

Water Right Number 1790-3

1. Considered January 20, 19 71

2. Name of Applicant Lincoln County Rural Water System

3. Post Office Address Richard Lommen, Chairman, Harrisburg, S.D.

4. Amount of water claimed 1.63

5. Source of water supply ground water

6. Water to be used for Suburban Housing

Acres to be irrigated _____

7. Water to be diverted and used in Minnehaha County

about 10 Sioux Falls Well Field Acres of _____

8. Proof of Publication

Received 1-15-71

Not received _____

9. Application

Approved _____

Subject to _____

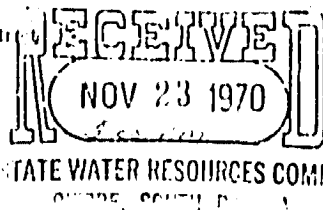
Not approved _____

Action deferred _____

10. Remarks:

No. 1790-3Map No. 1299-3 Water Division No. 3 BIG SIOUX RIVER

(Blank to be filled by the Engineer for the W. P. C.)



APPLICATION FOR PERMIT

To Appropriate Water within the State of South Dakota

(NOTE - Draw a box through items not applicable)

1. Name of Applicant Lincoln County Rural Water System
 Postoffice address Harrisburg, State South Dakota
 If a corporation show date and place of incorporation September 15, 1970 - Canton, South Dakota
2. Method of accomplishing work (contract, employment of others, or by direct labor) Combination
3. Name of diversion work Lincoln County Rural Water System (Sioux Falls Well Site)
4. Amount of water claimed (cubic feet per second) 1.631 cfs, Storage - 590,000 gal.
5. Source of water supply Ground Water
6. Location of point of diversion Diversion points as shown in the attached list of Sioux Falls Water Rights Numbers.
- County Minnehaha
7. Annual period or periods during which water is to be used Continuous
8. Use to be made of water, (irrigation, industrial, municipal, commercial, recreation, etc.) Rural (Suburban)

XXXXXXXXXXXX

Total number of acres to be irrigated _____

List below each forty acre subdivision, or lot, or fraction thereof and show number of acres to be irrigated in each.

Land Description	No. Acres Irr.	Land Description	No. Acres Irr.

Attach sheet if more space is needed

10. Time required to complete construction of water supply system Five years. Additional time required to complete application of water to the proposed beneficial use Four years.
11. Choice of newspaper for Notice of Intent to Appropriate Water publication Sioux Falls Argus Leader
12. Principal Features of the Proposed Water Supply System.

A. Works proposed to divert water from its natural source.

Wells as shown in question six.

B. Works proposed to transport water to place of use.

A portion of Sioux Falls Distribution System and rural distribution system as shown on attached water rights map.

C. Works proposed to apply water to beneficial use.

405 service connections

Estimated Total Cost \$916,781.00

Attachments: Attach Form 2A if diversion from a well or dugout, or if storage of water, is proposed. Attach map
 (See instructions concerning preparation.)

STATE OF SOUTH DAKOTA

) ss.

County of Lincoln

I, Richard Lommen, Pres., the applicant, certify that I have read the foregoing application and have examined the attached map and that the matters therein stated are true and that I intend, and am able to complete the necessary construction.

Signed

Richard Lommen, Pres.

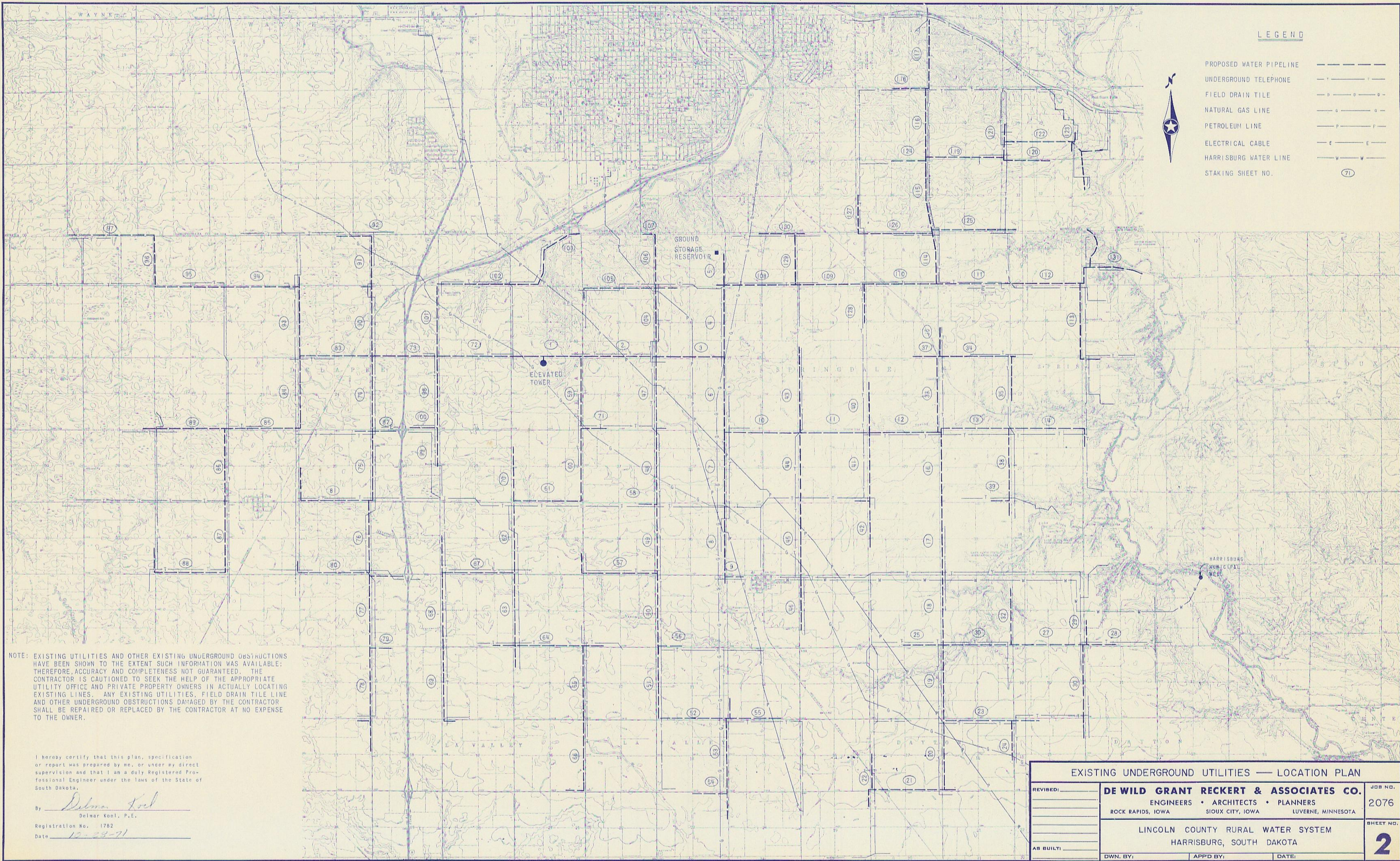
Subscribed and sworn to before me this

23

day of

Nov19 70

Therese T. Tammes
 Notary Public (or other qualified official)



LEGEND

- PROPOSED WATER PIPELINE
- UNDERGROUND TELEPHONE
- FIELD DRAIN TILE
- NATURAL GAS LINE
- PETROLEUM LINE
- ELECTRICAL CABLE
- HARRISBURG WATER LINE
- STAKING SHEET NO. 71

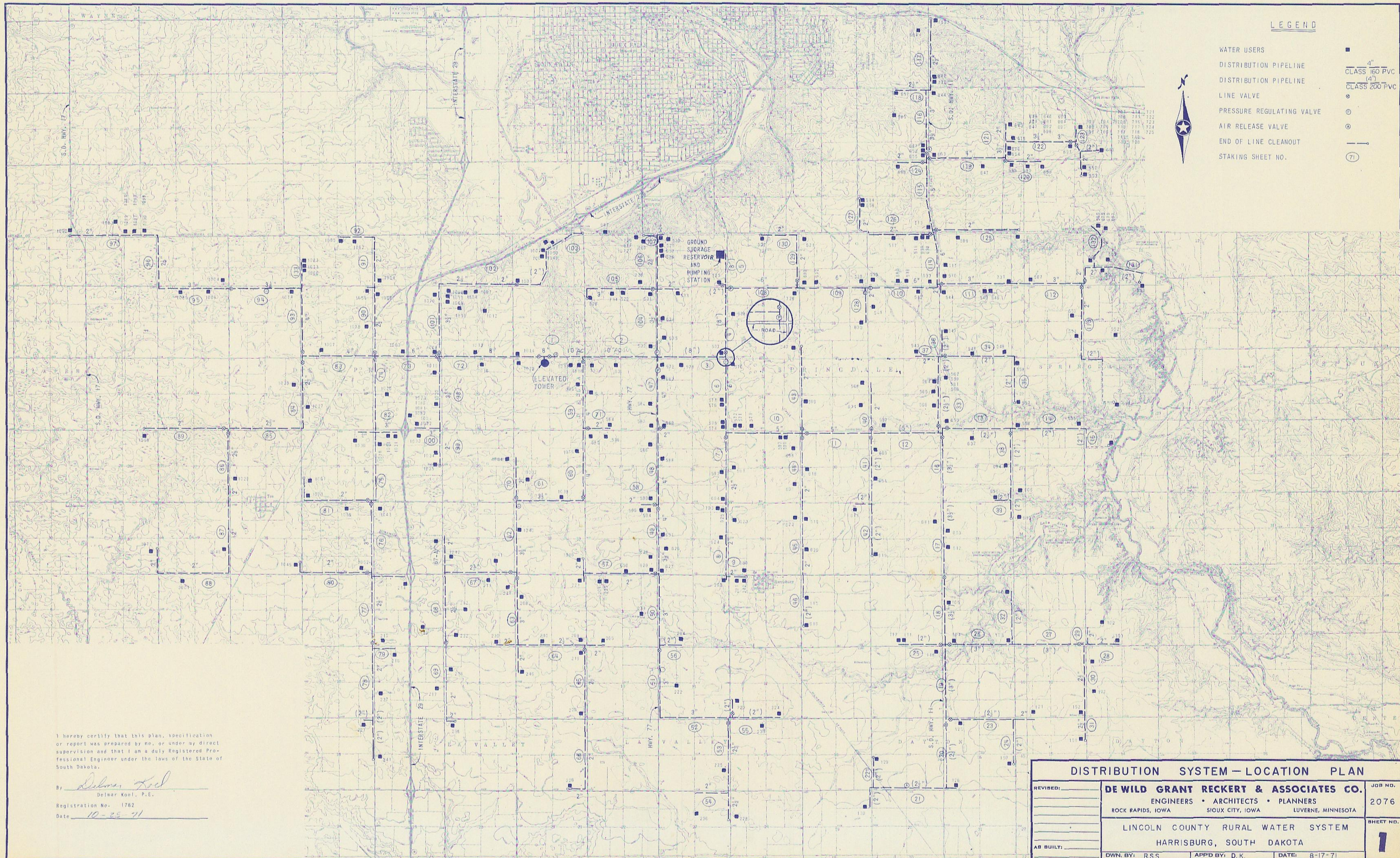
NOTE: EXISTING UTILITIES AND OTHER EXISTING UNDERGROUND OBSTRUCTIONS HAVE BEEN SHOWN TO THE EXTENT SUCH INFORMATION WAS AVAILABLE; THEREFORE, ACCURACY AND COMPLETENESS NOT GUARANTEED. THE CONTRACTOR IS CAUTIONED TO SEEK THE HELP OF THE APPROPRIATE UTILITY OFFICE AND PRIVATE PROPERTY OWNERS IN ACTUALLY LOCATING EXISTING LINES. ANY EXISTING UTILITIES, FIELD DRAIN TILE LINE AND OTHER UNDERGROUND OBSTRUCTIONS DAMAGED BY THE CONTRACTOR SHALL BE REPAIRED OR REPLACED BY THE CONTRACTOR AT NO EXPENSE TO THE OWNER.

I hereby certify that this plan, specification or report was prepared by me, or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of South Dakota.

By Delmar Koel
Delmar Koel, P.E.
Registration No. 1782
Date 12-23-71

EXISTING UNDERGROUND UTILITIES — LOCATION PLAN

REVISED:	DE WILD GRANT RECKERT & ASSOCIATES CO. ENGINEERS • ARCHITECTS • PLANNERS ROCK RAPIDS, IOWA SIOUX CITY, IOWA LUVERNE, MINNESOTA	JOB NO. 2076
AS BUILT:		SHEET NO. 2
DWN. BY:		LINCOLN COUNTY RURAL WATER SYSTEM HARRISBURG, SOUTH DAKOTA
APP'D BY:		
DATE:		



LEGEND

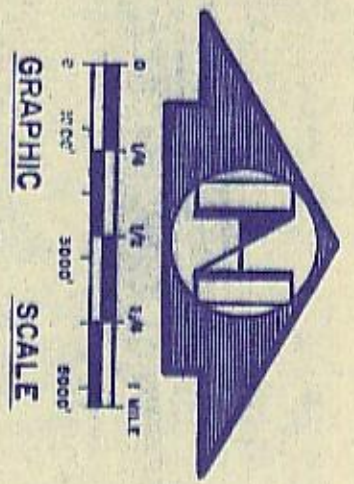
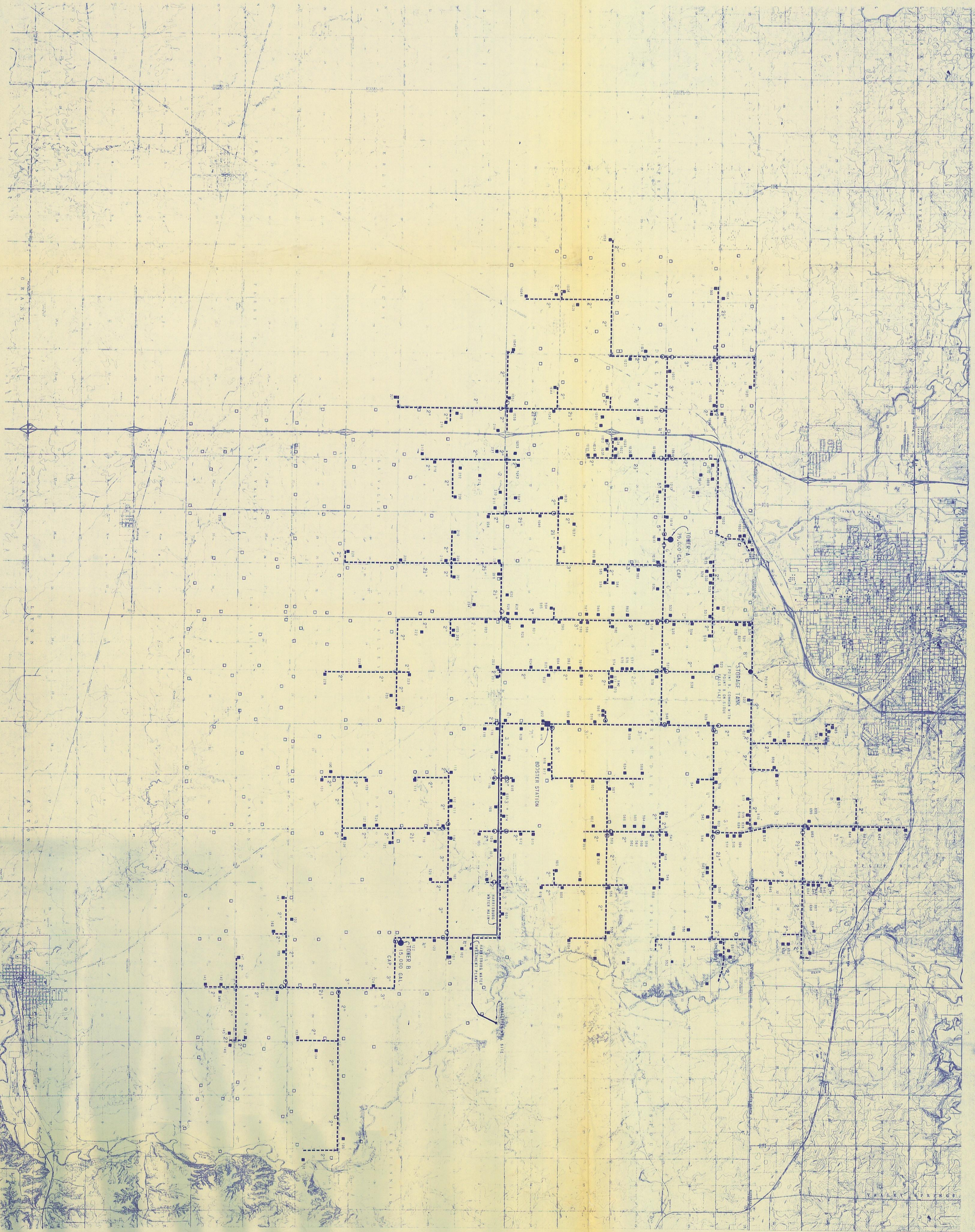
- WATER USERS
- DISTRIBUTION PIPELINE
- DISTRIBUTION PIPELINE
- LINE VALVE
- PRESSURE REGULATING VALVE
- AIR RELEASE VALVE
- END OF LINE CLEANOUT
- STAKING SHEET NO.

I hereby certify that this plan, specification or report was prepared by me, or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of South Dakota.

By Delmar Koel
Delmar Koel, P.E.
Registration No. 1762
Date 10-25-71

DISTRIBUTION SYSTEM - LOCATION PLAN

REVISION:	DE WILD GRANT RECKERT & ASSOCIATES CO.	JOB NO.
	ENGINEERS • ARCHITECTS • PLANNERS	2076
	ROCK RAPIDS, IOWA	SIoux CITY, IOWA
		LUVERNE, MINNESOTA
	LINCOLN COUNTY RURAL WATER SYSTEM	SHEET NO.
	HARRISBURG, SOUTH DAKOTA	1
AS BUILT:	DWN. BY: R.S.S.	APPD BY: D.K.
	DATE: 8-17-71	



PRELIMINARY LAYOUT OF
PROPOSED WATER DISTRIBUTION SYSTEM
FOR
LINCOLN COUNTY RURAL WATER SYSTEM
SOUTH DAKOTA

LEGEND

■ USER
□ NON-USER
--- PROPOSED PIPELINE SIZE AS NOTED
○ VALVE

WATER RIGHT APPLICATION APPROVAL

The Water Resources Commission hereby approves Water Right Application No. 1790-3
LINCOLN COUNTY RURAL WATER SYSTEM HARRISBURG
(Applicant) (Post Office Address)
SOUTH DAKOTA With the following modifications:
(State)

The ~~irrigation~~ well approved under this Permit will be located near domestic wells and ~~municipal~~ ^{MUNICIPAL & IRRIGATION} wells which may obtain water from the same aquifer. The ~~irrigation~~ well owner, under this Permit, shall control his ~~irrigation~~ withdrawals so there is not a reduction of needed water supplies in existing domestic wells or in irrigation ^{MUNICIPAL} wells having prior water rights.

Date of first receipt of application NOVEMBER 23 19 70
 Date of return to applicant for correction, amendments or changes required — 19 —
 Date of receipt of corrected application — 19 —
 Approved JANUARY 20 19 71, Recorded in Book 11 Page 214

WATER RIGHT PERMIT NO. 1790-3

The Water Resources Commission hereby grants and issues this Water Right Permit No. 1790-3 authorizing the construction of the water use system and the putting of water to beneficial use as stated in the Application and as modified in the Water Right Application approval, subject, however, to the following limitations and conditions:

1. The date from which applicant may claim right is NOVEMBER 23 19 70
2. The equivalent of at least one-fifth of the work above specified is to be completed on or before JULY 20 19 72
3. The whole of said work is to be completed on or before JANUARY 20 19 76
4. The limit of time from proof of beneficial use of water appropriated in accordance herewith is JANUARY 20 19 80
5. The water appropriated shall be used for the purpose of RURAL WATER SUPPLY
6. The prior right of all persons who, by compliance with the laws of the State of South Dakota, have acquired a right to the use of water must not be injuriously affected by this appropriation.
7. The amount of the appropriation herein granted shall not exceed 1.63 cubic feet per second; neither shall it exceed the capacity of the above described water supply system, nor shall it exceed the amount of water needed for ~~beneficial use~~ ^{USED FOR RURAL WATER SUPPLIES} ~~and if for the irrigation purpose said appropriation must be limited to not more than 3 acre feet per acre per year and be limited to not more than one-seventieth (1/70) of one cubic foot of water per second of time for each acre of land to which water is~~ actually and beneficially ~~applied for irrigation~~ ^{applied for irrigation} on or before JANUARY 20 19 80; said water to be used during the following described annual period: CONTINUOUSLY

Witness my hand this 21ST day of JANUARY 19 71

WATER RESOURCES COMMISSION

By:

[Signature]
 Chief Engineer, Executive Officer

Certificate of Construction Issued _____ 19 _____

Water License Issued _____ 19 _____

City of Sioux Falls
Water Rights Numbers
for Existing Wells.

254-3	through	276-3
298-3	through	300-3
395-3	through	397-3
1305-3, 1306-3,		
1347-3, 1519-3		

LOCATION OF CITY WELLS

Well No. 1	T102 NR 50W	2,220 So Ctr Sec. 32 1,750 West Sec. 32
Well No. 2	T101 NR 50W	1,450 No Ctr Sec. 5 1,275 West Ctr Sec. 5
Well No. 3	T101 NR 50W	2,440 So Ctr Sec. 5 1,126 East Ctr Sec. 5
Well No. 4	T101 NR 50W	2,510 So Ctr Sec. 5 860 West Ctr Sec. 5
Well No. 8	T100 NR 51W	65 So NE Cor. Sec. 7 1,370 West NE Cor. Sec. 7
Well No. 10	T101 NR 50W	2,510 So Ctr Sec. 5 2,050 West Ctr Sec. 5
Well No. 11	T101 NR 50W	150 No Ctr Sec. 5 760 West Ctr Sec. 5
Well No. 12	T101 NR 50W	760 No Ctr Sec. 5 495 West Ctr Sec. 5
Well No. 13	T101 NR 50W	1,390 So Ctr Sec. 5 1,995 West Ctr Sec. 5
Well No. 14	T101 NR 49W	1,715 So Ctr Sec. 4 2,575 West Ctr Sec. 4
Well No. 15	T101 NR 50W	955 So Ctr Sec. 5 2,319 East Ctr Sec. 5
Well No. 16	T101 NR 50W	200 No Ctr Sec. 5 1,980 East Ctr Sec. 5
Well No. 17	T101 NR 50W	1,360 No Ctr Sec. 5 1,620 East Ctr Sec. 5
Well No. 18	T101 NR 50W	2,540 No Ctr Sec. 5 1,320 East Ctr Sec. 5
Well No. 19	T100 NR 50W	1,620 No Ctr Sec. 8 3,215 East Ctr Sec. 8
Well No. 20	T102 NR 50W	2,045 So Ctr Sec. 32 1,586 West Ctr Sec. 32
Well No. 21	T101 NR 50W	2,350 No Ctr Sec. 5 2,125 West Ctr Sec. 5
Well No. 22	T102 NR 50W	1,980 So Ctr Sec. 32 185 West Ctr Sec. 32
Well No. 23	T101 NR 50W	560 So Ctr Sec. 5 65 East Ctr Sec. 5
Well No. 24	T101 NR 50W	2,575 No Ctr Sec. 5 2,475 East Ctr Sec. 5
Well No. 25	T103 NR 50W	150 No Ctr Sec. 29 800 West Ctr Sec. 29
Well No. 26	T103 NR 50W	155 N Ctr Sec. 29 2,015 East Ctr Sec. 29

Well No. 27	T101 NR 51W	2,475 So Ctr Sec. 6 1,255 East Ctr Sec. 6
Well No. 28	T101 NR 49W	725 East Ctr Sec. 6 760 So Ctr Sec. 6
Well No. 29	T102 NR 49W	330 West Ctr Sec. 32 130 So Ctr Sec. 32
Well No. 30	T102NR 49W	2,510 West Ctr Sec. 33 165 No Ctr Sec. 33
Well No. 31	T102 NR 49W	2,600 So Ctr Sec. 20 1,150 West Ctr Sec. 20
Well No. 32	T102 NR 49W	2,200 West Ctr Sec. 20 50 So Ctr Sec. 20
Well No. 33	T102 NR 49W	50 East Ctr Sec. 20 50 South Ctr Sec. 20
Well No. 34	T101 NR 49W	SE $\frac{1}{4}$ of NE $\frac{1}{4}$ of Sec. 6
DC-1	T101 NR 49W	1,050 East of NW Corner Sec. 9 40 South of NW Corner of Sec. 9
DC-2	T101 NR 49W	1,050 East SW Corner of Sec. 4 200 North SW Corner Sec. 4

*12. Principal Features of the Proposed Water Supply System (continued.)

D. Well Information or Estimates

(1) Drill Hole, Diameter _____, Depth _____

(2) Casing, Type _____, Diameter _____, Thickness _____
(wood, concrete, steel, etc)

(3) Perforated Screen.

Type _____, Diameter _____, Length _____

(4) Gravel Pack, Thickness _____, Length of gravel pack _____

E. Dugout Information or Estimates.

(1) Surface dimensions _____, Depth _____

* F. Fill out for Either a Well or a Dugout.

(1) Water Bearing Materials. (Please attach a copy to test well log if available.)

Character of Water bearing materials: _____

Depth to top of water bearing material _____

Depth to bottom of water bearing material _____

Thickness of water bearing material _____

Depth to water (ground surface to water level) _____

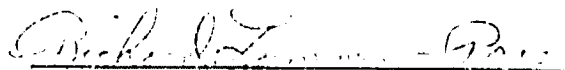
(2) Distance to nearest existing household or livestock watering wells.

On same owner's property _____ rds. On property owned by others _____ rds.

G. Water Storage Dams.

If the proposed water use system contains one or more water storage dams, please show in the space below, the height, maximum water depth, surface area and storage capacity of each storage dam. The location of each water storage dam should be shown on the water right map.

*As shown in the attached list of Sioux Falls Water Rights Numbers.


Signature of Applicant

1790-3

Publish first publication, on or before December 24, 1970

NOTICE
INTENT TO APPROPRIATE WATER

Pierre, South Dakota 57501

Edin December 2, 1970

Notice is hereby given that Lincoln County Rural Water System

whose post office address, is Harrisburg, South Dakota, has made an application in accordance with the provisions of the water laws of South Dakota for a permit to appropriate for beneficial use

1.63 cubic feet of water per second of time from the ground water through the

Sioux Falls Well Sites, the point of diversion of which ^{is} to be located ~~in the~~ ^{at} ~~the same~~ ^{as for the City of Sioux Falls existing} .33 diversion points located in Section

7, T100N, R51W; Sections 4, 6 and 9, T102N, R49W; Sections 5 and 8, T101N, R50W;

Section 3, T101N, R51W; Sections 20, 32 and 33, T102N, R49W; Section 32, T102N, R50W;

and Section 29, T103N, R50W.

~~of Section 32, T102N, R50W.~~ Range . Said water to be used for the purpose

of providing ~~irrigation on the following described lands~~

water supplied for rural family use within the Lincoln County Rural Water System.

This application No. 1790-3 will be considered by the Water Resources Commission at their office at

Pierre upon the 20th day of January, 1971, at 2:00 P. M. All interested persons may appear and be heard.

cc: Bernard Utch, County Agent,
Canton, S.D.

WATER RESOURCES COMMISSION

By:

cc: Richard Lounen, Chairman
Lincoln County Rural Water System
Harrisburg, S.D.

BURTON. F. JONES, Water Rights Specialist

No. 1790-3

PROOF OF PUBLICATION

STATE OF SOUTH DAKOTA)
County Minnehaha) ss.

I, W. T. HAGGAR hereby

certify that the annexed printed copy of Notice of Intent to Appropriately

Water was taken from the Sioux Falls Argus Leader

A newspaper which during the whole time of publication of said notice
herein after stated, has been and is printed and published in the _____

State _____ of South Dakota

County of Minnehaha and State of South Dakota;
that the said notice was published in said newspaper on the following
four dates:

Saturday 5, December 1970

Saturday 12, December 1970

Saturday 19, December 1970

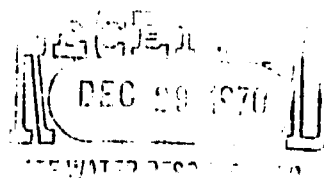
Saturday 26 December 1970

W. T. Haggar
(Signature)

Comptroller
(Title)

December 26, 1970
(Date Signed)

NOTICE
INTENT TO APPROPRIATE WATER
Pierre, South Dakota 57501
December 3, 1970
Notice is hereby given that Lincoln
County Rural Water System, whose post
office address is Harrisburg, South Da-
kota, has made an application in ac-
cordance with the provisions of the wa-
ter laws of South Dakota for a permit
to appropriate for beneficial use 1.43
cubic feet of water per second of time
from ground water through the Sioux
Falls Well Sits, the point of diversion
of which are to be the same as for
the City of Sioux Falls existing 33 di-
version points located in Section 7, T100N,
R11W; Section 4, 6 and 9, T101N,
R11W; Sections 5 and 8, T101N, R50W;
Section 4, T101N, R51W; Sections 20, 22
and 31, T102N, R40W; Section 22, T102N,
R50W; and Section 19, T103N, R50W.
Said water to be used for the purpose
of providing water supplies for rural
family use within the Lincoln County
Rural Water System.
This application No. 1790-3 will be con-
sidered by the Water Resources Com-
mission at their office at Pierre upon
the 20th day of January, 1971, at 2:00
P.M. All interested persons may appear
and be heard.
WATER RESOURCES COMMISSION
By: BURTON F. JONES,
Water Rights Specialist
cc: Bernard Ulhe,
County Agent,
Canton, S.D.
cc: Richard Lommen, Chairman
Lincoln County Rural Water System
Harrisburg, S.D.
Dec. 5, 12, 19, 26, 1970



RESOLUTION

A RESOLUTION CONCURRING IN THE APPLICATION OF LINCOLN COUNTY RURAL WATER SYSTEM FOR A PERMIT TO APPROPRIATE SURPLUS WATERS THROUGH A PORTION OF THE SIOUX FALLS WATER DISTRIBUTION SYSTEM.

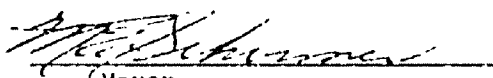
WHEREAS, the Lincoln County Rural Water System is making application to the State Water Resources Commission for a permit to appropriate surplus water from diversion points under permit to the City of Sioux Falls, and

WHEREAS, it is proposed that the City of Sioux Falls and the Lincoln County Rural Water System enter into an agreement concerning the delivery of surplus water to the Lincoln County Rural Water System through a portion of the Sioux Falls distribution system, and

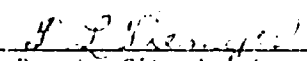
WHEREAS, the statutes of the State of South Dakota require that the Lincoln County Rural Water System obtain its own permit for water rights, now therefore

BE IT RESOLVED that the City Commission of the City of Sioux Falls, South Dakota hereby concurs in and does not object to the application of the Lincoln County Rural Water System for a permit to appropriate surplus water providing that such water is delivered to Lincoln County through the facilities of the Sioux Falls Water Department.

Adopted this 23rd day of November, 1970.


Mayor

ATTEST:
M. SZANEIT, City Auditor

By: 
Deputy City Auditor

PETITION

The undersigned, each, respectfully petition and request the Water Resources Commission of the State of South Dakota to deny the application of the Lincoln County Rural Water System, Harrisburg, South Dakota, to appropriate ground water through City of Sioux Falls Well Sites under application No. 1790-3 filed with the Water Resources Commission at Pierre, South Dakota, on the 3rd day of December, 1970.

	NAME	ADDRESS	TOWNSHIP	DATE
1.	Harold J. Peterson	Pierre, S.D.	Mapleton	Dec 29, 1970
2.	Ernest Christ	Pierre, S.D.	Mapleton	Dec 28, 1970
3.	Polmer A. Moton	Pierre, S.D.	Mapleton	Dec 28, 1970
4.	Alfred W. Duster	Pierre, S.D.	Mapleton	Dec 28, 1970
5.	Alvin M. Burke	Pierre, S.D.	Mapleton	Dec 28, 1970
6.	Robert P. Wickham	Pierre, S.D.	Mapleton	Dec 28, 1970
7.	L. M. M. M.	Pierre, S.D.	Mapleton	Dec 28, 1970
8.	L. M. M. M.	Pierre, S.D.	Mapleton	Dec 28, 1970
9.	Lester E. Farley	Pierre, S.D.	Mapleton	Dec 28, 1970
10.	James A. Brown	Pierre, S.D.	Mapleton	Dec 29, 1970
11.	William B. Brown	Pierre, S.D.	Mapleton	Dec 29, 1970
12.	W. M. M. M.	Pierre, S.D.	Mapleton	Dec 29, 1970
13.	Arnold C. Jundson	Pierre, S.D.	Mapleton	Dec 29, 1970
14.	Garret E. Threlk	Pierre, S.D.	Mapleton	Dec 29, 1970
15.	Garret E. Threlk	Pierre, S.D.	Mapleton	Dec 29, 1970
16.	Garret E. Threlk	Pierre, S.D.	Mapleton	Dec 29, 1970
17.	Carl F. Eggers	Pierre, S.D.	Mapleton	Dec 29, 1970
18.	Barney L. Wild	Pierre, S.D.	Mapleton	Dec 29, 1970
19.	Jim Christensen	Pierre, S.D.	Mapleton	Dec 29, 1970
20.	Carol Ann	Pierre, S.D.	Mapleton	Dec 29, 1970
21.	Harold Peterson	Pierre, S.D.	Mapleton	Dec 30, 1970
22.	Robert E. Brown	Pierre, S.D.	Mapleton	Dec 30, 1970

	NAME	ADDRESS	TOWNSHIP	DATE
23.	William H. Velt	575 N. Dakota	Mapleton	Dec 31, 1970
24.	Lill P Strand	309 S Capital	Mapleton	Dec 31, 1970
25.	Harold Borgeson	Remmer, S.D.	Mapleton	Dec 31, 1970
26.	Oscar J. Kjaer	Sioux Falls, S.D.	Mapleton	Jan 4, 1971
27.	Duane Bergeson	Remmer, S.D.	Mapleton	Jan 4, 1971
28.	Daniel Hansen	Remmer, S.D.	Mapleton	Jan 4, 1971
29.	J. W. Persen	Remmer, S.D.	Mapleton	Jan 4, 1971
30.	Ray D. J. Berg	Remmer, S.D.	Mapleton	Jan 4, 1971
31.	Ernest Curdstone	Remmer, S.D.	Mapleton	Jan 4, 1971
32.	Herman Brende	Sioux Falls, S.D.	Mapleton	Jan 4, 1971
33.	Verla Quast	Remmer, S.D.	Mapleton	Jan 4, 1971
34.	Arvin M. Krol	Remmer, S.D.	Mapleton	Jan 4, 1971
35.	Douglas Kunchen	Remmer, S.D.	Mapleton	Jan 4, 1971
36.	John D. Henningson	Sioux Falls, S.D.	Mapleton	Jan 4, 1971
37.	Clarence Mackmiller	Remmer, S.D.	Mapleton	Jan 4, 1971
38.	Archie Harvey	Remmer, S.D.	Mapleton	Jan 6, 1971
39.	Edna Harvey	Remmer, S.D.	Mapleton	Jan 6, 1971
40.	Miss Mary Wilson	Remmer, S.D.	Mapleton	Jan 6, 1971
41.	Olaf S. Svedlund	Remmer, S.D.	Mapleton	Jan 6, 1971
42.	Beulah C. Svedlund	Remmer, S.D.	Mapleton	Jan 6, 1971
43.	Sandra T. Svedlund	Remmer, S.D.	Mapleton	Jan 6, 1971
44.	Leslie L. Smith	Remmer, S.D.	Mapleton	Jan 6, 1971
45.	Lenna Smith	Remmer, S.D.	Mapleton	Jan 6, 1971
46.	Myrna Berg	Remmer, S.D.	Mapleton	Jan 6, 1971
47.	Robert M. Reed	Sioux Falls, S.D.	Mapleton	Jan 6, 1971
48.	Jim Schuetz	Sioux Falls	Mapleton	Jan 7, 1971
49.	James D. S. S. S. S.	Sioux Falls, S.D.	Mapleton	Jan 7, 1971
50.	Beane & W. W. W.	Sioux Falls, S.D.	Mapleton	Jan 8, 1971

	NAME	ADDRESS	TOWNSHIP	DATE
51.	Edna S. Pomeroy	R. 1, S. 1, T. 1	Mapleton	8-1-1971
52.	Shirley J. Helgeson	S. 1, T. 1, R. 1, Mapleton	Mapleton	8-1-1971
53.	Thomas J. Helgeson	1717 1/2 E. 1st St. No. Mapleton	Mapleton	8-1-1971
54.	Barbara Helgeson	7700 W. 1st St. S. 1, T. 1, R. 1, Mapleton	Mapleton	8-1-1971
55.	Ralph Benson	3500 W. Cliff View Dr. S. 1, T. 1, R. 1, Mapleton	Mapleton	Jan. 8, 1971
56.	Gertrude M. Walch	Sioux Falls, S. 1, T. 1, R. 1, Mapleton	Mapleton	Jan. 9, 1971
57.	John O. Walch	Sioux Falls, S. 1, T. 1, R. 1, Mapleton	Mapleton	Jan. 9, 1971
58.	John E. Walch	Sioux Falls, S. 1, T. 1, R. 1, Mapleton	Mapleton	Jan. 9, 1971
59.	Norma F. Berg	Renner, S. D. Mapleton	Mapleton	Jan. 9, 1971
60.	Palmer J. Peterson	Renner, S. D. Mapleton	Mapleton	Jan. 9, 1971
61.	Norma Carlson	Sioux Falls, S. D. Mapleton	Mapleton	Jan. 10, 1971
62.	Wendy Carlson	Sioux Falls, S. D. Mapleton	Mapleton	Jan. 10, 1971
63.	Mrs. Schwan	Sioux Falls, S. D. Mapleton	Mapleton	Jan. 10, 1971
64.	Helen M. Schwan	Sioux Falls, S. D. Mapleton	Mapleton	Jan. 10, 1971
65.	Harold V. Peterson	Renner, S. D. Mapleton	Mapleton	Jan. 12, 1971
66.	Walter Erickson	Renner, S. D. Mapleton	Mapleton	Jan. 13, 1971
67.	Bertha Schade	Renner, S. D. Mapleton	Mapleton	Jan. 13, 1971
68.	Ida Moran	Renner, S. D. Mapleton	Mapleton	Jan. 13, 1971
69.	Clara Mustad	Renner, S. D. Mapleton	Mapleton	Jan. 13, 1971
70.	Constance Mustad	Renner, S. D. Mapleton	Mapleton	Jan. 13, 1971
71.	Sophie Heston	Renner, S. D. Mapleton	Mapleton	Jan. 13, 1971
72.	James C. Heston	Renner, S. D. Mapleton	Mapleton	Jan. 13, 1971
73.	Lillian M. Heston	Renner, S. D. Mapleton	Mapleton	Jan. 13, 1971
74.	Mary Heston	Renner, S. D. Mapleton	Mapleton	Jan. 13, 1971
75.	Gilda Heston	Renner, S. D. Mapleton	Mapleton	Jan. 14, 1971
76.	Carl Heston	Renner, S. D. Mapleton	Mapleton	Jan. 14, 1971
77.	Betty C. Berg	Renner, S. D. Mapleton	Mapleton	Jan. 16, 1971
78.	George Kielman	Renner, S. D. Mapleton	Mapleton	Jan. 16, 1971
79.	Robert M. Kielman	Renner, S. D. Mapleton	Mapleton	Jan. 16, 1971
80.	Palma Peterson	Renner, S. D. Mapleton	Mapleton	Jan. 16, 1971

	NAME	ADDRESS	TOWNSHIP	DATE
81.	<i>Richard Nelson</i>	<i>Sioux Falls, S.D.</i>	<i>11th St.</i>	<i>1-17</i>
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CIRCULATOR'S CERTIFICATE

The undersigned hereby certifies that he personally circulated the within and foregoing petition consisting of four pages and that each person whose name is subscribed thereto personally signed the same upon the date indicated opposite said signature. Upon knowledge, information and belief, the undersigned states that each such person lives in an area likely to be affected by additional diversion of ground water through City of Sioux Falls Well Sites.

Dated this 18th day of January, 1971.

George J. [Signature]
Signature

PETITION

The undersigned, each, respectfully petition and request the Water Resources Commission of the State of South Dakota to deny the application of the Lincoln County Rural Water System, Harrisburg, South Dakota, to appropriate ground water through City of Sioux Falls Well Sites under application No. 1790-3 filed with the Water Resources Commission at Pierre, South Dakota, on the 3rd day of December, 1970.

	NAME	ADDRESS	TOWNSHIP	DATE
1.	<u>Arvid Peterson</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>12/29/70</u>
2.	<u>James Peterson</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>12/29/70</u>
3.	<u>Olga J. Mac</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>12/29/70</u>
4.	<u>Arvid Peterson</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>12/30/70</u>
5.	<u>Ed A. Peterson</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>12/30/70</u>
6.	<u>Arvid Peterson</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>12/31/70</u>
7.	<u>Arvid Peterson</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>12-31-70</u>
8.	<u>Jennie M. Swartz</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>12-31-70</u>
9.	<u>James Peterson</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>12-31-70</u>
10.	<u>Reuben D. Marik</u>	<u>Baltic, S. Dak.</u>	<u>Sverdrup</u>	<u>Dec. 31, 1970</u>
11.	<u>Esther Fossum</u>	<u>Baltic, S. Dak.</u>	<u>Sverdrup</u>	<u>Dec. 31, 1970</u>
12.	<u>Arvid Peterson</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>Dec. 31/70</u>
13.	<u>Arvid Peterson</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>Dec 31/1970</u>
14.	<u>John Peterson</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>Dec 31 1970</u>
15.	<u>Holland K. Brundel</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>Dec 31, 1970</u>
16.	<u>Hattie Peterson</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>Dec 31, 1970</u>
17.	<u>Arvid Peterson</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>Dec 31, 1970</u>
18.	<u>Holland K. Brundel</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>Dec 31, 1970</u>
19.	<u>Arvid Peterson</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>Dec 31-1970</u>
20.	<u>Arvid Peterson</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>Dec 31, 1970</u>
21.	<u>Arvid Peterson</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>Dec 31, 1970</u>
22.	<u>Arvid Peterson</u>	<u>Baltic S. Dak.</u>	<u>Sverdrup</u>	<u>Dec 31 1970</u>

	NAME	ADDRESS	TOWNSHIP	DATE
23.	Amund Hansen	Baltic, S. D.	Sverdrup	Jan 2-71
24.	Darwin Munked	Baltic, S. D.	Sverdrup	Jan 2-71
25.	Amund Hansen	Baltic, S. D.	Sverdrup	Jan 2-71
26.	Albert H. Berg	Baltic, S. D.	Sverdrup	Jan 5-71
27.	Wm. J. Berg	Baltic, S. D.	Sverdrup	Jan 8-71
28.	Don D. Smith	Baltic, S. D.	Sverdrup	Jan 1-71
29.	Leo B. Skeneke	Baltic, S. D.	Sverdrup	Jan 2-1971
30.	Louis M. Hansen	Baltic, S. D.	Sverdrup	Jan 9-1971
31.	John M. Hansen	Baltic, S. D.	Sverdrup	Jan 7-1971
32.	J. C. Jorgensen	Baltic, S. D.	Sverdrup	Jan 9-1971
33.	Walter Jorgensen	Baltic, S. D.	Sverdrup	Jan 7-1971
34.	Walter Jorgensen	Baltic, S. D.	Sverdrup	Jan 11-1971
35.	Angela Jorgensen	Baltic, S. D.	Sverdrup	Jan 11-1971
36.	Walter Jorgensen	Baltic, S. D.	Sverdrup	Jan 11-1971
37.	Jimmy Voller	Garrison, S. D.	Sverdrup	Jan 11-1971
38.	Walter Jorgensen	Baltic, S. D.	Sverdrup	Jan 11-1971
39.	Walter Jorgensen	Baltic, S. D.	Sverdrup	Jan 11-1971
40.	Bernie Jorgensen	Baltic, S. D.	Sverdrup	Jan 11-1971
41.	Marie Jorgensen	Baltic, S. D.	Sverdrup	Jan 12-1971
42.	Arnold Jorgensen	Baltic, S. D.	Sverdrup	Jan 12-1971
43.	Olga Jorgensen	Baltic, S. D.	Sverdrup	Jan 12-1971
44.	Walter Jorgensen	Baltic, S. D.	Sverdrup	Jan 12-1971
45.	Walter Jorgensen	Baltic, S. D.	Sverdrup	Jan 12-71
46.	Clara M. Tidemann	Baltic, S. D.	Sverdrup	Jan 12-71
47.	Franklin J. Tidemann	Baltic, S. D.	Sverdrup	Jan 12-71
48.	Richard Tidemann	Baltic, S. D.	Sverdrup	Jan 12-71
49.	John M. Tidemann	Baltic, S. D.	Sverdrup	Jan 12-71
50.	Don Tidemann	Baltic, S. D.	Sverdrup	Jan 12-71

	NAME	ADDRESS	TOWNSHIP	DATE
51.	Marian Gregg	Belted, S. Dak.	Seward	Jan 12, 1921
52.	Butt M. Anderson	Belted, S. Dak.	Seward	Jan 12, 1921
53.	Rodney D. Decker	Belted, S. Dak.	Seward	Jan 12, 1921
54.	Levin M. Erickson	Belted, S. Dak.	Seward	Jan 12, 1921
55.	Olga B. Vesseth	Belted, S. Dak.	Seward	Jan 12, 1921
56.	John A. Thustad	Belted, S. Dak.	Seward	Jan 13, 1921
57.	James M. Nelson	Belted, S. Dak.	Seward	Jan 13, 1921
58.	Fred Thompson	Belted, S. Dak.	Seward	Jan 13, 1921
59.	Eliot D. Berg	Belted, S. Dak.	Seward	Jan 13, 1921
60.	James M. Peterson	Belted, S. Dak.	Seward	Jan 13, 1921
61.	Leon W. Runk	Belted, S. Dak.	Seward	Jan 13, 1921
62.	Edmund W. Schreier	Sioux Falls, S. D.	Mapleton	Jan 13, 21
63.	Samuel Nehl	Garretson, S. D.	Mapleton	Jan 13, 21
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CIRCULATOR'S CERTIFICATE

The undersigned hereby certifies that he personally circulated the within and foregoing petition consisting of four pages and that each person whose name is subscribed thereto personally signed the same upon the date indicated opposite said signature. Upon knowledge, information and belief, the undersigned states that each such person lives in an area likely to be affected by additional diversion of ground water through City of Sioux Falls Well Sites.

Dated this 13 day of January, 1911.

Harold B. Smith
Signature

PETITION

The undersigned, each, respectfully petition and request the Water Resources Commission of the State of South Dakota to deny the application of the Lincoln County Rural Water System, Harrisburg, South Dakota, to appropriate ground water through City of Sioux Falls Well Sites under application No. 1790-3 filed with the Water Resources Commission at Pierre, South Dakota, on the 3rd day of December, 1970.

NAME	ADDRESS	TOWNSHIP	DATE
1. <u>Alma Thompson</u>	<u>Remmer S.D.</u>	<u>Sverdrup</u>	<u>Jan 9 1971</u>
2. <u>Rebecca Thompson</u>	<u>Remmer S.D.</u>	<u>Sverdrup</u>	<u>Jan 9 1971</u>
3. <u>Walter K. Borg</u>	<u>Remmer S.D.</u>	<u>Sverdrup</u>	<u>Jan 9 1971</u>
4. <u>Robert L. Borg</u>	<u>Remmer S.D.</u>	<u>Sverdrup</u>	<u>Jan 12 1971</u>
5. <u>Harstad Thorsdahl</u>	<u>Remmer S.D.</u>	<u>Sverdrup</u>	<u>Jan 12 1971</u>
6. <u>Gom Thorsdahl</u>	<u>Remmer S.D.</u>	<u>Sverdrup</u>	<u>Jan 12 1971</u>
7. <u>Charles E. Borg</u>	<u>Baltic, S.D.</u>	<u>Well Rapids</u>	<u>Jan 13 71</u>
8. <u>Gene Haagenen</u>	<u>Baltic S.D.</u>	<u>Sverdrup</u>	<u>Jan 13 - 71</u>
9. <u>Lyford K. Reby</u>	<u>Baltic S.D.</u>	<u>Sverdrup</u>	<u>Jan 13 - 1971</u>
10. <u>Kenneth Gunderson</u>	<u>Remmer S. Dak</u>	<u>Sverdrup</u>	<u>Jan 13 - 1971</u>
11. <u>Donald S. Sittig</u>	<u>Baltic, S. Dak</u>	<u>Sverdrup</u>	<u>Jan 13 - 1971</u>
12. <u>Mrs Mae Sundeen</u>	<u>Remmer, S.D.</u>	<u>Sverdrup</u>	<u>Jan 14 1971</u>
13. _____	_____	_____	_____
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Dated this 18 day of Jan, 1971.


Signature

PETITION

The undersigned, each, respectfully petition and request the Water Resources Commission of the State of South Dakota to deny the application of the Lincoln County Rural Water System, Harrisburg, South Dakota, to appropriate ground water through City of Sioux Falls Well Sites under application No. 1790-3 filed with the Water Resources Commission at Pierre, South Dakota, on the 3rd day of December, 1970.

NAME	ADDRESS	TOWNSHIP	DATE
1. <u>Edmund Peterson</u>	<u>Lincoln Co. S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
2. <u>Curtis O. Eggen</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
3. <u>John Eggen</u>	<u>Renner, S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
4. <u>Sydney Wald</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
5. <u>Joe Peterson</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
6. <u>Andy Thayer</u>	<u>Renner</u>	<u>Mapleton</u>	<u>12-28-70</u>
7. <u>Stanley W. Peterson</u>	<u>6109 N. Cliff</u>	<u>Mapleton</u>	<u>28 Dec. 70</u>
8. <u>Luella Thayer</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
9. <u>Con. McQuiston</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
10. <u>Robert E. De Grief</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
11. <u>Lawrence De Grief</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
12. <u>Leon A. Miller</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
13. <u>Orville H. Hestad</u>	<u>Sioux Falls S.D.</u>	<u>Benton</u>	<u>12-28-70</u>
14. <u>Chris J. Jensen</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
15. <u>Maurice Myrnes</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
16. <u>Richard Christensen</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
17. <u>Barbara Christensen</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
18. <u>Mary Beth</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
19. <u>Linda Clouson</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
20. <u>Dennis E. Christensen</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
21. <u>Paul Christensen</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
22. <u>Alan E. Larson</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>

	NAME	ADDRESS	TOWNSHIP	DATE
23.	<u>Bullhorns, Oliver</u>	<u>Rte 11 Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
24.	<u>James R. McJunkin</u>	<u>Box 103A Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
25.	<u>Elmer Brendle</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
26.	<u>Elroy Mundherke</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-28-70</u>
27.	<u>Joe (Custodian)</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
28.	<u>Mrs. Sally Langdon</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
29.	<u>Elmer Eggen</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
30.	<u>Andrey Konold</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
31.	<u>Herbert Wehler</u>	<u>904 E 6th N</u>	<u>Mapleton</u>	<u>12-29-70</u>
32.	<u>Chuck Schneider</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
33.	<u>Marvin Larson</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
34.	<u>Leslie McIntyre</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
35.	<u>Leslie (Leslie)</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
36.	<u>David Nelson</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
37.	<u>Mrs. N. James Boyum</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
38.	<u>Mrs. Orlan Kappdal</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
39.	<u>Mrs. Julia Newman</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
40.	<u>Stanley Rott</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
41.	<u>Mrs. Karen Miller</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
42.	<u>Mrs. Lillian Brendle</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
43.	<u>Mrs. Lillian (Lillian)</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
44.	<u>John (John)</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
45.	<u>John (John)</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
46.	<u>David (David)</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
47.	<u>Walter (Walter)</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
48.	<u>John (John)</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
49.	<u>Walter (Walter)</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>
50.	<u>John (John)</u>	<u>Renner S.D.</u>	<u>Mapleton</u>	<u>12-29-70</u>

	NAME	ADDRESS	TOWNSHIP	DATE
51.				
52.	Ed Christensen	Renner, S.D.	Mapleton	12-29-70
53.	Raymond S. Fabel	Renner, S.D.	Mapleton	12-29-70
54.	Tom (Peggy)	Renner, S.D.	Mapleton	12-29-70
55.	Beall H. Kold	Renner, S.D.	Mapleton	12-29-70
56.	Charles Berg	Renner, S.D.	Mapleton	12-29-70
57.	Steven Thun	Renner, S.D.	Mapleton	12-29-70
58.	Howard Decker	Renner, S.D.	Mapleton	12-29-70
59.	Ronald C. Parley	Renner, S.D.	Mapleton	12-29-70
60.	Arvid Vandervort	Renner, S.D.	Mapleton	12-29-70
61.	Edmund Christiansen	Renner, S.D.	Mapleton	12-29-70
62.	Edmond J. McQuinn	Renner, S.D.	Mapleton	12-29-70
63.	Norma Giesgen	Renner, S.D.	Mapleton	12-30-70
64.	J. N. Gertel	Battle, S.D.	Dierks	12/30-70
65.	M. H. Robertson	Renner, S.D.	Dierks	12-30-70
66.	Clarence Cain	Renner, S.D.	Mapleton	12-30-70
67.	Wallace H. Carr	Renner, S.D.	Mapleton	12/30/70
68.	Art E. Chapman	RR#2 Sioux Falls	Mapleton	12/30/70
69.	Richard E. Larson	Renner, S.D.	Mapleton	12/30/70
70.	Walter Westergaard	Renner, S.D.	Mapleton	12/31/70
71.	Edmund Christiansen	Renner, S.D.	Mapleton	12/31/70
72.	Lawrence Larson	Renner, S.D.	Mapleton	12/31/70
73.	Mr. Edith Smith	Renner, S.D.	Mapleton	12/31/70
74.	Dennis Johnson	Sioux Falls S.D. RR#4	Benton	12/31/70
75.	Herbert Larson	Renner, S.D.	Mapleton	12/31/70
76.	Lawrence P. Papp	Renner, S.D.	Mapleton	12/31/70
77.	Willis R. Baertman	Sioux Falls S.D.	Mapleton	12-31-70
78.	Mrs. Gary Eggers	Renner, S.D.	Mapleton	1-1-71
79.	Alan Hopkins	Renner, S.D.	Mapleton	1-1-71
80.	Eric Schroder	Renner, S.D.	Mapleton	1-2-71

	NAME	ADDRESS	TOWNSHIP	DATE
81.	<u>Edgar G. Leland</u>	<u>Remmer S.D.</u>	<u>Sioux Falls</u>	<u>1/2-71</u>
82.	<u>Clarence G. Schell</u>	<u>Belle</u>	<u>Sioux Falls</u>	<u>1-2-71</u>
83.	<u>W. James Bayne</u>	<u>Remmer S.D.</u>	<u>Mapleton</u>	<u>1/2/71</u>
84.	<u>Kenneth Elom</u>	<u>Remmer S.D.</u>	<u>Mapleton</u>	<u>1/3/71</u>
85.	<u>Milton Jones</u>	<u>6509 N. Cliff</u>	<u>Mapleton</u>	<u>1/3/71</u>
86.	<u>Ch. Pearson</u>	<u>Remmer S.D.</u>	<u>Mapleton</u>	<u>1-3-71</u>
87.	<u>Demack Jones</u>	<u>Remmer S.D.</u>	<u>Mapleton</u>	<u>1-3-71</u>
88.	<u>William G. Linton</u>	<u>Remmer S.D.</u>	<u>Mapleton</u>	<u>1-3-71</u>
89.	<u>Mrs. Maurine Myrnes</u>	<u>Remmer S.D.</u>	<u>Mapleton</u>	<u>1-4-71</u>
90.	<u>Robert Brundage</u>	<u>RBT 2 Sioux Falls</u>	<u>Mapleton</u>	<u>1-4-71</u>
91.	<u>Clarence S. Bor</u>	<u>Remmer S.D.</u>	<u>Mapleton</u>	<u>1-6-71</u>
92.	<u>Mrs. Elsie Woods</u>	<u>5801 N. Cliff</u>	<u>Mapleton</u>	<u>1-7-71</u>
93.	<u>Leon John Peterson</u>	<u>Rt 2 Sioux Falls</u>	<u>Mapleton</u>	<u>1-9-71</u>
94.	<u>Dr. Mort L. Jones</u>	<u>Remmer S.D.</u>	<u>Mapleton</u>	<u>1-12-1971</u>
95.	<u>Morris M. Dean</u>	<u>Remmer S.D.</u>	<u>Mapleton</u>	<u>Jan 12-1971</u>
96.	<u>Mrs. M. L. (L.) Jones</u>	<u>Remmer S.D.</u>	<u>Mapleton</u>	<u>Jan 13-1971</u>
97.				
98.				
99.				
100.				

CIRCULATOR'S CERTIFICATE

The undersigned hereby certifies that he personally circulated the within and foregoing petition consisting of four pages and that each person whose name is subscribed thereto personally signed the same upon the date indicated opposite said signature. Upon knowledge, information and belief, the undersigned states that each such person lives in an area likely to be affected by additional diversion of ground water through City of Sioux Falls Well Sites.

