CONSTRUCTION DRAWINGS

FOR BIDDING PURPOSES ONLY

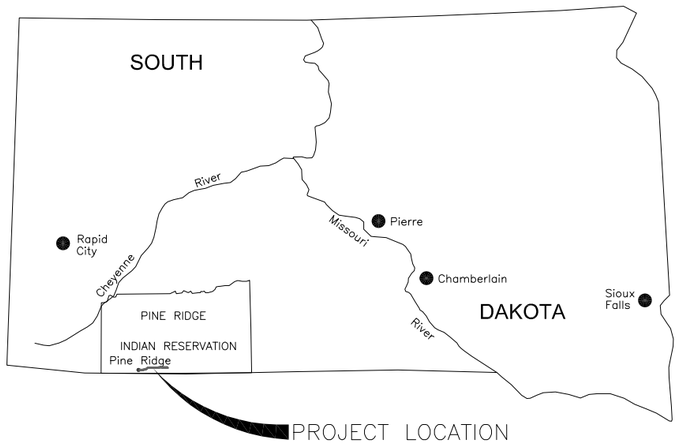
FOR

OGLALA SIOUX RURAL WATER SUPPLY SYSTEM
US HIGHWAY 18 EAST WATER PIPELINE REPLACEMENT
OGLALA LAKOTA COUNTY, SOUTH DAKOTA

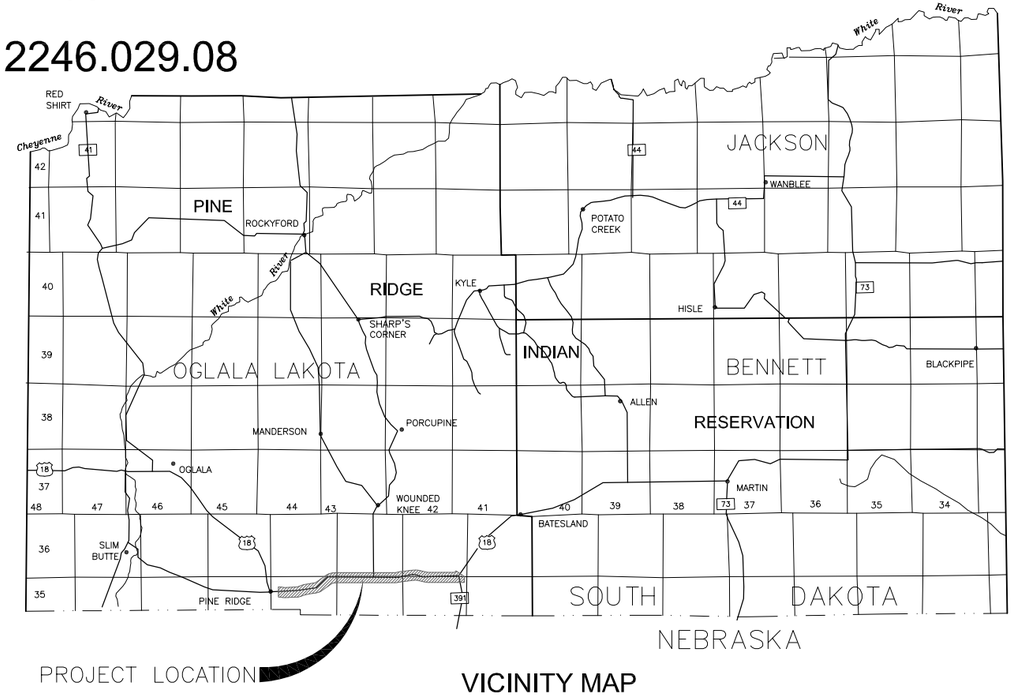
JULY, 2015

PCN X03R

MMI P/N 2246.029.08



LOCATION MAP



VICINITY MAP

APPROVED BY:

CRAIG L. NOWAK, P.E.
Project Manager

MORRISON MAIERLE, INC.
PROJECT NO.

2246.029.08

SHEET NO. DRAWING NO. SHEET TITLE

GENERAL

		COVER
1	G-1	ESTIMATE OF QUANTITIES AND GENERAL NOTES
2	G-2	THRUST BLOCK DETAILS

WATER MAIN CONFLICTS

3	C-1	PLAN AND PROFILE INDEX MAP
4	C-2	PLAN AND PROFILE STA. 124+00 TO STA. 140+00 STA. 188+00 TO STA. 194+00 STA. 252+00 TO STA. 272+00
5	C-3	PLAN AND PROFILE STA. 280+00 TO STA. 290+00 STA. 310+00 TO STA. 320+00
6	C-4	PLAN AND PROFILE STA. 330+00 TO STA. 346+00 STA. 530+00 TO STA. 536+00 STA. 590+00 TO STA. 600+00
7	C-5	PLAN AND PROFILE STA. 696+00 TO STA. 702+00 STA. 714+00 TO STA. 722+00 STA. 822+00 TO STA. 834+00
8	C-6	PLAN AND PROFILE STA. 834+00 TO STA. 848+00 STA. 892+00 TO STA. 900+00 STA. 918+00 TO STA. 926+00

SHEET NO. DRAWING NO. SHEET TITLE

SERVICE MAIN CONFLICTS

9	C-7	PLAN AND PROFILE STA. 128+00 TO STA. 132+00 STA. 162+00 TO STA. 192+00

SERVICE LINE LOCATIONS

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12	S-3	SERVICE LINE LOCATIONS
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DETAILS

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CORROSION PROTECTION

17	CP-1	TYPICAL CORROSION PROTECTION DETAILS
18	CP-2	TYPICAL CORROSION PROTECTION DETAILS
19	CP-3	TYPICAL CORROSION PROTECTION DETAILS

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WATER PIPELINE REPLACEMENT QUANTITIES

ITEM NO.	DESCRIPTION OF ITEM	ESTIMATED QUANTITY	UNIT
009E0010	MOBILIZATION	1	LS
451E0506	1.5" PVC PIPE	250	FT
451E0512	3" PVC PIPE	1700	FT
451E0606	6" PVC WATER MAIN	200	FT
451E0612[1]	12" PVC WATER MAIN	5150	FT
451E0614	14" PVC WATER MAIN	3350	FT
451E1277	1.5" WATER SERVICE	6	EACH
451E3902	2" AIR RELEASE VALVE ASSEMBLY	3	EACH
451E3903	3" AIR RELEASE VALVE ASSEMBLY	1	EACH
451E4112	12" BUTTERFLY VALVE WITH BOX	1	EACH
451E4114	14" BUTTERFLY VALVE WITH BOX	1	EACH
451E4203	3" GATE VALVE WITH BOX	3	EACH
451E4206	6" GATE VALVE WITH BOX	1	EACH
451E4380	TRACER WIRE ACCESS BOX	3	EACH
451E4400	PIPE INSULATION	8800	SQ FT
451E4918	IMPORTED TRENCH BACKFILL	20	CU YD
451E5103	BORE AND JACK 3" PIPE	250	FT
451E5106	BORE AND JACK 6" PIPE	125	FT
451E5114	BORE AND JACK 14" PIPE	125	FT
451E6105	CONNECT TO EXISTING WATER MAIN	32	EACH
451E6515	REMOVE AND RESET FIRE HYDRANT	1	EACH

[1] INCLUDES 4050 FT OF CL160 PIPE AND 1100 FT OF CL200 PIPE

GENERAL NOTES:

FOR BIDDING PURPOSES ONLY

1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS.
2. EXISTING UTILITIES ARE SHOWN BASED ON INFORMATION AVAILABLE TO THE ENGINEER AND MAY NOT BE COMPLETE OR MAY VERY IN LOCATION. CONTRACTOR IS RESPONSIBLE FOR CONTACTING UTILITIES FOR LOCATION BEFORE EXCAVATION (WITHIN REQUIRED TIME FRAME), AND IS RESPONSIBLE FOR PROTECTION OF ALL UTILITIES WHETHER OR NOT THE UTILITIES ARE SHOWN ON THE PLANS.
3. CONTRACTOR IS RESPONSIBLE FOR PROTECTION OF ALL STRUCTURES ENCOUNTERED ALONG THE PIPELINE ROUTE AND OTHER CONSTRUCTION AREAS. ALL DAMAGED FENCES ARE TO BE REPAIRED TO EXISTING CONDITION OR BETTER. WHERE BILLBOARDS MUST BE DISTURBED, CONTRACTOR SHALL TAKE CARE TO NOT DAMAGE THE STRUCTURE AND WILL COMPENSATE OWNER FOR ANY DAMAGE TO SIGN. IT IS HIGHLY RECOMMENDED THAT THE CONTRACTOR CARRY OUT A STRUCTURAL SURVEY TO IDENTIFY CONDITIONS OF ANY STRUCTURES THAT MIGHT HAVE ANY POTENTIAL OF DISTURBANCE BY THE PROJECT. SAID STRUCTURAL SURVEY WOULD CONSIST OF PHOTOGRAPHS OR VIDEO TAPING BOTH BEFORE AND AFTER CONSTRUCTION.
4. THE CONTRACTOR SHALL CALL FOR THE EXISTING UTILITY LOCATION STAKES 48 HOURS PRIOR TO DIGGING. CALL LOCATING SERVICE AND ALL APPLICABLE UTILITY COMPANIES AS NECESSARY.
5. THE CONTRACTOR SHALL PROVIDE THE ENGINEER WITH HIS PROPOSED PIPE SYSTEM LAYOUT FOR REVIEW PRIOR TO ORDERING ANY PIPE MATERIALS. LAYOUT SHALL INCLUDE DEPTH OF BURY, PRESSURE CLASS FOR DUCTILE IRON PIPE, WALL THICKNESS AND MATERIAL GRADE FOR STEEL AND DIMENSION RATIO (DR) FOR PVC AS APPROPRIATE.
6. ALL DEBRIS RESULTING FROM CONSTRUCTION OPERATING SHALL BE HAULED OFF-SITE AND DISPOSED OF PROPERLY AT THE CONTRACTOR'S EXPENSE.
7. ALL AREAS DISTURBED BY GRADING ACTIVITIES, INCLUDING STAGING/STORAGE AND HAUL ROUTES, SHALL BE EITHER PAVED OR SEEDED AND RETURNED TO THEIR ORIGINAL CONDITION.
8. PRESERVE AND PROTECT SURVEY MONUMENTS AND MARKERS THROUGHOUT CONSTRUCTION. IF DAMAGE OCCURS OR REMOVAL BECOMES NECESSARY, IMMEDIATELY NOTIFY ENGINEER AND RESTORE MONUMENT OR MAKERS TO ORIGINAL CONDITION. RESTORATION TO BE AT THE CONTRACTOR'S SOLE EXPENSE. PRESERVE PRIVATE AND PUBLIC MONUMENTS THAT ARE FOUND. IF MONUMENT MUST BE REMOVED, REPLACE AT ORIGINAL LOCATIONS USING REGISTERED LAND SURVEYOR. NOTIFY ENGINEER WHEN MONUMENTS ARE ENCOUNTERED. IF GOVERNMENT MONUMENTS ARE ENCOUNTERED, REFERENCE THE MONUMENT FOR LATER REPLACEMENT AND PROVIDE 10-DAY ADVANCE NOTIFICATION TO ENGINEER WHO WILL NOTIFY THE PROPER AUTHORITY.
9. CONTRACTOR SHALL MAKE EVERY ATTEMPT TO AVOID DISTURBANCE OF NATURAL VEGETATION TO SUCH EXTENT THAT IS REASONABLE. ALL DISTURBED AREAS SHALL BE RESEEDED OR RESODDED IN ACCORDANCE WITH CONTRACT SPECIFICATIONS.
10. CONTRACTOR SHALL PROVIDE SEPARATE SPOIL PILES FOR THE FIRST 6 INCHES OF SOIL REMOVED (REFERRED TO AS TOPSOIL), AND REMAINING SOIL. IN AREAS WHERE SHALE IS EXCAVATED, CONTRACTOR SHALL AVOID PLACEMENT OF BROKEN SHALE WITHIN 2 FEET OF PIPE. TOP SOIL (TOP 6 INCHES EXCAVATED) SHALL BE USED FOR THE TOP 6 INCHES OF BACKFILL. ALL EXCESS BACKFILL SHALL BECOME PROPERTY OF THE CONTRACTOR FOR DISPOSAL AT HIS EXPENSE.
11. WATER FOR TESTING THIS PROJECT MAY BE OBTAINED FROM THE OGLALA SIOUX RURAL WATER SUPPLY SYSTEM (OSRWSS). CONTACT OSRWSS STAFF FOR AN APPROVED LOCATION TO OBTAIN CONSTRUCTION WATER. DISPOSAL OF TEST WATER SHALL BE CARRIED OUT IN ACCORDANCE WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS. ALL PERMITS MUST BE APPLIED FOR AND PURCHASED BY THE CONTRACTOR UNLESS SPECIFICALLY CALLED OUT A THE RESPONSIBILITY OF OWNER ON THE PLANS OR IN THE CONTRACT DOCUMENTS.
12. ALL REPLACEMENT PIPING ON MAINS TO BE AWWA C900, CLASS 150, UNLESS OTHERWISE SPECIFIED.
13. PROVIDE THRUST BLOCKING AT ALL BENDS, TEES, REDUCERS AND OTHER SIMILAR LOCATIONS. THE BLOCKING SHALL BE SO PLACED, UNLESS SPECIFICALLY SHOWN OTHERWISE, SO THAT PIPE AND FITTING JOINTS WILL BE ACCESSIBLE FOR REPAIRS. THRUST BLOCKS SHALL BE SIZED FOR HYDROSTATIC TEST PRESSURE. SEE DRAWING G-2 FOR DETAILS.
14. ALL CAST IRON DUCTILE PIPE FITTINGS, VALVES, VALVE BOXES AND OTHER MISCELLANEOUS METAL ITEMS SHALL BE WRAPPED IN POLYETHYLENE IN ACCORDANCE WITH AWWA C105 "POLYETHYLENE ENCASEMENT FOR GRAY AND DUCTILE CAST-IRON PIPING FOR WATER AND OTHER LIQUIDS".
15. CONNECT DISSIMILAR PIPE MATERIALS BY MEANS OF A FLEXIBLE COUPLING. INSTALL FITTINGS IN STRICT CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. PROVIDE SHOP DRAWING OF SELECTED FITTING FOR APPROVAL PRIOR TO USE.
16. ALL PIPE TO BE INSTALLED IN APPROXIMATE LOCATIONS SHOWN ON THESE PLANS UNLESS SPECIFIC OFFSETS ARE PROVIDED.
17. ALL EXISTING WATER LINES, FITTINGS, AND STRUCTURES TYPE, SIZE AND LOCATIONS ARE APPROXIMATE BASED ON WATER DISTRIBUTION SYSTEM BASE MAPS AND FIELD OBSERVATION. CONTRACTOR TO FIELD VERIFY ALL NEW CONNECTION POINTS.
18. ALL PIPE TO BE INSTALLED WITH A MINIMUM OF 6 FOOT DEPTH OF COVER PER STANDARD DETAIL (02221)
19. ALL GATE VALVES WITH BOXES TO BE INSTALLED PER STANDARD DETAIL (15955)
20. ALL BUTTERFLY VALVES WITH BOXES TO BE INSTALLED PER STANDARD DETAIL (15956)
21. THE CONTRACTOR SHALL FURNISH AND MAINTAIN ALL NECESSARY TRAFFIC CONTROL IN ACCORDANCE WITH THE ROADWAY WORK SPECIFICATIONS.
22. ALL EXISTING UTILITIES AND SERVICE LINES SHALL BE KEPT IN SERVICE AT ALL TIMES DURING CONSTRUCTION OF THIS PROJECT, UNLESS OTHERWISE AUTHORIZED BY OWNER. CONTRACTOR TO PROVIDE TEMPORARY WATER AS NECESSARY.
23. REMOVE AND REPLACE EXISTING WATER LINE MARKER POSTS DISTURBED DURING CONSTRUCTION.
24. REPAIR AND RECONNECT EXISTING TRACER WIRES CUT OR DAMAGED DURING CONSTRUCTION USING METHODS CALLED OUT IN THE SPECIFICATIONS.
25. THE CONTRACTOR SHALL ADJUST TO GRADE ALL WATER AND GAS VALVE BOXES, AND MANHOLES THAT FALL WITHIN THE LIMITS OF THIS CONTRACT. THE CONTRACTOR SHALL KEEP ALL SAID WATER, GAS, AND EXISTING SEWERS AND THEIR APPURTENANCES FREE OF DEBRIS AND OPERABLE AT ALL TIMES DURING CONSTRUCTION.
26. THE CONTRACTOR SHALL PAY ALL PERMIT AND OTHER ASSOCIATED FEES REQUIRED BY LOCAL, STATE AND FEDERAL AGENCIES.

VERIFY SCALE!
THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.
MODIFY SCALE ACCORDINGLY!

