6	10' R.C. Piles	32 "	"	320		2100#		1.90	"	608 00	
7	Double Track Slabs 10 pcs.	6'-6"x15'-11"				30900#		130.00	Each	1300 00	
8	Concrete fence posts	5 pcs.								No charge	
9	Concrete pile ends	26 "								No charge	
10										$6295 75	
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
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30											
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32											
33											
34											
35											
36											
37											

1-A	Frogs, Switches and Parts			
1-B	Track Fastenings			
1-C	Track Tools			
2-A	Interlocking & Signal Material			
2-B	Telegraph & Telephone Material			
3	Brick, Lime, Cement, Stone, Etc.			
4	Lumber, Bridge & Building			
5-A	Switch Ties, Treated & Untreated			
5-B	Cross Ties, Treated & Untreated			
6	Iron Bridges, Turntables, etc.			
7	Ballast all kinds			
8	Rail, except scrap			
9-A	Fuel & Water Station Material			
9-B	Elevators, & Coal & Ore handling Machinery			
9-C	Steam Derricks, Shovels, Ditchers, etc.			
10	Chemicals for Timber Treatment			
11	Bolt, Nuts, Washers, etc.			
12	Springs for Locomotives & Cars			
13	Flues, Boiler			
14	Tubing, Ferrules & Soft Metals			
15	Bar Iron & Steel, etc.			
16	Sheet Steel, No. 13 & Heavier			
17	Heavy Forgings for Locomotives			
18	Car Forgings, etc.			
19	Locomotive Castings Iron & Steel			
20	Car Castings Iron & Steel			
21	Brass Castings & Journal Bearings			
22	Air Brake Material			
23	Mechanical Appliances for Locomotives			
24	Passenger Car Trimmings			
25	Electrical Material for Locomotives			
26	Electrical Material for Cars			
27	Shop Fuel			
28	Foundry Supplies			
29	Wheels, Tires, Axles & Centers			
30	Lumber, Locomotive & Car			
31	Machinery & Machine Tools			
32	Locomotive Boilers, Fireboxes, etc.			
33	Trucks for Locomotives & Cars			
34	Material in Process of Manufacture			
35	Floating Equipment Material			
36	Locomotive, Train & Station Supplies			
37	Oil House Material			
38	Ice, & Packing for Ice Houses			
39	Fuel for Locomotives			
40	Fuel for Stations & Cars			
41	Commissary Supplies			
42	Pipe, Iron & Steel			
43	Pipe Fittings			
44	Electric Lighting Material for Buildings, etc.			
45	Hardware			
46	Rubber & Leather Goods, etc.			
47	Glass, Drugs, Chemicals & Painters' Supplies			
48	Stationery & Printing			
49	Power Plant Equipment			
50	Scrap, All Kinds			
	TOTAL - - -			

Form 317 25M 9-18-22 W

Arithmetic	
Arith. checked	
Gen. verification	
Recap.	
Recap. checked	
Recap. verified	

Northern Pacific Railway Company

INVENTORY

No.

Lister's Sheet No. 2

Reinforcing rods charged to Engr. Dept. DAS #10 on hand at

Listed by C. E. Springer

Called by

Location of Material Auburn, Wn.

Auburn Concrete Plant Store, June 8 1926 Division Seattle

	DESCRIPTION			New or S. H.	Quantity or Number	LOT WEIGHT Pcs.	LOT WEIGHT Lbs	Total Weight	Price	Unit	Amount		Class'n No.
1	Size	Length	No. Pcs.		Lin.ft.	Pr.ft.		Per cwt.					
2	1-1/8"	48'-10"	11	new	537'-2"	3.38		1816	3.7511	Cwt.	68	12	
3	"	19'- 9"	40	"	790	"		2670	"	"	100	15	
4	"	29'-0"	17	"	493	"		1666	3.12	"	51	98	
5	"	28'-4"	3	"	85	"		287	"	"	8	95	
6	"	24'-4"	363	"	8833	"		29856	"	"	931	51	
7	"	20'	128	"	2560	"		8653	"	"	269	97	
8	"	19'	58	"	1102	"		3725	"	"	116	22	
9	"	15'-4"	349	"	5351'-4"	"		18087	"	"	564	31	
10	"	9'-4"	7	"	65'-4"	"		221	"	"	6	90	
11	"	7'-5"	3	"	22'-3"	"		75	"	"	2	34	
12	"	3'-6"	11	"	38'-6"	"		130	"	"	4	06	
13	"	3'-0"	2	"	6'-0"	"		20	"	"		62	
14	"	2'-6"	18	"	45'-0"	"		152	"	"	4	74	
15	Total 1-1/8" rod				19928'-7"	"		67358#			$2129	87	
16													
17	1-1/4" rod plain	33'-9"	119	"	4016'-3"								
18	" " "	27'-2"	6		163'								
19	Total 1-1/4" rods				4179'-3"	4.173	17440		2.94		512	73	
20													
21	1" rod	3'	4	"	12	2.67		32	2.09			67	
22	1" Sqr.	3'	1	"	3	3.4		10	2.09			21	
23	1" "	2'-10"	3	"	8'-6"	3.4		29	2.09			61	
24	3/4" Sqr.	2'-6"	5	"	12'-6"	1.913		24	2.84			68	
25	1/4" "	0'-23"	800	SH	1533'	0.167		256	2.76		7	07	
26	Pile Plates 2-1/8"x1/8"x1'-3-3/4"												
27	2 hole 5469 pcs.			New		1.25#	ea.	6836#	5.13		350	68	
28			Total Reinforcing								3002	52	
29													
30	Supplies and Raw Material charged to DAS #10												
31													
32	Sheet Iron 24"x8"x1/8"				10 sheets			540#	4.82	sheet	48	20	
33	Elasterite Paint				20 gals.						6	48	
34		Total supplies on hand									$ 54	68	
35													
36													
37													

1-A	Frogs, Switches and Parts			
1-B	Track Fastenings			
1-C	Track Tools			
2-A	Interlocking & Signal Material			
2-B	Telegraph & Telephone Material			
3	Brick, Lime, Cement, Stone, Etc.			
4	Lumber, Bridge & Building			
5-A	Switch Ties, Treated & Untreated			
5-B	Cross Ties, Treated & Untreated			
6	Iron Bridges, Turntables, etc.			
7	Ballast all kinds			
8	Rail, except scrap			
9-A	Fuel & Water Station Material			
9-B	Elevators, & Coal & Ore handling Machinery			
9-C	Steam Derricks, Shovels, Ditchers, etc.			
10	Chemicals for Timber Treatment			
11	Bolt, Nuts, Washers, etc.			
12	Springs for Locomotives & Cars			
13	Flues, Boiler			
14	Tubing, Ferrules & Soft Metals			
15	Bar Iron & Steel, etc.			
16	Sheet Steel, No. 13 & Heavier			
17	Heavy Forgings for Locomotives			
18	Car Forgings, etc.			
19	Locomotive Castings Iron & Steel			
20	Car Castings Iron & Steel			
21	Brass Castings & Journal Bearings			
22	Air Brake Material			
23	Mechanical Appliances for Locomotives			
24	Passenger Car Trimmings			
25	Electrical Material for Locomotives			
26	Electrical Material for Cars			
27	Shop Fuel			
28	Foundry Supplies			
29	Wheels, Tires, Axles & Centers			
30	Lumber, Locomotive & Car			
31	Machinery & Machine Tools			
32	Locomotive Boilers, Fireboxes, etc.			
33	Trucks for Locomotives & Cars			
34	Material in Process of Manufacture			
35	Floating Equipment Material			
36	Locomotive, Train & Station Supplies			
37	Oil House Material			
38	Ice, & Packing for Ice Houses			
39	Fuel for Locomotives			
40	Fuel for Stations & Cars			
41	Commissary Supplies			
42	Pipe, Iron & Steel			
43	Pipe Fittings			
44	Electric Lighting Material for Buildings, etc.			
45	Hardware			
46	Rubber & Leather Goods, etc.			
47	Glass, Drugs, Chemicals & Painters' Supplies			
48	Stationery & Printing			
49	Power Plant Equipment			
50	Scrap, All Kinds			
	TOTAL - - -			

Form 317 25M 9-18-22 W

Arithmetic	
Arith. checked	
Gen. verification	
Recap.	
Recap. checked	
Recap. verified	

Northern Pacific Railway Company

INVENTORY

No. 3

Lister's Sheet No.

Listed by C. E. Springer

Called by

Location of Material

Inventory of equipment, buildings and platforms on hand at Auburn Concrete Plant Store, June 8 192 6 Division Seattle

	DESCRIPTION	New or S. H.	Quantity or Number	LOT WEIGHT Pcs.	LOT WEIGHT Lbs	Total Weight	Price	Unit	Amount	Class'n No.
1	Following items were charged to		Value new.				% of original Value		Present Value	
2	Auburn Concrete Plant in 1914 AFE									
3	1200-14 See Book 1, page 11 for									
4	details.									
5	Gravel and Sand Bins									
6	Labor and material		689	29						
7	Freight		154	66						
8			843	95			20%		$168	79
9	Cement house 16.5 x 28									
10	Frame constructions not sealed inside									
11	Shingle roof, concrete and old stringer									
12	foundation									
13	Labor and material		233	89						
14	Freight		18	97						
15			252	86			20%		50	57
16	Guy Derrick 5 ton capacity									
17	Complete with guy lines, 350 lin.ft.									
18	3/4" hoisting cable, 250 lin.ft. 5/8"									
19	cable and blocks		877	22						
20	Freight		50	72						
21			927	94			20%		185	59
22	Tool house and office size 12'x36'									
23	Frame bldg. shingle roof		169	69						
24	Freight		15	50						
25			185	19			20%		37	04
26	Steel Shed 16'x30'									
27	Frame building shingle roof		182	87						
28	Freight		20	35						
29			203	22			20%		40	64
30	Steel Racks 6'x30'									
31	Shingle roof frame bldg.		51	22						
32	Freight		6	20						
33			57	42			20%		11	48
34	Trestle from gravel bin to screens		398	03						
35	Freight		68	42						
36	Labor extending trestle 1914		86	15						
37			552	60			20%		110	52
	Forward								$ 604	63

1-A	Frogs, Switches and Parts			
1-B	Track Fastenings			
1-C	Track Tools			
2-A	Interlocking & Signal Material			
2-B	Telegraph & Telephone Material			
3	Brick, Lime, Cement, Stone, Etc.			
4	Lumber, Bridge & Building			
5-A	Switch Ties, Treated & Untreated			
5-B	Cross Ties, Treated & Untreated			
6	Iron Bridges, Turntables, etc.			
7	Ballast all kinds			
8	Rail, except scrap			
9-A	Fuel & Water Station Material			
9-B	Elevators, & Coal & Ore handling Machinery			
9-C	Steam Derricks, Shovels, Ditchers, etc.			
10	Chemicals for Timber Treatment			
11	Bolt, Nuts, Washers, etc.			
12	Springs for Locomotives & Cars			
13	Flues, Boiler			
14	Tubing, Ferrules & Soft Metals			
15	Bar Iron & Steel, etc.			
16	Sheet Steel, No. 13 & Heavier			
17	Heavy Forgings for Locomotives			
18	Car Forgings, etc.			
19	Locomotive Castings Iron & Steel			
20	Car Castings Iron & Steel			
21	Brass Castings & Journal Bearings			
22	Air Brake Material			
23	Mechanical Appliances for Locomotives			
24	Passenger Car Trimmings			
25	Electrical Material for Locomotives			
26	Electrical Material for Cars			
27	Shop Fuel			
28	Foundry Supplies			
29	Wheels, Tires, Axles & Centers			
30	Lumber, Locomotive & Car			
31	Machinery & Machine Tools			
32	Locomotive Boilers, Fireboxes, etc.			
33	Trucks for Locomotives & Cars			
34	Material in Process of Manufacture			
35	Floating Equipment Material			
36	Locomotive, Train & Station Supplies			
37	Oil House Material			
38	Ice, & Packing for Ice Houses			
39	Fuel for Locomotives			
40	Fuel for Stations & Cars			
41	Commissary Supplies			
42	Pipe, Iron & Steel			
43	Pipe Fittings			
44	Electric Lighting Material for Buildings, etc.			
45	Hardware			
46	Rubber & Leather Goods, etc.			
47	Glass, Drugs, Chemicals & Painters' Supplies			
48	Stationery & Printing			
49	Power Plant Equipment			
50	Scrap, All Kinds			
	TOTAL - - -			

Form 317 25M 9-18-22 W

Arithmetic
Arith. checked
Gen. verification
Recap.
Recap. checked
Recap. verified

Northern Pacific Railway Company

INVENTORY

No.
Lister's Sheet No. 4

Listed by C. E. Springer
Called by
Location of Material

Inventory of equipment, buildings and platforms at Auburn Concrete Plant Store, June 8 192 6 Division Seattle

	DESCRIPTION	New or S. H.	Quantity or Number	LOT WEIGHT Pcs.	LOT WEIGHT Lbs	Total Weight	Price	Unit	Amount	Class'n No.
1		Value new				% of orig. Value			Present Value	
2	Forward								604 63	
3	Water Supply									
4	½ interest in 4" wire wound wood									
5	pipe line 1800 ft. long connecting									
6	with Company main of 10" wood pipe									
7	line along main line R/W one-half									
8	of cost		260 11							
9	Freight		6 25							
10			266 36				20%		53 27	
11										
12	1 Worthington Duplex Steam Pump									
13	Size 6"x4"x6"		60 00							
14	Freight		3 00							
15			63 00				20%		12 60	
16	1 Concrete Mixer									
17	Smith 3/4 yard batch mixer mounted									
18	on platform with upright engine									
19	complete and in fair running									
20	order. Labor & Matl.		957 09							
21	Freight		80 65							
22			1037 74				20%		207 55	
23	Cast Iron Pipe Forms									
24	4 - 36" Pipe forms complete									
25	6 - 24" " " "		4292 43							
26	4 - 24" " " outside only									
27	Freight		687 90							
28			4980 33				50%		2490 16	
29	9 - Pile Forms		457 57							
30	Freight		27 80				20%		97 07	
31	Pipe Mandrels 24" and 36"									
32	Labor & Material		267 89							
33	Freight		35 00							
34			302 89				20%		60 58	
35										
36										
37										
	Forward								$3525 86	

1-A	Frogs, Switches and Parts			
1-B	Track Fastenings			
1-C	Track Tools			
2-A	Interlocking & Signal Material			
2-B	Telegraph & Telephone Material			
3	Brick, Lime, Cement, Stone, Etc.			
4	Lumber, Bridge & Building			
5-A	Switch Ties, Treated & Untreated			
5-B	Cross Ties, Treated & Untreated			
6	Iron Bridges, Turntables, etc.			
7	Ballast all kinds			
8	Rail, except scrap			
9-A	Fuel & Water Station Material			
9-B	Elevators, & Coal & Ore handling Machinery			
9-C	Steam Derricks, Shovels, Ditchers, etc.			
10	Chemicals for Timber Treatment			
11	Bolt, Nuts, Washers, etc.			
12	Springs for Locomotives & Cars			
13	Flues, Boiler			
14	Tubing, Ferrules & Soft Metals			
15	Bar Iron & Steel, etc.			
16	Sheet Steel, No. 13 & Heavier			
17	Heavy Forgings for Locomotives			
18	Car Forgings, etc.			
19	Locomotive Castings Iron & Steel			
20	Car Castings Iron & Steel			
21	Brass Castings & Journal Bearings			
22	Air Brake Material			
23	Mechanical Appliances for Locomotives			
24	Passenger Car Trimmings			
25	Electrical Material for Locomotives			
26	Electrical Material for Cars			
27	Shop Fuel			
28	Foundry Supplies			
29	Wheels, Tires, Axles & Centers			
30	Lumber, Locomotive & Car			
31	Machinery & Machine Tools			
32	Locomotive Boilers, Fireboxes, etc.			
33	Trucks for Locomotives & Cars			
34	Material in Process of Manufacture			
35	Floating Equipment Material			
36	Locomotive, Train & Station Supplies			
37	Oil House Material			
38	Ice, & Packing for Ice Houses			
39	Fuel for Locomotives			
40	Fuel for Stations & Cars			
41	Commissary Supplies			
42	Pipe, Iron & Steel			
43	Pipe Fittings			
44	Electric Lighting Material for Buildings, etc.			
45	Hardware			
46	Rubber & Leather Goods, etc.			
47	Glass, Drugs, Chemicals & Painters' Supplies			
48	Stationery & Printing			
49	Power Plant Equipment			
50	Scrap, All Kinds			
	TOTAL - - -			

Form 317 25M 9-18-22 W

Arithmetic	
Arith. checked	
Gen. verification	
Recap.	
Recap. checked	
Recap. verified	

Northern Pacific Railway Company

INVENTORY

No.

Lister's Sheet No. 5

Listed by C. E. Springer

Called by

Location of Material

Inventory of equipment, buildings and platforms at Auburn Concrete Plant Store, June 8 192 6 Division Seattle

	DESCRIPTION	New or S. H.	Quantity or Number	LOT WEIGHT Pcs.	LOT WEIGHT Lbs	Total Weight	Price	Unit	Amount	Class'n No.
1			Value New			% of Orig. Value			Present Value	
2	Forward								3525 86	
3	Privy									
4	Labor & Material		22 85							
5	Freight		1 50							
6			24 35			20%			4 87	
7	Loading track 300 ft. long 56# rail									
8	Labor & Material		456 79							
9	Freight		100 92							
10			557 71			20%			278 85	
11	1 Donkey Engine Wn. #4428									
12	Boiler out of service, cable drums									
13	used for hoist		970 00							
14	Freight		25 05							
15			995 05			20%			199 01	
16	Following items were charged on									
17	AFE 1018-18									
18										
19	1 Stationary Boiler from Eng. 728		1332 62			20%			266 52	
20	with injector									
21	Boiler house shed									
22	Labor & material		92 13			20%			18 43	
23	Slab platform concrete									
24	Labor & material		581 83			70%			407 28	
25	Slab Forms		271 46			20%			54 29	
26										
27	Slab runway		39 91			20%			7 98	
28										
29	Template for bending reinforcing rods		12 40			20%			2 48	
30										
31	Cement house floor		87 60			20%			17 52	
32										
33	Bulk Head		13 10			20%			2 62	
34										
35	Following item charged Jan. a/c 1922									
36	Form for concrete water barrel		93 70			20%			46 85	
37										
	Forward								4832 56	

1-A	Frogs, Switches and Parts			
1-B	Track Fastenings			
1-C	Track Tools			
2-A	Interlocking & Signal Material			
2-B	Telegraph & Telephone Material			
3	Brick, Lime, Cement, Stone, Etc.			
4	Lumber, Bridge & Building			
5-A	Switch Ties, Treated & Untreated			
5-B	Cross Ties, Treated & Untreated			
6	Iron Bridges, Turntables, etc.			
7	Ballast all kinds			
8	Rail, except scrap			
9-A	Fuel & Water Station Material			
9-B	Elevators, & Coal & Ore handling Machinery			
9-C	Steam Derricks, Shovels, Ditchers, etc.			
10	Chemicals for Timber Treatment			
11	Bolt, Nuts, Washers, etc.			
12	Springs for Locomotives & Cars			
13	Flues, Boiler			
14	Tubing, Ferrules & Soft Metals			
15	Bar Iron & Steel, etc.			
16	Sheet Steel, No. 13 & Heavier			
17	Heavy Forgings for Locomotives			
18	Car Forgings, etc.			
19	Locomotive Castings Iron & Steel			
20	Car Castings Iron & Steel			
21	Brass Castings & Journal Bearings			
22	Air Brake Material			
23	Mechanical Appliances for Locomotives			
24	Passenger Car Trimmings			
25	Electrical Material for Locomotives			
26	Electrical Material for Cars			
27	Shop Fuel			
28	Foundry Supplies			
29	Wheels, Tires, Axles & Centers			
30	Lumber, Locomotive & Car			
31	Machinery & Machine Tools			
32	Locomotive Boilers, Fireboxes, etc.			
33	Trucks for Locomotives & Cars			
34	Material in Process of Manufacture			
35	Floating Equipment Material			
36	Locomotive, Train & Station Supplies			
37	Oil House Material			
38	Ice, & Packing for Ice Houses			
39	Fuel for Locomotives			
40	Fuel for Stations & Cars			
41	Commissary Supplies			
42	Pipe, Iron & Steel			
43	Pipe Fittings			
44	Electric Lighting Material for Buildings, etc.			
45	Hardware			
46	Rubber & Leather Goods, etc.			
47	Glass, Drugs, Chemicals & Painters' Supplies			
48	Stationery & Printing			
49	Power Plant Equipment			
50	Scrap, All Kinds			
	TOTAL - - -			

Form 317 25M 9-18-22 W

Arithmetic	
Arith. checked	
Gen. verification	
Recap.	
Recap. checked	
Recap. verified	

Northern Pacific Railway Company

INVENTORY

No.

Lister's Sheet No. 6

Listed by C. E. Springer

Called by

Location of Material

Store, June 8 1928 Division Seattle

	DESCRIPTION	New or S. H.	Quantity or Number	LOT WEIGHT Pcs.	LOT WEIGHT Lbs	Total Weight	Price	Unit	Amount		Class'n No.
1			Value New			% of Value	Orig.		Present Value		
2	Forward								4832	56	
3	Steel shed 16'x48' constructed 1920										
4	AFE 1200-14 ED 146-20										
5	Labor		118	94							
6	Material		467	61							
7			586	55		50%			293	28	
8											
9	Total present value of equipment								# 5125	84	
10	Buildings and platforms exclusive										
11	of tools.										
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											

1-A	Frogs, Switches and Parts			
1-B	Track Fastenings			
1-C	Track Tools			
2-A	Interlocking & Signal Material			
2-B	Telegraph & Telephone Material			
3	Brick, Lime, Cement, Stone, Etc.			
4	Lumber, Bridge & Building			
5-A	Switch Ties, Treated & Untreated			
5-B	Cross Ties, Treated & Untreated			
6	Iron Bridges, Turntables, etc.			
7	Ballast all kinds			
8	Rail, except scrap			
9-A	Fuel & Water Station Material			
9-B	Elevators, & Coal & Ore handling Machinery			
9-C	Steam Derricks, Shovels, Ditchers, etc.			
10	Chemicals for Timber Treatment			
11	Bolt, Nuts, Washers, etc.			
12	Springs for Locomotives & Cars			
13	Flues, Boiler			
14	Tubing, Ferrules & Soft Metals			
15	Bar Iron & Steel, etc.			
16	Sheet Steel, No. 13 & Heavier			
17	Heavy Forgings for Locomotives			
18	Car Forgings, etc.			
19	Locomotive Castings Iron & Steel			
20	Car Castings Iron & Steel			
21	Brass Castings & Journal Bearings			
22	Air Brake Material			
23	Mechanical Appliances for Locomotives			
24	Passenger Car Trimmings			
25	Electrical Material for Locomotives			
26	Electrical Material for Cars			
27	Shop Fuel			
28	Foundry Supplies			
29	Wheels, Tires, Axles & Centers			
30	Lumber, Locomotive & Car			
31	Machinery & Machine Tools			
32	Locomotive Boilers, Fireboxes, etc.			
33	Trucks for Locomotives & Cars			
34	Material in Process of Manufacture			
35	Floating Equipment Material			
36	Locomotive, Train & Station Supplies			
37	Oil House Material			
38	Ice, & Packing for Ice Houses			
39	Fuel for Locomotives			
40	Fuel for Stations & Cars			
41	Commissary Supplies			
42	Pipe, Iron & Steel			
43	Pipe Fittings			
44	Electric Lighting Material for Buildings, etc.			
45	Hardware			
46	Rubber & Leather Goods, etc.			
47	Glass, Drugs, Chemicals & Painters' Supplies			
48	Stationery & Printing			
49	Power Plant Equipment			
50	Scrap, All Kinds			
	TOTAL - - -			

Form 317 25M 9-18-22 W

Arithmetic	
Arith. checked	
Gen. verification	
Recap.	
Recap. checked	
Rscap. verified	

Northern Pacific Railway Company

INVENTORY

No.

Lister's Sheet No. 7

Listed by C. E. Springer

Called by

Location of Material

Inventory of tools, etc., on hand at Auburn Concrete Plant.

Store, June 8 192 6 Division Seattle

	DESCRIPTION		New or S. H.	Quantity or Number	LOT WEIGHT Pcs.	LOT WEIGHT Lbs	Total Weight	Price	Unit	Amount	Class'n No.
1		Date		Cost Record Book -		Page	Value New		% of Org. Value		Present Value
2	1 Anvil	1915		1	-	38	7.98		50%		3.99
3	1 #3 New Easy Bolt Cutter	1916		1	-	54	5.40		50%		2.70
4	1 Grindstone	1918		1	-	157	2.91		50%		1.45
5	1 Set pipe dies ¼" to 2" with stock	"		1	-	11	18.68		50%		9.34
6	1 set pipe dies 2½" 2 Pipe cutter 1" to 2½"	1914		1	-	11	3.69		50%		1.85
7	Saunders #2 and 3										
8	1 Ratchet drill 1 3/4" bit	"		1	-	11	10.00		25%		2.50
9	1 1" bit										
10	2 - 36" Stillson Wrenches										6.75
11	1 - 14" Monkey Wrench										.75
12	1 - 24" Monkey Wrench	1915		1	-	29	1.43		50%		.72
13	1 Hack saw frame 12"	1914		1	-	11	.65		50%		.32
14	2 BallPean hammers						1.20		50%		.60
15	1 6# sledge	1917		1	-	93	.37		50%		.18
16	1 - 12# Sledge	1922		-		25	1.55		50%		.78
17	1 Blacksmith hammer			1	-	195	.52		50%		.26
18	1 Cold Chisel			1	-	6	.25		50%		.12
19	2 " "										.25
20	1 Set bolt taps and dies ¼" to 3/4" with stock Green River #103	1914		1	-	11	9.56		50%		4.78
21	2 Pinch bars	1914		1	-	11	1.75		50%		.87
22	1 Claw bar										.50
23	1 Peavy handled	1923				14	.75		50%		.37
24	3 Picks no handle	1917		1	-	109	.80		50%		.40
25	2 Coal Scoops #2	1923				2	3.88		50%		1.94
26	4 #2 Shovels	1923				2	5.26		50%		2.68
27	1 Ax S.B.	1914		1	-	4	1.90		50%		.95
28	1 Ax S.B.	1921		2	-	156	1.45		50%		.72
29	1 Mortar hoe	1921		2	-	137	1.10		50%		.55
30	1 Poker for donkey Engine	1914		1	-	11	.55		50%		.28
31	2 Wheel barrows	1914		1	-	11	10.50		50%		5.25
32	3 concrete carts	1914		1	-	9	45.00		50%		22.50
33	3 Concrete carts (AFE 1018-18)	1917		1	-	96	58.31		50%		29.15
34	1 Lug hook	1914		1	-	11	2.50		50%		1.25
35	1 Combination bench and pipe vise	1914		1	-	11	2.75		50%		1.37
36	1 Plaster trowel	1921				137	1.53		50%		.76
37	3 - 8" White wash brushes	1924					8.12		100%		8.12
	2 - 8 Level padlocks	1923				2	.78		50%		.39
	1 - #7 Marvel rod cutter	1923				13	27.15		50%		13.57
	1 Machine Vise #104½	1924					9.79		50%		4.90
	1 Hand ax										.75
	1 - 50' tape lines										.50
	S.H. pipe and fittings various sizes										20.00
	1 Form pick										.15
	Form wrenches			1	-	11	2.10		50%		1.05
	2 - 3/4" double wood blocks			1	-	11	1.26		50%		.63
	1 Push car			1	-	11	74.00		20%		14.80
	2 - 3/4" Hose Nozzles			1	-	11	.25		50%		.12
	Total present value of tools										$ 171.86

1-A	Frogs, Switches and Parts			
1-B	Track Fastenings			
1-C	Track Tools			
2-A	Interlocking & Signal Material			
2-B	Telegraph & Telephone Material			
3	Brick, Lime, Cement, Stone, Etc.			
4	Lumber, Bridge & Building			
5-A	Switch Ties, Treated & Untreated			
5-B	Cross Ties, Treated & Untreated			
6	Iron Bridges, Turntables, etc.			
7	Ballast all kinds			
8	Rail, except scrap			
9-A	Fuel & Water Station Material			
9-B	Elevators, & Coal & Ore handling Machinery			
9-C	Steam Derricks, Shovels, Ditchers, etc.			
10	Chemicals for Timber Treatment			
11	Bolt, Nuts, Washers, etc.			
12	Springs for Locomotives & Cars			
13	Flues, Boiler			
14	Tubing, Ferrules & Soft Metals			
15	Bar Iron & Steel, etc.			
16	Sheet Steel, No. 13 & Heavier			
17	Heavy Forgings for Locomotives			
18	Car Forgings, etc.			
19	Locomotive Castings Iron & Steel			
20	Car Castings Iron & Steel			
21	Brass Castings & Journal Bearings			
22	Air Brake Material			
23	Mechanical Appliances for Locomotives			
24	Passenger Car Trimmings			
25	Electrical Material for Locomotives			
26	Electrical Material for Cars			
27	Shop Fuel			
28	Foundry Supplies			
29	Wheels, Tires, Axles & Centers			
30	Lumber, Locomotive & Car			
31	Machinery & Machine Tools			
32	Locomotive Boilers, Fireboxes, etc.			
33	Trucks for Locomotives & Cars			
34	Material in Process of Manufacture			
35	Floating Equipment Material			
36	Locomotive, Train & Station Supplies			
37	Oil House Material			
38	Ice, & Packing for Ice Houses			
39	Fuel for Locomotives			
40	Fuel for Stations & Cars			
41	Commissary Supplies			
42	Pipe, Iron & Steel			
43	Pipe Fittings			
44	Electric Lighting Material for Buildings, etc.			
45	Hardware			
46	Rubber & Leather Goods, etc.			
47	Glass, Drugs, Chemicals & Painters' Supplies			
48	Stationery & Printing			
49	Power Plant Equipment			
50	Scrap, All Kinds			
	TOTAL - - -			

Form 317 25M 9-18-22 W

Arithmetic	
Arith. checked	
Gen. verification	
Recap.	
Recap. checked	
Recap. verified	

Northern Pacific Railway Company

INVENTORY

No.

