

Bid Documents



For the construction of

**Erie Parkway Reuse Waterline Improvements
P21-287**

AUGUST 24, 2021

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Part 1 – Request For Bids

Project (Work): Erie Parkway Reuse Waterline Improvements

Project (Work) No.: P21-287

Submittal Date and Location:

Electronic Bids will be received by the Town of Erie (the "Town") through the Rocky Mountain E-Purchasing System ("RMEPS"), until **11:00 a.m.**, local time, **September 15, 2021** for the **Erie Parkway Reuse Waterline Improvements (P21-287)**. Bids will be time-stamped by RMEPS upon receipt.

Bid Opening:

All bids must be submitted electronically using the portal at <https://www.bidnetdirect.com/colorado>. Bid results will be published on the RMEPS after the submittal deadline.

The required Bid documents must be received in the RMEPS submission portal on or before the Bid due date and time. **Hardcopy submittals will not be accepted.** It is the Bidder's sole responsibility to ensure all required Bid documents are submitted through RMEPS by the submission deadline. RMEPS does not allow for uploading Bid documents after the Bid due date and time has closed.

Bids will be time-stamped by RMEPS upon receipt. After uploading bid documents, **Bidders must click the SUBMIT button.** The Town will not accept uploads that are "saved" but not "submitted". To verify that a Bid has been submitted successfully, Bidders may contact BidNet Support or verify, via the Bid Management tab in Bidder's account, that the documents are not in "Draft" status. The Town does not have access to or control of the vendor side of RMEPS. If website or other problems arise during response submission, vendor **MUST** contact RMEPS to resolve issue prior to the response deadline. **(800-835-4603)**.

Specifications and bid documents will be available after **4:00 p.m. on August 25, 2021** and may be obtained from the RMEPS website at <https://www.bidnetdirect.com/colorado>. All questions related to this bid should be submitted through the RMEPS website by **1:00 p.m.** local time, on **September 8, 2021**. All answers to questions received will be sent in a formal addendum (if needed), by **September 10, 2021**.

Optional Pre-Bid Meeting:

A virtual pre-bid meeting will be held on Wednesday **September 1, 2021 at 10:00 a.m.** Bidders are NOT required to attend the pre-bid meeting. Please see Zoom information below:

Engineering is inviting you to a scheduled Zoom meeting.

Join Zoom Meeting

<https://townoferie.zoom.us/j/89917645652?pwd=MDZhdkERFN0RZK0tSQkEzVXNDNFA2dz09>

Meeting ID: 899 1764 5652

Passcode: 798821

One tap mobile

+17207072699,,89917645652# US (Denver)

+12532158782,,89917645652# US (Tacoma)

Dial by your location

+1 720 707 2699 US (Denver)

+1 253 215 8782 US (Tacoma)

+1 346 248 7799 US (Houston)

+1 312 626 6799 US (Chicago)

+1 646 558 8656 US (New York)

+1 301 715 8592 US (Washington DC) Meeting ID: 899 1764 5652 Find your local number: <https://townoferie.zoom.us/j/89917645652?pwd=MDZhdkERFN0RZK0tSQkEzVXNDNFA2dz09>

The Town of Erie requests Bids for:

Construction of a reuse waterline located in Erie Parkway between South Briggs Street and Powers Street. Work consists of installation of 1,460 LF of 8" and 12" reuse waterline, asphalt patching, traffic control, seeding, and site restoration.

Part 2 - Instructions to Bidders

- 2.1. A "Bid" is a responsive, conforming, unconditional, complete, legible, and properly executed offer by a Bidder on the form supplied by the Town to provide the work specified in the Request for Bids for the compensation specified.
- 2.2. Bids shall be clearly marked with the work name, contact person, mailing address, and telephone number of the Bidder.
- 2.3. It shall be the responsibility of the Bidder to ensure that the Bid is in proper form and in the Town's possession by or before the time and date designated in the Request. Bids will not be accepted after the designated time and date. Any Bid received late will be returned to the Bidder unopened, if possible.
- 2.4. If a mistake is made or discovered during or after the Bid review, the Town reserves the right to determine which party made the mistake and whether the mistake is material and, after these determinations, the Town, in its sole reasonable discretion, shall decide whether to accept or reject the Bid. No advantage shall be taken by any party of manifest clerical errors or omissions in any Bid or the Contract Documents. Bidders shall notify the Town immediately of any errors or omissions that are encountered.
- 2.5. Any interlineation, alteration, or erasure shall be initialed by the Bidder. On the Bid, the price of each item shall be stated in numerals and words; in case of conflict, the words shall control. In the case of conflict between the indicated sum of any addition of figures and the correct sum, the correct sum shall control.
- 2.6. The Town shall not reimburse any Bidder for any cost incurred in preparing a Bid or attending equipment demonstrations, inspections, pre-bid conferences, or interviews.
- 2.7. Any amplification, clarification, explanation, interpretation, or correction of a Bid shall be made only by written addendum, and a copy of the addendum shall be posted on the RMEPS website. The Town is not responsible for any amplification, clarification, explanation, or interpretation or correction of a Bid not contained in written addenda.
- 2.8. Bids by corporations shall be executed in the corporate name by the president or a vice-president (or a corporate officer accompanied by evidence of authority to sign), and the corporate seal shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown. Bids submitted by partnerships shall be executed in the partnership name and signed by a partner, and the legal address of the partnership shall be shown. Bids submitted by limited liability companies shall be executed in the company's name and signed by a member, and the legal address of the company shall be shown. Names and titles shall be typed or printed below each signature.

2.9. The following information may be requested from the top three bidders:

- 2.9.1. The names and resumes of staff personnel who will be assigned to the work.
 - 2.9.2. A complete proposed scope of work and schedule, including any alternatives that can be identified. The Bidder is expected to review the work site prior to submittal of the Bid.
 - 2.9.3. The names and addresses of any subcontractors who will be retained for the work.
 - 2.9.4. A list of the Bidder's previous experience on construction of similar projects.
- 2.10. The submission of a Bid shall be conclusive evidence and a legal admission that the Bidder: (1) has no questions, complaints, or objections in connection with the Contract Documents, subject to any requests made by the Bidder for amplification, clarification, explanation, interpretation, or correction; (2) has no questions, complaints, or objections as to the completeness, sufficiency, scope, or detail of the Bid; and (3) has full knowledge of the scope, nature, quality, and quantity of the equipment to be provided, the performance criteria, the requirements of the Contract Documents, the site and conditions of delivery, the Erie Municipal Code, and other applicable law.
- 2.11. The contract will be awarded to the lowest responsible and responsive Bidder complying with the terms and conditions, guidelines, and specifications presented in the Bid Request and these Instructions to Bidders. The Town reserves the right to determine, in its sole reasonable discretion, whether any Bid meets the needs or purposes intended and is within the approved budget. The Town does not base its award on prices alone. Also to be considered are: quality of product; past experience with the Bidder or any subcontractors, consultants, products or suppliers; qualifications of the Bidder and/or subcontractors or suppliers; services offered; warranties; maintenance considerations; long-range costs; delivery; and similar conditions.
- 2.12. The Town reserves the right to conduct such investigations as it deems necessary to assist in the evaluation of any Bid to establish the experience, responsibility, reliability, references, reputation, qualifications, or financial ability of any Bidder, manufacturer or supplier. The purpose of such investigation is to satisfy the Town that the Bidder has the experience, resources, and commercial reputation necessary to supply the specified equipment and to perform the necessary warranty and product support in accordance with the Contract Documents in the prescribed manner and time.

- 2.13. Pursuant to C.R.S. § 8-19-101, if the Town's appropriation or expenditure of moneys for the work may be reasonably expected to exceed \$500,000 in the aggregate for any fiscal year, a Colorado resident Bidder shall be allowed preference over a nonresident Bidder equal to the preference given or required by the state or foreign country in which the nonresident Bidder is a resident.
- 2.14. The Town reserves the right, if it deems such action to be in its best interests, to reject any and all Bids or to waive any irregularities or informalities therein. Any incomplete, false, or misleading information provided by any Bidder shall be grounds for rejection of the Bid. If Bids are rejected, the Town further reserves the right to investigate and accept the next best Bid in order of ranking, or to reject all Bids and re-solicit for additional Bids.
- 2.15. No Bid shall include federal excise taxes or state or local sales or use taxes.
- 2.16. In the event of any claim, suit, or demand which may result from any Bid, or the award of any contract as a result of submission of a Bid, Colorado law shall govern any such claim, suit, or demand and the rights and duties of the parties.
- 2.17. The Bid, including all required documents, shall be submitted using the enclosed forms. The Summary and Bid Schedule shall be used for submitting the fees, and the completed forms shall be submitted in a separate sealed envelope.
- 2.18. Reserved.
- 2.19. All parts not specifically mentioned which are necessary in order to provide a complete unit, shall be included in the Bid. Any item listed as "Standard" in the manufacturer's published specification, furnished by the Bidder, is assumed to be included in the Bid. Any variations shall be outlined in writing, noting cost factors where applicable.
- 2.20. Bids shall be in accordance with the specifications contained in the attached Contract Documents. Should any requirement in the specifications not be included in manufacturer's specification sheets, the Bidder shall include with its Bid a statement of compliance. Failure to do so shall be grounds for disqualification of the Bid.
- 2.21. The successful bidder shall provide a statement of standard warranty of the manufacturer per specifications.
- 2.22. For all contracts in excess of \$50,000, the Town requires a bid bond in the form of a corporate surety bond in the amount of 5% of the total Bid amount before the Town can accept and consider any Bid. Bids with the required bid bond shall submit a copy of the bond on the RMEPS website and mail an original to the office of the Town Clerk, 645 Holbrook Street, P.O. Box 750, Erie, CO 80516. Upon award, such bid bonds shall be returned to the unsuccessful Bidder(s). For the

successful Bidder, the bid bond will be returned upon receipt of the required payment and performance bond, in the full amount of the contract price.

- 2.23. Any Bid received as a result of this request is prepared at the Bidder's expense and becomes Town property and is therefore a public record upon opening by the Town. No Bid may be withdrawn for a period of 60 days after the deadline for Bids.

Bid Form

The undersigned offers and agrees to furnish all items, upon which the prices are quoted, at the price set opposite each item, if this Bid is accepted within 60 days of the due date. The undersigned also agrees to commence work within 10 days of receipt of the Notice to Proceed. The undersigned certifies that no federal, state, or local tax is included in the quoted prices and that none will be added.

Bidder acknowledges receipt of the following Addenda:

<u>ADDENDUM 1</u>	<u>09/03/21</u>
<u>ADDENDUM 2</u>	<u>09/10/21</u>
<u> </u>	<u> </u>

Name of Bidder: GOODLAND CONSTRUCTION, INC.

Address: 760 NILE ST.

GOLDEN, CO 80401

Telephone Number: 303-278-8100

Email Address: MATT@GOODLANDCONSTRUCTION.COM

Bid Schedule

To: All bids must be submitted electronically using the portal at <https://www.bidnetdirect.com/colorado>

Work: Erie Parkway Reuse Waterline Improvements, P21-287 _____

Pursuant to the request for bids for the above-named work and being familiar with all contractual requirements, therefore, the undersigned Bidder hereby proposes to furnish all labor, materials, tools, supplies, equipment, plant, transportation, services, and all other things necessary for the completion of the contractual work. All other work to complete the work but not specifically itemized shall also be included as incidental to the work cost. Contractor also agrees to pay all taxes imposed by law in connection with the Work, except the Town of Erie Sales Tax, for purchases within the Town, and shall procure all permits and licenses necessary for the prosecution of the Work. Contractor shall obtain a Town tax-exempt number for the sales tax exemption for all purchases related to the contractual work and perform the work in accordance with the time of completion set forth herein, for and in consideration of the following unit and lump sum prices:

Lump Sum Bid Price

The Bidder agrees to accept as full payment, as herein specified, based upon the undersigned's own estimate of quantities and costs, the amount of Base Bid Price:

\$ 137,500.00
ONE HUNDRED THIRTY SEVEN THOUSAND FIVE HUNDRED DOLLARS AND ZERO CENTS
(in words. The amount written in words has precedence.)

Bid Item No 1 – Mobilization and Demobilization:

\$ 20,000.00
TWENTY THOUSAND DOLLARS AND ZERO CENTS
(in words. The amount written in words has precedence.)

Bid Item No 2 – Traffic Control:

\$ 85,000.00
EIGHTY FIVE THOUSAND DOLLARS AND ZERO CENTS

(in words. The amount written in words has precedence.)

Bid Item No 3 - Permitting:

\$ 3,500.00

THREE THOUSAND FIVE HUNDRED DOLLARS AND ZERO CENTS

(in words. The amount written in words has precedence.)

Bid Item No 4 – Erosion Control and Sediment Maintenance:

\$ 12,500.00

TWELVE THOUSAND FIVE HUNDRED DOLLARS AND ZERO CENTS

(in words. The amount written in words has precedence.)

Bid Item No 22 – Road Pavement Markings:

\$ 16,500.00

SIXTEEN THOUSAND FIVE HUNDRED DOLLARS AND ZERO CENTS

(in words. The amount written in words has precedence.)

Unit-Price Bid Form

Bid Submitted by: GOODLAND CONSTRUCTION, INC.

BID ITEM	DESCRIPTION	QTY	PAY UNIT	Unit Price	TOTAL COST OF BID ITEM
GENERAL SITE WORK					
1	Mobilization and Demobilization	1	LS	\$ 20,000	\$ 20,000
2	Traffic Control	1	LS	\$ 85,000	\$ 85,000
3	Permitting	1	LS	\$ 3,500	\$ 3,500
4	Erosion Control and Sediment Maintenance	1	LS	\$ 12,500	\$ 12,500
REMOVAL					
5	Tree Retention and Protection	3	EA	\$ 875	\$ 2,625
6	Remove and Dispose of Existing Asphalt	700	SY	\$ 15	\$ 10,500
7	Remove and Dispose of Concrete Curb and Gutter	120	LF	\$ 5	\$ 600
8	Remove and Dispose of Concrete Walk	45	SY	\$ 15	\$ 675
9	Remove and Dispose of Stamped Concrete Median	7	SY	\$ 15	\$ 105
10	Protect Existing Utility Lines at Crossings	8	EA	\$ 1,500	\$ 12,000
11	Exported Spoils	400	CY	\$ 40	\$ 16,000
REUSE WATER					
12	C900 Reuse Water Main Piping	1460	LF	\$ 137	\$ 200,020
13	Reuse Water Main Gate Valves	3	EA	\$ 3,240	\$ 9,720
14	Blow-Off Valve	1	EA	\$ 5,610	\$ 5,610
15	Ductile Iron Tee, 12"x8"	1	EA	\$ 2,910	\$ 2,910
16	Ductile Iron Pipe Bend	8	EA	\$ 1,505	\$ 12,040
17	Install Thrust Blocks	12	EA	\$ 1,217	\$ 14,598
18	Connection to Existing Pipe	2	EA	\$ 6,580	\$ 13,160
RESTORATION					
19	Imported Backfill	160	CY	\$ 50	\$ 8,000
20	Aggregate Base Course	235	CY	\$ 67	\$ 15,745
21	Hot Mix Asphalt (HMA) - PG 64-22	305	TONS	\$ 208	\$ 63,333
22	Road Pavement Markings	1	LS	\$ 16,500	\$ 16,500
23	Install Concrete Curb and Gutter	120	LF	\$ 30	\$ 3,540
24	Install Concrete Walk	45	SY	\$ 90	\$ 4,050
25	Install Colored and Stamped Concrete Median	7	SY	\$ 200	\$ 1,400
26	Landscaping and General Surface Restoration	100	SY	\$ 25	\$ 2,500
ESTIMATED QUANTITIES					
27	Groundwater Dewatering	0	MONTHS	\$ 20,000	\$ -
28	Stabilization of Subgrade Soil	0	CY	\$ 250	\$ -
Total Bid Price					\$ 536,631.25

\$14,604.00

\$63,440.00

\$3,600.00

\$536,804.00

Total Unit Price Work: \$ 399,131.25

THREE HUNDRED NINETY NINE THOUSAND ONE HUNDRED THIRTY ONE DOLLARS AND TWENTY FIVE CENTS (Figures)

(in words. The amount written in words has precedence.)


Total Bid Price Lump Sum and Unit Price: \$ 536,631.25 \$536,804.00

(Figures)

FIVE HUNDRED THIRTY SIX THOUSAND SIX HUNDRED THIRTY ONE DOLLARS AND TWENTY FIVE CENTS (in words. The amount written in words has precedence.)

Bidder: GOODLAND CONSTRUCTION, INC.

By:



PRESIDENT

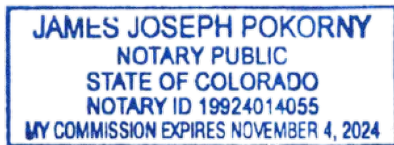


State of Colorado)
) ss.
County of JEFFERSON)

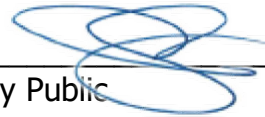
The foregoing instrument was subscribed, sworn to and acknowledged before me this 15 day of SEPTEMBER, 2021, by MATT WORLAND, as PRESIDENT of GOODLAND CONSTRUCTION, INC.

My commission expires: 11/04/24

(Seal)



Notary Public



Bidder's Qualification Statement

A Statement showing the qualifications of Bidder may be a prerequisite to the Bidder being awarded the Contract. The qualification statement is intended to assure the Town that a high degree of overall workmanship can be expected, and that the Work will be completed within the time limits contained in the Contract Documents.

All items on the statement must be answered in full and submitted within 48 hours of the Bid opening, if requested. The qualification statement will be reviewed by the Town after all Bids have been received and opened and prior to award.

The Bidder shall answer and furnish the following items for review:

1. Name of Bidder. GOODLAND CONSTRUCTION, INC.

2. Permanent address and phone number of Bidder.
760 NILE ST
GOLDEN, CO 80401

3. Date company was organized. MARCH 1994

4. If a corporation, where incorporated. COLORADO

5. Number of years engaged in contracting business under present firm or trade name. 26

6. Certified copy of financial statement prepared during current fiscal year as prepared for bank or bonding company, if applicable. UPON REQUEST

7. List of current jobs new under contract, indicating client and telephone number, size, type of job and percentage of completion of each and date of completion. (Use additional sheets if necessary).
SEE ATTACHED

8. List of projects of this size and complexity completed within the last 3 years along with contract amount, client's name and address.
SEE ATTACHED



CONTRACTOR INFORMATION

1. ORGANIZATION

GoodLand has been in business under its present business name since 1994. We have operated at our present place of business since 1998.

Date of incorporation: March 29, 1994, State of incorporation: Colorado

President's name: Matt Worland

Vice President's names: Ben Worland & Louis Worland

Secretary / Treasurer's name: Jim Pokorny

2. LICENSING

Registration or license numbers in which we are legally qualified to do business:

(Partial List)

City of Arvada - No. L00-003, City of Aurora - No. A18271, City of Denver - No.

1017755, No. 020157, No. 091016, City of Boulder - No. 3798, City of Lakewood - No.

8548, City of Westminster - No. 58029

3. EXPERIENCE

a. GoodLand performs Demolition, Concrete, Drainage, Grading, Utilities, Site Amenities, and Landscape with our own forces.

b. See attached Job Reference / Work on Hand Sheets.

4. REFERENCES

The following is our trade references:

Rio Grande Co., 201 Santa Fe Drive, Denver, CO 80223

Contact: Darren Rugg – (303) 825-2211 Fax: (303) 825-4655

Email: drugg@riograndeco.com

Martin Marietta, 1627 Cole Blvd. Suite 200, Lakewood, CO 80401

Contact: Misty Hawkins - (720) 245-6403 Fax: (303) 657-4495

Email: Misty.Hawkins@martinmarietta.com

Pioneer Sand Company, 7608 Hwy 93, Golden, CO 80401

Contact: Kelly Parker – (720) 485-8739 Fax: (303) 628-5040

Email: kelly.parker@pioneerco.com

Our Bank Reference is:

BOK Financial

15710 W. Colfax Ave., Golden, CO 80401

Contact: Dick Schell – (720) 264-5621

The name of our Bonding Agent is:

IMA, Inc

1705 17th St., Denver CO 80202

Contact: Michael Lischer - (303) 534-4567

Our accountant that prepares our audited financial statement is:

Martin, Vejvoda & Associates

3443 S. Galena St. #200, Denver, CO 80231

Contact: David Grinde – (303) 338-9277

760 Nile Street, Golden CO 80401 (303) 278-8100 Fax (303) 278-0231



GoodLand Construction, Inc.
KEY PERSONNEL – ERIE PRKWY REUSE WATERLINE

MATT WORLAND

President/Project Manager

Matt began with GoodLand Construction in 1998 gaining valuable field operations experience. Moving rapidly up the ranks in 2006, Matt took over as a Superintendent, and in 2014 he became Vice President/Project Manager, managing day to day operations, and supervising crews, equipment, materials, and subcontractors. In 2017 Matt was named President and now handles his Project Manager duties plus his new office duties as President. Matt like his partners, believes that a professional, hands on approach adds a personal dynamic to each job and allows for good communication with each client and this is the key to good business.

BEN WORLAND

Vice President/Project Manager

Ben started with GoodLand Construction in 1998 working summers while attending college. After graduating from Colorado State University with a Construction Management Degree in 2003, Ben took over the lead role of Contract Administrator and was an integral part of the company. In 2006, Ben took his expertise into field operations, where he became Superintendent. In 2014 he became Vice President/Project Manager responsible for managing day to day operations, and supervising crews, equipment, materials, and subcontractors.

JORGE CASTRO

Project Manager/ Utility Division Head

With over 20 years of experience in utility construction, Jorge joined the GoodLand team in 2019 to lead our utility division. His responsibilities included everything from estimating to ordering materials to overseeing every aspect of the work. Jorge's wealth of knowledge and problem solving is hands down the best in the business. Prior to working with GoodLand, Jorge worked from Blanco, Inc. Pipeline Construction as Project Manager from 2007-2019. He performed all facets of pipeline construction including a 24" water main project the was 6 miles long. He got his start in the utility world working for Concrete Works from 1999-2007 working his way up the ranks from pipe layer to operator and eventually superintendent before moving on to help build Blanco, Inc.

MIDGE DEMAREST

Contract Administrator

With an emphasis to detail and a passion for construction Midge's responsibilities include all Contract Administration, Purchasing and Accounts Receivable. She loves the challenge of researching all the details of a projects so the guys out in the field have nothing to worry about. Midge has been with GoodLand since 2014 and works closely with Matt and Ben organizing all aspects of the project.

RYAN NEELEY***Estimator***

Graduating from Colorado State University in Construction Management, Ryan worked for his family business Rocky Mountain Lasers until joining GoodLand Construction in march of 2016. GoodLand is excited to use his educational skills; Ryan brings to the table a great understanding of the overall process of construction and the numbers side of the business he learned at Rocky Mountain Lasers.

PAULA MARCU***Accounts Payable***

With over 25 years of Accounts Payable and HR experience Paula has a knowledge of all aspects of bookkeeping and office Human Resources. Working from small offices to large corporate offices she has found a home at GoodLand in 2019. She handles all day to day operations and is multi-talented juggling many tasks at once.

JAN LAST***Payroll Clerk***

Hired in 2009, Jan works part-time and handles all payroll, including certified wages. The "one" to go to for any certified wage questions Jan's understanding of all aspects of certified payroll is invaluable. Jan's also knowledgeable in accounting and helps with tax reporting.

GOODLAND CONSTRUCTION, INC.				
VEHICLES				
ID #	Description	Model	Driver	Vin No.
10	2014 Truck	F150	Louie	1FTFW1ET6EKE14526
12	2014 Truck	F-350	Randy's New Truck	1FT8X3BT3EEA37545
13	2012 Truck	F250	Eric F.	1FT7X2B61CEA39520
14	2007 Truck	F150	Sergio Jr.	1FTVF12567NA27316
15	1997 Truck	F350	Traffic Control	1FDKF37H1VED04058
16	2004 Truck	F250	Yard	1FTNF20L74EE01306
18	2000 Truck	F250	Randy	1FTNX21F0YEA36897
19	2014 Truck	F150	Jose F.	1FTNF1CF4EKD16491
20	2004 Truck	F250	Ralph	1FTNF20L44ED73612
21	2012 Truck	F250	Ben	1FT7W2B69CEC94063
22	2015 Truck	F250	Matt	1FT7W2B62FEB30917
23	2012 Truck	F150	Ralph	1FTNF1CF7CKD39857
24	2013 Truck	F150	Ruben R	1FTPF1CF1DKE98285
25	1994 Freight Liner	F350	Joaquin	1FV3HFAA6RL592021
26	1997 Truck	F350	YARD	1FDJF37GXVEB45074
27	2009 Truck	F150	Ruben Lee	1FTVF12V09KA70277
28	2009 Truck	F150	Manuel V's old	1FTVF12V29KA70278
29	1997 Truck	F450	Matt	1FDLF47G7VEA03876
30	2004 Truck	F250	John French	1FTNX211L74EC71443
31	2009 Truck	F150	Sergio Jr.	1FTVF12V49KA70279
32	2013 Truck	F150	Monty	1FTPF1CF6DKE93051
34	2001 Truck	F350	New 2/18/16	1FDWF36F91EB21969
35	1997 Truck	F450	Ruben R	1FDLF47FXVEC53426
36	2008 Truck	F250	Joaquin	1FTSX20568EE27144
37	1997 Truck	F450	1000 Water (M.W.)	1FDLF47G1VEA11357
38	2016 Truck	F250	Manuel V	1FTBF2A68GEC69835
41	2015 Toyota	Camry	Jim	4T1BK1FK9FU557830

TRAILERS				
ID #	Description	Model	Driver	Vin No.
T1	1997 Red trailer		Flatbed	342305
T2	2008 Trailer	20' Steel Cargo	Randy is buying so we di	11WHC20228W301984
T3	78 Superior 8x20	2SD7M-PH	Form	TRL25D7M03143
T4	1999 Trailer	BRI Dump trailer	Ben has	43YDC142XXC003083
T6	1998 Cargo	6 x 16	Ralph	11WEC1620WW236604
T7	98 Superior 6x14	2PT7M-PH		1S9HP1425WC241602
T8	1997 Trailer	Cargo	Jose V.	11WEC1222VW228752
T9	99 MAC Lander	Black Flatbed		4UVPF1829X1000413
T13	Goose Neck	JKM		1J9GF25264B253583
T14	2000 - HMD TU	WaterTrailer		ID11038881CO
T15	2000 Cargo	6 x 16		11WEC1626YW255239
T16	2001 Cargo	8 x 18		11WHC18231W262228
T17	2003 Cargo	8 x 16	Definitely Eric's 10/18/10	11WHC16283W274137
T18	Arrow Board			519054
T19	Arrow Board Solartech	AB0525D		519003
T20	Arrow Board	AMI MB		0104-70512
T21	Welder Trailer	ABO525D		519055
T22	2003 WW 12' Cargo	8 x 12	Joaquin	11WEC12203W273346
	New Water Tank-500	Portable Tank		
EQUIPMENT				
E1	2001 N H Loader	LW 130	Mike B	605611
E3	2008 - CAT	262C	Matt	MST00544
E4	D. W. Trencher	3500		3NO505
E5	2006 Smooth Drum Roller	IR SD-45D	Ben	SN 188428
E6	2015 CAT	262D		ODTB03065
E7	2008-CAT	262C	Jose F.	MST02608
E8	2008 - CAT	262C	Mike B	MST00717
E10	2014 CAT Skidsteer	262D		ODTB01370
E12	2014 CAT Skidsteer	262D		ODTB01369
E13	2004 - CAT	262B	Jose V.	PDT00785

E14	2004 - CAT	262B		PDT00561
E15	Komatsu Excavator	PC-45R-8E		F21081
E16	Komatsu Excavator	PC-78US-6		7155
E17	Komatsu Loader	WA-250-5		A73758
E18	Ground Heater	WAC		1223
E19	Kubota Excavator	U55RI	Ben	20797
E20	Kubota Excavator	U55-4R1	Ben	25129
E21	2013-CAT	262C2		TMW01013
E22	2011 Polaris Ranger	Ranger 400		4XARH45A6B4200988
E23	2009 CAT Excavator	314CL CR		SNY00663

Goodland Construction Inc.

PROJECT REFERENCES

Project	Owner	Architect	
Superior Town Center McCaslin Rd & Main St Superior	RC Superior, LLC c/o Ranch Cap Jessica Sergi 858-523-1799 3830 Valley Centre Dr San Diego CA 92130		<u>Contract Amount:</u> \$2,628,324.00 <u>Completion:</u>
<hr/>			
SH42 and Short St Geometric I Short St & Courtesy Rd (CO-42 Louisville	City of Louisville Kathy Kron (303) 335-4736 749 Main St. Louisville CO 80027	Same	<u>Contract Amount:</u> \$2,737,501.61 <u>Completion:</u> 04/15/2020
<p><i>One-half mile of new road construction will consist of asphalt demolition with all new subgrade and asphalt including new inle electrical sleeving for future lights, a traffic control signal and striping to finish it off.</i></p>			
<hr/>			
Broomfield Intersections Sheridan Blvd & Midway Blvd I Broomfield	City of Broomfield Katie Allen (303) 438-6250 One Descombes Drive Broomfield CO 80021	Same	<u>Contract Amount:</u> \$1,685,024.46 <u>Completion:</u> 06/01/2020
<p><i>This project is located at two locations, Eldorado Blvd. & Interlocken Loop and Sheridan Blvd. & Midway Blvd. Both locations improvements completed including one new signal pole in each location. New medians, ramps, curb & gutter and sidewalk w improve the traffic flow for these intersections.</i></p>			
<hr/>			
88th Street Improvements 88th St from Rock Creek Pkwy Superior	Town of Superior Alex Ariniello 303-499-3675 124 E. Coal Creek Dr Superior CO 80027	J&T Consulting Jason Murray 303-857-6222 305 Denver Ave. Suite D Fort Lupton, CO 80621	<u>Contract Amount:</u> \$3,164,658.98 <u>Completion:</u> 10/01/2020

To improve traffic flow 88th Ave. underwent a major changes that included widening the entire road, adding roundabouts, new pedestrian islands and in anticipation of the new development in the area a new water line with stub-outs.

Construction Contract

This Construction Contract (the "Contract") is made and entered into this _____ day of _____, 20__ (the "Effective Date"), by and between the Town of Erie, 645 Holbrook Street, P.O. Box 750, Erie, CO 80516, a Colorado municipal corporation (the "Town"), and GoodLand Construction, Inc., an independent contractor with a principal place of business at 760 Nile Street, Golden Colorado, 80401 ("Contractor") (each a "Party" and collectively the "Parties").

For the consideration hereinafter set forth, the receipt and sufficiency of which are hereby acknowledged, the Parties agree as follows:

1. **Scope of Work.** Contractor shall perform the following described work (the "Work"), in accordance with this Contract and the Contract Documents, attached hereto and incorporated herein by this reference:

Construction of a reuse waterline located in Erie Parkway between South Briggs Street and Powers Street. Work consists of installation of 1,460 LF of 8" and 12" reuse waterline, asphalt patching, traffic control, seeding, and site restoration.

2. **Bonds.** Within 10 days of the date of this Contract, Contractor shall provide the payment and performance bond and certificate of insurance required by the Contract Documents. A payment and performance bond is not required for contract amounts under \$50,000 unless indicated differently in the Request for Bids or the Contract Documents.

3. **Commencement and Completion of Work.** Contractor shall commence the Work within 10 days of date of the Notice to Proceed. Substantial Completion of the Work shall be accomplished within 122 days of the date of commencement, unless the period Substantial Completion is extended otherwise in accordance with the Contract Documents. Final Completion of the Work shall be accomplished within 30 days of the date of Substantial Completion.

4. **Contract Price.** The Town agrees to pay Contractor, subject to all of the terms and conditions of the Contract Documents, for the Work, an amount not to exceed \$536,804.

5. **Workers Without Authorization.**

a. ***Certification.*** By entering into this Contract, Contractor hereby certifies that, at the time of this certification, it does not knowingly employ or contract with a worker without authorization who will perform work under this Contract and that Contractor will participate in either the E-Verify Program administered by the United States Department of Homeland Security and Social Security Administration or the Department Program administered by the Colorado Department of Labor and

Employment in order to confirm the employment eligibility of all employees who are newly hired for employment to perform work under this Contract.

b. *Prohibited Acts.* Contractor shall not knowingly employ or contract with a worker without authorization to perform work under this Contract or enter into a contract with a subcontractor that fails to certify to Contractor that the subcontractor shall not knowingly employ or contract with a worker without authorization to perform work under this Contract.

c. *Verification.*

1. If Contractor has employees, Contractor has confirmed or attempted to confirm the employment eligibility of all employees who are newly hired for employment to perform work under this Contract through participation in either the E-Verify Program or the Department Program.

2. Contractor shall not use the E-Verify or Department Program procedures to undertake pre-employment screening of job applicants while this Contract is being performed.

3. If Contractor obtains actual knowledge that a subcontractor performing work under this Contract knowingly employs or contracts with a worker without authorization who is performing work under this Contract, Contractor shall: notify the subcontractor and the Town within 3 days that Contractor has actual knowledge that the subcontractor is employing or contracting with a worker without authorization who is performing work under this Contract; and terminate the subcontract with the subcontractor if within 3 days of receiving the notice required pursuant to subsection a hereof, the subcontractor does not stop employing or contracting with the worker without authorization who is performing work under this Contract; except that Contractor shall not terminate the contract with the subcontractor if during such 3 days the subcontractor provides information to establish that the subcontractor has not knowingly employed or contracted with a worker without authorization who is performing work under this Contract.

d. *Duty to Comply with Investigations.* Contractor shall comply with any reasonable request by the Colorado Department of Labor and Employment made in the course of an investigation conducted pursuant to C.R.S. § 8-17.5-102(5)(a) to ensure that Contractor is complying with the terms of this Contract.

e. *Affidavits.* If Contractor does not have employees, Contractor shall sign the attached "No Employee Affidavit." If Contractor wishes to verify the lawful presence of newly hired employees who perform work under the Contract via the Department Program, Contractor shall sign the "Department Program Affidavit" attached hereto.

6. Keep Jobs In Colorado Act. Pursuant to the Keep Jobs in Colorado Act, C.R.S. § 8-17-101, *et seq.* (the "Act"), and the rules adopted by the Division of Labor of the Colorado Department of Labor and Employment implementing the Act (the "Rules"), Contractor shall employ Colorado labor to perform at least 80% of the work under this Contract and shall obtain and maintain the records required by the Act and the Rules. For purposes of this Section, "Colorado labor" means a person who is a resident of the state of Colorado at the time of this Contract, without discrimination as to race, color, creed, sex, sexual orientation, marital status, national origin, ancestry, age, or religion except when sex or age is a *bona fide* qualification. A resident of the state of Colorado is a person with a valid Colorado driver's license, a valid Colorado state-issued photo identification, or documentation that he or she has resided in Colorado for the last 30 days. Contractor represents that it is familiar with the requirements of the Act and the Rules and will fully comply with same. This Section shall not apply to any project for which appropriation or expenditure of moneys may be reasonably expected not to exceed \$500,000 in the aggregate for any fiscal year.

7. Miscellaneous.

a. *Governing Law and Venue.* This Contract shall be governed by the laws of the State of Colorado, and any legal action concerning the provisions hereof shall be brought in Boulder County, Colorado.

b. *No Waiver.* Delays in enforcement or the waiver of any one or more defaults or breaches of this Contract by the Town shall not constitute a waiver of any of the other terms or obligation of this Contract.

c. *Integration.* This Contract and any attached exhibits constitute the entire Contract between Contractor and the Town, superseding all prior oral or written communications.

d. *Third Parties.* There are no intended third-party beneficiaries to this Contract.

e. *Notice.* Any notice under this Agreement shall be in writing, and shall be deemed sufficient when directly presented or sent pre-paid, first class U.S. Mail to the Party at the address set forth on the first page of this Agreement.

f. *Severability.* If any provision of this Contract is found by a court of competent jurisdiction to be unlawful or unenforceable for any reason, the remaining provisions hereof shall remain in full force and effect.

g. *Modification.* This Contract may only be modified upon written agreement of the Parties.

h. *Assignment.* Neither this Contract nor any of the rights or obligations of the Parties shall be assigned by either Party without the written consent of the other.

i. *Governmental Immunity.* The Town and its officers, attorneys and employees are relying on, and do not waive or intend to waive by any provision of this Contract, the monetary limitations or any other rights, immunities, and protections provided by the Colorado Governmental Immunity Act, C.R.S. § 24-10-101, *et seq.*, as amended, or otherwise available to the Town and its officers, attorneys or employees.

j. *Rights and Remedies.* The rights and remedies of the Town under this Contract are in addition to any other rights and remedies provided by law. The expiration of this Contract shall in no way limit the Town's legal or equitable remedies, or the period in which such remedies may be asserted, for work negligently or defectively performed.

k. *Subject to Annual Appropriation.* Consistent with Article X, § 20 of the Colorado Constitution, any financial obligation of the Town not performed during the current fiscal year is subject to annual appropriation, shall extend only to monies currently appropriated, and shall not constitute a mandatory charge, requirement or liability beyond the current fiscal year.

In Witness Whereof, this Construction Contract has been executed by the Parties as of the Effective Date.

Town of Erie, Colorado

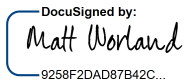
Jennifer Carroll, Mayor

Attest:

Heidi Leatherwood, Town Clerk

Contractor

GoodLand Construction, Inc.

By: 

Matt Worland, President

No Employee Affidavit
[To be completed only if Contractor has no employees]

1. Check and complete one:

I, _____, am a sole proprietor doing business as _____. I do not currently employ any individuals. Should I employ any employees during the term of my Contract with the Town of Erie (the "Town"), I certify that I will comply with the lawful presence verification requirements outlined in that Contract.

Or

I, _____, am the sole owner/member/shareholder of _____, a _____ [specify type of entity – *i.e.*, corporation, limited liability company], that does not currently employ any individuals. Should I employ any individuals during the term of my Contract with the Town, I certify that I will comply with the lawful presence verification requirements outlined in that Contract.

2. Check one.

I am a United States citizen or legal permanent resident.

The Town must verify this statement by reviewing one of the following items:

- *A valid Colorado driver's license or a Colorado identification card;*
- *A United States military card or a military dependent's identification card;*
- *A United States Coast Guard Merchant Mariner card;*
- *A Native American tribal document;*
- *In the case of a resident of another state, the driver's license or state-issued identification card from the state of residence, if that state requires the applicant to prove lawful presence prior to the issuance of the identification card; or*
- *Any other documents or combination of documents listed in the Town's "Acceptable Documents for Lawful Presence Verification" chart that prove both Contractor's citizenship/lawful presence and identity.*

Or

I am otherwise lawfully present in the United States pursuant to federal law.

Contractor must verify this statement through the federal Systematic Alien Verification of Entitlement ("SAVE") program, and provide such verification to the Town.

