

Purchasing Division Finance Department

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Addendum 1 Solicitation 23-99336 1st Ave East Reconstruction Project #2100

This addendum serves to notify all bidders of the following changes to the solicitation documents:

NOTICE

This Addendum is issued to modify, explain or correct the original drawings, specifications and/or previous addenda and is hereby made a part of the Contract Documents. Please attach this Addendum to the specification and note receipt of this Addendum on the Request for Bid.

GENERAL

- 1. Minnesota Power electrical duct bank will be constructed as part of the project. The work is described in the Drawings and Specification noted below.
- 2. The Project Bid Form is revised.
- 3. Descriptions of changes to drawings are for reference only and provide only a general overview of changes made. It is the Contractor's responsibility to fully assess and provide the specific requirements of the Work on all Plan sheets regardless of the description of sheet change(s) provided herein.

DRAWINGS

- 1. Drawing changes to the STATEMENT OF ESTIMATED QUANTITIES are as follows:
 - a. Sheet 5; Delete Sheet 5 in its entirety and replace with revised Sheet 5. Revisions to Sheet 5 are as follows:
 - i. Added ELECTRICAL DUCT BANK column.
 - ii. Revised quantities for MOBILIZATION.
 - b. Sheet 6; Delete Sheet 6 in its entirety and replace with revised Sheet 6. Revisions to Sheet 6 are as follows:
 - i. Added ELECTRICAL DUCT BANK column.
 - c. Sheet 7; Delete Sheet 7 in its entirety and replace with revised Sheet 7. Revisions to Sheet 7 are as follows:
 - i. Added ELECTRICAL DUCT BANK column.
 - ii. Revised quantities for FURNISH AND INSTALL FIBER-OPTIC CABLE.
 - iii. Added pay item FURNISH AND INSTALL PARKING METER POST.

- d. Sheet 8; Delete Sheet 8 in its entirety and replace with revised Sheet 8. Revisions to Sheet 8 are as follows:
 - i. Added ELECTRICAL DUCT BANK column.
 - ii. Added pay items CONNECT IN EXISTING ELECTRICAL MANHOLE NO. 283, CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 1259, ELECTRICAL DUCT BANK TYPE 1, ELECTRICAL DUCT BANK TYPE 2, 6" NON-METALLIC CONDUIT ELECTRICAL DUCT (DIRECTIONAL BORE).
 - iii. Revised quantities for TRAFFIC CONTROL.
- 2. Sheet 20; Delete Sheet 20 in its entirety and replace with revised Sheet 20. Revisions to Sheet 20 are as follows:
 - a. Electrical duct bank added to roadway typical section.
- 3. Sheet 21; Delete Sheet 21 in its entirety and replace with revised Sheet 21. Revisions to Sheet 21 are as follows:
 - a. Added Inset D.
- 4. Sheet 68; Delete Sheet 68 in its entirety and replace with revised Sheet 68. Revisions to Sheet 68 are as follows:
 - a. Added electrical duct bank to Construction Plan and Profile.
- 5. Sheet Hw1; Delete Sheet Hw1 in its entirety and replace with revised Sheet Hw1. Revisions to Sheet Hw1 are as follows:
 - a. Tabulation revised.
- 6. Sheets SB1 through SB8 are hereby added to the Plans.

SPECIFICATIONS

- 1. SP-9, (1404) MAINTENANCE OF TRAFFIC AND (2563) TEMPORARY TRAFFIC MANAGEMENT is hereby amended as follows:
 - a. "SP-9.3.6 The Contractor shall maintain access to all building entries at all times equivalent (at a minimum) to the existing level of service. Only under circumstances where the Contractor can demonstrate that the Work cannot be completed without closure of a building entry will consideration be made for entry closure. Any entry closure duration must be minimized and must be coordinated at least 2 weeks in advance with the Engineer. Contractor will be required to work overnights and weekends to minimize duration and impact of building entry closures.
 - b. SP-9.3.7 The Contractor shall cooperate with the Fannie Rose Building and its tenants (101-107 E. Superior St.), including Duluth Coffee whose storefront abuts Superior Street and 1st Avenue East to ensure and facilitate pedestrian access, deliveries, and access to the building. Duluth Coffee roasts and ships coffee beans for commercial distribution from their building during the first part of the week (typically Monday Wednesday) as well as serving as a full service coffee shop for patrons seven days of the week. Removal and restoration of walks and all subsurface work abutting the Fannie Rose Building entries must occur during non-business hours. Robust and ADA compliant temporary surface(s) must be provided during normal business hours that allows for pedestrian traffic, equipment and truck traffic for deliveries and shipments, and to protect the Work. The Contractor shall coordinate with Duluth Coffee to ensure access, deliveries, and shipments. Facilitating such access shall include, but is not limited to, all necessary placement and removal of temporary surfacing, steel plates, and grating required, assisting with delivery and shipment loading and unloading through the

project work zone or other assistance as deemed necessary to maintain their uninterrupted business operations and complete the Work.

- c. SP-9.3.8 Minor street demolition and restoration corresponding to an area approximately 8-ft x 20-ft is required to facilitate the work as depicted on Sheet SB-8. All removals and restoration shall be paid for under the appropriate Contract pay item provided in the Plans. Engineer will track and measure all work in this area for payment therefor. The Contractor shall submit a traffic control plan for all work in 2nd Alley for review and approval by the Engineer at least 2 weeks prior to the start of the Work.
- 2. SP-34, (2504) TEMPORARY WATER SERVICE is hereby amended as follows:
 - a. Add the following to SP.34.1, paragraph five (general shutdown restrictions):
 4. Fannie Rose Building and Tenants (101-107 E. Superior St.)—Shutdowns are not permitted during normal business hours and shall occur at night. Coordinate with all building tenants prior to commencing the work.
- 3. SP-40, (2540) FURNISH AND INSTALL PARKING METER POST is hereby added to the project Special Provisions.
- 4. Special Provision Division "SB" for the Electrical Duct Bank system is hereby added to the project Special Provisions.
- 5. Special Provision Division STM for the Steam system is hereby deleted in its entirety and replaced with revised Special Division STM dated 3/14/2023.

RESPONSES TO BIDDER QUESTIONS

- 1. What work is to be performed under item "2011.601 As Built"?
 - a. As-Built Drawings are limited to the As-Built Drawing requirements described and as noted for payment in Division SS for the project traffic signal system.
- 2. Sanitary sewer laterals what are the connection requirements to the existing sewer main. Are we connecting to the existing service stub or the main itself. If we are connecting to the main what is the required connection type / detail.
 - a. New sanitary sewer laterals will be connected to the main using the connection type listed in the City of Duluth Construction Standards table 2503-2. Generally this allows the reuse of the existing wye if a watertight connection can be provided otherwise the table provides various options depending upon the main material.
- 3. The in place typical on sheet 20, note 5, states that all items shown in the pavement detail are included in the remove pavement item including the aggregate base. The other typical sections call out removal of aggregate sections is included in the common excavation pay item. Can you verify that this is correct.
 - a. This is how the plan quantity for common excavation was calculated. All sections will require additional common excavation due to the new section's thickness but the first 6 inches of aggregate base for the section from STA 102+54 to 107+26 will be paid for under the item "remove pavement".
- 4. Is intermediate completion date #2 driven by the start date of City Project 1462 (3rd Street) or is it for work associated with the Zenith Project.
 - a. Intermediate completion date #2 is driven by avoiding conflicts with the 3rd Street project. Due to delays in bidding that project the City will be receptive to requests to extend that date so long as no more than one entrance to the Old Central High School (E

3rd Street and 1st Avenue E) is unusable and the extension does not cause conflicts with the 3rd Street project progress.

- 5. What date are you using for question cutoff?
 - a. Friday, April 21 will be the latest that questions can be accepted for inclusion in a possible addendum on April 24.

END OF ADDENDUM

Please acknowledge receipt of this Addendum by checking the acknowledgment box within the <u>www.bidexpress.com</u> solicitation.

Posted: April 20, 2023

STATEMENT OF	ESTIMATED	QUANTITIES
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SEQ NOTES	
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- 1. ITEMS ARE FOR EXPLORATORY EXCAVATION AND MISCELLANEOUS WORK AT THE DIRECTION OF THE ENGINEER. DISPOSAL OF EXCAVATED MATERIALS SHALL BE CONSIDERED INCIDENTAL.
- 2. PAYMENT EXCAVATION, BEDDING, AND GRANULAR BACKFILL SHALL BE INCLUDED FOR PAYMENT IN THE APPLICABLE MANHOLE, CATCH BASIN, AND VAULT STRUCTURE PAY ITEM.
- BITUMINOUS MATERIAL FOR TACK COAT (SPEC. 2357) SHALL BE PLACED AT A RATE IF 0.03-0.05 GAL./SQ. YD. BETWEEN ALL LIFTS AND SHALL BE CONSIDERED INCIDENTAL.
- BASED ON 1250 SQUARE FEET OF DISTURBED AREAS REQUIRING TURF ESTABLISHMENT. TURF ESTABLISHMENT SHALL CONSIST OF SOIL BED PREPARATION, FERTILIZER, SEEDING, AND ROLLED EROSION PREVENTION PRODUCT PER MNDOT 2575.3.L.
- REFER TO SHEETS ST11-ST12 FOR STEAM MANHOLE #1 AND #2 REQUIREMENTS. ALL WORK TO PROVIDE AND PLACE STEAM MANHOLE AS SHOWN SHALL BE INCLUDED FOR PAYMENT UNDER THE RESPECTIVE STEAM MANHOLE PAY ITEMS (INCLUDING EXCAVATION, BEDDING, AND GRANULAR BACKFILL).
- 6. BITUMINOUS TONNAGE COMPUTED AT 115 LBS/SQ YD/INCH OF THICKNESS.
- REFER TO THE SPECIAL PROVISIONS AND SHEETS 64-66 FOI WATER MAIN STAGING AND TEMPORARY WATER SERVICE REQUIREMENTS (INCIDENTAL).
- 8. BASED ON 50' X 20' PAD PER CONSTRUCTION ENTRANCE
- 9. UNDISTRIBUTED QUANTITY TO BE PLACED AT DIRECTION OF THE ENGINEER.

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F 10 2301:504 CONCRETE PAVEMENT 8.0° SQ YD 1 494 Image: F 10 2301:507 STRUCTURAL CONCRETE PAVEMENT 8.0° CU YD 332 Image: F 10 2301:508 SUPPLEMENTAL PAVEMENT REINFORCEMENT POUND 1 809 Image: F 10 2301:602 DRILL AND GROUT DOWEL BAR (EPOXY COATED) EACH 104 Image: F 10 2301:602 DRILL & GROUT REINF BAR (EPOXY COATED) EACH 83 Image: F 10 2301:603 PAVEMENT END ANCHOR LIN FT 121 Image: F 10 2302:502 DOWEL BAR EACH 885 Image: F 10 2302:502 TYPE SP 9.5 WEARING COURSE MIXTURE (3,C) TON 453 Image: F 10 2360:509 <			F	10	2301.503	INTEGRANT CURB DESIGN B6	LIN FT	10	
F 10 2301:507 SIROUTORAL CONCRETE COND 332 Image: F 10 2301:508 SUPPLEMENTAL PAVEMENT REINFORCEMENT POUND 1 809 Image: F 10 2301:602 DRILL AND GROUT DOWEL BAR (EPOXY COATED) EACH 104 Image: F 10 2301:602 DRILL AND GROUT REINF BAR (EPOXY COATED) EACH 83 Image: F 10 2301:603 PAVEMENT END ANCHOR LIN FT 121 Image: F 10 2301:603 PAVEMENT END ANCHOR LIN FT 121 Image: F 10 2302:502 DOWEL BAR EACH 885 Image: F 10 2360:509 TYPE SP 9.5 WEARING COURSE MIXTURE (3,C) TON 453 Image: G Image: F 10 2360:509 TYPE SP 12.5 NON WEARING COURSE MIXTURE (3,C) TON 453 Image: G Image: F 10 2360:509 TYPE SP 12.5 NON WEARING COURSE MIXTURE (3,C) TON 502 Image: F Image: F Image: F Image: F Image: F Image: F				10	2301.504	CONCRETE PAVEMENT 8.0"	SQ YD	1 494	
F 10 2301.308 SUPPLEMENTAL PAYEMENT REINFORCEMENT POUND 1 809 F 10 2301.602 DRILL AND GROUT DOWEL BAR (EPOXY COATED) EACH 104 P 17 2301.602 DRILL & GROUT REINF BAR (EPOXY COATED) EACH 83 F 10 2301.603 PAVEMENT END ANCHOR LIN FT 121 F 10 2302.502 DOWEL BAR EACH 885 F 10 2302.502 DOWEL BAR EACH 885 Signed F 10 2302.502 DOWEL BAR EACH 885 Signed F 10 2302.502 DOWEL BAR EACH 885 Signed F 10 2360.509 TYPE SP 9.5 WEARING COURSE MIXTURE (3,C) TON 453 3,6 D 10 2360.509 TYPE SP 12.5 NON WEARING COURSE MIXTURE (3,C) TON 502 RW RW1 2411.507 STRUCTURAL CONCRETE (1652) (P) CU YD 63				10	2301.507			332	
Image: Second			F	10	2301.506		FUUND	104	
F 10 2001002 DALL & GROUT REINF BAR (EPOAT COATED) EACH 00 F 10 2301.603 PAVEMENT END ANCHOR LIN FT 121 F 10 2302.502 DOWEL BAR EACH 885 3,6 D 10 2360.509 TYPE SP 9.5 WEARING COURSE MIXTURE (3,C) TON 453 3,6 D 10 2360.509 TYPE SP 12.5 NON WEARING COURSE MIXTURE (3,C) TON 502 3,6 D 10 2360.509 TYPE SP 12.5 NON WEARING COURSE MIXTURE (3,C) TON 502 Image: Structure of the structure			P	10	2301.002	DRILL AND GROUT DOWEL BAR (EPOXT COATED)	EACH	83	
F 10 2001000 DOWEL BAR EACH 885 Image: Second s			F	10	2301.603	PAVEMENT FND ANCHOR		121	
3,6 D 10 2360.509 TYPE SP 9.5 WEARING COURSE MIXTURE (3,C) TON 453 3,6 D 10 2360.509 TYPE SP 9.5 WEARING COURSE MIXTURE (3,C) TON 453 3,6 D 10 2360.509 TYPE SP 12.5 NON WEARING COURSE MIXTURE (3,C) TON 502		<u> </u>	F	10	2302.502	DOWEL BAR	EACH	885	
3,6 D 10 2360.509 TYPE SP 9.5 WEARING COURSE MIXTURE (3,C) TON 453 3,6 D 10 2360.509 TYPE SP 12.5 NON WEARING COURSE MIXTURE (3,C) TON 502									
3,6 D 10 2360.509 TYPE SP 12.5 NON WEARING COURSE MIXTURE (3,C) TON 502 Image: Second		3,6	D	10	2360.509	TYPE SP 9.5 WEARING COURSE MIXTURE (3,C)	TON	453	
RW RW1 2411.507 STRUCTURAL CONCRETE (1G52) (P) CU YD 63 (P) DENOTES PLAN. QUANTITIES CU YD 63 CU YD		3,6	D	10	2360.509	TYPE SP 12.5 NON WEARING COURSE MIXTURE (3,C)	TON	502	
(P) DENOTES PLAN QUANTITIES			DW	Dilla	0414 507			07	
	l				2411.507	STRUCTURAL CONCRETE (1652) (P)	UTD	6 <i>3</i>	

I HEREBY CERTIFY that this plan, specification or
report was prepared by me or under my direct
supervision and that I am a duly Licensed Professional
Engineer under the laws of the State of Minnesota.

LHB PROJECT NO. 220974

BRAD SCOTT
PRINTED NAME

TAD SAT

SIGNATURE

1ST AVENUE EAST (SUPERIOR ST TO 3RD ST) CITY PROJECT NO. 2100

		CITY PRO	JECT 2100		\sim	Δ
SEWER	HOT WATER	STEAM	ROADWAY	STORM }	ELECTRICAL DUCT BANK	3 WALI
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NOTES	CHART	SHEET NO.	ITEM NO.	ITEM DESCRIPTION	UNITS	TOTAL ESTIMATI QUANTIT
	RW	RW1	2411.507	STRUCTURAL CONCRETE (1P62)	CU YD	10
	RW	RW1	2411.507	STRUCTURAL CONCRETE (3G52) (P)	CU YD	75
	RW	RW1	2411.507	STRUCTURE EXCAVATION CLASS E (P)	CU YD	1 28
	RW	RW1	2411.507	STRUCTURE EXCAVATION CLASS R	CU YD	10
	RW	RW1	2411.508	REINFORCEMENT BARS (P)	POUND	7 10
	RW	RW1	2411.508	REINFORCEMENT BARS (EPOXY COATED) (P)	POUND	8 76
	RW	RW1	2411.601	DRAINAGE SYSTEM	LUMP SUM	1
	G,H,M	11,12,15	2451.507	GRANULAR BACKFILL (CV)	CU YD	3 30
	RW	RW1	2451.507	COURSE AGGREGATE BEDDING (CV)	CU YD	140
	G	11	2451.507	STRUCTURE EXCAVATION CLASS R	CU YD	85
	RW	RW1	2475.503	ORNAMENTAL METAL RAILING (P)	LIN FT	176
	N	15	2502 503		LIN FT	1.50
			2002.000			
	J	13	2503.503	10" PVC PIPE SEWER	LIN FT	33
	J	13	2503.503	8 DUCTILE TRUN PIPE SEWER		28
	J	13	2503.503	12 RU FIFE SEWER DESIGN JUUD 21" DO DIDE SEWER DESIGN JOOR		68
		13	2503.503	21 RC PIPE SEWER DESIGN SOUD		49
		13	2503.505	CONNECT TO EXISTING STORM SEWER	EACH	+3
	M	15	2503.602	CONNECT SEWER SERVICE	FACH	1.
	M	15	2503.602	SANITARY TRACER BOX	EACH	14
	м	15	2503.603	6" PVC SANITARY SERVICE PIPE	LIN FT	38
	М	15	2503.603	8" PVC SANITARY SERVICE PIPE	LIN FT	10
7	1	12	2504 601	TEMPORARY WATER SERVICE		1
/		12	2504.602	RECONNECT WATER SERVICE	FACH	5
	G	11	2504.602	CONNECT TO EXISTING WATER MAIN	EACH	5
	L	14	2504.602	ADJUST VALVE BOX	EACH	5
	Н	12	2504.602	6" GATE VALVE AND BOX	EACH	g
	G	11	2504.602	8" GATE VALVE AND BOX	EACH	4
	G	11	2504.602	12" GATE VALVE AND BOX	EACH	2
	Н	12	2504.602	INSTALL 8"X6" TAPPING TEE W/ELECTROFUSION SADDLE	EACH	g
	G,H	11,12	2504.602	WATER TRACER BOX	EACH	2
	G	11	2504.602	HYDRANT ASSEMBLY	EACH	4
	G,H,L	11,12,14	2504.602	CONCRETE ENCASED VALVE BOX COVER IN ROADWAY	EACH	14
	G	11	2504.603	8" DIPS HDPE WATER MAIN SDR 11	LIN FT	67
	G	11	2504.603	12" DIPS HDPE WATER MAIN SDR 11	LIN FT	8
	G н	11	2504.603	16 DIPS HDPE WATER MAIN SDR 11		9
9		12	2504.604	3" POLYSTYRENE INSULATION	SQ YD	1.
2	J	13	2506.502	CONSTRUCT DRAINAGE STRUCTURE DESIGN G	EACH	5
2	J	13	2506.502	CONSTRUCT DRAINAGE STRUCTURE DESIGN H	EACH	
	L	13	2506.502	ADJUST FRAME AND RING CASTING	EACH	1
2	J	13	2506.503	CONST DRAINAGE STRUCTURE DES 48-4020	LIN FT	8
2	J	13	2506.503	CONST DRAINAGE STRUCTURE DES 60-4020	LIN FT	1
	J,L	13,14	2506.602	CONCRETE ENCASED CASTING COLLAR	EACH	19
	J	13	2506.602	CONNECT INTO EXISTING DRAINAGE STRUCTURE	EACH	2
	L	14	2506.602	MANHULE FRAME SEAL	LACH	<u>و</u>
	HW_A	LIWA	2508 602	CONNECT TO EVISTING HWD	EACH	<u> </u>

### LHB PROJECT NO. 220974

I HEREBY CERTIFY that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

BRAD SCOTT PRINTED NAME

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DATE 46198 LIC. NO. CITY PROJECT NO. 2100

1ST AVENUE EAST (SUPERIOR ST TO 3RD ST)

FAD SAT-SIGNATURE

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SHEET NO. 6 OF 73 SHEETS

NOTES	CHART	SHEET NO.	ITEM NO.	ITEM DESCRIPTION	UNITS	ESTIMATED QUANTITY	WATE
	HW-A	HW1	2508.602	INSTALL 2"/5.5" HOT WATER ISOLATION VALVE	EACH	8	
	HW-A	HW1	2508.602	INSTALL 4"/8" HOT WATER ISOLATION VALVE	EACH	2	
	HW-A	HW1	2508.602	INSTALL 6"/10" HOT WATER ISOLATION VALVE	EACH	2	
	HW-A	HW1	2508.602	INSTALL 12"/20" HOT WATER ISOLATION VALVE	EACH	4	
	HW-B	HW1	2508.602	1" RECIRCULATION ASSEMBLY	EACH	2	
	HW-B	HW1	2508.602	FURNISH AND INSTALL 2'X3' FLASH CHAMBER	EACH	3	
	HW-B	HW1	2508.602	FURNISH AND INSTALL 24" FLASH CHAMBER	EACH	1	
	HW-A	HW1	2508.602	CONNECT TO EXISTING STEAM TUNNEL	EACH	1	
	HW-B	HW1	2508.602	CONNECT TO STORM STRUCTURE	EACH	3	
	HW-A	HW1	2508.602	CONNECT TO EXISTING CONDUIT	EACH	1	
	HW-B	HW1	2508.602	INSTALL 24"X36" HANDHOLE	EACH	6	
	HW-B	HW1	2508.603	INSTALL 1"/4" HWP	LIN FT	30	
	HW-B	HW1	2508.603	INSTALL 2"/5.5" HWP	LIN FT	80	
	HW-A	HW1	2508.603	INSTALL 4"/9" HWP	LIN FT	352	
	HW-A	HW1	2508.603	INSTALL 6"/11" HWP	LIN FT	2 084	
	HW-A	HW1	2508.603	INSTALL 8"/14" HWP	LIN FT	40	
	HW-A	HW1	2508.603	INSTALL 12"/20" HWP	LIN FT	996	
	HW-B	HW1	2508.603	FURNISH AND INSTALL 6" DIP CL 52	LIN FT	77	
	HW-A	HW1	2508.603	FURNISH AND INSTALL 2" SCH80 PVC CONDUIT	LIN FT	3 605	1
	HW-A	HW1	2508.603	FURNISH AND INSTALL FIBER-OPTIC CABLE	LIN FT	3 747	$\uparrow \neg \neg \uparrow$
						h	$   \rightarrow                                  $
	ST-A	ST1	2509.601	REMOVE & REPLACE EXISTING STEAM VAULT LID	LUMP SUM	1	1
	ST-A	ST1	2509.601	REMOVE VENT PIPES	LUMP SUM	1	
	ST-A	ST1	2509.601	REMOVE EXPANSION JOINT	EACH	8	
	ST-A	ST1	2509.602	FURNISH AND INSTALL STEAM MANHOLE	EACH		
	ST-A	ST1	2509.602	INSTALL EXPANSION JOINTS	EACH	8	
	ST-A	ST1	2509.602	CONNECT CONDENSATE DRAIN TO STORM STRUCTURE	EACH	2	
	ST-A	ST1	2509.603	REMOVE ASBESTOS CONTAINING PIPE INSULATION TYPE D	LIN FT	80	1
	ST-A	ST1	2509.603	4" 316SS CONDENSATE DRAIN PIPE	LIN FT	30	
	ST-A	ST1	2509.603	FURNISH AND INSTALL VENT PIPES	LIN FT	70	
5			2509.615	STEAM MANHOLE #1	EACH	1	
5			2509.615	STEAM MANHOLE #2	EACH	1	
	RW	RW1	2511.504	GEOTEXTILE FILTER TYPE 3	SQ YD	75	
	RW	RW1	2511.507	RANDOM RIPRAP CLASS II	CU YD	40	
		16	2521 510		CO LT	00.770	
	U WG	0 DW1	2521.518			22 3/0	
	<u>т</u> түү	16	2531 503	CONCRETE CURB AND CLITTER DESIGN R624		1 776	
	0	16	2531.505	CONCRETE CURB AND CUTTER DESIGN 5524		<u>413</u>	
	0	16	2531.503	8" CONCRETE DRIVEWAY PAVEMENT		388	
	р р	17	2531.504			71	
	P	17	2531.603	TRUNCATED DOMES	SQ FT	219	
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L			2540.602	FURNISH AND INSTALL PARKING METER POST	EACH	29	hi
		<u>ସ</u> ା 1	2545 502	LIGHTING LINIT TYPE SPECIAL 1	FACH	10	

I HEREBY CERTIFY that this plan, specification or
report was prepared by me or under my direct
supervision and that I am a duly Licensed Profess
Engineer under the laws of the State of Minnesot

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46198 LIC. NO. CITY PROJECT NO. 2100