Dated this 16 day of Jan, 1971.

Stanley M. Peterson
Signature

COUNTY OF MINNEHAHA)

states that he is a resident of Mapleton Township, Minnehaha County, South Dakota, and that he makes this affidavit upon personal knowledge of the facts herein set forth.

He knows that no more than six years ago he and other persons in the area could obtain good wells for domestic water inexpensively and without having to drill more than twenty feet. In fact it was possible to obtain water without drilling by simply driving the pipe and sand point into the ground. Since that time the water level has steadily dropped and many such shallow wells are either dry or in danger of becoming dry. The present water level has been lowered to the point where if it continues to be lowered at the same rate, it will be necessary for home and land owners in the area to convert to expensive deep well systems merely to obtain water for domestic uses.

There is little irrigation within Mapleton Township and little chance of irrigation even at present water use levels. The City of Sioux Falls, because of its massive water needs, would undoubtedly object to any application for irrigation permits.

While the present request for water constitutes only a small percentage increase in the number of gallons to be removed annually, the use by Lincoln County residents, once the water is readily available, can be expected to increase rapidly. In addition, the needs of the City of Sioux Falls have steadily increased and can be expected to do so in the foreseeable future. The available water supply at the present time is limited and will, even without the proposed diversion to Lincoln County, become more so as the City of Sioux Falls continues to expand.

Your affiant believes from his observations that pumping at the present annual rate affects the amount of available sub-soil moisture. Your affiant and others in Mapleton and Sverdrup Townships depend upon adequate sub-soil moisture for crops. Agriculture in those areas is essentially dry-land farming dependent upon water from natural sources with little chance that irrigation systems will be available. Sub-soil moisture content is, therefore, a matter of deep concern.

WHEREFORE, your affiant respectfully requests the Commission to deny application
No. 1790-3.

Al. Brown

Subscribed and sworn to before me this 17th day of January, 1971.

Wm. J. Miller
Notary Public - State of South Dakota
My commission expires: 10-22-75

COUNTY OF MINNEHAHA)

being first duly sworn on oath deposes and

He knows that no more than six years ago he and other persons in the area could obtain good wells for domestic water inexpensively and without having to drill more than twenty feet. In fact it was possible to obtain water without drilling by simply driving the pipe and sand point into the ground. Since that time the water level has steadily dropped and many such shallow wells are either dry or in danger of becoming dry. The present water level has been lowered to the point where if it continues to be lowered at the same rate, it will be necessary for home and land owners in the area to convert to expensive deep well systems merely to obtain water for domestic uses.

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WHEREFORE, your affiant respectfully requests the Commission to deny application

No. 1790-3.

Willie J. Anderson

Subscribed and sworn to before me this 10th day of January, 1971.

Marion A. Kelle
Notary Public - South Dakota
My commission expires: 10-22-75

RESOLUTION

A RESOLUTION CONCURRING IN THE APPLICATION OF LINCOLN COUNTY RURAL WATER SYSTEM FOR A PERMIT TO APPROPRIATE SURPLUS WATERS THROUGH A PORTION OF THE SIOUX FALLS WATER DISTRIBUTION SYSTEM.

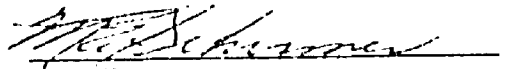
WHEREAS, the Lincoln County Rural Water System is making application to the State Water Resources Commission for a permit to appropriate surplus water from diversion points under permit to the City of Sioux Falls, and

WHEREAS, it is proposed that the City of Sioux Falls and the Lincoln County Rural Water System enter into an agreement concerning the delivery of surplus water to the Lincoln County Rural Water System through a portion of the Sioux Falls distribution system, and

WHEREAS, the statutes of the State of South Dakota require that the Lincoln County Rural Water System obtain its own permit for water rights, now therefore

BE IT RESOLVED that the City Commission of the City of Sioux Falls, South Dakota hereby concurs in and does not object to the application of the Lincoln County Rural Water System for a permit to appropriate surplus water providing that such water is delivered to Lincoln County through the facilities of the Sioux Falls Water Department.

Adopted this 23rd day of November, 1970.


Mayor

ATTEST:
M. SZAMEIT, City Auditor

By: 
Deputy City Auditor

TO: The Commissioners, City of Sioux Falls:

As counsel for Mapleton Township, and on behalf of the Board of Supervisors thereof, the undersigned respectfully presents the following:

1. It is the understanding of the Board of Supervisors of Mapleton Township that the City of Sioux Falls is presently considering providing water to residents of Lincoln County, South Dakota, residing adjacent to the City of Sioux Falls.

2. The said Board of Supervisors does hereby enter its formal protest on behalf of the inhabitants of Mapleton Township to the proposed plan to provide water to residents of Lincoln County for the following reasons:

a. The City of Sioux Falls has, in the past been concerned at various times about whether the available water supply was sufficient for the use of its citizens.

b. The primary source of water for the City of Sioux Falls is the aquifer lying North of the City, a substantial portion of which underlies Mapleton Township.

c. The residents of Mapleton Township are, even now aware of the effect upon the water level in Mapleton Township caused by pumping for the use of the City of Sioux Falls.

d. A substantial portion of the water used by the City of Sioux Falls is pumped from wells located within Mapleton Township, and, presumably, if water is hereafter provided to residents of Lincoln County, the amount of water removed from within Mapleton Township would be substantially increased.

e. The additional water taken from Mapleton Township would inevitably further impair the water resources available to the residents thereof.

f. Plentiful water resources are essential to the Mapleton Township community.

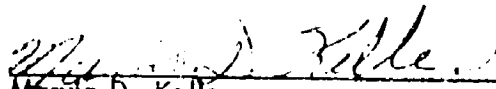
g. At the present time the use of water resources within Mapleton Township, particularly by the agricultural community, is severely restricted. Requests

for permits to use water resources for irrigation purposes are uniformly opposed by the City Commission.

h. The only logical result of the additional water requirements which providing water to Lincoln County residents can result in is additional restrictions upon the use of water resources by residents of Mapleton Township.

Accordingly, the undersigned, on behalf of Mapleton Township, respectfully requests that the proposed plan under which this City would supply water to Lincoln County residents be rejected.

Dated this 26th day of October, 1970.


Marvin D. Keller

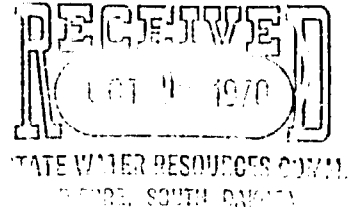
KELLER AND PARKER

Attorneys for Mapleton Township, a public
corporation

613 Northwestern Bank Building
Sioux Falls, South Dakota 57102

October 29, 1970

Mr. William Sratka
Assistant Attorney General
Capitol Building
Pierre, South Dakota 57501



Dear Bill:

Recently, our City Commission, by a vote of 2 to 1 approved, subject to certain restrictions, the sale of municipal water to an agricultural district outside the city limits. SDCL 9-47-1 provides in part that water not required or used for municipal purposes may be advantageously disposed of to districts outside the limits of the municipality.

After this was approved, it was brought to my attention that the State Water Resources Commission, from time to time, publishes notices of appropriation of water, giving notice to owners of certain sections of land that certain water will be appropriated for the "purpose of providing future municipal water supplies for the City of Sioux Falls."

Because of this appropriation, the question has been brought up as to whether or not the City would have the right to sell that water outside of the City limits, on the theory that the appropriation extends only to the City of Sioux Falls. I am enclosing the copy of one of the notices referred to.

I am also enclosing a copy of a protest filed with the City, by counsel for Mapelton Township, which is one of the townships under which the aquifer for the City lies.

In talking with Mr. Burton Jones of the State Water Resource Commission, I was advised that they will be meeting on November 4 and 5 and that you are the Attorney General assigned to them. I do believe that they will be submitting the question to you of whether or not the City can dispose of water to districts outside of the city limits under the above set of facts. For that reason, I felt that it might be advantageous to you to give you advance notice of this question and we certainly hope that an Attorney General's opinion will be forthcoming on it.

Sincerely,

Enclosures
RAS:cf

Roger A. Schiager
City Attorney

November 6, 1970

Mr. Roger A. Schiager
City Attorney
City of Sioux Falls
Sioux Falls, South Dakota 57100

Dear Mr. Schiager:

Please refer to your letter of October 29, 1970, addressed to Mr. William Srstka, Assistant Attorney General, in which you express concern as to whether or not water rights held by the City permits delivery of water to users outside the City limits.

SDCL 46-1-5(2) provides that a municipality may not acquire or hold water rights for other than its own purposes. However, water rights may be acquired by the district entity with diversion and delivery of water to the district through the City's water system. Such arrangement, of course, is subject to City approval. SDCL 46-7-1 covers as related to water rights.

Under the factual situation cited in your letter, any water rights which may be granted under application by the rural district entity for permit to appropriate water (SDCL 46-5-10 through 46-5-30) with diversion and delivery of water through the City's water system would be subject to provisions of SDCL 46-5-39,40.

The Attorney General's office concurs in the contents of this letter.

I hope that these comments are helpful and that the desires of the City and the rural people may be consummated.

Sincerely,

JWG:ls
cc Attorney General, Pierre, S.D.
Richard Lommen, Harrisburg, S.D.
Mayor M. E. Schirmer, Sioux Falls, S.D.

J. W. Grimes

November 13, 1970

Mr. Marvin D. Keller
613 Northwestern Bank Building
Sioux Falls, South Dakota 57102

Re: Proposed sale of water by
City of Sioux Falls to
residents of Lincoln County

Dear Mr. Keller:

This concerns your letter of November 10, 1970.

The proposed water service to Lincoln County residents by Sioux Falls is subject to certain statutory conditions. SDCL 9-47-1 provides authority for the City to deliver water not required or used for municipal purposes to Lincoln County residents. SDCL 46-1-5(2) provides that Sioux Falls may not acquire or hold water rights for other than its own purposes. Pursuant to SDCL 46-5-38, Sioux Falls has acquired water rights for present and future needs from ground water underlying Mapleton Township subject to provisions of SDCL 46-1-5.

Under these conditions it is anticipated that the Lincoln County people will make application for water rights (SDCL 46-6-3 and 46-5-5 through 46-5-30) with diversion and delivery through the Sioux Falls water system. Procedural action on such an application includes public hearing before the Water Resources Commission (SDCL 46-5 17,20). If or when such an application is received, I shall endeavor to notify you as to the public hearing in case the published hearing notice should escape your attention. I am sure that the Water Resources Commission will welcome any presentations for the hearing from the supervisors or people of Mapleton Township, whether made in person or otherwise. Attendance at the hearing may be desirable but is not mandatory.

I hope that this information is helpful.

Sincerely,

J. W. Grimes

JWG:ls

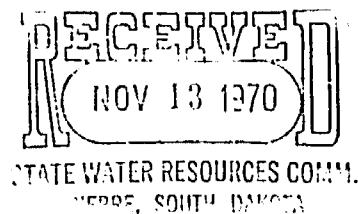
KELLER AND PARKER
ATTORNEYS-AT-LAW
613 NORTHWESTERN BANK BUILDING

MARVIN D. KELLEF
ROBERT J. PARKER

PHONE 605-336-1898
SIOUX FALLS, SO. DAK. 57102

November 10, 1970

Mr. J. W. Grimes
Chief Engineer
Water Resources Commission
State Capitol Building
Pierre, South Dakota 57501



Re: Proposed sale of water by City of Sioux Falls to
residents of Lincoln County

Dear Mr. Grimes:

I represent Mapleton Township. Recently the City Commissioners of the City of Sioux Falls, by a 2-1 vote approved in principle the sale of water by the City to certain residents of Lincoln County, South Dakota. This is a matter of major concern to the Board of Supervisors and electorate of Mapleton Township.

Mapleton Township lies directly North of the City, along either side of the Big Sioux River. The greater number of wells maintained by the City for its water supply are located within the territorial limits of Mapleton Township. The volume of water drawn by the City from its wells has a direct effect upon the water level of the aquifer which underlies Mapleton Township, and, as a consequence, has a direct effect upon the availability of water to residents of the Township.

For some time the City has used every device at its disposal to limit the use of water by residents of the Township. The reason advanced for the need of such limitation has been the alleged shortage of available water resources for the use of the City. Yet the City Commission has now approved the sale of water resources to residents of another County, without consulting the persons most affected thereby. It can be presumed that, if this proposal is accepted by the Water Resources Commission, the residents of Mapleton Township will shortly be required to accept more severe limitations upon their water supply.

Mr. J. W. Grimes
Page 2
November 10, 1970

The State of South Dakota is now, and for the foreseeable future will be, primarily dependent upon a viable agricultural community. Agricultural production varies in direct proportion with the ready availability of water. The residents of Mapleton Township will not voluntarily accept a further reduction of available water supplies.

Accordingly, I respectfully request that the undersigned as well as the Mapleton Township Supervisors, to whom a copy of this letter is sent, be notified a reasonable time in advance of any hearings concerning the proposed sale of the date and time thereof that we may have an opportunity to appear and make a presentation in opposition to the proposal.

Very truly yours,

KELLER AND PARKER


Marvin D. Keller

MDK:jk

cc: Board of Supervisors
Mapleton Township

Mr. Morris Oien, Supervisor
Mapleton Township
Renner, South Dakota 57055

Mr. James Wehde, Supervisor
Mapleton Township
Route #1
Garretson, South Dakota 57030

Mr. Curtis Eggers, Supervisor
Mapleton Township
Renner, South Dakota 57055

U. S. Department of Agriculture
South Dakota State University cooperating



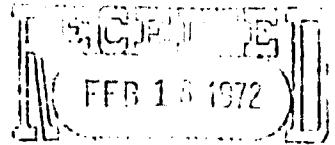
Canton, S. Dak. 57013

LINCOLN COUNTY EXTENSION SERVICE

Located In Courthouse

Telephone 605-987-5941

February 17, 1972



Mr. J. W. Grimes
South Dakota Water Resources Commission
State Office Building No. 2
Pierre, South Dakota 57501

STATE WATER RESOURCES COMMISSION
PIERRE, SOUTH DAKOTA

Dear Joe,

Water System bids have been let and the bids have been awarded.
Bids were awarded to:

Division I (Lines and Installation of lines) -- Subsurfco, Corp.
of Grand Island, Nebraska.

Division II (Above ground storage tank) -- Universal Tank and Iron
Works, Inc., of Indianapolis, Indiana.

Division III (Under ground concrete storage reservoir) -- Moorhead
Construction Co., Inc., of Moorhead, Minnesota.

The Water System has hired an inspector for the construction period of
the Rural Water System.

Sincerely,

Gerald L. Spilde
Gerald L. Spilde
Assistant County Agent

GLS:as

LINCOLN COUNTY
RURAL WATER SYSTEM
REQUIREMENTS

Job No. 2076
November 10, 1970

Initial Usage - 75% Domestic Water Used
25% Livestock Water Used

Ultimate Usage - 100% Domestic Water Used
100% Livestock Water Used

	305 Users (Initial Usage)	305 Users (Ultimate Usage)	*405 Users (Ultimate Usage)
Daily Gal.	85.0 thousand	225.0 thousand	292.5 thousand
Monthly Gal.	2.55 million	6.75 million	8.77 million
**Cubic feet per sec.	0.393	1.065	1.359

*Maximum System Design Capacity

**Computed as a continuous flow over 8 hours (transmission main design)

NOTE: Application for permit was made for 1.359 + 20% or 1.631 cfs.
The system could conceivably deliver this additional amount
of water with the addition of booster stations, additional
reservoirs looped lines, etc.

DK:jme

SPECIFICATIONS
AND
CONTRACT DOCUMENTS
FOR THE
CONSTRUCTION OF
LINCOLN COUNTY RURAL WATER SYSTEM

HARRISBURG, SOUTH DAKOTA

BOARD OF DIRECTORS

Richard Lommen - President
Joe Hoffman - Vice President
Gene Schroeder - Secretary
John Juel - Treasurer
Harry Hall
Lloyd Oppold
Arnold Zueger

ATTORNEY

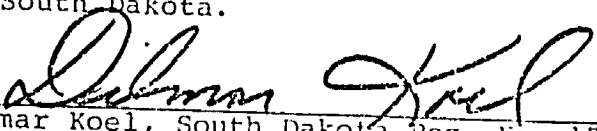
Brown & Myrabo

LINCOLN COUNTY EXTENSION AGENT

Bernard Uthe

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of South Dakota.

By


Delmar Koel, South Dakota Reg. No. 1782

Date

11-8-71

Revised 12-28-71

DEWILD GRANT RECKERT & ASSOCIATES CO.
ENGINEERS - ARCHITECTS - PLANNERS
ROCK RAPIDS, IOWA
SIOUX CITY, IOWA

SPECIFICATIONS
AND
CONTRACT DOCUMENTS
FOR
CONSTRUCTION OF

DIVISION I - DISTRIBUTION SYSTEM

DIVISION II - WATER TOWER

DIVISION III - GROUND STORAGE RESERVOIR
AND PUMPING STATION

FOR

LINCOLN COUNTY RURAL WATER SYSTEM

HARRISBURG, SOUTH DAKOTA

1971

Job No. 2076

DEWILD GRANT RECKERT & ASSOCIATES CO.
ENGINEERS - ARCHITECTS - PLANNERS
ROCK RAPIDS, IOWA
SIOUX CITY, IOWA

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LINCOLN COUNTY RURAL WATER SYSTEM
HARRISBURG, SOUTH DAKOTA

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ADVERTISEMENT FOR BIDS

Sealed bids will be received by Lincoln County Rural Water System, hereinafter referred to as the "Owner", for performing the work as set forth in the plans and specifications on or before 1230 o'clock P.M., January 31, 1972, in the Lincoln County Courthouse, Carbon, South Dakota, at which time said bids will be publicly opened and read.

The proposed rural water system shall consist of the following divisions of work and approximate quantities and kinds of materials.

Division I - Distribution System -

Construction of approximately 140 miles of main line, and service line, size 1" through 10", valves, meter pits, basement meter installations, and miscellaneous appurtenant work.

Time for completion - 365 calendar days.

Division II - Elevated Storage Tank -

Construction of a steel elevated storage tank, 100,000 gallons capacity and miscellaneous appurtenant work.

Time for completion - 150 calendar days.

Division III - Ground Storage Reservoir -

Construction of a 750,000 gallon reinforced concrete ground storage reservoir, pumping station, and miscellaneous appurtenant work.

Time for completion - 150 calendar days

All proposals shall be made on bid forms provided by the Engineer.

Each bid must be accompanied by a certified check or bidder's bond payable to the Owner for five percent of the total amount of the bid. As soon as the bid prices have been compared, the Owner will return the check or bond of all except the three lowest responsible bidders of each Division. When the contract is awarded, the checks or bonds of the two remaining unsuccessful bidders of each Division will be returned. The check or bond of the successful bidder of each Division will be retained until the contract and surety bond have been executed and approved, after which it will be returned.

A performance and payment bond in the amount of 100% of the contract price will be required to insure faithful performance of the Contract.

A 1 year maintenance bond will be required.

The Owner reserves the right to reject any and all bids or to accept any bid. It is understood that the work to be done is being financed with a loan or grant or both from the Farmers Home Administration, U.S. Department of Agriculture. Contractor's Proposals shall hold firm for sixty (60) days to allow the Owner to complete its financing arrangements. Mutually agreed upon extensions of time may be made, if necessary.

Plans, specifications and proposed contract documents may be examined at the office of the Engineer. Copies of said plans, specifications and contract documents may be secured at the office of DeWild Grant Reckert & Associates Co., Engineers and Architects, Rock Rapids, Iowa 51246, upon payment of twenty-five dollars (\$25.00), all of which will be refundable upon return of the plans and specifications in good condition within ten (10) days following the date of letting; otherwise no refund shall be made.

LINCOLN COUNTY RURAL WATER SYSTEM
HARRISBURG, SOUTH DAKOTA

By /s/ Richard Lommen
President

ITEM I

NOTICE AND INSTRUCTIONS TO BIDDERS

Date: 1972

1. Sealed bids will be received by the Lincoln County Rural Water System hereinafter referred to as the "Owner," for performing the work as set forth in the Plans and Specifications attached hereto, on or before _____ o'clock _____, in the _____, at which time said bids will be publicly opened and read.
2. (See Advertisement for Bids for time of letting.)
All bids must be made on the blank form of proposal attached hereto.
3. Each bid must be accompanied by a certified check or bidder's bond payable to the Owner for five per cent of the total amount of the bid. As soon as the bid prices have been compared, the Owner will return the check or bond of all except the three lowest responsible bidders. When the contract is awarded, the checks or bonds of the two remaining unsuccessful bidders will be returned. The check or bond of the successful bidder will be retained until the contract and surety bond have been executed and approved, after which it will be returned.
4. A performance and payment bond in the amount of 100 percent of the contract price with a corporate surety approved by the Owner and Engineer, will be required for the faithful performance of the contract, and the bidder shall state in the proposal the name and address of the surety or sureties who will sign this bond in case the contract is awarded to him. A maintenance bond guaranteeing the repair of all damage due to improper materials or workmanship for a period of one year after the acceptance of the work by the Owner will also be required.
5. The party to whom the contract is awarded will be required forthwith to execute the contract and a performance and payment bond within ten calendar days from the date when the written notice of the award of the contract is mailed to the bidder at the address given by him. In case of failure to do so, the Owner may at his option consider that the bidder has abandoned the contract, in which case the certified check or bidder's bond accompanying the proposal shall become the property of the Owner.
6. The Owner reserves the right to reject any and all bids or to accept any bid. It is understood that the work to be done is being financed with a loan or grant or both from the Farmers Home Administration, U. S. Department of Agriculture. Contractors' proposals shall hold firm for sixty days to allow the Owner to complete its financing arrangements. Mutually agreed upon extensions of time may be made, if necessary.
7. If the prospective contract exceeds \$10,000, the bidder must submit Form FHA 400-6, "Compliance Statement," with his bid. An Equal Opportunity Clause will be a part of all construction contracts exceeding \$10,000.

8. If the prospective contract exceeds \$10,000 and the contractor has 100 or more employees, he will file Standard Form 100, "Employer Information Report," with the Joint Reporting Committee, P. O. Box 12, Springfield, Va. 22150, within 30 days after the contract award and annually on or before March 31 thereafter for the life of the contract.
9. If the prospective contract is for \$50,000 or more and the successful bidder has 50 or more employees, he will develop and place on file within 120 days of the contract award written affirmative action compliance programs using Form AD-425, "Contractor's Affirmative Action Plan for Equal Employment Opportunity," as a guideline.
10. Before the award of the contract, any bidder may be required to furnish evidence satisfactory to the Owner and to the Engineer of the necessary facilities, ability, and pecuniary resources to fulfill the conditions of the said contract.
11. Prior to signing the contract, the Contractor shall submit on a Form acceptable to the Owner and Engineer, an overall construction schedule for the project. This construction schedule shall start with the proposed date of signing the contract, and the completion date shall be the date specified in the contract.
12. Bidders must satisfy themselves by personal examination of the location of the proposed work, by examination of the Plans and Specifications and requirements of the work and the accuracy of the estimate of the quantities of the work to be done, and shall not at any time after the submission of a bid dispute or complain of such estimate nor assert that there was any misunderstanding in regard to the nature or amount of work to be done.
13. The Construction Contract and the Detailed Specifications contain the provisions required for the construction of the project. No information obtained from any officer, agent, or employee of the Owner on any such matters shall in any way affect the risk or obligation assumed by the Contractor or relieve him from fulfilling any of the conditions of the contract.
14. Proposals which are incomplete, unbalanced, conditional or obscure or which contain additions not called for, erasures, alterations or irregularities of any kind or which do not comply with the Notice and Instructions to Bidders may be rejected at the option of the Owner.
15. A bidder may withdraw any proposal he has submitted at any time prior to the hour set for the closing of the bids provided the request for withdrawal is signed in a manner identical with the proposal being withdrawn. No withdrawal or modification will be permitted after the hour designated for closing the bids.

Item I (cont.)

16. For the purpose of clarification it is understood that the work to be done is being financed in whole or in part by means of a loan and grant made or insured by the United States acting through the Farmers Home Administration of the Department of Agriculture. The Farmers Home Administration will, therefore, require approval by its representatives of all contracts, attachments, and similar documents, all partial and final payments estimates, and all change orders.
17. Computation of quantities that will be the basis for payment estimates, both monthly and final, will be made by the Engineer.
18. The word "Owner" means the Lincoln County Rural Water System.
The Owner will be responsible for payment in accordance with the terms of the contract.

The word "Contractor" means the person, firm or corporation to whom the award is made. Subcontractors as such will not be recognized.

The word "Engineer" refers to the DeWild Grant Reckert & Associates Co., designated by the Owner as its engineering representative during the course of construction to make appropriate inspections and computations of payments.

The word "Representative" means the State Director of the Farmers Home Administration or his designee.
19. Plans and Specifications may be obtained from the DeWild Grant Reckert & Associates Co.. A deposit of \$ 25.00 will be required for the Plans and Specifications. \$ 25.00 of which will be refunded to those returning them in good condition within ten days of the bid opening.

Lincoln County Rural Water System
Owner

BY /s/ Richard Lommen

TITLE President

ITEM II

BIDDER'S PROPOSAL

Place Harrisburg, So. Dak.

Date 1972

1. In compliance with your invitations for bids dated _____ and subject to all the conditions thereof, the undersigned _____

A Corporation incorporated in the State of _____ a _____
consisting of _____

_____ an individual trading as _____

_____ of the City of _____, State of _____ hereby proposes to furnish and do everything required by the contracts to which this refers for the construction of all structures listed at the unit prices shown for each bid item on the following Bid Schedule. (The Bid Schedule attached lists the various divisions of construction contemplated in the Plans and Specifications, together with an estimate of the units of each. With these units as the basis, the bidder will extend each item, using the cost he inserts in the unit column. Any total cost found inconsistent with the unit cost when the bids are examined will be deemed in error and corrected to agree with the unit cost which shall be considered correct.)

2. The undersigned bidder does hereby declare and stipulate that this proposal is made in good faith, without collusion or connection with any other person or persons bidding for the same work, and that it is made in pursuance of and subject to all the terms and conditions of the Notice and Instructions to Bidders, the Construction Contract, the Detailed Specifications, and the Plans pertaining to the work to be done, all of which have been examined by the undersigned.
3. Accompanying this proposal is a certified check or standard bid bond in the sum of _____ dollars (\$ _____) in accordance with the Notice and Instructions to Bidders.
4. The undersigned bidder agrees to execute the contract and a performance and payment bond for the amount of the total of this bid within 10 calendar days from the date when the written notice of the award of the contract is delivered to him at the address given on this proposal. The name and address of the corporate surety with which the Bidder proposes to furnish the specified performance and payment bond is as follows:

5. The undersigned bidder agrees to abide by the requirements of Executive Order No. 11246, as amended. To that end, he submits a completed Form FHA 400-6, "Compliance Statement", as ITEM X of the Contract Documents. He agrees to execute the Equal Opportunity Clause as part of the Construction Contract. If the proposed contract is for \$50,000 or more and the bidder has 50 or more employees, he further agrees to develop a written affirmative action compliance program and, if he has 100 or more employees, to file the report required after the contract award.
6. All the various phases of work enumerated in the Detailed Specifications with their individual jobs and overhead, whether specifically mentioned, included by implication or appurtenant thereto, are to be performed by the Contractor under one of the items listed in the Bid Schedule, irrespective of whether it is named in said list.
7. Payment for work performed will be in accordance with the Bid Schedule, subject to changes as provided for in the Construction Contract.
8. Bids shall include sales tax and all other applicable taxes and fees.
9. Bidders are invited to bid one or all Divisions of the Proposal; however, separate awards will be considered on all Divisions as deemed advantageous to the owner.

Tied bids will not be allowed except with deducts. Bidders may stipulate a deduct for award of more than one Division of the Proposal.

Stipulation and Deduct: _____

(Contractor)

By _____

(Title)

(Business Address)

Contractor's License No. _____

ITEM IV

BID SCHEDULEDivision I

<u>Item No.</u>	<u>No. of Units</u>	<u>Description</u>	<u>Unit Price</u>	<u>Total Price</u>
1.	8,100 L.F.	10" Class 150 AC pipe, per lin. ft.	\$_____	\$_____
2.	13,150 L.F.	8" Class 200 PVC pipe, per lin. ft.	_____	_____
3.	5,400 L.F.	5" Class 200 PVC pipe, per lin. ft.	_____	_____
4.	15,800 L.F.	3½" Class 200 PVC pipe, per lin. ft.	_____	_____
5.	15,800 L.F.	3" Class 200 PVC pipe, per lin. ft.	_____	_____
6.	25,050 L.F.	2½" Class 200 PVC pipe, per lin. ft.	_____	_____
7.	72,600 L.F.	2" Class 200 PVC pipe, per lin. ft.	_____	_____
8.	7,950 L.F.	8" Class 160 PVC pipe, per lin. ft.	_____	_____
9.	30,350 L.F.	6" Class 160 PVC pipe, per lin. ft.	_____	_____
10.	15,800 L.F.	5" Class 160 PVC pipe, per lin. ft.	_____	_____
11.	50,200 L.F.	4" Class 160 PVC pipe, per lin. ft.	_____	_____
12.	35,800 L.F.	3½" Class 160 PVC pipe, per lin. ft.	_____	_____
13.	66,000 L.F.	3" Class 160 PVC pipe, per lin. ft.	_____	_____
14.	91,500 L.F.	2½" Class 160 PVC pipe, per lin. ft.	_____	_____
15.	188,650 L.F.	2" Class 160 PVC pipe, per lin. ft.	_____	_____

<u>Item No.</u>	<u>No. of Units</u>	<u>Description</u>	<u>Unit Price</u>	<u>Total Price</u>
16.	15,600 L.F.	2" Class 200 PVC (Service Pipe), per lin. ft.	_____	_____
17.	23,850 L.F.	1½" Class 200 PVC (Service Pipe), per lin. ft.	_____	_____
18.	53,900 L.F.	1" Class 250 PVC or 1" P.E. 3306 (Service Pipe), per lin. ft.	_____	_____
19.	2 ea.	10" Butterfly valve and box, per each	_____	_____
20.	2 ea.	8" Butterfly valve and box, per each	_____	_____
21.	3 ea.	6" Butterfly valve and box, per each	_____	_____
22.	1 ea.	5" Butterfly valve and box, per each	_____	_____
23.	12 ea.	4" Butterfly valve and box, per each	_____	_____
24.	22 ea.	3" Gate valve and box, per each	_____	_____
25.	35 ea.	2" Gate valve and box, per each	_____	_____
26.	40 ea.	1½" Ball valve and box, per each	_____	_____
27.	244 ea.	1" Ball valve and box, per each	_____	_____
28.	1 ea.	5" Interstate highway crossing encased, per each	_____	_____
29.	2 ea.	8" Highway crossing encased, per each	_____	_____
30.	1 ea.	6" Highway crossing encased, per each	_____	_____

<u>Item No.</u>	<u>No. of Units</u>	<u>Description</u>	<u>Unit Price</u>	<u>Total Price</u>
31.	2 ea.	5" Highway crossing encased, per each	_____	_____
32.	2 ea.	4" Highway crossing encased, per each	_____	_____
33.	2 ea.	3½" Highway crossing encased, per each	_____	_____
34.	5 ea.	3" Highway crossing encased, per each	_____	_____
35.	7 ea.	2½" Highway crossing encased, per each	_____	_____
36.	14 ea.	2" Highway crossing not encased, per each	_____	_____
37.	21 ea.	Highway service line crossing, 1½" and 1", not encased, per each	_____	_____
38.	2 ea.	6" Railroad crossing encased, per each	_____	_____
39.	1 ea.	5" Railroad crossing encased, per each	_____	_____
40.	1 ea.	4" Railroad crossing encased, per each	_____	_____
41.	1 ea.	2½" Railroad crossing encased, per each	_____	_____
42.	4 ea.	2" Railroad crossing encased, per each	_____	_____
43.	1 ea.	1" Meter w/remote readout and post, (meter pit installation), per each	_____	_____
44.	152 ea.	5/8" x 3/4" meter w/remote readout (basement installation), per each	_____	_____
45.	127 ea.	3/4" meter w/remote readout, (basement installation), per each	_____	_____

(FHA 424.2)

<u>Item No.</u>	<u>No. of Units</u>	<u>Description</u>	<u>Unit Price</u>	<u>Total Price</u>
46.	12 ea.	5/8" x 3/4" Meter w/remote readout and post, (meter pit installation), per each	\$ _____	\$ _____
47.	6 ea.	3/4" Meter w/remote readout and post, (meter pit installation), per each	_____	_____
48.	19 ea.	Meter pits, per each	_____	_____
49.	8 ea.	Meter pit setter installation, per each	_____	_____
50.	11 ea.	Tandem meter pit setter installatin (for pressure regulator), per each	_____	_____
51.	64 ea.	Basement meter assembly, per each	_____	_____
52.	215 ea.	Basement meter assembly (for pressure regulator), per each	_____	_____
53.	147 ea.	Subscriber pressure regulators, per each	_____	_____
54.	79 ea.	Subscriber high capacity pressure regulators, per each	_____	_____
55.	2 ea.	Main line pressure reducing valve installation (single setting), per each	_____	_____
56.	2 ea.	Main line pressure reducing valve installation (tandem setting), per each	_____	_____
57.	5 ea.	Automatic air release valve installation, per each	_____	_____

(FHA 424.2)

<u>Item No.</u>	<u>No. of Units</u>	<u>Description</u>	<u>Unit Price</u>	<u>Total Price</u>
58.	2 ea.	Manual air release valve installation, per each	_____	_____
59.	32 ea.	Line cleanout installation (1½"), per each	_____	_____
60.	1 ea.	Fire Hydrant, per each	_____	_____
TOTAL DIVISION I			\$ _____	_____

ALTERNATE BID ITEMS

<u>Item No.</u>	<u>No. of Units</u>	<u>Description</u>	<u>Unit Price</u>	<u>Total Price</u>
2A.	13,150 L.F.	8" Class 150 A.C. pipe, per lin. ft.	\$ _____	\$ _____
8A.	7,950 L.F.	8" Class 150 A.C. pipe, per lin. ft.	_____	_____
9A.	30,350 L.F.	6" Class 150 A.C. pipe, per lin. ft.	_____	_____
14A.	91,500 L.F.	2½" Class 200 PVC pipe, per lin. ft.	_____	_____
15A.	188,650 L.F.	2" Class 200 PVC pipe, per lin. ft.	_____	_____
48A.	19 ea.	Meter pits (alternate construction), per each	_____	_____

BID SCHEDULE

Division II

The Bidder agrees to perform all the work necessary for complete construction of a 100,000 gallon steel double ellipsoidal elevated storage tank complete with footings, control manhole and miscellaneous appurtenant and site work as shown on the plans and as described in the specifications for a lump sum price of:

\$ _____

BID SCHEDULE

Division III

The Bidder agrees to perform all the work necessary for complete construction of a 750,000 gallon reinforced concrete storage reservoir and pumping station complete with miscellaneous appurtenant and site work as shown on the plans and as described in the specifications for a lump sum price of:

\$ _____

ITEM III
NOTICE OF AWARD

Description of Work: Construction of _____
_____ for the _____

To _____

The Owner represented by the undersigned has considered the Proposal submitted by you for the above described work in response to its Notice and Instructions to Bidders dated _____, 19____.

It appearing that it is to the best interest of said Owner to accept your Proposal in the amount of _____ (\$ _____), you are hereby notified that your Proposal has been accepted for items _____

You are required by the Notice and Instructions to Bidders to execute the formal contract with the undersigned Owner and to furnish the required Contractor's Performance and Payment Bond within ten days from the date of the delivery of this Notice to you.

If you fail to execute said contract and to furnish said bond within ten days from the date of delivery of this Notice, said Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your Proposal as abandoned and to award the work covered by your Proposal to another, or to re-advertise the work or otherwise dispose thereof as the Owner may see fit.

Dated this _____ day of _____, 19____

Owner

ACCEPTANCE OF NOTICE

By _____

Receipt of the above Notice of
Award is hereby acknowledged this
_____ day of _____,
19____.

Title _____

By _____

Title _____

ITEM V

CONSTRUCTION CONTRACT

THIS AGREEMENT, made this _____ day of _____, 19____,
at Harrisburg State of South Dakota, by and between
the Lincoln County Rural Water System hereinafter called the "Owner,"
and _____, hereinafter called the "Con-
tractor."

WITNESSETH THAT:

In consideration of the mutual covenants and conditions hereinafter set forth,
the Owner and Contractor hereby agree as follows:

1. STATEMENT OF WORK. The Contractor shall furnish and pay the cost, including sales tax and all other applicable taxes and fees, of all the necessary materials not furnished by the Owner and shall furnish and pay for all the superintendence, labor, tools, equipment and transportation and perform all the work required for the construction of all structures listed and itemized under the bid schedule of the Bidder's Proposal attached hereto as Item II in strict accordance with the Plans, Specifications and requirements which are attached hereto and made a part hereof, and any amendments thereto and such supplemental Plans and Specifications which may hereafter be approved. This Construction Contract shall be construed as including and consisting of Items I, II, III, IV, V, and VI attached hereto.
2. COMPLETION OF WORK. The Contractor shall complete the work covered by this contract within _____*_____ calendar days after the date of the notice to proceed.
3. CONTRACT SUM. The Owner shall pay the Contractor for the performance of said work, subject to additions and deductions provided herein, _____ dollars (\$ _____) as the base bid in conformity with the bid schedule in Item IV.
4. PERFORMANCE AND PAYMENT BOND. The Contractor shall within ten days after the receipt of the Notice of Award and before the commencement of any operations hereunder execute the contract and furnish the Owner with a performance and payment bond in a penal sum equal to the amount of the contract price, conditioned upon the performance by the Contractor of all undertakings, covenants, terms, conditions and agreements of this contract, and upon the prompt payment by the Contractor to all persons supplying labor and materials in the prosecution of the work provided by this contract. Such bond shall be executed by the Contractor and a corporate bonding company licensed to transact such business in the State of South Dakota and acceptable to the Owner. The expense of this bond shall be borne by the Contractor. If at any time a surety on such bond becomes irresponsible or loses its right to do business in the State of South Dakota, the Owner may

- * Division I - 365 days
- * Division II - 150 days
- * Division III - 150 days

require another surety which the Contractor shall furnish within ten calendar days after receipt of written notice to do so. Evidence of authority of an attorney in fact acting for the corporate surety must be provided in the form of a certificate as to his power of attorney and to the effect that it is not terminated and remains in full force and effect on the date of the bond. The form of the bond shall be subject to approval by the Owner.

5. **MAINTENANCE BOND.** A maintenance bond in the amount of 20 percent of the contract price with a corporate surety approved by the Owner and the Engineer will be required. Such bond shall be provided before final payment is made to the Contractor and shall guarantee the repair of all damage due to faulty materials or workmanship provided or done by the Contractor. This guarantee shall remain in effect for a period of one year after the date of final acceptance of the job by the Owner.
6. **LIQUIDATED DAMAGES.** If the work embraced by this contract is not completed on or before the date set for completion or any extension thereof, the actual damages for the delay will be impossible to determine and in lieu thereof, the Contractor shall pay to the Owner as fixed, agreed and liquidated damages the sum of one hundred dollars (\$ 100.00) per day for each calendar day of delay until the work is satisfactorily completed. Whatever sums may be due the Owner as liquidated damages for delay may be deducted from payments due the Contractor or may be collected from the Contractor or the Contractor's surety.
7. **PAYMENT.** Payment shall be made to the Contractor for work performed under this contract for the quantities of work as determined in accordance with sections 20 and 21 of the contract. Payment for extra work will be made in accordance with sections 10 and 20 of this contract.
8. **SERVICE OF NOTICES.** All notices required to be given hereunder shall be mailed or delivered in the case of the Owner to DeWild Grant Reckert & Assoc. Co., Rock Rapids, Iowa 51246 and in the case of the Contractor to _____
9. **INTENT OF PLANS AND SPECIFICATIONS.** The Contractor shall keep on the job a copy of the Plans and Specifications and shall at all times give the Owner and Engineer access thereto. Anything mentioned in the Specifications and not shown on the Plans or shown on the Plans and not mentioned in the Specifications shall be of like effect as if shown or mentioned in both. In case of differences between the Plans and Specifications, the Specifications shall govern. The Contractor shall not take advantage of any errors, discrepancies or omissions which may exist in the Plans and Specifications, but shall immediately call them to the attention of the Engineer whose interpretation or correction thereof shall be conclusive.
10. **EXTRA WORK AND CHARGES.** Extra work shall be work for which no unit bid was received in the proposal and which was not included in the bid schedule and will not be construed to mean work for which unit bids

Item V (cont.)

were received but which is in excess of the quantity mentioned in the proposal. The Owner, without invalidating the contract, may order extra work or make changes in the work, the contract sum being adjusted accordingly. All such work shall be executed under the conditions of the original contract except that any claim for extension of time caused thereby shall be adjusted at the time of ordering such change. All such changes shall be agreed to and recorded on Form FHA 424-7, "Contract Change Order." In giving instructions, the Engineer shall have authority to make minor changes in the work not involving extra cost and not inconsistent with the purpose of the work, but otherwise, except in an emergency endangering life or property, no extra work or change shall be made unless covered by Form FHA 424-7, and no claim for an addition to the contract sum shall be valid unless so covered. Before becoming effective, all Change Orders must be signed by all parties indicated.

The value of such extra work or change shall be determined in one or more of the following ways:

- (a) By estimate and acceptance in a lump sum.
- (b) By unit prices named in the contract or subsequently agreed upon.

Changed work shall be adjusted, considering separately the work added and the parts omitted. Amount of adjustment for parts omitted shall be estimated at the time omission of work is authorized and the agreed adjustment will be deducted from the subsequent monthly estimates.

The Owner reserves the right to contract with any person or firm other than the Contractor for any or all extra work. The Contractor's attention is especially called to the fact that he shall be entitled to no claim for damages for anticipated profits on any portion of work that may be omitted.

11. **CLAIMS FOR EXTRA COST.** If the Contractor claims that any changes in the work or any instructions by means of drawings or otherwise involve extra cost, he shall give the Engineer written notice thereof within a reasonable time after receipt of such instructions or of notice of such changes and, in any event, before proceeding to carry out such instructions or to put such changes into effect, except in case of an emergency endangering life or property. In all such cases the Contractor shall keep a correct account of the extra cost in such form as the Engineer may direct and shall present such account supported by receipts to the Engineer. The Owner shall be entitled to reject any claim for extra cost concerning which the foregoing procedure is not followed.
12. **LICENSES AND PERMITS.** The Owner shall secure and pay for permits required for permanent structures. The Contractor shall obtain and pay for all other necessary licenses and permits and shall faithfully comply with all laws, ordinances and regulations, (Federal, State, or local) which may be applicable to the operations to be conducted hereunder.
13. **OTHER WORK.** Wherever work being done by the Owner or by other contractors is contiguous to work covered by this contract, the respective rights of the various interests involved shall be established by the Engineer to secure the completion of the various portions of the work in general harmony.
14. **RESPONSIBILITY OF THE ENGINEER.** The term "Engineer" wherever used in this contract shall be DeWild Grant Reckert & Assoc. Co., or his duly authorized representative. Notices of any change in the Engineer shall be given in writing by the Owner to the Contractor. The Engineer shall have full authority to interpret the Plans and Specifications and shall determine the amount, quality, and acceptance of the work and supplies to be paid for under this contract and every question relative to the fulfillment of the terms and provisions therein. Unless otherwise specifically provided in the Specifications, all workmanship, equipment, and materials incorporated in the work are to be of the best grade of their respective kinds for the purpose.

It shall be the duty of the Engineer to enforce the Specifications in a fair and unbiased manner, although he has the right to waive any term of the Specifications if that term is found to be unreasonable and inconsistent with the general spirit of the Specifications. If a variation from any requirement is allowed, the Engineer shall grant the same in writing with the reasons for his action outlined, and such actions will not invalidate or change the contract in any other manner.
15. **WAIVER.** It is expressly understood and agreed that any waiver granted by the Engineer or the Owner of any term, provision or covenant of this contract shall not constitute a precedent nor breach of the same or any other terms, provisions, or covenants of this contract.

Item V (cont.)

Neither the acceptance of the work by the Owner nor the payment of all or any part of the sum due the Contractor hereunder shall constitute a waiver by the Owner of any claim which the Owner may have against the Contractor or surety under this contract or otherwise.

16. **SUPERINTENDENCE.** The Contractor shall constantly superintend all the work embraced in this contract in person or by a responsible agent who shall have in writing full authority to act for him and to carry out all the instructions given by the Engineer.
17. **LABOR PROVISIONS.** The Contractor and his subcontractors shall discharge whenever ordered to do so by the Engineer, any employee who is disorderly or whose conduct in the opinion of the Engineer is detrimental to the prosecution of the work.

No person whose age or physical condition is such as to make his employment dangerous to his health and safety or to the health and safety of others shall be employed on the work, and in no event shall any person under the age of sixteen years be employed.

The work shall at all times be prosecuted under safe working conditions, and the conditions of work shall be subject to inspection and correction by the Engineer or safety inspectors of the Owner.

Form FHA 400-2, "Equal Opportunity Clause," shall be a part of this Construction Contract and shall be signed by the Contractor at the time the contract is executed.

18. **LIABILITY INSURANCE.** The Contractor shall procure and maintain, at his own expense, during the life of this contract, liability insurance as hereinafter specified. All such insurance shall be subject to the approval of the Owner for adequacy of protection, and shall include a provision preventing cancellation without ten days' prior notice to the Owner in writing. The liability insurance required is as follows:

- (a) Contractor's General Public Liability and Property Damage Insurance issued to the Contractor and protecting him from all claims for personal injury, including death, and all claims for destruction of or damage to property, arising out of or in connection with any operations under this contract, whether such operations be by himself or by any subcontractor under him, or anyone directly or indirectly employed by the Contractor or by a subcontractor under him.

All such insurance shall be written with a limit of liability of not less than \$100,000.00 for all damages arising out of bodily injury, including death, at any time resulting therefrom, sustained by any one person in any one accident; a limit of liability of not less than \$200,000.00 for any such damages sustained by two or more persons in any one accident; a limit of liability of not less than

\$25,000.00 for all damages arising out of injury or destruction of property, (including property of the Owner) in any one accident; and a limit of liability of not less than \$50,000.00 for all damage arising out of injury to or destruction of property, including property of the Owner, during the policy period.

All such insurance shall be written on a comprehensive policy form and in the event blasting operations are required in performance of the work, shall specifically cover all blasting operations. Certificates evidencing the issuance of such insurance, addressed to the Owner on forms approved by the Owner, shall be filed with the Owner within ten days after the date of the Notice of Award.

- (b) General Public Liability and Property Damage insurance issued to the Owner, its officials, its officers and its employees acting in the scope and course of their employment, and protecting them from all claims for personal injury, including death, and all claims for destruction of or damage to property, arising out of or in connection with any operations under the Contractor's contract, whether such operations be by the Contractor or by any subcontractor under him or by anyone directly or indirectly employed by the Contractor or a subcontractor under him. All such insurance shall have the minimum limits of liability specified in the preceding paragraph. All such insurance policies shall be delivered to the Owner within ten days after the date of the Notice of Award.

19. **COMPENSATION INSURANCE.** The Contractor shall procure and maintain, at his own expense, during the life of this contract, in accordance with the provisions of the laws of the State of South Dakota, Workman's Compensation Insurance, including occupational disease provisions, for all of his employees at the site of the project and in case any work is sublet, the Contractor shall require such subcontractor similarly to provide Workman's Compensation Insurance, including occupational disease provisions for all of the latter's employees unless such employees are covered by the protection afforded by the Contractor.

In case any class of employees engaged in hazardous work under this contract at the site of the project is not protected under Workman's Compensation statute, the Contractor shall provide, and shall cause each subcontractor to provide adequate and suitable insurance for the protection of his employees not otherwise protected.

Certificates evidencing the issuance of such insurance shall be filed with the Owner within ten days after the date of the Notice of Award.

20. **PAYMENTS FOR WORK COMPLETED.** Partial payments will be made as the work progresses at the end of each calendar month, or as soon thereafter as practicable on estimates made by the Engineer and as approved by the Owner, provided that the Contractor is performing the

Item V (cont.)

overall job in a diligent manner. In making partial payments, there shall be retained ten percent on the amount of each estimate until final completion and acceptance of all work covered by the contract.

Upon the completion and acceptance of the work, the Engineer shall issue a certificate that the work has been completed and accepted by him under the conditions of this contract, and shall make and approve the final estimate of the work. The entire balance found to be due the Contractor, including the retained percentages, but excepting such sums as may be lawfully retained by the Owner, shall be paid to the Contractor. Such payment shall be conditioned, however, upon the submission by the Contractor of evidence satisfactory to the Owner that all claims for labor, material, and any other outstanding indebtedness in connection with this Contract have been paid.

If after the work has been substantially completed, full completion thereof is materially delayed through no fault of the Contractor and the Engineer so certifies, the Owner shall upon the Certificate of the Engineer, and without terminating the Contract, make payment for the balance due for that portion of the work fully completed and accepted. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claim.

21. **PAYMENTS WITHHELD.** The Engineer may withhold or, on account of subsequently discovered evidence, nullify the whole or part of any estimate to such extent as may be necessary to protect the Owner from loss on account of:

- (a) Defective work not remedied.
- (b) Claims filed or reasonable evidence indicating probable filing of claims.
- (c) Failure of the Contractor to make payments properly to sub-contractors or for material or labor.
- (d) A reasonable doubt that the contract can be completed for the balance then unpaid.
- (e) Damage to another Contractor.
- (f) Failure of the Contractor to keep his work progressing in accordance with his time schedule.

When the above grounds are removed, payment shall be made for amounts withheld because of them.

22. **MEASUREMENT OF QUANTITIES.** The computation of quantities that will be the basis for estimates, both monthly and final, shall be made by the Engineer in accordance with the methods defined in the Plans and Specifications.

23. **ASSIGNMENT AND TRANSFER OF CONTRACT.** The Contractor shall not assign or transfer this contract or any part thereof or any interest therein without consent in writing of the Owner and the Contractor's surety, and any such assignment or transfer without such written consent shall be null and void.
24. **INDEMNITY.** The Contractor shall indemnify and save harmless the Owner, the Owner's agents and employees, from and against all losses and all claims, demands, payments, suits, actions, recoveries, and judgments of every nature and description brought or recovered against them by reason of any act or omission of the said Contractor, his agents, or employees, in the execution of the work or in guarding the same.
25. **SUBCONTRACTS.** The Contractor shall have full responsibility under these conditions, general provisions, Plans and Specifications for any subcontracts which he may let.
26. **ADJUSTMENT OF DISPUTE.** All questions or controversies which may arise between the Contractor and the Owner, under or in reference to this contract, shall be subject to the decision of some competent person to be agreed upon by the Owner and the Contractor, and his decisions shall be final and conclusive upon both parties. Should the Owner and Contractor be unable to agree upon such person, a board of three arbitrators shall be chosen, one by the Owner, one by the Contractor, and the third by the two so chosen, and the decision of any two of said arbitrators shall be final and binding upon the parties. If either party to the contract neglects or fails for a period of ten days after notice from the other party to designate an arbitrator hereunder, the arbitrator designated by the other party shall have full power to decide the dispute in the same manner as though a board of three arbitrators had been selected. The referee or arbitrators shall decide which party shall pay the cost of arbitration, and final payment to the Contractor shall not be made until the full decision of the referee or arbitrators has been rendered.
27. **PROTECTION OF WORK AND PROPERTY.** The Contractor shall continuously maintain adequate protection of all his work and materials from damage or theft and shall protect the Owner's property and all adjacent property from injury or loss arising in connection with activities under his contract. The Contractor shall make good any such damage, injury, or loss, except such as may be directly due to errors in the Contract Documents or such as may be caused by agents or employees of the Owner.

The Contractor shall take, use, provide, and maintain all necessary precautions, safeguards, and protection to prevent accidents, or injury to persons or property on, about, or adjacent to the site of the work. The Contractor shall post danger signs warning against any hazards created by the work being done under his contract. He shall designate a responsible member of his organization on the work whose duty shall be the prevention of accidents, and the name of the person so designated shall be reported to the Engineer and Owner in writing. In an emergency

Item V (cont.)

affecting the safety of life, or of the work or adjoining property, the Contractor, without special instruction or authorization from the Engineer or Owner, is hereby permitted to act, at his discretion, to prevent such threatened loss or injury, and he must take such action if so instructed or authorized by the Engineer or Owner.

The Contractor shall also protect adjacent property as required by law.

28. **LAND OF OWNER, USE OF, BY CONTRACTOR.** The Owner shall provide the land upon which the work under this contract is to be done, and will, so far as is convenient, permit the Contractor to use as much of the land as is required for the erection of temporary construction facilities and storage of materials, together with the right of access to same, but beyond this, the Contractor shall provide, at his cost and expense, any additional land required.
29. **LIENS.** If at any time there shall be evidence of any lien or claim for which the Owner might become liable and which is chargeable to the Contractor, the Owner shall have the right to retain out of any payment then due or thereafter to become due, an amount sufficient for complete indemnification against such lien or claim. In the event the Owner has already paid to the Contractor all sums due under this contract or the balance remaining unpaid is insufficient to protect the Owner, the Contractor and his surety shall be liable to the Owner for any loss so sustained.
30. **TIMELY DEMAND FOR STAKES AND INSTRUCTIONS.** The Contractor shall provide reasonable and necessary materials, opportunities and assistance for setting stakes and making measurements, including the furnishing of a rodman or a chainman at intermittent times during the construction period. He shall not proceed until he has made timely demand upon the Engineer for, and has received from him, such stakes and instructions as may be necessary as the work progresses. The work shall be done in strict conformity with such stakes and instructions.
31. **PRESERVATION OF STAKES.** The Contractor shall carefully preserve bench marks, reference points and stakes, and in case of wilful or careless destruction, he will be charged with the resulting expense and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.
32. **INSPECTION.** The Engineer and his representative shall, at all times, have access to the work during its construction, and shall be furnished with every reasonable facility for ascertaining that the stock and materials used and employed, and the workmanship are in accordance with the requirements and intentions of the Specifications. All work done and all materials furnished shall be subject to their inspection and approval. If any work should be covered up without approval or consent of the Engineer, it must, if required by the Engineer, be uncovered for examination at the Contractor's expense.

Re-examination of questioned work may be ordered by the Engineer and if so ordered, the work must be uncovered by the Contractor. If such work be found in accordance with the Contract Documents, the Owner shall pay the cost of re-examination and replacement. If such work be found not in accordance with the Contract Documents, the Contractor shall pay such cost unless he shall show that the defect in the work was caused by another Contractor, and in that event, the Owner shall pay such cost.

The inspection of the work shall not relieve the Contractor of any of his obligations to fulfill his contract as prescribed, and defective work shall be made good and unsuitable materials shall be rejected, notwithstanding that such defective work and materials have been previously overlooked and accepted on estimates for payment. All work shall be tested to the satisfaction of the Engineer before acceptance.

No work shall be done at night without the prior approval of the Engineer.

33. **DEFECTIVE WORK OR MATERIAL.** The Contractor shall promptly remove from the premises all work and materials condemned by the Engineer as failing to conform to the contract, whether incorporated or not, and the Contractor shall promptly replace and re-execute his own work in accordance with the Contract and without expense to the Owner and shall bear the expense of making good all work of other contractors destroyed or damaged by such removal or replacement.

If the Contractor does not remove such condemned work or materials within a reasonable time after notice, the Owner may remove them and store the materials at the expense of the Contractor. If the Contractor does not pay the expenses of such removal within ten days' time thereafter, the Owner may, upon thirty days' written notice, sell such materials at auction or at private sale and shall account for the net proceeds thereof after deducting all the costs and expenses that should have been borne by the Contractor.

34. **OTHER CONTRACTS.** The Owner may award other contracts. The Contractor shall fully cooperate with such other Contractors and carefully fit his own work to that provided under other contracts as may be directed by the Engineer. The Contractor shall be liable for any act which will damage or interfere with the performance of work by any other Contractor.
35. **OWNER'S RIGHT TO TAKE OVER THE WORK.** If the Contractor should be adjudged a bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed to take over his affairs, or if he should fail to prosecute his work with due diligence and carry the work forward in accordance with his work schedule and the time limits set forth in the Contract Documents, or if he should fail to substantially perform one or more of the provisions of the Contract Documents to be performed by him, the Owner may serve written notice on the Contractor and the surety on his performance bond, stating its

Item V (cont.)

intention to exercise one of the remedies hereinafter set forth and the grounds upon which the Owner bases its right to exercise such remedy.

In any event, unless the matter complained of is satisfactorily cleared within ten days after service of such notice, the Owner may, without prejudice to any other right or remedy, exercise one of such remedies, at once, having first obtained a certificate from the Engineer that sufficient cause exists to justify such action.