Signature

Date

Department Program Affidavit

[To be completed only if Contractor participates in the Department of Labor Lawful Presence Verification Program]

I, Goodland Construction, as a public contractor under contract with the Town of Erie (the "Town"), hereby affirm that:

1. I have examined or will examine the legal work status of all employees who are newly hired for employment to perform work under this public contract for services (the "Contract") with the Town within 20 days after such hiring date;
2. I have retained or will retain file copies of all documents required by 8 U.S.C. § 1324a which verify the employment eligibility and identity of newly hired employees who perform work under the Contract; and
3. I have not and will not alter or falsify the identification documents for my newly hired employees who perform work under the Contract.

DocuSigned by:

9258E2DAD87B42C

Signature

9/26/2021

Date

Notice of Award

Date: _____

Contractor: _____

RE: Erie Parkway Reuse Waterline Improvements (P21-287)

Dear _____:

Thank you for submitting a Bid. Your firm submitted the most qualified Bid and you have been selected as the successful Contractor. Accordingly, this is your Notice of Award for the above-mentioned project.

Attached please find the Construction Contract. Please review and sign and, within 10 days of receipt of this letter, return along with your certification of insurance and payment and performance bond, if applicable, each in the full amount of the Contract Price, and appropriate powers of attorney. When dating the above documents, please make sure that all dates, on all documents, are the same and that the insurance policy reflects the requirements of the Contract Documents. Please return all of the documents at the same time.

Upon receipt of the signed Contracts, the Town will execute and return one fully executed version to you.

Should you have any questions, please call me at _____.

Sincerely,

_____, Project Manager

Notice to Proceed

Date: _____

Contractor: _____

RE: Erie Parkway Reuse Waterline Improvements

Dear _____:

This letter is your Notice to Proceed, effective as of the date cited below. This notice is in reference to the Construction Contract between you and the Town of Erie concerning the above-mentioned project.

Please note that in accordance with the Construction Contract, Work must commence within ten days of the date of this Notice, and all Work must be substantially completed within _____ (_____) days of the date of this Notice, which shall be the ___ day of _____, 20__, and finally completed within _____ days of the date of this Notice, which shall be the ___ day of _____, 20_.

If you have any questions, please call me at _____.

Sincerely,

_____, Project Manager

Acknowledgement

Receipt of the above Notice to Proceed is hereby acknowledged.

Contractor

By: _____

Title: _____

Date: _____

Bid Bond

Know All Men By These Presents

That Goodland Construction, Inc., 760 Nile *, as Principal, and Hartford Fire Insurance Company as Surety, are held and firmly bound unto the Town of Erie, Colorado, hereinafter called Owner, as Obligee, in the penal sum of Five Percent of Total Amount Bid dollars (\$---5%---), for the payment of which sum in lawful money of the United States, well and truly to be made, said Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.


*Street, Golden, CO 80401

Whereas, the Principal has submitted a Bid to Owner for certain Work or services generally described as follows: Links Court Drainage Improvements, Erie, CO; Project Number P21-637

Now, Therefore, (a) if said Bid shall be rejected, or (b) if said Bid shall be accepted and the Principal is awarded the Contract and, within the time and manner specified in the Contract Documents, enters into a written Contract in the prescribed form and shall give such bond or bonds as may be specified in the Contract Documents to guarantee faithful performance of such Contract and to guarantee prompt payment of labor and materials furnished in the prosecution thereof, and shall provide to Owner a Certificate of Insurance as required by the Contract Documents, and shall in all other respects perform the Contract created by the acceptance of said Bid, or (c) in the event of the failure of the Principal to enter such Contract and to give such bond or bonds, and Certificate of Insurance, if the Principal shall pay to Owner the difference not to exceed the penalty hereof between the amount specified in said Bid and such larger amount for which the Owner may in good faith contract with another party to perform the Work covered by said Bid, then this obligation shall be null and void, otherwise it shall be and remain in full force and effect.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety hereunder shall be in no way impaired or affected by any alteration or irregularities in the bid or in the bidding procedure or by any extension of time within which Owner may accept such Bid, and does hereby waive notice of same.

Dated this _____ 9th _____ day of _____ September _____, 2021.

Hartford Fire Insurance Company
(Surety)
By: 
Title: Kristen Moore, Attorney-in-Fact

Goodland Construction, Inc.
(Principal)
By: 
Title: PRESIDENT



(Acknowledgments and power of attorney to be attached)
Corporate seal must be affixed if principal is a corporation.

POWER OF ATTORNEY

Direct Inquiries/Claims to:

THE HARTFORD
BOND, T-11

One Hartford Plaza
Hartford, Connecticut 06155

Bond.Claims@thehartford.com

call: 888-266-3488 or fax: 860-757-5835

KNOW ALL PERSONS BY THESE PRESENTS THAT:

Agency Name: IMA INC
Agency Code: 34-340140

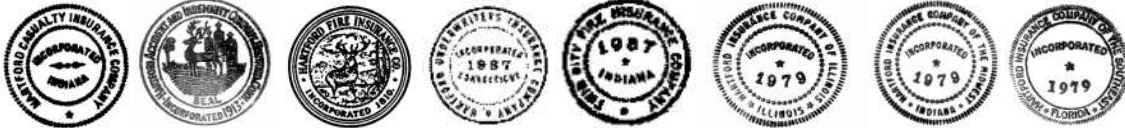
- Hartford Fire Insurance Company**, a corporation duly organized under the laws of the State of Connecticut
- Hartford Casualty Insurance Company**, a corporation duly organized under the laws of the State of Indiana
- Hartford Accident and Indemnity Company**, a corporation duly organized under the laws of the State of Connecticut
- Hartford Underwriters Insurance Company**, a corporation duly organized under the laws of the State of Connecticut
- Twin City Fire Insurance Company**, a corporation duly organized under the laws of the State of Indiana
- Hartford Insurance Company of Illinois**, a corporation duly organized under the laws of the State of Illinois
- Hartford Insurance Company of the Midwest**, a corporation duly organized under the laws of the State of Indiana
- Hartford Insurance Company of the Southeast**, a corporation duly organized under the laws of the State of Florida

having their home office in Hartford, Connecticut, (hereinafter collectively referred to as the "Companies") do hereby make, constitute and appoint, **up to the amount of** Unlimited :

Jennifer L. Clampert, Amy Coonts, David Dondlinger, Sarah Finn, Michael Lischer Jr., Nicole L. McCollam, Kristen Moore, Brandi J. Tetley, Danielle Waring of DENVER, Colorado

their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign its name as surety(ies) only as delineated above by , and to execute, seal and acknowledge any and all bonds, undertakings, contracts and other written instruments in the nature thereof, on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

In Witness Whereof, and as authorized by a Resolution of the Board of Directors of the Companies on May 23, 2016 the Companies have caused these presents to be signed by its Assistant Vice President and its corporate seals to be hereto affixed, duly attested by its Assistant Secretary. Further, pursuant to Resolution of the Board of Directors of the Companies, the Companies hereby unambiguously affirm that they are and will be bound by any mechanically applied signatures applied to this Power of Attorney.



Shelby Wiggins

Shelby Wiggins, Assistant Secretary

Joelle L. LaPierre

Joelle L. LaPierre, Assistant Vice President

STATE OF FLORIDA

COUNTY OF SEMINOLE

ss. Lake Mary

On this 20th day of May, 2021, before me personally came Joelle LaPierre, to me known, who being by me duly sworn, did depose and say: that (s)he resides in Seminole County, State of Florida; that (s)he is the Assistant Vice President of the Companies, the corporations described in and which executed the above instrument; that (s)he knows the seals of the said corporations; that the seals affixed to the said instrument are such corporate seals; that they were so affixed by authority of the Boards of Directors of said corporations and that (s)he signed his/her name thereto by like authority.



Jessica Ciccone

Jessica Ciccone
My Commission HH 122280
Expires June 20, 2025

I, the undersigned, Assistant Vice President of the Companies, DO HEREBY CERTIFY that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which is still in full force effective as of September 9, 2021.

Signed and sealed in Lake Mary, Florida.



Keith D. Dozois

Keith D. Dozois, Assistant Vice President

SURETY BOND DIGITAL SEAL
The Hartford Financial Services Group, Inc.

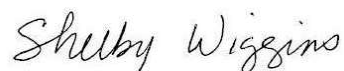
To Our Valued Partners:

In efforts of continuing business during the pendency of the COVID-19 pandemic, The Hartford has authorized its Attorneys-in-Fact to affix the electronic corporate seal in a digital format, in lieu of its traditional raised seal to any bond document issued on its behalf by any such Attorney-in-Fact.

The Hartford agrees and affirms that the digital corporate seal affixed to any bond document is equivalent to its raised corporate seal had it been affixed to the bond document itself.

Effective this 30th day of March, 2020.

The Hartford



Shelby Wiggins, Assistant Secretary

The Hartford Financial Services Group, Inc.
P.O. Box 958461
Lake Mary, FL 32795

P: 888-656-0817
F: 877-257-2166

www.thehartford.com/bond
www.thehartford.com
www.facebook.com/thehartford
www.twitter.com/thehartford

Payment And Performance Bond

Bond No. _____

Know All Men By These Presents: That

(Firm) _____

(Address) _____

(an Individual), (a Partnership), (a Corporation), hereinafter referred to as "the Principal", and

(Firm) _____

(Address) _____

hereinafter referred to as "the Surety", are held and firmly bound unto the Town of Erie, Colorado, a Municipal Corporation, hereinafter referred to as "the Owner", in the penal sum of _____ Dollars in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors and assigns, jointly and severally, firmly by these presents.

The Conditions of this Obligation are such that whereas the Principal entered into a certain Contract with the Owner, dated the ____ day of _____, 20____, a copy of which is hereto attached and made a part hereof for the performance of the Work, _____.

Now, Therefore, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions and agreements of said Contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without Notice to the Surety and during the life of the guaranty or warranty period, and shall satisfy all claims and demands incurred under such Contract, and shall fully indemnify and save harmless the Owner from all cost and damages which it may suffer by the Principal's failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, and make payment to all persons, firms, subcontractors and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such Contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, repairs on machinery, equipment and tools, consumed, rented or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor performed in such work, whether by subcontractor or otherwise, then this obligation shall be void; otherwise it shall remain in full force and effect.

Provided, Further, that the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the Work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this Bond; and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the Work or to the Specifications.

Provided, Further, that no final settlement between the Owner and the Principal shall abridge the right of any beneficiary hereunder whose claim may be unsatisfied.

In Witness Whereof, this instrument is executed in 5 counterparts, each one of which shall be deemed an original, this _____ day of _____, 20____.

Attest:	Principal
By: _____	By: _____
Title: _____	Title: _____
	Address: _____

(Corporate Seal)

	Surety
Attest:	Surety: _____
By: _____	By: _____
Attorney-in-Fact: _____	Title: _____
	Address: _____

(Surety Seal)

Note: Date of Bond must not be prior to date of Contract and Surety must be authorized to transact business in the State of Colorado and be acceptable to the Town.

Certificate of Final Payment

With reference to Contract Number P21-287 dated _____, 20__, between the undersigned Contractor and the Town of Erie, for: Erie Parkway Reuse Waterline Improvements at Erie, Colorado

The undersigned hereby certifies that all costs, charges and expenses incurred by it on its behalf for work, labor, services, materials and equipment supplied to the foregoing premises, and/or used in connection with its Work under the Contract have been duly paid.

The undersigned further certifies that to its best knowledge and belief (based upon reasonable investigation) each of its subcontractors and material men have duly paid all costs, charges and expenses incurred by them or on their behalf for work, labor, services, materials and equipment supplied to the foregoing premises and/or used by them in connection with the Undersigned's Work under the Contract.

In consideration of _____ dollars (\$_____) representing final payment under the Contract, the undersigned hereby releases and discharges the Owner and Owner's property from all claims, liens and obligations of every nature arising out of or in connection with the performance of the Work.

As additional consideration for the final payment, and to the fullest extent permitted by law, the undersigned agrees to indemnify and hold harmless Owner from and against all costs, losses, damages, claims, causes of action, judgments and expenses arising out of or in connection with claims against Owner which may be asserted by the undersigned or any suppliers, subcontractors of any tier or any of their representatives, officers, agents and employees for the costs, losses, damages, claims, causes of action, judgments and expenses and expenses that are attributable to the act, omission, error, professional error, mistake, negligence or other fault of the undersigned.

The foregoing shall not relieve the Undersigned of its obligations under the provisions of the Contract as amended, which by their nature survive completion of the Work including, without limitation, warranties, guarantees and indemnities.

Executed this _____ day of _____, 20__.

Contractor

Certificate of Final Acceptance

To: _____ Date: _____
Project No.: _____
Project Title: _____

This is to advise you that a final inspection of the referenced Work has been made and all work and material was found to be satisfactory. Therefore, the Work is considered to be complete in accordance with the approved plans, specifications and contract documents.

In accordance with the Contract, all Warranty periods shall begin as of the date of this letter.

Town of Erie

By: _____
Title: _____

General Provisions

Part 1. Definitions

1.01 Contract Documents:

- A. Bid Form (Including Bid Summary);
- B. Bid Schedule;
- C. Bidder's Qualification Statement;
- D. Construction Contract;
- E. General Provisions
- F. Special Provisions;
- G. Technical Specifications;
- H. Construction Drawings;
- I. Certificate of Insurance Verification;
- J. Notice of Award;
- K. Notice to Proceed;
- L. Bid Bond;
- M. Payment and Performance Bond;
- N. Certificate of Final Payment;
- O. Final Acceptance Form;
- P. Documentation submitted by Contractor prior to Notice of Award; and
- Q. Addenda

1.02 Change Order:

A written order issued by the Town after execution of the Contract authorizing an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Time.

1.03 Town:

The Town of Erie, Colorado.

1.04 Contract:

The entire written agreement covering the performance of the Work described in the Contract Documents including all supplemental agreements thereto and all general and special provisions pertaining to the Work and materials therefor.

1.05 Contract Price:

The amount set forth in Paragraph 4 of the Construction Contract.

1.06 Contract Time:

The time for completion of the Work as set forth in Paragraph 3 of the Construction Contract.

1.07 Day:

Calendar day, unless otherwise specified. When the last day for the occurrence of an event falls on a Saturday, Sunday or legal holiday as recognized by the Town, the time for performance shall be automatically extended to the next business day.

1.08 Final Completion:

The date as certified by the Project Manager when all of the Work is completed and final payment may be made.

1.09 Project Manager:

The Town's duly authorized representative in connection with the Work.

1.10 Subcontractor:

Any person, firm or corporation with a direct contract with Contractor who acts for or in behalf of Contractor in executing any part of the Contract, excluding one who merely furnishes material.

1.11 Substantial Completion:

The date as certified by the Project Manager when the Town occupies or takes possession of all or substantially all of the Work, or when the Town may occupy or take possession of all or substantially all of the Work and put it to beneficial use for its intended purposes.

1.12 Work:

All the work specified, indicated, shown or contemplated in the Contract Documents, including all alterations, amendments or extensions thereto made by supplemental agreements or written orders of the Project Manager.

Part 2. Time

2.01 Time of the Essence:

All times stated in the Contract Documents are of the essence.

2.02 Final Acceptance:

Upon Final Completion, the Project Manager will issue final acceptance.

2.03 Changes in the Work:

The Town reserves the right to order changes in the Work, in the nature of additions, deletions or modifications, without invalidating the Contract, and to make corresponding adjustments in the Contract Price and the Contract Time. All changes shall be authorized by a written Change Order signed by the Project Manager. The Change Order shall include appropriate changes in the Contract Documents and the Contract Time. The Work shall be changed and the Contract Price and Contract Time modified only as set forth in the written Change Order. Any adjustment in the Contract Price resulting in a credit or a charge to the Town shall be determined by mutual agreement of the parties

before the work set forth in the Change Order is commenced. If a Change Order results in an increase in the Contract Price, approval of the Erie Board of Trustees shall be required, and if such approval is not obtained, the Town shall have no payment obligation regardless of whether the Work pursuant to the Change Order has been performed.

2.04 Delays:

A. If Contractor is delayed in the progress of the Work by fire, unusual delay in transportation, unanticipated adverse weather conditions, or other unavoidable casualties beyond Contractor’s control, the Contract Time shall be extended for a reasonable period of time. “Weather” means precipitation, temperature, or wind, and an “adverse weather condition” means weather that on any calendar day can be deemed unsafe or impede progress as approved by Project Manager. The term “unanticipated adverse weather conditions” means the number of days in excess of the anticipated adverse weather days per month as set forth below:

Monthly Anticipated Adverse Weather Days											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
7	4	4	4	6	3	4	2	3	3	2	5

By reason of example only, if in March there are 2 days of adverse weather conditions, Contractor may not request an additional time extension as anticipated adverse weather days are included in the schedule. However, if in March there are 5 days of adverse weather conditions, Contractor shall be entitled to request a time extension of one additional day.

- B. Any request for extension of the Contract Time shall be made in writing to the Project Manager not more than 7 days after commencement of the delay; otherwise it shall be waived. Any such request shall contain an estimate of the probable effect of such delay on the progress of the Work.
- C. Contractor shall not be entitled to any increase in the Contract Price, or to damages, or to additional compensation as a consequence of any such delays.

2.05 No Damages For Delay:

In strict accordance with C.R.S. § 24-91-103.5, the Town shall not amend the Contract Price to provide for additional compensation for any delays in performance which are not the result of acts or omissions of the Town or persons acting on behalf of the Town.

Part 3. Contractor’s Responsibilities

3.01 Completion/Supervision Of Work:

Contractor hereby warrants that it is qualified to assume the responsibilities and render the services described herein and has all requisite corporate authority and licenses in good standing. The services performed by Contractor shall be in accordance with generally accepted professional practices and the level of competency presently

maintained by others in the same or similar type of work, and in compliance with applicable laws, ordinances, rules and regulations. Contractor shall be responsible for completion of all Work in a timely and workmanlike manner in accordance with the terms and specifications of the Contract Documents, including the techniques, sequences, procedures and means. Contractor shall be responsible for the coordination of all Work. Contractor shall supervise and direct the Work and give it all attention necessary for proper supervision and direction. Contractor shall maintain a supervisor on site at all times when Contractor or any subcontractor is performing Work.

3.02 Duty to Inspect:

Contractor shall inspect all Contract Documents, tests and reports, including soil tests and engineering tests, if applicable, and shall conduct a site or field review prior to executing the Contract. Contractor assumes the risk of all conditions which are disclosed, or which are reasonably suggested by any such tests or reports, or which would be disclosed by a field or site review. Contractor shall have the affirmative duty to advise the Town of any concerns which Contractor may have regarding construction conditions prior to executing the Contract.

3.03 Furnishing of Labor and Materials:

- A. Contractor shall provide and pay for all labor, materials and equipment, including: tools; construction equipment and machinery; utilities, including water; transportation; and all other facilities and services necessary for the proper completion of the Work.
- B. In all purchases of supplies, materials and provisions to be incorporated or otherwise used by Contractor in the Work, Contractor shall use supplies, materials and provisions produced, manufactured or grown in Colorado if such supplies, materials and provisions are not of inferior quality to those offered by competitors outside of Colorado.
- C. While engaged in the performance of the Work, Contractor shall maintain employment practices that do not violate the provisions of the Colorado Antidiscrimination Act of 1957, C.R.S. § 24-34-301, et seq.

3.04 Employee Safety and Conduct:

- A. Contractor shall maintain at all times strict discipline of its employees, and Contractor shall not employ on the Work any person unfit or without sufficient knowledge, skill, and experience to perform properly the job for which the employee was hired.
- B. Contractor shall be responsible to the Town for the acts, negligence and omissions of all direct and indirect employees and subcontractors. The Contract Documents shall not be construed as creating any contractual relation between any subcontractor and the Town.

- C. Contractor shall provide for and oversee all safety orders and precautions necessary for the safe performance of the Work. Contractor shall take reasonable precautions for the safety of all employees and others whom the Work might affect, all work and materials incorporated into the Work, and all property and improvements on the work site and adjacent property.
- D. Contractor and its employees, and employees of the Contractor's suppliers, agents, and subcontractors shall at all times treat local residents and the public with respect and courtesy. Contractor shall conduct his work in such a manner as to cause the least inconvenience to local residents and the public. The Project Manager may demand dismissal of workers for any of the following:
 - 1. Being discourteous or disrespectful to local residents or the public.
 - 2. Abuse or taunting of pets.
 - 3. Disposing of rubbish in locations other than approved receptacles.
 - 4. Use of vulgar, abusive, or harassing language or gestures.
 - 5. Use or possession of alcoholic beverages or drugs other than over-the-counter and prescription drugs.
 - 6. Elimination of body waste in locations other than approved sanitation facilities.
 - 7. Damage or defacement of private property outside of street right-of-way and not necessary for the completion of the Work.
 - 8. Trespassing on private property.
 - 9. Use of water from private residences without permission from the resident.

3.05 Cleanup:

- A. Contractor shall keep the work site and adjoining ways free of waste material and rubbish caused by its employees or subcontractors. Contractor shall remove all such waste material and rubbish daily during construction, together with all tools, equipment, machinery and surplus materials. Contractor shall, upon termination of its Work, conduct general cleanup operations on the work site, including the cleaning of all surfaces, paved streets and walks, and steps. Contractor shall also conduct such general cleanup operations on adjacent properties which were disturbed by the Work.
- B. If Contractor fails to perform the cleanup required by this Section, after written notice, the Town may cause the cleanup to be performed at Contractor's expense. Upon receipt of a statement for such cleanup, Contractor shall pay to the Town the costs incurred by the Town for such cleanup, or the Town shall have the right to withhold said amount from any final payment due to Contractor.

3.06 Payment of Royalties and License Fees:

Contractor agrees to pay all royalties and license fees necessary for the Work, and to defend against all actions for infringement of copyright or patent rights, and to save and hold the Town harmless from such actions.

3.07 Taxes, Licenses and Permits:

Contractor shall pay all taxes imposed by law in connection with the Work, except the Town of Erie Sales Tax, for purchases within the Town, and shall procure all permits and licenses necessary for the prosecution of the Work. Contractor shall obtain a Town tax-exempt number for the sales tax exemption.

3.08 Samples and Shop Drawings:

Contractor shall furnish, upon the request of the Project Manager, samples and shop drawings to the Project Manager, who shall review them for conformance with the Contract Documents. All Work shall comply with approved samples and drawings.

3.09 Compliance with Laws and Regulations:

Contractor shall comply with all federal, state and local laws, ordinances, rules, regulations and orders in any manner relating to the Work. If any provision of the Contract Documents is at variance therewith, Contractor shall notify the Project Manager promptly.

3.10 Subcontractors:

- E. Contractor shall furnish to the Project Manager at the time the Construction Contract is executed, a list of names of subcontractors to whom Contractor proposes to award the portions of the Work to be subcontracted by Contractor.
- F. Contractor shall not employ a subcontractor to whose employment the Town reasonably objects, nor shall Contractor be required to hire a subcontractor to whose employment Contractor reasonably objects.
- G. All contracts between Contractor and subcontractor shall conform to the provisions of the Contract Documents, and shall incorporate the relevant provisions of the Contract Documents.

3.11 Corrective Work:

When any Work does not conform to the Contract Documents, Contractor shall make the necessary corrections so that the Work will so conform. Such corrections shall be accomplished within the time period approved by the Project Manager. Failure to complete such required corrections within the time period required shall constitute a breach of the Contract. The Town's review, approval or acceptance of, or payment for any work shall not be construed as a waiver of any rights under this Contract or any cause of action arising out of the performance of this Contract.

3.12 Other Contracts:

The Town reserves the right to let other contracts in connection with the Work. Contractor shall cooperate with all other contractors so that their work is not impeded by the Work, and Contractor shall give other contractors access to the work site necessary to perform their contracts.

3.13 Communication:

Contractor shall direct all communications to the Town regarding the Work to the attention of the Project Manager.

Part 4. Termination

4.01 Labor Disputes:

Notwithstanding any other provision contained in this Contract, in the event of any picket or other form of labor dispute at the construction site, Contractor shall continue to perform the Work without interruption or delay. If Contractor ceases performance of the Work because of such picket or other form of labor dispute, the Town may terminate the services of Contractor after giving 48 hours' written notice of its intent to do so.

4.02 Default:

The Town may terminate this Contract upon thirty days' written notice to Contractor if Contractor defaults in the timely performance of any provision of the Contract Documents, or otherwise fails to perform the Work, or any part thereof, in accordance with the Contract Documents. Termination of the Contract by the Town shall not be the Town's exclusive remedy, and the Town may pursue such other remedies and actions lawfully available to the Town including, but not limited to, an action at law for damages against Contractor or any bonding agency issuing a bond hereunder, or an action in equity for injunctive relief.

Part 5. Warranties:

5.01 Warranty of Fitness of Equipment and Materials:

Contractor represents and warrants to the Town that all equipment and materials used in the Work, and made a part of the Work, or placed permanently in the Work, shall be new unless otherwise specified in the Contract Documents. All equipment and materials used shall be of good quality, free of defects and in conformity with the Contract Documents. All equipment and materials not in conformity with the Contract Documents shall be considered defective.

5.02 General Warranty:

Contractor shall warrant and guarantee all material furnished and work performed by Contractor for a period of two years from the date of final acceptance of the Work by the Project Manager. Under this warranty, Contractor agrees to repair or replace, at its own

expense and under the direction of the Project Manager, any portion of the Work which fails or is defective, unsound, unsatisfactory because of materials or workmanship, or which is not in conformity with the provisions of the Contract. Should Contractor fail to perform any such work within the warranty period after a request by the Town, the Town may withdraw from the Payment and Performance Bond any and all amounts necessary to complete the required work. The expiration of the warranty period shall in no way limit the Town's legal or equitable remedies, or the period in which such remedies may be asserted, for work negligently or defectively performed.

Part 6. Bonds, Insurance and Indemnification

6.01 Indemnification:

- A. Contractor agrees to indemnify and hold harmless the Town and its officers, insurers, volunteers, representatives, agents, employees, heirs and assigns from and against all claims, liability, damages, losses, expenses and demands, including attorney fees, on account of injury, loss, or damage, including, without limitation, claims arising from bodily injury, personal injury, sickness, disease, death, property loss or damage, or any other loss of any kind whatsoever, which arise out of or are in any manner connected with this Contract or the Contract Documents, to the extent that such injury, loss or damage is attributable to the act, omission, error, professional error, mistake, negligence or other fault of Contractor, any subcontractor of Contractor, or any officer, employee, representative, or agent of Contractor or of any subcontractor of Contractor, or which arise out of any worker's compensation claim of any employee of Contractor or of any employee of any subcontractor of Contractor.
- B. Contractor, to the fullest extent permitted by law, shall defend, investigate, handle, respond and provide defense for and defend against any such liability, claims, damages, losses, expenses or demands at the sole expense of Contractor, or at the option of the Town, Contractor agrees to pay the Town or reimburse the Town for defense costs incurred by the Town in connection with any such liability, claims, damages, losses, expenses or demands. Contractor, to the fullest extent permitted by law, shall defend and bear all other costs and expenses related thereto, including court costs and attorney fees, whether or not such liability, claims or demands alleged are groundless, false or fraudulent.
- C. This indemnification provision is intended to comply with C.R.S. § 13-21-111.5(6) and shall be read as broadly as permitted to satisfy that intent. Contractor's liability under this provision shall be to the fullest extent of, but shall not exceed, that amount represented by the degree or percentage of negligence or fault attributable to Contractor, any subcontractor of Contractor, or any officer, employee, representative, or agent of Contractor or of any subcontractor of Contractor. If Contractor is providing architectural,

engineering, surveying or other design services under this Agreement, the extent of Contractor's obligation to defend, indemnify and hold harmless the Town may be determined only after Contractor's liability or fault has been determined by adjudication, alternative dispute resolution or otherwise resolved by mutual agreement of the Parties, as provided by C.R.S. § 13-50.5-102(8)(c).

6.02 Notice of Claim:

If Contractor receives any claim arising from the performance of the Work, Contractor shall notify the Town in writing of the nature of the claim within 24 hours of receipt of the claim by Contractor. In this notice, Contractor shall provide evidence that Contractor has notified Contractor's insurer of the claim. Contractor shall keep the Town apprised of the disposition of the claim, and Contractor shall take all necessary action to resolve the claim and make restitution, if required, as quickly as possible.

6.03 Insurance:

H. Contractor agrees to procure and maintain, at its own cost, a policy or policies of insurance sufficient to insure against all liability, claims, demands, and other obligations assumed by Contractor pursuant to this Contract. At a minimum, Contractor shall procure and maintain, and shall cause any subcontractor to procure and maintain, the insurance coverages listed below, with forms and insurers acceptable to the Town.

1. Worker's Compensation insurance as required by law.
 2. Commercial General Liability insurance with minimum combined single limits of \$1,000,000 each occurrence and \$2,000,000 general aggregate. The policy shall be applicable to all premises and operations, and shall include coverage for bodily injury, broad form property damage, personal injury (including coverage for contractual and employee acts), blanket contractual, products, and completed operations. The policy shall contain a severability of interests provision, and shall include the Town and the Town's officers, employees, and contractors as additional insureds. No additional insured endorsement shall contain any exclusion for bodily injury or property damage arising from completed operations.
- I. Such insurance shall be in addition to any other insurance requirements imposed by law. The coverages afforded under the policies shall not be canceled, terminated or materially changed without at least 30 days prior written notice to the Town. In the case of any claims-made policy, the necessary retroactive dates and extended reporting periods shall be procured to maintain such continuous coverage. Any insurance carried by the Town, its officers, its employees, or its contractors shall be excess and not contributory insurance to that provided by Contractor. Contractor shall be solely responsible for any deductible losses under any policy.

- J. Contractor shall provide to the Town a certificate of insurance as evidence that the required policies are in full force and effect. The certificate shall identify this Contract.

6.04 Performance and Payment Bond:

Contractor shall furnish a Payment and Performance Bond in the full amount of the Contract Price, as security for the faithful performance and payment of all Contractor’s obligations under the Contract Documents, including the warranty. This bond shall remain in effect at least until two years after the date of Final Completion.

Part 7. Payment

7.01 Progress Payments:

- A. The Town shall make periodic progress payments to Contractor within 30 days following the Project Manager’s approval of the Work completed. A progress payment shall be made only after Contractor has submitted an application for a progress payment on a form approved by the Project Manager, and if requested by the Project Manager, Contractor shall submit copies of invoices from subcontractors or supplies and partial waivers executed by each.
- B. Progress payments shall be in an amount equal to 95% of the Work actually completed. Completed Work shall include materials and equipment not incorporated in the Work but delivered to the work site and suitably stored.
- C. If Contractor fails to complete any required Work within the time period agreed between Contractor and the Project Manager, or within any time period set forth in the Contract Documents, as modified or extended, the Town is expressly authorized to withhold any progress payment for such Work until such Work is completed.

7.02 Final Payment:

Upon final acceptance of the Work, the Town shall make final payment to Contractor pursuant to C.R.S. § 38-26-107.

7.03 Liquidated Damages:

- A. Because time is of the essence and delayed performance constitutes a compensable inconvenience to the Town and its residents, the liquidated damages established in this Section shall be enforced. Such damages are not a penalty. For each day Final Completion is delayed after the Final Completion date stated in the Construction Contract, as modified through approved change orders, Contractor shall be assessed the following amounts:

Contract Price	Amount per day
\$0-\$50,000	\$350
\$50,000-\$100,000	\$380
\$100,000-\$250,000	\$440

\$250,000-\$500,000	\$520
\$500,000-\$1,000,000	\$640
\$1,000,000-\$2,000,000	\$820
\$2,000,000-\$4,000,000	\$1,080
\$4,000,000-\$8,000,000	\$1,450
\$8,000,000-\$12,000,000	\$1,820
\$12,000,000 or greater	\$2,250

- B. Allowing Contractor to continue and finish the Work or any part thereof after the Final Completion date shall not operate as a waiver on the part of the Town of any of its rights under the Contract Documents. Any liquidated damages assessed shall not relieve Contractor from liability for any damages or costs of other contractors caused by a failure of Contractor to complete the Work in the Contract Time. Liquidated damages may be deducted from any payment due Contractor or the retainage. If the liquidated damages exceed the amount owed to Contractor, Contractor shall reimburse the Town.

7.04 Oral Agreements Prohibited:

This Contract is expressly subject to the provisions of C.R.S. § 29-1-110(1), and Contractor acknowledges that neither the Town nor any employee or agent thereof is authorized to expend or contract for the expenditure of any monies in excess of those appropriated by the Erie Board of Trustees. The Town acknowledges that sufficient funds have been appropriated to pay the Contract Price, but Contractor shall not rely upon the appropriation of any funds in addition to those already appropriated unless and until the same are lawfully appropriated by the Erie Board of Trustees.

7.05 Items Not Included in Bid:

No additional compensation shall be paid for any costs or services listed in the Contract Documents but not specifically listed in the Bid as a Bid item.

7.06 Changes in Quantity:

- A. Except as provided in Section 7.07, the unit Bid price shown in the Bid Schedule shall be used to determine the payment owed Contractor for any changes in quantity.
- B. The actual quantity placed, as determined by the Project Manager, shall be used to calculate the payment due to Contractor.
- C. Prior to any Work being performed in excess of any of the Bid Schedule quantities, Contractor shall notify the Town, in writing, of every quantity that will exceed 105% of the quantity listed on the Bid Schedule.
- D. Except as provided in Section 7.08, Contractor shall not be entitled to compensation for any increased expense, loss of expected reimbursement or loss of anticipated profits, directly or indirectly caused by any changes in quantity.

7.07 Bid Price Adjustments:

- A. When a major item is increased to more than 125% or decreased below 75% of the original quantity stated on the Bid Schedule, the unit Bid price shall be modified by written change order. Payment for major items shall be calculated by multiplying the actual quantity placed by the modified Bid price.
- B. For purposes of this Section, a major item is any item having a Bid value, determined by multiplying the Bid quantity by the unit Bid price that exceeds 10% of the original Contract Price.

7.08 Eliminated Items:

Should any items contained in the Bid Schedule be found unnecessary for completion of the Work, the items shall be eliminated. The Contract Price shall be modified through written change order, and the amount of the change order shall be the eliminated quantity multiplied by the unit Bid price stated in the Bid Schedule, minus any reasonable costs incurred by Contractor for the eliminated items. Reasonable costs shall be determined by the Project Manager based on information provided by Contractor, and may include mobilization of eliminated materials and equipment mobilization costs, if the sole purpose of the equipment was to place the eliminated material. In no case shall the costs exceed the amount of the eliminated items.

7.09 Materials Stored But Not Incorporated:

Payments may be made to Contractor for materials stored on the work site but not incorporated into the Work as evidenced by invoices or cost analyses of material produced, if the material has been fabricated or processed and is ready for installation into the Work and conforms with the Contract Documents. Payments shall not exceed 85% of the price shown in the Bid Schedule or 100% of the certified invoice cost of the stockpiled material, whichever is less. Payment for stockpiled materials shall not relieve Contractor of responsibility for loss or damage to the material. Payment for living plant materials or perishable materials shall not be made until the living or perishable material is made an integral part of the finished Work.

7.10 Cost Records:

Contractor shall make cost records available to the Town if the Town deems it necessary to determine the validity and amount of any item claimed.

Part 8. Miscellaneous

8.01 Publications:

Any and all publications relating to the Work and authored by Contractor or any of its subcontractors shall be submitted to the Town for its prior written approval of the content of the publication. If the Town disapproves of the content of the publication, the author shall withdraw it from publication. The term "publication" as used herein shall include articles or letters to be published in any newspaper, magazine, trade journal or other periodical.

8.02 Confidentiality:

Any and all reports, information, data, statistics, forms, designs, plans, procedures, systems, studies and any other communication form of knowledge given to or prepared or assembled by Contractor under this Contract shall, to the extent authorized and permitted by law, be kept as confidential and not be made available by Contractor to any individual, company or organization without the prior written consent of the Town. Notwithstanding the foregoing, Contractor shall not be restricted from releasing information in response to a subpoena, court order, or legal process, but Contractor shall notify the Town in writing before responding.

8.03 Independent Contractor:

Contractor, for all purposes arising out of this Contract, is an independent contractor and not an employee of the Town. It is expressly understood and agreed that Contractor shall not be entitled to any benefits to which the Town's employees are entitled, such as overtime, retirement benefits, worker's compensation, injury leave or other leave benefits.

8.04 Conflicts:

Should any conflict arise in the Contract Documents, the order of precedence is as follows:

1. Construction Contract.
2. Special Provisions.
3. General Provisions.
4. Supplemental Specifications.
5. Detailed Plans (Calculated dimensions will govern over scaled dimensions).

Special Provisions

1. **General.**
 - A. All labor, services, material, and other work necessary for the construction of this project shall be provided by Contractor. Contractor's responsibilities shall include, but not be limited to: managing the budget; scheduling and coordinating work meetings; conducting field tests and geotechnical studies; preparing exhibits and participating in formal and informal public meetings at locations provided by the Town; and timely processing field orders, change orders and notices of substantial completion.
 - B. Contractor shall carefully examine all Work, and shall be solely responsible for the character, quality, and quantities of Work, materials, and compliance with the Contract Documents.
 - C. Contractor shall identify any and all necessary easements for construction and maintenance of the Work.
2. **Other Regulations.**
 - A. Contractor shall ensure that the Work is in compliance with the Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual, CDOT Specifications, AASHTO Specifications, International Building Code, Uniform Plumbing Code, Uniform Mechanical Code, National Electrical Code, Americans with Disabilities Act, and other applicable codes and specifications.
 - B. In case of any discrepancy between any of the requirements set forth in the Urban Drainage and Flood Control District Urban Storm Drainage Criteria Manual, CDOT Specifications, AASHTO Specifications, International Building Code, Uniform Plumbing Code, Uniform Mechanical Code, National Electrical Code, Americans with Disabilities Act, and these Contract Documents, the more stringent requirement shall apply. If any questions arise as to which requirement is more stringent than another, the Project Manager shall be authorized to determine which is more stringent, and the Project Manager's decision shall be final.
3. **Representatives.** Contractor shall have at the work site at all times as its agent, a competent superintendent capable of reading and thoroughly understanding the Contract Documents and being thoroughly experienced in the type of work being performed. The Town shall have a representative on the job site to observe work for conformance with the Contract Documents.
4. **Work Administration.** The Town shall administer the Work, including the finalization of any change orders, pay estimates and payments of such, acceptance of work, and other matters as stipulated in the Contract Documents.
5. **Engineer.** The Engineer for this Work shall be the Town Engineer.

6. Inspections and Testing.

- A. Contractor shall be responsible for performing materials testing. In addition to the materials testing performed by Contractor, the Town may conduct Quality Assurance testing at its own discretion.
- B. Contractor shall coordinate its construction schedule with the testing agency and Town so that key inspection points may be observed. If Contractor fails to provide reasonably adequate notice or proceeds without the required inspection, the subject work shall be re-exposed or redone in its entirety, while the inspector is present. No extra compensation shall be awarded to Contractor for extra work due to Contractor's failure to coordinate inspections with the testing agency or the Town. All costs associated with Contractor's failure to coordinate inspections shall be borne by Contractor.
- C. Contractor shall perform construction inspections. Contractor shall attend any pre-construction meeting(s) and be available to provide technical assistance during the course of construction as necessary. Contractor shall provide site visits and reviews upon request from the Town during the construction phase to ensure compliance with the intent of the plans and to resolve any potential conflicts. Contractor shall provide a written summary after each site visit.
- D. Contractor shall be responsible for scheduling the final inspection with the Town.