			CITY PRO	JECT 2100	(	~~~~~	
SEV	WER	HOT WATER	STEAM	ROADWAY	STORM 8	ELECTRICAL	X WALL
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NUIES	CHART	SHEET NO.	ITEM NO.	ITEM DESCRIPTION	UNITS	ESTIMATED QUANTITY	WATE
	SL	SL1	2545.502	LIGHTING UNIT TYPE SPECIAL 2	EACH	1	
	SL	SL1	2545.502	LIGHT FOUNDATION DESIGN E MODIFIED	EACH	11	
	SL	SL1	2545.502	SERVICE CABINET	EACH	1	
	SL	SL1	2545.502	EQUIPMENT PAD	EACH	1	
	SL	SL1	2545.502	HANDHOLE	EACH	4	
	SL	SL1	2545.503	1" NON-METALLIC CONDUIT	LIN FT	131	
	SL	SL1	2545.503	2" NON-METALLIC CONDUIT	LIN FT	1 443	
		SS1-SS22	2545.503	UNDERGROUND WIRE 1/C 2 AWG	LIN FT	721	
		SS1-SS22	2545.503	UNDERGROUND WIRE 1/C 6 AWG	LIN FT	8 324	
		SS1-SS22	2550.502	OUTDOOR FIBER SPLICE ENCLOSURE	EACH	2	
		SS1-SS22	2550.503	1.5" NON-METALLIC CONDUIT	LIN FT	1 210	
	SL	SL1	2550.503	CAT 6 CABLE	LIN FT	162	
		SS1-SS22	2550.601	FIBER OPTIC CABLE TESTING	LUMP SUM	1	
		SS1-SS22	2550.602	FIBER OPTIC SPLICE / PATCH PANEL	EACH	2	
		SS1-SS22	2550.602	FIBER OPTIC PIGTAIL TERMINATION	EACH	2	
		SS1-SS22	2550.602	FIBER OPTIC CABLE SPLICING	EACH	3	
		SS1-SS22	2550.602	PULL VAULT	EACH	3	
$\sim\sim\sim$	SB	SB1	2550.602	CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283	EACH		$\sim$
	SB	SB1	2550.602	CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 1259	FACH	1	
	SB	SB1	2550.602		EACH	1	
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$\sim\sim$	SB	SB1	2550.603	FLECTRICAL DUICT BANK TYPE 1		376	$\sim$
	SB	SB1	2550.603	FLECTRICAL DUCT BANK TYPE 2		60	
	SB	SB1	2550.603			588	
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		+	2563.601	TRAFFIC CONTROL			0.
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~~~~	ST	SM2	2563.601	INSTALL SIGN PANEL TYPE SPECIAL	LUMP SUM EACH		0.
~~~~	ST ST	SM2 SM2	2563.601 2564.502 2564.602	INSTALL SIGN	EACH		~~ ~~
	ST ST ST	SM2 SM2 SM2 SM2	2563.601 2564.502 2564.602 2564.602	INSTALL SIGN PANEL TYPE SPECIAL INSTALL SIGN INSTALL SIGN	EACH EACH EACH	1 1 6 9	0.
	ST ST ST ST	SM2 SM2 SM2 SM2 SM2 SM2	2564.502 2564.602 2564.602 2564.618	INSTALL SIGN PANEL INSTALL SIGN INSTALL SIGN INSTALL SIGN INSTALL SIGN INSTALL SIGN	EACH EACH EACH EACH EACH	1 1 6 9 77	0.
	ST ST ST ST ST	SM2 SM2 SM2 SM2 SM2 SM2 SM2 SM2	2564.502 2564.602 2564.602 2564.618 2564.618	INSTALL SIGN PANEL TYPE SPECIAL INSTALL SIGN INSTALL SIGN INSTALL SIGN SIGN SIGN	EACH EACH EACH SQ FT SQ FT	1 1 6 9 77 21	
	ST ST ST ST ST ST	SM2 SM2 SM2 SM2 SM2 SM2 SM2	2563.601 2564.502 2564.602 2564.602 2564.618 2564.618	INSTALL SIGN PANEL TYPE SPECIAL INSTALL SIGN INSTALL SIGN INSTALL SIGN SIGN SIGN PANEL	EACH EACH EACH EACH SQ FT SQ FT	1 1 6 9 77 21	
	ST ST ST ST ST ST	SM2 SM2 SM2 SM2 SM2 SM2 SM2 SM2 SM2	2563.601 2564.502 2564.602 2564.602 2564.618 2564.618 2564.618	INSTALL SIGN PANEL TYPE SPECIAL INSTALL SIGN INSTALL SIGN INSTALL SIGN PANEL SIGN SIGN PANEL EMERGENCY VEHICLE PREEMPTION SYSTEM	EACH EACH EACH EACH SQ FT SQ FT	1 1 6 9 77 21 1	
	ST ST ST ST ST ST	SM2 SM2 SM2 SM2 SM2 SM2 SM2 SM2 SS1-SS22 SS1-SS22	2563.601 2564.502 2564.602 2564.602 2564.618 2564.618 2565.501 2565.501	INSTALL SIGN PANEL TYPE SPECIAL INSTALL SIGN INSTALL SIGN INSTALL SIGN INSTALL SIGN SIGN PANEL SIGN SIGN PANEL EMERGENCY VEHICLE PREEMPTION SYSTEM TRAFFIC CONTROL SIGNAL SYSTEM	EACH EACH EACH EACH SQ FT SQ FT LUMP SUM	1 1 6 9 77 21 1 1	0.
	ST ST ST ST ST	SM2 SM2 SM2 SM2 SM2 SM2 SM2 SM2 SS1-SS22 SS1-SS22 SS1-SS22 SS1-SS22	2563.601 2564.502 2564.602 2564.602 2564.618 2564.618 2565.501 2565.501 2565.516 2565.602	INSTALL SIGN PANEL TYPE SPECIAL INSTALL SIGN INSTALL SIGN INSTALL SIGN INSTALL SIGN SIGN PANEL SIGN SIGN PANEL EMERGENCY VEHICLE PREEMPTION SYSTEM TRAFFIC CONTROL SIGNAL SYSTEM INSTALL APS PEDESTRIAN PLISH BUILTON STATION	EACH EACH EACH EACH SQ FT SQ FT LUMP SUM SYSTEM FACH	1 1 6 9 77 21 1 1 1	
	ST ST ST ST ST ST	SM2 SM2 SM2 SM2 SM2 SM2 SM2 SS1–SS22 SS1–SS22 SS1–SS22 SS1–SS22 SS1–SS22	2563.601 2564.602 2564.602 2564.618 2564.618 2565.501 2565.501 2565.516 2565.602 2565.602	TRAFFIC CONTROL INSTALL SIGN PANEL TYPE SPECIAL INSTALL SIGN INSTALL SIGN SIGN SIGN SIGN EMERGENCY VEHICLE PREEMPTION SYSTEM TRAFFIC CONTROL SIGNAL SYSTEM INSTALL APS PEDESTRIAN PUSH BUTTON STATION EIBER OPTIC TRUNK CABLE 12SM	LUMP SUM EACH EACH EACH SQ FT SQ FT LUMP SUM SYSTEM EACH	1 1 6 9 77 21 1 1 1 1 305	
	ST ST ST ST ST ST	SM2 SM2 SM2 SM2 SM2 SM2 SM2 SS1–SS22 SS1–SS22 SS1–SS22 SS1–SS22	2563.601 2564.502 2564.602 2564.602 2564.618 2565.501 2565.501 2565.516 2565.602 2565.603	INSTALL SIGN PANEL TYPE SPECIAL INSTALL SIGN INSTALL SIGN INSTALL SIGN PANEL SIGN SIGN PANEL EMERGENCY VEHICLE PREEMPTION SYSTEM TRAFFIC CONTROL SIGNAL SYSTEM INSTALL APS PEDESTRIAN PUSH BUTTON STATION FIBER OPTIC TRUNK CABLE 12SM	LUMP SUM EACH EACH SQ FT SQ FT LUMP SUM SYSTEM EACH LIN FT	1 1 6 9 77 21 1 1 1 1 305	
8	ST ST ST ST ST	SM2 SM2 SM2 SM2 SM2 SM2 SM2 SS1-SS22 SS1-SS22 SS1-SS22 SS1-SS22 S1 SS1-SS22	2563.601 2564.502 2564.602 2564.602 2564.618 2564.618 2565.501 2565.501 2565.502 2565.602 2565.603	INSTALL SIGN PANEL TYPE SPECIAL INSTALL SIGN INSTALL SIGN INSTALL SIGN INSTALL SIGN PANEL SIGN SIGN PANEL EMERGENCY VEHICLE PREEMPTION SYSTEM TRAFFIC CONTROL SIGNAL SYSTEM INSTALL APS PEDESTRIAN PUSH BUTTON STATION FIBER OPTIC TRUNK CABLE 12SM STABILIZED CONSTRUCTION EVIT	LUMP SUM EACH EACH EACH SQ FT SQ FT LUMP SUM SYSTEM EACH LIN FT	1 1 6 9 77 21 1 1 1 305 1	
8	ST ST ST ST ST Q Q	SM2 SS1-SS22 51 SS1-SS22 51 SS1-SS22 18 18	2563.601 2564.502 2564.602 2564.602 2564.618 2565.501 2565.501 2565.516 2565.602 2565.603 2573.501 2573.501	IRAFFIC CONTROL INSTALL SIGN PANEL TYPE SPECIAL INSTALL SIGN INSTALL SIGN INSTALL SIGN PANEL SIGN SIGN PANEL EMERGENCY VEHICLE PREEMPTION SYSTEM TRAFFIC CONTROL SIGNAL SYSTEM INSTALL APS PEDESTRIAN PUSH BUTTON STATION FIBER OPTIC TRUNK CABLE 12SM STABILIZED CONSTRUCTION EXIT STORM DRAIN INLET PROTECTION	LUMP SUM EACH EACH EACH SQ FT SQ FT LUMP SUM EACH LIN FT LUMP SUM EACH	1 1 6 9 77 21 1 1 1 305 1 48	
8	ST ST ST ST ST Q Q Q	SM2 SM2 SM2 SM2 SM2 SM2 SS1-SS22 SS1-SS22 51 SS1-SS22 51 SS1-SS22 18 18 18	2563.601 2564.502 2564.602 2564.602 2564.618 2565.501 2565.501 2565.502 2565.602 2565.603 2573.501 2573.502	INSTALL SIGN PANEL TYPE SPECIAL INSTALL SIGN INSTALL SIGN INSTALL SIGN INSTALL SIGN PANEL SIGN SIGN PANEL EMERGENCY VEHICLE PREEMPTION SYSTEM TRAFFIC CONTROL SIGNAL SYSTEM INSTALL APS PEDESTRIAN PUSH BUTTON STATION FIBER OPTIC TRUNK CABLE 12SM STABILIZED CONSTRUCTION EXIT STORM DRAIN INLET PROTECTION SEDIMENT CONTROL LOC TYPE POCK	LUMP SUM EACH EACH EACH SQ FT SQ FT LUMP SUM EACH LIN FT LUMP SUM EACH LIN FT	1 1 6 9 77 21 1 1 1 1 305 1 48 32	
8	ST ST ST ST ST Q Q Q	SM2 SS1-SS22 51 SS1-SS22 51 SS1-SS22 18 18 18 18	2563.601 2564.502 2564.602 2564.602 2564.618 2564.618 2565.501 2565.501 2565.602 2565.603 2573.501 2573.502 2573.503	TRAFFIC CONTROL INSTALL SIGN PANEL TYPE SPECIAL INSTALL SIGN INSTALL SIGN INSTALL SIGN PANEL SIGN SIGN PANEL EMERGENCY VEHICLE PREEMPTION SYSTEM TRAFFIC CONTROL SIGNAL SYSTEM INSTALL APS PEDESTRIAN PUSH BUTTON STATION FIBER OPTIC TRUNK CABLE 12SM STABILIZED CONSTRUCTION EXIT STORM DRAIN INLET PROTECTION SEDIMENT CONTROL LOG TYPE ROCK	LUMP SUM EACH EACH EACH SQ FT SQ FT LUMP SUM SYSTEM EACH LIN FT LUMP SUM EACH LIN FT	1 1 6 9 77 21 1 1 1 305 1 48 32	
8	ST ST ST ST ST Q Q Q Q	SM2 SM2 SM2 SM2 SM2 SM2 SM2 SS1–SS22 SS1–SS22 SS1–SS22 SS1–SS22 18 18 18 18	2563.601 2564.502 2564.602 2564.602 2564.618 2565.501 2565.501 2565.502 2565.602 2565.603 2573.501 2573.502 2573.503	TRAFFIC CONTROL INSTALL SIGN PANEL TYPE SPECIAL INSTALL SIGN INSTALL SIGN PANEL SIGN SIGN PANEL EMERGENCY VEHICLE PREEMPTION SYSTEM TRAFFIC CONTROL SIGNAL SYSTEM INSTALL APS PEDESTRIAN PUSH BUTTON STATION FIBER OPTIC TRUNK CABLE 12SM STABILIZED CONSTRUCTION EXIT STORM DRAIN INLET PROTECTION SEDIMENT CONTROL LOG TYPE ROCK THEE ESTABLISHMENT	LUMP SUM EACH EACH EACH SQ FT SQ FT LUMP SUM SYSTEM EACH LIN FT LUMP SUM EACH LIN FT	1 1 6 9 77 21 1 1 1 1 305 1 48 32 1	
8	ST ST ST ST ST Q Q Q Q	SM2 SS1-SS22 51 SS1-SS22 18 18 18 18 18 18	2563.601 2564.502 2564.602 2564.602 2564.618 2564.618 2565.501 2565.501 2565.602 2565.602 2565.603 2573.501 2573.502 2573.503 2575.501	TRAFFIC CONTROL INSTALL SIGN PANEL TYPE SPECIAL INSTALL SIGN INSTALL SIGN PANEL SIGN SIGN PANEL EMERGENCY VEHICLE PREEMPTION SYSTEM TRAFFIC CONTROL SIGNAL SYSTEM INSTALL APS PEDESTRIAN PUSH BUTTON STATION FIBER OPTIC TRUNK CABLE 12SM STABILIZED CONSTRUCTION EXIT STORM DRAIN INLET PROTECTION SEDIMENT CONTROL LOG TYPE ROCK TURF ESTABLISHMENT	LUMP SUM EACH EACH EACH SQ FT SQ FT LUMP SUM SYSTEM EACH LIN FT LUMP SUM EACH LIN FT LUMP SUM	1 1 6 9 77 21 1 1 1 1 305 1 48 32 1	
8	ST ST ST ST C Q Q Q Q Q C C C C C C C C C C C C C	SM2 SS1-SS22 51 SS1-SS22 51 SS1-SS22 18 18 18 18 18 18 18 18 18 18 18 18 18 18 18 18 18 19 110	2563.601 2564.502 2564.602 2564.602 2564.618 2565.501 2565.501 2565.502 2565.602 2565.602 2573.501 2573.502 2573.503 2575.501	TRAFFIC CONTROL INSTALL SIGN PANEL TYPE SPECIAL INSTALL SIGN PANEL SIGN SIGN PANEL EMERGENCY VEHICLE PREEMPTION SYSTEM TRAFFIC CONTROL SIGNAL SYSTEM INSTALL APS PEDESTRIAN PUSH BUTTON STATION FIBER OPTIC TRUNK CABLE 12SM STABILIZED CONSTRUCTION EXIT STORM DRAIN INLET PROTECTION SEDIMENT CONTROL LOG TYPE ROCK	LUMP SUM EACH EACH EACH SQ FT SQ FT LUMP SUM EACH LIN FT LUMP SUM EACH LIN FT LUMP SUM	1 1 6 9 77 21 1 1 1 1 305 1 48 32 1 1 48	
8	ST ST ST ST ST Q Q Q Q PM	SM2 SM2 SM2 SM2 SM2 SM2 SM2 SS1-SS22 SS1-SS22 51 SS1-SS22 51 SS1-SS22 18 18 18 18 18 18 18 2 SM2 SM2	2563.601 2564.502 2564.602 2564.602 2564.618 2565.501 2565.501 2565.602 2565.603 2573.502 2573.502 2573.503 2575.501 2582.503	TRAFFIC CONTROL INSTALL SIGN PANEL TYPE SPECIAL INSTALL SIGN PANEL SIGN SIGN SIGN PANEL EMERGENCY VEHICLE PREEMPTION SYSTEM TRAFFIC CONTROL SIGNAL SYSTEM INSTALL APS PEDESTRIAN PUSH BUTTON STATION FIBER OPTIC TRUNK CABLE 12SM STABILIZED CONSTRUCTION EXIT STORM DRAIN INLET PROTECTION SEDIMENT CONTROL LOG TYPE ROCK IURF ESTABLISHMENT 4" SOLID LINE MULTI-COMPONENT GROUND IN (WR)	LUMP SUM EACH EACH EACH SQ FT SQ FT LUMP SUM SYSTEM EACH LIN FT LUMP SUM EACH LIN FT LUMP SUM	1 1 6 9 77 21 1 1 1 1 305 1 48 32 1 1 496 \$20	

LHB PROJECT NO. 220974

I HEREBY CERTIFY that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

В	RAD S	SCOTT
P	RINTED	NAME

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 3-14-2023 DATE
 1ST AVENUE EAST (SUPERIOR ST TO 3RD ST)

 46198 LIC. NO.
 CITY PROJECT NO. 2100

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SHEET NO. 8 OF 73 SHEETS



REVISION	TYPICAL SECTIONS						
<u>A</u> <u>4-17-2023</u>		SHEET NO	20	OF	73	SHEETS	
		SHELL NO.	20	UI	/5	JHLLIJ	



A 17 2023	THICKE SECTIONS	
	SHEET NO. 21 OF 73 SHEETS	



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		EXCAVATION -	CONNECT TO	INSTALL HOT	CONNECT TO	CONNECT TO	INSTALL 4"/9"	INSTALL 6"/11"	INSTALL 8"/14"	INSTALL 12"/20"	FURNISH &	FURNISH &		
		ROCK	EXISTING HWP	ISOLATION	EXISTING STEAM TUNNEL	EXISTING CONDUIT	HWP	HWP	HWP	HWP	INSTALL 2" SCH80 PVC	INSTALL FIBER-OPTIC		A)
(1)	FACILITY DESCRIPTION			VALVE							CONDUIT	CABLE	REMARKS	
STATION TO STATION)
		(2106)	(2508)	(2508)	(2508)	(2508)	(2508)	(2508)	(2508)	(2508)	(2508)	(25.00)		
		CULVD	FACU	FACU	FACIL	FACU						(2508)		
1.1	t Avenue Fact	CUYD	EACH	EACH	EACH	EACH	LIN FI	LIN FI	LINFI	LIN FI	LIN FI	LIN FI		
0+00			2			1								
0+00 to 4+61	12"/20" HWP	47	2			1				922	972	1292		
0+76	12" ISOLATION VALVES			2						JLL	JLL			\longrightarrow
1+87 to 3+03				-										
4+61 to 4+81	8"/14" HWP								40		40	40		
4+81 to 15+23	6"/11" HWP	45						2084			2084	2066)
5+00	6" ISOLATION VALVE ASSEMBLY			2										\longrightarrow
15+23 to 16+81	4"/9" HWP				1		316				316	158)
16+60	4" ISOLATION VALVES			2										
15	st Street East			_										
20+23	12" ISOLATION VALVES			2										
20+00 to 20+37	12"/20" HWP			_						74	74	74)
Old Centra	al High School Service													
100+00 to 100+18	4"/9" HWP						36				72	72		
	-	92	2	8	1	1	352	2084	40	996	3508	3702		
(1) STATIONING BASED OF	N HOT WATER SYSTEMASTATIONING					$\overline{ \land \land}$	$\wedge \wedge$		\sim \wedge \wedge		<u> </u>	\wedge \wedge	$ \land \land \land \land$	$\overline{}$
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(2) HOT WATER BOLATION	N VALVES FOR THE DRAIN AND VENT	ASSEMBLIES CAN B	BE FOUND ON TABL	E HW-B HOT WAII	IN AFFORTENANCE.	5								
HW-B														HW-B
HW-B		INSTALL 2"/5.5"	1"	FURNISH &	FURNISH &	CONNECT TO	INSTALL 24"X36"	INSTALL 1"/4"	INSTALL 2"/5.5"	FURNISH &	FURNISH &	FURNISH &		HW-B
HW-B		INSTALL 2"/5.5" HOT WATER	1" RECIRCULATION	FURNISH & INSTALL 2'X3'	FURNISH & INSTALL 24''	CONNECT TO STORM	INSTALL 24"X36" HANDHOLE	INSTALL 1"/4" HWP	INSTALL 2"/5.5" HWP	FURNISH & INSTALL 6" DIP	FURNISH & INSTALL 2"	FURNISH & INSTALL		HW-B
HW-B		INSTALL 2"/5.5" HOT WATER ISOLATION VAVLE ²	1" RECIRCULATION ASSEMBLY	FURNISH & INSTALL 2'X3' FLASH CHAMBER	FURNISH & INSTALL 24" FLASH CHAMBER	CONNECT TO STORM STRUCTURE	INSTALL 24"X36" HANDHOLE	INSTALL 1"/4" HWP	INSTALL 2"/5.5" HWP	FURNISH & INSTALL 6" DIP CL 52	FURNISH & INSTALL 2" SCH80 PVC CONDUIT	FURNISH & INSTALL FIBER-OPTIC CABLE	DEMADI/S	HW-B
HW-B (1) STATION TO STATION	FACILITY DESCRIPTION	INSTALL 2"/5.5" HOT WATER ISOLATION VAVLE ²	1" RECIRCULATION ASSEMBLY	FURNISH & INSTALL 2'X3' FLASH CHAMBER	FURNISH & INSTALL 24'' FLASH CHAMBER	CONNECT TO STORM STRUCTURE	INSTALL 24"X36" HANDHOLE	INSTALL 1"/4" HWP	INSTALL 2"/5.5" HWP	FURNISH & INSTALL 6" DIP CL 52	FURNISH & INSTALL 2" SCH80 PVC CONDUIT	FURNISH & INSTALL FIBER-OPTIC CABLE	REMARKS	HW-B
HW-B	FACILITY DESCRIPTION	INSTALL 2"/5.5" HOT WATER ISOLATION VAVLE ² (2508)	1" RECIRCULATION ASSEMBLY (2508)	FURNISH & INSTALL 2'X3' FLASH CHAMBER (2508)	FURNISH & INSTALL 24'' FLASH CHAMBER (2508)	CONNECT TO STORM STRUCTURE (2508)	INSTALL 24"X36" HANDHOLE (2508)	INSTALL 1"/4" HWP (2508)	INSTALL 2"/5.5" HWP (2508)	FURNISH & INSTALL 6" DIP CL 52 (2508)	FURNISH & INSTALL 2" SCH80 PVC CONDUIT (2508)	FURNISH & INSTALL FIBER-OPTIC CABLE	REMARKS	HW-B
HW-B	FACILITY DESCRIPTION	INSTALL 2"/5.5" HOT WATER ISOLATION VAVLE ² (2508)	1" RECIRCULATION ASSEMBLY (2508)	FURNISH & INSTALL 2'X3' FLASH CHAMBER (2508)	FURNISH & INSTALL 24" FLASH CHAMBER (2508)	CONNECT TO STORM STRUCTURE (2508)	INSTALL 24"X36" HANDHOLE (2508)	INSTALL 1"/4" HWP (2508)	INSTALL 2"/5.5" HWP (2508)	FURNISH & INSTALL 6" DIP CL 52 (2508)	FURNISH & INSTALL 2" SCH80 PVC CONDUIT (2508)	FURNISH & INSTALL FIBER-OPTIC CABLE (2508)	REMARKS	HW-B
HW-B	FACILITY DESCRIPTION	INSTALL 2"/5.5" HOT WATER ISOLATION VAVLE ² (2508) EACH	1" RECIRCULATION ASSEMBLY (2508) EACH	FURNISH & INSTALL 2'X3' FLASH CHAMBER (2508) EACH	FURNISH & INSTALL 24'' FLASH CHAMBER (2508) EACH	CONNECT TO STORM STRUCTURE (2508) EACH	INSTALL 24"X36" HANDHOLE (2508) EACH	INSTALL 1"/4" HWP (2508) LIN FT	INSTALL 2"/5.5" HWP (2508) LIN FT	FURNISH & INSTALL 6" DIP CL 52 (2508) LIN FT	FURNISH & INSTALL 2" SCH80 PVC CONDUIT (2508) LIN FT	FURNISH & INSTALL FIBER-OPTIC CABLE (2508) LIN FT	REMARKS	HW-B
HW-B (1) STATION TO STATION	FACILITY DESCRIPTION	INSTALL 2"/5.5" HOT WATER ISOLATION VAVLE ² (2508) EACH	1" RECIRCULATION ASSEMBLY (2508) EACH	FURNISH & INSTALL 2'X3' FLASH CHAMBER (2508) EACH	FURNISH & INSTALL 24'' FLASH CHAMBER (2508) EACH	CONNECT TO STORM STRUCTURE (2508) EACH	INSTALL 24"X36" HANDHOLE (2508) EACH	INSTALL 1"/4" HWP (2508) LIN FT	INSTALL 2"/5.5" HWP (2508) LIN FT	FURNISH & INSTALL 6" DIP CL 52 (2508) LIN FT	FURNISH & INSTALL 2" SCH80 PVC CONDUIT (2508) LIN FT	FURNISH & INSTALL FIBER-OPTIC CABLE (2508) LIN FT (2508)	REMARKS	HW-B
HW-B (1) STATION TO STATION 1st 0+82	FACILITY DESCRIPTION	INSTALL 2"/5.5" HOT WATER ISOLATION VAVLE ² (2508) EACH 2	1" RECIRCULATION ASSEMBLY (2508) EACH	FURNISH & INSTALL 2'X3' FLASH CHAMBER (2508) EACH	FURNISH & INSTALL 24" FLASH CHAMBER (2508) EACH	CONNECT TO STORM STRUCTURE (2508) EACH	INSTALL 24"X36" HANDHOLE (2508) EACH	INSTALL 1"/4" HWP (2508) LIN FT	INSTALL 2"/5.5" HWP (2508) LIN FT 20	FURNISH & INSTALL 6" DIP CL 52 (2508) LIN FT 23	FURNISH & INSTALL 2" SCH80 PVC CONDUIT (2508) LIN FT	FURNISH & INSTALL FIBER-OPTIC CABLE (2508) LIN FT (2508)	REMARKS	HW-B
HW-B (1) STATION TO STATION 1st 0+82 1+07	FACILITY DESCRIPTION	INSTALL 2"/5.5" HOT WATER ISOLATION VAVLE ² (2508) EACH 2	1" RECIRCULATION ASSEMBLY (2508) EACH	FURNISH & INSTALL 2'X3' FLASH CHAMBER (2508) EACH 1	FURNISH & INSTALL 24'' FLASH CHAMBER (2508) EACH	CONNECT TO STORM STRUCTURE (2508) EACH	INSTALL 24"X36" HANDHOLE (2508) EACH	INSTALL 1"/4" HWP (2508) LIN FT	INSTALL 2"/5.5" HWP (2508) LIN FT 20	FURNISH & INSTALL 6" DIP CL 52 (2508) LIN FT 23	FURNISH & INSTALL 2" SCH80 PVC CONDUIT (2508) LIN FT	FURNISH & INSTALL FIBER-OPTIC CABLE (2508) LIN FT (2508)	REMARKS	HW-B
HW-B (1) STATION TO STATION 1st 0+82 1+07 3+31	FACILITY DESCRIPTION FACILITY DESCRIPTION	INSTALL 2"/5.5" HOT WATER ISOLATION VAVLE ² (2508) EACH 2	1" RECIRCULATION ASSEMBLY (2508) EACH	FURNISH & INSTALL 2'X3' FLASH CHAMBER (2508) EACH 1	FURNISH & INSTALL 24'' FLASH CHAMBER (2508) EACH	CONNECT TO STORM STRUCTURE (2508) EACH 1	INSTALL 24"X36" HANDHOLE (2508) EACH	INSTALL 1"/4" HWP (2508) LIN FT	INSTALL 2"/5.5" HWP (2508) LIN FT 20	FURNISH & INSTALL 6" DIP CL 52 (2508) LIN FT 23	FURNISH & INSTALL 2" SCH80 PVC CONDUIT (2508) LIN FT	FURNISH & INSTALL FIBER-OPTIC CABLE (2508) LIN FT (2508)	REMARKS	HW-B
HW-B (1) STATION TO STATION 1st 0+82 1+07 3+31 4+96	FACILITY DESCRIPTION FACILITY DESCRIPTION t Avenue East DRAIN ASSEMBLY HANDHOLE HANDHOLE VENT/DRAIN ASSEMBLY	INSTALL 2"/5.5" HOT WATER ISOLATION VAVLE ² (2508) EACH 2 2 4	1" RECIRCULATION ASSEMBLY (2508) EACH	FURNISH & INSTALL 2'X3' FLASH CHAMBER (2508) EACH 1 1	FURNISH & INSTALL 24'' FLASH CHAMBER (2508) EACH	CONNECT TO STORM STRUCTURE (2508) EACH 1 1	INSTALL 24"X36" HANDHOLE (2508) EACH	INSTALL 1"/4" HWP (2508) LIN FT	INSTALL 2"/5.5" HWP (2508) LIN FT 20 40	FURNISH & INSTALL 6" DIP CL 52 (2508) LIN FT 23 36	FURNISH & INSTALL 2" SCH80 PVC CONDUIT (2508) LIN FT	FURNISH & INSTALL FIBER-OPTIC CABLE (2508) LIN FT (2508)	REMARKS	HW-B
HW-B (1) STATION TO STATION 1st 0+82 1+07 3+31 4+96 6+11	FACILITY DESCRIPTION FACILITY DESCRIPTION TAVENUE East DRAIN ASSEMBLY HANDHOLE VENT/DRAIN ASSEMBLY HANDHOLE	INSTALL 2"/5.5" HOT WATER ISOLATION VAVLE ² (2508) EACH 2 4	1" RECIRCULATION ASSEMBLY (2508) EACH	FURNISH & INSTALL 2'X3' FLASH CHAMBER (2508) EACH 1 1 1	FURNISH & INSTALL 24'' FLASH CHAMBER (2508) EACH	CONNECT TO STORM STRUCTURE (2508) EACH 1 1	INSTALL 24"X36" HANDHOLE (2508) EACH 1 1 1	INSTALL 1"/4" HWP (2508) LIN FT	INSTALL 2"/5.5" HWP (2508) LIN FT 20 40	FURNISH & INSTALL 6" DIP CL 52 (2508) LIN FT 23 36	FURNISH & INSTALL 2" SCH80 PVC CONDUIT (2508) LIN FT	FURNISH & INSTALL FIBER-OPTIC CABLE (2508) LIN FT (2508) 24.5	REMARKS	HW-B
HW-B (1) STATION TO STATION 1st 0+82 1+07 3+31 4+96 6+11 9+46	FACILITY DESCRIPTION FACILITY DESCRIPTION ST Avenue East DRAIN ASSEMBLY HANDHOLE HANDHOLE VENT/DRAIN ASSEMBLY HANDHOLE HANDHOLE	INSTALL 2"/5.5" HOT WATER ISOLATION VAVLE ² (2508) EACH 2 2 4	1" RECIRCULATION ASSEMBLY (2508) EACH	FURNISH & INSTALL 2'X3' FLASH CHAMBER (2508) EACH 1 1	FURNISH & INSTALL 24'' FLASH CHAMBER (2508) EACH	CONNECT TO STORM STRUCTURE (2508) EACH 1 1	INSTALL 24"X36" HANDHOLE (2508) EACH 1 1 1 1 1 1	INSTALL 1"/4" HWP (2508) LIN FT	INSTALL 2"/5.5" HWP (2508) LIN FT 20 40	FURNISH & INSTALL 6" DIP CL 52 (2508) LIN FT 23 36	FURNISH & INSTALL 2" SCH80 PVC CONDUIT (2508) LIN FT 49	FURNISH & INSTALL FIBER-OPTIC CABLE (2508) LIN FT (2508) 24.5	REMARKS	HW-B
HW-B (1) STATION TO STATION 1st 0+82 1+07 3+31 4+96 6+11 9+46 12+63	FACILITY DESCRIPTION FACILITY DESCRIPTION t Avenue East DRAIN ASSEMBLY HANDHOLE HANDHOLE VENT/DRAIN ASSEMBLY HANDHOLE HANDHOLE HANDHOLE	INSTALL 2"/5.5" HOT WATER ISOLATION VAVLE ² (2508) EACH 2 4	1" RECIRCULATION ASSEMBLY (2508) EACH	FURNISH & INSTALL 2'X3' FLASH CHAMBER (2508) EACH 1 1 1	FURNISH & INSTALL 24'' FLASH CHAMBER (2508) EACH	CONNECT TO STORM STRUCTURE (2508) EACH 1 1	INSTALL 24"X36" HANDHOLE (2508) EACH 1 1 1 1 1 1 1 1 1	INSTALL 1"/4" HWP (2508) LIN FT	INSTALL 2"/5.5" HWP (2508) LIN FT 20 40	FURNISH & INSTALL 6" DIP CL 52 (2508) LIN FT 23 36	FURNISH & INSTALL 2" SCH80 PVC CONDUIT (2508) LIN FT 49 48	FURNISH & INSTALL FIBER-OPTIC CABLE (2508) LIN FT (2508) 24.5 20	REMARKS	HW-B
HW-B (1) STATION TO STATION 1st 0+82 1+07 3+31 4+96 6+11 9+46 12+63 16+26	FACILITY DESCRIPTION FACILITY DESCRIPTION TAVENUE East DRAIN ASSEMBLY HANDHOLE HANDHOLE HANDHOLE HANDHOLE HANDHOLE HANDHOLE VENT ASSEMBLY	INSTALL 2"/5.5" HOT WATER ISOLATION VAVLE ² (2508) EACH 2 4 4	1" RECIRCULATION ASSEMBLY (2508) EACH	FURNISH & INSTALL 2'X3' FLASH CHAMBER (2508) EACH 1 1 1 1 1	FURNISH & INSTALL 24'' FLASH CHAMBER (2508) EACH	CONNECT TO STORM STRUCTURE (2508) EACH 1 1 1	INSTALL 24"X36" HANDHOLE (2508) EACH 1 1 1 1 1 1 1 1	INSTALL 1"/4" HWP (2508) LIN FT	INSTALL 2"/5.5" HWP (2508) LIN FT 20 40 40 20	FURNISH & INSTALL 6" DIP CL 52 (2508) LIN FT 23 36 36 18	FURNISH & INSTALL 2" SCH80 PVC CONDUIT (2508) LIN FT 49 48	FURNISH & INSTALL FIBER-OPTIC CABLE (2508) LIN FT (2508) 24.5 20	REMARKS	HW-B
HW-B (1) STATION TO STATION 1st 0+82 1+07 3+31 4+96 6+11 9+46 12+63 16+26 16+78	FACILITY DESCRIPTION FACILITY DESCRIPTION TAVENUE East DRAIN ASSEMBLY HANDHOLE HANDHOLE VENT/DRAIN ASSEMBLY HANDHOLE HANDHOLE HANDHOLE VENT ASSEMBLY RECIRCULATION	INSTALL 2"/5.5" HOT WATER ISOLATION VAVLE ² (2508) EACH 2 4 4	1" RECIRCULATION ASSEMBLY (2508) EACH	FURNISH & INSTALL 2'X3' FLASH CHAMBER (2508) EACH 1 1 1 1 1	FURNISH & INSTALL 24'' FLASH CHAMBER (2508) EACH	CONNECT TO STORM STRUCTURE (2508) EACH 1 1 1	INSTALL 24"X36" HANDHOLE (2508) EACH 1 1 1 1 1 1 1 1 1 1 1	INSTALL 1"/4" HWP (2508) LIN FT	INSTALL 2"/5.5" HWP (2508) LIN FT 20 40 40 20	FURNISH & INSTALL 6" DIP CL 52 (2508) LIN FT 23 36 36 18	FURNISH & INSTALL 2" SCH80 PVC CONDUIT (2508) LIN FT 49 48	FURNISH & INSTALL FIBER-OPTIC CABLE (2508) LIN FT (2508) 24.5 20	REMARKS	HW-B
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NISH & All 2" 30 PVC IDUIT	FURNISH & INSTALL FIBER-OPTIC CABLE		RE	MARKS	A	
508)	(2508)					\sum
N FT	LIN FT					$\langle \rangle$
22	1292					$\langle \rangle$
40	40					
)84	2066					$ \longrightarrow $
16	158					
74	74					
						$ \longrightarrow $
72	72)
508	3702					
\wedge	\wedge	\wedge	\frown	\nearrow		\sim

NISH & ALL 2" 30 PVC IDUIT	FURNISH & INSTALL FIBER-OPTIC CABLE	REMARKS
508)	(2508)	
N FT	LIN FT	
	(2508)	
19	24.5	
48	20	
7	45	

SB	ELECTRICAL DUCT BANK							
STATION	L / R	CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283 2550	CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 1259 2550	ELECTRICAL MANHOLE 2550	ELECTRICAL DUCT BANK TYPE 1 2550	ELECTRICAL DUCT BANK TYPE 2 2550	6" NON- METALLIC CONDUIT ELECTRICAL DUCT (DIRECTIONAL BORE) 2550	REMARKS
		EACH	EACH	EACH	LIN FT	LIN FT	LIN FT	
103+70.77	14.21' RT		1					CONNECT TO EMH-1259
103+70.77 - 107+42.18	14.21' RT - 27.35' RT				376			EMH-1259 TO PEMH-01
107+42.18	33.00' LT- 27.35' RT					60		FUTURE CONNECTION TO PEMH-01
107+42.18	27.35' RT			1				PEMH-01
107+42.18 - 107+48.95	27.35' RT - 322.83' RT						588	PEMH-01 TO EMH-283
107+48.95	322.83' RT	1						CONNECT TO EMH-283
PROJECT TO	TALS	1	1	1	376	60	588	PROJECT TOTALS

LHB PROJECT NO. 220974 & 230223

I HEREBY CERTIFY that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.



	<u>4-7-2023</u> DATE	1ST AVENUE EAST (SUPERIOR ST TO 3RD ST)
-	41423	CITY PROJECT NO. 2100

REVISION	CONSTRUCTION CHARTS				
<u>/\ 4-17-2023</u>	$ m \Delta$ sheet no. SB1 of SB8 sheets				

NOTES:

THE TYPICAL DUCT BANK CONSISTS OF CONCRETE ENCASED 6" CONDUITS IN A DESIGNATED ARRAY (ROW X COL.) RE-ARRANGEMENT OF THE DUCT BANK ARRAY IS REQUIRED AT CONNECTIONS TO EXISTING MANHOLES OR DUCT BANKS AND MAY BE REQUIRED AT UTILITY CROSSINGS OR IF OTHER OBSTRUCTIONS ARE ENCOUNTERED. NO CHANGE ORDERS OR MODIFICATIONS TO THE UNIT PRICE BID FOR DUCT BANK SHALL BE PERMITTED REGARDLESS OF THE NUMBER OR TYPE OF SUCH RE-ARRANGEMENT(S) REQUIRED.

KEY NOTES:

- (1)PROFILE GRADE IN PLAN IS BOTTOM OF DUCT BANK.
- (2) CONCRETE ENCASEMENT SHALL CONSIST OF MIX HIGH EARLY CONCRETE COLORED WITH RED DYE. BACKFILL MAY COMMENCE ONLY AFTER CONCRETE STRENGTH IS 75% OF THE SPECIFIED CONCRETE STRENGTH CONCRETE CYLINDER TESTS FOR EACH DAY'S POUR SHALL ESTABLISH TIMING. REFER TO SPECIAL PROVISIONS FOR ADDITIONAL REQUIREMENTS.
- (3)NO ADJUSTMENTS (INCREASES) IN PAY QUANTITIES OR PRICES WILL BE MADE FOR TRENCH EXCAVATION BEYOND THE LIMITS SHOWN. ANY TRENCH EXCAVATION REQUIRED TO FACILITATE THE CONTRACTOR'S OPERATIONS FOR THE SEQUENCING OF THE WORK, OR TO MEET OSHA SAFETY REQUIREMENTS IS INCIDENTAL.
- (4)SPACERS SHALL SECURELY SUPPORT AND MAINTAIN UNIFORM SPACING OF THE PIPE ASSEMBLY AND CHAIRS SHALL PROVIDE 3 INCHES ABOVE THE BOTTOM OF THE TRENCH DURING THE CONCRETE POUR. SECURE SPACERS TO PIPES AND EARTH TO PREVENT FLOATING DURING CONCRETE POUR. PROVIDE NONFERROUS TIE WIRES TO PREVENT DISPLACEMENT OF THE PIPE DURING THE CONCRETE POUR. THE WIRES SHALL NOT ACT AS SUBSTITUTE FOR SPACERS. PULL TAPE SHALL BE INSTALLED INSIDE OF EACH DUCT RUN.
- (5)SHALL NOT BE MEASURED SEPARATELY BUT SHALL BE INCLUDED FOR PAYMENT UNDER ITEM 2550.603, "DUCT BANK TYPE ___" FOR THE APPLICABLE DUCT BANK TYPE SHOWN IN THE PLANS.
- (6) EXCAVATION AND DISPOSAL OF TRENCH EXCAVATION MATERIAL OFF SITE SHALL NOT BE MEASURED SEPARATELY BUT SHALL BE CONSIDERED INCLUDED FOR PAYMENT UNDER ITEM 2550.603, "DUCT BANK TYPE___ FOR THE APPLICABLE DUCT BANK TYPE SHOWN IN THE PLANS.
- MINIMUM PAY WIDTH IN ROCK SHALL BE 24 INCHES MEASURED FROM OUTSIDE OF STRUCTURE. MAXIMUM PAY WDTH IN ROCK SHALL BE 36" MEASURED FROM OUTSIDE OF STRUCTURE. PAID FOR AS STRUCTURE EXCAVATION CLASS R.
- 8 6" MINIMUM REMOVAL REQUIRED. MAXIMUM PAY LIMIT IN ROCK SHALL BE 12".
- (9)FURNISH AND INSTALL GRADE ADJUSTMENT RINGS. GRADE ADJUSTMENT RINGS SHALL NOT BE MEASURED SEPARATELY FOR PAYMENT BUT SHALL BE INCLUDED FOR PAYMENT UNDER ITEM 2550.602 "ELECTRICAL MANHOLF"
- (10) SHALL NOT BE MEASURED SEPARATELY BUT SHALL BE INCLUDED FOR PAYMENT UNDER ITEM 2550.602 "ELECTRICAL MANHOLE".
- (11) EXCAVATION AND DISPOSAL OF STRUCTURE EXCAVATION MATERIAL OFF SITE SHALL NOT BE MEASURED SEPARATELY BUT SHALL BE INCLUDED FOR PAYMENT UNDER ITEM 2550.602 "ELECTRICAL MANHOLE".
- (12) SEE ELECTRICAL MANHOLE DETAIL SHEETS FOR DUCT BANK PENETRATION AND ELEVATIONS.
- (13) SEE DUCT BANK TYPICAL ARRAY TYPES ON SHEET SB3.
- (14) ADDITIONAL GRANULAR BACKFILL 3149.2.D.1 REQUIRED TO BACKFILL ROCK EXCAVATION SHALL NOT BE MEASURED SEPARATELY BUT SHALL BE INCLUDED FOR PAYMENT UNDER ITEM 2550.602 "ELECTRICAL MANHOLF"
- (15) CONTRACTOR SHALL FURNISH AND INSTALL FRAME AND CASTING COVER. FRAME AND CASTING SHALL NOT BE MEASURED SEPARATELY BUT SHALL BE INCLUDED FOR PAYMENT UNDER ITEM 2550.602 "ELECTRICAL MANHOLE".



DUCT BANK, NTS 1X6-6" DUCT BANK SHOWN (13)



TYPICAL ELECTRICAL DUCT INTO MANHOLE CONNECTION











- NOTES: 1. ALL WORK ON THIS SHEET SHALL BE INCLUDED FOR PAYMENT UNDER 1. ALL WORK ON THIS SHEET SHALL BE INCLUDED FOR PAYMENT UNDER ITEM 2550.602, "CONNECT INTO EXISTING MANHOLE NO. 1259". 2. DIMENSIONS RELATED TO THE ELECTRICAL DUCT BANK ARE TO THE
- DIMENSIONS RELATED TO THE ELECTRICAL DUCT BANK ARE TO THE OUTSIDE OF CONCRETE ENCASEMENT. CONTRACTOR SHALL DEDUCT 3" FROM THESE OUTSIDE DIMENSIONS FOR THE WALL PENETRATION.
 PVC DUCTS SHALL EXTEND NO MORE THAN 6" INSIDE OF MANHOLE AS MEASURED FROM THE INSIDE WALL FACE.





- NOTES: 1. ALL WORK ON THIS SHEET SHALL BE INCLUDED FOR PAYMENT UNDER
- ALL WORK ON THIS SHELL SHALL BE INCLODED FOR PAILMENT UNDER ITEM 2550.602, "ELECTRICAL MANHOLE".
 DIMENSIONS RELATED TO THE ELECTRICAL DUCT BANK ARE TO THE OUTSIDE OF CONCRETE ENCASEMENT. MANHOLE MANUFACTURER SHALL DEDUCT 3" FROM THESE OUTSIDE DIMENSIONS FOR THE WALL PENETRATION.
- 3. PVC DUCTS SHALL EXTEND NO MORE THAN 6" INSIDE OF MANHOLE AS MEASURED FROM THE INSIDE WALL FACE.





- NOTES: 1. ALL WORK ON THIS SHEET SHALL BE INCLUDED FOR PAYMENT UNDER 1. ALL WORK ON THIS SHEET SHALL BE INCLUDED FOR PAYMENT UNDER ITEM 2550.602, "CONNECT INTO EXISTING MANHOLE NO. 283". 2. DIMENSIONS RELATED TO THE ELECTRICAL DUCT BANK ARE TO THE
- OUTSIDE OF CONCRETE ENCASEMENT. CONTRACTOR SHALL DEDUCT 3" FROM THESE OUTSIDE DIMENSIONS FOR THE WALL PENETRATION.
 PVC DUCTS SHALL EXTEND NO MORE THAN 6" INSIDE OF MANHOLE AS MEASURED FROM THE INSIDE WALL FACE.







SP-40 (2540) FURNISH AND INSTALL PARKING METER POST

SP-40.1 DESCRIPTION

This special provision describes furnishing and installing parking meter posts and brackets at locations directed by the Engineer.

Notify the City of Duluth Parking Office at 218-730-5470 a minimum of 5 working days prior to opening sections of First Avenue E. to all traffic and coordinate installation of the parking meter heads. The City of Duluth Parking Office will direct Interstate Parking to install the salvaged parking meter heads.

SP-40.2 MATERIALS

- A Posts: Furnish and Place 2-inch IPS Galvanized pipe standard in accordance to the size and dimensions in the City detail. The pipe shall be clean & mill galvanized no stenciling is permitted.
- B Base Post (soil/sod application): Furnish 2.5-inch IPS Galvanized pipe standard with minimum inner diameter to fit the 2-inch IPS Galvanized pipe standards. Minimum length shall be 38-inch, maximum length shall be 48-inch. The pipe shall be clean & mill galvanized. Remove all burrs inside and outside. Inside diameter must be uniformly round.
- C Meter Bracket: Furnish and Place Double Meter Adapter STD Machined (part no. 9116) manufactured by Duncan Parking Technologies, 340 Industrial Park Road, Harrison, AR 72601.