REVISIONS

NO.	DESCRIPTION	DATE	BY

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REGISTERED PROFESSIONAL ENGINEER
REG. NO. 8274
CRAIG L. NOWAK
SOUTH DAKOTA
6-30-15

DRAWN BY: NCK
DSGN. BY: MRK
APPR. BY: CLN
DATE: 07/2015
Q.C. REVIEW BY:
DATE:

WATER MAINTENANCE AND CONSERVATION
US 18 EAST CONFLICTS
PINE RIDGE INDIAN RESERVATION SOUTH DAKOTA

ESTIMATE OF QUANTITIES AND GENERAL NOTES

PROJECT NUMBER 2246.029.08
SHEET NUMBER 1 of 19
DRAWING NUMBER G-1

THRUST BLOCK NOTES AND DETAILS

FOR BIDDING PURPOSES ONLY

HORIZONTAL BENDS – BEARING AREA OF THRUST BLOCKS IN SQ. FT.
(150 PSI LINE PRESSURE, 2000LB/SF SOIL BEARING PRESSURE)

FITTING SIZE	TEE, WYE, PLUG, OR CAP	90° BEND PLUGGED CROSS	TEE PLUGGED RUN		BEND ANGLE		
			A1	A2	45°	22 1/2°	11 1/4°
2	0.75	1.13	1.13	0.75	–	–	–
3	1.13	1.50	1.50	1.13	1.13	0.75	–
4	1.50	2.10	2.85	2.10	1.50	1.13	–
6	3.15	4.50	6.45	4.50	2.40	1.50	1.13
8	5.70	7.95	11.4	8.10	4.35	2.25	1.50
10	8.85	12.6	17.7	12.6	6.90	3.60	1.80
12	12.8	18.0	25.5	18.0	9.90	5.10	2.55
14	17.3	24.5	34.5	24.5	13.4	6.90	3.45
16	22.5	32.0	45.0	32.0	17.4	9.00	4.50
18	28.5	40.5	57.0	40.5	21.9	11.4	5.70
20	35.3	50.0	70.5	50.0	27.2	14.1	7.05
24	51.0	72.0	102	72.0	39.3	20.4	10.2

VOLUME OF THRUST BLOCK IN CUBIC YARDS
150 PSI – (VERTICAL BENDS)

FITTING SIZE	BEND ANGLE		
	11 1/4°	22 1/2°	45°
2	0.02	0.05	0.14
3	0.04	0.11	0.31
4	0.08	0.22	0.54
6	0.22	0.52	1.21
8	0.42	0.96	2.15
10	0.68	1.53	3.35
12	1.01	2.23	4.82
14	1.41	3.07	6.55
16	1.87	4.04	8.56
18	2.39	5.14	10.8
20	2.97	6.36	13.4
24	4.33	9.21	19.2

HORIZONTAL BENDS – BEARING AREA OF THRUST BLOCKS IN SQ. FT.
(200 PSI LINE PRESSURE, 2000LB/SF SOIL BEARING PRESSURE)

FITTING SIZE	TEE, WYE, PLUG, OR CAP	90° BEND PLUGGED CROSS	TEE PLUGGED RUN		BEND ANGLE		
			A1	A2	45°	22 1/2°	11 1/4°
2	1.00	1.50	1.50	1.00	–	–	–
3	1.50	2.00	2.00	1.50	1.50	1.00	–
4	2.00	2.80	3.80	2.80	2.00	1.50	–
6	4.20	6.00	8.60	6.00	3.20	2.00	1.50
8	7.60	10.6	15.2	10.8	5.80	3.00	2.00
10	11.8	16.8	23.6	16.8	9.20	4.80	2.40
12	17.0	24.0	34.0	24.0	13.2	6.80	3.40
14	23.0	32.6	46.0	32.6	17.8	9.20	4.60
16	30.0	42.6	60.0	42.6	23.2	12.0	6.00
18	38.0	54.0	76.0	54.0	29.2	15.2	7.60
20	47.0	66.6	94.0	66.6	36.2	18.8	9.40
24	68.0	96.0	136	96.0	52.4	27.2	13.6

VOLUME OF THRUST BLOCK IN CUBIC YARDS
200 PSI – (VERTICAL BENDS)

FITTING SIZE	BEND ANGLE		
	11 1/4°	22 1/2°	45°
2	0.03	0.07	0.16
3	0.06	0.17	0.36
4	0.13	0.31	0.66
6	0.32	0.72	1.51
8	0.60	1.32	2.72
10	0.97	2.10	4.28
12	1.42	3.05	6.19
14	1.97	4.18	8.46
16	2.60	5.49	11.1
18	3.32	6.98	14.1
20	4.11	8.63	17.4
24	5.97	12.5	25.1

HORIZONTAL BENDS – BEARING AREA OF THRUST BLOCKS IN SQ. FT.
(250 PSI LINE PRESSURE, 2000LB/SF SOIL BEARING PRESSURE)

FITTING SIZE	TEE, WYE, PLUG, OR CAP	90° BEND PLUGGED CROSS	TEE PLUGGED RUN		BEND ANGLE		
			A1	A2	45°	22 1/2°	11 1/4°
2	1.33	2.00	2.00	1.33	–	–	–
3	2.00	2.67	2.67	2.00	2.00	1.33	–
4	2.67	3.73	5.06	3.73	2.67	2.00	–
6	5.60	8.00	11.5	8.00	4.26	2.67	2.00
8	10.1	14.1	20.3	14.4	7.73	4.00	2.67
10	15.7	22.4	31.5	22.4	12.3	6.40	3.20
12	22.7	32.0	45.3	32.0	17.6	9.06	4.53
14	30.7	43.4	61.3	43.4	23.7	12.3	6.13
16	40.0	56.8	80.0	56.8	30.9	16.0	8.00
18	50.6	72.0	101	72.0	38.9	20.3	10.1
20	62.6	88.8	125	88.8	48.2	25.1	12.5
24	90.6	128	181	128	69.8	36.3	18.1

VOLUME OF THRUST BLOCK IN CUBIC YARDS
250 PSI – (VERTICAL BENDS)

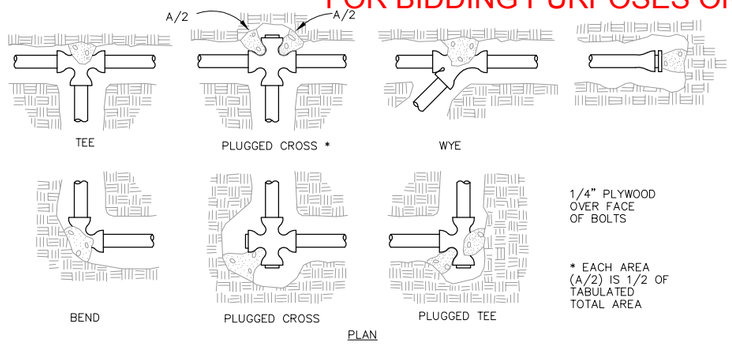
FITTING SIZE	BEND ANGLE		
	11 1/4°	22 1/2°	45°
2	0.04	0.10	0.21
3	0.09	0.22	0.46
4	0.17	0.40	0.83
6	0.42	0.93	1.91
8	0.78	1.69	3.43
10	1.25	2.66	5.39
12	1.83	3.86	7.79
14	2.53	5.29	10.6
16	3.33	6.94	13.9
18	4.24	8.81	17.7
20	5.25	10.9	21.8
24	7.62	15.8	31.5

HORIZONTAL BENDS – BEARING AREA OF THRUST BLOCKS IN SQ. FT.
(300 PSI LINE PRESSURE, 2000LB/SF SOIL BEARING PRESSURE)

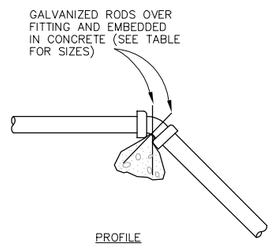
FITTING SIZE	TEE, WYE, PLUG, OR CAP	90° BEND PLUGGED CROSS	TEE PLUGGED RUN		BEND ANGLE		
			A1	A2	45°	22 1/2°	11 1/4°
2	1.78	2.66	2.66	1.78	1.00	1.00	–
3	2.66	3.55	3.55	2.66	2.66	1.78	–
4	3.55	4.97	6.75	4.97	3.55	2.66	–
6	7.46	10.7	15.3	10.7	5.68	3.55	2.66
8	13.5	18.8	27.0	19.2	10.3	5.33	3.55
10	21.0	29.8	42.0	29.8	16.3	8.53	4.26
12	30.2	42.6	60.4	42.6	23.5	12.1	6.04
14	40.9	57.9	81.7	57.9	31.6	16.3	8.17
16	53.3	75.7	107	75.7	41.2	21.3	10.7
18	67.5	95.9	135	95.9	51.9	27.0	13.5
20	83.5	118	167	118	64.3	33.4	16.7
24	121	171	242	171	93.1	48.3	24.2

VOLUME OF THRUST BLOCK IN CUBIC YARDS
300 PSI – (VERTICAL BENDS)

FITTING SIZE	BEND ANGLE		
	11 1/4°	22 1/2°	45°
2	0.05	0.12	0.25
3	0.12	0.27	0.56
4	0.22	0.49	1.01
6	0.52	1.13	2.31
8	0.96	2.05	4.14
10	1.54	3.23	6.50
12	2.24	4.68	9.40
14	3.08	6.41	12.8
16	4.06	8.40	16.8
18	5.16	10.7	21.3
20	6.39	13.2	26.3
24	9.26	19.0	37.9



PLAN



PROFILE

FITTING SIZE	ROD SIZE	EMBEDMENT
12" AND LESS	#6	30"
14" – 16"	#8	36"

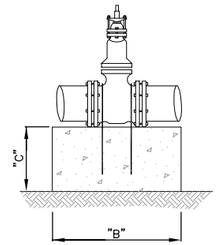
THRUST BLOCKING IS NOT REQUIRED FOR HORIZONTAL BENDS WHERE LENGTHS OF RESTRAINED JOINT PIPE ARE SPECIFIED ENTERING AND EXITING A RESTRAINED JOINT FITTING. PROVIDE THRUST BLOCKING FOR VERTICAL BENDS IN ADDITION TO PROVIDING SPECIFIED LENGTHS OF RESTRAINED JOINT.

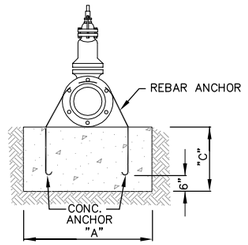
THRUST BLOCK DETAILS

NTS

THRUST BLOCK NOTES

1. KEEP CONCRETE CLEAR OF JOINT AND JOINT ACCESSORIES.
2. CONCRETE THRUST BLOCKING SHALL BE POURED AGAINST UNDISTURBED EARTH.
3. REQUIRED VOLUMES OR BEARING AREAS AT FITTINGS SHALL BE AS INDICATED BELOW, ADJUSTED, IF NECESSARY, TO CONFORM TO THE TEST PRESSURE(S) AND ALLOWABLE SOIL BEARING STRESS(ES) STATED IN THE SPECIFICATIONS.
4. THRUST BLOCK VOLUMES FOR VERTICAL BENDS HAVING UPWARD RESULTANT THRUSTS ARE BASED ON TEST PRESSURE OF 150 PSIG AND THE WEIGHT OF CONCRETE = 4050 LBS/CU YD. TO COMPUTE VOLUMES FOR DIFFERENT TEST PRESSURES, USE THE FOLLOWING EQUATION: VOLUME = (TEST PRESS./150) x (TABLE VALUE).
5. BEARING AREAS FOR HORIZONTAL BEND THRUST BLOCKS ARE BASED ON TEST PRESSURE OF 150 PSIG AND AN ALLOWABLE SOIL BEARING STRESS OF 2000 LBS/SQ FT. TO COMPUTE BEARING AREAS FOR DIFFERENT TEST PRESSURES AND SOIL BEARING STRESSES, MULTIPLY TABLE VALUES BY THE FACTOR $(13.33)(P^1/S^1_b)$, WHERE: P^1 = ACTUAL TEST PRESSURE, PSIG; S^1_b = ACTUAL SOIL BEARING PRESSURE, PSF.
6. THRUST BLOCKS FOR VERTICAL BENDS HAVING DOWNWARD RESULTANT THRUSTS SHALL BE THE SAME AS FOR HORIZONTAL BENDS.
7. BEARING AREAS, VOLUMES, AND SPECIAL BLOCKING DETAILS SHOWN ON PLANS TAKE PRECEDENCE OVER THIS STANDARD.
8. BEARING AREA OF THRUST BLOCK SHALL NOT BE LESS THAN 1.0 SQ FT.
9. VERTICAL BENDS THAT REQUIRE A THRUST BLOCK VOLUME EXCEEDING 5 CUBIC YARDS REQUIRE SPECIAL BLOCKING DETAILS.
10. TEST PRESSURES ARE SHOWN IN THE PIPING SCHEDULE.
11. ALLOWABLE SOIL BEARING STRESS IN ACCORDANCE WITH SPECIFICATION SECTION 15060.





NOTE:
COAT RODS WITH "KOPPERS" BITUMASTIC NO. 50 COATING OR EQUAL.

THRUST BLOCK DIMENSIONS

ANCHOR ROD SIZE	VALVE SIZE	150 PSI			200 PSI			250 PSI			300 PSI		
		"A"	"B"	"C"	"A"	"B"	"C"	"A"	"B"	"C"	"A"	"B"	"C"
3/4"	4",6"&8"	2'–0"	2'–0"	2'–0"	2'–0"	2'–0"	2'–0"	2'–0"	2'–0"	2'–0"	2'–0"	2'–0"	2'–7"
3/4"	10"	2'–6"	2'–6"	2'–0"	2'–9"	2'–6"	2'–6"	3'–0"	3'–0"	3'–0"	3'–7"	3'–0"	3'–0"
3/4"	12"	3'–0"	3'–0"	2'–8"	3'–5"	3'–0"	3'–0"	4'–3"	3'–0"	3'–0"	5'–1"	3'–0"	3'–0"
1"	14"	3'–5"	3'–0"	3'–0"	4'–6"	3'–0"	3'–0"	4'–0"	4'–0"	4'–0"	4'–9"	4'–0"	4'–0"
1 1/8"	16"	4'–4"	3'–0"	3'–0"	4'–1"	4'–0"	4'–0"	5'–1"	4'–0"	4'–0"	6'–1"	4'–0"	4'–0"
1 1/4"	18"	5'–5"	3'–0"	3'–0"	5'–1"	4'–0"	4'–0"	6'–4"	4'–0"	4'–0"	5'–9"	5'–0"	5'–0"
1 3/8"	24"	6'–5"	4'–0"	4'–0"	6'–6"	5'–0"	5'–0"	6'–5"	6'–0"	6'–0"	7'–8"	6'–0"	6'–0"

NOTE: PRESSURES SHOWN ABOVE ARE MAXIMUM WORKING PRESSURE IN SYSTEM.

THRUST BLOCKING AND ANCHORS ARE REQUIRED ON VALVES ONLY WHEN SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS.

VALVE THRUST BLOCK DETAILS

NTS

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NO.	DESCRIPTION	DATE	BY

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REGISTERED PROFESSIONAL ENGINEER REG. NO. 8270 CRAIG L. NOWAK SOUTH DAKOTA 6-30-15

DRAWN BY: NCK
DSGN. BY: MRK
APPR. BY: CLN
DATE: 07/2015
Q.C. REVIEW BY:
DATE:

WATER MAINTENANCE AND CONSERVATION
US 18 EAST CONFLICTS
PINE RIDGE INDIAN RESERVATION SOUTH DAKOTA

THRUST BLOCK DETAILS

PROJECT NUMBER 2246.029.08
SHEET NUMBER 2 of 19
DRAWING NUMBER G-2

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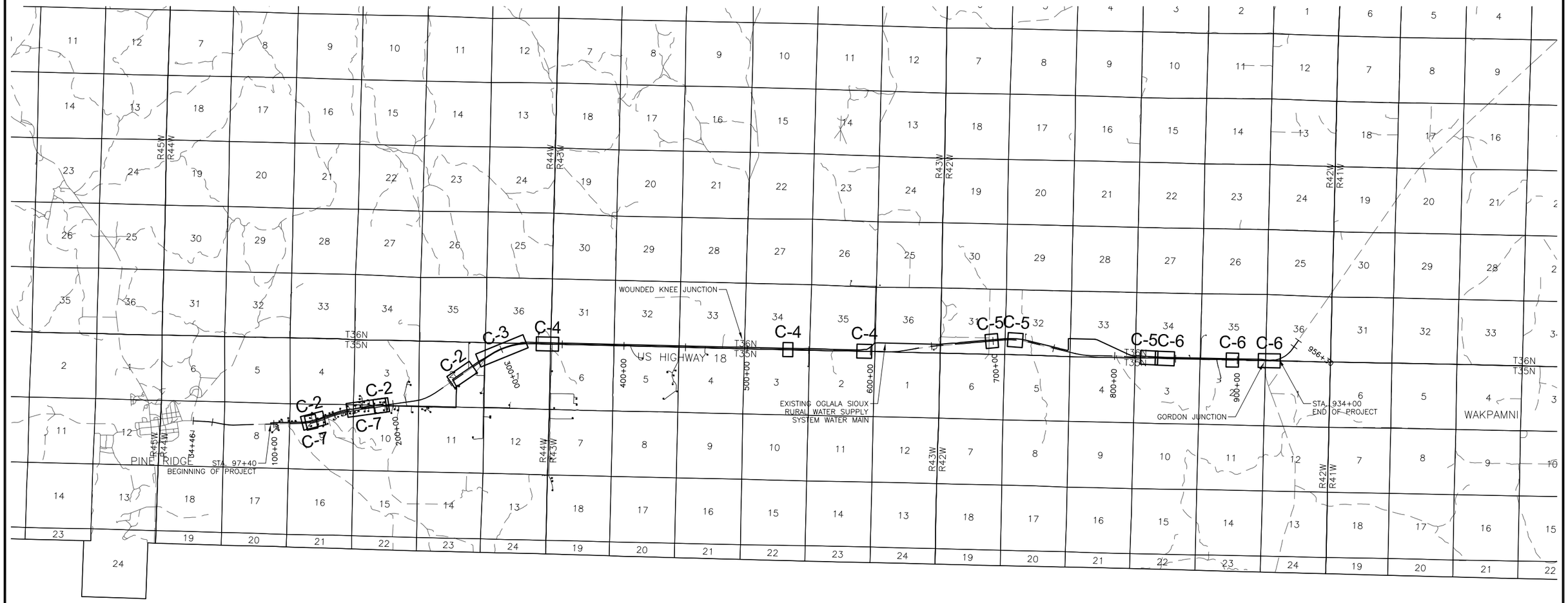

NOTE:

PUBLIC LAND SURVEY AND GEOGRAPHIC FEATURES SHOWN HERE ARE FROM INFORMATION PROVIDED BY THE BUREAU OF INDIAN AFFAIRS, ABERDEEN, SOUTH DAKOTA, NOVEMBER 2006.