7. Construction Schedule.

- A. At the time of the Pre-construction Conference, Contractor shall prepare and submit to the Town for review a construction schedule including: proposed daily construction hours; details of all construction items; start and finish dates; confirmation and dates for coordinating all utility relocation and/or interruptions; and the same information for all subcontractor(s). The schedule shall not be changed without prior notification and review by the Town. The schedule shall be in the form of a chart of suitable scale to indicate approximately the percentage of Work scheduled for completion at any time. Contractor shall enter on the chart the actual progress at the end of each 2-week interval as directed by the Town and shall deliver to the Town a copy thereof on a biweekly basis.
- B. Contractor shall also prepare and submit a schedule of the anticipated manpower by title and duty. The manpower proposed shall be adequate for orderly flow of work and completion within the time specified in the Contract Documents.
- C. All construction activities shall be coordinated with the Project Manager.

8. Saturday, Sunday, Holiday and Night Work.

- A. Work shall normally not be performed on Saturdays, Sundays, observed holidays, or outside of the daytime working hours of 7:00 a.m. to 7:00 p.m.,

or as indicated on the construction schedule. Lane closures are restricted to 9:00 a.m. to 4:00 p.m. on arterial and collector streets, except for such work as may be necessary for proper care, maintenance, and protection of Work already completed, or in cases where the Work would be endangered or if hazards to life or property would result.

- B. If Contractor believes it necessary to work on Saturdays, Sundays, holidays, or at night, Contractor shall make a request no later than 7:00 a.m. two business days prior to desired work dates and receive written approval before such date so that inspection and engineering services can be provided. Such approval may be revoked by the Town if Contractor fails to maintain adequate equipment and lighting at night for the proper prosecution, control, and inspection of the work. If Work is performed without the Town's prior approval, and as a result the Town had not assigned inspectors to the work, the Town may declare Work performed during this period of time defective, solely on the grounds that it was not properly inspected.
- C. Any Work performed on a Saturday, Sunday, holiday, or night shall be at Contractor's risk in terms of extra costs, extra work, or unforeseen conditions.

9. Progress Reports.

- A. Contractor shall prepare at least monthly a progress report for the project in a form, in sufficient detail, and of a character approved by the Project Manager. The progress report shall specify an estimated percentage of completion (including percentage of completion of each activity and event shown on the progress schedule), whether the project is on schedule and, if not, the reasons therefore and any proposed adjustments to the schedule, as well as the contract time worked for each category of labor and the projected Work to be completed in the next succeeding month.
- B. If the completion of any part of the Work or the delivery of materials is behind the approved schedule, Contractor shall submit a plan acceptable to the Project Manager for bringing the Work up to schedule. The Town shall have the right to withhold progress payments for the work if Contractor fails to update and submit the progress/manpower schedule and reports as specified.

10. Pre-construction Conference.

- A. Contractor shall coordinate the Pre-construction Conference. Contractor's designated supervisor(s) assigned to the Work shall attend this meeting.
- B. Prior to mobilizing construction equipment, a Pre-construction Conference will be held. Contractor's designated superintendent(s) or supervisor(s) assigned to the Work shall attend this meeting. Contractor shall, at a minimum, provide the following to the Town at the Pre-construction Conference:
 - (1) The construction schedules;
 - (2) A detailed estimate of partial payments for the Work;

- (3) The traffic control plan;
- (4) A detailed plan showing site access and staging areas; and
- (5) A subcontractor submittal, including names and contact phone numbers.

11. Fees and Permits.

- A. Prior to commencing any Work, Contractor shall secure, at its own expense, all necessary fees and permits required for the performance of the Work. The cost of compliance with this Section (including fees) is included in the Contract Price, and no additional compensation shall be provided.
- B. All fees for permits issued by the Town shall be waived.

12. Existing Utilities.

- A. The Work shall be coordinated with all impacted utility companies, districts, associations, agencies, and residents located in the work site. Contractor shall conduct the meeting and provide summary minutes.
- B. Contractor shall determine the actual location of all existing utilities prior to starting any Work. Contractor shall contact the Utility Notification Center of Colorado to schedule area utility locates (811) and follow up with utility companies, as needed, for field locations prior to the start of Construction Work. If the exact location and depth of existing underground utilities are unknown, Contractor shall perform all necessary exploratory excavation to locate these facilities which may affect the Work prior to beginning construction. Contractor shall obtain required locates and Contractor shall include the information on the plans. Contractor shall resolve any utility discrepancies. Contractor shall be liable for all damage done to existing utilities in the performance of the Work.
- C. If Contractor requests that utility companies relocate utilities for Contractor's convenience, such relocation shall be at Contractor's expense.
- D. The time of performance under the Contract shall not be extended to account for repair of utilities which are damaged by Contractor.

13. Water and Electricity. Contractor shall provide and maintain, at its own expense, an adequate supply of water and electricity required for the Work. Contractor shall install and maintain supply connections and lines satisfactory to the Project Manager, and prior to Final Completion, Contractor shall remove the supply lines at its expense. If water is needed during construction, Contractor will obtain a hydrant meter from the Town for use during the project at the Contractor's expense.

14. Dust Control. Contractor shall use measures to prevent and control dust within the area affected by the Work. No additional compensation shall be paid to Contractor for dust control. Contractor shall clean any soil, dirt, or debris tracked onto any adjacent streets. Within 24 hours of notification by the Town that any

adjacent streets require cleaning, Contractor shall clean such streets or the Town may have the streets cleaned and deduct the cost of such cleaning from the Contract Price.

15. Construction Staging Areas. All construction staging areas shall be located within the work site. The boundaries of construction staging areas shall be approved by the Town. Construction staging areas shall be used for material storage, parking for equipment, and employees' vehicles. A construction trailer shall not be required, but may be used if the location of the trailer is approved by the Town. Upon Final Completion, all staging areas shall be clean and restored to their original condition. No additional compensation shall be provided to Contractor for cleaning of construction staging areas.
16. Sanitary Facilities.
 - A. Sanitary convenience for the use of all persons employed on the work, properly screened from public observation, shall be provided in sufficient numbers and in such a manner and at such points as approved by the Town. The contents shall be removed and disposed of in a satisfactory manner.
 - B. The sanitary conveniences specified above shall be the obligation and responsibility of Contractor. The facilities shall be made available to all other contractors, subcontractors, and inspection personnel in the work site.
 - C. Contractor shall supply sufficient drinking water from approved sources to all of its employees.
 - D. Full compensation for compliance with this Section is included in the Contract Price, and no additional compensation shall be provided.
17. Soils Investigations and Foundation Engineering.
 - A. Contractor shall be responsible for all geotechnical investigations necessary to design and perform the Work. Soil and subsurface investigation have not been conducted at the site. Bidders are urged to examine soils investigation data and to make their own investigation of the site before bidding.
 - B. Owner and Engineer disclaim all responsibility for the accuracy, true location, and extent of soils investigation(s) that have been prepared by others. They further disclaim responsibility for interpretations of that data by bidders, as in projecting soil-bearing values, rock profiles, soil stability and the presence, level, and extent of underground water.
 - C. Owner and Engineer disclaim all responsibility for the existence of other soil and subsurface investigations that may have been previously prepared for Owner, Engineer, or others. It is the sole responsibility of the Bidder to obtain other soil and subsurface investigations that may be available for interpretation, at no additional cost to the Owner.
 - D. Soil investigation data is not part of the contract documents.
 - E. CORROSION PROTECTION SYSTEMS

- a. Site soils shall be evaluated for corrosion prior to backfilling. When soil resistivity is less than two thousand five hundred (2,500) ohm-centimeters (OHM_CM) but greater than one thousand (1,000) OHM_CM, ductile iron pipe and fittings must be protected against corrosion in accordance with a design provided by a qualified professional engineer licensed in the State of Colorado.
18. Lines and Grades. Contractor shall lay out the Work and shall be responsible for all measurements in connection therewith. Contractor shall, at its own expense, furnish all stakes, templates, platforms, equipment, and labor, including surveyors that may be required in setting and cutting or laying out any part of the Work. Contractor shall be responsible for the proper execution of the Work to such lines and grades.
 19. Traffic Control.
 - A. Contractor shall furnish all necessary flag persons; erect and maintain warning lights, advance warning signs, detour signs, barricades, temporary fence, and sufficient safeguards around all excavations, embankments, obstructions; and perform any other work necessary for the protection of all work being performed, and for the safety of the public and pedestrian traffic, as well as motor vehicles. All signs and barricades shall conform to the current Manual on Uniform Traffic Control Devices.
 - B. At the Pre-construction Conference, Contractor shall submit a copy of the traffic control plan for review by the Town. The plan shall discuss the traffic control measures proposed for the safety of vehicular and pedestrian traffic through the work site.
 - C. Contractor shall at all times take proper precautions for the protection of and replacement or restoration of landscaping, driveway culverts, street intersection culverts or aprons, irrigation crossings and systems, mailboxes, driveway approaches, signs, existing utilities, and all other public and private installations that may be encountered during the Work.
 - D. No driveway or private alley shall be blocked without prior written permission from the resident who would be affected by such blocking, with a copy to the Town.
 - E. Contractor shall at least 72 hours written notice to all affected home/business owners within 500 feet of the limits of the project prior to beginning the Work. This also includes information of any lane closures, including dates and times. The Town shall send a press release if needed.
 - F. It is anticipated that a large number of employees will use automobiles for transportation to and from the work site. It shall be Contractor's responsibility to: maintain, protect, and control traffic in the vicinity of and in the work site; restrict parking on streets near the work site; and provide necessary parking areas for all employees in suitable locations as approved by the Town.

20. Archaeological and Historical Discoveries.
- A. Contractor shall inform the Town of any evidence which might suggest to a layperson that archaeological or historical materials may be present in the work site. Upon making such a discovery, Contractor shall do whatever is necessary to avoid disturbing the work site. This may require that Contractor's activities be redirected or stopped until the Town determines how to proceed.
 - B. As a result of Contractor's efforts to preserve the potential discovery at the work site, if Contractor's activities are delayed for longer than 8 normal work hours, Contractor shall prepare accounting information to support an adjustment to the Contract Price.
21. Water Control.
- A. Contractor shall take such precautions as necessary to construct the Work in a dry condition, and Contractor shall provide for drainage, dewatering, and control of all surface and subsurface water and shall erect any necessary temporary structures or other facilities at its own expense.
 - B. Contractor, at its own expense, shall furnish all necessary equipment and materials required to control the surface and subsurface water in all the areas from the commencement of Work through Final Completion.
 - C. Contractor shall be responsible for furnishing, transporting, and installing all materials and equipment, well points, pumping, channelization, diversion, damming, or other means of controlling surface water and ground waters.
22. Disposal Site.
- A. Contractor shall be responsible for the removal of all excess excavation, debris, deleterious material, muck, asphalt, concrete, trees, stumps, remains from clearing and grubbing, and all other materials not used for the construction of the improvements. Costs of disposal are included in the Contract Price and shall not entitle Contractor to additional compensation.
 - B. Contractor's cost for loading, hauling, daily cleaning of streets, disposal of the earthwork (excavation) materials, together with the construction, maintaining and watering of haul roads, and dump fees and permits are included in the Contract Price and shall not entitle Contractor to additional compensation.
23. Video Prior to Construction. Contractor shall provide the Town with a video of the entire work site prior to beginning construction, including all adjacent areas, at Contractor's own expense. One copy of the video shall be provided to the Town and become the property of the Town prior to the commencement of any Work.
24. Existing Improvements and Restoration.
- A. Contractor has field inspected the work site and fully understands that existing landscaping and improvements are present within the work site. Such existing improvements shall be protected. Any damage or disruption in the public right-

of-way, drainage easements, Town property, or private property related to the Work shall be restored to pre-existing or better condition.


- B. Contractor shall be responsible for replacing all existing improvements, including irrigation systems and landscaping, damaged during Contractor's activities, except as otherwise provided in the Contract Documents.
25. Erosion Control. Contractor shall provide an erosion/sediment control plan for use during construction. The plan shall include site specific details showing the type, location, and quantity of BMP's to be used. The erosion/sediment control plan shall be designed to prevent sediment from leaving the construction area. Special attention shall be given to prevent sediment from entering into any wetland area.
 26. Vandalism. Contractor shall take all necessary steps to protect the work site from vandalism. Contractor shall be solely responsible to repair any damage caused by vandalism, including the removal of graffiti, at Contractor's own cost. The Contract Price shall not be increased to reimburse Contractor for such costs.

SUBCONTRACTOR LISTING

The following information is submitted which gives the name, business address, and portion of the Work for each subcontractor that will be used for a portion of the Work as specified in the Instructions to Bidders if the Bidder is awarded the Contract. Additional numbered pages shall be attached to this page as required. Each page shall be headed "SUBCONTRACTOR LISTING" and signed.

<u>Name</u>	<u>Business Address</u>	<u>Description of Work to be Performed</u>	<u>Subcontractor Contract Amount</u>	<u>Business Located Within 30 Mile Radius of Town</u>
<u>Asphalt Specialties</u>				<u>Yes</u> <u>No</u>
	<u>10100 Dallas St. Henderson, CO</u>	<u>Asphalt</u>	<u>\$ 53,825.00</u>	<input checked="" type="checkbox"/> <input type="checkbox"/>
<u>Innovative Traffic Control</u>	<u>4104 W Eisenhower Blvd, Loveland, CO</u>	<u>Traffic Control</u>	<u>\$ 40,000.00</u>	<input checked="" type="checkbox"/> <input type="checkbox"/>
<u>_____</u>	<u>_____</u>	<u>_____</u>	<u>\$ _____</u>	<input type="checkbox"/> <input type="checkbox"/>
<u>_____</u>	<u>_____</u>	<u>_____</u>	<u>\$ _____</u>	<input type="checkbox"/> <input type="checkbox"/>
<u>_____</u>	<u>_____</u>	<u>_____</u>	<u>\$ _____</u>	<input type="checkbox"/> <input type="checkbox"/>
<u>_____</u>	<u>_____</u>	<u>_____</u>	<u>\$ _____</u>	<input type="checkbox"/> <input type="checkbox"/>
<u>_____</u>	<u>_____</u>	<u>_____</u>	<u>\$ _____</u>	<input type="checkbox"/> <input type="checkbox"/>
<u>_____</u>	<u>_____</u>	<u>_____</u>	<u>\$ _____</u>	<input type="checkbox"/> <input type="checkbox"/>

<u>Name</u>	<u>Business Address</u>	<u>Description of Work to be Performed</u>	<u>Subcontractor Contract Amount</u>	<u>Business Located Within 30 Mile Radius of Town</u>	
				<u>Yes</u>	<u>No</u>
_____	_____	_____	\$ _____	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	_____	\$ _____	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	_____	\$ _____	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	_____	\$ _____	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	_____	\$ _____	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	_____	\$ _____	<input type="checkbox"/>	<input type="checkbox"/>
_____	_____	_____	\$ _____	<input type="checkbox"/>	<input type="checkbox"/>

Signed by:  Date: 9/16/2021

Matt Worland
 (Name)
President
 (Title)

END OF SECTION

PRELIMINARY CONSTRUCTION SCHEDULE & SEQUENCE PLAN

The CONTRACTOR shall submit with their Bid a preliminary construction schedule and sequence plan for the TOWN's review. This construction sequence shall be in sufficient detail to show complete construction of the project while meeting the requirements of these specifications. The TOWN understands that the construction area is tight and access to the properties is vital. The Preliminary Construction Sequence as it pertains to maintaining vehicular and pedestrian access will be used by the OWNER in helping determine award of the contract. Additional numbered pages and any exhibits required to describe the construction sequence shall be attached to this page as required. Each page shall be headed "PRELIMINARY CONSTRUCTION SCHEDULE & SEQUENCE" and signed.

DATE(S)	WORK ITEM
11/1/2021	Mobilize
11/2/2021	Install Erosion Control Measures
11/3/2021-11/5/2021	Pothole Existing Utilies and Connections
11/8/2021	Waterline Connection and Gate Valve STA 24+58.7
11/8/2021-11/12/21	Shift Traffic and Install Waterline to STA 23+09.7
11/15/2021-12/3/2021	Install waterline to STA STA 11+66.5
12/6/2021-12/10/2021	Install blowoff and cross Erie Pkwy to SA 10+00
12/13-2021-12/17/2021	Cleanup and Demob

Signed by: 

Date: 9/16/2021

Matt Worland
(Name)

President
(Title)

Technical Specifications

SECTION 00 01 07 - SEALS PAGE
FOR
ERIE PARKWAY REUSE WATERLINE IMPROVEMENTS
(P21-287)
FOR
TOWN OF ERIE

PHILLIP W. SACK = PWS

**TECHNICAL SPECIFICATIONS TABLE OF CONTENTS
FOR
REUSE WATERLINE
FOR
TOWN OF ERIE**

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NOT USED

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NOT USED

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NOT USED

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NOT USED

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NOT USED

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NOT USED

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NOT USED

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NOT USED

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NOT USED

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NOT USED

DRAWINGS

See Sheet G-1 for Drawing Index

SUPPLEMENTARY INFORMATION

END OF SECTION

SECTION 01 10 00 - SUMMARY OF WORK

PART 1 GENERAL

1.1 GENERAL

- A. This Summary of Work supplements and amplifies certain sections of the General Conditions and Supplementary General Conditions. The General Conditions and Supplementary General Conditions shall apply except as modified herein. These Special Provisions and additional technical specifications may contain occasional requirements not pertinent to the project. However, these specifications shall apply in all particulars insofar as they are applicable to this project.

1.2 SECTION INCLUDES

- A. Work covered by the Contract Documents
- B. Work by OWNER
- C. Work by Others
- D. CONTRACTOR use of site and premises
- E. Work sequence
- F. OWNER occupancy
- G. Partial OWNER occupancy
- H. Easements and right-of-way
- I. Fences
- J. Protection of public and private property
- K. Maintenance of traffic
- L. Barricades and lights
- M. Field Engineering
- N. Lines and grades
- O. Regulatory requirements
- P. Cutting and patching
- Q. Alteration Project Procedures
- R. Coordination

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of this Contract consists of constructing a number of improvements as identified in these Contract Documents (Plans and Project Manual) for the Town of Erie at Erie Parkway between South Briggs Street and Powers Street. The improvements are generally described as the installation of a reuse waterline, asphalt patching, traffic control, seeding, and site restoration.

Major Elements of the Work include but are not limited to the following:

1. Permits, Inspection and Testing
 - a. Obtain, coordinate and pay for permits, testing and inspections except for those items specifically identified to be provided by or paid for by OWNER.
 - b. Coordinate, provide and pay for surveying.
2. Demolition
 - a. Temporary and/or permanent removal, storage, transport, and disposal of existing portions of the existing reuse waterline and surface features to be replaced whether in part or in whole
 - 1) Miscellaneous concrete demolition
 - 2) Miscellaneous asphalt demolition
 - 3) Colored and Stamped Concrete median demolition
 - 4) Demolition of miscellaneous existing reuse waterline components to accommodate connection of new reuse waterline to existing.
3. Sitework
 - a. Work including but not limited to the following:
 - 1) Clearing and grubbing, excavation, backfill, grading, stockpiling and placement of fill material, asphalt paving, concrete flat work, drainage control and maintenance, reestablishment of landscaping to all disturbed areas and all work associated with planning, permitting, furnishing, maintaining, operating and removal of the stormwater management system.
4. Reuse Waterline
 - a. Work necessary for the preparation, furnishing, and installation of buried reuse waterline including but not limited to the following:
 - 1) Excavation, shoring, backfill, forming, reinforcing, placing, consolidating, testing, finishing and curing of cast in place concrete and grout.
 - 2) Furnishing and installation of isolation gate valves, approximately 1,475 LF of 12-inch pipe, fittings, blow off assembly, and restraint devices.
5. Coatings, Sealants and Corrosion Control

- a. Work necessary for the preparation, furnishing, installation and testing of sealants and coatings.
- 6. Commissioning and Start Up
 - a. Work necessary for the commissioning, start up, and testing of the improvements and systems including but not limited to the following:
 - 1) Leak testing of reuse water lines.
 - B. Furnish all materials, equipment, supplies, appurtenances; provide all construction equipment and tools; and perform all necessary labor and supervision to complete the Work.
 - C. Coordinate the progress of the Work including coordination between trades, subcontractors, suppliers, public utilities, Engineer, Resident Project Representative, work by other CONTRACTOR(s) and OWNER to insure the progress of Work.
 - D. It is the intent of this contract that Work proceeds in the most expeditious manner possible.
 - E. Construct the Work under both lump sum and unit pricing as indicated in the Bid Form.
 - F. The above general outline of principal features of the work does not in any way limit the responsibility of the CONTRACTOR(s) to perform all work and furnish all equipment, labor and materials required by the specifications and drawings. The drawings and specifications shall be considered and used together. Anything appearing as a requirement of either shall be accepted as applicable to both even though not so stated therein or shown.
 - G. No attempt has been made in these specifications or drawings to segregate work covered by any trade or subcontract under one specification. Such segregation and establishment of subcontract limits will be solely a matter of specific agreement between the CONTRACTOR and its subcontractors and shall not be based upon any inclusion, segregation, or arrangement in or of these specifications.

1.4 WORK BY OWNER

- A. Normal day to day operations of the Town of Erie will be ongoing; CONTRACTOR's activities and construction shall not isolate OWNER's operation or maintenance activities.

1.5 WORK BY OTHERS

- A. NOT USED

1.6 CONTRACTOR USE OF SITE AND PREMISES

- A. All work shall be carried on with due regard for safety to the public.
- B. The limits of the site which may be used for construction, storage, materials handling, parking of vehicles and other operations related to the project include the project site as shown on the drawings and adjacent public rights-of-way subject to permission of the public OWNER of that right-of-way. The limits of work also include rights of access obtained by the CONTRACTOR, subject to all public laws and regulations and rights of access by utility companies and other holders of easement rights.
- C. Contractor shall limit his use of the premises for Work and storage, to allow for OWNER occupancy and operations.
- D. Coordinate use of premises under direction of OWNER.
- E. Assume full responsibility for the protection and safekeeping of products stored on site under this Contract.
- F. Move any stored products, under CONTRACTOR's control, which interfere with operations of the OWNER or Residents.
- G. Obtain and pay for the use of additional storage or work areas needed for operations.
- H. Contractor may use those areas indicated on the drawings for storage and such additional areas as OWNER may designate.

1.7 WORK SEQUENCE

- A. Construct Work in stages to allow for OWNER's continuous occupancy and for uninterrupted service of all water and sewer service, except as allowed for temporary interruption. Coordinate construction schedule and operations with the OWNER and Engineer.
- B. Work which may interrupt the normal operations is to be accomplished at such times that are convenient to the Residents and OWNER. Plan work and overtime if needed to complete construction techniques of the various improvements. No claims for extra compensation for overtime work required to conform to these requirements will be allowed.

- C. Certain work within this contract may require connection to and coordination with the work of other CONTRACTORS and OWNER. The CONTRACTOR under these specifications shall cooperate fully with all other CONTRACTORS and OWNER and carefully fit its own work to such other work as may be directed by the ENGINEER. The CONTRACTOR shall not commit or permit any act to be committed which will interfere with the performance of work by any other CONTRACTOR or the OWNER.
- D. Sequences other than those specified will be considered by OWNER and Engineer during schedule review, provided they afford equivalent continuity of construction and OWNER's operations and are presented clearly in the Construction Schedules per Section 01 32 16.
- E. Develop a Work Sequencing Plan meeting the schedule considerations outlined herein and meeting Work requirements.
 - 1. The CONTRACTOR understands and agrees that the time of completion is an essential consideration in development of his proposal and construction schedule.
 - 2. The description of schedule or construction techniques that follows herein shall not relieve the CONTRACTOR of the responsibility for detailed planning, coordination, scheduling and other responsibilities as required by the Contract Documents.
 - 3. Major Project milestones to be indicated on the construction schedule and Work Sequencing Plan with critical project milestones are as follows:
 - a. OWNER issuance of Notice of Award.
 - b. OWNER and CONTRACTOR execution of Agreement.
 - c. OWNER issuance of Notice to Proceed (NTP). Please note that Due to the long lead times associated with procuring materials, the TOWN will work with the CONTRACTOR on the NTP date. The intent is such that after award, the CONTRACTOR shall make submittal of all critical materials and after obtaining approval CONTRACTOR is expected to procure the approved materials with NTP Issued along with the approved submittals.
 - d. Contractor to submit and achieve completion of submittal process for initial project submittals identified in *the Contract Documents*.
 - e. Contractor to contact and coordinate with utility companies for location of utility companies existing infrastructure within and adjacent to the site and the CONTRACTOR's areas of work.

- f. Verify size, material of construction and the horizontal and vertical location for existing utilities prior to the beginning of excavation.
- g. Complete investigation of geotechnical and groundwater dewatering needs.
- h. Contractor to achieve completion of submittal process for all critical submittals prior to beginning construction or ordering materials.
- i. Provide, install and maintain stormwater management devices.
- j. Mobilize to site and provide temporary utilities and facilities of Section 01 50 00.
- k. Provide, install and maintain material and storage facilities of Section 01 50 00.
- l. Establish and protect site horizontal and vertical control points.
- m. Begin delivery of materials and equipment to the site only after completion of work of Section 01 50 00 and completion of submittal process related to the material or equipment to be delivered to the site.
- n. Substantial completion of reuse water improvements.
- o. Substantial completion of roadway asphalt and concrete flatwork improvements.
- p. Final Completion including but not limited to cleanup of the site as well as complete demobilization of the CONTRACTOR, his equipment, facilities and supplies.

1.8 OWNER OCCUPANCY

- A. OWNER will occupy the premises during the entire period of construction for the conduct of normal operations. Cooperate with OWNER in all construction operations to minimize conflict, and to facilitate OWNER use of site and facilities.

1.9 PARTIAL OWNER OCCUPANCY

NOT USED

1.10 EASEMENTS AND RIGHT-OF-WAY

- A. OWNER will provide permanent easement for new reuse waterline near the intersection of Briggs St and Erie Parkway.

- B. Confine construction operations to the immediate vicinity of the location indicated on Drawings and use due care in placing construction tools, equipment, excavated materials, and pipeline materials and supplies, so as to cause the least possible damage to property and interference with traffic.
- C. When portions of the work contemplated are within easements held by the OWNER on private property, the CONTRACTOR shall ascertain for itself to what extent the width, status, and special conditions attached to easements may have on its operations and all costs resulting therefrom shall be included and absorbed in the unit prices of the CONTRACTOR's bid. CONTRACTOR shall coordinate with private property OWNERS and businesses if required. Landscaping, surface restoration and fence restoration shall be completed within 24 hours following piping and conduit installation and other construction work. Temporary fencing shall be provided continuously until such private fencing is properly restored.
- D. The CONTRACTOR's attention is directed to 1.4.C.4 of the General Conditions regarding safety and the protection of property. Certain portions of this project require working near existing structures and property within private easements. It is the CONTRACTOR'S responsibility to conduct its operations and limit the size of equipment used in such a manner to prevent damage to existing property from excessive vibration or from other direct or indirect CONTRACTOR operations. The cost associated with repairing or replacing property that is damaged by the CONTRACTOR's operations shall be the responsibility of the CONTRACTOR, in accordance with the General Conditions.
- E. On Private Property:
 - 1. If use of land outside Town's easement is desirable or necessary, obtain consent of, and execute a written agreement with, the OWNER and tenant of the land.
 - 2. Do not enter for material delivery or occupy for any purpose with personnel, tools, equipment, construction materials, or excavated materials, any private property outside the designated construction easement without written permission of the OWNER and tenant.
 - 3. If the easement crosses areas which are leveled or stockpiled for gravel operations, re-level or replace stockpiles to original or better condition to the satisfaction of the property OWNER and tenant.
- F. Within Road, County Road or Highway and Railroad Rights-of-Way:
 - 1. Contractor will complete, obtain and pay for permits.
 - 2. Perform all work and conduct all operations of CONTRACTOR, his employees, and

his subcontractors in accordance with the requirements, and under the control (through OWNER) of the authority owning, or having jurisdiction over and control of, the right-of-way in each case.

3. Reimburse authorities, through OWNER, for expense of any flag man or protective devices which may be required by authorities in connection with the Work.

1.11 FENCES

- A. Maintain all fences affected by the Work until completion of the Work.
- B. Do not relocate or dismantle fences which interfere with construction operations before obtaining written permission from the fence OWNER with an agreement as to the length of time the fence may be left relocated or dismantled.
- C. Where fences must be maintained across the construction easement install adequate gates.
- D. Keep gates closed and locked when not in use.
- E. At the completion of Work across any tract of land restore fences to their original or better condition and to their original location.

1.12 SAFETY STANDARDS AND ACCIDENT PREVENTION

- A. The CONTRACTOR shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours. The required and/or implied duty of the ENGINEER to conduct construction review of the CONTRACTOR's performance does not, and is not intended to, include review of the adequacy of the CONTRACTOR's safety measures in, on, or near the construction site.
- B. The CONTRACTOR shall comply with the safety standards provisions of applicable laws and building and construction codes. The CONTRACTOR shall exercise every precaution at all times for the prevention of accidents and protection of persons, including employees, and property. During the execution of the work the CONTRACTOR shall provide and maintain all guards, railing, lights, warnings, and other protective devices which are required by law, or which are reasonably necessary for the protection of persons and property from injury or damage.

1.13 PUBLIC SAFETY AND CONVENIENCE

- A. General Rule: The CONTRACTOR shall ensure the safety of the public during its performance of the Work and shall minimize any public inconvenience in addition to any other requirement imposed by law. These duties include, but are not limited to, the matters listed below.
- B. Access: The CONTRACTOR shall not unreasonably restrict access to public facilities, commercial property, fire hydrants, residential property, and other areas where the public can be expected to be present, such as sidewalks and streets without first obtaining approval of the OWNER. Driveways shall be closed only with the approval of the OWNER or after obtaining specific permission from the property OWNER or OWNERS. In addition, the CONTRACTOR shall not obstruct or interfere with travel over any public street or sidewalk without approval of the OWNER.
- C. Public Transit: The CONTRACTOR shall not interfere with the normal operation of any public transit vehicles unless otherwise authorized.
- D. Work Site: The CONTRACTOR shall keep the Project site safe in compliance with applicable law. Safety includes, but is not limited to: 1) providing an approved type of secured and adequate barricades or fences that are easily visible from a reasonable distance around open excavations; 2) closing up or covering with steel plates all open excavations at the end of each Working Day in all street areas and in all other areas when it is reasonably required for public safety; 3) marking all open work and obstructions by lights at night; 4) installing and maintaining all necessary signs, lights, flares, barricades, railings, runways, stairs, bridges, and facilities; 5) observing any and all safety instructions received from the OWNER; and 6) following all laws and regulations concerning worker and public safety. In the event that the law requires greater safety obligations than that imposed by the OWNER, the CONTRACTOR shall comply with the law.
- E. Emergency: Emergency vehicles, including but not limited to police, fire, and disaster units shall be provided access to the work site at all times.
- F. Cleanliness: The CONTRACTOR shall, on a continuing basis, keep the surfaces of all public and private roadways, sidewalks, and other pathways free of dirt, mud, cold plane grindings, and other matters that the CONTRACTOR may place upon the road. The cost of performing such work shall be included in the CONTRACTOR's Bid and no additional payment will be made for performing this task.
- G. Parking: The CONTRACTOR shall make any necessary contacts with all applicable governmental bodies to arrange for the removal of parked automobiles, vehicles and

other obstructions if they would interfere with the performance of the CONTRACTOR'S work.

- H. Accidents: The CONTRACTOR'S Project Manager or superintendent shall be in charge of accident prevention. CONTRACTOR shall take all actions necessary to prevent damage, injury and loss to persons and property as a result of accidents.
- I. Project Health and Safety Plan: CONTRACTOR shall develop, publish, and implement an overall Project Health and Safety Program for the Project. This Program shall conform to all applicable codes. CONTRACTOR shall submit the written Safety Program to the OWNER within 30 days after the receipt of the written Notice to Proceed. The Plan shall be assembled to address project specific health and safety issues to both the public and on-site personnel. The plan shall include the following items when they apply:
- Employee Orientation
 - Safety Inspections
 - Instruction and Training
 - Accident Reporting
 - Signs and Barricades
 - Fire Prevention and Protection
 - Welding, Cutting, and Burning
 - Painting and Surface Treatment
 - Electricity
 - Machinery and Mechanized Equipment
 - Excavations
 - Sanitation
 - Chlorine Safety
 - Hazardous Materials
 - Hazardous Communications Program
 - Job Hazard Analysis
 - First Aid/Medical Facilities
 - Personal Protective Equipment
 - Confined Space Entry Plan
 - Shoring Plan
 - Fall Protection Plan
 - Emergency Action Plan
 - Housekeeping
 - Safety Training Requirements and Certification
 - Pedestrian Access Around Work Site During Construction and After Hours

If the project requires other health and safety issues to be addressed, they too shall be included in the Project Health and Safety Plan. The Program shall subsequently be distributed to and implemented by the CONTRACTOR's personnel as well as its Subcontractors and Suppliers. CONTRACTOR shall fully implement and comply with the Safety Program and shall submit to the OWNER a letter signed by CONTRACTOR'S OWNER/president affirming such implementation and compliance within 15 days after on-site work has started. CONTRACTOR shall notify the OWNER when safety meeting will be held so that OWNER's personnel may attend. A copy of the approved Health and Safety Plan must be maintained on-site at all times during the life of the Project.

The OWNER has no responsibility for Work site safety. Work site safety is the responsibility of the CONTRACTOR. The CONTRACTOR is required to have a competent person on site at all times during construction activities.

The CONTRACTOR shall provide signs on work zone fencing that provide information regarding access to businesses and stating that such businesses are open and in operation. The CONTRACTOR shall furnish and install the signs and provide sign attachments for the various business names.

1.14 PROTECTION OF PUBLIC AND PRIVATE PROPERTY

- A. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground construction uncovered or otherwise affected by construction operations.
- B. Restore to their original condition or to a condition as acceptable to the OWNER, pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences and other surface structures affected by construction operations together with sod and shrubs in yards and parking, whether within or outside the easement
- C. Use new materials for replacements.
- D. Do not remove trees outside the permanent easement, except as authorized by OWNER:
 - 1. Where practical, tunnel beneath trees in yards and parking when on or near the line of trench
 - 2. Employ hand excavation as necessary to prevent tree injury.
 - 3. Adequately protect trees left standing against damage by construction operations.
- E. Contractor shall be responsible for all damage to streets, roads, highways, shoulders, ditches, embankments, culverts, location or character, which may be caused by transporting equipment, materials, or personnel to or from the Work or any or site thereof, whether by him or his subcontractors
- F. Make satisfactory and acceptable arrangements with the OWNER of, or the agency or authority having jurisdiction over, any damaged property concerning its repair or replacement, or payment of costs incurred in connection with the damage.
- G. Keep fire hydrants and water control valves free from obstruction and available for use at all times.

1.15 MAINTENANCE OF TRAFFIC

- A. Conduct Work to interfere as little as possible with public travel, whether vehicular or pedestrian:
1. Whenever it is necessary to cross, close, or obstruct private roads, driveways and walks, provide and maintain suitable and safe bridges, detours, or other temporary expedients for accommodation of private travel.
 2. Give OWNERS of private drives reasonable notice before interfering with them.
 3. In making street or access road crossing, do not block more than one-half the street at a time:
 - a. Whenever possible, widen the shoulder on the opposite side to facilitate traffic flow.
 - b. Provide temporary surfacing on shoulders as necessary.
 4. Maintenance of traffic is not required if CONTRACTOR obtains written permission from the OWNER and tenant of private property, or from the authority having jurisdiction over public property involved, to obstruct traffic at the designated point.
- B. Temporary Bridges:
1. Construct temporary bridges at all points where maintenance of traffic near project site as well as across pipeline construction is necessary.
 2. Bridges erected in private roads and driveways shall be adequate for the service to which they will be subjected.
 3. Bridges in public streets, roads, and highways shall be acceptable to the authority having jurisdiction there over.
 4. Provide substantial guard rails and suitably protected approaches.
 5. Provide foot bridges not less than 4 feet wide with handrails and uprights of dressed lumber.
 6. Maintain bridges in place as long as the conditions of the work require their use for safety of the public on private property, except that when necessary for the proper prosecution of the Work in the immediate vicinity of a bridge, the bridge may be relocated or temporarily removed for such period as the authority having jurisdiction may permit.
 7. Driveways shall be left open and ready for use at the end of the work shift.

8. All expenses involved in providing for construction, maintenance, and use of private roads or driveways, shall be borne by the CONTRACTOR and the amount thereof absorbed in the unit prices of the CONTRACTOR's bid.

C. Detour:

1. Provide, as required, bridges across trenches, barricades, guardrail approaches, lights, signals, signs, and other devices necessary for protection of the Work and public safety.
2. Where the authority having jurisdiction requires that traffic be maintained over any construction work in a public street, road, or highway, and traffic cannot be maintained on the original roadbed, or pavements, construct and maintain a detour around the Work.

1.16 BARRICADES AND LIGHTS

- A. Protect streets, roads, highways, and other public thoroughfares which are closed to traffic by effective barricades with acceptable warning signs.
- B. Locate barricades at the street intersecting public thoroughfare on each side of the blocked section.
- C. Provide suitable barriers, signs, and lights to the extent required to adequately protect the public, OWNER personnel, Engineer and Resident Project Representative
- D. Provide similar warning signs and lights at obstructions such as material piles and equipment.
- E. Illuminate barricades and obstructions with warning lights from sunset to sunrise.
- F. Store materials and conduct work to cause the minimum obstruction to the OWNER, Engineer and Resident Project Representative
- G. Install and maintain barricades, signs, lights, and other protective devices in conformity with applicable statutory requirements and, as required by the authority having jurisdiction.

1.17 FIELD ENGINEERING

- A. Employ a Land Surveyor registered in the State of Colorado and acceptable to the Engineer.
- B. Contractor to locate and protect survey control and reference points.

- C. Control datum for survey is that shown on Drawings.
- D. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.
- E. Submit a certificate signed by the Land Surveyor that the elevations and locations of the Work are in conformance with the Contract Documents.

1.18 LINES AND GRADES

- A. Construct all Work to the lines, grades, and elevations indicated on the Drawings:
 - 1. Remove and reconstruct improperly located Work.
- B. Contractor to employ Land Surveyor who will establish horizontal and vertical control points:
 - 1. Use these points as datum for the Work.
 - 2. Provide, without charge, such competent personnel and tool, stakes, and other materials as Engineer may require in establishing or designating control points, in checking layout survey, and measurement work performed by CONTRACTOR.
- C. Provide all additional survey, layout, and measurement work required:
 - 1. Work performed by a qualified professional engineer or registered land surveyor acceptable to Engineer.
 - 2. Locate and protect control points prior to starting site work, and preserve all permanent reference points during construction:
 - a. Make no changes or relocations without prior written notice to Engineer.
 - b. Report to Engineer when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
 - c. Require surveyor to replace Project control points which may be lost or destroyed:
 - 1) Establish replacements based on original survey control.
 - 3. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate mean:
 - a. Site improvements:
 - 1) Stakes for grading, fill and topsoil placement.