Lister's Sheet No. 8

Listed by C. E. Springer

Called by

Location of Material

Auburn Concrete Plant Store, June 8 192 6 Division Seattle

	DESCRIPTION	New or S. H.	Quantity or Number	LOT WEIGHT Pcs.	LOT WEIGHT Lbs	Total Weight	Price	Unit	Amount	Class'n No.
1	SUMMARY									
2	Manufactured product, Raw Material and Supplies						Amount			
3	Concrete Piles and Slabs M & S Class #3						$6295.75			
4	Reinforcing rods DAS #10						3002.52			
5	Supplies DAS #10						54.68			
6	Total Mfg. product Raw Material and Supplies						$9352.95		$9352.95	
7										
8							Present			
9	Plant, Equipment and Tools						Value			
10	Equipment, Buildings and Platforms						5125.84			
11	Tools						171.86			
12	Total present value Plant Equipment and tools						$5297.70		5297.70	
13		Total							$14650.65	
14										
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1-A	Frogs, Switches and Parts			
1-B	Track Fastenings			
1-C	Track Tools			
2-A	Interlocking & Signal Material			
2-B	Telegraph & Telephone Material			
3	Brick, Lime, Cement, Stone, Etc.			
4	Lumber, Bridge & Building			
5-A	Switch Ties, Treated & Untreated			
5-B	Cross Ties, Treated & Untreated			
6	Iron Bridges, Turntables, etc.			
7	Ballast all kinds			
8	Rail, except scrap			
9-A	Fuel & Water Station Material			
9-B	Elevators, & Coal & Ore handling Machinery			
9-C	Steam Derricks, Shovels, Ditchers, etc.			
10	Chemicals for Timber Treatment			
11	Bolt, Nuts, Washers, etc.			
12	Springs for Locomotives & Cars			
13	Flues, Boiler			
14	Tubing, Ferrules & Soft Metals			
15	Bar Iron & Steel, etc.			
16	Sheet Steel, No. 13 & Heavier			
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47	Glass, Drugs, Chemicals & Painters' Supplies			
48	Stationery & Printing			
49	Power Plant Equipment			
50	Scrap, All Kinds			
	TOTAL - - -			

St.Paul,Minn., July 2nd,1926.

Desk 7 Order 6-1331

Mr.M.F.Clements,
Bridge Engineer.

Dear Sir:-

Referring to your letter of July 1st, MFC, regarding 1/4" round rods on GSK-7771 for Auburn Plant:-

The American Steel & Wire Co. are wiring Duluth for car number in which material was shipped and as soon as we receive same we will advise Mr. Cook.

Yours truly,

ELM:HN

Purchasing Agent.

MFC

Saint Paul, July 1, 1926

Mr. R. J. Elliott:

On GSK-7771 is an item covering 1/4" round rods for Auburn concrete plant. I understand this material was shipped from Duluth on June 18th. Mr. Cook is now wiring for the car number so that he can trace the shipment from that end.of the line.

Bridge Engineer.

FORM 1386

Telegram—Be Brief

MFC

Time Filed

M.

Saint Paul, July 1, 1926

A R Cook
Seattle

B-55 Have taken up with Purchasing Agent. If you are delayed you can obtain one quarter inch deformed bars from South Tacoma. They have 7000 lineal feet in stock A-1

M F CLEMENTS

N. P. 1386 12-24

TELEGRAM—BE BRIEF

TIME FILED

M.

100 cf x

Seattle Jul 1 1926

TFClements

JUL 1 1926

StPaul

My B-50 June 25th your A-21 June 26th one quarter inch rods for Auburn plant advise car number B-55

ARCook

1141a

June 18

MFC

Saint Paul, June 28, 1926

Mr. H. E. Stevens:

Referring to Mr. Kyle's letter of June 24th in regard to requisitions for concrete pipe in the western territory.

On June 5th you wrote Mr. Elliott stating that the Auburn Concrete Plant would be reopened and that requisitions would be placed for the material. You also stated that you expected to purchase a small amount of pipe to keep the road crews working until material had been manufactured and seasoned at the Auburn plant.

It is not the intention to purchase any outside pipe other than that which can be furnished from Darling. At the time I was in Spokane you asked me to take up with Mr. Cook his pipe requirements and I received from him information that he required 120 feet of 24" pipe at M.P. 44+3800, First District, Seattle Division. I wrote a letter to Mr. Derrig asking that he ship that amount of pipe and shipment was made from Darling on June 18th. At a later date Mr. Craver wired the General Storekeeper requesting that he purchase 32 feet of 24" pipe for Bridge 72-1 and 24 feet of 24" pipe for Bridge 77 on the Pasco Division, near Yakima. Pasco Division requisition LFN-54 provided for this pipe and the General Storekeeper placed an order on Mr. Derrig. This pipe has also been shipped. The remaining pipe will be

MFC

Saint Paul, June 28, 1926

Mr. H. E. Stevens:

Referring to Mr. Kyle's letter of June 24th in regard to requisitions for concrete pipe in the western territory.

On June 5th you wrote Mr. Elliott stating that the Auburn Concrete Plant would be reopened and that requisitions would be placed for the material. You also stated that you expected to purchase a small amount of pipe to keep the road crews working until material had been manufactured and seasoned at the Auburn plant.

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furnished from Auburn and the original requisitions covering pipe requirements can be placed by the General Storekeeper on Mr. Cook, who will make shipment from the Auburn plant.

Bridge Engineer.

FORM 1386

Telegram—Be Brief

Time Filed

M.

MFC

Saint Paul, June 21, 1926

F R Bartles

Seattle

Referring to copy of Derrig's letter to me June 18th regarding 120 feet 24 inch concrete pipe for Easton. All former requisitions for pipe have been cancelled. Furnish me requisition for pipe at Easton. A-15

M F CLEMENTS

JUN 16 1926

Saint Paul, June 18, 1926

Mr. M. F. Clements:

Complying with your letter of June 10th in which you ordered 120 ft. of 24" concrete pipe shipped to Superintendent F. R. Bartles at Easton, Wash., this is to advise you that 88 ft. went forward on the 16th in N. P. car No. 63198 and 32 ft. on the 18th in N. P. car No. 68353. I presume Superintendent will make formal requisition to cover.

J. J. Deering

District Engineer

HDS:B

c.c. Supt. Bartles
Easton, Wash.

M.P. 44+3800 Seattle Div 1st Dist

JJK
Kyle

Mr. Clements:

Kyle's office advises that all requisitions for purchase of pipe for West End have been canceled. When requisition is received from Cook or Bartles, Kyle will make order on Deering to cover pipe already forwarded.

WH 6/21/26

MFC

Saint Paul, June 10, 1926.

Mr. J. T. Derrig:

The Auburn Concrete plant is being repaired and Mr. Cook will begin to turn out pipe in about thirty days. In the meantime there is required on the Seattle Division 120 feet of 24" pipe and I ask that you make immediate shipment from Darling, billing same to F. R. Bartles at Easton, Washington.

Bridge Engineer.

Cy-Mr.H.E.Stevens
Mr.A.R.Cook: Will you kindly make requisition for the pipe and note on it that preliminary ordered was covered by my letter of June tenth.

M.F.C.

N. P. 1386 12-24

541cf k

TELEGRAM—BE BRIEF

TIME FILED

M.

JUN 9 1926

Seattle June 8 1926

M F Clements

St Paul

Please order one hundred and twenty feet of twenty four inch reinforced concrete culvert pipe mile post 44 plus 3800 feet first district Seattle Divn, think this is all pipe necessary as we will be delivering from Auburn the forepart of July. L-7

A R Cook

1140p

N. P. 1386 12-24

TELEGRAM—BE BRIEF

TIME FILED

M.

21 np d

St Paul June 2 1926

M F Clements

Spokane

~~xxxxx22x~~Have 224 feet of 24 inch and 280 feet of 36 inch pipe on hand at Darling of which 96 ft of 24 inch and 72 feet of 36 inch have been poured in excess of 30 days all above pipe has been poured in excess of 20 days advise further if you wish any shipments made D 142

J T Derrig

1124 am

FORM 1366

Telegram—Be Brief

MFC

Time Filed

M.

Saint Paul, June 26, 1926

A R Cook
Seattle, Washington

B-50 One quarter inch material left Duluth June 18th. McKay placed order for mesh from Seattle. Get shipping date from him. A-21

M F CLEMENTS

N. P. 1566 12-24

TELEGRAM—BE BRIEF

TIME FILED

M.

[illegible] cfm

Seattle June 25 1926

M F Clements

JUN 26 1926

StPaul

A 7 June 14th Re Mesh and one quarter inch rods for Auburn plant when will shipment go fwd B-50

ARCook

1251A 26

FORM 1386

Telegram—Be Brief

Time Filed

M.

MFC

Saint Paul, June 18, 1926

A R Cook
Seattle Wash

L-188 One quarter inch wire has been shipped from Duluth. It will be at Auburn soon as wire mesh. One quarter reinforcement will answer if necessary. A-11

M F CLEMENTS

ED 72.9
GSK 7771

N. P. 1386 12-24

TELEGRAM—BE BRIEF

TIME FILED

M.

[redacted] cf an

Seattle June 17/26

M F Clements

ST PAUL

JUL 15 1926

So Tacoma Store advises has in stock 7965 feet of one quarter inch reinforming rods will this answer your purpose L-188.

A R Cook

338PM

FORM 1366

Telegram—Be Brief

Time Filed

M.

MFC

Saint Paul, June 14, 1926

A R Cook
Seattle

L-11 Purchasing Agent has placed order for mesh at this end. West end bid based on shipping from Illinois. One quarter inch rods cannot be obtained on coast and will ship from here. ~~xxx~~ A-7

M F CLEMENTS

N. P. 1386 12-24

545 CFQ

TELEGRAM—BE BRIEF

TIME FILED

M.

Seattle June 12 1926 M F Clements

StPaul

A-6 My reqn 70 one quarter rods are for pipe not piles would like early delivery figuring on shipping manufactured product forepart of July otherwise we will have to buy a large amount of pipe for this seasons work Can rods be purchased at Seattle and early Dely secured L-11

A R Cook

320PM

#2 Rods 26" #3 - 24"

FORM 1386

Telegram—Be Brief

Time Filed

M.

MFC

Saint Paul, June 11, 1926

A R Cook
Seattle Wash

Your requisition 70. Are plain 1/4" round rods soft steel rods for piles. Will six weeks delivery be O K on them. A-6

M F CLEMENTS

Cy-Mr.Crassweller

FORM 1365

Telegram—Be Brief

MFC

Time Filed

M.

Saint Paul, June 10, 1926

A R Cook
Seattle

L-20 We will not purchase a form for 48 inch pipe for Auburn. Requirements for the system are small and we are now making 48 inch pipe at Darling. A-4

M F CLEMENTS

N. P. 1386 12-24

TELEGRAM—BE BRIEF

TIME FILED

M.

2cf k

Seattle June 8 1926 M F Clements

JU 9 1926

StPaul

Please answer my telegram L-20 of May twenty ninth L-8

A R Cook

1141p

FORM 1366

Telegram—Be Brief

RRB

Time Filed

M.

Saint Paul, ~~May~~ June 1, 1926

A R Cook
Seattle Wash.

L-20 Talk with Mr. Clements who will be in Seattle soon. A-1

R R BROCKWAY

12-24

TELEGRAM—BE BRIEF

TIME FILED

M.

04cf k

Seattle May 29 1926 M F Clements

StPaul

Item in budgets 1924 and 1925 call for forty eight inch steel culvert form for Auburn concrete plant was this a transfer from some other point to Auburn and is the arrangement to be carried out L-20

A R Cook

746p

On Line Seattle,
May 30th, 1926.

Mr. A. R. Cook:

Mr. Elliott is again inquiring as to purchase of concrete pipe for west end requirements. Inasmuch as it will be at least thirty days before we will have any pipe available from Auburn, I think it will be advisable for you to submit requisition forsuch pipe as is actually needed to take care of requirements for the next thirty days.

If you will wire Mr. Clements the amount, he will arrange to have order placed immediately, with requisition to follow.

Chief Engineer.

HES:h

cc Mr. M.F. Clements

Saint Paul, May 17, 1926.

Mr. A. R. Cook:

Your letter of the 7th and wire of the 13th about Auburn concrete plant:

MAY 18 1926

I have discussed this matter again with Mr. Clements and after further consideration am convinced the best plan will be for us to re-open the plant with company force, and I wish you would arrange accordingly.

I do not think it will be necessary to do any extensive rebuilding of this plant in order to handle such pipe requirements as are now in sight. We estimate there are approximately 35,000 lineal feet of temporary culverts remaining in track West of Spokane which will eventually be replaced with concrete pipe; requirements being approximately 26,000 feet of 24" pipe and 9,000 feet of 36" pipe.

In order to handle this to best advantage I believe we are justified in running the plant practically continuously until we have made up the bulk of the above requirements. It is very questionable, however, if we would want to rebuild the plant as it formerly existed, and Mr. Clements is of the opinion that a locomotive crane purchased and assigned to the plant would probably handle the operation to better advantage than reconstruction to the old plan. We can hardly expect to get locomotive crane in operation in time to be of any substantial assistance in getting out the 3,000 feet of pipe required for this years installation, and I think, therefore, such temporary repairs should be made as will enable us to start operating promptly and keep

running until we decide just what should be done in the way of plant rehabilitation.

Mr. Clements will be in Spokane next week on a law case and I have requested him to proceed to Seattle as soon as possible thereafter and go over this entire matter and reach an agreement with you as to the future of the Auburn plant.

H. E. STEVENS,
Chief Engineer.

HES:h

cc Mr. M.F. Clements

MFC

Saint Paul, May 15, 1926

Mr. H. E. Stevens:

I have your letter of May 11th in regard to the manufacture of pipe at Auburn. I also have Mr. Cook's wire to you of May 13th.

In my letter of April 19th I estimated that it would cost the company $2.53 for 24" pipe and $3.75 for 36" pipe as against Mr. Stillwell's price of $2.50 and $4.00. In other words, there would be practically no saving to the Railway Company in the operation of the plant. You have criticised my analysis and assumed that pipe can be manufactured by the Railway Company at a less figure.

The estimated cost of $2,600 for repairing the plant was furnished by Mr. Cook in his letter of January 5, 1925 and in my opinion is none too high. The plant is thirteen years old and the timber is in such condition that it will require considerable work to put the plant in shape. A complete rebuilding such as outlined in Mr. Cook's wire would exceed $2,600. I would assume that if $2,600 will put the plant in operation for one year, there would be other extensive repairs to be made during the three year period.

As far as I am concerned, I would be perfectly willing to see the plant operated by company forces if it were placed on the basis of continuous operation, working twelve months out of

the year, until we had sufficient pipe manufactured to take care of estimated requirements to replace all timber culverts west of Spokane. If this is done we can, no doubt, make a saving over the cost by contract.

File returned herewith.

Bridge Engineer.

Encl.

Saint Paul, May 11, 1926. file

Mr. M. F. Clements:

Returning again my entire file about the manufacture of concrete pipe at Auburn. In my letter of April 21st to Mr. Cook, I instructed him to either arrange with Mr. Stillwell for contract or arrange with Mr. Farmer to open the plant. I judge from his reply of May 7th that he has made no definite arrangements either way, but he has secured a reduction in price from the Stillwell Company and recommends we accept same.

He has further complicated matters by introducing the question of allowing Stillwell and King to start a sand and gravel business in addition to the manufacture of pipe and concrete products. I am not at all certain that we would want to encourage a commercial sand and gravel business at this location, considering the fact that Grant Smith & Company have an arrangement of that kind at Kanaskat and we have favorable contracts with the Pioneer Sand & Gravel Company for gravel from Steilacoom. The introduction of this item will necessitate securing approval of the Traffic and Operating Departments and re-drafting of the contract, and in such re-drafting I think we should also secure unit prices for piling and slabs.

Even with the reduced prices offered by Mr. Stillwell I do not think there is anything to be gained by making such contract. Mr. Cook makes no comment on my query as to the cost of putting the plant into shape for operation. If this can be done for $2600 as estimated, I am unable to see why we should

bother with this contract, particularly in view of the record we have heretofore made in operating this plant by company force - furthermore, if Mr. Stillwell can use the plant about as it now exists there is no good reason why we cannot do likewise.

If it costs but $2600 to repair the plant why should the unit overhead per lineal foot of pipe be doubled, as you have suggested in your letter of April 19th?

If we can make the pipe at a cost of $1.43 for 24" and $2.03 for 36", we will save $ .97 per foot on the 24" and $1.72 per foot on the 36" as compared with Mr. Stillwell's prices.

Assuming the 35,000 lineal feet of temporary culverts remaining in track West of Spokane are eventually replaced with concrete pipe, and the ratio between 24 and 36" remains approximately as it has remained in the past, we would manufacture in total 26,000 ft. of 24" concrete pipe and 9,000 ft. of 36" pipe, and the total saving as compared with Mr. Stillwell's prices would be $40,700.

Assuming the program of replacement was spread over a ten year period and the pipe was all manufactured in a five year period, we would have carrying charges on about $30,000 worth of pipe for a period of five years - or say $9,000 at 6% interest.

Assuming it cost $10,000 to rebuild the plant and $1500 per year for a period of five years to keep the plant in repair, the total overhead on that basis would amount to $26,500 - and still leave us a saving of over $14,000 as compared with Mr. Stillwell's prices.

M. M. F. Clements #3

I think the above assumptions are extreme and that we would actually be able to make much greater savings than these figures indicate.

The item which seems to be most questionable is the wide variation in assumption as to what will have to be done to put the plant in shape for operation. Mr. Stillwell seems to think it can be done for little or nothing - you estimate $2600 and Mr. Cook fails to go into the matter in any way whatever, other than make a general statement of items, which I should judge amount to very nearly a complete rebuilding. I do not believe this is necessary and I am inclined to think we ought to tell Mr. Cook to organize his crew and go ahead at once on the basis of company force.

Chief Engineer.

HES:h

enc

Not used

AGREEMENT made the First (1st) day of April, A. D., 1926, between the Northern Pacific Railway Company, hereinafter called the "Company", and J. B. Stillwell, doing business under the name of J. B. Stillwell Company, hereinafter called the "Contractor".

WHEREAS, the Company has a plant for the manufacture of concrete products at Auburn, Washington, and it has been agreed between the parties that the Contractor will manufacture at the said plant such concrete products as the Company may require him to do.

The Contractor will take the plant as it now stands and will make repairs for placing it in a working condition and maintaining it at his expense and on completion of the contract will return it to the Company in a condition equal to what he found it at the date of the contract.

The Contractor will furnish all labor, services and material for, and will construct complete, and finish in the most thorough, workmanlike and substantial manner in every respect, to the satisfaction of the Chief Engineer of the Company, and in accordance with plans and specifications to be furnished by the Company, such concrete products as may be ordered by the Company.

This agreement to go into effect on the first (1st) day of April, 1926, and continue for a period of five years thereafter, provided, however, that said agreement may be cancelled at the expiration of any calander year by either party, giving to the other party thirty (30) days written notice of its intention so to do.

The Company will pay the following prices for said concrete products, F.O.B. cars at Auburn, Washington:

For 24" Reinforced Concrete Pipe
in 8 foot sections, per lineal foot - - - - -$ 2.50

For 36" Reinforced Concrete Pipe
in 8 foot sections, per lineal foot - - - - -$ 4.00

For extra work done under written orders of the Engineer of the Company, for which prices are not named herein, the Contractor shall be paid the actual outlay in such work and ten percent additional.

The sand and gravel used in the manufacture of concrete products will be furnished to the Contractor in the pit at the Auburn Gravel Plant at five (5) cents per cubic yard.

Approximate estimates of the work done will be made monthly and paid on or about the twentieth (20th) day of the following month.

The Contractor shall carry on the work in such manner and at such times, and at such points, as the Engineer for the Company from time to time shall direct, but the Contractor shall have full control of his employes and be solely responsible for all personal injuries caused in any manner by carrying on any work under this contract.

In witness whereof, the parties hereto have executed these presents.

Witnesses as to the Company

_____

_____

NORTHERN PACIFIC RAILWAY CO.

By _____

Witnesses as to the Contractor

_____

_____

_____

_____(Seal)

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Witnesses as to the Company

NORTHERN PACIFIC RAILWAY CO.

_____

By _____

_____

Witnesses as to the Contractor

_____

_____

_____

_____(Seal)

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For 36" Reinforced Concrete Pipe
in 8 foot sections, per lineal foot - - - - -$ 4.00

For extra work done under written orders of the Engineer of the Company, for which prices are not named herein, the Contractor shall be paid the actual outlay in such work and ten percent additional.

The sand and gravel used in the manufacture of concrete products will be furnished to the Contractor in the pit at the Auburn Gravel Plant at five (5) cents per cubic yard.

Approximate estimates of the work done will be made monthly and paid on or about the twentieth (20th) day of the following month.

The Contractor shall carry on the work in such manner and at such times, and at such points, as the Engineer for the Company from time to time shall direct, but the Contractor shall have full control of his employes and be solely responsible for all personal injuries caused in any manner by carrying on any work under this contract.

In witness whereof, the parties hereto have executed these presents.

Witnesses as to the Company

_____

_____

NORTHERN PACIFIC RAILWAY CO.

By _____

Witnesses as to the Contractor

_____

_____

_____

_____(Seal)

AGREEMENT made the First (1st) day of April, A. D., 1926, between the Northern Pacific Railway Company, hereinafter called the "Company", and J. B. Stillwell, doing business under the name of J. B. Stillwell Company, hereinafter called the "Contractor".

WHEREAS, the Company has a plant for the manufacture of concrete products at Auburn, Washington, and it has been agreed between the parties that the Contractor will manufacture at the said plant such concrete products as the Company may require him to do.

The Contractor will take the plant as it now stands and will make repairs for placing it in a working condition and maintaining it at his expense and on completion of the contract will return it to the Company in a condition equal to what he found it at the date of the contract.

The Contractor will furnish all labor, services and material for, and will construct complete, and finish in the most thorough, workmanlike and substantial manner in every respect, to the satisfaction of the Chief Engineer of the Company, and in accordance with plans and specifications to be furnished by the Company, such concrete products as may be ordered by the Company.

This agreement to go into effect on the first (1st) day of April, 1926, and continue for a period of five years thereafter, provided, however, that said agreement may be cancelled at the expiration of any calander year by either party, giving to the other party thirty (30) days written notice of its intention so to do.

The Company will pay the following prices for said concrete products, F.O.B. cars at Auburn, Washington:

For 24" Reinforced Concrete Pipe
in 8 foot sections, per lineal foot - - - - -$ 2.50

For 36" Reinforced Concrete Pipe
in 8 foot sections, per lineal foot - - - - -$ 4.00

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By _____

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NORTHERN PACIFIC RAILWAY CO.

By _____

Witnesses as to the Contractor

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_____

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The Contractor shall carry on the work in such manner and at such times, and at such points, as the Engineer for the Company from time to time shall direct, but the Contractor shall have full control of his employes and be solely responsible for all personal injuries caused in any manner by carrying on any work under this contract.

In witness whereof, the parties hereto have executed these presents.

Witnesses as to the Company

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_____

NORTHERN PACIFIC RAILWAY CO.

By _____

Witnesses as to the Contractor

_____

_____

_____

_____(Seal)

MFC

Saint Paul, April 22, 1926.

Mr. L. Crasswaller:

I return herewith your file covering bids for the manufacture of concrete pipe on the west end.

Bridge Engineer.

Encl.

MFC

Saint Paul, April 19, 1926

Mr. H. E. Stevens:

Referring to your letter of April 15th in regard to a contract with J. B. Stillwell for the manufacture of concrete pipe at Auburn.

The actual requirements for concrete pipe on the west end for 1926 are 2780 lineal feet of 24" and 636 lineal feet of 36" pipe. You quote from my letter of November 6, 1924 and state that the average price of 24" pipe is $1.43 and for 36" pipe $3.03. the latter figure is in error and should have been $2.03. In my letter of November 6th I gave you the labor and material cost for 1922, 1923 and 1924 and to those figures should be added the overhead cost due to the construction of the plant and development of the pit.

The average cost charged for products charged out in 1922, 1923 and 1924 is as follows:

24" pipe	1.43 + .55	=	$1.98
36" "	2.03 + .86	=	$2.89

In September 1925 it was proposed to entirely rebuild at a new location in the pit and the cost of the plant at present day prices would exceed the cost in 1912. The overhead charges for construction at the present time, based on the same amount of pipe that has been manufactured in the past, would exceed the original overhead charges.

The amount of pipe manufactured in the various years

since the construction of the Auburn plans is as follows; and you will note that the requirements have been less in the last few years than during the earlier life of the plant.

Year	24" pipe	36" pipe	Total
1914	2240	2576	4816
1915	4240	1072	5312
1916	6608	2680	9288
1917	6432	2320	8752
1918	6512	3200	9712
1919	6080	1328	7408
1920	3984	1024	5008
1921	3392	688	4080
1922	5662	1900	7562
1923	5342	2054	7396
1924	2630	1272	3902
1925	3108	768	3876
1926(Est)	2780	636	3416

The total amount of pipe manufactured between 1912 and 1925 was 77,112 lineal feet. The total length of temporary culverts in existence on the lines west of Spokane is 35,000 lineal feet and if we were to rebuild the plant today the overhead charges would be increased to wipe out the new construction cost.

Assuming the overhead plant costs to be double those previously charged, the cost of pipe by company forces would be:

24" pipe 1.43 + 1.10 = $2.53
36" " 2.03 + 1.72 = $3.75

These are to be compared with Mr. Stillwell's prices of $2.50 and $4.00.

I am still of the opinion that we should make a contract with Mr. Stillwell.

Bridge Engineer.

Saint Paul, April 15, 1926.

Mr. M. F. Clements:

Your letter of the 13th about contract with J. B. Stillwell for manufacture of concrete pipe at the Auburn Plant:

In your letter of September 28, 1925 you gave the estimated requirements for west end pipe for 1926 as 3000 ft. of 24" and 400 ft. of 36" pipe.

In comparison of costs, of company plant operation, given in your letter of November 6, 1924 you show an average price of $1.43 per foot for 24" pipe and $3.03 per foot for 36" pipe for the three years operation - 1922, 1923 and 1924.

Mr. Cook, in his letter of January 5, 1925, stated location of plant would have to be changed if we were to operate the plant another season. It seems to me, however, if Mr. Stillwell can operate the plant as it stands we ought to be able to do so with equally satisfactory results, and if our past record is a true statement of costs, it is a substantially less figure than is quoted by Mr. Stillwell.

If Mr. Farmer is still available, it seems to me we had better investigate a little further the possibility of operating this plant ourselves before we decide about contract. It was claimed that material was of inferior quality, but I do not think we would be likely to get any better quality from Mr. Stillwell's manufacture than we will get from our own operations.

The real difference seems to be the probability that the Contractor would get along with very minor repairs, whereas

if we operate the plant we had expected to make very substantial repairs. Possibly, however, this is not necessary, but in any event a saving of $1.00 per foot in the manufacturing cost of pipe would more than pay for a reasonable amount of repairs.

Chief Engineer.

HES:h

Form 1386

Telegram—Be Brief

Time Filed

M.

MFC

Saint Paul, April 15, 1926

A R Cook
Seattle

My A-18 Hold up any work in connection with Auburn Concrete Plant or notice to J. B. Stillwell to start work. Giving further consideration to operation by company force. A-21

M F CLEMENTS

MFC

Saint Paul, April 13, 1926

Mr. H. E. Stevens:

I hand you herewith form of agreement to be made with J. B. Stillwell for the manufacture of reinforced concrete pipe at the Auburn Concrete Plant. I also attach copy of a specification which was submitted through the Purchasing Agent at the time we obtained bids for the concrete pipe, using the cast iron forms at Auburn.

In submitting his bid to the Purchasing Department Mr. Stillwell based his prices upon the use of the Auburn Concrete Plant. Nothing has been said to Mr. Stillwell about a contract over a period of years and I thought we should make up a form of contract specifying a five year period, which could be cancelled at the expiration of any year by either party. The contract provides that we will turn the Auburn Concrete Plant over to Mr. Stillwell and he will take it in the condition in which he finds it, making such repairs as may be necessary for the construction of pipe.

It is possible that we may need a few concrete piles and these could be handled as extra work under this form of contract. The manufacture of any other products or the sale of washed gravel for ballast, or material for commercial purposes, could be covered by a supplementary contract.

If the form meets with your approval I will submit it

to the Legal Department and then to Mr. Stillwell.

Bridge Engineer.

Encl.

N. P. 1386 12-24

TELEGRAM—BE BRIEF

TIME FILED

M.

MFC

Saint Paul April 12, 1926

A R Cook
Seattle Wash

Notify J B Stillwell we accept his proposition to Purchasing Agent fof manufacture of concrete pipe. The Engineering Department will make contract with him direct. Will send you form of contract for pipe and we can supplement it for any other products which may be agreed upon later. He should start work soon as possible. A-18

M F CLEMENTS

St. Paul, Minnesota.
April 9th, 1926.
Desk 2.

Mr. M. F. Clements,
Birdge Engineer.

Dear Sir:

Relative to your letter of the 7th inst. and conversation of this A.M. regarding reinforced concrete pipe for Pasco, Seattle and Tacoma Divisions.

The Massey Concrete Products Corp. write me under date of the 8th in part as follows:

"We beg to sumit the following revised prices on this material.

Approximately 2600 Feet of 24"
Massey Class B Culvert Pipe.....$2.29 per lin.ft.

Approximately 344 feet of 36"
Massey Class B Culvert Pipe.....$4.12 per lin.ft.

These prices are f.o.b. our Factory Spokane and are based on our receiving your order for the entire amounts mentioned above.

We have quoted you on our Class B design which it has been our pleasure to furnish you from Spokane for some time."

I understand this will make no change in your recommendation, but am giving you the information for your record. I will hold the requisitions referred to until I hear from you further.

Yours truly,

Purchasing Agent.

LC/MR

MFC

Saint Paul, April 7, 1926

Mr. R. J. Elliott:

Referring to your letter of March 31st in regard to bids for reinforced concrete pipe to be manufactured on the west end of the line.

The low bid is that of J. B. Stillwell and Mr. Stillwell proposes to take over the Auburn concrete plant and manufacture the pipe we require. Inasmuch as his bid is considerably lower than others in that territory, I think we should purchase pipe from Mr. Stillwell.

If you were to place the pipe according to your inquiry, it would be necessary for us to make a separate contract with Mr. Stillwell for the use of the plant and it is Mr. Stevens' opinion that we should reject all of the bids received and use Mr. Stillwell's prices in a contract that will also provide for the use of the Auburn plant. The Engineering Department will arrange to make such a contract and at the proper time requisition can be made against the party in charge, who will undoubtedly be Mr. Cook.

As soon as the contract has been made I will return the requisitions to you with an outline of the method to be followed in placing them against the manufacturer.

Bridge Engineer.

Jan 26a

MFC

Saint Paul, April 6, 1926

Mr. R. J. Elliott:

I return herewith your file of papers in regard to corrugated culvert pipe for Tacoma, Seattle and Pasco Divisions. I have analyzed the bids and applied freight rates from the point of origin to the various points where the pipe would be used and for that purpose have assumed Pasco, Seattle and Centralia.

The low bid for 8" pipe is the Berger Manufacturing Company, using Uloy metal; for 12 and 15 inch pipe The Wheeling Corrugating Company, using Ohio metal and for 24" pipe the Western Steel Products Company of Duluth, using Keystone Copper Bearing Steel. The total amount of 8" pipe required is 20 feet and the total amount of 24" pipe required is 36 feet. It seems to me, therefore, to be advisable to place the order with one company and as far as the Engineering Department is concerned, I suggest that you purchase the culverts of all sizes from the Wheeling Corrugating Company, using Ohio metal.