LEGEND

—W— WATER LINE

SERVICE AND RESIDENCE

N

3/4 3/8 0 3/4 1 1/2

SCALE IN MILES

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APPR. BY: CLN
DATE: 07/2015

Q.C. REVIEW
BY: _____
DATE: _____

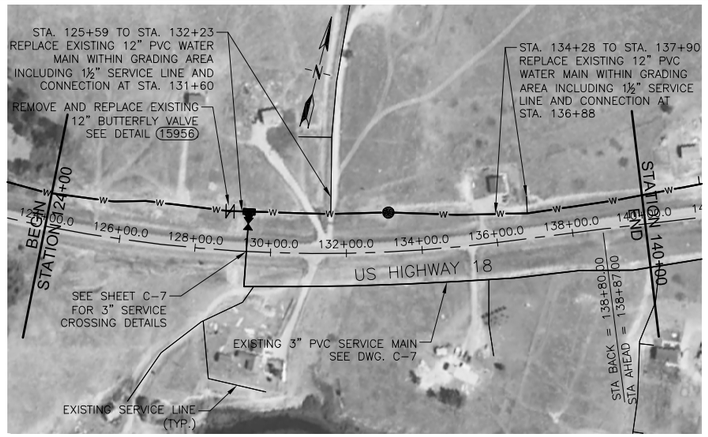
WATER MAINTENANCE AND CONSERVATION
US 18 EAST CONFLICTS
PINE RIDGE INDIAN RESERVATION SOUTH DAKOTA

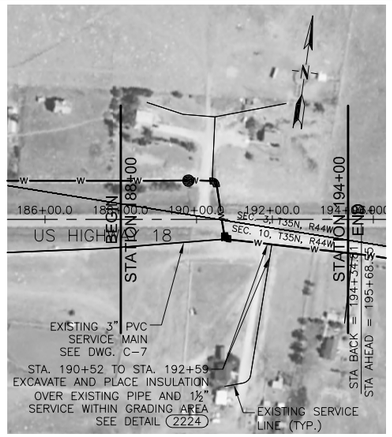
PLAN AND PROFILE
INDEX MAP

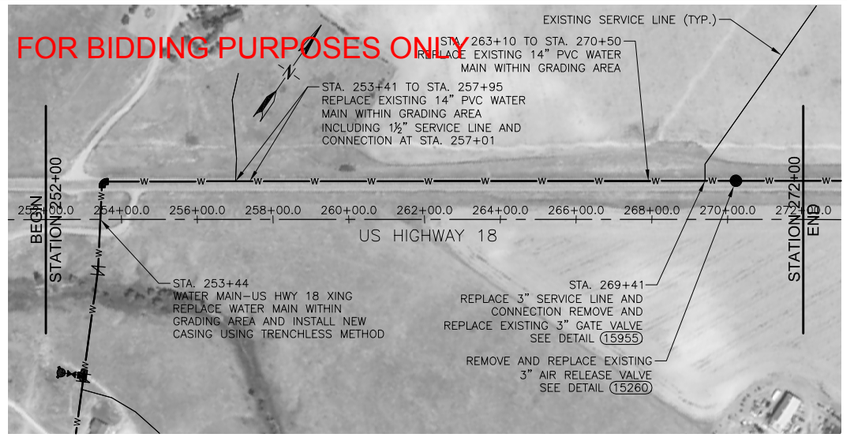
PROJECT NUMBER 2246.029.08

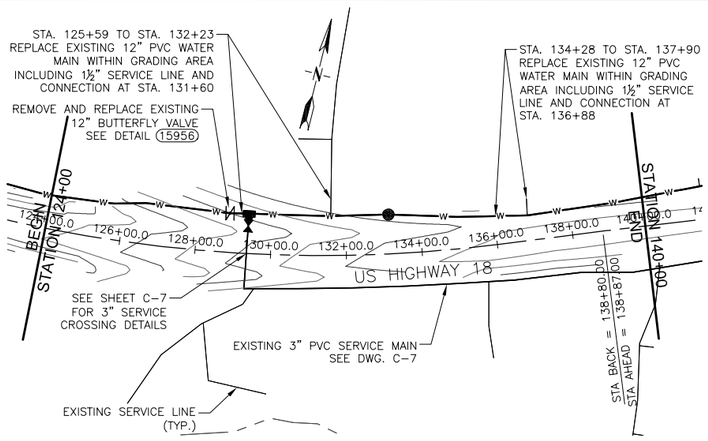
SHEET NUMBER 3 of 19

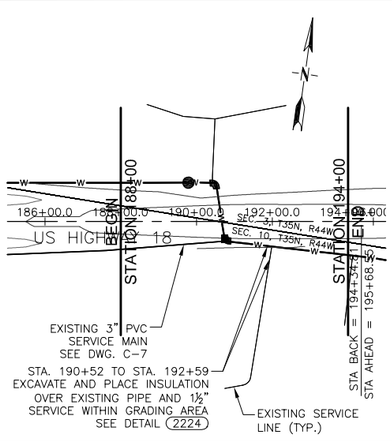
DRAWING NUMBER C-1





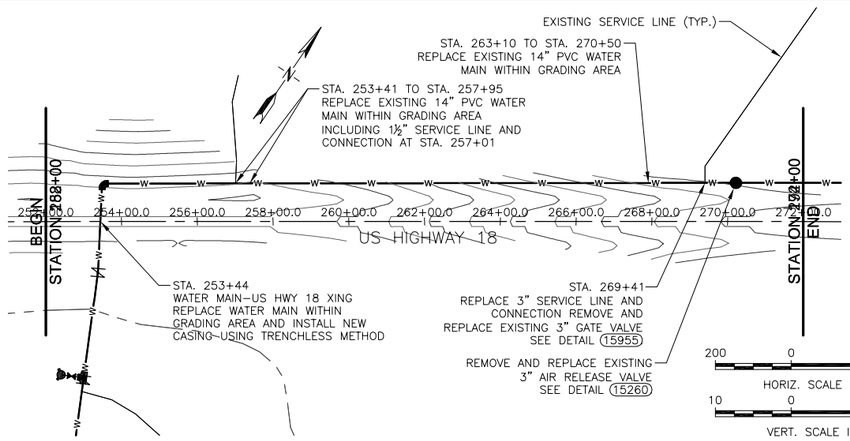


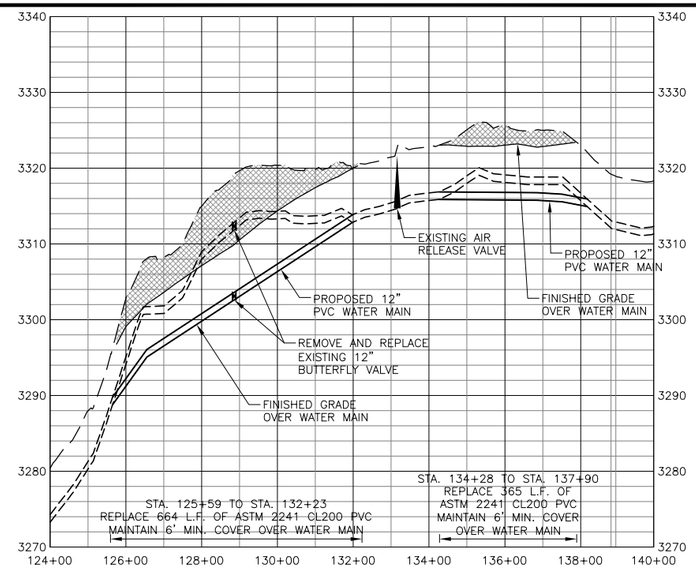


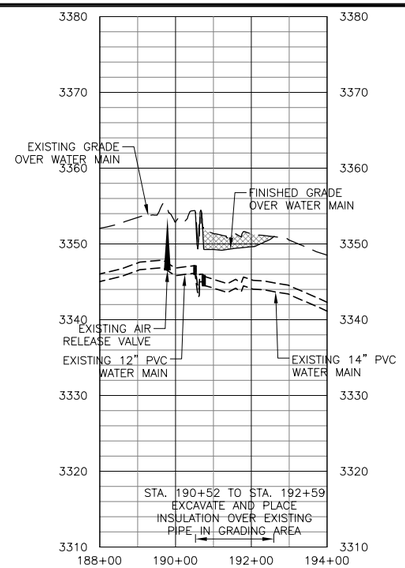


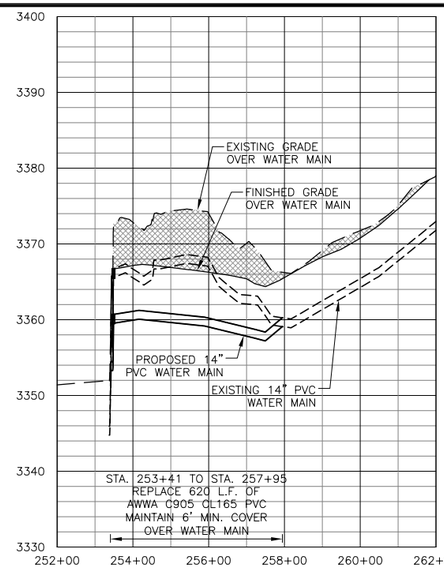
LEGEND

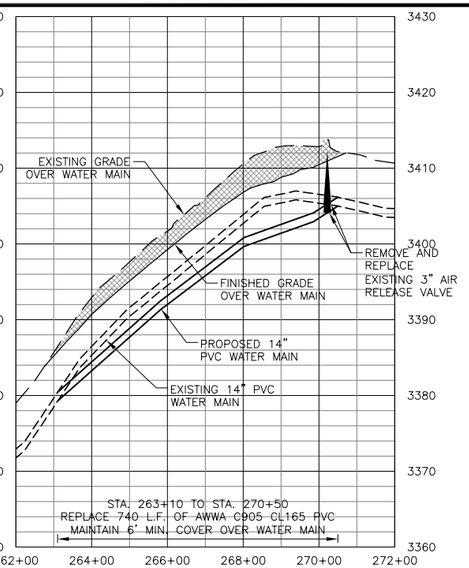
- FILL AREA
- CUT AREA
- BLOW-OFF HYDRANT
- GATE VALVE
- BUTTERFLY VALVE
- AIR RELEASE VALVE











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DRAWN BY: NCK
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APPR. BY: CLN
DATE: 07/2015
Q.C. REVIEW BY:
DATE:

WATER MAINTENANCE AND CONSERVATION
US 18 EAST CONFLICTS
PINE RIDGE INDIAN RESERVATION SOUTH DAKOTA

PLAN AND PROFILE - STA. 124+00 TO STA. 140+00
STA. 188+00 TO STA. 194+00
STA. 252+00 TO STA. 272+00

PROJECT NUMBER 2246.029.08
SHEET NUMBER 4 of 19
DRAWING NUMBER C-2

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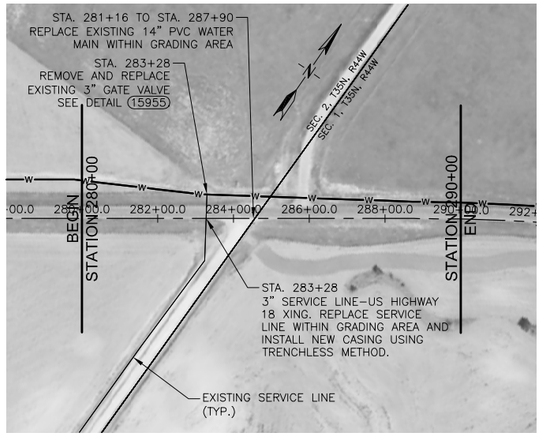
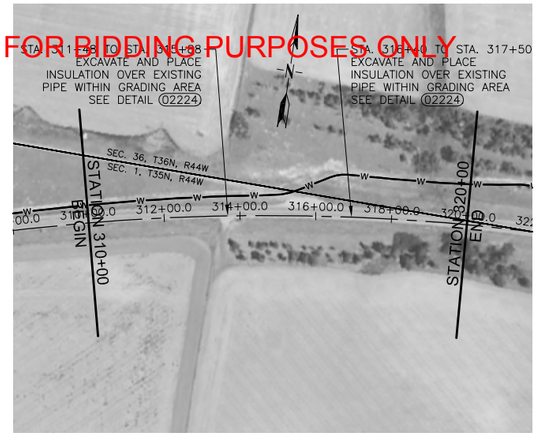
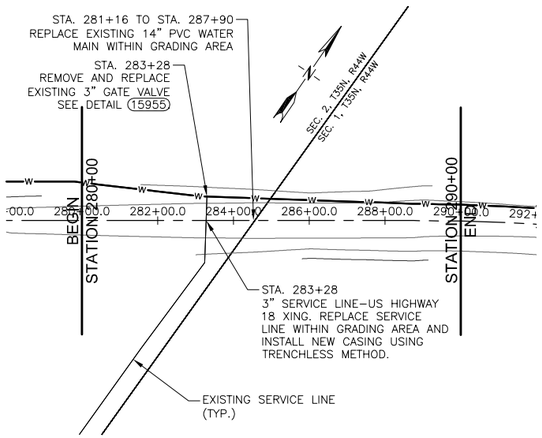
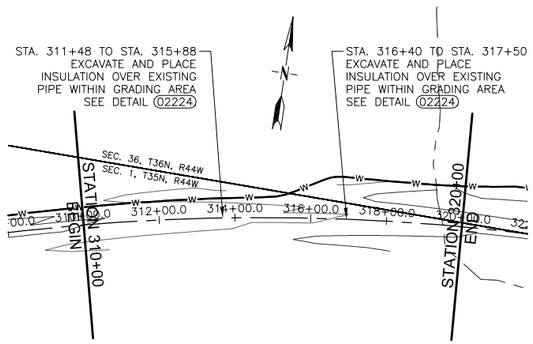






LEGEND

- FILL AREA
- CUT AREA
- BLOW–OFF HYDRANT
- GATE VALVE
- BUTTERFLY VALVE
- AIR RELEASE VALVE



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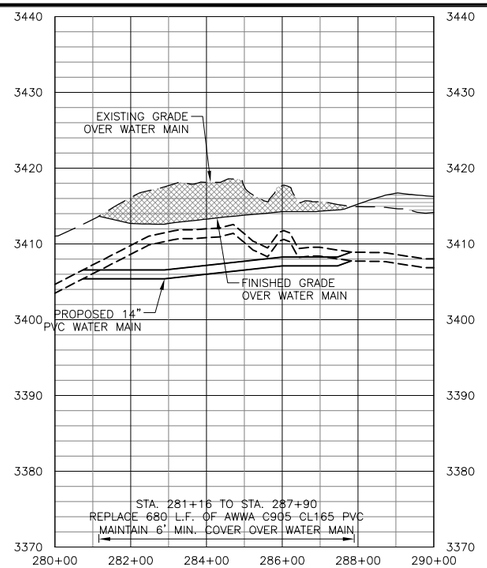
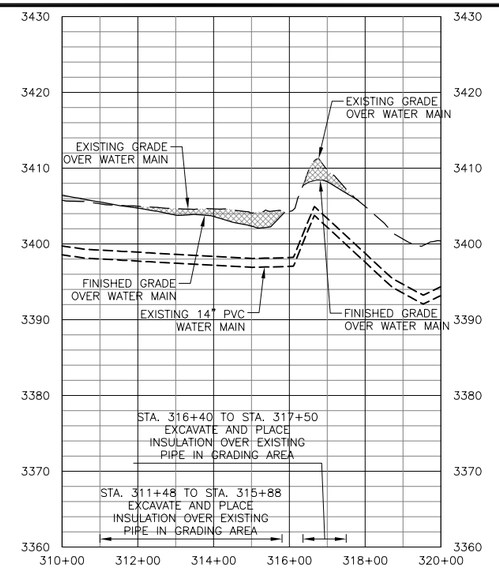
10 0 10 20
VERT. SCALE IN FEET





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DSGN. BY: MRK
APPR. BY: CLN
DATE: 07/2015
Q.C. REVIEW BY:
DATE:

WATER MAINTENANCE AND CONSERVATION
US 18 EAST CONFLICTS
PINE RIDGE INDIAN RESERVATION SOUTH DAKOTA

PLAN AND PROFILE
STA. 280+00 TO STA. 290+00
STA. 310+00 TO STA. 320+00

PROJECT NUMBER 2246.029.08
SHEET NUMBER 5 of 19
DRAWING NUMBER C-3

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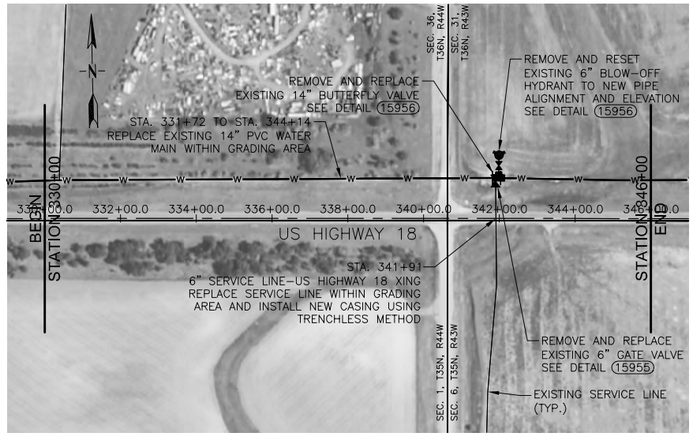
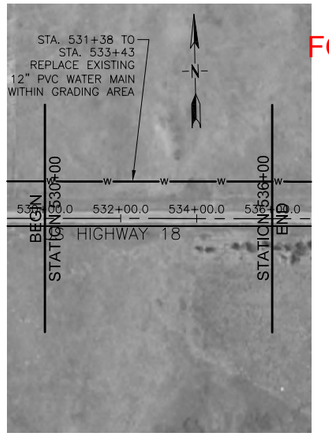
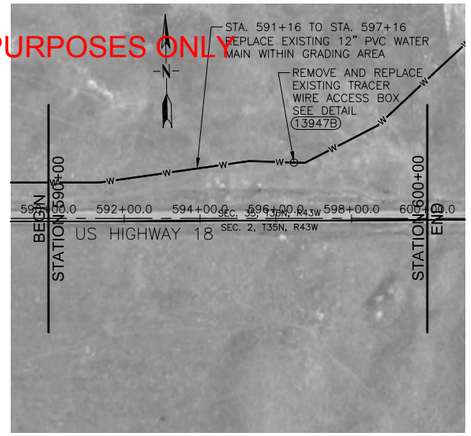
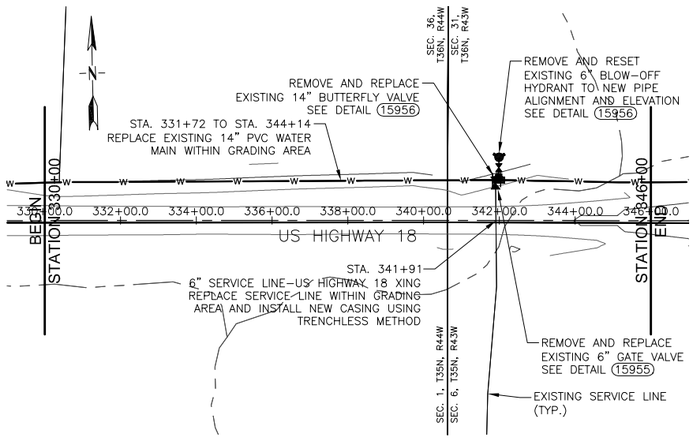
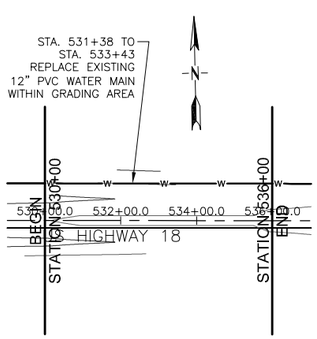
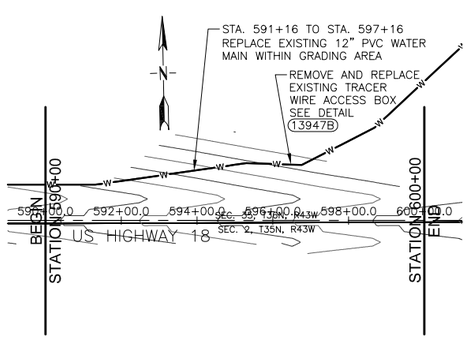










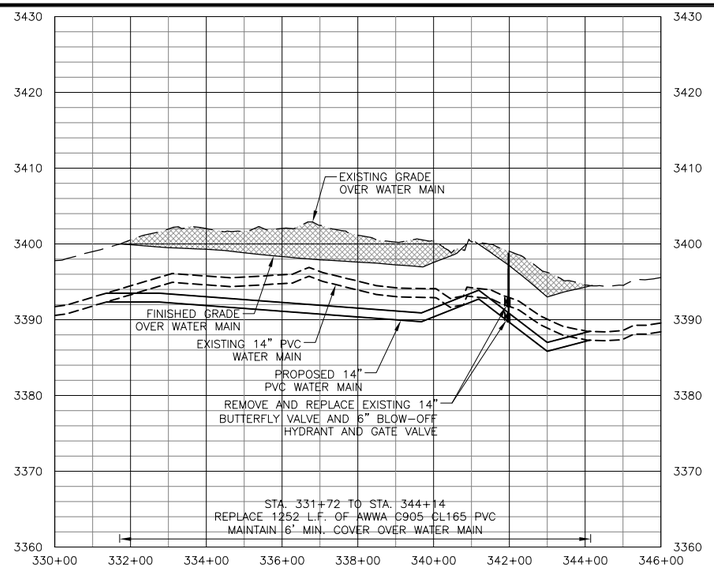


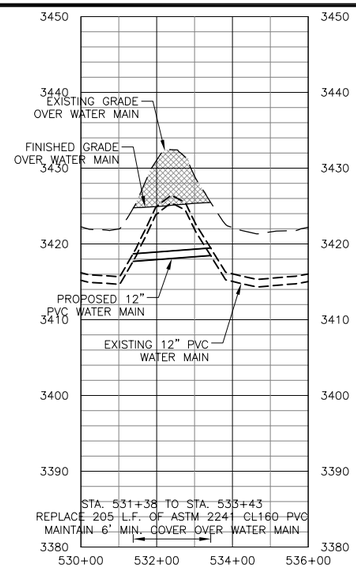
LEGEND

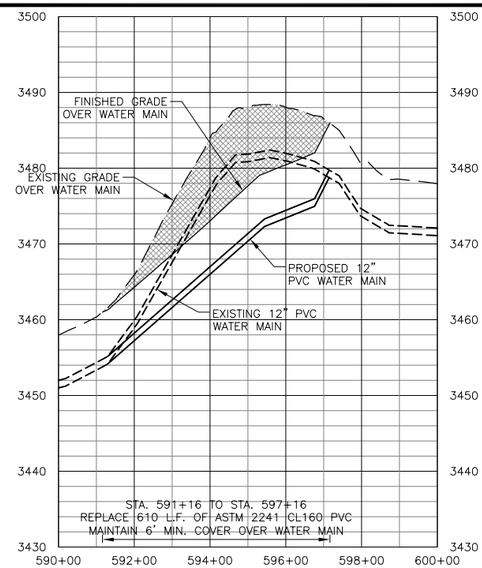
- FILL AREA
- CUT AREA
- BLOW-OFF HYDRANT
- GATE VALVE
- BUTTERFLY VALVE
- AIR RELEASE VALVE