- 2) Stakes for roadway centerline and grading
 - 3) Stakes for curb and gutter alignment and slopes
 - 4) Utility alignments and slopes
 - 5) Top of pipe elevations for reuse waterlines
4. From time to time, verify layouts by the same methods.
 5. Maintain a complete, accurate log of all control and survey work as it progresses.
 6. On request of Engineer, submit documentation to verify accuracy of field engineering work.

1.19 REGULATORY REQUIREMENTS

- A. Comply with all federal, state, and local laws, regulations, codes, and ordinances applicable to the Work.
- B. References in the Contract Document to local codes shall mean the codes in effect in Boulder County, Town of Lyons, and State of Colorado.
- C. The following specific permits apply to the Work of this Contract and include but are not limited to:
 1. Boulder County Utility, Traffic Control and Stormwater Quality Permits
 - a. Applied for by CONTRACTOR
 - b. Paid for by CONTRACTOR
 - c. Executed by CONTRACTOR
 2. Town of Erie Right of Way Permit
 - a. Applied for by CONTRACTOR
 - b. Paid for by CONTRACTOR
 - c. Executed by CONTRACTOR
 3. CDPHE Erosion Control and Construction Dewatering Permit
 - a. Applied for by CONTRACTOR
 - b. Paid for by CONTRACTOR
 - c. Executed by CONTRACTOR
- D. Other standards and codes which apply to the Work are designated in the specifications.

1.20 CUTTING AND PATCHING

- A. Employ skilled and experienced installer to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements which affects:
 - 1. Structural integrity of element.
 - 2. Integrity of weather-exposed or moisture-resistant elements.
 - 3. Efficiency, maintenance, or safety of element.
 - 4. Visual qualities of sight-exposed elements.
 - 5. Work of OWNER or separate CONTRACTOR.
- C. Inspection:
 - 1. Inspect existing conditions of the Project, including elements subject to damage or to movement during cutting and patching.
 - 2. After uncovering work, inspect the conditions affecting the installation of products, or performance of the work.
 - 3. Report unsatisfactory or questionable conditions to the Engineer in writing; do not proceed with the work until the Engineer has provided further instructions.
- D. Preparation:
 - 1. Provide adequate temporary support as necessary to assure the structural value of integrity of the affected portion of the Work.
 - 2. Provide devices and methods to protect other portions of the Project from damage.
 - 3. Provide protection from the elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water.
 - 4. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.
 - 5. Restore work which has been cut or removed; install new products to provide completed Work in accordance with requirements of Contract Documents.
 - 6. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces

- E. Execution: Execute cutting, fitting, and patching including attendant excavation and backfill, required to complete Work, or to:
 - 1. Fit the several parts together, to integrate with other Work.
 - 2. Uncover portions of the Work to install or correct ill-timed Work.
 - 3. Remove and replace defective and nonconforming Work.
 - 4. Remove samples of installed Work as specified for testing.
 - 5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
- F. Execute work by methods which will avoid damage to other work, and provide proper surfaces to receive patching and finishing.
- G. Cut rigid materials using masonry saw or core drill.
- H. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
- I. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.
- J. Identify any hazardous substance or condition exposed during the Work to the OWNER for decision or remedy.
- K. Provide products as specified or as required to complete cutting and patching operations.

1.21 ALTERATION PROJECT PROCEDURES

- A. Materials: As specified in product Sections; match existing products and work for patching and extending work
- B. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
- C. Remove, cut, and patch work in a manner to minimize damage and to provide a means of restoring products and finishes to specified condition.
- D. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified condition for each material, with a neat transition to adjacent finishes.

- E. Where new work abuts or aligns with existing, perform a smooth and even transition. Patched work to match existing adjacent work in texture and appearance.
- F. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Engineer?
- G. Where a change of plane of ¼ inch or more occurs, submit recommendation for providing a smooth transition for Engineer review.
- H. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.
- I. Finish surfaces as specified in individual product Sections.

1.22 COORDINATION

- A. Coordinate scheduling, submissions, and Work of the various Sections of specifications to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later. Verify all dimensions and location of items installed later.
- B. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate completion and clean up of Work of separate Sections in preparation for Substantial Completion.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01 22 20 - MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 GENERAL

- A. The total amount bid in the Bid Form shall cover all Work required by the Contract Documents. The prices bid shall include all costs associated with the proper and successful completion for the Work including, but not limited to: furnishing all materials, equipment, supplies and appurtenances; providing all construction equipment and tools; and, performing all necessary labor and supervision to fully complete the Work. All Work not specifically set forth as to the pay item or items listed in the Bid Form shall be considered subsidiary obligations of the CONTRACTOR and all costs in connection therewith shall be included in the prices bid.

1.2 SECTION INCLUDES

- A. Format and Data Required
- B. Preparation of Application for each Progress Payment
- C. Substantiating Data for Progress Payments
- D. Preparation of Application for Final Payment
- E. Submittal Procedure
- F. Basis of Payment
- G. Base Bid
- H. Bid Item No. 1 through 25

1.3 RELATED SECTIONS

- A. The following list of Related Sections is not all inclusive and is provided for convenience only.
 - 1. Division 00, Procurement and Contracting Requirements
 - 2. Section 01 29 73, Schedule of Values

1.4 FORMAT AND DATA REQUIRED

- A. Submit applications typed on Application for Payment and Certificate for Payment using the required form included in Division 00 with itemized data typed on 8-1/2 inch by 11-inch white paper continuation sheets. Copies of forms are available from Engineer.

- B. Provide Itemized Data on Continuation Sheet:
 - 1. Format, schedules, line items, and values: Those of Section 01 29 73, Schedule of Values.

1.5 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

- A. Submit Applications for Payment to Engineer in accordance with the schedule established by Conditions of the Contract and Agreement Between OWNER and CONTRACTOR.
- B. Application Form:
 - 1. Fill in required information, including that for Change Orders executed prior to the date of submittal application.
 - 2. Fill in summary of dollar values to agree with the respective totals indicated on the continuation sheets.
 - 3. Execute certification with the signature of authorized officer of the CONTRACTOR's firm.
 - 4. Notarize signature where required on Certificate for Payment.
- C. Continuation Sheets:
 - 1. Fill in total list of all scheduled component items of Work, with time number and the scheduled dollar value for each item.
 - 2. Fill in the dollar value in each column for each scheduled line item when work has been performed or products stored.
 - 3. List each Change Order executed prior to the date of submission at the end of the continuation sheets:
 - a. List by Change Order number, dollar amount, and description as for an original component item of work.
 - 4. Use data from approved Schedule of Values: Provide dollar value in each column for each line item for portion of work performed and for stored products.

1.6 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

- A. When OWNER or Engineer requires substantiating data, CONTRACTOR shall submit suitable information, with a cover letter identifying:
 - 1. Project

2. Application number and date
 3. Detailed list of enclosures
 4. For stored products:
 - a. Item number and identification as shown on application
 - b. Description of specific material
- B. Submit 1 copy of data and cover letter for each copy of application.
- C. Submit an updated construction schedule with each application for payment.
- D. Submit construction photographs and video records taken during period for which payment is requested; reference requirements of Section 01 32 33, Construction Photographs.
- E. Submit evidence of payment and release of liens within 60 days of payment to CONTRACTOR for Work performed by subcontractors or for equipment and materials delivered to the site during construction.

1.7 PREPARATION OF APPLICATION FOR FINAL PAYMENT

- A. Fill in Application form as specified for progress payments.
- B. Use continuation sheets for presenting the final statement of accounting as specified in Section 01 70 00, Contract Closeout.

1.8 SUBMITTAL PROCEDURE

- A. Submit Applications for Payment to Engineer at the times stipulated in the Agreement.
- B. Number: Five copies of each Application.
- C. When Engineer finds the Application properly completed and correct, he will transmit two Certificates for Payment to OWNER, with a copy to CONTRACTOR. Upon approval by OWNER, OWNER will transmit payment to CONTRACTOR with one copy of Certificate attached.

1.9 BASIS OF PAYMENT

- A. For all lump sum work, payment will be made on the basis of percent of Work and materials furnished complete in place in accordance with the descriptions herein, the project manual, details on the drawings, and as identified in the Schedule of Values.

1. No payment will be made for bid items or quantities that are not installed.
 2. Except as may be otherwise stipulated, no labor, equipment, materials, or any incidentals required to complete the work will be furnished by OWNER.
 3. Lump sum prices indicate items where the CONTRACTOR is responsible for verifying and determining the work during the bidding process and adjustments will not be made unless the CONTRACTOR can sufficiently demonstrate such adjustment.
- B. For all unit price work, payment will be made on the unit basis of Work and materials furnished complete in place in accordance with the descriptions herein, the project manual, details on the drawings, and as identified in the Schedule of Values.
1. No payment will be made for bid items or quantities that are not installed.
 2. Except as may be otherwise stipulated, no labor, equipment, materials, or any incidentals required to complete the work will be furnished by OWNER.
 3. If the actual Work requires more or fewer quantities than those quantities indicated, provide the required quantities at the unit prices contracted.
- C. Payment for Mobilization and Demobilization: Includes costs for personnel, equipment and supplies, construction offices and the utility costs associated therewith, bonds and insurance, preparing the Project Schedule, etc. Payments will be made based on the percent of work completed in accordance with the “adjusted contract amount” for construction items. The “adjusted contract amount” is defined as the total contract amount less the amount for Mobilization and Demobilization.
1. The amount for mobilization and demobilization shown in the Schedule of Values shall not exceed 5 percent of the total contract amount.
 2. When 1 percent of the adjusted contract amount for construction items is earned, 15 percent of the mobilization and demobilization amount shown in the Schedule of Values will be paid.
 3. When 5 percent of the adjusted contract amount for construction items is earned, an additional 25 percent of the mobilization and demobilization amount shown in the Schedule of Values will be paid.
 4. When 10 percent of the adjusted contract amount for construction items is earned, and additional 35 percent of the mobilization and demobilization amount shown in the Schedule of Values will be paid.
 5. Upon completion of all Work items, payment for the remainder of the mobilization and demobilization amount shown in the Schedule of Values will be paid.

D. Estimated quantities:

1. Estimated quantities in Bid Form are approximate and used only for:
 - a. Basis for estimating probable cost of Work.
 - b. For comparison of Bids submitted for Work
2. Actual work done or materials furnished under Unit Price items may differ from estimated quantities.
3. Basis of payment: Actual amount of Work done and materials furnished complete in place in accordance with the description below, the project manual and details on the drawings.
4. Contractor or OWNER may request re-negotiation of the Unit Price for an item if the actual field measured Work done for that item differs from the estimated quantity by a variance of more than 50 percent, unless specified otherwise in the description of the bid item below.
5. Contractor will not submit any claim for damages or loss of anticipated profit for any item for which the actual Work performed is accordance with Article 1.9 E 4.
6. Re-negotiated Unit Prices shall be based on actual costs to CONTRACTOR of performing the Work plus a reasonable allowance for overhead and profit covered by the renegotiated Unit Price.
7. Contractor shall submit to OWNER satisfactory data substantiating the actual costs to perform the Work covered by the Unit Price being re-negotiated and substantiating its overhead rate.
8. No payment will be made for quantities of the bid item that are not installed.

1.10 BASE BID

1. No quantity measurement for payment will be made.
2. Payment will be made on a lump sum basis relative to percent complete of all Work required to complete the project in conformance with the Contract Documents, including cleanup, and other Work that is not otherwise covered in a bid item.

1.11 BID ITEM NO 1– MOBILIZATION AND DEMOBILIZATION

1. Quantity measurement for payment will be made as indicated in Article 1.9 C of this specification.
2. Payment will be made on a lump sum basis as indicated in Article 1.9 C of this specification.

1.12 BID ITEM NO 2 – TRAFFIC CONTROL

1. No quantity measurement for payment will be made.
2. Payment will be made on a lump sum basis relative to percent complete for all Work required for traffic control in conformance with the Contract Documents, including but not limited to, all labor, equipment, and materials for installing all necessary traffic control measures, preparation of traffic controls plans from authorities having jurisdiction, traffic control devices, temporary signs, temporary barricades, setup and removal of signage as many times as is required by construction sequencing, flaggers, and all other items or work specified in the technical specifications and permits. Payment also includes providing flaggers wherever and whenever traffic is restricted to one drive lane by the CONTRACTOR's operations per the approved traffic control plan. Payment for lighting stations and other additional costs related to night or weekend work will be considered incidental to this bid item.

1.13 BID ITEM NO 3 – PERMITTING

1. No quantity measurement for payment will be made.
2. Payment will be made on a lump sum basis relative to percent complete to include all Work required to obtain and maintain compliance with permitting requirements not specified in other bid items, including but not limited to paying all fees, coordination, execution and submittal of all applications, furnishing all engineering, design, labor, equipment, testing and materials.

1.14 BID ITEM NO 4 – EROSION CONTROL AND SEDIMENT MAINTENANCE

1. No quantity measurement for payment will be made.
2. Payment will be made on a lump sum basis relative to percent complete of items for all Work required for erosion and sediment control, including but not limited to, furnishing all materials, labor, tools, and equipment necessary to install and maintain the temporary erosion control and sediment maintenance measures throughout the life of the project, in accordance with approved permits, and to remove the temporary erosion control devices when ordered by the Engineer. Erosion control measures shown on the Plans are not intended to represent all measures required on this project. Payment also includes the preparation and enforcement of a Pollution Control Plan including a Spill Prevention Control and Countermeasures Plan.

1.15 BID ITEM NO 5 – TREE RETENTION AND PROTECTION

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made on a per each (EA) basis.
3. Unit price includes:
 - a. All associated costs, materials, labor, tools, and equipment necessary to protect trees, including but not limited to, furnishing all labor, equipment, and materials.

1.16 BID ITEM NO 6 – REMOVE AND DISPOSE OF EXISTING ASPHALT

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made on a per square yard (SY) basis.
3. Unit price includes:
 - a. All associated costs, materials, labor, tools, and equipment necessary to protect, existing curbs, gutters, aprons, driveways and other concrete flatwork not scheduled for demo or replacement, milling, cutting, removal and disposal of all existing asphalt required to be demolished for trench excavation.

1.17 BID ITEM NO 7 – REMOVE AND DISPOSE OF CONCRETE CURB AND GUTTER

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made on a per linear foot (LF) basis.
3. Unit price includes:
 - a. All associated costs, materials, labor, tools, and equipment necessary for cutting, removing, disposal of all existing curb and gutters required to be demolished for trench excavation of the reuse water main to the next existing control joint away from the edge of the trench.

1.18 BID ITEM NO 8 – REMOVE AND DISPOSE OF CONCRETE WALK

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made on a per square yard (SY) basis.
3. Unit price includes:

- a. All associated costs, materials, labor, tools, and equipment necessary for removing and disposal of all existing concrete walks required to be demolished for trench excavation of the reuse water main to the next existing control joint away from the edge of the trench.

1.19 BID ITEM NO 9 – REMOVE AND DISPOSE OF STAMPED CONCRETE MEDIAN

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made on a per square yard (SY) basis.
3. Unit price includes:
 - a. All associated costs, materials, labor, tools, and equipment necessary for removing and disposal of all existing concrete median and brick pavers required to be demolished for trench excavation of the reuse water main to the next existing control joint away from the edge of the trench.

1.20 BID ITEM NO 10 – PROTECT EXISTING UTILITY LINES AT CROSSINGS

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made for each (EA) utility crossing.
3. Unit price includes:
 - a. All associated costs, materials, labor, tools, and equipment necessary to retain, support, and protect existing utilities at new reuse water main crossings.

1.21 BID ITEM NO 11 – EXPORTED SPOILS

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made on a per cubic yard (CY) basis.
3. Unit price includes:
 - a. All associated costs, materials, labor, tools, and equipment necessary for removal and disposal of excess dirt or unsuitable soil from trench excavation.

1.22 BID ITEM NO 12 – C900 REUSE WATER MAIN PIPING

1. Quantity measurement for payment will be made.

2. Payment will be made on a unit price basis. A payment will be made on a per linear foot of pipe that is installed without deduction for fittings and valves. When water mains intersect, the measurement of each main shall be to the intersection of the center lines of the connecting fittings.
3. Unit price includes:
 - a. All associated costs, materials, labor, tools, and equipment necessary to demo, cut, repair, remove and dispose of existing irrigation, water and sewer piping within trench limits of new reuse water piping; excavate, install, bed and backfill to road subgrade or finished grade elevation in landscaping areas; furnish and install new reuse water main pipe, including but not limited to all required mechanical pipe restraint and joint restraint systems for pipe and marking tape.
 - b. Price includes costs associated with testing and flushing of the reuse water mains.
4. Unit price excludes:
 - a. This unit pricing does not include costs associated with the installation of reuse water main gate valves.
 - b. This unit pricing does not include costs associated with the installation of fittings.
 - c. This unit pricing does not include costs associated with making connections to existing piping.

1.23 BID ITEM NO 13 – REUSE WATER MAIN GATE VALVES

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made for each valve that is installed.
3. Unit price includes:
 - a. All associated costs, materials, labor, tools, and equipment necessary to excavate and install valves, mechanical joint restraint systems, valve boxes, risers, covers, extensions, and centering stems including all other necessary material, work, and equipment required for this item in accordance with the drawings and project manual.

1.24 BID ITEM NO 14 – BLOW-OFF VALVE

1. Quantity measurement for payment will be made.

2. Payment will be made on a unit price basis. A payment will be made for each blow-off assembly that is installed.
3. Unit price includes:
 - a. All associated costs, materials, labor, tools, and equipment necessary to excavate and install 12" reuse water main plug with 2" tap, 2" pipe, valves, valve box, curb stop box, risers, covers, extensions, gravel, bed and backfill to road subgrade or finished grade elevation in landscaping areas, including all other necessary material, work, and equipment required to complete this item in accordance with the drawings and the project manual.

1.25 BID ITEM NO 15 – DUCTILE IRON TEE, 12" X 8"

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made for each ductile iron tee that is installed.
3. Unit price includes:
 - a. All associated costs, materials, labor, tools and equipment necessary to install, mechanical joint restraint systems, bed and backfill to road subgrade or finished grade elevation in landscaping areas, all tee fittings.

1.26 BID ITEM NO 16 – DUCTILE IRON PIPE BEND

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made for each ductile iron pipe bend that is installed.
3. Unit price includes:
 - a. All associated costs, materials, labor, tools and equipment necessary to install, mechanical joint restraint systems, bed and backfill to road subgrade or finished grade elevation in landscaping areas, all pipe bends.

1.27 BID ITEM NO 17 – INSTALL THRUST BLOCK

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made for each thrust block that is installed.
3. Unit price includes:

- a. All associated costs, materials, labor, tools and equipment necessary to install, concrete thrust blocks (including concrete, excavation, and thrust plates) including all other necessary material, work, and equipment required to complete this item in accordance with the drawings and the project manual.

1.28 BID ITEM NO 18 – CONNECTION TO EXISTING PIPE

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made for each connection to existing pipe that is completed.
3. Unit price includes:
 - a. All associated costs, materials, labor, tools and equipment necessary to connect to existing reuse water main.
 - b. The unit price shall include any incidental excavation, backfill and additional work required to cut or tie to existing piping including but not limited to the installation of branch-line fittings, restraint, concrete thrust blocks, bedding and backfill to road subgrade or finished grade in landscaping areas as well as demo, removal and disposal of pipe and fittings required for completion of the work.

1.29 BID ITEM NO 19 – IMPORTED BACKFILL

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made on a per cubic yard (CY) basis.
3. Unit price includes:
 - a. All associated costs, materials, labor, tools, and equipment necessary for importing, storing and installing backfill for trench backfilling as well as all incidental work in accordance with the drawings and the project manual.

1.30 BID ITEM NO 20 – AGGREGATE BASE COURSE

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made on a per cubic yard (CY) basis.
3. Unit price includes:

- a. All associated costs, materials, labor, tools, and equipment necessary for providing, storing, and installing aggregate base course as well as all incidental work in accordance with the drawings and the project manual.

1.31 BID ITEM NO 21 – HOT MIX ASPHALT (HMA) –PG 64-22

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made on a per ton (TON) basis.
3. Unit price includes:
 - a. All associated costs, materials, labor, tools, and equipment necessary for providing and installing the HMA as well as all incidental work in accordance with the drawings and the project manual.

1.32 BID ITEM NO 22 – ROAD PAVEMENT MARKINGS

1. No quantity measurement for payment will be made.
2. Payment will be made on a lump sum basis relative to percent complete of items for all Work required for road pavement markings, including but not limited to, furnishing all materials, labor, tools, and equipment necessary to replace all impacted road pavement markings to match existing conditions.

1.33 BID ITEM NO 23 – INSTALL CONCRETE CURB AND GUTTER

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made on a per linear foot (LF) basis.
3. Unit price includes:
 - a. All associated costs, materials, labor, tools, and equipment necessary for replacing removed sections of curb and gutter.

1.34 BID ITEM NO 24 – INSTALL CONCRETE WALK

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made on a per square yard (SY) basis.
3. Unit price includes:

- a. All associated costs, materials, labor, tools, and equipment necessary for replacing removed sections of concrete walk.

1.35 BID ITEM NO 25 – INSTALL COLORED AND STAMPED CONCRETE

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made on a per square yard (SY) basis.
3. Unit price includes:
 - a. All associated costs, materials, labor, tools, and equipment necessary for replacing removed sections of colored and stamped concrete.

1.36 BID ITEM NO 26 – LANDSCAPING AND GENERAL SURFACE RESTORATION

1. Quantity measurement for payment will be made.
2. Payment will be made on a unit price basis. A payment will be made on a per square yard (SY) basis.
3. Unit price includes:
 - a. All associated costs, materials, labor, tools, and equipment necessary for surface restoration other than streets, sidewalks, curbs and gutters including stripping and stockpiling topsoil, regrading to original contours, bark mulching planting areas, seeding, sodding and successful establishment of vegetative cover, including ongoing supplemental irrigation, fertilization and maintenance of plantings as well as cleanup following construction as required.

1.37 BID ITEM NO 27 - ESTIMATED QUANTITY FOR GROUNDWATER DEWATERING

1. Quantity measurement for payment will be made. A payment will be made for each month that the dewatering system is in service.
2. Payment will be made on a unit price basis. A payment will be made for mobilization, installation and commissioning of the dewatering system. Monthly payments will be made for rental and operation costs. A payment will be made for demobilization and decommissioning of the dewatering system.
3. Unit price includes:
 - a. All costs associated with groundwater dewatering that is not due to overland intercepted stormwater, collection of rain within excavation or any other source of water that in the opinion of the Engineer is not groundwater.

1.38 BID ITEM NO 28 - ESTIMATED QUANTITY FOR STABILIZATION OF SUBGRADE SOIL

1. Quantity measurement for payment will be made to the nearest ½ cubic yard of material removed by estimating the limits of the excavation through physical measurement. Estimation of this quantity in terms of truckloads or other means shall be at the sole discretion of the Engineer and OWNER.
2. Payment will be made on a unit price basis. Payment will be made on a cubic yard basis after stabilization is complete in place. No payment will be made for over-excavation performed without prior direction from the Engineer.
3. Unit price includes:
 - a. All costs associated with soil stabilization to achieve adequate bearing conditions for foundations, utilities or paving by means other than dewatering and/or compaction of native soils where removal of unsuitable soils and stabilization are directed by written instructions from the Engineer, including but not limited to, the excavation, shoring, removal, and disposal of material necessary in order to achieve suitable bearing conditions. Payment for this item shall not include work required due to CONTRACTOR's negligence to properly prepare and protect the work.

PART 1 PRODUCTS - NOT USED

PART 2 EXECUTION - NOT USED

END OF SECTION

SECTION 01 25 00 - PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Description of product options available to CONTRACTOR, including:
 - 1. Products Specified by Reference Standards or by Description Only.
 - 2. "Named" products
 - 3. "Or Equal" products
 - 4. "Substitution" products
- B. Procedures for securing acceptance of proposed Substitutions.

1.2 RELATED SECTIONS

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section.
- B. Division 00, Procurement and Contracting Requirements
- C. Section 01 33 00 – Submittal Procedures.

1.3 GENERAL REQUIREMENTS

- A. The Contract is based on standards of quality established in Contract Documents:
 - 1. In agreeing to terms and conditions of Contract, CONTRACTOR has accepted a responsibility to verify that specified products are available and to place orders for all required materials in such a timely manner as is needed to meet construction schedule.
 - 2. Neither OWNER nor Engineer agrees to substitution of materials or products called for in Contract Documents, except as they may be specifically allowed as stated otherwise in writing.
- B. The Contract Documents may reference product options by the following four methods:
 - 1. Products Specified by Reference to Standards or by Description Only
 - 2. "Named" products
 - 3. "Equal" products
 - 4. "Substitution" products

- C. Regardless of how products are referenced, Contractor must submit information in accordance with Section 01 33 00 demonstrating the proposed product or system meets the specifications.

1.4 PRODUCT OPTIONS

- A. Products Specified by Reference to Standards or by Description Only
 - 1. Refers to any product specified by reference to standard specification or standard such as ASTM, AWWA, or similar standards, or by description.
 - 2. Any product that meets the referenced or specified standard and/or description may be used in the Work.
- B. "Named" Products
 - 1. Refers to products specified by specifically naming one or more manufacturers.
 - 2. Named manufacturer(s) reflects standard of quality and/or the basis of design for the product or system.
 - 3. Where materials and/or products are specified by specifically naming one or more manufacturer and/or model number, without stating that an "Equal" or "Accepted Substitution" will be considered, only the "Named" material and/or products may be used in the Work.
 - 4. Being "Named", by reference to a manufacturer or model number, does not relieve CONTRACTOR, supplier or manufacturer of responsibility to meet specifications.
- C. "Equal" Products
 - 1. Where "Named" products or systems are followed by the words: "Equal"; "Or Equal"; "Approved Equal"; or "Accepted Equal"; CONTRACTOR may use the "Equal" product in the Work.
 - 2. "Equal" products must meet or exceed the standard of quality established by reference to the Named product and must also conform to all referenced standards and specifications.
 - 3. "Equal" products are not considered "Substitutions" but are subject to the review provision of Section 01 33 00.
- D. "Substitution" Products
 - 1. "Substitutions" refers to any product or system that is not specifically named, and no provision for allowance of an "Equal" product or system is included when describing the product or system.
 - 2. Substitutions to "Named" or "Equal" products will be considered only if the Named product is followed by the words "(or) Accepted Substitution".
 - 3. Where the phrase "(or) Accepted Substitution" occurs in Contract Documents, do

not assume that materials, equipment or products will be accepted as a Substitution.

4. Proposed Substitutions will only be considered by Engineer after the effective date of the OWNER-CONTRACTOR Agreement upon written request for Substitution in accordance with this Section and the Agreement terms.

1.5 SUBSTITUTIONS

- A. Engineer will consider requests for Substitutions only within 30 days after date of the Agreement.
- B. Requests for Substitution will only be considered when submitted through CONTRACTOR.
- C. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submissions, without separate written request.
- D. Substitutions may be considered when a Product becomes unavailable through no fault of CONTRACTOR:
 1. Should the CONTRACTOR demonstrate to satisfaction of Engineer that specified material or product was ordered in a timely manner and will not be available in time for incorporation into this Work, CONTRACTOR shall submit to Engineer such data on proposed substitute materials and/or product as are needed to help Engineer determine suitability of proposed Substitution.
- E. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- F. A request constitutes a representation that CONTRACTOR:
 1. Investigated proposed product and determined that it meets or exceeds quality level of specified product and that it will perform function for which it is intended.
 2. Will provide same warranty for Substitution as for specified Product.
 3. Will coordinate installation and make changes to other Work which may be required for Work to be complete with no additional cost to OWNER.
 4. Will provide a complete operating installation including any and all changes and additions in structure, piping, building, mechanical and electrical work, controls and accessories necessary to accommodate proposed Substitution.
 5. Waives claims for additional costs or time extension which may subsequently become apparent.
 6. Will reimburse OWNER for review or redesign services associated with review by Engineer and re-approval by authorities.

1.6 PROCEDURE FOR REQUESTING SUBSTITUTION

- A. Submit three copies of request for substitution for consideration in a manner similar to provisions for submission requirements under Section 01 33 00:
 - 1. Substitutions will be considered as "deviations" to the Contract Documents.
 - 2. Submit with transmittal letter describing the deviation and justifications for accepting Substitution.
 - 3. Submit shop drawings, product data, and certified test results attesting to proposed substitution equivalence.
 - 4. Burden of proof is on the proposer.
- B. Limit each request to one proposed Substitution.
- C. Transmittal Contents:
 - 1. Identification of proposed Substitution:
 - a. Manufacturer's name
 - b. Telephone number and representative contact name.
 - c. Specification section or drawing reference of originally specified product including discrete name or tag number.
 - 2. Manufacturer's literature clearly marked to show compliance of proposed Substitution with Contract Documents.
 - 3. Itemized comparison of original product and proposed Substitution addressing characteristics including but not necessarily limited to:
 - a. Size
 - b. Composition
 - c. Weight
 - d. Electrical or mechanical requirements
 - e. Installation and maintenance requirements
 - 4. Product experience:
 - a. Location of at least five previous projects and the date that each installation was completed, commissioned and accepted by OWNER utilizing product in similar situation per Contract Documents.
 - b. Name and telephone number of persons knowledgeable of proposed product associated with referenced projects.
 - c. Field data and test reports associated with proposed product and installations that demonstrate the ability of the system to meet or exceed the specified requirements.

5. Identify any changes to construction schedule or cost required to implement proposed substitution.
6. Samples:
 - a. Provide in similar manner under provisions of Section 01 33 00 as requested by Engineer.
 - b. Provide full size sample if requested by Engineer.
 - c. Samples will be retained by Engineer until substantial completion.
 - d. Engineer is not responsible for loss or damage to samples.

1.7 ACCEPTANCE OR REJECTION

- A. Engineer will notify CONTRACTOR in writing of decision to accept or reject request for Substitution:
 1. Decision of Engineer is final.
 2. Engineer will affix stamp and indicate acceptance of Substitution in writing.
 3. The contract will be amended under the provisions of the General Conditions for substitutions that are acceptable.
- B. Engineer reserves the right to require proposed Substitution to comply with all aspects of specified product to secure design intent.
- C. If request for Substitution results in change of Contract Amount or Contract Time, adjustments will be applied under provisions in General Conditions.
- D. Substitutions will be rejected if:
 1. Submission is not through CONTRACTOR with CONTRACTOR stamp of approval.
 2. Requests for Substitution are not made in accordance submission procedures outlined herein.
 3. Acceptance will require substantial revision of the original design as determined by Engineer.
 4. Substitution is not equal to original product specified or will not adequately perform intended function as determined by Engineer.

1.8 REIMBURSEMENT OF SUBSTITUTION REVIEW COSTS

- A. In the event Substitutions are proposed to Engineer after award of Contract, Engineer will record all time used by Engineer and Engineer's consultants in evaluating each proposed Substitution.

- B. Contractor shall reimburse OWNER for all charges of Engineer and Engineer's consultants for time spent in evaluating proposed Substitution, whether or not the Engineer approves a proposed Substitution:
 - 1. Costs for Substitution review will be deducted from payments due CONTRACTOR as change order deducts.
 - 2. Charges for review of proposed Substitution will include Engineer's Project Manager, Engineer's consultants in accordance with their current rate schedule.

1.9 DELAYS

- A. Delays in construction arising by virtue of the non-availability of a specified material and/or product will not be considered by the Engineer as justifying an extension of the agreed time of Substantial and/or Final Completion.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

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SECTION 01 26 13 - REQUEST FOR INTERPRETATION (RFI)

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Definitions
- B. Requirements
- C. Format
- D. Distribution

1.2 RELATED SECTIONS

- A. Division 00, Procurement and Contracting Requirements
- B. Section 01 33 00 – Shop Drawings, Product Data, and Samples

1.3 DEFINITIONS

- A. Request for Interpretation: A document submitted by the CONTRACTOR requesting clarification of a portion of the Contract Documents, hereinafter referred to as an RFI.

1.4 REQUIREMENTS

- A. Contractors Request for Interpretation (RFIs): Should CONTRACTOR be unable to determine from the Contract Documents the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of Work is described differently at more than one place in the Contract Documents; the CONTRACTOR shall request that the Engineer make an interpretation of the requirements of the Contract Documents to resolve such matter. CONTRACTOR shall comply with procedures specified herein to make Requests for Interpretation (RFIs).
- B. Subcontractor-Initiated and Supplier-Initiated RFIs: RFIs from subcontractors and material suppliers shall be submitted through, be reviewed by and be attached to an RFI prepared, signed, and submitted by CONTRACTOR. RFIs submitted directly by subcontractors or material suppliers will be returned unanswered to the CONTRACTOR.
 - 1. Contractor shall review all subcontractor and supplier initiated RFIs and take actions to resolve issues of coordination, sequencing and layout of the Work.

2. RFIs submitted to request clarification of issues related to means, methods, techniques and sequences of construction or for establishing trade jurisdictions and scopes of subcontracts will be returned without interpretation. Such issues are solely the CONTRACTOR's responsibility.
 3. Contractor shall be responsible for delays resulting from the necessity to resubmit an RFI due to insufficient or incorrect information presented in the RFI.
- C. Requested Information: CONTRACTOR shall carefully study the Contract Documents to ensure that information sufficient for interpretation of requirements of the Contract Documents is not included. RFIs that request interpretation of requirements clearly indicated in the Contract Documents will be returned without interpretation.
1. In all cases in which RFIs are issued to request clarification of issues related to means, methods, techniques, and sequences of construction, for example, pipe and duct routing, clearances, specific locations of Work shown diagrammatically, apparent interferences and similar items, the CONTRACTOR shall furnish all information required for the Engineer to analyze and/or understand the circumstances causing the RFI and prepare a clarification or direction as to how the CONTRACTOR shall proceed.
 2. If information included with this type of RFI by the CONTRACTOR is insufficient, the RFI will be returned.
 3. Organize RFI considering scope and impact of RFI subject matter on work to be completed by all trades. Requested information shall be limited to a specific work item or area, treatment process or specific equipment and critical related systems. RFIs addressing multiple unrelated subjects will be returned without response with direction to resubmit RFIs conforming to the requirements of this section.
- D. Allow a minimum of 14 calendar days for review of RFI by Engineer upon receipt of RFI at Engineer's office. RFIs received after 12:00 p.m. local time shall be considered received on the next regular working day for the purpose of establishing the start of the 14-day review period.
1. Time required to mail submissions or resubmissions is not considered part of review period.
 2. Limit the total amount of RFIs to twenty (20) for the duration of the Project.
 3. Requests for expedited reviews shall be limited to 5 total RFIs. Expedited review period shall be 7 calendar days.
 4. Charges for engineering review of RFIs in excess of 20 shall be back charged to the CONTRACTOR for the time required to process them. Charges may include time

for the Engineer's Project Manager, Engineer and Submittal in accordance with the current rate schedule.

- E. Unacceptable Uses for RFIs: RFIs shall not be used for the following purposes:
 - 1. To request approval of submittals, use procedure specified in Section 01 33 00 – Submittal Procedures.
 - 2. To request changes that only involve change in Contract Time and Contract Sum comply with provisions of the Contract General Conditions, as discussed in detail during pre-construction meeting.
 - 3. To request different methods of performing Work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Contract General Conditions).
 - 4. To request information for several unrelated aspects of work.
- F. In the event that the CONTRACTOR believes that a clarification by the Engineer results in additional cost or time, CONTRACTOR shall not proceed with the Work indicated by the RFI until authorized to proceed by the OWNER and Engineer and claims, if any, are resolved in accordance with provisions in the General Conditions of the Contract.
- G. Contractor shall prepare and maintain a log of RFIs, and at any time requested by the Engineer, the CONTRACTOR shall furnish copies of the log showing all outstanding RFIs.

1.5 FORMAT

- A. RFIs shall be prepared using the form provided by Engineer.
 - 1. Forms shall be completely filled in, and if prepared by hand, shall be fully legible after copying.
 - 2. Each RFI shall be given a discrete, consecutive number.
 - 3. Each page of the RFI and each attachment to the RFI shall bear the Project name, project number, date, RFI number, and descriptive title.
 - 4. Contractor shall sign all RFIs attesting to good faith effort to determine from the Contract Documents the information requested for interpretation. Frivolous RFIs shall be subject to reimbursement from CONTRACTOR to OWNER for fees charged by Engineer, Engineer's consultants and other design professionals engaged by the OWNER.

1.6 DISTRIBUTION

- A. Engineer will distribute copies of RFIs with responses to:
1. One copy to OWNER.
 2. One copy to Resident Project Representative.
 3. One copy to be retained in Engineer's file.
 4. One copy to CONTRACTOR to be kept on file at job site.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

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SECTION 01 29 73 - SCHEDULE OF VALUES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Schedule of Values
- B. Sub-schedule of Unit Material Values
- C. Cash Flow Projection

1.2 RELATED SECTIONS

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section.
- B. Section 01 22 20, Measurement and Payment
- C. Section 01 31 00, Project Meetings

1.3 SUBMITTALS

- A. CONTRACTOR may be required to submit a schedule of values, sub-schedule of unit material values and cash flow projections for the Work as indicated in Division 00, Procurement and Contracting Requirements.
- B. Submit to Engineer a Schedule of Values allocated to the various portions of the Work, within seven (7) days after the Notice of Award.
- C. Upon request of Engineer, support the values with data which will substantiate their correctness.
- D. An unbalanced Schedule of Values providing over payment of CONTRACTOR on items of the Work which will be performed early will not be accepted.
- E. Revise and resubmit the Schedule of Values until acceptable to Engineer. No Applications for Payment shall be submitted until Schedule of Values is accepted.
- F. The Schedule of Values, when accepted by Engineer, shall be used only as the basis for the CONTRACTOR's Applications for Payment.

1.4 FORM AND CONTENT OF SCHEDULE OF VALUES

- A. Type schedule on 8-1/2 inch by 11-inch white paper; CONTRACTOR's standard forms and automated printout will be considered for approval by Engineer upon CONTRACTOR's request. Identify schedule with:
 - 1. Title of project and location
 - 2. Engineer and project number
 - 3. Name and address of CONTRACTOR
 - 4. Contract designation
 - 5. Date of submission
- B. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction.
- C. Follow the Table of Contents of this Project Manual as the format for listing component items:
 - 1. Identify each line item with the number and title of the respective major section of the specifications.
- D. For each major line-item list sub-values of major products or operations under the item.
- E. List such items as bond and insurance premiums, temporary construction facilities, monthly field overhead, mobilization and demobilization separately.
- F. For the Various Portions of the Work:
 - 1. Each item shall include a directly proportional amount of the CONTRACTOR's overhead and profit.
 - 2. For items on which progress payments will be requested for stored materials, break down the value into:
 - a. The cost of the materials, delivered and unloaded, with taxes paid.
 - b. The total installed value, including CONTRACTOR's overhead and profit.
- G. The sum of all values listed in the schedule shall equal the total Contract Sum.