- (a) The Owner may terminate the services of the Contractor, which termination shall take effect immediately upon service of notice thereof on the Contractor and his surety, whereupon the surety shall have the right to take over and perform the contract. If the surety does not commence performance of the contract within ten days after service of the notice of termination, the Owner may itself take over the work, take possession of and use all materials, tools, equipment, and appliances on the premises and prosecute the work to completion by such means as it shall deem best. In the event of such termination of his service, the Contractor shall not be entitled to any further payment under his contract until the work is completed and accepted. If the Owner takes over the work and if the unpaid balance of the contract price when the Owner takes over the work, exceeds the cost of completing the work, including compensation for any damages or expenses incurred by the Owner through the default of the Contractor, such excess shall be paid to the Contractor. In such event, if such cost, expenses, and damages shall exceed such unpaid balance of the contract price, the Contractor and his surety shall pay the difference to the Owner. Such cost, expenses, and damages shall be certified by the Engineer.
- (b) The Owner may take control of the work and either make good the deficiencies of the Contractor itself or direct the activities of the Contractor in doing so, employing such additional help as the Owner deems advisable. In such event the Owner shall be entitled to collect from the Contractor and his surety, or to deduct from any payment then or thereafter due the Contractor, the costs incurred by it through the default of the Contractor, provided the Engineer approves the amount thus charged to the Contractor.
- (c) The Owner may require the surety on the Contractor's bond to take control of the work at once and see to it that all the deficiencies of the Contractor are made good with due diligence. As between the Owner and the surety, the cost of making good such deficiencies shall all be borne by the surety. If the surety takes over the work, either upon termination of the services of the Contractor or upon instructions from the Owner to do so, the provisions of the Contract Documents shall govern in respect to the work done by the surety, the surety being substituted for the Contractor as to such provisions, including provisions as to

payment for the work and provisions of this section as to the right of the Owner to do the work itself or to take control of the work.

36. **CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE CONTRACT.** If the work shall be stopped under an order of any court or other public authority for a period of three months through no act or fault of the Contractor or of any one employed by him, then the Contractor may on seven days' written notice to the Owner and the Engineer stop work or terminate this contract and recover from the Owner payment for all work executed, any losses sustained on any plant or material, and a reasonable profit. If the Engineer shall fail to issue any certificate for payment within ten days after it is due, or if the Owner shall fail to pay the Contractor within fifteen days after its maturity and presentation any sum certified by the Engineer, then the Contractor may on seven days' written notice to the Owner and the Engineer stop work and give written notice of intention to terminate this contract. If the Owner shall thereafter fail to pay the Contractor within seven days after receipt of such notice, then the Contractor may terminate the contract and recover from the Owner payment for all work executed, any losses sustained upon any plant or materials, and a reasonable profit.
37. **DELAYS AND EXTENSION OF TIME.** If the Contractor be delayed at any time in the progress of the work by an act or neglect of the Owner or the Engineer, or of any employee of either, or by any separate Contractor employed by the Owner, or by changes ordered in the work, or by strike, lockouts, fire, unusual delay in transportation, unavoidable casualties, or any causes beyond the Contractor's control, or by delay authorized by the Engineer, or by any cause which the Engineer shall decide to justify the delay, then the time of completion shall be extended for such reasonable time as the Engineer may decide.
- No such extension shall be made for delay occurring more than seven days before claim therefor is made in writing to the Engineer. In the case of a continued cause of delay, only one claim is necessary.
- This section does not exclude the recovery of damages for delay by either party under other provisions in the Contract Documents.
38. **RIGHT OF OCCUPANCY.** The Owner shall have the right, if necessary, to take possession of and to use any completed or partially completed portions of the work, if such use be approved by the Engineer even if the time for completing the entire work or such portions of the work has not expired and even if the work has not been finally accepted. Such possession and use shall not constitute an acceptance of such portions of the work. The Owner shall not have the right of such possession and use if it materially interferes with the Contractor's operations. The Owner shall also have the right to enter the premises for the purpose of doing work not covered by its contract with the Contractor.

Item V (cont)

39. **UNDERGROUND OBSTRUCTIONS.** The Contractor shall anticipate all underground obstructions such as waterlines, gaslines, sewer lines, utility lines, concrete, and debris. No extra payment will be allowed for the removal, replacement, repair or possible increased cost caused by underground obstructions. Any such lines or obstructions indicated on the map show only the approximate location and must be verified in the field by the Contractor. The Owner and Engineer will endeavor to familiarize the Contractor with all known underground utilities and obstructions, but this will not relieve the Contractor from full responsibility in anticipating all underground obstructions.
40. **ACCEPTANCE.** Final inspection and acceptance of the work shall be made for the Owner by the Engineer in collaboration with the Engineer for the Farmers Home Administration. Such inspection shall be made as soon as practical after the Contractor has notified the Owner in writing that the work is ready for such inspection.
41. **FINAL ESTIMATES.** Upon the completion and acceptance of the work, the Engineer shall issue a certificate that the whole work provided for in this contract has been completed and accepted by him under the conditions and terms thereof and shall make the final estimate of the work. The final estimate of the work must be checked and approved by both the Engineer and the Representative for the Farmers Home Administration. After issuance of the certificate, the entire balance found to be due the Contractor, including said retained percentage but excepting such sums as may be retained lawfully by said Owner, shall be paid to the Contractor by the Owner in accordance with existing State laws. Before the approval of the final estimate, the Contractor shall submit evidence satisfactory to the Owner that all payrolls, material bills and outstanding indebtedness in connection with this contract have been paid.
42. **CLEANING UP.** Upon completion or termination of the work, the Contractor shall, as directed by the Engineer, remove from the vicinity of the work all equipment and all temporary structures, waste materials and rubbish resulting from his operations, leaving the premises in a neat and presentable condition. In the event of his failure to do so, the same may be done by the Owner at the expense of the Contractor, and his surety shall be responsible therefor.
43. **MAINTENANCE OF SYSTEM.** The Contractor shall, for a period of one year after completion and acceptance of work, repair at his expense any leak or other failures. During the first 30 days of this period, the Contractor shall clean out any screens or valves that have become plugged with dirt and debris during this 30-day period. The 10 percent retainer on the contract payments will be held by the Owner until the end of this 30-day period. In the event that the Contractor should fail to make such repairs and adjustments or other similar work, the Owner may do so and charge the Contractor the cost of the same. At the end of the 30 days, the Contractor may at his option furnish a maintenance bond for the remaining 11 months or he may elect to have the Owner retain the 10 percent for the remainder of the period.

44. **EQUAL OPPORTUNITY.** During the performance of this contract, the contractor agrees as follows: (Added 3-4-71 -- PN 247.)
- (a) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited, to the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; lay-off or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post inconspicuous places available to employees and applicants for employment, notices to be provided by the Farmers Home Administration setting forth the provisions of this nondiscrimination clause.
 - (b) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.
 - (c) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the Farmers Home Administration, advising the said labor union or workers' representative of the contractor's commitments under this agreement as required pursuant to section 301 of Executive Order 11246 of September 24, 1963, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
 - (d) The contractor will comply with all provisions of such Executive Order and of all relevant rules, regulations, and orders of the Secretary of Labor and any prior authority which remain in effect.
 - (e) The contractor will furnish all information and reports required by such Executive Order, rules, regulations, and orders, or pursuant thereto, and will permit access to his books, records, and accounts by the Farmers Home Administration and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

Item V (cont.)

- (f) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further contracts in accordance with procedures authorized in such Executive Order and such other sanctions may be imposed and remedies invoked as provided in the such Executive Order or by such rule, regulation, or order, or as otherwise provided by law.
- (g) The contractor will include the provisions of paragraphs (a) through (f) in every subcontract or purchase order, unless exempted by such rules, regulations, or orders, so that such provisions will be binding upon each such subcontractor or vendor. The contractor will take such action as the Farmers Home Administration may direct as a means of enforcing such provisions, including sanctions for noncompliance: Provided, however, that in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the Farmers Home Administration, the contractor may request the United States to enter into such litigation to protect the interest of the United States

The provisions of this "Equal Opportunity Clause" are not applicable to any contract not exceeding \$10,000.

This contract shall be binding upon the parties hereto and their respective heirs, executors, administrators, successors, and assigns.

IN WITNESS WHEREOF, the parties hereto have caused these presents to be executed the day and year first above written.

Lincoln County Rural Water System
Owner

Attest:

By _____

Title President

Title Secretary

FHA Instruction 424.2
Exhibit C
Page 16
Item V (cont.)
(Added 3-4-71 - PN 247)

Contractor

By _____

Title _____

Approved as lender or insurer of funds
to defray the costs of this contract, and
without liability for any payments there-
under, the Farmers Home Administration
hereby concurs in the award of this
contract to

U. S. Department of Agriculture
Farmers Home Administration

By _____

Title _____

This contract shall not be effective unless and until approved by the State Director of
the Farmers Home Administration, U. S. Department of Agriculture, or his delegated
representative.

ITEM XI

LINCOLN COUNTY RURAL WATER SYSTEM
HARRISBURG, SOUTH DAKOTA

CERTIFICATE OF OWNER'S ATTORNEY

I, the undersigned, Lloyd Myrabo, duly authorized and acting legal representative of Lincoln County Rural Water System, do hereby certify as follows:

I have examined the foregoing contract and surety bond and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements has been duly executed by the proper parties thereto acting through their duly authorized representative; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with terms, conditions and provisions thereof.

Lloyd Myrabo

Date _____

UNITED STATES DEPARTMENT OF AGRICULTURE
FARMERS HOME ADMINISTRATION

Form FHA 400-6 COMPLIANCE STATEMENT
(Rev. 2-17-71)

This statement relates to a proposed contract with _____

(Name of borrower or grantee)

who expects to finance the contract with assistance from the Farmers Home Administration, United States Department of Agriculture. I am the undersigned bidder or prospective contractor. I represent that - - -

1. I ☐ have, ☐ have not, participated in a previous contract or subcontract subject to executive order 11246 (regarding equal employment opportunity) or a preceding similar Executive order.
2. If I have participated in such a contract or subcontract, I ☐ have, ☐ have not, filed all compliance reports that I have been required to file in connection with the contract or subcontract.

If the proposed contract is for \$50,000 or more and I have 50 or more employees, I also represent that - - -

3. I ☐ have, ☐ have not previously had contracts subject to the written affirmative action program requirements of the Secretary of Labor.
4. If I have participated in such a contract or subcontract, I ☐ have, ☐ have not, developed and placed on file at each establishment affirmative action programs as required by the rules and regulations of the Secretary of Labor.

I understand that if I have failed to file any compliance reports that have been required of me, I am not eligible and will not be eligible to have my bid considered or to enter into the proposed contract unless and until I make an arrangement regarding such reports that is satisfactory to the Farmers Home Administration or to the office where the reports are required to be filed.

I also certify that I do not maintain or provide for my employees any segregated facilities at any of my establishments, and that I do not permit my employees to perform their services at any location, under my control, where segregated facilities are maintained. I certify further that I will not maintain or provide for my employees any segregated facilities at any of my establishments, and that I will not permit my employees to perform their service at any location, under my control, where segregated facilities are maintained. I agree that a breach of this certification is a violation of the Equal Opportunity clause in my contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom, or otherwise. I further agree that (except where I have obtained identical certifications for proposed subcontractors for specific time periods) I will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity clause; that I will retain such certifications in my files; and that I will forward the following notice to such proposed subcontractors (except where the proposed subcontractors have submitted identical certifications for specific time periods): (See Reverse).

**NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENTS FOR
CERTIFICATIONS OF NON-SEGREGATED FACILITIES**

A certification of Nonsegregated Facilities, as required by the May 9, 1967, order (32F.R. 7439, May 19, 1967) on Elimination of Segregated Facilities, by the Secretary of Labor, must be submitted prior to the award of a subcontract exceeding \$10,000 which is not exempt from the provisions of the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semiannually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.

Date _____

Signature of Bidder or Prospective Contractor

Address (include Zip Code)

ITEM VI

PERFORMANCE-PAYMENT BOND

THE STATE OF _____
COUNTY OF _____

KNOW ALL MEN BY THESE PRESENTS: That we (1) _____
(2) _____ of _____
hereinafter called Principal and (3) _____ of _____
State of _____, hereinafter called the Surety, are held and
firmly bound unto (4) _____, hereinafter called Owner, and
unto all persons, firms, and corporations who may furnish materials for, or
perform labor upon the building or improvements hereinafter referred to in
the penal sum of _____ Dollars (\$ _____)
in lawful money of the United States to be paid in (5) _____,
for the payment of which sum, well and truly to be made, we bind ourselves,
our heirs, executors, administrators and successors, jointly and severally,
firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the
Principal entered into a certain contract with (6) _____
A. D. 19____, a copy of which is hereto attached and made a part hereof for
the construction of: (7) _____

NOW, THEREFORE, if the principal shall (1) well and truly perform and
fulfill all the undertakings, covenants, terms, conditions, and agreements
of said contract during the original term of said contract and any extension
thereof that may be granted by the Owner, with or without notice to the surety,
and during the life of any guaranty required under the contract, and (2) promptly
make payment to all persons supplying labor and material to the principal or
to any subcontractor of the principal in the prosecution of the work provided
for in said contract (failing which such persons shall have a direct right of
action against the principal and surety under this obligation), and (3) well and
truly perform and fulfill all the undertakings, covenants, terms, conditions,
and agreements of any and all duly authorized modifications of said contract
that may hereafter be made, and promptly make payment to all persons supplying
labor and material to the principal or to any subcontractor of the principal in
the prosecution of the work provided for in such modifications (failing which
such persons shall have a direct right of action against the principal and surety
under this obligation), notice to the surety of all duly authorized modifications
being hereby waived, then this obligation to be void; otherwise to remain in
full force and virtue.

IN WITNESS WHEREOF, this instrument is executed in _____
counterparts, each one of which shall be deemed an original, this the
_____ day of _____, 19____.

FHA Instruction 424.2
Exhibit C
Page 2
Item VI (cont.)

ATTEST:

(Principal) Secretary
(SEAL)

Witness as to Principal

(Address)

ATTEST:

(Surety) Secretary
(SEAL)

Witness as to Surety

(Address)

(8) _____
Principal

By _____

Address

Surety

By _____
Attorney-in-Fact

(Address)

.....
NOTE: Date of Bond must not be prior to date of Contract.

- (1) Correct name of Contractor.
- (2) A Corporation, a Partnership or an Individual, as case may be.
- (3) Correct name of Surety.
- (4) Correct name of Owner.
- (5) County and State.
- (6) Name of owner - and the date of the contract including the day, month, and year.
- (7) Describe facilities.
- (8) If Contractor is Partnership, all partners should execute bond.

APPLICATION FOR PAYMENT

CONTRACTOR'S APPLICATION NO. _____

JOB _____ PERIOD FROM _____ TO _____

TO _____ OWNER. APPLICATION IS MADE FOR PAYMENT,

AS SHOWN BELOW, IN CONNECTION WITH THE _____ WORK

FOR YOUR _____ PROJECT.

(1) DESCRIPTION OF WORK	(2) CONTRACT AMOUNT	(3) THIS APPLICATION		(4) COMPLETED TO DATE		(5) BALANCE TO FINISH
		Labor	Materials	(a) Percent	(b) Amount	
	\$	\$	\$	%	\$	\$
TOTAL	\$	\$	\$	%	\$	\$

This is to certify that the work as listed above has been completed in accordance with the Contract Documents. That all lawful charges for labor, materials, etc., covered by previous certificates for payment have been paid and that a payment is now due in the amount of

_____ DOLLARS (\$_____)

from which retainage of _____% as set out in the Contract Documents shall be deducted _____

_____ CONTRACTOR

DATE 19 PER _____

(See Reverse For Instructions)

INSTRUCTIONS FOR COMPLETING THIS FORM FHA-SD-424-11B, APPLICATION FOR PAYMENT:

PURPOSE: This form will be used by contractors working on construction financed by the Farmers Home Administration.

1. Partial payments will be made in accordance with contract terms or as otherwise agreed.
2. The form is to be completed as follows. Make _____ copies.

Column (1), Description of Work: All items of work will be listed exactly as they appear on the bid schedule in the contract.

Column (2), Contract Amount: Enter the exact contract amount as shown for each item in the bid schedule.

Column (3), This Application - Labor and Materials: Enter the amount for labor and materials for the work completed during the period which this application covers.

Column (4), Completed to Date - (a) Percent and (b) Amount:
(a) Show the total percentage of each item completed up to the end of this pay period.
(b) Show the total dollar value of each item completed up to the end of this pay period.

Column (5), Balance to Finish: Show the dollar value of the amount of work of each item yet to be finished.

ALL TOTALS MUST BE ADDED FOR EACH COLUMN.

CHANGE ORDERS: When Change Orders are issued to change quantity and the amount of an item or add new items, it will be treated as another item and added to the list of items in column (1) with figures entered in the proper columns.

AT THE BOTTOM OF THE FORM THE CONTRACTOR MUST COMPLETE THE AMOUNT DUE AND THE CALCULATIONS FOR RETAINAGE. He should enter the date and sign all copies.

Send all copies to the Project Engineer or Architect. If there is none for the project, then send all copies to the FHA County Supervisor as instructed.

CERTIFICATE FOR PAYMENT

ISSUE DATE _____

CERTIFICATE NO. _____

TO _____ OWNER

THIS IS TO CERTIFY that in accordance with your contract dated _____, 19____
with _____, Contractor for _____
_____ is entitled to Payment No. _____ which is for the period
_____ 19____ through _____ 19____, in the amount of: _____
_____ Dollars (\$ _____). The present status of the account

for the above contract is as follows:

ORIGINAL CONTRACT SUM \$ _____

Additions Deductions

Change Order approved in previous
months by Owner - Total

\$ _____ \$ _____

Change Order No. _____

Change Order No. _____

Change Order No. _____

Totals \$ _____ \$ _____

Total Additions \$ _____

Sub Total \$ _____

Total Deductions \$ _____

This is to certify that all bills are
paid for which previous certificates
for payment were issued.

TOTAL OF CONTRACT TO DATE \$ _____

CONTRACTOR _____

Work to Finish (this date) \$ _____

BY _____

Due Contractor to date \$ _____

DATE _____ 19____

Less Retainage _____% \$ _____

Less Previous Payments \$ _____

THIS CERTIFICATE \$ _____

CERTIFICATE APPROVAL

OWNER _____

BY _____ DATE _____

FARMERS HOME ADMINISTRATION

BY _____

Date _____ 19____

This certificate is based on the estimated
amount of work complete in the period covered
and any retainage shown is deducted there-
from. This certificate is not negotiable, it
is payable only to the payee named herein and
its issuance, payment and acceptance are
without prejudice to any rights of the Owner
or Contractor under their contract.

TITLE _____
BY _____

(See Reverse For Instructions)

INSTRUCTIONS FOR COMPLETION OF FORM FHA-SD-424-11A, CERTIFICATE FOR PAYMENT:

PURPOSE: This form will be used by Engineers or Architects working on projects financed by the Farmers Home Administration. In the absence of an Engineer or Architect, the form will be completed by the County FHA Supervisor.

The information for this form will be taken from Form FHA-SD-424-11B which will be received from the contractor.

The form will be completed in _____ copies as follows:

1. Fill in all information as called for in the heading.
2. The original contract sum will be the total amount of the official contract - this figure will never be changed.
3. Always enter in the total amount for all change orders listed on previous certificates for payment.
4. List the change orders that were issued this pay period.
5. As change orders are issued, you must complete the calculations to adjust the TOTAL CONTRACT TO DATE figure.
6. Work to Finish: This figure will come from the Form FHA-SD-424-11B, Total of Column (5), Balance to Finish.
7. Due Contractor to Date: This figure will be taken from Column 4(b) of Form FHA-SD-424-11B.
8. Less Retainage: The amount of retainage will accumulate with each payment application and the total of the previous payment certificates and the one being prepared will be entered here.
9. Less Previous Payments: The total of all previous payments will be entered here; this will be the amount of their payment.
10. The certification signed below will be signed by the person completing the form. (All copies.)
11. The contractor must sign all copies. (The person preparing the form will get his signature.)
12. All copies of the completed form will be forwarded to the County FHA Supervisor. He will review it. All interim payment certificates will be signed by him.
13. When approved by FHA, all copies will be forwarded to the proper officer representing the governing body of the owner.
14. The governing body will take action, sign, date, and return all copies to the County FHA Supervisor for distribution.

SPECIAL CONDITIONS

SC-1. Responsibility of Contractor for Backfill: The Contractor shall be responsible, financially and otherwise, for (a) any and all settlement or erosion of trench and other backfill which may occur from the time of original backfilling until the expiration of a period of one year from and after the date of final acceptance of the entire contract under which the backfilling work was performed, (b) the refilling and repair of all backfill settlement or erosion and the repair or replacement to the original or a better condition of all pavement, top surfacings, driveways, curbs, gutters, walks, surface structures, utilities, drainage facilities, sod and shrubbery which have been damaged as a result of said backfill settlement or erosion or which have been removed or destroyed in connection with backfill replacement operations, and (c) any and all damage claims filed with or court actions brought against the Owner for and on account of any damage(s) directly or indirectly caused by said backfill settlement or erosion.

The Contractor shall make or cause to be made all necessary backfill replacements and repairs or replacements appurtenant thereto, within seven (7) days from and after due notification by the Engineer or Owner of backfill settlement or erosion and resulting damage at any designated location(s).

SC-2. Liquidated Damages: It is hereby understood and mutually agreed by and between the Contractor and the Owner that the date of beginning, rate of progress and the time of completion of the entire contract are ESSENTIAL CONDITIONS of this Contract. It is further mutually understood and agreed that the work embraced in this contract shall be commenced on a date as stated in the Notice to Proceed and shall be completed in accordance with the calendar days set forth in the Construction Contract.

IF THE SAID CONTRACTOR SHALL NEGLECT, FAIL OR REFUSE TO COMPLETE THE WORK WITHIN THE TIME SPECIFIED, then the Contractor does hereby agree as a part consideration for the awarding of this Contract to pay to the Owner the amount specified below, not as a penalty, but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the contract for completing the work.

The said amount of one hundred dollars (\$100.00) per day is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain. Said amount is agreed to be the amount of damages which the Owner would sustain and said amounts shall be retained by the Owner from current periodic estimates.

It is further agreed that time is of the essence in each and every portion of this Contract and where under the Contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this contract.

SC-3. Public Convenience: During the progress of the work, the convenience of the local public and of residents along the work shall be considered and, where possible, their rights of access shall be preserved. Temporary driveways, approaches and crossings shall be provided where practicable and maintained in good condition. Construction materials shall be so stored or stockpiled as to cause as little obstruction as possible and still be readily accessible for use or inspection.

SC-4. Water Requirements: (DIVISION I AND DIVISION II CONTRACTORS)

Upon completion of the ground storage reservoir and pumping station the Division I Contractor will have available water for testing, flushing and disinfecting. The Division I Contractor shall pay the Owner 35¢/1,000 gallons of water used for such purposes to cover the cost of water purchase from the City of Sioux Falls and miscellaneous costs. The Division I Contractor shall also make available water to the Division II Contractor for his needs at 35¢/1,000 gallons. The Division I Contractor will be billed for water monthly based on the master meter reading in the pumping station less usage by rural customers that may have been connected to the line.

Water required by the Division I Contractor for testing, flushing and disinfecting prior to completion of the ground storage reservoir and pumping station shall be furnished by the Division I Contractor from a source and by a method approved by the Engineer at the sole expense of the Division I Contractor.

SC-5. Utility Lines: There are privately owned utility lines in the area. Utility crossings are in the area and have been noted on the Plans. However, the Contractor shall notify all utility companies before the start of construction so that the Owners may positively locate their utility service. The Contractor shall be held responsible for any damage incurring to any utility.

SC-6. Highway or Railroad Crossings: The Plans show the locations of all highway or railroad crossings. The Contractor shall contact the governing agency or Owner and notify them of their anticipated schedule of construction. The governing agency or Owner will not assume any responsibility for damage to any utility.

SC-7. Rights-of-Way: The rights-of-way necessary for construction of the project will be provided by the Owner. The Contractor shall confine his construction operations to the immediate vicinity of the location shown on the Plans and shall use due care in placing construction tools, equipment, excavated materials and pipe line materials and supplies, so as to cause the least possible damage to property and interference with traffic.

The Contractor shall be responsible for all damage to crops and other property outside of the boundaries of the rights-of-way and shall make satisfactory settlement for such damage directly with the property owner and tenant involved, as their interests in such damage may require. The pipeline rights-of-way on private property shall not exceed 15' right and 15' left of the pipeline centerline. In most cases the 30' pipeline easement shall be adjacent to the road right-of-way on fence line on private property.

If it is necessary or desirable that the Contractor use or occupy land outside of the Owner's rights-of-way, the Contractor shall obtain written consent from or execute a written agreement with the Owner and tenant of such land permitting such occupation; the Contractor shall not enter for pipe delivery or occupy for any other purposes with men, tools, equipment, construction materials, or with materials excavated from the pipe trench, any private property outside the designated right-of-way boundaries without such written permission from the Owner and tenant of the entered or occupied property. Each owner and tenant of land or other property so notified by the Contractor shall be informed not less than five (5) days prior to such occupation.

SC-8. Fences: All existing fences which interfere with the construction operations shall be maintained by the Contractor until the completion of the work affected thereby, unless permission is obtained from the Owner or tenant thereof to leave an interfering fence dismantled for any agreed period of time. Where fences must be maintained across the pipe line right-of-way, adequate gates shall be installed in such fences on each side of the pipe line, which gates shall be kept closed at all times they are not in use.

On completion of the work across any tract of land, the Contractor shall restore all fences to their original or to a better condition and quality, purchasing new material to replace all materials lost, damaged or destroyed. Temporary gates installed by the Contractor in any fence line may be left in place with the permission of the Owner and tenant of such fence.

All materials used in fence repairs or replacements shall be of same material as original fence or better.

SC-9. Barricades and Lights: All open trenches and other excavations shall be provided with suitable barriers, signs and lights to the extent that adequate protection is provided to the public

against accident by reason of such open construction. Obstructions such as material piles and equipment shall be provided with similar warning signs and lights.

All barricades and obstructions shall be illuminated by means of acceptable warning lights at night and all lights used for this purpose shall be kept burning from sunset to sunrise. Materials stored upon or alongside public streets, roads and highways shall be so placed that the work at all times shall be so conducted as to cause the minimum obstruction and inconvenience to the traveling public.

All barricades, signs, warning lights and other protective devices shall be installed and maintained in conformance with applicable statutory requirements and where within highway rights-of-way as required by the authority having jurisdiction thereover.

SC-10. Protection and Maintenance of Public and Private Property:
The Contractor shall protect, shore, brace, support and maintain all underground pipes, conduits, drains and other underground construction uncovered or otherwise affected by the construction work performed by him. All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires and other surface structures affected by construction operations in connection with the performance of the contract, together with all sod and shrubs in yards and parkings crossed by or adjacent to the pipe line shall be maintained, and if removed or otherwise damaged, shall be restored to the original condition thereof as determined and approved by the Engineer. All replacements of such underground construction and surface structures or parts thereof shall be made with new materials conforming to the requirements of these specifications or, if not specified, as approved by the Engineer.

The Contractor shall be responsible for all damage to streets, roads, highways, ditches, shoulders, embankments, culverts, bridges or other public or private property or facility, regardless of location or character, which may be caused by moving, hauling, or otherwise transporting equipment, materials or men to or from the work or any site thereof, whether by him or his subcontractor(s). The Contractor shall make, without delay, satisfactory and acceptable arrangements with the Owner(s) of or the agency or authority having jurisdiction over the damaged property, surface, structure or facility concerning its repair or replacement or payment of costs incurred in connection with said damage.

SC-11. Copies of Plans and Specifications: The Contractor will be furnished without cost to him with up to five (5) copies of all plans, specifications and staking sheets, together with any and all addenda thereto. The Contractor shall keep one (1) copy of all such specifications and drawings constantly accessible on the work.

Additional copies of such specifications and drawings, in excess of the number furnished without charge to the Contractor, may be obtained by him from the Engineer for the cost of printing and delivery of the additional copies so obtained.

SC-12. Schedule of Operation: Before work is started, the Contractor shall prepare a detailed schedule of all construction operations that shall not only indicate the sequence of the work, but also the time of starting and completion of each part and the cost thereof as indicated in the cost breakdown estimate. The schedule will be submitted to the Engineer for his approval and shall include Contractor's cost estimates by months.

If conditions beyond the control of the Contractor justify and the Owner approves an extension of time, the Contractor shall revise the construction schedule in accordance with the approved extensions.

The Owner may require the Contractor to add to his plant, equipment and construction forces, as well as increases in the working hours, if operations fall behind the approved schedule to an extent that the completion of the work within the specified time appears doubtful.

SC-13. Schedule of Construction: The Division I Contractor's attention is directed to Section 1-1.08 of the Technical Specifications. The Contractor shall arrange his schedule of construction so as to provide for a section or area of work to be completed and ready for use. No road crossings, or skips in pipeline construction shall be left, causing an area or section to be unusable. Said schedule of construction shall be presented to the Engineer for his checking and approval. Any skips in line construction left beyond a reasonable time and without a reasonable explanation shall be subject to removal from the next monthly pay estimate.

SC-14. Repairs After Job Completion: It is understood that repairs, due to faulty workmanship or materials, shall be covered by the Performance and Maintenance Bond. However, a break in one of the lines shall be deemed an emergency and must be repaired immediately. The Contractor, therefore, prior to leaving the project shall have an understanding and agreement by signed letter or appropriate entry in the Owner's minutes of the meeting as to the procedure for making said emergency repairs and notification to the Contractor.

SC-15. Field Office: The Division I Contractor, during the performance of this contract, shall maintain a suitable field office complete with telephone at the site of the work which shall be the headquarters of a representative authorized to receive drawings, instructions

or other communications or articles from the Owner or the Owner's agents; and any such communication given to the said representative or delivered at the Contractor's office at the site of the work in his absence, shall be deemed to have been given to the Contractor. Copies of the Contract Documents, specifications and plans for the work shall be kept at the said office, available for use at any time.

In addition to the above, upon request of the Engineer, the Division I Contractor shall provide a suitable field office, either adjacent to or partitioned off from his office at the site for use of the Engineer and Inspectors. The office shall be provided with outside entrance door with a substantial lock; glazed windows suitable for light and ventilation and adequate heating and lighting facilities. The office shall be of sufficient size to care for and shall be furnished with a suitable work table, two chairs, a plan rack and a locker to be used for the storage of surveying instruments. The door or doors on the locker shall be equipped for padlocking. The general arrangement of the office and facilities provided shall meet with the approval of the Engineer.

SC-16. Changes and Alterations: The Engineer and Owner reserve the right to make such changes and alterations in the plans or in the quantities of the work as may be considered necessary or desirable, and such changes and alterations shall not be considered as a waiver of any condition of the Contract, nor shall invalidate any of the provisions thereof. The Contractor shall perform the work as increased or decreased, and no allowances will be made for anticipated profits. When such changes and alterations increase or decrease, the quantity of work to be done, or materials to either party to the contract upon demand shall be entitled to a revised consideration on that portion of the work above or below twenty (20) percent of the quantity stated in the proposal, such revised consideration to be determined by special agreement. Contract Change Order procedure will be followed in all cases.

LOG OF TEST HOLES
AND
SUBSOIL REPORT

Soil Exploration Company

FORMERLY OPERATED AS A DEPARTMENT OF
TWIN CITY TESTING AND ENGINEERING LABORATORY, INC.
352 CROMWELL AVENUE - ST. PAUL, MINN. 55114 - 645-6446

BRANCH OFFICES:
FARGO, ND.
BISMARCK, ND.
SIOUX FALLS, SD.
WATERLOO, IOWA
ROCHESTER, MINN.

OFFICERS:
CHARLES W. BRITZIUS-President
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CLINTON R. EUE-Secretary
JOHN F. GISLASON-Treasurer

August 6, 1971

DeWild-Grant-Reckert and Associates
315 First Avenue
Rock Rapids, Iowa 51246

Attention: Mr. Delmar Koel

Re: Soil Investigation - Proposed
Water Storage Facilities -
Harrisburg, South Dakota -
#600-325

Gentlemen:

We have conducted a soil investigation and foundation analysis for the referenced project. We are transmitting five copies of our report. This work was conducted in accordance with your verbal authorization on June 28, 1971.

Under separate cover we are sending representative samples of the soil for your personal inspection. About 50% of the remaining soil samples will be held at this office for two months and will then be discarded unless we are notified to hold them for a longer period of time.

As part of our professional services, we have on our staff foundation and soils engineers and engineering geologists available for consultation. As the scope of the project develops, they will be available to you to discuss the specific problems as they arise or aid you in your evaluations.

Very truly yours,

SOIL EXPLORATION COMPANY


Samuel Ng


Thomas K. Smith, P. E.

SN/TKS:dk
Encs.

SOIL INVESTIGATION
PROPOSED WATER STORAGE FACILITIES
LINCOLN COUNTY RURAL WATER SYSTEM

HARRISBURG, SOUTH DAKOTA

#600-325

REPORT OF SOIL INVESTIGATION
PROPOSED WATER STORAGE FACILITIES
LINCOLN COUNTY RURAL WATER SYSTEM

HARRISBURG, SOUTH DAKOTA

#600-325

INTRODUCTION

This report presents our findings and recommendations pertaining to the soil investigation and engineering analysis for the referenced project. The purpose of this report is to describe the soil conditions encountered at the site, to analyze and evaluate these conditions, the laboratory test results, and, based on this data, to recommend possible foundation designs and construction procedures.

FIELD INVESTIGATION PROCEDURES

A total of five soil test borings were made at two project sites on July 1 and 2, 1971. The borings were put down approximately at the locations given on the site plan furnished to us, as shown on the attached sketch. The surface elevations were referenced to the iron pipes near the borings, as shown also on the sketch, both taken as 100.0', an assumed elevation.

Soil sampling was performed in accordance with ASTM: D 1586-67. Using this procedure, a 2" O. D. split barrel sampler is driven into the soil by a 140 lb weight falling 30". After an initial set of 6", the number of blows required to drive the sampler an additional 12" is known as the penetration resistance or N value. The N value is an index of the relative density of cohesionless soils and the consistency of cohesive soils. Thin wall tube samples were obtained according to ASTM: D 1587-67 where indicated by appropriate symbol on the boring logs.

As the samples were obtained in the field, they were visually and manually classified by the crew chief in accordance with ASTM: D 2488-69. Representative portions of all samples were then returned to the laboratory for further examination and for verification of the field classification. In addition, selected samples were submitted to a program of laboratory tests. Logs of the borings indicating the depth and identification of the various strata, the N value, the laboratory test data, water level information and pertinent information regarding the method of maintaining and advancing the drill holes are attached. Charts illustrating the soil classification procedure, the descriptive terminology and symbols used on the boring logs are also attached.

SITE AND SOIL CONDITIONS

General

The referenced project involves two proposed water storage facilities which are:

1. an elevated water tank (at construction site A), with 100,000 gallons capacity,
- and 2. a ground water tank (at construction site B) with 750,000 gallons capacity.

The proposed construction sites are about three miles apart; and both are located approximately east of the intersection of Highways 29 and 229.

Soil Conditions At Site A

Borings 1, 2 and 3 were put down at this site on/or near the proposed tank footing locations. The ground surface at the boring locations has less than 1' difference in elevation.

Based on the boring logs, the predominant soil in the soil profile is a lean clay. A thin layer of topsoil was found at the surface. The lean clay has a consistency ranging from medium to stiff; its penetration resistance increases at greater depths.

Soil Conditions at Site B

Borings 4 and 5 were made at this site around the tank periphery. According to the furnished topographic map, the ground surface slopes down from westerly to easterly direction and shows approximately 4' difference in elevation.

The boring logs show that the soil profile consists of a clay till underlain by a fine alluvium which in turn is underlain by another clay till. The alluvium is a clayey silt which is encountered at about 18' to 39' and 42' in borings 4 and 5, respectively. In general, the till is fairly firm whereas the alluvium is soft and indicates a relatively uniform consistency.

Geology

According to our available geologic information, the first bedrock at this area is probably the Sioux Quartzite. The depth of this rock may be at less than 100' below grade.

GROUND WATER

Ground water was observed in one boring at Site A and in both borings at Site B. However, since the water level measurements were made in impermeable soils within a short period of time, they should not be regarded as a reliable indication of the water table position. Furthermore, both seasonal and annual water table fluctuations may be expected to occur.

LABORATORY TESTS

Representative soil samples were submitted to our laboratory to determine their natural moisture content, dry density, liquid limit, plastic limit and unconfined compressive strength. In addition, a consolidation test and triaxial compression tests were performed for clayey silt samples obtained from borings at Site B

to evaluate its shearing strength and compressibility. The test results are presented on the boring logs and the attached diagrams.

ANALYSIS AND RECOMMENDATIONS

Site A (Borings 1, 2 and 3)

We understand that the elevated water tank, 30' in diameter, will be constructed at this site. The tank will be multi-legged type and its capacity will be approximately 100,000 gallons. We assume that the foundation would be placed, a common practice, at about 8' below grade.

According to the boring logs, a transition of the clay consistency from medium to rather stiff at/or near the assumed foundation depth was observed. In general, the rather stiff clay was encountered at about elevation from 89' to 92', depending on the topography of the site. We recommend using a net allowable load of 4000 pounds per square foot at elevation 89' throughout the site. A net allowable load is defined as the soil bearing capacity at the base of the foundation in excess of that at the same level due to the surrounding surcharge. This loading would provide a factor of safety of three against a general shear failure and should not result in a detrimental settlement.

It is noticed from boring log 3 that ground water may be encountered near the bottom of excavation. Excessive water percolation may occur during excavation due to the presence of lenses of waterbearing sand. However, a direct sump pump system would be sufficient for dewatering.

In order to avoid infiltration of surface runoff into the clay through the backfill, we suggest providing a sloping impervious surface on final grade draining away from the tank area.

Site B (Broings 4 and 5)

Proposed Construction

We understand that the proposed structure at this site will be a concrete ground water tank, 82.5' in diameter by 20' high. According to the present design concept, it is anticipated to construct a concrete bottom slab with thickened periphery section to support the wall load. The roof slab will be supported by columns which in turn will be supported by individual footings. We further understand that a tank will be partially buried in the ground depending on the soil conditions which will be analyzed subsequently. For landscaping purpose, the final grade will be at about elevation 100' (approximately elevation 500' according to the topographic map); and therefore, a 4' high berm with approximately 10' width will be added on the existing grade at the east side following the tank construction.

The Feasibility of Construction

As stated previously the soft clayey silt is located at about elevation 80'. This silt can be easily disturbed and subsequently loses its strength, especially when it is under wet conditions. Therefore, it would be very difficult to carry out the construction on this material without inducing any disturbance. Consequently, in order to secure adequate support for the water tank, it would be feasible to place the bottom slab on the clay at shallower depth or on deep foundations. We understand that it is not intended to consider the latter concept. However, according to our analysis, the former concept is quite feasible. It will be discussed further in the following sections.

Recommended Foundation Construction

The lean clay overlying the silt appears to be quite stiff and could be used as a

load bearing layer as well as a working platform so that the silt will not be disturbed during construction. Based on a classical foundation method, "flotation", which suggests compensating structural weight by the weight of soils being removed, we recommend constructing the bottom slab at a depth approximately 6' above the silt, or at elevation 86' according to our assumed datum. This would require about 12' of soil to be removed at borings 4 and 5. The weight of the removed soil will be a little less than the weight of the tank plus the weight of water. According to our analysis, assuming that the bottom slab would be a rigid type, or with somewhat heavier reinforcement, the structure should be safe against a shear failure. However, a long term settlement would be expected. The nature of the settlement will be further discussed subsequently.

Evaluation of Potential Settlement

We understand that a maximum settlement or displacement of 1" is allowed. The rigid tank structure probably would not be affected structurally by this amount of settlement; in fact, the tank could stand even more movement. However, any tank movement greater than the allowable magnitude would induce structural damage to the pipeline connection and subsequently interfere with the routine operation.

Based on our laboratory test results, we have conducted a settlement analysis of the tank based on the present design concept stated previously. Our analysis also based on the assumption that the silt is a homogeneous isotropic material and the samples tested are representative for the soil layer. The results of the settlement analysis shows less than 1" of total probable settlement under the tank and the new berm; and the differential settlement caused by the weight of the berm would not exceed $\frac{1}{2}$ ".

Since our analysis is based on the laboratory test results, we wish to point out that the characteristics of the silt seldom can be represented by a few laboratory test. Consequently, there is the possibility for somewhat more settlement due to varying conditions not encountered in the borings. Therefore, we suggest performing a frequent observation on the tank movement. This would bring an immediate recognition of any excessive settlement under the tank load.

Soil Excavation

Our foundation analysis is based on an assumption that the top of the clayey silt alluvium is quite level. It is possible that its elevation could deviate somewhat from that encountered in borings 4 and 5 (elevation 80'). In any case, a minimum distance of 4' between the tank bottom and the silt should be maintained. On the other hand, it is essential to keep the excavation depth to at least 10' to compensate the weight of the applied load in order to reduce the amount of potential displacement of the structure. Since the depth of the silt under the higher ground is not definitely known, we suggest making depth measurements, such as auger borings, at bottom of excavation at several locations. The borings should be made before the excavation reaches the required depth. If the silt is found at a depth significantly different from that stated in our assumption, we suggest that we be notified to review the new situation.

REMARKS

The recommendations and/or suggestions contained in this report are our opinions based on data which are assumed to be representative of the site explored; but because the area of the borings in relation to the entire area is very small, and for other reasons, we do not warrant conditions below the depths of our borings, or that the strata logged from our borings are necessarily typical of the entire site.

Soil Exploration Company

JOB NO. 600-325 VERTICAL SCALE 1" = 5' LOG OF TEST BORING NO. 1

PROJECT PROPOSED WATER STORAGE FACILITIES, HARRISBURG, SOUTH DAKOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS			
					NO.	TYPE	W	D	L.L. P.L.	Qu
	☐ SURFACE ELEVATION <u>101.2'</u>									
1½	SILTY CLAY, black, medium (CL-OL)	TOPSOIL	5		1	SS				
12	LEAN CLAY, a little gravel, brown mottled, medium to rather stiff, a few lenses of sand and silty clay above 6' (CL)	TILL	7		2	SS				
			5		3	SS				
			7		4	SS				
					5	2T	21	108	42 18	4100
			13		6	SS	20	108		4500
			16		7	SS				
21	LEAN CLAY, a little gravel, brownish gray and brown mottled to gray, stiff (CL)		20		8	SS				
			22		9	SS				
	End of Boring									

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
7-12	1:00	21'		21'	to	None
7-12	1:55	21'		21'	to	None
					to	
					to	

START 7-12-71 COMPLETE 7-12-71

METHOD 6FA 0 - 19½' @ 1:00

CREW CHIEF Hagedorn

Soil Exploration Company

JOB NO. 600-325 VERTICAL SCALE 1" = 5' LOG OF TEST BORING NO. 2

PROJECT PROPOSED WATER STORAGE FACILITIES, HARRISBURG, SOUTH DAKOTA

PROJECT PROPOSED WATER STORAGE FACILITIES, KENNEDY												
DEPTH IN FEET	DESCRIPTION OF MATERIAL		GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
	SURFACE ELEVATION 100.4'					NO	TYPE	W	D	L.L. P.L.	Qu	
1½	SILTY CLAY, black, soft (CL-OL)		TOPSOIL	2	*	1	SS					
	LEAN CLAY, a little gravel, brown mottled, medium to stiff, a few lenses of waterbearing sand from 10' - 12' (CL)		TILL	8		2	SS					
				9		3	SS					
				8		4	SS					
						5	2T					
				13		6	SS					
				14		7	SS					
				14		8	SS					
				23		9	SS					
21	End of Boring											
	*Note: Water level is expected to rise higher than the measurement indicated below, possibly up to about 10' where minor sources of water were noticed while sampling and from appearance of samples. Additional rechecks would be required for verification.											

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
7-12	1:50	21'	None	21'	to	None
7-12	2:05	21'	None	21'	to	18'*
					to	
					to	

START 7-12-71 COMPLETE 7-12-71

METHOD 6FA 0 - 19½' @ 1:50

CREW CHIEF Hagedorn

Soil Exploration Company

JOB NO. 600-325 VERTICAL SCALE 1" = 5' LOG OF TEST BORING NO. 3
 PROJECT PROPOSED WATER STORAGE FACILITIES, HARRISBURG, SOUTH DAKOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS			
					NO.	TYPE	W	D	L.L. P.L.	Qu
	┌ SURFACE ELEVATION <u>101.2'</u>									
1½	SILTY CLAY, black, soft (CL-OL)	TOPSOIL	4		1	SS				
	LEAN CLAY, a little gravel, brown mottled, rather stiff to stiff, a few lenses of moist to waterbearing sand (CL)	TILL	13		2	SS				
			11		3	SS				
			13		4	SS				
			10		5	SS				
			13		6	SS				
			14		7	SS				
21			17		8	SS				
	LEAN CLAY, a little gravel, brown and grayish brown mottled, stiff (CL)		19		9	SS				
			22		10	SS				
33	Continued on next page									

Soil Exploration Company

JOB NO. 600-325

VERTICAL SCALE 1" = 5'

LOG OF TEST BORING NO. 3 Cont.

PROJECT PROPOSED WATER STORAGE FACILITIES, HARRISBURG, SOUTH DAKOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS			
					NO.	TYPE	W	D	L.L. P.L.	Qu
33	LEAN CLAY, a little gravel, gray, stiff to rather stiff (CL)		20		11	SS				
41	End of Boring		14		12	SS				

WATER LEVEL MEASUREMENTS							START <u>7-12-71</u>	COMPLETE <u>7-12-71</u>
DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL	METHOD <u>3 1/2" HSA</u> <u>0 - 39 1/2'</u> @ <u>11:10</u>	
7-12	11:10	41'	39 1/2'		to	39'		
7-12	11:35	41'	None	25'	to	None		
7-12	1:55	41'	None	24'	to	11 1/2'		
					to			
CREW CHIEF <u>Hagedorn</u>								

Soil Exploration Company

JOB NO. 600-325 VERTICAL SCALE 1" = 5' LOG OF TEST BORING NO. 4
 PROJECT PROPOSED WATER STORAGE FACILITIES, HARRISBURG, SOUTH DAKOTA

PROJECT _____										
DEPTH IN FEET	DESCRIPTION OF MATERIAL SURFACE ELEVATION 97.7'	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS			
					NO.	TYPE	W	D	L.L. P.L.	Qu
1	LEAN CLAY, dark grayish brown, soft (CL)	1. TOPSOIL	5		1	SS				
	LEAN CLAY, a little gravel, brown mottled, medium to rather stiff, a few lenses of sand and silty sand, some lenses of silty clay below about 14½' (CL)	TILL	7		2	SS				
				3	SS	20	107			
			7		4	SS				
				5	SS					
			12		6	SS				
			14		7	SS	20	107		
			14	▽	8	SS				
18	CLAYEY SILT, brown mottled, soft (CL-ML)	FINE ALLUVIUM	4		9	SS				
				10	3T	33	88	35 22	Qc	
			4		11	SS				
				12	3T	29	93	35 21	C	
			4		13	SS	33	88		
			4		14	SS				
39	Continued on next page									

Soil Exploration Company

 JOB NO. 600-325

 VERTICAL SCALE 1" = 5'

 LOG OF TEST BORING NO. 4 Cont.

 PROJECT PROPOSED WATER STORAGE FACILITIES, HARRISBURG, SOUTH DAKOTA

PROJECT PROPOSED WATER STORAGE FACILITIES, HARRISBURG, SOUTH											
DEPTH IN FEET	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS				
					NO.	TYPE	W	D	L.L. P.T.	Qu	
39	LEAN CLAY, a little gravel, brown mottled, medium to stiff (CL)	TILL	7		15	SS					
			11		16	SS					
			15		17	SS					
			24		18	SS					
			17		19	SS					
64	LEAN CLAY, a little gravel, brown and gray mottled, stiff (CL)		30		20	SS					
66	End of Boring *Influenced by jet water.										

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	RAILED DEPTHS	WATER LEVEL
7-2	11:15	66'	44½'		to	11½'*
7-2	11:50	66'	None	19'	to	15½'
					to	
					to	

 START 7-1-71 COMPLETE 7-2-71

 METHOD 3 1/2 HSA C - 44½' @ 11:15
J.W. 44½' - 64½'

 CREW CHIEF Hagedorn

Soil Exploration Company

JOB NO. 600-325 VERTICAL SCALE 1" = 5' LOG OF TEST BORING NO. 5
 PROJECT PROPOSED WATER STORAGE FACILITIES, HARRISBURG, SOUTH DAKOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS			
					NO.	TYPE	W	D	L.L. P.L.	Qu
	SURFACE ELEVATION 97.4'									
1/2	LEAN CLAY, ~~dark grayish brown, soft (CL)~~	TOPSOIL			1	SS				
2	LEAN CLAY, brown, medium (CL)	WEATHERED SOIL	7		2	SS				
4	LEAN CLAY, a little gravel, brown mottled, medium (CL)	TILL	8		3	SS				
5 1/2	SILTY CLAY, brown, soft (CL)	FINE ALLUVIUM	6		4	SS				
	LEAN CLAY, a little gravel, brown mottled, medium to rather stiff, a few lenses of clayey silt above 9' a few lenses of sand and silty sand (CL)	TILL			5	SS				
				6	2T					
				7	SS					
				10	8	SS	21	104		
				13	9	SS				
				13	10	SS				
18 1/2	CLAYEY SILT, brown mottled, soft to medium (CL-ML)	FINE ALLUVIUM	4		11	SS				
					12	2T				
			3		13	SS				
					14	2T				
			5		15	SS				
			5		16	SS				
			7		17	SS				
42	Continued on next page									

Soil Exploration Company

JOB NO. 600-325

VERTICAL SCALE 1" = 5'

LOG OF TEST BORING NO. 5 Conc.

PROJECT PROPOSED WATER STORAGE FACILITIES, HARRISBURG, SOUTH DAKOTA

DEPTH IN FEET	DESCRIPTION OF MATERIAL	GEOLOGIC ORIGIN	N	WL	SAMPLE		LABORATORY TESTS			
					NO.	TYPE	W	D	L.L. P.L.	Qu
42	LEAN CLAY, a little gravel, brown mottled, rather stiff to stiff (CL)	TILL	12		18	SS				
51			16		19	SS				
	End of Boring									

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	BAILED DEPTHS	WATER LEVEL
7-1	12:30	51'	49½'		to	35½'
7-1	12:55	51'	None	25½'	to	22'
7-2	11:30	51'	None	18'	to	15½'
					to	

START 7-1-71 COMPLETE 7-1-71

METHOD 6FA 0 - 26' 11:40

3½HSA 0 - 49½'

CREW CHIEF Hagedorn

SOIL EXPLORATION COMPANY

TRIAXIAL TEST DATA

JOB NO. 600-325

PROJECT WATER STORAGE FACILITIES, HARRISBURG, S. D.

BORING NO. 4 SAMPLE NO. 1G DEPTH 21'-22 1/2'

TYPE OF TEST Unconsolidated-Undrained (staged)

SAMPLE SIZE: 1 3/8 x 2 3/4

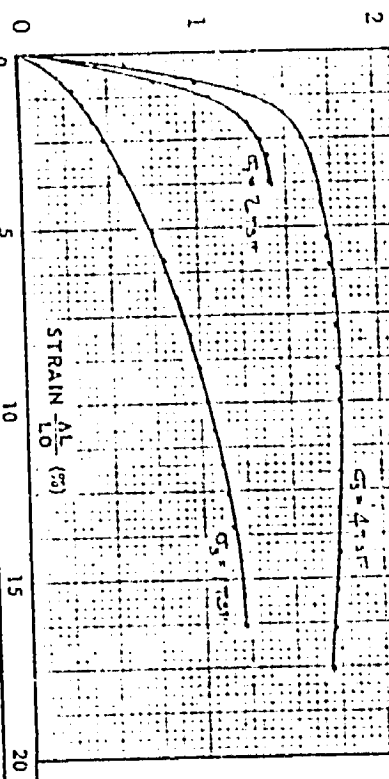
SOIL TYPE: Clayey Silt

MOISTURE-DENSITY: 33 % 88 PCF

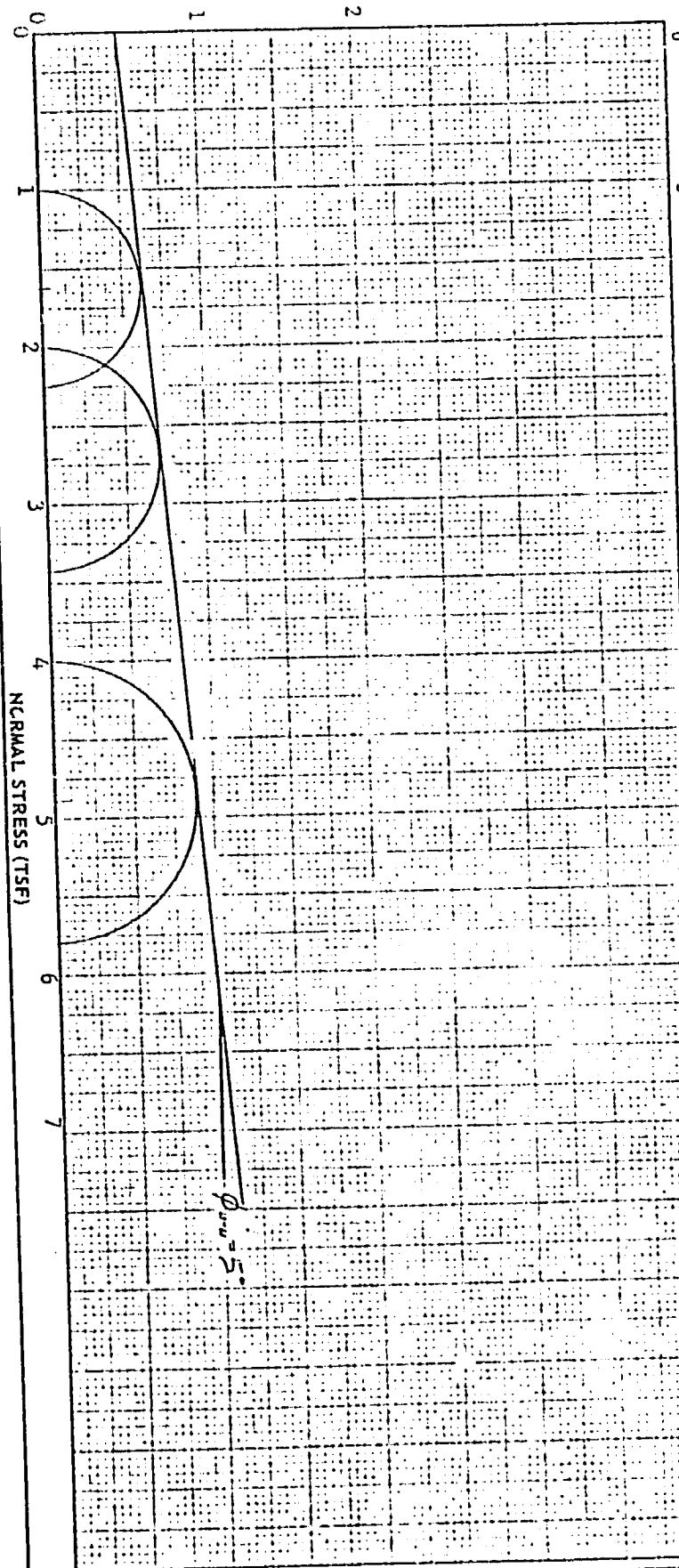
ATTERBERG LIMITS: LL 35 PL 22

REMARKS Sample confined under pressures of 1, 2 and 4 tsf with lines sealed off and then stressed to peak strength @ constant strain of 1 1/2% per minute

(DEVIATOR STRESS (TSF))



SHEAR STRESS (TSF)



SOIL EXPLORATION COMPANY

TRIAxIAL TEST DATA

JOB NO. 600-325

PROJECT WATER STORAGE FACILITIES, HARRISBURG, S. D.