- D Surface Mount Base: Furnish Round Post Surface Mount Base (Part Number S238SR) as supplied by The Traffic Sign Store (<u>http://www.trafficsignstore.com</u>).
- E Mounting Hardware: Furnish bracket and surface mount base hardware as supplied or required by the manufacturers for outdoor applications in salt spray environments.
- F Rebar: Furnish and Place #4 Reinforcing steel in accordance with MnDOT 3301.
- G Granular Backfill (Furnish Granular Backfill in accordance with MnDOT 3149.

SP-40.3 CONSTRUCTION REQUIREMENTS

A Posts: Layout the post locations per the City Standard Detail T-1 and as directed by the Engineer. The anticipated location and number of meter posts is as follows:

Location	Number of Parking Meter Posts
Superior Street to 1 st Street (East Side)	5
Superior Street to 1 st Street (West Side)	6
1 st Street to 2 nd Street (East Side)	8
1 st Street to 2 nd Street (West Side)	5
2 nd Street to 3 rd Street (East Side)	5

- B Posts—Concrete Sidewalk Installation: Bolt the Surface Mount Bases to the Concrete Walk and install the post into the base in accordance with the manufacturer's requirements.
- C Meter Bracket: Install the meter bracket in accordance with the manufacturer's recommendations.

SP-40.4 METHOD OF MEASUREMENT

The Engineer will measure Furnish and Install Parking Meter Post and Bracket by each post and foundation installed.

SP-40.5 BASIS OF PAYMENT

Payment will be made under Item 2540.601 (FURNISH AND INSTALL PARKING METER POST AND BRACKET) at the Contract bid price per Each, which shall be payment in full for all labor, equipment, and materials required to install the parking meter posts and brackets.

SPECIAL PROVISIONS Division SB - Duct Bank

1st AVENUE EAST SUPERIOR STREET TO 3RD STREET

City Project # 2100

City of Duluth, Minnesota 411 West 1st Street Duluth, MN 55802





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SP-4	(2550) DUCT BANK	. 6
SP-5	ELECTRICAL MANHOLE	. 8

CERTIFICATION

I HEREBY CERTIFY THAT THIS plan, SPECIFICATION, or report was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the State of Minnesota.

Danie/ haw Signature

Signature

April 18, 2023 Date Daniel G. Shaw, PE Typed or Printed Name

41423

License No.

SP-1 GOVERNING SPECIFICATIONS

A. The 2019 Edition of the 'City of Duluth, Minnesota Construction Standards' shall govern except as modified by these Special Provisions.

SP-1.2 REFERENCE STANDARDS

- A. <u>ASTM C109/C109M</u> Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens); 2021.
- B. <u>ASTM C150/C150M</u> Standard Specification for Portland Cement; 2022.
- C. <u>ASTM C430</u> Standard Test Method for Fineness of Hydraulic Cement by the 45-μm (No. 325) Sieve; 2017.
- D. <u>ASTM C490/C490M</u> Standard Practice for Use of Apparatus for the Determination of Length Change of Hardened Cement Paste, Mortar, and Concrete; 2021.
- E. <u>ASTM C618</u> Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2023.
- F. <u>ASTM C807</u> Standard Test Method for Time of Setting of Hydraulic Cement Mortar by Modified Vicat Needle; 2021.
- G. <u>ASTM C858</u> Standard Specification for Underground Precast Concrete Utility Structures; 2019.
- H. <u>ASTM C891</u> Standard Practice for Installation of Underground Precast Concrete Utility Structures; 2020.
- I. <u>ASTM C990</u> Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants; 2009.
- J. <u>ASTM C1107/C1107M</u> Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020
- K. <u>ASTM C1248</u> Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.
- L. <u>ASTM D3035</u> Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter; 2021.
- M. <u>ASTM D3350</u> Standard Specification for Polyethylene Plastics Pipe and Fittings Material; 2021.
- N. <u>ASTM D4832</u> Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders; 2016 (2018).
- O. <u>ASTM F714</u> Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter; 2022.
- P. <u>ASTM F1962</u> Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings; 2022.
- Q. <u>ASTM F2620</u> Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings; 2020a, with Editorial Revision (2021).
- R. <u>API SPEC 13A</u> Specification for Drilling Fluids Materials; 2022.
- S. <u>MAB (Municipal Advisory Board)</u> Guidelines for Use of Mini-Horizontal Directional Drilling for Placement of HDPE (PE4710) Pipe in Municipal Applications, MAB-7; 2020.

SP-2 (2550) 6" NON-METALLIC CONDUIT (DIRECTIONAL BORE)

SP-2.1 DESCRIPTION

A. This work consists of horizontal directional drilling and installing multiple 6" HDPE conduits in accordance with the details in the plans including all costs incidental thereto, including but not limited to all labor, equipment, and materials. The work includes two parallel bores. Each bore will install 3-6" HDPE conduits.

SP-2.2 MATERIALS

- A. HDPE Pipe and Fittings
 - Polyethylene pipe conforming to ASTM F714, Polyethylene (PE) Pressure Pipe and Fittings, 4" through 63". Pipe and fittings shall be PE4710, ASTM D3350 Cell classification 445574C, SDR 11. Joints and fittings shall be butt heat fusion type, ASTM F2620. Ends shall be plain for butt fusion joining. All fittings shall be molded if a molded fitting is available. All fabricated fittings shall be minimum SDR 9.
- B. Bentonite: API SPEC 13A, high swelling montmorillonite, capable of mixing with water to form a stable homogeneous suspension.
- C. Fly Ash: ASTM C618, Class F.
- D. Pea Gravel:
 - 1. Smooth and well-rounded.
 - 2. Free from deleterious material.
 - 3. Uniformly graded from 1/4-inch to 3/8-inch size with no more than 10 percent passing No. 4 sieve.
- E. Sand for contact or consolidation grouting:
 - 1. Clean natural silica sand.
 - 2. 100 percent passing No. 20 sieve.
 - 3. Maximum 20 percent passing No. 200 sieve.
- F. Select Granular Backfill: Conforming to MnDOT 3149.2.D.3 Select Granular Backfill.

SP-2.3 CONSTRUCTION REQUIREMENTS

- A. PREPARATION
 - 1. Locate positions of entry and exit pits. Excavate as required to accommodate equipment setting.
 - 2. In so far as possible, locate the equipment in such a way as to minimize the noise impact on surrounding properties.
 - 3. Establish elevation and horizontal datum for bore head control.
 - 4. Establish an area for pipe layout and assembly.
 - 5. Lay out and assemble pipes in a manner so as not to disrupt traffic or residential or commercial activities adjacent to the construction area. Obtain permission from the city for use of areas outside of the project limits if additional temporary workspace is needed to layout pipes.

- a. Assemble and join pipe on site using the butt-fusion method to provide a leak proof joint prior to insertion.
- b. Fusing shall be performed by personnel certified as fusion technicians by the manufacturer of the polyethylene pipe and/or the fusing equipment.
- c. The butt-fused joints shall maintain true alignment and shall have uniform rollback beads from the fusing process.
- d. Provide watertight joints with a tensile strength equal to that of the pipe.
- e. Allow adequate cooling time prior to the release of the pressure from the fusing unit.
- f. All joints subject to acceptance by the Owner's designated inspector prior to insertion.
- g. Cut out and replace all defective joints.

B. INSTALLATION

- 1. Pilot Hole:
 - a. Drill from entrance point to exit point following vertical and horizontal alignments shown.
 - b. Plot actual horizontal and vertical alignment of pilot hole as it advances.
 - i) Monitor the route taken by the drilling unit.
 - ii) Plot alignment at intervals no greater than 25 feet.
 - Provide the Owner's designated site inspector with position and inclination of pilot hole prior to the back reaming and pipe insertion for review of tolerance compliance.
 - c. Control groundwater and keep pilot hole open by using drilling mud under pressure or other methods.
 - d. Alignment:
 - i) Grade tolerance: conform to minimum and maximum depths shown on plans.
 - ii) Wall curvature: less than that which will produce wall stresses at 0.50 of yield stress of pipe after installation.
 - iii) If pilot hole is deviating from designed horizontal or vertical alignment, return pilot hole to proper alignment with no abrupt changes and at a rate not to exceed 1 foot per 50 feet of advance.
 - iv) If pilot hole does not conform to specified requirements, drill a new pilot hole meeting alignment requirement at no cost to the Owner.
- 2. Pipes Placement:
 - a. Obtain Owner approval prior to enlarging pilot hole and placing pipes.
 - b. Enlarge pilot hole using a back reamer to a diameter sufficient for pulling 3-pipes into position simultaneously.
 - c. Use a disconnect swivel set to limit the stress within the pipes to less than its elastic limit.

- d. Handle pipes in a manner that does not over stress the pipes.
 - i) Minimum pipe radius of curvature: conform to the limits set by the pipe manufacturer.
 - ii) If pipes are damaged or buckle during placement, remove the damaged section, and replace it with new pipe.
- e. Minimum of ten feet of pipe exposed at both ends of the bore.
- f. Clean exposed pipe ends for installation of fittings.
- 3. Disposal and Handling of Drilling Mud and Cuttings:
 - a. Make adequate provisions for the handling and containing of muddy water, drilling mud, and cuttings during drilling operations.
 - i) Do not discharge these materials into waterways.
 - ii) Conform with local regulatory requirements.
 - b. Construct mud pits at the entry and exit points to completely contain mud and prevent its escape.
 - c. Haul contaminants away to a legal disposal site.
 - d. Do not force drilling mud into waterways, or discharge onto the ground surface.
- 4. End Fittings:
 - a. Allow the installed pipes to reach equilibrium temperature with the surrounding environment before making any connections to the pipes or connecting the pipes to manholes.
 - b. Install a temporary cap or cover at the end of each pipe to prevent contamination from soil or debris.
- 5. Removing and Abandoning Pipe:
 - a. Remove and retain possession of all pipe that is not installed in conformance with all tolerances and test requirements.
 - b. Completely fill bore hole with grout, sand, or flowable fill to prevent future settlement.
 - c. Abandon pipe that cannot be withdrawn in place.
 - i) Cut pipe off at least 3 feet below ground surface.
 - ii) Record location of pipe on record drawings.
 - iii) Fill pipe and annular space with flowable fill.
- C. FIELD QUALITY CONTROL
 - 1. Survey the ground elevation above each pipe centerline before, during and after the directional drilling operations.
 - a. Conduct survey to an elevation accuracy of 0.1 feet.
 - b. Survey at 25-foot intervals along the pipe centerline.
 - 2. Measure daily during active operations above the work, and at least ten feet in front of the work.
 - 3. Provide a copy of the as-built survey data .csv file to the Owner.

- D. CLEANING
 - 1. Backfill and compact entry and exit pits up to subgrade elevations using Select Granular Backfill.
 - a. Below pavements, within 3 feet of subgrade: 100 percent (optimum moisture: -3 percent to +3 percent);
 - b. Below pavements, more than 3 feet below subgrade elevations: 95 percent (optimum moisture: -3 percent to +3 percent); and,
 - c. Below turf or landscaped areas: 90 percent (optimum moisture: n/a)
 - 2. Grade areas to match the original profile and make ready for surfacing according to the plans.
 - 3. Remove all equipment, supplies, excess excavation materials and miscellaneous items associated with the directional drilling operation and leave the site in a clean and tidy condition.

SP-2.4 METHOD OF MEASUREMENT

A. Measurement will be made by the linear foot of an acceptably constructed grouping of 3- 6" diameter HDPE conduits installed together in a single bore. Linear measurement will be made from electrical manhole to electrical manhole and not more than 1 linear foot of the pipe grouping will be measured from the inside wall of the electrical manhole without approval from the Engineer.

SP-2.5 BASIS OF PAYMENT

A. Payment will be under Item 2550.603 (6" NON-METALIC CONDUIT (DIRECTIONAL BORE)) at the Contract bid price per lineal foot of bore completed. Payment shall be compensation in full for all costs to construct a grouping of 3–6-inch conduits complete and in place including all costs incidental thereto, including but not limited to all labor, materials, equipment, excavation of bore pits, disposal of excavated material, boring, assembly of pipes, insertion of pipes, pull tape, import and placement of backfill and compaction of bore pits.

SP-3 (2550) CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. "()"

SP-3.1 DESCRIPTION

A. This work consists of connecting new electrical duct bank into and/or through existing electrical manholes in accordance with the details in the Plans.

SP-3.2 MATERIALS

- A. Epoxy Coated Reinforcement Bars
 - 1. Epoxy Coated Reinforcement Bars shall conform to the requirements of MnDOT 3301 for the type and size specified.
- B. Concrete shall be a dyed red, high-early 2,500 psi ready mix with 3/8-inch pea gravel.
- C. Concrete for Manhole -511 cover replacement shall conform to MnDOT 2461, Table 2461-6 Mix Number 3G52.

- D. Submittals: The Contractor shall submit the following for approval by the Engineer before being delivered to the site.
 - 1. Product Data: Provide data on materials and accessories.
 - 2. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

SP-3.3 CONSTRUCTION REQUIREMENTS

- A. General Provisions
 - 1. Saw-cut or core the concrete sidewall(s) of the existing electrical manhole to create an opening to receive the new electrical duct. Conform to the dimensions shown on the Plans for the required duct bank size.
 - 2. Drill and grout reinforcement bars into the existing electrical manhole sidewalls around the duct bank openings. The size, quantity, spacing and embedment depth of the reinforcement bars shall be as shown on the Plans.
 - 3. Install the new electrical conduits as shown on the Plans.
 - 4. Infill the opening in the electrical manhole sidewall and encase the electrical conduits using concrete. Conform to the details on the Plans.

SP-3.4 METHOD OF MEASUREMENT

A. The Engineer will measure CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. "(__)" for payment required by the contract. The Engineer will calculate each based on the locations shown on the Plans. The Engineer will not separately measure saw-cutting, reinforcement bar installation or concrete placement but all such work shall be considered included for payment under the Bid Item 2550.602 Connect into Existing Electrical Manhole No. "(__)".

SP-3.5 BASIS OF PAYMENT

A. The Engineer will measure the number of satisfactorily installed connections to existing electrical manholes. Payment will be under Item 2550.602 (Connect into Existing Electrical Manhole No. (___) at the Contract bid price per Each, including, but not limited to all labor, equipment and materials required to complete the work.

SP-4 (2550) DUCT BANK

SP-4.1 DESCRIPTION

- A. This work consists of constructing concrete duct bank in accordance with the Plans, the MnDOT standard specifications, the manufacturer's recommendations, the applicable NECA/NEIS/NEMA standards, and the following:
 - 1. Duct bank is hereby defined as a system of parallel ducts grouped together and installed in concrete as indicated in the plans and described in these special provisions.

SP-4.2 MATERIALS

- A. Electrical Conduit and fittings shall consist of Rigid PVC, Schedule-40, 6-inch with couplings in 10-foot lengths, furnished and installed by Contractor.
- B. All conduit spacers shall be furnished and installed by Contractor.
- C. Concrete for duct bank shall be a dyed red, high-early 2,500 psi ready mix with 3/8-inch pea gravel.
- D. Bedding: Duct bank shall be bedded on Aggregate Base materials meeting MnDOT 3138, Class 5.
- E. Structure Backfill: Duct bank trenching shall be backfilled with granular material meeting MnDOT 3149.2.D.1 Granular Backfill.

SP-4.3 CONSTRUCTION REQUIREMENTS

- A. Excavate for duct bank installation to depth and grade indicated in drawings.
- B. Compact the trench subgrade to a firm and unyielding condition with a ride-on vibratory compactor with a minimum compaction force of 9,000 pounds. Notify the engineer of soft spots for potential correction.
- C. Place class 5 aggregate base. Compact base to 100 percent relative compaction.
- D. Cut duct square using saw or pipe cutter; de-burr cut ends.
- E. Insert duct to shoulder of fittings; fasten securely using cement.
- F. Install no more than equivalent of three 90-degree bends between pull points.
- G. Provide suitable fittings to accommodate expansion and deflection where required.
- H. Stagger duct joints vertically in concrete encasement 6 inches minimum, center to center.
- I. Locate parallel ducts with 7-1/2 inches separation, center to center.
- J. Use spacers and chairs installed not greater than 8 feet on centers.
- K. Securely band ducts together and anchor ducts to prevent movement during concrete placement (every 8-ft minimum between spacers). Provide reinforcing bars driven 6-inches (min.) into aggregate base and through edges of spacers to stabilize the pipe and spacers during pour.
- L. Place concrete formwork that is true and plumb to the dimensions of the duct bank shown in the plans.
- M. Encase ducts in concrete. Provide minimum 3-inch concrete cover at bottom, top, and sides of duct bank. Place concrete under provisions of MnDOT 2461. Concrete shall obtain a minimum of 75 percent of the specified strength prior to backfill. In no case shall concrete be backfilled in less than 24 hours from completion of pour.
- N. Connect to existing concrete duct bank encasement or precast duct encasement using dowels.
- O. Connect to existing and new manholes as shown in the plans.
- P. Use suitable caps to protect installed duct against entrance of dirt and moisture. Clean and swab pipe as required.
- Q. Pass a mandrel (diameter ½" smaller than duct diameter and 6-inches long) through each duct. If mandrel fails to pass, investigate obstruction or misalignment and correct.
- R. Provide suitable pull tape (mule tape) in each empty duct except sleeves and nipples.

- S. Provide flared bell housing at interior of all manholes.
- T. Backfill duct bank excavation under the provisions of MnDOT 2105. Provide granular backfill meeting MnDOT 3149.2.D.1. Spread backfill in loose lifts of approximately 8-inches. The relative compaction of trench backfill shall conform to the following:
 - 1. Below pavements, within 3 feet of subgrade: 100 percent (optimum moisture: -3 percent to +3 percent);
 - 2. Below pavements, more than 3 feet below subgrade elevations: 95 percent (optimum moisture: -3 percent to +3 percent); and,
 - 3. Below turf or landscaped areas: 90 percent (optimum moisture: n/a)
- U. The Plans show the duct bank horizontal alignment and vertical profile elevations required and specific duct bank array configurations at each location. Rearrangements of the duct bank arrays may be required at connections to electrical vaults or to avoid utility conflicts. No change orders or modifications to the unit price bid for duct bank shall be permitted regardless of the number or type of such re-arrangements required. The minimum clearance and concrete cover depths shown in the plans shall apply to alternate duct bank configurations.

SP-4.4 METHOD OF MEASUREMENT

A. The Engineer will measure ELECTRICAL DUCT BANK TYPE () for payment for the type indicated as required by the contract. The Engineer will calculate linear feet of duct bank for each type indicated based on the dimensions shown on the Plans. The Engineer will not separately measure the various items that constitute the electrical duct bank construction including, but not limited to, conduit, concrete encasement, trench excavation and offsite disposal, subgrade preparation, bedding, class 5 aggregate base, duct installation, spacer installation, spacer anchors, duct banding, concrete reinforcement, concrete encasement, integral concrete color, pull tape, and backfill or trench backfill but all such work shall be considered included for payment under ELECTRICAL DUCT BANK TYPE () by the type and size indicated in the Plans.

SP-4.5 BASIS OF PAYMENT

A. The Engineer will measure the number of linear feet of satisfactorily installed ELECTRICAL DUCT BANK TYPE (). Payment will be under Item 2550.603 ELECTRICAL DUCT BANK TYPE () by the type and size indicated in the Plans at the Contract bid price per linear foot, including, but not limited to all labor, equipment and materials required to complete the work.

SP-5 <u>ELECTRICAL MANHOLE</u>

SP-5.1 DESCRIPTION

A. This work consists of furnishing and installing new concrete electrical manhole in accordance with the Plans and the standard specifications including, but not limited to all labor, equipment, materials, excavation, subgrade preparation, class 5 aggregate base, precast electrical manhole, polyethylene grade rings, connection of duct bank, installation of cover casting and backfill, and all costs incidental thereto.

SP-5.2 MATERIALS

- A. General Provisions / References
 - 1. Electrical Manholes shall conform to ASTM C858 and MnDOT Specification 2506.
- B. Pre-Cast Electrical Manhole
 - 1. Furnish and install precast concrete manholes having the shape and size indicated on the Plans. Manholes shall be comprised of modular, two-piece interlocking sections complete with accessories. A 38-inch nominal diameter access hole shall be provided in the top slab.
 - Pre-cast manhole joints shall be sealed with a butyl-rubber-based preformed flexible sealant conforming to ASTM C990. The material shall comply with ASTM C990 for Type B Gaskets and shall meet the testing requirements of EPA Method 524.2 for Drinking Water Volatile Organic Compounds.
 - 3. Provide EZ-STIK by Press-Seal Gasket Corporation or approved equal.
 - 4. Provide electrical duct bank openings in the manhole walls conforming to the sizes and locations indicated on the Plans.
 - 5. Provide a ground wire loop, 1-1/2" PVC ground rod sleeve in the manhole floor and 4pulling irons at the manhole corners.
 - 6. Provide a sump in the floor of the manhole having a pan and lid.
 - 7. No ladder is required.
- C. Cover Frame and Casting 36-inch Diameter
 - 1. Cover frames and castings will be supplied by the Contractor and installed by the Contractor.
- D. Manhole Adjustment Rings
 - 1. Adjustment rings shall be molded from high-density polyethylene as defined in ASTM D1248. The complete adjustment system utilizing the HDPE rings shall consist of the rings sealed to the manhole structure, casting, and each other by means of an approved butyl sealant. The Contractor shall utilize a combination of wedge rings and flat rings to achieve proper slope of the casting. Shims shall not be used. Concrete adjustment rings shall not be used.
- E. Non-Shrink Grout or Cement-base Polymer Modified Patching and Repair Mortar
 - 1. Non-shrink grout shall be a non-metallic type grout which is durable in wetting and drying, freezing and thawing conditions, and shall conform to the requirements set forth in ASTM C1107. Cement-based polymer modified patching mortar shall conform to the requirements set forth in ASTM C109, ASTM C490, and ASTM C807.
- F. Bedding
 - 1. Manholes shall be bedded on Aggregate Base materials meeting MnDOT Specification 3138, Class 5.
- G. Structure Backfill
 - 1. Manholes shall be backfilled with granular material meeting MnDOT Specification 3149.2.D.1, Granular Backfill.

- H. Submittals
 - 1. Shop Drawings: Submit dimensional fabrication and installation drawings to show details of items incorporated in the work.
 - 2. Product Data: Provide data on materials and accessories.
 - 3. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

SP-5.3 CONSTRUCTION REQUIREMENTS

- A. General Provisions
 - 1. Installation of Electrical Manholes shall conform to ASTM C891.
 - 2. Excavate for manhole installation to depth and grade indicated on the Plans.
 - 3. Compact the excavated area subgrade to a firm and unyielding condition.
 - 4. Place manhole bedding materials over the prepared subgrade area to the minimum depths as indicated on the Plans and compact.
 - 5. Install manhole level and at the orientation and elevation indicated on the Plans.
 - 6. Non-shrink grout or cement-based polymer modified patching mortar shall be used to patch lifting holes in the manhole.
 - 7. Install electrical duct bank and electrical conduits into manhole in conformance with the details on the Plans.
 - 8. Contractor shall use a combination of flat and sloping manhole adjustment rings to adjust the casting to the slope and grade of the roadway surface such that the top of the frame and casting are not more than 3/8-inch below the pavement surface. A straightedge will be place across the center of the installed casting and will touch both sides of the pavement. A measurement will be taken at the center of the casting. Castings that are measured at more than 3/8-inch below the pavement prior to final acceptance of the project will be raised to the prescribed depth of 3/8-inch. All costs associated with this corrective action will be assumed by the Contractor.
 - 9. Place Granular Backfill in loose lifts of approximately 8-inches thickness around sides of manhole and compact each lift. The relative compaction of structure backfill shall conform to the following:
 - a. Below pavements, within 3 feet of subgrade: 100 percent (optimum moisture: -3 percent to +3 percent);
 - b. Below pavements, more than 3 feet below subgrade elevations: 95 percent (optimum moisture: -3 percent to +3 percent)

SP-5.4 METHOD OF MEASUREMENT

A. The Engineer will measure ELECTRICAL MANHOLE for payment required by the contract. The Engineer will calculate each based on the quantity shown on the Plans. The Engineer will not separately measure the various items that constitute the electrical manhole construction including, but not limited to, structure excavation and offsite disposal, bedding, casting installation, duct bank connection to the manhole or structure backfill but all such work shall be considered included for payment under the pay item ELECTRICAL MANHOLE.

SP-5.5 BASIS OF PAYMENT

A. The Engineer will measure the number of satisfactorily installed ELECTRICAL MANHOLE. Payment will be under Item 2550.602 (ELECTRICAL MANHOLE) at the Contract bid price per each, including, but not limited to all labor, equipment and materials required to complete the work.

- END -

SPECIAL PROVISIONS

Division STM - Steam

1ST AVENUE EAST (SUPERIOR ST TO 3rd ST)

City Project # 2100

City of Duluth, Minnesota 411 West 1st Street Duluth, MN 55802
CERTIFICATION

I HEREBY CERTIFY THAT THIS plan, SPECIFICATION or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Signature

SEAN M McFARLING, PE Typed or Printed Name

<u>3/14/2023</u> Date 47062 License No.

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APPENDIX A GILSULATE INSULATION INSTALLATION MANUAL

STM-1 SUMMARY OF WORK

This work shall consist of the removal of existing steam piping and insulation and the installation of underground schedule 40 steel steam piping, fittings, and appurtenances. The steam piping shall be installed in a trench box and insulated with pour in place insulation. All work shall be performed according to these Special Provisions and the 2023 City of Duluth, Minnesota Construction Standards.

STM-2 COORDINATION WITH OTHER WORK

The Contractor shall coordinate with Duluth Energy Systems, the City, and their contractors. Coordination efforts will be considered as incidental to the cost of the project, and no additional compensation will be provided, therefore.

STM-3 STEAM VALVE OPERATIONS

Duluth Energy Systems representatives will perform all valve operations necessary to isolate, drain, and fill all steam piping. The CONTRACTOR shall be responsible for planning his/her work in accordance with the contract sequencing detailed in these Special Provisions. The Contractor shall notify the Duluth Energy System representative a minimum of one (1) week in advance of any work that is planned to occur on existing Duluth Energy System facilities (disconnection, reconnection, capping, etc.) where system shutdown or isolation is required. The CONTRACTOR shall be responsible for providing the materials necessary for removing water from the work site when required.

STM-4 THERMAL/WEATHER CONSTRAINTS

The following constraints shall be followed in the course of performing the work.

- Work on the steam system shall only be performed between May 1 and September 30 and when the daytime high temperatures are greater than fifty degrees Fahrenheit (50°F), and the overnight low temperatures are greater than forty degrees Fahrenheit (40°F).
- B. Backfilling shall not occur when the outside air temperature is below fifty degrees Fahrenheit (50°F).
- C. Tie-in connections to the existing steam system shall be completed in a continuous period.