1.5 SUBSCHEDULE OF UNIT MATERIAL VALUES

- A. Submit a sub-schedule of Unit Costs and Quantities for:
 - 1. Products on which progress payments will be requested for stored products.
- B. The form of submittal shall parallel that of this Section, Section 01 29 73, Schedule of Values, with each item identified the same as the line item in the Schedule of Values.

- C. The unit quantity for bulk materials shall include an allowance for normal waste.
- D. The Unit Values for the Materials Shall be Broken Down into:
 - 1. Cost of the material, delivered and unloaded at the site, with taxes paid.
 - 2. Installation costs, including CONTRACTOR's overhead and profit.
- E. The installed unit value multiplied by the quantity listed shall equal the cost of that item in the Schedule of Values.

1.6 CASH FLOW PROJECTION

- A. Submit estimated cash flow projection for the project:
 - 1. Estimate monthly pay applications.
 - 2. Coordinate with Schedule of Values and Section 01 32 16, Construction Schedule.
- B. Resubmit a revised cash flow projection with any pay application which brings the aggregate of all pay applications to date to value which differs from the projected value by more than +20 percent.

1.7 BREAKDOWN OF CONTRACT PRICE

- A. Within 10 days after the Effective Date of the Contract, submit a complete breakdown of all lump sum bid items showing the value assigned to each part of the work, including an allowance for profit and overhead adding up to the total lump sum contract price.
- B. Breakdown of lump sum bids shall be coordinated with the items in the schedule of values and shall be in sufficient detail to serve as the basis for progress payments during construction.
- C. Engineer will review the contract price breakdown and may request items to be further broken down or for more items be added in order to facilitate tracking of work progress for payment.
- D. Preparatory work, mobilization and demobilization, bonds, and insurance required in setting up the job will be allowed as a separate entry on the cost breakdown and shall be in accordance with the provisions of Measure and Payment Specification 01 22 20.
- E. Upon acceptance of the breakdown of the contract price by the Engineer, it shall be used as the basis for all requests for payment.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION

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SECTION 01 31 00 - PROJECT MEETINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General requirements.
- B. Preconstruction conference.
- C. Schedule finalization meeting.
- D. Progress meetings.
- E. Preinstallation conferences.

1.2 RELATED SECTIONS

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section.
- B. Section 01 01 00, Summary of Work.
- C. Section 01 32 16, Construction Schedules.
- D. Section 01 33 00, Submittal Procedures
- E. Section 01 70 00, Contract Closeout.

1.3 GENERAL REQUIREMENTS

- A. CONTRACTOR will schedule and administer pre-construction meeting, regularly scheduled progress meetings, and specifically called meetings throughout the progress of the Work:
 - 1. Prepare agenda for meetings including items requested by OWNER and CONTRACTOR.
 - 2. Notify OWNER and CONTRACTOR 7 days in advance of meeting date.
 - 3. Preside at meetings.

4. Record the minutes; include all significant proceedings and decisions.
 5. Reproduce and distribute copies of minutes within 5 days after each meeting:
 - a. To all participants in the meetings.
 - b. To OWNER.
 - c. Furnish 3 copies of minutes to CONTRACTOR.
- B. Engineer may attend meetings.
- C. OWNER may attend meetings.
- D. Representatives of CONTRACTOR(s)-, subcontractors, and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.

1.4 PRECONSTRUCTION CONFERENCE

- A. CONTRACTOR will schedule a conference after Notice of Award.
- B. Location: A central site, convenient for all parties.
- C. Attendance:
1. OWNER's Representative.
 2. Engineer and his professional consultants.
 3. Resident Project Representative.
 4. CONTRACTOR's Superintendent.
 5. Major Subcontractors.
 6. Major Suppliers.
 7. Others as appropriate.
- D. Agenda:
1. Execution of OWNER / CONTRACTOR Agreement.
 2. Submission of executed bonds and insurance certificates.
 3. Distribution of Contract Documents.

4. Submission of list of subcontractors and suppliers, list of products, Schedule of Values, and progress schedule.
5. Designation of personnel representing the parties in Contract and the Engineer.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, cost proposal requests, Change Orders and Contract closeout procedures.
7. Construction scheduling and updates.
8. Scheduling activities of geotechnical Engineer.
9. Critical work sequencing.
10. Major equipment deliveries and priorities.
11. Procedures for maintaining Record Documents.
12. Use of premises:
 - a. Office, work and storage areas.
 - b. OWNER's requirements.
13. Construction facilities, controls and construction aids.
14. Temporary utilities provided by OWNER.
15. All safety and first-aid procedures are responsibility of the CONTRACTOR.
16. Security and housekeeping procedures as required by the OWNER.
17. Procedures for testing.
18. Requirements for start-up of equipment.

1.5 SCHEDULE FINALIZATION MEETING

- A. CONTRACTOR will schedule at least 10 days before submission of the first Application for Payment.
- B. Location: A central site convenient for all parties.
- C. Attendance:
 1. OWNER's representative.
 2. Engineer.

3. CONTRACTOR.
 4. Others, as appropriate.
- D. Suggested Agenda:
1. Schedule of Values.
 2. Construction Schedule.
 3. Submittal Schedule.
 4. Equipment Delivery Schedule.

1.6 PROGRESS MEETINGS

- A. CONTRACTOR will schedule and administer meetings throughout progress of the Work at maximum biweekly intervals.
- B. Location of the Meetings: The project field office of the CONTRACTOR, or other locations arranged for by CONTRACTOR, convenient to all parties.
- C. CONTRACTOR will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies within five days to Engineer, OWNER, participants, and those affected by decisions made.
- D. Attendance:
1. OWNER's Representative.
 2. Engineer, and his professional consultants as needed.
 3. Resident Project Representative as needed.
 4. CONTRACTOR's Superintendent.
 5. Subcontractors as appropriate to the agenda.
 6. Suppliers as appropriate to the agenda.
 7. Others, as appropriate.
- E. Agenda:
1. Review minutes of previous meetings.
 2. Review unresolved issues from last meeting.
 3. Review of Work progress.

4. Field observations, problems, conflicts and decisions.
5. Identification of problems which impede planned progress.
6. Review of submittals schedule and status of submittals.
7. Review of off-site fabrication and delivery schedules.
8. Maintenance of progress schedule.
9. Corrective measures to regain projected schedules.
10. Planned progress during succeeding work period.
11. Coordination of projected progress.
12. Maintenance of quality and work standards.
13. Effect of proposed changes on progress schedule and coordination
14. Other business relating to Work.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 32 16 - CONSTRUCTION SCHEDULES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Requirements.
- B. Format.
- C. Content.
- D. Progress Revisions.
- E. Submittals.
- F. Distribution.

1.2 RELATED SECTION

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section.
- B. Section 01 10 00, Summary of Work.
- C. Section 01 22 20, Measurement and Payment.
- D. Section 01 31 00, Project Meetings.
- E. Section 01 33 00, Submittal Procedures.
- F. Section 01 29 73, Schedule of Values.
- G. Section 01 70 00, Contract Closeout.

1.3 REQUIREMENTS

- A. CONTRACTOR may be required to submit an estimated construction progress schedule for the Work, with sub-schedules of related activities which are essential to its progress as indicated in Division 00, Procurement and Contracting Requirements.
- B. Within 10 days after Effective Date of Agreement, CONTRACTOR shall prepare and submit to Engineer estimated construction progress schedules for the Work, with subschedules of related activities which are essential to its progress.
- C. Submit revised progress schedules with each pay request.

- D. OWNER may require CONTRACTOR to add to his plant, equipment, or construction forces, as well as increase the working hours, if operations fall behind schedule at any time during construction period.

1.4 FORMAT

- A. General schedule format: Conform to ©Primavera, Suretrack critical path method (CPM) scheduling format or approved equal:
 - 1. Base schedule on workdays and regular working hours, Monday through Friday, as specified in Division 00, Procurement and Contracting Requirements.
 - 2. Minimum sheet size: 8-1/2 inch by 11 inch.
 - 3. Color format.
- B. Row (Listings)—Show:
 - 1. Project Title.
 - 2. Major areas of construction.
 - 3. Construction activities within major areas of construction.
 - 4. Provide a separate bar for each construction activity. Bars to be annotated with activity description.
 - 5. Critical path activities to be clearly identified by color and lines.
 - 6. List in chronological order by start date each major area of construction and then by each construction activity within its respective area of construction.
 - 7. Show project start date, finish date, data date, run date, and revision table.
 - 8. Contract milestone dates.
 - 9. Legend.
- C. Column (Headings)—Show:
 - 1. Activity ID: Define by number corresponding to major specification sections.
 - 2. Activity Description.
 - 3. Percent Complete.
 - 4. Original Duration.
 - 5. Remaining Duration.

6. Total Float.
7. Early Start.
8. Early Finish.
9. Time Scale: Identify first day of each week. Allow space for notations.
10. Data date line.

1.5 CONTENT

A. Construction progress schedule:

1. Submit initial construction schedule for full length of Contract time as specified in Division 00, Procurement and Contracting Requirements, including number of days for float.
2. Initial construction schedule submitted with early substantial and final completion prior to specified Contract time will not be acceptable.
3. Initial construction schedule will be used to evaluate critical path and Contract time extensions requested by CONTRACTOR.
4. Subsequent construction schedules may reflect an accelerated schedule with early finish that may or may not include reduced number of days for float when compared to the initial construction schedule for full Contract time.
5. Show complete sequence of construction by activity or major area of construction.
6. Major areas of construction to include, at a minimum, each separate stage of Work as specified in Section 01 10 00, Summary of Work, and major items of Work as specified in Divisions 02 through 44.

B. Submittals schedule for shop drawings and product data—Show:

1. The dates for CONTRACTOR's submittals.
2. The dates accepted submittals will be required from Engineer. Extensions of time for delays in submittal approval shall only be allowed as provided in Section 01 33 00.

C. Products delivery schedule—Show delivery dates for:

1. All major items of equipment and materials.

1.6 PROGRESS REVISIONS

- A. Progress schedules are to be representative of actual construction progress and sequencing of activities. Schedules that do not accurately represent construction progress will be rejected.
- B. Indicate progress of each activity as of data date.
- C. Show changes occurring since previous submission of schedule:
 - 1. Major changes in scope.
 - 2. Activities modified since previous submission.
 - 3. Revised projections of progress and completion.
 - 4. Other identifiable changes.
- D. Provide narrative report as needed to define:
 - 1. Problem areas, anticipated delays, and impact on schedule.
 - 2. Corrective action recommended, and its effect.
 - 3. Effect on changes on schedules of other prime contractors.

1.7 SUBMITTALS

- A. Submit initial schedules within 10 days after award of Contract:
 - 1. Engineer will review schedules and return review copy within 10 days after receipt.
 - 2. If required, resubmit within 7 days after return of review copy.
- B. Submit revised progress schedules with each Application for Payment.
- C. At each submission submit the number of opaque reproductions which the CONTRACTOR requires, plus 3 copies which will be distributed by Engineer. Do not submit fewer than 5 copies.
- D. Submit 1 reproducible transparency and 1 opaque reproduction initially, 2 opaque reproductions for each resubmission.

1.8 DISTRIBUTION

- A. Engineer will distribute copies of accepted schedules to:

1. One copy to OWNER.
 2. One copy to Resident Project Representative.
 3. One copy to be retained in Engineer's file.
 4. One copy to CONTRACTOR to be kept on file at job site.
 5. Remainder to CONTRACTOR for his distribution.
- B. Schedule recipients will report promptly to Engineer and CONTRACTOR, in writing, any problems anticipated by projections shown in schedules.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 01 32 33 - CONSTRUCTION PHOTOGRAPHS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Construction record photographs and video prior to beginning and during the course of the Work.

1.2 RELATED SECTIONS

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section.
- B. Section 01 10 00, Summary of Work.
- C. Section 01 22 20, Measurement and Payment.
- D. Section 01 33 00, Submittal Procedures
- E. Section 01 45 00, Quality Control.
- F. Section 01 70 00, Contract Closeout.
- G. Section 01 78 00, Project Record Documents.

1.3 REFERENCE STANDARDS

NOT USED.

1.4 DEFINITIONS

NOT USED.

1.5 SYSTEM DESCRIPTION

NOT USED.

1.6 PERFORMANCE AND DESIGN REQUIREMENTS

- A. General:

1. The CONTRACTOR's attention is directed to the following conditions:
 - a. No payments will be approved for any Work done under the Contract until all preconstruction prints and videos specified in this Section have been provided.
 - b. No payments will be approved for any Work done under the Contract until all monthly progress prints and videos specified in this Section for all monthly pay periods up to and including the current pay period have been provided.
 2. Costs of photography
 - a. Pay all costs for specified photography, video, and prints:
 - 1) Parties requiring additional photography or print will pay for them directly.
- B. Photography required.
1. CONTRACTOR shall provide a digital camera for their use that will have the ability to meet the requirements of this Section.
 - a. Digital images at least 1,600 by 1,200 pixels in size.
 - b. Photographs taken with a 6.0 mega-pixel camera or better.
 2. Take a comprehensive photographic survey and video of the existing facility and site before beginning operations to be used to document the condition prior to beginning work.
 3. Take a minimum of 5 photographs per week during construction.
 4. Take photographs on the date on which each scheduled Application for Payment is due.
 5. Saved in either a tiff (tagged image file format) or a jpeg (joint photographic experts group) file format.
 6. Photographic prints become the property of OWNER.
- C. Video required.
1. CONTRACTOR shall provide a video recording device for their use that will have the ability to meet the requirements of this Section.
 - a. High-Definition Digital video with at least 1920 by 1080 resolution.
 - b. Color video.

- c. Video recording equipment shall have a minimum 10x optical and 200x digital zoom.
 2. Video preconstruction, ongoing and final construction on separate media.
 3. Saved in mpeg (moving picture experts group) file format.
 4. Video recordings become the property of OWNER.
- D. Delivery of prints and video recording.
1. 7 days prior to mobilization to the site and before any construction or improvements begins, take photographs and video of site documenting preconstruction conditions.
 2. Deliver photos and/or video to the Engineer with monthly pay requests or within 15 days of photo/video date as required by Engineer.
 3. Photos and/or video showing work for which the CONTRACTOR is requesting payment will be submitted at the same time the pay request is submitted.
 4. Deliver photos and video on USB with Text tile for labeling.
 5. Provide one (1) duplicate USB.

1.7 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00.
- B. Shop Drawings:
NOT USED.
- C. Product Data:
 1. Provide monthly photographs and videos.
- D. Samples:
NOT USED.
- E. Design Data:
NOT USED.
- F. Manufacturer's Shop Test Reports:

- NOT USED.
- G. Certificates:
NOT USED.
- H. Bill of Lading:
NOT USED.
- I. Manufacturer's Field Reports:
NOT USED.
- J. Manufacturer's Certificates:
NOT USED.
- K. Warranty:
NOT USED.

1.8 QUALITY ASSURANCE

NOT USED

1.9 DELIVERY, STORAGE, AND HANDLING

NOT USED.

1.10 ENVIRONMENTAL CONDITIONS

NOT USED.

1.11 WARRANTY

NOT USED.

1.12 MAINTENANCE MATERIALS

NOT USED.

PART 2 PRODUCTS

2.1 MATERIALS

A. Photos

1. Color:

a. Resolution: High-Definition.

2. USB with Text file for label indicating project number and date video was taken.

B. Video

1. Color:

a. Resolution: High-Definition.

2. USB with Text file for label indicating project number and date video was taken.

PART 3 EXECUTION

3.1 TECHNIQUE

A. Factual Presentation.

B. Correct Exposure and Focus:

1. High resolution and sharpness.
2. Maximum depth-of-field.
3. Minimum distortion.

C. Video:

1. Do not walk while videoing, zoom in/out, pan slowly the required directions. Stop, walk to next location and begin again.
2. Provide comments during video.
3. Show date on video.

3.2 VIEWS REQUIRED

A. Photograph from locations to adequately illustrate the condition of construction and the state of the Project:

1. Photographic survey of the existing facility or site:
 - a. Show all items of equipment.
 - b. Show all areas to be modified.
 - c. Show all areas in which CONTRACTOR will conduct operations or store equipment.
2. Monthly photographs:
 - a. Average 20 views monthly until final acceptance.
 - b. Views as designated by the Engineer or OWNER.

B. Identify each photo in an excel photo log listing:

1. Name of project.
2. Orientation of view (i.e., looking southeast, looking north, etc.).
3. Date and time of exposure.
4. Digital image name.

C. Name each digital image:

1. Name of project
 - a. Erie Parkway Reuse

2. Major utility corresponding station to work being documented utilizing the following groups.
 - a. Water STA #+##
 - b. Roadway STA #+##
 - c. Curb, Gutter and Sidewalk STA #+##
3. Orientation of view.
4. Number each photo in a given group in consecutive numerical order within the group.
5. Example: Erie Parkway Reuse Water STA 1+00 SE 1
Erie Parkway Reuse Water STA 1+00 SE 2
Erie Parkway Reuse Water STA 1+00 N 3

D. Identify each video on the storage media:

1. Name of Project.
2. Explanation in detail the different views and work being documented.
3. Date and time of exposure, use both verbal and mechanical devices available.
4. Labeling shall be done by use of word processing equipment. Handwritten labels shall not be acceptable.

E. Quantities: Provide 3 prints, two videos, and two copies of each storage media of each view plus such additional prints as CONTRACTOR may require for his file.

F. Engineer will distribute, after review:

1. One copy of each view to OWNER (Photograph and Video).
2. One copy of each view to Engineer's file (Photograph and Video).
3. One copy of each view returned to CONTRACTOR for inclusion in Project Record Document.

END OF SECTION

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SECTION 01 33 00 – SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submission of all Shop Drawings, product data and other submittals as required by the Contract Documents for all equipment and materials to be furnished under this contract unless specifically indicated otherwise.

1.2 RELATED SECTIONS

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section.
- B. Section 01 25 00, Product Options and Substitutions.
- C. Section 01 29 73, Schedule of Values.
- D. Section 01 32 16, Construction Schedules.
- E. Section 01 45 00, Quality Control.
- F. Section 01 70 00, Contract Closeout.
- G. Sections for Divisions 1 through 44, Required Submittals.

1.3 SUBMITTALS

- A. Schedule of Submittals - Within seven (7) calendar days after the effective date of Notice of Award and prior to execution of the Agreement, submit a complete submittal schedule and list of all items requiring submission in a matrix form, including:
 - 1. A separate row for each submittal and submittal type required by the Contract Documents.
 - 2. A separate column for each of the following organized horizontally from left to right in the order listed:
 - a. Submittal number.
 - b. Specification section number.

- c. Submittal type.
 - 1) Construction Progress Schedules.
 - 2) Breakdown of Contract Price.
 - 3) Construction Photographs.
 - 4) CONTRACTOR Emergency Contact List.
 - 5) CONTRACTOR Safety Plan.
 - 6) CONTRACTOR Erosion and Sediment Control Plan.
 - 7) CONTRACTOR Traffic Control and Protection Plan.
 - 8) Product data.
 - 9) Shop drawings.
 - 10) Fabrication Drawings.
 - 11) Certificate of Compliance.
 - 12) Design Data.
 - 13) Test Reports.
 - 14) Manufacturer's Instructions.
 - 15) Manufacturer's Field Reports.
 - 16) Manufacturer's Certificate of Installation.
 - 17) Other submittals required in other specification sections.
 - d. Resubmittal.
 - e. Specification section title.
 - f. Description of the item with the name of manufacturer, trade name and model number.
 - g. Intended submission date.
 - h. Order release date.
 - i. Lead time to delivery.
 - j. Anticipated delivery date.
3. Highlight any items that require expedited review to meet the Project schedule.

4. Present in tabular format with appropriately labeled columns acceptable to Engineer for both electronic and hard copy versions. Submit updated version to Engineer on monthly basis.
- B. Shop Drawings—Drawings shall be presented in a clear and thorough manner:
1. Identify details by reference to sheet and detail, schedule or room numbers shown on Contract Drawings.
 2. Identify products and equipment by reference to name and tag number shown on Contract Drawings.
 3. Scale and Measurements: Make drawings accurate to a standard engineering or architectural scale (metric scales are not acceptable) with sufficient detail to show the kind, size, arrangement and function of component materials and devices.
 4. Illustrate construction and assembly of components and their connections to piping, equipment and Products.
 5. Indicate static and dynamic weights, torque and power requirements of products and equipment for the conditions and operating ranges specified.
 6. Illustrate and dimension the actual fabricated dimensions of assembled configuration.
 7. Illustrate and dimension required installation tolerances.
 8. Illustrate and dimension the minimum unrestricted area required to install, maintain and operate each assembly.
 9. Provide wiring, piping and control diagrams.
 10. Show external connections, anchorages, and supports required.
 11. Shop Drawing sheet size: 8-1/2 inch by 11 inch, 11 inch by 17 inch or 24 inch by 36 inch.
- C. Fabrication Drawings—Drawings shall be presented in a clear and thorough manner:
1. Identify details by reference to sheet and detail, schedule or room numbers shown on Contract Drawings.
 2. Identify equipment by reference to equipment name and tag number shown on Contract Drawings.
 3. Scale and Measurements: Make drawings accurate to a standard engineering or architectural scale (metric scales are not acceptable) with sufficient detail to show the kind, size, arrangement and function of component materials and devices.

4. Illustrate construction and assembly of components and their connections to piping, equipment and Products.
 5. Illustrate and dimension the actual fabricated dimensions of each part and accessory as well as its assembled configuration showing supports and anchorage.
 6. Illustrate and dimension required installation tolerances.
 7. Illustrate and dimension the minimum unrestricted area required to install, maintain and operate each part and accessory.
 8. Show external connections, anchorages, and supports required.
 9. Provide wiring, piping and control diagrams.
 10. Provide sequential numbering for each fabricated item and accessory to reflect field assembly requirements. Sequential numbering on fabrication drawings shall match the number designated on and assigned to items and accessories delivered to the field.
 11. Fabrication Drawing sheet size: 11 inch by 17 inch or 24 inch by 36 inch.
- D. Product Data—Preparation:
1. Clearly mark each copy to identify each product, accessory and model proposed to be incorporated into the work.
 2. Identify each product and equipment assembly by reference to name and tag number shown on the P&IDs.
 3. Catalog cut sheets: Cross-out or delete irrelevant data.
 4. Show performance characteristics and capacities.
 5. Show dimensions and clearances required for installation and maintenance.
 6. Show wiring, piping and control diagrams.
 7. Show external connections, anchorages, and supports required.
 8. Indicate static and dynamic weights, torque and power requirements of products and equipment for the conditions and operating ranges specified.
- E. "Certificate of Compliance":
1. Provided by manufacturer or supplier in lieu of submittal data required.
 2. Certifies that product data or item identified in certificate is in total compliance with Contract Document requirements.
 3. Specifically identifies project name and that there is no deviation from Contract

Documents.

4. Identify equipment by reference to equipment name and tag number shown in Contract Documents.
 5. Identify limits of equipment, materials or work provided.
 6. Provide for specific product data or item only as indicated herein.
- F. Construction Schedule: Designate in the construction schedule, or in a separate coordinated shop drawing schedule, the dates for submission and the dates that reviewed submittals will be needed.
- G. Samples—Shall be of sufficient size, quality and quantity to clearly illustrate:
1. Functional characteristics of the product, with integrally related parts and attachment devices.
 2. Full range of installed color, texture and pattern.
 3. Comply with requirements identified in individual specification sections.
- H. Manufacturer's standard schematic drawings and diagrams:
1. Modify drawings and diagrams to delete information which is not applicable to the Work by crossing out or omitting irrelevant data.
 2. Supplement standard information to provide information specifically applicable to the Work.
- I. Field samples and mock-ups:
1. CONTRACTOR shall erect, at the Project site, at a location acceptable to the Engineer.
 2. Size or area: That specified in the respective specification section.
 3. Fabricate each sample and mock-up complete and finished.
 4. Remove mock-ups at conclusion of Work or when acceptable to the Engineer.

1.4 CONTRACTOR RESPONSIBILITIES

- A. Identify all submittals required by the Contract Documents.
- B. Review and determine all materials and equipment needed to complete Work during the first six months of construction as specified in Section 01 10 00, Summary of Work. Begin submittal process upon execution of the Agreement and make initial submittals

for equipment and materials needed for first six months within twenty (20) calendar days from Notice to Proceed.

- C. Review submittal data prior to submission for accuracy and completeness for each submission.
- D. Approve and stamp each submission before submitting it.
- E. Determine and verify:
 - 1. Field measurements.
 - 2. Field construction criteria.
 - 3. Catalog numbers and similar data.
 - 4. Conformance with specifications.
- F. Prior to each submission, carefully review and coordinate all aspects of each item being submitted. All information required for a fully functional assembly are to be submitted at the same time to allow for a comprehensive review.
- G. Verify that each item and the submittal for it conform in all respects with specified requirements of the Work and of the Contract Documents with respect to means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto.
- H. Make submissions promptly in accordance with Construction Schedule, and in such sequence as to cause no delay in the Work or in the work of any other contractor.
- I. Limit requirements for expedited submittal review by Engineer to no more than 40 total submittals:
 - 1. Expedited submittal review period: no less than 14 calendar days.
- J. Notify Engineer in writing, at time of submission, of any deviations in the submittals from Contract Document requirements:
 - 1. Identify and tabulate all deviations in transmittal letter.
 - 2. Indicate essential details of all changes proposed, including modifications to other facilities that may be a result of the deviation.
 - 3. Include required piping and wiring diagrams.
 - 4. Failing to identify a deviation in transmittal letter is cause for immediate return of

submittal for correction without further review.

- K. Provide resubmissions within 14 calendar days following return of reviewed submissions for submittal items with disposition of either "Exceptions Noted - Submit Supplemental Data" or "Returned for Correction". Promptly make corrections noted, address noted Contract Document requirements, unresolved issues and all other comments of Engineer prior to resubmission.
- L. Fabricate products or beginning Work for which submittals are required in advance of receiving approved submittals from Engineer, shall be at CONTRACTOR's own risk and may result in the rejection, removal and replacement of work that meets the intent of the contract documents at the CONTRACTOR's own cost.
- M. Materials and equipment shall be ordered a sufficient time in advance to allow time for reviews and shall be available on the job when needed. Last minute review will not be given for inferior substitutes for material or equipment.
- N. CONTRACTOR shall perform the Work in compliance with the requirements and comments set forth in returned Submittals.

1.5 SUBMISSION REQUIREMENTS

- A. Make submissions far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and resubmissions, and for placing orders and securing delivery.
- B. Do not make "mass submittals" to the Engineer. "Mass submittals" are defined as six (6) or more submittals or items in one (1) day or twenty (20) or more submittals or items in one (1) week. If "mass submittals" are received, Engineer's stated review time will be extended as necessary to perform proper review. Engineer will review "mass submittals" based on priority determined by Engineer after consultation with OWNER and CONTRACTOR.
- C. Neither Engineer's receipt, review, return of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.
- D. All information required for a fully functional assembly are to be submitted at the same time to allow for a comprehensive review.
- E. In scheduling, allow a minimum of 21 calendar days for review by Engineer following receipt of submission in Engineer's office:

1. Time required to mail submissions or resubmissions is not considered part of review period.
- F. Consecutively number all submissions:
1. Assign a unique submittal number to each submittal in accordance with the following example:
 - a. Submittal number 033000-01A, where:
 - 1) 03 30 00 is the specification section;
 - 2) 01 is the submittal type in accordance with the legend above;
 - 3) A is the first in a sequence of re-submittals for this submittal item if required;
- G. Number of Submittals Required:
1. Total Submittals: The number of submittals shall be limited to a total of *fifty (50)* for the Project, including resubmittals.
 2. Number of copies: Submit a maximum of 2 copies for CONTRACTOR's use, plus a maximum of 4 copies which may be distributed by Engineer after review. Do not submit more than 6 copies.
 3. Samples: Submit 3 of each sample unless specified otherwise in individual specification section.
- H. Accompany each submission with letter of transmittal showing all information required for identification and checking. Submittals shall contain:
1. Submittal number.
 2. Identification of revisions on resubmissions.
 3. Date of submission and dates of any previous submissions.
 4. Project title and number.
 5. OWNER Contract identification number if applicable.
 6. The names of:
 - a. CONTRACTOR.
 - b. Supplier.
 - c. Manufacturer.

7. Specification section title.
8. Identification of each product in the submittal on a separate line item.
9. An 8 inch by 4 inch blank space for CONTRACTOR's and Engineer's stamps on first page of submittal.
10. Field dimensions, clearly identified as such.
11. Relation to adjacent or critical features of the Work or materials.
12. Applicable standards, such as ASTM or Federal Specification numbers.
13. Identification of deviations from Contract Documents:
 - a. If CONTRACTOR proposes to provide material or equipment of work which deviates from the Contract Documents, indicate so under "deviations" on the transmittal form accompanying the submittal copies.
 - b. Identify all requested deviations on each sheet of the submittal where a deviation would occur clearly notated as "deviation".
 - c. If deviations from contract documents are indicated and therefore requested by CONTRACTOR, the submittal shall be accompanied by a detailed, written justification for each deviation.
 - d. Failure to include a copy of marked-up specification sections or contract drawings, along with justification for any requested deviations to contract requirements, with the submittal shall be cause for rejection of the entire submittal with no further consideration by Engineer.
14. Confirmation of compliance with Contract Documents:
 - a. Unless a Certificate of Compliance is permitted for material or equipment where specified, provide the following documents to demonstrate compliance with the Contract Documents:
 - 1) Copy of relevant Drawings with all addendum updates that apply to products in Divisions 03 through 40 marked to show specific changes necessary for Products proposed in CONTRACTOR's submittal:
 - a) If no changes are required, Drawing(s) shall be marked "no changes required".
 - b) Relevant Drawings include as a minimum control diagrams, process and instrumentation diagrams (P&IDs), and Process (P) drawings.

- 2) A copy of each pertinent specification section in Divisions 03 through 40 with all addendum updates included, and all referenced and applicable specification sections, with their respective addendum updates included, with each paragraph check-marked to indicate specification compliance. Otherwise mark to indicate requested deviations from specification requirements per paragraph 1.5.E.13.
- 3) Failure to include copies of relevant specifications and drawings with submittal, whether changes are required or not, shall be cause for return for correction of entire submittal with no further review by Engineer.

15. Stamp cover sheet of each submittal as identified in letter of transmittal.

16. CONTRACTOR's stamp: Initialed or signed, certifying review and approval of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work and of Contract Documents. Use stamp to include wording similar to the following:

<p>This submittal has been reviewed by [<i>name of contractor</i>] and approved with respect to the means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incidental thereto. [<i>Name of contractor</i>] also warrants that this submittal complies with contract documents and all deviations from the Contract Documents are enumerated thereon:</p> <p>Section No: _____ Submittal No: _____</p> <p>DATE: _____ BY: _____</p>
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- I. Submittal Log:
 1. Maintain an accurate submittal log for duration of the Work showing current status of all submissions and submittals at all times.
 2. Show submittal number, section number, section title, submittal description, date of submission, date of return and disposition of submittal.
 3. Make submittal log available to Engineer for Engineer's review upon request.
- J. Unless specified otherwise, make submissions in groups to facilitate efficient review and approval:

1. Provide separate transmittal cover sheet for each submittal in the group as follows:
 - a. Provide separate transmittal sheet for each specification section and for each type of submittal required in the technical specification section that the information pertains to for example a separate transmittal sheet would be provided for each of the following:
 - 1) 33 05 13-01 Manhole Shop Drawings.
 - 2) 33 05 13-02 Manhole Product Data.
 - 3) 33 05 17-01 Precast Concrete Valve Vaults and Meter Boxes Shop Drawings.
 - 4) 33 05 17-02 Precast Concrete Valve Vaults and Meter Boxes Product Data.
 2. Upon making initial submittal for each specification section, the submittal package for that section shall include shop drawings, product data, samples, and design data as required in each specification section.
 3. Include all associated items from individual specification sections to assure that all information is available for checking each item when it is received.
 4. Whether a submittal is complete or not shall be at the Engineer's sole discretion. At a minimum, a complete submittal is considered to include information for each product specified under a given specification section.
 5. Concurrently submit and group submittals to including all products, parts and accessories when an item or assembly consists of products specified under multiple specification sections.
 6. Partial submittals may be returned for correction as not complying with provisions of the Contract and without review by Engineer.
 7. CONTRACTOR may be held liable for delays due to poorly organized, incomplete or partial submissions.
 8. CONTRACTOR may be held liable for delays due to not grouping submittals as indicated above.
 9. Do not include items from more than one specification section for any one submittal number.
- K. CONTRACTOR may require subcontractors to provide drawings, setting diagrams and similar information to help coordinate the Work, but such data shall remain between CONTRACTOR and his subcontractors and will not be reviewed by Engineer unless specifically called for within the Contract Documents.

1.6 DISPOSITION OF SUBMITTALS

A. No Exceptions Taken

1. Resubmission not required.
2. Distribution:
 - a. One copy sent to OWNER.
 - b. One copy sent to Resident Project Representative.
 - c. One copy retained in Engineer's file.
 - d. Remaining copies returned to CONTRACTOR for his use:
 - 1) A minimum of one copy to be kept on file at CONTRACTOR's office at job site.

B. Make Corrections Noted

1. Resubmission not required.
2. Comply with corrections or comments as noted on submittal and in transmittal letter.
3. Work performed or products furnished to comply with exceptions noted on submittal.
4. Copies of submittal data in operation and maintenance manuals to be revised according to exceptions.
5. Distribution:
 - a. One copy sent to OWNER.
 - b. One copy sent to Resident Project Representative.
 - c. One copy retained in Engineer's file.
 - d. Remaining copies returned to CONTRACTOR for his use:
 - 1) A minimum of one copy to be kept on file at CONTRACTOR's office at job site.

C. Submit Specified Item

1. Submit Supplemental information to original submittal.
2. Submit information as requested by Engineer's review letter.

3. Work performed or products furnished to comply with exceptions noted on submittal.
 4. Copies of submittal data in operation and maintenance manuals to be revised according to exceptions.
 5. Distribution:
 - a. One copy sent to OWNER.
 - b. One copy sent to Resident Project Representative.
 - c. One copy retained in Engineer's file.
 - d. Remaining copies returned to CONTRACTOR for his use:
 - 1) A minimum of one copy to be kept on file at CONTRACTOR's office at job site.
- D. Receipt Acknowledged
1. Resubmission not required.
 2. Distribution:
 - a. One copy sent to OWNER.
 - b. One copy sent to Resident Project Representative.
 - c. One copy retained in Engineer's file.
 - d. Remaining copies returned to CONTRACTOR for his use:
 - 1) A minimum of one copy to be kept on file at CONTRACTOR's office at job site.
- E. Revise and Resubmit
1. Resubmission required.
 2. Comply with corrections or comments as noted on submittal and in transmittal letter.
 3. Work performed or products furnished to comply with exceptions noted on submittal.
 4. Copies of submittal data in operation and maintenance manuals to be revised according to exceptions.
 5. Distribution:

- a. One copy sent to OWNER.
- b. One copy sent to Resident Project Representative.
- c. One copy retained in Engineer's file.
- d. Remaining copies returned to CONTRACTOR for his use:
 - 1) A minimum of one copy to be kept on file at CONTRACTOR's office at job site.

F. Rejected

1. Distribution:

- a. One copy sent to Resident Project Representative.
- b. One copy retained in Engineer's file.
- c. Three copies, max, returned to CONTRACTOR for revision and resubmittal.
- d. Remaining copies destroyed.
- e. Copy of transmittal letter sent to OWNER.

1.7 DISPOSITION OF SAMPLES

A. No Exceptions Taken

1. Resubmission not required.

2. Distribution:

- a. One sample sent to OWNER.
- b. One sample sent to Resident Project Representative.
- c. One sample retained in Engineer's file.
- d. Acknowledgment: Copy of transmittal letter sent to CONTRACTOR.

B. Make Corrections Noted

1. Do Not Resubmit.

2. Work performed or products furnished to comply with exceptions noted in acknowledgment.

3. Distribution:

- a. One sample sent to OWNER.

- b. One sample sent to Resident Project Representative.
 - c. One sample retained in Engineer's file.
 - d. Acknowledgment: Copy of transmittal letter sent to CONTRACTOR.
 - C. Receipt Acknowledged
 - 1. Resubmission not required.
 - 2. Distribution:
 - a. One copy sent to OWNER.
 - b. One copy sent to Resident Project Representative.
 - c. One copy retained in Engineer's file.
 - d. Remaining copies returned to CONTRACTOR for his use:
 - 1) A minimum of one copy to be kept on file at CONTRACTOR's office at job site.
 - D. Revise and Resubmit
 - 1. Resubmission required.
 - 2. Distribution:
 - a. One sample sent to Resident Project Representative.
 - b. One sample retained in Engineer's file.
 - c. One sample sent to CONTRACTOR for revision and resubmittal.
 - d. Copy of transmittal letter sent to OWNER.

1.8 RESUBMISSION REQUIREMENTS

- A. Make corrections or changes in submittals required by Engineer and resubmit until disposition not requiring resubmission or additional information is made. CONTRACTOR shall direct specific attention in writing to revisions made including those that are other than the corrections called for by Engineer on previous submittals.
- B. CONTRACTOR shall furnish required submittals with sufficient information and accuracy to obtain required review of an item without additional submittals. Engineer will record Engineer's time for reviewing excessive submittals will be in accordance with Article 1.9 of this Specification.

- C. If CONTRACTOR requests a change of a previously reviewed submittal item, CONTRACTOR shall be responsible for Engineer's charges to OWNER for its review time in accordance with Article 1.9 of this Specification, and OWNER may impose a set-off against payments due to CONTRACTOR to secure reimbursement for such charges, unless the need for such change is beyond the control of CONTRACTOR. For of a previously reviewed submittal item that is needed for reasons that are beyond the control of CONTRACTOR, they shall follow the procedures for Substitutions in Specification 01630.
- D. Transmit each resubmission under new letter of transmittal. Use number of the original submittal followed directly by a capital letter corresponding to the number of times a submittal is resubmitted (i.e., 1, 1A, 1B, etc.).
- E. Revise initial Drawings or data and resubmit as specified for the initial submittal.
- F. Indicate any changes which have been made other than those requested by Engineer.
- G. Samples: Submit new samples as required for initial submittal.

1.9 REIMBURSEMENT OF REVIEW COSTS:

- A. If more than two (2) submissions of an item are required to meet the Project specifications, CONTRACTOR shall be responsible for Engineer's charges to OWNER for its review time, and OWNER may impose a set-off against payments due to CONTRACTOR to secure reimbursement for such charges, unless the need for such change is beyond the control of CONTRACTOR.
- B. Costs for Engineer review can and may be deducted from payments due CONTRACTOR as itemized deducts to CONTRACTOR's Applications for Payment.
- C. Charges for review of resubmissions will include Engineer's Project Manager, Engineer, and Submittal Clerk in accordance with Engineers current billing rate schedule which may be adjusted to allow for yearly increases.