Bridge Engineer.

Encl.

St. paul, Minnesota.

Mar. 31st, 1926.

Desk 2.

Mr. B. F. Clements,

Bridge Engineer.

Dear Sir:

Relative to reinforced concrete pipe for the West End, bids on which I left with you yesterday. The Massey Co.'s representative, Mr. McClintock, say they have been furnishing us with their Class B Pipe exclusively for the last fifteen years. They have reduced the price of this pipe to

$2.82 per foot for 24"

$4.66 per foot for 36"

Yours truly,

R. E. Elliott

Purchasing Agent.

LC/MR

All rages returned to Mr Crossmiller 4/1/26

N. P. 1386 12-24

28cfe

TELEGRAM—BE BRIEF

TIME FILED

M.

Seattle Apr 5 1926

M F Clements

St Paul

A-1 Have just succeeded in getting hold of Stilwell His bid based on speciifications which callx for pipe loaded on cars Will want to use sand and gravel from Auburn pit bid based on paying railway company five cents per cubic yard for sand and gravel used Rail way company not to spend any money fitting up plant Will want to use pipe line and will make such repairs as are necessary to pipe line Stilwell says would like to have opportunity to bid on slabs and piling should any be required If can make proper arrangements with railway company would like to make a try for establishment of commercial sand and gravel business which would include selling washed ballast to other railroads This matter however outside of bid for constructing pipe L-2

A R Cook

138am 6

N. P. 1386 12-24

TELEGRAM—BE BRIEF

TIME FILED

M.

MFC

Saint Paul, April 2, 1926

A R Cook
Seattle

Bids on concrete pipe obtained by McKay. J.B. Stillwell bid based on his use of Auburn Concrete Plant. If he uses plant Railway Company will not spend any money for repairs or additional equipment. Does Stillwell understand this. Does Stillwell's price include loading on cars. Peerless Co. Seattle put in good bid. A-1

M F CLEMENTS

N. P. 1344 5-25

Bidder	Location	Delivered Price per Lin Ft. Longview 24" Pipe	Longview 36" Pipe	Seattle 24" Pipe	Seattle 36" Pipe	Pasco 24" Pipe	Pasco 36" Pipe
J. B. Stillwell	Seattle	259	412	250	400	307	478
Concrete Pipe Co	Portland	370	530	400	572	447	637
Peerless Conc Prods Co	Seattle	309	462	300	450	357	528
Concrete Pipe Co	Seattle X	339	487	330	475	387	553
Pioneer Sand & Gravel Co	Seattle	389	442	380	430	437	508
Longview Concrete Pipe Co	Longview	350	450	380	491	427	556
Massey Concrete Products Co	Spokane	368	526	363	558	345	494
"	Class "B" Pipe	302	504	299	497	288	478
				229	412		

MFC

Ju 36a

March 18, 1926

Massey Concrete Products Corporation,
Peoples Gas Building,
Chicago, Illinois.

Gentlemen:

Referring to your letter of March 16th in regard to concrete pipe to be manufactured on the west end of our line, using Northern Pacific forms.

The forms in question have been used by the Northern Pacific since 1912 and we have never found any difficulty in obtaining a good surface on the pipe. The cast iron forms are planed so that they provide a smooth surface on the concrete pipe, both inside and out. You will note that the inside form is made slightly smaller at the lower end than at the upper end and this permits the pulling of the inside form.

At the Auburn plant the forms were assembled on a platform. On this platform were placed four small metal plates which held the two sections of the pipe in the proper position while the concrete was being poured. At the Auburn plant we used a mixture which probably contained a slight excess of water but there was no difficulty experienced spading the material by using a metal pipe or rod and working the concrete to permit the escape of water and air bubbles.

There is no objection to decreasing the length of this pipe by the use of a 3/4" strip at the bottom.

Yours truly,

Bridge Engineer.

MASSEY CONCRETE PRODUCTS CORPORATION

PRECAST REINFORCED CONCRETE

PIPE, PILING, CRIBBING, SIGNAL MATERIAL AND OTHER PRODUCTS FOR RAILWAYS, HIGHWAYS, ETC.

GENERAL OFFICES
PEOPLES GAS BUILDING, CHICAGO

March 16th, 1926.

Mr. M. F. Clements, Bridge Engr.
Northern Pacific Railway Company.,
St. Paul, Minnesota.

Dear Sir:

We are figuring on bidding on the 24 and 36" reinforced concrete pipe made according to your drawing and specifications. You are to furnish the forms from your Auburn plant for this work.

We have a drawing covering the details of these forms and the writer would like to know whether you used these forms in making jiggled pipe or a cast pipe. A question arose in the writer's mind as to whether a satisfactory surface could be produced in these forms as there is no way of getting down into the barrel of the pipe to spade against the inside form on account of the part of the inside form forming the bell end being integral with the inside form. The writer would be very glad to know what method you use in tamping or spading this pipe at your Auburn plant.

Would you object to decreasing the length of this pipe as made in these forms by 3/4 of an inch, figuring on using a 3/4" base ring in the bottom so as to properly space the inside form in relation to the outside form.

Will you kindly advise.

Yours very truly,

E. C. Alexander

ECA:JS

Manager of Production

MFC

Saint Paul, March 5, 1926

Mr. H. E. Stevens:

Referring to your letter of March fourth tracing for reply to your letter of November 23rd in regard to dismantling the Auburn Concrete Plant.

The Purchasing Department is now obtaining bids on concrete pipe from local commercial plants on the coast and if the prices we obtain for the 1926 requirements are reasonable, I think we should proceed immediately with the dismantling of the Auburn plant, but if we find that prices are above the average, I think we should make some arrangements about continuing the operation in the future.

Bridge Engineer.

St. Paul, Minn., Mar. 4, 1926.

Mr. M. F. Clements:

Please refer to your letter of November 23rd, in regard to dismantling the Auburn concrete plant and advise status.

H S Stevens
Chief Engineer

REG:wp

We should know this

MPC

Saint Paul, Feb. 18, 1926.

Mr. C. C. Kyle:

I return herewith Pasco, Seattle and Tacoma Division requisitions covering reinforced concrete pipe. These have been tabulated on the attached sheet. Mr. McKay wires that he is holding Pasco Division requisition No. 98 covering 56 feet of 36 inch pipe which is not included in this tabulation.

Seattle Division Requisition 22 includes 16 lineal feet of 24" pipe for M. P. 17+3660 and 32 lineal feet of 24" pipe for M.P. 17+4700, Bellingham Branch. Requisition indicates this pipe will be furnished from Auburn and this amount has not been included in the tabulation. Same applies also to Seattle Division Requisition 15 covering a total of 48 lineal feet of 24" pipe noted to be supplied from South Tacoma.

Ten copies of the specifications dated February 18th under which this pipe should be purchased, as well as ten prints each of the pipe and forms, are attached. It is our intention to furnish the six 24" and four 36" cast iron forms now at Auburn, Washington, free of charge to the successful bidder, he to unload and load same upon completion of the order.

I have secured the following list of pipe manufacturers on the coast who should be requested to bid:

Longview Concrete Pipe Co.,
Longview, Washington.

Vancouver Concrete Pipe Co.,
Vancouver, Washington.

Pioneer Sand & Gravel Co.,
Leary Building,
Seattle, Washington.

Grant Smith & Co.,
Seattle, Washington.

Concrete Pipe Co.,
Ballard,
Seattle, Washington.

Peerless Concrete Pipe Co.,
Argo,
Seattle, Washington.

Concrete Pipe Company,
Centralia, Washington.

Bridge Engineer.

Encl.

N O R T H E R N P A C I F I C R A I L W A Y C O M P A N Y

1926 REINFORCED CONCRETE PIPE REQUIREMENTS FOR PASCO, SEATTLE AND TACOMA DIVISIONS.

From Pasco Division Requisitions Nos. 50 to 57, inclusive, Seattle Division Nos. 15, 16, 17, 18, 20, 22 and 32, and Tacoma Division Nos. 66 and 85. (Exclusive of 96 lineal feet of 24" pipe to be furnished from Auburn and Tacoma as noted on requisitions)

	24" R.C.P.	36" R.C.P.
Pasco Division		
Reqn. No. 50	72 lin. ft.	
51	40 "	
52		48 lin. ft.
53	232 "	32 "
54	104 "	152 "
55	48 "	72 "
56	24 "	
57	56 "	
Totals:	576 "	304 "
Seattle Division		
Reqn. No. 15	64 "	72 "
16	336 "	
17	16 "	
18	56 "	
20	24 "	
22	48 "	
32	296 "	160 "
Totals:	840 "	232 "
Tacoma Division		
Reqn. No. 66	1168 "	144 "
85	88 "	8 "
Totals:	1256 "	152 "
GRAND TOTALS:	2672 "	688 "

Office of Bridge Engineer,
Saint Paul, Feb. 18, 1926

2088 2/17/26

1926 Reinforced Concrete Pipe Requirements for Pasco, Seattle & Tacoma Divisions.

From Pasco Div. Requisitions Nos, 50 to 57 incl., Seattle Div. Nos 15, 16, 17, 18, 20, 22, & 32 and Tacoma Div. Nos. 66 & 85. (Exclusive of 96 lin ft. of 24" pipe to be furnished from Auburn and Tacoma as noted on requisitions)

		24" R.C.P.	36" RCP.
PASCO DIVISION			
Req. No. 50		72	
51		40	
52			48
53		232	32
54		104	152
55		48	72
56		24	
57		56	
	Totals	576	304
SEATTLE DIVISION			
Req. No. 15		64	72
16		336	
17		16	
18		56	
20		24	
22		48	
32		296	160
	Totals	840	232
TACOMA DIVISION			
Req. No. 66		1168	144
85		88	8
	Totals	1256	152
	Grand Totals	2672 lin.	688 lin. ft.

15, 16, 17, 18, 20, 22 32

65
85

N O R T H E R N P A C I F I C R A I L W A Y C O M P A N Y

S P E C I F I C A T I O N S

For

The Manufacture of Reinforced Concrete Pipe, Using Railway Company Forms from Auburn, Washington.

PLANS

The pipe to be manufactured shall conform to Northern Pacific Railway Company's plan for 24 inch and 36 inch diameter Circular Reinforced Concrete Pipe, dated September 20, 1922.

MATERIALS

Cement shall be tested Portland Cement, conforming to the Northern Pacific Railway Company's Standard Specification No. E-108, dated June 1, 1917.

Sand shall be clean, coarse and sharp, free from soft particles and vegetable matter, and shall grade approximately uniformly from one-quarter inch diameter and down, with not over 25 percent passing a No. 50 sieve.

Broken stone or gravel shall be clean and of durable rock of approximately uniform grading from one-quarter inch up to three-quarter inch diameter. It shall be free from clay, loam, flat chips, fine sand and other impurities.

Reinforcing steel shall be deformed bars conforming to the American Society for Testing Materials. Specification A-15-14 for intermediate grade.

MANUFACTURE

The mixture shall be one part of cement to five parts of sand and stone, the sand and stone to be mixed in such proportions as to secure a dense concrete. The approximate proportions to be two parts of sand and three parts of stone. Proportions to be measured by volume, one sack of cement (94 pounds) shall be assumed to measure one cubic foot. Sand and stone shall be measured in cubic feet and loosely as thrown into the measuring box. The amount of water

used shall be the minimum amount required to produce a plastic or workable mixture that can be worked into the forms and around the reinforcement.

The reinforcing steel shall be cleaned of all mill and rust scales with steel brushes before being placed in the forms. It shall be assembled, securely wired together and placed in the forms exactly as called for on the plan and in such a manner that it will remain true to shape and in the proper position during the manufacturing process. Reinforcement shall not be placed less than three-quarter inch from the face of the form.

CURING

Care shall be taken to prevent the rapid drying out of the pipe after it has been removed from the form. During the first seven days after removal the pipe shall be thoroughly wet down, inside and out, at least three times every 24 hours, and when the weather is hot and dry, at least five times every 24 hours.

MARKING

In order to insure the correct laying of the pipe sections they shall be marked so that the vertical axis shown on the plan can be easily identified. This shall be done by permanently marking the location of the vertical axis on the forms, placing the reinforcing steel in its proper location with respect to this axis each time the form is filled, and then marking the axis on the bell of the pipe before removing the forms. Upon one side of the pipe this axis shall be indicated by a line marked "Top" in black paint. The date of pouring shall also be painted on each pipe.

HANDLING, STORING & SHIPPING

Care shall be exercised in the handling of the pipe from the mixing platform to the storage yard so that no damage will result.

The pipe shall be stored until properly cured and then loaded on cars as directed by the Railway Company. No pipe shall be loaded until so ordered by the Railway Company and the manufacturer shall have no claim for storage on account of the Railway Company failing to order the pipe shipped as rapidly as cured. In no case shall pipe be shipped in less than 28 days from the date of pouring.

The pipe shall be so loaded on cars as to prevent shifting of same during transit.

INSPECTION

The manufacturer shall notify the Railway Company sufficiently in advance of the date he expects to begin manufacturing pipe so that the Railway Company may furnish an inspector. The manufacturer shall co-operate with the inspector and furnish the facilities necessary for the proper inspection of the pipe.

All pipe shall be substantially free from fractures, large or deep cracks and surface roughness. Pipe shall be subject to rejection on account of any of the following:

(a) Fractures or cracks passing through the shell which, in the opinion of the inspector, so weaken the pipe as to make its strength questionable.

(b) Defects, such as an unreasonable amount of honeycombing, which indicate imperfect mixing and moulding.

(c) Exposure of the reinforcement when such exposure indicates that the reinforcement is misplaced.

Pipe shall not be shipped until it has been inspected and accepted. All pipe rejected shall be the property of the manufacturer and shall be replaced by the manufacturer with pipe which meets the requirements of these specifications without cost to the Railway Company.

FORMS

The Railway Company owns six complete forms for 24 inch pipe and four complete forms for 36 inch pipe which are now stored at Auburn, Washington. These are of cast iron and conform to plan dated Office of Assistant Engineer, Tacoma, Washington. The company will furnish these forms on board cars at the manufacturer's plant. The manufacturer will unload the forms and, upon the completion of the contract and when so directed, will reload same without additional cost to the Railway Company. The manufacturer shall clean the forms and return them to the company in as good condition as when he received them, ordinary wear excepted. If, upon receipt of the forms, any parts are broken or missing, the contractor shall at once notify the company of the extent of the damage.

The manufacturer will be held responsible for the safe handling of the forms and will be required to make good any damage resulting from the careless or improper handling of same.

GENERAL

For the pipe to be manufactured under these specifications, the manufacturer shall furnish all labor, equipment and material entering into the manufacture of same, with the exception of the cast iron forms, and will complete same in the most thorough, workmanlike and substantial manner.

The work shall be started at once and completed as rapidly as the number of forms and proper curing will permit.

Payment will be made upon invoices submitted by the manufacturer for pipe loaded on cars.

Office of Bridge Engineer,
Saint Paul, February 18, 1926.

NORTHERN PACIFIC RAILWAY COMPANY

SPECIFICATIONS

For

The Manufacture of Reinforced Concrete Pipe, Using Railway Company Forms from Auburn, Washington.

PLANS

The pipe to be manufactured shall conform to Northern Pacific Railway Company's plan for 24 inch and 36 inch diameter Circular Reinforced Concrete Pipe, dated September 20, 1922.

MATERIALS

Cement shall be tested Portland Cement, conforming to the Northern Pacific Railway Company's Standard Specification No. E-108, dated June 1, 1917.

Sand shall be clean, coarse and sharp, free from soft particles and vegetable matter, and shall grade approximately uniformly from one-quarter inch diameter and down, with not over 25 percent passing a No. 50 sieve.

Broken stone or gravel shall be clean and of durable rock of approximately uniform grading from one-quarter inch up to three-quarter inch diameter. It shall be free from clay, loam, flat chips, fine sand and other impurities.

Reinforcing steel shall be deformed bars conforming to the American Society for Testing Materials. Specification A-15-14 for intermediate grade.

MANUFACTURE

The mixture shall be one part of cement to five parts of sand and stone, the sand and stone to be mixed in such proportions as to secure a dense concrete. The approximate proportions to be two parts of sand and three parts of stone. Proportions to be measured by volume, one sack of cement (94 pounds) shall be assumed to measure one cubic foot. Sand and stone shall be measured in cubic feet and loosely as thrown into the measuring box. The amount of water

used shall be the minimum amount required to produce a plastic or workable mixture that can be worked into the forms and around the reinforcement.

The reinforcing steel shall be cleaned of all mill and rust scales with steel brushes before being placed in the forms. It shall be assembled, securely wired together and placed in the forms exactly as called for on the plan and in such a manner that it will remain true to shape and in the proper position during the manufacturing process. Reinforcement shall not be placed less than three-quarter inch from the face of the form.

CURING

Care shall be taken to prevent the rapid drying out of the pipe after it has been removed from the form. During the first seven days after removal the pipe shall be thoroughly wet down, inside and out, at least three times every 24 hours, and when the weather is hot and dry, at least five times every 24 hours.

MARKING

In order to insure the correct laying of the pipe sections they shall be marked so that the vertical axis shown on the plan can be easily identified. This shall be done by permanently marking the location of the vertical axis on the forms, placing the reinforcing steel in its proper location with respect to this axis each time the form is filled, and then marking the axis on the bell of the pipe before removing the forms. Upon one side of the pipe this axis shall be indicated by a line marked "Top" in black paint. The date of pouring shall also be painted on each pipe.

HANDLING, STORING & SHIPPING

Care shall be exercised in the handling of the pipe from the mixing platform to the storage yard so that no damage will result.

The pipe shall be stored until properly cured and then loaded on cars as directed by the Railway Company. No pipe shall be loaded until so ordered by the Railway Company and the manufacturer shall have no claim for storage on account of the Railway Company failing to order the pipe shipped as rapidly as cured. In no case shall pipe be shipped in less than 28 days from the date of pouring.

The pipe shall be so loaded on cars as to prevent shifting of same during transit.

INSPECTION

The manufacturer shall notify the Railway Company sufficiently in advance of the date he expects to begin manufacturing pipe so that the Railway Company may furnish an inspector. The manufacturer shall co-operate with the inspector and furnish the facilities necessary for the proper inspection of the pipe.

All pipe shall be substantially free from fractures, large or deep cracks and surface roughness. Pipe shall be subject to rejection on account of any of the following:

(a) Fractures or cracks passing through the shell which, in the opinion of the inspector, so weaken the pipe as to make its strength questionable.

(b) Defects, such as an unreasonable amount of honeycombing, which indicate imperfect mixing and moulding.

(c) Exposure of the reinforcement when such exposure indicates that the reinforcement is misplaced.

Pipe shall not be shipped until it has been inspected and accepted. All pipe rejected shall be the property of the manufacturer and shall be replaced by the manufacturer with pipe which meets the requirements of these specifications without cost to the Railway Company.

FORMS

The Railway Company owns six complete forms for 24 inch pipe and four complete forms for 36 inch pipe which are now stored at Auburn, Washington. These are of cast iron and conform to plan dated Office of Assistant Engineer, Tacoma, Washington. The company will furnish these forms on board cars at the manufacturer's plant. The manufacturer will unload the forms and, upon the completion of the contract and when so directed, will reload same without additional cost to the Railway Company. The manufacturer shall clean the forms and return them to the company in as good condition as when he received them, ordinary wear excepted. If, upon receipt of the forms, any parts are broken or missing, the contractor shall at once notify the company of the extent of the damage.

The manufacturer will be held responsible for the safe handling of the forms and will be required to make good any damage resulting from the careless or improper handling of same.

GENERAL

For the pipe to be manufactured under these specifications, the manufacturer shall furnish all labor, equipment and material entering into the manufacture of same, with the exception of the cast iron forms, and will complete same in the most thorough, workmanlike and substantial manner.

The work shall be started at once and completed as rapidly as the number of forms and proper curing will permit.

Payment will be made upon invoices submitted by the manufacturer for pipe loaded on cars.

Office of Bridge Engineer,
Saint Paul, February 18, 1926.

MFC

Feb. 17, 1926

The Sandstone Quarries Co.,
510 Plymouth Building,
Minneapolis, Minnesota.

Gentlemen:

I have your letter of January sixth submitting prices for the manufacture of concrete products for the Northern Pacific Railway.

It has been decided that we should purchase pipe and pikes from manufacturers on our own line. The prices which you quote are favorable but the difference in price is practically absorbed by the foreign line and local freight charges.

I thank you very much for your trouble in the matter and it is possible that we can get together at some time in the future.

Yours truly,

Bridge Engineer.

MFC

Feb. 17, 1926

Polaris Concrete Products Co.,
6010 Medina Street,
Duluth, Minnesota.

Gentlemen:

I have your letter of January second submitting prices for concrete products to be used on the Northern Pacific.

The prices which you submitted were slightly higher than those obtained from a manufacturer on our own line and we will not make a change at the present time.

Yours truly,

Bridge Engineer.

Ba36-a

Saint Paul, Jan. 28, 1926

Polaris Concrete Products Co.,
6010 Medina Street,
Duluth, Minnesota.

Gentlemen:

I have your letter of January 26th in regard to the making of concrete products for the Brthern Pacific Railway in 1926.

I note you state that you will be in Saint Paul the first week in February. I expect to be out of town at that time but I will arrange to have Mr. Beach discuss with you the proposition which you wish to make at that time.

Yours truly,

Bridge Engineer.

CyMr.M.W.Beach

Saint Paul, Jan 28, 1926

48" pipe 24"
57 " 36

MFC

Dec. 18, 1925

Sandstone Quarries Co.,
510 Plymouth Building,
Minneapolis, Minnesota.

Gentlemen:

I understand that the Great Northern Railway has purchased at various times from your company concrete piling and concrete slabs for use in reinforced concrete trestles.

The Northern Pacific Railway has been using concrete trestles for a number of years and I am sending you the Northern Pacific plan of a concrete pile and concrete slab. Would your company consider manufacturing these products for the Northern Pacific Railway and if so, will you kindly give an approximate price f.o.b. cars, Northern Pacific tracks, at Hinckley, Minn., your company to furnish all materials entering into the piles and slabs.

Yours truly,

Bridge Engineer.

Bdc-65

MFC

Saint Paul, December 5, 1925.

Mr. A. R. Cook,
Assistant Chief Engineer,
Seattle, Washington.

Dear Sir:-

As yet no decision has been r eached in regard to dismantling the Auburn Concrete Plant. I think we should know definitely what will be done in regard to furnishing concrete pipe, piles and slabs for the 1926 work before a definite decision is made in regard to the Auburn plant.

While in Seattle I discussed the manufacture of concrete products with Mr. Ostrander of the Pioneer Sand & Gravel Company and I understand that they have in mind going into the manufacture of concrete products, especially pipe. I think it would be well to go into the question of making a contract with some company on the coast for the manufacture of our pipe requirements. In order to obtain our standard pipe it would be well to turn our metal forms over to the contractor who undertakes to make our pipe. I understand there are several plants on the coast and I recently made an inspection of the one at Longview. Possibly we could turn one or two of our forms over to them and obtain the pipe that would be required in that vicinity.

Yours truly,

Bridge Engineer.

Saint Paul, October 1, 1925.

Mr. M. F. Clements:

Your letter of September 28 about dismantling the Auburn concrete plant.

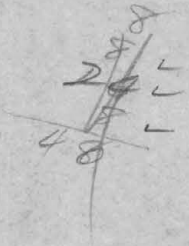
You do not mention the tentative future program as to slabs and reinforced concrete piling. Is it your idea that we will make these locally as required?

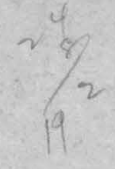
I wish you would discuss this matter with Mr. Stotler and make a personal inspection of the plant. Meanwhile I will hold papers, it being my understanding that you may get another tentative proposition from another contractor for continuing the plant.

Chief Engineer.

Concrete pile at Auburn

59 - 25' Piles
24 - 30' "
33 - 20' "
37 - 15' "
24 pcs 24" per = 192'
10 waste slabs 6'-6"





Form 134 8-29-23 1500 RP

NORTHERN PA

RECOMMENDED AND ESTIMATED COST OF (A) REPAIRS, (B) RENEWALS AND (C) IM

PASCO DIVISION

STATION EAST BRIDGE NUMBER NAME OF STREAM	Kind	Length	Height	Date Built or Rebuilt	High Water Below B. of R.	Drainage Area and Coefficient	BRIEF DESCRIPTI
SUNNYSIDE JCT.							
Brg. 2-2	HT	380	33	1905			
	PT	658	23				Adjust rods

wal. Where all or part of the work is recommended for improvement, show on separate
st to renew in kind, the cost of the proposed improvement. Any repairs to parts of the
The alternate estimates disapproved will be crossed out by the Chief Engineer. The last
gineer, and, except for items marked X indicating not authorized until formally approved
enance of Way, Chief Engineer, Asst. General Manager, General Manager and Auditor.

MFC 9a-65.

Saint Paul, November 23, 1925.

Mr. H. E. Stevens:

Referring to your letter of October 1st and tracer of November 21st in regard to dismantling the Auburn concrete plant.

This matter is still under consideration and I will give you a definite answer as soon as I have had replies from manufacturers on the construction of plants on the coast.

Bridge Engineer.

St. Paul, Minn., Nov. 21, 1925.

Mr. M. F. Clements:

Please refer to my letter of October 1st in regard to dismantling the Auburn concrete plant and advise status.

H. B. Stevens
Chief Engineer

REG:wp

Re: Inventory of concrete pipe, etc.,
on hand at Auburn Concrete Plant,
as of October 31, 1925

Seattle, Washington,
November 13, 1925

Mr. H. E. Stevens,
Chief Engineer,
St. Paul, Minn.

Dear Sir:-

Enclosing herewith inventory of concrete pipe, piles and slabs, reinforcing rods and supplies on hand at Auburn Concrete Plant, October 31, 1925.

Since that date 16 pieces of the 24" RCpipe have been shipped to Seattle Division, leaving only 8 pieces of that size now in stock.

Yours truly,

A. R. Cook

CESw

CC-M.F.Clements,
C.C.Kyle
S.H.Robson

N.P. 317
5-24

NW C.

NO.

INVENTORY OF MATERIALS AND SUPPLIES

-1-

LISTER'S SHEET NO.

Material charged to M&S Class #3 ARC 5-580 and 5-76)

ARITHMETIC
ARITH. CHECKED
GEN. VERIFICATION
RECAP.
RECAP. CHECKED
RECAP VERIFIED

LISTED BY C. E. Springer

CALLED BY

LOCATION OF MATERIALS Auburn, Wn.

Manufactured product on hand at Auburn Concrete Plant

STORE, October 31 192 5 DIVISION Seattle

	DESCRIPTION	NEW OR S. H.	QUANTITY OR NUMBER	UNIT Wt.	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1	24" RC Pipe 4 pcs (1924 product)	new	Lin.Ft 32	3255#				lin.ft 1.60	51.20		
2	24" RC " 20 pcs.	"	160	3255#				1.90	304.00		
3	30' RC Piles 24 pcs.	"	630	6600#				1.90	1197.00		
4	25' RC Piles 29 pcs	"	725	5260#				1.90	1377.50		
5	25' RC piles 33 pcs (1924 product)	"	825	5260#				1.15	948.75		
6	20' RC Piles 33 pcs.	"	660	4300#				1.90	1254.00		
7	15' RC Piles 37 pcs.	"	555	3500#				1.90	1054.50		
8	10' RC Piles 42 pcs.	"	420	2100#				1.90	798.00		
9	Double track slabs 10 pcs	"		30900#				ea 130.00	1300.00		
10	Concrete fence posts 11 pcs.	"							No charge		
11	Concrete pile ends 26 pcs.	S.H.							" "		
12									$ 8284.95		
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											

20
129
5

3-3/16" - R. H. 10" C. TO C. OUTSIDE HOLES

N.P. 317
5-24

INVENTORY OF MATERIALS AND SUPPLIES

-2-

NO. _____

LISTER'S SHEET NO. _____

ARITHMETIC _____
ARITH. CHECKED _____
GEN. VERIFICATION _____
RECAP. _____
RECAP. CHECKED _____
RECAP VERIFIED _____

Reinforcing rods charged to
Engr. Dept. DAS #10
on hand at
Auburn Concrete Plant.

LISTED BY C. E. Springer

CALLED BY _____

LOCATION OF MATERIALS Auburn, Wn.

_____ STORE, Oct. 31st 192 5 DIVISION Seattle.

	DESCRIPTION	NEW OR S. H.	QUANTITY OR NUMBER	UNIT Wt. Ft	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1	Size " length 1-1/8 rd 48'-10" No. Pcs 11	new	lin.ft 537'2"	3.38			1816	3.7511	68.12		
2	" 19'- 9" 40	"	790'	"			2670	"	100.15		
3	" 29'-0" 17	"	493'	"			1666	3.12	51.98		
4	" 28' 4" 3	"	85'	"			287	"	8.95		
5	" 24' 4" 363	"	8833'	"			29856	"	931.51		
6	" 20' 128	"	2560'	"			8653	"	269.97		
7	" 19' 58	"	1102'	"			3725	"	116.22		
8	" 15' 4" 349	"	5351'4"	"			18087	"	564.31		
9	" 9' 4" 7	"	65'4"	"			221	"	6.90		
10	" 7' 5" 3	"	22'3"	"			75	"	2.34		
11	" 3' 6" 11	"	38'6"	"			130	"	4.06		
12	" 3' 0" 2	"	6'0"	"			20	"	.62		
13	" 2' 6" 18	"	45'0"	"			152	"	4.74		
14	Total 1-1/8" rd rods		19928'7"				67358		2129.67		
15	1.1/4" rd plain 33' 9" - 127	"	4286'3"								
16	" " 27'-2" 14		380'4"								
17			4666'7"	4.173			19473	2.94	572.50		
18	1" rd 3' 4	"	12'	2.67			32	2.09	67		
19	1" sq 3' 1	"	3'	3.4			10	2.09	21		
20	1" sq 2' 10" 3	"	8'6"	3.4			29	2.09	61		
21	3/4" sq 2'6" 5	"	12'6"	1.913			24	2.84	68		
22	1/4" sq 0"23" 1219	SH	2336	0.107			390	2.76	10.76		
23	Pile plates 2-1/8"x1/8"x1-3 3/4"										
24	2 hole 5469 pcs	new		1.25 ea			6836	5.13	350.68		
25	Total Reinforcing						94152		$3065.98		
26											
27											

3-3/16" - R. H. 10" C. TO C. OUTSIDE HOLES

N.P. 317
5-24

INVENTORY OF MATERIALS AND SUPPLIES

-3-

NO. _____

LISTER'S SHEET NO. _____

ARITHMETIC _____
ARITH. CHECKED _____
GEN. VERIFICATION _____
RECAP. _____
RECAP. CHECKED _____
RECAP VERIFIED _____

Supplies and raw material charged to Engineering Dept., D.A.S. #10 on hand at

Auburn Concrete Plant

LISTED BY C. E. Springer

CALLED BY _____

LOCATION OF MATERIALS Auburn, Wash.