HORIZ. SCALE IN FEET: 200 0 200 400

VERT. SCALE IN FEET: 10 0 10 20







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DRAWN BY: NCK
DSGN. BY: MRK
APPR. BY: CLN
DATE: 07/2015
Q.C. REVIEW BY:
DATE:

WATER MAINTENANCE AND CONSERVATION
US 18 EAST CONFLICTS
PINE RIDGE INDIAN RESERVATION SOUTH DAKOTA

PLAN AND PROFILE - STA. 330+00 TO STA. 346+00
STA. 530+00 TO STA. 536+00
STA. 590+00 TO STA. 600+00

PROJECT NUMBER 2246.029.08
SHEET NUMBER 6 of 19
DRAWING NUMBER C-4

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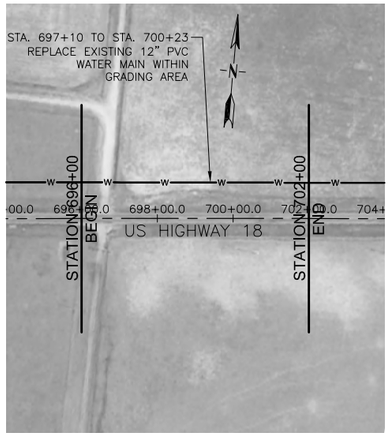
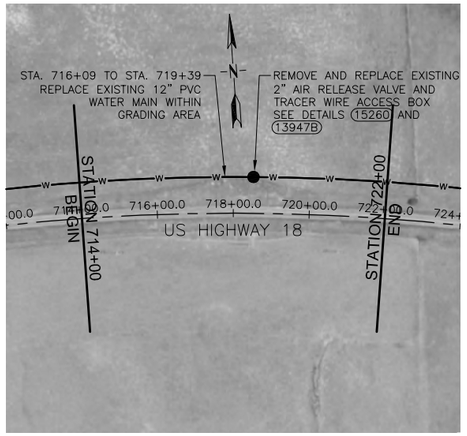
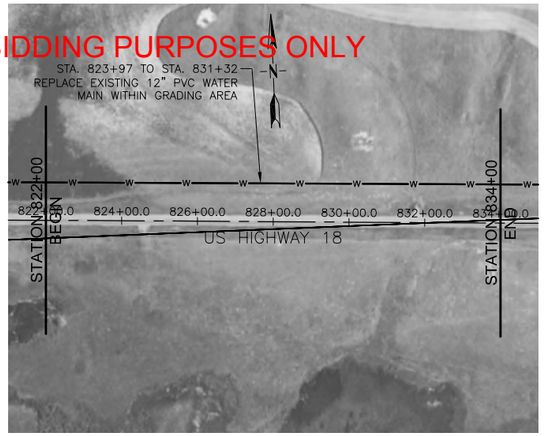
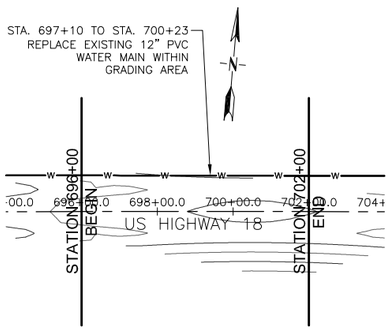
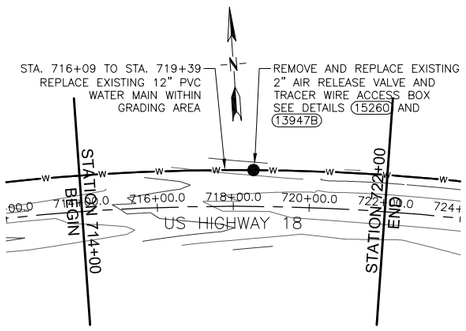
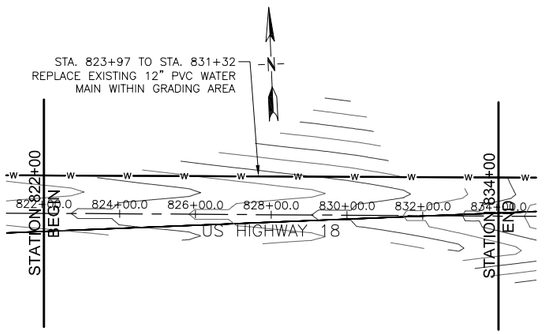










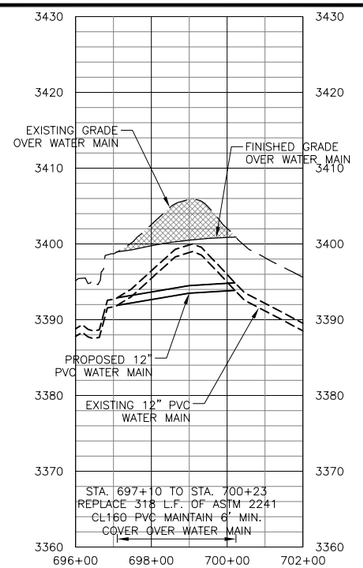


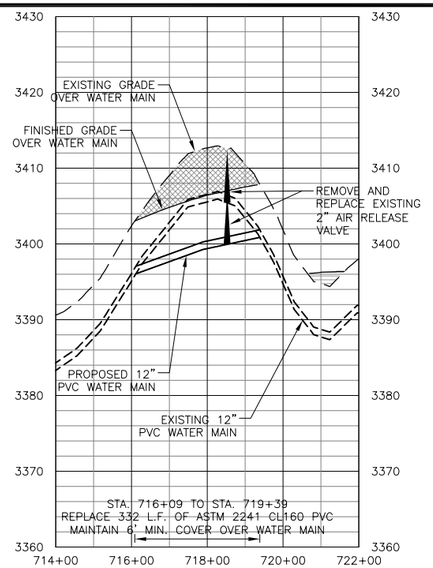
LEGEND

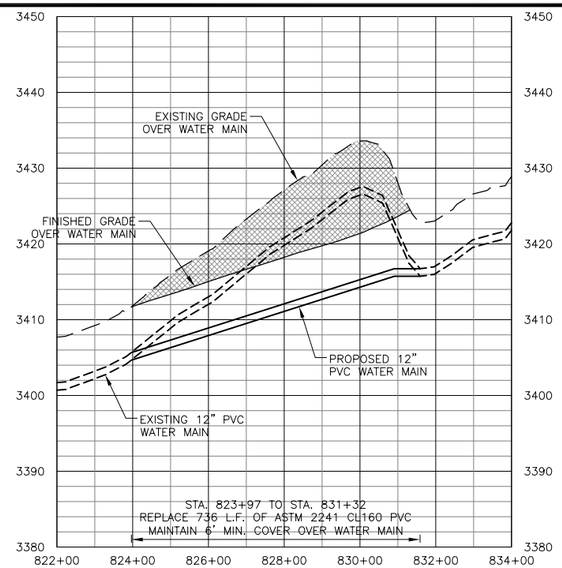
- FILL AREA
- CUT AREA
- BLOW-OFF HYDRANT
- GATE VALVE
- BUTTERFLY VALVE
- AIR RELEASE VALVE

200 0 200 400
HORIZ. SCALE IN FEET

10 0 10 20
VERT. SCALE IN FEET







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REGISTERED PROFESSIONAL ENGINEER
REG. NO. 8274
CRAIG L. NOWAK
SOUTH DAKOTA
6-30-15

DRAWN BY: NCK
DSGN. BY: MRK
APPR. BY: CLN
DATE: 07/2015

Q.C. REVIEW
BY:
DATE:

WATER MAINTENANCE AND CONSERVATION
US 18 EAST CONFLICTS
PINE RIDGE INDIAN RESERVATION SOUTH DAKOTA

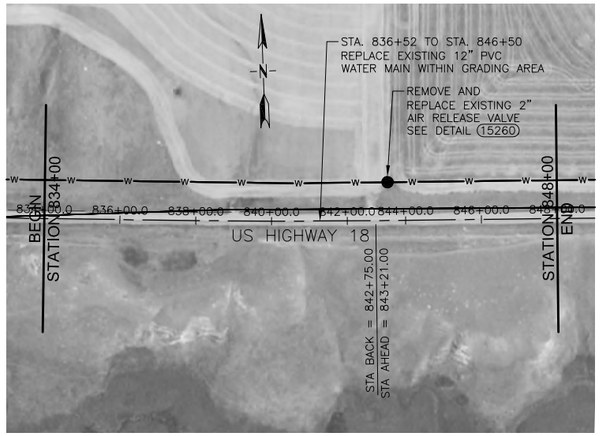
PLAN AND PROFILE - STA. 696+00 TO STA. 702+00
STA. 714+00 TO STA. 722+00
STA. 822+00 TO STA. 834+00

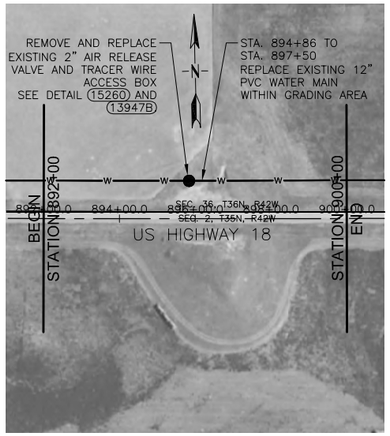
PROJECT NUMBER
2246.029.08

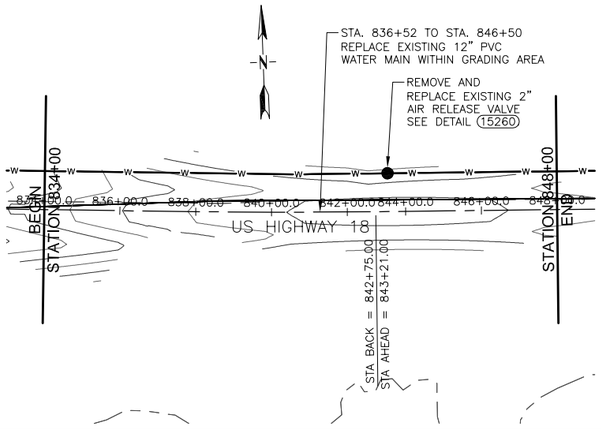
SHEET NUMBER
7 of 19

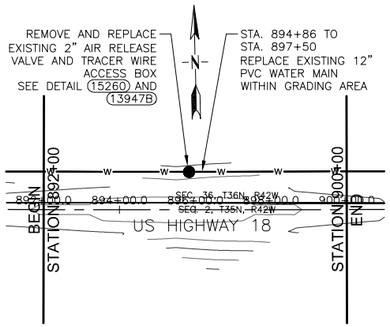
DRAWING NUMBER
C-5

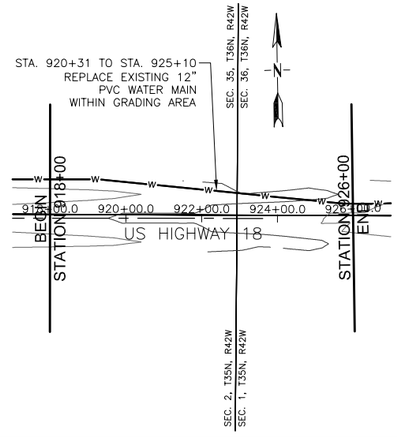
FOR BIDDING PURPOSES ONLY







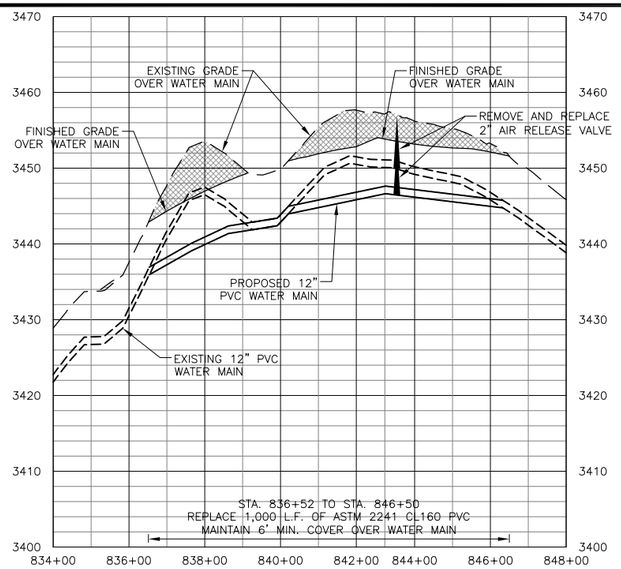


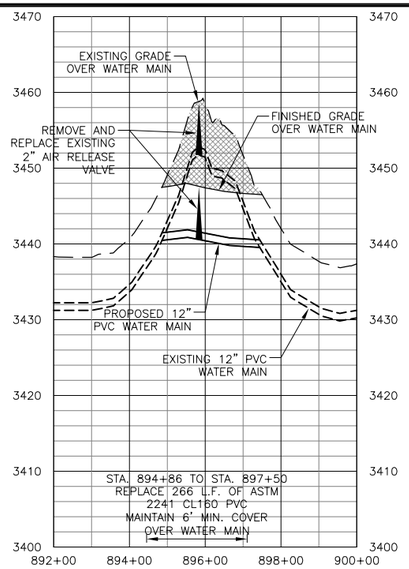


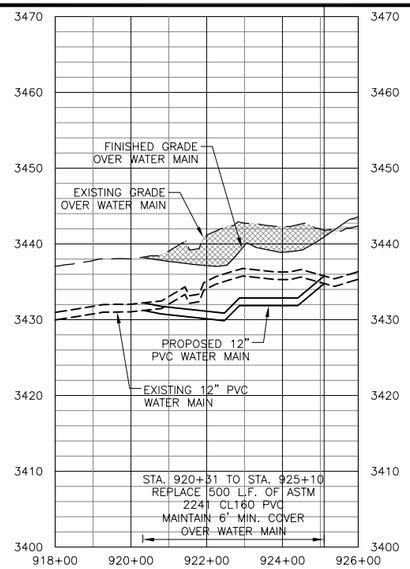
LEGEND

- FILL AREA
- CUT AREA
- BLOW-OFF HYDRANT
- GATE VALVE
- BUTTERFLY VALVE
- AIR RELEASE VALVE

200 0 200 400
HORIZ. SCALE IN FEET
10 0 10 20
VERT. SCALE IN FEET







VERIFY SCALE!
THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.
MODIFY SCALE ACCORDINGLY!

REVISIONS

NO.	DESCRIPTION	DATE	BY

Q:\2246\WM&C\HWY 18 East Conflicts\ACAD\Sheets\C-6.dwg Plotted by nick kohut on Jun/30/2015

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Great Falls, MT 59401
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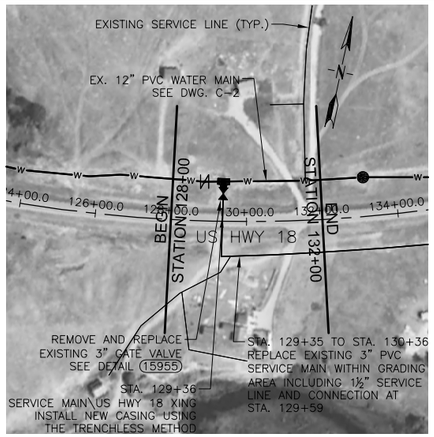
REGISTERED PROFESSIONAL ENGINEER REG. NO. 8276 CRAIG L. NOWAK SOUTH DAKOTA 6-30-15

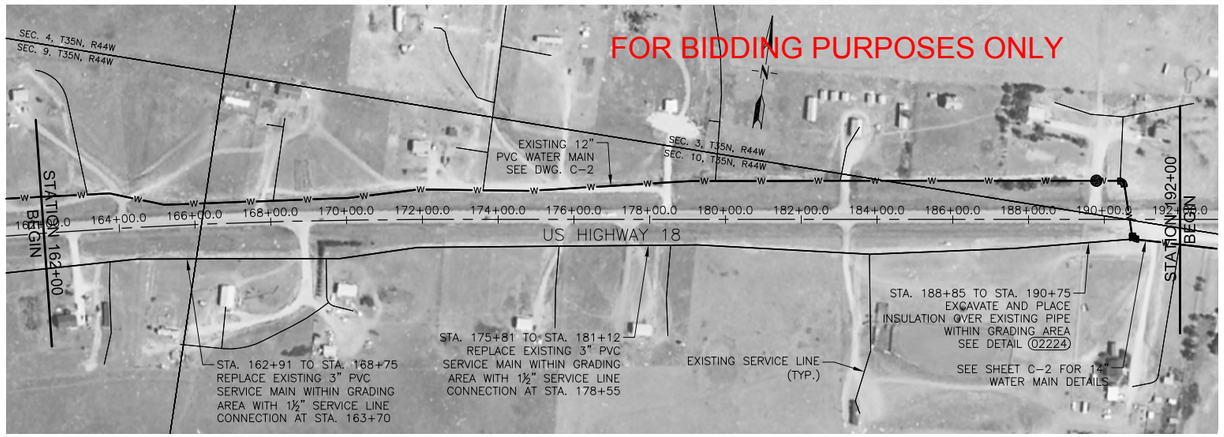
DRAWN BY: NCK
DSGN. BY: MRK
APPR. BY: CLN
DATE: 07/2015
Q.C. REVIEW BY:
DATE:

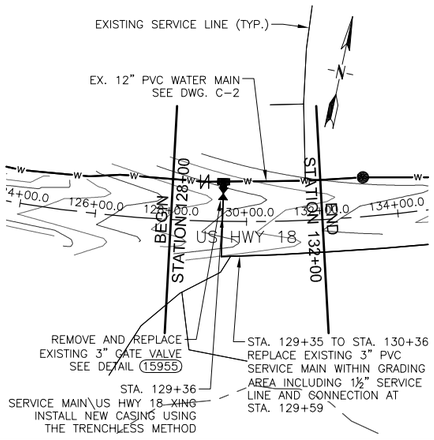
WATER MAINTENANCE AND CONSERVATION
US 18 EAST CONFLICTS
PINE RIDGE INDIAN RESERVATION SOUTH DAKOTA