1.10 ENGINEER'S DUTIES

- A. Review submittals with reasonable promptness provided that each submittal has been called for by the Contract Documents, is stamped by CONTRACTOR and complies with the requirements indicated above:
 - 1. No extensions of time are allowed due to Engineer's delay in reviewing submittals unless all the following criteria are met:

- a. CONTRACTOR has notified Engineer in writing that an expedited review of particular submittal in question is critical to the progress of the Work and CONTRACTOR has identified the requested submittal return date.
 - b. Engineer has failed to return submittal within 21 days of receipt of the submittal or receipt of said notice, whichever is later.
 - c. CONTRACTOR demonstrates that delay in progress of the Work was directly attributable to Engineer's failure to return submittal within 21 days.
2. No extensions of time are allowed due to delays in progress of the Work caused by rejection and subsequent resubmission of data, including multiple resubmissions.
- B. Review drawings and data submitted only for general conformity with Contract Documents:
1. Engineer's review of drawings and data does not indicate a thorough review of all dimensions, quantities, and details of material, equipment device or items shown.
 2. Engineer's review will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, generally conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
 3. Engineer's review does not relieve CONTRACTOR of responsibility for errors, omissions or deviations nor responsibility for compliance with the Contract Documents.
 4. Engineer's review shall not extend to means, methods, techniques, sequences, procedures or operations of construction, or to safety precautions and programs incidental thereto. No information regarding these items will be reviewed whether or not included in submittals.
 5. Engineer's review of a separate item as such will not indicate approval of the assembly in which the item functions.
 6. Informational submittals and other similar data are for Engineer's information, do not require Engineer's responsive action, and will not be reviewed or returned with comment.
 7. Submittals made by CONTRACTOR that are not required by Contract Documents may be returned without action.

- C. Assume that none of the information in the submittal comprises a deviation to the Contract Documents unless CONTRACTOR advises Engineer otherwise in writing which is acknowledged by Engineer in writing:
 - 1. Consider and review only those deviations from the Contract Documents clearly identified as such in submittal and tabulated in the Letter of Transmittal.
 - 2. At the discretion of the Engineer, notify CONTRACTOR that review of specific deviations will be reviewed under provisions of Supplementary Conditions Section 00 73 00
- D. Return submittals to CONTRACTOR for distribution or for resubmission.
- E. Transmit, unreviewed, to CONTRACTOR copy of submittals received directly from suppliers, manufacturers and subcontractors.
- F. Transmit, unreviewed, to CONTRACTOR copy of submittals not called for by the Contract Documents or which have not been approved by CONTRACTOR.
- G. Engineer will not review uncalled-for shop drawings or product data except by special arrangement.
- H. Affix stamp and indicate approval for submittal or resubmission requirements.

1.11 SUBMITTAL SCHEDULE

- A. Unless indicated otherwise, provide all submittals required by individual sections of the Contract Documents to establish compliance with the specified requirements.
- B. CONTRACTOR may provide “Certificate of Compliance” in lieu of product data submittal as required above for the following sections:

<u>Section</u>	<u>Title</u>
02 41 00	Demolition
03 60 00	Grout

CONTRACTOR may coordinate with Engineer to provide “Certificate of Compliance” for other sections as agreed to by Engineer. Engineer’s determination of acceptance of CONTRACTOR’s certification in lieu of product data submittal as required above is final.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 01 42 13 - ABBREVIATIONS AND SYMBOLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Abbreviations for organizations and standards
- B. Other abbreviations and symbols

1.2 ORGANIZATIONS AND STANDARDS

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturers Association
AASHTO	American Association State Highway and Transportation Officials
ACI	American Concrete Institute
AFBMA	Antifriction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AI	Asphalt Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
APA	American Plywood Association
ASCE	American Society Civil Engineers
ASHRAE	American Society Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
AWPA	American Wood Products Association or American Wood Preservers Association
AWPB	American Wood Preserver's Board
AWWA	American Water Works Association
CDPHE	Colorado Department of Public Health and Environment
CDOT	Colorado Department of Transportation
CIPRI	Cast Iron Pipe Research Institute
CISPI	Cast Iron Soil Pipe Institute
CMAA	Crane Manufacturer's Association of America

CRSI	Commercial Standard
FGMA	Flat Glass Marketing Association
FM	Factory Mutual
FS	Federal Specification
HMI	Hoist Manufacturer's Institute
IEEE	Institute Electrical and Electronics Engineers
IFI	Industrial Fasteners Institute
IPCEA	Insulated Power Cable Engineers Association
MIL	Military Specification
MMA	Monorail Manufacturer's Association
NAAMM	National Association Architectural Metals Manufacturers
NBHA	National Builders Hardware Association
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association or National Forest Products Association
NHPMA	Northern Hardwood and Pine Manufacturer's Association
NSF	National Sanitation Foundation Testing Laboratory
NWMA	National Woodwork Manufacturer's Association
OSHA	Occupational Safety and Health Administration
PCI	Prestressed Concrete Institute
PS	Product Standard
RCSHSB	Red Cedar Shingle and Hand-Split Shake Bureau
RIS	Redwood Inspection Service
SAE	Society of Automotive Engineers
SCPRF	Structural Clay Products Research Foundation
SJI	Steel Joist Institute
SPI	Society of the Plastics Industry
SSPC	Steel Structures Painting Council
TCA	Tile Council of America

UL	Underwriter's Laboratories
US	U.S. Bureau of Standards
USBR	U.S. Bureau of Reclamation
WCLIB	West Coast Lumber Inspection Bureau
WIC	Woodwork Institute of California
WWPA	Western Wood Products Association

1.3 OTHER ABBREVIATIONS AND SYMBOLS

ac	alternating current
amp	ampere
AV	air vent
AWG	American wire gage
BIL	basic impulse level
BCY	bank cubic yard
C	centigrade or Celsius
CIP	Complete-in-place
cu	cubic
dc	direct current
diam	diameter
F	Fahrenheit
ft (')	foot
ga	gage
gal	gallon
GSP	galvanized steel pipe
hp	horsepower
Hz	hertz
hrs(s)	hour(s)
IBBM	iron body, bronze-mounted
in(")	inch
IPS	iron pipe size

kV	kilovolt
kVA	kilovoltampere
lb	pound
lf	linear foot
mA	milliampere
max	maximum
MG	million gallons
MH	manhole
NPT	national pipe thread
PL	plate
PVC	polyvinyl chloride
sq	square
vf	vertical foot
yd	yard
°	degree
'	feet
"	inch
%	percent

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 01 42 19 - REFERENCE STANDARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance.
- B. Schedule of references.

1.2 QUALITY ASSURANCE

- A. For products or workmanship specified by association, trade, Federal Standards, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents.
- C. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. The contractual relationship, duties, and responsibilities of the parties to the Contract or those of the Engineer shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.3 SCHEDULE OF REFERENCES

	A		
AA	Aluminum Association 900 19 th St., NW Washington, DC 20006 www.aluminu.org	AASHTO	American Association of State Highway and Transportation Officials 444 N. Capitol St., NW, Suite 249 Washington, DC 20001 www.aashto.org
AABC	Associated Air Balance Council 1518 K St., NW Washington, DC 20005 www.aabchq.com	ABMA	American Bearing Manufacturers Association 1200 19 th St., NW, Suite 300 Washington, DC 20036-2422 www.abma-dc.org
AAMA	American Architectural Manufacturers Association 1827 Walden Office Sq., Suite 104 Schaumburg, IL 60173-4268 www.aamanet.org	ACGIH	American Conference of Governmental Industrial Hygienists 1330 Kemper Meadow Dr., Suite 600 Cincinnati, OH 45240 www.acgih.org

ACI	American Concrete Institute P.O. Box 9094 Farmington Hill, MI 48333-9094 www.aci-int.org	AIA	American Institute of Architects 1735 New York Ave., NW Washington, DC 20006 www2.aia.org/myaia
ACPA	American Concrete Pipe Association 222 W. Las Colinas Blvd., Ste. 641 Irving, TX 75039-5423 www.concrete-pipe.org	AICE	American Institute Of Chemical Engineers 3 Park Ave New York, NY 10016-5991 www.aiche.org
ADC	Air Diffusion Council 1000 E. Woodfield Rd., Suite 102 Schaumburg, IL 60173-5921 www.flexibleduct.org	AISC	American Institute of Steel Construction One East Wacker Dr., Suite 3100 Chicago, IL 60601-2001 www.aisc.org
ADSC	The International Association of Foundation Drilling 9696 Skillman Street, Suite 280 Dallas, TX 75243 www.adsc-iafd.com	AISI	American Iron and Steel Institute 1101 17th St., NW, Ste. 1300 Washington, DC 20036 www.steel.org
AF&PA	American Forest and Paper Association 1111 19 th St., NW, Suite 800 Washington, DC 20036 www.afandpa.org	AITC	American Institute of Timber Construction 7012 S. Revere Pkwy, Suite 140 Englewood, CO 80112 www.aitc-glulam.org
AFSA	American Fire Sprinkler Association, Inc. 9696 Skillman St., Suite 300 Dallas, TX 75243-8264 www.sprinklernet.org	AMCA	Air Movement and Control Association International, Inc. 30 W. University Dr. Arlington Heights, IL 60004-1893 www.amca.org
AFSS	American Filtration And Separation Society 252 N. Washington St., Suite A Falls Church, VA 22046 www.afssociety.org	ANSI	American National Standards Institute 1819 L Street, NW Washington, DC 20036 www.ansi.org
AGC	Associated General Contractors Of America 333 John Carlyle St., Suite 200 Alexandria, VA 22317 www.agc.org	APA/EWA	APA-The Engineered Wood Association P.O. Box 11700 Tacoma, WA 98411-0700 www.apawood.org
AHA	American Hardboard Association 1210 W. Northwest Hwy. Palatine, IL 60067 www.hardboard.org	APFA	American Pipe Fittings Association 111 Park Pl. Falls Church, VA 22046 www.apfa.com
AI	Asphalt Institute Research Park Drive P.O. Box 14052 Lexington, KY 40512-4052 www.asphaltinstitute.org	API	American Petroleum Institute 1220 L Street NW Washington, DC 20005-4070 www.api.org
		AREMA	American Railway Engineering and Maintenance-of-Way Association 8201 Corporate Drive, Suite 1125 Landover, MD 02785-2230 www.arema.org

ARI	Air-Conditioning and Refrigeration Institute 4301 N. Fairfax Dr., Ste. 425 Arlington, VA 22203 www.ari.org	AWS	American Welding Society 550 NW LeJeune Rd. Miami, FL 33126 www.amweld.org
ARRA	Asphalt Recycling and Reclaiming Association #3 Church Circle, PMB 250 Annapolis, MD 21401 www.arra.org	AWWA	American Water Works Association 6666 W. Quincy Ave. Denver, CO 80235 www.awwa.org
ASCE	American Society of Civil Engineers World Headquarters 1801 Alexander Graham Bell Dr. Reston, VA 20191-4400 www.asce.org		B
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329 www.ashrae.org	BHMA	Builders Hardware Manufacturers Association, Inc. 355 Lexington Ave., `17 TH Floor New York, NY 10017 www.buildershardware.com
ASME	American Society of Mechanical Engineers 3 Park Ave. New York, NY 10016-5990 www.asme.org	BIA	Brick Institute of America 11490 Commerce Park Dr. Reston, VA 22091 www.bia.org
ASNT	American Society for Non-Destructive Testing Inc. 1711 Arlingate Ln. Columbus, OH 43228-0518 www.asnt.org		C
ASSE	American Society of Sanitary Engineering 901 Canterbury, Suite A Westlake, OH 44145 www.asse-plumbing.org	CAGI	Compressed Air and Gas Institute 1300 Sumner Cleveland, OH 44115 www.cagi.org
ASTM	American Society of Testing Materials International 100 Barr Harbor Dr. West Conshohocken, PA 19428-2959 www.astm.org	CDA	Copper Development Association, Inc. 260 Madison Ave., 16th Flr. New York, NY 10016 www.copper.org
AWI	Architectural Woodwork Institute 1952 Isaac Newton Sq. West Reston, VA 20190 www.awinet.org	CDPHE	Colorado Department of Public Health and Environment 4300 Cherry Creek Dr., S. Denver, CO 80222 www.cdphe.state.co.us
AWPA	American Wood-Preservers' Association P.O. Box 5690 Granbury, TX 76049 www.awpa.com	CDOT	Colorado Department of Transportation 4201 E. Arkansas Ave. Denver, CO 80220 www.dot.state.co.us
		CGA	Compressed Gas Association 1725 Jefferson Davis Hwy, Suite 1004 Arlington, VA 22202-4102 www.cganet.com
		CII	Chlorine Institute, Inc. 1300 Wilson Blvd. Rosslyn VA 22209 www.cl2.com

CISCA	Ceilings and Interior Systems Construction Association 1500 Lincoln Hwy, Suite 202 St. Charles, IL 60174 www.cisca.org	DIPRA	Ductile Iron Pipe Research Association 245 Riverchase Pkwy E., Ste. O Birmingham, AL 35244 www.dipra.org
CISPI	Cast Iron Soil Pipe Institute 5959 Shallowford Rd., Suite 419 Chattanooga, TN 37421 www.cispi.org	EIMA	EIFS Industry Members Association 3000 Corporate Center Dr., Suite 270 Morrow, GA 30260 www.eifsfacts.com
CLFMI	Chain Link Fence Manufacturers Institute 9891 Broken Land Pkwy, Suite 300 Columbia, MD 21046 www.chinlinkinfo.org	EJCDC	Engineer's Joint Contract Documents Committee American Consulting Engineers Council (www.acec.com) 1015 15th St., NW Washington, DC 20005
CRI	Carpet and Rug Institute 310 S. Holiday Ave. Dalton, GA 30722-2048 www.carpet-rug.com	EJMA	Expansion Joint Manufacturers Association 25 N. Broadway Tarrytown, NY 10591 www.ejma.org
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Rd. Schaumburg, IL 60173-4758 www.crsi.org	EPA	Environmental Protection Agency US EPA/NSCEP P.O. Box 42419 Cincinnati, OH 45242 www.epa.gov
CSI	The Construction Specifications Inst. 99 Canal Center Plaza, Suite 300 Alexandria, VA 22314 www.csinet.org		F
CSSB	Cedar Shake and Shingle Bureau P.O. Box 1178 Sumas, WA 98295 www.cedarbureau.org	FAA	Federal Aviation Administration 800 Independence Ave., SW Washington, DC 20591 www.faa.gov
CTI	Cooling Technology Institute 530 Wells Fargo Drive, Suite 218 Houston, TX 77090 www.cti.org	FGMA	Glass Association of North America 2945 SW Wanamaker Dr., Suite A Topeka, KS 66614 www.glasswebsite.com
	D - E	FM	FM Global Corporate Headquarters P.O. Box 7500 Johnston, RI 02919 www.fmglobal.com
DASMA	Door and Access Systems Manufacturers Association International 1300 Summer Avenue Cleveland, OH 44115-2851 www.dasma.com	FS	Federal Specification Unit General Services Administration Federal Supply Service FSS Acquisition Management Center Environmental Programs and Engineering Policy Division Washington, DC 20406 http://pub.fss.gsa.gov
DHI	The Door and Hardware Institute 14150 Newbrook Dr., Suite 200 Chantilly, VA 20151 www.dhi.org		

FSSA	Fire Suppression Systems Association 5024-R Campbell Blvd. Baltimore, MD 21236 www.fssa.net	IEEE	Institute of Electrical and Electronics Engineers, Inc. 3 Park Ave., 17 th Floor New York, NY 10016-5997 www.ieee.org
G - H - I			
GA	Gypsum Association 810 First St., NE, Suite 510 Washington, DC 20002 www.usg.com www.gypsum.org	IMIAC	International Masonry Industry All-Weather Council International Masonry Institute (www.imiweb.org) 815 15th St., NW Washington, DC 20005
GANA	Glass Association of North America 2945 Southwest Wanamaker Dr., Suite A Topeka, KS 66614 www.glasswebsite.com/gana	IES	Illuminating Engineering Society of North America 120 Wall Street, 17 th Floor New York, NY 10005 www.iesna.org
HI	Hydraulics Institute Division of Gas Appliance Manufacturers Association 2107 Wilson Blvd., Suite 600 Arlington, VA 22201 www.gamanet.org	ILI	Indiana Limestone Institute of America 400 Stone City Bank Building Bedford, IN 47421 www.iliai.com
K - L			
HMMA	Hollow Metal Manufacturers Association Division of NAAMM 8 South Michigan Ave., Suite 1000 Chicago, IL 60603 www.naamm.org	KCMA	Kitchen Cabinet Manufacturers Association 1899 Preston White Dr. Reston, VA 20191-5435 www.kcma.org
HPVA	Hardwood Plywood and Veneer Association P.O. Box 2789 Reston, VA 20195-0789 www.hpva.org	LPI	Lightning Protection Institute 3335 N. Arlington Heights Rd., Suite E Arlington Heights, IL 60004 www.lightning.org
IAS	International Approval Services U.S. Operations 8501 E. Pleasant Valley Rd. Cleveland, OH 44131-5575 www.approvals.org	M - N	
ICBO	International Conference of Building Officials 5360 Workman Mill Rd. Whittier, CA 90601 www.icbo.org	MBMA	Metal Building Manufacturers Association 1300 Sumner Ave. Cleveland, OH 44115-2851 www.mbma.com
ICC	International Code Council 5203 Leesburg Pike #708 Falls Church, VA 22041 www.intlcode.org	MFMA	Maple Flooring Manufacturers Association 60 Revere Dr., Suite 500 Northbrook, IL 60062 www.maplefloor.org
		MIA	Marble Institute of America 30 Eden Alley, Suite 301 Columbus, OH 43215 www.marble-institute.com

MIL	Military Standardization Documents Defense Automated Printing Service 700 Robbins Ave., Building 4D Philadelphia, PA 19111-5094 www.dodssp.daps.mil	NCRP	National Council on Radiation Protection and Measurement 7910 Woodmont Ave., Suite 800 Bethesda, MD 20814-3095 www.ncrp.com
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry 127 Park St., NE Vienna, VA 22180-4602 www.mss-hq.com	NDI	Nickel Development Institute 214 King West, Suite 510 Toronto, Ontario Canada M5H 3S6 www.nidi.org
NAA	National Arborist Association Route 101, P.O. Box 1094 Amherst, NH 03031-1094 www.natlarb.com	NEBB	National Environmental Balancing Bureau 8575 Grovemont Circle Gaithersburg, MD 20877 www.nebb.org
NAAMM	National Association of Architectural Metal Manufacturers 8 South Michigan Ave., Suite 1000 Chicago, IL 60603 www.naamm.org	NECA	National Electrical Contractors Association 3 Bethesda Metro Center, Ste. 1100 Bethesda, MD 20814 www.necanet.org
NAAMM	North American Association of Mirror Manufacturers (Division of GANA) 2945 Southwest Wanamaker Dr., Suite A Topeka, KS 66614 www.glasswebsite.com	NELMA	Northeastern Lumber Manufacturers Association 272 Tuttle Road P.O. Box 87A Cumberland Center, ME 04021 www.nelma.org
NACA	NACE International 1440 South Creek Drive Houston, TX 77084 www.nace.org	NEMA	National Electrical Manufacturers Association 1300 N. 17th St., Ste. 1847 Rosslyn, VA 22209 www.nema.org
NAIMA	North American Insulation Manufacturers Association 44 Canal Center Plaza, Suite 310 Alexandria, VA 22314 www.naima.org	NETA	International Electrical Testing Association P.O. Box 687 106 Stone St. Morrison, CO 80465 www.netaworld.org
NAPHCC	National Association of Plumbing-Heating- Cooling Contractors 180 S. Washington Falls Church, VA 22040 www.phccweb.org	NFPA	National Fire Protection Association One Batterymarch Park P.O. Box 9101 Quincy, MA 02269-9101 www.nfpa.org
NBGQA	National Building Granite Quarries Association, Inc. 1220 L Street NW, Suite 100-167 Washington, DC 20005 www.nbgqa.com	NFPA	National Forest Products Association 1111 19 th St., NW Washington, DC 20036
NCMA	National Concrete Masonry Association 2302 Horse Pen Road Herndon, VA 20171-3499 www.mcma.org	NFRC	National Fenestration Rating Council 1300 Spring St., Suite 500 Silver Spring, MD 20910 www.nfrc.org

NGWA	National Ground Water Association 601 Dempsey Westerville, OH 43081	NSPI	National Spa and Pool Institute 2111 Eisenhower Ave. Alexandria, VA 22314 www.nspi.org
NIBS	National Institute of Building Sciences 1090 Vermont Ave., NW, Suite 700 Washington, DC 20005-4905 www.nibs.org	NSWMA	National Solid Wastes Management Association 4301 Connecticut Ave. NW, Suite 300 Washington, DC 20008 www.nswma.org
NIST	National Institute of Standards and Technology 100 Bureau Dr, MS 2150 Gaithersburg, MD 20899-2150 www.nist.gov	NTMA	National Terrazzo and Mosaic Association 110 E. Market St., Suite 200-A Leesburg, VA 20176 www.ntma.com
NLA	National Lime Association 200 North Glebe Rd., Suite 800 Arlington, VA 22203 www.lime.org	NUCA	National Utility Contractors Association 4301 North Fairfax Dr., Suite 360 Arlington, VA 22203-1627 www.nuca.com
NLGA	National Lumber Grades Authority #406-First Capital Pl. 960 Quayside Dr. New Westminster, BC V3M6G2 CANADA www.nlga.org	NWMA	National Woodwork Manufacturers Association 205 W. Touhy Ave. Park Ridge, IL 60068
NOFMA	National Oak Flooring Manufacturers Association P.O. Box 3009 Memphis, TN 38173-0009 www.nofma.org		P
NPCA	National Paint and Coatings Association 1500 Rhode Island Ave., NW Washington, DC 20005 www.paint.org	PCA	Portland Cement Association 5420 Old Orchard Rd. Skokie, IL 60077 www.portcement.org
NPCA	National Precast Concrete Association 10333 N. Meridian St., Suite 272 Indianapolis, IN 46290-1081 www.precast.org	PCI	Precast/Prestressed Concrete Institute 209 W. Jackson Blvd. Chicago, IL 60606-6938 www.pci.org
NRCA	National Roofing Contractors Association O'Hare International Center 10255 W. Higgins Rd., Ste. 600 Rosemont, IL 60018 www.roofonline.org	PDCA	Painting and Decorating Contractors of America 3913 Old Lee Hwy, Suite 33-B Fairfax, VA 22030 www.pdca.com
NSF	NSF International P.O. Box 130140 Ann Arbor, MI 48113-0140 www.nsf.org	PDI	Plumbing and Drainage Institute 45 Bristol Drive South Easton, MA 02375 http://PDlonline.org
NSPE	National Society Of Professional Engineers 1420 King St. Alexandria, VA 22314	PEI	Petroleum Equipment Institute P.O. Box 2380 Tulsa, OK 74101-2380 www.pei.org

PMI	Plumbing Manufacturers Institute 1340 Remington Rd., Suite A Schaumburg, IL 60173 www.pmihome.org	SMACNA	Sheet Metal and Air Conditioning Contractors' National Association 4201 Lafayette Center Dr. Chantilly, VA 20151-1209 www.smacna.org
PPFA	Plastic Pipe And Fittings Association 800 Roosevelt Rd., Bldg. C, Ste. 20 Glen Ellyn, IL 60137 www.ppfahome.org	SPIB	Southern Pine Inspection Bureau 4709 Scenic Hwy Pensacola, FL 32504-9094 www.spib.org
PS	Product Standard U.S. Dept. of Commerce Washington, DC 20203	SPRI	Single Ply Roofing Institute 200 Reservoir St., 309 A Needham, MA 02494 www.spri.org
PTI	Post Tensioning Institute 1717 W. Northern Ave., Suite 114 Phoenix, AZ 85021 www.post-tensioning.org	SSMA	Steel Stud Manufacturer Association 8 S. Michigan Ave Chicago, IL 60603
R			
RCSC	Research Council on Structural Connections www.boltcouncil.org	SSPC	SSPC: The Society for Protective Coatings 40 24 th St., 6 th Floor Pittsburgh, PA 15222-4656 www.sspc.org
RIS	The Redwood Inspection Service 630 J Street Eureka, CA 95501	STI	Steel Tank Institute 570 Oakwood Rd. Lake Zurich, IL 60047 www.steeltank.com
S			
SCMA	Southern Cypress Manufacturers Association 400 Penn Center Blvd., #530 Pittsburgh, PA 15235 www.cypressinfo.org	SWI	Steel Window Institute 1300 Sumner Ave. Cleveland, OH 44115-2851 www.steelwindows.com
SDI	Steel Deck Institute P.O. Box 25 Fox River Grove, IL 60021 www.sdi.org	SWRI	Sealant, Waterproofing, and Restoration Institute 2841 Main St. Kansas City, MO 64108 www.swrionline.org
SDI	Steel Door Institute 30200 Detroit Rd. Cleveland, OH 44145-1967 www.steeldoor.org	T	
SIGMA	Sealed Insulating Glass Manufacturers Association 401 N. Michigan Ave. Chicago, IL 60611 www.sigmaonline.org/sigma	TCA	Tile Council of America, Inc. 100 Clemson Research Blvd. Anderson, SC 29625 www.tileusa.com
SJI	Steel Joist Institute 3127 10 th Ave., North Ext. Myrtle Beach, SC 29577-6760 www.steeljoist.org	TIA/EIA	Telecommunications Industry Association/ Electronic Industries Alliance 2500 Wilson Blvd., Suite 300 Arlington, VA 22201 www.tiaonline.org

TMS	The Masonry Society 3970 Broadway, Suite 201-D Boulder, CO 80304-1135 www.masonrysociety.org	WCLIB	West Coast Lumber Inspection Bureau P.O. Box 23145 Portland, OR 97281 www.wclig.org
TPI	Truss Plate Institute 583 D'Onofrio Dr., Suite 200 Madison, WI 53719 www.tpinst.org	WDMA	Window and Door Manufacturers Association 1400 E. Touhy Ave., Suite 470 Des Plaines, IL 60018 www.nwwda.org
TPI	Turfgrass Producers International 1855-A Hicks Road Rolling Meadows, IL 60008 www.turfgrassod.org	WH	Intertek Testing Services (Warnock Hersey Listed) 3210 American Drive Mississauga, Ontario L4V 1B3 CANADA www.etlsemko.com
U – Z			
UL	Underwriters Laboratories, Inc. 333 Pfingsten Rd. Northbrook, IL 60062-2096 www.ul.com	WIC	Woodwork Institute of California 3164 Industrial Blvd. West Sacramento, CA 95691 www.wicnet.org
VMAA	Valve Manufacturers Association Of America 1050 17th St., NW, Ste. 280 Washington, DC 20036-5503 www.vma.org	WQA	Water Quality Association 4151 Naperville Rd. Lisle, IL 60532 www.wqa.org
		WWPA	Western Wood Products Association 522 SW 5 th Ave., Suite 500 Portland, CO 97204-2122 www.wwpa.org

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

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SECTION 01 45 00 - QUALITY CONTROL

PART 1 GENERAL

1.1 GENERAL

- A. This Section covers quality control requirements supplementary to those of the General Conditions and Technical Specifications.

1.2 SECTION INCLUDES

- A. Quality assurance and control of installation.
- B. Field samples and mock-up.
- C. Inspection and testing laboratory services and qualifications.
- D. Laboratory duties and limitations of authority of testing laboratory.
- E. CONTRACTOR's responsibilities.
- F. Manufacturer's field services and reports.
- G. Shop testing.
- H. Field testing.
- I. Testing and services schedule.

1.3 RELATED SECTIONS

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section.
- B. Division 00, Procurement and Contracting Requirements.
- C. Section 01 10 00, Summary of Work.
- D. Section 01 42 19, Reference Standards.
- E. Section 01 33 00, Submittal Procedures
- F. Section 01 61 00, Common Product Requirements.

- G. Sections for Divisions 2 through 44—Required testing, inspections and other documentation as may be required for quality control.

1.4 REFERENCES

- A. Conform to reference standards by date of issue current with date of Contract Documents.
- B. Obtain copies of standards when required by Contract Documents.
- C. Where specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 33 00, Submittal Procedures.
- B. Provide copies of written reports for materials, equipment or systems as scheduled at the end of this section. Reference each report by respective section number.
- C. Laboratory qualifications:
 - 1. Provide statement of qualifications from testing firm and testing firm personnel for review and acceptance by Engineer.
 - 2. Provide one copy of report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during the most recent tour of inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 - 3. Laboratory shall be independently owned and operated from the CONTRACTOR, OWNER AND ENGINEER.
- D. Personnel qualification:
 - 1. Personnel shall be employed with a company that is independently owned and operated from the CONTRACTOR, OWNER AND ENGINEER.
 - 2. Provide qualifications of observer to Engineer 30 days in advance of required observations. Observer subject to acceptance of Engineer.
 - 3. Provide qualifications of Responsible Geotechnical Engineer to Engineer 30 days in advance of required observations. Observer subject to acceptance of Engineer.
 - 4. Provide statement of qualifications for review and acceptance by Engineer for the following:
 - a. ACI certification

- b. Independent special inspector and testing as specified.
- E. Laboratory test reports:
 - 1. Provide written reports of each test and inspection to Engineer. Each report shall include:
 - a. Date issued.
 - b. Project title and number.
 - c. Testing laboratory name, address and telephone number.
 - d. Name and signature of laboratory inspector.
 - e. Date and time of sampling or inspection.
 - f. Record of temperature and weather conditions.
 - g. Date of test.
 - h. Identification of product and specification section.
 - i. Location of sample or test in the Project.
 - j. Type of inspection or test.
 - k. Results of tests and compliance with Contract Documents.
 - l. Interpretation of test results when requested by Engineer.
- F. Field test reports: Provide reports detailing results of the tests. Indicate compliance or non-compliance with Contract Documents. Identify corrective action for materials and equipment which fails to pass field tests.

1.6 QUALITY ASSURANCE/CONTROL OF INSTALLATION

- A. The OWNER or ENGINEER reserves the right to complete additional testing. In such cases, the CONTRACTOR shall provide safe access for the OWNER or ENGINEER and their inspectors to adequately inspect the quality of work and the conformance with project specifications.
- B. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce Work of specified quality.
- C. Comply fully with manufacturer's instructions, including each step-in sequence.
- D. Should manufacturer's instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
- E. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

- G. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities: Conditions of the Contract.
- H. Certification of products: Respective sections of specifications.
- I. Laboratory tests required and standards for testing: Respective sections of specifications.

1.7 FIELD SAMPLES

- A. Install field samples at the site as required by individual specifications sections for review.
- B. Acceptable samples represent a quality level for the Work.
- C. Where field samples are specified in individual sections, remove, and clear area after field sample has been accepted by Engineer.
- D. Obtainment of field sampling and locations of field testing shall be coordinated with Engineer. Engineer reserves the right to direct when a field sample is obtained and the location of field testing.
- E. The CONTRACTOR shall furnish such samples of all materials without charge to OWNER or ENGINEER.

1.8 MOCK-UP

- A. Tests will be performed under provisions identified in this section.
- B. Assemble and erect specified items, with specified attachment and anchorage devices, flashings, seals, and finishes.

1.9 INSPECTION AND TESTING LABORATORY SERVICES

- A. CONTRACTOR shall employ and pay for the services of an independent engineering firm to provide observations, present recommendations and perform all testing services both specified and those that may not be specifically identified in the technical specifications, except for that testing specifically identified to be provided by the OWNER in the technical specification sections. CONTRACTOR shall employ and pay for all retesting of materials and equipment which fail original tests with no reimbursement by the OWNER or ENGINEER:
 - 1. Employment of the laboratory shall in no way relieve CONTRACTOR's obligations to perform the Work of the Contract.

- B. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm with instructions by the Engineer. Payment for Engineers time associated with retesting will be charged to the CONTRACTOR by deducting inspection or testing charges from the Contract Price.
- C. Perform all tests to determine compliance with Contract Documents by an independent commercial testing firm acceptable to Engineer.

1.10 QUALIFICATION OF INDEPENDENT OBSERVATION AND TESTING AGENCY, LABORATORY AND PERSONNEL

- A. Meet "Recommended Requirements for Independent Laboratory Qualification," published by American Council of Independent Laboratories.
- B. Testing firm's laboratory: Staffed with experienced technicians, properly equipped and fully qualified to perform tests in accordance with specified standards.
- C. Meet requirements of ASTM E 329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction" as applicable.
- D. Meet requirements of ASTM D 3740, "Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction" as applicable.
- E. Meet requirements of ASTM D 3666 "Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials" as applicable.
- F. Meet requirements of ASTM C 1077 "Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation" as applicable.
- G. Authorized to operate in the State in which the Project is located.
- H. Testing equipment:
 - 1. Calibrated at reasonable intervals by devices of accuracy traceable to either:
 - a. National Bureau of Standards.
 - b. Accepted values of natural physical constants.

1.11 LABORATORY DUTIES

- A. Cooperate with Engineer and CONTRACTOR; provide qualified personnel after due notice.
- B. Perform specified inspections, sampling, and testing of materials and methods of construction:
 - 1. Comply with specified standards.
 - 2. Ascertain compliance of materials with requirements of Contract Documents.
- C. Promptly notify Engineer and CONTRACTOR of observed irregularities or deficiencies of work or products.

1.12 LIMITATIONS OF INDEPENDENT OBSERVATION AND TESTING AGENCY, LABORATORY AND PERSONNEL

- A. Agency, its Laboratory and personnel are not authorized to:
 - 1. Release, revoke, alter or enlarge on requirements of Contract Documents.
 - 2. Approve or accept any portion of the Work.

1.13 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with independent laboratory and personnel as well as provide safe access to Work.
- B. Secure and deliver to the laboratory adequate quantities of representative samples of materials proposed to be used and which require testing.
- C. Provide to the laboratory the preliminary design mix proposed to be used for concrete, asphalt and other material mixes which require control by the testing laboratory.
- D. Furnish copies of product test reports as required.
- E. Furnish incidental labor and facilities:
 - 1. To provide safe access to Work to be tested.
 - 2. To obtain and handle samples at the project site or at the source of the product to be tested.
 - 3. To facilitate inspections and tests.
 - 4. For storage and curing of test samples.

- F. Cooperate with independent testing firm; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested:
 - 1. Notify Engineer and independent firm one (1) week as well as 48 hours prior to expected time for operations requiring services to allow for scheduling of tests and laboratory assignment of personnel.
 - 2. Make arrangements with independent firm and pay for additional samples and tests required for CONTRACTOR's use.

1.14 MANUFACTURER'S FIELD SERVICES

- A. Coordinate and pay for the services of manufacturers' representatives to perform the specified services.
- B. When specified in individual specification Sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, testing, adjusting and balancing of equipment and, as applicable, to initiate instructions when necessary.
- C. Individuals to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.
- D. Qualification of Manufacturer's Representative: Authorized representative of the manufacturer; experienced in the application and installation of the subject equipment.
- E. Inspect, check and adjust equipment as required and approve installation.
- F. Be present when equipment is placed in operation.
- G. Revisit the site as often as required to correct all problems and until equipment installation and operation are acceptable to Engineer.

1.15 SHOP TESTS

- A. Coordinate and pay all costs associated with specified shop tests of equipment, including retesting of items which fail original tests specifically identified in the technical specifications.
- B. Where the specifications call for a shop test to be witnessed by a representative of the Engineer, notify Engineer not less than 14 days prior to the scheduled test date.
 - 1. CONTRACTOR is to pay for all costs of Engineer's first visit.

2. When subsequent visits by Engineer are required because of incomplete tests, retesting or subsequent tests, CONTRACTOR is to pay for all costs of Engineer's subsequent visits.

1.16 FIELD TESTING

- A. CONTRACTOR shall pay all costs associated with field testing of materials and equipment as required in respective sections of the specifications, unless specifically indicated to be paid by OWNER in individual technical specification sections.
- B. Provide all required materials, labor, equipment, water, and power required for testing.
- C. Perform all tests in presence of Engineer or OWNER and provide one copy of field test results to Engineer same day of tests.
- D. Prepare and submit to Engineer 5 copies of written reports detailing the results of the test and identifying corrective action for materials and equipment which fails to pass field test.
- E. Repair with no additional compensation all materials and equipment which fail during testing.
- F. CONTRACTOR shall be liable to OWNER for all costs of Engineer and other consultants of OWNER due to failed tests, delays in testing or premature requests for testing services.

1.17 TESTING AND SERVICES SCHEDULE

- A. Testing laboratory services shall be provided as indicated in the individual specification sections including, but not be limited to, the following:

<u>Specification</u>	<u>Type of Material, Equipment or System</u>
03 30 10	Concrete
31 23 23	Fill
31 23 24	Flowable Fill
32 12 16	Asphalt Concrete Pavement
33 13 00	Testing and Disinfecting of Water Utility Piping

1.18 SHOP TESTING

- A. Shop testing shall be provided as indicated in the individual specification sections including, but not be limited to, the following:

Specification Section	Type of Material, Equipment or System
33 12 16	Water Utility Distribution Valves
33 12 19	Fire Hydrants
40 05 23.15	Gate Valves
40 05 78	Miscellaneous Valves

1.19 MANUFACTURER'S FIELD SERVICES
NOT USED

1.20 FIELD TESTING

A. Field testing shall be provided as indicated in the individual specification sections including, but not be limited to, the following:

Specification Section	Type of Material, Equipment or System
03 30 00	Cast-In-Place Concrete
31 23 23	Fill
31 23 24	Flowable Fill
32 12 16	Asphalt Concrete Pavement
33 13 00	Testing and Disinfecting of Water Utility Piping
33 01 30.13	Sewer and Manhole Testing
33 05 13	Manholes
33 11 10	Water Utility Distribution and Transmission Piping
33 31 10	Sanitary Utility Sewerage Piping
33 41 10	Storm Utility Drainage Piping
33 12 19	Fire Hydrants
40 05 23.15	Gate Valves
40 05 78	Miscellaneous Valves

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 01 50 00 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary Utilities: Electricity, lighting, heating, ventilating, telephone service, water and sanitary facilities
- B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control
- C. Construction Facilities: Access roads, parking, progress cleaning, storage and temporary buildings

1.2 GENERAL REQUIREMENTS

- A. Field Offices:
 - a. NOT USED
- B. Temporary Utilities:
 - 1. Provide power for construction at the site
 - 2. Furnish, install and maintain all temporary utilities to assure continuous service required for the Work, except as allowed herein, and remove on completion of Work. Modify and extend systems as work progress requires
 - 3. Make arrangements with the electrical utility and with the Owner for power takeoff points, voltage and phasing requirements, transformers and metering
 - 4. Contractor shall pay the costs and fees arising from all temporary electrical power
 - 5. Make arrangements with the power company for direct billings to the Contractor at the Contractor's business address, not to the project site
 - 6. Provide the special electrical connections required for the Work
 - 7. Provide toilet and wash-up facilities for the work force at the site of work. They shall comply with applicable laws, ordinances, and regulations pertaining to the public health and sanitation of dwellings and camps
- C. Temporary Controls:
 - 1. Furnish, install and maintain all construction aids required for the Work, except as allowed herein, and remove on completion of the Work
 - 2. Furnish, install and maintain fences and/or barriers as required for protection of the public, property and the Work
- D. Construction Facilities:

1. Contractor access and parking to shall be limited to the contractor construction limits and material storage areas indicated on the drawings. Coordinate any additional access and parking required for Contractor's personnel or operations with adjacent property owner(s), Engineer and Owner
2. Provide storage buildings and yards in accordance with this Section and Section 01600 and otherwise required for the Contractor's use, secure additional storage as required
3. Clean and repair damage caused by temporary installations or use of temporary facilities

E. Health and Safety:

1. Contractor is solely responsible for all Health and Safety during the Work of this project
2. Portions of the plant are exposed to wastewaters of varying degrees of treatment
3. Solvents, gasoline, and other hazardous materials may enter the plant with incoming sewage, and, therefore, certain areas are hazardous to open flame, sparks, or unventilated occupancy.