_____ STORE, Oct. 31st. 192 5 DIVISION Seattle

	DESCRIPTION	NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1	Supplies.										
2	Sheet iron 24" x 8" x 1/8 10 sh.	new					540#	sheet 4.82	4820		
3	4" x 4" - 16 15 pcs.	"	320	ftBM				M 22.00	704		
4	Elasterite Paint	"	20	gals					648		
5	Total supplies on hand								6172		
6											
7											
8											
9											
10											
11											
12											
13											
14											
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24											
25											
26											
27											

3-3/16" - R. H. 10" C. T. OUTSIDE HOLES

N.P. 317
5-24

INVENTORY OF MATERIALS AND SUPPLIES

-4-

NO. _____

LISTER'S SHEET NO. _____

ARITHMETIC _____
ARITH. CHECKED _____
GEN. VERIFICATION _____
RECAP. _____
RECAP. CHECKED _____
RECAP VERIFIED _____

LISTED BY _____

CALLED BY _____

LOCATION OF MATERIALS _____

STORE, Auburn Concrete Plant Oct. 31st 192 5 DIVISION _____

	DESCRIPTION	NEW OR S. H.	QUANTITY OR NUMBER	UNIT	LOT WEIGHT PCS.	LOT WEIGHT LBS.	TOTAL WEIGHT	PRICE	AMOUNT	CLASS NO.	RECAPITULATION THIS SHEET
1	SUMMARY										
2	Concrete Pipe, Piles & Slabs - charged to M&S Class #3								8284.95		
3	Reinforcing rods, charged to D.A.S. #10						94152#		3065.98		
4	Supplies " " " " " " "		8						61.72		
5									11412.65		
6											
7											
8											
9											
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3-3/16" - R. H. 10" C. I. OUTSIDE HOLES

Re 36a

HOME OFFICE BOX 21
[redacted]ERE, N. J.

LOCK JOINT PIPE CO.
OFFICE DENVER BRANCH
301-303 WESTERN SECURITIES BLDG.
1716 CALIFORNIA STREET

TELEPHONES { MAIN 8208 / CHAMPA 4079

DENVER YARD
W. 8TH AVE. AND TEJON ST.

DENVER, COLO., December 10, 1925

Mr. M. F. Clements,
Bridge Engineer,
Northern Pacific Railway Co.,
St. Paul, Minn.

Dear Sir:

We have received your letter of November 20th in reply to our letter of November 12th in reference to concrete railroad reinforced culvert pipe for use on your railroad west of Helena Montana. It is noted that you will require approximately a mile of pipe in 1926.

I have taken this matter up with our Home Office at Ampere New Jersey and find that they are not planning to do any considerable amount of work in the Northwest within the next few months. Up to about March of the present year and for many years past, we had a branch at Seattle, Washington, but our operations there have been temporarily discontinued.

The cost of installing a plant at some point along your line in Montana, Idaho or Washington would be rather great unless it was done in connection with other operations. Therefore, we do not feel justified at this time in giving you quotations on culvert pipe FOB any point on your line. It is quite possible that our attitude in this matter might change materially within the next few months.

We desire to express our appreciation of your courtesy in giving us an opportunity to submit quotations and we are glad to know that you are willing to approve the designs that we submitted.

Yours very truly,

LOCK JOINT PIPE COMPANY

BY Wm B Freeman
(WM. B. FREEMAN)
BRANCH MANAGER

MFC

Nov. 20, 1925

Lock Joint Pipe Co.,
1716 California Street,
Denver, Colorado.

Gentlemen:

I have your letter of November 12th in regard to concrete railroad culvert pipe for the Northern Pacific Railway west of Helena, Montana.

For your information I am sending you plans of Northern Pacific standard pipe in 24", 36" and 48" sizes. You will note that all of this pipe has a four inch wall which provides a different strength for each size of pipe. The Northern Pacific began the manufacture of pipe in 1909 and it was considered at that time that a four inch wall should be the minimum thickness.

The plans of pipe which have been approved by the Union Pacific Railway would be satisfactory for our purpose and if you are in a position to manufacture pipe at any point on our railroad, we would be glad to consider the purchase of pipe from your company. We will require approximately 5000 lineal feet of pipe in 1926.

Yours truly,

Bridge Engineer.

HOME OFFICE BOX 21
AMPERE, N. J.

LOCK JOINT PIPE CO.
OFFICE DENVER BRANCH
301-303 WESTERN SECURITIES BLDG.
1716 CALIFORNIA STREET

TELEPHONES { MAIN 8208
CHAMPA 4079

DENVER YARD
W. 8TH AVE. AND TEJON ST.

DENVER, COLO., November 12, 1925

Is the Lock Jt Pipe OK? Write 11/17

Mr. M. F. Clements,
Bridge Engineer,
Engineering Department,
Northern Pacific Railroad Company,
St. Paul, Minn.

Dear Sir:

A copy of your letter of November 7th to our Chicago office in reference to reinforced concrete railroad culvert pipe has been referred to this office. We did not however receive a print of the design and would appreciate it if you would send one to us.

We are mailing to you our blueprints LJ #2203-C and LJ #2203-O which show our design for round pipe with circular reinforcement and oval reinforcement respectively, in sizes from 12" to 72". We also make 84" pipe with an 8" wall. Ordinarily we furnish bell end pipe in sizes up to and including 48" and the Lock Joint pipe in the larger sizes. This pipe is similar to slip joint pipe but it gives a stronger joint.

These blue prints have been approved by Mr. W. L. Brayton, Bridge Engineer of the Union Pacific Railroad for use under the Union Pacific tracks and we sell some little pipe to that Railroad. We make similar pipe for the Colorado & Southern and Denver & Rio Grande Western Railroads with somewhat lighter reinforcement. You will note that our designs are based on a loading of only 1600# per sq. ft. but we use a value of only 16,000# per sq. in. for tension in steel and 650# per sq. in. for compression in concrete. Since the report of the Joint Committee on Standard Specifications For Concrete and Reinforced Concrete was issued in the Proceedings of the American Society of Civil Engineers for October 1924, there has been a decided tendency to increase the safe unit stresses for both steel and concrete. In the Tentative Standard Specifications for Reinforced Concrete Culvert Pipe adopted on June 26, 1925 by the Joint Concrete Culvert Pipe Committee, a value of 27500# per sq. in. is recommended for cold-drawn steel wire and a value of 20,000# per sq. in. for billet steel with a value of n = 12 for the ratio of the modulus of elasticity of steel to that of concrete for concrete having an ultimate compressive strength at 28 days of 2200 to 2900 pounds per square inch. We almost invariably use American Steel & Wire Company triangular mesh for circumferential reinforcement, which we believe meets the specifications for cold-drawn steel wire, so that with the above values for steel and concrete our designs are for a loading of at least 2500# per sq. ft.

HOME OFFICE BOX 21
AMPERE, N. J.

LOCK JOINT PIPE CO.
OFFICE DENVER BRANCH
301-303 WESTERN SECURITIES BLDG.
1716 CALIFORNIA STREET

TELEPHONES { MAIN 8208
CHAMPA 4079

DENVER YARD
W. 8TH AVE. AND TEJON ST.

DENVER, COLO., November 12, 1925

#2.

We are enclosing herewith copies of letters and memoranda regarding our method of design, particularly for culvert pipe with two layers of circular reinforcement which we believe is a much better design than either elliptical pipe with circular reinforcement or circular pipe with elliptical reinforcement. While our designs for pipe with a single layer of oval reinforcement contain less steel than the other design, our prices for the two designs are very much the same. We can of course vary our reinforcement to suit your specifications if you so desire, but we prefer not to change our wall thicknesses.

It is noted that you are particularly interested in quotations on culvert pipe for use on your lines west of Helena, Montana. We have no plant in the northwest at the present time but we are willing to consider the installation of a plant, probably between Spokane and Seattle, if the volume of business would justify it. We would like you to give us some idea of your annual requirements. We would be willing to be governed to some extent by your suggestions in the matter of the location of a plant.

We have gone into this matter at some length in our initial letter to you so that you may get some insight into our ideas about making reinforced concrete culvert pipe. It may be that our designs will not appeal to you at all. On the other hand, you may be able to reconcile them to the design which you have been using for the past fifteen years. In that case, we shall be glad to have your suggestions when you send us a copy of your drawing.

Yours very truly,

LOCK JOINT PIPE COMPANY

BY Wm B Freeman
(WM. B. FREEMAN)
BRANCH MANAGER

PRIME OFFICE ADDRESS
BOX 21
ALPHA, N. J.

LOCK JOINT PIPE CO.

OFFICE
311 ENGINEERS BLDG.
1716 CALIFORNIA ST.

DENVER YARD
W. 8TH AVE. AND TEJON ST.
CITY

DENVER, COLO., March 20, 1922.

MEMORANDUM concerning Loading on Railroad Culverts and Design of Reinforced Concrete Pipe for Same.

1. This memorandum is written after study of the experiments and deductions of numerous authorities, including Rankine, Talbot and Marston. The last two rank among the leading American authorities on this subject at the present time. Marston's investigations were made public in Bulletin 31 of the Engineering Experiment Station of the Iowa State College of Agriculture and subsequent publications and have been widely reprinted. Talbot's experiments are published in Bulletin No. 22 of the Engineering Experiment Station of the University of Illinois and extracts from this and other publications by this author have been printed in many textbooks and handbooks. Talbot's investigations do not include tests of reinforced concrete pipe with a double layer of circular reinforcement but his theory of design is quite applicable to this type of reinforcement.

2. Loading: Every railroad has its own standard for live loads and locomotive loading but few live loadings when reduced to a unit basis have an intensity greater than 1500 pounds per square foot. The transmission and distribution of such loads through the ballast into the embankment is considered in detail in the "Second Progress Report of the Special Committee to Report on Stresses in Railroad Track" dated November 26, 1919, and published as Paper No. 1455 of the Transactions of the American Society of Civil Engineers. At a depth below the base of the tie greater than spacing of the ties a marked decrease in the intensity of pressure, due to track loads, is noted and ordinarily, at a depth greater than three feet below the base of the tie, the intensity of such pressure would be very small. In most cases, railroad culverts would have a depth of cover of at least three feet and, if the cover was less than that, a culvert properly designed for dead loads would take care of the maximum pressure from the live loading.

A culvert designed for a fill of 20 feet should be sufficiently strong to resist any pressure which would likely be brought to bear upon it by a combination of railroad live loads and embankment loads. Some authorities are of the opinion that there is little increase in the vertical pressure, due to backfilling, at depths over 16 feet. According to Marston's conclusions and tables it does not seem probable that the vertical loading on a round pipe in a railroad embankment at a depth of 20 feet would ever exceed 1600 lbs. per square foot. It is possible that a greater intensity of vertical pressure might be obtained in a fill 30 feet deep under certain conditions. As a practical matter, it is believed that a pipe designed for loading of 1600 pounds per square foot would answer all ordinary conditions found in railroad practice.

All authorities recognize the fact that the pressure due to the filling over a pipe does not always act in a vertical direction and that it may be quite oblique to the vertical. Under certain trench conditions it is conceivable that the horizontal pressure might exceed the vertical pressure. Generally speaking the railroads of this country have not taken this fact into account in the design of reinforced concrete pipe. Most of them assume a uniform vertical load W, which gives a bending moment $\frac{Wd}{16}$

at the crown of the pipe and an equal negative bending moment at the spring line. In this formula "d" is the mean diameter of the pipe ring in inches. The bending moment at the quarter points is assumed to be zero. To resist these bending moments the steel is placed in the so-called regions of tension, that is, near the inner circumference at the crown, near the neutral axis at the quarter points, and near the outer circumference at the spring line. As a matter of theory insofar as the steel is concerned, it can be easily seen that a pipe with reinforcement so placed would have little or no resistance to a concentrated or distributed load acting at an angle of 45 degrees to the vertical and in a case where the lateral pressure is much greater than the vertical pressure the reinforcement would be in just the opposite position to which it should be properly located. For that reason a pipe design with steel in the regions of tension is a comparative fallacy.

Where there is any considerable fill over a pipe the existence of a lateral pressure is recognized by all authorities. The minimum given by any authority is 25% of the vertical pressure due to the fill and most authorities use 33% or more. Talbot recognized the existence of lateral pressure but does not recommend that allowance be made for it in the case of reinforced concrete pipe with steel in the region of tension, designed for vertical loading. He recommends that it be considered an additional factor of safety because of the uncertainties in bedding and loading. His recommendation would not apply to a reinforced concrete pipe with double ring of reinforcement as such a pipe would have equal strength regardless of the direction of the pressure brought to bear upon it.

3. Design of Concrete Culvert Pipe: Accompanying this memorandum are two drawings, one of which shows round reinforced concrete pipe designed for vertical loading only. The circumferential reinforcement consists of one oval layer of steel in the regions of tension. Uniform loading assumed is 1600 pounds per square foot over the mean diameter of the pipe ring in inches, "d", and the formula used is $M = \frac{Wd}{15}$ where M is the bending moment in inch lbs. and W is the load per lin. foot of pipe. No allowance is made for lateral pressure in this design because of the uncertainties of loading. The cross-sectional area of the circumferential steel in the pipe is as follows per lin. ft. of pipe:

			Thickness of Pipe
12" pipe	-	.066 sq. in.	2"
15"	-	.093	2"
18"	-	.153	2½"
24"	-	.23	3"
30"	-	.27	3½"
36"	-	.32	4"
42"	-	.37	4½"
48"	-	.42	5"
60"	-	.52	6"
72"	-	.64	7"

OVAL REINF.

The same loading is assumed for a pipe with a double layer of circular reinforcement, but is is assumed that the direction of pressure may be either in a vertical direction or at any angle oblique to the vertical and that the lateral pressure or a pressure at right angles to the principal pressure is 25% of the principal pressure. In that case, under Talbot's theory, the maximum bending moment for a distributed load will be $\frac{3}{16}$ Wd. This bending moment will be greatest at the crown or at the end of the diameter parallel to the principal load and there will be an equal negative bending moment at an angle of 90 degrees from that point. It would, therefore, appear that the same area of steel would be required in each of the two layers of reinforcement. However, the thrust in the pipe ring at the end of the horizontal diameter or at the end of the diameter perpendicular to the direction of the principal pressure, must also be considered. If W is the total load per lin. ft. of pipe, this thrust T would be equal to $\frac{1}{2}$ W.

The tension in the steel at that point due to the bending moment will be reduced by the resisting compressive stresses due to the thrust. The following formula will apply:

$$f' = f - \left[\frac{\frac{1}{2} n T}{t(1+np)}\right]$$

Where f' is the net tesnile stress in the steel in pounds per square inches; f is the tensile stress due to the bending moment; t is the distance in inches from the compression face of concrete to the center of steel in tension; p is the ratio of the area of steel per unit length of ring to the area of concrete which is t times the unit length; and n is the ratio of the moduli of elasticity of steel and concrete. By the application of this formula, it will be noted that the area of steel in the outer ring of reinforcement need be little more than two thirds of the area in the inner layer under the assumed loading. This is also a rational design for a concentrated load acting in any direction as the maximum positive bending moment is immediately under the load and the maximum negative bending moment, 90 degrees from the load, is only 9/16 as much.

The formula for bending moments under distributed loads is worked out for a thin ring and the bending moment at the crown will be somewhat greater where the thickness of the ring is one tenth or more of the diameter, but the slightly increased tensile stress at the crown, due to this additional bending moment, will be compensated by the thrust at the crown due to lateral pressure.

The area of steel required for each of the two layers of reinforcement under the above loading and assumptions will be as follows per lineal foot of pipe:

TWO LAYERS OF CIRCULAR REINF.

Diameter	Inner Layer	Outer Layer	Both Layers	Thickness of Pipe
24"	.153 sq. in.	.124 sq. in.	.277 sq. in.	3"
30"	.208	.146	.354	3½"
36"	.245	.180	.425	4"
42"	.27	.21	.48	4½"
48"	.31	.24	.55	5"
60"	.39	.29	.68	6"
72"	.47	.33	.80	7"

For pipes 12", 15" and 18" in diameter, there is only one layer of reinforcement and which will be the same as is shown in the preceding design. It is assumed that the steel in both layers is placed 1" from the surface of the concrete.

4. These designs show the reinforcement which is considered proper for railroad culvert pipe under ordinary conditions of loading. For heavier loads the reinforcement can be increased accordingly and the Lock Joint Pipe Company is prepared to furnish pipe with the amount of steel called for by the specifications of any particular railroad.

The bell of the pipe is designed in all cases to be as strong as the body of the pipe and the longitudinal reinforcement extends into the bell.

The amount of longitudinal steel shown represents a fair average of railroad specifications. It may be increased or lessened to conform to particular specifications.

Wm. B. Freeman
Civil Engineer,
Lock Joint Pipe Company

September 17, 1925

Mr. M. W. Loving, Sec.,
American Concrete Pipe Association,
111 West Washington St.,
Chicago, Ill.

Dear Mr. Loving:

I have recently received from you a mimeographed manuscript entitled "Tentative Standard Specifications For Reinforced Concrete Culvert Pipe" adopted at the annual meeting of the Joint Concrete Culvert Pipe Committee which was held on June 26, 1925. It is noted that the Committee intends to hold another meeting at Ames Iowa in October at which time final action will probably be taken on these Tentative Specifications.

I have no particular comments to make on the specifications for materials or on the loading specifications but I would like to express my opinion regarding the design. In all of the design tables shown in these specifications two types of pipe are specified, namely, circular pipe and elliptical pipe and for a particular design the wall thickness for either type of pipe is the same. The elliptical pipe is to be provided with one layer of circular reinforcement in every case. While it is not so stated, it is assumed that circular pipe with the same amount of elliptical reinforcement would be acceptable, provided the elliptical reinforcement was accurately placed. For all of these designs, it is noted that circular pipe with circular reinforcement must have two lines for all sizes above 24" and it is required that each of these two lines of circular reinforcement must have the same area of steel as the single line of reinforcement in elliptical pipe. In making this recommendation, I do not believe that your committee has given full consideration to all of the elements that enter into the design of a concrete pipe or its actual performance in the trench and I would suggest that the committee look into this question more thoroughly.

As a practical matter, actual tests have indicated that for pipes up to 48 inches in diameter, a single ring of circular reinforcement in a round pipe gives all the strength which is figured for the same reinforcement in an elliptical pipe. As a matter of theory, there are a number of reasons that there should be less reinforcement in each of the two lines of a circular pipe than in the one ring of an elliptical pipe.

September 17, 1925

An elliptical pipe is designed on the theory that the loading will be vertical. It is not likely that this condition always exists in practice. For instance, the impact on a railroad culvert pipe from an approaching train may set up a stress which is acting at an angle a good many degrees from the vertical; in a wet or flowing trench, the lateral pressure on the pipe may be more than the vertical pressure. If the load is acting at an angle of 45° from the vertical, the steel being in the neutral axis is theoretically inadequate to resist the tension due to the bending moment, and if the principal load is acting horizontally the steel is theoretically in reverse position. For these and other reasons, Talbot recommends that no reduction be given in the computed bending moment in an elliptical pipe because of the effect of lateral pressure, and that the lateral pressure be regarded as a factor of safety.

The above objections do not apply to round pipe with two lines of circular reinforcement because it has the same strength no matter from what direction the load may come. Accordingly, it is perfectly safe to reduce the bending moment due to the vertical load by a percentage equivalent to the ratio of the intensity of the lateral pressure to the intensity of the vertical pressure, commonly designated as (q). In other words, if M is the bending moment produced by the vertical load and q is equal to 0.25, then it is perfectly safe to design a round pipe in a trench for a bending moment of 0.75M. The value of 0.25 for q, which the writer has been in the habit of using, is believed to be very conservative as many authorities allow at least 0.33. If the principal load acts from any other direction than the vertical, the lateral pressure may be assumed to be at right angles to this direction and the value of 0.25 for q is still perfectly safe for a pipe buried in a trench or a fill, the latter condition being the usual one for a culvert pipe. Accordingly, the writer believes that the inner line of reinforcement for a circular pipe with two lines of reinforcement need not contain more than 75% as much steel as is required for the single line of reinforcement in an elliptical pipe.

The points of maximum bending moment for a uniformly distributed vertical load are at the crown and spring line of a pipe. The bending moment at the spring line (or at the extremity of the diameter at right angles to the direction of the principal load) is negative and equal in amount to the bending moment at the crown of the pipe (or at the extremity of the diameter parallel to the direction of the principal load). The required area of steel in the outer line of reinforcement would be the same as for the inner line except for one reason, and this can not be taken advantage of in designing an elliptical pipe without resorting to the rather impractical procedure of varying the steel area in different parts of the circumference of the pipe ring. This reason is that the tension in the outer layer of steel at the spring line due to the bending moment will be reduced by the resisting compressive stresses set up by

September 17, 1925

the thrust due to the vertical load or the principal load. This thrust on one wall at the spring line may be designated as T and is equal to 1/2 W where W is the total vertical load per unit length of pipe for either concentrated or distributed load. The amount of tension (f') in the outer layer of steel at the spring line (or at the extremity of the diameter at right angles to the direction of the principal load), which is also the point where the negative bending moment is the greatest, is much less than the amount of the tension produced by the bending moment alone and may be calculated by the formula $f' = f - \frac{1/2nT}{t\,(14np)}$ where f is the tensile stress in the steel due to the bending moment, p is the ratio of steel area to concrete area, t is the distance from the compression face of the concrete to the center of the steel reinforcement and n is the ratio of moduli of elasticity of steel and concrete.

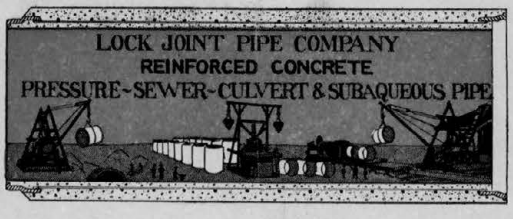
The writer has computed this formula for a great many diameters of pipe and finds that for an assumed safe unit tensile strength of steel, the actual steel area required in the outer line of reinforcement is only about 70% of that required in the inner line. Therefore for a circular pipe with two lines of reinforcement instead of having both lines of the same area as the single line requires for elliptical reinforcement, the inner line need have only about 75% as much steel and the outer line need have only from 50% to 55% as much steel, where the pipe is designed to be buried and round pipe should show up to particular advantage in a fill. The writer is convinced that actual loading tests under trench conditions will demonstrate the soundness of this line of reasoning and such tests, should be made with the loads acting in directions at various angles from the vertical as well as with loads acting from the vertical.

Yours very truly,

LOCK JOINT PIPE COMPANY

BY WMBF.

(WM. B. FREEMAN)
BRANCH MANAGER



FOR DESCRIPTION OF CENTRIFUGAL CONCRETE PIPE
SEE PAGE 35-36 LOCK JOINT PIPE COMPANY
CATALOG.

For Measured Leakage Concrete Pipe

See Page 17 Lock Joint Pipe Co-Catalog

For Measured Leakage Metal Pipes

See Pages 414-415 Waterworks Handbook
Flinn Weston & Bogert

Director of Public Works Norfolk, Va.
has considerable data on leakage in wood pipe
(Usually in excess of 1000 gallons per mile of
pipe line per inch of pipe diameter in 24 hours)

For Measured Capacity of Concrete Pipe

See Page 15 Lock Joint Pipe Co-Catalog
Page 894 Eng-News-Record May 28, 1925

Bulletin 852 U. S. Dept of Agriculture
Bureau of Public Roads

For Capitalized Bids on reinforced concrete, steel
and cast-iron pipe - See Eng. News-Record
March 5, 1925 Page 402

LOCK JOINT PIPE CO.

ESTABLISHED 1905

MANUFACTURERS OF

WATER, SEWER, CULVERT AND SUBAQUEOUS

REINFORCED CONCRETE PIPE

NEW YORK OFFICE
165 BROADWAY

GENERAL OFFICES
AMPERE, N.J.
TELEPHONE: ORANGE
4771-4772-3963

110 S. Dearborn St.,
Chicago, Illinois
November 9, 1925

Mr. M. F. Clements,
Bridge Engineer,
Northern Pacific Railway Co.,
St. Paul, Minnesota

Dear Sir:

We are pleased to acknowledge receipt of your letter of Nov. 7th with enclosed specifications on reinforced culvert pipe used by the Northern Pacific Railway Company.

With reference to your consideration of purchasing pipe for the western territory, we are referring your letter to our Mr. W. B. Freeman, Branch Manager, Lock Joint Pipe Company, Denver, Colorado, since the territory mentioned in your letter is more nearly in his section.

Yours truly,

LOCK JOINT PIPE COMPANY

By David A. Decker.

cc Amp
DAD/G

Ga 36a

MFC

Nov. 7, 1925.

Lock Joint Pipe Co.,
110 S. Dearborn Street,
Chicago, Illinois.

Gentlemen:

Complying with the request in your recent letter I am sending you two copies each of plans covering 24", 36" and 48" reinforced concrete pipe. This design of pipe has been used on the Northern Pacific Railway for the past fifteen years.

At the present time we have a contract with a company for the manufacture of pipe which is used on the Northern Pacific Railway for points east of Helena, Montana. Heretofore, we have made concrete pipe at one of our own plants at Auburn, Washington for the territory west of Helena, Montana. We are considering at the present time dismantling our plant and purchasing pipe for the western territory from any manufacturing concern which will furnish pipe to our plan and specification.

It is possible that you may be interested in a plant in the western territory and if so, we will consider a proposition of making a contract with you for the manufacture of pipe.

Yours truly,

Bridge Engineer.

Encl.

LOCK JOINT PIPE CO.

ESTABLISHED 1905

MANUFACTURERS OF

WATER, SEWER, CULVERT AND SUBAQUEOUS

REINFORCED CONCRETE PIPE

NEW YORK OFFICE
165 BROADWAY

GENERAL OFFICES
AMPERE, N.J.
TELEPHONE: ORANGE
4771-4772-3963

110 S. Dearborn St.,
Chicago, Illinois
October

Construction Engineer,
Northern Pacific Ry. Co.,
226 W. Adams Street,
Chicago, Illinois

Dear Sir:

We would appreciate very much your sending us a set of your specifications covering reinforced concrete pipe for railroad culvert work.

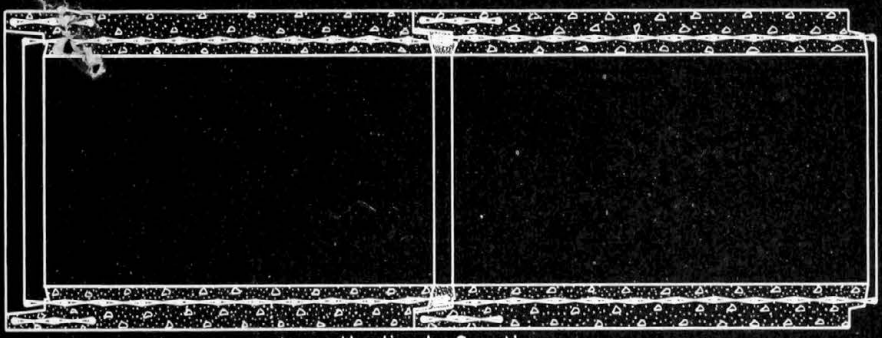
We have opened a branch office here in the city of Chicago, and will be interested in work which may come up under your direction.

Yours truly,

LOCK JOINT PIPE CO.

By D. A. Decker
G

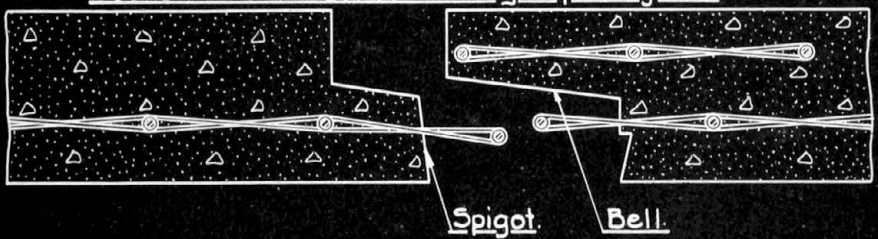
Boring + mud plan with specifications
Herewith
RBB



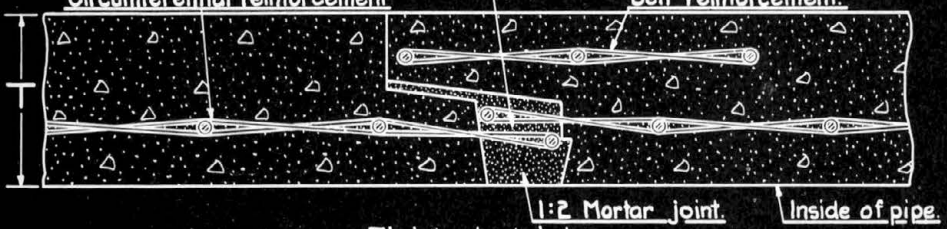
Longitudinal Section.

Pipes Made in 4' Lengths.

Section of Joint before Putting Pipe Together.



Reinforcement overlaps in joint giving continuous strength throughout pipe line.



Finished Joint.

Dia.	24"	27"	30"	33"	36"	39"	42"	45"	48"	54"	60"	66"	72"	78"	84"	90"	96"	108
T	3"	3½"	3½"	4"	4"	4"	4½"	4½"	5"	5½"	6"	6½"	7"	8"	8"	8½"	8½"	9"

"Lock Joint" Reinforced Concrete Sewer Pipe.

Sizes - 24" to 108"

LOCK JOINT PIPE Co.

AMPERE, N. J.