PLAN AND PROFILE - STA. 834+00 TO STA. 848+00
STA. 892+00 TO STA. 900+00
STA. 918+00 TO STA. 926+00

PROJECT NUMBER 2246.029.08
SHEET NUMBER 8 of 19
DRAWING NUMBER C-6

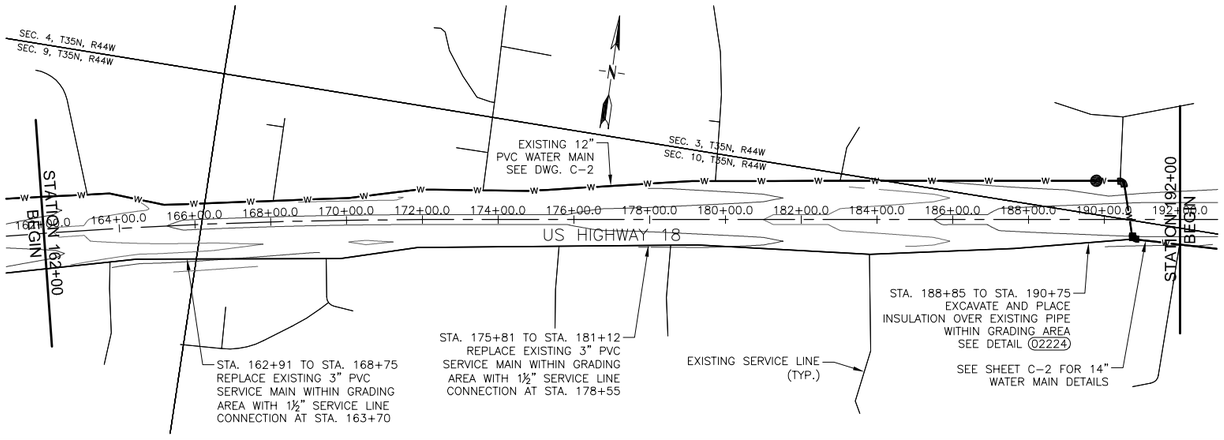




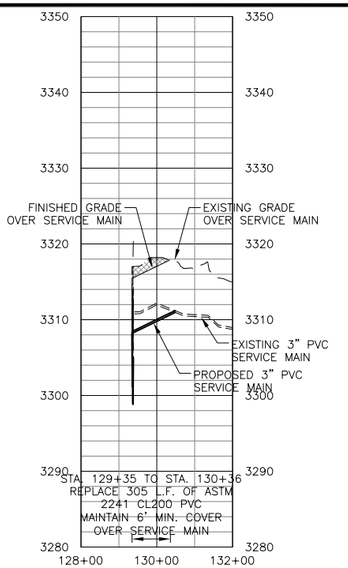


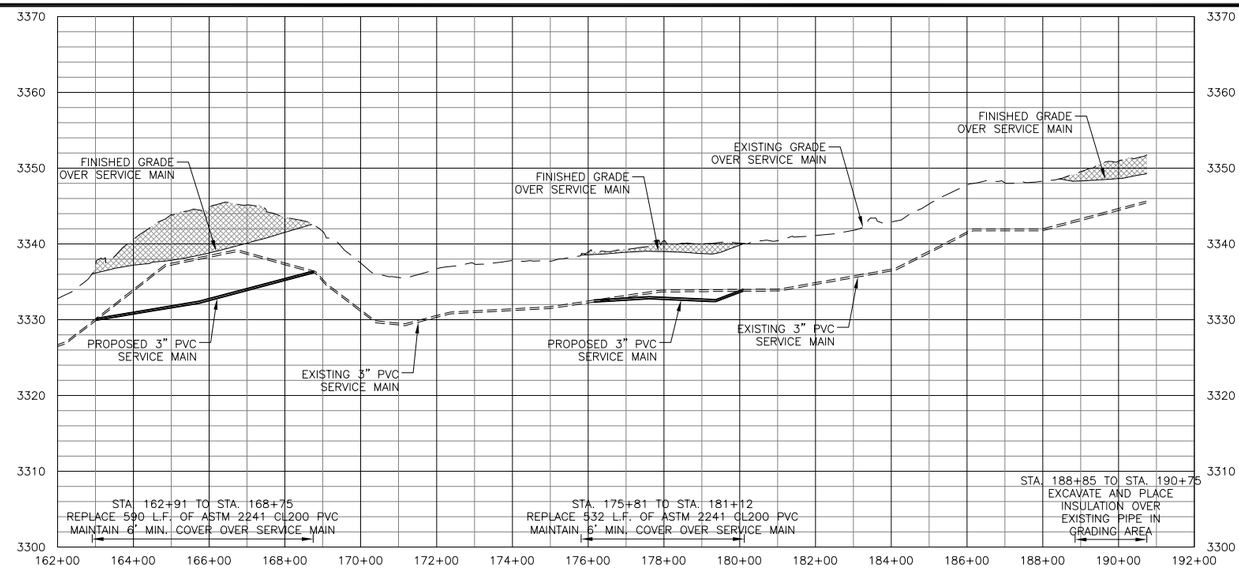
LEGEND

- FILL AREA
- CUT AREA
- BLOW-OFF HYDRANT
- GATE VALVE
- BUTTERFLY VALVE
- AIR RELEASE VALVE



200 0 200 400
HORIZ. SCALE IN FEET
10 0 10 20
VERT. SCALE IN FEET





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MODIFY SCALE ACCORDINGLY!

REVISIONS

NO.	DESCRIPTION	DATE	BY

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REGISTERED PROFESSIONAL ENGINEER REG. NO. 8370 CRAIG L. NOWAK SOUTH DAKOTA 6-30-15

DRAWN BY: NCK
DSGN. BY: MRK
APPR. BY: CLN
DATE: 07/2015
Q.C. REVIEW BY:
DATE:

WATER MAINTENANCE AND CONSERVATION
US 18 EAST CONFLICTS
PINE RIDGE INDIAN RESERVATION SOUTH DAKOTA

PLAN AND PROFILE
STA. 128+00 TO STA. 132+00
STA. 162+00 TO STA. 192+00

PROJECT NUMBER 2246.029.08
SHEET NUMBER 9 of 19
DRAWING NUMBER C-7

FOR BIDDING PURPOSES ONLY

FOR INFORMATIONAL PURPOSES ONLY
SERVICE LINE REPLACEMENTS ARE CALLED
OUT ON SHEETS C-2 - C-7

T36N
T35N

4 3 2 9 10 11 12

US HIGHWAY 18

STA. 283+28
SERVICE LINE–US HWY 18
XING

STA. 253+44
WATER MAIN–US HWY 18
XING

STA. 210+61
SERVICE LINE–US HWY 18
XING

EXISTING 12"
PVC WATER MAIN

STA. 190+63
WATER MAIN–US HWY 18
XING

EXISTING 14"
PVC WATER MAIN

PINE RIDGE

STA. 101+83
SERVICE LINE–US HWY 18
XING

STA. 129+36
SERVICE MAIN–US HWY 18
XING

NOTE:

PUBLIC LAND SURVEY AND GEOGRAPHIC FEATURES SHOWN HERE ARE FROM INFORMATION PROVIDED BY THE BUREAU OF INDIAN AFFAIRS, ABERDEEN, SOUTH DAKOTA, NOVEMBER 2006.

LEGEND

WATER LINE

SERVICE AND RESIDENCE

1/8 1/16 0 1/8 1/4
SCALE IN MILES

VERIFY SCALE!
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MODIFY SCALE ACCORDINGLY!

REVISIONS			
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REGISTERED PROFESSIONAL ENGINEER
REG. NO. 5270
CRAIG L. NOWAK
SOUTH DAKOTA
6-30-15

DRAWN BY: NCK
DSGN. BY: MRK
APPR. BY: CLN
DATE: 07/2015
Q.C. REVIEW
BY:
DATE:

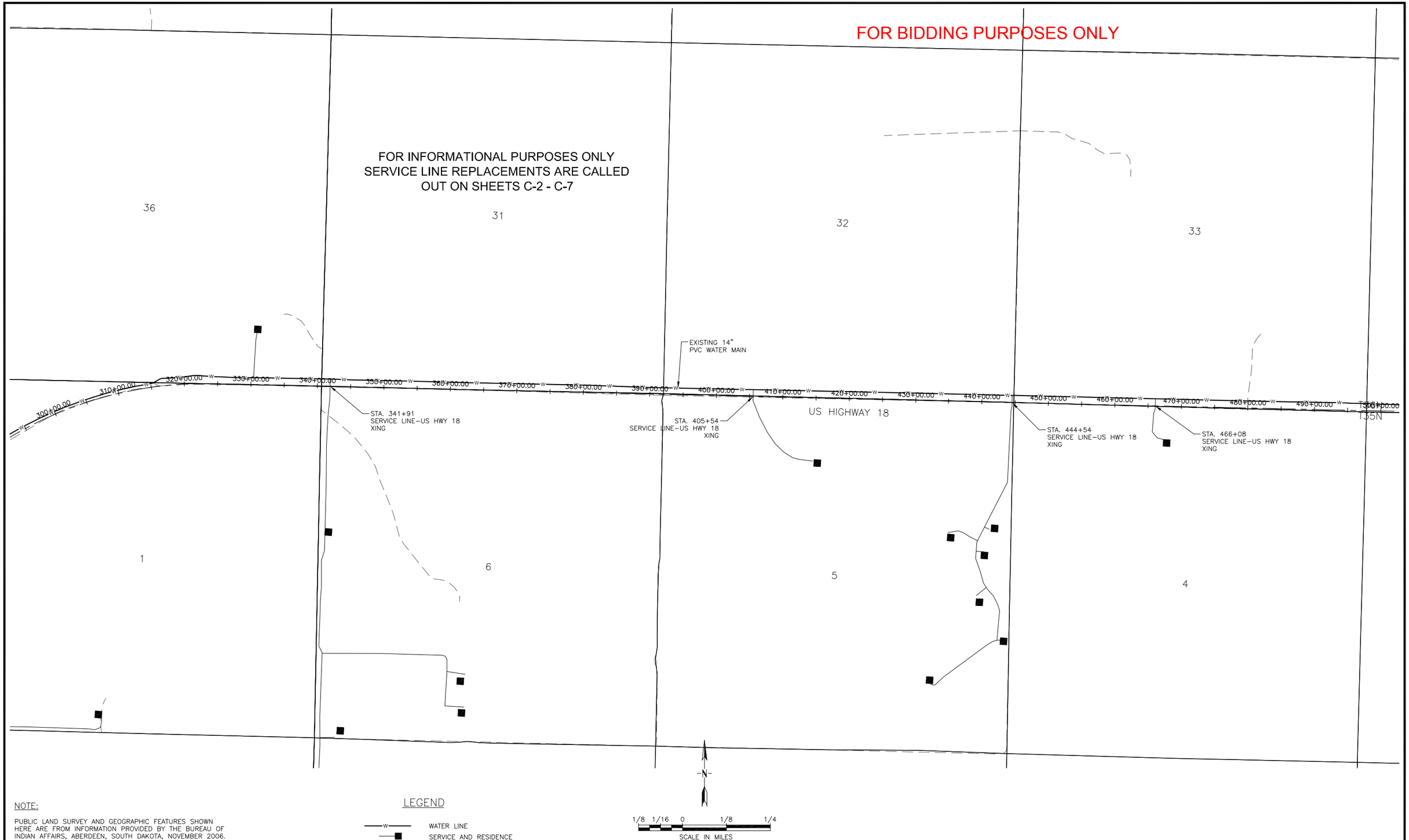
WATER MAINTENANCE AND CONSERVATION
US 18 EAST CONFLICTS
PINE RIDGE INDIAN RESERVATION SOUTH DAKOTA

US HIGHWAY 18 SERVICE LINE LOCATIONS

PROJECT NUMBER 2246.029.08
SHEET NUMBER 10 of 19
DRAWING NUMBER S-1

FOR BIDDING PURPOSES ONLY

FOR INFORMATIONAL PURPOSES ONLY
SERVICE LINE REPLACEMENTS ARE CALLED
OUT ON SHEETS C-2 - C-7



NOTE:

PUBLIC LAND SURVEY AND GEOGRAPHIC FEATURES SHOWN HERE ARE FROM INFORMATION PROVIDED BY THE BUREAU OF INDIAN AFFAIRS, ABERDEEN, SOUTH DAKOTA, NOVEMBER 2006.

LEGEND

—W— WATER LINE

SERVICE AND RESIDENCE

VERIFY SCALE!

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REVISIONS			
NO.	DESCRIPTION	DATE	BY

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REG. NO. 5270
CRAIG L. NOWAK
SOUTH DAKOTA
6-30-15

DRAWN BY: NCK
DSGN. BY: MRK
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DATE: 07/2015
Q.C. REVIEW
BY:
DATE:

WATER MAINTENANCE AND CONSERVATION
US 18 EAST CONFLICTS
PINE RIDGE INDIAN RESERVATION SOUTH DAKOTA

US HIGHWAY 18 SERVICE LINE LOCATIONS

PROJECT NUMBER
2246.029.08

SHEET NUMBER
11 of 19

DRAWING NUMBER
S-2

FOR BIDDING PURPOSES ONLY

FOR INFORMATIONAL PURPOSES ONLY
SERVICE LINE REPLACEMENTS ARE CALLED
OUT ON SHEETS C2 - C-7

35 36 31 32

2 1 6 5

EXISTING 14"
PVC WATER MAIN

US HIGHWAY 18

540+00.00 550+00.00 560+00.00 570+00.00 580+00.00 590+00.00 600+00.00 610+00.00 620+00.00 630+00.00 640+00.00 650+00.00 660+00.00 670+00.00 680+00.00 690+00.00 700+00.00 710+00.00 720+00.00 730+00.00 740+00.00

STA. 550+02
SERVICE LINE–US HWY 18
XING

STA. 654+25
SERVICE LINE–US HWY 18
XING

NOTE:

PUBLIC LAND SURVEY AND GEOGRAPHIC FEATURES SHOWN HERE ARE FROM INFORMATION PROVIDED BY THE BUREAU OF INDIAN AFFAIRS, ABERDEEN, SOUTH DAKOTA, NOVEMBER 2006.

LEGEND

W WATER LINE

SERVICE AND RESIDENCE

N

1/8 1/16 0 1/8 1/4
SCALE IN MILES

VERIFY SCALE!
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MODIFY SCALE ACCORDINGLY!

REVISIONS			
NO.	DESCRIPTION	DATE	BY

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6-30-15

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WATER MAINTENANCE AND CONSERVATION
US 18 EAST CONFLICTS
PINE RIDGE INDIAN RESERVATION SOUTH DAKOTA

US HIGHWAY 18 SERVICE LINE LOCATIONS

PROJECT NUMBER 2246.029.08
SHEET NUMBER 12 of 19
DRAWING NUMBER S-3

FOR BIDDING PURPOSES ONLY

FOR INFORMATIONAL PURPOSES ONLY
SERVICE LINE REPLACEMENTS ARE CALLED
OUT ON SHEETS C2 - C-7

33 34 35 36

4 3 2 1

EXISTING 12"
PVC WATER MAIN

770+00.00 780+00.00 790+00.00 800+00.00 810+00.00 820+00.00 830+00.00 840+00.00 850+00.00 860+00.00 870+00.00 880+00.00 890+00.00 900+00.00 910+00.00 920+00.00 930+00.00 940+00.00 950+00.00 956+29.51

T35N

US HIGHWAY 18

GORDON JUNCTION

STA. 883+67
SERVICE LINE–US HWY 18
XING

STA. 930+39
WATER MAIN–US HWY 18
XING

N

1/8 1/16 0 1/8 1/4
SCALE IN MILES

NOTE:

PUBLIC LAND SURVEY AND GEOGRAPHIC FEATURES SHOWN HERE ARE FROM INFORMATION PROVIDED BY THE BUREAU OF INDIAN AFFAIRS, ABERDEEN, SOUTH DAKOTA, NOVEMBER 2006.

LEGEND

WATER LINE

SERVICE AND RESIDENCE

VERIFY SCALE!
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REVISIONS			
NO.	DESCRIPTION	DATE	BY

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SOUTH DAKOTA
6-30-15

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DATE: 07/2015
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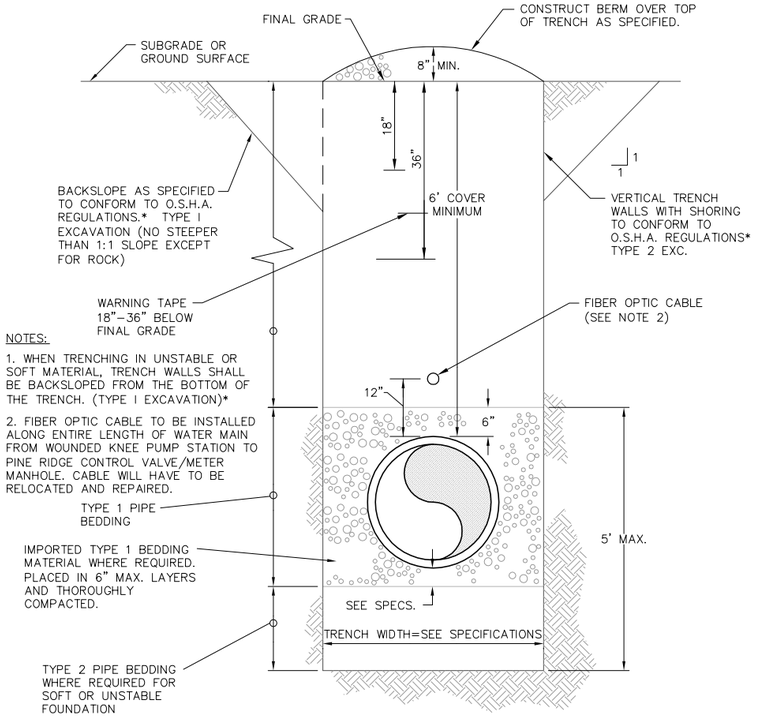
WATER MAINTENANCE AND CONSERVATION
US 18 EAST CONFLICTS
PINE RIDGE INDIAN RESERVATION SOUTH DAKOTA

US HIGHWAY 18 SERVICE LINE LOCATIONS

PROJECT NUMBER
2246.029.08
SHEET NUMBER
13 of 19
DRAWING NUMBER
S-4

FOR BIDDING PURPOSES ONLY



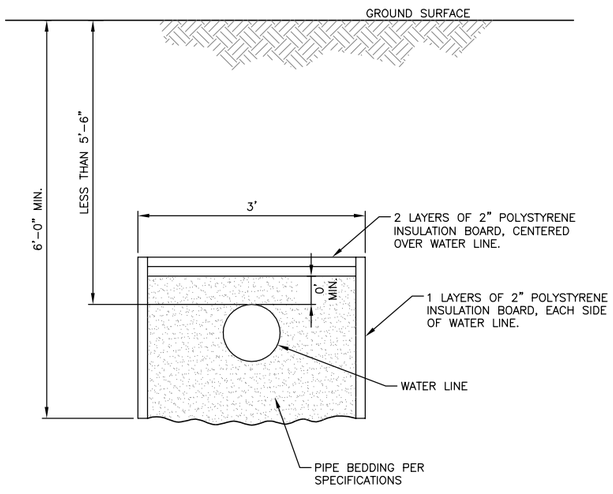
NOTES:

1. WHEN TRENCHING IN UNSTABLE OR SOFT MATERIAL, TRENCH WALLS SHALL BE BACKSLOPED FROM THE BOTTOM OF THE TRENCH. (TYPE I EXCAVATION)*
2. FIBER OPTIC CABLE TO BE INSTALLED ALONG ENTIRE LENGTH OF WATER MAIN FROM WOUNDED KNEE PUMP STATION TO PINE RIDGE CONTROL VALVE/METER MANHOLE. CABLE WILL HAVE TO BE RELOCATED AND REPAIRED.