- D. Night work on Duluth Energy System facilities shall only occur on Monday through Thursday nights, unless otherwise approved by Duluth Energy System and Duluth Energy System representative. The CONTRACTOR shall notify the Duluth Energy System Representative a minimum of five (5) working days in advance of any proposed nighttime work. The CONTRACTOR shall have enough staff onsite to perform all tie-in connection work during the time provided and shall remain on site until the pipe is re-activated and the welds are checked by the Duluth Energy System inspector.

STM-5 CONSTRUCTION SEQUENCING REQUIREMENTS

The following phasing sequence shall be followed for completing installation of Duluth Energy System facilities. The CONTRACTOR shall not deviate from this sequencing without prior written authorization from the City of Duluth and Duluth Energy Representative.

Segment 1 – Superior Street to 1st Street

Summary: Remove and replace existing buried steam expansion joints along existing steam piping from Superior Street project to MH500. Remove the roof slab of MH500 and replace with a new structural roof slab.

Parameters: Work shall occur between May 1, 2023 and September 30, 2023 and subject to the temperature constraints of **STM-4**.

Segment 2 – 1st Street E to 2nd Street E

Summary: Remove and replace existing buried steam expansion joints along existing steam piping from MH500 to the existing steam piping on the east side of 1st Avenue E at 2nd Street. Construct new steam trap manhole at the corner of 1st Avenue and 2nd Street. Connect to the existing steam piping at MH500 and 2nd Street.

Parameters: Work shall occur between May 1, 2023 and September 30, 2023 and subject to the temperature constraints of **STM-4**.

STM-6 (1201) PREQUALIFICATION OF BIDDERS

The provisions of MN/DOT 1201 are replaced with the following:

Duluth Energy Systems will require the following qualification information to be submitted with the Bids:

- A. Welding Procedure Specifications for welding on steel pipe (WPS).
- B. Procedure Qualification Records (PQR) corresponding to the submitted WPSs.
- C. Certification of Qualification for a minimum of three welders for the submitted WPSs. Each welder must submit coupon test results for upward and downward progression on specific pipe being installed.
- D. Coupon test results for each welder corresponding to each WPS.
- E. Reference documentation attesting to past experience installing steam piping systems. Such documentation shall include the name of the facility owner, location, date the work was performed, amount and size of pipe installed, and a contact name and phone number for verification purposes.
- F. The Bidders shall be responsible for all costs related to qualifying for the work specified in the Construction Documents. Including, but not limited to, labor, materials, consumables, testing services, and documentation.

STM-7 (1407) FINAL CLEANUP

The provisions of MN/DOT 1407 are supplemented with the following for work inside Duluth Energy System customer buildings:

- A. Remove temporary protective coating, barriers, and labels not required to remain.
- B. Clean finishes free of dust, stains, films, and other foreign material or substances.
- C. If applicable, clean and polish transparent materials, including mirrors, polished metal, and glass (interior and exterior).
- D. Clean resilient and hard surface floors, including exposed concrete floors, by sweeping and damp mopping.
- E. Where material or debris has washed or flowed into existing watercourses, ditches, gutters, drains, pipes, or structures during the Work, or elsewhere during the course of the Work, such material or debris shall be entirely removed and satisfactorily disposed or during the progress of the Work. Upon completion of the Work, the ditches, channels, drains, pipes, structures, and other areas shall be left in a clean and neat condition.
- F. Wipe surfaces of mechanical and electrical equipment clean; remove excess lubrication and other substances.
- G. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, areaways, and similar spaces.
- H. Clean light fixtures and lamps so the same will function with full efficiency.
- I. Clean permanent filters of ventilating equipment and replace disposable filters when units have been operated during construction. Clean ducts, blowers, and coils when units have been operated without filters during construction.
- J. Restore fire protection devices or control systems temporarily disabled for welding work.

STM-8 (1516) ACCEPTANCE

The provisions of MnDOT 1516.3 shall be supplemented by the following:

CONTRACTOR'S CLOSE-OUT SUBMITTALS

When Duluth Energy System has determined that the Work is acceptable under the Contract Documents and the Contract fully performed, Contractor shall prepare and submit the following related to the Steam Pipe:

- A. <u>Project Record Documents.</u>
 - 1. Maintain at Project Site for Duluth Energy System one (1) copy of Record Documents including Plans, Specifications, Addenda, Bulletins, Change Orders, and other Modifications to the Contract, plus Field Directives or other written instructions, reviewed submittals, and test reports to record actual construction conditions.
 - 2. Format for Record Documents
 - i. Project Manual and other information provided in a single .pdf file.
 - a. File name shall be in the following format:
 - Project Manual-[Project Name]-Project No. [Number]-[Contractor]
 - Legibly mark to record actual construction including manufacturers and catalog numbers used; suppliers of each product; and revisions to execution procedures.
 - c. Include Addenda, Change Orders, and other modifications.

B. <u>As Built Record Documents</u>

- 1. All Project Work of the Duluth Energy System's facilities (including piping, communication system equipment, heating conversion or connection interfaces) shall have as-built red-line drawings provided.
- 2. As-built red-lines shall be submitted on 8 ½" x 11" or 11" x 17" plan sheets and shall include notes on both plan and profile views.
- 3. The following supplemental information shall be provided in the form of red-line drawings to identify survey points and deviations from the Plans:
 - i. Isometric sketches of all pipe installations (may be combined with radiography/weld location sketch).
 - ii. Notation of modifications to the Conduit and Handhole layout.
- 4. It is the responsibility of the Contractor to ensure that they secure all of the necessary data and information to prepare and submit an accurate representation of the work completed in the field. Failure to secure required data prior to the concealment of the work may result in the re-excavation of the required components at the Contractor's expense.
- 5. The Contractor shall obtain verification of survey being performed from Duluth Energy System through signature or initials on an approved Steam Pipe Inspection and Testing Plan. *Duluth Energy System may halt pipe backfilling work around the Duluth Energy System's facilities at any time if it is known that the requisite survey has not taken place*.
- 6. Submission and Approval Process
 - i. The Contractor shall provide the red-lined plan to Duluth Energy System within one month of the substantial completion of each Phase of the Work. Following submittal, Duluth Energy System will provide a response to the Contractor within one month that shall include either an approval of the submittal or a request for

correction and/or additional information with respect to the data required. Upon request for correction, the Contractor shall have two weeks (14 days) to make corrections and return to Duluth Energy System for review.

a. Duluth Energy System's receipt of Project Record Documents, including drawings, shall not be a waiver of any deviations from the Contract.

MEASUREMENT AND PAYMENT

As-built documentation shall be incidental to the cost bid for the installation of Steam Pipe work.

STM-9 (1605) SUBSTITUTE MATERIALS

The provisions of MnDOT 1605 are supplemented with the following:

Specific manufacturers, materials, products, and equipment have been used in preparing the Contract Documents and thus establish minimum qualities for performance and appropriateness. Comply with specifications and reference standards as minimum requirements.

All bidders, contractors, suppliers, and manufacturers herein agree that, where a particular product or manufacturer is indicated, followed by a description of materials, special features, or performance criteria, the bidder, contractor, supplier, or manufacturer shall make all necessary modifications to their "Standard or Custom Products" to fully comply with the description of materials, special features, or performance criteria specified.

Submit to the Duluth Energy System a complete list of all subcontractors, suppliers, and products proposed to be used, with the name of the manufacturer and the installing subcontractor.

A. <u>Reference Standard Specifications</u>

Where products or materials are specified only by reference standard, provide any product meeting that standard. If the reference standard is followed by a description of materials, special features, or performance criteria, make all necessary modifications to "Standard or Custom Products" to fully comply with the description of materials, special features, or performance criteria specified.

B. <u>Descriptive Specifications</u>

Where products, materials, or pieces of equipment are specified by indicating a detailed description of the required properties, minimum attributes, special features, or performance criteria required, provide any product meeting that description. If descriptive specification is followed by a list of specified manufacturers and/or specified products, select product from only those manufacturers and specified products.

1. If manufacturer's standard product is listed in the specification and does not comply with the minimum description indicated, make all necessary modifications to "Standard or Custom Products" to fully comply with the description of materials, special features, or performance criteria specified.

- 2. If a list of specified manufacturers includes the following statement "Comparable Products of Other Specified Manufacturers", then select product only from manufacturers listed in the Special Provisions complying with the minimum attributes, special features, or performance criteria.
- 3. If list of specified manufacturers includes the following statement, "Comparable Products of Other Manufacturers", then select product from any manufacturer and product complying with the minimum attributes, special features, or performance criteria.

C. <u>Proprietary Specifications</u>

Where the desired products, materials, or equipment are indicated by specific manufacturer's name, brand name, model number, type designation, or other unique characteristics, provide only products listed in these Special Provisions, the Plans, or Details.

- 1. Where indicated in the Special Provisions as "No Substitution", bids must be based on the specific named products only.
- 2. Other manufacturers, even if listed as acceptable, must comply with the minimum levels of material, detailing, and dimensional restrictions established for the proprietary product.

STM-10 (1609) DEPARTMENT PROVIDED MATERIAL

The provisions of MnDOT 1605 are appended with the following:

A summary of Duluth Energy System furnished materials and equipment is as follows:

- A. Casting frames and lids
- B. Hyspan Expansion Compensators
- C. High-performance triple offset isolation valves
- D. Steam traps

The Contractor shall assume that items not included in the preceding list of materials shall be the responsibility of the Contractor to furnish, and shall be considered as incidental to the corresponding unit price bid items.

MANUFACTURERS INSTRUCTIONS

- A. Where Contract Documents require that installation of Work shall comply with manufacturer's printed instructions, <u>obtain and distribute copies of such instructions to</u> <u>parties involved in the installation</u>. Submit four (4) copies to the City of Duluth (two for the City and two for Duluth Energy Systems). Maintain one (1) set of complete instructions at the Project Site during installation and until Final Completion.
 - 1. Copies of manufactures printed instructions, where provided, will accompany material being used for construction. The Contractor shall verify that the necessary manufacturer's documents are received at the time material is transferred from the Duluth Energy System's storage facility.

- B. Handle, install, connect, clean, condition, and adjust products in accordance with such instructions and in conformity with Specifications. If Project conditions or Specifications conflict with manufacturer's instructions, consult with the Engineer for direction. Do not proceed with Work without clear instructions.
- C. Perform Work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless expressly modified or exempted by Contract Documents.
- D. Should a conflict exist between the Contract Documents and the Manufacturer's instructions, consult with Engineer for direction.

TRANSPORTATION AND HANDLING

- A. The Contractor shall be responsible for loading and transport of the necessary materials to the project site.
- B. The Contractor shall handle, haul, and distribute all materials and all surplus materials on the different portions of the Work, as necessary or required and shall be responsible for the protection, loss of, or damage to materials and equipment furnished by the Contractor or others until Final Completion and acceptance of the Work. Contractor and all subcontractors are responsible for all damaged items caused by their respective employees and agents (including subcontractors) and shall replace all such damaged items without additional cost to Owner.
- C. The Contractor shall deliver all surplus materials to the Duluth Energy System's storage facility at no additional cost at the completion of the Work.
- D. The Contractor shall arrange with material suppliers and manufacturers for delivery and entry of equipment to the site at a suitable time. Inform appropriate parties of the size of access available for equipment so assembly of large units of equipment on site may be considered when they are being manufactured.

STORAGE AND PROTECTION

- A. The Contractor is responsible for all costs of onsite storage and demurrage. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible.
- B. Store products subject to damage by the elements in weather-tight enclosures. Maintain temperature and humidity within the ranges required by manufacturer's instructions.
- C. Exterior Storage: Store fabricated products above the ground, on blocking or skids, to prevent soiling or staining. Cover products that are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.
- D. Provide substantial coverings to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.
- E. The Contractor is responsible for damaged items and shall replace such damaged items at no expense to Owner.
- F. All materials and equipment to be incorporated in the Work shall be placed so as not to injure any part of the Work or existing facilities and so that free access can be had at all

times to all parts of the Work and to all public utility installations in the vicinity of the Work. Materials and equipment shall be kept neatly piled and compactly stored in such locations as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants

STM-11 (2104) REMOVE ASBESTOS-CONTAINING INSULATION TYPE()

GENERAL NOTES

- A. Work covered under this section includes the removal and disposal of steam pipe insulation with asbestos-containing material (ACM). Abatement and demolition work associated with this section will include the removal, handling and disposal of all ACM and non-ACM materials associated with the steam pipe type to be removed. All work shall be performed in accordance with all applicable local, state and federal guidelines and regulations.
- B. Arrowhead Consulting & Testing, Inc (Industrial Hygienist) will perform area monitoring, and on-site inspections. Collecting of the contractor personal sampling in compliance with the OSHA standard (1926.1101) shall be the Contractor's responsibility. Arrowhead Consulting & Testing, Inc shall complete collection of work in progress and area samples on site during construction.
- C. All asbestos related work shall be performed by an asbestos abatement Contractor licensed in the State of Minnesota. The licensed asbestos abatement Contractor shall provide Certified and trained asbestos abatement workers and site supervisors during the handling and disturbance of any asbestos containing-materials. Additional training should include, but is not limited to: Hazardous Communication, Lock Out/Tag Out/ Confined Space, Hearing Conservation, and Respirator Care and Use. Contractor shall ensure compliance with the 40 CFR Part 61 otherwise known as the National Emission Standard for Hazardous Air Pollutants (NESHAP).
- D. When performing asbestos related activities, all trades other than the asbestos abatement contractor must be outside the regulated barrier that has been established by the asbestos abatement contractor.

SCOPE OF WORK

A. Remove asbestos-containing pipe and fitting insulation from steam lines. Removal must be completed using Minnesota Department of Health approved asbestos abatement methods when applicable. The insulation is part of a steam upgrade and includes asbestos containing insulation that may be present on existing steam piping. The asbestos abatement work shall be coordinated to occur concurrently or sequenced in conjunction with other related utility work along the project corridor.

B. Abatement conditions on the project shall be classified as follows:

Description	Remarks
ASBESTOS- CONTAINING PIPE INSULATION TYPE A	Sawcut and remove top of existing concrete tunnel/duct. Demolition/Abatement of ACM insulation, sprayed insulation & steel steam pipe.
ASBESTOS- CONTAINING PIPE INSULATION TYPE B	Sawcut and remove top of existing concrete tunnel/duct. Demolition/Abatement of ACM insulation & steel steam pipe.
ASBESTOS- CONTAINING PIPE INSULATION TYPE C	Demolition/Abatement of existing concrete tunnel/duct, ACM insulation, sprayed insulation & steel steam pipe.
ASBESTOS- CONTAINING PIPE INSULATION TYPE D	Demolition/Abatement of existing concrete encasement, ACM insulation, & steel steam pipe.
ASBESTOS- CONTAINING PIPES INSULATION TYPE E	Demolition/Abatement within existing steam vaults.
ASBESTOS- CONTAINING PIPE INSULATION TYPE F	Demolition/Abatement of existing service laterals consisting of steel pipe, ACM insulation, with "tar paper" wrap.

GENERAL CONDITIONS

- A. The Asbestos Abatement Contractor shall submit proper notifications to all local, state and federal regulatory agencies including but not limited to the MPCA/ MDH Notification of Asbestos Related Work (form w-sw4-06). Any required permit fees shall be the responsibility of the Contractor. The Minnesota Pollution Control Agency and Minnesota Department of Health shall be notified when asbestos-related work meets or exceeds 260 linear feet of friable asbestos-containing materials on pipes, 160 square feet of friable asbestos-containing material on other facility components, or, if linear feet or square feet cannot be measured, a total of 35 cubic feet of friable asbestos-containing materials on or off all facility components in one facility. MPCA notification requires 10work day advanced notification prior to commencing asbestos abatement activities. The MDH requires 5-calendar day notification prior to asbestos abatement activities.
- B. The Asbestos Abatement Contractor will properly transfer containerized asbestos containing waste from worksite to an enclosed and secured dumpster and/or enclosed truck and properly dispose of the asbestos-containing waste in an asbestos approved landfill.

C. The Asbestos Abatement Contractor is responsible for submitting contract documents 1 through 2 in submittals section within 5-days of award of contract, planning and permit documents 2 through 10 within 2 weeks of commencing work, disposal document 11 with pay applications and project completion documents 12 and 13 in submittals section within thirty (30) days of project completion so a final report can be completed.

SUBMITTALS

Submittals documents A through J shall be submitted to the Industrial Hygienist. Submittals documents K through M shall be submitted to the Owner and/or Owners Representative. Contractor shall submit the following documents:

- A. Certificate of Insurance;
- B. Copy of the Asbestos Abatement Contractor's and Subcontractor's current Minnesota Asbestos Abatement Contractor License.
- C. Copy of the Asbestos Abatement and Emission Control Plan that meets the requirements of part 4620.3560, Subpart 3 of the Minnesota Department of Health (MDH) Asbestos Abatement Rules and in conformance with the requirements of 40 CFR 61.145.
- D. Copy of local, state and federal permits listed above including but not limited to MPCA/MDH completed "Notification of Asbestos-Related Work" notification and MDH permit.
- E. Name, experience, and training of person to be Site Supervisor of the project. Provide evidence person is accredited as an Asbestos Site Supervisor in accordance with MDH regulation part 4620.3310.
- F. Delineation of responsibility of work site supervision, names, and home telephone numbers.
- G. Safety Data Sheets (SDS) on encapsulants, sealers, and all other potentially hazardous materials to be used on the project.
- H. Explanation of the handling of asbestos contaminated waste including DOT identification number of hauler.
- I. Copy of the plan to comply with OSHA compliance monitoring including the name and qualifications and AIHA certification number of Contractor's testing laboratory for OSHA compliance monitoring.
- J. Written description of emergency procedures to be followed in case of injury or fire. This section must include evacuation procedures, source of medical assistance (name and telephone number) and procedures to be used for access by medical personnel.
- K. Copies of disposal tickets and manifests shall be submitted with the application for payment.
- L. Copies of all transport manifests, trip tickets and disposal receipts for all asbestos waste materials removed from the work area during the abatement process. Documentation shall include date of removal, type of waste removed, quantity by weight and volume, and final destination. (Project Completion Submittals)

M. A copy of Contractor's daily logs and sign in/out sheets. (Project Completion Submittals) STM-10

PERSONAL PROTECTION

Asbestos Abatement Contractors and/or Subcontractors shall ensure their employees are protected in accordance with all local, state and federal regulations.

Personal protective equipment (PPE) will include the following:

- A. Respirators shall be worn as required by the OSHA standard. Minimum protection is ½ face respirator with P-100 filters. Supplemental filters are required when using a product that requires additional protection. Review Safety Data Sheets (SDSs) for proper filters, as needed.
- B. Full disposable suits with hoods and booties must be TYVEK or equivalent.
- C. Gloves that will protect the hands from environmental conditions.
- D. Eye protection to protect against hazards. Minimum protection shall be safety glasses with side shields.

PRODUCTS

There are no unique products required for completion of asbestos abatement. Contractors must have SDSs onsite for the chemical products that are brought to the jobsite.

All references to polyethylene sheeting in this Specification means the material will be a minimum thickness of 6-mil.

WORK PROCEDURES

- A. Secure work area to prevent access by unauthorized personnel. Barriers shall be positioned at sidewalks during asbestos abatement activities to separate pedestrians from work area.
- B. Lock Out/ Tag Out equipment when required.
- C. Coordinate activities to permit access by other trades required for the work, enabling them to complete work which is assigned to them.
- D. Accomplish all work required by contract drawings, including work specifically noted plus additional work related to specific work noted.
- E. Decontaminate all horizontal surfaces in the work area utilizing HEPA filtered vacuums and wet wipe methods.
- F. Hand pick asbestos debris that may be in soil under exposed friable asbestos-containing materials. The material shall be adequately wetted and placed in an asbestos disposal bag.
- G. All wet soil from cutting operations or wetting of broken pipe must be removed immediately and managed as asbestos containing waste material.
- H. Removal of asbestos-containing materials must be completed in accordance with the Minnesota Department of Health Asbestos Abatement Rules. Removal methods are summarized below.

- 1. Where applicable (inside vaults), construct a full enclosure with attached five-stage decontamination. Containments shall be constructed when exposed friable asbestos-containing materials to be removed exceeds 10-square feet and/or 25- linear feet per project/event. Negative pressure of -0.02 inches of water shall be established prior to removal. Air inside containment shall be filtered through a HEPA- filtered ventilation system exhaust in accordance with MDH asbestos abatement rules. Asbestos materials must be adequately wet during removal and placed and sealed in containers while wet. Clean all interior surfaces upon completion of gross abatement inside enclosure system. Visually inspect after post cleaning and removal of containment walls and floors. Area air samples will be collected by the Industrial Hygienist outside the enclosure per MDH requirements. Five clearance samples are required to clear enclosure. All sample must achieve MDH clearance standard of less than 0.01 fibers per cubic centimeter of air.
- 2. Where applicable, use MDH approved glovebag methods. Glovebag methods can be used when the amount of exposed friable asbestos-containing materials to be removed is less than 10-square feet or 25-linear feet per project/event or a total of 160-square feet or 260-linear feet per calendar year. A remote decontamination unit must be available for use per MDH rules. Polyethylene sheeting shall be placed on the floor/ground under glovebag after the area has been pre-cleaned. Asbestos containing material must be adequately wet inside the glovebag prior to removal. Glovebags cannot be reused or slid down a pipe run. All exposed ends must be sealed with a bridging encapsulant. Glovebags must be collapsed with a HEPA vacuum. Area air samples will be collected by the Industrial Hygienist per MDH requirements.
- 3. Where applicable, abandoned pipes and asbestos insulation may be removed by wrap and cut methods. Lines must be properly drained and disconnected prior to cutting out pipe. Lock Out/Tag Out procedures may apply. A remote decontamination unit must be provided by the Contractor and used by all asbestos workers. Pipes shall be wrapped with two layers of polyethylene sheeting. Insulation removed must be completed using MDH approved glovebag methods. All wrapped pipe shall be properly labeled. Area shall be visually inspected for residual asbestos-waste. Area air samples will be collected by the Industrial Hygienist per MDH requirements.
- 4. Where applicable, abandoned asbestos containing pipe runs inside concrete may be removed intact. A Minnesota certified asbestos worker shall cut concrete tunnel/duct in manageable sections, abate asbestos containing materials using MDH approved glovebag methods, and lift the pipe and concrete tunnel/duct sections into asbestos waste containers. The exposed asbestos ends must be sealed with two layers of 6-mil polyethylene sheet prior to placing in waste container.

Contractor shall coordinate disposal, salvage or recycling of non-ACM material removed during the steam utility demolition. Contractor shall be responsible for separation, handling, disposal, salvage methods to be used. Non-ACM waste shall not be staged on site.

AIR MONITORING

Perimeter air monitoring will be conducted in the work zone during all asbestos abatement activities by the onsite Industrial Hygienist and paid for by the Owner. Air monitoring collection STM-12

points will be located within 10-feet of asbestos abatement activities in areas where public pedestrian walkways and trade construction personnel border the established asbestos work zone. Air monitoring will document potential airborne asbestos fiber exposures to general population using the walkways (sidewalks)and non-ACM construction workers completing trade work nearby. Samples will be submitted for analysis with a 24- hour turnaround time. Contractor will be notified within 24 to 48-hours of any results that identify quantifiable levels so adjustments to methods, exclusions zones and personnel protective equipment can be implemented as needed.

WASTE DISPOSAL