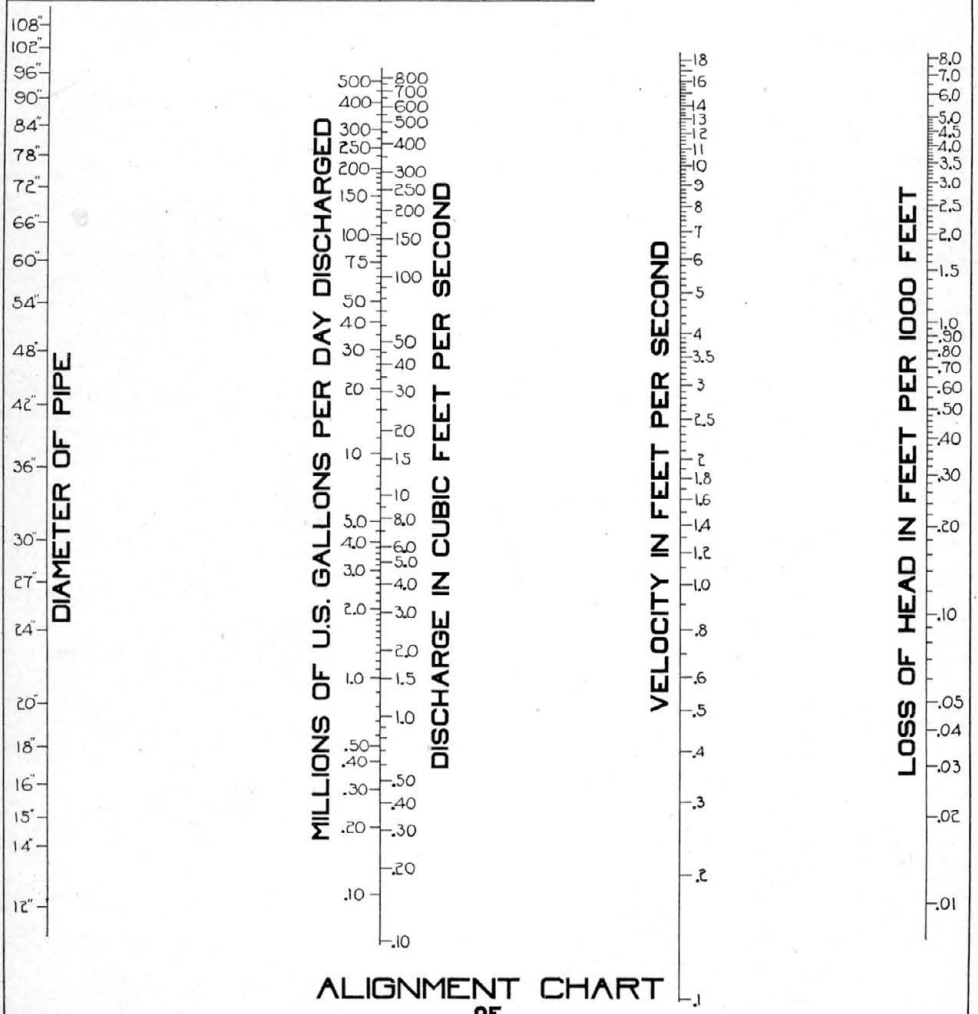
DISCHARGE FOR "LOCK JOINT" PIPE

VALUES OF COEFFICIENT "C" IN WILLIAMS-HAZEN FORMULA & OF "N" IN KUTTER'S, CORRESPONDING TO $C_s = 0.360$

VELOCITY	1 FT. PER SEC.		3' PER SEC.		5' PER SEC.		10' PER SEC.	
DIAMETER	"C"	"N"	"C"	"N"	"C"	"N"	"C"	"N"
12"	135	.0106	124	.0110	118	.0110	112	.0111
24"	137	.0107	127	.0115	124	.0115	116	.0117
48"	141	.0114	130	.0119	125	.0120	119	.0120
96"	150	.0115	136	.0120	130	.0121	123	.0123

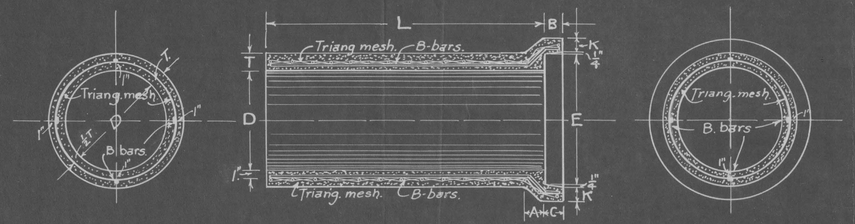
SCOBEY'S FORMULA-$Q = 0.00546\ C_s d^{2.625} H^{0.5}$

Q = Discharge in Cubic Feet per Second=Sec.Ft.
H = Loss of Head from Friction in Feet per 1000 Feet.
d = Internal Diameter of Pipe in Inches.
C_S = Scobey's Coefficient - Value Adopted =0.360



ALIGNMENT CHART
OF
DISCHARGE FOR "LOCK JOINT" REINFORCED CONCRETE PIPE COMPUTED BY SCOBEY'S FORMULA FROM BULLETIN 852 U.S. DEPT. OF AGRICULTURE, BUREAU OF PUBLIC ROADS

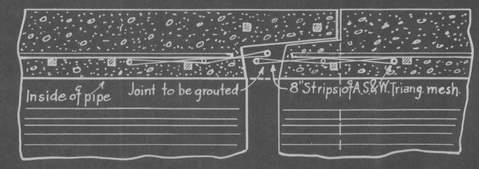
A STRAIGHT LINE DRAWN ACROSS THE FOUR SCALES, INTERSECTS AT CORRESPONDING VALUES OF DIAMETER, DISCHARGE, VELOCITY AND LOSS OF HEAD



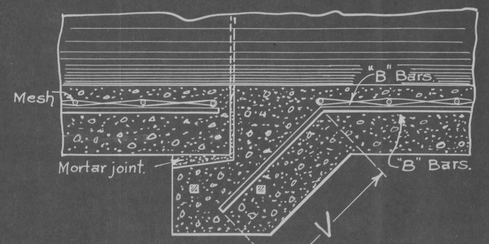
PIPE WITH SINGLE LAYER OF CIRCUMFERENTIAL MESH REINFORCEMENT.

TABLE OF QUANTITIES.

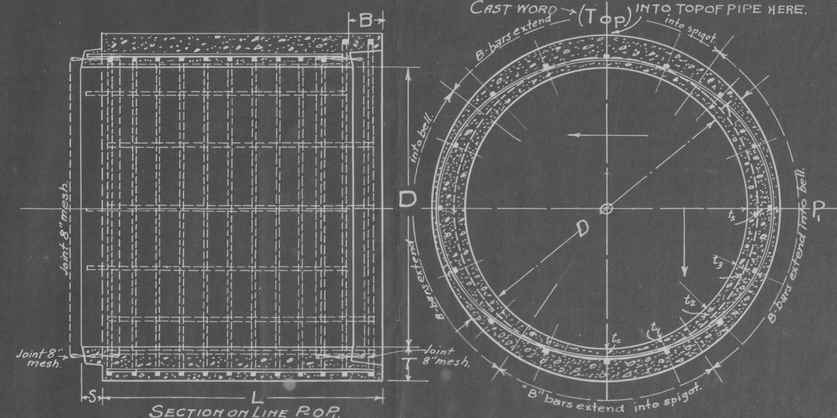
D.	L.			LONGITUDINAL REINF.					CIRCUMFERENTIAL REINF. F.A.S.&W.CO. TRIANG. MESH						
												MESH IN SHELL		BELL MESH.	
Diameter Inches.	Length of sections.	Cu. Yds. concrete per section.	Approx. Weight lbs. per section.	Number of "B" Bars.	Length of "B" Bars.	Size & shape.	Total Sectional area Sq. In.	Weight lbs. of steel per ft. of pipe.	Number of layers.	Style number of mesh.	Min. Sectional area of steel per in. ft. of SHELL Sq. In.	Weight lbs. of Circ. steel per ft. of pipe.	Width inches	Circum. with 8 in. lap.	Width inches.	Circum. with 8 in. lap.
12"	4 Ft.	0.103	400	4	4'2"	½" Rnd	0.20	0.67	1	.068 or 28	.066	1.25	44"	4'4"	8"	5'8"
15"	4 Ft.	0.124	525	4	4'2"	¼" "	0.20	0.67	1	.093 or 26	.093	2.00	44"	5'2"	8"	6'5"
18"	4 Ft.	0.187	750	4	4'3"	½" Sq	0.56	1.90	1	.153 or 23	.153	3.60	44"	6'0"	8"	7'8"



SECTION THRU. THE "LOCK-JOINT"

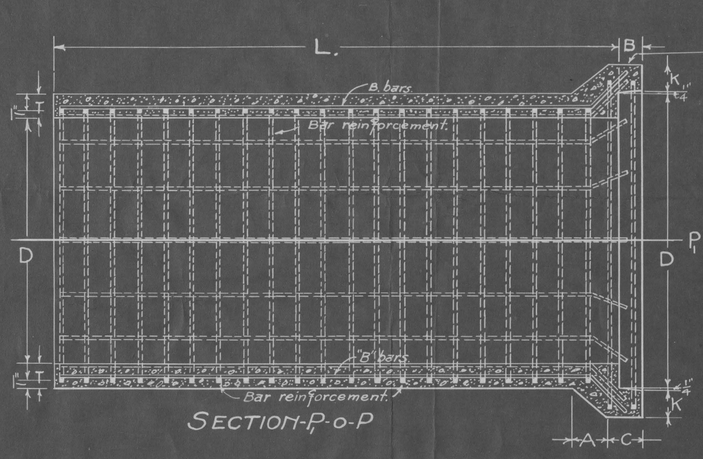


SECTION THRU BELL-END JOINT.



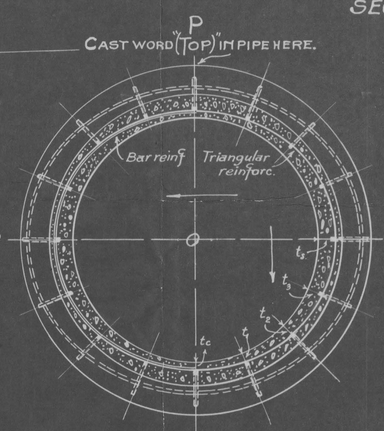
LOCK JOINT PIPE WITH BAR REINFORCEMENT.

TO BE USED FOR CULVERTS 60 IN. & 72 IN. DIAMETER.
(ALSO for Culverts 24 in. & upwards when specified.)

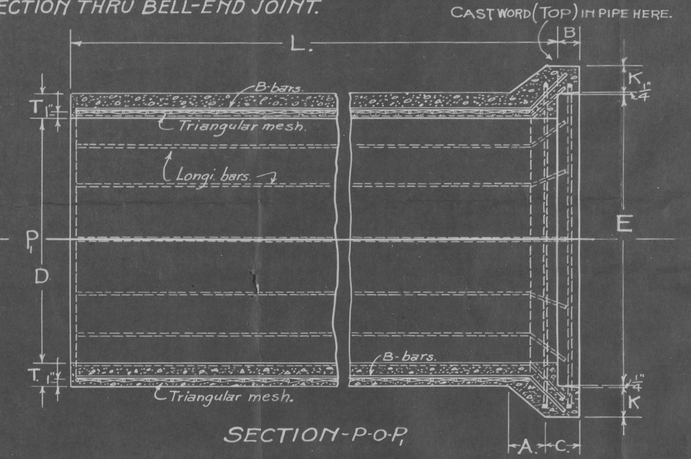


SECTION-P-O-P

PIPE WITH SINGLE OVAL LAYER OF BAR REINFORCEMENT.

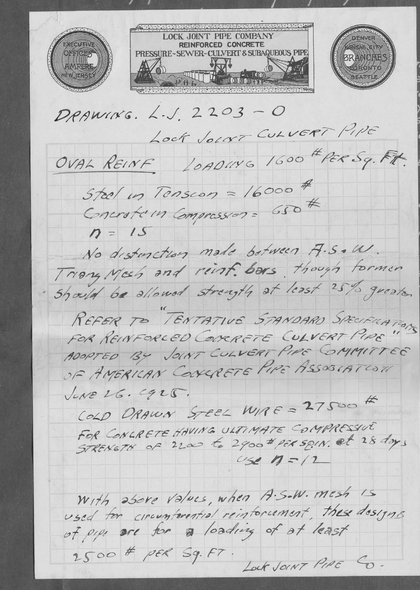


CROSS-SECTION OF PIPE.



SECTION-P-O-P,

PIPE WITH SINGLE OVAL LAYER OF MESH REINFORCMENT.



LOCK JOINT PIPE COMPANY
REINFORCED CONCRETE
PRESSURE-SEWER-CULVERT & SUBAQUEOUS PIPE

DRAWING. L.J. 2203 - O
Lock Joint CULVERT PIPE

OVAL REINF. LOADING 1500 # PER Sq. FT.

Steel in Tension = 16000 #
Concrete in Compression = 650 #
n = 15
No distinction made between A.S.&W.
Triang. Mesh and reinf. bars though formerly should be allowed strength at least 25% greater.
Refer to "TENTATIVE STANDARD SPECIFICATIONS FOR REINFORCED CONCRETE CULVERT PIPE" ADOPTED BY JOINT CULVERT PIPE COMMITTEE OF AMERICAN CONCRETE PIPE ASSOCIATION JUNE 26. 1925.
COLD DRAWN STEEL WIRE = 27500 #
FOR CONCRETE HAVING ULTIMATE COMPRESSIVE STRENGTH OF 2200 to 2700 # PER SQ IN. at 28 days
USE n = 12

With above values, when A.S.W. mesh is used for circumferential reinforcement, these designs of pipe are for a loading of at least 2500 # PER Sq. FT.

Lock Joint Pipe Co.

DETAIL OF "B" BARS.

TABLE OF QUANTITIES

PIPE D. Diameter	PIPE L. Length of Sections	Cu. Yds. concrete per section.	Approx. weight lbs. per section.	LONGITUDINAL REINFORCEMENT. Number of bars.	Size and Shape.	LENGTH. "B" bars overall.	LENGTH. "V" inches.	Total Sectional area of steel. Sq. in.	Weight lbs. of Long. steel per ft. of pipe.	CIRCUMFERENTIAL REINFORCEMENT. Number of layers.	Position of reinforcement. t_c.	t_1.	t_2.	t_3.	t_6.	FOR A.S.&W.Co. TRIANG. MESH REIN. Style No. of mesh.	Min. Sectional area of steel per in. ft. of Shell Sq. in.	Wt. lbs. of circ. steel per ft. of pipe.	Width of A.S.W.Co. MESH IN.	Periphery of mesh with 8 in. lap.	OVAL SHAPED STEEL IN REGIONS OF TENSION. FOR STEEL BAR REINFORCEMENT. Size and shape of bars.	Spacing C. to C.	Number per pipe.	Sectional area of steel per in. ft. of Shell Sq. in.	Weight lbs. of steel per ft. of pipe.	NET Periphery of reinf.	Periphery with 8 in. lap & Coupling
24 in.	8 Ft.	0.58	2200	6	1" Sq.	8 Ft. 1 in.	6 in.	0.84	2.9	1	1 in.	1 3/8 in.	1 3/4 in.	1 7/8 in.	2 in.	No 245 or 32	0.225	6.5	48" 44"	7 Ft. 9 in.	1/4 Sq. Tw.	3 1/4 in.	29	0.231	5.6	7 Ft. 1 in.	7 Ft. 9 in.
30 "	do.	0.84	3300	8	"	8 Ft. 1 in.	7 "	1.10	3.8	1	do.	1 5/8 "	1 3/4 "	2 1/4 "	2 1/2 "	" 267 " 40	0.267	9.7	48" 42"	9 " 5 "	1/4 do.	2 3/4 "	33	0.273	8.1	8 " 9 "	9 " 5 "
36 "	do.	1.15	4500	10	"	8 " 2 "	8 "	1.40	4.8	1	do.	1 5/8 "	2 "	2 3/4 "	3 "	" 336 " 39	0.325	13.7	48" 42"	11 " 2 "	do. do.	5 1/4 "	18	0.321	11.5	10 " 6 "	11 " 6 "
42 "	do.	1.50	5800	12	"	8 " 2 "	8 1/2 "	1.70	5.7	1	do.	1 3/8 "	2 1/4 "	3 1/2 "	3 1/2 "	" 365 " 38	0.365	18.1	48" 40"	12 " 10 "	do. do.	4 1/2 "	21	0.375	15.5	12 " 2 "	13 " 2 "
48 "	do.	1.92	7500	16	"	8 " 2 "	9 "	2.30	7.6	1	do.	1 3/4 "	2 1/2 "	3 5/8 "	4 "	——	——	——	——	——	do. do.	4 "	23	0.422	20.0	13 " 11 "	14 " 11 "
60 "	do.	2.60	10500	18	1/2 Round	7 " 10 "	Straight	3.50	12.0	1	do.	2 "	3 "	4 1/2 "	5 "	" 245 " 31	Lock Jt	bothends 8 in.		17 " 5 "	do. do.	3 3/4 "	29	0.519	30.6	17 " 4 "	18 " 4 "
72 "	do.	3.60	14500	24	" do.	7 " 10 "	do.	4.70	16.0	1	do.	2 5/8 "	3 1/2 "	5 1/4 "	6 "	" 245 " 31	do.	do. do.	8 in.	20 " 7 "	do. do.	2 5/8 "	35	0.642	45.1	20 " 8 "	21 " 8 "

BELL REINFORCEMENT. SAME WHETHER SHELL IS REINFORCED WITH MESH OR BARS. FORM	Number of bars.	Size and Shape.	Net Periphery of reinf.	Periphery with lap & Coupling	Weight lbs. of Circ. steel in bell lbs.		PIPE. D. Diameter.	L. Length.
Oval.	2	8 Round	8 Ft. 9 in.	9 Ft. 9 in.	7.5 lbs.		24 in.	8 Ft.
do.	2	do.	10 " 10 "	11 " 10 "	8.9 "		30 "	do.
do.	2	1/2 Sq. Tw.	12 " 10 "	13 " 10 "	13.2		36 "	do.
do.	2	" "	15 " 0 "	16 " 0 "	15.3		42 "	do.
do.	2	" "	16 " 9 "	17 " 9 "	17.0		48 "	do.
Round	2	" "	18 " 0 "	19 " 0 "	18.2		60 "	do.
do.	2	" "	21 " 0 "	22 " 0 "	21.0		72 "	do.

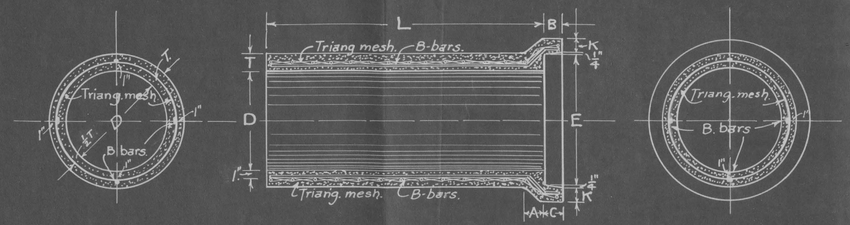
Pipe in diameters shown in above table can be furnished in either 4 Ft. or 8 Ft. lengths. 60" and 72" pipe to have "Lock-Joint."
Pipe in diameters from 24" to 42" can be furnished with either triangular mesh or steel bars for circumferential reinforcement.

TABLE OF DIMENSIONS.

D. Diameter	BELL END PIPE. E.	T.	K.	B.	A.	C.	LOCK JOINT. T.	B.	S.	AREA OF WATERWAY Sq. Feet.
12 In.	16 4/7 In.	2 In.	2 4/7 In.	2 1/2 In.	3 3/4 In.	2 3/4 In.	——	——	——	0.79
15 In.	19 1/7 In.	2 In.	2 1/7 In.	2 1/2 In.	3 3/4 In.	2 3/4 In.	——	——	——	1.23
18 In.	23 1/7 In.	2 1/2 In.	2 3/4 In.	3 In.	4 In.	3 In.	——	——	——	1.77
24 In.	30 2/7 In.	3 In.	2 4/7 In.	3 In.	4 4/7 In.	3 3/4 In.	3 - In.	3 - In	1 1/2 In.	3.14
30 In.	37 5/7 In.	3 1/2 In.	3 2/7 In.	3 4/7 In.	4 5/7 In.	4 5/7 In.	3 1/2 In.	3 - In.	1 1/2 In.	4.91
36 In.	44 6/7 In.	4 In.	4 In.	3 4/7 In.	4 5/7 In.	5 1/7 In.	4 - In.	4 1/7 In.	2 1/8 In.	7.07
42 In.	51 5/7 In.	4 1/2 In.	4 1/2 In.	3 5/7 In.	6 1/7 In.	5 5/7 In.	4 1/2 In.	5 1/2 In.	3 1/2 In.	9.62
48 In.	58 4/7 In.	5 In.	5 In.	4 In.	7 1/7 In.	6 In.	5 - In.	5 1/2 In.	3 1/2 In.	12.57
60 In.	——	——	——	——	——	——	6 - In.	5 1/2 In.	3 1/2 In.	19.63
72 In.	——	——	——	——	——	——	7 - In.	5 1/2 In.	3 1/2 In.	28.27

RAILROAD CONCRETE CULVERT PIPE
OVAL REINFORCEMENT
LOCK JOINT PIPE CO.

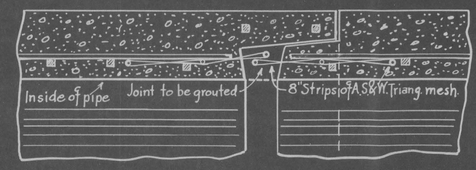
MAIN OFFICE AMPERE N.J. DENVER. MARCH. 1922.



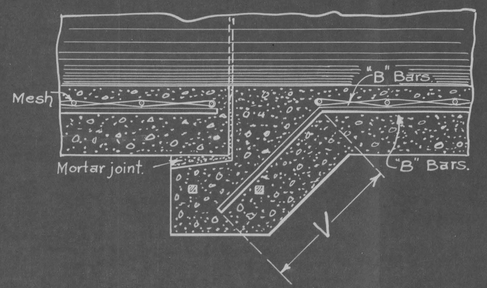
PIPE WITH SINGLE LAYER OF CIRCUMFERENTIAL MESH REINFORCEMENT.

TABLE OF QUANTITIES.

D. Diameter Inches.	L. Length of sections.	Cu.Yds.concrete per section.	Approx.Weight lbs.per section.	Longitudinal Reinf. Number of "B" Bars.	Length of "B" Bars.	Size & shape.	Circumferential Reinf. Total Sectional area Sq.in.	Weight lbs. of steel per ft. of pipe.	Number of layers.	Style number of mesh.	Min.Sectional area of steel per lin.ft. of SHELL Sq.in.	Weight lbs. of circ. steel per ft. of pipe.	Mesh in Shell Width inches	Mesh in Shell Circum. with 8in.lap.	Bell Mesh Width inches.	Bell Mesh Circum. with 8in.lap.
12"	4Ff.	0.103	400	4	4'2"	1/4" Rnd	0.20	0.67	1	.068 or 28	.066	1.25	44"	4'4"	8"	5'8"
15"	4Ff.	0.124	525	4	4'2"	1/4" "	0.20	0.67	1	.093 or 26	.093	2.00	44"	5'2"	8"	6'5"
18"	4Ff.	0.187	750	4	4'3"	3/16" Sq	0.56	1.90	1	.153 or 23	.153	3.60	44"	6'0"	8"	7'8"



SECTION THRU. THE "LOCK-JOINT"



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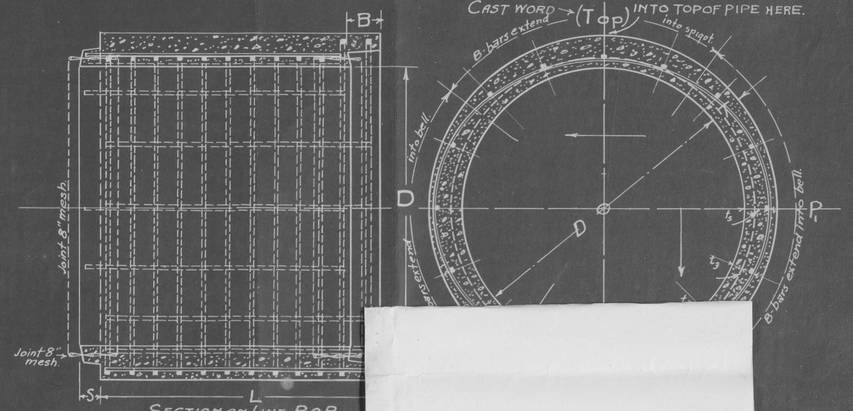
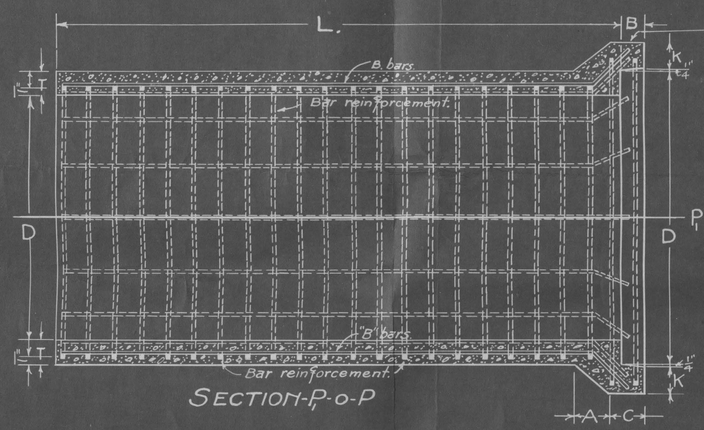
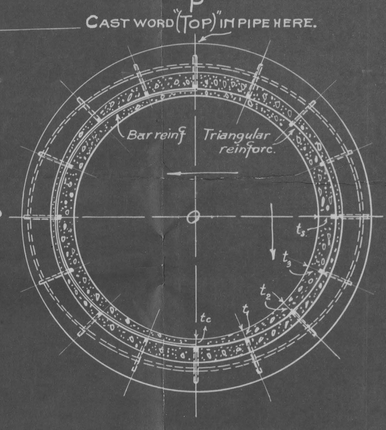


SECTION ON LINE P.O.P.
LOCK JOINT PIPE
TO BE USED FO
(ALSO for Cu

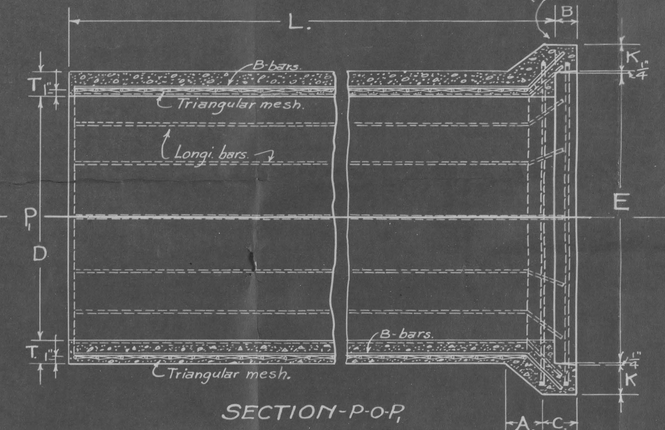


SECTION-P-O-P

PIPE WITH SINGLE OVAL LAYER OF BAR REINFORCEMENT.



CROSS-SECTION OF PIPE.



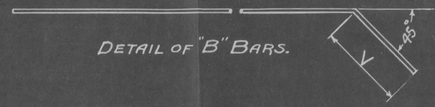
SECTION-P-O-P1

PIPE WITH SINGLE OVAL LAYER OF MESH REINFORCEMENT.

TABLE OF QUANTITIES

Pipe D. Diameter	Pipe L. Length of Sections	Cu.Yds.concrete per section.	Approx.weight lbs.per section.	Longitudinal Reinforcement Number of bars.	Size and Shape	Length "B" bars overall.	Length "V" inches	Total Sectional area of steel Sq.in.	Weight lbs. of long.steel per ft. of pipe.	Circumferential Reinforcement Number of layers.	Position of reinforcement. t_c	t_1	t_2	t_3	t_6	Oval shaped-Steel in regions of tension. For A.S.&W.Co.Triang.mesh rein. Style No. of mesh.	Min.Sectional area of steel per lin.ft. of shell Sq.in.	Width of A.S.&W.Co. mesh in.	Periphery of mesh with 8in.lap.	For Steel bar reinforcement. Size and shape of bars.	Spacing C to C.	Number per pipe.	Sectional area of steel per lin.ft. of shell Sq.in.	Weight lbs. of steel per ft. of pipe.	Net periphery of circumferential bars with 8in.laps.	Bell Reinforcement. Same whether shell is reinforced with mesh or bars. Form	Number of bars.	Size and Shape	Net periphery of rein.	Periphery of bars with lap at Sections	Wt. of Circ. steel in bell in lbs.	Pipe. D. Diameter.	Pipe. L. Length.
24 in.	8 Ff	0.58	2200	6	5/8 Round	8 Ff. 1 in	6 in.	0.84	2.9	1	1 in.	1 1/8 in.	1 3/8 in.	1 7/8 in.	2 in.	No 245 or 32	0.226	6.5	48"+44"	7 Ff. 9 in	1/4 Sq. TW	3 1/4 in.	29	0.231	5.6	7 Ff. 1 in	Oval.	2	5/8 Round	8 Ff. 9 in	9 Ff. 9 in	7.5 lb.	24 in.	8 Ft.
30 "	do.	0.84	3300	8	"	8'-1"	7 "	1.10	3.8	1	do.	1 3/8 "	1 3/4 "	2 1/4 "	2 1/2 "	" 267-40	0.267	9.7	48"+42"	9'-5"	do.	2 3/4 "	33	0.278	8.1	8'-9"	9'-5"	do.	2	do	10'-10"	11'-10"	8.9 "	30 "	do.
36 "	do.	1.15	4500	10	"	8'-2"	8 "	1.40	4.8	1	do.	1 1/8 "	2 "	2 1/4 "	3 "	" 336-39	0.325	13.7	48"+42"	11'-2"	do.	5 1/4 "	18	0.321	11.5	10'-6"	11'-6"	do.	2	Sq. TW	12'-10"	13'-10"	13.2	36 "	do.
42 "	do.	1.50	5800	12	"	8'-2"	8 1/2 "	1.70	5.7	1	do.	1 1/2 "	2 1/4 "	3 1/4 "	3 1/2 "	" 365-38	0.365	18.1	48"+40"	12'-10"	do.	4 1/2 "	21	0.375	15.5	12'-2"	13'-2"	do.	2	" "	15'-0"	16'-0"	15.3	42 "	do.
48 "	do.	1.92	7500	16	"	8'-2"	9 "	2.30	7.6	1	do.	1 3/8 "	2 2/3 "	3 5/8 "	4 "	——	——	——	——	——	do.	4 "	23	0.422	20.0	13'-11"	14'-11"	do.	2	" "	16'-9"	17'-9"	17.0	48 "	do.
60 "	do.	2.60	10500	18	3/4 Round	7'-10"	Shall.	3.50	12.0	1	do.	2 "	3 "	4 1/2 "	5 "	"245 or 31	Lock Jt	bothends	8 in.	17'-5"	do.	3 1/4 "	29	0.519	30.6	17'-4"	18'-4"	Round	2	" "	18'-0"	19'-0"	18.2	60 "	do.
72 "	do.	3.60	14500	24	7/8 "	7'-10"	do.	4.70	16.0	1	do.	2 1/8 "	3 1/2 "	5 1/4 "	6 "	"245 or 31	do.	do. do.	8 in.	20'-7"	do.	3 1/4 "	35	0.642	45.1	20'-8"	21'-8"	do.	2	" "	21'-0"	22'-0"	21.0	72 "	do.

Pipe in diameters shown in above table can be furnished in either 4 ft. or 8 ft. lengths. 60" and 72" pipe to have "Lock-Joint."
Pipe in diameters from 24" to 42" can be furnished with either triangular mesh or steel bars for circumferential reinforcement.



DETAIL OF "B" BARS.

TABLE OF DIMENSIONS.