BORING NO. 4 SAMPLE NO. 10 DEPTH 21'-22 1/4'

TYPE OF TEST Consolidated-Undrained

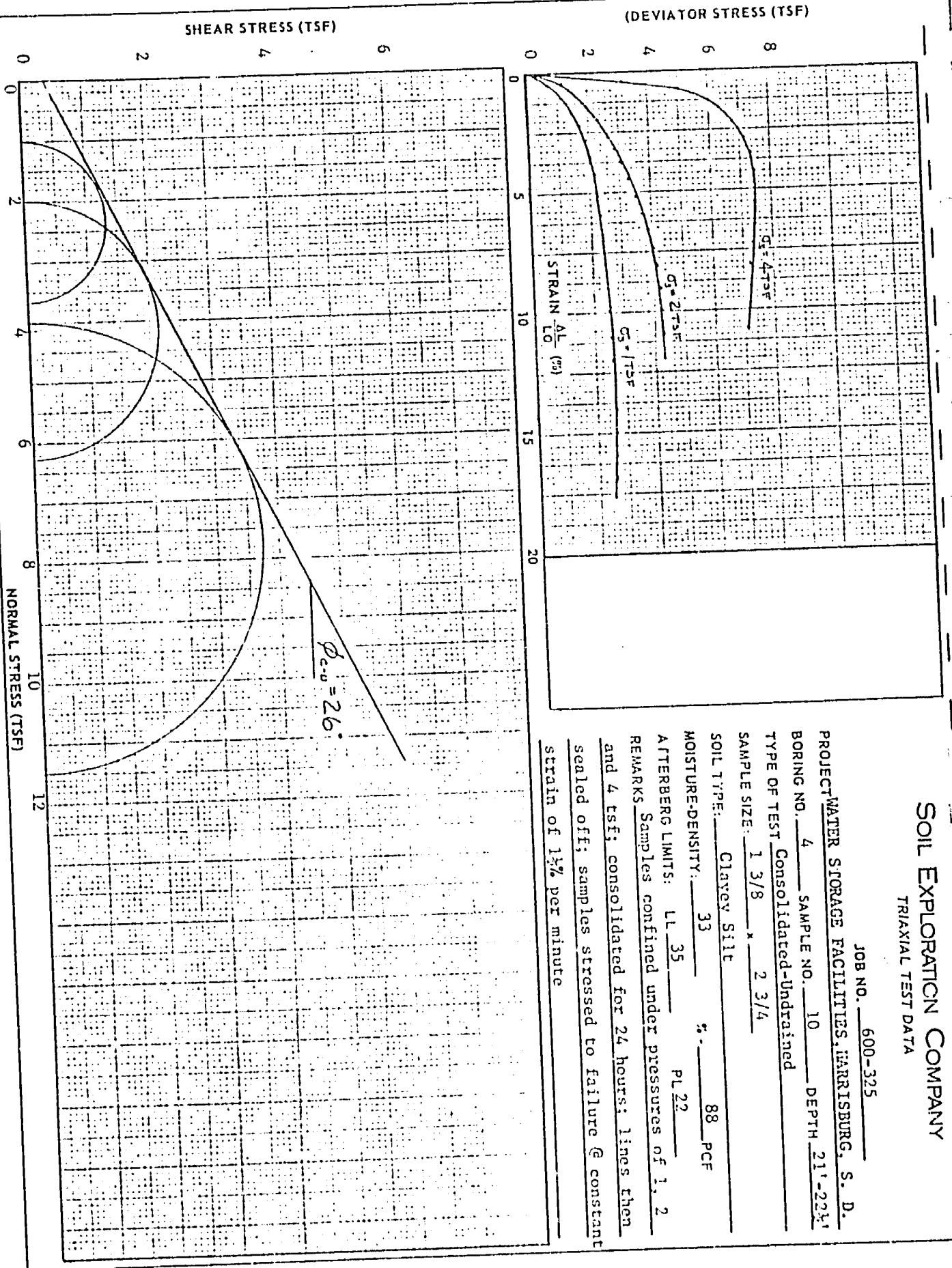
SAMPLE SIZE: 1 3/8 x 2 3/4

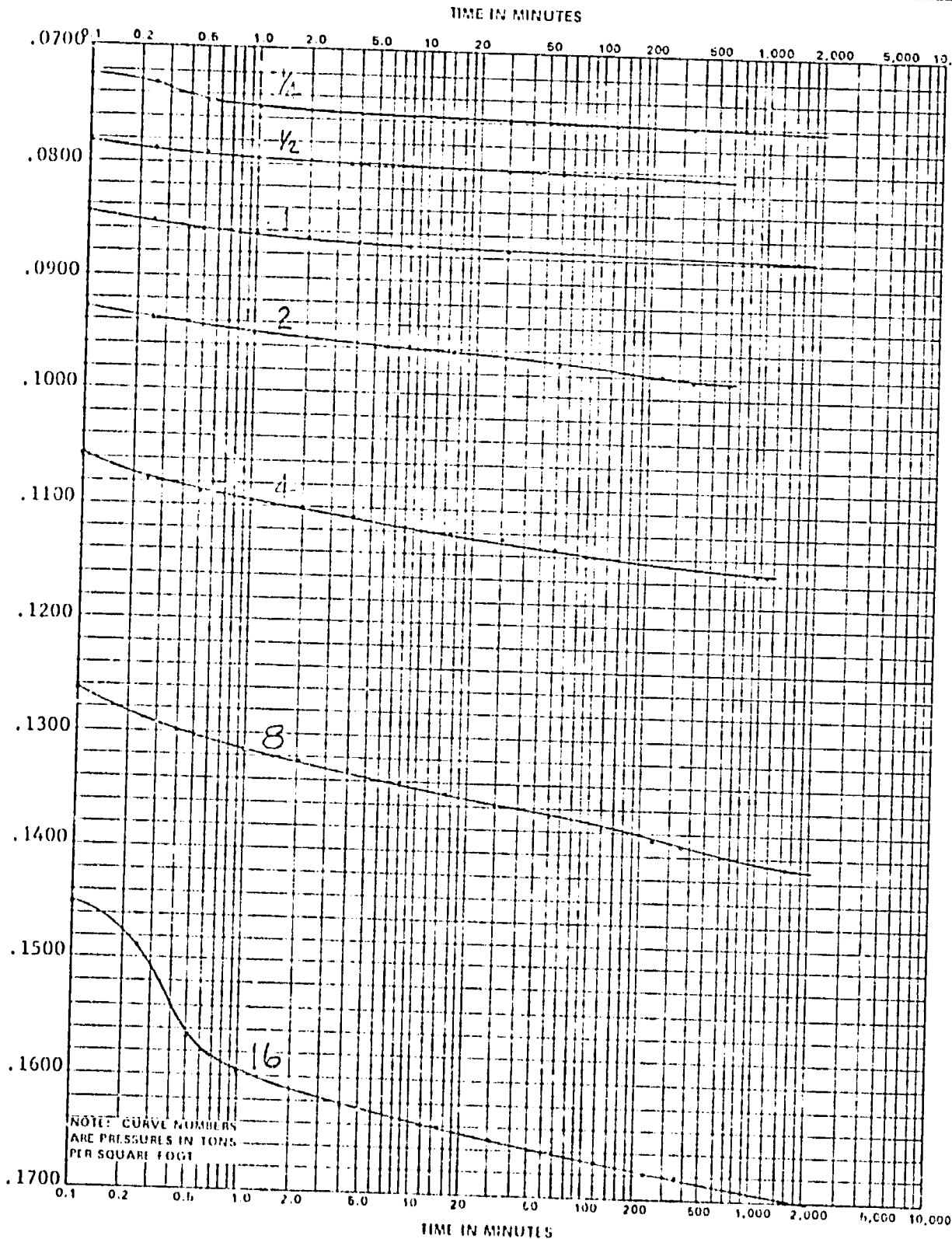
SOIL TYPE: Clayey Silt

MOISTURE-DENSITY: 33 % 88 PCF

AFTERBERG LIMITS: LL 35 PL 22

REMARKS Samples confined under pressures of 1, 2 and 4 tsf; consolidated for 24 hours; lines then sealed off; samples stressed to failure @ constant strain of 1 1/2% per minute





PROJECT: WATER STORAGE FACILITIES, HARRISBURG, SOUTH DAKOTA

JOB NO.: 600-325

SAMPLE NO.: 12

BORING NO.: 4

DEPTH: 28 $\frac{1}{2}$ ' - 29 $\frac{1}{2}$ '

CONSOLIDATION TEST-TIME CURVES

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS

SYMBOL	DEFINITION
C.S.	Continuous Sampling
P.D.	2-3/8" Pipe Drill
C.O.	Cleanout Tube
3/4 HSA	3/4" I.D. Hollow Stem Auger
4 FA	4" Diameter Flight Auger
6 FA	6" Diameter Flight Auger
2 1/2 C	2 1/2" Casing
4C	4" Casing
D.M.	Drilling Mud
J. W.	Jet Water
H. A.	Hand Auger
NXC	Size NX Casing
BXC	Size BX Casing
AXC	Size AX Casing
SS	2" O.D. Split Spoon Sample
2T	2" Thin Wall Tube Sample
3T	3" Thin Wall Tube Sample

LABORATORY TEST SYMBOLS

SYMBOL	DEFINITION
W	Moisture content - percent of dry weight
D	Dry density-pounds per cubic foot
LL, PL	Liquid and plastic limits determined in accordance with ASTM D 423 and D 424
Qu	Unconfined compressive strength-pounds per square foot in accordance with ASTM D 2166-66
Additional insertions in Qu column	
Pq	Penetrometer reading-tons/square foot
Ts	Torvane reading-tons/square foot
G	Specific gravity - ASTM D 854-58
SL	Shrinkage limit - ASTM D 427-61
pH	Hydrogen ion content-meter method
O	Organic content-combustion method
M.A.*	Grain size analysis
C*	One dimensional consolidation
Qc*	Triaxial compression

*See attached data sheet and/or graph

WATER LEVEL

SYMBOL - 

Water levels shown on the boring logs are the levels measured in the borings at the time and under the conditions indicated. In sand, the indicated levels can be considered reliable ground water levels. In clay soil, it is not possible to determine the ground water level within the normal scope of a test boring investigation, except where lenses or layers of more pervious waterbearing soil are present and then a long period of time may be necessary to reach equilibrium. Therefore, the position of the water level symbol for cohesive or mixed texture soils may not indicate the true level of the ground water table. The available water level information is given at the bottom of the log sheet.

DESCRIPTIVE TERMINOLOGY

DENSITY

TERM	"N" VALUE
Very loose	0-4
Loose	5-8
Medium Dense	9-15
Dense	16-30
Very Dense	Over 30

CONSISTENCY

TERM	"N" VALUE
Soft	0-4
Medium	5-8
Rather Stiff	9-15
Stiff	16-30
Very Stiff	Over 30

Standard "N" Penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch OD split spoon.

RELATIVE PROPORTIONS

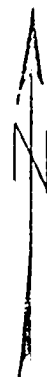
TERM	RANGE
Trace	0-5%
A Little	5-15%
Somewhat	15-30%
With	30-50%

PARTICLE SIZES

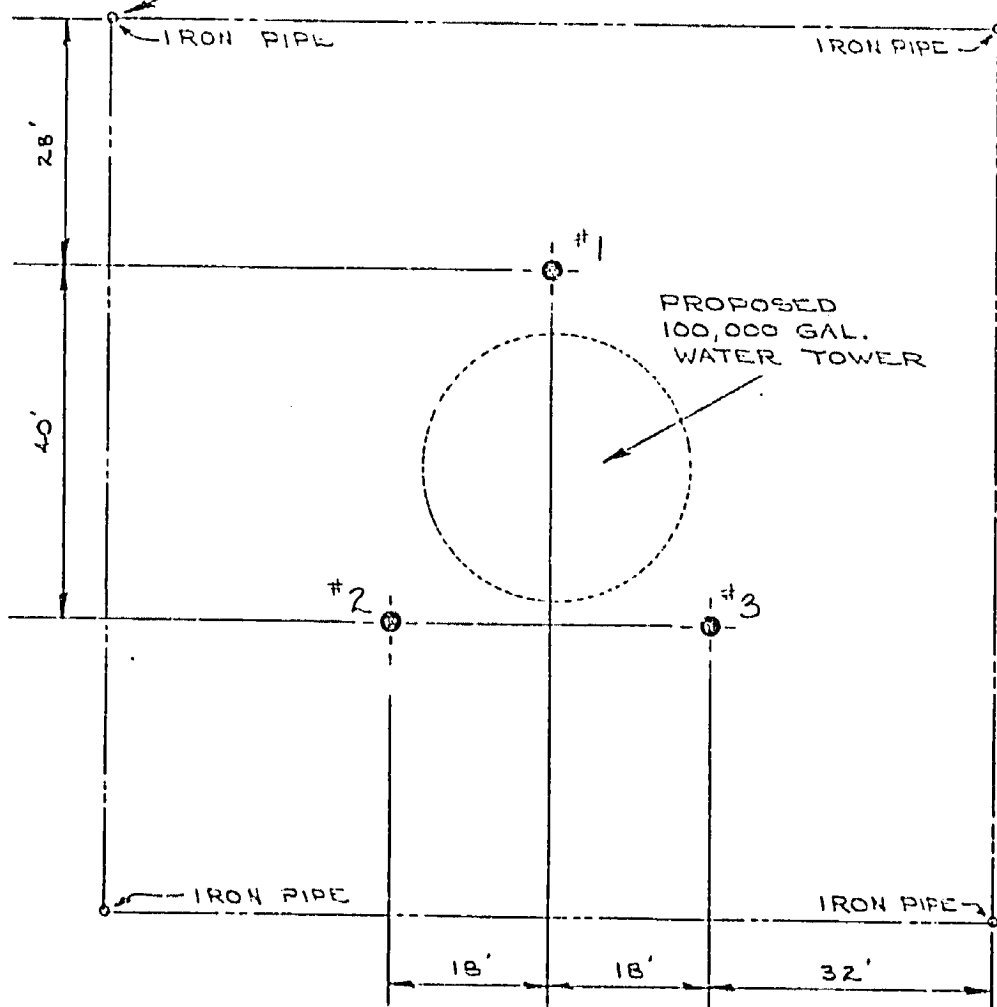
Boulders	Over 3"
Gravel	
Coarse	3/4"-3"
Fine	#4-#20
Sand	
Coarse	#4-#10
Medium	#10-#40
Fine	#40-#200
Silt and Clay	Determined by plasticity Characteristics

Note: Sieve sizes shown are U.S. Standard

CO. RD.



T.B.M. EL. 100.0'
TOP OF IRON PIPE



SITE "A"

SKETCH 1 OF 2

DRAWN BY J.P. CHECKED BY [Signature]

SOIL TEST BORINGS

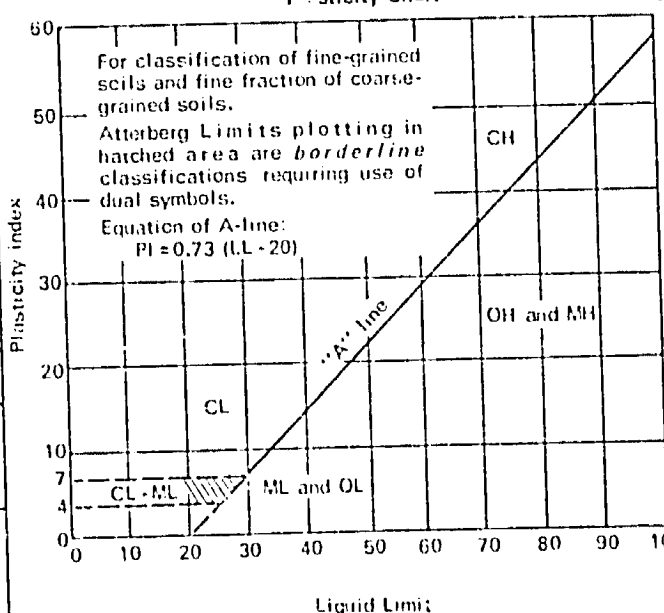
SCALE: 1" = 20'

JOB NO. 600-325

CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

ASTM Designation: D 2487 - 69 AND D 2488 - 69

(Unified Soil Classification System)

Major divisions			Group symbols	Typical names	Classification criteria				
Coarse-grained soils More than 50% retained on No. 200 sieve*	Gravels 50% or more of coarse fraction retained on No. 4 sieve	Clean gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Classification on basis of percentage of fines Less than 5% pass No. 200 sieve GW, GP, SW, SP More than 12% pass No. 200 sieve GM, GC, SM, SC 5 to 12% pass No. 200 sieve <i>borderline</i> classifications requiring use of dual symbols	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3			
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines		Not meeting both criteria for GW			
		Gravels with fines	GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Atterberg limits plotting in hatched area are <i>borderline</i> classifications requiring use of dual symbols		
			GC	Clayey gravels, gravel-sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7			
	Sands More than 50% of coarse fraction passes No. 4 sieve	Clean sands	SW	Well-graded sands and gravelly sands, little or no fines		$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_z = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3			
			SP	Poorly graded sands and gravelly sands, little or no fines		Not meeting both criteria for SW			
		Sands with fines	SM	Silty sands, sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Atterberg limits plotting in hatched area are <i>borderline</i> classifications requiring use of dual symbols		
			SC	Clayey sands, sand-clay mixtures		Atterberg limits above "A" line with P.I. greater than 7			
			Fine-grained soils 50% or more passes No. 200 sieve*	Sils and clays Liquid limit 50% or less		ML		Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	
						CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
OL	Organic silts and organic silty clays of low plasticity								
Sils and clays Liquid limit greater than 50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts		*Based on the material passing the 3 in. (76 mm) sieve.					
	CH	Inorganic clays of high plasticity, fat clays							
	OH	Organic clays of medium to high plasticity							
	Highly organic soils	Pt			Peat, muck and other highly organic soils				

TECHNICAL SPECIFICATIONS

SECTION G-1

General Information Applicable to All Divisions

G1-01. Scope:

The Contractor shall furnish all labor, equipment, materials, supplies, appliances and other devices necessary to complete the installation of the work covered by the respective sections of the contract, except as otherwise specifically stated to be furnished by others. The Divisions covered by these specifications consist of the following:

- Division I - Distribution system piping.
- Division II - Elevated storage reservoir including control manhole.
- Division III - Construction of the ground storage reservoir and pumping station.

G1-02. Information to be Provided after Award of Contract:

The Contractor shall provide the following information and drawings for the Engineer's approval, wherever applicable. Unless otherwise specified five (5) copies of all shop drawings, equipment drawings, test reports and items of similar nature will be required.

- a. Outline and general arrangement drawings of all items of equipment; detailed drawings including changes to structures, piping, and associated work if item of equipment selected is other than the basic equipment specified herein.
- b. Foundation and anchor bolt details for all equipment.
- c. Shop drawings and manufacturer's data for prefabricated piping.
- d. Performance data and characteristic curves for all equipment furnished.
- e. Shop details for reinforcing steel.

- f. Shop details for structural steel, gratings, ladders, railings, and anchorages.
- g. Such other information of a similar nature as the Engineer may request.
- h. The Contractor shall also submit to the Engineer the following items:
 - (1) Reports of tests of materials.
 - (2) Instruction manuals and parts lists.
 - (3) Proposed construction schedules.
 - (4) Detailed breakdown of contract prices to be used in preparation of progress estimates.

G1-03. Standards and Codes:

Design and workmanship of installation and material shall be judged by tests and requirements set forth in the latest revisions of the following codes and standards:

- a. American Society for Testing Materials (ASTM).
- b. American National Standards Institute (ANSI)
- c. American Institute of Steel Construction (AISC).
- d. American Concrete Institute (ACI).
- e. American Welding Society (AWS).
- f. National Electrical Manufacturer's Association (NEMA).
- g. National Electrical Code (NEC).
- h. American Association of State Highway Officials (AASHTO).
- i. American Water Works Association (AWWA)

Workmanship and materials shall be in compliance with all applicable laws, building and construction codes, and applicable requirements of any governmental agency that is an interested participant in the project.

G1-04. Soil Borings:

Location of soil borings have been shown on the plans. Logs of the borings and a written report on the subsoil investigation are included in these specifications. These borings are for general information only and are not guaranteed for accuracy. Additional compensation will not be allowed if conditions vary from those shown.

G1-05. Material Tests:

The Contractor shall select an independent testing laboratory, to be approved by the Engineer, for the purpose of conducting all laboratory tests required on materials to be incorporated in the project. Duplicate copies of all test reports shall be furnished to the Engineer. The Contractor shall pay all costs in connection therewith. Sampling of materials at the site and preparation of concrete cylinders shall be under the supervision of the Engineer.

Laboratory tests will be required on the following items:

- a. Car or sealed bin samples for the cement requirements on the entire project. Tests and sampling to be in accordance with ASTM C150. (Division III Contractor only).
- b. Concrete aggregates shall be sampled and tested in accordance with ASTM C136 or C40. Tests shall be run on each 100 tons of aggregates incorporated in the project. (Division III Contractor only).
- c. Standard 6" compression cylinders in accordance with ASTM C-39 as follows:
 - (1) Division I - None required.
 - (2) Division II - During construction two cylinders shall be taken for 7-day and 28-day testing from each day's pour of concrete.
 - (3) Division III - See Section Three.
- d. Soil Compaction Tests - This pertains to the Division III Contractor only. See Section 3.

In lieu of the requirements specified in G1-05a and G1-05b, above, the Contractor may submit certified copies of analyses of materials or certified statements guaranteeing that the affected materials comply with the standards specified above for the Engineer's approval.

Materials shall not be shipped to the site until laboratory tests indicate compliance with applicable standard specifications. Materials may be further inspected and tested by the Engineer at the site.

G1-06. General Specifications.

Some of the workmanship and materials required for different portions of the project are the same. In order to avoid duplication, specifications covering this workmanship and materials of this nature are included as Section G2, G3, G4 and G5, immediately following. The Contractor will comply with the appropriate and pertinent paragraphs of these sections except as specifically otherwise provided within the technical specifications.

G1-07. Field Examination and Preliminary Operation:

The Contractor shall provide the Engineer with 3 complete sets of manufacturer's instructions for installation, operation, and maintenance of all equipment furnished including assembly drawings and symbols or numbers in order to simplify replacement. The booklets provided shall be durably bound in tough, long wearing covers. Two sets will be turned over to the Owner by the Engineer.

G1-08. Padlocks and Keys:

Padlocks and keys are required from all Contractors for various portions of the work. It shall be the Division I Contractor's responsibility to work together with the other Contractors and see that all padlocks are keyed alike and keys furnished on the project are the same. Twelve (12) keys shall be furnished.

G1-09. Piping Responsibilities between Division of Work:

Distribution System - (Division I)

Division I Contractor to furnish all fittings and/or reducers and/or adapters at points of juncture with other Contractors work.

Water Tower - (Division II)

Division II Contractor to a point 15' outside of the control vault where it will be continued by Division I Contractor.

Ground Storage Reservoir and Pumping Station - (Division III)

The City of Sioux Falls shall furnish and install a 16" x 10" tee at the end of the City's 16" cast iron line.

The Division III Contractor shall install the 10" C.I.P. line from the pumping station to the 16" x 10" tee and make the connection.

The Division III Contractor shall install all necessary piping between the pumping station and the ground storage reservoir.

The Division III Contractor shall install the 8" C.I.P. line to a point 10' outside of the pumping station where it will be continued by the Division I Contractor.

SECTION G-2

Excavation, Backfilling, and Grading

G2-01. Scope:

The work included in this section of the specifications includes stripping and disposal of vegetation as required, general site excavation and embankment, structural excavation, trench excavation, and backfilling and grading. This section pertains to the Division II Contractor only.

G2-02. Stripping and Disposal of Vegetation:

Prior to any general excavation operations, all surfaces which are to be excavated or embanked upon or otherwise disturbed, shall have the organic material stripped. This material shall not be reused in general site grading. The Contractor shall take precautions to insure that surfaces which are not directly affected by their operations shall be protected from damage and any non-affected areas damaged by carelessness shall be replaced by the Contractor at his own expense.

G2-03. General Site, Excavation and Embankment:

The areas, within the respective construction limits, shall be rough graded to approximate finish elevations shown on the plans.

All embankments constructed shall be compacted to a density of at least 95% of Standard Soil Proctor Density. Standard soil density tests may be run at the discretion of the Engineer. Wet-ting or drying of material to accomplish this will be required if necessary to obtain this degree of compaction. Embankments shall be formed by spreading the material in successive horizontal layers of not more than 6 inches loose depth each. Each layer shall be spread uniformly by the use of a road grader or other approved device and compacted with an approved tamping roller to the density previously specified. The compaction requirements shall include the slopes of embankments as well as the top surfaces.

Upon completion of the rough grading the final 4 inches shall be filled by spreading approved topsoil, rolling and fine grading until the final surface is at the finished contours and elevations shown on the plans.

All surfaces shall be protected and maintained in satisfactory condition until completion and final acceptance of the project.

G2-04. Structural and Trench Excavation, Backfilling:

Structure excavations shall be carried to a point not less than 12 inches outside of footing lines.

Trench excavation widths shall be not more than 12 inches wider than the outside pipe diameter measured at the top of the pipe.

Bank of excavations shall be kept as nearly vertical as possible.

Sheeting and bracing shall be provided if necessary to hold walls of the excavations.

On structure excavations, excavate last 4" by hand if machines are used for excavating.

Trench excavations shall be finished to grade and formed to provide bearing against undisturbed earth for full barrel length and $\frac{1}{4}$ circumference of pipe. Provide necessary bell holes for proper jointing. Over excavations shall be backfilled with gravel and tamped at the Contractor's expense.

Subsequent work shall be performed in dry ground. Hold ground water, if encountered, below the bottom of excavations using necessary pumps and apparatus.

All structures and trenches shall be protected against high water and surface drainage during construction.

Structure and trench excavations shall be backfilled after completion of work and testing with suitable earth or gravel free from boulders, large roots, or excessive sod or vegetation. The backfill over pipes shall be mechanically tamped in layers until the pipe has not less than 18" of cover over the top of the pipe. The remainder shall be filled in 6" lifts which shall be mechanically tamped or compacted by other approved methods. Each layer shall be compacted to a degree of compaction at least equal to 95% Proctor Density. Standard soil density tests may be performed at the discretion of the Engineer. Moistening or aerating of the backfill to obtain the required compaction will be required as necessary. Backfilling operations shall be carried on concurrently with pipe laying so that no more than 600 feet of trench will be left open at one time.

No settlement of backfill will be permitted. Backfill material shall be placed and tamped simultaneously on both sides of pipe. Foundation walls shall be satisfactorily protected by bracing during tamping. Backfill material shall be free of wood, frozen earth, and other foreign material.

The Contractor shall at all times keep the premises free from accumulations of waste material and rubbish caused by his employees or work and at the completion of the work he shall remove all his rubbish and all his tools, scaffolding, and surplus materials. Trenches shall be left slightly mounded over with backfill material.

SECTION G-3

Concrete and Masonry

G3-01. Scope:

The work covered by this section of the specifications includes any and all concrete furnished and installed under all sections of the project. Other specific requirements shall be as specified under respective sections. This Section pertains to all Contractors.

G3-02. Materials:

a. Portland Cement:

- (1) Regular: Single brand of Portland cement conforming to ASTM C150, Type II.
- (2) White: Non-Staining "Medusa White" by Medusa Portland Cement Co., or equal.

b. Aggregates:

- (1) Natural glacial gravels and sands or crushed limestone having clean sharp grains of strong durable minerals conforming with ASTM C33.
- (2) Permissible limits for deleterious substances in percent by weight.

	<u>Fine</u>	<u>Coarse</u>
Silt and Clay	1.00	1.50
Clay Lumps	1.00	0.50
Coal and Lignite	0.25	0.50
Material finer than #200 sieve	1.50	1.50
Other deleterious substance	2.00	3.00
Combinations of above items	4.00	4.00

- (3) Fine aggregate gradation in percent by weight passing.

3/8" sieve	100
No. 4 sieve	95 to 100
No. 8 sieve	75 to 95
No. 30 sieve	20 to 55
No. 200 sieve	0 to 1.5

- (4) Coarse aggregate gradation in percent by weight passing.

1½" sieve	100
1" sieve	50 to 95
¾" sieve	35 to 80
⅜" sieve	10 to 40
No. 4 sieve	0 to 5

The maximum size of coarse aggregate used shall not be larger than one-fifth of the narrowest dimension between forms of the member for which the concrete is to be used, nor larger than three-fourths of the minimum clear spacing between bars.

Permissible weighted loss for coarse aggregate subjected to 5 cycles of the magnesium sulphate soundness test; not more than 20%.

- (5) All aggregates shall be uniformly graded between above mentioned limits.

- c. Storage of Materials: Cement and aggregates shall be stored at the work site in such manner as to prevent deterioration or intrusion of foreign matter. Cement shall be kept clean and dry and free from weather damage. Any material which has deteriorated or been damaged shall not be used for concrete work.
- d. Water: The Contractor shall make arrangements for water for concrete work. Water shall be clean, fresh, and free from injurious amount of oil, alkali, acid, and organic matter.
- e. Admixtures:
- (1) Plasticizing: "Pozzolith" by Master Builders Co., or equal.
 - (2) Air-entraining: "Darex", or equal.
 - (3) Non-Shrink: "Embeco" by Master Builders Co., or equal.
- f. Reinforcing Steel and Wire Mesh:
- (1) Reinforcing Steel - Intermediate grade deformed billet steel or deformed rail steel bars conforming to ASTM A305 and A15 or A16.
 - (2) Wire-mesh electrically welded wire fabric conform with ASTM A185.

G3-03. Design Mix:

The concrete shall develop a minimum compressive strength of 3,500 pounds per square inch within 28 days after mixing when tested in accordance with ASTM specifications. The Contractor shall have the testing laboratory prepare a design mix for the project. The mix and a strength-time curve shall be submitted to the Engineer for approval. All laboratory and freight costs to be paid by Contractor.

In general the following proportions shall apply:

- a. Water-cement ratio - not to exceed 5.75 gallons of water per sack of cement including surface moisture on aggregates.
- b. Cement content - not less than 6 sacks per cubic yard.
- c. Fine aggregate - 35% to 50%.
- d. Coarse aggregate - 50% to 65%.
- e. Slump: 2" to 6", ASTM C143 (slumps on specific portions to be as specified).
- f. Air content - Floors and slabs - $6\% \pm 2$; walls - $3\% \pm 1$.

The unit of measure shall be the cubic foot. Ninety-four pounds of Portland cement (1 bag or $\frac{1}{4}$ barrel) shall be considered as one cubic foot.

The ratio between fine and coarse aggregate may be varied within the above limits to control density, workability and strength without altering the fixed ratio between cement and the combined aggregates.

G3-04. Forms:

Wood, metal or other material as approved by the Engineer and/or as specified herein.

- a. Wood Forms: Wood forms for unexposed concrete shall be clean, straight rough lumber or plywood. Wood forms for exposed concrete shall be plywood or with linings as specified.
- b. Plywood: Plywood for forms shall be moisture resistant, concrete form plywood, not less than 5-ply and at least $\frac{9}{16}$ " thick.

- c. Form Lining: Form lining shall be plywood, commercial Douglas fir, concrete form exterior, 3-ply, not less than $\frac{1}{4}$ " thick.
- d. Metal Forms: Metal forms shall be of a type approved by the Engineer, that will produce surfaces equal to those specified for wood forms.
- e. Form Oil: Form oil shall be a non-staining mineral oil.
- f. Form Sealer: "Form Film" as manufactured by A. C. Horn, or approved equal.

G3-05. Construction of Forms:

- a. Construct forms to slopes, lines and dimensions shown, plumb and straight and sufficiently tight to prevent leakage; securely brace and shore forms to prevent displacement and to safely support construction loads. Leakage of any type or in any location will not be permitted. Provide access openings to clean and inspect forms and reinforcing prior to depositing concrete. Do not coat forms with material that will stain or cause injury to exposed concrete surfaces. All coatings shall be applied to forms before reinforcement is placed and all surplus coating removed. Keep wood forms wet as necessary to prevent shrinkage. Forms for exposed concrete walls, beams, girders and columns shall provide for a $\frac{3}{4}$ inch chamfer on external corners. Construct forms for beams, girders and lintels so that sides may be removed without disturbing bottom of forms or its support. Forms for curved or circular surfaces shall be accurately built to conform to required shapes.
- b. Form ties shall be of a design approved by the Engineer. Ties shall be adjustable in length and free of devices which will leave a hole or depression back of the exposed surface of the concrete larger than $\frac{7}{8}$ " in diameter. Ties shall be such that when forms are removed, no metal shall be within 1" of the finished surface. Wire ties will not be permitted where the concrete surface will be exposed to weathering, or at any point where discoloration will be objectionable. Form ties for exposed concrete shall be removable type. Locate ties level and plumb in horizontal rows and vertical tiers. Remove ties completely, or to a depth of $1\frac{1}{2}$ inches from surfaces of concrete; fill holes with cement and sand mortar as specified in Paragraph G-3.13a(3). Mix and place mortar as dry as possible.

- c. Forms shall be removed in such manner as to insure the complete safety of the structure.

Minimum stripping time:

Footings	1 day
Walls	4 days
Self-supporting slabs & beams	2 weeks

G3-06. Reinforcement:

- a. Reinforcement shall be free from scale, rust, and coatings which will reduce the bond to the concrete.
- b. Bends for stirrups and ties shall be made around a pin having a diameter not less than 6 times the minimum thickness of the bar. All bars shall be bent cold. All laps to be a minimum of 20 diameters or as shown on plans.
- c. Metal reinforcement shall be accurately placed and adequately secured in position by concrete or metal chairs or spacers furnished and installed according to standard practice as recommended by Concrete Reinforcing Institute. Maintain clearance between re-bars and exterior concrete surfaces as shown. Where reinforcement in beams or girders is placed in two or more layers, the clear distance between layers shall be not less than 1", and the bars in the upper layers shall be placed directly above those in the bottom layer. Wire fabric used for reinforcing slabs on the ground shall have a minimum side and end lap of 6".

G3-07. Measuring:

- a. Cement shall be measured by weight or sack; aggregates by weight; water by weight or volume.
- b. Measuring equipment shall be designed for easy, accurate control during work and easy check by Engineer.
- c. Plasticizing material - follow manufacturer's recommendations; maintain minimum cement content as specified above.
- d. Air entraining additive - use dispensers approved by the Engineer.

G3-08. Mixing:

The mixer shall be designed for accurate proportioning of all material and the concrete shall be mixed until there is a uniform distribution of the materials. Materials shall be discharged completely before the mixer is recharged.

For job mixed concrete rotate at speed recommended by manufacturer; mix for at least one minute after all materials are in the mixer.

Ready-mixed concrete may be used if concrete meets all aforementioned specifications and plant meets approval of the Engineer. Ready-mixed concrete shall be mixed and delivered in accordance with ASTM C94.

G3-09. Cold Weather Concreting:

Concrete shall not be placed on frozen ground or earth containing frost. Maintain concrete temperatures between 60 degrees and 90 degrees F. when pouring; if necessary heat materials before mixing. During freezing weather concrete shall be maintained at 50 degrees F. for seventy-two hours after placing, or longer, if the Engineer requires. Methods of heating materials and protecting and heating concrete shall be approved by the Engineer. No frozen materials or materials containing ice shall be used. Use no salt or other chemicals to prevent freezing.

G3-10. Placing:

- a. Provide runways or other means approved by the Engineer, for wheeled equipment to convey the concrete to the points of deposits. The equipment used to deposit concrete shall not be wheeled over the reinforcement, nor the runways be supported on reinforcement.
- b. Remove water and all foreign matter from forms and excavations. Unless otherwise directed, wood forms and sand or sandy loam shall be thoroughly wetted just prior to placing concrete.
- c. Deposit concrete as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. Place no concrete until all reinforcing steel, pipes, conduits, sleeves, hangers, and other work required to be built into concrete have been inspected and approved by the Engineer.
- d. On exposed exterior concrete wall surfaces, protect the outside form from concrete spatter while placing concrete by shielding outside wall with a section of plastic or canvas at least 4 ft. square, supported by two wood handles on edges. Hold bottom of shield just above level of concrete being placed and move shield as location of concrete placement changes.
- e. Retempering: No concrete that has been partially hardened, become contaminated by foreign material or has been retempered, shall be used.

- f. Continuity of Placing: Concreting shall generally be carried on as a continuous operation until the placing of an individual section is completed. When construction joints are necessary they shall be made and located with the approval of the Engineer. Concrete shall be carefully worked around reinforcement and imbedded fixtures, along surfaces and into corners of forms. Vibrators shall be used, provided they are operated under experienced supervision, and forms are constructed to withstand their action.
- g. Concrete except, when placed and compacted by pneumatic means, by pumping or other special method, shall be placed in layers not over 12" deep and each layer shall be compacted with the aid of mechanical internal-vibrating equipment supplemented by hand spacing, rodding and tamping as directed by Engineer. Vibrators shall in no case be used to transport concrete inside of forms. The use of form vibrators will not be permitted. A steel hook made from #4 re-bar by 12' long, shall be used to puddle outside surfaces of walls and remove air bubbles. Its use shall be as directed by the Engineer. Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the concrete. At least one spare vibrator shall be maintained as a relief. The duration of vibration shall be limited to that necessary to produce satisfactory consolidation without causing objectionable segregation and shall be at least 20 seconds per square foot of exposed surface. The vibrator shall not be inserted into lower courses that have begun to set. Vibrators shall be applied at uniformly spaced points not farther apart than the visible effectiveness of the machine. Concrete shall be hand spaced along the face of the form and exterior faces of forms hammered to remove all air and water bubbles. Extra care shall be taken to thoroughly puddle and vibrate wall sections adjacent to construction joints and at the top and bottom of the walls.

G3-11. Construction Joints:

Joints in the concrete shall be avoided as far as possible, except where indicated on the plans or approved by the Engineer. All joints shall be made water-tight by the use of waterstops and keyways. Wherever construction joints are made in units which must retain water, and at locations shown on the plans, continuous waterstops similar and equal to polyvinylchloride Dura-joint, Type 4, as made by Electrovert, Inc., N.Y. 16, N.Y., shall be used. Installation and jointing shall be in strict accordance with the manufacturer's instructions.

In no case shall vertical joints be made in walls at nor near the corners. A schedule of construction joint location shall be submitted to the Engineer for approval, before construction.

When the work is stopped at the end of the day or for any reason, one or more continuous keyways shall be formed in the surface of the joint. A continuous waterstop, as specified above, shall also be placed if the function of the unit being constructed is to hold liquid. Keyways shall be made from beveled 2 x 4's or 2 x 6's as shown on plans.

The unit of operation shall not exceed 65'-0" in any horizontal direction. Concrete shall be placed continuously so that the unit will be monolithic construction. Arrangements shall be made in advance to insure continuous and adequate delivery of concrete. At least 48 hours shall elapse between the casting of adjoining units, unless this requirement is waived by the Engineer. Construction joints in floors shall be located near the midpoint of spans for the slabs, beams, or girders, unless a beam intersects a girder at the center in which case the joints in the girder shall be offset a distance equal to twice the width of the beam. Provision against shear shall be made by the use of inclined reinforcement. Joints in columns or piers shall be made at the underside of the deepest beam or girder framing thereto. Each column or pier shall be poured in a single operation at least 8 hours before any overhead work is placed thereon. Joints not shown or specified shall be so located as to least impair the strength and appearance of the work. Except where indicated on the drawing, no jointing shall be made in the footings, or foundation work without written approval from the Engineer. The placement of concrete shall be carried on at such a rate that the surfaces of concrete which have not been carried to joint levels will not have attained initial set before additional concrete is placed thereon. Girders, beams, and slabs shall be placed in one operation.

When a layer of concrete is to be poured on or against one which is already set, the entire surface, if not left rough previously, shall be roughened with a pick or by other suitable means where practicable, thoroughly cleaned, and carefully broomed with a layer at least one-quarter inch thick of cement mortar composed of one part Portland cement and two parts sand.

G3-12. Curing and Protection:

All concrete work, except sidewalks, shall be kept in a moist condition for at least seven days after placing by use of one of the following methods:

- a. Burlap Cover: Keep the concrete wet by light sprinkling for the first 12 hours and then cover with two layers of burlap, keep continuously wet for the balance of the curing period.
- b. Paper Cover: Immediately following an initial 12 hour sprinkling period, the surface shall be covered with a strong kraft waterproof paper (Federal Specification UU-P-264a) with perimeter edges and laps carefully sealed with tape and left in place for the balance of the curing period.
- c. Plastic Cover: Immediately following finishing operations, cover entire finished surface with plastic sheets, similar and equal to Visqueen. Carry covering over edges of slabs and anchor tightly with dirt. Seal joints in an approved manner so that cover is and remains relatively air-tight throughout duration of curing period.

Sidewalks may be cured with an approved membrane-type curing compound.

Protect concrete from injury due to sun, wind, cold weather, earth pressures, running water, construction operations, and other causes until properly cured. Any damaged concrete shall be removed and replaced by the Contractor at his own expense.

G3-13. Patching:

- a. Patch honeycomb in the following manner immediately after removal of forms:
 - (1) Chip out to a minimum depth of 1" or until sound concrete is exposed.
 - (2) Saturate hole with water.
 - (3) Fill with patching mortar mix of approximately 1 part white cement, two parts gray cement, 9 parts sand; vary white and gray cement as necessary to match surrounding concrete.
 - (4) Mix patching mortar approximately one hour before applications.
- b. Fill holes left by form ties:
 - (1) Tanks containing liquid: Fill holes to within 1" of surface with mortar made with non-shrink grout mixed according to manufacturer's recommendations. Fill remainder with patching mortar specified hereinbefore.

G3-14. Finishing:

- a. All exposed exterior surface - small voids to be filled with 1:2 mortar, with white cement added so finished color blends with adjacent surfaces. Mortar shall be firmly pressed into holes and floated smooth. Fins and projections and patched areas shall be made smooth by rubbing with a carborundum stone.
- b. All Other Surfaces: Remove ties and patch tie holes and any honeycomb as specified in G-3.14a, above.

G3-15. Testing:

- a. Compression Cylinders - Contractor to take samples as directed by Engineer. See Paragraph G-1.05c for number and method.
- b. Air Content - To be job-tested by Contractor as directed by the Engineer.

G3-16. Miscellaneous Concrete:

- a. Equipment Foundations: To be as shown on plans and required by equipment manufacturer. Grout to be made using non-shrink admixture in accordance with manufacturer's instruction.

G3-17. Sidewalks and other Exterior Slabs:

- a. Finishing: The concrete shall be vibrated, struck off true to cross section, after which it shall be finished smooth and even by means of a steel trowel followed by a light transverse brushing. Forms shall be left in place until the concrete has set sufficiently so that they can be removed without injury to the walk. The edges of the slabs shall be rounded with an edging tool.
- b. Forms: Forms for sidewalk shall be steel or wood and approved by the Engineer for strength, uniformity and general adequacy of the work. If wood forms are used they shall be of 2 inch material. Forms shall be set to the designated elevations on the plans. Expansion joints, $\frac{1}{2}$ inch thick, shall be placed at locations where the new sidewalk butts against any structure, and at intervals not to exceed 20 feet. Grooves 1 inch deep are to be cut transversely across the walk at intervals equal to the width of the walk installed, the minimum groove spacing to be 4 feet or as shown on plans. After the grooves are cut they shall be edged with the proper edging tool.

- c. Curing: All concrete shall be fully covered and protected from moisture evaporation, rapid temperature change and from rain, flowing water and mechanical injury during a period of at least 72 hours immediately following the finishing and edging of the sidewalk. The protective covering (curing method) or combination of methods, shall be approved by the Engineer. The use of a covering material which contains or becomes contaminated with sugar in any form, tannic acid, or any other substance considered detrimental to Portland cement will not be permitted. The initial curing medium shall be effective and applied so as to prevent checking, cracking and the appearance of dry spots in the surface of the concrete. The sides of the concrete slabs exposed by the removal of forms shall be protected immediately to provide continuance of curing and prevent injury of the sidewalk edges and the underlying subgrade. When it is expected during the progress of the work, and before all concrete has attained final set, that the temperature may fall below 40 degrees F., a sufficient supply of straw, hay or other material suitable in the opinion of the Engineer must be maintained on hand on the project site, to cover the concrete and to adequately protect its surface and edges against freezing until it is at least 10 days old.

SECTION G-4

Project Piping

G4-01. Scope:

This section pertains to all Contractors. The Division I Contractor shall adhere only to those sections not covered in his Technical Specifications.

G4-02. Piping Schedule:

Cast Iron Pipe - C.I.P.
Steel Pipe
Galvanized Pipe
Copper Pipe

G4-03. Cast Iron Piping (C.I.P.):

a. Pipe:

- (1) ANSI Spec. A21-6, Method of Design A21.1, 18/40 metal or higher physical characteristics, Class 150, minimum wall thickness of 0.25 in. for 2" pipe, 0.35 in. for 4" pipe, 0.38 in. for 6" pipe, 0.41 in. for 8" pipe and 0.44 in. for 10" pipe.
- (2) Half-thick cement lining. Federal Spec. WW-P-421A.
- (3) Joints:
 - (a) Underground-mechanical joint ANSI-A21.11 where shown on plans; otherwise, slip-on or roll-on type, ANSI-A21.11, Fed. Spec. WW-P-421.
 - (b) Above ground and as shown on plans - ANSI B16.1 flanged pipe, with red rubber full face gasket, U.S. Rubber Co., Rainbow, or equal.
- (4) On mechanical joint and slip-on type metal tipped gaskets or metal wedges to insure electrical conductivity.

b. Fittings:

- (1) Mechanical Joint - ANSI A21.10 and A21.11; Class 250 through 12", half thick cement lining.
- (2) Flanged - ANSI B16.1; Class 250 through 12"; half-thick cement lining.

c. Valves:

- (1) Gate Valves* - AWWA C500-61 , iron body, bronze trim, double disc, non-rising stem, mechanical joint or flanged as required to fit pipe. Valves to be similar and equal to M & H Gate Valves, AWWA, Class C, non-rising stem. Valves not buried, provide with standard handwheel.
- (2) Valve Boxes - Cast iron of extension type complete with cover with screw or slide type adjustment and flared base. Minimum thickness of materials - 3/16 inch. Shaft - 5½" diameter. The boxes shall be of sufficient length to provide the required depth of cover over the pipe without being fully extended.
- (3) Check Valves - M & H Fig. 50 flanged ends with lever and weight.
- (4) Air Relief Valve - Golden Anderson Fig. GH4-150-X.
- (5) Pressure Relief Valve -
 - (a) 2" - Golden Anderson Figure 667-D-BBBM
 - (b) 2½" or Larger - Golden Anderson Fig. 66-D-IBBM.
- (6) Butterfly Valves* - Dresser "450"
 - (a) 4" hand lever operated.
 - (b) 6" and larger furnish with crank operator.
- (7) Electric Check Valves - Golden Anderson Fig. 173-D-IBBM-X

d. Couplings: Dresser Style 38 or as specified suitable to fit type of connecting pipes.

e. Weir Plates and Frames: Frames shall be of aluminum as shown and specified on the plans. Weir plates shall be of similar and equal to those made by Neenah Manufacturing Company or as specified.

*NOTE: All valves shall be CCW opening; i.e., the operator shall turn CCW to open the valve.

G-40.04. Steel Piping:

- a. Pipe: ANSI B36.1, Schedule 40, open hearth, lap welded or seamless.
- b. Fittings:
 - (1) AWWA C208, Class 125, steel water pipe fittings.
 - (2) All bends to be smooth.
 - (3) Connections welded AWWA C206, AWS D7.0.
 - (4) Connections flanged AWWA C207, AWWA standard welded steel hub flanges, Class E.
- c. Valves:
 - (1) Gate and Globe Valves* - Crane or equal, 100 lb. screwed brass or bronze; rising stem, screwed bonnet type; capable of being repacked under pressure wide open.
 - (2) Gate Valves* - Brass double discs.
 - (3) Globe Valves* - Renewable composition disc suitable for water.
 - (4) Check Valves - Swing check with brass disc and seat.
 - (5) Needle Valves* - Crane No. 88, or equal.
- d. Joints: Threaded or welded, according to manufacturer's instructions.

G4-05. Galvanized Steel Piping (G.I.):

- a. Pipe: ANSI G8.7, Schedule 40; hot dip, galvanized open hearth, lap welded or seamless.
- b. Fittings: See also "Steel Piping". Threaded fittings of malleable iron.
- c. Valves: Check valves, swing check with brass disc and seat. See also "Steel Piping".
- d. Joints: Threaded or welded, according to manufacturer's instructions.

*NOTE: All valves shall be CCW opening.

G-4.06. Copper Piping:

- a. Pipe: Type L hard-drawn seamless copper tubing.
- b. Fittings and Valves: Cast brass or bronze.
- c. Joints: Soldered, sweat or brazed, in accordance with manufacturer's instructions.

G4-07. Pipe Installation:

- a. Excavation and Backfill:
 - (1) As specified under Section G-2 of these specifications.
 - (2) Outside water lines laid with minimum earth cover of 5'-6" above top of pipe.
 - (3) Use suitable fittings where grade or alinement requires offsets greater than $\frac{1}{2}$ " per foot.
- b. Provide sufficient unions and flanged connections to permit dismantling of equipment for maintenance.
- c. Install as shown except where necessary to vary to suit details of equipment.
- d. Small piping shown in schematic only; arrange to provide workable layout with convenient locations for valves and accessories.
- e. Clean pipe interior before laying; keep clean during laying by plugs or other approved methods; keep trench water out of pipe, keep ends tightly closed when work is not in progress.
- f. Before lowering, and while suspended, check for defective pipe by tapping with light hammer. Defective, damaged or unsound pipe will be rejected.
- g. All fittings at bends in pipe shall be firmly wedged between the fitting and undisturbed vertical face of trench with poured-in-place concrete thrust blocks.
- h. Use batter boards and tight string line at all times on gravity lines to insure uniform slope and true alinement.

G4-08. Pipe through Walls:

- a. Use standard cast iron wall pipe or wall sleeves, as indicated on the plans, in the structures. No water leakage around pipes is permitted. Walls poured with pipe in place or block out, caulk and lead pipe in place.

G4-09. Pipe Supports:

- a. Contractor to provide piers, hangers, etc., as required.
- b. Transfer no loads or temperature stresses to connection or equipment.
- c. Design to prevent vibration or movement. Hangers to be Grinnel, or equal.
- d. Obtain Engineer's approval.

G4-10. Slope and Drainage:

- a. Slope all piping for drainage.
- b. Slope drain lines as shown on plans or 1/8" per foot minimum where not indicated.

G4-11. Accessibility:

- a. Valves, vents, reliefs, drip traps, etc., to be conveniently accessible.
- b. Provide operating devices required for operation of accessories from normal working surface.

G4-12. Testing:

- a. Pressure Water and Air Lines: Test at pressure of 150 pounds per square inch. Maintain pressure until all points in system are inspected. Correct and repair any leakage as above.

NOTE: This section does not pertain to the Division I Contractor.

G4-13. Sterilization of Water Lines and Water System:

- a. Flush thoroughly after pressure testing and back-filling have been completed.
- b. Sterilize by injecting a solution of chlorinated lime and water at a slow rate. Conform to AWWA C601-68.

Retain solution in lines for 24 hours. Minimum residual concentration in any part of system after 24 hours to be 10 parts per million.

- c. Thoroughly flush all lines until residual chlorine at any point is not over 2 parts per million.

SECTION G-5

Miscellaneous Iron and Structural Steel and Aluminum

G5-01. Scope:

The work included in this section of the specifications consists in furnishing and installing all structural steel, aluminum and miscellaneous iron for the project as shown on the plans and as specified herein. This section pertains to all Contractors.

G5-02. General Notes:

- a. See drawings, schedules and details for items of miscellaneous iron, aluminum and structural steel work required.
- b. Before any fabrication is begun, shop drawings of all miscellaneous metal items shall be submitted to the Engineer for approval. The drawings shall show sizes of metal, method of assembly, hardware and anchorage or connection with other work and other details as required for a completely detailed shop drawing.
- c. The general drawings show the general requirements and extent and details of the work required. It shall be understood, however, that these drawings are not shop drawings and shall be amplified and further detailed as the work progresses in order to produce a perfect working job. The supplying of additional fastenings and other details necessary to make a complete and practicable construction shall be considered a part of this contract.

G5-03. Materials:

- a. Cast Iron: Cast iron shall be of soft gray iron, true to pattern, smooth and straight and free from defects impairing strength, durability, or appearance.
- b. Wrought Iron: Genuine wrought iron conforming to ASTM Specifications A41 for bolts, rods, and bars; A42 for plates and A162 for sheets.
- c. Steel: Conform to ASTM Specifications A7-61T for structural steel and A27-60 for cast steel. Miscellaneous steel not otherwise indicated or specified shall be mild steel.

G5-04. Workmanship:

- a. Steel shall be well formed to shape and size, with sharp lines or angles. Shearing and punching shall leave clean, true lines and surfaces. Weld or rivet permanent connections. Do not use screws or bolts where they can be avoided; where used, heads shall be countersunk, screwed up tight and threads nicked to prevent loosening. Curved work shall be evenly sprung.
- b. Castings shall be sound and free from warp, holes and other defects that impair their strength or appearance. Exposed surfaces shall have a smooth finish and sharp, well-defined lines and arrises. Machined joints, where required, shall be milled to a close fit. Provide holes and connections for the work of other trades.

G5-05. Painting and Protective Coating:

- a. All ferrous metal shall be properly cleaned and given one shop coat of red lead, zinc chromate or other approved rust resisting paint. Anchors that are built into masonry or concrete shall be coated with asphalt paint unless specified to be galvanized. Where hot-dip galvanized or zinc-coated metal is required it shall not be shop primed unless specifically called for, but all abraded places and weldings shall be touched up with paint. Where hot-dip galvanizing or hot zinc coating is specified it shall be done in accordance with the Standard Specifications of the American Hot Dip Galvanizers Association.
- b. Where ferrous metal is exposed and is to receive additional painting, the shop coat shall be as recommended by the finished paint manufacturer and as approved by the Engineer.

G5-06. Structural Steel:

- a. Fabrication: Unless otherwise shown or specified herein, fabricate structural steel in accordance with current edition of specifications adopted by American Institute of Steel Construction. Punch and drill steel as indicated on drawings or specified for attachment of other materials thereto; punching and drilling required but not definitely indicated on drawings or specified shall be done in the field.

- b. Erection: Except as otherwise shown on drawings or specified herein, all details of erection shall be in accordance with the specification of the design, Fabrication and Erection of Structural Steel for Buildings (riveted, bolted, and arc-welded construction) and the Code of Standard Practice for Steel Buildings and Bridges as issued by the American Institute of Steel Construction.

G5-07. Manhole Steps:

- a. "Neenah" R-1980-E or approved equal.
- b. Install solidly in concrete and masonry walls.
- c. Install as noted on plans.

G5-08. Anchor Bolts:

- a. Cast in place as noted on drawings.
- b. Phillips Redhead Concrete Anchor into concrete structures. Sizes as noted on plans.

DIVISION I

DISTRIBUTION PIPING

SECTION 1

General

1-1.01. Scope of Work:

The work covered by this Division of the specifications shall consist of furnishing all plant, labor, equipment, appliances and materials, and in performing all operations required in the construction or installation of new water lines, valves, meter pits, including excavation, backfilling, testing, sterilization, incidentals and miscellaneous work necessary to furnish a complete rural water distribution system as shown on the plans and as specified in these specifications.

1-1.02. Location of Work:

The project is located in Lincoln County, South Dakota, just south of the City of Sioux Falls, South Dakota. The exact location is shown on the plans and staking sheets.

1-1.03. Boundaries of Work:

The Owner has acquired 30' easements on most of the private property along the proposed pipeline routes. Where easements have been obtained it is the Owner's intention to construct the pipelines adjacent to county and state right-of-way on private property. Unless noted on the staking sheets the centerline of the pipe on private property shall be approximately 15 feet inside of the road right-of-way line. Where construction is within county or state highway right-of-way the pipe shall be installed as near the right-of-way line as practical. The Contractor shall not enter upon or occupy with personnel, tools, equipment or materials any area outside of such rights-of-way or easements without written consent of private owners or county or state officials of said lands.

Any contractor or sub-contractor working on a specific portion of this work shall so schedule and conduct his work as not to impede unnecessarily any work being done by others on or adjacent to his work.

1-1.04. Protection and Maintenance of Site:

Excepting as otherwise provided herein, the Contractor shall protect all structures, walks, pipelines, trees, shrubbery, lawns, etc., during the progress of his work, and shall remove from the

site all debris and unused material; and shall, upon completion of the work, restore the site as nearly as possible to its original condition including the replacement, at the Contractor's sole expense, of any facility or landscaping which has been damaged beyond restoration to its original condition or destroyed. When terraces and other conservation contour improvements are encountered during the trenching, laying, and backfilling of the line, special care shall be taken to restore such areas to its original profile and condition. The Contractor shall not be responsible for agricultural crop damage within construction limits or easements. See Special Conditions, SC-7.

1-1.05. Staking Sheets:

Each mile or less of pipeline has been drawn on a 10½" x 16" staking sheets. Included are locations, stations and materials inventory. Copies of the staking sheets may be inspected at the office of the Engineer. At least five (5) complete sets of the staking sheets will be made available to the Contractor awarded the project.

The staking sheets showing the proposed pipeline shall be jointly reviewed in the field by the Contractor and the Engineer prior to construction. The Contractor shall at that time propose any changes or clarifications he feels desirable. These changes, if approved by the Engineer, will be made at that time and so recorded on the staking sheets.

No changes in the construction proposed as set forth on the staking sheets shall be made by the Contractor without the prior approval of the Engineer. A representative of the Engineer or Owner will remain in the immediate vicinity of the construction activities at all times and will be available to consider and approve any changes proposed by the Contractor, if acceptable.

Due to the necessity of making on-the-spot corrections and changes on staking sheets, it will not be possible for the Engineer to issue revised staking sheets to the Contractor in all cases. When changes are made, dated, and initialled by the Engineer on any set of the Contractor's staking sheets, it shall be the Contractor's responsibility to transfer these changes to all other sets of staking sheets being used by the Contractor for construction purposes.

1-1.06. Permits, Certificates, Laws and Ordinances:

The Owner shall procure permits to construct on state, county and railroad property. The Contractor shall give at least 48 hours written notice of any proposed construction to the following agencies.

State and Interstate Right-of-Way

Mr. T. B. Hillmer
District Engineer
South Dakota Department of Highways
Box 880
Mitchell, South Dakota
Phone 605-996-6651

County Right-of-Way

Lincoln County

Mr. John Frislie
Highway Superintendent
County Courthouse
Canton, South Dakota 57013
Phone 605-987-5841

Minnehaha County

Mr. Frank Culvert
Highway Superintendent
Box 1364
Sioux Falls, South Dakota 57101
Phone 605-336-3110

Railroad Right-of-Way

Chicago Rock Island & Pacific Railroad

Mr. H. E. Strate, Division Engineer
Fourth & Vine Street
Des Moines, Iowa 50309
Phone 515-284-7168

Burlington Northern Railroad

Mr. G. J. Pechmann, Division Engineer
Mr. R. O. Hammerstrom, Superintendent
Burlington Northern Passenger Station
Minneapolis, Minnesota 55401
Phone 612-333-0124

Chicago, Milwaukee, St. Paul & Pacific Railroad Co.