Disposal of asbestos waste must be in accordance with local, state and federal regulations. Asbestos-containing waste must be placed in asbestos waste bags, double bagged and goose necked or placed in sealed drums and properly labeled. All asbestos waste must be fully encapsulated and transported in closed trucks or roll-off containers which have been lined with polyethylene sheeting.

Waste must be hauled to a landfill approved to accept asbestos waste. Waste disposal manifests must be submitted with application for payment and/or within one month from project completion to the Owner and/or Owner's Representative.

MEASUREMENT AND PAYMENT

A. <u>Bid Item 2104.603, "Remove Asbestos Containing Pipe Insulation Type X"</u> shall be measured by type specified at the Contract bid price per linear foot. Abatement includes the removal and disposal of all ACM and non-ACM materials associated with each steam pipe insulation condition type. Material to be removed include but are not limited to: concrete duct, anchors, guides, insulation, and ACM. Steel steam piping with asbestos insulation will be paid for under the corresponding bid item. Payment for each asbestos abatement type will be by the type specified at the Contract bid price per linear foot, which shall be payment in full for all wet sawing, abatement, permits, disposal fees, loading and hauling of the material, and all associated costs. Measurement for each type of removal will measured from center to center of junction fittings, catch basins, or manholes.

STM-12 (2105) EARTHWORK AND PIPE BACKFILL

REFERENCES

- A. <u>Minnesota Department of Transportation Standard Specifications for Construction, 2019</u> Edition (MnDOT), Section 2105 – Excavation and Embankment.
- B. <u>American Society for Testing and Materials (ASTM):</u>
 - 1. ASTM C33: Specification for Concrete Aggregates;
 - 2. ASTM D422: Method for Particle Size Analysis of Soils;
 - 3. ASTM D1556: Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

- 4. ASTM D2922: Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (shallow depth);
- 5. ASTM D3017: Test Method for Moisture Content of Soil and Soil-Aggregate Mixtures;
- 6. ASTM D4318: Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

SUBMITTALS

Submit material qualification tests, field density test reports and other noted items directly from testing laboratory. The following Submittals are required for portions of the Work specified in this Section.

A. <u>Materials Qualification Test</u>

A submittal is required directly from a testing lab to indicate that a proposed soils material complies with Contract Document requirements.

- 1. Provide the following information and qualification tests for each specified soils material type, including on-site materials, prior to use on project.
 - i. Source Location prior to delivery to site;
 - ii. Name of material and gradation analysis, ASTM D422;
 - iii. Liquid limit, plastic limit and plasticity index, ASTM D4318 (cohesive soils materials only, but not required for topsoil);
 - iv. Proctor density or relative density information according to test method identified in compaction requirements paragraph (not required for topsoil);
 - v. Constituent analysis (topsoil only).
- 2. This requirement applies to each new source of similar materials, for every 3,000 cubic yards of soils material taken from the same source, and at any time a visual difference in the material is observed by the Owner, its representatives, or Duluth Energy Systems.

SITE CONDITIONS

- A. The steam portion of the Work is not designed to create an earthwork excavation and backfill balance.
 - 1. Additional soils material needed for bedding or backfill of the steam pipe shall be imported.
 - 2. Unsuitable, unstable, and excess soils material generated by the Work shall be disposed off-site in a legal manner unless noted otherwise.
 - 3. There will be no change in Contract amount or time because of importation or disposal of soils materials.
- B. All grade subsidence or loss of soils material resulting from required construction activities is considered incidental to the Work. No additional payment will be considered for furnishing or placing any material required to achieve indicated design grades or subgrades.

C. Protect all excavation bottoms against freezing when the atmospheric temperature may be less than 35 degrees Fahrenheit during the excavation and open trench period.

PRODUCTS

A. <u>Soils Materials</u>

- 1. Unless otherwise indicated, all specified soils materials are assumed to be imported.
- 2. Structure (vaults, manholes, etc.) Backfill
 - i. Material meeting the requirements of MnDOT 3149.2D.2 Structural Backfill

EXECUTION

- A. <u>Examination</u>
 - 1. Examine the areas and conditions under which backfilling is to be performed. Contact Duluth Energy Systems to verify all pipe bedding and backfill is acceptable. The Contractor shall not proceed with pipe installation until unsatisfactory conditions have been corrected, and acceptance by the Duluth Energy Systems Representative is obtained through signature or initials on an approved steam Inspection and Testing Plan.
 - 2. Verify and assume full responsibility for adequacy of bearing and foundation conditions for all construction equipment utilized for excavation and pipe and structure placement.
 - 3. Footing/Foundation Subgrade
 - i. Coordinate observation by Duluth Energy Systems of footing/foundation subgrade prior to associated concrete placement and comply with required corrective procedures to obtain satisfactory subgrade.
 - ii. Provide documentation to Duluth Energy Systems indicating that subgrades meet or exceed design bearing values shown on plans.
- B. <u>Site Water Control & Dewatering</u>
 - 1. **Do not allow** groundwater, surface water or direct precipitation to accumulate in excavations or on exposed subgrades.
 - i. Steam piping insulation is particularly susceptible to damage from excessive water. *Trenches must be maintained free from standing water at all times.*
 - ii. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations.
 - Provide and maintain pumps, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations. Establish systems to ensure water is removed during nonconstruction periods.
 - 2. Failure to adequately maintain a trench free of water will result in the rejection of the pipe installation at the discretion of Duluth Energy Systems, with no additional compensation provided to the Contractor. Replacement of any and all pipe or insulation rejected as a result of the Contractor's failure to maintain adequate trench

drainage or dewatering shall be the responsibility of the Contractor. This shall include, but not be limited to, excavation, removal of previously installed components, purchase of replacement piping, fittings, valves, joint kits, etc., welding, insulating, jacketing, and backfilling of the replacement piping.

C. Excavation and Rough Grading

- Unless agreed to be extra work by Duluth Energy Systems, all excavation, and stone/rock foundation wall removal for the steam piping installation shall be included in the Work and will not be subject to a Contract price adjustment, excluding rock/bedrock excavation paid for under the Bid Item 2105.607, Trench Excavation Class R.
- 2. Excavate to a depth and limits required for construction of steam piping, insulation, valves, fittings, and structures.
- 3. Remove unsuitable and unstable materials in accordance with this Specification.
- 4. Excavate and grade to elevations and dimensions shown in the Plans within a tolerance of 0.10' (+/-) for pipe installation, and 0.05' (+/-) for footing/foundation installations.
 - i. Once elevations are set, take care not to disturb the bottom of the excavation prior to pipe or concrete installation.
 - Excavations under joint locations, "bell holes", for welding will only be allowed where welding is not feasible outside of the trench or with pipe on cribbing.
 Where permitted, bell holes shall be constructed to provide approximately 1' of space below the pipe and long enough to permit proper welding of pipes, insulation, and HDPE jacket jointing.
 - iii. The Contractor may choose to excavate the entire trench to a depth that allows workers to work under the pipe at its own risk, and no additional compensation for extra excavation, rock excavation, or pipe bedding material will be provided.
- 5. Extend excavation limits a sufficient distance from footings and foundations to permit placing and removal of trench boxes, concrete form work, and other required construction and inspection tools.
- 6. For rock excavation and foundation wall removal areas, level all areas for pipe or footing foundations on rough or sloping rock planes.

D. <u>Backfill Construction Prerequisites</u>

- 1. Backfill excavations and construct fills as promptly as work permits, but not until completion of the following activities:
 - i. Testing and approval from Independent Testing Laboratory of all imported or select on-site fill materials;
 - ii. Acceptance of construction below finish grade;
 - iii. Inspection, testing, approval, and recording of locations of underground utilities;
 - iv. Removal of concrete form work;

- v. Removal of shoring and bracing, and backfilling of voids with satisfactory materials;
- vi. Completion of waterproofing or damp-proofing, if required;
- vii. Removal of trash and debris;
- viii. Completion of permanent lateral bracing of foundations walls;
- ix. Testing and acceptance Independent Testing Laboratory of subgrades to receive fill, subbase or base course.
- x. All requisite pipe testing has occurred in accordance with **STM-13 Steam and Condensate Piping System**.
- E. <u>Compaction Requirements</u>
 - Compact Pipe Bedding and Pipe Backfill materials according to the requirements of the "Specified Density Compaction" method as detailed in MnDOT Section 2105 – Excavation and Embankment, Part 2105.3F and 2105.3F.1. The minimum sampling and testing for compaction shall be in accordance with the requirements found within the City of Duluth Construction Standards and Schedule for Materials Testing (Appendix B).
 - 2. Penetration Index (PI) testing shall not be performed on Pipe Backfill Material for steam piping.

F. <u>Filling And Backfilling</u>

- 1. Support walls laterally as required to prevent displacement and protect waterproofing, insulation, and all underground piping utilities and structures.
- 2. Do not place fill on unsuitable material as defined, insufficiently compacted material, snow, ice, mud, or frozen material.
- Do not operate heavy equipment closer to walls than a distance equal to height of backfill above bottom of footing. Do not operate tampers within six inches (6") of pipe.
- 4. Commence filling at lowest portion of structure or backfill area.
- 5. Advance first lift of fill material in front of hauling and spreading equipment with that equipment traveling on the lift to avoid disturbance of sensitive subgrade soils or damage to the pipe.
- 6. Fill uniformly in horizontal layers, over approved subgrade.
 - i. For compaction areas using heavy equipment, provide successive lifts of 8" maximum loose thickness.
 - ii. For compaction areas using light weight equipment (e.g. "whacker"), use maximum loose thickness of 4".

- 7. Moisten or dry material(s) by selected methods to maintain moisture content per ASTM D3017 within 3 percent of optimum when placing and compacting to specified density.
 - i. Provide water required to obtain optimum moisture content of materials to obtain specified density.
- 8. If there is a break in the continuity of filling operations in an area, scarify top 6" and compact constructed subgrade to same minimum percentage of maximum density as layer of new work immediately above subgrade before continuing fill operations.
- 9. Provide testing of each successive lift in conformance with compaction requirement paragraph.
- 10. Scarify, remove, recompact, or otherwise rectify all soft or yielding areas resulting from Contractor's operations, rain, or other forces and test before new fill or construction is placed.
- 11. Maintain previously compacted material and recompact and fill as necessary to keep fill or subgrade to specified density and elevations.
- G. <u>Field Density Tests:</u>
 - 1. The City of Duluth, or its contracted third party testing company, shall perform compaction testing for Quality Control purposes. The Contractor shall coordinate and cooperate with the City to provide appropriate notification and access to perform the testing in the location specified.
 - 2. Contractor shall excavate any areas of failing compaction tests, and replace at near optimum moisture, re-compact and retest all areas failing to meet compaction requirements at no additional cost to the Owner or Duluth Energy Systems.

MEASUREMENT AND PAYMENT

All costs of excavating to foundation grade, dewatering, preparing the foundation, furnishing and installing bedding materials, placing and compacting backfill materials, and other work necessary for prosecution and completion of the work as specified, shall be included for payment as part of the relevant Contract bid items without any direct compensation being made therefore.

1. No payment will be made for structure excavation or trench excavation of concrete structures. All costs for excavation, foundation preparation, dewatering, and separating unacceptable materials shall be considered incidental to relevant Contract bid items.

STM-13 (2509) STEAM AND CONDENSATE PIPING SYSTEM

GENERAL

This work consists of installing a steam pipe in a trench box to be filled with a pour in place insulation material. The system shall be provided as specified below and shown on the drawings.

A. <u>Summary</u>

1. The district energy heating pipes carry steam under pressure in a district energy network. Install steam piping as indicated on the Plans and as herein specified.

2. Means for expansion must be made in pipe offsets or loops unless this is compensated for integrally in the system.

B. <u>References and Standards</u>

- Other than by reference, listed references, standards and specifications are not contained in this Specification. Unless otherwise noted, the most current version of the standard or reference is applicable. Obtain, become familiar with and, where indicated or inferred, conform to the listed references and standards. References and standards are considered minimum requirements unless indicated otherwise. Any references to methods of measurement or payment in references and standards are not applicable. Tolerances in references and standards are applicable only if not indicated otherwise in this Specification. In event of conflict between the references or standards and this Specification, this Specification applies.
- 2. American Society for Testing and Materials (ASTM):
 - i. ASTM A36: Specification for Structural Steel;
 - ii. ASTM A53: Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless;
 - iii. ASTM D3034: Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
- 3. American Society of Mechanical Engineers (ASME) / American National Standards Institute (ANSI):
 - i. ASME B31.1 Power Piping
 - ii. ASME BPV Section II: Material Specifications
 - iii. ASME BPV Section IX: Welding and Brazing Qualifications
 - iv. ANSI 16.3
 - v. ANSI 16.4
- 4. American Welding Society (AWS):
 - i. AWS D10.12: Recommended Practices and Procedures for Welding Low Carbon Steel Pipe
 - ii. A2.4: Symbols for Welding and Non-destructive Testing
 - iii. A3.0: Welding Terms and Definitions

SUBMITTALS

The following submittals are required for portions of the Work specified in this Section.

A. <u>Certificate of Compliance</u>

A Submittal in letter form to indicate a product or portion of the Work complies with the Contract Documents.

- 1. Provide certificate of compliance for the following items. Certificate must be generated by the manufacturer or supplier and must be notarized.
 - i. Welding electrode
 - ii. Pipe and fittings
 - iii. Gilsulate Insulation
 - iv. Expansion Pads
 - v. Valves
- B. <u>Welding Procedure Specifications (WPS)</u>
 - 1. Welding procedures specifically covering all erection welds to be made as part of the Work shall be submitted to the Engineer for review and release before welding is initiated.
 - 2. WPSs shall be prepared in sufficient detail to ensure that the following items, as a minimum, are included and clearly described:
 - i. The applicable requirements of this Specification, of ANSI B31.1, Power Piping, and all of the essential and nonessential variables required by ASME BPV Section IX.
 - ii. A dimensioned sketch of the actual weld joint to be used for the erection welding. Superimposed on this sketch or on a separate sketch for this purpose, shall be the pass sequence proposed to be used. Variations in thickness, joint geometry and pass sequence proposed to be covered and used shall be covered by separate sketches, but may be contained within the same procedure, provided essential variables are not violated.
 - iii. The procedure to be followed for the handling and storage of low hydrogen electrodes and other welding materials. This item may be included in a separate procedure.
 - iv. The weld joint preparation methods that are proposed for use on the piping components.
 - v. The ASME or ASTM (as applicable) Specification, the grade and P-number of the base material to be welded.
 - vi. The pipe diameter and/or base metal thickness range covered by the procedure.
 - vii. The ASME Specification and AWS classification number of the filler metals to be used. Also the "F" and "A" numbers.
 - viii. The type, polarity and range of current and the voltage to be used.
 - ix. Preheat, interpass and post-weld heat treatment temperatures and procedures involved.
 - x. Slag removal and/or other weld cleaning methods proposed for use.
 - xi. Quality control methods proposed to be used.

- 3. Each welding procedure submitted shall have an identifying title, unique number, revision number, or letter and date, identifying it in such a manner as to preclude it from being confused with any other procedure used for erection.
- 4. Each welding procedure shall be identified with the piping system on which it will be used. This may be accomplished by incorporating this information into the welding procedure or by a separate listing combining all piping systems and the welding procedures applicable to each piping system.
- 5. A typical Welding Procedure Specification (WPS) form is contained in Part QW, Appendix A, QW 482 of ASME BPV Section IX.
- C. <u>Welding Procedure Qualification Record (PQR)</u>
 - 1. Welding Procedure Qualification Records (PQR's) shall be submitted to the Engineer for review and release for each welding procedure submitted to be used in the piping system.
 - 2. The PQR submittal shall include sufficient information in the test records to cover, but not necessarily be limited to:
 - i. The welding procedure number.
 - ii. The test plate(s) identification number(s).
 - iii. The identification of the welder used for welding the procedure qualification test plate.
 - iv. The ASME or ASTM Specification and grade of base material used, P-number and pipe diameter and/or wall thickness.
 - v. The ASME Specification and AWS Classification number of the filler metal used. Also the ASME "F" and "A" numbers.
 - vi. The configuration of the test specimen(s) used and their identification number(s).
 - vii. The individual and organization who conducted the test(s).
 - viii. The test(s) date(s) and results.
 - ix. The certification signed by person responsible for the qualification activity.
 - 3. A typical Procedure Qualification Record (PQR) form is contained in Part QW, Appendix A, QW-483 of ASME BPB Section IX.
- D. <u>Welder Performance Qualification</u>
 - 1. The Certification of Qualification for all welders and tack welders that are to be used for erection welding on piping systems covered by this Specification shall be submitted to the Engineer for review prior to their use for erection welding.
 - i. Any erection welds made by a welder in piping systems covered by this Specification, prior to Engineer receiving written confirmation of welder qualification and demonstration of welding abilities on thin-walled steel piping shall be subject to radiography, if applicable, or removal, at Engineer's discretion, the cost of which shall be borne by the Contractor.

- 2. All welders and tack welders to be employed in the erection of piping systems covered by this Specification shall be qualified by tests in accordance with the requirements of ASME BPV Section IX.
- 3. The welder and tack welder qualification tests shall be conducted for or by the specific erection Contractor performing work on the Contract. The transfer of performance qualification tests between contractors or subcontractors is not permitted.
- 4. Sufficient information shall be included in the record of performance qualification test to cover but not necessarily be limited to:
 - i. The name and identification number of the welder or tack welder being tested.
 - ii. The welding procedure used.
 - iii. The test plate(s) identification number.
 - iv. The ASME or ASTM Specification and grade of the base material used, P-number and the pipe diameter and wall thickness.
 - v. The ASME Specification and AWS Classification of the filler metal used. Also the ASME "F" and "A" numbers.
 - vi. The configuration of the test specimen(s) used and their identification number(s).
 - vii. The individual and organization who conducted the test(s).
 - viii. The certification signed by person responsible for the qualification activity.
- 5. A typical record of welder or welding operator qualification test form is contained in Part QW, Appendix A, QW 484 of ASME BPV Section IX.
- 6. All welders and tack welders that are to perform work on the Duluth Energy Systems' piping as part of the Contract shall perform the Welder Performance Qualification Test on thin-walled steel piping at a location, as determined by Duluth Energy Systems, prior to the welder performing any work on the Contract. All tests will be prepared, welded, and tested in accordance with the requirements of ASME BPV Section IX. Test coupons shall be examined by radiography Duluth Energy Systems will provide piping materials for the purpose of such qualification, and Owner will provide representatives to witness the testing, and reserves the right to reject acceptance of the Welder Performance Qualification tests through the Contract if the welder is unable to exhibit the ability to work on thin-walled steel piping during the qualification tests.

E. <u>Welding Contractor Requirements</u>

The Contractor performing the work on the Duluth Energy Systems piping shall provide reference documentation attesting to their past experience installing pressurized steel steam piping. Such documentation shall include the name of the facility owner, location, date the work was performed, amount and size of pipe installed, and a contact name and phone number for verification purposes.

F. <u>Product Data</u>

Provide manufacturer's data and technical specifications on the following Contractor furnished products, where applicable. Marketing or sales literature is not acceptable.

- 1. Schedule 40 steam piping and fittings
- 2. Schedule 80 condensate piping and fittings
- 3. Fittings, including but not limited to, elbows, tees, and flanges.
- 4. High temperature coating
- 5. Isolation valves
- 6. Steam traps
- 7. Check valves
- 8. Strainers
- 9. Insulation materials
- G. Special Reports
 - 1. Pipe Cleaning and Flushing Procedure
 - 2. Alignment and Grade Report (Survey Points File)
 - 3. Record Drawing
 - 4. Weld Identification
 - The weld identification method to be used for the Project shall be in the form of an "isometric" drawing showing the location of all welds with the corresponding welder I.D. for each weld The Welding Isometric Drawing shall be included with the Final Records and submitted to the Engineer at the conclusion of the project. The Welding Isometric Drawing should to show the location of all radiographs taken on the Project as well as Liquid Penetrant Examination weld numbers.
 - ii. After completion of a weld joint, the welder shall identify his work in the manner specified by the erecting Contractor.

H. <u>Testing Reports</u>

1. Dye Penetrant and X-Ray Tests

DELIVERY, STORAGE, AND HANDLING

A. <u>Materials Inspection</u>

For Owner supplied materials, the Contractor shall inspect materials at time of pickup and sign the Material Transfer Record indicating receipt of the materials in good condition.

- B. <u>Pipe Storage and Handling:</u>
 - 1. Store pipe and fittings to prevent damage by heat, sunlight, weight deflection, or other environmental conditions.
 - 2. Protect ends of all piping materials, including fittings from damage prior to jointing.

- 3. If a specific pipe material is subject to deformation from specific environmental conditions, store and deliver pipe to trench in enclosed or shaded transport with controlled environment as necessary to protect pipe.
- 4. Take extreme care in the handling of pipe with interior and/or exterior coatings and wraps to prevent damage prior to installation.
- 5. Materials shall be stored as to facilitate inspection and ensure preservation of the quality and fitness of the work, including proper protection against damage by freezing and wet weather.

PRODUCTS

- A. <u>Materials and Products Not Specified</u>
 - 1. Any materials or products required or implied to accomplish the Work indicated or inferred by the Plans and not specified in this Project Specification or on the Plans shall be furnished by the Contractor in conformance with the applicable specifications, with no additional compensation thereto.
- B. <u>Piping</u>
 - 1. Steam piping shall be standard weight (Std. Wt. is the same as Sch. 40 through 10"), steel, ASTM A-53, Grade B, ERW.
 - 2. Condensate drain piping:
 - i. Condensate drain piping in valve chambers shall be extra strong (XS is the same as Sch. 80 through 8"), steel, ASTM A-53, Grade B, ERW.
 - ii. Buried condensate piping shall be extra strong (Sch. 80), 316 stainless steel.
 - 3. A high temperature coating shall be applied to the steam and condensate piping. Approved manufacture:
 - i. Sherwin Williams EPO-PHEN FF or approved equal.
 - 4. Pipe joints shall be welded in accordance with the Pressure Piping Code, ASME/ ANSI B 31.1.
- C. <u>Isolation Valves (not including mainline isolation valves)</u>
 - 1. Over 2 inch isolation valves
 - i. Flanged cast steel gate valve.
 - ii. Flexitallic graphite gaskets.
 - iii. ASME Class 300 construction.
 - iv. Suitable for 300 PSI steam service.
 - 2. 2 inch and under isolation valves
 - i. Suitable for 300 PSI saturated steam service.
 - ii. 800# valves.
 - iii. Threaded or socket weld ends.

- iv. Steel construction.
- v. MPTFE seal assemblies.
- vi. SS ball and SS blowout proof stem.
- D. <u>High Temperature Pipe Insulation System (Valve Chambers):</u>
 - 1. Insulation applied to 2 inch thickness for piping less than 4 inch in diameter or 4 inch thickness for larger piping.
 - i. Approved Manufacture:
 - a. Foamglas by Owens Corning
 - b. Pyrogel XTE by Aspen Aerogels insulation.
 - 2. Stainless steel jacketing and banding.
 - 3. Removable flexible ceramic fiber insulation jacket on valves and expansion joints.
- E. <u>High Temperature Pipe Insulation System (Concrete Trench Box and Direct Buried</u> <u>Connections):</u>
 - 1. Insulation applied to 4 inch thickness.
 - i. Approved Manufacture:
 - a. Foamglas by Owens Corning
 - b. Pyrogel XTE by Aspen Aerogels insulation.
 - 2. Stainless steel banding.
 - 3. Stainless steel jacket with bitumen membrane.
 - 4. Approved Manufacturer:
 - i. Pittwrap SS Jacketing by Owens Corning
- F. <u>Expansion Joints:</u>
 - 1. Externally pressurized style
 - 2. Rated for 300 psig and 500 °F
 - 3. Seamless construction
 - 4. SCH80 Butt weld ends
 - 5. Approved Products
 - i. Hyspan Series 3500
- G. <u>Steam traps:</u>
 - 1. Bucket trap.
 - 2. Rated for 250 PSI steam service.
 - 3. Cast iron body and cover.
 - 4. Stainless steel valve pin and seat.

- 5. Stainless steel bucket.
- 6. Stainless steel bucket assembly.
 - i. Approved Manufacturers:
 - a. Armstrong
- H. <u>Strainers, check valves, and other fittings.</u>
 - 1. Rated for 250 PSI steam service.
- I. <u>Ancillary Products</u>
 - 1. Miscellaneous Metals: Steel shapes, plate, bars, ASTM A36
 - i. Modular Link Type Seals and Sleeves:
 - a. Modular Seal assembly consisting of elastomeric links and metal pressure plates and bolts.
 - b. 20 PSI differential pressure rating.
 - c. Temperature rating, -67 to 400 degrees F.
 - d. High temperature link assemblies, silicone rubber material.
 - e. Corrosion resistant pressure plates and bolting: Steel Zinc Dichromate.
 - f. Seals by Thunderline Corp. or equal.
 - g. Sleeves 0.25" thick steel with diameter as required to accommodate seal device.
 - h. Provide minimum 1/2" water stop ring welded to outside of sleeve where indicated.
 - 2. Welding Filler Metals
 - i. General:
 - a. All filler metals shall be fully identified by the ASME Specification number and the AWS classification number whenever referenced in a document.
 - b. When the filler metals are referenced in welding procedures specifications, procedure qualification records, or the record of welder qualification tests, the filler metals shall also be identified by the appropriate ASME group number (F-number) and weld metal analysis number (A-number).
 - ii. Filler Metal Storage and Handling:
 - a. Filler metal storage and handling procedures shall be required to maintain the material in a clean and dry condition up to the time of use.
 - b. Low hydrogen electrodes shall be handled and stored in accordance with the manufacturer's recommendations to avoid moisture pickup and to retain the low hydrogen characteristics of the electrode.

- c. The methods to be used for handling and storing electrodes shall be covered in the welding procedure (See Paragraph 7.2.3) or shall be submitted separately.
- iii. Filler metals for use with carbon steel base materials:
- iv. The filler metals used for SMAW shall conform to ASME Specification for Mild Steel Covered Arc Welding Electrodes, SFA-5.1, AWS Classification E7018, E6010, & E7010Utility Identification
- 3. Buried Warning Tape: 6" wide polyethylene underground utility warning tape with legend and color as follows:

Steam "Caution Steam Line Below" Yellow

i. Acceptable Manufacturers and Products:

"Warnoline" tape by Safety Sign Company, Cleveland, Ohio. www.safetysignco.com, 1-800-992-1177.

"Shieldtec" tape by Empire Level, Inc., Mukwonago, WI. www.empirelevel.com, 1-800-872-8425

- ii. Or equal as approved by Duluth Energy Systems.
- 4. Polystyrene Insulation
 - i. High-load (100 psi) compressive strength rigid insulation board shall be as Manufactured by Dow Chemical Company specifically for buried utility's insulation within traffic-loaded conditions.
- 5. Tracer Wire
 - i. Wire Size or Gauge: 12 AWG
 - ii. Jacket color: Yellow
 - iii. Jacket coating type: 30 mil. thick HDPE or High Molecular Weight Polyethylene (HMWPE)
 - iv. Wire Type: Stranded, Copper Clad Steel or Copper with minimum break load of 302 lbs.
 - v. Compression Crimp Splice Connectors
 - a. All underground spliced connections used within the DC cathodic protection circuit shall be made through the use of copper compression crimp connectors.
 - (1) The proper size connectors shall be used in accordance with the manufacturer's recommendations.
 - (2) Connectors shall be crimped with a hand tool capable of delivering a minimum of 12 tons of compressive force.
 - vi. Splice Encapsulation

- a. All spliced connections used within the DC cathodic protection circuit shall be sealed with a waterproof direct burial splice kit manufactured for tap or branch splice connections. Acceptable manufacturers:
- vii. 3M[™] ScotchcastTM Power Cable Tap Splice Kit 90-B1. Follow manufacturer's recommended installation requirements.
- viii. Grounding rod: 1.5 lb. magnesium grounding anode with a minimum of 20 feet of lead wire.
- ix. Terminal Access Box:
 - a. Quazite PC1118BA12 w/ PC1118CA0012 cover
 - b. Cover to read DULUTH ENERGY SYSTEMS

SUBMITTALS

- A. <u>Shop Drawings:</u> Submit dimensional fabrication and installation drawings to show details of items incorporated in the work.
- B. <u>Product Data:</u> Provide data on materials and accessories.
- C. <u>Manufacturer's Certificate:</u> Certify that products meet or exceed specified requirements.

EXECUTION

- A. <u>General Provisions and Requirements</u>
 - 1. Excavation, bedding, and backfill shall be considered incidental to the installation of this item.
 - 2. Consumables such as welding rod and gases shall be considered incidental to the installation of this item.
 - 3. Joint testing shall be considered incidental to the installation of this item.
 - 4. Welding of the carrier pipe shall be in conformance with the Pressure Piping Code ANSI B31.1, the manufacturer's instructions, and DES standards.
 - 5. Correction of failed pipe joints shall be at the expense of the contractor.
 - 6. Install steam piping and all associated components in accordance with the Plans, this Specification, manufacturer's instructions, and reviewed submittals.
 - 7. Steam service entry valves shall be installed with the valve handles to the sides of the pipes and in a reasonably accessible and operable location, unless directed otherwise by Duluth Energy Systems.
- B. <u>Preparation of Work Site</u>
 - 1. Coordination: Coordinate all utility work operations to protect existing and/or new concurrent construction.
- C. <u>Alignment and Grade:</u>
 - 1. Protect and maintain all necessary stakes and bench marks for installing the pipe to the alignment and grade as shown in the Plans.

- 2. Verify all service entry locations prior to installing pipe. Report any discrepancies in location or elevation of connection points to Duluth Energy Systems. Failure to report discrepancies in locations and elevations of connection points prior to beginning pipe installation may result in re-work with no additional compensation to the Contractor.
- 3. The Contractor shall make no deviation from required alignment and grade without written approval from Duluth Energy Systems. Unapproved deviations may be cause for rejection and correction with no additional compensation to the Contractor.

D. <u>Pipe Laying</u>

- 1. The Contractor's attention is directed to **STM-12 Earthwork and Pipe Backfill** for specific requirements as they pertain to bedding and backfill materials.
- 2. Carefully inspect each pipe unit. Remove all foreign matter and dirt from inside the pipe. Damaged units will be rejected or repaired to the satisfaction of Duluth Energy Systems.
- 3. Install the piping to the alignment and grades indicated on the Plans. Temporary supports may be used to raise the piping or to allow rotating the pipe to facilitate welding joints. Bedding material may be excavated at pipe joints to provide clearance for welding.
- 4. The ends of the pipe in the trench not being fitted or welded shall be securely capped at all times to prevent the entrance of foreign matter.
- 5. Pipe shall not, under any circumstances, be placed in water or allowed to become submerged in a flooded trench.
- 6. Elbows and tees shall have expansion board installed according to the Plans and Details.
- 7. Mitered Joints: Deflections in piping that require less than 3 degrees to complete piping alignment may be mitered pipe connections if carefully cut to ensure proper alignment of pipe ends to allow for proper welded joint. Contractor shall utilize elastic flexibility of the pipe wherever possible by welding a minimum of three pipes together and bending the pipe without yielding.

E. <u>Pipe Welding</u>

- 1. Welders to be currently certified for pipeline welding in accordance with AWS standards. All welding on pipes, fittings, and valves to be done by personnel who have passed an approved competence test and have been certified.
- 2. Shielded Metal Arc Welding (SMAW) is the welding process to be used for the field erection of piping systems covered by this Specification. Gas Metal Arc Welding (GMAW) may be used for shop fabrication. The type of rods and filler used shall be selected to match the base metal alloy analysis.
- 3. Welding and weld quality per AWS D10.12.

- 4. Definitions
 - i. The base terms and definitions to be used in conjunction with this Specification are found in ANSI B31.1, 100.2.
 - ii. All other terms and definitions which apply to the scope of this Specification are to be in accordance with AWS A3.0-76.
- 5. Weld Joint Configuration
 - i. Weld ends that are to be field welded shall be prepared to the joint configuration specified in the submitted Welding Procedure Specification.
 - ii. Steel pipe ends shall be square cut with flat ends or be properly beveled and aligned and spaced for welding with no internal or external burrs.
 - iii. Removal of a portion of pipe to facilitate welding of the joint and then replacing the cut out section, sometimes referred to as "fish mouth" or "window" welding, will not be permitted.
 - iv. Prepare pipe ends in tees, laterals and reducers for weld penetration in accordance with ANSI B31.1 Standards.
 - v. Pipe with wall thickness of 0.142 inches (1/4-in) or 3.6 mm or less shall have a square butt joint design; pipe with greater wall thicknesses shall have a weld preps beveled for welding.
 - vi. Weld all pipe joints 3" in diameter and larger, including fittings with full penetration butt welds except where flanges are required.
 - vii. On piping smaller than 3" diameter, socket weld components may be used.
 - viii. Whenever possible, weld joints should be at least 3 pipe diameters apart, unless otherwise directed by the Engineer.
- 6. Permanent Attachments
 - i. Permanent attachments shall be made from materials having a similar chemical composition and a weldable quality that is compatible with best piping material.
 - ii. Permanent attachment welds, such as pipe supporting elements, etc., may be either of the full or partial penetration type as specified in the Plans.
 - iii. All permanent attachment welds shall be welded in accordance with a qualified and detailed welding procedure that completely describes the specific attachment, including joint configuration, preheat, welding technique and postweld heat treatment. <u>The welding procedure shall be submitted to the</u> <u>Engineer for review and release before welding is initiated</u>.
- 7. Temporary Attachments
 - i. Temporary attachments shall be made from materials of weldable quality that are compatible with the base piping material.
 - ii. Temporary attachment welds such as strong-backs, alignment clamps, etc., may be partial penetration welds.

- iii. Temporary attachments to the piping shall be welded by qualified welders using the same welding procedure and filler metals as specified and qualified for the piping system(s).
- iv. Welds shall be made using the same preheat, if any, as required for the piping system(s).
- v. All indications of temporary attachments used during erection shall be removed. The surface to which they were welded shall be restored to its original condition by grinding and, if necessary, the deposition of weld metal. The filler metal used shall have equivalent strength of the base material. The welders shall be qualified for the specific procedure used.
- 8. Preheat and Interpass Temperatures
 - i. The following are the mandatory minimum preheat and interpass temperature for carbon steel materials:

Chemistry and Thickness Limitations	Minimum Temperature
Less than 0.30%C specified Max. & 1" thickness and less	50° F
Over 0.30%C specified Max. & thickness over 1"	175° F

- ii. Preheat shall be done in such a manner that the minimum temperature is reached for the full thickness of the pipe wall for a distance of at least 3" on each side of the weld preparation.
- iii. The preheat temperatures shall be checked by use of temperature-indicating crayons, thermocouples, optical or contact pyrometers or other suitable means to assure that the required preheat temperature is obtainable prior to and during the welding operations.
- iv. Preheat temperature checking shall be done in such a manner that the actual temperature of the pipe wall is measured. Surface measurements shall not be taken immediately after removal of the heat source, since such measurements can give false readings.
- 9. Welding Technique and Workmanship
 - i. Base Metal Preparation
 - a. Pipe end preparation for carbon steel weld joints may be accomplished by either machining or machine thermal cutting. When thermal cutting or beveling is used, the cut surfaces shall be ground or machined to remove a minimum of 1/16" of the heat affected metal.
 - b. The same preheat required for welding shall be used for thermal cutting and beveling.

- c. Surfaces and edges to be welded shall be smooth, uniform and free from fins, tears, cracks, or other defects which would adversely affect the quality or strength of the subsequent weld.
- d. Prior to welding, the pipe surfaces for 4" on each side of the joint shall be cleaned of all paint, oil, grease, water, rust, loose or thick scale or other deleterious materials that would have a detrimental effect on subsequent weld quality or produce objectionable fumes during welding.
- ii. Joint Fit-Up
 - a. The geometry of pipe weld joints (i.e., joint preparation and root opening) shall be in accordance with the tolerances specified by the weld joint sketches contained in the welding procedures submitted to the Engineer.
 - b. In cases where the internal misalignment exceeds 1/16", the component with the wall extending internally shall be trimmed internally so that the adjoining internal surfaces are approximately flush. This trimming shall not result in a piping component wall thickness less than the minimum design thickness and the change in contour shall not exceed 30 degrees.
- iii. Transition, Different Outside Diameters
 - a. When pipes of different outside diameters are to be welded together, either of the following two procedures shall be followed:
 - (1) Fill the weld joint with weld flush with the outside surface of the pipe having the larger diameter. The weld metal transition between the larger and smaller pipe shall have a slope not exceeding 1:3 which may be obtained by grinding.
 - (2) Taper the outside diameter of the larger pipe by grinding or machining before welding to the outside diameter of the smaller pipe, the angle not exceeding 30°.
- iv. Tack Welds
 - a. Tack welds which are to be incorporated into the final weld shall:
 - (1) Be subject to the same quality requirements as the weld.
 - (2) Be made with electrodes of the same quality and strength as will be used for the first pass of the weld.
 - (3) Be of sufficient number and length to maintain alignment and dimensional tolerances prior to and during the welding of the root pass.
 - (4) Have all slag thoroughly removed prior to welding the root or other tack covering pass.
 - (5) Have a profile which can be welded over without adversely affecting the weld quality.
 - (6) Be made by qualified tack welders using procedures comparable to those to be used for the weld.

- (7) Be visually inspected by the welder or inspector prior to the deposition of the first or root weld pass and any defective tact weld removed and repaired.
- b. Tack welds which are not to be incorporated into the weld shall be removed completely after their need has been fulfilled.
- c. The same preheat shall be used for all tack welds on pipe joints as is required for the final weld.
- d. Sufficient tack welds and/or clamps shall be used to maintain the dimensional integrity of the pipe joint and system, as well as preventing significant stresses across the weld during welding.
- v. Minimum Temperature
 - a. Welding shall not be done when the ambient temperature is lower than 0° F (-18° C) or when the pipe surfaces near the weld are wet, exposed to rain, snow, sleet or high wind, or when the welders would be exposed to inclement weather conditions. The ambient environmental temperature may be below 0° F, but a heated structure or shelter around the area being welded could maintain the temperature adjacent to the weldment of 0° F or higher and permit welding.
 - b. When the base materials are below the specified minimum temperature required in Paragraph 8.i, they shall be preheated so that the parts are at or above the specified minimum temperature.
- vi. Erection Welding Parameters
 - a. The welding parameters, i.e., joint configuration, polarity, current, voltage, etc., used in erection shall conform in every respect to the submitted, qualified, and released welding procedure. The pass sequence of the welding procedure shall be used as a guide for weld pass placement and may be modified for variations in base metal thickness electrode diameter, etc.
- vii. Weld Cleaning
 - a. After each weld pass, any slag that is present shall be removed (by wire brushing, chipping or, if necessary, grinding), any undercut blended (by grinding) and any excessive bead convexity and/or surface defects removed (by grinding or chipping) prior to the deposition of the next weld pass or layer.
 - b. The completed weld shall be cleaned of all slag and weld spatter by chipping, wire brushing or grinding. Excessive convexity or surface roughness shall be corrected by grinding.
- viii. Arc Strikes
 - a. Maximum effort shall be made to confine arc strikes to the areas to be covered by the finished weld.

- b. Arc strikes made in areas not to be covered by the finished weld shall be ground and visually inspected to assure that the pipe surface is restored to its original condition.
- ix. Weld Craters
 - a. Weld craters shall be filled to the full cross of the finished weld.
- x. Weld Overlap
 - a. All welds shall be free of overlap.
- xi. Weld Undercut Limitations
 - a. The welding technique employed shall be such as to minimize the undercutting of the adjacent base metal or weld metal.
 - b. Undercut in excess of 1/32" in or adjacent to a weld groove face shall be blended by grinding prior to the deposition of the next layer of weld metal.
 - c. Undercut of the edge of a finished weld (butt or fillet) in excess of 1/32" shall be corrected by the deposition of a cover pass of weld metal.
 - d. Undercuts shall not encroach on the minimum required section thickness or they must be corrected irrespective of depth.
 - e. Sharp changes in section at the toe of any finished weld shall be blended by grinding, or, where such grinding would result in thinning the base metal below design minimum, by the deposition of a weld cover pass.
- xii. Weld Reinforcement
 - a. As-welded surfaces are permitted; however, the surfaces of welds shall be sufficiently free from coarse ripples, grooves, overlaps, abrupt ridges and valleys to allow the proper interpretation of radiographic and other nondestructive examinations when nondestructive examinations are required.
 - b. For single welded piping component butt welds, the thickness of the weld reinforcement (in inches) shall not exceed the amount shown below.

Base Metal Thickness	Max. Reinforcement Thickness
Up to 1/8 inclusive	3/32"
Over 1/8 to 3/16, inclusive	1/8"
Over 3/16 to 1/2, inclusive	5/32"
Over 1/2 to 1, inclusive	3/16"

- c. The thickness of weld reinforcement shall be based on the thickness of the thinner of the materials being joined.
- d. The weld reinforcement thickness shall be determined from the higher of the abutting surfaces involved.
- e. Weld reinforcement may be removed if so desired.
- xiii. Fillet Welds
 - a. Fillet weld configurations shall be in accordance with AWS provisions.
- 10. Weld Identification
 - The weld identification method to be used for the Project shall be in the form of an "isometric" drawing showing the location of all welds with the corresponding welder I.D. for each weld The Welding Isometric Drawing shall be included with the Final Records and submitted to the Engineer at the conclusion of the project. The Welding Isometric Drawing should to show the location of all radiographs taken on the Project as well as Liquid Penetrant Examination weld numbers.
 - ii. After completion of a weld joint, the welder shall identify his work in the manner specified by the erecting Contractor.
- 11. Postweld Heat Treatment
 - a. The permissible temperature range and minimum holding time for postweld heat treatment shall be in accordance with Table 132 of ANSI B31.1, except as modified by Table 132.1 of ANSI B31.1.
 - b. Where postweld heat treatment is required, it shall be included in the qualified welding procedure.
- F. Backfilling and Identification
 - 1. Pipe/Structure Backfilling
 - i. Backfill as soon as practical after pipe has been placed and insulated and in accordance with the As-Built Documentation requirements of **STM-8 Acceptance**.
 - <u>Above Pipe Zone</u>: Deposit specified material in maximum 12" lifts to required final subgrade elevation and compact in accordance with requirements of STM-12 Earthwork and Pipe Backfill.
 - 2. Buried Utility Identification
 - 3. During utility backfilling, place warning tape approximately 1' (or less if appropriate) above all on-site main line piping, service line piping, electrical conduits for communications, etc.; if lines are placed by other utility are disturbed, furnish tape and arrange placement by utility.
- G. <u>Pipe Cleaning</u>
 - 1. After installation but before backfilling, and sequencing the work such that all piping will be cleaned from a low point without cleaning through valves, the Contractor will thoroughly clean the interior of all pipes of all scale, dirt, and debris by water power jetting of the pipes. All scale and debris shall be flushed and removed from the pipeline.
 - 2. For pipes smaller than 4 inch, after installation and before final in service test, a full flow pressurized flush may be performed in lieu of power jetting where the piping configuration will not allow power jetting to be properly performed.

- 3. To establish that pipe and fittings of smaller diameter can be successfully cleaned, submit for the Duluth Energy Systems' approval a method and procedure proposed to satisfy the cleaning requirements.
- 4. The cleaning procedure may be repeated at the discretion of Duluth Energy Systems. Contractor shall notify Duluth Energy Systems 48 hours in advance of flushing operations.
- 5. Take all precautions necessary to prevent damage to the pipe, insulation, or structures from the cleaning operation and remove the water from the excavations.
- 6. Take all necessary precautions to ensure that no oil or other lubricant comes in contact with either the inside or outside walls of the pipe.
- 7. Each segment shall be flushed in a manner to allow water to drain out of the pipe at low points.
- 8. At the conclusion of pipe flushing for a given segment of pipe, the Contractor shall obtain verification from Duluth Energy Systems through signature or initials on the HWP Inspection and Testing Plan.

H. <u>Tracer Wire Installation</u>

- 1. Connections are not allowed in areas where there will be direct burial of the pipe.
- 2. Wire shall be placed top center of each pipe above the pour in place insulation.
- 3. Tracer wire shall be routed through a separate 3/4" capped conduit penetration through the wall (holes drilled for wire) and sealed with silicone sealant on both sides of the conduit prior to backfill.
- 4. Install tracer wire as a single continuous wire. Splicing of wire, if necessary, shall be done in a manner that produces an electrically and mechanically sound connection using an approved lockable connector specifically designed for direct burial.
- 5. Wire shall be terminated at the service take off within a communications handhole, valve standpipe, or a 12"x18" handhole when the previous two are not available, and within a 12" x 12" Hoffman enclosure within the building. A 5' coil of each wire shall be left in the enclosure.
- 6. Damage to the wire occurring during installation shall be immediately repaired by removing the damaged wire and installing a new section of wire with approved connectors.
- 7. Grounding
 - i. Tracer wire must be properly grounded at all dead ends/stubs.
 - ii. Grounding shall be achieved by use of a 1.5 pound, drive-in magnesium grounding anode rod with a minimum of 20 feet of lead wire.
 - iii. If grounding the tracer wire at the meter, 2 Terminal access boxes are required to allow for locates to be done from the meter or toward the meter.
 - iv. When anode wire will be connected to a tracer wire access box, a minimum of 2 feet of slack wire is required after meeting final elevation.

- 8. No bare tracer wire shall be exposed either below or above ground. Exposed ends such as at meter risers are not allowed and shall be protected from exposure.
- 9. Inspection and testing.
 - i. Verify tracer wire installation by using low frequency (512 Hz or similar) line locating equipment.
 - a. Verification shall be witnessed by the Owner.
 - b. Verify tracer wire installation upon completion of rough grading and again prior to final completion.
 - c. Continuity testing of the tracer wire system, in lieu of using locating equipment, shall not be accepted.

QUALITY ASSURANCE

- A. <u>Contractor's Responsibilities</u>
 - 1. Establishment of an inspection and testing plan for the steam pipe. This plan shall include all items requiring testing and inspection in accordance with these Special Provisions.
 - 2. The Contractor shall arrange and pay for the following tests and inspections required for performance of the Work:
 - i. Tests and inspections associated with liquid penetrant testing.
 - ii. Tests and inspections of materials, products, or equipment to certify compliance with Contract Documents, before incorporation into the Work.
 - iii. Tests, inspections, or laboratory services necessary with respect to substitutions.
 - iv. Additional tests and inspections when initial tests or inspections indicate Work does not comply with Contract Documents will be completed at the Contractor's expense.
 - 3. The Contractor shall maintain an adequate inspection system and perform such inspections to insure that the Work performed is in conformance with contract requirements. The Contractor is to make available to Duluth Energy Systems adequate records of such inspections.
 - 4. If any Work to be done away from the construction site is to be inspected on behalf of Duluth Energy Systems during its fabrication, manufacture, or testing, or before shipment, the Contractor shall provide a minimum of 48 hours (2 working days) notice to Duluth Energy Systems to arrange for personnel to inspect the Work.
 - 5. Where the Contractor is required to perform or submit material tests, they shall:
 - i. Cooperate with parties requiring material or weld tests
 - ii. Provide qualified personnel after due notice
 - iii. Perform tests according to schedule
 - iv. Promptly submit a copy of each test report to Duluth Energy Systems

- 6. For tests and inspections performed at the Site, promptly notify parties performing the Work and Duluth Energy Systems of observed irregularities or deficiencies of Work or materials to prevent proceeding with Work which may subsequently be determined to be defective.
- 7. Include the following in each report as applicable.
 - i. Date report issued.
 - ii. Project title and number.
 - iii. Testing laboratory name, address, and telephone number.
 - iv. Name and signature of laboratory inspector.
 - v. Date and time of sampling, testing, or inspection.
 - vi. Temperature and weather conditions.
 - vii. Identification of product and Specification Section.
 - viii. Location of sample or test in the Project.
 - ix. Type of inspection or test.
 - x. Results of tests and compliance with Contract Documents.
 - xi. Interpretation of test results when requested by Duluth Energy Systems.
- B. <u>Weld Inspection and Testing</u>
 - 1. Welding and Testing procedures shall be in accordance with ANSI B31.1 and the following requirements. All repair and testing of defective welds shall be performed by the Contractor at no additional cost to Duluth Energy Systems.
 - 2. All steam piping shall be tested for leaks via dye penetrant testing in accordance with these specifications.
 - 3. There shall be <u>NO</u> failed weld tests allowed in the piping system.
 - 4. Inspection
 - i. Visual inspection of the weld joint and weld shall be done in an area where suitable light is available. The use of spotlights, magnifiers, or other inspection devices is recommended whenever such devices will enhance the inspection operation.
 - ii. Joints shall be visually inspected prior to welding for compliance with this Specification and the released welding procedure for items such as cleanliness, correct groove configuration, alignment, conditions of tack welds if present, the preheat temperature if specified filler metals to be used, etc.
 - iii. The welds shall be visually inspected after each pass of multi-pass welds to assure that the weld bead has been properly cleaned of slag, and is free of surface cracks, porosity, excessive convexity, undercut, and other defects. Noted defects shall be removed prior to making the next weld pass.

- iv. Complete welds shall be visually inspected by a qualified weld inspector for the following:
 - a. Weld Shape and Appearance:
 - (1) The surface of welds shall be smooth and even, sufficiently free of coarse ripples, grooves, abrupt ridges and valleys to allow for proper evaluation of NDE, if required.
 - (2) The welds shall be uniform in width and the weld reinforcement joined smoothly into the adjacent base metal.
 - (3) Weld reinforcement per Paragraph 9.xii.
 - (4) Butt weld surface profile per Paragraph 9.xii.
 - (5) Fillet weld configuration per Paragraph 9.xiii.
- v. Any cracks on the external surface of a weld or base metal shall be cause for rejection.
- vi. Any visible evidence of lack of complete joint penetration of joints requiring 100 percent penetration shall be cause for rejection.