D. Diameter	Bell End Pipe. E.	T.	K.	B.	A.	C.	Lock Joint. T.	B.	S.	Area of Waterway Sq. Feet
12 In.	16 7/8 In.	2 In.	2 5/8 In.	2 1/2 In.	3 7/8 In.	2 3/8 In.	——	——	——	0.79
15 In.	19 7/8 In.	2 In.	2 5/8 In.	2 1/2 In.	3 7/8 In.	2 3/8 In.	——	——	——	1.23
18 In.	23 7/8 In.	2 1/2 In.	2 3/8 In.	3 In.	4 In.	3 In.	——	——	——	1.77
24 In.	30 1/2 In.	3 In.	2 3/4 In.	3 In.	4 1/2 In.	3 3/8 In.	3- In.	3- In	1 1/2 In.	3.14
30 In.	37 3/8 In.	3 1/2 In.	3 1/2 In.	3 1/2 In.	4 5/8 In.	4 5/8 In.	3 1/2 In.	3- In.	1 1/2 In.	4.91
36 In.	44 3/8 In.	4 In.	4 In.	3 1/2 In.	4 3/8 In.	5 3/8 In.	4- In.	4 1/2 In.	2 3/8 In.	7.07
42 In.	51 1/2 In.	4 1/2 In.	4 1/2 In.	3 3/8 In.	6 1/2 In.	5 3/8 In.	4 1/2 In.	5 1/2 In.	3 1/2 In.	9.62
48 In.	58 3/4 In.	5 In.	5 In.	4 In.	7 5/8 In.	6 In.	5 - In.	5 1/2 In.	3 1/2 In.	12.57
60 In.	——	——	——	——	——	——	6- In.	5 1/2 In.	3 1/2 In.	19.63
72 In.	——	——	——	——	——	——	7- In.	5 1/2 In.	3 1/2 In.	28.27

Concrete to consist of one part Portland cement, two parts clean sand and three parts of broken stone or clean gravel, which will pass through a 1 in. ring. These proportions may be varied to secure greater density or strength but in no case shall the amount of cement be less than one fifth of the combined amount of sand and gravel.
Portland cement shall meet requirements of the American Society of Testing Materials. Ultimate tensile strength of circular steel to be 70,000 # per sq.in or more.
Longitudinal steel to be of grade of standard reinforcing bars.
Working strength of steel in tension = 16000 # per Sq.in.
Working strength of concrete in compression = 650 # per Sq.in.

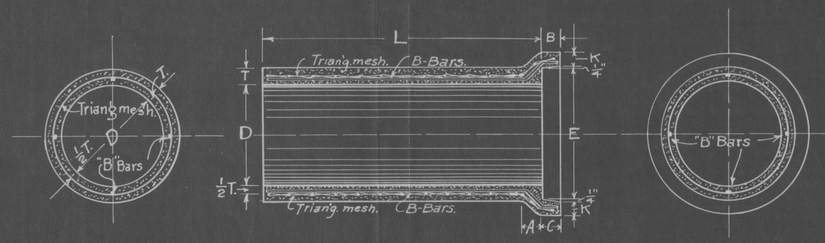
Assumptions:-

Talbot's formula used in design. Uniform vertical load of 1600 # per Sq.ft. over pipering assumed. No allowance made for lateral pressure-)
W = Uniform vertical load per lin. ft. of pipe in lbs. (or restraint.)
d_1 = Mean diameter in inches of pipe ring.
t = Distance in inches from compression face of concrete to center of Steel in Tension.
b = 12 inches = Unit length of pipe.
f_s = Tensile unit stress in steel in lbs. per sq.in. under bending moment M.
A = Area in sq.in. of steel in tension per ft. of pipe.
$p = \frac{A}{bt}$ = Ratio of areas, steel in tension to concrete.

M_c = Bending moment at C, in pounds per ft. of pipe.
M_s = Bending moment at S, in pounds per ft. of pipe.
Let C = Cromn of pipe at extremity of vertical diameter.
Let S = Spring line of pipe at extremity of horizontal diameter.
Formula = $M_c = -M_s = \frac{Wd_1}{16}$
f_s approx. = $\frac{M}{0.87 A t}$

RAILROAD CONCRETE CULVERT PIPE
OVAL REINFORCEMENT
LOCK JOINT PIPE CO.

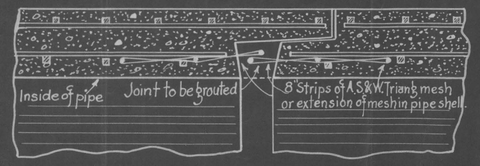
MAIN OFFICE AMPERE N.J. DENVER. MARCH. 1922.



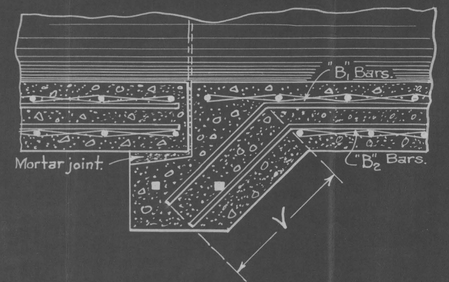
PIPE WITH SINGLE LAYER OF CIRCULAR MESH REINFORCEMENT.

TABLE OF QUANTITIES.

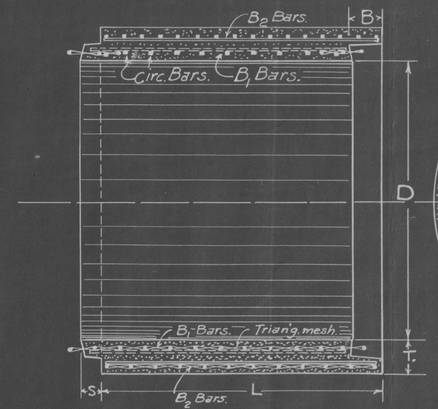
D.	L.			LONGITUDINAL REINF.				CIRCUMFERENTIAL REIN'F-A.S.&W.CO.TRIANG'MESH.								
												MESH IN SHELL		BELL MESH		
Diameter Inches.	Length of Sections	Cu. Yds. Concrete per Section.	Approx Weight lbs. per section	Number of "B" Bars.	Length of "B" Bars	Size & shape.	Total Sectional area Sq. In.	Weight lbs. of steel per ft. of pipe.	Number of layers.	Style number of Mesh.	Min. Sectional area of steel per in. ft. of Shell. Sq. in.	Wt. lbs. of circ. steel per ft. of pipe.	Width inches.	Circum. with 8 in. lap.	Width inches.	Circum. with 8 in. lap.
12"	4 Ft.	0.103	400	4	4'2"	½" Rnd	0.20	0.67	1	.068 or 28	.066	1.25	44"	4' 4"	8"	5' 8"
15"	4 Ft.	0.124	525	4	4'2"	½" Rnd	0.20	0.67	1	.093 or 26	.093	2.00	44"	5' 2"	8"	6' 5"
18"	4 Ft.	0.187	750	4	4'3"	⅝" Sq	0.56	1.90	1	.153 or 23	.153	3.60	44"	6' 0"	8"	7' 8"

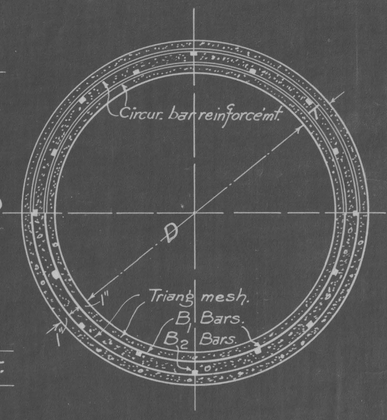


SECTION THRU THE "LOCK-JOINT"



SECTION THRU BELL-END JOINT.



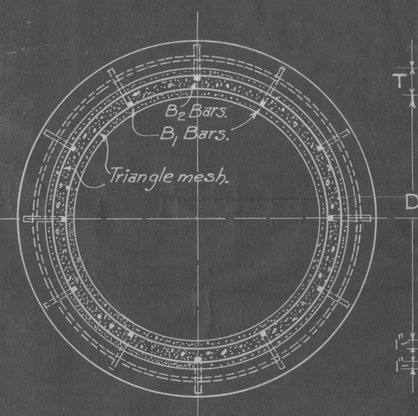


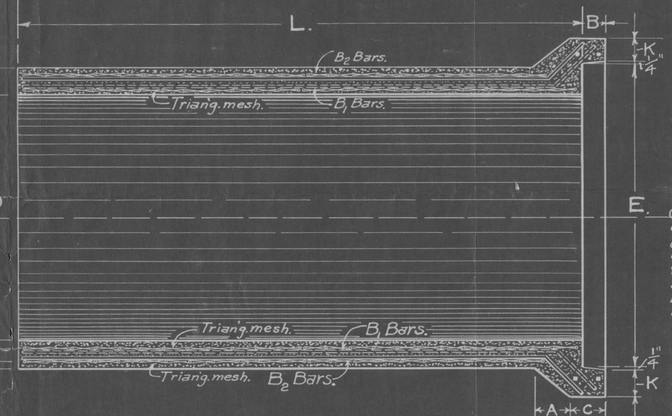
LOCK JOINT PIPE WITH EITHER MESH OR BAR REINFORCEMENT.

TO BE USED FOR CULVERTS 60IN. & 72IN. DIAMETER.
(ALSO for Culverts 24in & upwards when specified.)

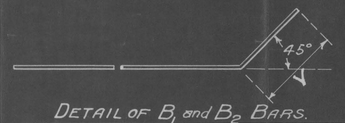
TABLE OF DIMENSIONS.

D. Diameter	BELL END PIPE. E.	T.	K.	B.	A.	C.	LOCK JOINT. T.	B.	S.	AREA OF WATERWAY Sq. Feet.
12 In.	16 7/8 In.	2 In.	2 7/8 In.	2 1/2 In.	3 3/8 In.	2 3/8 In.	—	—	—	0.79
15 In.	19 7/8 In.	2 In.	2 7/8 In.	2 1/2 In.	3 3/8 In.	2 3/8 In.	—	—	—	1.23
18 In.	23 3/4 In.	2 1/2 In.	2 7/8 In.	3 In.	4 In.	3 In.	—	—	—	1.77
24 In.	30 1/2 In.	3 In.	2 7/8 In.	3 In.	4 7/8 In.	3 3/8 In.	3 - In.	3 - In.	1 1/2 In.	3.14
30 In.	37 1/2 In.	3 1/2 In.	3 1/2 In.	3 1/2 In.	4 7/8 In.	4 3/8 In.	3 1/2 In.	3 - In.	1 1/2 In.	4.91
36 In.	44 1/2 In.	4 In.	4 In.	3 1/2 In.	4 3/8 In.	5 1/4 In.	4 - In.	4 1/4 In.	2 1/4 In.	7.07
42 In.	51 3/4 In.	4 1/2 In.	4 1/2 In.	3 3/4 In.	6 1/4 In.	5 1/4 In.	4 1/2 - In.	5 1/2 In.	3 1/2 In.	9.62
48 In.	58 3/4 In.	5 In.	5 In.	4 In.	7 1/2 In.	6 In.	5 - In.	5 1/2 In.	3 1/2 In.	12.57
60 In.	—	—	—	—	—	—	6 - In.	5 1/2 In.	3 1/2 In.	19.63
72 In.	—	—	—	—	—	—	7 - In.	5 1/2 In.	3 1/2 In.	28.27





PIPE WITH DOUBLE LAYER OF CIRCULAR MESH REINFORCEMENT.



DETAIL OF B_1 and B_2 BARS.

TABLE OF QUANTITIES.

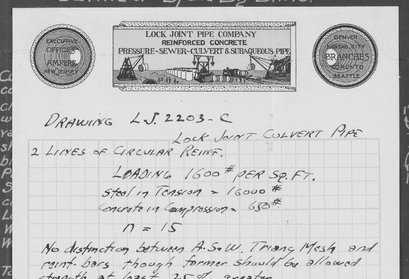
D	L			LONGITUDINAL REINFORCEMENT.				CIRCULAR-REINFORCEMENT IN SHELL-A.S.&W.CO.-TRIAN. MESH.								BELL REINFORCEMENT.			
					LENGTH.				INNER LAYER.				OUTER LAYER.			Same whether shell is reinforced with mesh or bars.			
Diameter Inches.	Length of Sections	Cu. Yds. concrete per section.	Approx weight lbs. per section.	Number of "B" bars.	Size and Shape.	"B" bars over all.	"B2" bars over all.	"V" Inches.	Total Sectional area Sq. In. Weight lbs. of long. steel per ft. of pipe.	Number of layers.	Style number of mesh.	Min. sectl. area of steel per in. ft. of Shell Sq. In.	Wt. lbs. of circ. steel per ft. of pipe.	Style number of Mesh.	Min. sectl. area of steel per in. ft. of Shell Sq. In.	Wt. lbs. of circ. steel per ft. of pipe.	number Circ. bars	Size & shape.	Net circumference	Circumference with 8 in. lap. Wt. lbs. of circ. steel in bell. lbs.
24 In.	8 Ft.	0.58	2200	6	⅝" Sq.	8'2"	8'1"	6 In.	0.84	2.9	2	153 or 23	0.153	4.6	48+48	7 Ft. 6 In.	126 or 25	0.124	4.0	48+44	8'0"	2	½" Round	8'8"	9'8"	7.3
30 "	"	0.84	3300	8	"	8'2"	8'1"	7 "	1.10	3.8	2	208 or 41	0.208	7.5	do.	9 "	146 " 34	0.146	6.0	do.	9'10"	2	"	10'7"	11'7"	8.7
36 "	"	1.15	4500	10	"	8'3"	8'2"	8 "	1.40	4.8	2	245 or 31	0.245	10.5	do.	10'8"	180 " 33	0.180	8.7	do.	11'8"	2	"	12'5"	13'5"	10.0
42 "	"	1.50	5800	12	"	8'4"	8'2"	9 "	1.70	5.7	2	267 or 40	0.267	12.8	do.	12"2"	208 " 41	0.208	11.3	48+40	13'6"	2	Sq. Tw	14'6"	15'6"	14.8
48 "	"	1.92	7500	16	"	8'4"	8'1"	9 "	2.30	7.6	2	309 or 39	0.309	16.8	do.	13'9"	245 " 31	0.245	15.1	do.	15'4"	2	"	16'3"	17'3"	16.5
60 "	"	2.60	10500	18	½" Round	7'8"	7'10"	Strait.	3.50	12.0	2	395 or 38	0.380	26.0	48+52	17"2"	287 " 40	0.283	21.0	48+48	19'0"	[for the Lock Joint reinforcement of joint is continuation of shell] mesh or a strip of same mesh specified for shell.				
72 "	"	3.60	14500	24	"	7'8"	7'10"	"	4.70	16.0	2	——	0.470	31.5	do.	20'4"	336 " 39	0.325	28.6	do.	22'8"					

Notes.

Pipe in diameters shown in above table can be furnished in either 4 ft. or 8 ft. lengths.
For diameters 30inch and upwards circular reinforcement for either layer may be either triangular mesh or steel bars, or a combination of the two may be used.

DATA ON REINFORCEMENT WHEN CIRCULAR STEEL BARS ARE USED IN SHELL OF PIPE.

D.	L.	No. of lines of reinforcement	INNER LAYER. Size and shape of circular bars	Spacing of bars C. to C.	Number per pipe	Sectional area of steel per in. ft. of Shell Sq. in.	Weight lbs. of circ. steel per ft. of pipe	Net circumference of reinf.	OUTER LAYER. Size and shape of Circl. bars	Spacing C. to C.	Number per pipe	Sectional area of steel per in. ft. of shell sq. in.	Weight lbs. of circ. steel per ft. of pipe	Net Circumference of reinf. (Crossed bars with lap of 30 diameters	Diameter.
30 In.	8 Ft.	2	¼" Sq. Tw.	3½ In.	28	0.214	6.1	8 Ft. 5 In.	¼" Sq. Tw.	5 In.	19	0.15	4.7	9 Ft. 2 In.	30 In.
36 "	do.	2	¼" Sq. Tw.	3 "	32	0.250	8.5	10'0"	¼" " "	4½ "	22	0.176	6.6	11 Ft. 0 In.	36 "
42 "	do.	2	¼" " "	2¾ "	35	0.272	10.6	11'6 In.	¼" " "	3¾ "	25	0.206	9.0	12'10"	42 "
48 "	do.	2	¼" " "	2½ "	38	0.314	14.0	13'1"	¼" " "	3½ "	29	0.240	12.0	14'8"	48 "
60 "	do.	2	¼" " "	4½ "	23	0.397	22.3	16'6"	¼" " "	2 "	36	0.286	17.8	18'4"	60 "
72 "	do.	2	¼" " "	3½ "	27	0.482	32.2	19'8"	¼" " "	5 "	20	0.337	25.2	22'0"	72 "



DRAWING L.J. 2203-C
Lock Joint Culvert Pipe
2 Lines of Circular Reinf.
LOADING 1500 # PER Sq. FT.
Steel in Tension = 16000 #
Concrete in Compression = 650 #
n = 15

No distinction between A.S.&W. Triang. Mesh and round bars, though former should be allowed strength at least 25% greater.

REFER TO "TENTATIVE STANDARD SPECIFICATIONS FOR REINFORCED CONCRETE CULVERT PIPE" ADOPTED BY JOINT CULVERT PIPE COMMITTEE OF AMERICAN CONCRETE PIPE ASSOCIATION JUNE 26-CP 45.

COLD DRAWN STEEL WIRE = 27500 #
FOR CONCRETE HAVING ULTIMATE COMPRESSIVE STRENGTH OF 2200 @ 2900 # PER Sq. IN. @ 28 DAYS
USE n = 12

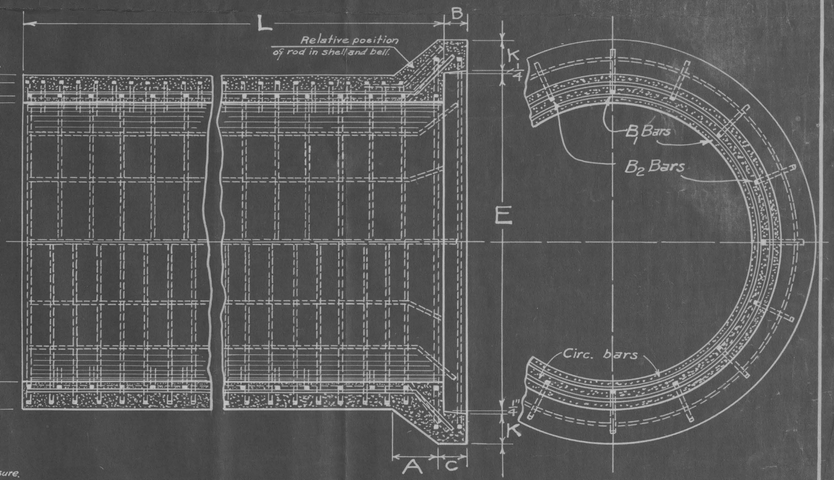
With above values, when A.S.&W. mesh is used for circumferential reinforcement, those designs of pipe are for a loading of at least 2500 # per Sq. Ft.

Lock Joint Pipe Co

of the principal pressure. Let S = Spring [illegible] of pipe at the extremity of the horizontal diameter, or a point at the extremity of the diameter, perpendicular to the direction of the principal pressure.

General Formula = $M = \frac{Qd}{16}$ where Q is total distributed load, M = approx. .087 A T f (but computed more closely)

Specific Formula $Mc = -M_3 = \frac{Wd}{16} - \frac{9Wd}{16} - \frac{3Wd}{16}$ $f' = \frac{T}{T} - \frac{3nT}{T(T+np)}$ at points S.

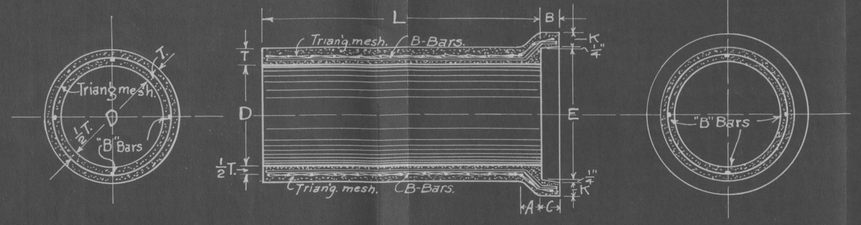


PIPE WITH CIRCULAR BAR REINFORCEMENT.

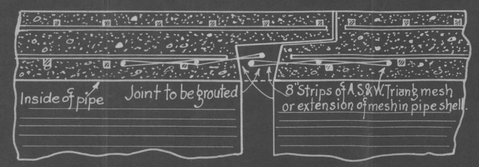
DRAWING L.J. 2203-C

RAILROAD CONCRETE CULVERT PIPE
CIRCULAR REINFORCEMENT
LOCK JOINT PIPE CO.

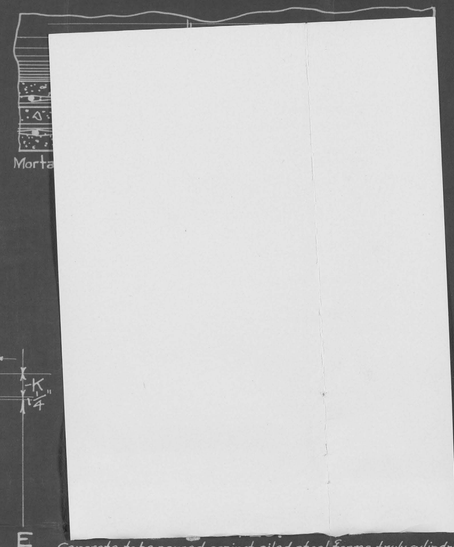
MAIN OFFICE AMPERE N.J. — DENVER MARCH. 1922

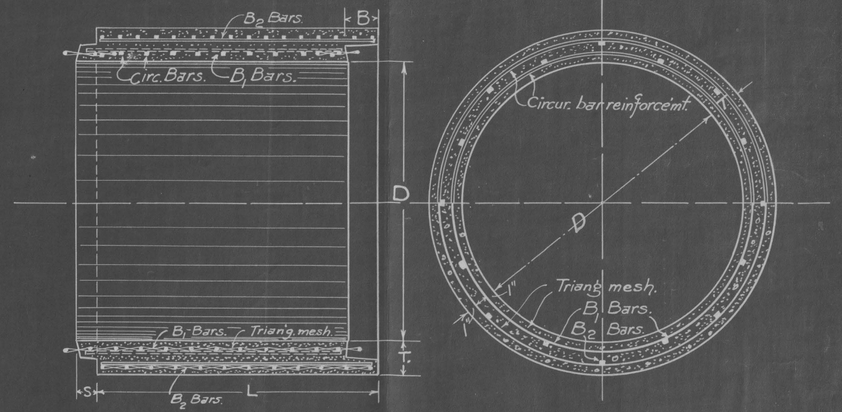


PIPE WITH SINGLE LAYER OF CIRCULAR MESH REINFORCEMENT.



SECTION THRU THE "LOCK-JOINT"



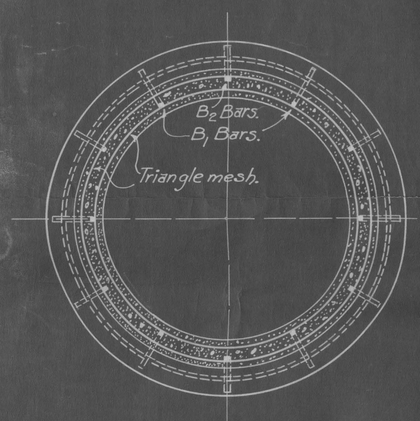


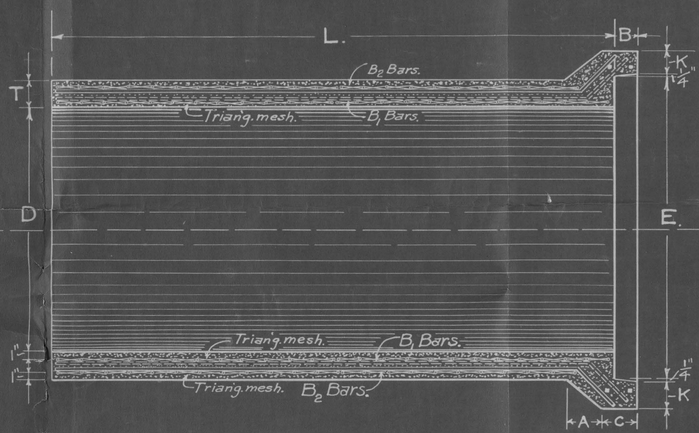
LOCK JOINT PIPE WITH EITHER MESH OR BAR REINFORCEMENT.

TO BE USED FOR CULVERTS 60IN. & 72IN. DIAMETER.
(ALSO for Culverts 24in & upwards when specified)

TABLE of QUANTITIES.

D.	L.			LONGITUDINAL REINF.					CIRCUMFERENTIAL REIN'F.-A.S.&W.CO.TRIANG'MESH								
													MESH IN SHELL		BELL MESH	
Diameter Inches.	Length of Sections.	Cu.Yds.Concrete per Section.	Approx Weight lbs. per Section.	Number of "B" Bars.	Length of "B" Bars.	Size & shape.	Total Sectional area Sq. In.	Weight lbs of steel per Ft. of pipe.	Number of layers.	Style number of mesh.	Min. Sectional area of steel per in. Sh. of SHELL Sq. in.	Weight lbs of circ. steel per Ft. of pipe.	Width inches.	Circum. with 8 in. lap.	Width inches.	Circum. with 8 in. lap.
12"	4 Ft.	0.103	400	4	4'2"	½" Rnd	0.20	0.67	1	.068 or 28	.066	1.25	44"	4' 4"	8"	5' 8"
15"	4 Ft.	0.124	525	4	4'2"	½" Rnd	0.20	0.67	1	.093 or 26	.093	2.00	44"	5' 2"	8"	6' 5"
18"	4 Ft.	0.187	750	4	4'3"	¾" Sq	0.56	1.90	1	.153 or 23	.153	3.60	44"	6' 0"	8"	7' 8"





PIPE WITH DOUBLE LAYER OF CIRCULAR MESH REINFORCEMENT.

TABLE of QUANTITIES.

D	L			LONGITUDINAL REINFORCEMT.						CIRCULAR-REINFORCEMT. IN SHELL-A.S.&W.CO-TRIAN. MESH.										BELL REINFORCEMENT.			
					LENGTH.					INNER LAYER.					OUTER LAYER.					Some whether shell is reinforced with mesh or bars.			
Diameter Inches.	Length of Sections.	Cu.Yds.concrete per section.	Approx weight lbs per section.	Number of bars.	"B" bars over all.	"B2" bars over all.	Size and Shape.	"V" Inches.	Total Sectional area Sq. In.	Weight lbs of long. steel per Ft. of pipe.	Number of layers.	Style number of mesh.	Min. sectional area of steel per in. Sh. Sq. In.	Wt. in lbs. of circ. steel per Ft. of pipe.	Width of Trian. mesh inches.	Circum. of mesh with 8" lap.	Style number of Mesh.	Min. sectional area of steel per in. Sh. Sq. In.	Wt. lbs. of circ. steel per Ft. of pipe.	Width of Tr. mesh. inches.	Circum. of mesh with 8" lap.	number Circ. bars	Size & shape.	Net circum. ference	Circum. ference of Sections.	Wt. of circ. steel in bell lbs.
24 In.	8 Ft.	0.58	2200	6	8'2"	8' 1"	½ Sqre.	6 In.	0.84	2.9	2	153 or 23	0.153	4.6	48+48	7 Ft. 6 In.	126 or 25	0.124	4.0	48+44	8' 0"	2	round	8' 8"	9' 8"	7.3
30 "	"	0.84	3300	8	"	8' 1"	"	7"	1.10	3.8	2	208 or 41	0.208	7.5	do.	9" 1"	146 " 34	0.146	6.0	do.	9' 10"	2	"	10' 7"	11' 7"	8.7
36 "	"	1.15	4500	10	"	8' 2"	"	8"	1.40	4.8	2	245 or 31	0.245	10.5	do.	10" 8"	180 " 33	0.180	8.7	do.	11' 8"	2	"	12' 5"	13' 5"	10.0
42 "	"	1.50	5800	12	"	8' 2"	"	9"	1.70	5.7	2	267 or 40	0.267	12.8	do.	12" 2"	208 " 41	0.208	11.3	48+40	13' 6"	2	Sq. tw	14' 6"	15' 6"	14.8
48 "	"	1.92	7500	16	"	8' 1"	"	9"	2.30	7.6	2	309 or 39	0.309	16.8	do.	13" 9"	245 " 31	0.245	15.1	do.	15' 4"	2	" "	16' 3"	17' 3"	16.5
60 "	"	2.60	10500	18	Rnd.	Rnd.	Round	Strait	3.50	12.0	2	395 or 38	0.380	26.0	48+52	17" 2"	287 " 40	0.283	21.0	48+48	19' 0"	[for the Lock Joint, reinforcemt. points in continuation of shell mesh or 8" strips of same mesh specified for shell.				
72 "	"	3.60	14500	24	"	"	"	"	4.70	16.0	2	—	0.470	31.5	do.	20' 4"	336 " 39	0.325	28.6	do.	22' 8"					

Notes.

Pipe in diameters shown in above table can be furnished in either 4 ft. or 8 ft. lengths.
For diameters 30 inch and upwards circular reinforcement for either layer may be either triangular mesh or steel bars or a combination of the two may be used.

DATA ON REINFORCEMENT WHEN CIRCULAR STEEL BARS ARE USED IN SHELL OF PIPE.

D.	L.	No. of lines of reinforcement.	INNER LAYER.						OUTER LAYER.						Diameter.
Diameter	Length.		Size and shape of circular bars	Spacing of bars C. to C.	Number per pipe	Sectional area per in. Sh. Sq. In.	Weight lbs of circ. steel per Ft. of pipe	Net Circumference of cage.	Size and shape of Circ. bars	Spacing C. to C.	Number per pipe.	Sectional area of steel per in. Sh. Sq. In.	Weight lbs of circ. steel per Ft. of pipe.	Net Circumference of cage.	
30 In.	8 Ft.	2	¼ Sq. Tw.	3½ In.	28	0.214	6.1	8 Ft. 5 In.	9 Ft. In.	¼ Sq. Tw.	5 In.	19	0.15	4.7	9 Ft. 2 In.	9 Ft. 10 In.	30 In.
36 "	do.	2	¼ Sq. Tw.	3 "	32	0.250	8.5	10' 0"	10' 8"	¼ " "	4½ "	22	0.176	6.6	11 Ft. 0 In.	11' 8"	36 "
42 "	do.	2	¼ " do.	2⅝ "	35	0.272	10.6	11" 6 In.	12" 2"	¼ " "	3¾ "	25	0.206	9.0	12" 10"	13' 6"	42 "
48 "	do.	2	¼ " do.	5/2 "	18	0.314	14.0	13" 1"	14" 1"	¼ " "	3½ "	29	0.240	12.0	14" 8"	15' 4"	48 "
60 "	do.	2	¼ " do.	4½ "	23	0.397	22.3	16" 6"	17" 6"	¼ " "	2½ "	36	0.286	17.8	18" 4"	19' 0"	60 "
72 "	do.	2	¼ " do.	3½ "	27	0.482	32.2	19' 8"	20' 8"	¼ " "	5 "	20	0.337	25.2	22" 0"	22' 8"	72 "

Concrete to be poured against oiled steel forms truly cylindrical. Concrete to consist of one part Portland cement, two parts clean sand and three parts of broken stone or clean gravel, which will pass through a 1 in. ring. These proportions may be varied to secure greater density or strength but in no case shall the amount cement be less than one fifth of the combined amount of sand and gravel.
Portland cement shall meet requirements of the American Society of Testing Materials. Ultimate tensile strength of circular steel to be 70000 # per sq. in or more.
Longitudinal steel to be of grade of Standard reinforcing bars.
Working strength of steel in tension = 16000 # per Sq. in.
Working strength of concrete in compression = 650 # per Sq. in.