Mr. F. P. Pawlak, Division Engineer
Mr. W. K. Peterson, Superintendent
412 10th Street, N.E.
Austin, Minnesota 55912
Phone 507-437-4529

The Contractor shall at his own expense, procure all other permits, certificates and licenses required of him by law for the execution of his work. He shall comply with all Federal, State, County or Local Laws, Ordinances or rules and regulations relating to the performance of the work.

1-1.07. Special Permits and Obligations Required of the Contractor:

The Contractor shall, at such times as is necessary, obtain permission from each property owner to trespass through the property owner's improvements and shall, during the stringing of pipe and construction, utilize all existing gates and openings so far as practical. The Contractor shall also obtain permission prior to the cutting of any fences. In all cases, fences shall be restored to its original condition or better so far as possible. All gates shall be left in condition found; opened or closed. In any doubt arises, gates shall be closed. All loss of livestock due to negligence shall be the direct responsibility of the Contractor. Temporary gates shall be installed wherever the fence has been cut and livestock are in the area. Temporary gates will not be required where livestock is not a problem. If there is a question contact the property owner.

The Contractor shall be responsible for damage to all existing underground utilities, pipelines, drain tiles, etc. Where drain tiles are suspected, property owners should be contacted.

For underground utilities in the area the following people must be notified before construction begins in the vicinity of these utilities:

Underground Telephone - Notify:

Dakota Cooperative Telephone Co.
Irene, South Dakota (Southern Area)
Phone 605-263-3301

Northwestern Bell Telephone Co.
Sioux Falls, South Dakota (Northern Area)
Phone 605-338-0964

Underground Power Lines - Notify:

Northern States Power -

Mr. R. L. Kehm
Division Engineer
Sioux Falls, South Dakota
Phone 605-336-2700

Lincoln-Union Electric -

Mr. Dale Jenkinson
Alcester, South Dakota
Phone Office - 3181
Home - 4441

Underground Pipelines - Notify:

Mobil Pipeline Co. -

Mr. George Little
Mobil Pipeline Co.
Box 7
Akron, Iowa 51101
Phone Station - 712-552-2689
Home - 712-568-3371

Williams Bros. Pipeline Co. -

Mr. Cliff Minor
Williams Bros. Pipeline Co.
5300 West 12th
Sioux Falls, South Dakota 57107
Phone 605-338-5771

American Oil Co. -

Mr. George Georgesen
P.O. Box 1827
7th Plymouth
Sioux City, Iowa 51012
Phone 712-227-4312

Northern Natural Gas Co.

Northern Natural Gas Co.
Harrisburg, South Dakota 57032
Phone 605-743-2541

Harrisburg Municipal Water Line

Mr. Ed Knaback
Harrisburg, South Dakota
Phone 605-743-2184

1-1.08. Pipe Installation Schedule:

The Division I Contractor shall install the transmission line between the pumping station at the ground storage reservoir site and the elevated water storage reservoir first. As soon as water is available the aforementioned line shall be pressurized, flushed and disinfected. Users along the lines so pressurized shall be connected as soon as flushing, disinfection and testing are completed and safety of water supply is assured. Only after the main transmission line has been completed will the Contractor begin work on branch lines off the main transmission lines. The Contractor shall complete the work in the center of the project

(Div. I)

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and then work toward the east portion and finish up in the west and south areas. The important goal is to keep the lines continuous and place the system in operation as it proceeds. The Contractor shall furnish a well-planned construction schedule to be reviewed and approved by the Engineer and Owner. The construction sequence shall not be haphazard but shall commence in an orderly manner so that as soon as segments are completed they can be pressurized and the users connected. It is imperative that users along completed lines be connected as soon as possible. If a section of line is in the ground and water is available but user service lines have not been installed, said section will be considered incomplete and not ready for use and consequently may not be considered for payment.

It shall be understood that the installation of service lines includes completed and functional meter pits and/or basement meter assemblies ready for the subscriber to draw water.

SECTION 2

Trenching, Excavation, Laying and Backfilling

1-2.01. General Requirements:

All open trenching shall be done with a ladder or wheel type machine. The use of other type machines such as a back hoe for trenching will be permitted when unusual trenching conditions are encountered. Excavation and trenching work shall include the removal, handling and disposal of all materials so removed and shall further include: (a) stripping of the trench and other excavation areas, including trees, stumps, brush, debris, roots within the construction limits to the satisfaction of the Engineer; (b) removal of all pavement (either asphalt or Portland cement pavement so removed shall be sawed or jackhammered so that a neat straight edge remains); pavement so removed shall be replaced by the Contractor at the sole expense of the Contractor; (c) removal of junk, and structures or portions thereof; (d) sheeting, shoring, bracing and protection of adjacent property, trees and other structures; (e) protection of (or replacement thereof if damaged) of existing pipelines, electric lines, buried telephone cables, electric lines, drains, field drain tiles, conduits, culverts, sewers, poles, road signs, overhead utilities, etc.; (f) removal of rocks or boulders encountered while trenching or excavating; (g) preparation of subgrades, pipe embedment, backfilling, and disposal of excess excavation and other materials.

Banks of excavations shall be kept as near vertical as possible and where required shall be properly sheeted and braced. Where, in the opinion of the Engineer, damage is liable to result from removal of the sheeting, it shall remain in place.

1-2.02. Pipe Trench Excavation:

Pipe lines shall be located as shown on Plans, and Staking Sheets or as directed by the Engineer. Where the grade, elevation or minimum depth of cover of any pipe line or any part thereof is shown on the Drawings, the pipe shall conform to such requirements. Where not otherwise specified, the minimum depth of cover over the pipe shall not be less than 60-inches for 3" and larger and 66-inches for 2½" and smaller. These minimum depths shall be measured from the original ground level to the nearest surface of the pipe. Pipelines installed under roads (including hard surface and gravel) and railroads shall have a minimum cover of 72-inches measured from the surface of the road or the railroad ties to the nearest surface of the pipe. Where the pipe elevation is determined by minimum depth only, excavation at all points shall be of sufficient depths to properly grade the pipe on tangents and vertical curves as required by the Engineer or dictated by the minimum bending radius of the pipe recommended by the manufacturer.

Trenches shall be of sufficient width to provide ample room for the workmen engaged in the handling of the pipe and making the joints. The trench width shall be a minimum of three times the nominal diameter of the pipe. Bottoms of the trenches shall be accurately graded to provide uniform bearing and support for the pipe. If uniform bearing and support cannot be obtained along the entire length of pipe due to hardness of ground, the excavation shall be carried to a depth of not less than two (2) inches nor more than six (6) inches below grade and a sand fill or cushion provided for the purpose of grading and bedding the pipe. This material shall be sufficiently damp to insure proper compaction and shaping of the bed. Said material if required shall be furnished and installed by the Contractor at no expense to the Owner.

Bell holes, when required, shall be dug after the line has been properly graded and shall be of sufficient size for proper completion of the pipe joints.

1-2.03. Special Locations:

At locations in fields where contour farming practices such as terraces are encountered, special care shall be taken to replace the contours as originally encountered. The same practice shall be followed with regard to road crossing, including ditches, back-slopes, and roadways. On roads or driveways which have gravel surfacing, equal surfacing shall be replaced.

1-2.04. Protection of Excavation:

The Contractor shall at his expense adequately protect all excavation from caving by providing suitable sheeting, shoring and bracing where deemed necessary by the Engineer, but failure of the Engineer to direct the placing of such protection will not relieve the Contractor of his responsibility for damage resulting from its omission.

Where water is encountered, the sheeting shall be designed and placed in a manner that will drain the water around and outside the forms to a sump to be pumped out or removed by other approved means. Water will not be allowed to accumulate in the excavated areas.

1-2.05. Plow In or Trenchless Method:

Two types of construction techniques namely, the "feed down" and "pull in" methods, may be approved by the Engineer for all or parts of the system where soils, terrain, type of material being placed and methods of joining said material and other conditions are compatible with the methods.

Where the "trenchless" method is elected by the Contractor and approved by the Engineer, he shall excavate a start trench to the required depth at the beginning of each run of pipe to be placed.

The shank and chute in the feed down method, or the shank and soil expander in the pull-in method shall be lowered into the start trench and checked before placement of the pipe is started.

The Contractor shall not subject to excessive stresses or to bends less than the minimum bending radius of the pipe recommendation by the manufacturer. Any sections of pipe that have been excessively scarred or grooved in the laying operation, shall be removed from the project.

Existing underground utilities shall be exposed by excavation ahead of the pipe installation and shall be protected by the Contractor against any damage.

Restoration of the slot shall be done by the Contractor immediately following the pipe placement.

When requested by the Engineer, the Contractor shall excavate and expose the pipe previously laid at any point requested.

The Engineer may restrict the use of the method when in his opinion the soil or other conditions would not make a satisfactory installation possible.

Minimum cover requirements previously stated, shall be maintained by the "feed down" or "pull in" trenchless method of pipe installation.

1-2.06. Laying and Backfilling, Plastic Pipe:

Only competent and experienced men at laying plastic pipe shall be employed on this phase of work. Any incompetency observed by the Engineer must be removed at his request. The pipe, fittings and valves shall be placed in the trench with care. Under no circumstances shall the pipe or other materials be dropped or dumped into the trench. The pipe shall not be dragged in such a manner as to scratch the pipe surface; an excessive amount of scratching of the pipe or any deep scratches shall be cause for rejection of the pipe.

All pipe shall be snake into the trench bottom by alternating from one side of the trench to the other on alternate lengths of pipe if the trenching method is utilized.

During the laying operation each pipe shall be thoroughly cleaned inside immediately prior to the cementing of the joints. A swab of sufficient size to lightly touch the walls shall be run through the pipe, assuring that all foreign matter shall be removed. At the termination of each cementing operation, the open end of the pipe shall be tightly sealed off by a suitable cover until cementing and laying operations are resumed.

Solvent Weld Joints - All dirt, dust and moisture shall be removed from the surfaces to be welded. Solvents are to be applied with a non-synthetic bristle brush of proper width. The solvent and/or filler solvent shall be applied in a method recommended by the pipe manufacturer and approved by the Engineer.

Solvent weld joints shall be given at least fifteen (15) minutes set-up curing time before moving or handling. No pipe or fittings shall be joined when the temperature is below 40 degrees or above 90 degrees F. unless the method is specifically approved by the Engineer and the pipe manufacturer.

Bed and Cover - Each section of pipe in the trench shall rest upon the pipe bed for the full length of its barrel. The bottom of the trench shall be free from rocks, clods, or other sharp-edged objects. The subgrade upon which the pipe is placed shall consist of material suitable for supporting the pipe without excessive settlement or stress development.

If the pipe is to be laid in a trench having a rock bottom, six inches of sand or other suitable bed material shall be prepared before the pipe is lowered into the trench. Said material if required shall be furnished and installed by the Contractor at no expense to the Owner.

Backfilling of the pipe shall be made by depositing backfill materials of selected earth or sand at the sides of the pipe and to a depth of not less than twelve (12) inches above the top of the pipe. The placing of this portion of the backfill shall be done by hand or a mechanical method approved by the Engineer. If the placing of this portion of the backfill is approved for mechanical methods, the backfill material shall contain no stones of greater than 3/4" in diameter and shall be free from large clods and frozen earth. The method shall be such that the material is not dropped from the top of the trench onto the unprotected pipe.

The remainder of the trench backfill may be placed by hand or mechanical methods and shall be made in accordance with the Section on "Backfilling of Trenches" in these Specifications.

1-2.07. Laying and Backfilling, Asbestos Cement Pipe:

Pipe shall be thoroughly cleaned of all foreign matter before lowering into the trench and shall be kept clean during all laying operations. As directed by the Engineer, the pipe shall be laid directly on the trench bottom or on earth mounds.

Pipe Laid on Trench Bottom

Pipe Laid on Trench Bottom - Pipe shall be laid directly on a trench bottom containing coupling holes and shaped to provide continuous contact with the pipe between coupling holes.

Coupling Holes - Prior to lowering pipe into the trench a coupling hole shall be dug in the trench bottom having a length, width and depth to allow assembly and to maintain a minimum clearance of 2-inches between coupling and undisturbed trench bottom.

Shaping Trench Bottom - Prior to lowering pipe into the trench, the trench bottom between coupling holes shall be made flat and cut true and even to grade so as to provide continuous contact of the trench bottom with the pipe.

Pipe Laid on Earth Mounds

Pipe Laid On Earth Mounds - Pipe shall be laid on earth mounds of a size adequate to hold pipe in alignment and to maintain a 2-inch minimum clearance from coupling to undisturbed trench bottom as required below. Earth mounds shall be of approved, damp backfill material tamped in place.

Number of Mounds - Each pipe shall be laid on two mounds with center of each mound placed one-fifth of the pipe length from each end.

Clearance Under Pipe Line - The trench shall be excavated a minimum of 2-inches below the grade of the bottom of the outside diameter of the couplings and high spots between couplings shall be leveled so as to maintain a minimum of 2-inches under the pipe barrel. The earth mounds shall be tamped firmly in place and carried to a height which will allow for placement of the pipe so as to maintain, prior to backfilling, a minimum clearance of 2-inches between the trench bottom and the pipe and coupling.

Deflections from a straight line or grade, made necessary by vertical curves or horizontal curves or offsets, shall not exceed one (1) inch per linear foot of pipe between the centerlines extended, of any two connecting lengths of pipe. If the required alignment requires deflections in excess of those specified above, cast iron fittings shall be used as approved by the Engineer.

Backfilling shall be made by hand, depositing backfill materials, selected earth or sand, under and at the sides of the pipe and compacted by tamping. From the centerline of the pipe to a depth of twelve inches above the top of the pipe, the trench shall be backfilled by hand, with selected earth or sand, for asbestos cement pipe.

The remainder of the backfill may be placed by hand or mechanical methods and shall be made in accordance with the Section on Backfilling of Trenches, in these Specifications.

Backfilling of Trenches - After the embedment and first one foot of backfill above the top of pipe has been made the remainder of the backfill shall be in accordance with this provision of the Specifications. The remainder of the backfill shall be placed by hand or mechanical methods and shall be left in a mound over the centerline of the ditch. The backfill shall be made of fill material which shall be free from rock of over 12 inches in length and/or diameter.

Cultivated fields shall have a minimum of eighteen (18) inches of rock free material and in uncultivated fields and yards, a minimum of eight (8) inches of rock free materials. Both shall be measured from the original ground surface. Where backfill material is not available, the required material shall be obtained from a borrow area arranged for by the Contractor. No top soil shall be stripped from the adjacent area of the trench. All backfilling shall be carefully done in a manner that shall not harm the pipe and to the satisfaction of the Engineer.

Wherever trenches have not been properly filled or when settlement or erosion occurs, they shall be refilled and mounded so that any further settlement will leave the ditch to conform to the surface of the original ground. Backfilling across sidewalks, roadways, driveways, and within 10' of meter pits, etc., shall be made as specified, except that all fill above the pipe shall be deposited in layers not greater than six (6) inches and each layer shall be thoroughly tamped and compacted so that upon completion of backfilling; graveling, paving, roadway surfacing, or sidewalks may be immediately replaced.

Backfilling meeting the above requirements may be done prior to testing at the Contractor's option. This will be allowed to prevent displacement of the pipe during testing operations. Should the pipe not withstand the hydrostatic test as outlined in these Specifications, the Contractor shall be required to uncover the pipe to determine the cause of failure.

1-2.08. Excess Excavated Materials:

Excess excavated material, not required for backfill or grading, shall be removed from the site of excavation when within streets, roadways, highways, parkings and driveways, both public and private, by and at the expense of the Contractor. The Contractor shall be responsible for obtaining a proper disposal site, and the disposal of such material shall be to the satisfaction of the Owner and the Engineer in each case.

Excess excavated earth material, free from rock or stones of larger than one (1) inch in diameter, located in open fields shall be distributed directly over the pipe trench, to a maximum depth of no greater than ten (10) inches above the original ground surface, across the trench width. The mounding over the trench shall have uniform side slopes extending no greater than three (3) feet from the center of the trench.

Rocks or boulders excavated and too large to be used in the backfill provisions of these Specifications shall be hauled from the site by and at the expense of the Contractor. The Contractor shall be responsible for obtaining suitable disposal sites and shall be responsible to the Owner and the Engineer for the proper disposal of the material and said rock material shall be left in a manner satisfactory to the land owner.

1-2.09. Structure Excavation:

Excavation for structures, meter pits and other appurtenances shall be of such a size as to leave a minimum of one (1) foot of clear space between the structures finished outer surface and the embankment or sheeting and bracing line.

The backfill around the structure or meter pit shall be made in no greater than six (6) inch layers and each layer shall be tamped and compacted before proceeding to the next layer. Top soil shall be placed in the final four (4) inches of backfill and shall be raked to a smooth condition and tapered from the finish elevation of the meter pit or structure, to a point two (2) feet away to normal ground level.

1-2.10. Conduit Excavation for Highways, County Roads and Railroads:

Pipe lines larger than 2 inches under highways, or paved county or township roads and railroads so designated on the plans shall be encased in a steel encasement of the type, size, length, and depth necessary to meet the requirements of the state or county highway officials. At the points of entry and exit from the casing,

the plastic pipe shall be protected from cutting and pinching by a sleeve which extends at least 12 inches in both directions from the end of the casing. Such sleeves may be made of sections of larger sizes of pipe. Where space permits sleeves shall be doubled. Fill at the ends of the casing pipe shall be hand placed and thoroughly hand tamped for a distance along the axis of the pipe at least three (3) feet out from the end of the casing, the full width of the trench and to a height of at least one foot above the pipe. Pipelines 2 inches or smaller need not be encased but shall be Schedule 80 PVC pipe. All roads with hard surfacing and railroads so designated on the plan shall be bored or driven through. The depths of the boring shall be a minimum of 72 inches below the roadway surface and the length of encasement shall be in accordance with the permits issued by the controlling agencies. As noted before the Owner will procure said permits. Said crossings are located on the Drawings. Any location in doubt shall be approved by the Engineer.

The Contractor shall contact the controlling agency for each crossing and notify these authorities when the work is scheduled to commence. See Section 1-2.06, these specifications.

SECTION 3

Distribution System

1-3.01. Inspection of Materials During Construction:

Any materials not meeting these Specifications, or obviously faulty material, shall be rejected by the Engineer and removed from the jobsite by the Contractor. At the option of the Engineer, joints may be cut from the pipeline for inspection. No more than two (2) joints shall be cut out in any one day for inspection unless a joint examined proved unsatisfactory to the Engineer. In case of an unsatisfactory joint, joints shall be cut out of the line and examined until two (2) consecutive joints examined prove satisfactory.

1-3.02. Incidental Items of Work:

All fittings at bends in the pipe line shall be firmly wedged against the vertical face of the trench in order to prevent the fittings from being blown off of the lines when under pressure. This wedging shall be done with precast concrete slabs or by pouring concrete in the opening between the fitting and the solid undisturbed trench face. This wedging hereafter referred to as thrust blocking shall be required at all points where the pipe changes directions such as all tees, elbows, wyes, caps, valves, hydrants, etc.

Thrust blocks may be constructed of precast concrete slabs having a compressive strength of at least 2,000 psi providing the slabs are properly wedged between the fitting and trench surface; however, the preferred blocking practice shall be by pouring concrete between the fittings and the trench wall as shown on the Drawings. The concrete mixture shall be one part cement, two parts washed sand and five parts gravel. The thrust blocks should be constructed so the bearing surface is in direct line with the major force created by the pipe or fitting. The earth bearing surface shall be undisturbed and only the simplest of forms shall be required.

If the character of the soil is such that adequate bearing may not be obtained the Engineer may direct the placement of thrust restraint rods.

1-3.03. Setting of Valves and Hydrants:

Valves, curb stops, hydrants and valve or service boxes installed in trenches shall be placed where shown on the Drawings unless otherwise directed by the Engineer. Hydrants, valves, curb stops and valve or service boxes shall be set plumb with the valve or service box positioned directly over the valve. After being correctly positioned, the earth fill shall be carefully tamped around the valve or service box for a distance of four (4) feet on all sides of the box.

Hydrants shall be set at such an elevation that the connecting pipe and the distribution main shall have the same depth of cover. Each hydrant shall be placed upon a concrete slab or concrete blocks not less than four (4) inches thick and 12 x 24 inches in plan. The backside of the hydrant opposite the pipe connection shall be firmly braced against the vertical face of the trench to prevent the hydrant from blowing off at the line. All wedging and re-strain rods if required, shall be in accordance with the previous paragraph in these Specifications. Around the base of the hydrant, seven (7) cubic feet of crushed rock shall be installed to insure complete drainage of the hydrant.

Before installing any hydrant, valve or curb stop, care shall be taken to see that all foreign material and objects are removed from the interior of the barrel. Stuffing boxes shall be tightened and the valve, hydrant or stop shall be opened and closed to see that all moving parts are in working order. Each valve or service box in paved areas shall be protected by a concrete slab in accordance with the detail on the Drawings.

In dirt or gravel roads, the valve box shall be buried a minimum of twelve (12) inches below the surface for protection against ruts and grading. Valves and boxes in open fields shall be installed out of farmed area and preferably located as near as possible to a fence line or undisturbed areas; if not feasible the top of valve box shall be placed a minimum of eighteen (18) inches below the normal surface if located in a cultivated field.

1-3.04. Stream Crossings:

Pipe lines under streams and creeks shall be protected by encasement pipe of steel pipe, metal pipe, or P.V.C. pipe, as called out on the Drawings or as directed by the Engineer. All lines placed beneath stream channels shall be installed a minimum of seventy-two (72) inches below the bottom of the stream or channel bed. The encasement pipe shall extend to a point ten (10) feet beyond the bank edge of the stream or channel being crossed.

Where steel or metal encasement pipes are used, a P.V.C. bushing pipe four (4) feet in length shall be installed at the ends of the encasement pipe to prevent friction damage to the carrier pipe.

At the Contractor's option all stream crossings may be made by using cast iron pipe as the carrier pipe with the elimination of the encasement pipe.

Streams of such minor magnitude not justifying encasement and stream crossing designation on the Drawings, shall still be installed in the same profile manner, except that no encasement shall be required.

If, at the time of construction, any of the following conditions should appear: (a) Evidence of recent severe cutting or erosion; (b) Crossing of recent channel improvements where new stream location is not stabilized, such as pilot channels, newly constructed pond spillways, etc.; (c) Crossing of proposed channel improvements, the Owner and Engineer shall be notified and shall be reason for the Owner and Engineer to authorize additional crossings to be constructed by the Contractor.

1-3.05. Testing:

All pipe lines shall be tested with water to 25% above the rated working pressure of the pipe, corrected to the lowest elevation of the section being tested. The lines shall be tested in sections, with a section being the shortest length of line between shutoff valves.

The rated working pressure of Class 160 PVC pipe shall be assumed to be 120 psi and the rated working pressure of Class 200 PVC pipe shall be assumed to be 150 psi. The rated working pressure of Class 150 A.C. pipe shall be assumed to be 150 psi.

All tests and testing equipment shall be provided by the Contractor at no cost to the Owner. Testing equipment and testing procedure shall be approved by the Engineer. Prior to performance of the test all air shall be expelled from the pipeline to the satisfaction of the Engineer. This may be accomplished by means of air relief valves, blowoff valves, hydrants or other means. If required, taps shall be made at high points where air relief valves are not called for on the plans. Such taps shall be plugged after testing is completed.

The test shall be conducted with all service lines along the length of the test section installed.

The test shall consist of pumping water into the section through one of the service lines, bringing the pressure to 25% above the rated working pressure, corrected for the lowest point being tested. The pressure shall be maintained for fifteen minutes.

The Contractor shall then open the valve and repressure the line to the testing pressure and shall then close the system for another fifteen (15) minute period.

At the end of the second fifteen (15) minute period the Contractor shall again pump into the line, out of a water container which shall be capable of measuring the amount of water required to bring the line back to the corrected testing pressure.

The final repressuring of the line shall not require more than one-quarter of a gallon per mile of line being tested, regardless of the pipe diameter. The test shall be recorded with the amount of water required and the pressure maintained along with the service location at which the test was conducted.

Any section not meeting these test requirements shall be repaired and retested until the minimum test requirements are met.

1-3.06. Clean-Up:

The accomplishment of clean-up by the Contractor shall be made as soon as possible and shall be considered as a factor of prime importance in the completion of the project. The backfill requirements shall be strictly adhered to and all backfill around meter pits and through yards shall be raked and left in such a manner as the land owner may re-establish his yard or lawn. The Contractor shall clean-up all portions of the project and signed releases by the landowner shall not relieve the Contractor of the responsibility of clean-up to the satisfaction of the project Owner and the Engineer.

The Contractor shall notify the Engineer and the Owner of his request for final inspection for the project or part of the project if so sectionalized by the Engineer. The Engineer, Contractor, and a representative of any applicable governing agency and representatives of the Owner shall be present for the inspection. The Owner's representatives shall have the authorization of the Owner for the on-site acceptance of the Contractor's clean-up.

Any problems arising after the acceptance inspection, such as backfill settlement, shall be considered after the fact and shall be recognized as maintenance under the Contractor's Maintenance Bond. Any expense involved on the part of the Engineer and Owner to make return inspections due to the Contractors presenting the project in a known unacceptable manner shall be compensated for by the Contractor prior to final payment.

SECTION 4

Pipe and Fittings

1-4.01. Plastic Pipe, P.V.C.:

Plastic pipe and fittings shall be furnished by the Contractor and shall be laid and joined in accordance with these Specifications and the manufacturer's recommendations. The P.V.C. pipe shall have a minimum hydrostatic working pressure as shown on the bid proposal and located as shown on the Plans.

The P.V.C. pipe shall be manufactured of Type 1, Grade 1, 2,000 psi design stress for water at 74.3 degrees F. and designated as PVC 1120 and shall conform to ASTM D-1784 compound specifications. All pipe shall bear the National Sanitation Foundation (NSF) seal of approval and shall conform with the requirements of Commercial Standard CS-256-63 and ASTM D-2241. The pipe shall be precision extruded from new Polyvinyl Chloride material and shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects. The pipe shall be extruded in strict accordance with the raw material manufacturer's recommendations and specifications.

The type of coupling to be used shall be designated as follows: Belled End (B.E.), Coupled End (C.E.), Gasket Joint (G.J.).

1-4.02. Belled End Pipe:

Belled end pipe shall meet all of the above requirements and shall have an integral bell considered as the female end. The bell shall have a minimum wall thickness at all points on the bell equal to the wall thickness of the class designation of the pipe. The socket depth of the bell shall be no less than one diameter of the pipe. The male end shall have a ring painted around the end and in such a manner as to allow field checking of the setting depth of pipe in the socket.

1-4.03. Coupled End Pipe:

Coupled end pipe shall meet all of the previous stated manufacturing requirements and shall be shipped with one coupling factory applied. All couplings shall be from extruded or moulded stock and shall be factory tapered to provide an interference fit for at least one-half of the socket depth. The couplings furnished shall provide a minimum contact length of one diameter of the pipe each side of the center. The entrance to the coupling shall be beveled to prevent wiping off of the solvents on the male end. All uncoupled ends shall have a ring painted around the end in such a manner as to allow field checking of the setting depth of pipe in the socket.

1-4.04. Gasket Joint Pipe:

Gasket joint pipe shall meet all of the previous stated manufacturing requirements. The pipe shall be coupled and sealed against infiltration and exfiltration by means of a rubber ring seated in the coupling or integral bell. If couplings are used they shall be a twin gasketed coupling with a positive stop in the center that will automatically position the pipe ends within the coupling. Single gasket couplings welded to one end of the pipe will not be accepted. Pipe that has an integral bell as a part of the pipe with a single gasket shall be approved. All coupling or bells shall have a seating depth of at least one diameter of the pipe. The male ends of the pipe shall be beveled at the factory for ease of entry into the coupling and shall have a ring painted around the end in such a manner as to allow field checking of the setting depth of pipe in the socket.

1-4.05. PVC Lengths:

All of the above specified types of pipe shall be supplied in standard laying lengths of 20 or 40 feet. However 40 feet or longer lengths of pipe will be approved only upon adequate verification by the Contractor that he has equipment capable of fully supporting the pipe while being transported and distributed over the project.

1-4.06. PVC Delivery:

The manufacturer shall deliver the pipe to the jobsite by means which will adequately support it, and not subject it to undue stresses. The load shall be so supported that the bottom rows of pipe are not damaged by crushing. The pipe shall be carefully unloaded and stored on the project or a site prepared and furnished by the Contractor. Pipe ends shall be covered during delivery from the manufacturer to the jobsite.

1-4.07. PVC Initial Laying:

The Contractor shall make arrangements with the pipe manufacturer to have a factory representative, skilled in the installation of the specified pipe, to be present for a minimum of one day at the starting of the laying of the pipe. A pipe supply house representative will not be considered as being a factory representative.

1-4.08. PVC Samples:

A sample of the pipe to be used, along with chemical data sheets, intended couplings and fittings shall be submitted to the Engineer for his approval. Approval must be obtained prior to delivery to the jobsite.

1-4.09. Fittings (Exclusive of Couplings):

Fittings shall be of the same material as the pipe, and in no case shall a fitting have a thinner wall than that of the specified pipe to be furnished. The dry fit of fittings must be snug. If the fit is such that it is loose, the fittings and/or pipe shall be rejected as faulty because of improper size. Building up of the joint to overcome a loose fit with multiple layers of filler solvent will not be permitted. All fittings (except for gasket joint pipe) shall be of socket type for solvent weld. The socket shall be so designed with a taper to provide an interference fit. Fittings shall have a minimum socket depth of no less than the following table. Fittings not meeting the specified depth shall be fitted with deep socket adapters. The adapters shall be installed into the fittings under shop conditions at least 48 hours prior to the installation of the fitting.

<u>Pipe Size</u>	<u>Socket</u>
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1½"	1.375
2"	1.500
2½"	2.000
3"	2.500
3½"	3.000
4"	4.000
5"	4.500
6"	5.000
8"	6.000
10"	8.000

1-4.10. Elbows:

Elbows of 90 degree and 45 degree bends shall be of the long radius type bend. Material thickness shall be equal to that of the specified pipe but in no instance shall it be less than .10 inch.

1-4.11. Mechanical Joint Adapters:

Mechanical joint adapters when required for valve settings or various specified connections shall be made of Schedule 80 PVC at least 12 inches long. One end shall be built up to an O.D. equal to that required by the mechanical joint fitting.

1-4.12. Deep Socket Adapters:

Deep socket adapters are intended to convert the standard shallow socket fitting to a deep socket and shall be required on all fittings not meeting the minimum socket depth in the fitting

table above. The socket and wall thickness requirements shall be equal to those for pipe couplings (one pipe diameter depth). The adapters must be installed under shop conditions at least 48 hours prior to the fitting installation to insure a good fit and weld.

1-4.13. PVC Welding Solvents:

PVC welding solvents are engineered and formulated to perform under a given joint design and condition. All solvent shall be purchased from the pipe manufacturer. The PVC welding solvent shall be compounded to conform to the socket fit and weather conditions at the time of installation. At no time shall solvent weld be made when the temperature conditions exceed the manufacturer's recommendations.

1-4.14. Fittings for Gasket Joint Pipe:

Fittings for gasket joint pipe shall be manufactured by the pipe supplier. The fittings shall be socket type with the same gasket design as used on the pipe coupling. The socket depths shall meet all of the requirements listed for the adjoining pipe and the wall thickness shall be no less than that for the specified pipe and under no condition shall it have less than 200 psi rating for continuous operation at 73.4 degrees F. All tees, crosses and elbows must be of gasket design the same as the pipe coupling. If special fittings, requiring the use of solvent welds such as mechanical joint adapters, reducers, etc., the parts shall be fabricated under shop conditions at least 48 hours prior to installation to insure a good fit and weld.

1-4.15. Cast Iron Pipe:

Cast iron pipe shall be furnished by the Contractor and shall be installed in accordance with the manufacturer's recommendations and these Specifications. All cast iron pipe shall be Class 150, Mechanical Joint or various rubber gasket push on joints meeting AWWA Specification C111 and ANSI Specification A21.11, unless otherwise specified on the Drawings.

All pipe shall be ductile cast iron and shall conform to AWWA Specification C151 and ANSI Specification A21.51. The pipe shall have a standard cement lining with a bituminous seal coat meeting AWWA Specification C104 and ANSI Specification A21.4. All pipe in three inch through twelve inch sizes shall be Thickness Class No. 2.

1-4.16. Fittings:

Fittings for cast iron pipe shall be either Mechanical Joint, Class 250, meeting all the applicable requirements of ANSI A21.10 (AWWA C110) and ANSI A21.11 (AWWA C111) or an approved rubber gasket joint fitting conforming to ANSI A21.10 (AWWA C110) for thickness and radii of curvature and to ANSI A21.11 (AWWA C111) for type of joint. All fitting shall be cement lined in accordance with ANSI A21.4 (AWWA C104).

If flanged fittings are noted on the Drawings for use they shall conform to ANSI A21.10 (AWWA C110) or to ANSI B16.1, and shall be rated for not less than 175 psi for water service. All flanged fittings shall be furnished faced and drilled to Standard 125 pound template unless otherwise noted.

1-4.17. Cement Asbestos Pipe:

If asbestos cement pipe is authorized for use on the work, it shall be furnished by the Contractor and laid in accordance with the manufacturer's recommendations and specifications. The pipe shall be Class 150 pipe, complying with the provisions of AWWA Standard Specification C400-65T and ASTM C296, designed for water working pressure of 150 pounds per square inch, unless otherwise shown on the Drawings, and on the Bid Proposal. It shall be furnished in lengths which, when properly connected together, shall equal the total length for each straight run of pipe, and the ends of each length shall be machined to facilitate joining the pipe sections, using the couplings that are specified.

Each piece of pipe shall be furnished with a Standard Ring-Tite or Fluid Tite Coupling. Each coupling shall consist of a heavy asbestos sleeve and two (2) rubber ring gaskets designed for use together. The sleeve in each case shall have two (2) grooves machined on the inner surface to hold the rubber rings in proper position.

The pipe shall be sampled and tested in accordance with the provisions of the governing AWWA Specifications. Tests shall include hydrostatic tests, flexure tests and three-edge bearing tests. Factory inspection by the purchaser will not be required, but the manufacturer shall furnish for delivery in duplicate to the Engineer certified copies of records showing results of all tests in each category.

1-4.18. Fittings:

Fittings for use in connecting asbestos-cement pipe, with the exception of couplings, shall be short body cast iron fittings, complying with ANSI A21.10 and A21.11. Short body cast iron 250 psi pressure, Mechanical Joint fittings only shall be used.

1-4.19. Galvanized Pipe:

Galvanized pipe, when approved for use, shall comply with the requirement of A.S.T.M. Serial Designation A120-69 and subsequent revisions entitled "Black and Hot Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Uses."

1-4.20. Service Line and Meter Pit Installation:

Services shall be located as shown on the drawings and shall consist of all items as shown on the drawings and covered in these specifications.

Excavation for the meter pit shall be at a minimum to allow for proper installation and shall be at a depth to allow the pit to rest on undisturbed earth and be at the required depth. The meter pit and lid shall be set so the lid is four (4) inches higher than the surrounding normal yard area. The backfill around the pit shall be tamped and the top soil tapered from the top of lid to a point two (2) feet away to normal ground level. The backfill shall then be raked to a smooth condition and all other excess materials hauled away from the area. No meter pits shall be left open on the property side for the Owner's convenience unless the Contractor assumes responsibility for its final appearance.

Service line shall be furnished in 2", 1½" or 1" size as specified in the Bid Proposal.

<u>Size</u>	<u>Class and Material</u>
2"	Class 200 PVC
1½"	Class 200 PVC or PE-3306
1"	Class 250 PVC or PE-3306

P.E. service line (when used) shall be high molecular weight polyethylene service pipe, 160 pound rating, Iron Pipe Size, known as PE-3306, SDR-7 conforming to Commercial Standard CS-255-63.

Service saddles for PVC Pipe shall be installed on the main line and shall have a "O" ring seal between the pipe and the saddle. The saddles shall have female, I.P.S. outlet size as required and shall be "Dresser", Style 194 or an approved equal. The connection of the service line to the service saddle shall be made with a compression coupling as manufactured by Ford Meter Box Co., Inc., or an approved equal.

1-4.21. Service Lines into Basements:

In all cases except where meter pits are utilized the service lines shall be installed into existing basements by the Contractor.

As noted on the plans where 1½" or 2" PVC service line is installed a reducer to 1" shall be installed at a point not greater than 6' outside of the house foundation. The 1" pipe from this point and through the basement wall shall be Schedule 80 PVC or Galvanized Pipe.

The basement wall shall be drilled slightly larger than the O.D. of the 1" pipe and then patched and or caulked so that a first class job is the end result.

The basement meter assemblies shall be installed by the Contractor and braced or supported in such a manner that stresses are not transferred to the incoming pipeline.

The meter readout shall be installed on the outside of the house, five feet above the ground line, in a convenient location.

SECTION 5

Appurtenances and Materials

1-5.01. Gate Valves:

Gate valves shall be used on all two inch and three inch lines. The valves shall have mechanical joint ends, except for valves with compression joint ends constructed for use on PVC pipe. Said compression joint ends shall have a minimum socket depth of at least one diameter of the pipe. Each gate valve shall have a clear waterway of the full nominal diameter of the of the valve and shall be opened by turning the valve nut to the left.^{*} The operating nut, or wheel if specified for above ground installation, shall have cast thereon an arrow indicating the direction for opening. All valves for underground installation shall be provided with a standard AWWA two inch operating nut. The valve shall be designed for no less than 200 pounds per square inch of water working pressure. Prior to factory shipment each valve shall be tested by hydraulic pressure equal to twice the specified pressure rating and year in which the valve was made, cast on the body. Each valve shall conform to the latest standard specifications adopted by the AWWA and shall be manufactured by the "M & H Valve Co.", Fig. 67; (Fig. 67-P, for PVC compression joint), or an approved equal.

1-5.02. Butterfly Valves:

Butterfly valves shall be used on all four inch and larger lines. The valves shall have mechanical joint ends, unless otherwise specified, except for valves that are constructed for use on PVC pipe with compression joint ends having a minimum socket depth of at least one diameter of the pipe. The valve operator shall be permanently sealed and lubricated. For underground installation the valve operator shall be provided with a standard AWWA two inch operating nut; the valve shall open by turning the nut to the left.^{*} Valves that are specified for above ground installation shall be supplied with a lever operator for sizes up to 8 inch; valves over 8 inch in size shall be supplied with a crank operator. The valve shall have a stainless steel seat which shall be cast as an integral part of the body. The valve drive shaft shall be of one piece hexagonal construction with no pins or keyed shafts which could shear and cause valve failure. The valve shall be designed for no less than 175 pounds per square inch of water working pressure. Prior to factory shipment each valve shall be tested by hydraulic pressure equal to twice the specified water working pressure. The valve shall be as manufactured by the "Dresser Manufacturing Co.", Type 450, Butterfly valve; or an approved equal.

^{*}Note: "Left-hand opening" means "turn CCW to open".

1-5.03. Small Line Valves:

1½ inch and smaller valves shall be as manufactured by one of the following companies: "Mueller, Oriseal Valve", "Ford Ball Valve" or an approved equal. All small line valves used on the distribution system shall be of the same type and manufacturer. It should be noted that 2" valves of this type are also called for in some of the control valve structures.

1-5.04. Valve Boxes:

Valve boxes for 4" and larger valves shall be 2 pieces with a minimum 5¼ inch shaft, slip type made of cast iron or plastic. If plastic valve boxes are furnished they shall have cast iron collars and cast iron lids. The lid shall have the word "WATER" cast thereon. The valve boxes shall be suitable for depth of cover over the pipeline as specified or as required in each case.

The foregoing shall hold true for 3" and smaller valves except that the shaft shall not be smaller than 4¼ inches.

Valve boxes for 1½" valves shall be furnished with Arch Pattern Bases.

1-5.05. Valve Operating Keys:

Four "T" type valve operating keys shall be furnished to the Owner for each type of valve used on the distribution system. The keys shall be of sufficient length for the operation of all underground valves or ball valves in the distribution system. The operating keys shall be of the same manufacturer as the valves.

1-5.06. Meters (Magnetic Type) 5/8" through 2" Size:

Manufacturer - Rockwell, Neptune, Badger, or Hersey.

Type - Magnetic Drive, Sealed Register, Positive Displacement Disc or Piston Meters.

Size - Must conform to American Water Works Specifications C-700-61.

Length - Must conform to American Water Works Specifications C-700-61.

Construction - The meters shall be designed to have two chambers housing the working parts. The upper chamber shall be sealed and de-humidified and will house the register, change gears, gear

train and upper magnet. The lower chamber shall be sealed and house the measuring interior and disc, strainer, and the lower magnet. The upper and lower magnets shall be so positioned to form a magnetic drive between parts.

Calibration - The meter design will allow calibration in the local shop for minor alteration to registration after repair and cleaning.

Cases - All meters shall have an outer case with a separate measuring chamber which is easily removed from the case. Cast iron frost bottoms, or bronze bottoms can be provided. All meters shall have cast on them in raised characters the size and direction of flow through the meter. 1½" and 2" meters will be split case type with bronze lower and upper shell assemblies.

External Bolts and Washers - All external bolts and washers shall be of corrosion resistant material and be easily removed from the main case.

Registers - Hermetically Sealed - Registers shall be straight reading. The figures on the number wheels shall be large and distinct. The register must have a large test or sweep hand and all gearing will be contained in an hermetically sealed unit, and will be guaranteed for ten (10) years.

The oscillating piston type meter register shall be secured to the upper main case by means of a locking device secured in the interior of the meter so that the register cannot be removed externally.

Minimum capacity of the 5/8" register shall be 10,000,000 gallons. The first totalizer wheel shall be black without numerals. Balance of the wheels shall be white with black numerals.

Measuring Chamber - The measuring chamber shall be of bronze or nylon and shall not be cast as part of the main case. All piston and disc assemblies will be interchangeable.

Stuffing Box - There shall be no stuffing box.

Strainers - All meters must be provided with an internal strainer made of corrosion resistant material and be easily removed from the meter. Stainless steel strainer will be preferred.

Test - Shall conform to AWWA test specifications or any other test specifications agreed to by the customer and manufacturer.

Pressure - Meters shall be guaranteed to operate under a working pressure of 150# per square inch, without leakage or damage to any parts.

Workmanship and Materials - All meters will be guaranteed against defects in materials and workmanship for a period of one year from date of shipment.

Accuracy - All meters shall be guaranteed by the manufacturer to conform to all requirements of the AWWA - Accuracy Specifications for a minimum of five (5) years.

Selection - The Owner reserves the right to select any of the above meters at the Contractor's bid price.

1-5.07. Remote Register Specifications:

Meter Register - The register shall be magnetically driven; it shall contain the reducing gear train, odometer and generator that pulses the remote register. The register shall have a visible totalizing odometer and test sweep so that registration of the meter can be read at the meter and the meter can be tested with its register.

Outside Register - The outside register shall be contained in a weatherproof, corrosion proof, high impact resistant material. The register shall be an electro-mechanical counter, containing sufficient number wheels to provide a reading capacity equal to the register on the meter, to which it is connected. The odometer construction shall be such that the number wheels can be manually reset, at the site, to zero (0) or any other number that may be required, to match the meter register.

The indication of the remote reader for any size of meter shall be 1,000 gallons.

Mounting screws shall be concealed by the cover, and cover screws shall be drilled to accommodate seal wires.

The system must be operative at a minimum distance of 100 feet between meter and remote register when connected by two (2) conductor cable, whose wire size is 22 ga.

Twenty-five (25) feet of two (2) conductor cable (22 ga. wire) shall be provided for each unit and necessary spade lug connectors. The cable shall be supplied in continuous lengths on spools so that the installers can cut cable to the length required, for specific installations.

1-5.08. Subscriber Meter Pits: (Where Required)

The meter pits shall be constructed as shown on the plans. If well curbing is used it shall have a concrete compressive strength of not less than 3,000 psi. The top frame and cover shall be a Ford "Monitor" cover with 20" lid and inner lid for frost protection.

1-5.09. Cleanout, 1½":

A 1½" cleanout, constructed of galvanized pipe as detailed on the Drawings, shall be constructed at locations shown on the Plans. Some locations may be at ends of lines, others beside the mains. The cleanout shall be constructed as detailed on the Plans and shall consist of a 1½" valve and box as specified. A short length of 1½" galvanized pipe, a 1½" elbow drilled with a hole for drainage, a 1½" length of pipe extending above the ground with an elbow and capped nipple. The valve box and riser shall be set in or near a fence line or right-of-way line as shown on the plans.

1-5.10. Subscriber Meter Setters: (Meter Pit Installation)

The meter setters shall be a copper setter, Ford V-170 series with 12" riser or equal. The setter shall have a P.E. or P.V.C. compression joint inlet and 1" male I.P. male union swivel outlet. Where a pressure regulator is called for a tandem setter shall be furnished.

The tandem setter shall be a Ford V-170 series, Type "C" with 12" riser. All setter cross bars shall have an eye for the insertion of a ½" cross brace to hold the meter setters upright. All setters shall be furnished with inlet angle valves and with saddle nuts for the meter and stainless steel insert stiffeners for the compression fittings. All setters shall be furnished with test valve on outlet.

1-5.11. Subscriber Pressure Regulator: (Meter Pit and Basement Installation)

The subscriber pressure regulators shall be a ¾" Watts No. U5 or No. 223S (high capacity) as required or approved equal.

1-5.12. Subscriber Check Valves: (Meter Pit and Basement Installation)

Check valves shall be 1", 100 pound lift check valves equal to "Crane Co.", No. 1246.

1-5.13. Signs:

Each main line valve, service line valve and special regulating valve structure shall be furnished with a sign. The signs shall be 14 gauge, zinc coated steel, ASTM-A93. Letters are to be white with blue background and blue border. Shop drawings covering letter size, etc., must be submitted for approval. See plans for dimensions and other construction details. The signs may be ordered from Iowa State Industries, Anamosa, Iowa. One sign shall be placed adjacent to (in the fence line or road right-of-way line) of each and every main line valve and by each service line valve and by each main line pressure regulating valve and by each air release valve and by each line cleanout.

1-5.14. Fire Hydrants:

Fire hydrants shall be Mueller Co. and be furnished with two 2½-inch hose nozzles, 5-inch valve opening and 6-inch inlet. Fire hydrants shall be installed with 5'-6" cover. Two hydrant wrenches shall be furnished by the Contractor and turned over to the Owner when construction is completed.

1-5.15. Subscriber Meter Assemblies: (Basement Installation)

The following meter assemblies shall be furnished and installed by the Contractor. The assemblies shall consist of the following items:

a. Basement Meter Assembly

1. 3/4" Ball Meter Valve, Ford B13-342 w/1" I.P.S. inlet and 3/4" I.P.S. outlet.
- *2. 5/8" x 3/4" or 3/4" meter (as required) w/remote readout and cable.
3. 3/4" x 1" straight meter coupling, Ford SPM-23.
4. 1" bronze lift check valve, Crane No. 1246.

b. Basement Meter Assembly with Pressure Regulator

1. 3/4" Ball Valve, Ford B11-343 w/1" I.P.S. inlet and 3/4" I.P.S. outlet.
2. 3/4" Brass or Bronze nipple.
- *3. 3/4" pressure regulator, Watts No. 223S or U5 as required with strainers.

4. 3/4" straight meter coupling, Ford SPM-2R.
- *5. 5/8" x 3/4" or 3/4" meter (as required) w/remote readout and cable.
6. 3/4" x 1" straight meter coupling, Ford SPM-23.
7. 1" Bronze Lift Check Valve, Crane No. 1246

*Note: These items (the meters and pressure regulators) will be bid separately and are not to be included with the basement meter assembly bid price.

SECTION 6

Disinfection

1-6.01. General:

All pipelines of the system, from the supply to all parts of the distribution system shall be disinfected as follows: Water containing at least 100 parts per million of free available chlorine shall be allowed to stand in the pipe for at least eight (8) hours, after which there should be at least 25 parts per million residual chlorine remaining in the water. All new valves and cleanouts shall be operated while the pipeline is filled with the heavily chlorinated water. A 100 parts per million concentration corresponds to about four (4) pounds of ordinary chloride of lime (25 percent available chlorine) or 1.5 pounds of high test calcium hypochlorite (70 percent available chlorine) per 1,000 gallons of water in the system.

<u>Line Size</u>	<u>Approximate Gallons of Water Per Foot</u>	<u>Approximate Gallons of Water Per Mile</u>
2"	.164	866
2½"	.255	1,330
3"	.368	1,943
3½"	.501	2,645
4"	.654	3,453
5"	1.02	5,386
6"	1.47	7,762
8"	2.62	13,834

SECTION 7

Miscellaneous Main Line Special Valves and Structures

1-7.01. General:

The Contractor shall install special valves and structures as indicated on the plans or as directed by the Engineer. The special valves shall be installed with structures including all necessary piping, valves, unions, miscellaneous fittings, sensing lines and other equipment and appurtenances as detailed on the plans.

1-7.02. Automatic Air Release Valves:

Automatic air release valves shall be located as designated on the plans or as directed by the Engineer. The air release valves shall be a 1" Golden Anderson Fig. GH4-150-X or approved equal. See plans for construction details and location.

1-7.02. Manual Air Release Valves:

Manual air release valves shall be located as designated on the plans or as directed by the Engineer. The manual air release valve shall be an "Iowa" Model L-51 (3/4") freezless yard hydrant as manufactured by the Woodford Manufacturing Co., Des Moines, Iowa or equal. Each hydrant shall be furnished with a padlock approved by the Engineer to utilize holes in the side links so hydrant may be locked in the closed position. See plans for construction details and location.

1-7.03. Pressure Regulating Valves:

Pressure regulating valves shall be located as designated on the plans or as directed by the Engineer. The pressure regulating valves shall be 2" Golden Anderson Figure 43-D-IBBM-X, Model BGA-710512-A-D or approved equal. The valve shall maintain any desired, constant downstream delivery pressure against a higher inlet head, and sensitively operate to avoid any excess rise of downstream pressure under any sudden varying flow condition. All valves shall be factory set and inspected and adjusted on the job site by an authorized factory representative.

1-7.04. Pressure Gauges:

Pressure Gauges shall be included in the pressure regulating installation as indicated on the plans. The pressure gauges shall be equal to the Type 1, pressure gauge 4½" as manufactured by

the Marsh Instrument Co., Skokie, Illinois. The dial range shall be 200 pounds, the numerals shall be 20 pounds and the primary divisions shall be 5 pounds.

1-7.05. Structure Covers:

The structure covers shall be Ford "Monitor" or equal with 20" lids and inner lids for frost protection.

1-7.06. Structures:

Structures shall be constructed as detailed on the plans. Careful attention shall be given to the elevation and vertical alignment of the structure. Backfill shall be compacted as noted on the plans to avoid excessive ground water seepage and for frost protection.

The structures shall be set on concrete blocks as noted and gravel installed in the bottoms.

All openings in the structures shall be carefully grouted after installation of the pipes.

The precast manhole sections shall conform to ASTM C478-61T. The cast iron manhole steps shall be Neenah R-1980-E or equal.

Where well curb sections are used they shall have a concrete compressive strength of not less than 3,000 psi.

SECTION 8

Basis of Payment

1-8.01. General:

Payment for work performed by the Contractor under this Division of the Specifications will be made at the approved contract unit price for each of the items listed in the Proposal and measured as hereinafter specified. This price and payment shall constitute full compensation to the Contractor for all costs in connection with furnishing all labor, tools, equipment and materials necessary to complete the items in accordance with the Drawings and Specifications. All incidental work which may or may not have been shown on the Drawings or specified, but which is essential to the completion of the project in a workmanlike manner, including backfill, cleanup and disposal of surplus and waste material, shall be accomplished by the Contractor without additional cost to the Owner.

1-8.02. Measurement and Payment:

The quantities listed in the Proposal are not guaranteed quantities and are listed only for convenience in comparing bids. Payment will be made for the quantities actually constructed or installed, be they more or less than the listed quantities; said quantities to be measured and paid for as follows:

a. Furnishing and Installation of Pipelines.

Furnishing and installation of pipelines will be paid for at the respective contract unit price per linear foot for each size of new pipe actually installed, measured on top of ground along centerline of trench without deduction for space occupied by valves and fittings, including that portion of the line as installed within the limits of Highway and Stream Crossings. Each item shall include trenching and backfilling, together with tunneling under or removing and reconstructing surface obstruction not designated for separate payment; restoration of sod and gravel surfacing; loading, transporting, stringing and installing pipe; furnishing and installing joint materials; testing, chlorinating and flushing the pipelines and all incidental and appurtenant work required to complete the items in accordance with the detailed Drawings and Specifications.

b. Furnishing and Installation of Valves and Boxes.

Furnishing and installation of valves and boxes will be paid at the respective contract unit price for each valve and box of the respective size and type actually installed in the pipeline. Each item shall include furnishing and installing the valve, complete with valve box and cover, and sign, at the indicated location.

c. Pipe Fittings:

Pipe fittings will be considered as a part of the pipeline and shall be included in the unit price bid per foot of pipeline.

d. Meters: (Meter Pit Installation)

Meters and installation shall be paid for at the unit price bid including remote readouts, wire and posts.

e. Meters: (Basement Installations)

Meters and installation shall be paid for at the unit price bid including remote readouts and wire.

f. Subscriber Meter Pits:

Subscriber meter pits will be paid for at the respective unit price as a lump sum for each pit. Each pit shall include the cover, concrete blocks, gravel in the bottom, including excavation and backfill.

g. Service Pipe and Fittings:

Service pipe and fittings will be paid for at the respective contract unit price per linear foot actually furnished and installed, measured from the centerline of the main to the centerline of the meter pit or house foundation, including that portion of the line installed within the limits of Highway service crossings, and including saddle or tee connections to the main line.

h. Subscriber Pressure Regulators:

Pressure regulators will be paid for at the unit price bid. Payment shall include the regulator, materials equipment and labor necessary for the complete installation. (Either basement or meter pit installation).

i. 3/4" Meter Setters: (Single and Tandem - Meter Pit Installation)

3/4" meter setters will be paid for at the respective contract price. Each setter shall include the furnishing and installing of copper setter including inlet angle valve inlet compression fitting, brace pipe, test valve on outlet, outlet pipe to 12" outside of the meter pit and check valve in the outlet pipe.

j. Basement Meter Assembly:

Basement meter assemblies including installation will be paid for at the respective contract price. Each assembly shall include the following items:

1. 3/4" Ball Valve
2. Meter (Bid as separate item)
3. 3/4" x 1" straight meter coupling
4. 1" Bronze lift check valve

Each assembly shall include the cost of furnishing and installing 1" schedule 80 PVC or 1" galvanized pipe through the basement wall, with necessary connections to the service line, necessary fittings and elbows to connect the meter assembly so that it is installed parallel to a basement wall, necessary brackets or supports for the meter assembly so that no stresses are transferred to the incoming line, and necessary caulking and/or patching of the basement wall for a neat first-class finished job.

k. Basement Meter Assembly to Facilitate Pressure Regulator:

Basement meter assemblies to facilitate pressure regulators including installation will be paid for at the respective contract price. Each assembly shall include the following items:

1. 3/4" Ball Valve
2. 3/4" Nipple
3. Pressure Regulator (Bid as separate item)
4. 3/4" Straight meter coupling.
5. Meter (Bid as separate item)
6. 3/4" x 1" straight meter coupling
7. 1" Bronze lift check valve

Each assembly shall include the cost of furnishing and installing 1" schedule 80 PVC or 1" galvanized pipe through the basement wall, with necessary connections to the service line, necessary fittings and elbows to connect the meter assembly so that it is installed parallel to a basement wall, necessary brackets or supports for the meter assembly so that no stress are transferred to the incoming line, and necessary caulking and/or patching of the basement wall for a neat first-class finished job.

l. Highway and Railroad Crossings:

Highway and railroad crossings will be paid for at the respective contract price as a lump sum. This item shall include the casing pipe (where required) and/or boring and jacking. This payment only includes those authorized crossings made without disturbing the road bed. The carrier pipe shall be measured straight through and will be paid for at the unit bid price for pipeline.

m. Highway Service Crossings:

Highway service crossings will be paid for at the respective contract unit price as a lump sum. This item shall include the casing pipe (if required) and/or boring and jacking. This payment only includes those authorized crossings made without disturbing the road bed. The carrier pipe shall be measured straight through and will be paid for at the unit bid price for service line.

n. Line Cleanouts (1½"):

1½" line cleanouts will be paid for at the unit price bid. The cleanout shall include pipe from the main line (including main line fitting) one 1½" valve and valve box, galvanized pipe, gravel underdrain and all excavation, backfill and incidentals including sign to complete the installation as shown on the plans.

o. Manual Air Release Valves:

Manual air release valves will be paid for at the unit bid price. The manual air release valve shall include the main line saddle, corporation stop and pipe from the main line. The price shall also include one ¾" curb stop valve and valve box, ¾" hydrant, gravel underdrain and all excavation, backfill and incidentals including sign to complete the installation as shown on the plans.

p. Automatic Air Release Valve:

Automatic air release valves will be paid for at the contract bid price. The automatic air release valves shall include the main line saddle, corp. stop and pipe from the main line. The price shall include one 3/4" ball valve, 1" air release valve, valve support, structure with cover and all excavation, backfill and incidentals including sign to complete the installation as shown on the plans. The price shall also include necessary testing and adjusting.

q. Main Line Pressure Regulator: (Single and Tandem Installation)

Pressure regulators will be paid for at the unit bid price. The regulators shall include main line fittings and pipe from the main line. The price shall include the following:

Single Installation - Two 4½" pressure gauges, two 2" ball valves, two 2" unions, and one 2" pressure reducing valve.