- vii. Craters shall be filled to the full cross section of the required weld.
- viii. Undercut shall be held to the requirements of Paragraph 9.xi.
- ix. Evidence of overlap or visible lack of fusion shall be cause for rejection of the weld, if present. Lack of fusion is defined as a condition wherein the fusion between a weld bead and the adjacent material, either base or weld metal, is incomplete. Overlap is defined as the protrusion of weld metal beyond the limits of fusion (see Paragraph 9.x).
- x. Any surface porosity shall be removed by grinding. The ground area shall be built up by the addition of weld metal, if the minimum required section thickness has been infringed upon.
- xi. All weld spatter and slag shall be removed from the weld and adjacent areas in a manner that provides a surface finish conforming to the requirements of the base material specification.
- xii. All indications of arc strikes remaining after welding shall be removed (see Paragraph 9.viii). This shall be confirmed by NDE.
- xiii. All indications of tack welds, temporary attachments, strong backs, etc., used for fabrication and not specified on drawings shall be removed, and the surface to which they were welded restored to its original condition by grinding and, if necessary, the deposition of weld metal using the same filler metals as designated for the production welds in accordance with Paragraphs 7 and 9.iv prior to hydrostatic testing.

- 5. Nondestructive Examination (NDE)
 - i. Radiography of Piping Welds
 - a. Procedure Requirements
 - (1) Duluth Energy Systems will be responsible initial weld radiography in accordance with Line f of this Paragraph. The Contractor shall schedule, pay for, and perform any additional weld radiography for all weld repairs in accordance with this Specification.
 - (2) The procedure shall include, but not be limited to, the requirements of ANSI B31.1; the American Society for Mechanical Engineers (ASME) Sec V Nondestructive Examination, Art. 2, Para. T281; and this Specification.
 - (3) In addition to the requirements of ANSI B31.1 and ASME Sec V, the following shall apply:

Type 4 film shall not be used.

Fluorescent screens shall not be used.

One film shall be used for each radiographic exposure.

The procedure shall be submitted to the Engineer for review and release prior to such examinations.

- b. Personnel performing or assisting in radiographic examinations shall be qualified and certified in accordance with American Society for Nondestructive Testing (ASNT) SNT TC-1A.
- c. Examination Procedure
 - (1) The surface condition of finished welds shall be suitable for proper radiographic examination.
 - (2) Welds shall be visually inspected prior to radiography.
 - (3) Welds shall be repaired if any of the following discontinuities are observed:

Cracks;

Surface Porosity;

Excessive weld reinforcement greater than specified in ANSI B31.1, Table 127.4.2;

Lack of surface penetration;

Incomplete penetration when interior surface is accessible;

Undercut shall not exceed 1/32" (0.8 mm) and shall not encroach on the minimum required section thickness;

Weld overlap and craters.

- (4) Radiography of fabrication welds shall be performed in accordance with the written procedure.
- d. Acceptance Standards

Welds shown by radiography to have any of the following types of discontinuities are unacceptable:

- (1) Any type of crack or zone of incomplete fusion or penetration.
- (2) Any elongated indication having a length greater than:

1/4" (6.0 mm) for t up to 3/4" (14.0 mm) inclusive;

1/3 t for t from 3/4" (19.0 mm) to 2-1/4" (57.0 mm) inclusive;

3/4" (19.0 mm) for t over 2-1/4" (57.0 mm) where t is the thickness for the thinner portion of the weld.

NOTE: "t" referred to in preceding Subparagraphs pertains to the thickness of the weld being examined; if a weld joins two members having different thickness at the weld, t is the thinner of the two thicknesses.

- (3) Any group of indications in line with an aggregate length greater than t in a length of 12t, except where the distance between the successive indications exceeds 6L, where L is the longest indication in the group.
- (4) Porosity in excess of that shown as acceptable in App A-250 of Sec I of the ASME Boiler and Pressure Vessel Code.
- e. Repairs of all defects disclosed by radiography shall be reexamined in accordance with this Specification.
- f. Frequency of Field Radiographic Examination
 - (1) The Owner will perform radiographic examination (X-ray) on a minimum of twenty (20) percent of the total butt welds performed by each welder with a minimum of 5% of the X-rays being taken by welds performed in the trench. The Contractor shall keep a log for each welder and shall notify the Owner when radiographic examination is required to meet the requisite frequency.
 - (2) If defects are detected in the work of a welder, the inspection of the work done by that welder shall be expanded at Contractor expense, to comprise a total of at least three additional joints. These tracers may be taken anywhere on the Project where there are exposed and accessible welds <u>previously</u> made by the welder.
 - (3) If any joint in the expanded inspection is rejected, further radiography shall be conducted to provide 100 percent coverage of work <u>previously</u> done by that welder, until five joints in succession are satisfactory.
 - (4) When all joints in the expanded inspection are satisfactory, the inspection shall revert to 10 percent minimum random sampling.

- (5) When defects are detected regularly, or when welding is carried out under poor conditions (as determined by the DES Project Representative), the Engineer may expand radiographic control to 100 percent at the Contractor's expense, with notification in writing thereto.
- g. Records and Submittals
 - (1) Copies of the following documents shall be submitted to the Engineer for review and release:

Radiographic testing procedure

Personnel Certifications;

Radiographic reader sheets, including film interpretation;

(2) One radiographic film of each radiographed location shall be submitted to the Engineer for review and release.

Included with the films shall be all radiographic films containing discontinuities requiring repair.

<u>All</u> radiographic films, including tracer and repair films, taken on the piping systems are the sole property of Owner.

(3) Each document and film shall contain, but not be limited to, the following identifying information:

Client Name (Owner)

Identification of the Piping System (Project Number)

Date of Radiography

Manufacturer's Name or Symbol

Weld Identification Number

Welder Identification

Signature of Interpreter

Examination Procedure Number

- (4) The Contractor shall obtain verification from the Owner's Representative through signature or initials on an approved steam pipe Inspection and Testing Plan that all radiography is completed in accordance with the specifications and is acceptable.
- 6. Liquid Penetration Examination of Piping Welds
 - i. General
 - a. 100% of the welds on the steam piping system shall be tested per the approved procedure. Under certain special conditions, such as during overnight connection sequences, the Contractor may request welds receive visual inspection by Duluth Energy Systems in lieu of liquid penetration

examination. The decision to accept visual inspection under special conditions shall be at the sole discretion of Duluth Energy Systems.

- b. The Contractor is responsible for all costs associated with liquid penetration testing.
- c. The Contractor shall be responsible for notifying the Engineer at least 24 hours prior to the proposed start of liquid penetration testing.
- ii. Procedure Requirements
 - a. The liquid penetration examination shall be performed in accordance with a detailed written procedure. The procedure shall be <u>submitted to the</u> <u>Engineer for review and release prior to such examinations</u>.
 - b. The procedure shall include, but not be limited to, the requirements of ANSI B31.1; the American Society for Mechanical Engineers (ASME) Sec V Nondestructive Examination, Art 6, Para. T681; and this Specification.
 - c. In addition to the requirements of ANSI B31.1 and ASME Sec. V., the following shall apply:
 - (1) Shot or sand blasting shall not be used on the surface prior to examination.
 - (2) Cleaning solvents and penetration families shall be certified by the manufacturer to contain not more than one percent (1%) by weight of sulfur, nor more than one percent (1%) residual total halogens.
 - (3) Intermixing of penetration families will not be permitted.
 - (4) Fluorescent penetration examination not allowed.
 - (5) Personnel performing or assisting in liquid penetration examinations shall be qualified and certified in accordance with American Society for Nondestructive Testing (ASNT), SNT TC-1A.
- iii. Examination Procedure
 - a. The surface condition of finished welds shall be suitable for proper liquid penetration examination.
 - b. All welds shall be visually inspected prior to liquid penetration examination.
 - c. Welds shall be repaired if any of the following discontinuities are observed:
 - (1) Cracks;
 - (2) Surface porosity;
 - (3) Excessive weld reinforcement greater than specified in ANSI B31.1, Table 127.4.2;
 - (4) Lack of surface penetration;
 - (5) Incomplete penetration when ID surface is accessible;

- (6) Undercut shall not exceed 1/32" (0.8 mm) and shall not encroach on the minimum required section thickness;
- (7) Weld overlap or craters.
- d. Liquid penetration examination shall be performed in accordance with the written procedure.
- iv. Acceptance Standards
 - a. Indications whose major dimensions are greater than 1/16" (1.6 mm) shall be considered relevant.
 - b. The following relevant indications are unacceptable:
 - (1) Any cracks or linear indications;
 - (2) Rounded indications with dimensions greater than 3/16" (5.0 mm);
 - Four or more rounded indications in a line, separated by 1/16" (2.0 mm) or less, edge to edge;
 - (4) Ten or more rounded indications in any six square inch (3870 MM²) of surface with the major dimension of this area not to exceed six inches (150 MM) with the area taken in the most unfavorably location relative to the indications being evaluated.
- v. Re-Examination of Repairs
 - a. Repairs of all defects disclosed by liquid penetration examination shall be reexamined in accordance with this Specification.
- vi. Records and Submittals
 - a. Three copies of the following documents shall be submitted to the Engineer for review and release:
 - (1) Liquid penetration examination procedure
 - (2) Liquid Penetration Examination Report
 - (3) Personnel Certifications
 - a. Liquid penetration examination results shall be reported on a written report form containing at least the following data:
 - Client Name (Owner)

Identification of the Piping System (Project Number)

Weld Joint Identification.

Date of Examination.

Signature of Examiner.

Examination Procedure Number.

Material Identification.

Type of Penetration Method used.

Results of examination and defect locations before repair.

- b. The Contractor shall obtain verification from the Owner's Representative through signature or initials on an approved steam pipe Inspection and Testing Plan that all liquid penetrant examinations are completed in accordance with the specifications and is acceptable.
- 2. Repairs
 - i. All welds containing defects shall be repaired by first removing the defective area by either machining, grinding, chipping, flame or arc gouging or a combination of these methods. Whenever flame or arc gouging is used, an additional 1/16" of the gouged surface shall be removed by grinding or machining. The method selected shall be appropriate for the material involved.
 - ii. Base materials which require preheating for welding shall also be preheated to the same extent before flame or arc gouging.
 - iii. The defective portion of the weld shall be removed without substantial removal of the base material.
 - Repair welds shall be made in accordance with the same procedure used for the original weld or by another welding process if it is part of a qualified procedure. The cavity to be repaired may differ in contour and dimensions from the original joint. The side walls of the excavated area shall have a minimum included angle of 75° and the ends shall have a minimum included angle of 120°.
 - v. The repaired area shall be examined by the same method, to the same extent and to the same acceptance requirements as the original weld.
 - vi. The Engineer shall be notified, prior to repair welding, of all weld defects which extend into the base material.
 - vii. Weld repairs that are required after postweld heat treatment in components which require postweld heat treatment shall again be postweld heat treated after repair welding.
- 3. Re-Examination of Repairs
 - i. If a weld should fail to pass a Liquid Penetration Examination, the repair must be made in accordance with approved repair procedures.
 - ii. The section shall then be retested be the above procedure except that welded joints previously accepted need not be re-examined.
 - iii. If in the judgment of Duluth Energy Systems, it is impractical to follow the repair procedure for any reason, required modifications in the procedure shall be subject to the Duluth Energy Systems' written approval.
 - iv. The Contractor shall be responsible for the ultimate leak tightness of the line subject to Duluth Energy Systems' approval. All repair and testing of defective welds shall be performed by the Contractor at no cost to Duluth Energy Systems.

MEASUREMENT AND PAYMENT

- A. <u>Bid Item 2509.601, "Remove Vent Pipes"</u> shall be a lump sum payment for all the steam manhole vent pipes removed for the Work, regardless of footage of piping removed. Payment includes the removal and disposal of existing vent pipe. Payment shall be for all excavation, sawing, disposal fees, loading and hauling of the material, and all associated costs.
- B. <u>Bid Items 2509.602, "Remove Expansion Joint"</u>, shall be measured by each buried expansion compensator removed.

Removal and remediation of asbestos insulation and other asbestos affected materials will be paid for under the corresponding bid item. Payment for removal of steam expansion joint shall be at the Contract bid price per linear foot, which shall be payment in full for all excavation, sawing and removal of concrete duct, removal of non-asbestos insulation, disposal fees, loading and hauling of the material, and all associated costs.

C. <u>Bid Items 2509.602, "Install Expansion Joint", shall be measured by each installed</u> expansion compensator.

Payment shall include all labor, equipment, and materials necessary for the installation of the expansion compensator according to the plans and the manufacturer's instructions, including insulation around expansion joint, replacement of concrete duct, and backfill.

D. <u>Bid Items 2509.603, "X" 316SS Condensate Drain Pipe"</u>, shall be measured by the linear foot for each designated size of stainless steel condensate drain pipe installed from steam manhole to connecting storm drain. Condensate Pipe shall be measured through tees, elbows, and other fittings for the designated pipe size. Branches from tees shall be measured by the linear foot for the designated branch size from the centerline of the tee connection.

Payment shall include all labor, equipment, and materials necessary for the installation of the condensate pipe, including, but not limited to, trench excavation and shoring, trench drain piping, trench dewatering and pipe protection; pipe fit-up and placement, welding, installation of bends, tees, and other fittings; high temperature coating; including but not limited to pipe cleaning, tracer wire and enclosures, warning tape, and backfill.

E. <u>Bid Items 2509.603, "Furnish and Install Vent Pipes"</u>, shall be measured by the linear foot for each vent pipe installed from steam manhole to the final location. Vent Pipe shall be measured through tees, elbows, and other fittings.

Payment shall include all labor, equipment, and materials necessary for the installation of the vent pipe, including, but not limited to, ductile iron and epoxy coated steel piping, trench excavation and shoring, pipe fit-up and placement, installation of bends, tees, and other fittings, flashing, fastener, tracer wire and enclosures, warning tape, and backfill.

STM-14 (2508) CONCRETE & UTILITY STRUCTURES

GENERAL

- A. <u>Summary</u>
 - 1. The Contractor, and/or a manufacturer selected by the Contractor and approved by Duluth Energy Systems, shall furnish all labor, materials, equipment, and incidentals required to construct concrete structures, structural slabs, and concrete wall penetrations in accordance with the Plans and these Specifications.
 - 2. Shop drawings shall be prepared by a licensed Engineer with their signature and stamp affixed.
- B. <u>References and Standards</u>
 - Other than by reference, listed references, standards and specifications are not contained in this Specification. Unless otherwise noted, the most current version of the standard or reference is applicable. Obtain, become familiar with and, where indicated or inferred, conform to the listed references and standards. References and standards are considered minimum requirements unless indicated otherwise. Any references to methods of measurement or payment in references and standards are not applicable. Tolerances in references and standards are applicable only if not indicated otherwise in this Specification. In event of conflict between the references or standards and this Specification, this Specification applies.
 - i. Minnesota Department of Transportation Standard Specifications (MnDOT)
 - a. Section 2461 Structural Concrete
 - b. Section 2506 Manholes and Catch Basins
 - ii. American Society for Testing and Materials (ASTM):
 - a. ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - b. ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - c. ASTM A307 Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
 - d. ASTM C150 Standard Specification for Portland Cement
 - e. ASTM C270 Standard Specification for Mortar for Unit Masonry
 - f. ASTM C443 Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
 - g. ASTM C476 Standard Specification for Grout for Masonry
 - h. ASTM C478 Standard Specification for Precast Reinforced Concrete Manhole Sections
 - i. ASTM C857 Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

- j. ASTM C858 Standard Specification for Underground Precast Concrete Utility Structures
- k. ASTM C990 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
- I. ASTM C1384 Standard Specification for Admixtures for Masonry Mortars
- m. ASTM C1677 Standard Specification for Joints for Concrete Box, Using Rubber Gaskets
- n. ASTM D7088 Standard Practice for Resistance to Hydrostatic Pressure for Coatings Used in Below Grade Applications Applied to Masonry

C. <u>Submittals</u>

- 1. The Contractor shall be required to provide the following shop drawings to Duluth Energy Systems for review and acceptance prior to constructing any precast or castin-place concrete utility structure. Shop drawings will be required for the following types of structures, where applicable:
 - i. Valve Chambers
 - ii. Anchors
 - iii. Guides
 - iv. Pipe Supports
- The Contractor shall obtain and submit plans and specifications prepared and certified by a Professional Structural Engineer licensed in the State of Minnesota
- 3. The Contractor shall anticipate up to 10 working days upon receipt of a submittal for Duluth Energy Systems to review shop drawings. Shop drawings will be reviewed, redlined, and returned to the Contractor with one of the following notes:
 - i. Reviewed \rightarrow Reviewed for general conformance with the Contract Documents. No resubmittal is necessary.
 - v. Reviewed as Noted → Reviewed for general conformance with the Contract Documents. Notes are included for the Contractor's benefit. No resubmittal is necessary.
 - vi. Revise and Resubmit \rightarrow Reviewed for general conformance and found to be outside the provisions of the Contract Documents. Resubmittal is necessary.
 - vii. Rejected → Reviewed for general conformance and found to be outside the provisions of the Contract Documents. A "Rejected" item does not meet multiple portions of the Contract Documents, and will generally be accompanied with an explanation of why a rejection was provided.
- 4. Any precast or cast-in-place concrete utility structures constructed partially or in its entirety prior to the submittal and subsequent review of shop drawings may be rejected at the discretion of Duluth Energy Systems, and shall be replaced by the Contractor with no additional compensation.

5. The Contractor shall submit all concrete mix designs used for cast-in-place structures to Duluth Energy Systems for approval.

PRODUCTS

A. <u>Valve Chambers (Vaults)</u>

- 1. The Contractor shall furnish and install all necessary materials required to construct sub-base, footings, install filter fabric, drain rock, and drain pipes to the storm sewer as specified in the plans. Vaults shall be assembled in accordance with the structure manufacturer's recommendations.
- 2. Vaults shall conform to the requirements as outlined in the Plans and the following:
 - i. All steam vaults shall be cast in place.
 - ii. Be designed by a Professional Engineer licensed in the State of Minnesota to have wall, floor, and top slabs able to sustain an HS-25 loading.
 - iii. Precast sections shall have tongue and groove or ship-lap joints with a butyl mastic sealant conforming to ASTM C990.
 - iv. Cement used for concrete utility structures shall be Type IIA (air-entrained) or Type IIIA (air-entrained high-early strength) Portland cement conforming to ASTM C150 or equal as approved by Duluth Energy Systems.
 - v. All sections shall be cured by an approved method. Precast sections shall not be shipped until the concrete has attained a compressive strength of 4,000 psi or until 5 days after fabrication and/or repair, whichever is longer.
 - vi. The requirements for Grade B concrete as defined in MnDOT Section 2461 shall be met where higher-grade concrete is not specified in the Plans.
 - vii. Forms for cast-in-place vaults shall not be removed until the concrete has reached a minimum compressive strength of 2,500 psi.
 - viii. Brick or masonry used to build any walls or provided for infill of pipe openings shall conform to ASTM C150.
 - ix. Unless otherwise stated in this section, concrete structures shall comply with the requirements found within MnDOT 2506.

B. <u>Anchors, Guides, and Supports</u>

- 1. The Contractor shall be responsible for furnishing and installing concrete steam anchors, guides and supports to control expansion of the underground steam distribution system.
- 2. Concrete shall conform to the requirements of MN/DOT SPEC Section 2461 for the type and size specified.
- 3. Final Anchor and guide sizing and location shall be approved by the steam distribution system insulation manufacturer.
- 4. Excavation, bedding, and backfill shall be considered incidental to the installation of this item.

- 5. Required concrete formwork shall be considered incidental to the installation of this item.
- 6. All anchors, guides, and supports shall be coated with a sealant approved by Duluth Energy Systems. Approved sealants are:
 - i. Sherwin Williams EPO-PHEN FF
 - ii. Or approved equal
- C. Castings and Adjustment Rings
 - i. Duluth Energy Systems shall furnish castings to the Contractor for installation of all castings for valve access structures. Contractor shall be responsible for providing all adjustment rings necessary to bring the castings to final roadway grade.

D. <u>Sealing & Waterproofing</u>

For all structures, the Contractor shall be required to complete sealing of the structure, pipe "knockouts", and any joints using the following approved materials:

- 1. Mortar Mix: One part Type 1, ASTM C150, cement by volume and three (3) parts clean, sharp sand by volume.
- 2. Non-Shrink Grout: Pour Rok[®], Embeco[®] 636, or approved equal.
- 3. Water Sealing Material: SikaSet[®] Plug, or approved equal.
- 4. Joint Sealing Material: All precast concrete joints shall be sealed with a butyl rubber joint seal, "O-ring", or ram neck installed to ensure a waterproof seal along the entire length of a joint.

E. <u>Structural Slabs</u>

- 1. The Contractor shall be responsible for furnishing and installing all reinforced pavement and sidewalk sections shown in the Plans. The Contractor shall furnish and install all necessary materials required to construct the reinforced pavement and sidewalk sections as shown in the Plans and details.
- 2. The location and approximate size of permanent reinforced pavement and sidewalk sections are noted in the Plans. If the Contractor chooses to sequence the work in a manner that would place either construction haul roads or traffic above the Duluth Energy Systems' facilities with less than one (1) foot of cover for any amount of time, the Contractor shall be responsible for providing suitable protections, to be determined by Duluth Energy, above the facility as a method of protecting the facility with no additional compensation. The exception to this cover requirement would be for the explicit installation of roadway subgrade, curb, gutter, and pavement installation directly above the Duluth Energy Systems' facilities. The Contractor may chose an alternative method for "bridging" over existing facilities ("blistering", steel plates, precast concrete slabs, etc.), and will be required to submit any proposed method to bridge the pipe to Duluth Energy Systems for review and approval.
- 3. Where applicable, the Plan details show concrete slabs to be installed above valve locations where castings are to be installed. These slabs may vary in size per the

details. Standpipes, castings and concrete slabs shall be furnished and installed per the requirements of this Specification.

- 4. Where the structural slabs are located within the concrete pavement section, the structural slabs shall be constructed from concrete meeting the requirements of the concrete pavement.
- 5. Where the structural slabs are located outside of the concrete pavement section, the structural slabs shall be constructed from concrete meeting the following:
 - i. Cement used for concrete structural slabs shall be Type IIA (air-entrained) of Type IIIA (air-entrained high-early strength) Portland cement conforming to ASTM C150 or equal as approved by Duluth Energy Systems.
 - ii. Concrete structural slabs shall meet the requirement of Grade B or higher as outlined in MN/DOT 2461.
 - iii. The concrete mix design for concrete structural slabs shall be MN/DOT mix number 3Y40, or as approved by the engineer.
- 6. Traffic shall not be allowed onto HS-25 slabs until the compressive strength of the concrete reaches a minimum of 3,000 psi.
- F. <u>Building Wall Penetrations</u>
 - 1. All concrete and masonry wall openings for steam pipe, sleeves, casings, or conduit pipe shall be sealed with the following:
 - i. Non-Shrink Grout: Pour Rok[®], Embeco[®] 636, or approved equal.
 - ii. Water Sealing Material: SikaSet[®] Plug, or approved equal.
 - Exterior Waterproofing: All building wall penetrations shall be sealed with an bitumastic sealant approved by Duluth Energy Systems for use on foundation walls. Approved sealants are:
 - a. BASF MasterSeal HLM 5000
 - b. RoofWorks Fibered Roof and Foundation Coating
 - c. SealMaster Fibered Roof and Foundation Coating
 - d. Gardner 0405-GA Fibered Roof & Foundation Coating
 - e. APOC 202 Fibered Roof & Foundation Coating
 - f. Or approved equal
 - 2. All porous stone foundation wall openings for steam pipe, sleeves, casings, or conduit pipe shall be covered with Portland Cement, troweled to a smooth finish, then sealed with the following:
 - i. <u>Water Sealing Material</u>: SikaSet[®] Plug, or approved equal.

- ii. Exterior Waterproofing: All building wall penetrations shall be sealed with a bitumastic sealant approved by Duluth Energy Systems for use on foundation walls. Approved sealants are:
 - a. BASF MasterSeal HLM 5000
 - b. RoofWorks Fibered Roof and Foundation Coating
 - c. SealMaster Fibered Roof and Foundation Coating
 - d. Gardner 0405-GA Fibered Roof & Foundation Coating
 - e. APOC 202 Fibered Roof & Foundation Coating
 - f. Or approved equal

EXECUTION

A. <u>Utility Structure Construction Requirements</u>

- 1. General Requirements
 - i. Conform to the requirements of **STM-12 Earthwork and Pipe Backfill** for subgrade preparation. Placement on natural grade is preferred, if stable.
 - ii. Allow poured-in-place concrete footings and floor slabs to reach a strength of 3,500 psi before continuing structure construction.
 - iii. Provide continuous performed butyl rubber joint seal as specified in all horizontal joints of precast structures.
 - a. Install in accordance with manufacturer's recommendations.