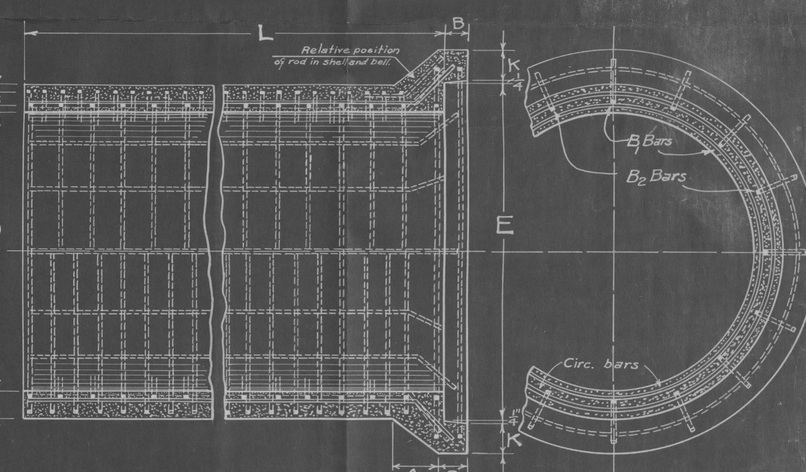
Assumptions:-

Talbot's Formula used in design with assumed uniform loading of 1600 # per Sq. Ft. over pipe ring:
W = Load in lbs. per lin. ft. of pipe.
d_1 = Mean dia. in inches of pipe ring.
t = Distance in inches from compression face of concrete to center of steel in tension.
t_1 = 1 in. Distance of steel in either layer from face of concrete.
b = 12 in. = unit length of pipe.
f = Tensile unit stress in steel, in lbs. per sq in. under Bending-Moment M; = also tensile unit stress in steel at C.
f' = Net unit tensile stress in steel in lbs. per sq. in. at S.
Mc = Bending Moment at C. in inch lbs. per ft. of pipe.
M_s = Bending Moment at S. in inch lbs. per ft. of pipe.
A = Area in Sq. In. of Steel in tension per ft. of pipe.
n = 15 ratio modulus of elasticity, Steel to concrete.
$p = \frac{A}{bt}$ = Ratio of areas, Steel in tension to Concrete.
q = 0.25 = Assumed minimum ratio of horizontal to vertical intensity of pressure or the ratio of the intensity of pressure, in a direction perpendicular to the principal pressure, to the intensity of the principal pressure.
qW = Pressure on a unit length of pipe at right angles to direction of the principal load.
T = Thrust at S = ½ W. Let C = Crown of pipe at extremity of vertical diameter, or a point on pipe ring at the extremity of the diameter parallel to the direction of the principal pressure. Let S = Spring of pipe at the extremity of the horizontal diameter, or a point at the extremity of the diameter, perpendicular to the direction of the principal pressure.

General Formula = $M = \frac{Qd}{16}$ where Q is total distributed load.

M = approx. .037 $A f' t$ (but computed more closely.)

Specific Formula $Mc = -M_s = \frac{Wd_1}{16} - \frac{qWd_1}{16} = \frac{3Wd_1}{16}$ $\quad f' = \frac{f}{1 + \frac{2nT}{t(1+np)}}$ at point S.



PIPE WITH CIRCULAR BAR REINFORCEMENT.

TABLE of DIMENSIONS.

D. Diameter.	BELL END PIPE. E.	T.	K.	B.	A.	C.	LOCK JOINT. T.	B.	S.	AREA OF WATERWAY Sq. Feet.
12 In.	16¾ In.	2 In.	2¼ In.	2½ In.	3¾ In.	2⅝ In.	——	——	——	0.79
15 In.	19¾ In.	2 In.	2¼ In.	2½ In.	3¾ In.	2⅝ In.	——	——	——	1.23
18 In.	23¾ In.	2½ In.	2⅝ In.	3 In.	4 In.	3 In.	——	——	——	1.77
24 In.	30½ In.	3 In.	2⅝ In.	3 In.	4¼ In.	3⅜ In.	3 - In.	3 - In.	1½ In.	3.14
30 In.	37⅝ In.	3½ In.	3½ In.	3½ In.	4⅝ In.	4⅜ In.	3½ In.	3 - In.	1½ In.	4.91
36 In.	44¾ In.	4 In.	4 In.	3½ In.	4⅝ In.	5¼ In.	4 - In.	4¼ In.	2⅛ In.	7.07
42 In.	51¾ In.	4½ In.	4½ In.	3⅝ In.	6¼ In.	5⅜ In.	4½ - In.	5½ In.	3½ In.	9.62
48 In.	58⅝ In.	5 In.	5 In.	4 In.	7⅛ In.	6 In.	5 - In.	5½ In.	3½ In.	12.57
60 In.	——	——	——	——	——	——	6 - In.	5½ In.	3½ In.	19.63
72 In.	——	——	——	——	——	——	7 - In.	5½ In.	3½ In.	28.27

DRAWING L.J. 2203-C

RAILROAD CONCRETE CULVERT PIPE
CIRCULAR REINFORCEMENT
LOCK JOINT PIPE CO.

MAIN OFFICE AMPERE N.J. — DENVER MARCH. 1922

D.8

8-8

MFC

Saint Paul, October 26, 1925.

Mr. J. T. Derrig:

Referring to your letter of October 13th in regard to a shipment of reinforced concrete pipe to a point on the west end of the line.

It has not been fully decided that pipe will be shipped from Darling to points west of Paradise. It is possible that we will make arrangements with a contractor for the manufacture of concrete pipe at some point on the west coast or make an arrangement similar to the one we have at Darling and in that case shipments frm Darling would be limited to territory east of Paradise.

Bridge Engineer.

Saint Paul, October 13, 1925.

Mr. M. F. Clements,

Bridge Engineer.

Referring to your letter of September 28th, relative to shipment of material from the Auburn Plant to Darling, also stating that it would be advisable to make delivery of Darling pipe to points further west. We have on hand as of this date the following pipe at Darling:

924 lineal feet of twenty four inch pipe
1496 lineal feet of thirty six inch pipe

This pipe is stored on concrete slabs where pipe is manufactured, and it will considerably facilitate our work at the plant if the shipments could be made in the near future. If the weather continues good until November 1st, we could manufacture some additional pipe this fall. Undoubtedly a portion of the concrete pipe on the west end could be placed to advantage during the winter, and under the circumstances I would like to make some shipments in order to increase our storage capacity at Darling. Will you please instruct Supervisors on the west end to place their requisitions at an early date.

District Engineer

JTD:J

Ba 65

MFC

Saint Paul, September 28, 1925.

Mr. H. E. Stevens:

Referring to your letter of August third in regard to the Auburn Concrete Plant.

The plant was operated during the years 1913 to 1923 inclusive, for the purpose of manufacturing piles, pipe and slabs. The cost of the plant has been entirely absorbed in the prices charged for the manufactured products. The sand and gravel adjacent to the plant which can be handled by the plant equipment, has been worked out. The plant itself requires extensive repairs.

The question to be considered at the present time is the construction by the Railway Company of a plant at a new location in the Auburn Pit or at a new location, or the making of a contract with outside parties to manufacture pipe at a company gravel pit, or the purchase of pipe from pipe manufacturers. From the investigations which have been made I do not think it advisable to build a plant at present.

Attached you will find a statement of the various products for maintenance purposes shipped from Auburn since the plant was constructed in 1913 and the estimated requirements for 1926.

You will observe that the requirements since 1923 have been very much reduced and they will continue to decrease in the future.

In 1925 we paid the following prices for concrete pipe:

	Massey Conc. Products Co. fob cars N.P. tracks Spokane	Foley Bros. fob cars at Darling
24" Pipe-wt. 450 lbs. per ft.	$2.90 per l.f.	$2.55 per l.f.
36" " " 620 " " "	4.78 " "	3.25 " "
48" " " 767 " " "	6.78 " "	--

If we assume a cost of $0.0015 per ton mile for hauling pipe west and .003 for hauling east, we can ship 24 inch pipe 1273 miles west from Darling or to Sand Point, Idaho. On the same basis we can ship 36 inch pipe to Spokane for $3.25 + .78 (freight) = $4.03 as compared to the Massey Pipe at $4.78. We can, therefore, furnish 36 inch pipe from Darling to any point on the system for a less out of pocket cost than the cost of Massey pipe.

It is my recommendation that we ship 24 inch pipe from Darling as far west as Sand Point and 36 inch pipe to points east of the Cascade Mountains. It is possible that we can obtain concrete pipe for the coast points at some plant on the coast and if not, can use corrugated pipe on branch lines and ship 36 inch pipe for main lines from Darling. All 24 inch concrete pipe for points west of Spokane can be shipped from Massey Company at Spokane or the territory can be cut off at the Cascade Mountains and the west end supplied from coast points.

I will immediately look into the question of buying concrete pipe at some point west of the Cascade Mountains.

It is my recommendation that we dismantle the Auburn plant. The rods now in stock at that point should be shipped to

South Tacoma. The manufactured products can be shipped from Auburn as required. The pipe and any other forms should be shipped to Darling. The remaining equipment should be turned over to the store.

Bridge Engineer.

Encl.

Cy-Mr.B.Blum
Mr.J.T.Derrig

NORTHERN PACIFIC RAILWAY COMPANY

AUBURN CONCRETE PLANT

Statement Showing
The Amount of Various Concrete Products
Shipped from the Years 1914 to 1924,
Inclusive.

	Lin. Ft. Pipe			Lin. Ft. Piles				Slabs		Water
Year	24"	36"	48"	15'	20'	25'	30'	7'x16'	6½'x16'	Bbls.
1914										
1915										
1916										
1917	6992	2520	368	1035	400	575	1980	59	21	
1918	5344	1952	16	135	1260	1650				
1919	3768	1288	64	210	200		1530			
1920	3984	1328			280	100	570	8		
1921	4600	1432				200	1230	4	4	
1922	6224	2576								24
1923	5342	2054								
1924	3056	1288						64		
1925	3108	768						(32)		
1926	3000	400								

Office of Bridge Engineer,
Saint Paul, September 28, 1925.

N.P. Ry

Auburn Concrete Plant

Statement showing

the amount of various concrete products

shipped from the years 1914 to 1924 inclusive.

Year	Lin Ft Pipe			Lin Ft Piles				Slabs		Water Bbls
	24"	36"	48"	15'	20'	25'	30'	7"x16'	6½"x16'	
1914										
1915										
1916										
1917	6992	2520	368	1035	400	575	1980	59	21	
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1920	3984	1328			280	100	570	8		
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1922	6224	2576								24
1923	5342	2054								
1924	3056	1288						64		
1925	3108	768						(32)		
1926	3000	400								

Can ship pipe Boiling to Atlanta

24 94½ per lin ft - freight

36 1.30 per lin ft - freight

Saint Paul, August 3, 1925.

Mr. M. F. Clements:

Herewith copy of Mr. Cook's letter of July 30, about Auburn concrete plant.

I discussed this with Mr. Cook last week and he thinks we ought to dismantle the plant.

I do not know how much of a program we will have next year in the way of reinforced concrete products, and it seems to me disposition of the plant will depend somewhat on what program we have in view.

Will you please check up and advise your recommendations.

Chief Engineer.

encl.

C O P Y

Seattle, Wash., July 30, 1925.

Mr. H. E. Stevens, Chief Engineer,
Saint Paul, Minn.

Dear Sir:-

Referring to our conversation yesterday regarding the leasing of the Auburn Gravel Pit and entering into an arrangement for the manufacture of pipe, slabs and piling for the Railway Company in connection with the lease.

Pursuant to our conversation, I am writing Mr. Stillwell this morning that it is your opinion that we should not proceed any further in the matter at the present time.

Referring to the probability of not again opening up the Auburn concrete plant. If this suggestion is to be final it would seem that we should dismantle the plant and turn such equipment as we have into the Store Department as it is rapidly deteriorating and parts disappearing thru theft and it would seem that it would be a good idea to also ship the reinforcing steel to South Tacoma as that is also disappearing a little at a time and is too convenient for anyone that desires to get a few reinforcing bars.

Yours truly

A. R. COOK

MFC

Saint Paul, July 22, 1925

Mr. H. E. Stevens:

Referring to your letter of July 13th in regard to a contract with J. B. Stillwell for the operation of a gravel washing plant at Auburn, Washington.

Mr. Stillwell has made a tentative proposition for taking over the Auburn Gravel pit, in which he outlined in a general way the existing plant and facilities which were to be furnished by the railway company, the amount of gravel the railway company would be required to purchase, the royalty the contractor would pay for gravel sold commercially and the time limit of an operating contract. Mr. Stillwell also states that he would make concrete products at agreed prices. There is nothing in Mr. Stillwell's letter in regard to the plant which he will construct and I assume that it is his intention to build the plant and remove it at the end of his contract without expense to the Railway Company.

The present concrete plant has served its life and the cost has been entirely absorbed by the manufactured products. Outside of the forms, hoisting engine and concrete mixer there is very little of value. The gravel immediately adjacent to the plant which can be worked through it, is worked out and if a plant is to be operated at Auburn pit, it should be moved to some other location in the pit.

There is a ten inch gravity pipe line which follows the

railway right of way adjacent to the Auburn pit which supplied water to the Auburn terminal. Water for the terminal is now obtained from wells and the gravity flow is no longer used. There is no reason why we should not be willing to permit Mr. Stillwell to use the water supply from the ten inch pipe.

The tracks in the gravel pit can be used in connection with a washing plant.

A washing plant requires considerable land for waste dirt and water and I am not sure the railway company owns sufficient land for that purpose. The contractor should be held liable for any damage to privately owned property due to water and silt from the washing plant.

The contractor requires the railway company to take 50,000 cubic yards of ballast per year for six years, with option for five additional years. We would be required, therefore, to take 550,000 cubic yards of washed ballast in eleven years. We already have a washing plant at Kanasket for supplying ballast in this territory and the additional cost of hauling to the Tacoma Division from Kanasket over what it would cost at Auburn would be ten cents per cubic yard. The Kanasket price is 25 cents per cubic yard and Mr. Stillwell's proposed price is 45 cents per cubic yard.

Personally, I do not think it advisable to include in the contract an agreement to purchase any specified amount of ballast. It is possible that the railway company may desire to haul from Auburn for short distances north or south of Auburn, but the amount taken from Auburn should not be permitted to interfere

with present contract at Kanaskat.

In making a contract with Mr. Stillwell we should agree to the following:

(1) The Contractor to be permitted to operate a concrete plant for the manufacture of concrete piles, pipe, slabs, etc., at an agreed price. The contract should provide for an adjustment in price at certain periods.

(2) The contractor will be permitted to use any part of the existing concrete plant without charge.

(3) The contractor to be permitted to sell gravel commercially, paying the railway company a roaylty for each cubic yard removed from the pit.

(4) The railway company to purchase such gravel as it would require at an agreed price.

(5) The contractor should also furnish a price for pit run material loaded directly in cars, if such material were required by the railway company.

If Mr. Stillwell wishes to build a gravel washing plant for the sale of commercial gravel and build and operate a plant for the construction of concrete products, we should make a contract with him. The contract should not include any large amount of washed or pit run ballast.

File returned.

Bridge Engineer.

Encl.

MFC

Saint Paul, July 22, 1925

Mr. H. E. Stevens:

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The present concrete plant has served its life and the cost has been entirely absorbed by the manufactured products. Outside of the forms, hoisting engine and concrete mixer there is very little of value. The gravel immediately adjacent to the plant which can be worked through it, is worked out and if a plant is to be operated at Auburn pit, it should be moved to some other location in the pit.

There is a ten inch gravity pipe line which follows the

railway right of way adjacent to the Auburn pit which supplied water to the Auburn terminal. Water for the terminal is now obtained from wells and the gravity flow is no longer used. There is no reason why we should not be willing to permit Mr. Stillwell to use the water supply from the ten inch pipe.

The tracks in the gravel pit can be used in connection with a washing plant.

A washing plant requires considerable land for waste dirt and water and I am not sure the railway company owns sufficient land for that purpose. The contractor should be held liable for any damage to privately owned property due to water and silt from the washing plant.

The contractor requires the railway company to take 50,000 cubic yards of ballast per year for six years, with option for five additional years. We would be required, therefore, to take 550,000 cubic yards of washed ballast in eleven years. We already have a washing plant at Kanasket for supplying ballast in this territory and the additional cost of hauling to the Tacoma Division from Kanasket over what it would cost at Auburn would be ten cents per cubic yard. The Kanasket price is 25 cents per cubic yard and Mr. Stillwell's proposed price is 45 cents per cubic yard.

Personally, I do not think it advisable to include in the contract an agreement to purchase any specified amount of ballast. It is possible that the railway company may desire to haul from Auburn for short distances north or south of Auburn, but the amount taken from Auburn should not be permitted to interfere

with present contract at Kanaskat.

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(1) The Contractor to be permitted to operate a concrete plant for the manufacture of concrete piles, pipe, slabs, etc., at an agreed price. The contract should provide for an adjustment in price at certain periods.

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(5) The contractor should also furnish a price for pit run material loaded directly in cars, if such material were required by the railway company.

If Mr. Stillwell wishes to build a gravel washing plant for the sale of commercial gravel and build and operate a plant for the construction of concrete products, we should make a contract with him. The contract should not include any large amount of washed or pit run ballast.

File returned.

Bridge Engineer.

Encl.

Saint Paul, July 13, 1925.

Mr. M. F. Clements:

Please note my file about tentative proposition of Mr. J. B. Stillwell for installation and operation of a gravel plant at Auburn Pit.

With return of file will you please let me have your recommendations.

I expect to be on the coast within the next week or ten days, and would like to have your reply in time to discuss with Mr. Cook.

Chief Engineer.

HES-ar

Encl.

Ba 61

St. Paul, Minn., May 15, 1925

Mr. M. F. Clements:

Please refer to my letter of January 20th in regard to relocation and reconstruction of the Auburn concrete plant, and advise status.

REG:wp

H O Stevens
Chief Engineer

Ga65

On Train #4, R. M. Divn.,
January 20, 1925.

Mr. M. F. Clements:

Your letter of the 14th about relocation and reconstruction of the Auburn concrete plant.

I discussed this matter with Mr. Cook, and we are agreed that it will not be necessary to open the plant during 1925.

Probably during 1926 it will become necessary to manufacture additional pipe, slabs, etc., and I wish during the next few months you would secure the necessary data and work up comparative estimates for alternate designs as you suggest.

I think your idea of using a locomotive crane instead of a fixed derrick is a good one, provided, of course, we can work out someplan that will make the crane available when we need it.

There is also a possibility that we might work out a contract arrangement for handling the pipes and slabs with Grant Smith & Company in connection with the operation of the Kanaskat pit, similar to the arrangement we now have with Foley Brothers at the Darling pit.

Chief Engineer.

HES-ar
cc-Mr. A. R. Cook.

MFC

Saint Paul, April 7, 1925.

Mr. H. E. Stevens:

Referring to your letter of March 30th requesting weights of the raw materials entering into the manufacture of concrete products.

The following tabulation gives the total weight of sand, gravel, cement and steel reinforcing entering into the various units constructed at Auburn:

	Sand	Gravel	Cement	Steel Reinf.
24" R.C.Pipe 8' long	954#	2128#	532#	70#
36" R.C.Pipe 8' long	1368	3024	768	95
30' Concrete Piles	1437	3150	777	449
25' Concrete Piles	1198	2625	648	374
20' Concrete Piles	958	2100	518	299
15' Concrete Piles	719	1575	389	224
10' Concrete Piles	479	1050	259	150
1 Single Track Slab 7x16'(2 slabs=1 span)	10280	22615	5707	1088
+ 1 Double " " 7x16' "	10250	22545	5690	1070
+ 1 " " " 6½x16' "	9575	21063	5315	981
+ Water Barrels	167	167	80	9.5

The above figures include waste.

+ Interpolated on basis of plan dimensions, or figured from quantities on plans, with 10 percent waste added. Other figures are based on Valuation Department records.

Bridge Engineer.

MFC

Saint Paul, April 7, 1925.

Mr. H. E. Stevens:

Referring to your letter of March 30th requesting weights of the raw materials entering into the manufacture of concrete products.

The following tabulation gives the total weight of sand, gravel, cement and steel reinforcing entering into the various units constructed at Auburn:

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+ Water Barrels	167	167	80	9.5

The above figures include waste.

+ Interpolated on basis of plan dimensions, or figured from quantities on plans, with 10 percent waste added. Other figures are based on Valuation Department records.

Bridge Engineer.

Weights ~~Quantities~~ of raw materials entering into concrete products of Auburn Plant

	Sand	Gravel	Cement	Steel Reinforcing	
24" RCP - 8' long	954	2128	532	70	= 84
36" RCP 8' long	1368	3024	768	95	
30' Concrete Piles	1437	3150	777	449	21
25' "	1198	2625	648	374	
20' "	958	2100	518	299	
15' "	719	1575	389	224	
10' "	479	1050	259	150	
1 Single Tradeslab 7'x16' (2 slabs = 1 span)	10280	22615	5707	1088	17.5
* 1 Double 7'x16' " "	10250	22545	5690	1070	
* 1 Double 6½x16' " "	9575	21063	5315	981	16.3 cy
* Water beams	167	167	80	9.5	

The above figures ~~are~~ include waste.

* Interpolated on basis of plan dimensions, or figured from quantities on plans, with 10% waste added. Other figures are based on valuation department records

WT
4/3/25

Dirt. work.

from Graham 4/2/25 MK

Column —

Slabs.

Quantities per span - 2 slabs - #

Sand	20560	
Gravel	45 230	
Cement	11 414	
Rods	2 172	
Wire	3.4	
	79 379	
	39.690	

Piles per lin ft

Sand	47.9	lbs
Gravel	105.0	
Cement	25.9	
Rods	14.9	
Wire	.05	
	193.75	

Reinf. Conc. Pipe per lin ft	24" 32.55	36" 46.80	48"
Sand	119.3	171.0	
Gravel	266.0	378.0	
Cement	66.5	96.0	114.2
Rods	3.15	4.51	29.35
Wire	.10	.11	?
Mesh	5.44	7.28	?
	460.49	656.98	
	8	8	
	2683.92	5255.20	

proportions to be used for 24" 36" 48" pipe

Saint Paul, March 30, 1925.

Mr. M. F. Clements,

Bridge Engineer,

Dear Sir:

Referring to your letter of March 16th giving list of weights of product manufactured at the Auburn Concrete Plant:

Will you please also let me have a list of raw material and weights entering into the manufacture of this product, and also the points of origin.

Yours truly,

Chief Engineer.

JHR-w

lsa65

MFC

Saint Paul, March 16, 1925

Mr. H. E. Stevens:

Referring to your letter of March 6th in regard to weights of concrete products manufactured at Auburn.

The following is a list of weights which were determined in 1922:

24" Reinforced Concrete Pipe 8'-0" long	3255 lbs.
36" " " " 8'-0" "	4680 "
30" " " Piles	6600 "
25' " " "	5260 "
20' " " "	4300 "
15' " " "	3500 "
10' " " "	2200 "
1 Single Track Slab 7'x16'(two per span)	33300 "
1 Double " " 7'x16' " " "	30900 "
1 " " " 6½'x16' " " "	28700 "
Water Barrels	375 "

Concrete pipe at Darling have the following weight:

24" R.C.P.	3600 lbs.
36" "	4960 "
Massey Company Pipe	
48" R.C.P.	6136 "

Bridge Engineer.

MFC

Saint Paul, March 16, 1925

Mr. H. E. Stevens:

Referring to your letter of March 6th in regard to weights of concrete products manufactured at Auburn.

The following is a list of weights which were determined in 1922:

24"	Reinforced Concrete Pipe 8'-0" long	3255 lbs.
36"	" " " 8'-0" "	4680 "
30"	" " Piles	6600 "
25'	" " "	5260 "
20'	" " "	4300 "
15'	" " "	3500 "
10'	" " "	2200 "
1	Single Track Slab 7'x16'(two per span)	33300 "
1	Double " " 7'x16' " " "	30900 "
1	" " " 6½'x16' " " "	28700 "
	Water Barrels	375 "

Concrete pipe at Darling have the following weight:

24" R.C.P.	3600 lbs.
36" "	4960 "
Massey Company Pipe	
48" R.C.P.	6136 "

Bridge Engineer.

Saint Paul, Mar. 6, 1925.

Mr. M. F. Clements,

Bridge Engineer.

Dear Sir:

Will you please let me have a statement showing weights of products manufactured at Auburn. This is for the purpose of setting up freight on material charged to Additions & Betterments.

Yours truly,

Chief Engineer.

R-w

Handsaker
Brockaway

look up
quite

3/13

Weights of Concrete pipe as used at Auburn for estimating freight (Letter P&T. to A.C. Tenell 12/6/20 referred to in letter M.F.C. to H.E.S. 5/18/21)

Chf Eng. file 2225 (3)

24" - 3255#
36" 4680#
48" 5630#.

Weights of Auburn products as shown in calculation dated 5/29/22 "Proposed Selling Price" - Purch Dept. file GA 65 (1912-23)

Based on output of 1917-1922 -

24" RCP	3255#	
36" "	4700#	
30' Piles	6600#	(= 220#/ft)
25' "	5260#	(= 210#/ft)
20' "	4300#	(= 215#/ft)
15' "	3500#	(= 231#/ft)
10' "	2200	(= 220#/ft.)
Single Tr. Slabs	33300#	7'x16'
D.T. Slabs	30900# 28700#	(~~track centers not given~~) 7' wide x 16' 6½ x 16'
Water barrels	375#	

Weights shown in analysis of Operation Cost, prorated by weight (1921-1922)

Purch Dept file GA 65 (1912-23)

24" RCP	3255# per 8' length	(6053360#/14976 ft)
36" RCP	4700# " "	(2951600#/5028 ft)
Piling	217# per ft.	(557820#/2565 ft)
S. Tr. Slabs	33300#	(133200# / 4 slabs)

By the way these items divide out they appear not to be averages based on actual separate weighings, but totals based on assumed averages.

Weights used by Val. Dept. (Graham 3/13/25)

24" - RCP	3600#	
36" RCP	4960#	
48" RCP	6136#	
Single Tr Slab	70000# per span (2 slabs)	for whole system — these are theoretical figures said to agree with average of actual weighings fairly well.
Piling	220# per ft	

HH
3/14/25

Ba63

Saint Paul, February 9, 1925.

Mr. A.R.Cook:

Your letter of the 6th advising that Mr. Ostrander has suggested the possibility of making at his washing plant concrete pipe and other products required by the Railway Company.

This is one of the possibilities I asked you and Mr. Clements to look up in connection with the study you are to make as to what should be done with the Auburn gravel plant.

I think it would be well to secure a definite proposition from Mr. Ostrander covering all the products which we now make at Auburn, we to turn over to him forms or any special equipment now used at the Auburn plant.

H. E. STEVENS.
Chief Engineer.

HES-ar

cc-Mr. M.F.Clements

Ba65

MFC

Saint Paul, January 14, 1925.

Mr. H. E. Stevens:

Referring to your letter of January 9th in regard to the Auburn Concrete Plant.

I have considered Mr. Cook's report giving reasons for the increased cost of manufacturing concrete products at Auburn and also the cost of rebuilding various parts of the plant to put it in working condition, taking into consideration your suggestion of rebuilding the plant in a different location in the Auburn pit and rebuilding it in an entirely new location.

As I have already written you, I do not believe it would be advisable to open the plant in 1925. By the purchase of a comparatively small amount of 24" pipe and by manufacturing the slabs at Pasco, we can, with the present stock of materials, meet the requirements of the 1925 work.

It would, therefore, seem advisable to consider the reconstruction of the plant at Auburn or at some other location. In connection with the building of concrete slabs it is necessary to have a heavy crane for loading them on cars and if the plant is rebuilt in the Auburn pit, the wrecking crane at Auburn will always be available for loading purposes. If the plant were to be moved to Kanaskat or Steilacoom, it would be necessary to provide a heavy crane or derrick with sufficient capacity for loading slabs.

In this connection, it might be well to consider a plant of an entirely different design and use in connection with the

handling of gravel a locomotive crane having sufficient capacity to load slabs. The crane would be available for other work at times when the plant was not in operation.

The compression tests which we have made on concrete materials from the Auburn pit have not shown up very well and from the standpoint of strength, it would be advisable to move to some other location than Auburn. On the other hand, the labor situation cannot be taken care of as well at either Kanaskat or Steilacoom.

If you desire, I can work up several suggested schemes of plants at various locations and in all probability the question of cost will be the deciding factor.

File of papers returned herewith.

Bridge Engineer.

Encl.

MFC

Saint Paul, January 14, 1925.

Mr. H. E. Stevens:

Referring to your letter of January 9th in regard to the Auburn Concrete Plant.

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If you desire, I can work up several suggested schemes of plants at various locations and in all probability the question of cost will be the deciding factor.

File of papers returned herewith.

Bridge Engineer.

Encl.

Saint Paul, January 9, 1925.

Mr. M. F. Clements:

I am attaching file terminating with Mr. Cook's letter of January 5, giving a very general explanation as to the reasons for the high cost of concrete products from the Auburn pit during the past season.

As stated by Mr. Cook, the plant is in very poor condition and probably will have to be rebuilt. The question therefore arises as to the advisability of rebuilding in its present location or moving to some location where we can obtain a better quality of material.

As soon as Mr. Cook has secured preliminary data as to the possibilities, he will take the matter up with you for detailed consideration and preparation of final report.

Please return the file with your comments so that I may take the matter up with Mr. Cook personally when I see him in Seattle next week.

Chief Engineer.

HES-ar

Encl.

Saint Paul, January 9, 1925.

Mr. A. R. Cook:

Your letter of January 5 about operation of the Auburn concrete plant.

Apparently the high cost is partly due to excessive overhead account of maintaining forces during periods when you had little or no work for them to do, and partly due to the poor condition of equipment and the unfavorable physical conditions now prevailing at the pit.

You make no definite recommendations as to reconstruction of the plant in its present location, or change in location. If you have not already done so, I wish you would make an investigation and comparative costs of output based on -

(1) Rebuilding the plant in its present location.
(2) Rebuilding in a different location in the Auburn pit.
(3) Rebuilding in an entirely new location.

Possibly we ought to consider moving the plant to Kanaskat, or perhaps to some point in the vicinity of Steilacoom. All possibilities should be considered and report made in time to permit getting definite authority before it becomes necessary to resume operations. Please handle promptly.