TYPICAL PIPE TRENCH 02221

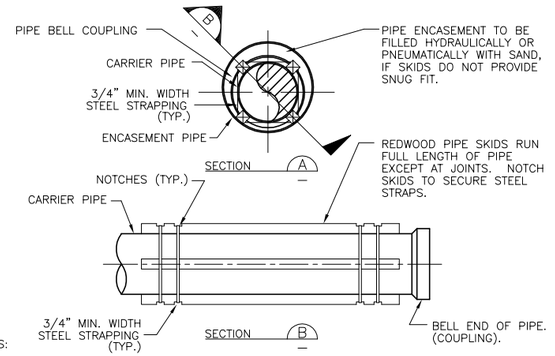
NOT TO SCALE

* SEE O.S.H.A. SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION, SECTION 1926.652.



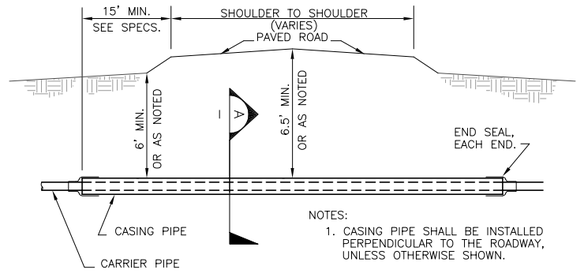
PIPE INSULATION DETAIL 02224

NOT TO SCALE



NOTES:

1. THE PIPE SKIDS SHALL BE OF SUFFICIENT DEPTH TO PREVENT THE BELL END OF THE PIPE FROM COMING IN CONTACT WITH THE PIPE CASING. SKID DEPTH SHALL EXCEED THE OUTSIDE SURFACE OF THE OUTERMOST EDGE OF THE PIPE BELL BY A MINIMUM OF ¾ INCH.
2. DO NOT USE CREOSOTE TREATED WOODEN PIPE SKIDS WITH PVC PIPE AS CREOSOTE WILL DAMAGE PVC MATERIAL.
3. SEE SPECIFICATIONS FOR CASING CHOCK ALTERNATIVE TO REDWOOD SKIDS.
4. SEE SPECS FOR ALTERNATIVE TRENCHLESS METHODS.



ROAD BORING AND JACKING – TYPICAL CROSS SECTION

ROAD CROSSING DETAIL 02225

NOT TO SCALE

VERIFY SCALE!
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DRAWN BY: NCK
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WATER MAINTENANCE AND CONSERVATION
US 18 EAST CONFLICTS
PINE RIDGE INDIAN RESERVATION SOUTH DAKOTA

STANDARD DETAILS

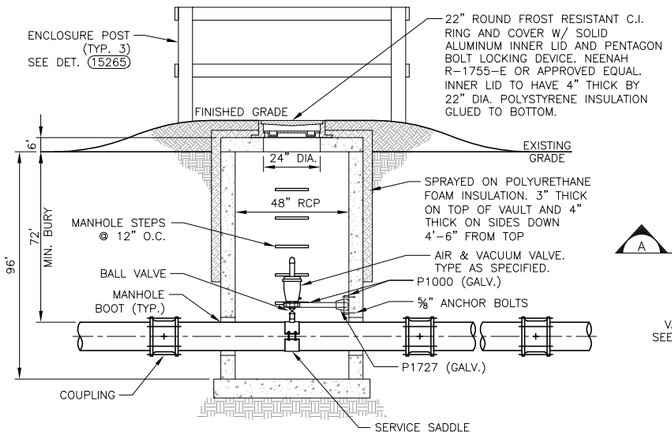
PROJECT NUMBER 2246.029.08
SHEET NUMBER 14 of 19
DRAWING NUMBER D-1

FOR BIDDING PURPOSES ONLY

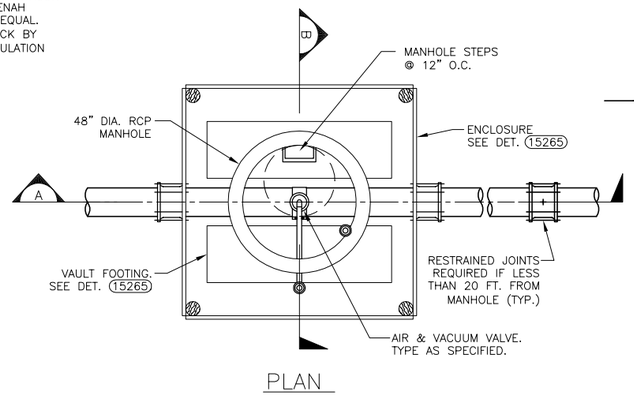
NOTES:

1. SWAY BRACE PRODUCT NUMBERS ARE UNISTRUT. USE UNISTRUT, KINLINE OR EQUAL. SECURE CARV TO SWAY BRACE W/ 2"x 12 GA. STRAP. USE STRUT MFR'S BOLTS AND NUTS. PAINT GALV. ITEMS BEFORE INSTALLATION.

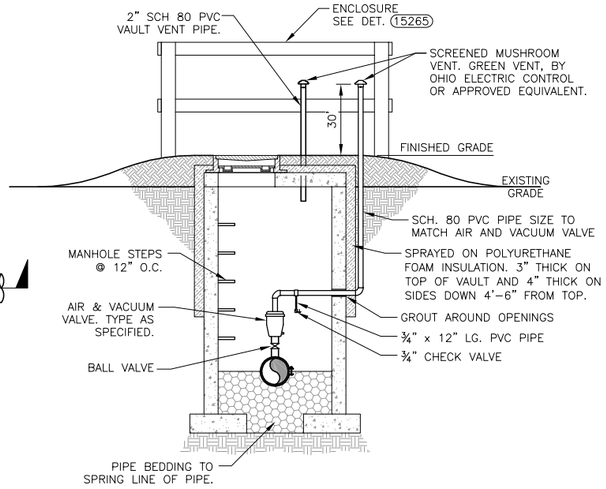
2. SEE SPECIFICATIONS AND DRAWINGS FOR TYPE AND SIZE OF AIR RELEASE AND BALL VALVE.



SECTION A



PLAN

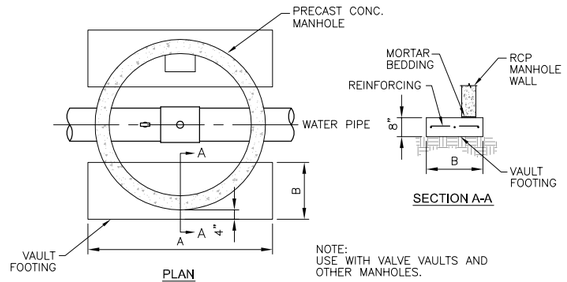


SECTION B

ARV VAULT DETAIL

SCALE: 3/8" = 1'-0"

15260



PLAN

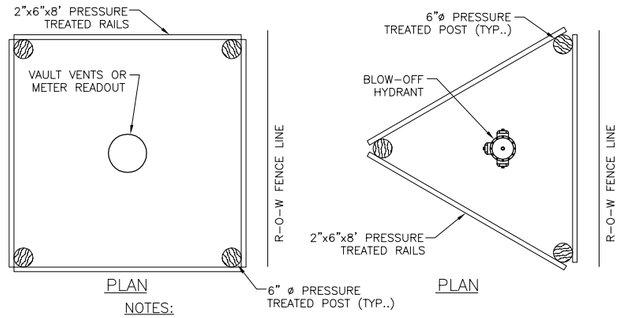
NOTE:
USE WITH VALVE VAULTS AND OTHER MANHOLES.

	A	B	REINFORCING
48" MANHOLE (58" O.D.)	6'-4"	2'-0"	W/3~#4 LONG, 4~#4 TRANS. (SHORT)
60" MANHOLE (72" O.D.)	6'-6"	2'-0"	W/3~#4 LONG, 4~#4 TRANS. (SHORT)
72" MANHOLE (86" O.D.)	7'-8"	2'-0"	W/3~#4 LONG, 4~#4 TRANS. (SHORT)
84" MANHOLE (100" O.D.)	8'-10"	3'-8"	W/4~#4 LONG, 6~#4 TRANS. (SHORT)
90" MANHOLE (107" O.D.)	9'-4"	3'-8"	W/4~#4 LONG, 6~#4 TRANS. (SHORT)
96" MANHOLE (114" O.D.)	10'-0"	3'-8"	W/4~#4 LONG, 6~#4 TRANS. (SHORT)

TYPICAL VAULT FOOTING

NOT TO SCALE

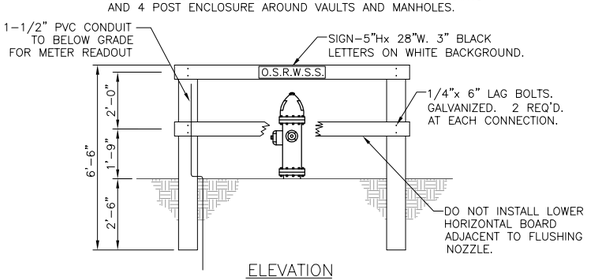
15264



NOTES:

1. PROVIDE PROTECTIVE ENCLOSURE FOR VAULT VENTS, BLOW-OFF HYDRANTS AND METER READOUTS. CENTER FENCE AROUND ITEM BEING FENCED.

2. PROVIDE 3 POST ENCLOSURE AROUND BLOW-OFF HYDRANTS AND 4 POST ENCLOSURE AROUND VAULTS AND MANHOLES.



ELEVATION

ENCLOSURE DETAIL

SCALE: 3/8" = 1'-0"

15265

VERIFY SCALE!
THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.
MODIFY SCALE ACCORDINGLY!

REVISIONS			
NO.	DESCRIPTION	DATE	BY

Q:\2246\WM&C\HWY 18 East Conflicts\ACAD\Sheets\D-2.dwg Plotted by nick kohut on Jun/30/2015

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REGISTERED PROFESSIONAL ENGINEER REG. NO. 5270 CRAIG L. NOWAK SOUTH DAKOTA 6-30-15

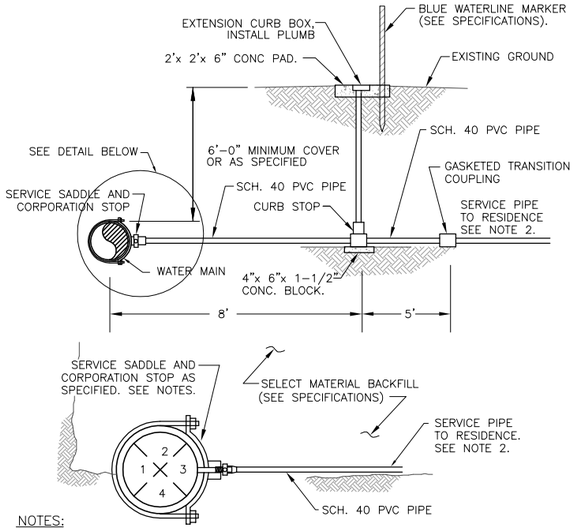
DRAWN BY: NCK
DSGN. BY: MRK
APPR. BY: CLN
DATE: 07/2015
Q.C. REVIEW
BY:
DATE:

WATER MAINTENANCE AND CONSERVATION
US 18 EAST CONFLICTS
PINE RIDGE INDIAN RESERVATION SOUTH DAKOTA

STANDARD DETAILS

PROJECT NUMBER 2246.029.08
SHEET NUMBER 15 of 19
DRAWING NUMBER D-2

FOR BIDDING PURPOSES ONLY



NOTES:

1. WATER MAIN TAP SIZES VARY PER THE SERVICE CONNECTIONS DRAWINGS.
2. SERVICE PIPE WILL BE INSTALLED TO ONE OR MULTIPLE SERVICES; PIPE SIZE WILL VARY PER THE SERVICE CONNECTIONS DRAWINGS. IF NOT SHOWN SPECIFICALLY ON THE DRAWINGS, SIZE OF SERVICE PIPE TO EACH INDIVIDUAL RESIDENCE SHALL BE 1½".

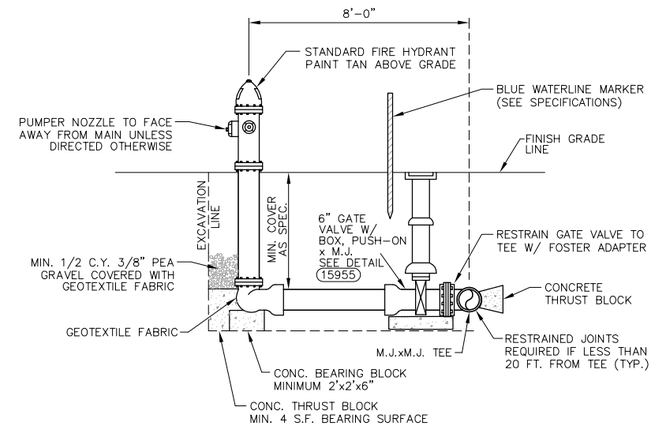
15930

RURAL WATER SYSTEM RESIDENTIAL SERVICE LINE

NOT TO SCALE

NOTES:

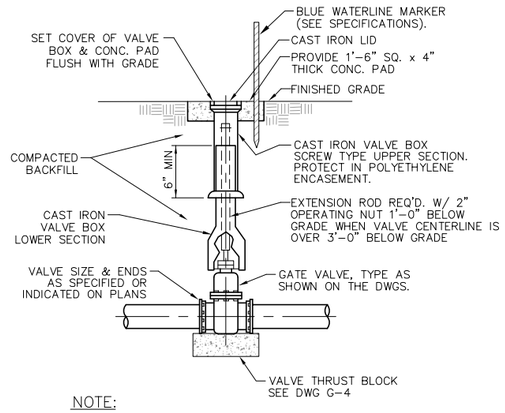
1. THRUST BLOCKING TO BE IN CONFORMANCE W/ DRAWING G-4.
2. FOR BOLTED FITTINGS, BLOCKING SHALL NOT OBSTRUCT BOLTS.
3. HYDRANT WEEP HOLES TO REMAIN UNOBSTRUCTED.
4. PROVIDE PROTECTIVE ENCLOSURE AROUND HYDRANTS PER DETAIL 15265
5. COAT ALL FERROUS METAL PIPING, FITTINGS, VALVES, ETC. AS SPECIFIED.



BLOW-OFF HYDRANT DETAIL

NOT TO SCALE

15936



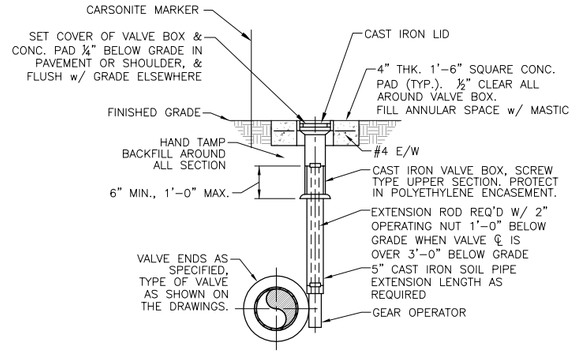
NOTE:

PROTECT BURIED VALVES WITH CORROSION PROTECTION, AS SPECIFIED.

BURIED GATE VALVE BOX

NOT TO SCALE

15955



NOTE: PROTECT BURIED VALVES WITH CORROSION PROTECTION, AS SPECIFIED.

BURIED BUTTERFLY OR PLUG VALVE BOX SETTING

NOT TO SCALE

15956

VERIFY SCALE!

THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.

MODIFY SCALE ACCORDINGLY!

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REGISTERED PROFESSIONAL ENGINEER REG. NO. 8470 CRAIG L. NOWAK SOUTH DAKOTA 6-30-15

DRAWN BY: NCK
DSGN. BY: MRK
APPR. BY: CLN
DATE: 07/2015

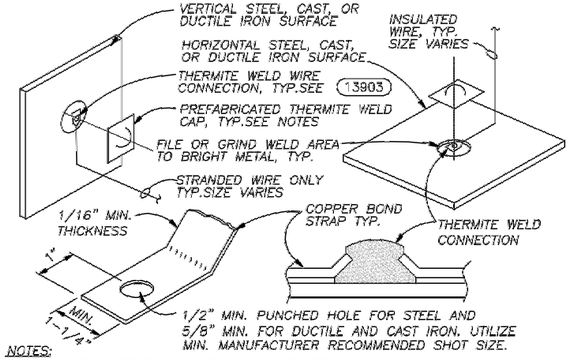
Q.C. REVIEW
BY:
DATE:

WATER MAINTENANCE AND CONSERVATION
US 18 EAST CONFLICTS
PINE RIDGE INDIAN RESERVATION SOUTH DAKOTA

STANDARD DETAILS

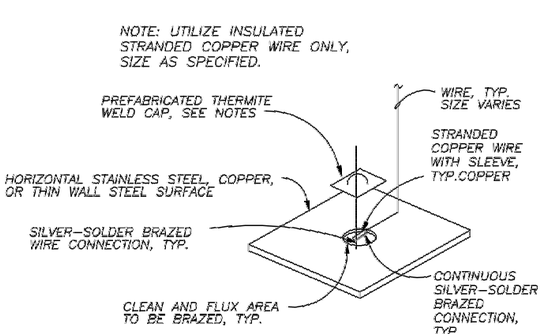
PROJECT NUMBER 2246.029.08
SHEET NUMBER 16 of 19
DRAWING NUMBER D-3

FOR BIDDING PURPOSES ONLY



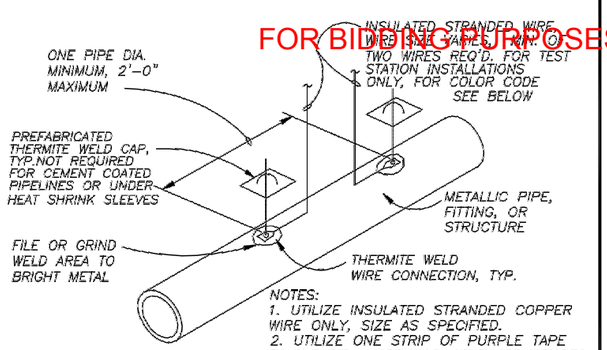
NOTES:
1. COPPER SLEEVE REQUIRED FOR THERMITE WELDING OF No. 10 AWG AND SMALLER WIRE AND No. 4 AND No. 2 AWG JOINT BOND WIRES.
2. WELDER AND CARTRIDGE SIZE VARIES ACCORDING TO SURFACE SHAPE, MATERIAL, AND HORIZONTAL OR VERTICAL SURFACE. CONSULT WELDER MANUFACTURER FOR RECOMMENDED WELDER AND CARTRIDGE.
3. FOR MULTIPLE WIRE CONNECTIONS TO PIPE SEPARATE THERMITE WELD CONNECTIONS BY ONE PIPE DIAMETER MINIMUM, 2'-0" MAXIMUM.
4. WIRE CONNECTIONS TO FOREIGN PIPELINES SHALL BE MADE BY FOREIGN PIPELINE REPRESENTATIVE.
5. USE 15 GRAM MAXIMUM SIZE WELD CARTRIDGES FOR CONNECTIONS TO PETROLEUM AND NATURAL GAS PIPELINES OR STRUCTURES. THERMITE CONNECTIONS ONLY AS SPECIFIED & APPROVED BY OWNER. CROW'S FOOT LARGER WIRE CONNECTIONS IF SPECIFIED & APPROVED BY OWNER.
6. COAT COMPLETED THERMITE WELD CONNECTIONS W/ PREFABRICATED IP OR XP HANDYCAP, HEAT SHRINK SLEEVE, EPOXY, OR AS OWNER SPECIFIED.
7. COLOR CODE WIRES ACCORDING TO WIRE COLOR CODE SEE (13902)
8. ATTACH THERMITE WELD TO STUD OR WELD BASE PLATE IF PROVIDED.
9. INSTALL PIPE MARKING SIGNS NEXT TO TEST STATIONS AS SPECIFIED.