 - b. Butt ends together and do not overlap material.
 - c. Leave protective paper in place during application and handling; remove just prior to coupling.
- 2. Storm Sewer Connections
 - i. Unless pre-fabricated holes are provided for as part of the Storm Sewer construction, the Contractor shall core drill into storm sewer to make the final drain connection, and in all instances close and seal all openings around the outside of the pipe in precast structures in accordance with these Special Provisions.
- 3. Sanitary Sewer Connections
 - i. Unless pre-fabricated holes are provided for as part of the Storm Sewer construction, the Contractor shall core drill into storm sewer to make the final drain connection, and in all instances close and seal all openings around the outside of the pipe in precast structures in accordance City of Duluth Standards.
- 4. Anchors, Guides, and Pipe Supports
 - i. Just prior to pouring the insulation coat all exposed steel with bitumastic sealant. Bitumastic must be tacky during insulation installation.
 - a. Coat the post, support channel, and knee brace on anchors.

- b. Coat the steel guide brackets and spacer angles on guides.
- c. Coat concrete pipe supports.
- 5. Wall Penetrations and Exterior Waterproofing Systems
 - i. Prior to backfilling structures and wall penetrations, install all exterior waterproofing seals and membranes.
 - ii. Waterproofing membrane shall extend from the pipe penetration to the following limits on the existing wall:
 - a. Poured Concrete Wall: waterproofing shall extend a minimum of 24" onto solid concrete of existing foundation wall
 - b. Concrete Masonry Block Wall: waterproofing shall extend to the existing unaffected waterproofing membrane. If there is no existing membrane, waterproofing shall extend 36" in each direction.
 - c. Other Foundation Wall Materials: waterproofing membrane shall extend a minimum of 36" from the wall penetration onto the existing wall. Porous foundation walls shall require an application of troweled non-shrink concrete mortar prior to the installation of the waterproof membrane.
 - Waterproofing seals and membranes on flash chamber structures shall extend 24" in each direction from the pipe penetrations or to the corners of the structures, whichever is greater.
 - iv. Waterproofing must be left visible for the Duluth Energy Systems to inspect prior to backfilling.
 - v. Backfilling around waterproofing prior to Duluth Energy Systems' inspection may be grounds for rejection of work and re-excavation for inspection at the Contractor's expense.

B. <u>Quality Assurance</u>

1. All concrete included into the Work for the steam system shall be tested in accordance with City of Duluth Construction Standards.

MEASUREMENT AND PAYMENT

- A. <u>Bid Item 2509.601, "Remove and Replace Existing Steam Vault Lid"</u>, shall be a lump sum payment for the removal of the existing vault lid and replacement according to the plans and details provided. Payment shall include all labor, equipment, and material to remove the existing lid and construct the replacement, including, but not limited to, salvage of existing castings, concrete sawing of existing structure, falsework, steel reinforcement bars, excavation, bedding, backfill, waterproofing, and installation of castings. The Engineer will not separately measure formwork or excavation and backfill but all such work shall be considered included for payment under this item.
- B. <u>Bid Item 2509.602, "Furnish and Install Steam Manhole"</u>, shall be paid for by each concrete structure furnished and installed regardless of depth. Payment shall include all labor, equipment and material to construct the valve chamber, including, but not limited to, structural design by licensed Professional Engineer, excavation, foundation material,

bedding, backfill, pipe connections, installing casting furnished by DES, and labor necessary to seal the structure from water infiltration/exfiltration and raise the casting to finish grade.

Steam and condensate piping within the valve chamber, steam trap station, valve chamber venting system, condensate cooler (if required), piping anchors, complete piping insulation and jacketing shall be considered incidental the bid item. Installation of DES provided expansion joints, valve chamber covers, and main large diameter valves shall be considered incidental to the bid item.

C. <u>Bid Item 2509.602, "Connect Condensate Drain to Storm Structure", shall be paid for</u> each condensate drain pipe connection to an existing or proposed storm sewer structure. Payment shall include all labor, equipment, and materials necessary to provide drainage connection to the storm sewer for the steam system, including, but not limited to, coredrilling, concrete mortar mix, concrete bricks, bitumastic sealant, and other appurtenant work required.

All other costs for work related to this section, including, but not limited to, excavation and base levelling for concrete slabs, preparing the foundation, concrete forms, steel reinforcing bars, placing and consolidating concrete, curing materials, or other work necessary for prosecution and completion of the work as specified, shall be included for payment as part of the relevant Contract bid items without any direct compensation being made therefore.

STM-15 (2508) WALL AND FLOOR PENETRATION SLEEVES

SLEEVES

Openings for the passage of pipes through floors and walls of block, rock, or concrete structures shall be formed of sleeves of standard-weight steel pipe. The sleeves shall be of ample diameter to pass the steam pipe and to permit such thermal expansion as may occur. Threaded nipples shall not be used as sleeves.

- Sleeves in exterior walls below ground or in walls below the groundwater level shall have a 1/2-inch (1/2") high annular ring of 1/4-inch (1/4") thick plate welded with a continuous weld completely around the sleeve at about mid-length.
- B. All sleeves shall be set accurately before the concrete is placed or shall be built in accurately as the masonry is being built.
- C. All sleeves through exterior walls or floors in exposed areas shall be Schedule 40 steel pipe (minimum wall thickness).

INSTALLATION OF SLEEVES

- A. <u>Fabricate all sleeves from new materials.</u>
 - 1. Pipe sleeve inside diameter shall be a minimum of one-inch (1") larger than the outside diameter of the HDPE insulation jacket.
 - 2. Wall sleeves shall be installed flush with both sides of the wall penetration, unless noted otherwise in the Plans.

- 3. Floor sleeves shall extend two inches (2") above the floor, unless noted otherwise in the Plans.
- 4. All sleeves shall be sealed between the wall and the sleeve, as well as between the sleeve and carrier pipe as shown in the Plans.
- 5. Exterior wall penetrations shall be sealed in accordance with the provisions of **STM-15 Concrete and Utility Structures**.

MEASUREMENT AND PAYMENT

Wall/Floor penetration sleeves shall be considered incidental to the cost bid for the Concrete and Utility Structures bid items.

- END -

Line No	Item No	Description	UOM	QTY	Unit Cost Total Cost
1	2011 601	AS BUILT	LUMP SUM	1	
2	2021 501	MOBILIZATION	LUMP SUM	1	
2	2104 502			21	
3	2104.302		EACH	21	
4	2104.502	REMOVE MANHOLE OR CATCH BASIN	EACH	23	
5	2104.502	REMOVE HYDRANT	EACH	3	
6	2104.502	REMOVE SIGN	EACH	9	
7	2104.502	REMOVE SIGNAL SYSTEM	EACH	1	
8	2104.502	REMOVE LIGHT FOUNDATION	EACH	21	
9	2104.502	REMOVE SIGN PANEL	EACH	11	
10	2104 502	SALVAGE PEDESTRIAN PLISH BUTTON STATION	FACH	1	
11	2104 502		EACH	6	
10	2104.502		EACH	0	
12	2104.302	SALVAGE SIGN PANEL	EACH	9	
13	2104.502	SALVAGE SIGN PANEL TYPE SPECIAL	EACH	1	
14	2104.503	SAWING CONCRETE PAVEMENT (FULL DEPTH)	LIN FT	1 219	
15	2104.503	SAWING BITUMINOUS PAVEMENT (FULL DEPTH)	LIN FT	461	
16	2104.503	REMOVE WATER MAIN	LIN FT	849	
17	2104.503	REMOVE SEWER PIPE (STORM)	LIN FT	1 501	
18	2104 503	REMOVE CUBB	LIN FT	672	
10	2104 503	REMOVE CURB & CUTTER		1 207	
20	2104.503			127	
20	2104.303	REMOVE RETAINING WALL		137	
21	2104.503	REMOVE HANDRAIL		130	
22	2104.518	REMOVE SIDEWALK	SQ FT	15 562	
23	2104.518	REMOVE CONCRETE DRIVEWAY PAVEMENT	SQ FT	3 051	
24	2104.518	REMOVE PAVEMENT	SQ YD	6 575	
25	2104.518	REMOVE BITUMINOUS DRIVEWAY PAVEMENT	SQ FT	1 434	
26	2104.601	REMOVE CONDUIT SYSTEM	LUMP SUM	1	
27	2104 602	REMOVE PARKING METER POST	EACH	9	1
28	2104.602	REMOVE ARANDONED GAS		811	
20	2104.003			2 000	
29	2100.007			2 802	
30	2106.507		CU YD	92	
31	2106.507	GRANULAR EMBANKMENT (CV)	CU YD	420	
32	2106.507	SELECT GRANULAR EMBANKMENT MOD 7% (CV)	CU YD	2 540	
33	2108.504	GEOTEXTILE FABRIC TYPE 9	SQ YD	5 061	
34	2123.510	COMMON LABORERS	HOUR	20	l i
35	2123 510	0.5 CITXD SHOVE	HOUR	20	
26	2123 510			20	
30	2123.310			20	
37	2211.507	AGGREGATE BASE (CV) CLASS 5	CUYD	1792	
38	2301.503	INTEGRANT CURB DESIGN B6	LINFI	10	
39	2301.504	CONCRETE PAVEMENT 8.0"	SQ YD	1 494	
40	2301.507	STRUCTURAL CONCRETE	CU YD	332	
41	2301.508	SUPPLEMENTAL PAVEMENT REINFORCEMENT	POUND	1 809	
42	2301.602	DRILL AND GROUT DOWEL BAR (EPOXY COATED)	EACH	104	
43	2301 602	DRILL & GROUT REINE BAR (EPOXY COATED)	FACH	83	
44	2301.603	PAVENENT END ANCHOR	LIN FT	121	
44	2301.003			005	
43	2302.302		LACIT	000	
46	2360.509	TYPE SP 9.5 WEARING COURSE MIXTURE (3,C)	TON	453	
47	2360.509	TYPE SP 12.5 NON WEARING COURSE MIXTURE (3,C)	TON	502	
48	2411.507	STRUCTURAL CONCRETE (1G52)	CU YD	63	
49	2411.507	STRUCTURAL CONCRETE (1P62)	CU YD	10	
50	2411.507	STRUCTURAL CONCRETE (3G52)	CU YD	75	
51	2411.507	STRUCTURE EXCAVATION CLASS E	CU YD	1 285	
52	2411 507	STRUCTURE EXCAVATION CLASS R	CU YD	10	
52	2411.509			7 104	
55	2411.300	REINFORGEMENT DARS	POUND	7 104	
54	2411.306	REINFORCEMENT DARS (EPOXT COATED)	POUND	0/00	
55	2411.601	DRAINAGE SYSTEM	LUMP SUM	1	
56	2451.507	GRANULAR BACKFILL (CV)	CU YD	3 303	
57	2451.507	COURSE AGGREGATE BEDDING (CV)	CU YD	140	
58	2451.507	STRUCTURE EXCAVATION CLASS R	CU YD	85	
59	2475.503	ORNAMENTAL METAL RAILING	LIN FT	176	
60	2502.503	4" PERF PVC PIPE DRAIN	LIN FT	1 592	
61	2503.503	10" PVC PIPE SEWER	LIN FT	33	1
62	2503 503			28	
62	2503.303			607	<u>├ </u>
03	2003.003			007	
64	2503.503	21° RC PIPE SEWER DESIGN 3006	LINFI	498	
65	2503.503	24" KC PIPE SEWER DESIGN 3006	LIN FT	494	
66	2503.602	CONNECT TO EXISTING STORM SEWER	EACH	7	
67	2503.602	CONNECT SEWER SERVICE	EACH	11	
68	2503.602	SANITARY TRACER BOX	EACH	14	
69	2503.603	6" PVC SANITARY SERVICE PIPE	LIN FT	385	
70	2503.603	8" PVC SANITARY SERVICE PIPE	LIN FT	102	
71	2504 601	TEMPORARY WATER SERVICE	LUMP SUM	1	
72	2504 602	RECONNECT WATER SERVICE	FACH	5	
72	2504.602		EACH	5	
74	2504.002		EACH	5	
74	2004.602		EACH	5	
/5	2504.602	6" GATE VALVE AND BOX	EACH	9	
76	2504.602	8" GATE VALVE AND BOX	EACH	4	
77	2504.602	12" GATE VALVE AND BOX	EACH	2	
78	2504.602	INSTALL 8"X6" TAPPING TEE W/ELECTROFUSION SADDLE	EACH	9	
79	2504.602	WATER TRACER BOX	EACH	21	
80	2504.602	HYDRANT ASSEMBLY	EACH	4	
81	2504 602	CONCRETE ENCASED VALVE BOX COVER IN ROADWAY	FACH	14	
82	2504.602	a" DIPS HDPE WATER MAIN SDR 11		679	
02	2504.003			010	<u>├</u>
03	2004.003			01	
84	2504.603	ID UIPS HUPE WATEK MAIN SUK 11	LINFT	90	
85	2504.603	6" HUPE SUR 11 SERVICE PIPE	LIN FT	233	
86	2504.604	3" POLYSTYRENE INSULATION	SQ YD	14	
87	2506.502	CONSTRUCT DRAINAGE STRUCTURE DESIGN G	EACH	5	
88	2506.502	CONSTRUCT DRAINAGE STRUCTURE DESIGN H	EACH	16	
89	2506.502	CASTING ASSEMBLY	EACH	16	
90	2506 502	ADJUST FRAME AND RING CASTING	FACH	12	1
01	2506 502			95	
02	2500.505			46	
32	2000.003			10	
93	2506.602	CONCRETE ENCASED CASTING COLLAR	EACH	19	
94	2506.602	CONNECT INTO EXISTING DRAINAGE STRUCTURE	EACH	2	
95	2506.602	MANHOLE FRAME SEAL	EACH	9	

Ser S	0500 000		EACH	0		
30	2008.002	CONNECT TO EXISTING HWP	EACH	2		
97	2508.602	INSTALL 2"/5.5" HOT WATER ISOLATION VALVE	EACH	8		
98	2508.602	INSTALL 4"/8" HOT WATER ISOLATION VALVE	EACH	2		
00	2508 602	INISTALL 6"/10" HOT WATER ISOLATION VALVE	EACH	2		
99	2300.002		EACH	2		
100	2508.602	INSTALL 12"/20" HOT WATER ISOLATION VALVE	EACH	4		
101	2508.602	1" RECIRCULATION ASSEMBLY	EACH	2		
102	2508 602	FURNISH AND INSTALL 2'X3' FLASH CHAMBER	FACH	3		
402	0500.000		EACH	4		
103	2008.002	FURNISH AND INSTALL 24 FLASH CHAMBER	EACH			
104	2508.602	CONNECT TO EXISTING STEAM TUNNEL	EACH	1		
105	2508 602	CONNECT TO STORM STRUCTURE	FACH	3		
106	2500.002		EACH	1	1	
100	2006.002	CONNECT TO EXISTING CONDOT	EACH			
107	2508.602	INSTALL 24"X36" HANDHOLE	EACH	6		
108	2508 603	INSTALL 1"/4" HWP	LIN FT	30		
100	2509,602			80	1	
109	2000.000	INSTALL 2 /3.3 HWP		00		
110	2508.603	INSTALL 4"/9" HWP	LIN FT	352		
111	2508.603	INSTALL 6"/11" HWP	LIN FT	2 084		
112	2509 602			40		
112	2300.003	INSTALL 0/14 TWF	LINFI	40		
113	2508.603	INSTALL 12"/20" HWP	LIN FT	996		
114	2508.603	FURNISH AND INSTALL 6" DIP CL 52	LIN FT	77		
115	2508 603	EURNISH AND INSTALL 2" SCH80 PVC CONDUIT	LIN FT	3 605		
110	2500.005			0 7 4 7		
116	2508.603	FURNISH AND INSTALL FIBER-OPTIC CABLE	LINFI	3747		
117	2509.601	REMOVE & REPLACE EXISTING STEAM VAULT LID	LUMP SUM	1		
110	2500 601	DEMOVE VENT DIDES	LUMD SUM	1	1	
110	2309.001		LOWF SOW			
119	2509.601	REMOVE EXPANSION JOINT	EACH	8		
120	2509.602	FURNISH AND INSTALL STEAM MANHOLE	EACH	1		
121	2500 602	INSTALL EXPANSION JOINTS	EACH	0	1 1	
121	2009.002		EACH	Ö	┥───┤	
122	2509.602	CONNECT CONDENSATE DRAIN TO STORM STRUCTURE	EACH	2		
123	2509.603	REMOVE ASBESTOS CONTAINING PIPE INSULATION TYPE D	LIN FT	80		
104	2500 602	4" 316SS CONDENSATE DRAIN PIPE		20	1 1	
124	2009.003	4 STUSS CONDENSATE DRAIN FIFE		30		
125	2509.603	FURNISH AND INSTALL VENT PIPES	LIN FT	70		
126	2509 615	STEAM MANHOLE #1	EACH	1		
407	2000.010		EACH			
127	2009.015		EACH	1		
128	2511.504	GEOTEXTILE FILTER TYPE 3	SQ YD	75		
129	2511 507	RANDOM RIPRAR CLASS II		40		
120	2511.507		00 TD	40		
130	2521.518	6" CONCRETE WALK	SQFI	22 370		
131	2521.518	6" CONCRETE WALK SPECIAL	SQ FT	308		
132	2531 503	CONCRETE CURB AND GUITTER DESIGN 8624	LIN FT	1 776		
102	2001.000			1110		
133	2531.503	CONCRETE CURB AND GUTTER DESIGN 5524	LINFI	413		
134	2531.504	8" CONCRETE DRIVEWAY PAVEMENT	SQ YD	388		
135	2531 603		LIN FT	71		
100	2551.005			010		
136	2531.618	TRUNCATED DOMES	SQFI	219		
137	2540.602	FURNISH AND INSTALL PARKING METER POST	EACH	29		
138	2545 502	LIGHTING LINIT TYPE SPECIAL 1	EACH	10		
100	2040.002		EAOH	10		
139	2545.502	LIGHTING UNIT TYPE SPECIAL 2	EACH	1		
140	2545.502	LIGHT FOUNDATION DESIGN E MODIFIED	EACH	11		
141	2545 502	SERVICE CABINET	FACH	1		
141	2545.502		EACH	1		
141 142	2545.502 2545.502	SERVICE CABINET EQUIPMENT PAD	EACH EACH	1		
141 142 143	2545.502 2545.502 2545.502	SERVICE CABINET EQUIPMENT PAD HANDHOLE	EACH EACH EACH	1 1 4		
141 142 143 144	2545.502 2545.502 2545.502 2545.503	SERVICE CABINET EQUIPMENT PAD HANDHOLE	EACH EACH EACH	1 1 4 131		
141 142 143 144	2545.502 2545.502 2545.502 2545.503	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1* NON-METALLIC CONDUIT	EACH EACH EACH LIN FT	1 1 4 131		
141 142 143 144 145	2545.502 2545.502 2545.502 2545.503 2545.503	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT	EACH EACH EACH LIN FT LIN FT	1 1 4 131 1 443		
141 142 143 144 145 146	2545.502 2545.502 2545.502 2545.503 2545.503 2545.503	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG	EACH EACH EACH LIN FT LIN FT	1 1 4 131 1 443 721		
141 142 143 144 145 146 147	2545.502 2545.502 2545.502 2545.503 2545.503 2545.503 2545.503	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 2 AWG	EACH EACH EACH LIN FT LIN FT LIN FT	1 1 4 131 1443 721 8 324		
141 142 143 144 145 146 147	2545.502 2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 6 AWG	EACH EACH LIN FT LIN FT LIN FT LIN FT	1 4 131 1443 721 8 324		
141 142 143 144 145 146 147 148	2545.502 2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503 2550.502	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1* NON-METALLIC CONDUIT 2* NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 6 AWG OUTDOOR FIBER SPLICE ENCLOSURE	EACH EACH LIN FT LIN FT LIN FT LIN FT EACH	1 4 131 1443 721 8 324 2		
141 142 143 144 145 146 147 148 149	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503 2550.502 2550.502	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 6 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5" NON-METALLIC CONDUIT	EACH EACH LIN FT LIN FT LIN FT EACH LIN FT	1 4 131 1 443 721 8 324 2 1 210		
141 142 143 144 145 146 147 148 149 150	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503 2550.502 2550.503 2550.503	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 6 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5" NON-METALLIC CONDUIT CAT 6 CABLE	EACH EACH LIN FT LIN FT LIN FT LIN FT EACH LIN FT	1 4 131 1443 721 8 324 2 1 210 162		
141 142 143 144 145 146 147 148 149 150	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503 2550.502 2550.503 2550.503 2550.503	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 6 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5" NON-METALLIC CONDUIT CAT 6 CABLE EVERE DEVICE CABLE TESTING	EACH EACH LIN FT LIN FT LIN FT LIN FT EACH LIN FT LIN FT	1 4 131 1443 721 8 324 2 1 210 162		
141 142 143 144 145 146 147 148 149 150 151	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503 2545.503 2550.502 2550.503 2550.503	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 6 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5" NON-METALLIC CONDUIT CAT 6 CABLE FIBER OPTIC CABLE TESTING	EACH EACH LIN FT LIN FT LIN FT EACH LIN FT LIN FT LUN FT LUMP SUM	1 4 131 1443 721 8 324 2 1 210 162 1		
141 142 143 144 145 146 147 148 149 150 151 152	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503 2550.502 2550.503 2550.503 2550.601 2550.602	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 4 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5" NON-METALLIC CONDUIT CAT 6 CABLE FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC SPLICE / PATCH PANEL	EACH EACH LIN FT LIN FT LIN FT EACH LIN FT LIN FT LIN FT LUM FT LUM PSUM EACH	1 4 131 1443 721 8324 2 1210 162 1 2		
141 142 143 144 145 146 147 148 149 150 151 151 152 153	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503 2550.502 2550.502 2550.503 2550.601 2550.602	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 6 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5" NON-METALLIC CONDUIT CAT 6 CABLE FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC PLICE / PATCH PANEL FIBER OPTIC PLICE / PATCH PANEL FIBER OPTIC PLICE / PATCH PANEL	EACH EACH LIN FT LIN FT LIN FT EACH LIN FT LIN FT LUMP SUM EACH EACH	1 4 131 1443 721 8 324 2 1 210 162 1 2 2		
141 142 143 144 145 146 147 148 149 150 151 150 151 152 153	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503 2545.503 2550.502 2550.503 2550.601 2550.601 2550.602	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1' NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 6 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5" NON-METALLIC CONDUIT CAT 6 CABLE FIBER OPTIC CABLE TESTING FIBER OPTIC SPLICE / PATCH PANEL FIBER OPTIC SPLICE / PATCH PANEL FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE SPLICE/PATCH PANEL FIBER OPTIC CABLE SPLICE/PATCH PANEL FIBER OPTIC CABLE SPLICE/PATCH PANEL	EACH EACH LIN FT LIN FT LIN FT EACH LIN FT LIN FT LIN FT LUM FT LUM PSUM EACH EACH	1 1 4 131 1443 721 8 324 2 1210 162 1 2 2 2 2 2 2 2 2 2 2 2 2 2		
141 142 143 144 145 146 147 147 148 149 150 151 152 153 154 154	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503 2550.502 2550.503 2550.601 2550.602 2550.602 2550.602	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 6 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5" NON-METALLIC CONDUIT CAT 6 CABLE FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC PICTAL TERMINATION FIBER OPTIC CABLE SPLICING	EACH EACH EACH LIN FT LIN FT LIN FT LIN FT LIN FT LIN FT LUMP SUM EACH EACH EACH	1 1 4 131 1443 721 8 324 2 1210 162 1 1 2 2 2 3 3		
141 142 143 144 145 146 147 148 149 150 151 152 153 154 155	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503 2545.503 2550.502 2550.503 2550.601 2550.602 2550.602 2550.602	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1* NON-METALLIC CONDUIT 2* NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 6 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5* NON-METALLIC CONDUIT CAT 6 CABLE FIBER OPTIC CABLE TESTING FIBER OPTIC SPLICE / PATCH PANEL FIBER OPTIC SPLICE / PATCH PANEL FIBER OPTIC CABLE SPLICING FIBER OPTIC CABLE SPLICING FULL VAULT	EACH EACH LIN FT LIN FT LIN FT EACH LIN FT LIN FT LIN FT LUM PSUM EACH EACH EACH	1 1 4 131 1443 721 8324 2 1210 162 1 2 2 2 3 3 3		
141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503 2550.502 2550.503 2550.601 2550.602 2550.602 2550.602 2550.602	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 6 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5" NON-METALLIC CONDUIT CAT 6 CABLE FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC PICTAL TERMINATION FIBER OPTIC CABLE SPLICING PULL VAULT CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283	EACH EACH EACH LIN FT LIN FT LIN FT LIN FT LIN FT LUMP SUM EACH EACH EACH EACH	1 1 4 131 1443 721 8 324 2 1210 162 1 162 1 2 2 3 3 3 1		
$\begin{array}{r} 141\\ 142\\ 143\\ 144\\ 145\\ 146\\ 147\\ 148\\ 149\\ 150\\ 151\\ 152\\ 153\\ 154\\ 155\\ 156\\ 156\\ 157\\ \end{array}$	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503 2545.503 2550.502 2550.503 2550.503 2550.601 2550.602 2550.602 2550.602 2550.602	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 6 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5" NON-METALLIC CONDUIT CAT 6 CABLE FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC PICT / PATCH PANEL FIBER OPTIC PICT / PATCH PANEL FIBER OPTIC CABLE SPLICING PULL VAULT CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283 CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283	EACH EACH LIN FT LIN FT LIN FT EACH LIN FT LIN FT LIN FT LUMP SUM EACH EACH EACH EACH EACH EACH	1 1 4 131 1443 721 8 324 2 1210 162 1 2 3 3 3 1 1		
141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 156	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503 2550.503 2550.503 2550.601 2550.602 2550.602 2550.602 2550.602 2550.602	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 6 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5" NON-METALLIC CONDUIT CAT 6 CABLE FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC PICTAIL TERMINATION FIBER OPTIC CABLE SPLICING PULL VAUT CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283 CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283	EACH EACH EACH LIN FT LIN FT LIN FT LIN FT LIN FT LIN FT LIN FT LUMP SUM EACH EACH EACH EACH EACH EACH	1 1 4 131 1443 721 8 324 2 1210 162 1 2 2 3 3 3 1 1 1		
141 142 143 144 145 146 147 147 148 147 148 147 150 151 151 152 153 154 155 155 155 157 158	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503 2545.503 2550.502 2550.503 2550.503 2550.601 2550.602 2550.602 2550.602 2550.602 2550.602	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 6 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5" NON-METALLIC CONDUIT CAT 6 CABLE FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC PICALE TESTING FIBER OPTIC PICAL TERMINATION FIBER OPTIC CABLE SPLICING PULL VAULT CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283 CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283 ELECTRICAL MANHOLE	EACH EACH EACH LIN FT LIN FT LIN FT LIN FT LIN FT LIN FT LIN FT LUMP SUM EACH EACH EACH EACH EACH EACH EACH EACH	1 1 4 131 1443 721 8 324 2 1210 162 1 2 2 3 3 1 1 1 1		
141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503 2550.503 2550.503 2550.601 2550.602 2550.602 2550.602 2550.602 2550.602 2550.602	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 6 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5" NON-METALLIC CONDUIT CAT 6 CABLE FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC PICTAIL TERMINATION FIBER OPTIC CABLE SPLICING PULL VAULT CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283 CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283 ELECTRICAL MANHOLE FIBER OPTIC TRUNK CABLE 144SM	EACH EACH EACH LIN FT LIN FT LIN FT LIN FT LIN FT LIN FT LIN FT LUMP SUM EACH EACH EACH EACH EACH EACH EACH EACH	1 1 4 131 1443 721 8 324 2 1210 162 1 2 2 3 3 1 1 1 1 605		
141 142 143 144 145 146 147 147 148 147 150 151 151 152 155 156 155 155 157 158 157	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503 2545.503 2550.502 2550.503 2550.601 2550.602 2550.602 2550.602 2550.602 2550.602 2550.602 2550.602 2550.602	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 2 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5" NON-METALLIC CONDUIT CAT 6 CABLE FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC PICT / PATCH PANEL FIBER OPTIC PICT / PATCH PANEL FIBER OPTIC CABLE SPLICING PULL VAULT CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283 CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283 ELECTRICAL MANHOLE FIBER OPTIC TRUNK CABLE 144SM ELECTRICAL PUCK BANK TYPE 1	EACH EACH LIN FT LIN FT LIN FT EACH LIN FT LIN FT LIN FT LUMP SUM EACH EACH EACH EACH EACH EACH EACH EACH	1 1 4 131 1443 721 8 324 2 1210 162 1 2 2 3 3 1 1 1 1 1 1 1 1 1 1 1 1 1		
141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 169 169	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503 2550.503 2550.503 2550.601 2550.602 2550.602 2550.602 2550.602 2550.602 2550.602 2550.603 2550.603	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 6 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5" NON-METALLIC CONDUIT CAT 6 CABLE FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC PICTAIL TERMINATION FIBER OPTIC CABLE SPLICING PULL VAULT CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283 CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283 ELECTRICAL MANHOLE FIBER OPTIC TRUNK CABLE 144SM ELECTRICAL DUCT BANK TYPE 1 CONNECT INTO EXISTING FIG	EACH EACH EACH LIN FT LIN FT LIN FT LIN FT LIN FT LIN FT LIN FT LIN FT EACH EACH EACH EACH EACH EACH EACH EACH	1 1 4 131 1443 721 8 324 2 1210 162 1 2 2 3 3 1 1 1 1 605 376 575		
141 142 143 144 145 146 147 148 149 150 151 152 155 156 157 158 159 160 161	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2545.503 2545.503 2550.502 2550.503 2550.601 2550.602 2550.602 2550.602 2550.602 2550.602 2550.602 2550.602 2550.603 2550.603	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UDDERGROUND WIRE 1/C 2 AWG UDDERGROUND WIRE 1/C 6 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5" NON-METALLIC CONDUIT CAT 6 CABLE FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC PICT / PATCH PANEL FIBER OPTIC PICT / PATCH PANEL FIBER OPTIC CABLE SPLICING PULL VAULT CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283 CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283 ELECTRICAL MANHOLE FIBER OPTIC TRUNK CABLE 144SM ELECTRICAL DUCT BANK TYPE 1 ELECTRICAL DUCT BANK TYPE 2	EACH EACH EACH LIN FT LIN FT EACH LIN FT LIN FT LIN FT LUMP SUM EACH EACH EACH EACH EACH EACH EACH EACH	1 1 4 131 1443 721 8 324 2 1210 162 1 1 2 2 3 3 1 1 1 1 1605 376 60		
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141 142 143 144 145 146 147 148 149 150 151 152 155 156 157 158 159 160 161 162	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2550.502 2550.503 2550.503 2550.601 2550.602 2550.602 2550.602 2550.602 2550.602 2550.603 2550.603 2550.603 2550.603	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UDDERGROUND WIRE 1/C 2 AWG UDDERGROUND WIRE 1/C 6 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5" NON-METALLIC CONDUIT CAT 6 CABLE FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC PICT / PATCH PANEL FIBER OPTIC CABLE SPLICING PULL VAULT CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283 CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283 ELECTRICAL MANHOLE FIBER OPTIC TRUNK CABLE 144SM ELECTRICAL DUCT BANK TYPE 1 ELECTRICAL DUCT BANK TYPE 1 ELECTRICAL DUCT BANK TYPE 2 6" NON-METALLIC CONDUCT	EACH EACH EACH LIN FT LIN FT EACH LIN FT LIN FT LIN FT LUMP SUM EACH EACH EACH EACH EACH EACH EACH LIN FT LIN FT LIN FT LIN FT LIN FT	1 1 4 131 1443 721 8 324 2 1210 162 1 1 2 2 3 3 1 1 1 1 1 1 1 1 1 1 1 1 1		
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141 142 143 144 145 146 147 148 149 150 151 155 156 157 158 150 161 162 163 164	2545.502 2545.502 2545.503 2545.503 2545.503 2545.503 2550.502 2550.503 2550.503 2550.601 2550.601 2550.602 2550.602 2550.602 2550.602 2550.602 2550.603 2550.603 2550.603 2550.603 2550.603	SERVICE CABINET EQUIPMENT PAD HANDHOLE 1" NON-METALLIC CONDUIT 2" NON-METALLIC CONDUIT UNDERGROUND WIRE 1/C 2 AWG UNDERGROUND WIRE 1/C 6 AWG OUTDOOR FIBER SPLICE ENCLOSURE 1.5" NON-METALLIC CONDUIT CAT 6 CABLE FIBER OPTIC CABLE TESTING FIBER OPTIC CABLE TESTING FIBER OPTIC PICTAL TERMINATION FIBER OPTIC CABLE SPLICING PULL VAULT CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283 CONNECT INTO EXISTING ELECTRICAL MANHOLE NO. 283 ELECTRICAL MANHOLE FIBER OPTIC TUNK CABLE 144SM ELECTRICAL DUCT BANK TYPE 1 ELECTRICAL DUCT BANK TYPE 2 6" NON-METALLIC CONDULT ELECTRICAL DUCT (DIRECTIONAL BORE) TRAFFIC CONTROL	EACH EACH EACH LIN FT LIN FT EACH LIN FT LIN FT LIN FT LIN FT EACH EACH EACH EACH EACH EACH LIN FT LIN FT LIN FT LIN FT LIN FT LIN FT LIN FT	1 1 4 131 1443 721 8 324 2 1210 162 1 1 2 2 2 3 3 3 3 1 1 1 1605 376 60 588 1 1		
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