Mr. Clements has accumulated considerable information as to the cost of constructing plants of various types and capacities, and cost of operation under different conditions, and as soon as you have obtained the necessary physical data to permit a start on computations, I wish you would take the matter up with Mr. Clements so that he may assist you in the preparation of your figures.

HES-ar
cc-Mr. Clements

H. E. STEVENS,
Chief Engineer.

MFC

Saint Paul, January 10, 1925.

Mr. H. E. Stevens:

Referring to your notation on Mr. Cook's letter of January fifth in regard to concrete pipe requirements for 1925.

Mr. Cook's list has been checked over and found correct, and the excess of the requirements over the stock on hand is as follows:

632 lin. ft.	24"	Pipe
576 "	48"	"
32 Slabs	7'x 16'	

It is possible that there may be a small shortage of concrete piles also.

In any event, we would buy the 48" concrete pipe and we can purchase 632 lineal feet from the Massey Company at Spokane, or use that amount of corrugated pipe on branch lines, depending on the prices obtained at the time of purchase.

The slabs are required for bridges on the Pasco Division and I think it would be best to have the supervisor on the Pasco Division build them at Pasco.

I would, therefore, recommend that we do not operate the Auburn Plant in 1925, reducing the stock to a minimum, and consider the building of a new plant.

Mr. Cook's letter returned.

Bridge Engineer.

Encl.

MFC

Saint Paul, January 10, 1925.

Mr. H. E. Stevens:

Referring to your notation on Mr. Cook's letter of January fifth in regard to concrete pipe requirements for 1925.

Mr. Cook's list has been checked over and found correct, and the excess of the requirements over the stock on hand is as follows:

632 lin. ft.	24"	Pipe
576 "	48"	"
32 Slabs	7'x 16'	

It is possible that there may be a small shortage of concrete piles also.

In any event, we would buy the 48" concrete pipe and we can purchase 632 lineal feet from the Massey Company at Spokane, or use that amount of corrugated pipe on branch lines, depending on the prices obtained at the time of purchase.

The slabs are required for bridges on the Pasco Division and I think it would be best to have the supervisor on the Pasco Division build them at Pasco.

I would, therefore, recommend that we do not operate the Auburn Plant in 1925, reducing the stock to a minimum, and consider the building of a new plant.

Mr. Cook's letter returned.

Bridge Engineer.

Encl.

Price per foot of RCP and Piles made at Auburn Con. Plant.

Seattle, Wash.,
October 28, 1924.

Mr. H.E. Stevens,
Chief Engineer,
St. Paul, Minn.

Dear Sir:-

Referring to my letter to you of October 9th, 1924 please advise price per lineal foot to be used on inventory for reinforced pipe and piles made at Auburn Concrete Plant during the season of 1924.

Yours truly,

CES:C

(Signed) A. R. COOK

cc - MFC

Ptc 65

MFC

Saint Paul, November 6, 1924.

Mr. H. E. Stevens:

Referring to your notation on Mr. Cook's letter of October 28th in regard to the price per lineal foot to be used in the inventory for reinforced pipe and piles made at the Auburn Concrete Plant in 1924.

I think we should use the inside prices which are listed in my letter of even date.

Mr. Cook's letter is returned herewith.

Bridge Engineer.

Encl.

MFC

Saint Paul, November 6, 1924.

Mr. H. E. Stevens:

Referring to your letter of October 14th in regard to Mr. Cook's annual report for the operation of the Auburn concrete plant.

Mr. Cook has made up the usual report that covers the operations of 1924 and it appears that the cost of labor and material for the various units has been greater than in previous years.

The following is a comparison of costs of the units manufactured in the years 1922, 1923 and 1924:

24" Concrete Pipe

1922	Plant Operation Cost	$ 1.32
1923	" " "	1.38
1924	" " "	1.60

1.45 + .33 = 1.78

3)4.30

36" Concrete Pipe

1922	Plant Operation Cost	$ 1.90
1923	" " "	1.94
1924	" " "	2.25

2.03 + .48 = 2.51

3)6.09

Concrete Piles

1922	Plant Operation Cost	$ 1.07
1923	" " "	1.17
1924	" " "	1.16

Concrete Slabs

1923	Plant Operation Cost	$121.38
1924	" " "	145.00

Since the Federal Administration I have been fixing the price of concrete products in advance of their manufacture and the prices have been made with the idea of covering the cost of operation and overhead charges, which include interest on the investment, gravel pit charge, taxes, insurance and allowance for the original investment in the plant. The Accounting Department does not include any of these overhead charges except the retirement of the original cost of the plant and the prices that have been fixed have resulted in the wiping out of the original investment and establishing a credit.

From the personal record which I have kept of the cost data I have developed the fact that the overhead expenses which I have enumerated are equal to twenty percent of the operating costs, assuming the operating cost to include labor, material and repairs to the plant. I think, therefore, it would be advisable to fix an inside price which will cover labor, material and repairs only and to also fix an outside price which is 20 percent greater than the inside price; the outside price to be used on all joint work where the cost is shared with with foreign lines.

I would fix the following inside and outside prices for the material manufactured in 1924:

	Inside	Outside
24" Pipe per lin. ft.	$ 1.60	$ 1.90
36" " " "	2.25	2.70
Concrete Piles per lin. ft.	1.15	1.40
Single Track Slabs	145.00	175.00

Bridge Engineer.

Saint Paul, October 14, 1924.

Mr. M. F. Clements:

You have copy of Mr. Cook's annual report of operation of the concrete plant at Auburn.

Will you and Mr. Cribbs please make the usual analysis of these figures.

Chief Engineer.

HES-ar

cc-Mr. H.A.Cribbs

Re: Annual report of Auburn
Concrete Plant.

Seattle, Wash.,
October 9, 1924.

Mr. H. E. Stevens,
Chief Engineer,
St. Paul, Minn.

Dear Sir:-

I am sending you in duplicate annual report for Auburn Concrete Plant covering period from January 1st, 1924 to Sept. 30, 1924, duplicate being for Mr. Clement's use. Also sheet showing receipts and expenditures for same period.

On pages 6 and 7 manufacturer's cost is shown for pipe piles and slabs made during 1924. This does not include any charges for insurance, taxes, pit charge for gravel, interest or depreciation of plant. For the 44 S.T. Slabs made during this year, manufacturer's cost was $145.00 each or total of $6380.00, and this figure was used in billing them out for non-joint work on Pasco and Idaho Divisions.

Pipe and piles made during 1924 have not yet been transferred to M & S Stock, but this transfer will be made upon receipt of advice from you as to price per lineal foot to be used in charging out. Will also require this price for use on inventory October 31, 1924, please advise.

Pipe, Piles and Slabs made prior to 1924 are carried in M & S Stock Cl. #3, and all shipments from this stock during 1924 have been billed out at price previously agreed on and credited to M & S Cl. #3.

The allowance for depreciation, etc. credited to Auburn Concrete Plant, for sales made in previous years in accordance with prices fixed by Mr. Clements, has resulted in wiping out the charge for investment and accumulating a surplus, so that I presume the 1924 product can safely be charged to M & S Stock at approximately manufacturer's cost, which is considerably below the prices used for 1924 sales from M & S Stock (See page #3 of report.)

However in billing out from M & S Stock for joint work, a percentage should be added for Store Expense etc.

A portion of the surplus above noted consists of credits allowed - DAS #10 for 42 pcs. 10' piles invoiced at $1.90 lin.ft. - $798.00, which were made in 1917 and for which no use has been found as yet. Also 10 double track concrete slabs made in 1918 invoiced at $130.00 each - $1300.00, and 43 - 15' concrete piles- $1225.50 neither of which seem much in demand.

Yours truly,

A R Cooks

CES:C

encl.

cc - MFC

ANNUAL REPORT

AUBURN CONCRETE PLANT

1924

OFFICE OF ASST. CHIEF ENGR.
SEATTLE, WASHINGTON,
September 30th, 1924.

AUBURN CONCRETE PLANT

SUMMARY OF COST OF OPERATION FOR 1924

		Operating Acct.	Investment Acct.	Total
Inventory 12/31/1923				
Raw Material	6255.96			
Supplies	461.20	6717.16		6717.16
Operation Costs 1/1-24 to 9/30/24		7024.12		7024.12
		13741.28		13741.28
Deduct Inventory 9/30/1924				
Raw Material	3160.07			
Supplies	234.84	3394.91		3394.91
Manufacturers' cost 1924) See Sheet 6 for details)		10346.37		10346.37
1924 Manufactured Product (44 slabs) Shipped out 1924 & credited to Opr. a/c) (Pasco Div. F-6-346-347-348-350) and Idaho Div. F-6-349)		6380.00		6380.00
Credit on slabs made prior to 1924) and turned over to M&S Stocks) (ARC #76-M-1491))		143.91	106.09	250.00

Inventory 9/30/1924 for 1924 Mfg. Product

Price not yet fixed. To be credited to DAS #10

24" RC Pipe	128 pcs.	1024 lin.ft.	@ 1.60
36" RC Pipe	76 "	608 " "	@ 2.25
25' RC Piles	33 "	825 " "	@ 1.16

Gravel Pit charges for gravel used during 1924

754 cu.yd. @ 10¢ 75.40

NOTE:-

Manufactured product made prior to 1924 was transferred to M&S a/c during 1923. See sheet #3 for inventory.

Office of Asst. Chief Engineer,
Seattle, Washington,
September 30, 1924.

PRODUCT SOLD 1/1/1924 to 9/30/1924. From stock made prior to 1924.

Credited to M & S Cl. #3.

Concrete Pipe

24" RCP 382 pcs.	3056 lin.ft.	1.90	5806.40
36" RCP 161 pcs.	1288 " "	2.80	3603.40

S.T. Concrete slabs

20 pcs.	145.00	2900.00
		12312.80

1924 Product sold 1/1/1924 to 9/30/1924

Credited to DAS #10. Auburn Concrete Plant, Operation a/c

S.T. Concrete slabs.

44 pcs.	145.00	6380.00

STATEMENT OF OUTPUT FOR 1924

	R.C.P.		Piles					Slabs	
	24"	36"	30'	25'	20'	15'	10'	Single	Double
On hand 1/1/1924	552	200	21	29	33	43	42	20	10
Made 1924	128	76	-	33	-	-	-	44	-
Shipped 1924	382	161	-	-	-	-	-	64	-
On hand 9/30/1924	298	115	21	62	33	43	42	-	10

Office Asst. Chief Engr.,
Seattle, Washington.
September 30, 1924.

AUBURN CONCRETE PLANT

INVENTORY MANUFACTURED PRODUCT ON HAND SEPTEMBER 30, 1924.

1924 Product charged to DAS #10 (Price not yet fixed)

	No. Pcs.	Lin.ft.	
24" RC Pipe	128	1024	1.60
36" RC Pipe	76	608	2.25
25' RC Piles	33	825	1.16

Product made prior to 1924
Charged to M&S Cl. #3 (ARC S-580 and S-76)

Concrete Pipe	No. Pcs.	Lin.ft.	Price	
24" RCP	170	1360	1.90 lin.ft.	2584.00
36" RCP	39	312	2.80 " "	873.60
Concrete Piles				
30' Piles	21	630	1.90 " "	1197.00
25' "	29	725	1.90 " "	1377.50
20' "	33	660	1.90 " "	1254.00
15' "	43	645	1.90 " "	1225.50
10' "	42	420	1.90 " "	798.00
		3080		
Concrete Slabs				
Double track slabs	10		130.00 each	1300.00
				10609.60
Concrete fence posts	11			No. chg.
Concrete Pile ends.	26			" "

Office of Asst- Chief Engr.,
Seattle, Washington,
September 30, 1924.

AUBURN CONCRETE PLANT

INVENTORY - SEPTEMBER 30, 1924.

Reinforcing Rods	Lin.Ft.	Unit Wt.	Weight	Price per cwt.	Amount
1 1/8" Rd.	1327'2"	3.38	4486#	3.7511	168.27
" "	18730'11"	"	63311#	3.12	1975.30
1½" "	32'	5.31	170#	2.94	5.00
1¼" " Plain	5148'5"	4.173	21484#	2.94	631.63
1" "	27'	2.67	72#	2.09	1.50
1" Sq.	64'10"	3.4	220#	2.09	4.60
3/4" "	42'6"	1.913	81#	2.84	2.30
3/4" Rd.	6'	1.502	9#	2.84	.26
3/8" "	348'8"	0.46	161#	4.20	6.76
¼" Sq.	2561'	0.167	428#	2.76	11.81
5469 Pile Plates 2 1/8"x1/8"x1'3 3/4" 2 hole 1.25 ea.			6836#	5.13	350.68
Total Reinforcing			97258#		$3158.11
Annealed Wire No. 11			25#	3.60	.90
Malthine Paper ½ roll - 250 sq.ft.					1.06
Total raw material on hand 9/30/24					$3160.07

Supplies

Coal tons 3	6000#	3.75 ton		11.25
60D spikes	17#	2.81 cwt.		.48
Sheet Iron 24"x8"x1/8" - 10 sheets	540#	4.82 sheet		48.20
4"x4"-16' - 7099 Ft. BM		22.00 M		156.17
Engine oil - 5 gals.		.312 gal		1.56
Valve oil - 5 "		.50 "		3.50
Coal oil - 5 "		.145		.72
Elasterite Paint 40 "				12.96
Total supplies on hand 9/30/24				$234.84

AUBURN CONCRETE PLANT

INVENTORY - SEPTEMBER 30, 1924.

Recapitulation
Raw Material on hand

Reinforcing	$3158.11	
Mesh	None	
Wire	.90	
Malthine Paper	1.06	$3160.07
Supplies		234.84

Manufactured Product on hand
Charged to DAS #10 (Price not yet fixed)

24" RCP	1024 lin.ft.	1.60
36" "	608 " "	2.25
25' Piles	825 " "	1.16

Total A/C DAS #10 _____

_____

Manufactured product on hand - charged to M & S Cl. #3

24" RCP	1360 lin.ft.	$2584.00
36" RCP	312 " "	873.60
Piles	3080 " "	5852.00
D.T. Slabs	10 Pcs.	1300.00
		$ 10609.60

AUBURN CONCRETE PLANT

SUMMARY OF OPERATION FOR 1924

	24" R.C.P. 128 pcs. 1024 lin.ft.	36" R.C.P. 76 pcs. 608 lin.ft.	25' Piles 33 pcs. 825 lin.ft.	S.T. Slabs 44 pcs.	Total Operation Costs.
Screening Sand and Gravel	122.89	108.87	53.90	527.12	812.78
Cement	429.25	370.72	126.82	1341.41	2268.20
Rods	141.62	137.61	396.79	1996.49	2672.51
Wire	2.87	1.84	1.62	13.32	19.65
Mesh	226.55	181.89	--	--	408.44
Malthine Paper	--	--	--	25.10	25.10
Asphalt Paint	--	--	--	60.04	60.04
Labor	412.58	311.50	254.45	1365.71	2344.24
General Expense	257.28	220.58	107.19	896.84	1481.89
Repairs	43.78	37.53	18.24	153.97	253.52
Total Manufacturers' Cost	1636.82	1370.54	959.01	6380.00	10346.37

Note: Manufacturers' cost shown above does not include any charges for insurance, taxes, pit charge for gravel, interest or depreciation of plant.

Office of Asst. Chief Engr.,
Seattle, Washington.
September 30, 1924

AUBURN CONCRETE PLANT

COST OF MANUFACTURING PER LINEAL FOOT FOR THE YEAR 1924.

	24" R.C.P.		36" R.C.P.		R.C.Piles		S.T. Slabs	
	Rate	Cost	Rate	Cost	Rate	Cost	Rate	Cost per Slab
Screening Sand & Gravel	1.07796 cy.yd.	.12001	1.07796 cu.yd	.17906	1.07796cy.	.06533	1.07796 cy	11.98000
Cement	2.438925 bbl	.41919	2.438925 bbl.	.60974	2.438925 bbl	.15372	2.438925 bbl	30.48660
Rods	3.80596 cwt	.13830	4.21341 cwt.	.22633	3.34038 cwt.	.48096	3.30939	45.37477
Wire	4.50 cwt	.00280	4.50 cwt	.00303	4.50 cwt	.00196	4.50 cwt	.30273
Mesh	.02879 sq.ft.	.22124	.02879 sq.ft.	.29916	--	--	--	--
Malthine Paper	--	--	--	--	--	--	.01 lin.ft.	.57045
Asphalt Paint	--	--	--	--	--	--	.625417 gal.	1.36454
Labor	--	.40291		.51234		.30843		31.03886
General Expense		.25125		.36280		.12993		20.38273
Repairs		.04275		.06173		.02211		3.49932
Manufacturers Cost		1.59845		2.25419		1.16244		145.00 +

Note: 44 S.T. Slabs made during 1924 have been shipped out and invoiced at $145.00 per slab.
Total. $6380 credited to operation c/c for 1924.

Office Asst. Chief Engineer,
Seattle, Washington
September 30, 1924

MFC

Saint Paul, Sept. 26, 1924.

Mr. H. E. Stevens:

Each year we are purchasing about 500 lineal feet of 48" Reinforced Concrete Pipe for maintenance work west of Paradise.

I believe it would be well to purchase one steel form for Auburn Plant so that this pipe can be manufactured by our own forces.

A form would cost about $500.00 and I believe it would pay for itself in one year.

Jas. E. Clements

Bridge Engineer.

Ga65

MFC

Saint Paul, Sept. 26, 1924.

Mr. H. E. Stevens:

Each year we are purchasing about 500 lineal feet of 48" Reinforced Concrete Pipe for maintenance work west of Paradise.

I believe it would be well to purchase one steel form for Auburn Plant so that this pipe can be manufactured by our own forces.

A form would cost about $500.00 and I believe it would pay for itself in one year.

Bridge Engineer.

Form 4189 12-21-23 1M RP

NORTHERN PACIFIC RAILWAY COMPANY

OFFICE OF ENGINEER OF TESTS.

Report No. 29080

St. Paul, Minn., July 14th 1924

To Mr. A. R. Cook, P.A. Engr., Seattle, Wn.

CONCRETE COMPRESSION SPECIMENS.

Sent in by A. R. Cook Representing Work at Auburn Concrete Plant

Test Request No. 148 On Mfgr. Pipe, Piles, Etc.

RESULTS OF COMPRESSION TESTS:

Test No.	Size	Area	Age	Mix	Maximum Load in Lbs.	Ultimate Strength Per Sq. In. in Lbs.
1	6x6x6	36 sq.in.	35 dys.	1-2-4	61660	1713
2	"	"	"	"	98530	2737
3	"	"	"	"	110570	3071

REMARKS:

The ultimate strength of the cubes Nos. 2 and 3 is considerably higher than the average cube of similar age and mix, while cube No.1 is considerably lower. Cube No. 1 showed no evidence as to the cause of low results.

DW(1)
CC--HES(3)

H. S. BURNHAM.

Engineer of Tests.

Form 823 — 2-7-13 15Bks. RP

NORTHERN PACIFIC RAILWAY COMPANY
REQUEST FOR EXAMINATION OF MATERIAL

TEST REQUEST NO. 148

MR. H. R. Burnham, Engineer of Tests — Seattle, Wash. June 30 191 4

PLEASE EXAMINE Three test cubes 6"x6" made at Auburn Concrete Plant, Auburn, Wash. from material used in manufacturing pipe, piles Etc

RECEIVED AT

FROM Auburn Wash June 27th 1924

CAR NO. Express INITIALS

TO APPLY ON REQUISITION NO. ORDER NO.

NO. OF PIECES	DIMENSIONS OR PATTERN NO.	REMARKS
3	6"x6" Test Cubes	For 28 day test
		Cubes made 6-7-24
		1 - 2 - 4 Mixture
		Please send results of tests to
M. F. C.		A. R. Cook Seattle, Wash.

REPLY TO REQUEST FOR EXAMINATION OF MATERIAL, NO.

ST. PAUL, MINN., 191

MR.

REPORT OF { INSPECTION / ANALYSIS / TEST } NO. WAS MADE TO MR. 191

ENGINEER OF TESTS.

REPLY TO REQUEST FOR EXAMINATION OF MATERIAL, NO._____

ST. PAUL, MINN., _____ 191____

MR._____

REPORT OF { INSPECTION / ANALYSIS / TEST } NO._____ WAS MADE TO MR._____ 191____

_____

ENGINEER OF TESTS.

Form 4189 12-21-23 1M RP

NORTHERN PACIFIC RAILWAY COMPANY

OFFICE OF ENGINEER OF TESTS.

Report No. 29936

St. Paul, Minn., June 25th 1924

To Mr. A. R. Cook, Asst. Chief Engr., & Engr. M. of W., Seattle, Wash.

CONCRETE COMPRESSION SPECIMENS.

Sent in by A. R. Cook Representing Work at Concrete Plant, Auburn, Wn.

Test Request No. 147 On Mfg. Pipe, Piles, Etc.

RESULTS OF COMPRESSION TESTS:

Test No.	Size	Area	Age	Mix	Maximum Load in Lbs.	Ultimate Strength Per Sq. In. in Lbs.
1	6"x6"x6"	36 sq.in.	28 dys.	1-2-4	95760	2660
2	"	"	"	"	101630	2820
3	"	"	"	"	100630	2795

REMARKS: The ultimate strength of the above cubes is considerably higher than that of the average cube of similar age and mix.

DW(1)
CC--HES(3)

H. G. BURNHAM

Engineer of Tests.

Form 4189

NORTHERN PACIFIC RAILWAY COMPAN

OFFICE OF ENGINEER OF TESTS.

Report No. 28935

St. Paul, Minn., June 25th 1924

To Mr. J. T. Derrig, Dist. Engineer, St. Paul, Minn.

CONCRETE COMPRESSION SPECIMENS.

Sent in by A. J. Behrens, Insp. Representing Work at St. Paul, Minn.

Test Request No. 10 On 3rd St. Sewer

RESULTS OF COMPRESSION TESTS:

Test No.	Size	Area	Age	Mix	Maximum Load in Lbs.	Ultimate Strength Per Sq. In. in Lbs.
43-a	6"x6"x6"	36 sq.in.	28 dys	1-2-4	70660	1965
b	"	"	60 "	"	131740	3660
c	"	"	90 "	"	127670	3545
44-a	"	"	28 "	"	72560	2020
b	"	"	60 "	"	113740	3155
c	"	"	90 "	"	156620	4350
45-a	"	"	28 "	"	57630	1600
b	"	"	60 "	"	100680	2795
c	"	"	90 "	"	102690	2850
46-a	"	"	28 "	"	52650	1465
-b	"	"	60 "	"	107700	2990
c	"	"	90 "	"	113780	3160
47-a	"	"	28 "	"	86700	2410
b	"	"	60 "	"	99760	2770
c	"	"	90 "	"	115690	3210
48-a	"	"	28 "	"	71690	1990
b	"	"	60 "	"	93660	2600
c	"	"	90 "	"	94620	2630
49-a	"	"	28 "	"	93600	2600
b	"	"	60 "	"	96660	2690
c	"	"	90 "	"	76680	2130

REMARKS: It will be noted that cubes #45-a and 46-a evidenc
strength far below, and cubes #43-a, 44-a, 45-c, 48-a, 48-c, and 49-
below that of the average cube of their respective age and mix. Cu
45-a and 46-a appeared to be soft and crumbly. The other cubes sh
as to the cause of the low results.

DW(1)
CC--HES(3)

Ll.

Er

Form 4189 12-21-23 1M RP

NORTHERN PACIFIC RAILWAY COMPANY

OFFICE OF ENGINEER OF TESTS.

Report No. 28909

St. Paul, Minn., June 23rd 19 24

To Mr. A. R. Cook, Asst. Chief Engineer & Engineer M. of W., Seattle, Wash.

CONCRETE COMPRESSION SPECIMENS.

Sent in by A. R. Cook Representing Work at Concrete Plant at Auburn, Wash.

Test Request No. 146 On Pipes, Piles, Etc.

RESULTS OF COMPRESSION TESTS:

Test No.	Size	Area	Age	Mix	Maximum Load in Lbs.	Ultimate Strength Per Sq. In. in Lbs.
1	6"x6"x6"	36 sq.in.	28 dys.	1-2-4	~~107730~~ 106630	2960
2	"	"	"	"	99740	2770
3	"	"	"	"	94690	2635

REMARKS: The ultimate strength of the above cubes is considerably higher than that of the average cube of similar age and mix.

DW(1)
CC--HES(3)

H. G. BURNHAM,
Engineer of Tests.

In 7 Elements ✓

Form 823 2-7-13 15Bks. RP

NORTHERN PACIFIC RAILWAY COMPANY
REQUEST FOR EXAMINATION OF MATERIAL

TEST REQUEST NO. 1417 Jab5

MR. H G Burnham Seattle, Wash June 14th 1924
Engineer of Tests

PLEASE EXAMINE Three test cubes 6"x6" made at Auburn Concrete Plant, Auburn Wash, from material used in manufacturing pipe, piles etc

RECEIVED AT

FROM Auburn, Wash June 13 - 1924

CAR NO. Express INITIALS

TO APPLY ON REQUISITION NO. ORDER NO.

NO. OF PIECES	DIMENSIONS OR PATTERN NO.	REMARKS
3.	6"x6" Test Cubes	For 28 day test
		Cubes made 5-27-24
		1-2-4 Mixture
		Please send result of tests to
		A. R. Cook
		Seattle, Wash
M. F. C.		

REPLY TO REQUEST FOR EXAMINATION OF MATERIAL, NO.

ST. PAUL, MINN., 191

MR.

REPORT OF { INSPECTION / ANALYSIS / TEST } NO. WAS MADE TO MR. 191

ENGINEER OF TESTS.

REPLY TO REQUEST FOR EXAMINATION OF MATERIAL, NO._____

ST. PAUL, MINN.,_____ 191___

MR._____

REPORT OF { INSPECTION / ANALYSIS / TEST } NO._____ WAS MADE TO MR._____ 191___

_____

ENGINEER OF TESTS.

ba65

MFC

Saint Paul, March 5, 1924.

Mr. H. E. Stevens:

On September 17th you furnished me with Mr. Cook's 1923 report on the operation of the Auburn Concrete Plant and you requested at that time that I work up a statement showing the charge which should be made for billing out the pipe.

Our practice has been to fix the prices of concrete products in advance and Mr. Cook's report furnishes not only the operating cost but also the return from the sale of pipe.

Mr. Cook will require prices at this time for selling the 1924 products and I attach a blue print dated October 9, 1923, on which is shown the selling price which I think should be used for the manufactured products on hand and for additional products manufactured in 1924. I also attach a statement which shows the general items of expense in the 1923 operation and the status of the plant investment as of December 31, 1923.

In all probability the net investment at the end of 1924 will be wiped out and in the years that follow the unit prices on the various manufactured products can be reduced.

Mr. Cook's report is returned herewith.

Bridge Engineer.

Encl.

NORTHERN PACIFIC RAILWAY COMPANY

Auburn Concrete Plant

Statement of 1923 Operation

Operation		
Cement	$5408.00	
Sand and Gravel	1214.90	
Reinforcement	4525.58	
Miscellaneous	2755.75	
Labor	4556.77	
Repairs	158.37	
Total Operation		$18,619.37
Overhead		
Interest on 1922 Depreciated Investment	$1670.76	
Gravel Pit Charge	152.60	
Taxes	205.00	
Insurance	65.00	
Total Overhead		$ 2,093.36
		$20,712.73
Sale of Products		$24,887.49
Profit:		$ 4,174.76

Status of Investment December 31, 1923.

Investment		
Cost of Plant	$17,576.62	
Cost of Manufactured Products on hand	15,760.49	
Total Cost:		$33,337.11
Less Profit from Sale of Products		4,174.22
		$29,162.89
Sale Price of Concrete Products in Stock	$23,095.30	
Salvage Value of Plant	3,000.00	
		$26,095.30
Net Investment:		$ 3,067.59

Office of Bridge Engineer,
Saint Paul, March 5, 1924.

Saint Paul, September 17, 1923.

Mr. M. F. Clements:

You have copy of Mr. Cook's letter of the 10th, about cost of operation of the Auburn concrete plant.

In accordance with our usual practice, I wish you would work up statement showing charge which should be made in billing out this pipe.

Chief Engineer.

HES-ar

Re: 1923 report covering
operation of Auburn
Concrete Plant.

Seattle, Wash.,
Sept. 10, 1923.

Mr. H. E. Stevens,
Chief Engineer,
St. Paul, Minn.

Dear Sir:-

Enclosing herewith report in duplicate, covering operation of Auburn Concrete Plant for season of 1923; also inventory, in duplicate, of manufactured stock, raw material and supplies on hand at Auburn Concrete Plant as of August 31, 1923.

One copy of each of these reports is for Mr. Clements' use in working up prices to be fixed for 1924 shipments of pipe, piles and slabs.

The manufacturers' cost shown on sheets 7 and 8 of the Annual Report for 1923 does not include any charges for insurance, taxes, pit charge for gravel, interest or depreciation of plant. I understand Mr. Clements has prepared statements showing these items for previous years and that he will take these "overhead costs" into consideration in fixing the prices for future shipments.

The accounts kept in this office for 1923 shipments were handled as in previous years, a fixed price per lineal foot of pipe (22¢ for 24" pipe and 33¢ for 36" pipe, as per Mr. Clements' letter of May 3, 1921) being credited to Investment Acct., to take care of plant depreciation.

I understand from Mr. Clements' letter of June 22, 1923, that for future shipments no credit to Investment Acct. is to be shown on accounting records.

Am enclosing copy of the accounting record for 1923 for convenience in checking cost record kept in St. Paul office.

If there are any items omitted from our record (other than entries subsequently cancelled by correction entries) please furnish copy of same so that our record may be brought up to date.

Yours truly,

CHS:L cc MFC

No. 65

MFC

Saint Paul, March 4, 1924.

Mr. H. E. Stevens:

Requisition ARC-23 provides rods for 1200 lineal feet of 24" pipe and 400 lineal feet of 36" pipe.

This is sufficient to keep the plant busy during the time the forces are working on slabs and piles required for 1924. It is not sufficient to provide a surplus which will supply the 1925 requirements without operating in 1925.

Bridge Engineer.

Encl.

MFC 52-65

Saint Paul, February 12, 1924.

Mr. H. E. Stevens:

Referring to your notation on Mr. Cook's letter of February 18th in regard to the manufacture of various concrete products at the Auburn concrete plant.

It will be necessary for Mr. Cook to make up the 46 concrete slabs to fill out the requirements for 1924 and he should fill in with such other products as may be necessary for the economical operation of the plant. I think we should, however, keep down the stock of manufactured product to the lowest possible figure.

Mr. Cook's proposition of using up odd size stock material should be carried out. We have on hand a number of rods which were ordered for the concrete slab inverts at Stampede but a change was made in the plan to use the concrete slabs, and these rods should be used up in the manufacture of slabs for bridges.

I think the detail as outlined in Mr. Cook's letter is O. K.

Mr. Cook's letter is returned herewith.

Bridge Engineer.