VERTICAL AND HORIZONTAL WIRE AND COPPER STRAP THERMITE CONNECTIONS (13901)
NTS



NOTES:
1. BRAZE (SILVER-SOLDER) COPPER WIRE ELECTRICAL CONNECTION TO COPPER, STAINLESS STEEL, AND THIN WALL STEEL (0.035" OR LESS) PIPING OR TUBING.
2. SELECT A LOCATION TO BRAZE ON FITTING EDGE OR LIP, SO AS TO NOT DAMAGE INTERNAL COATINGS, RUBBER LINING, OR GASKETS.
3. CLEAN AND PREPARE SURFACE FOR BRAZING. FLUX SURFACE WITH A SUITABLE TYPE FLUX FOR MATERIAL TYPES BEING SOLDERED IN ACCORDANCE WITH THE SILVER SOLDER MANUFACTURER'S INSTRUCTIONS..
4. BRAZE THE SLEEVED COPPER WIRE WITH A SUITABLE TYPE SILVER BRAZING ALLOY FOR THE MATERIALS BEING CONNECTED IN ACCORDANCE WITH BRAZE MATERIAL MANUFACTURER'S DIRECTIONS.
5. SILVER-SOLDER WIRE TO PROPERLY PREPARED AND FLUXED AREA IN A MANNER SO AS TO NOT LEAVE CRACKS OR CREVICES IN THE COMPLETED BRAZED CONNECTION. VISUALLY INSPECT AND TAP WITH HAMMER TO TEST ADHESION.
6. ALLOW TO COOL AND REMOVE REMAINING FLUX WITH (STAINLESS STEEL) WIRE BRUSH AND SOLVENT CLEAN (SSPC SP-1).
7. ONLY COAT CONNECTIONS TO COPPER AND THIN WALL STEEL PIPING OR TUBING IN SPECIFIED THERMITE WELD COATING METHOD. STAINLESS STEEL CONNECTIONS DO NOT NEED TO BE COATED.

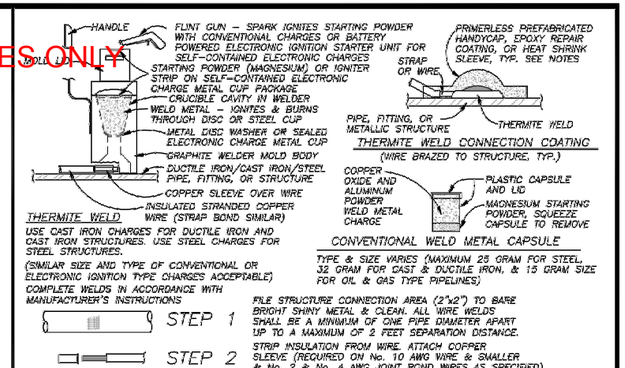
BRAZED WIRE CONNECTIONS (13901B)
NTS



NOTES:
1. UTILIZE INSULATED STRANDED COPPER WIRE ONLY, SIZE AS SPECIFIED.
2. UTILIZE ONE STRIP OF PURPLE TAPE TO IDENTIFY NORTH OR WEST STRUCTURES AND ONE STRIP OF GRAY TAPE TO IDENTIFY SOUTH OR EAST STRUCTURES, AS REQ'D.

WIRE COLOR CODE
1. PIPELINE TEST WIRES:
   WATER – BLUE WASTEWATER – GREEN OR PURPLE IF REUSE
   FOREIGN PIPELINES – WHITE OR AS REQUESTED BY FOREIGN PIPELINE COMPANY
   CURRENT TEST SPAN WIRES – UPSTREAM SIDE MARK W/ RED TAPE
2. UNPROTECTED PIPELINE – BLACK
3. CASINGS – ORANGE
4. ANODE LEADS – BLACK – (UPSTREAM W/ RED TAPE)
   RIBBON ANODES – BLACK– IDENTIFY LOCATION & DIRECTION W/ TAGS
5. REFERENCE ELECTRODE WIRES – YELLOW
6. COUPON WIRES – GREEN – DUAL LEADS TO EACH COUPON
   PROTECTED COUPON – GREEN (W/ 1 STRIP OF WHITE TAPE)
   UNPROTECTED COUPON – GREEN (W/ 1 STRIP OF BLACK TAPE)
7. TRACER WIRES NON-METALLIC PIPE – GREEN W/ 2 STRIPS BLACK TAPE

PIPELINE WIRE CONNECTION (13902)
NTS



THERMITE WELD
USE CAST IRON CHARGES FOR DUCTILE IRON AND CAST IRON STRUCTURES. USE STEEL CHARGES FOR STEEL STRUCTURES.
(SIMILAR SIZE AND TYPE OF CONVENTIONAL OR ELECTRONIC IGNITION TYPE CHARGES ACCEPTABLE)
COMPLETE WELDS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS

TYPE & SIZE VARIES (MAXIMUM 25 GRAM FOR STEEL, 32 GRAM FOR CAST & DUCTILE IRON, & 15 GRAM SIZE FOR OIL & GAS TYPE PIPELINES)

STEP 1 – FILE STRUCTURE CONNECTION AREA (2"x2") TO BARE BRIGHT SHINY METAL & CLEAN. ALL WIRE WELDS SHALL BE A MINIMUM OF ONE PIPE DIAMETER APART UP TO A MAXIMUM OF 2 FEET SEPARATION DISTANCE.

STEP 2 – STRIP INSULATION FROM WIRE. ATTACH COPPER SLEEVE (REQUIRED ON No. 10 AWG WIRE & SMALLER & No. 2 & No. 4 AWG JOINT BOND WIRES AS SPECIFIED)

STEP 3 – 1/4" MIN. ATTACH COPPER SLEEVE TO WIRE WITH CORRECT HAMMER DIE OR CRIMP TOOL. FACTORY SLEEVES SHALL BE ANGLED AND FIELD MADE BONDS SHALL HAVE WIRE EXTEND 1/4" PAST SLEEVE SO WIRE IS EXPOSED TO THERMITE WELD.

STEP 4 – PLACE WASHER IN BOTTOM OF MOLD AND FILL CRUCIBLE W/POWDER OR INSERT PREPACKED ELECTRONIC CANISTER CHARGE, CLOSE LID, MOLD FIRMLY W/OPENING AWAY FROM OPERATOR, & IGNITE W/FLINT GUN OR ELECTRONIC IGNITION STARTER.

STEP 5 – REMOVE SLAG FROM CONNECTION, VISUALLY INSPECT & TAP WELD TO TEST FOR SOUNDNESS & ADHESION W/ HAMMER. MEASURE JOINT BOND RESISTANCE AS SPECIFIED. REPLACE ALL POORLY FORMED, UNSIGHTLY, POROUS, HIGH RESISTANT, OR DEFECTIVE WELDS. INSTALL ADDITIONAL BOND WIRE OR STRAP IF REQUIRED.

STEP 6 – CLEAN AND COAT CONNECTION AND EXPOSED STRUCTURE SURFACE WITH HEAT SHRINK SLEEVE, PRIMERLESS HANDYCAP, OR EPOXY REPAIR COATING MATERIALS PER BELOW, APPLY IN ACCORDANCE WITH COATING MANUFACTURER'S RECOMMENDATIONS.

6-A. IF CADWELD CONNECTION LOCATED AT PIPE JOINT TO BE COATED WITH HEAT SHRINK SLEEVE, APPLY MASTIC FILLER AND HEAT SHRINK SLEEVE OVER CONNECTION. NO HANDYCAP REQUIRED. IF NOT, THEN EITHER:
6-B. UTILIZE PRIMERLESS HANDYCAP IP OR EQUAL FOR No. 10 AWG AND SMALLER WIRE.
6-C. UTILIZE PRIMERLESS HANDYCAP XL-IP (EXTRA LARGE) OR EQUAL FOR No. 8 AND LARGER WIRE AND PIN WELD TYPE CONNECTIONS.
6-D. OR UTILIZE 100 PERCENT MOISTURE TOLERANT EPOXY REPAIR COATING (PROTAL 7125 OR EQUAL) FOR HARD TO COAT CONNECTIONS AND SPOT COATING REPAIR.
6-E. REPAIR PIPE OR STRUCTURE COATING DAMAGE WITH SPECIFIED AND APPROVED COATING REPAIR MATERIALS FOR ORIGINAL COATING TYPE.

GENERAL EXOTHERMIC WELD & COATING PROCEDURES
THERMITE WELD AND WIRE CONNECTION (13903)
NTS

INSTALLATION TYPE	
P	POST MOUNT
F	FLUSH MOUNT

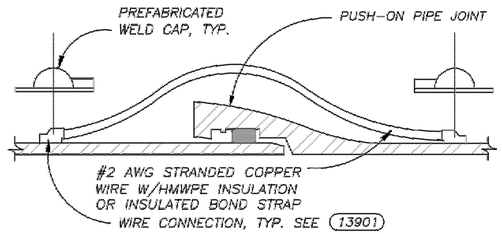
TEST STATION TYPE	
T	– STANDARD, TWO WIRE
F	– FOREIGN PIPE CROSSING
C	– CASING
A	– ANODE
I	– BURIED INSULATOR
XB	– CROSS BOND
IRE	– REFERENCE ELECTRODE/PLASTIC PIPE
IRC	– REFERENCE COUPONS/PLASTIC PIPE
F – D	– FOREIGN CROSSING WITH DRAIN ANODE
F – A	– FOREIGN CROSSING WITH GROUND ANODES
T – C	– TYPE T W/ 200' CURRENT SPAN
GA–P	– GALVANIC ANODE TO PIPELINE
GA–F	– GALVANIC ANODE TO FITTING
– TEMP	– TEMPORARY TEST STATION
– TW	– TRACER WIRE ACCESS BOXES

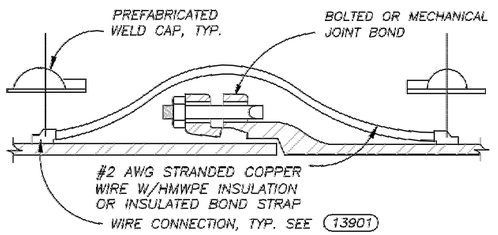
NOTE: INSTALL PIPE MARKING SIGNS NEXT TO TEST STATIONS AS SPECIFIED.

TEST STATION DETAILS 13920 AND 13930 SERIES
EXAMPLE TEST STATION
INSTALLATION TYPE TEST STATION TYPE
P – C
POST MOUNT CASING TEST STATION

NOTES:
1. TEST STATIONS SHALL BE INSTALLED AT THE APPROXIMATE LOCATIONS GIVEN IN THE SCHEDULE OR AS APPROVED BY THE ENGINEER IN THE FIELD. ACTUAL LOCATIONS AND TYPE MAY VARY DEPENDING UPON ACTUAL FIELD CONDITIONS ENCOUNTERED.
2. ADDITIONAL TEST STATIONS SHALL BE INSTALLED IF UNKNOWN FIELD CONDITIONS OR FOREIGN PIPE LOCATIONS ARE ENCOUNTERED DURING CONSTRUCTION. THESE ADDITIONAL TEST STATIONS SHALL BE LOCATED AND CONSTRUCTED AS APPROVED BY ENGINEER IN THE FIELD.
3. REFER TO "CP" SERIES DRAWINGS FOR TEST STATION DETAILS.
4. INSTALL CURRENT TEST SPAN TEST WIRES, REFERENCE ELECTRODES, COUPONS, ANODES, OR GROUND CELLS, ETC.; ONLY AT LOCATIONS NOTED ON TEST STATION SCHEDULE OR PLAN DRAWINGS.

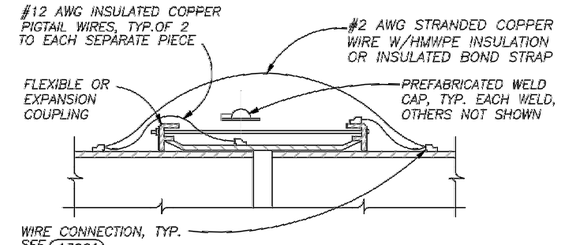
STANDARD TEST STATION LEGEND (13904)
NTS

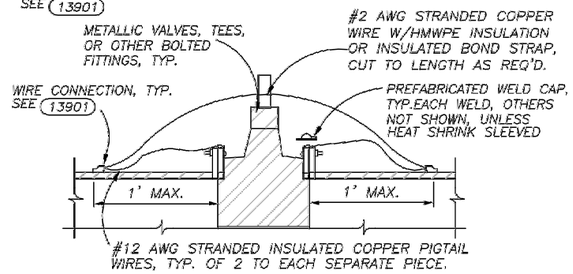




NOTES:
1. NUMBER OF JOINT BONDS AT EACH JOINT AS SPECIFIED
2. PUSH-ON & MECHANICAL JOINT SHOWN, TYP. OF ALL JOINT TYPES.
3. JOINT BONDING NOT REQUIRED ON CAST IRON SOIL PIPE
4. ATTACH THERMITE WELD TO STUD OR WELD BASE PLATE IF PROVIDED.

INSULATED WIRE JOINT BOND (13905)
NTS





NOTES:
1. NUMBER OF JOINT BONDS AT EACH JOINT AS SPECIFIED
2. INSTALL AT FLEXIBLE COUPLINGS AND BOLTED CONNECTIONS WITH PIG TAIL WIRES TO COUPLING OR FITTING BODY IF HEAT SHRINK SLEEVE AND STRAP TYPE JOINT BONDS NOT ALREADY UTILIZED.
3. POSITION & PROVIDE LENGTH AS REQUIRED FOR MIN. TOTAL 2" SLACK.
4. ATTACH THERMITE WELD TO STUD OR WELD BASE PLATE IF PROVIDED.
5. PROVIDE ADDITIONAL PIGTAIL WIRES TO MULTIPLE SEGMENTED FITTINGS, TYP. OF 2 TO EACH SEPARATE PIECE, LENGTH AS REQ'D.

COUPLING OR FITTING JOINT BOND (13906)
NTS

VERIFY SCALE!
THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.
MODIFY SCALE ACCORDINGLY!

REVISIONS			
NO.	DESCRIPTION	DATE	BY

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DRAWN BY: NCK
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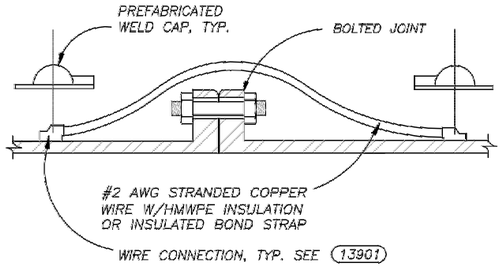
Q.C. REVIEW BY: _____
DATE: _____

WATER MAINTENANCE AND CONSERVATION
US 18 EAST CONFLICTS
PINE RIDGE INDIAN RESERVATION SOUTH DAKOTA

TYPICAL CORROSION PROTECTION DETAILS

PROJECT NUMBER 2246.029.08
SHEET NUMBER 17 of 19
DRAWING NUMBER CP-1

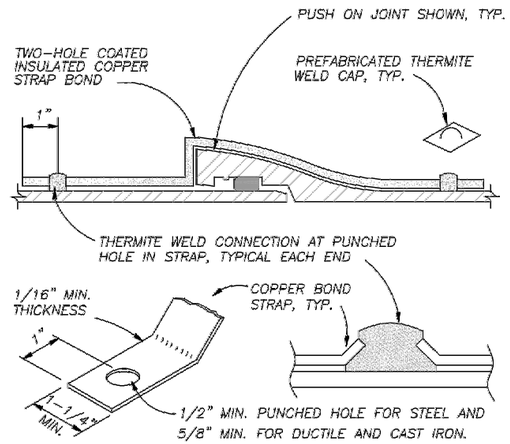
FOR BIDDING PURPOSES ONLY



NOTES:
1. NUMBER OF JOINT BONDS AT EACH JOINT AS SPECIFIED
2. BOLTED JOINT CONNECTION SHOWN, TYPICAL OF ALL JOINT TYPES.
3. INSTALL AT BOLTED TYPE CONNECTIONS IF HEAT SHRINK SLEEVE AND STRAP JOINT BONDS NOT ALREADY UTILIZED
4. ATTACH THERMITE WELD TO STUD OR WELD BASE PLATE IF PROVIDED.

BOLTED CONNECTION JOINT BOND 13907

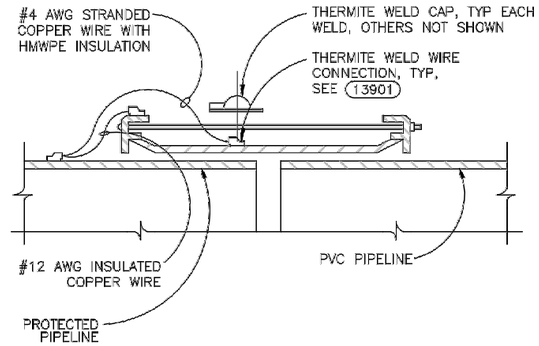
NTS



NOTES:
1. NUMBER OF STRAP BONDS AT EACH JOINT AS SPECIFIED.
2. CADWELD AND FORM COPPER STRAP TO MATCH JOINT PROFILE.
3. PROVIDE COATED INSULATED BOND STRAP PER SPECIFICATIONS.
4. TWO-HOLE INSULATED BOND STRAP CAN BE USED IN PLACE OF WIRE TYPE JOINT BOND, WHERE BARE PIPE OR HEAT SHRINK SLEEVE IS NOT REQUIRED FOR JOINT COATING. PRIME AND COAT THERMITE CONNECTION WITH PREFABRICATED THERMITE WELD CAP. COAT BARE COPPER AREAS W/ REPAIR COATINGS PER COATING MANUFACTURER AND SPECIFICATIONS.
5. ATTACH THERMITE WELD TO STUD OR WELD BASE PLATE IF PROVIDED.