Tandem Installations - Two 4½" pressure gauges, four 2" ball valves, four 2" unions and two 2" pressure reducing valves.

All installations shall include structures with covers and all excavation, backfill and incidentals including signs to complete the installation as shown on plans. The price shall also include necessary testing and adjusting.

r. Fire Hydrants:

Fire hydrants will be paid for at the unit bid price. The fire hydrant shall include excavating and backfilling, furnishing and installing the hydrant, complete with thrust blocking, connections, testing and adjusting.

DIVISION 2
ELEVATED STORAGE RESERVOIR

SECTION 1

Standard Specifications

This project shall comply with the applicable portions of the latest issue of American Water Works Association D100, "AWWA STANDARD FOR STEEL TANKS - STANDPIPES, RESERVOIRS, AND ELEVATED TANKS - FOR WATER STORAGE," and D102, "AWWA STANDARD FOR PAINTING AND RE-PAINTING STEEL TANKS, STANDPIPES, RESERVOIRS, AND ELEVATED TANKS FOR WATER STORAGE." These AWWA standards are hereby made a part of these specifications by reference and when referred to, the requirements contained therein as modified herein shall apply to the project as if fully stated herein. They will hereafter be referred to as AWWA D100 and AWWA D102.

2-1.01. AWWA D100 Section 1 - General:

AWWA D100 Section 1 - General shall apply except under Sec. 1.3 and Sec. 1.4, the Contractor shall also furnish and install foundations.

The information furnished by the purchaser as suggested in Sec. B2 of Appendix B of AWWA D100 is as follows:

- B2.1 Capacity: Capacity shall be 100,000 U.S. gallons.
- B2.2 Height: See plans.
- B2.3 Roof: Not applicable.
- B2.4 Head Range: Head range shall not exceed 25 feet between overflow and low capacity level.
- B2.5 Joints: Joints shall be welded.
- B2.6 Riser: Riser shall be 10-inch diameter.
- B2.7 Completion Time: See Construction Agreement.
- B2.8 Site: See location plan.
- B2.9 Snow Loading: Snow load shall be considered in design.
- B2.10 Access Road: A public road with gravel surface is adjacent to the site.
- B2.11 Nearest City: Sioux Falls, South Dakota. See location plan.

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- B2.12 Transportation: See location plan.
- B2.13 Electric Power: Electric power is furnished to the area by Northern States Power with business offices in Sioux Falls, South Dakota. See Electrical Section.
- B2.14 Compressed Air: Not available.
- B2.15 Soil Bearing Value: A soil investigation and foundation analysis taken at the sites by Omaha Testing Laboratories is included in these specifications. The Contractor shall satisfy himself that this information is representative and accurate before he bases his design upon it.
- B2.16 Corrosion Allowance: Follow Contractor's normal practice.
- B2.17 Safety Cages: Safety cage shall be required on column ladder.
- B2.18 Pipe Connections: See plans.
- B2.19 Overflow: An 8-inch overflow to ground shall be provided. A 4-feet by 8-feet by 4-inch concrete splash pad shall be provided under the overflow. Maximum pumping rate is not expected to exceed 600 gallons per minute.
- B2.20 Silt Stop: A removable silt stop is not required.
- B2.21 Balcony: A balcony is required with suitable railing.
- B2.22 Cover: See plans. Piping shall have minimum ground cover of 5½ feet.
- B2.23 Cleaning Mill Scale: Mill scale shall be removed as specified either by the latest revision of Steel Structures Painting Council Surface Specification No. 6 (Commercial Blast Cleaning) or Steel Structures Painting Council Surface Specification No. 8 (pickling).
- B2.24 Painting: Exterior surfaces shall be painted with AWWA D102 Outside Paint System No. 1 (Alkyd). The three coat system shall be used. Finish color shall be selected by the purchaser. The name "LINCOLN COUNTY RURAL WATER" shall be painted in the block-style letters, with final letter size, design, color, and locations to be approved by the Engineer, on two sides of the tank.

Interior surfaces shall be painted with AWWA D102 Inside Paint System No. 3 (Zinc-Phenolic).

Disinfection of the tank shall be accomplished by the Contractor in accordance with AWWA D102, Section 5 - Disinfection of Tank, first, second or third method.

- B2.25 Special Accessories: The tank riser shall be insulated with 3-inches of U-200 urethane with an aluminum outer covering.

A circulating pump with thermostatic control shall be furnished and installed in the valve vault with suction off the base of the riser and discharge back up into the tank through a 1-inch copper pipe placed inside the riser and terminating at the top of the riser. The circulating pump shall be built with the impeller mounted directly on the motor shaft with bronze fittings, stainless steel shaft, and mechanical self-lubricating seal. The pump shall be capable of pumping 30 gallons per minute against a total dynamic head of 96 feet.

- 2-1.02. AWWA D100 Section 2 - Materials:

AWWA D100 Section 2 - Materials shall apply in its entirety.

- 2-1.03. AWWA D100 Section 3 - General Design:

AWWA D100 Section 3 - General Design shall apply in its entirety.

- 2-1.04. AWWA D100 Section 5 - Design of Elevated Tanks:

AWWA D100 Section 5 - Design of Elevated Tanks shall apply in its entirety.

- 2-1.05. AWWA D100 Section 7 - Accessories for Elevated Tanks:

AWWA D100 Section 7 - Accessories for Elevated Tanks shall apply in its entirety.

- 2-1.06. AWWA D100 Section 8 - Welding:

AWWA D100 Section 8 - Welding shall apply in its entirety.

- 2-1.07. AWWA D100 Section 9 - Shop Fabrication:

AWWA D100 Section 9 - Shop Fabrication shall apply as applicable.

- 2-1.08. AWWA D100 Section 10 - Erection:

AWWA D100 Section 10 - Erection shall apply as applicable.

2-1.09. AWWA D100 Section 12 - Testing:

AWWA D100 Section 12 - Testing shall apply as applicable.

2-1.10. AWWA D100 Appendix B - Recommendations:

AWWA D100 Appendix B - Recommendations subsections B2, B4, B6, B7, B8, B9 except Contractor shall furnish and install foundations, B10, B11, B12, B13, B14, B15, B16, B17 and B18 shall apply.

SECTION 2

Piping and Appurtenances

2-2.01. Scope:

The work covered by this section of the specifications shall include furnishing of all labor, equipment, materials, supplies and incidentals necessary to install all water lines and appurtenances as shown on the plans and as herein specified.

2-2.02. Piping:

The Contractor shall furnish and install all labor, tools, equipment and material required to connect the water towers to a point 15' outside the control manhole, including all necessary fittings, valves, fire hydrants and appurtenances as shown on the plans. All piping and fittings shall conform to Section G-4 of the specifications or as specified herein.

2-2.03. Valves and Miscellaneous Equipment:

This section of the specifications includes furnishing and installing all labor, plant, equipment, materials, tools, appliances and appurtenances required for the following items of equipment:

- (1) Control Manhole - As noted on the plans; structural and dimensional details of the valve vaults shall be worked out by the Contractor and submitted to the Engineer for approval.
- (2) Gate Valve - In the location shown on the plans furnish and install non-rising stem gate valves complete with hand wheels. Gate valves shall be flanged ends and shall be equal to M & H double disc Figure 52 gate valves.
- (3) Dresser Coupling - At the points designated, furnish and install Dresser couplings on the piping. Units shall be Style 38 for cast iron pipe.
- (4) Sump Pump: Sump pump shall be Yeomans size D2, Model B, or equal, $\frac{1}{2}$ H.P., Drain-Dri sump pump, 110 volt, single phase, 60 cycle, 1750 RPM.

(5) Altitude Gauge: Altitude Gauge shall be the Type 7 combination pressure and altitude, dial size 4½", dial range 100 pounds and 230 feet, the numerals shall be 10 pounds and 20 feet, the primary divisions shall be 2 pounds and 2 feet. The altitude gauge shall be as manufactured by the Marsh Instrument Company, Skokie, Illinois or equal.

2-2.04. Painting:

Painting of the control manhole piping will not be required if cast iron pipe is used throughout. If steel piping is furnished it shall be painted as well as other miscellaneous uncoated metals in accordance with 2-1.01, B2.24 (exterior surfaces).

SECTION 3

Site Work

2-3.01. Scope:

This section of the specifications includes all excavation, embankment, backfilling, and site improvements within the construction limits shown on the plans. Applicable portions of Section G-2 of the specifications shall be strictly complied with.

a. Seeding:

This work consists of fertilizing and seeding the previously fine-graded area within the disturbed areas around the structures. These areas are to be covered with a commercial type lawn seed. Upon completion (of spreading topsoil) surface shall be hand raked or other means used that will provide a comparable job of fine grading. If the topsoil has become packed after spreading, it shall be disked and harrowed until the surface has been thoroughly loosened to a depth of 3 to 4 inches after which it shall be fertilized and raked as specified above. Special care shall be taken to provide adequate surface drainage, fill low spots, and remove lumps which may exist. Apply a commercial type fertilizer, such as 10-20-5 at the rate of 8 pounds per 1,000 square feet. Fertilizer shall be uniformly spread and worked into the upper 2-4 inches of soil by disking or other approved methods. Fertilizer shall be delivered to the site in bags or other convenient containers, each fully labeled and bearing the name, trademark, and warranty of the producer.

All seed used shall be labeled in accordance with the U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act in effect on the date of solicitation for proposals. All seed shall be furnished in sealed standard containers. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable. Seed shall be equal to the State of Iowa Seed Certification Standards.

<u>Type of Grass Seed</u>	<u>Pounds of Pure Live Seed, per 1,000 sq. ft.</u>
Alta Fescue, Festuca elatior Arundinacea, var. "Alta"	1.0
Red Top, Agrostis alba	0.5
Trifolium repens (white clover)	0.2
Kentucky Bluegrass (Poa praetensis)	1.5

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The aggregate percentage of material other than grass seed shall include all nonviable seed, chaff, hulls, live seed of crop plants other than those specified above, harmless inert matter, and weed seed and shall not exceed one (1) percent of the total weight of the mixture.

The seed shall be applied by approved sowing equipment. The seed shall be uniformly distributed over the designated area by sowing half the seed in one direction; the balance at right angles to the first. The seed shall then be covered to an average depth of $\frac{1}{4}$ inch to $\frac{1}{2}$ inch by means of a brush harrow, chain harrow, cultipacker or other approved device. Seeding shall not be done during windy weather.

All seeding work shall be done between April 1, and May 15, or August 15 and October 1, except as otherwise approved in writing by the Engineer. When delays in operations carry the work beyond the most favorable planting season for the species designated, or when conditions are such, by reason of drought, high winds, excessive moisture or other factors, that satisfactory results are not likely to be obtained, the Engineer will stop the work and it shall be resumed only when, in his opinion, conditions are favorable again or when approved alternative or corrective measures and procedures have been adopted.

b. Fencing:

The tower site shall have a new fence on four sides of the site as shown on the plans. The fencing shall be Keystone nonclimbable fence, 2" x 4" spaced copper-bearing galvanized steel wire, 48" high, 12 $\frac{1}{2}$ gauge wire with wrapped joints, with 1 strand of 12 $\frac{1}{2}$ gauge barbed wire on the top. Posts shall be full length pentachlorophenol treated, size 5" diameter x 8' long. Post spacing shall be on 10 ft. centers. Interior posts shall be set plumb and thoroughly tamped. Fencing shall be tightly strung in a workmanlike manner. The tops of the posts shall be of uniform height. Furnish and install one 14 ft. wide gate in the location directed by the Engineer. The gate shall be equal to Farmaster Stock Guard tubular steel gate, Model SG-14. Tubing shall be 55,000 psi, 1-5/8" O.D. steel. Wire shall be 14 gauge. The gate shall be complete with all required fittings.

Gate posts and corner posts shall be 6" diameter x 8 ft. long, set in concrete, at least 18" in diameter, by full bury depth of posts. Braces shall be installed at all corners in the fences.

d. Padlocks:

Furnish and install for control manhole and the gate one heavy duty Master padlock to be approved by the Engineer. All padlocks shall be keyed alike. See G1-08. Furnish 4 keys to the Owner. A heavy duty chain, 30" in length, shall be furnished for the gate.

SECTION 2-4

Electrical

2-4.01. Scope:

The work covered by this section of the specifications shall include furnishing of all labor, equipment, materials, supplies and incidentals necessary to install entire electrical system as shown on the plans and as herein specified.

2-4.02. Code Requirements:

All work shall be installed in accordance with the National Electric Code (NEC) and all local and state codes. Where applicable all material shall bear the Underwriter's Seal of Approval.

2-4.03. Workmanship:

The work specified herein shall be performed in a neat and workmanlike manner by experienced men skilled in the trade.

2-4.04. Power Supply:

The power supply to the elevated storage tank shall be 120/240 volts, single phase, 60 cycle, 3-wire service. Furnish and install one 30 foot class 6 meter pole and meter loop as shown on the plans. Northern States Power Company will furnish the meter and socket. Power supplier is Northern States Power Company, Sioux Falls, South Dakota, Mr. R. L. Kehm, Division Engineer.

2-4.05. Conduit Work:

All wiring shall be encased in rigid metal conduit. Conduit shall be galvanized. All fittings shall be weatherproof. Screw type fittings with gaskets shall be used. The conduit shall be rigidly supported.

2-4.06. Conductors:

Unless specified otherwise, all wire shall be copper with type TW insulation.

2-4.07. Boxes and Conduit Fittings:

Switch boxes, outlet boxes, junction boxes, and other conduit fittings shall be galvanized. Each box shall be suitable in size for the number of conductors entering it. Screw type fittings with gaskets shall be used.

2-4.08. Service Entrance Equipment:

Furnish and install rigid conduit riser, weatherhead, conductors with three-foot extra at weatherhead, and panel as follows:

Conductors to be 3-#10/AWG copper THW.

Riser conduit to be 3/4" galvanized rigid.
Use 1" conduit from meter pole to valve vault.

Disconnect switch to be Square D, Cat. No. H221RB, or equal, weatherproof, fusible, 30A., 2-pole, 240 volts, padlocked cover.

Panel to be Square D, Cat. No. M6RO, or equal, weatherproof, 60A., 6 plug-fuse branches, padlocked cover.

2-4.09. Grounding:

Bond neutral to ground in panel. Install a bare #6 copper ground wire down pole to a 5/8" x 8' copper ground rod installed 1 foot from base of pole in undisturbed earth.

The conduit system shall be installed so as to be grounded and electrically continuous. Bonding jumpers shall be installed from grounding terminals on outlets to the outlet box.

2-4.10. Control Manhole:

All conduit in vault to be 1/2" galvanized rigid. All conduit in vault may be exposed.

2-4.11. Wall Heater:

The wall heater shall be a 240 V., 1Ø, surface mounted, 2 KW, fan-forced heater with integral thermostat. The wall heater shall be mounted 24" above floor. Use Chromalox Cat. No. RSF-420 or equal.

2-4.12. Water Sensing Thermostat:

Provide and install a thermostatic device to control circulating pump motor. Mercoid Corporation Series DA-35-2, Range 2, 10' capillary tubing, remote bulb 2, brass protective well in riser; or equal.

2-4.13. Security Light:

Furnish and install one 175 watt mercury security light, Sylvania #3-FLB175-103-CL-30 or equal, 120 volt high reactance normal power factor ballast, acrylic 12" open bottom diffuser, clear 175 watt mercury lamp, 30" arm, and 120 volt photo control. Light to be mounted 25 feet high on one of the legs of the tower as shown on the plans.

2.4.14. Obstruction Light:

Obstruction light shall be double fixture, constant burning, red globe, 2-116 watt lamps, FAA Spec. L-810, Crouse-Hinds type EOL, Cat. No. 44507A, or equal.

The photocell control for the obstruction light shall be Crouse-Hinds Cat. No. 51711, Type PEC-4, 120 V., outdoor type. Proper adapter for weatherproof mounting shall be furnished. Photocell control shall be mounted at least 15' high facing north.

2-4.15. Level Transmitter:

Furnish and install 120 volt circuit to the location shown on the plans. Furnish and install the $\frac{1}{2}$ " riser tap. The copper line connecting the riser tap to the level transmitter shall be provided by others.

The level transmitter shall be furnished and installed by others.

2-4.16. Control Cable Conduit:

Furnish and install $\frac{1}{2}$ " conduit for underground telephone cable entrance as shown on the plans. Furnish and install 2 feet of $\frac{1}{2}$ " conduit through control manhole wall at level transmitter location for telephone cable.

2-4.16. Shop Drawings:

Provide shop drawings for approval on all equipment herein.

SECTION 5

Measurement and Payment

2-5.01. General:

All work completed under this Section of the specifications, unless otherwise noted, is on a lump sum basis. The Contractor shall accept the compensation as herein provided in full payment for furnishing all plant, labor, equipment, appliances and materials, and in performing all operations in connection with the various classes of work; also for all costs arising from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the work and up to the time of acceptance.

The water tower shall include footings, piping and appurtenances including the complete control manhole, including miscellaneous valves, sump pump, altitude gauge, light, heater, circulating pump, etc., electrical work, including obstruction light, and site work including fencing and seeding.

DIVISION 3

GROUND STORAGE RESERVOIR
AND
PUMPING STATION

SECTION 3

Ground Storage Reservoir and Pumping Station

General Description of Work -

The work covered by this Division of the specifications includes furnishing of all plant, labor, equipment, materials, tools, appliances, and appurtenances required to furnish and install the basic items of work listed below:

Construction of ground storage reservoir and pumping station including excavation, embankment, backfill, site work, reinforced concrete and miscellaneous construction and all items necessary for complete construction of the reservoir and pumping station building including all piping, fittings, mechanical equipment, pumps, valves, flow measuring equipment, and other appurtenant items as well as electrical and control equipment necessary for completion of the reservoir and pumping station.

The work shall be confined within the construction limits of the treatment plant site shown on the plans. This Contractor shall comply with all of the requirements of Section G-1, G-2, G-3, G-4 and G-5, where applicable, and conform to all of the requirements set forth in the Advertisement for Bids, Notice and Instructions to Bidders, Bidder's Proposal, Bid Schedule, Construction Contract, Compliance Statement, Performance and Payment Bond, and Special and General Conditions hereof, as well as to the Technical Specifications for Division III which follow.

The piping responsibilities outside of the reservoir and pumping station shall be as outlined in Section G1-09.

SECTION 3-1 - EARTHWORK

3-1.01. GENERAL

1.1 SCOPE

a. This Section includes all labor, materials, equipment and related services necessary to do all earthwork indicated on the drawings or specified herein.

1.2 SUBMITTALS

a. Compaction Tests: Submit test reports of soil density analysis to Engineer for approval.

3-1.02. EXECUTION

2.1 PROTECTION

a. Protect existing drive, and other features on or adjacent to the site from damage from the work of this Section where such items are to remain.

2.2 LAYOUT OF STRUCTURE

a. Accuracy shall be Contractor's responsibility. Building shall be staked out and Engineer's approval obtained before commencing excavation.

2.3 EXCAVATION

a. Excavate to lines, grades and dimensions indicated on the drawings.

b. Excavate as necessary to remove all organic topsoil occurring within the lines of the new building. Remove other soils as indicated on the drawings.

c. Notify the Engineer if questionable soil conditions are encountered. Do not proceed with the work without approval.

d. Final excavation shall be done by hand. If excavations are unnecessarily carried below the required elevations, the excavation shall be filled to the proper elevation with mass concrete at the contractor's expense.

e. Slope excavations as necessary for the safe and proper execution of the work.

f. Excavated material which is suitable for fill or backfill shall be stockpiled on the site. Remove unsuitable material from the site.

g. Maintain excavations in a clean condition and keep free of water at all times. Protect from frost and freezing. Do not excavate to full depth during freezing weather unless footings or slabs can be poured immediately after completion of excavation work.

2.4 BACKFILL

a. Material for Backfill

Suitable material from the site may be used for backfilling. If sufficient suitable material is not available on the site, the Contractor shall provide additional suitable material, from off-site sources, at his expense.

b. Backfilling:

Smooth and level the entire surface of the existing soil and thoroughly compact by mechanical tamping or vibrating until there is no loss of elevation. Place fill in 6" deep lifts, and compact each lift by approved methods to not less than 88% - 92% Modified Proctor Density.

Promptly backfill excavations as work permits. Do not backfill foundation walls retaining earth until walls and piers have attained full design strength or before walls have been dampproofed, if required, and dampproofing has cured 38 hours after application. Adequately shore walls which retain earth. Place backfill in 6" deep lifts and compact by approved methods to not less than 88% - 92% Modified Proctor Density.

Fill under the building and backfill shall be tested for compaction by a soils testing laboratory, and test reports shall be submitted to the Owner and Engineer for approval. A Modified Proctor Density analysis in accordance with ASTM D1557-66T shall be made for each type of material. Field density tests shall be made in conformance with ASTM D1556-64 for each 1' depth of fill, or portion thereof, at locations determined by Engineer. Costs of density tests shall be paid by Contractor.

2.5 ROUGH GRADING AND FILLING

a. Rough Grading:

Cut and fill to transform site to indicated elevations and contours. Establish rough grades at proper elevations to receive indicated thicknesses of topsoil, base fill material, slabs, bituminous surfacing and other finished materials. Slope grades away from the building. Remove debris from the site. Rough grading shall be finished by blading to reasonably smooth contours. Remove material which is unsuitable for fill purposes from the site.

b. Fill Material:

Fill material for rough grading shall be clean and free from debris, boulders, topsoil and excessive silt and clay. Suitable approved material from the site may be used for fill. If sufficient suitable material is not available on the site, the Contractor shall provide additional suitable approved material from off-site sources.

Place fill in 6" deep lifts, and compact each lift by approved methods to not less than 85% Modified Proctor Density. Fill shall be tested for compaction as specified above.

c. Excess Material:

Remove material which is unsuitable for fill and excess material from the site to a location designated by the Owner but not to exceed two miles from the construction site.

2.6 BASE FILL FOR CONCRETE SLABS ON GRADE

a. Provide a sand-gravel base fill compacted to a depth of not less than 4" under interior concrete slabs on grade.

b. Exterior slab, on grade shall have sand-gravel base compacted to depth not less than 2".

c. Fill material shall be reasonably well graded, clean, and free of organic materials and clay.

d. Before placing the base fill, smooth and level the surface of the existing soil and thoroughly compact by mechanical tamping or vibrating until there is no loss of elevation. Base fill shall be approved by the Engineer before slabs may be placed.

2.7 FINISH GRADING

- a. Finish grade area around building, within construction limits. Entire area to be rough graded to within 4" of finished grade.
- b. Topsoil shall be free of heavy clay, coarse sand, stones, roots or other foreign material, suitable for the growth of grass and plants. Provide additional topsoil from off the site as required to bring the site to finish elevations.
- c. Topsoil shall be leveled, hand raked to provide a uniform surface to drain freely.

2-8. MISCELLANEOUS SITE WORK

This section of the specifications includes seeding, fencing etc., within the construction limits shown on the plans.

- a. Seeding - This work consists of fertilizing and seeding the previously fine-graded area within the disturbed areas around the structures within the construction limits. These areas are to be covered with a commercial type lawn seed. Upon completion of spreading topsoil to the depth specified the surface shall be hand raked or other means used that will provide a comparable job of fine grading prior to seeding. If the topsoil has become packed after spreading, it shall be disked and harrowed until the surface has been thoroughly loosened to a depth of 3 to 4 inches after which it shall be fertilized and raked as specified above. Special care shall be taken to provide adequate surface drainage, fill low spots, and remove lumps which may exist. Apply a commercial type fertilizer, such as 10-20-5 at the rate of 8 pounds per 1,000 square feet. Fertilizer shall be uniformly spread and worked into the upper 2-4 inches of soil by disking or other approved methods. Fertilizer shall be delivered to the site in bags or other convenient containers, each fully labeled and bearing the name, trademark, and warranty of the producer.

All seed used shall be labeled in accordance with the U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act in effect on the date of solicitation for proposals. All seed shall be furnished in sealed standard containers. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable. Seed shall be equal to the State of Iowa Seed Certification Standards.

<u>Type of Grass Seed</u>	<u>Pounds of Pure Live Seed, Per 1,000 sq. ft.</u>
Alta Fescue, <i>Festuca elatior</i> Arundinacea, var. "Alta"	1.0
Red Top, <i>Agrostis alba</i>	0.5
Trifolium repens (white clover)	0.2
Kentucky Bluegrass (<i>Poa praetensis</i>)	1.5

The aggregate percentage of material other than grass seed shall not exceed one (1) percent of the total weight of the mixture.

The seed shall be uniformly distributed over the designated area by sowing half the seed in one direction; the balance at right angles to the first. The seed shall then be covered to an average depth of $\frac{1}{4}$ inch to $\frac{1}{2}$ inch. Seeding shall not be done during windy weather.

All seeding work shall be done between April 1, and May 15, or August 15 and October 1, except as otherwise approved in writing by the Engineer.

b. Fencing - A fence shall be constructed around the periphery of the site as shown on the plans. Existing fence along the sides of the site within the construction limits shall be removed. The new fence shall be tied to the remaining existing fence. The fencing shall be Keystone nonclimbable fence, 2" x 4" spaced copper-bearing galvanized steel wire, 48" high, 12½ gauge wire with wrapped joints, with 1 strand of 12½ gauge barbed wire on the top. Posts shall be full length pentachlorophenol treated, size 5" diameter x 8' long. Post spacing shall be on 10 ft. centers. Interior posts shall be set plumb and thoroughly tamped. Fencing shall be tightly strung in a workmanlike manner. The tops of the posts shall be of uniform height. Furnish and install one 14 ft. wide gate in the location directed by the Engineer. The gate shall be equal to Farmaster Stock Guard tubular steel gate, Model SG-14. Tubing shall be 55,000 psi, 1-5/8" O.D. steel. Wire shall be 14 gauge. The gate shall be complete with all required fittings.

Gate posts and corner posts shall be 6" diameter x 8 ft. long, set in concrete, at least 18" in diameter, by full bury depth of posts. Braces shall be installed at all corners in the fences.

c. Padlocks - Furnish and install for the one heavy duty Master padlock to be approved by the Engineer. All padlocks shall be keyed alike. Furnish 4 keys to the Owner. A heavy duty chain, 30" in length, shall be furnished for the gate.

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SECTION 3-2 - CONCRETE FORMWORK

3-2.01. GENERAL

1.1 SCOPE

a. This Section includes all labor, materials, equipment and related services necessary to furnish, install and remove all concrete formwork indicated on the drawings or specified herein.

b. The following work is specified under other Sections:

Reinforcing - CONCRETE REINFORCEMENT.

Heavyweight aggregate concrete - CAST-IN PLACE CONCRETE.

1.2 SPECIFICATION REFERENCE

a. Work shall conform to American Concrete Institute ACI 301-66, "Specifications for Structural Concrete for Buildings" and ACI 347-63, "Recommended Practice for Concrete Formwork," unless otherwise specified herein.

3-2.02. PRODUCTS

2.1 MATERIALS

a. Form Ties, Anchors and Accessories shall be of standard manufacture, suitable for the intended purpose.

b. Form Oil shall be nonstaining.

c. Type of Forms:

Rough Form Finish. Concealed concrete shall have a rough or form board finish as defined by ACI 301-66, or better. Forms shall be constructed of wood, plywood, tempered hardboard or metal.

Form Board Finish: Exposed concrete where noted shall have a rough lap finish as defined by ACI 301-66 or better. Forms shall be constructed of wood as detailed.

Plywood Finish. Exposed smooth concrete shall have a plywood finish as defined by ACI 301-66.

Forms shall be constructed of not less than 5/8" thick plywood or wood forms lined with not less than 3/16" thick tempered hardboard for smooth finish. Forms shall be con-

structed of 1 x 12 rough sawn, where noted for form board finish. Sheets shall be as large as practicable and shall be free from torn grain, worn edges or other defects which would impair the texture of the concrete surfaces. Boards for form board finish shall be of the length required, with no horizontal joints permitted from finish grade to the top of the walls.

Steel forms may be used with the approval of the Engineer.

3-02.3 EXECUTION

3.1 CONSTRUCTION OF TEMPORARY FORMWORK

a. The design and construction of forms and supports shall conform to the requirements of ACI 301-66 and ACI 347-63 as a minimum standard.

b. Provide forms for all concrete work including footings. Construct forms so that completed concrete will conform to shapes, lines, grades and dimensions indicated and required. Forms shall be true, plumb and level with reasonably tight joints. Adequately support and brace forms.

c. Box-out and provide openings as required. Leave openings for cleaning of forms and proper placement of concrete.

d. Build in anchors, inserts, bolts and other devices indicated or required for the various portions of all the work.

e. Oil temporary forms with non-staining form oil before reinforcing steel is placed.

3.2 REMOVAL OF FORMS

a. Do not remove forms or supports until concrete has acquired sufficient strength to safely support its own weight and the super-imposed loads.

b. Remove formwork for columns, walls, beam sides and other parts not supporting the weight of the concrete as soon as the concrete has hardened sufficiently to resist damage from removal operations.

c. Formwork for slabs, beam soffits and other parts supporting the weight of the concrete shall remain in place until the concrete has reached its specified 28 day strength. If shores and other vertical supports are arranged so that the form facing material may be removed without disturbing the shores and supports, the form facing material may be removed after 14 days of proper curing, but shores and supports shall remain until the concrete has reached its specified 28 day strength.

3.3 CHAMFER CORNERS

- a. All exposed exterior poured concrete corners shall be 3/4" wood chamfered.

SECTION 3-3 - CONCRETE REINFORCEMENT

3-3.01. GENERAL

1.1 SCOPE

a. This Section includes all labor, materials, equipment and related services necessary to furnish and install all concrete reinforcement indicated on the drawings or specified herein.

1.2 SPECIFICATION REFERENCE

a. Work shall conform to ACI 315-65, "Manual of Standard Practice for Detailing Reinforced Concrete Structures", and ACI 318-63, "Building Code Requirements for Reinforced Concrete", unless otherwise specified herein.

1.3 SUBMITTALS

a. Shop Drawings. Submit shop drawings for approval. Shop drawings shall include location, mark, spacing and bending details for all bars and the type and location of all accessories.

3-3.02. PRODUCTS

2.1 MATERIALS

a. Reinforcing Bars shall be new billet steel, A615, grade 40.

b. Reinforcing Mesh shall be welded steel wire fabric conforming to ASTM A185-54. Mesh not otherwise indicated on the drawings shall be fabricated from 10 gauge wire spaced 6" o.c. each way (6 x 6 10/10).

c. Accessories shall conform to ACI 315-65. Where finished concrete surfaces are exposed to view or weather, accessories in contact with these surfaces shall be galvanized or an approved plastic.

3.1 FABRICATION AND DELIVERY

a. Reinforcing steel shall be shop fabricated to size, shape and dimensions indicated on the approved shop drawings. Bars shall be free from mill scale, excessive rust or other deleterious coatings. Bars shall be bent cold, and no method of fabrication shall be used which would be injurious to the material.

b. After fabrication, bars shall be sorted, bundled and tagged with metal tags bearing the bar mark.

c. At the job site, reinforcing steel shall be stored clear of the ground and protected from damage and rusting.

3.2 PLACING

a. All reinforcing, including temperature steel, shall be supported and tied. Wire mesh in structural slabs shall be lapped so that full, uncut squares of mesh of both sheets lap each other at least $1\frac{1}{2}$ times or 12", whichever is greater. Wire mesh in labs on grade shall be lapped so that full, uncut squares of mesh of both sheets lap each other at least $\frac{1}{2}$ times or 6", whichever is greater.

b. Reinforcing steel shall be placed strictly in accordance with the approved shop drawings.

c. Reinforcing steel shall be properly positioned and supported, wired together and securely fastened in place to ensure against displacement during the placing of concrete. Reinforcing steel for slabs on grade shall be supported on concrete brick or reinforcing bar supports.

d. Reinforcing shall be protected by the thicknesses of concrete indicated on the Drawings. Where not otherwise indicated, the minimum thicknesses shall be as follows:

Concrete against ground without use of forms - 3" for bars, 2" for mesh.

Concrete against ground, but placed in forms or concrete exposed to weather - 2" for bars larger than #5 and $1\frac{1}{2}$ " for #5 bars or smaller.

Columns and beams not exposed to ground or weather - $1\frac{1}{2}$ ".

Slabs and walls not exposed to weather - $3/4$ ".

e. Place temperature reinforcing for slabs on grade at the center of the slab.

f. The Contractor shall promptly notify the Engineer when all reinforcing steel for each pour has been placed, and concrete shall not be poured without Engineer's approval.

SECTION 3-4 - CAST-IN-PLACE CONCRETE

3-4.01. GENERAL

1.1 SCOPE

a. This Section includes all labor, materials, equipment and related services necessary to furnish and install all cast-in-place concrete indicated on the drawings or specified herein.

b. The following work is specified under other Sections:

Gravel base under slabs - EARTHWORK.

Form work - CONCRETE FORM WORK.

Reinforcing - CONCRETE REINFORCEMENT.

c. The work in this Section includes, but is not limited to:

Heavy aggregate concrete.

Built-in work of other trades.

Expansion joint fillers.

Sealing concrete floors.

1.2 FIELD REFERENCE MANUAL

a. Work shall conform to the American Concrete Institute ACI 301-66, "Specifications for Structural Concrete for Building", unless otherwise specified herein. A copy of ACI 301-66 shall be kept in the project field office at all times.

1.3 SUBMITTALS

a. Laboratory Design Mix: Submit laboratory prepared design mix based on samples of aggregate to be used for concrete for the project. All laboratory and freight costs shall be paid by the Contractor.

b. Concrete Compressive Tests: Submit copies of 7 day and 28 day concrete tests. All laboratory and freight costs shall be paid by the Contractor.

3-4.02. PRODUCTS

2.1 MATERIALS

a. Concrete materials shall conform to ASTM Standard Specifications as follows:

Cement - Portland Cement: ASTM C150-68, Type II,
(Clear Well).

Cement - Portland Cement: ASTM C150-68, Type I,
(All Other Concrete).

Aggregates: ASTM C33-64, maximum size of coarse aggregate shall be as follows:

Footings	1½"
All other reinforced concrete	¾"

Water: Clean, potable and free of deleterious amounts of acid, alkalies or organic materials.

b. Admixtures - Air-Entraining Agent: Grace Darex AEA or Protex Industries PROTEX.

c. Membrane Curing Compound: Shall be Horncure 30D, or Sonneborn Buildings Products, Inc., Hydrocide Curing Compound, Resin Base.

d. Vapor Barrier: Shall be 4 mil thick white polyethylene sheeting.

e. Expansion Joint Filler: Preformed, resilient, non-extruding, asphalt impregnated cane fiber joint filler conforming to Fed. Spec. HH-F-341c, Type 1, Class B, Flexcel.

f. Floor Hardener: Sonneborn Building Products, Inc., Sonothane.

3-4.03. EXECUTION

3.1 WORKMANSHIP

a. Strength of Concrete:

Reservoir roof slab, walls, and columns, 4,000 psi.
Reservoir floor slab, 3,000 psi.

All other concrete, 3,000 psi.

Provide air-entraining agent in concrete for all exterior concrete and interior slabs on grade; air content shall be $5\% \pm 1$. Air-entrained concrete may be used at other locations, at Contractor's option.

b. Concrete Mix Design:

This Contractor shall have the testing laboratory prepare a design mix for the project, the mix shall be submitted to the Engineer for approval.

c. Compression Tests:

Standard compression test cylinders shall be made in the field and tested by an independent testing laboratory in accordance with ASTM C31-66, C39-64 and C172-54. Test reports shall be submitted to the Engineer.

One set of cylinders shall be made for each day's pour in excess of one cubic yard, one set of cylinders shall be made for each fifty cubic yards or fraction thereof. One set shall consist of three cylinders. Two cylinders shall be delivered to the laboratory, cured and tested at 7 and 28 days respectively, the third cylinder shall be protected and cured in the same manner as the in-place concrete.

d. Concrete Placement:

Preparation: All concrete shall be Ready-Mix concrete, mixed and delivered in accordance with the requirements set forth in ASTM C94-65.

Placing Concrete: Contractors shall notify Engineer before placement of any concrete. Place no concrete until all reinforcing steel, pipes, conduits, sleeves, hangers and other work required has been installed and inspected. Placing of concrete shall conform to ACI 301-66 and ACI 614-59, "Recommended Practice for Measuring, Mixing and Placing Concrete". Place concrete as continuously as possible until pour is complete so that no concrete is placed against concrete that has attained its initial set, except at authorized joints.

Place concrete as nearly as possible to its final position. Prevent segregation by use of chutes or tremies as necessary.

Maximum free drop shall be four feet. Compact during placing with internal vibrators, work around reinforcement and into form corners.

Construction joints for concrete foundation walls and other concrete walls, not indicated on the drawings, shall be so made and located as to least impair the strength of the structure. All construction joints shall be keyed and have reinforcing steel extend through the joints except where otherwise required. Reinforcing fabric shall not be carried through floor construction joints.

Concrete floors on grade shall be 4" minimum thickness and shall be reinforced with 6 x 6 10/10 welded wire fabric, unless noted or specified otherwise. This reinforcing shall be located at the mid depth or slightly above and shall extend within two to four inches of construction joints and edges of slab.

Concrete floors shall receive a steel trowel finish. The finished surface shall not vary more than $\frac{1}{4}$ " when measured with a 10 ft. template.

Exterior concrete slabs shall receive a broom finish.

e. Joints:

Form joints in concrete work according to details and where indicated on the drawings. Place concrete in one monolithic pour between joints.

Expansion Joints. Provide expansion joints where interior slabs on grade abut restraining walls and elsewhere as indicated on the drawings. Form expansion joints with $\frac{1}{2}$ " thick, asphalt impregnated type expansion joint filler extending the full depth of the slab.

Construction Joints: Wherever construction joints are made in reservoir roof slab and walls, continuous waterstops similar and equal to polyvinylchloride Dura-joint, Type 4, as made by Electrovert, Inc., N.Y. 16, N.Y., shall be used. Installation shall be in strict accordance with the manufacturer's instructions. Reservoir floor slab shall be poured in one continuous pour without construction joints. The maximum length of continuous concrete pour between joints shall be 70 feet. Joints, other than control or expansion joints, shall be located and constructed so as to least impair the strength of the structure. Locations and details shall be approved by the Engineer. Roughen and thoroughly clean the surface of the concrete; remove all laitance; and set the surface before placing new concrete against the joint. In addi-

tion, slush vertical joints with a neat cement grout immediately before placing of new concrete. At least 2 hours shall elapse after depositing concrete in columns or walls before depositing in adjoining beams or slabs.

- f. Extreme Weather Precautions. When pouring concrete in cold weather, follow "Recommended Practice for Cold Weather Concreting", ACI 306-66. When pouring concrete in dry, hot weather, follow "Recommended Practice for Hot Weather Concreting", ACI 605-59.
- g. Curing. Curing compound shall be applied in accordance with the recommendations of the manufacturer.
- h. Floor Hardener. All exposed finished concrete floors shall receive a 3-coat application in strict accordance with manufacturer's instructions, including preparation of the concrete floor prior to application.
- i. Vapor Barrier. Install vapor barrier over gravel base, under floor slabs on grade, lapping all edges 6".

3.2 PATCHING

- a. Patch honeycomb in the following manner immediately after removal of forms:
 - (1) Chip out to a minimum depth of 1" or until sound concrete is exposed.
 - (2) Saturate hole with water.
 - (3) Fill with patching mortar mix of approximately 1 part white cement, two parts gray cement, 9 parts sand; vary white and gray cement as necessary to match surrounding concrete.
 - (4) Mix patching mortar approximately one hour before applications.
- b. Fill holes left by form ties:
 - (1) Tanks containing liquid: Fill holes to within 1" of surface with mortar made with non-shrink grout mixed according to manufacturer's recommendations. Fill remainder with patching mortar specified hereinbefore.

3.3 FINISHING

- a. All exposed exterior surface - small voids to be filled with 1:2 mortar, with white cement added so finished color blends with adjacent surfaces. Mortar shall be firmly pressed into holes and floated smooth. Fins and projections and patched areas shall be made smooth by rubbing with a carborundum stone.
- b. All Other Surfaces: Remove ties and patch tie holes and any honeycomb as specified in 3.2.a, above.

SECTION 3-5 - OPEN WEB JOISTS

3-5.01. GENERAL

1.1 SCOPE

a. This Section includes all labor, material, equipment and related services necessary to furnish and install all open web joists indicated on the drawings or specified herein.

1.2 SPECIFICATION REFERENCE

a. Work shall conform to the current edition of the Steel Joist Institute (SJI) or the American Institute of Steel Construction (AISC) appropriate "Standard Specifications and Load Tables for Open Web Steel Joists."

1.3 SUBMITTALS

a. Shop Drawings. Submit shop drawings for approval. Show layout and note sizes, dimensions, bridging, anchors and other accessories.

3-5.02. PRODUCTS

2.1 MATERIALS

a. Open web steel joist shall be manufactured by a member of the SJI or AISC. Other manufacturers must obtain prior approval.

b. Joists shall be welded, open web type, H-Series, manufactured in conformance with the SJI "Standard Specifications for Steel Joists, H-Series." Joist numbers appearing on the drawings refer to Standard SJI designations.

c. Provide two lines of bridging in accordance with SJI specifications. All bridging to be rigid cross bridging.

d. Joists parallel to walls shall be laterally anchored there-to at both the top and bottom chords at each bridging line. Furnish clips, angles and other anchorage devices.

2.2 SHOP FINISH

a. Joists shall be given one coat of red oxide zinc chromate primer meeting Federal Spec. TT-P-63c Steel Structural Painting Council Spec. 15-68T, Type 1.

b. The fabricator shall furnish sufficient (one-half gallon minimum) paint of each type of the erector for field touch up of connections and abrasions.

3-5.03. EXECUTION

3.1 ERECTION

a. Joist and accessories shall be transported, stored, and erected in a manner which will avoid damage or deformation. Damaged joists shall be replaced.

b. Set joists accurately to lines and dimensions indicated on the approved shop drawings. Install bridging immediately as joists are set. Bridging shall be carefully aligned and neatly installed.

c. Joists shall have a minimum bearing of 4"

Joists shall be securely grouted in bearing pockets formed in concrete walls according to SJI Specifications.

d. Construction loads shall be kept off joists until they are permanently anchored and bridged.

e. Immediately after erection, welds, scratches or other abraded spots on joists shall be properly cleaned and touched up with the same paint used for the prime coat.

SECTION 3-6 - METAL DECKING

3-6.01. GENERAL

1.1 SCOPE

- a. This Section includes all labor, material, equipment and related services necessary to furnish all metal roof deck and formwork indicated on the drawings or specified herein.
- b. The following work is specified under other Sections:
 - Steel bar joists - OPEN WEB JOISTS.
 - Roof opening framing - MISCELLANEOUS METAL.
 - Roof skylights - ROOF ACCESSORIES.
- c. Included shall be such items as rib adapter sheets, closures, drain collars, ridge and valley plates, and welding plates where deck changes direction.

1.2 SUBMITTALS

- a. Submit shop drawings for approval. Show layout, show sizes, rib adapter sheets, closures, drain collars and all other accessories.

3-6.02. METAL ROOF DECK

2.1 MATERIALS

- a. Design of deck shall conform to the "Specifications for the Design of Light Gauge Cold Formed Steel Structural Members" as published by the American Iron and Steel Institute.
- b. Deck shall be 1½" x 20 gauge, Type A.
- c. Deck and accessories shall receive one coat of baked on rust inhibitive alkyd resin enamel.

2.2 ERECTION

- a. Deck shall be cut for three span condition where possible.
- b. End joints shall overlap 2 inches and shall occur only at supports. End joints in adjacent sheets shall be staggered to occur at alternate supports.

- c. Fasten deck by welding $\frac{1}{4}$ " x $\frac{3}{4}$ " long at maximum facing of 12 inches on center at intermediate support and 6 inches on center at end lap supports.
- d. Side joints shall be welded or button punched at a maximum spacing of 3'-6" between supports, ribs of each shall interlock with adjacent unit.
- e. All welds must be secure at the time roofing is applied.
- f. Line of support shall be transferred to top side of deck with chalk line prior to welding. Burned holes through deck shall be cause for rejection.
- g. Retouch all abrasions, welds, etc., top and bottom surface, after erection with paint matching the shop coat.

SECTION 3-7 - MISCELLANEOUS METAL

3-7.01. GENERAL

1.1 SCOPE

a. This Section includes all labor, material, equipment and related services necessary to furnish and install all miscellaneous metal indicated on the drawings or specified herein.

b. The following work is specified under other Sections:

Ornamental metal - ORNAMENTAL METAL.

1.2 SUBMITTALS

a. Submit shop drawings for approval for each item included in the work of this Section.

3-7.02. PRODUCTS

2.1 MATERIALS

a. Metal shall be new, of the best commercial quality for the purpose intended and free from defects impairing strength, durability or appearance.

b. Structural steel shall conform to ASTM A36-69.

3-7.03. EXECUTION

3.1 FABRICATION

a. Structural members shall be designed according to AISC standards so as to adequately support the loads. Fabricate according to approved shop drawings.

b. Remove rust, scale, flux deposit, oil and other foreign material from ferrous metal work and apply one shop coat of rust-inhibitive primer containing at least 50% rust inhibitive pigments. Paint shall be carefully applied to provide a smooth and even surface. Items indicated to be galvanized after fabrication shall be hot dip galvanized with a tight coating weighing not less than 1.0 ounces per square foot of surface.

3.2 ERECTION

a. Work shall be erected square, plumb, straight, true to line and level, accurately fitted, with tight joints and intersections. The completed installation shall be secure and rigid with sufficient strength to support the loads.

3-7.04. MISCELLANEOUS ITEMS

4.1 MISCELLANEOUS BOLTS AND ANCHORS

a. Furnish miscellaneous bolts and anchors indicated on the Drawings and not specified under other Sections of this Specification. Fabricate according to details. Furnish nuts and washers for all bolts.

4.2 ROOF OPENING FRAMING

a. Furnish and install all miscellaneous structural steel framing not specifically indicated on the Structural Drawings for roof openings 12" x 12" or larger in size. Unless otherwise detailed, framing shall consist of two 3 x 3 x $\frac{1}{4}$ header angles welded to beams and joists and four upset 3 x 3 x $\frac{1}{4}$ angles welded together and to header angles and framing the opening. Drill frame angles for $\frac{3}{8}$ " diameter bolts spaced not over 16" on center to secure blocking.

4.3 MANHOLE FRAMES

a. Furnish manhole frames and lids as indicated on drawings and manufactured by Neenah Foundry Company, Neenah, Wisconsin.

4.4 WALL RUNGS

a. Furnish aluminum rungs as detailed by Alcoa Aluminum Company.

SECTION 3-8 - ORNAMENTAL METAL

3-8.01. GENERAL

1.1 SCOPE

a. This Section includes all labor, material, equipment and related services necessary to furnish and install all ornamental metal indicated on the drawings or specified herein.

b. The following work is specified under other Sections:

Miscellaneous metal - MISCELLANEOUS METAL.

1.2 SUBMITTALS

a. Submit shop drawings, show layout and note sizes, dimensions, accessories for each item included in the work of this Section.

3-8.02. PRODUCTS

2.1 MATERIALS

a. Aluminum in extruded members shall conform to ASTM B221-66, Alloy 6063, temper T5 or T6. Aluminum in castings shall conform to ASTM B26-65, Alloy 43.

b. Accessories and connections for aluminum shall be aluminum or non-magnetic stainless steel.

3-8.03. EXECUTION

3.1 FABRICATION

a. Work shall be detailed, fabricated and finished in accordance with the recommendations contained in the NAAMM Architectural Metals Handbook.

b. Joints shall be detailed so as to maintain the strength and rigidity of adjoining members.

c. Work shall be shop assembled ready for erection, insofar as possible.

3-8.04. EXECUTION

4.1 ERECTION

a. Work shall be erected square, plumb, straight, true to line and level, accurately fitted, with tight joints and intersections by mechanics experienced in the erection of architectural metal.

3-8.05. MISCELLANEOUS ITEMS

5.1 ALUMINUM LETTERS

a. Furnish letters reading LINCOLN COUNTY RURAL WATER SYSTEM where indicated on the Drawings. Letters shall be Microgramma No. 339 8" height, with a face width of 1", letter depth 7/8" as manufactured by Colite Industries, Inc. Finish shall be #1 black baked on enamel. Use mounting method PM Type K and mount letter 1½" from wall.

SECTION 3-9 - ROUGH CARPENTRY

3-9.01. GENERAL

1.1 SCOPE

a. This Section includes all labor, material, equipment and related services necessary to furnish and install all rough carpentry indicated on the drawings or specified herein.

b. The following work is specified under other Sections:

Concrete formwork - CONCRETE FORMWORK.

3-9.02. PRODUCTS

2.1 MATERIALS

a. Lumber:

Lumber shall conform to the requirements of U.S. Simplified Practice Recommendation R16-53.

Lumber shall be new, sound and thoroughly seasoned. Moisture content shall not exceed 19% at time of installation. Lumber shall be dressed, S4S unless otherwise specified. Sizes indicated on the drawings are nominal.

Grades and species of lumber shall be as follows:

Studs, Plates, Bucks, Blocking, Nailers and Miscellaneous Framing Lumber: Standard grade Douglas Fir, Western Hemlock or Western Larch.

Boards: No. 2 Common Ponderosa Pine, Sugar Pine, White Fir or Lodgepole Pine.

b. Preservative Treatment:

Lumber used for cants, nailers, or other purposes in contact with composition roofing and lumber used for blocking in conjunction with openings in exterior walls shall be preservative treated. Preservative shall be WOODLIFE applied by either the vacuum or pressure method in a closed retort.

3-9.03. EXECUTION

3.1 INSTALLATION

a. Storage and Protection:

Lumber shall be delivered, piled, handled and stored in a manner that will prevent damage.

b. Rough Hardware:

Furnish and install rough hardware including nails, screws, bolts, cinch anchors, toggle bolts, framing anchors and similar items. Rough hardware shall be of the proper size, type and strength for the use intended and for the material to be fastened. Use non-corrosive, non-staining rough hardware for exterior application.

Furnish anchor bolts indicated on the Drawings or otherwise required to attach wood plates and bucks to concrete. Bolts shall be $\frac{1}{2}$ " diameter, threaded one end with $1\frac{1}{2}$ " right angle bend opposite end. Bolts shall extend not less than 6" into concrete.

c. Workmanship:

Work shall be accurately constructed square, true, to required levels and lines, and adequately fastened and anchored to produce a sturdy, rigid system.

d. Roof Curbs and Cants:

Furnish and install wood cants, curbs and blocking in and about the roof as indicated on the drawings. Construct according to details. Fasten blocking and cants at parapet walls to deck only, do not fasten to walls.

Wood cants, curbs, blocking and other work in conjunction with the built-up bituminous roofing and sheet metal work shall meet the approval of the roofing and sheet metal contractors.

e. Blocking, Nailers and Grounds:

Furnish and install wood blocking, bucks, nailers, and similar items indicated on the drawings or otherwise necessary for the attachment of work of all trades. Install securely and accurately to receive the intended work.

SECTION 3-10 - BUILDING INSULATION

3-10.01. GENERAL

1.1 SCOPE

a. This Section includes all labor, material, equipment and related services necessary to furnish and install all building insulation indicated on the drawings or specified herein.

b. The following work is specified under other Sections:

Rigid roof insulation - ROOFING AND ROOF INSULATION.

c. The R Values for the insulation materials shall be as determined by "The Standard for Mineral Wool Building Insulation," 1960 Edition, of the NMWIA. R Values listed are minimum requirements.

d. Identification: All insulation materials shall be properly identified on the package with the manufacturers' name and R Value, and shall indicate the fiber material.

3-10.02. PRODUCTS

2.1 MATERIALS

a. Wall insulation shall be Zonolite Dyform Tufhide, 2" thick, as manufactured by W. R. Grace & Company.

b. Perimeter insulation shall be Styro Foam SB or Score Board, 2" thick, as manufactured by The Dow Chemical Company.

3-10.03. EXECUTION

3.1 APPLICATION OF INSULATION

a. Workmanship:

All workmanship shall meet requirements of CSI 70107-68.

b. Preparation of Walls:

All walls shall be clean and free of all loose material, form release agents, etc.

c. Application:

Install perimeter insulation dry against foundation wall while backfill is being placed on walls with Dow Mastic #7. Install insulation on sand fill bed under slab butting to perimeter insulation and at sides.

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Install wall insulation with latex modified mortar, latex-modified K260 adhesive. Adhesive shall be applied to Dyfoam boards in accordance with manufacturer's instructions for installation. Boards shall be applied horizontally with vertical joints staggered. All joints shall be tight. Cut neatly where required for electrical outlet, switches, piping, etc.

SECTION 3-11 - ROOFING AND ROOF INSULATION

3-11.01. GENERAL

a. This Section includes all labor, material, equipment and related services necessary to furnish and install all built-up bituminous roofing and roof insulation indicated on the Drawings or specified herein.

b. The following work is specified under other Sections:

Wood blocking, edge strips, curbs and cants - ROUGH CARPENTRY.

Sheet metal work - SHEET METAL WORK.

Roof skylights - ROOF ACCESSORIES.

1.2 SUBMITTALS

a. Guarantee:

The Roofing Contractor shall be approved by the Engineer. Upon completion of the Project, the Roofing Contractor shall guarantee materials and workmanship for a period of (2) years. The guarantee shall be submitted on an acceptable form approved by the South Dakota Roofing Contractors. Notify the Engineer of non-acceptable metal flashing or materials prior to roofing installation.

b. Samples:

Samples may be required before application of the flood coat if there is any question regarding the adhesion of plies or amount of bitumen. The Contractor shall cut one sample for inspection and weighing if requested for all work completed in any one day. If separation of plies is evident, the work shall be removed. If the weight of the sample is deficient, an additional ply shall be applied. Weights per square shall be within 15% of the following pro-rated to the size of sample:

Base felt	45 lbs.
Finishing felts (2)	30 lbs.
Bitumen	<u>85 lbs.</u>
TOTAL	160 lbs.

3-11.02. PRODUCTS

2.1 MATERIALS

- a. Insulation shall be fiberglass roof insulation, 1½" thick, over metal decks. Thermal conductance (k) shall be .18 or less.
- b. Base Felt shall be Johns-Manville No. 45 asbestos base felt.
- c. Finishing Felt shall be Johns-Manville asbestos finishing felt.
- d. Bitumen shall be Johns-Manville JM-190 asphalt or JM Topgard, Type B, or C.
- e. Nails shall be Capped E/S Nails or Tube-Lok Nails.
- f. Base Flashing - Johns-Manville Specification FE-1.
- g. Roof Edging - Johns-Manville Specification FE-30.

3-11.03. EXECUTION

3.1 APPLICATION OF INSULATION

- a. Preparation of Decks, Metal and Concrete:

Roof decks shall be dry, clean and properly graded to outlets. Where not otherwise provided, a wood strip of the same thickness as the insulation shall be secured to the roof decks adjoining all eaves to act as a stop for the insulation. If the metal deck surface is such that a satisfactory bond cannot be obtained between the deck and the adhesive, coat the deck with Concrete Primer and allow to dry. The concrete roof deck over the reservoir shall be coated with concrete primer and allowed to dry.

- b. Application of Insulation:

In accordance with manufacturer's instructions.

Insulation shall be applied in two layers, with all joints staggered.

No insulation shall be required over reservoir roof deck.

The insulation shall not be left exposed to the weather. No more insulation shall be applied than can be completely covered with the finished built-up roofing on the same day.

3.2 APPLICATION OF ROOFING

a. Application of Roofing:

In accordance with Johns-Manville Specification No. 101.

b. Over the insulation apply one layer of base felt, lapping each course two inches over the preceding course. Mop the full width under each felt with JM-190 using approximately 35 pounds per square.

c. Starting at the roof drains, apply one 18" wide, then over that one full 36" wide finishing felt. Following felts are to be applied full width overlapping the preceding felt by 19" in such a manner that at least two plies of felt cover the base felt at any point. Each felt shall be firmly and uniformly set without voids into hot JM Topgard Type B or C applied just before the felt at a rate of approximately 25 pounds per square spread uniformly over the entire surface.

d. Flood the surface with JM Topgard Type B or C at a rate of approximately 20 pounds per square and while still hot.

e. 1½" x 12" tapered edge strips and 4" x 45 degrees cants shall be furnished under this Section.

f. Provide proper turn back of base felt at roof edges to prevent seepage at gravel stops.

SECTION 3-12 - SHEET METAL WORK

3-12.01. GENERAL

1.1 SCOPE

a. This Section includes all labor, material, equipment and related services necessary to furnish and install all sheet metal work indicated on the drawings or specified herein.

b. The following work is specified under other Sections:

Wood blocking, curbs, edge strips - ROUGH CARPENTRY.

Roofing and base flashing - ROOFING AND ROOF INSULATION

Roof skylights - ROOF ACCESSORIES.

Sealant - CAULKING AND SEALANTS

1.2 REQUIREMENTS

a. Obtain complete data at the building in all cases before proceeding with the fabricating, assembling or erection of work.

b. The various sections shall be uniform and accurately fitted so as to line up straight and true and rigidly secured in place.