F. Products may be new or used, but must be serviceable, adequate for the intended purpose, and must not violate the requirements of any applicable codes or standards

1.3 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Comply with applicable Federal and State rules and regulations, local codes and ordinances
2. Comply with utility company requirements

1.4 TEMPORARY ELECTRICITY

- A. Contractor shall arrange for and pay all costs associated with power service to the field office and to Contractor's storage sheds and pay all costs for energy used
- B. Construction equipment larger than 15 amps, 120 V, single phase, arrange for and pay all costs associated with temporary power service either from the local utility or a portable engine-generator
- C. Equipment testing:
 1. NOT USED
- D. Provide power outlets for construction operations, with branch wiring and distribution boxes located at the site. Provide flexible power cords as required

- E. Provide main service disconnect and overcurrent protection at convenient location
 - F. Permanent convenience receptacles may not be utilized during construction
 - G. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting:
 - 1. Provide 20 ampere duplex outlets, single phase circuits for power tools
 - 2. Provide 20 ampere, single phase branch circuits for lighting
 - H. Pay all costs for installation and removal of temporary electrical service
- 1.5 TEMPORARY LIGHTING
- A. Provide and maintain incandescent lighting for construction operations
 - B. Provide and maintain lighting to exterior staging and storage areas after dark for security purposes as required
 - C. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required
 - D. Maintain lighting and provide routine repairs
- 1.6 TEMPORARY HEATING
- A. Provide and pay for all temporary heat as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions of the installation of materials and to protect materials and finishes from damage due to temperature or humidity
 - B. Portable heaters shall be standard approved units complete with controls
 - C. Pay all costs of installation, maintenance, operation and removal and for fuel consumed
 - D. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications
 - E. Maintain ambient temperature of 65 degrees F or lower throughout Summer and 75 degrees F or higher throughout Winter in field offices, unless indicated otherwise in specifications
- 1.7 TEMPORARY VENTILATING
- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases

- B. Provide and pay for temporary ventilation equipment as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation of materials and to protect materials and finishes from damage due to temperature or humidity
- C. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors or gases
- D. Portable ventilators shall be standard approved units complete with controls
- E. Pay all costs of installation, maintenance, operation and removal and for power consumed

1.8 TELEPHONE SERVICE

- A. NOT USED

1.9 INTERNET SERVICE

- A. Provide, maintain and pay for high speed internet service utilizing either DSL or cable modem to each field office starting no later than the time that the first field office is mobilized to the site until project Final Completion.
- B. Provide a minimum of two direct line instruments in Field Office for internet service:
 - 1. To Contractors field office, one direct line
 - 2. To Engineer's field office, one direct line
- C. Wi-fi hot spots are not acceptable
- D. Pay all costs for removal of internet
- E. Internet direct line instruments will be in addition to direct line instruments required for telephone service

1.10 TEMPORARY WATER SERVICE

- A. Obtain all water required for construction purposes.
 - 1. The location where water may be obtained will be coordinated at the preconstruction conference.
- B. Provide all drinking water required by Contractor's and Engineer's personnel. Pay all costs.

1.11 TEMPORARY SANITARY FACILITIES

- A. Provide sanitary facilities:

1. As required by laws and regulations
2. Not less than 1 facility for every 20 employees of Contractor and subcontractors at the site

- B. Service, clean and maintain facilities and enclosures
- C. Do not permit construction personnel to use Owner's facilities

1.12 CONSTRUCTION AIDS

- A. Provide construction aids and equipment required to facilitate the safe execution of the Work: scaffolds, staging, ladders, stairs, ramps, runways, platforms, railways, hoists, cranes, chutes and other such facilities and equipment
- B. Relocate construction aids as required by progress of construction, by storage or work requirements, and to accommodate legitimate requirements by Owner
- C. Completely remove temporary materials, equipment, and services at completion of the Project
- D. Clean and repair damage caused by installation or by use of temporary facilities:
 1. Remove foundations and underground installations for construction aids
 2. Grade the areas for the site affected by temporary installations to required elevations and slopes and clean the area

1.13 PROTECTION OF INSTALLED WORK

- A. Protect installed Work and provide special protection where specified in individual specification Sections
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings
- D. Protect finished driving surfaces, floors, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials
- E. Prohibit storage upon waterproofed or roofed surfaces. If activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer
- F. Protect landscaped areas from construction activities

1.14 SECURITY

- A. Provide security to protect Work from unauthorized entry, vandalism, or theft

- B. Coordinate with Owner's security program
- C. Access to site will be through the main gate and limited to the working hours set forth in *the Contract Documents*
- D. Provide a minimum of two (2) matching key rings each fitted with keys for each lock that may restrict access to the work
 1. Each set of keys shall be secured to an adequately sized key ring
 2. Provide only one copy of a given key per ring

1.15 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition
- B. Provide suitable barriers as required for public protection and the protection of Owner's employees
- C. Protect non-owned vehicles, vehicular traffic, stored materials, site and structures from damage
- D. Install facilities of a neat and reasonable uniform appearance, structurally adequate for the required purposes
- E. Relocate barriers as required by progress of construction
- F. Completely remove barriers, including foundations, when construction has progressed to the point that they are no longer needed
- G. Clean and repair damage caused by installation, fill and grade the areas of the site to required elevations and slopes and clean the area

1.16 TEMPORARY FENCING

- A. Construction: Commercial grade chain link fence
- B. Provide 6 foot high fence around construction site; equip with vehicular gates with locks
- C. Provide additional fencing to protect stored materials and products or to ensure public safety and the safety of Owner's employees

1.17 EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather-tight closures with exterior openings to provide acceptable working conditions, accommodate and protect Products, allow for temporary

heating and maintenance of required ambient temperatures identified in individual specification Sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks

- B. Provide temporary roofing as required to protect work and equipment

1.18 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition
- B. Remove debris and rubbish from remote spaces prior to enclosing the space
- C. Remove waste materials, debris, and rubbish from site periodically and dispose off-site in accordance with local and state regulations
- D. At a minimum, the site and areas of work are to be cleaned on a weekly basis
- E. Sweep, vacuum and clean interior areas prior to start of surface finishing

1.19 ACCESS ROADS

- A. Construct and maintain temporary roads accessing public thoroughfares to service construction area, field offices and parking areas
- B. Extend and relocate as Work progress requires. Provide detours necessary for unimpeded traffic flow
- C. Provide and maintain access to fire hydrants, free of obstructions and hazards
- D. Provide means of removing mud from vehicle wheels before entering street or clean streets as required by owner

1.20 PARKING

- A. Dedicated on-site parking adjacent to and abutting entrance to Engineer's field office shall be provided and reserved for Engineer and Owner's exclusive use. At a minimum two of the four spaces shall be reserved at all times for use by the Engineer of Record.
- B. Contractor shall keep and maintain access and parking areas clean and free from debris, hazards, mud, muck and snow to provide for their uninterrupted use.
- C. Contractor shall be liable for all damages incurred to vehicles of site visitors that are caused due to the contractors negligence including but not limited to the following:
 - 1. Leaking or flat tires

2. Other property damage per Division 1

1.21 FIELD OFFICES AND SHEDS

A. NOT USED

1.22 EQUIPMENT

1. NOT USED

1.23 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to Final Application for Payment

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated

C. Clean and repair damage caused by installation or use of temporary work

D. Restore existing facilities used during construction to original condition acceptable to Owner. Restore permanent facilities used during construction to specified condition

1.24 BULK MATERIAL STOCKPILING

A. Dedicated on-site stockpiling locations away from existing structures, fences, utilities or other improvements that would limit their access or use.

B. Contractor shall install, construct, and maintain, access to and around stockpiling areas areas clean and free from debris, hazards, mud, muck and snow to provide for their uninterrupted use.

C. Contractor shall be liable for all damages incurred to vehicles of site visitors that are caused due to the contractors negligence including but not limited to the following:

D. Contractor shall install, construct, and maintain erosion BMP's in accordance with the approved erosion and sediment control plan for all stockpiled materials.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01 56 39 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes provisions for temporary protection of trees and other plant life in preparation for site or building excavation Work.
- B. Related Sections:
 - 1. Section 31 23 16 - Excavation.
 - 2. Section 31 23 17 - Trenching.
- C. This specification shall be applied concurrently and in conjunction with other plant material protection measures herein described and specified.

PART 2 MATERIALS – NOT USED

PART 3 EXECUTION

3.1 INSPECTION

- A. Inspect all trees specified on the Drawings for protection prior to construction.
 - 1. Document with written memorandum and photographs any unusual conditions.
 - 2. Submit copies of documentation to ENGINEER prior to beginning work.
- B. Verify all conditions on the Drawings with actual conditions at Site regarding tree protection prior to any site disturbance.
- C. The ENGINEER must be present during demolition of existing conditions occurring within the drip line of trees designated to remain.
- D. Notify ENGINEER twenty-four (24) hours prior to inspections and/or tagging of protected trees.

3.2 PROTECTION

- A. Install barricades at drip lines of trees designated to remain prior to the commencement of construction.
- B. Clearly designate protected trees and clear of any material storage, personnel, or vehicular movement.

- C. Provide temporary fencing, barricades, and guards as necessary or required to protect trees designated on the Drawings to remain, from damage above and below grade.
- D. Protect root systems of trees and plant life to remain.
 - 1. Protect from damage due to noxious materials in solution caused by runoff or spillage during mixing and placement of construction materials.
 - 2. Protect from flooding, erosion, or excessive wetting resulting from dewatering operations and compaction.
 - 3. Protect against unauthorized cutting, breaking, skinning roots and branches, or bruising bark.
 - 4. Protect from smothering and compaction.
 - a. Do not store construction materials or permit vehicles to drive or park within the drip line area of any tree to remain.
 - 5. Protect from dumping of refuse in close proximity.
- E. Where cutting is necessary, review conditions with the ENGINEER before proceeding, and comply with directives of ENGINEER.

3.3 EXCAVATION AROUND TREES

- A. Excavate within drip lines of trees only where indicated on the Drawings or as directed by ENGINEER.
- B. Where trenching for utilities is required within drip lines, tunnel under or around roots by hand excavating.
 - 1. Where possible trench toward trunk of tree and tunnel under central root mass to avoid severing all lateral roots on side of trench.
 - 2. Do not cut main lateral roots or tap roots over one inch in diameter.
 - 3. Temporarily support and protect trees from damage until permanently covered with approved backfill.
- C. Do not allow exposed roots to dry out before backfill is placed.
 - 1. Provide temporary earth or burlap cover.
 - 2. Water roots daily when exposed and maintain in a moist condition.
- D. Backfill roots only upon inspection approval from the ENGINEER.

1. Backfill around root excavations only with clean imported topsoil free from materials deleterious to root growth.
 2. Backfill to eliminate voids and compact only by means of manual tamping at root areas.
 3. Water sufficiently to settle topsoil and eliminate voids or air pockets around roots.
 4. Allow for natural settlement of soil surface, and furnish and apply topsoil sufficient to bring to original finish grade after backfill settlement.
- E. If during excavation, any condition arises that threatens the survivability of the protected tree, or an unknown condition arises that affects the stability or integrity of the root system, notify the ENGINEER immediately.

3.4 REPAIR AND REPLACEMENT OF DAMAGED TREES

- A. In the event of damage to existing trees:
1. Immediately prune limbs smaller than 3" caliper or roots smaller than 2" caliper to repair trees damaged by construction operations.
 2. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged trees.
 3. Any such pruning and/or repairs shall be approved in advance and at completion by ENGINEER.
 4. The ENGINEER shall reserve the right, at cost to the CONTRACTOR, to obtain the services of a Certified Consulting Arborist with current membership in the American Society of Consulting Arborists to determine the severity of damage.
 5. The CONTRACTOR is responsible for the cost of repairs caused by their actions or by the actions of subcontractors engaged by the CONTRACTOR.
- B. Remove and replace dead or damaged trees which are determined by the ENGINEER to be incapable of restoration to normal growth patterns at no additional cost to OWNER.
1. Provide new trees of the same species as those removed or damaged, with size and/or quantity to be determined by ENGINEER.
 2. Furnish replacement trees and plant life to the Site and plant, maintain, and warranty as directed by the ENGINEER.

3. If trees are not replaceable with the same species, and size, compensate the OWNER for the replacement cost of the trees based on the evaluation of a Certified Consulting Arborist.
4. The CONTRACTOR is responsible for additional costs of removing damaged trees and labor for planting new specimens.

3.5 DESIGNATED TREE REMOVAL PROCEDURES

- A. If designated tree removal is specified by ENGINEER, furnish labor, material, and equipment necessary for removing and/or salvaging existing trees, if necessary, as designated on the Drawings for removal.
 1. Verify location and species with ENGINEER prior to removal.
- B. Salable logs or timber may be sold to CONTRACTOR's benefit upon notification and prior approval of OWNER. Upon approval, remove salable logs or timber promptly from site.

3.6 DESIGNATED TREE TRANSPLANTING PROCEDURES

- A. If designated tree transplanting is specified by ENGINEER, verify and identify existing trees to be transplanted.
- B. All work shall be in accordance with the standards and practices outlined in the following: Tree and Shrub Transplanting Manual, E.B. Himelick, 1981 Ed., International Society of Arboriculture.
- C. Prior to commencement of Work, submit a coordination schedule, method of transplanting, traffic control, routing, etc., to ENGINEER, for review and approval.
- D. Warranty for transplanted trees shall be determined and directed on a case by case basis by the ENGINEER, upon contracting of specified transplanting work.
- E. Review and verify location of utilities in area of operation. Obtain location and jurisdictional approval from utilities prior to transplanting activities. Protect utilities and the public at all times.
- F. Prior to transplanting, spray trees with an anti-desiccant emulsion-type film forming agent, "Dowax" by Dow Chemical Company, "Wilt-Pruf" by Nursery Specialty Products Inc., "D-Wax", by Plant Products Inc., or approved equal, prior to digging with two separate applications allowing forty-eight (48) hours apart. Use a power sprayer to provide an adequate film over trunks, branches, stems, twigs, and foliage. Anti-desiccant must be dry prior to relocation.

- G. Dig, ball and burlap, and move designated trees for relocation to the new planting location shown on the Drawings. In the event the new planting area is not prepared, place tree in a storage area approved by the ENGINEER solely designated for healing-in of plant materials until final planting may occur. Brace in a vertical position, provide shade, wind protection, and irrigation at plant storage area. Utilize all horticulturally proper methods for plant storage. Plants shall be maintained by CONTRACTOR while in storage.

3.7 GRADING AND FILLING AROUND TREES

- A. Maintain existing grade within drip line of trees unless otherwise indicated on the Drawings or directed by the ENGINEER.

3.8 MAINTENANCE OF PROTECTIVE MEASURES

- A. Maintain protective measures throughout the construction process. Immediately repair any alteration to protection measures throughout construction process. Repair or reinstall protective measures immediately upon alteration. Monitor protective measures daily.
- B. Remove and clear area of debris and fencing, barricades, etc., upon final written approval of ENGINEER.

END OF SECTION

SECTION 01 61 00 – COMMON PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General requirements for materials and equipment.
- B. Quality assurance and qualifications.
- C. Delivery, storage and handling.
- D. Job conditions.
- E. Warranty.
- F. Material and fabrication requirements.
- G. Preparation, installation and field quality control requirements.

1.2 RELATED SECTIONS

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section.
- B. Section 01 10 00, Summary of Work.
- C. Section 01 33 00, Submittal Procedures
- D. Section 01 45 00, Quality Control.

1.3 GENERAL REQUIREMENTS

- A. The section applies to all equipment provided under this contract.
- B. Provide all new materials and equipment, except as specified or required by testing.
- C. Except as specifically indicated or specified, materials and equipment removed from the existing structure shall not be used in the completed Work.

- D. CONTRACTOR to coordinate equipment with other parts of the Work, including verification or compatibility of structures, piping, wiring and equipment components.
- E. CONTRACTOR is responsible for all alterations in the Work to accommodate equipment differing in dimensions or other characteristics from that contemplated in the Contract Drawings or specifications.
- F. Do not use any material or equipment for any purpose other than that for which is designed or specified.

1.4 DEFINITIONS

- A. Special tools, instruments, devices, or accessories: Any tools, instruments, devices or accessories required for repair, adjustment or maintenance of equipment which are designed especially for the equipment in question, or which are not normally kept in stock by local tool suppliers.

1.5 QUALIFICATIONS

- A. Installers Qualifications: Equipment and material shall be installed and placed in service by or under the guidance of qualified personnel having the knowledge and experience necessary for proper results. Where CONTRACTOR's or subcontractor's employees are not properly qualified, such personnel shall be field representative of the equipment supplier.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Arrange deliveries of products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site.
- B. Deliver products in undamaged condition, in manufacturer's original container or packaging, with identifying labels intact and legible, all in accordance with manufacturer's instructions.
- C. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and accepted submittals and that products are properly protected, undamaged and correct quantities.
- D. Provide equipment and personnel to handle products by methods to prevent soiling or damage to products or packaging.
- E. Box, crate, or otherwise completely enclose and protect all equipment.

- F. Protect painted surfaces against impact, abrasion, discoloration or other damage.
- G. Include complete packing lists and bills of material with each shipment.
- H. Deliver anchor bolts together with templates sufficiently early to permit setting when structural concrete is placed.
- I. Package materials and equipment to facilitate handling and protect against damage during transit handling or storage.
- J. Protect equipment from exposure to the elements and keep thoroughly dry and dust free at all times.
- K. Grease or oil all bearings and similar items.
- L. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate-controlled enclosures.
- M. For exterior storage of fabricated products, place on sloped supports, above ground on blocking or skids to prevent soiling, staining or other damage.
- N. Provide off-site storage and protection when site does not permit on-site storage or protection.
- O. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
- P. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- Q. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- R. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.
- S. Store immediately upon delivery.
- T. Store electrical equipment and equipment with bearings in weather tight structures maintained above 60 degrees F.

- U. Protect electrical equipment, controls, and insulation against moisture, water, and dust damage.
- V. Connect and operate continuously all space heaters furnished in electrical equipment.
- W. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.
- X. Provide permanent, labeled, packings for spare parts.

1.7 JOB CONDITIONS

- A. The project is a utility and roadway project in a residential neighborhood..
- B. Altitude: Approximately 5,300 feet above MSL.
 - 1. Winter Temperature: -20 degrees F.
 - 2. Summer Temperature: 110 degrees F.

1.8 WARRANTY

- A. Warranty all materials and equipment for no less than 2 *years* from the date of Substantial Completion against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, leakage, breakage or other failure.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Suitable for the service conditions.
- B. Structural and miscellaneous fabricated steel in equipment shall conform to AISC standards, except as otherwise specified.

2.2 ACCESSORIES

- A. Anchor bolts:
 - 1. Provided with at least 2 nuts per bolt.
 - 2. Minimum diameter: 3/4 inch.
 - 3. Long enough to permit 1-1/2 inch of grout below baseplate, if equipment is baseplate mounted, and to provide adequate anchorage into structural concrete.

- B. Baseplates:
 - 1. Cast iron or welded steel.
 - 2. Provide for pumps, compressors and similar equipment.
 - 3. Neat design.
 - 4. Pads for anchoring.
 - 5. Adequate grout holes.
 - 6. Provide pump bases with a means for collecting leakage and a threaded drain connection.
- C. Special tools and accessories:
 - 1. Provide all special tools, instruments and accessories required for proper maintenance.
 - 2. Provide all special lifting and handling devices required.

2.3 FABRICATION

- A. Design, fabricate, and assemble in accordance with the best modern manufacturing and shop practices.
- B. Manufacture parts to standard sizes and gages.
- C. Two or more items of the same type shall be identical by the same manufacturer and interchangeable.
- D. Design structural members for shock and vibratory loads:
 - 1. Use 1/4-inch minimum thickness for all steel which will be submerged, wholly or partially, during normal operation.
- E. Lubrication system:
 - 1. Require no more than weekly attention during continuous operation.
 - 2. Require no attention during equipment startup and shutdown.
 - 3. No lubricant wasting.
 - 4. Convenient and accessible:
 - a. Oil drains and fill plugs easily accessible from the normal operating area or platform.

- b. Drains located to allow convenient collection of oil during oil changes without removing the equipment from its normal installed position.
5. Provide constant level oilers or oil level indicators for oil lubrication systems.

2.4 FINISHING

- A. Shop primer for steel and iron surfaces: Tnemec "77H Chem-Prime", Sherwin Williams "Ken Kromik Universal Metal Primer," Porter "284 Universal Primer," or approved equal.
- B. Rust preventative coating for machined, polished and nonferrous surfaces not to be painted: Houghton "Rust-Veto 344", Rust-Oleum "R-9", or approved equal.
- C. Paint for self-contained or enclosed components such as motors, speed reducers and starters: High grade, oil-resistant enamel.
- D. All shop primer paint shall be compatible with the final coat paint used by the CONTRACTOR.
- E. Coat all steel and iron surfaces.
- F. Protect surfaces which will be inaccessible after assembly for the life of the equipment.
- G. Provide a smooth uniform base for painting of exposed surfaces by finishing smooth, cleaning thoroughly, and filling as necessary.
- H. Apply shop primer to protect equipment to be field painted.
- I. Shop finish self-contained or enclosed components.

2.5 SOURCE QUALITY CONTROL AND TESTS

- A. Observation of performance tests:
 - 1. Where specifications require the presence of Engineer for testing of equipment, OWNER is to pay for all costs of Engineer's first visit.
 - 2. If subsequent visits by Engineer are required because of incomplete tests, retesting or subsequent tests, CONTRACTOR shall reimburse OWNER for all costs.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Inspect equipment for signs of pitting, rust decay, or other deleterious effects of storage. Do not install any equipment showing such effects. Replace damaged equipment with identical new equipment.

3.2 PREPARATION

- A. Install equipment anchor bolts during placement of structural concrete.

3.3 INSTALLATION

- A. Anchor baseplates to the concrete base and fill space beneath with grout. Shims used during grouting shall be removed after grouting.
- B. Provide lubricants as recommended by the equipment manufacturer in sufficient quantity to fill all lubricant reservoirs and to replace all consumption during testing, startup and operation prior to acceptance of equipment by OWNER.
- C. For material and equipment specifically indicated or specified to be reused in the Work:
 - 1. Use special care in removal, handling, storage, and reinstallation to assure proper function in the completed Work.
 - 2. Arrange for transportation, storage, and handling of products, which require off-site storage, restoration, or renovation. Pay all costs for such Work.
- D. Handle, install, connect, clean, condition, and adjust products in strict accord with manufacturer's instructions and in conformity with specified requirements:
 - 1. Obtain and distribute copies of such instructions to parties involved in the installation in the manner detailed in the submittal section.
 - 2. Maintain one set of complete instructions at the job site during installation and until completion.
 - 3. Perform Work in accord with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.
 - 4. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer for further instructions.

- 5. Do not proceed with Work without clear instructions.
- E. No shimming between machined surfaces is allowed.

3.4 FIELD QUALITY CONTROL

- A. Provide a qualified manufacturer's field representative when specified in individual Specification Sections and Section 01 45 00, Quality Control, or in the detailed specifications to provide the services specified.
- B. Where installation assistance is specified, manufacturer's representative is to observe, guide, instruct and direct CONTRACTOR's erection or installation procedure.
- C. Where an installation check is specified, manufacturer's representative is to verify equipment is properly installed as detailed in individual Specification Sections and Section 01 45 00, Quality Control, or in technical detailed specifications.
- D. Field representatives are to revisit the site as often as necessary to attain installation satisfactory to Engineer.
- E. Acceptance of Work in connection with the installation of equipment furnished by others is subject to acceptance by the field representative. Such acceptance by the field representative or Engineer does not relieve CONTRACTOR of responsibility for planning, supervising, and executing the installation of Work or of responsibility for defective Work.

3.5 ADJUSTING

- A. Perform under provisions of Section 01 45 00, Quality Control.
- B. Perform all required adjustment tests, operation checks, and other startup activities required.

3.6 CLEANING

- A. Perform under provisions of Section 01 74 00, Cleaning.
- B. Repaint all painted surfaces which are damaged prior to equipment acceptance to Engineer's satisfaction.

END OF SECTION

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SECTION 01 70 00 - CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Adjusting.
- D. CONTRACTOR's closeout submittals.
- E. Project record documents.
- F. Warranties.
- G. Spare parts and maintenance materials.
- H. Delivery to OWNER.
- I. Substantial completion.
- J. Final inspection.
- K. Re-inspection fees.
- L. Final adjustments of accounts.
- M. Final application for payment.

1.2 RELATED SECTIONS

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section.
- B. Division 00, Procurement and Contracting Requirements.
- C. Section 01 50 00, Construction Facilities and Temporary Controls.
- D. Section 01 74 00, Cleaning.
- E. Section 01 78 00, Project Record Documents.
- F. Town of Erie Standard Specification Section 200

1.3 CLOSEOUT PROCEDURES

- A. Comply with requirements stated in conditions of the Contract and in specifications for administrative procedures in closing out the Work.

- B. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's inspection.
- C. Provide submittals to Engineer/Owner that are required by governing or other authorities.
- D. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.4 FINAL CLEANING

- A. Provide final cleaning under provisions of Section 01 74 00, Cleaning.
- B. Execute final cleaning prior to final inspection.

1.5 ADJUSTING

- A. NOT USED

1.6 CONTRACTOR'S CLOSEOUT SUBMITTALS

- A. Project Record Documents.
- B. Spare parts and maintenance materials: As specified in individual sections and as specified herein.
- C. Evidence of payment and waiver of claims: As specified in General and Supplementary Conditions.
- D. Two copies of each specified special bond, warranty, and service contract.
- E. Final inspection reports by all regulatory agencies demonstrating the agencies' final approval.
- F. At Contract close-out, deliver Record Documents to Engineer for the OWNER.
- G. Accompany submittal with transmittal letter in duplicate, containing:
 - 1. Date.
 - 2. Project title and number.
 - 3. CONTRACTOR's name and address.

4. Title and number of each Record Document.
 5. Signature of CONTRACTOR or his authorized representative.
- H. In addition to these contract documents, the requirements of the Town of Erie Section 200 Acceptance Procedures of their Standards and Specifications shall apply. In the event of a conflict between this project manual and Section 200 of the Town of Erie Standards and Specifications, the more stringent shall apply.

1.7 PROJECT RECORD DOCUMENTS

- A. Provide Project Record Documents under provisions of Section 01 78 00, Project Record Documents.

1.8 WARRANTIES

- A. Provide duplicate notarized copies.
- B. Execute and assemble documents from Subcontractors, suppliers, and manufacturers.
- C. Provide Table of Contents and assemble in three-inch D-ring binder with durable plastic cover.
- D. Submit prior to final Application for Payment.
- E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.9 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification sections.
- B. Deliver to Project site; obtain receipt prior to final payment.
- C. Store the items in a clean, dry, heated, storage shed, or bonded warehouse.
- D. Protect all items from damage during storage. Store in sturdy wooden boxes or crates with lid.

1.10 DELIVERY TO OWNER

- A. At or prior to time of inspection for Substantial Completion deliver all required items to OWNER at place on site designated by OWNER:
 - 1. CONTRACTOR and representatives of OWNER and Engineer shall inspect and inventory all items delivered.
- B. Submit to Engineer detailed itemized summary of all items delivered:
 - 1. Organize summary by specification sections.
 - 2. Indicate on summary any items delivered which were damaged or defective.
 - 3. CONTRACTOR and OWNER's and Engineer's representatives shall sign summary certifying that all items listed were delivered and that, unless otherwise noted on summary, all items were in good condition at time of delivery to OWNER.
- C. Engineer will review summary for completeness and inform CONTRACTOR promptly of any deficiencies therein.
- D. CONTRACTOR shall deliver all additional items identified by Engineer and replace all damaged and defective items noted on original summary before requesting final inspection.
- E. Summary for additional and replacement items, signed by CONTRACTOR and OWNER's and Engineer's representatives, shall be submitted.

1.11 SUBSTANTIAL COMPLETION

- A. When CONTRACTOR considers the Work is substantially complete, he shall submit to Engineer:
 - 1. A written notice that the Work or designated portion thereof is substantially complete.
 - 2. A list of items to be completed or corrected.
- B. Within reasonable time after receipt of such notice, Engineer will make an inspection to determine status of completion.
- C. Should Engineer determine that the Work is not substantially complete:
 - 1. Engineer will promptly notify CONTRACTOR in writing, giving reasons therefore.
 - 2. CONTRACTOR shall remedy deficiencies in the Work and send second written

notice of Substantial Completion to Engineer.

3. Engineer will re-inspect the Work.
- D. When Engineer finds that the Work is substantially complete, he will:
1. Prepare and deliver to OWNER tentative Certificate of Substantial Completion with tentative list of items to be completed or corrected before final payment.
 2. After consideration of any objections made by OWNER as provided in Conditions of the Contract and when Engineer considers the Work substantially complete, he will execute and deliver to OWNER and CONTRACTOR definite Certificate of Substantial Completion with revised tentative list of items to be completed or corrected.
- E. No Certificate of Substantial Completion will be issued by Engineer until detailed itemized summary is submitted for review.
- F. Final payment will not be made until all specified spare parts, maintenance materials, and special tools have been delivered to OWNER in acceptable condition.

1.12 FINAL INSPECTION

- A. When CONTRACTOR considers the Work is complete, CONTRACTOR shall submit written certification that:
1. Contract Documents have been reviewed.
 2. Work has been inspected for compliance with Contract Documents.
 3. Work has been completed in accordance with Contract Documents.
 4. Equipment and systems have been tested in the presence of the OWNER's representative and are operational.
 5. Work is completed and ready for final inspection.
- B. Engineer and Consultant will make an inspection to verify status of completion with reasonable promptness after receipt of such certification.
- C. Should Engineer consider that the Work is incomplete or defective:
1. Engineer will promptly notify CONTRACTOR in writing listing incomplete or defective work.
 2. CONTRACTOR shall take immediate steps to remedy stated deficiencies and send second written certification to Engineer that the Work is complete.

3. Engineer will re-inspect Work.
- D. When Engineer finds that the Work is acceptable under Contract Documents, Engineer shall request CONTRACTOR to make closeout submittals.

1.13 REINSPECTION FEES

- A. Should Engineer and Consultant perform re-inspections due to failure of the Work to comply with claims of status of completion made by CONTRACTOR:
1. OWNER will compensate Engineer for such additional services of Consultant.
 2. OWNER will deduct amount of such compensation from final payment to CONTRACTOR.

1.14 FINAL ADJUSTMENTS OF ACCOUNTS

- A. Submit final statement of accounting to Engineer.
- B. Statement shall reflect all adjustments to contract sum:
1. Original Contract Sum.
 2. Additions and deductions resulting from:
 - a. Previous Change Orders.
 - b. Deductions for uncorrected Work.
 - c. Deductions for liquidated damages.
 - d. Deductions for re-inspection payments.
 - e. Other adjustments.
 3. Total Contract Sum, as adjusted.
 4. Previous payments.
 5. Sum remaining due.

1.15 FINAL APPLICATION FOR PAYMENT

- A. Submit final Application for Payment in accordance with procedures and requirements stated in conditions of the Contract.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 01 74 00 - CLEANING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Hazards and governing control.
- B. Cleaning materials.
- C. General work area conditions during construction.
- D. Interior and exterior (site) cleaning.
- E. Final cleaning.

1.2 RELATED SECTIONS

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section.
- B. Division 01, General Requirements.
- C. Cleaning of certain parts of the work described in various sections of the specifications.

1.3 STORAGE AND HANDLING

- A. Store cleaning products and cleaning wastes in containers specifically designed for those materials.

1.4 SCHEDULING

- A. Schedule cleaning operations so that dust and other contaminants disturbed by cleaning process will not fall on newly painted surfaces.

1.5 HAZARDS AND GOVERNING CONTROL

- A. Hazards Control:
 - 1. Store volatile wastes in covered metal containers and remove from premises daily.
 - 2. Prevent accumulation of wastes which create hazardous conditions.
 - 3. Provide adequate ventilation during use of volatile or noxious substances.
- B. Conduct cleaning and disposal operations to comply with laws and safety orders of governing authorities including anti-pollution laws:

1. Do not burn or bury rubbish and waste materials on project site.
2. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.

PART 2 PRODUCTS

2.1 CLEANING MATERIALS

- A. Cleaning Agents:
 1. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.
 2. New and uncontaminated.
- B. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

PART 3 EXECUTION

3.1 GENERAL WORK AREAS DURING CONSTRUCTION

- A. Maintain premises and public properties free from accumulations of waste and debris caused by work on this project.
- B. Prevent dust nuisance attributable to this work.
- C. Do not drop or throw materials.
- D. Handle materials in a controlled manner with as few handlings as possible.
- E. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on newly painted surfaces.
- F. Dispose of degradable debris at an approved solid waste disposal site.
- G. Dispose of non-degradable debris at an approved solid waste disposal site or in an alternate manner approved by Engineer and regulatory agencies.
- H. Repair, patch, and touch-up marred surfaces to specified finish to match adjacent surfaces.
- I. On completion of work, leave area in a clean, natural looking condition. Remove all signs of temporary construction and activities incidental to construction of required permanent Work.

3.2 INTERIOR CLEANING

A. Cleaning During Construction:

1. Keep work areas clean so as not to hinder health, safety or convenience of personnel in existing facility operations.
2. At maximum weekly intervals, dispose of waste materials, debris, and rubbish.
3. Vacuum clean interior areas when ready to receive finish painting. Continue vacuum cleaning on an as-needed basis, until substantial completion.
4. Vacuum clean interior spaces, including inside cabinets.
5. Control dust in work areas of existing facilities:
 - a. Provide protection to existing electrical and mechanical equipment as required to eliminate detrimental effects due to construction.
 - b. Check air handling filters in existing units having construction activities. Weekly replace as necessary.
 - c. Check interior of existing electric panels and vacuum if dust accumulation has occurred at maximum monthly intervals.
 - d. Sweep all floors, including basins, tunnels, platforms, walkways, and pick up and dispose of all debris at maximum weekly intervals. Use dust suppressant sweeping compound in areas open to areas of existing facility operations.

B. Final Cleaning:

1. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.
2. Clean equipment to a sanitary condition.
3. Wipe all lighting fixture reflectors, lenses, lamps and trims clean.
4. Wash and shine glazing and mirrors.
5. Polish glossy surfaces to a shine finish.
6. Ventilating systems:
 - a. Clean permanent filters and replace disposable filters if units were operated during construction.
 - b. Clean ducts, blowers and coils if units were operated without filters during construction.
7. Replace all burned out lamps.
8. Broom clean process area floors.
9. Mop office and control room floors.

3.3 EXTERIOR (SITE) CLEANING

A. Cleaning During Construction:

1. Construction debris:
 - a. Confine in strategically located container(s) covered to prevent blowing by wind.
 - b. Remove from work area to container daily.
 - c. Haul from site once a week (minimum).
2. Vegetation: Keep weeds and other vegetation trimmed to 3-inch maximum height.
3. Remove soils, sand, and gravel deposited on paved areas and walks as required to prevent muddy or dusty conditions:
 - a. Do not flush into storm sewer system.
4. Comply with stormwater general permit requirements, and monitor and employ best management practices (BMP).

B. Final Cleaning:

1. Clean debris from roofs, gutters, downspouts, and drainage systems.
2. Clear and remove surplus and discarded materials, temporary structures and debris of every kind.
 - a. Surplus and waste materials removed from the site shall be disposed of at a permitted disposal site satisfactory to the OWNER.
3. Remove trash and debris containers from site.
 - a. Re-seed areas disturbed by location of trash and debris containers.
4. Broom clean and wash paved surfaces.
5. Rake clean other surfaces of grounds.

3.4 FIELD QUALITY CONTROL

- A. During substantial completion walk through or prior to start-up, conduct an inspection with Engineer to verify acceptable condition of all work areas.
- B. Should Contractor fail or refuse to clean up and remove surplus materials and debris, trash or other discarded materials as provided for herein, OWNER may do so or cause same to be done at Contractor's expense, and reasonable costs to OWNER to clear site shall be deducted from final payment.

END OF SECTION

SECTION 01 78 00 - PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Maintenance of record documents.
- B. Throughout progress of Work, maintain an accurate record of changes in the Contract Documents, and, upon completion of Work, transfer recorded changes to set of Record Documents.

1.2 RELATED SECTIONS

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section.
- B. Division 00, Procurement and Contracting Requirements.
- C. Section 01 70 00, Contract Closeout.
- D. Include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 01 of these Specifications.
- E. Individual sections of Technical Specifications.

1.3 SUBMITTALS

- A. Comply with pertinent provisions under Section 01 33 00, Submittal Procedures.
- B. Engineer's acceptance of the current status of Project Record Documents will be a prerequisite to Engineer's recommendation for payment of progress payments and final payment under the Contract.
- C. Prior to submitting each request for progress payment, secure Engineer's acceptance of the current status of the Project Record Documents.
- D. Prior to submitting request for final payment, submit the final Project Record Documents to Engineer for acceptance.

1.4 QUALITY ASSURANCE

- A. Delegate the responsibility for maintenance of Record Documents to one person on CONTRACTOR's staff acceptable to Engineer.

- B. Accuracy of records:
 - 1. Thoroughly coordinate changes within Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to show the change properly.
 - 2. Accuracy of records shall be such that future search for items shown in the Contract Documents may rely reasonably on information obtained from accepted Project Record Documents.
 - 3. The CONTRACTOR shall provide Field Engineering services as identified in Section 01 10 00, Summary of Work, to provide accurate horizontal and vertical elevations on all joints of pipe, manholes, rims of manholes and other features identified in Section 01 10 00.
- C. Make entries within 24 hours after receipt of information that the change has occurred.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Maintain job set of Record Documents completely protected from deterioration and from loss and damage until completion of the Work and transfer of all recorded data to the final Project Record Documents.
- B. In the event of loss of recorded data, use means necessary to again secure the data for Engineer's acceptance:
 - 1. Such means shall include, if necessary in the opinion of Engineer, removal and replacement of concealing materials
 - 2. In such case, provide replacement to the standards originally required by the Contract Documents.