COATED COPPER STRAP JOINT BONDS 13909

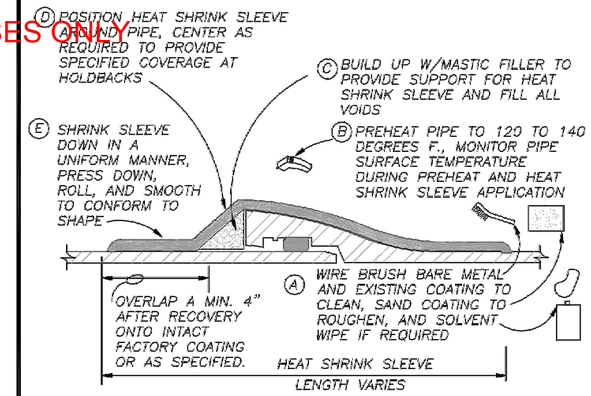
NTS



NOTE:
1. ATTACH THERMITE WELD TO STUD OR WELD BASE PLATE IF PROVIDED.

INSULATED FLEXIBLE COUPLING 13910

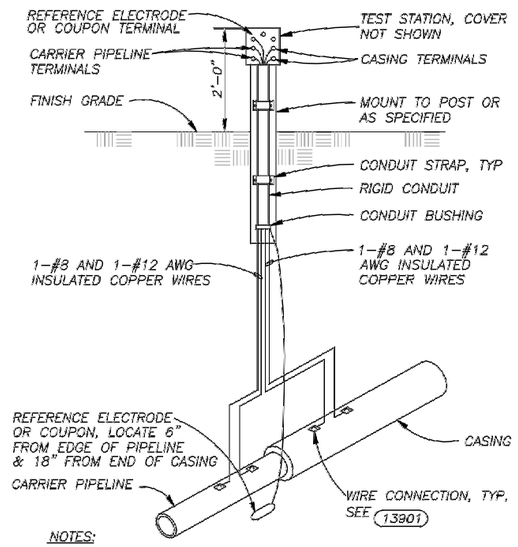
NTS



NOTES:
1. PUSH-ON JOINT SHOWN, TYPICAL OF ALL JOINT TYPES OR REPAIRS.
2. MASTIC AND SLEEVE SHALL BE AS RECOMMENDED BY HEAT SHRINK SLEEVE MANUFACTURER FOR EACH PIPE AND JOINT TYPE.
3. Clean, PREHEAT, APPLY MASTIC FILLER AND HEAT SHRINK SLEEVE PER HEAT SHRINK MANUFACTURER'S DIRECTIONS WHILE MONITORING PREHEAT AND APPLICATION TEMPERATURES.
4. ALLOW COMPLETED SLEEVE TO COOL BEFORE BACKFILLING.
5. HEAT SHRINK SLEEVE JOINT COATING AND MASTIC FILLER SHALL COMPLETELY COVER PIPE HOLD BACK, JOINT, AND BOND STRAP. MASTIC FILLER SHALL PROVIDE SMOOTH TRANSITION AT ALL EDGES AND STEP-DOWNS AND FILL ALL VOIDS.
6. JOINT BOND WIRES/STRAPS, ANODE & TEST LEADS (NOT SHOWN) SHALL BE COMPLETELY ENCASED UNDER THE HEAT SHRINK SLEEVE COATING.

HEAT SHRINK SLEEVE JOINT COATING OR PIPE COATING REPAIR 13917

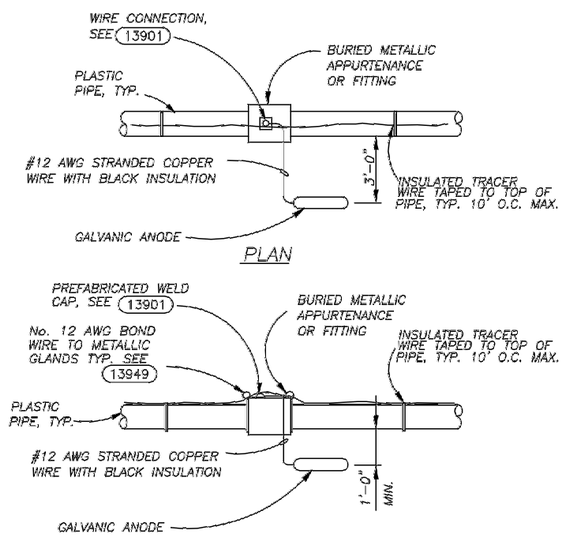
NTS



NOTES:
1. INSTALL REFERENCE ELECTRODES OR COUPONS ONLY AT TEST STATIONS INDICATED ON TEST STATION LOCATION SCHEDULE.
2. COLOR CODE WIRES ACCORDING TO WIRE COLOR CODE 13902

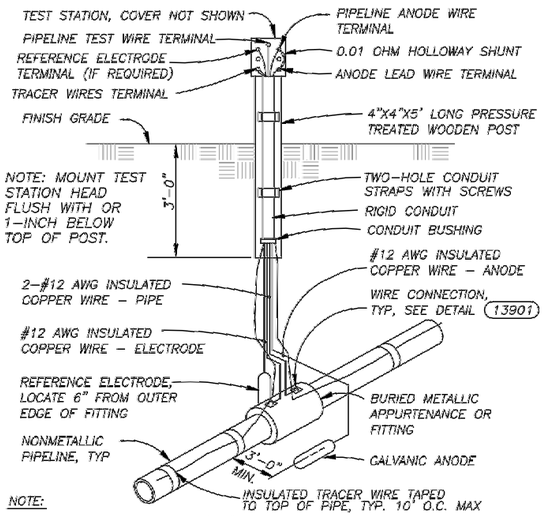
TYPE P-C POST MOUNTED TEST STATION 13924

NTS



GALVANIC ANODE INSTALLATION AT BURIED METALLIC FITTINGS 13940

NTS



NOTE:
1. INSTALL GALVANIC ANODE 1'-0" BELOW PIPE INVERT ELEVATION.
2. INSTALL REFERENCE ELECTRODES ONLY AT TEST STATIONS INDICATED ON TEST STATION LOCATION SCHEDULE.
3. COLOR CODE WIRES ACCORDING TO WIRE COLOR CODE 13902
4. INSTALL PIPE MARKING SIGNS NEXT TO TEST STATIONS AS SPECIFIED.

TYPE P-GA-F (GALVANIC ANODE TO FITTING)

POST MOUNTED TEST STATION WITH GALVANIC ANODE 13941

NTS

VERIFY SCALE!
THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.
MODIFY SCALE ACCORDINGLY!

REVISIONS

NO.	DESCRIPTION	DATE	BY

Q:\2246\WM&C\HWY 18 East Conflicts\ACAD\Sheets\CP-2.dwg Plotted by nick kohut on Jun/30/2015

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REGISTERED PROFESSIONAL ENGINEER REG. NO. 6270 CRAIG L. NOWAK SOUTH DAKOTA 6-30-15

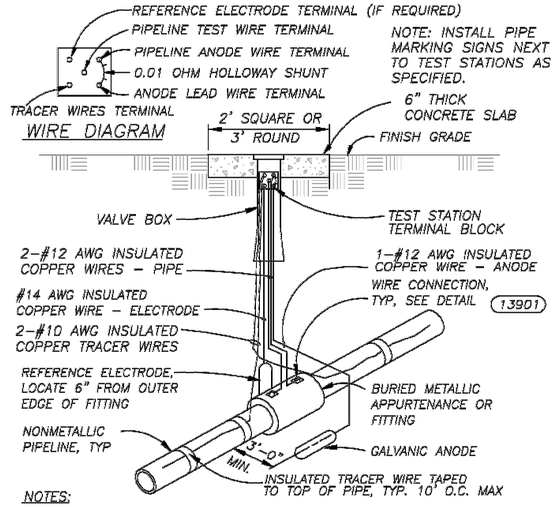
DRAWN BY: NCK
DSGN. BY: MRK
APPR. BY: CLN
DATE: 07/2015
Q.C. REVIEW BY:
DATE:

WATER MAINTENANCE AND CONSERVATION
US 18 EAST CONFLICTS
PINE RIDGE INDIAN RESERVATION SOUTH DAKOTA

TYPICAL CORROSION PROTECTION DETAILS

PROJECT NUMBER 2246.029.08
SHEET NUMBER 18 of 19
DRAWING NUMBER CP-2

FOR BIDDING PURPOSES ONLY



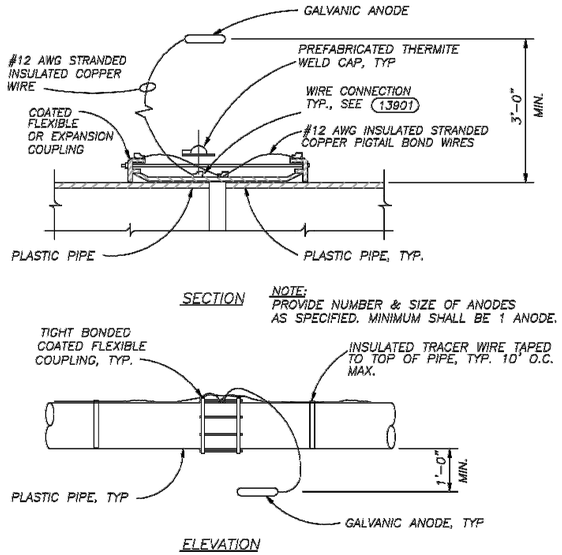
NOTES:

1. PROVIDE SUFFICIENT SLACK IN TEST WIRES TO ALLOW TERMINAL BLOCK TO EXTEND 18" OUT OF TEST STATION. COIL WIRES IN TEST STATION.
2. INSTALL GALVANIC ANODE 1'-0" BELOW PIPE INVERT ELEVATION.
3. INSTALL REFERENCE ELECTRODES ONLY AT TEST STATIONS INDICATED ON TEST STATION LOCATION SCHEDULE.
4. COLOR CODE WIRES ACCORDING TO WIRE COLOR CODE (13902).

TYPE F-GA-F (GALVANIC ANODE TO FITTING)

FLUSH MOUNTED TEST STATION WITH GALVANIC ANODE (13942)

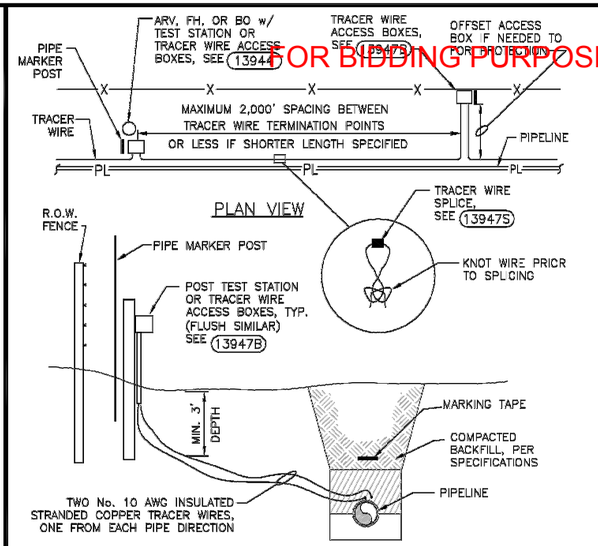
NTS



NOTE:
PROVIDE NUMBER & SIZE OF ANODES AS SPECIFIED. MINIMUM SHALL BE 1 ANODE.

CORROSION PROTECTION FOR FLEXIBLE COUPLINGS ON PLASTIC PIPE (13943)

NTS

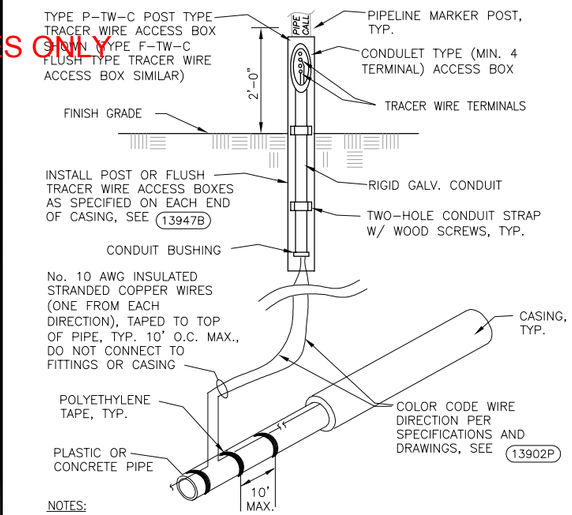


NOTES:

1. TERMINATE TRACER WIRE AT TEST STATIONS OR TRACER WIRE ACCESS BOXES LOCATED AT SPECIFIED DISTANCES, STRUCTURES AND END OF EACH PIPE RUN. TEST TRACER WIRE CONTINUITY.
2. LOCATE TRACER WIRE ACCESS BOXES OR TEST STATIONS IN PROTECTED LOCATIONS. OFFSET TEST STATIONS OR TRACER WIRE ACCESS BOXES TO R.O.W. FENCELINE OR EDGE OF ROADWAY, IF NO PROTECTED LOCATION AVAILABLE OVER PIPELINE. CO-ORDINATE TEST STATION OR TRACER WIRE ACCESS BOX LOCATIONS WITH ENGINEER.

TRACER WIRE DETAIL (13947)

NOT TO SCALE

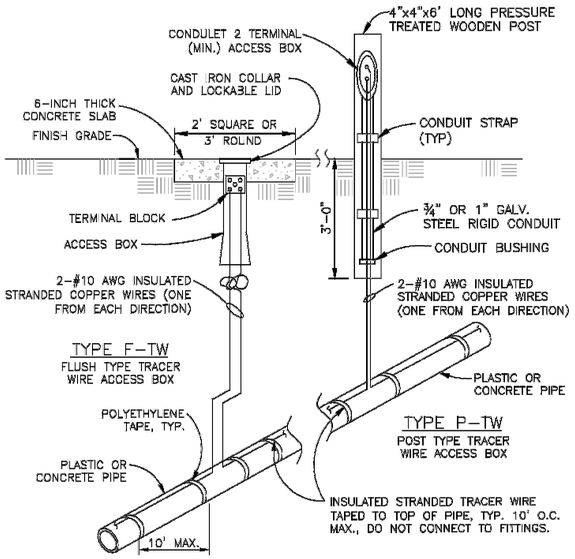


NOTES:

1. INSTALL TRACER WIRE ACCESS BOX AT EACH END OF CASING, POST TYPE ACCESS BOX SHOWN (FLUSH SIMILAR), USE POST TYPE IF POSSIBLE. FOR FLUSH BOXES PROVIDE SUFFICIENT SLACK IN WIRES TO ALLOW TERMINAL BLOCK TO EXTEND MIN. 18" OUT OF BOX. COIL WIRES IN FLUSH TYPE ACCESS BOX.
2. INSTALL NUMBER AND SIZE OF PREPACKAGED GALVANIC ANODES TO METALLIC CASINGS, ONLY IF INDICATED ON TEST STATION/TRACER WIRE ACCESS BOX LOCATION SCHEDULE OR DRAWINGS OR IF SPECIFIED, SEE (13947A)

TYPE P-TW-C AND F-TW-C (CASING) TRACER WIRE ACCESS BOXES AT CASINGS (13947C)

NTS

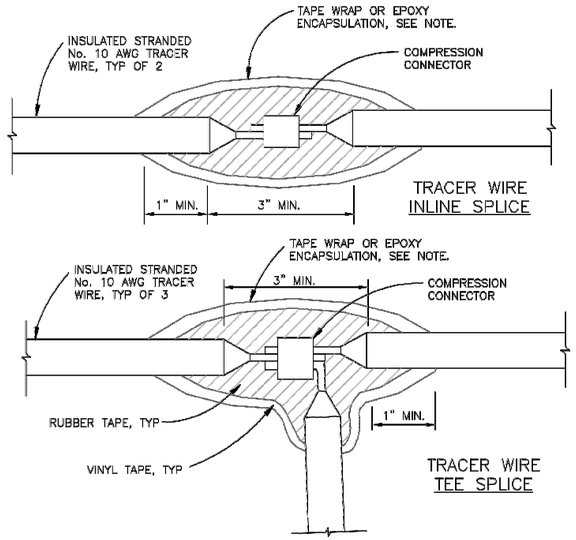


NOTES:

1. FLUSH & POST TYPE ACCESS BOXES SHOWN, USE POST IF POSSIBLE.
2. INSTALL WHERE NO TEST STATIONS AVAILABLE FOR TERMINATION, SO AS TO ALLOW NO TRACER WIRE SPANS LONGER THAN 2,000 FEET.
3. PROVIDE SUFFICIENT SLACK IN TRACE WIRES TO ALLOW TERMINAL BLOCK TO EXTEND 18" OUT OF FLUSH BOX. COIL WIRES IN ACCESS BOX.
4. INSTALL PIPE MARKING SIGNS NEXT TO BOXES AS SPECIFIED.

TRACER WIRE ACCESS DETAIL (13947B)

NOT TO SCALE

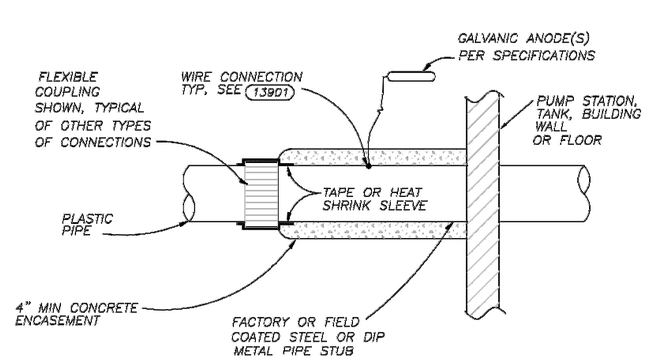


NOTES:

1. MAKE CONNECTION WITH COMPRESSION TYPE CONNECTOR IN ACCORDANCE WITH COMPRESSION CONNECTOR MANUFACTURER RECOMMENDATIONS OR SECURE WITH SPLIT BOLT AND SOLDER. COMPLETE ONLY IN PRESENCE OF ENGINEER.
2. WRAP ENTIRE CONNECTION WITH 3 LAYERS OF HIGH VOLTAGE RUBBER TAPE AND THEN WRAP WITH 3 LAYERS OF VINYL ELECTRICAL TAPE OR ENCAPSULATE IN EPOXY SPLICE KIT. EXTEND A MINIMUM OF 1-INCH ONTO INTACT WIRE INSULATION.

TRACER WIRE SPLICES (13947S)

NOT TO SCALE



NOTES

1. CADWELD WIRES, ASSEMBLE AND TEST COUPLING FITTING CONNECTION AND COAT PRIOR TO CONCRETE ENCASEMENT AND BACKFILLING.
2. COAT METAL PIPE STUB PER SPECIFICATIONS PRIOR TO ENCASEMENT.
3. CENTER 12" WIDE JOINT WRAP TAPE OR HEAT SHRINK SLEEVE ON FLEXIBLE COUPLING AND PIPE INTERFACE AFTER TESTING BEFORE ENCASEMENT.
4. COMPLETELY ENCASE COATED STEEL OR DUCTILE IRON PIPE STUB BETWEEN FLEXIBLE COUPLING AND CONCRETE STRUCTURE, BUILDING WALL, FLOOR OR UNDER TANK WITH A MIN. 4-INCH THICK CONCRETE LAYER.
5. INSTALL GALVANIC ANODE(S) TO CONCRETE ENCASED PIPE, ONE MINIMUM.
6. PROVIDE COMPLETE CONCRETE ENCASEMENT FOR FULL LENGTH OF METAL PIPE STUB UNDER CONCRETE FLOOR SLAPS OR TANK BOTTOMS.

CONCRETE ENCASED METAL PIPE STUB BETWEEN PLASTIC PIPE FLEXIBLE COUPLING AND CONCRETE STRUCTURE CONNECTION (13948)

NTS

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