1.3 SUBMITTALS

a. Shop Drawings. Submit shop drawings on manufactured items for approval. Show layout and note sizes, dimensions, anchors and other accessories, plus detail drawing of each member and connection.

3-12.02. PRODUCTS

2.1 MATERIALS

a. Galvanized Iron (zinc coated steel sheets) shall comply with ASTM A-93. Zinc coating not less than 1.25 ounces. Minimum gauge exposed installation, 26 gauge (U.S. Standard Gauge), concealed flashing, 28 gauge. Nails and fittings shall be galvanized.

c. Solder shall be 50% lead - 50% tin solder, conforming to ASTM B-32.

d. Bituminous Plastic Cement, Federal Specs. SS-C-153, Type 1.

e. Nails and screws suited for the purpose shall be the same material, or shall be compatible with the sheet metal.

f. Cleats for sheet metal work shall be provided where required, spaced not over 2' o.c. Cleats shall be 2" wide x 3" long of same material and weight as metal being installed, and fastened with two nails.

g. Continuous locking strip of same weight and material as the metal being installed shall be fastened with nails 4" o.c.

3-12.03. EXECUTION

3.1 EXAMINATION OF SURFACES

a. Examine supporting materials and surfaces to receive sheet metal before commencing work. Commencing work shall be construed as acceptance of the surfaces by this Contractor as satisfactory to receive the sheet metal.

3.2 FABRICATION

a. Fabricate sheet metal work to size, shape, profile and according to details indicated on the drawings. Plain surfaces shall be free from waves or buckles. Exposed edges shall be beaded or returned for strength and appearance. Provide ribs, cleats and reinforcement necessary to make the sections rigid and substantial. Allow for expansion and contraction. Finished width of lock seams and soldered lap seams shall be not less than 1", and finished width of unsoldered lap seams shall be not less than 3".

b. Generally, shop joints shall be single locked and soldered or lapped, riveted and soldered. Field joints shall be 1½" loose locked flat seam to provide ½" movement each way. Fill seam with sealant.

c. Corners shall be shop formed pieces. Internal corners shall be lapped, riveted and soldered. External corners shall be lapped, riveted and soldered where exposed to view and locked and soldered where appearance is not a factor. Field joints shall be located not less than 12" nor more than 5 feet from corners.

3.3 INSTALLATION

a. The surfaces to receive sheet metal shall be sound and thoroughly clean and dry at the time sheet metal work is installed.

b. Coordinate work with roofing and other contractors, and properly schedule sheet metal work. Install metal base flashings, gravel stops, roof jacks and other work required to be built into the composition roofing and flashing promptly so that roofing operations may be carried on continuously to completion without delay.

c. Dissimilar metals shall not be placed in contact, surfaces shall be given a coat of plastic cement or separated with a non-absorptive tape or gasket.

d. After installation clean to remove flux, grease, dirt and other foreign matter.

3.4 ROOF CURBS FOR OPENINGS

a. Fabricate counterflashing for roof curbs at openings in roof deck from 26 gauge galvanized iron. Counterflashing shall lap composition base flashing not less than 3". Hem bottom edges to form a drip. Corners may be formed in the field.

3.5 MISCELLANEOUS SHEET METAL WORK

a. Fabricate miscellaneous items of sheet metal work indicated on the drawings and not specified under other Sections. Fabricate as indicated on the drawings.

SECTION 3-13 - ROOF ACCESSORIES

3-13.01. GENERAL

1.1 SCOPE

a. This Section includes all labor, material, equipment and related services necessary to furnish and install all roof accessories indicated on the drawings or specified herein.

b. The following work is specified under other Sections:

Wood blocking, curbs and cants - ROUGH CARPENTRY.

Built-up bituminous roofing - BUILT-UP ROOFING.

Sheet metal flashing - SHEET METAL WORK.

1.2 SUBMITTALS

a. Shop Drawings. Submit shop drawings for approval for each item included in the work of this Section.

3-13.02. PRODUCTS

2.1 ROOF SKYLIGHTS

a. Furnish and install two roof skylights where indicated on drawings. Skylights shall be Standard Dome Model DDS1-3636 as manufactured by Wasco Products, Inc., and shall be factory assembled consisting of an Acrylic plastic double dome and extruded aluminum retaining frame and an extruded aluminum curb frame with integral condensation and weepage gutter. Acrylic plastic shall be sealed W-10, white translucent.

3-13.03. EXECUTION

3.1 INSTALLATION

a. Install skylights securely according to details ready to receive roofing and flashing. Skylight shall be thoroughly water and weather tight. Finished installation shall meet the approval of the roofing contractor.

SECTION 3-14 - CAULKING AND SEALANTS

3-14.01. GENERAL

1.1 SCOPE

a. This Section includes all labor, material, equipment and related services to do all caulking and sealing work specified herein or indicated on the drawings and not specifically mentioned in other Sections of this specification.

b. The following work is specified under other Sections.

Expansion joint fillers for interior concrete work -
CAST-IN-PLACE CONCRETE.

Sealing certain flashing - SHEET METAL WORK.

3-14.02. PRODUCTS

2.1 MATERIALS

a. Polysulfide Base Sealant: Sonoloastic Sealant, product of Sonneborn Building Products, Inc., Non-Sag Type.

b. Oil Base Compound: Kaukit, Product of Sonneborn Building Products, Inc.

c. Primer for Polysulfide Base Sealant shall be as recommended by the sealant manufacturer.

d. Back-up material for sealant shall be Non-Staining, Closed Cell, Expanded Polyethylene Foam, Dow Chemical "Ethafoam". Furnish with square edge in thickness required.

e. Primer for caulking compound shall be as recommended by the caulking compound manufacturer.

f. Oakum shall be hand-picked, dry spun, rot-proof treated. Rope yard shall be free from tar, oil or other foreign substance.

3-14.03. EXECUTION

3.1 WORKMANSHIP

- a. Clean, prime and prepare joints strictly according to the manufacturer's recommendations.
- b. Polysulfide Base Sealant at following locations:

Exterior hollow metal frames.
Exterior wall grilles and mechanical openings.
Metal thresholds.
- c. Oil Base Compound at following locations:

Interior hollow metal frames and interior of exterior hollow metal frames shall be caulked with tooled, neat, near 90 degree bead (prior to painting).
- d. Joints to receive sealant shall be packed with polyethylene, compressed 30%, as required to produce depth of joint recommended by the sealant manufacturer for each joint width to be caulked.
- e. Prime concrete surfaces to be caulked with sealant strictly according to the manufacturer's recommendations.
- f. Prime concrete surfaces to be caulked with caulking compound, and clean metal surfaces with mineral spirits or other approved solvent.
- g. Joint to receive caulking compound wider than their depth shall be raked out. Joints deeper than 3/4" shall be packed with oakum or polyethylene foam to bring the back of the joint to within 3/4" of the surface.
- h. Surfaces to be caulked shall be thoroughly clean and dry. Air temperature shall be at least 40 degrees F. when caulking is applied.
- i. Apply sealant and caulking compound strictly according to manufacturer's instructions. Material shall be gun applied using a nozzle of sufficient size to fill the joint completely.
- j. Remove excess material and smears as the work progresses, and leave adjacent surfaces clean and free of caulking.

SECTION 3-15 - HOLLOW METAL DOORS AND FRAMES

3-15.01. GENERAL

1.1 SCOPE

a. This Section includes all labor, material, equipment and related services necessary to furnish and install all hollow metal doors and hollow metal frames indicated on the drawings or specified herein.

b. The following work is specified under other Sections:

Caulking - CAULKING AND SEALANTS

Finish hardware - FINISH HARDWARE

Glass and glazing - GLASS AND GLAZING

1.2 SUBMITTALS

a. Submit shop drawings for approval. Shop drawings shall include details of field splices and anchorage.

3-15.02. PRODUCTS

2.1 HOLLOW METAL FRAMES (Doors and Chlorine Room Window)

a. Frame shall be constructed of cold rolled, pickled and annealed steel. Use 14 gauge where required for UL label. Use not less than 16 gauge for all other frames.

b. Construct frame to size, shape, profile and according to details indicated on the drawings. Frame shall be one piece, welded, unit type construction.

c. Breaks shall be accurately formed, true and sharp. Corners shall be square and in alignment. Corners including stops shall be fully mitered, ground to hairline accuracy, and continuously arc welded on the back side to produce rigid, hairline joints. Joints shall be invisible. Grind welds smooth.

d. Mortise, reinforce and drill and tap for hardware. Cover mortises with pressed steel mortar boxes tightly fitted and firmly attached to back of frame.

e. Provide stiffeners and reinforcing necessary to insure a rigid and secure installation.

f. Provide 12 gauge floor clips for all frame. Provide jamb anchors spaced not over 30" on center for all frames.

g. Frame shall be thoroughly cleaned and given one coat of rust inhibitive primer containing at least 50% rust inhibitive pigments.

2.2 HOLLOW METAL DOORS

a. Hollow metal door shall be constructed of cold rolled, pickled and annealed steel. Face sheets shall be not less than 18 gauge.

b. Fabricate hollow metal door to size, shape and according to details indicated on the Drawings. Door shall be 1-3/4" thick, flush type hollow metal door constructed of two formed steel sheets welded to continuous vertical stiffeners formed from not less than 20 gauge steel and spaced not over 6" on center. Faces shall be without seams. Install insulation between stiffeners.

c. Continuously reinforce vertical edges of door with steel not less than the gauge of the face sheets. Vertical edges shall have joints continuously welded and ground smooth or otherwise finished to a hairline joint. Reinforce top and bottom of door with continuous steel channels not less than 18 gauge. Close top of exterior door with additional piece or install channel with web up to form a weathertight closure. Reinforce edges and corners.

d. Grind exposed welds smooth. Fill irregularities with metallic putty and sand smooth. Finished work shall be free from warps and buckles. Faces shall be flat. No point on the face shall deviate from a flat plane more than 1/16".

e. Mortise, reinforce and drill and tap for hardware.

f. Door shall be filled and completely sanded, thoroughly cleaned, bonderized and given two coats of rust inhibitive primer containing at least 50% rust inhibitive pigments.

g. Wrap and carton or crate door to adequately protect during shipment.

2.3 PREPARATION FOR HARDWARE

a. Mortise, reinforce and drill and tap for mortised hardware and reinforce for surface applied hardware. Butt reinforcing shall be 3/16" x 1 1/2" x 12" steel. Lock front and strike reinforcing shall be 3/16" x 1 1/2" x 3" steel. Reinforcing for closers and other reinforcing shall be not less than 12 gauge steel.

b. Furnish at least two rubber door mates per frame, GJ64 or other approved type standard with manufacturer. Drill frames for door mates.

3-15.03. EXECUTION

3.1 ERECTION

- a. Hollow metal shall be stored clear of the ground and protected from water and the elements.
- b. Erect frame before enclosing wall construction. Frame shall be erected plumb, square and true to line. Securely attach floor clips. Brace as necessary to prevent displacement or distortion until surrounding construction is completed.
- c. Frame shall be securely anchored according to approved shop drawings.

SECTION 3-16 - FINISH HARDWARE

3-16.01. GENERAL

1.1 SCOPE

a. This Section includes all labor, material, equipment and related services necessary to furnish and install all finish hardware indicated on the drawings or specified herein.

b. The following work is specified under other Sections:

Rough hardware - ROUGH CARPENTRY.

Metal doors and frames - HOLLOW METAL DOORS AND FRAMES

1.2 REQUIREMENTS

a. The schedules contained herein have been listed to indicate the scope of the work; however, the hardware contractor shall provide all work reasonably required to provide the building with complete, necessary and proper hardware for the best operation with matching quality, design and finish.

1.3 SUBMITTALS

a. Hardware Schedules. Submit hardware schedules and keying instructions to the Engineer for approval. The hardware schedules shall clearly indicate the manufacturer of each item proposed, including those items listed in these Specifications.

b. Templates. Furnish hardware templates to other subcontractors where special mortising, tapping, reinforcing or similar preparatory work during fabrication is required to receive hardware.

3-16.02. PRODUCTS

2.1 MATERIALS

a. Finish: As shown in schedule.

b. Keying: Keyed as directed by Engineer and Owner.

c. Design: The numbers in this hardware schedule are taken from the following catalogs:

Butts, hinges
Locksets
Door Closers
Misc. Items
Door Stops and Holders

Stanley Hardware
Schlage Lock Co.
LCN Closers, Inc.
Cipco Corporation
Glynn-Johnson

2.2 HARDWARE SCHEDULE

Heading No. 1 & 2 - Door No. 1 & 2

1½ pr.	Butts RBBK-179 PC 4½" x 4¼ NRP
1 lock	DSIPD-26D
1 holder	SPH40
1 set	3/16" x 3/8" weatherstripping
1 threshold	S295
1 door bottom	SM-1-A
1 rain drip	R200A
1 thresholder	#536 RIXSON

SECTION 3-17 - GLASS AND GLAZING

3-17.01. GENERAL

1.1 SCOPE

a. This Section includes all labor, material, equipment and related services necessary to furnish and install all glass and glazing indicated on the drawings or specified herein.

b. The following work is specified under other Sections:

Metal doors - HOLLOW METAL DOORS AND FRAMES

Window - HOLLOW METAL DOORS AND FRAMES

1.2 SPECIFICATION REFERENCE

a. Unless specifically detailed or specified otherwise, glazing work shall be performed in accordance with the minimum standards of the Flat Glass Jobbers Association (FGJA) Glazing Manual.

1.3 REQUIREMENTS

a. Sizes of glass indicated on drawings are given only as a guide for estimating purposes, and actual size shall be determined by measurement of the actual openings.

3-17.02. PRODUCTS

2.1 MATERIALS

a. Flat glass shall conform to Fed. Spec. DD-G-451a and shall be manufactured by Pittsburgh Plate Glass, Libbey-Owens Ford or American -ST Gobain. Glass shall be factory labeled on each pane, and labels shall be left on glass until final cleaning. Glass shall be as follows:

Polished Plate Glass: $\frac{1}{4}$ " thick, glazing quality.

b. Glazing Materials: Sealants, glazing compounds tapes and back-up materials shall be the products of one manufacturer insofar as possible. All materials used together shall be compatible with each other. Materials to be used together with a sealant shall be approved for such use by the sealant manufacturer. Materials shall be delivered to the job in their original sealed containers.

3-17.03. EXECUTION

3.1 WORKMANSHIP

- a. Before commencing work, inspect sash and other frames to be glazed to determine that frames, sash and stops are set true and straight with proper clearances. Do not proceed until conditions which would result in a less than first class glazing installation are satisfactorily corrected.
- b. Do not apply glazing materials at temperatures below 40 degrees F. or to damp or frosted surfaces. Mix and apply glazing strictly according to the manufacturer's instructions. Do not thin or adulterate glazing materials. Mix compounds thoroughly.
- c. Sash rabbets and stops shall be clean and dry at the time of glazing. Before glazing metal sash, remove oil, lacquer or other material to which the compound will not readily adhere or which will tend to delaminate from the metal.
- d. Accurately cut glass to fit actual openings while maintaining proper clearances.
- e. Set glass using setting blocks and spacers to insure proper edge clearance and uniform beads of compound. Clearances shall conform to the FGJA Glazing Manual and the glazing material manufacturer's recommendations. Center glass in glazing rabbets. Cut and set sheet glass so that wave or distortion runs horizontally. Rabbets in wood shall be primed or oiled before glazing. Prime other materials as required by the glazing material manufacturer.
- f. Remove and replace glazing beads carefully to avoid marking or defacing the frames, sash, stops or fastenings. In general, glass shall be set in a full bed of glazing tape, or sealant. Compound shall be neatly trimmed and faced on both sides of glass after stops are replaced with finished face of compound parallel to, and flush with surface of stops. Clean excess compound from glaze immediately after setting.
- g. Mask joints as necessary. Apply sealant under pressure. Tool and finish sealant as necessary to produce a neat, water-tight joint. Use solvent or cleaning agent recommended by sealant manufacturer to clean sealant from adjacent surfaces as work progresses.

3.2 INTERIOR METAL FRAMES WITH APPLIED STOPS

- a. Glaze interior hollow metal doors and frames and extruded tubular aluminum frames with applied stops (frames without vinyl or neoprene glazing inserts) using glazing tape both sides. Firmly glaze in place with cracks sealed, free of rattles.

SECTION 3-18. - PAINTING

3-18.01. GENERAL

1.1 SCOPE

a. The work required under this Section consists of all painting and finishing work and related items necessary to complete the work indicated on drawings, described in the specifications, and listed in the Painting Schedule included herein.

b. List of Items Included:

Without restricting the volume or generality of the above "Extent", the work to be performed under this Section shall include, but is not limited to the following:

NOTE: The terms "paint" or "painting" as used in this Section in a general sense have reference to sealers, primers, stains, oil, alkyd, latex and enamel type paints, and the application of these materials.

Painting of all exposed woodwork, interior and exterior, millwork, and doors.

The field painting of all exposed surfaces of all millwork, ferrous metal work, including galvanized, of the building exterior and interior, in whatever location found, which is not finish painted under other sections of the specifications, specifically Structural Steel, Miscellaneous Metal, Ornamental Metal, Metal Door and Frame, and Finish Hardware.

1.2 MANUFACTURER

a. Except as otherwise specified, proprietary names used in this Section refer to products manufactured by Pratt & Lambert Co. The Base Bid shall be based on providing all materials or products which are hereinafter specified by name and/or manufacturer.

1.3 NOTIFICATION

a. The Contractor shall notify the Engineer at least 48 hours prior to the beginning of any painting, and at least 24 hours prior to the application of the succeeding coats.

1.4 INSPECTION OF SURFACES

a. Before starting any work, surfaces to receive paint finishes shall be examined carefully for defects which cannot be corrected by the procedures specified herein under "PREPARATION OF SURFACES" and which might prevent satisfactory painting results. Work shall not proceed until such damages are corrected.

b. The commencing of work shall be construed as acceptance of the surfaces, and thereafter contractor shall be fully responsible for satisfactory work as required herein.

1.5 JOB, WEATHER AND TEMPERATURE CONDITIONS

a. Maintain temperature in building at constant 65 degrees F. or above. Once painting has commenced, provide constant temperature of 65 degrees F. or above, and prevent wide variation in temperature which might result in condensation on freshly painted surfaces.

b. Before painting is started, it shall be broom cleaned and excessive dust shall be removed.

1.6 COLORS

a. Colors of all finishes will be set forth in the color schedule to be furnished by the Engineer.

b. Samples: Submit to the Engineer for approval not less than two weeks before any painting will start. Obtain approval in writing before delivering materials.

c. Approval: Material furnished shall match in color and sheen the approved sample.

3-18.02. PRODUCTS

2.1 MATERIALS

a. All paints, varnishes, enamel, stains, paste fillers and similar materials must be delivered in the original containers with the seals unbroken and labels intact, and with the manufacturer's instructions printed thereon.

b. All painting materials, such as linseed oil, shellac and turpentine, shall be pure and of highest quality, and shall be approved by the Engineer.

c. Paint shall arrive on the job ready-mixed, except for tinting of undercoats and possible thinning.

d. All thinning and tinting materials shall be as recommended by the manufacturer for the particular material thinned or tinted.

2.2 APPLICATION EQUIPMENT

a. Application equipment shall be adequate and commensurate for the work and workmanship required herein.

b. This work shall include all required ladders, scaffolding, drop cloths, maskings, scrapers, tools, sandpaper, dusters and cleaning solvents, as required to perform the work and achieve the results herein specified.

3-18.03. EXECUTION

3.1 WORKMANSHIP, GENERAL

a. Application may be by brush, roller or airless spray, upon approval from Engineer. When airless spray is used the surface shall be rolled following the spray application.

b. Equipment shall be kept clean and in proper condition to provide a job commensurate with the intent of this specification.

c. Do not use same tools for application of paint on smooth surfaces that were originally used to paint concrete block.

d. All materials shall be mixed, thinned, modified and applied only as specified by the manufacturer's directions.

e. All priming coats and undercoats shall be tinted to the approximate shade of the final coat.

f. The Contractor not only shall protect his work at all times, but shall also protect all adjacent work and materials by suitable covering or other method during progress of his work. Upon completion of the work, he shall remove all paint and varnish spots from the floors, glass and other surfaces.

g. All materials shall be evenly spread and smoothly flowed on to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.

h. All coats shall be thoroughly dry before applying succeeding coats.

i. WHERE SPRAY PAINTING IS SPECIFIED - the Contractor shall finish 100 square feet by spraying as a sample of finish, upon the request of the Engineer. This shall be finished with materials specified or approved.

3.2 PREPARATION OF SURFACES

a. General:

Surfaces shall be clean, dry and adequately protected from dampness.

Surface shall be free of any foreign material which will adversely affect adhesion or appearance of applied coating.

b. Ferrous Metal Surfaces:

Remove dirt and grease with mineral spirits and wipe dry with clean cloths.

Remove rust, mill scale and defective paint down to sound surfaces or bare metal.

Touch up all bare metal and damaged shop coats with specified rust inhibitive primer.

For ferrous surfaces with shop coats touched up, as above required, the first coat, as listed in the following schedule, may be omitted.

d. Galvanized Metal Surfaces:

Remove dirt and grease with mineral spirits and wipe dry with clean cloths.

3.3 WORKMANSHIP FOR EXTERIOR PAINTING

a. Exterior painting shall not be done when the surface temperature is below 50 degrees F., while the surface is damp, or during cold, rainy or frosty weather. Avoid painting surfaces while they are exposed to hot sun.

b. Door shall have top, bottom and side edges finished the same as the exterior face of the door.

3.4 WORKMANSHIP FOR INTERIOR PAINTING

a. Enamel or finish applied to metal shall be sanded with fine sandpaper and then cleaned between coats to produce an even smooth surface.

3.5 SCHEDULE OF PAINTING

Paint thickness shown after each product is the dry mil thickness per coat, coverage shown is approximate sq. ft. per U.S. gallon.

EXTERIOR

a. Ferrous Metals:

- (1) Surface shall be cleaned and any scratches or breaks in prime coat shall be painted with Zinc Chromate Primer.
- (2) 2 coats P & L Sildura, brushed on, 700 sq. ft., 1 mil.

b. Hollow Metal Door and Frame:

- (1) Sand with 4/0 production paper to remove rust and runs.
- (2) 1 coat P & L Noxide #96 One Day Primer Red, 750 sq. ft., 1 mil.
- (3) Sand with 5/0 production paper.
- (4) 2 coats P & L Sildura Enamel, 700 sq. ft., 1 mil.

c. Galvanized Metals:

- (1) Treat per paragraph 3.2f.
- (2) 2 coats P & L Vapex House Paint, 500 sq. ft., 1.5 mil.

INTERIOR:

a. Metals and Structural Members: (Exposed Joists, Deck, etc.)

- (1) 1 coat P & L Interior Trim Primer, 700 sq. ft., 1.25 mil.
- (2) 1 coat P & L Vitralite Enamel Undercoating, 600 sq. ft., 1 mil.
- (3) 1 coat P & L Vitralite Enamel, Eggshell, 450 sq. ft., 1.5 mil.

NOTE: If shop prime coated, omit primer. (Spot prime scratches, welds, etc.). If galvanized steel, pretreat surface per paragraph 3.2d.

b. Insulation and Wood Base and Exposed Concrete Walls:

- (1) 1 coat P & L Vapex 45 Primer, 700 sq. ft. 1.25 mil
- (2) 2 coats P & L Vapex House Paint, 500 sq. ft. 1.5 mil

3-18.04. PIPING AND EQUIPMENT PAINTING

1.1 GENERAL

The object of these specifications is to provide the material and workmanship necessary to produce a first class job. Painting shall be done at such times as the Contractor and Engineer may agree upon in order that dust-free and neat work be obtained. All painting shall be done strictly in accordance with the manufacturer's instructions.

1.2. QUALITY OF PAINT

The paints and the paint products of INERTOL, Newark 5, N.J. and San Francisco 7, California, mentioned in the following specifications are set up as standards of quality, except as otherwise provided herein. The usual "or equal" clause shall apply. Products of other manufacturers comparable in quality and type of those specified will be acceptable if said paints are offered by the Contractor with satisfactory data on past performance in water works, composition, directions for use, and other information required and if approved by the Engineer. Colors where not specified shall be as selected by the Engineer.

1.3 PREPARATION OF SURFACE

All surfaces to be painted shall be prepared in a workmanlike manner with the objective of obtaining a smooth, clean and dry surface, free from cracks, ridges, nail holes, etc.

a. Metal - Rust, dust and scale, as well as all other loose or foreign substances shall be removed.

1.4 APPLICATION OF PAINT

The painter shall apply each coating at the rate specified for brush application.

1.5 THINNERS

Where thinning is necessary, only the products of the manufacturer furnishing the paint, and for the particular purpose, shall be allowed, and all such thinning shall be done strictly in accordance with the manufacturer's instructions.

Pipe Lines - The following color schedule shall be followed for all exposed pipe lines and fittings.

Pipe Carrying Liquid
Line from City to Reservoir
Lines from Reservoir to Distribution
Chlorine Solution Lines

Color Coding
Light Green
Light Blue
Yellow

Pipe lines and other equipment shall be given two finish coats of Intertol Glamortex at the rate of one gallon per 300 square feet. Bituminous coated pipe shall be covered with two coats of Tar Stop (200 sq. ft./gal./coat prior to applying finish coats to prevent bleeding.

SECTION 3-19

Plumbing, Heating and Ventilating

3-19.01. General: (Plumbing)

The Contractor shall provide all items, articles, materials, operations or methods listed, mentioned or scheduled on the Drawings, and/or herein specified, including all labor, materials, equipment, and incidentals necessary and required for their completion. Applicable provisions of General Conditions govern work under this section. All plumbing shall comply with the South Dakota State Plumbing Code.

3-19.02. Scope: (Plumbing)

The Contractor shall furnish and install all piping cold water, waste, vent and all attachments and accessories as listed on the plans or herein.

Items to be installed include floor drains, sump pump, etc., as shown on the plans, specified herein, or both.

3-19.03. Delivery and Storage of Materials:

Make provisions for delivery and safe storage of materials and required arrangements with other Contractors for introduction into the building of equipment too large to pass through finished openings. Materials to be delivered to such stages of the work as will expedite the work as a whole and marked and stored in such a way as to be easily checked and inspected.

3-19.04. Data and Measurements:

Data herein and on drawings is a general arrangement only. The Contractor shall obtain exact measurements, levels, etc., at the site and adapt his work to actual conditions at the building.

3-19.05. Materials and Equipment:

Materials and equipment specified to be of a certain make or type or equal, shall be of the make or type specifically mentioned unless written approval for alternate material has been obtained from the Engineer.

3-19.06. General Installation of Piping:

Cut to measured fit at building, installed parallel to walls and ceilings to properly clear all openings and provide necessary clearances for operation of doors, windows, access panels, valves,

etc. Excessive cutting will not be permitted. All changes of direction shall be made with fittings except bends will be permitted in soft tempered tubing. Open ends shall be capped or plugged when work is not in progress. Interior of pipes shall be kept free of cuttings, dirt, scale and loose materials of any nature. Install to permit free expansion without causing damage to joints, pipes, hangers, units to which connected, structure or undue noise. Exposed piping to be run as closely as possible to finished surfaces and piping to be concealed in shafts, wall chases, spaces or furrings provided therefore where possible.

Unions shall be installed where required for disconnection and to facilitate quick repair without dismantling long lengths of piping. No valve, trap, cleanout, or other part normally required for operation or maintenance shall be installed in an inaccessible place.

All joints to be watertight and caulking of threaded joints or holes will not be permitted. Paint, varnish, putty, etc., will not be permitted on any joint until the joint has been tested. Crosses may be used only on vent pipes, water supply pipes, or as specified. Joints in steel pipe to be made with clean cut threads and graphite and oil compound applied to make thread only, with pipe reamed to full size after cutting. Joints in hard copper tubing to be made with surfaces properly cleaned and bright, cut ends reamed, fluxed as recommended by make of fittings. Flared joints to be made with tubing expanded without splits, with flaring tool. Concealed joints in copper water piping shall be soldered, sweat, or brazed.

3-19.07. Pipe Hangers:

Support all pipe firmly to prevent sagging, pocketing, swaying or displacement. Suspended piping is to be held by vertically adjustable split ring pipe hangers. Metal pipe covering protectors are to be used where necessary to prevent damage to insulation. Chain, wire, or perforated hangers not acceptable. Trapeze hangers may be used in lieu of separate hangers where practical. Hook plates are to be used for supporting pipe from side walls. Install hangers in line with adjacent hangers and at changes in direction. Maximum spacing shall not exceed the following schedule:

<u>Pipe Size, Inches</u>	<u>Max. Spacing, Feet</u>
$\frac{1}{2}$	6
$\frac{3}{4}$ and 1	8
$1\frac{1}{2}$ to $2\frac{1}{2}$	10
3 and 4	14

3-19.08. Sleeves and Inserts:

Provide sleeves securely cemented in place and of sufficient size to accommodate pipe passing through masonry or concrete. Sleeves in structural supports to be galvanized steel pipe and elsewhere may be galvanized sheet metal. Sleeves through floors to be flush with finished floor and space between pipe and sleeve caulked watertight. This Contractor to set sleeves and inserts in concrete or masonry during construction to avoid cutting or drilling of finished work.

3-19.09. Cleanup and Adjusting:

All parts of the work to be left clean with equipment, fixtures, valves, pipe fittings cleaned of grease and metal cuttings. Any stoppage, discoloration or other damage to portions of building, its finish or furnishings, due to Contractor's failure to properly clean systems to be repaired at Contractor's expense. All surplus materials of the Contractor and any rubbish to be removed as it accumulates.

3-19.10. Pipe and Fittings:

Waste, drain and vent pipe, and all such pipe inside building lines shall be extra heavy weight cast iron, hub and spigot, asphaltum coated. Above ground fixture wastes less than 2" in diameter and branch vents may be galvanized iron, with coated drainage fittings.

Interior water supply piping, including domestic cold water, shall be type "L" hard drawn copper with cast brass or bronze fittings. Exterior water pipe shall be type "K" copper.

3-19.11. Joints and Connections:

Pipe or fittings with double hubs on the same run or double tee branches will not be permitted on soil or waste piping. Drilling, tapping, or welding of soil, waste, drain or vent pipes or use of saddle hubs or bands will not be permitted. Dead ends shall be avoided except where necessary to extend clean-outs so as to be accessible. Slip joints in drainage piping may be used only in waste lines between trap seal and fixtures. Metal to metal contact unions may be used in drainage piping only in trap seals and on inlet side of trap.

3-19.12. Clean-Outs and Test Tees:

Clean-outs shall be installed near the end of each horizontal run, and where shown on the plans. Clean-outs to be of the same size as pipe in which installed. All clean-outs to be located for easy access and rodding. Test tees with brass screw plugs to be installed 30" above floor in vertical soil and waste stacks.

Floor clean-outs shall be Josam Series Y-1110-B consisting of bronze raised head plug, cast bronze round flush access cover, and cast iron caulking ferrule.

3-19.13. Fixtures, Trimming and Equipment:

All fixtures are to be designed to prevent backflow of polluted water or waste into the water supply system. Fixtures to be as specified below or equal.

Sump Pump: Enpo Model 1250 or equal submersible sump pump. Motor shall be $\frac{1}{2}$ H.P., 4-pole, 115 volt, 60 cycle, single phase designed for intermittent duty.

Wall Hydrants: Woodford Model 7 with $\frac{3}{4}$ " supply fitting chrome finished brass.

Floor Drains: Josam series 200 cast iron floor drain with integral trap, double drainage flange and weepholes and polished brass adjustable Super-Flo strainer.

Plant Water System Pressure Regulator: The pressure regulator shall be a Watts 1" No. 223S or equal.

3-19.14. Testing:

Drainage and venting systems shall be filled with water to level of highest stack and proved tight in presence of Engineer. If necessary to cover pipe before roughing-in is ready for inspection, tests to be made with water at pressure of 15 psi. Cold and hot water pipe used at 100 psi and proved tight. Defective work repaired and inspection and tests repeated. Tightness of valves and stops proven in both open and closed positions.

3-19.15. Sterilizing:

Water lines shall be sterilized with sufficient chlorine to provide a dosage of not less than 300 ppm with a contact period of not less than 16 hours with all valves and lines opened and closed at least 3 times during the sterilizing period. Following the contact period the water shall be thoroughly flushed from the system until the residue chlorine contact is not more than 0.20 ppm.

3-19.16. General: (Heating and Ventilating)

The Contractor shall provide all items, articles, materials, operations or methods listed, mentioned or scheduled on the Drawings and/or herein specified, including all labor, materials, equipment, and incidentals necessary and required for this completion. Applicable provisions of General Conditions govern work under this section.

3-19.17. Scope: (Heating and Ventilating)

Furnish all labor, material to completely install a heating and ventilating system as shown on the plans and specifications. System equipment shall include unit heaters, power roof ventilator, etc. All auxiliary equipment and materials such as controls, control wiring, thermostats, grilles, vents, pipes, insulation, disconnect switches, motor starters, etc., as indicated on the plans and/or specified herein shall be furnished and installed by the Contractor except as otherwise noted. All items of materials, labor, or equipment not specifically mentioned on the drawings or specifications but are necessary to complete approved installation shall be furnished as if specifically mentioned.

3-19.18. Codes and Ordinances:

All motors and motor control equipment shall meet requirements of the National Electrical Codes.

Heating units shall be located to maintain proper clearances between themselves and any combustible material.

All heating units shall be approved by the Underwriter's Laboratory and shall be so labeled.

3-19.19. Shop Drawings:

A complete list of all equipment that this Contractor proposes to install, giving pertinent information regarding each piece of equipment shall be submitted to the Engineer for approval.

3-19.20. Delivery and Storage of Materials:

Make provisions for delivery and safe storage of materials and required arrangements with other Contractors for introduction into the building of equipment too large to pass through finished openings. Materials to be delivered to such stages of the work as will expedite the work as a whole and marked and stored in such a way as to be easily checked and inspected.

3-19.21. Data and Measurements:

Data herein and on drawings is a general arrangement only. The Contractor shall obtain exact measurements, levels, etc., at the site and adapt his work to actual conditions at the building.

3-19.22. Materials and Equipment:

Materials and equipment specified to be of a certain make or type or equal, shall be of the make or type specifically mentioned unless written approval for alternate material has been obtained from the Engineer.

3-19.23. Cleanup and Adjusting:

All parts of the work to be left clean with equipment, fixtures, valves, pipe fittings cleaned of grease and metal cuttings. Any stoppage, discoloration or other damage to portions of building, its finish or furnishings, due to Contractor's failure to properly clean systems to be repaired at Contractor's expense. All surplus materials of the Contractor and any rubbish to be removed as it accumulates.

3-19.24. Power Roof Ventilator (E-1):

Furnish and install a Model BB-45 belt drive centrifugal roof exhauster as manufactured by Penn Ventilation Co. or equal. Unit capacity shall be 790 CFM at 1/8" static pressure operating at 580 RPM. Motor shall be 1/6 H.P. for operation from a 120 volt, 60 cycle, single phase power supply and shall include internal overload protection. Unit shall be interlocked with mortorized outside air damper. Damper shall be constructed of 16 gauge steel with interlocking edges, neoprene seals and reinforced driving blades. All shafts on damper shall be equipped with nylon bearings. Unit shall be complete with necessary mounting brackets and linkages, and sets shall be furnished in black enamel. Two-position damper shall be standard motor equipped. See Section 3-20C.09 for method of control.

3-19.25. Louver and Damper:

Furnish and install a Ruskin Type L3 or equal Outside Air Intake Louver and Motorized Damper of the size shown on drawings. Louver shall be 20 gauge type J weatherproof fixed blade with 1/8" galvanized bird screen on interior. Motorized damper shall be interlocked with exhaust fan E-1, to open when fan starts.

3-19.26. Electric Unit Heater (Pump Room):

Furnish and install Chromalox LUH-05-13 or equal. Heating capacity shall be 17,075 BTU/Hr. at 480 volt, 60 cycle, 3 phase. Fan motor shall be 1/50 H.P., 1050 RPM, 480 volt, single phase.

See Section 3-20C.09 for method of control.

3-19.27. Chlorine Room Exhaust Fan (E-2):

Furnish and install a Model P-10R propeller type exhaust fan as manufactured by Penn Ventilator Co. or equal in the Chlorine Room.

Unit shall be complete with fan direct connected to motor, fan guard, and gravity operated shutter mounted on the exterior of the building. Unit shall be capable of exhausting 600 CFM at 1/8" static pressure. Motor shall be 1/10 H.P. for operation from a 120 volt, 60 cycle, single phase power supply and shall include internal thermal overload protection.

Unit shall be controlled with the lights in the Chlorine Room.

3-19.28. Electric Unit Heater (Chlorine Room):

Furnish and install one surface mounted wall heater, Chromalox RSF-415 or equal, 240 volt, 1Ø, 1500 watts, integral thermostat, and fan-forced. Install heater 2 feet above floor in chlorinator room as shown on plan. Power connection specified in Electrical Section 3-20C.10.

The electrical section is arranged as follows:

- A - General
- B - Materials and Installation
- C - Power and Light
- D - Control Center
- E - Controls
- F - Instrumentation and Telemetry
- G - Additions to Sioux Falls Water Plant

SECTION 3-20

Electrical

A - General

3-20A.01. Scope:

This Division is to describe and specify wiring, electrical equipment, and the integrated control system for the Lincoln County Rural Water System at Harrisburg, South Dakota. The work covered by this section shall be the complete electrical system as specified herein and as shown on the drawings. Specific work to be included shall be as follows:

- a. Pump Station - All electrical and control.
- b. Control from Sioux Falls Water Plant

3-20A.02. Quality of Work:

The equipment and work design and installation shall be in accordance with best present-day practices, and conform with and test in accordance with applicable sections of latest revisions of the following codes and standards unless specifically noted to the contrary.

- 1. American National Standards Institute (ANSI)
- 2. Institute of Electrical and Electronic Engineers (IEEE)
- 3. National Electrical Manufacturer's Association (NEMA)
- 4. National Board of Fire Underwriters, National Electric Code (NEC)

5. National Electrical Safety Code (NESC)

6. Insulated Power Cable Engineer Association (IPCEA)

3-20A-03. Tests:

The Contractor shall make field tests and checks necessary to phase and to connect all apparatus and instruments, as well as factory-test equipment as required to determine that all connections are properly made and that apparatus functions satisfactorily.

3-20A.04. Omissions:

Items specified but not drawn and items drawn but not specified shall be furnished and installed as if both specified and drawn. The installation shall be complete notwithstanding the omission of certain details herein.

SECTION 3-20

Electrical

B - Materials and Installation

3-20B.01. Scope:

The Contractor shall furnish and install all equipment, materials, labor, tools, and methods required to construct the project as shown on the plans and as specified herein.

3-20B.02. Materials:

All materials shall be new of the types specified and shall bear the approval of the Underwriter's Laboratory where applicable.

3-20B.03. Raceway Installation:

All wiring shall be in galvanized rigid conduit or electrical metallic tubing (EMT). Rigid conduit shall be used where raceway is installed in concrete slab on grade, underground, or where exposed to severe mechanical damage. Rigid conduit shall be used for service entrance conduit and all feeder conduit.

All raceways shall be grounded and electrically continuous. Raceways shall be installed so as to avoid low spots or where moisture can collect. If this is unavoidable, provisions shall be made for drainage.

Galvanized flexible conduit shall be used where flexibility is needed such as for motors. Grounding jumpers shall be installed around flexible metal conduit where grounding is not assured to the structural frame or by other accepted means.

Raceway sizes shall be in accordance with the NEC for the number of conductors carried. All conduits shall be swabbed out or blown out before pulling wires so as to remove all moisture and foreign and/or abrasive material. These requirements shall be applicable to all raceway systems specified herein.

All conduit shall be concealed in the concrete walls and floor. Use extensions on all wall boxes so that covers will be flush against wall insultaion. Where conduit is exposed, such as on ceiling, conduit shall be in alignment with the visible features of the buildings.

3-20B.04. Boxes and Conduit Fittings:

Switch boxes, pull boxes, outlet boxes, and junction boxes shall be galvanized.

Each box must be suitable in size for the number of conductors entering it. Ceiling fixture boxes shall be 4" octagonal or larger.

Rigid conduit elbows and couplings shall be galvanized.

3-20B.05. Wire:

All wire shown as #4 or smaller shall be copper and shall be the product of General Cable, Anaconda, or equal manufacturer. All wire #2 or larger may be aluminum.

All wire shall be Type THW insulated (75 degrees C.) or TW insulated (60 degrees C.) as called for on the plans.

3-20B.06. Code Enforcement:

All work shall be covered by the provisions of the NEC as previously stated in Section 3-26A.02. All provisions of the code will be rigidly enforced by the Engineer with the following sections getting special attention.

- a. Section 210-5. Color Code: The interpretation of this section is that all branch circuit wiring on this project shall be black, red, blue and white, with green used for grounding only. The black, red and blue conductors shall be connected to the same ungrounded conductor throughout the project. The black conductors shall be connected to the left or A bus, the red conductor to the middle B bus, and the blue conductor to the right or C bus on all panels. The following is a tabulation of the color coding that shall be used on this project:

<u>Branch Circuit</u>	<u>Switch Leg</u>
Black - - - - -	Yellow
Red - - - - -	Orange
Blue - - - - -	Purple
All Neutrals	White
All Grounding Conductors	Green
All Runners (3 and 4-way)	Brown

All branch circuit conductors and switch legs of the same color should be connected to the same ungrounded conductor throughout the installation.

- b. Section 310-12: Current Carrying Capacity: This table shows the current ratings of various size conductors for not more than three conductors in the raceway.

Note No. 8 to this table calls for de-rating these values to 80% with 4 to 6 conductors and 70% with 24 conductors.

- c. Chapter 9, Table I, Number of Conductors in Conduit: In no cases will exceptions be allowed to the provisions of this table.

3-20B.06. Switches and Outlets:

Wiring devices shall be as follows:

- a. Switch, toggle, S.P., 15 A., T-rated, 120 V.
- b. Switch, toggle, 3-way, 15A., T-rated, 120 V.
- c. Duplex convenience outlet, 20-amp, grounding type.
- d. Duplex convenience outlet, 20-amp, grounding type, weatherproof.

All switches and outlets are to be surface mounted at 4'-0" above floor unless otherwise specified.

SECTION 3-20

Electrical

C - Power and Light

3-20C.01. Scope:

This section shall cover the complete installation of wiring for power and light. This is to include all work indicated on the plans or herein.

3-20C.02. Power Supply:

The power supply will be 480-volt, 3-phase, 4-wire service. Service to building shall be overhead. Power supplier is Northern States Power Company, Sioux Falls, South Dakota, Mr. R. L. Kehm, Division Engineer.

3-20C.03. Service Entrance:

The service entrance conductors shall be furnished and installed by the Contractor. These conductors shall be 3 -250 MCM THW/AL and 1 - #2 THW.

This Contractor shall furnish and install 2½" rigid conduit pole riser and underground conduit to the control center in the pump station. The riser shall be fastened to power company's pole Watt hour meter and socket furnished by Northern States Power Company and installed by Contractor. Mount socket on power company's pole.

3-20C.04. Service Equipment:

The service equipment shall be Square D, or equal. The 200 ampere main breaker shall be a type LA, 3-pole unit. The single-phase panel shall be type NQO, 60 ampere main breaker, 1-phase, 3-wire S/N, QO and Q1 breakers. All above equipment shall be a part of the control center.

3-20C.05. Dry-Type Transformer:

The dry-type transformer providing 120/240 volt single-phase service shall be located within the control center in a separate cubicle. The unit shall be 7½ KVA size.

3-20C.06. Grounding:

Bond neutral to ground in control center and ground control center solidly to a 1-inch or larger water pipe. Grounding conductor shall be #4 bare copper. Grounding jumpers across flexible conduit at motors shall be #6 bare copper. All grounding connectors shall be of an approved type for the purpose. All grounding type outlets shall be bonded by means of a jumper connected to the grounding screw terminal in the box.

3-20C.07. Security Lighting:

One 100-watt, 120-volt mercury vapor light shall turn on at dusk and off at dawn by means of integral photocell.

3-20C.08. Reservoir Lighting:

Furnish and install two sealed-beam floodlights, Stonco Cat. No. 150-L or equal, wire guard, 150 watt par 38 flood bulbs, and watertight box. Mount on the ceiling 2 feet from the access hatch.

Mount watertight switch next to access hatch. Reservoir lighting circuit shall be underground from pumping station to reservoir. At reservoir conceal $\frac{1}{2}$ " conduit in the concrete wall from below ground to the mounting box at the south access hatch. Use $\frac{1}{2}$ " conduit with 2 - #12 TW conductors.

3-20C.09. Telephone:

A 1-inch rigid conduit shall be furnished and installed from the south side of the building to the main telephone junction box, located in the control center. $\frac{3}{4}$ " conduit shall also be furnished and installed to the telephone outlet location as shown on the plans. Furnish and install telephone outlet box and cover.

3-20C.10. Other Equipment:

This Contractor shall make connections to other equipment as specified herein and as shown on the plans.

- (1) High Service Pumps and Check Valves - Provide all control and wiring as shown. Provide 1" and $\frac{1}{2}$ " conduit to each H.S. pump. $\frac{1}{2}$ " conduit is for electric check valve conductors. High service pumps are specified in Section 3-21.01.

- (2) Pump Room Unit Heater - Provide all wiring and control as shown. Contactor shall be 3-pole, 480 volt, 20 ampere contacts rating and shall be located in MCC. Thermostat shall be heating type "make" on temperature drop, contacts rated 10 amperes, 120 volt. Thermostat shall control heating contactor. Electric unit heater is specified in Section 3-19.26.
- (3) Sump Pump - Provide all wiring as shown. Connection to motor shall be by cord and Buss SRU fustat unit. Sump pump shall come complete with package control. Sump pump is specified in Section 3-19.13.
- (4) Roof Ventilator (E-1) - Provide all wiring and control as shown. Connection to motor shall be by cord and Buss SRU fustat unit. Roof ventilator shall be controlled by thermostat, cooling type, "make" on temperature rise, contacts rated 10 amperes, 120 volt, minimum setting to be 70 degrees F. Include with thermostat a "ON-OFF-AUTO" switch to control ventilator and damper. Roof ventilator is specified in Section 3-19.24. *
- (5) Motorized Damper - Provide all wiring and control as shown. Damper shall open when roof ventilator is energized and close when roof ventilator is de-energized. Damper shall be controlled by thermostat controlling roof ventilator. Connection to motor shall be by cord and Buss SRU fustat unit. Damper is specified in Section 3-19-25.
- (6) Priming Pump - Provide all wiring as shown. Connection to motor shall be by cord and Buss SRU fustat unit. Priming pump shall come complete with package control. Priming pump is specified in Section 3-21.02.
- (7) Electric Valve - Provide all wiring and control as shown. Electric valve control is specified in Section 3-20G.09. Electric valve is specified in Section 3-21.04.
- (8) Chlorine Room Heater - Provide all wiring as shown. Heater shall supplied with integral thermostat. Heater is specified in Section 3-19.28.
- (9) Chlorine Room Exhaust Fan (E-2) - Provide all wiring as shown. Exhaust fan shall run when chlorine room light is on. Exhaust fan is specified in Section 3-19-27.

SECTION 3-20

Electrical

D - Control Center

3-20D.01. Scope:

The Contractor shall furnish and install, in the Pump Station, a control center and associated controls as shown on the plans. This control center shall be built and supplied by a manufacturer who has an approved experience record and who is normally engaged in the production of similar equipment. The entire system shall be factory assembled and tested prior to shipment. The manufacturer shall warrant the control center to be free of defects of material and workmanship for a period of one year from the date of acceptance of the project. It is the intent of these specifications to obtain a control center with all controls in a single enclosure.

The Base Bid shall be on Honeywell instruments and Square D control center.

3-20D.02. Diagrams:

Complete electrical and hydraulic diagrams and functional description shall be provided by successful manufacturer for approval by the Engineer. Upon completion of the job the manufacturer shall supply to the Engineer six (6) copies of "As Built" drawings and diagrams.

3-20D.03. Factory Supervision:

The Contractor shall supply the services of a technical representative from the control manufacturer to supervise the final adjustments of the control system and instruct the operating personnel in the use and maintenance of this equipment. This technical representative shall be available for as long a period as necessary in order to put the plant into the desired operating condition. The time of his presence on the site shall be coordinated with the Contractor, Engineer, and Operating Personnel.

3-20D.04. Enclosure:

The enclosure shall be NEMA type I, Class II construction, Type C wiring, free standing steel cubicle as required. Cubicle shall be front opening with all wiring accessible from the front. Cubicle shall be manufacturer's standard size insofar as these dimensions will satisfy the space limitations.

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Name plates for identification of equipment and devices shall be provided. These shall be micarta, bakelite or equal. Name-plate titles are subject to Engineer's approval. The finish for the control center shall be a prime coat and two coats of manufacturer's standard finish color. Color charts shall be furnished with shop drawings for selection by Engineer.

The control center shall contain the following components:

1. All Control Components
2. Main Breaker
3. Dry Transformer
4. 120/240 volt Distribution Panel
5. Combination Motor Starters
6. Heating Contactor
7. Chart Recorder, Tower Level
8. Transmitter - Reservoir Level
9. Tone Equipment
10. Air Compressor for Bubbler
11. Reservoir Level Indicator
12. Chlorination Selector Switch

All motor starters and main breakers shall be in individual compartments with circuit breakers operated by an outside handle. The hinged door to a compartment shall be capable of opening only if the handle is in the "Off" position. All circuit breaker handles shall also have provision for locking in the "Off" position. The distribution panel shall be behind a flush hinged door in the control center.

Provide space in the control center for future control components as shown on plans. Also make cutouts in panel for future lights, switches, etc., and insert chrome plugs.

SECTION 3-20

Electrical

E - Controls

3-20E.01. General:

Provide controls as shown in the control diagrams on the plans and as specified hereinafter.

3-20E.02. Motors:

All motors are provided with equipment driven, therefore are included with equipment specification.

3-20E.03. Motor Starters:

All motor starters shall be combination magnetic starters, line voltage, circuit breaker type, 480 volt, with overload relays on all phase conductors and with under voltage release. All starters shall be appropriate size for motor controlled and shall have 120 volt coil and auxiliary contacts as required for control functions indicated.

3-20E-04. Circuit Breakers:

Circuit breakers shall also include auxiliary contacts as required so that the 120 volt control circuit for the equipment will be deactivated when circuit breaker is in "Off" position.

3-20E.05. Switches:

Switches shall be marked "Hand-Off-Auto", or "On-Off" as indicated on the control diagrams. All selector switches shall be oil tight type.

3-20E.06. Pilot Lights:

All pilot lights shall be dim-glow, 110 volts. "Motor called for" shall be white, "Motor Running" all be green. "Alarm Condition" shall be red.

3-20E.07. Elapsed Time Meters:

Elapsed time meters shall be similar to G.E. Type KT time meter. Meter shall register operating time of motor in minimum units of tenths of hours. Register shall be minimum 6 digit.

3-20E.08. Alarm Silencers:

Alarm silencer units shall consist of appropriate relays, pilot lights, and pushbuttons to provide the following operation:

Under normal conditions the red pilot light shall be "dim-glow". When the pilot contact initiates an "alarm" condition the pilot light shall glow brightly and the external alarm circuit shall be energized. Pushing the "silencer" button shall de-energize the external alarm circuit but the pilot light shall remain on bright until the alarm condition is removed.

3-20E.09. External Alarm:

The external alarm circuit shall consist of an exterior red light mounted as shown on the plans.

3-20E.10. Time Delays:

Time delay units shall be electric motor driven timers and shall be adjustable from 15 seconds to 10 minutes.

3-20E.11. Transfer Panel:

The transfer panel may be of the Selecto-board type using a miniature plug arrangement or a toggle switch arrangement so that any one of three items may be connected to any one of three control functions. Entire unit shall be behind hinged cover in the control center.

3-20E.12. Chlorination Switch:

The chlorination switch located in the MCC shall be 4-position selector switch. The four positions shall be:

- (1) Pre-Chlorination - Solenoid valve operates with 10" electric valve.
- (2) Post Chlorination - Solenoid valve operates with high service pumps.
- (3) Both - Both solenoid valves operate.
- (4) Off - Solenoid valves do not operate.

3-20E.13. Solenoid Valves:

Furnish and install two (2) solenoid valves, 3/4", 120 volt as shown on plan. One solenoid valve will operate when any high service pump operates and one solenoid valve will operate when 10" electric valve opens (see Section 3-20E.12). This control point shall be adjustable over a range of 10% to 90% of full electric valve opening.

3-20E.14. Bubbler Control:

The self-purging bubbler system shall activate the reservoir level recorder, reservoir high and low level alarm, and pump low-level cut-off.

Furnish and install $\frac{1}{2}$ " plastic bubbler line from motor control center to reservoir. Use 1" conduit sleeve over plastic line and bury at a minimum depth of 36". Slope the line to prevent freezing. Conceal bubbler line in reservoir wall adjacent to south hatch. Connect bubbler line on inside surface at top of reservoir to a $\frac{3}{4}$ " galvanized pipe with a reducer. Fasten $\frac{3}{4}$ " galvanized pipe to interior wall every 4' with straps. Extend galvanized pipe to 6" above floor of reservoir.

Air shall flow through the bubbler pipe from the control center to the reservoir. Variation in the liquid level shall produce corresponding variation in the air pressure required to maintain bubbling. Rate of bubbling shall be approximately one and one-half cubic feet per hour, 60 to 80 bubbles per minute, and shall be adjustable from the bubbler panel. Bubbler panel shall include an adjustable air flow regulator calibrated to set the rate of bubbling. Any impurities in air supply shall be removed by an air filter. Shut-off and bleed valves shall be included to facilitate adjustment.

Level measurement shall be by means of a diaphragm operated sensor. Bellows shall have restricted movement above and below point of movement. Pressure element shall be adjustable in the field without special tools over the entire range of control.

Source of air for the bubbler system shall be provided from an oil-less air compressor, Bell and Gossett #LCT or equal, capable of delivering 2 scfh @ 20 psi. Bubbler control and air compressor shall be located in the control center.

Tentative schedule for this operation shall be as follows:

Falling Levels

<u>Step</u>	<u>Level (ft.)</u>	<u>Energize</u>	<u>De-Energize</u>	<u>Remarks</u>
1	19 $\frac{1}{2}$ '		High Alarm	
2	3'	Low Alarm		
3	1'	H.S. Cutoff		
4	0'			Reservoir Floor

Rising Levels

<u>Step</u>	<u>Level (ft.)</u>	<u>Energize</u>	<u>De-Energize</u>	<u>Remarks</u>
1	2'		H.S. Cutoff	
2	3½'		Low Alarm	
3	19'	High Alarm		
4	20'			Overflow

3-20E.15. Remote Control - High Service Pumps:

The level transmitter at the tower, furnished and installed by this Contractor, shall transmit signals to the pump control in the control center at the pump station. The pump control contacts shall operate at the indicated settings described herein.

Closing of the pump control contact via a transfer panel shall activate a time delay in the alarm circuit, the white "called for" light, and the appropriate pump motor starter.

An auxiliary contact in the motor starter shall initiate the "pump running" signal. The receipt of this signal shall reset the time delay unit in the alarm circuit, activate the green "running" light and the elapsed time meter. If the motor starter drops out for any reason the time delay unit will time out and activate the alarm for that particular pump. The alarm shall not be activated if the pump is manually switched to "Off".

A low level cutoff incorporated in the bubbler control as previously specified shall prohibit either manual or automatic operation of the pumps.

Control of the pumps shall be through electric check valves.

The pump control shall have the following tentative schedule:

Tower Falling Levels

<u>Step</u>	<u>Elevation (ft.)</u>	<u>Start</u>	<u>Stop</u>	<u>Running</u>
1	1690.5		High Alarm	
2	1688.0	HS #1		HS #1
3	1686.0	HS #2		HS #1, 2
4	1681.0	Low Alarm		HS #1, 2, Low Alarm
5	1671.0			Bottom of Tank

Tower Rising Levels

<u>Step</u>	<u>Elevation (ft.)</u>	<u>Start</u>	<u>Stop</u>	<u>Running</u>
1	1683.0		Low Alarm	HS #1, 2
2	1690.0		HS #2	HS #1
3	1691.0		HS #1	---
4	1691.5	High Alarm		High Alarm
5	1692.0			Overflow

The pump control shall have the capacity to control an additional future pump.

3-20E.16. Electric Check Valves:

Furnish and install electric check valves for each high service pump. The $\frac{1}{2}$ " conduit to H.S. pumps shall be used for the electric check valve conductors.

Any start signal to a high service pump shall start the pump and simultaneously activate the solenoid on the electric check valve which will cause the valve to open slowly hydraulically.

Any stop signal shall de-energize solenoid which shall hydraulically close the check valve. When the check valve reaches the closed position, limit switches shall stop the pump motor.

Provision shall be made for emergency closing under "loss of Power" condition.

3-20E.17. Electric Valve Actuator:

Electric valve actuator shall position the electric valve at the pumping station. The electric valve controls rate of flow from Sioux Falls to reservoir at pumping station. Electric valve actuator is controlled from Sioux Falls water plant. Electric valve actuator is specified in Section 3-20F.07.

SECTION 3-20

Electrical

F - Instrumentation and Telemetry

3-20F.01. Scope:

Furnish and install an integrated system of telemetry and instrumentation as shown on the plans and hereinafter specified. The pumping station instruments and telemetry equipment shall be factory installed in the control center. The entire system shall be factory tested prior to shipment. The manufacturer shall warrant the instruments and telemetry equipment to be free of defects of material and workmanship for a period of one year from the date of acceptance of the project.

The Base Bid shall be on Honeywell instruments and telemetry equipment.

3-20F.02. Transmission Link:

The system transmission link carrying signals between the elevated tank and the pumping station shall be by leased 1 pair voice grade telephone line. The system transmission link carrying signals between the pumping station and Sioux Falls Water Plant shall be by leased 1 pair voice grade telephone line.

3-20F.03. Tone Transmitters:

Transmitters shall be of solid state modular construction and shall operate in the band-width of 365-3500 Hz spaced at 100 Hz. The generated tone shall be coupled through a band pass filter for rejection of unwanted signals and to provide proper impedance matching.

Frequency stability shall be $\pm .1\% + 2$ Hz. Input power shall be 12 vdc @ 20 ma. External connections shall be made to a screw type barrier terminal board. Test jacks mounted on the front panel shall permit level and voltage measurements to be made with the unit in operating position. Test switch and level adjustments shall be mounted on the front panel. Transmitters shall be Honeywell #682915 frequency shift type or equal.

3-20F.04. Tone Receivers:

Receivers shall be of solid state modular construction and shall operate in the same band-width as the transmitters. An input band pass filter shall be incorporated in the receiver to reject all but the desired input frequency.

The amplified tone signal shall be converted to dc to energize the output circuitry. Output switching shall be accomplished by a spdt plug-in relay and all analog signals shall be converted to a 4-20 ma signal proportional to the measured variable. All external connections including output circuitry shall be made at a screw type terminal board.

Test jacks and sensitivity control shall be mounted on the front panel. Input power shall be 30 ma at 12 vdc. Frequency stability shall be $\pm .1\%$ + 2 Hz. Tone receivers shall be Honeywell #682916 or equal.

3-20F.05. Tone Test Equipment:

One test meter shall be provided to:

- a. Measure dc voltage levels at each tone module
- b. Measure loop current
- c. Measure transmitter output level
- d. Check receiver sensitivity and adjustment

One extender card module shall be provided to allow bench servicing of equipment.

3-20F.06. Power Supply Modules:

Power supply modules shall be provided at the pumping station and Sioux Falls Water Plant control panel for the transmitters and receivers. Power supply modules shall be Honeywell #684002/801 or equal.

3-20F.07. Electric Valve Actuator:

The electric valve shall be positioned from Sioux Falls Water Plant. Electric valve actuator at the pumping station shall accept 4-20 ma dc current signal via a relay, Honeywell #R7165A or equal, which will position the valve to produce the desired flow rate.

3-20F.08. Flow Transmitter:

Flow at the pumping station shall be measured by a Penn/Badger Lo-Loss flow tube of the insert type sized as shown on the drawings. Tube shall be of the insert type and shall be fabricated from plastic reinforced fiberglass. Differential across the tube shall be sensed by a mercury-less transmitter of the pulse duration type.

The overall inaccuracy of the flow tube, flow transmitter, tone transmitter and receiver shall not be greater than 2% of the full range flow. The flow tube shall have a maximum rated capacity of 2,000 gpm and a minimum rated capacity of 200 gpm.

Sensing means shall be a stainless steel bellows meter body with adjustable zero; pulsation dampener and temperature and pressure compensating springs. A three valve equalizing manifold shall be provided. Meter body shall be close coupled to the indicating pulse duration transmitter which will indicate and linearize the flow signal and transmit via pulse duration/tone transmitter to Sioux Falls.

The flow tube and transmitter shall be located as shown on the plans.

Pulse duration cycle shall be 10 seconds with a 2 second live zero. The transmitter shall be the dial indicating type. Transmitter shall be Honeywell 474X2C2 or equal.

3-20F.09. Reservoir Level Transmitter:

Level at the reservoir shall be sensed by a pulse duration transmitter measuring the back pressure from a bubbler tube.

Transmitter shall be equipped with a bronze or stainless steel spiral to sense pressure and shall transmit a proportional pulse duration signal to the tone transmitter in the pumping station panel. The transmitter shall be the dial indicating type. Transmitter shall be Honeywell 474X2P2 or equal.

3-20F.10. Elevated Tank Transmitter:

Elevated tank transmitter shall be of the pulse duration type and shall sense the level in the elevated tank. Standpipe level shall be suppressed so that only the level in the tank is transmitted. Pulse duration signal proportional to tank level shall be transmitted to the pumping station panel. The transmitter shall be the dial indicating type. Transmitter shall be Honeywell 474X2P2.

Furnish and install the level transmitter in the control manhole at the elevated tower. 120 V. A.C. power supply, and control cable provided by others. Provide 1/2" copper line from level transmitter to riser.

3-20F.11. Pump Control and Power Supply:

The pump control shall incorporate circuit logic to start and stop each high service pump with 0-100% adjustable dead-band. The method of operation is specified in Section 3-26E.13. Pump control shall be Honeywell #TA5100 or equal.

3-20F.12. Elevated Tank Level Recorder:

Level of the elevated tank recorded at the pumping station shall be recorded on a 12" circular chart type recorder and shall accept a 4-20 ma signal. Chart shall be calibrated for 0' to 21'. Honeywell #Y452MA or equal.

SECTION 3-20

Electrical

G - Additions to Existing Sioux Falls Water Plant Control Panel

3.20G.01. General:

Provide controls as shown in the control diagrams on the plans and as specified hereinafter. The Base Bid shall be on Honeywell instruments. All equipment shall be installed in the available space at the existing panel in Sioux Falls Water Plant.

3-20G.02. Pilot Lights:

All pilot lights shall be red dim-glow, 110 volts. One pilot light shall indicate reservoir high level alarm. One pilot light shall indicate reservoir low level alarm. One pilot light shall indicate general alarm which shall consist of pump failure at the pump station or tower high and low level alarm. One pilot light shall indicate communications channel failure.

3-20G.03. Alarm Silencer:

The alarm silencer unit shall consist of appropriate relays, pilot lights, and pushbuttons to provide the following operation:

Under normal conditions the red pilot light shall be "dim-glow". When the pilot contact initiates an "alarm" condition the pilot light shall glow brightly and the buzzer circuit shall be energized. Pushing the "silencer" button shall de-energize the buzzer circuit but the pilot light shall remain on bright until the alarm condition is removed.

3-20G.04. Buzzer:

The existing buzzer mounted on the control panel shall be used in all alarm circuits.

3-20G.05. Additions to Control Center:

The following components shall be installed in the available space at the existing panel in the Sioux Falls Water Plant.

1. Miniature Reservoir Flow Recorder and Totalizer
2. Miniature Reservoir Level Recorder With Hi-Lo Alarm

3. General Alarm (Elevated Tank Alarm or Pump Failure Alarm)
4. Channel Failure Alarm
5. Electric Valve Control

In addition the Sioux Falls panel will contain all tone transmitters, receivers, and power supplies required to receive or transmit incoming or outgoing signals as herein specified.

Name plates for identification of devices and alarms shall be provided. These shall be micarta, bakelite, or equal. Nameplate titles are subject to the Engineer's approval.

3-20G.06. Miniature Reservoir Flow Recorder and Totalizer:

Flow transmitted from the pumping station shall be recorded on a 4" strip chart, electronic solid state recorder capable of accepting a 4-20 ma signal proportional to flow from its applicable tone receiver. A totalizer shall be provided to integrate and totalize rate of flow and display the value on a six digit counter.

Recorder shall be Honeywell NCS-10-10-X-X-421 or equal and totalizer shall be NW1-50.

3-20G.07. Miniature Reservoir Level Recorder:

Reservoir level transmitted from the pumping station will be recorded on a 4" strip chart, electronic recorder capable of accepting a 4-20 ma signal proportional to level from its applicable tone receiver. Strip chart shall be calibrated 0' to 20'.

Recorder shall be Honeywell NCS-10-10-X-X-421 or equal.

3-20G.08. General Alarm:

The general alarm shall consist of the elevated tank Hi-Lo alarm or high service pump failure alarm. These alarms, in addition to being displayed at the pumping station panel, will be retransmitted to the Sioux Falls panel as a single general alarm condition.

The intent of the single general alarm condition at Sioux Falls Water Plant is to alert the Sioux Falls personnel that the unmanned pumping station has an alarm condition. The personnel at the Sioux Falls Water Plant will then notify Lincoln County authorities of the alarm condition.

Transmission will be a single tone transmitter and reception will be by a single tone receiver.

This alarm shall be visually and audibly displayed at the Sioux Falls Water Plant control panel.

3-20G.09. Electric Valve Control:

The command signal to position the electric valve at the pumping station shall be initiated at Sioux Falls and transmitted via tone transmission to the pumping station panel.

A valve position set point unit shall be installed in the Sioux Falls panel and shall contain a 0-1000 ohm manual potentiometer graduated 0-100%. The potentiometer will drive a potentiometer-to-current transducer to provide a 4-20 ma signal which will be retransmitted by the tone transmitter and received at the pumping station and transduced to a signal acceptable to the valve actuator.

Electric valve positioner shall be Honeywell NAX-150.

3-20G.10. Channel Failure Alarm:

This alarm shall be visually and audibly displayed at the Sioux Falls Water Plant control panel.

Detection of either telephone line failure or power supply failure shall be accomplished by relays monitoring the carrier frequency at the receivers.

3-20G.11. Tone Transmitters and Receivers:

The same type of tone equipment shall be used at Sioux Falls as is specified for the pumping station. See plans for the required quantity.

3-20G.12. 120 Volt Supply:

There is 120 volt supply available in the Sioux Falls Water Plant control panel.

3-20G.13. Supervision and Installation:

Installation of this equipment at the Sioux Falls Water Plant control panel will be by the Contractor; however the responsibility to coordinate the entire system shall be the instrumentation suppliers.

The supplier shall provide qualified instrument service engineers to supervise the installation in accordance with accepted instrument practice. After installation all loops shall be checked for continuity, commissioned and calibrated with proper test equipment, i.e. manometers, deadweight testers, portable calibrators and the tone test equipment specified elsewhere.

The time required to carry out this work shall be as necessary to accomplish the specified requirements to the satisfaction of the owner and engineers.

Instrument supplier shall show proof of a qualified maintenance staff and parts stocking location within a radius of 100 miles from Sioux Falls. After this work has been completed certification shall be provided to the engineer that the system is ready for start up.

3-20G.14. Drawings and Submittals:

Instrument supplier shall submit six (6) copies of the following drawings and submittal data.

- Point to point wiring diagrams
- Panel layout drawings showing cutout dimensions
- Panel wiring diagrams
- Installation details for all equipment
- Specification details for all equipment
- Diagrams as required in Section 3-20D.02 of these specifications.

SECTION 3-21

Pumps and Miscellaneous Equipment

3-21.01. High Service Pumps:

The Contractor shall furnish all materials, tools, labor, service and required appurtenances as required to furnish, install two (2) high service pumps. The pumps will take suction from the ground storage tank (or directly from the system supply by-pass) and discharge to the rural water distribution system. Each pump shall be a horizontally split case, two-stage, centrifugal pump, complete with electric motor driver, flexible coupling with coupling guard, pump-driver base plate, pump case vent and drain valves and all other appurtenances required to install a complete unit. The two pumps shall be identical, each is described herein.

Conditions of Service:

Fluid:	Clean water, 40 - 70 degrees F.
Suction Pressure:	Varies from 10 ft. lift to 9 ft. submergence (dependent upon reservoir level,) measured from pump shaft centerline.
Design Total Head:	335 feet water at design flow and 10' suction lift.
Design Flow:	300 gpm.
Maximum Allowable Speed:	1800 rpm.
Maximum Allowable Shut-off Head:	380 feet water with + 11 feet water suction.
Maximum NPSH Required at Design Point:	15 feet.

The pump case shall be cast iron, with horizontal joint along pump shaft centerline, 125 lb. ASA flanged suction and 250 lb. ASA discharge nozzles in the lower case-half to allow ready access

to pump internals without breaking piping or driver connections by removing the upper case-half. Replaceable bronze casing wear rings shall be provided and shall be secured to the case lower half. The impellers shall be bronze, with integral wear rings, arranged on the shaft to oppose hydraulic thrusts. The shaft shall be stainless steel, with replaceable stainless steel packing wear rings. Bearings shall be grease or oil lubricated ball or roller bearing; unopposed hydraulic thrust shall be allowed in bearing design. Driver coupling shall be of the flexible design. Taps for vents and drains for each stage shall be provided in the pump case. The shaft seals shall be stuffing box, lantern ring and packing shall be specially selected to suit the conditions of service specified herein. The pump shall be as manufactured by Peerless Pump Co., Model #2½-TUAP-13½ or approved equal.

Each motor shall be horizontal, open drip-proof, ball bearing, grease lubricated squirrel cage induction, normal starting torque, 460 volts, three phase, 60 Hz, not greater than 1800 rpm. The nameplate power rating of the motor shall be not less than that required by the pump at design conditions of service. The nameplate plus service factor rating shall be not less than that required by the pump at any flow from zero to shut-off head.

3-21.02. Pump Priming Set:

The Contractor shall furnish and install one automatic, simplex vacuum priming pump complete with vacuum tank, wall shelf priming valves, controls and piping as shown on the plans or as specified herein. The vacuum tank shall have not less than 3.0 cu. ft. volume and shall be ASME coded, designed for full vacuum and shall be complete with water gage glass, vacuum gage, vacuum breaker, drain valve and tank water level switch to prevent vacuum pump operation if water is in the tank. The vacuum pump shall have a displacement rating of not less than 2.0 SCFM, shall be tank mounted and shall be complete with single phase, 120/240 volt electric driver. The vacuum pump shall be complete with vacuum switch controller, suction piping with check valve and exhaust muffler. A belt guard shall be required if belt driven equipment is furnished. A 1" NPT vacuum priming valve shall be furnished and installed at each high service pump.

The vacuum priming assembly shall be a manufacturer designed and assembled unit as manufactured by Valve & Primer Corporation "V-APCO" size 0 primer with No. 200-AP priming valves, Nash Engineering Co., Model 571, with Nash priming valves or approved equal.

3-21.03. 6" Turbine Meter and Register:

Meter shall be a 6" size, magnetic drive, propeller type, flanged tube, designed for 150 lbs. working pressure. Tube shall be integral cast of high tensile cast iron, with flanged ends, faced and drilled to conform to ASA Class 125 drilling. Meter tube shall be furnished with full-length stainless steel liner which shall have 4 straightening vanes, radially spaced 90" apart. Meter tube shall have the same nominal inside diameter throughout its length to offer minimum obstruction to the flow. Meter is to be suitable for normal flows of 90 to 900 GPM, and shall register within 2 percent of true flow at all flows within the rated range.

The rate indicator-totalizer shall have a full 4" diameter indicator dial having a range of 0 to 900 GPM. It shall also be equipped with a six digit, straight reading type totalizer reading in units of 1,000 gallons. The totalizer shall have a test hand to check the accuracy of the indicator. The assembly shall be designed for convenient installation of control switches. The unit shall have drive change gears as well as totalizer change gears. Meter to be Rockwell-Flow Control Model 102 or approved equal.

3-21.04. 10" Electric Valve (Throttling Solenoid Operated):

10" Golden Anderson (Angle Valve)

Figure No. X374-DA, Model BGA 711118, valve shall be provided with a potentiometer to give a readout of piston position.

3-21.05. 10" Flow Tube:

See Electrical and Control Section.

3-21.06. 8" Foot Valve:

The foot valve shall be an 8" flanged, iron body valve with leather disc and strainer, Crane No. 395 or equal.

3-21.07. Chlorine Equipment:

Furnish and install a gas chlorinator and accessories as shown on the plans and as herein specified. Chlorine feeding operation shall be of the manual set type. The units shall be similar and equal to the following items of equipment:

a. Chlorinators:

The control unit chlorinator shall be Wallace & Tiernan Series 91-100A V-notch chlorinator with a capacity of 1 to 20 lbs. per day of chlorine (wall mounted).

(Div. III)

TS-86

The auxiliary control unit shall be Wallace & Tiernan Series 91-100D V-notch chlorinator with a capacity of 1 to 20 lbs. per day of chlorine (wall mounted).

Chlorine is to be injected into the water system at two points as shown on the plans.

b. Accessories:

(1) Automatic switch-over package w/two cylinder units - Wallace & Tiernan 91-100C including 20 lead gaskets.

(2) 3/4" water shut-off valve, strainer and 0-200 psi gauge (to be located on 3/4" water supply line).

(3) Wrenches

(4) 3/4" solution tube (3/4" I.D.) Schedule 80 PVC rigid pipe to from injectors to injection points.

(5) Two injectors (wall mounted in chlorine room).

(6) Wallace and Tiernan Series 50.345 two cylinder direct reading scale.

(7) Two 3/4" solenoid valves - See electrical and control section.

(8) Safety vent plastic pipe to outside w/elbow and vent screen.

(9) Plastic gas line (1/2" I.D.)

(10) Two water main connections at injection points.

(11) Two ball check valves at each chlorine injection point.

(12) Two ball valves (PVC) in the 3/4" solution line near each injection point.

(13) Gas Mask - Safety Appliance Co., Model 84871 Spare Canister - Model 77711

c. Installation and Operation of Equipment:

Installation and testing of the equipment shall be supervised by a qualified manufacturer's representative. After the equipment has been installed, the Contractor shall provide the services of a competent operating engineer for purposes

of placing the equipment in operation, and instruction of the operators in the proper operations and maintenance of the equipment.

3-21.08. Chemicals:

The Contractor shall furnish the following chemicals supplied in original unopened packages not earlier than 2 weeks of planned start-up.

Chlorine

AWWA B301-59 - Liquid chlorine - 99.5% by volume Cl_2 .

Two returnable ICC cylinders - 150# net each.

(Contractor to pay cylinder deposit and send receipt to Owner).

3-21.09. Chlorine Test Kits:

The Contractor shall furnish the following chlorine test kits:

Hach Model CN-46 (0-1 ppm) chlorine test kit

Hach Model CN-21-P (0-250 ppm) chlorine test kit

The above chlorine test kits may be ordered from:

Hach Chemical Company
P.O. Box 907
Ames, Iowa

3-21.10. Sample Taps:

The Contractor shall furnish and install two (2) sample taps as shown on the plans.

Each sample tap shall be installed in a readily accessible location and shall be a $\frac{1}{2}$ " NPT brass sill cock.

SECTION 3-22

Measurement and Payment

Individual items of work included in Division III of the project will not be measured for separate payment. Payment for Division III will be made in accordance with the Construction Contract. The Contractor shall accept the lump sum price in the Contractor's Proposal for Division III, subject to additions or deductions approved by the Engineer and Owner, as full compensation for furnishing all plant, labor, materials, equipment and appliances, and for performing all operations in connection with the various classes of work required on the plans and in the specification; also for all costs arising from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the work and up to the time of acceptance of Division III.

The Division III Contractor shall provide the Engineer with a cost itemization after bid letting in order that proper partial payments may be made during progress of the work. Proper division of costs for the various aspects of the Division III work shall be subject to approval by the Engineer.

August 28, 1970

Mr. Joe Grimes
Chief Engineer
South Dakota Water Resources Commission
Pierre, South Dakota

Re: Lincoln County
Rural Water System
Job No. 2076

Dear Mr. Grimes:

We are enclosing one (1) copy of the preliminary engineering feasibility study and report for the Lincoln County Rural Water System for your information and use.

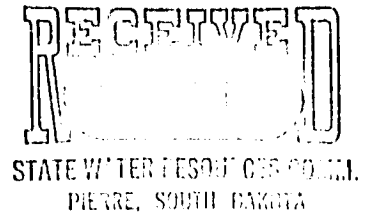
Very truly yours,

DEWILD GRANT RECKERT
& ASSOCIATES COMPANY

Delmar Koel
Delmar Koel, P. E.

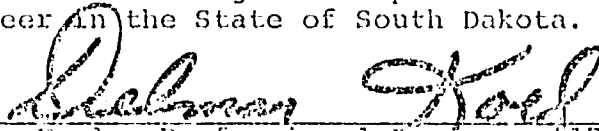
DK:mrw
Enclosure (1)

cc: Mr. Bernard Uthe
: Mr. Richard Lommen



PRELIMINARY
ENGINEERING FEASIBILITY STUDY
AND REPORT
FOR A
WATER DISTRIBUTION SYSTEM
FOR
LINCOLN COUNTY RURAL WATER SYSTEM
LINCOLN AND MINNEHAHA COUNTIES, SOUTH DAKOTA
SEPTEMBER, 1970

I hereby certify that this report was prepared
by me or under my direct personal supervision
and that I am a registered professional
engineer in the State of South Dakota.


Delmar Koel - Professional Engineer #1782

DEWILD GRANT RECKERT & ASSOCIATES CO.
ENGINEERS - ARCHITECTS - PLANNERS
ROCK RAPIDS, IOWA

DEWILD, GRANT, RECKERT & ASSOCIATES CO.

LINCOLN COUNTY RURAL WATER SYSTEM

HARRISBURG, SOUTH DAKOTA

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Brown and Myrabo, Attorneys

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PRELIMINARY
ENGINEERING REPORT AND FEASIBILITY STUDY
FOR
LINCOLN COUNTY RURAL WATER SYSTEM

HARRISBURG, SOUTH DAKOTA

I. GENERAL INFORMATION

The geographical area included in this feasibility study includes portions of two townships in Minnehaha County, and all or portions of four townships in Lincoln County, South Dakota, and consists of approximately 144 square miles. The average farm size in this area is nearly 250 acres. The income of this farm area is derived primarily from crops and livestock.

The area encompassed by the proposed system extends a maximum distance of 14 miles in width from north to south and 15 miles in length from east to west. The approximate center of the system is at 43° 27' North Latitude and 96° 43' West Longitude. The elevation over the area varies from 1250 feet above sea level along the Big Sioux River to a maximum elevation of 1550 in the higher areas. The average annual temperature is 47° F. with extremes varying from a low monthly average of 17.3° F. in January and a high monthly average of 75.7° F. in July. The average annual precipitation is about 25-inches with 18-inches of this average coming during their 153-day growing season.

The area covered by this system has a potentially good projected growth and development. This is largely due to the area location, being bounded on the north by Sioux Falls, to the east by the Big Sioux River, to the west by Interstates 229 and 29, and five miles to the south by U.S. Highway 18. A combination of these factors provides for the availability of land, good transportation, adequate labor force, recreation facilities, and municipalities. At present the economic area of which Lincoln County is a part has shown a more substantial increase in population than the entire state and Minnehaha County has shown the largest population change for the entire economic area which includes Lincoln, Minnehaha, Clay, Lake, Moody, Turner, Union and Yankton Counties.

Lack of adequate quantities of good quality water has been a major deterrent to desired economic growth of the area. Approximately 90% of the rural people haul water for their domestic and livestock useage. Due to the type of soil found in the area, continuous flows of underground water cannot be easily found for large supplies. Those supplies that are found are generally of a poor quality for domestic and livestock use.

The Board of Directors has canvassed the entire area and collected ten dollars (\$10.00) from each of the families interested in developing a water distribution system. At the time of this report, there are three hundred and six (306) interested families in the area that have made a contribution toward the cost of this study for developing a system for the area. Of these, one (1) is located beyond the feasible limits of the proposed system, which leaves a feasible system of three hundred and five customers.

One small unincorporated community, Schindler, is located within the area and will obtain water from the proposed system. The incorporated villages of Harrisburg and Tea also lie within the area but are not included in the proposed system since they have their own municipal systems. The proposed water system tentatively will obtain its water supply from an aquifer located west of the Big Sioux River, in Section 1-T99N-R49W.

Negotiations for water have been initiated with the City of Sioux Falls, but at the time of this report no agreement has been reached.

The total project cost has been estimated at \$1,011,950.00 or \$3,318.00 per user. This figure is somewhat lower than the cost per user in the Butte-Head Rural Water District because of the higher density in the proposed system.

By expansion of the well field and treatment plant the system will be capable of serving an additional 105 homes and additional industrial growth near the Tea interchanges. The proposed pipeline and towers could serve in excess of 410 users with no modification. Using 410 users the proposed cost per user would be \$2,468.00.

Based on discussions with the Farmers Home Administration it has been determined that the Association's share or contribution toward the cost of the project should be about 5% of the project cost. This is an average contribution per customer of \$160.00 or a total of \$48,800.00, based on three hundred and five (305) customers.

It is recommended that \$2,000.00 of the Association funds be held for operating expense until such time as revenue is available from the sale of water. The initial ten dollars (\$10.00) paid by each of the present subscribers should be considered as a part of the total contribution payment per consumer. It has been general practice in other systems to refund the ten dollars (\$10.00) to any subscriber that the Engineer or Association deems it impractical to serve. However a refund is not made to those who do not desire to fully participate when service is practical.

The calculations contained in the data sections of this report are based on the original interested subscribers and may be subject to alteration between the date of this report and the start of final design plans.

Based on the water use survey sheets the following numbers of people, livestock and poultry will be served by the proposed system:

People -	1,400*
Dairy Cows -	1,226
Feeder Cattle -	11,782
Hogs and Sheep -	18,387
Poultry -	45,499

*Includes 100 persons for a motel and 100 persons employed at Dakota Industries, both located at the Tea interchange on Interstate 29.

II. WATER SUPPLY

Between July 30, 1969 and August 15, 1969 a special ground water investigation was carried out along the Big Sioux River, east of Harrisburg, South Dakota. The purpose of the investigation was to assist Lincoln County in locating future water supplies. We are

including an introductory paragraph and the concluding paragraph of said report.

"The preparation of this report was performed under the supervision of Ronald Jackson, Engineer. The field work was performed by the Sioux Well Drilling Company of Sioux Falls, South Dakota and supervised by Ronald Jackson. Test hole locations were determined by Mr. Cleo Christensen, Ground Water Geologist, with the State Geological Survey, with slight alterations caused by access difficulties. Special thanks go to Mr. C. R. Kennedy of the Farmers Home Administration and to the Lincoln County Planning Commission and the Lincoln County Commissions, without whose cooperation the program could not have been completed."

"On the basis of the test drilling program and the production well test it is apparent that there is a good ground water aquifer in Section 1. This aquifer has produced a minimum of 120 gallons per minute on a 24 hour test and will produce even more using a standard irrigator screen. It is recommended that this aquifer be used as a water supply for future rural water systems in the County and that County officials take the necessary steps to create rural water districts and construct such systems."

The Association tentatively plans to obtain its water from the Big Sioux aquifer in Sec. 1-T99N-R49W. Test drilling in this area indicates the necessity of iron and maganese removal.

It is our recommendation that additional testing be conducted in Section 1-T99N-R49W to determine if there is adequate water available for both the Town of Harrisburg and the Lincoln County Rural Water System prior to preparation of final plans and specifications.

The Association is negotiating with the City of Sioux Falls for the purchase of water. No agreement has been reached at this time, and this report is based on the assumption of the above well site as the source of supply.

III. WATER DISTRIBUTION SYSTEM

A. SYSTEM:

The distribution system has been designed in anticipation of considerable population growth in the area. In addition to the present 305 customers, another 105 homes were assumed at points of expected growth. A reserve has also been added to the interchanges near Tea for expected industrial growth.

The design of the proposed distribution system pipelines has been based on the above reserve and from data taken from the water use survey sheets completed by each customer. The livestock design usage is based on maximum expected livestock use spread over a 12-hour period. Very large users may be required to provide some on-site storage in the form of stock tanks, etc., to take care of maximum instantaneous demand.

The average maximum use including livestock and domestic for the three hundred and five (305) proposed customers when spread over a 12 hour period is 1.02 gallons per minute per customer. A minimum residual pressure of 20 p.s.i. at full dynamic loading has been designed for the water main adjoining each proposed customer. Minimum pipeline size used has been 2-inches. The proposed design coupled with a moderate frequency of instantaneous use factor should provide very adequate service to the proposed three hundred and five (305) customers.

The distribution system as presently designed will include the following:

8" A.C. Pipe	66,250 Lineal Feet
6" P.V.C. Pipe	7,500 Lineal Feet
5" P.V.C. Pipe	7,950 Lineal Feet
4" P.V.C. Pipe	10,600 Lineal Feet
3½" P.V.C. Pipe	21,200 Lineal Feet
3" P.V.C. Pipe	74,500 Lineal Feet
2½" P.V.C. Pipe	83,100 Lineal Feet
2" P.V.C. Pipe	409,600 Lineal Feet

Total Pipe Mileage	128.4 miles
Customers/Mile	2.37/mile

An estimated 82,000 feet of 1½" service line has been included to bring the water from the mains to the basements of homes of the subscribers. It is the intention of the Board of Directors to install the meters in basements wherever practical. The Board feels that elimination of meter pits is desirable and furthermore service lines to the homes will encourage immediate usage of the water when the lines are pressurized.

B. WATER STORAGE:

The proposed system is divided into two separate service areas with elevated storage located in each. The elevated storage is of sufficient capacity to provide ¼ of one day's maximum demand in each area. The mains for filling the towers have been designed to meet the area's maximum daily demand in 8 hours.

The following elevated storage will be provided in the two (2) areas:

<u>Area</u>	<u>No. of Customers Served</u>	<u>Type</u>	<u>Total Capacity</u>
A	247	Waterball 120' to Overflow	75,000 gallons
B	58	Waterball 120' to Overflow	15,000 gallons

Each of the above units will be controlled by double acting altitude valves to prevent overflow while maintaining maximum water level.

C. DESIGN DATA AND WATER USE CRITERIA:

The average daily water requirement was obtained by tabulating the information obtained from the water survey sheets completed by the proposed water subscribers. The data sheets indicate an average use of about 280 gallons per customer per day based on 75% of the domestic usage or 30 gallons per capita per day (gpcd) and 25% of the livestock listed on the data

sheets. This is a total average daily use of 280 gallons x 305 customers or about 85,000 gallons per day. This results in an average demand rate of 0.39 gallons per minute per customer over a 12 hour period.

The maximum use per day per customer was obtained directly from the numbers of people and livestock listed in the survey sheets including an allowance for future expansions with the resulting demand spread over a 12 hour period. This demand rate then averages 1.02 gallons per minute per customer which results in a maximum to minimum demand ratio of 1.02/0.39 or 2.63 which should provide an adequate factor of safety for the pipeline design.

D. HYDRAULICS:

Complete hydraulic calculations using the maximum demand rate per customer from the data sheets as described above including an allowance for future expansion have been made to determine the best arrangement and most economical sizes of pipes to serve the proposed area. The distances and ground elevations were obtained for this feasibility report from topographic quadrangle maps published by the United States Geological Survey. The hydraulic calculations have been made by our computer and are not a part of this report but are available upon request. The friction losses for the system were computed using the Hazen-Williams formula with C values of 150 for polyvinylchloride (P.V.C.) pipe and 140 for asbestos cement (A.C.) pipe.

There is a surface relief differential of about 300 feet in vertical elevation across the proposed system and because of this and the length of pipelines required, it is not feasible to design a system with a narrow range of working pressures. The design utilized in the proposed system will supply water to customers at the maximum rates determined from the data sheets with a minimum residual pressure of 20 pounds per square inch (p.s.i.) to each user. The maximum pressure under static or low flow conditions will not exceed 90 p.s.i. At those points where excessive pressures will occur, individual pressure regulators will be installed in the basement or meter pit ahead of the meter.

E. MISCELLANEOUS DESIGN FEATURES:

Valves will be installed to enable the isolation of sections of pipe in the event of a line break or for maintenance in that section. Valves will be installed on every branch from the feeder main connecting the well field to Tower "A". Main line cleanouts will be installed in low areas, usually adjacent to dry waterways or creek beds, for cleaning and draining the system. There will also be cleanouts installed at the end of major "deadend" mains.

At the extreme high points where there are no adjacent customers, air relief valves will be installed to prevent entrapment of air in the pipelines.

All prices and estimates of probable costs are based on the use of Class 160 and/or Class 200 rigid P.V.C. plastic pipe and Class 200 A.C. asbestos cement pipe. At the time of receiving construction bids, alternate bids will be taken on all Class 200 P.V.C. pipe also. All service pipe will be Class 150 or Class 200 P.V.C. of 1½ inch diameter.

Service connections will be made by means of a reducing tee or saddle tee and a corporation cock. Standard service meters will be 5/8" x 3/4" frost-proof meters with bronze case and installed with necessary fittings. Individual pressure regulators will be installed at services ahead of the meter where required to control excessive pressures. The meters will be installed in basements where possible. Where basement installation is not practical, meters will be installed in pre-cast asbestos or clay meter pits with cast iron covers.

The exact location of the lines with respect to the road right-of-ways will be determined by the Engineer at the time of the final survey. Since much of the property adjoining the proposed lines is owned by members of the association, the lines will, in general, be placed on private property with easements being obtained from the respective property owners. If it is impossible to locate on private land because of the terrain or difficulty in obtaining easements, the pipelines in these locations will have to be placed within the public road right-of-way with permits obtained from the appropriate governing agency.

A study has been made of frost penetration depths; in all probability the lines will be installed with a minimum cover of 60-inches to protect them from freezing.

Trenching will be primarily in glacial till and clay soils. For this report it has been assumed no rock will be encountered. If further studies reveal rock excavation will be required, it may be necessary to drop that part of the project or realign the pipeline to fit field conditions.

Crossings of interstates, paved roads, and railroads will be made by boring so a steel or corrugated metal pipe encasement may be installed. The carrier pipeline will then be installed inside the encasement. All borings will be a minimum of 60-inches below the pavement or railroad ties.

F. ENGINEERING:

The engineering has been completed for the preliminary design with the locations and sizes of all main lines calculated on the basis of the previously mentioned design flow per customer. If the Engineer finds conditions which require major revisions in the system or in the estimated costs at the time of preparation of detailed plans, the approval of such changes will be obtained from the office of the Farmers Home Administration before the final plans are submitted.

The construction specifications will meet standards of the American Water Works Association. Provisions will be made during construction for hydrostatically testing all of the lines and for disinfection of the system segments before it is placed in service.

All plans and specifications will be submitted to Farmers Home Administration and the South Dakota State Department of Health for their respective approvals prior to advertising for construction bids.

G. CONSTRUCTION BIDDING PROCEDURES:

Competitive bids for construction of the proposed work will be requested and contracts awarded for all phases of the project. Contracts are usually awarded

to the lowest responsible bidder subject to the approval of the Association, the Engineer and the Farmers Home Administration.

All bidders are required to post a certified check as bid security at the time of submitting bids, and the successful Contractor or Contractors will be required to file a Performance Bond in the amount of 100% of the contract amount. This Bond will also guarantee the workmanship and materials for a period of one year after completion and acceptance of the project.

II. LIFE OF FACILITIES:

With proper construction and maintenance the system should, with the exception of pumps, motors, and paint coatings, have a useful life or not less than 40 years. Re-painting of exposed units can probably be expected about every 5 years and replacement of the working parts of pumps and motors within about 20 years.

IV. PROPERTY REQUIREMENTS AND COSTS

A. STRUCTURES:

Land will be required for the proposed elevated storage tanks, treatment plant, and well site. These sites can be acquired either through purchase or by obtaining perpetual easements. An estimate of \$1,500.00 for land costs has been used.

B. DISTRIBUTION PIPELINES:

1. Privately Owned Lands - Easements or permits to construct and maintain lines which cross or lie on privately owned lands must be obtained prior to submitting final loan docket.
2. Site Acquisition - Funds have been reserved in the estimate of probable cost to cover site acquisition, easements, and crop damage during construction. It has been customary on other projects of the same type that no payment is made for easements and only slight crop damage has been incurred. Should the Contractor become lax in his operations, he shall be held responsible for damages of crops outside of the limits of the construction easements.

3. State and County Properties - Permits will be obtained from the necessary agency at locations where pipelines must cross under or use public road rights-of-way.

C. OTHER COSTS:

Additional costs which are included in the estimate of probable cost include engineering and legal fees, abstracting costs, easement filing costs, and insurance premiums.

V. METHODS OF FINANCING

It is hereby recommended that the proposed system be financed by a loan from the Farmers Home Administration in the amount of \$965,150.00. On the basis of current practice the loan would have a term of 40 years and bear interest at the rate of 5% per annum.

The Association's share, about 5% of the loan involved, will average \$160.00 per customer or \$48,800.00 for the entire project. It is recommended that \$2,000.00 of this be retained to pay postage and other operational costs until the Association begins to receive revenue from the sale of water. The remaining \$46,800.00 should be applied to the cost of constructing the proposed system.

In our opinion the rate schedule which has been recommended is slightly higher than other rural systems in effect in other areas of the country with a density and usage equivalent to the proposed system. This is partially due to the additional capacity that has been provided for the expected future expansion of the system and the fact that the system intends, at present time anyway, to develop their own water supply and treatment facilities.

VI. ESTIMATE OF PROBABLE COSTS

The following cost estimate has been prepared by the Engineer without the benefit of final design plans or survey. (Date of cost estimate - August, 1970).

<u>Item No.</u>	<u>Description</u>	<u>Estimated Quantity</u>	<u>Unit Price</u>	<u>Total Estimated Cost</u>
1.	8" A.C. Pipe	66,250 L.F.	\$ 2.75	\$182,187.50
2.	6" P.V.C. Pipe	7,500 L.F.	1.75	13,125.00
3.	5" P.V.C. Pipe	7,950 L.F.	1.45	11,527.50
4.	4" P.V.C. Pipe	10,600 L.F.	1.05	11,130.00
5.	3½" P.V.C. Pipe	21,200 L.F.	0.85	18,020.00
6.	3" P.V.C. Pipe	74,500 L.F.	0.80	59,600.00
7.	2½" P.V.C. Pipe	83,100 L.F.	0.70	58,170.00
8.	2" P.V.C. Pipe	409,600 L.F.	0.60	245,760.00
9.	8" MJ Valve & Box	2 Ea.	180.00	360.00
10.	6" MJ Valve & Box	1 Ea.	120.00	120.00
11.	4" MJ Valve & Box	2 Ea.	90.00	180.00
12.	3" MJ Valve & Box	14 Ea.	75.00	1,050.00
13.	2" MJ Valve & Box	23 Ea.	65.00	1,495.00
14.	Line Cleanout	12 Ea.	70.00	840.00
15.	2" Air Relief Valve	6 Ea.	70.00	420.00
16.	Valve Flush Hydrant	2 Ea.	120.00	240.00
17.	Meter 5/8" x 3/4"	305 Ea.	45.00	13,725.00
18.	Pressure Regulator	98 Ea.	15.00	1,470.00
19.	Corporation Stop	305 Ea.	7.00	2,135.00

<u>Item No.</u>	<u>Description</u>	<u>Estimated Quantity</u>	<u>Unit Price</u>	<u>Total Estimated Cost</u>
20.	1½" P.V.C. Pipe (Service Line)	82,000 L.F.	0.70	57,400.00
21.	Service Line Valve and Box	305 Ea.	40.00	12,200.00
22.	Service Crossings	70 Ea.	175.00	12,250.00
23.	Highway Crossings	22 Ea.	300.00	6,600.00
24.	Railroad Crossings	5 Ea.	300.00	1,500.00
25.	Interstate Crossings	1 Ea.	4,500.00	4,500.00
26.	Booster Station, 250 GPM	1 Ea.	9,000.00	9,000.00
27.	Altitude Valve & Box	2 Ea.	1,500.00	3,000.00
28.	Hydrants	2 Ea.	300.00	600.00
29.	Elevated tank, 75,000 Gal. Capacity	1 Ea.	36,000.00	36,000.00
30.	Elevated tank, 15,000 Gal. Capacity	1 Ea.	25,000.00	25,000.00
31.	Wells, 2 @ 100 GPM	2 Ea.	19,000.00	38,000.00
32.	Treatment Plant, 200 GPM	1 Ea.	80,000.00	<u>80,000.00</u>
	Total Estimated Construction			\$907,605.00
	Engineering			50,845.00
	Legal			11,500.00
	Abstracting			4,000.00
	Land			1,500.00
	Inspection			11,500.00
	Contingencies			<u>25,000.00</u>
	Total Estimated Project Cost			\$1,011,950.00
	Less 305 @ \$160.00/Customer		\$48,800.00	
	Reserve of Initial Operation		<u>2,000.00</u>	
			\$46,800.00	
	Loan Required			\$ 965,150.00

VII. ESTIMATED INCOME

PROPOSED RATE SCHEDULE

Group I	- First 1,000 gallons/month or less	\$6.50/Minimum Charge
Group II	- Next 4,000 gallons	\$2.50/1,000 gallons
Group III	- Next 5,000 gallons	\$2.00/1,000 gallons
Group IV	- Next 10,000 gallons	\$1.50/1,000 gallons
Group V	- All over 20,000 gallons/ month	\$0.75/1,000 gallons

<u>Use Per Month</u>	<u>Revenue Per User</u>	<u>No. of Users</u>	<u>Revenue Per Month</u>
1,000 gals.	\$ 6.50	9	\$ 58.50
2,000 gals.	9.00	39	351.00
3,000 gals.	11.50	21	241.50
4,000 gals.	14.00	41	574.00
5,000 gals.	16.50	29	478.50
6,000 gals.	18.50	24	444.00
7,000 gals.	20.50	20	410.00
8,000 gals.	22.50	19	427.50
9,000 gals.	24.50	11	269.50
10,000 gals.	26.50	19	503.50
11,000 gals.	28.00	13	364.00
12,000 gals.	29.50	5	147.50
13,000 gals.	31.00	7	217.00
14,000 gals.	32.50	10	325.00
15,000 gals.	34.00	6	204.00
16,000 gals.	35.50	3	106.50
17,000 gals.	37.00	4	148.00
18,000 gals.	38.50	1	38.50
19,000 gals.	40.00	3	120.00
20,000 gals.	41.50	6	249.00
21,000 gals.	42.25	3	126.75
24,000 gals.	44.50	2	89.00
25,000 gals.	45.25	2	90.50
30,000 gals.	49.00	1	49.00
31,000 gals.	49.75	2	99.50
40,000 gals.	56.50	1	56.50
42,000 gals.	58.00	1	58.00
67,000 gals.	76.75	1	76.75
75,000 gals.	82.75	1	82.75
90,000 gals.	94.00	1	94.00
Totals Per Month		305	\$ 6,500.25
Total Per Year			\$78,003.00

VIII. ESTIMATED OPERATIONAL COSTS

A. POWER COSTS:

1. Well Pumps

$$\frac{175' \times 200 \text{ GPM}}{3,960 \times 0.70 \times 0.80} = 15.8 \text{ H.P.}$$

8 hr./day - 240 hr./mo.

$$\text{KWH} = 15.8 \times 240 \times .746 = 2,830 \text{ KWH/Mo.}$$

$$\text{Cost} = 2,830 \times \$0.02 = \$56.50/\text{mo.} = \$675.00/\text{year}$$

2. Main Booster Pumps at Treatment Plant

$$\frac{181' \times 200 \text{ GPM}}{3,960 \times 0.70 \times 0.80} = 16.3 \text{ H.P.}$$

$$\text{KWH} = 16.3 \times 240 \times .746 = 2,920 \text{ KWH/mo.}$$

$$\text{Cost} = 2,920 \times \$0.02 = \$58.45/\text{mo.} = \$700.00/\text{year}$$

Add \$700.00/year for heat

3. Small Booster Station

$$\frac{250' \times 150 \text{ GPM}}{3,960 \times 0.70 \times 0.90} = 16.9 \text{ H.P.}$$

$$\text{KWH} = 16.9 \times 240 \times .746 = 3,020 \text{ KWH/mo.}$$

$$\text{Cost} = 3,020 \times \$0.02 = \$60.40/\text{mo.} = \$725.00/\text{year}$$

B. SUMMATION OF OPERATING COSTS

1. Power Cost	\$ 2,800.00/year
2. Labor, Billing and Clerical	8,000.00
3. Chemicals	750.00
4. Insurance	500.00
5. Maintenance and Repair	2,000.00
6. Miscellaneous	<u>950.00</u>
	\$15,000.00/year

IX. BALANCE SHEET

A. Funds Provided

1. Estimated Water Income \$78,003.00

B. Funds Expended

1. Maintenance and Operation Costs \$15,000.00

2. Debt Service on Loan

\$965,150.00 - 38 yrs. - 5%
\$59.28/\$1,000/yr. \$57,214.00

Total Funds Expended \$72,214.00

Balance for Reserve \$ 5,789.00

X. RECOMMENDATIONS

A. PROJECT SUMMARY:

Customers Served	305
Total Pipe Footage	680,700 feet
Total Pipe Mileage	128.4 miles
Customers Per Mile	2.37
Water Storage Tanks	2
Treatment Plant	1
Booster Stations	1
Wells	2
Construction Cost	\$ 907,605.00
Total Project Cost	\$1,011,950.00
Loan Required	\$ 965,150.00
Association Funds Required	\$ 46,800.00
Loan Per Customer	\$ 3,165.00

B. ECONOMIC FEASIBILITY:

In Section VII of this Report it was determined that the Association annual water revenue, based on the proposed rate schedule and the anticipated average use of water per customer, will be \$78,003.00 per year. The estimated operating and maintenance costs per year, from Section VIII, is \$15,000.00. Annual debt service on the required loan is \$57,214.00 per year leaving an annual reserve balance of \$5,789.00. This is about a 10% reserve that is desirable.

C. CONTRIBUTIONS:

The Association contribution should average \$160.00 per customer which represents about 5% of the project cost per customer. The \$10.00 per customer already collected should be credited toward the total initial payment per customer.

There are quite a few additional prospective customers who could connect to the system if they chose to do so. It is recommended that all additional customers who desire service after construction has started be charged the full amount plus an additional amount to be determined by the Association Board. This can be handled in a business like manner by including a statement of the Association policy regarding post-connection customer hookup charges in the printed Association regulations.

D. LOAN REQUIRED:

We hereby recommend that a loan be approved for \$965,150.00.

E. REPAYMENT TERMS:

It is recommended that the loan have a term of forty years and be repaid from the proceeds of the sale of water to Association customers according to the Rate Schedule in Section VII and the Balance Sheet in Section IX.

F. PROPERTY AND LIABILITY INSURANCE:

It is recommended that property and fire insurance be carried on the treatment plant, wells and all pumps and electrical control units. The Association should also carry liability insurance to cover any person hired for operational and maintenance work.

SUPPLEMENT "A"
REVISED FINANCIAL DATA
ASSUMING WATER IS
PURCHASED FROM
SIOUX FALLS, SOUTH DAKOTA

September, 1970

IV. ESTIMATE OF PROBABLE COSTS

The following cost estimate has been prepared by the Engineer without the benefit of final design plan or survey. (Date of cost estimate - August, 1970).

<u>Item No.</u>	<u>Description</u>	<u>Estimated Quantity</u>	<u>Unit Price</u>	<u>Total Estimated Cost</u>
1.	8" A.C. Pipe	14,200 L.F.	\$ 2.75	\$ 39,050.00
2.	6" P.V.C. Pipe	7,950 L.F.	1.75	13,912.50
3.	5" P.V.C. Pipe	23,850 L.F.	1.45	34,582.50
4.	4" P.V.C. Pipe	26,500 L.F.	1.05	27,825.00
5.	3½" P.V.C. Pipe	51,600 L.F.	0.85	43,860.00
6.	3" P.V.C. Pipe	81,200 L.F.	0.80	64,960.00
7.	2½" P.V.C. Pipe	91,000 L.F.	0.70	63,700.00
8.	2" P.V.C. Pipe	378,900 L.F.	0.60	227,340.00
9.	8" MJ Valve & Box	2 Ea.	180.00	360.00
10.	6" MJ Valve & Box	1 Ea.	120.00	120.00
11.	4" MJ Valve & Box	2 Ea.	90.00	180.00
12.	3" MJ Valve & Box	14 Ea.	75.00	1,050.00
13.	2" MJ Valve & Box	23 Ea.	65.00	1,495.00
14.	Line Cleanout	12 Ea.	70.00	840.00
15.	2" Air Relief Valve	6 Ea.	70.00	420.00
16.	Valve Flush Hydrant	2 Ea.	120.00	240.00
17.	Meter 5/8" x 3/4"	305 Ea.	45.00	13,725.00
18.	Pressure Regulator	98 Ea.	15.00	1,470.00
19.	Corporation Stop	305 Ea.	7.00	2,135.00
20.	1½" P.V.C. Pipe (Service Line)	82,000 L.F.	0.70	57,400.00

<u>Item No.</u>	<u>Description</u>	<u>Estimated Quantity</u>	<u>Unit Price</u>	<u>Total Estimated Cost</u>
21.	1½" Service Line Valve and Box	305 Ea.	40.00	12,200.00
22.	Service Crossings	70 Ea.	175.00	12,250.00
23.	Highway Crossings	22 Ea.	300.00	6,600.00
24.	Railroad Crossings	5 Ea.	300.00	1,500.00
25.	Interstate Crossings	1 Ea.	4,500.00	4,500.00
26.	Booster Station, 250 GPM	1 Ea.	9,000.00	9,000.00
27.	Booster Station, 50 GPM	1 Ea.	4,000.00	4,000.00
28.	Altitude Valve & Box	2 Ea.	1,500.00	3,000.00
29.	Hydrants	2 Ea.	300.00	600.00
30.	Elevated tank, 75,000 Gal. Capacity	1 Ea.	36,000.00	36,000.00
31.	Elevated tank, 15,000 Gal. Cap.	1 Ea.	25,000.00	25,000.00
32.	Underground Water Storage Reservoir, 250,000 gallons	1 Ea.	70,000.00	70,000.00
Total Estimated Construction				\$779,315.00
Engineering				44,431.00
Legal				10,000.00
Abstracting				4,000.00
Land				2,500.00
Inspection				10,000.00
Contingencies				22,000.00
Total Estimated Project Cost				\$872,246.00
Less 305 @ \$150.00/Customer			\$45,750.00	
Reserve for Initial Operation			2,000.00	
			<u>\$43,750.00</u>	
Loan Required				\$828,496.00

<u>Use Per Month</u>	<u>Revenue Per User</u>	<u>No. of Users</u>	<u>Revenue Per Month</u>
1,000 gals.	\$ 6.25	9	\$ 56.25
2,000 gals.	8.75	39	341.25
3,000 gals.	11.25	21	236.25
4,000 gals.	13.75	41	563.75
5,000 gals.	16.25	29	471.25
6,000 gals.	17.75	24	426.00
7,000 gals.	19.25	20	385.00
8,000 gals.	20.75	19	394.25
9,000 gals.	22.25	11	244.75
10,000 gals.	23.75	19	451.25
11,000 gals.	24.75	13	321.75
12,000 gals.	25.75	5	128.75
13,000 gals.	26.75	7	187.25
14,000 gals.	27.75	10	277.50
15,000 gals.	28.75	6	172.50
16,000 gals.	29.75	3	89.25
17,000 gals.	30.75	4	123.00
18,000 gals.	31.75	1	31.75
19,000 gals.	32.75	3	98.25
20,000 gals.	33.75	6	202.50
21,000 gals.	34.50	3	103.50
24,000 gals.	36.75	2	73.50
25,000 gals.	37.50	2	75.00
30,000 gals.	41.25	1	41.25
31,000 gals.	42.00	2	84.00
40,000 gals.	48.75	1	48.75
42,000 gals.	50.25	1	50.25
67,000 gals.	69.00	1	69.00
75,000 gals.	75.00	1	75.00
90,000 gals.	86.25	1	86.25
Totals Per Month		305	\$ 5,909.00/Mo.
Total Per Year			\$70,908.00/Yr.

WATER COST TO USERS PER MONTH PER 1,000 GALLONS

First	1,000 gallons	Cost - \$6.25
Next	4,000 gallons	Cost - \$2.50
Next	5,000 gallons	Cost - \$1.50
Next	10,000 gallons	Cost - \$1.00
All over	20,000 gallons	Cost - \$0.75

VIII. ESTIMATED OPERATIONAL COST

A. WATER USE:

(From Rate Schedule)

2,586,000 gallons per month

B. WATER COST:

1. Assumed Purchase Price = 30¢/1,000 gal.

2. Cost Month - $2,586 \times \$0.30 = \$775.80/\text{Mo.}$

3. Cost/Year - $\$775.80 \times 12 = \$9,309.60/\text{Yr.}$

C. POWER COSTS:

1. Main Booster Station

$$\frac{216' \times 175 \text{ G.P.M.}}{3,960 \times 0.70 \times 0.80} = 17.0 \text{ H.P.}$$

$$8 \text{ hr./day} = 240 \text{ hr./mo.}$$

$$\text{KWH} = 17.0 \times 240 \times .746 = 3,043 \text{ KWH/Mo.}$$

$$\text{Cost} = 3,043 \times \$0.02 = \$60.86/\text{Mo.} = \$731.00/\text{Year}$$

2. Small Booster Station

$$\frac{195' \times 50 \text{ G.P.M.}}{3,960 \times 0.70 \times 0.80} = 4.40 \text{ H.P.}$$

$$8 \text{ hr./day} = 240 \text{ hr./mo.}$$

$$\text{KWH} = 4.40 \times 240 \times .746 = 788 \text{ KWH/Mo.}$$

$$\text{Cost} = 788 \times \$0.02 = \$15.76/\text{Mo.} = \$154/\text{Year}$$

D. SUMMATION OF ANNUAL OPERATION COSTS

1. Water Purchase	\$ 9,309.60
2. Power Costs	885.00
3. Labor, Billing and Clerical	3,000.00
4. Insurance	500.00
5. Maintenance and Repair	2,000.00
6. Miscellaneous	<u>1,115.40</u>
	<u>\$16,810.00/Yr.</u>

IX. BALANCE SHEET

A. FUNDS PROVIDED:

1. Estimated Water Income	\$70,908.00/Yr.
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B. FUNDS EXPENDED:

1. Water Purchases	\$ 9,309.60/Yr.
2. Maintenance and Operating Costs	\$ 7,500.40/Yr.
3. Debt Service on Loan 828,496.00 - 38 Yrs. - 5% @ \$59.28/1,000 yr.	\$49,113.00/Yr.

TOTAL FUNDS EXPENDED \$65,923.00/Yr.

BALANCE FOR RESERVE \$ 4,985.00

X. SUMMARY

A. Total Project Cost -	\$872,246.00
B. Cost per Customer -	\$ 2,860.00

WATER RIGHTS DIVISION

(605) 773-3352

April 15, 1982

Jerry Siegel, Manager
East Dakota Conservancy Subdistrict
524 17th Avenue
Brookings, South Dakota 57006

RE: 1790-3

Dear Mr. Siegel:

This letter is in response to your request for a review of the Lincoln County Rural Water System Permit No. 1790-3. This Permit authorizes diversion of 1.63 cfs or 731.87 gpm from the City of Sioux Falls well field in Minnehaha County north of Sioux Falls. The water is delivered to the Rural Water System through the Sioux Falls water distribution system.

The diversion rate of 1.63 cfs authorizes up to 1,053,893 gallons per day or 31,616,784 gallons in a 30 day month. I understand that the current contract between the City and the Rural Water System allows up to 6,000,000 gallons per month. You have asked if the existing Permit authorizes more than the 6,000,000 gallons per month? The answer is yes, any contract could be increased up to the limits stated above without any change in the authorized diversion rate and Permit No. 1790-3.

If there are additional questions on this Permit, please feel free to contact me.

Very truly yours,

JOHN HATCH, Chief Engineer
Water Rights Division

JH:ms



1790-3

**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3181
www.state.sd.us/denr

August 18, 1999

Dennis Larson, Manager
Lincoln county Rural Water System
P.O. Box 36
Harrisburg SD 57032

Dear Mr. Larson:

I am writing as a follow-up to our telephone conversation regarding Water Permit No. 1790-3. Specifically, you called regarding who the Water Rights Program lists as the holder of Water Permit No. 1790-3.

Water Permit No. 1790-3 appropriates 1.63 cubic feet of water per second through the city of Sioux Falls well sites with a priority date of November 23, 1970. In 1986, Lincoln County RWS applied to add the Town of Tea to the service area and to amend Water Permit No. 1790-3 to clarify the authorized appropriation of water.

On April 30, 1986, John Hatch, the Chief Engineer of the Water Right Program, sent you a letter stating that "Although LCRWS water is pumped, treated and delivered under an agreement between Sioux Falls and LCRWS, the water is from LCRWS water rights and not Sioux Falls water rights". From my review of the file, Mr. Hatch's analysis remains the same. Water Permit Nos. 1790-3 and 1790A-3 continues to be held solely in the name of Lincoln County RWS.

I hope this information is helpful. Please do not hesitate to contact me if you have any questions.

Sincerely,

Eric Gronlund
Water Rights Program
(605) 773-3352



1790-3
**DEPARTMENT of ENVIRONMENT
and NATURAL RESOURCES**

PMB 2020
JOE FOSS BUILDING
523 EAST CAPITOL
PIERRE, SOUTH DAKOTA 57501-3182
www.state.sd.us/denr

APR 01 2005

3454-3
6162-3

Lincoln County Rural Water System
Box 36
Harrisburg SD 57032

Dear Sir:

Enclosed are Water License Nos. 3454-3 & 6162-3. This is the final water right document completing your process of obtaining a Water Right. Enclosed is Receipt No. 001785 in the amount of \$50.00 which you paid for the investigation and issuance of the Water License No. 3454-3.

As long as you use the water beneficially, as stated in the Water License, State Water Laws provide that you have a continuing right to use the water.

Sincerely,

Garland Erbele, Chief Engineer
Water Rights Program
(605) 773-3352

NOTE: The applicable portions of No. 1790-3 & 1790A-3 are incorporated into Water License No. 6162-3.

enclosures