PART 2 PRODUCTS

2.1 RECORD DOCUMENTS

- A. Maintain on site, one set of the following record documents; record actual revisions to the Work:
 - 1. Contract Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other Modifications to the Contract.
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Field test reports.
 - 7. Construction photographs.

- B. Store record documents and samples separate from documents used for construction:
 - 1. Provide files and racks for storage of documents.
 - 2. Provide locked cabinet or secure storage space for samples.
- C. Record information concurrent with construction progress:
 - 1. Do not conceal any work until required information is recorded.
 - 2. Legibly mark to record actual construction.
- D. Specifications and addenda—Legibly mark and record at each Product section description of actual Products installed, including the following:
 - 1. Manufacturer's name, product model, number, trade name and supplies.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda, field order or change order.
- E. Record documents and shop drawings: Legibly mark each item to record actual construction including:
 - 1. Measured depths of foundations in relation to finish floor datum.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 4. Field changes of dimension and detail.
 - 5. Details not on original Contract Drawings.
 - 6. Changes made by Field Order or by Change Order.
- F. File documents and samples in accordance with Data Filing Format of the Uniform Construction Index.
- G. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
- H. Make documents and samples available at all times for inspection by Engineer.
- I. Job set: Promptly following receipt of OWNER's Notice to Proceed, secure from Engineer at no charge to CONTRACTOR one complete set of all Documents comprising the Contract.
- J. Final Record Documents: At a time nearing the completion of the Work, secure from Engineer at no charge to CONTRACTOR one complete set of blue-line copies of all Drawings in the Contract.

- K. Field Engineering survey log, field notes and electronic files with all adjustments to the project datum to be submitted at a time nearing the completion of the Work and at times requested by Engineer.

PART 3 EXECUTION

3.1 MAINTENANCE OF JOB SET

- A. Immediately upon receipt of job set, identify each of the Documents with the title, "RECORD DOCUMENTS—JOB SET".
- B. Preservation:
 - 1. Devise a suitable method acceptable to Engineer for protecting job set, considering the Contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed.
 - 2. Do not use job set for any purpose except entry of new data and for review by Engineer, until start of transfer of data to final Project Record Documents.
 - 3. Maintain job set at the site of Work as that site is designated by Engineer.
- C. Making entries on Drawings:
 - 1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe the change by graphic line and note as required.
 - 2. Date all entries.
 - 3. Call attention to the entry by a "cloud" drawn around the area or areas affected.
 - 4. In the event of overlapping changes, use different colors for the overlapping changes.
- D. Make entries in pertinent other Documents accepted by Engineer.
- E. Conversion of schematic layouts:
 - 1. In some cases on the Drawings, arrangements of conduits, circuits, piping, ducts, and similar items, is shown schematically and is not intended to portray precise physical layout.
 - a. Final physical arrangement is determined by CONTRACTOR, subject to Engineer's acceptance.
 - b. However, design of future modifications of the facility may require accurate information as to the final physical layout of items which are shown only schematically on the Drawings.
 - 2. Show on the job set of Record Drawings, by dimension accurate to within one inch, the centerline of each run of items described above.

- a. Clearly identify the item by accurate note such as "cast iron drain," "galv. water," and the like.
 - b. Show, by symbol or note, the vertical location of the item ("under slab," "in ceiling plenum," "exposed," and the like).
 - c. Make all identification so descriptive that it may be related reliably to the Specifications.
3. Engineer may waive the requirements for conversion of schematic layouts where, in Engineer's judgment, conversion serves no useful purpose. However, do not rely upon waivers being issued except as specifically issued in writing by Engineer.

3.2 FINAL PROJECT RECORD DOCUMENTS

- A. The purpose of final Project Record Documents is to provide factual information regarding all aspects of Work, both concealed and visible, to enable future modification of Work to proceed without lengthy and expensive site measurement, investigation, and examination.
- B. Label each document "Project Record Documents" in neat, large, printed letters.
- C. Acceptance of recorded data prior to transfer:
 1. Following receipt of blueline copies for Final Record Documents, and prior to start of transfer of recorded data thereto, secure Engineer's acceptance of all recorded data.
 2. Make required revisions.
- D. Transfer of data to Drawings:
 1. Use felt tip marking pens for recording information in the color code designated by Engineer.
 2. Carefully transfer change data shown on job set of Record Drawings to the corresponding bluelines, coordinating the changes as required.
 3. Clearly indicate at each affected detail and other Drawing, a full description of changes made during construction, and the actual location of items to be located.
 4. Call attention to each entry by drawing a "cloud" around the area or areas affected.
 5. Make changes neatly, consistently, and with the proper media to assure longevity and legibility.
- E. Transfer of data to other Documents:
 1. Use felt tip marking pens for recording information in the color code designated by Engineer.

2. If Documents other than Drawings have been kept clean during progress of Work, and if entries thereon have been orderly and acceptable to Engineer, the job set of those Documents other than Drawings will be accepted as final Record Documents.
 3. If any such Document is not acceptable to Engineer, secure a new copy of that Document from Engineer at Engineer's usual charge for reproduction and handling, and carefully transfer changed data to new copy for acceptance by Engineer.
- F. Submit documents to Engineer with claim for final Application for Payment.
- G. Review and submittal:
1. Submit completed set of Project Record Documents to Engineer as described above and under provisions of Section 01 33 00, Submittal Procedures.
 2. Participate in review meetings as required.
 3. Make required changes and promptly deliver final Project Record Documents to Engineer.

3.3 CHANGES SUBSEQUENT TO ACCEPTANCE

- A. CONTRACTOR has no responsibility for recording changes in Work subsequent to Final Completion, except for changes resulting from Warranty work.

END OF SECTION

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SECTION 02 41 00 - DEMOLITION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
- B. Demolition, removal, salvage and disposal of existing materials, structures and equipment where indicated on the Drawings and as specified in this Section Related Sections:
 - 1. Section 31 05 16 - Aggregates for Earthwork
 - 2. Section 31 10 00 - Site Clearing
 - 3. Section 31 22 13 - Rough Grading
 - 4. Section 31 23 16 - Excavation
 - 5. Section 33 11 50 - Existing Pipe Abandonment

1.2 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00.
 - 1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- B. Shop Drawings: Submit complete drawings and schedules plan for all demolition activities for the project that minimizing disturbances to existing utility services including the following:
 - 1. Drawings
 - a. Indicate limits and extent of demolition
 - b. Location of transfer of salvageable items to OWNER
 - c. Indicate location and type of construction for barricades and fences
 - 2. Schedule of salvageable items
 - a. Complete the schedule at the end of this section for OWNER's consideration of items that will be salvaged.
 - b. The OWNER will indicate which items are to be reinstalled at a part of the work of this contract. The material cost of the new item that is no longer installed due to reuse of an existing item will be to the benefit of the OWNER.
 - 3. Demolition Schedule

- a. Provide detailed demolition schedule and sequencing plan for review and approval by ENGINEER to include descriptions for demolition and removal procedures
- C. Certificates:
1. Submit to Engineer a copy of written permission of private property owners, with copy of fill permit for said private property, as may be required for disposal of materials.
 2. Permit for transport and disposal of hazardous debris.

1.3 QUALITY ASSURANCE

- A. Existing Conditions: Determine the extent of work required and limitations before proceeding with Work.
- B. Project record documents
1. Accurately record actual locations of capped utilities and subsurface obstructions
- C. Regulatory requirements
1. Conform to applicable Federal, State and local codes for demolition of structures, safety of adjacent structures, dust control, environmental requirements and disposal
 2. Obtain required permits from authorities
 3. Notify affected utility companies before starting work and comply with their requirements
 4. Do not close or obstruct roadways, sidewalks, or hydrants without written permission from Owner
 5. Conform to applicable regulatory procedures when discovering hazardous or contaminated materials
- D. Burning at the Site for the disposal of refuse, debris, and waste materials resulting from demolition and site clearing operations shall not be permitted.
- E. Permits: The Contractor is responsible for obtaining all necessary permits required for completion of the Work described in this Section.
- F. Protection of Persons and Property: Meet all federal, state, and local safety requirements for the protection of workmen, other persons, and property in the vicinity of the Work and requirements of the General Provisions.

- G. If the existing material to be demolished and removed contains any hazardous materials which will require special handling upon removal, such as asbestos or lead, it is the responsibility of the Contractor to remove and dispose of the material in accordance with all applicable federal, state and local regulations.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Existing Materials: All materials, equipment, miscellaneous items, and debris involved, occurring, or resulting from demolition, clearing, and grubbing work shall become the property of the Contractor at the place of origin, except as otherwise indicated in the Drawings or Specifications.
- B. Crushed Rock: As specified in Section 31 05 16-2.1, Aggregates for Earthwork. Of the size shown in the Drawings or specified herein.
- C. Sand: As specified in Section 31 05 16-2.2, Aggregates for Earthwork.

PART 3 EXECUTION

3.1 EXAMINATION

- A. The Owner assumes no responsibility for the actual condition of the facilities to be demolished. The Contractor shall visit the site, inspect all facilities and be familiar with all existing conditions and utilities.
- B. Demolition drawings identify major equipment and structures to be demolished only.
- C. Verify locations and depths of all existing utilities prior to demolition activities. Notify Engineer immediately of all discrepancies shown on the Drawings or that may arise due to the location of existing utilities and the work to be completed.
- D. Identify waste and salvage areas for placing removed materials.

3.2 PREPARATION

- A. Carefully coordinate the work of this Section with all other work and construction.
- B. Call Local Utility Line Information service at 1-800-922-1987, not less than three (7) working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.

2. Disconnect or arrange for disconnection of utilities (if any) affected by required work.
3. Keep all active utilities intact and in continuous operations.

3.3 PROTECTION

- A. Provide, erect, and maintain temporary barriers, enclosures, security fences and shoring at demolition locations in accordance with Section 01 50 00 to protect personnel.
- B. Utilities:
 1. Locate, identify, and protect utilities during the course of executing the work.
 2. Utility lines not indicated to be demoed or abandoned are to remain.
 3. Provide temporary connections to maintain existing service during construction
- C. Survey control: Protect benchmarks, survey control points, and existing structures from damage or displacement.
- D. Preservation and Trimming of Trees, Shrubs and Other Vegetation: As specified in Section 31 10 00-3.4.C, Site Clearing and Section 01 56 39, Temporary Tree and Plant Protection.
- E. Landscaped Areas: Protect existing landscaped areas as specified in Section 31 10 00-3.4.D, Site Clearing.
- F. Miscellaneous Site Features: Protect all existing miscellaneous site features from damage by excavating equipment and vehicular traffic, including but not limited to existing structures, fences, mailboxes, sidewalks, paving, guy wires, utility poles, and curbs.
- G. Repair and Replacement:
 1. Damaged items, including but not restricted to those noted above, shall be repaired or replaced with new materials as required to restore damaged items or surfaces to a condition equal to and matching that existing prior to damage or start of Work of this contract.
 2. Any damage to existing facilities or utilities to remain as caused by the Contractor's operations shall be repaired at the Contractor's expense.

3.4 CUTTING AND PATCHING

- A. Contractor shall be responsible for all excavation, backfill, cutting, fitting, and patching, including structures, pavement, utilities, pipes and conduits as well as providing attendants or other watchmen for the duration required to complete the Work or to:
 - 1. Make its several parts fit together properly
 - 2. Uncover portions of the Work to provide for installation of ill-timed work
 - 3. Remove and replace defective work
 - 4. Remove and replace work not conforming to requirements of Contract Documents
 - 5. Remove samples of installed work as specified for testing
- B. Provide products as specified or as required to complete cutting and patching operations
- C. Inspection:
 - 1. Inspect existing conditions of the Project, including elements subject to damage or to movement during cutting and patching
 - 2. After uncovering work, inspect the conditions affecting the installation of products, or performance of the work
- D. Preparation:
 - 1. Provide adequate temporary support as necessary to assure the structural integrity of the adjacent portion of the Work
 - 2. Provide devices and methods to protect other portions of the Project from damage
 - 3. Provide protection from the elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water
 - 4. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes
 - 5. Restore work which has been cut or removed; install new products to provide completed Work in accord with requirements of Contract Documents

3.5 DEMOLITION

- A. Conduct demolition to minimize interference with adjacent structures

- B. Conduct operations with minimum interference to Owner access. Maintain protected egress and access at all times
- C. Sprinkle site with water to minimize dust where required by Engineer, Resident Project Representative, or Owner. Provide all hoses, tanks, equipment, water connections and appurtenances necessary for this purpose
- D. Do not use water to extent causing flooding, contaminated runoff, or icing
- E. Break concrete and masonry into sections less than 3 feet in any dimension
- F. Repair damage to adjacent structures caused by CONTRACTOR or his SUBCONTRACTORS
- G. Protect and clean walls, fences, signs, mailboxes, trees, landscaping or adjacent structures exposed by demolition work
- H. Make neat saw cuts, around areas of concrete or asphalt to be removed, where remaining concrete or asphalt is to be incorporated into new work
- I. Remove buried piping, wiring, and conduit to be abandoned as required for the Work. Plug or cap the remaining pipe flush.
- J. Disconnect, remove, cap and identify designated utilities within demolition area
- K. Remove fencing and gates to be reinstalled in manner to prevent damage.
- L. Areas which are to be excavated for the purpose of demolition shall be cleared and stripped in accordance with Section 31 10 00-3.6, Site Clearing.
- M. Carefully consider all bearing loads and capacities for placement of equipment and material on site. In the event of any questions as to whether an area to be loaded has adequate bearing capacity, consult with Engineer prior to the placement of such equipment or material.
- N. Demolition of Existing Structures and Utilities:
 - 1. Excavate around existing structures and utilities as required to perform demolition operations and to plug associated existing pipelines where shown in the Drawing.
 - 2. Provide shoring, bracing, and supports, as required, to ensure adjacent structures and utilities are not damaged and structural elements of existing structures and utilities are not overloaded during demolition activities.

- a. Increase structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under any part of this Contract.
 - b. Remove all temporary protection when the Work is complete.
- O. Backfill at Demolished Structures:
- 1. For structures designated to be abandoned and/or demolished in place, concrete and/or masonry rubble and excavated soils resulting from demolition activities shall be used for backfill or placed in the bottoms of said structures only as directed by the Engineer.
 - 2. Concrete and masonry rubble used for backfilling shall be broken into pieces no larger than 12 inches on any one side.
 - 3. Materials resulting from abandonment/demolition activities approved for backfill shall be combined with imported filler sand to create a dense, compacted backfill.
 - 4. Backfilling or placement of the excavated material in the structures shall meet the following requirements.
 - a. Grout and plug all structure penetrations that will remain in place to prevent the migration of fine soils.
 - b. Furnish, place and compact filler sand along with the concrete and masonry rubble so that all voids are filled and a dense, compacted backfill is obtained.
 - c. Filler sand shall be placed in horizontal layers completely filling all voids between pieces of rubble and not exceeding 12 inches in thickness.
 - d. Each layer of filler sand shall be compacted to obtain at least 90 percent of maximum density as determined by ASTM Method D-698-78 (AASHTO T-99).
 - e. Water shall be furnished by the Contractor and added to each layer as required to maintain optimum moisture content.
 - f. The amount of filler sand used shall only be the amount needed to fill all voids created by placement of the concrete and asphalt rubble, as directed by the Engineer.
 - g. At locations where concrete and masonry rubble are used for backfill, they shall be placed such that a minimum of 3 feet of compacted non-rubble backfill material (crushed rock) exists between any rubble and finished grade. Protruding reinforcing bars shall be cut to lengths that allow granular backfill to be placed and compacted to required levels in and above the rubble.

5. Disposal of all materials not used for backfill shall be performed off-site and in compliance with applicable local, state, and federal codes and requirements.
 6. In areas where new construction will take place, no trace of these structures shall remain prior to placing of backfill.
- P. Backfilling within the footprint of new structures with rubble material resulting from demolition activities will not be allowed.
- Q. All existing improvements designated in the Drawings or specified to be removed, including but not limited to structures, pipelines, walls, footings, foundations, slabs, pavements, curbs, fencing, and similar structures occurring above, at, or below existing ground surface shall be included in the demolition work.
- R. Unless otherwise specified, any resulting voids shall be backfilled with suitable excavated or imported material compacted to the density of the adjacent soil.

3.6 EXISTING UTILITY ABANDONMENT

- A. General:
1. Utility demolition to include existing utilities present at the site that are affected by the work including but not limited to water, sanitary sewer and storm sewer.
 2. Remove, existing installation to accommodate new construction as indicated on Drawings or as directed by Engineer, Owner or serving utility
 3. Contractor to identify all serving utilities and coordinate demolition work with serving utility and perform demolition as necessary
- B. As specified in Section 33 11 50, Existing Pipe Abandonment.

3.7 ELECTRICAL AND CONTROL SYSTEM DEMOLITION

NOT USED

3.8 PERMANENT ABANDONMENT OF WELLS

NOT USED

3.9 ASPHALT AND CONCRETE DEMOLITION

- A. Asphalt pavement and concrete flatwork shall be removed to the limits shown in the Drawings. For concrete flatwork removal shall extend to the nearest control joint.
- B. The limits of the removal shall be saw cut.

- C. Asphalt pavement may not be used as rubble fill.

3.10 REMOVAL

- A. Remove debris, rock, excavated materials, rubble, abandoned piping, and extracted plant life resulting from abandonment and/or demolition activities from site.
- B. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.
- C. Removal: All material resulting from demolition, clearing, and grubbing, and trimming operations shall be removed from the project site and disposed of in a lawful manner. Materials placed on property of private property owners shall be by written permission only.
- D. Remove demolition debris daily
- E. Transport demolition debris to disposal area

3.11 GRADING

- A. All grading work shall be completed in accordance with Section 31 22 13, Rough Grading.

3.12 CLEANUP:

- A. During and upon completion of work, promptly remove all unused tools and equipment, surplus materials, debris, and dust and shall leave all areas affected by the work in a clean, condition, as may be subject to Engineer approval.
- B. Adjacent structures shall be cleaned of dust, dirt, and debris resulting from demolition.
- C. Adjacent areas shall be returned to their existing condition prior to the start of work.

3.13 SALVAGE

- A. Contractor shall coordinate with Owner to identify all valves, fire hydrants, fittings and other items to be salvaged, prior to commencing demolition activities for all areas of the project.
- B. Carefully remove items to be salvaged and delivered to Owner's storage:
 - 1. Store and protect items indicated to be reused in Work
 - 2. Replace in kind with new items any item damaged through carelessness in removal, storage, or handling

3.14 SCHEDULES

NOT USED

END OF SECTION

SECTION 03 21 00 - REINFORCING STEEL

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes all the work necessary to furnish, install, and complete the reinforcing steel.
- B. Section includes:
 - 1. Reinforcing steel
 - 2. Cable sleeves
 - 3. Reinforcing steel

1.2 RELATED SECTIONS

- A. Section 03 30 00 - Cast-In-Place Concrete

1.3 REFERENCE STANDARDS

- A. ACI 302—Recommended Practice for Concrete Floor and Slab Construction
- B. ACI 315—Manual of Standard Practice for Detailing Reinforced Concrete Structures
- C. ACI 318—Building Code Requirements for Reinforced Concrete
- D. ASTM A82—Cold Drawn Steel Wire for Concrete Reinforcement
- E. ASTM A185—Welded Steel Wire Fabric for Concrete Reinforcement
- F. ASTM A497—Welded Deformed Steel Wire Fabric for Concrete Reinforcement
- G. ASTM A615—Deformed and Plain Billet Steel Bars for Concrete Reinforcement
- H. CRSI—Concrete Reinforcing Steel Institute—Manual of Practice
- I. CRSI 63—Recommended Practice for Placing Reinforcing Bars
- J. CRSI 65—Recommended Practice for Placing Bar Supports, Specifications and Nomenclatures

1.4 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00.

1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- B. Shop Drawings: Submit complete fabrication, assembly and installation drawing for all products and accessories to illustrate construction and assembly of components and their connection to the work
- 1) General Arrangement Drawings
 - a) Include plans, elevations, sections, details of installation, and attachments to other Work
 - b) Indicated bar sizes, spacings, locations, and quantities of reinforcing steel
 - c) Indicate size and location of pipe penetrations, wall sleeves and embedments
 - d) Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties
 - 2) Fabrication Drawings
 - a) Reinforcing bar lists
 - b) System fabrication, dimensions, bar sizes, locations of connections, connection details, quantities of reinforcing steel and wire fabric bending and cutting schedules
 - c) Fabricator's detailed requirements for system foundations
 - 3) Furnish setting Drawings, templates, and directions for installation
- C. Product Data: Submit sufficient data to verify compliance with specifications to include materials, parts, and accessories:
1. Reinforcing Steel
 2. Welded Wire Fabric
 3. Reinforcing Steel Bar Supports
 4. Reinforcing Steel Tie Wire

- D. Mill Certificates: Mill test certificates shall be submitted to the ENGINEER to certify that the reinforcing steel meets the specified requirements. Mill test certificates shall be furnished and paid for by the CONTRACTOR.

1.5 QUALITY CONTROL

- A. The ENGINEER may require that test samples be taken, and test certificates be furnished by a reputable material testing laboratory at the OWNER's expense.

PART 2 PRODUCTS

2.1 DEFORMED REINFORCING BARS

- A. Unless otherwise specified, reinforcing steel shall be Grade 60 billet steel conforming to ASTM A615.
- B. Varying grades shall not be used interchangeably in structures.
- C. All such reinforcing shall be deformed steel bars with deformations conforming to the requirements set forth in ASTM Specification A615.
- D. Steel bending processes shall conform to the requirements of ACI 318.
- E. Bending or straightening shall be accomplished so that the steel will not be damaged.
- F. Kinked bars shall not be used.
- G. Spiral reinforcement and steel wire shall be cold-drawn steel wire conforming to the requirements of ASTM A82 unless shown otherwise on the Drawings.

2.2 PLAIN REINFORCING BARS

Spiral reinforcement shall be cold-drawn steel wire conforming to the requirements of ASTM A82 unless shown otherwise on the Drawings.

2.3 SUPPORTS

- A. Bar supports shall conform to ACI 315.
- B. Bar supports shall consist of approved high density "adobes", stainless steel chairs, plastic spacers or plastic shim plates.
 - 1. Brick, broken concrete masonry units, spalls, rocks or similar materials shall not be used for support of reinforcing steel.

2. Steel chairs shall be furnished with plastic tips when incorporated into concrete exposed to view, such as in the roof slab.
3. Plastic spacers shall be PRECO BARSPAN WHEELS, as manufactured by the PRECO CORPORATION or equal.
4. Plastic shim plates may be used to support the plastic spacers and shall be used to support the vertical reinforcing in the corewall, unless shown otherwise on the Drawings.

C. Hot-dipped Galvanized Reinforcing Bars

When reinforcing bars are indicated on the Drawings to be hot-dipped galvanized, they shall be galvanized in accordance with ASTM A767 and ASTM A143. The grade of reinforcing bars shall be as specified under Section 03210-2.1. The bars shall be galvanized in conformance with a Class 1 coating and shall be galvanized after fabrication and shearing.

D. Welded Wire Fabric Reinforcement

If specified on the Drawings, welded wire fabric shall be manufactured in accordance with ASTM A185. It shall be of new stock and free from rust when placed in the work.

E. Steel Tie Wire: Annealed steel tie wire shall be used to fasten the reinforcing steel in place.

PART 3 EXECUTION

3.1 REINFORCING BARS

Comply with the specified codes and standards and Concrete Reinforcing Steel Institutes recommended practice for "placing reinforcing bars," for details and methods of reinforcement placement and supports, and as herein specified.

A. General

1. Mild steel reinforcing bars shall be furnished, cut, bent, and placed as indicated on the Drawings.
2. At the time of placing concrete, all reinforcement shall be free from loose mill scale, rust, grease or other coating which might destroy or reduce its bond with concrete.
3. Steel reinforcement which is to be placed in the work shall be stored under cover to prevent rusting, and shall be placed on blocking such that no steel touches any ground surface.

4. All reinforcing steel placed in the work shall be tied together and supported in such a manner that displacement during placing of concrete and shotcrete will not occur.
5. When there is a delay in depositing concrete, reinforcement shall be re-inspected and cleaned when necessary.

B. Cutting and Bending

1. Steel reinforcement shall be cut and bent in accordance with ACI 318 and with approved practices and machine methods, either at the shop or in the field.
2. Reinforcement shall be accurately formed to the dimensions indicated on the Drawings and on the bending schedule.
3. Bends for hooks on bars shall be made around a pin having a diameter not less than six times the minimum thickness of the bar.
4. All bars shall be bent cold.

C. Minimum Bar Spacing

The clear distance between parallel bars shall not be less than one and one-half times the diameter of the bars and, unless specifically authorized, shall in no case be less than 1-inch, nor less than the maximum size of coarse aggregate specified.

D. Concrete Cover (Minimum)

1. On all formed surfaces which will be exposed to water, ground, or the elements, there shall be a nominal cover over the steel of 2 inches for bars number 6 through number 18 and 1-1/2 inches for bars number 5 and smaller, with an installation tolerance of + 1/4-inch. When crossing bars of different diameter are encountered in one face, one shall consider the bar size and location that will provide the largest cover over the nearest steel to the outside surface.
2. Unless otherwise specified in these specifications or shown on the Drawings, all reinforcing steel facing subgrades in footing and floors for concrete construction of the tank shall be given a nominal protective cover of 3.0-inch minimum. The largest cover shall be used when different size bars are encountered in one face.
3. The minimum cover over reinforcing steel for concrete construction of other facilities shall be as shown on the Drawings.
4. No "bury" or "carrier" bars will be allowed unless specifically approved by the ENGINEER.

E. Splicing

1. Except as shown or specified on the Drawings, reinforcing steel shall not be spliced at any location without specific approval by the ENGINEER. Splices in adjacent bars shall be staggered.
2. Where permitted or required, splices in reinforcing steel shall have sufficient lap to transfer full strength of the bar by bond and shear. Unless specified or shown otherwise on the Drawings, the bars at a lap splice shall be in contact with each other. In no event shall the lap be less than 40 diameters of the spliced bars.
3. Unless specified or shown otherwise on the Drawings, bars shall be lap spliced in accordance with ACI 318 and shall be fastened together with steel tie wire.
4. Unless shown otherwise on the Drawings, where bars are to be lapped spliced at joints in the concrete, all bars shall project from the concrete first placed, a minimum length equal to the lap splice length indicated on the Drawings. All concrete or other deleterious coating shall be removed from dowels and other projecting bars by wire brushing or sandblasting before the bars are embedded in a subsequent concrete placement.

F. Supports

1. All reinforcement shall be retained in place, true to indicated lines and grades, by the use of approved bar supports. The CONTRACTOR shall submit for ENGINEER's approval, samples of all bar supports he proposes to use along with a written description of where each bar support will be used.
2. The supports shall be of sufficient quantity, strength and stability to maintain the reinforcement in place throughout the concreting operations. Bar supports shall be placed no further than 4 feet apart in each direction. Supports must be completely concealed in the concrete and shall not discolor or otherwise mar the surface of the concrete. The CONTRACTOR shall be held responsible for providing the appropriate quantity and type of bar supports.
3. Do not place reinforcing bars more than 2 inches beyond the last leg on continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

G. Bar Tying

1. Bars shall be tied sufficiently often to prevent shifting. There shall be at least three ties in each bar length (this shall not apply to dowel laps or to bars shorter than 4 feet, unless necessary for rigidity).

2. Slab bars shall be tied at every intersection around the periphery of the slab. Wall bars and slab bar intersections shall be tied at not less than every fourth intersection, but at not greater than the following maximum spacings:

	Slab Bars <u>(inches)</u>	Wall Bars <u>(inches)</u>
Bars No. 5 and smaller	60	48
Bars No. 6 through No. 9	96	60
Bars No. 10 through No. 11	120	96

- H. Reinforcement Around Openings -- Where reinforcing steel has to be cut to permit passage of pipe or to create openings, and should no detail be shown for extra reinforcing in such areas, the area of steel removed by the creation of the opening must be replaced by placing at least double the area of steel removed by the opening equally around the openings. The steel shall be placed such that it extends 5 feet beyond the opening on each side to provide for sufficient bond.

3.2 WELDED WIRE FABRIC REINFORCEMENT

A. General

1. All necessary tie wiring, spacing chairs, or supports shall be installed to keep the welded wire fabric in place while concrete is being placed.
2. The welded wire fabric shall be bent as shown or required on the Drawings to fit the work. Welded wire fabric shall be rolled or otherwise straightened to make a perfectly flat sheet before placing in the Work.

B. Splicing

1. Welded wire fabric shall be lap spliced as indicated on the Drawings. If the lap splice length is not indicated on the Drawings, the welded wire fabric shall be spliced in accordance with ACI 318 and no less than a minimum of 40 wire diameters of the lapped wire, or 12 inches, whichever is greater.
2. Offset end laps in adjacent widths to prevent continuous laps in either direction.

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

- A. The extent of concrete work is shown on the Drawings.
- B. This Section covers cast-in-place concrete including framework, shoring for concrete, and installation into formwork of items such as anchor bolts, setting plates, bearing plates, anchorages, inserts, reveals, frames, nosings, sleeves, and other items to be embedded in concrete.
- C. Section includes:
 - 1. Concrete
 - 2. Portland cement
 - 3. Aggregates
 - 4. Water
 - 5. Admixtures
 - 6. Forms
 - 7. Form oil
 - 8. Epoxy adhesive
 - 9. Curing compounds
 - 10. Concrete accessories

1.2 RELATED SECTIONS:

- A. Section 03 21 00 - Reinforcing Steel
- B. Section 03 60 00—Grouting

1.3 REFERENCE STANDARDS

- A. ACI 211.1— Standard Practice for Selecting Proportions for Normal Heavyweight, and Mass Concrete
- B. ACI 214—Recommended Practice for Evaluating Compression Test Results of Field Concrete
- C. ACI 301—Structural Concrete for Buildings
- D. ACI 302—Recommended Practice for Concrete Floor and Slab Construction
- E. ACI 304—Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete
- F. ACI 305/305R—Hot Weather Concreting
- G. ACI 306/306R—Cold Weather Concreting

- H. ACI 308—Standard Practice for Curing Concrete
- I. ACI 309—Standard Practice for Consolidation of Concrete
- J. ACI 315—Manual of Standard Practice for Detailing Reinforced Concrete Structures
- K. ACI 318—Building Code Requirements for Reinforced Concrete
- L. ACI 347—Recommended Practice for Concrete Formwork
- M. ACI SP-66—American Concrete Institute—Detailing Manual
- N. ASTM A82—Cold Drawn Steel Wire for Concrete Reinforcement
- O. ASTM A185—Welded Steel Wire Fabric for Concrete Reinforcement
- P. ASTM A497—Welded Deformed Steel Wire Fabric for Concrete Reinforcement
- Q. ASTM A615—Deformed and Plain Billet Steel Bars for Concrete Reinforcement
- R. ASTM C31—Making and Curing Concrete Test Specimens in the Field
- S. ASTM C33—Concrete Aggregates
- T. ASTM C39—Test Method for Compressive Strength of Cylindrical Concrete Specimens
- U. ASTM C40—Standard Test Method for Organic Impurities in Fine Aggregate for Concrete
- V. ASTM C88—Standard Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate
- W. ASTM C94—Ready-Mixed Concrete
- X. ASTM C131—Standard Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine”
- Y. ASTM C136—Standard Test Method for Sieve Analysis to Fine and Coarse Aggregate
- Z. ASTM C143—Test Method for Slump of Hydraulic Cement Concrete
- AA. ASTM C150—Standard Specification for Portland Cement
- BB. ASTM C156—Standard Test Method for Water Loss Through Liquid Membrane Forming Curing Compounds for Concrete
- CC. ASTM C171—Sheet Materials for Curing Concrete
- DD. ASTM C173—Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
- EE. ASTM C231—Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- FF. ASTM C233—Standard Test Method for Air-Entraining Admixtures for Concrete
- GG. ASTM C260—Air Entraining Admixtures for Concrete

- HH. ASTM C289—Standard Test Method for Potential Alkali Silica Reactivity of Aggregates (Chemical Method)
- II. ASTM C309—Liquid Membrane-Forming Compounds for Curing Concrete
- JJ. ASTM C441—Standard Test Method for Effectiveness of Pozzolans or Ground Blast-Furnace Slag in Preventing Excessive Expansion of Concrete Due to the Alkali-Silica Reaction”
- KK. ASTM C457—Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete
- LL. ASTM C494—Chemical Admixtures for Concrete
- MM. ASTM C618—Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
- NN. ASTM C670—Standard Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials
- OO. ASTM C803—Standard Test Method for Penetration Resistance of Hardened Concrete
- PP. ASTM C979—Standard Specification for Pigments for Integrally Colored Concrete
- QQ. ASTM C1084—Standard Test Method for Portland-Cement Content of Hardened Hydraulic-Cement Concrete
- RR. ASTM D994—Preformed Expansion Joint Filler for Concrete (Bituminous Type)
- SS. ASTM D1190—Concrete Joint Sealer, Hot-Poured Elastic Type
- TT. ASTM D1751—Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
- UU. ASTM D1752—Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
- VV. ASTM D2103—Polyethylene Film and Sheeting
- WW. CRSI—Concrete Reinforcing Steel Institute—Manual of Practice
- XX. CRSI 63—Recommended Practice for Placing Reinforcing Bars
- YY. CRSI 65—Recommended Practice for Placing Bar Supports, Specifications and Nomenclature
- ZZ. PS 1—Construction and Industrial Plywood

1.4 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00.
 - 1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-

marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements

- B. Shop Drawings: Submit complete fabrication, assembly and installation drawing for all products and accessories to illustrate construction and assembly of components and their connection to the work
- 1) General Arrangement Drawings
 - a) Include plans, elevations, sections, details of installation, and attachments to other Work
 - b) Indicated bar sizes, spacings, locations, and quantities of reinforcing steel
 - c) Indicate size and location of pipe penetrations, wall sleeves and embedded conduit
 - d) Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties
 - 2) Fabrication Drawings
 - a) Reinforcing bar lists
 - b) System fabrication, dimensions, bar sizes, locations of connections, connection details, quantities of reinforcing steel and wire fabric bending and cutting schedules
 - c) Fabricator's detailed requirements for system foundations
 - 3) Furnish setting Drawings, templates, and directions for installation
 - a) Indicate extent and sequence of concrete placement
 - 4) Construction joints: The contractor shall submit a drawing indicating the location of all construction joints to the engineer for approval prior to concrete placement
- C. Product Data: Submit sufficient data to verify compliance with specifications to include materials, parts, and accessories:
1. Provide data on void form materials and installation requirements, joint devices, attachment accessories, and admixtures
 2. Forms
 3. Chamfer Strips
 4. Form Coating
 5. Form Ties
 6. Reinforcing Steel
 7. Welded Wire Fabric
 8. Reinforcing Steel Bar Supports
 9. Reinforcing Steel Tie Wire

10. Cement
 11. Fly Ash
 12. Admixtures
 - a. Acceleration
 - b. Retarder
 - c. Plasticizer
 - d. Air Entrainment
 13. Accessories
 - a. Expansion Joint Filler
 - b. Expansion and Contraction Joint Shear Bar Grease
 - c. Membrane Curing Compound
 - d. Bonding Admixture and Bonding Agent
 14. Manufacturer's Installation Instructions: Provide connection requirements and installation procedures
- D. Samples (NOT USED)
- E. Design Data:
1. Submit reports of tentative concrete mix design for structural concrete, concrete topping and concrete fill as well as testing for each tentative mix design including:
 - a. Slump range on which the design is based
 - b. Total gal of water per cubic yard
 - c. Brand, type, composition, and quantity of cement with manufacturer and plant location identified
 - d. Brand, type, composition and quantity of fly ash
 - e. Specific gravity and gradation of each aggregate
 - f. Ratio of fine to total aggregates
 - g. Surface-dry weight of each aggregate per cubic yard
 - h. Brand, type ASTM designation, active chemical ingredients and quantity of each admixture
 - i. Air content and tolerance
 - j. Water/cementitious material ratio and tolerance
 - k. Compressive strength based at 7- and 28-day compression tests
 - l. Time of initial set
 2. Existing data on proposed design mixes are acceptable if certified and complete
- F. Manufacturer's Test Reports:
1. Submit suppliers certified fly ash test reports for each shipment delivered to concrete supplier:
 - a. Physical and chemical characteristics
 - b. Certification of compliance with the specifications
 - c. Signed by Contractor and concrete supplier

- G. Certificates (NOT USED)
- H. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading.
- I. Manufacturer's Field Test Reports:
 - 1. Field Test Procedure (NOT USED)
 - 2. Manufacturer's Field Start-up Report (NOT USED)
 - 3. Field Test Report:
 - a. Provide field quality control testing reports detailing results of the tests. Indicate compliance or non-compliance with Contract Documents. Identify corrective action for materials and equipment which fails to pass field tests
 - 4. Submit concrete delivery tickets

1.5 PRE-CONCRETE PLACEMENT MEETING

- A. Schedule and attend a Concrete Placement meeting at least one (1) week prior to placing concrete.
- B. The meeting shall be attended by the OWNER, ENGINEER, CONTRACTOR, Testing Laboratory Representative, and the Concrete Supplier.
- C. The following shall be discussed at the meeting: Safety, Batching and Delivery, Adjustments to Mix; Site Dosing, Placement Rates and Anticipated Schedule of Placing and Finishing, Site Layout –Holding Area; Pump Truck Location; Truck Wash-out Area; Parking area, Equipment – Pumps and Appurtenances; Vibrators; Spare Equipment, Concrete Testing Procedures, and Curing.

1.6 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301
- B. Acquire cement and aggregate from same source for all work

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Cement and fly ash: Store in moisture proof enclosures, do not use if caked or lumpy
- B. Aggregate: Store to prevent segregation and inclusion of foreign materials, do not use the bottom 6 inch of piles in contact with the ground
- C. Reinforcing steel: Store on supports which will keep it from contact with the ground and cover to prevent unacceptable surface corrosion and contamination
- D. Rubber and plastic materials: Store in a cool place, do not expose to direct sunlight

- E. Prepare a delivery ticket for each load of ready-mixed concrete
- F. Truck operator shall hand ticket to Engineer at the time of delivery with ticket to show:
 - 1. Quantity delivered
 - 2. Actual quantity of each material in batch
 - 3. Outdoor temp in the shade
 - 4. Time at which cement was added
 - 5. Numerical sequence of the delivery
 - 6. Quantity of water that can be added in the field based on mix design
 - 7. Free moisture in fine and coarse aggregate in percent by weight
 - 8. Temperature of batch

1.8 ENVIRONMENTAL CONDITONS

- A. Refer to Section 01 61 00 for general design requirements of this site
- B. Project location: Erie, CO ; Elevation: 5, 045 feet AMSL

1.9 WARRANTY (NOT USED)

1.10 MAINTENANCE MATERIALS (NOT USED)

PART 2 PRODUCTS

2.1 FORMS

- A. Prefabricated: The Burke Company "Burke Forming System," Simplex "Industrial Steel Frame Forms," Symons "Steel-Ply," Universal "Uniform," or equal
- B. Plywood: PS 1, waterproof resin-bonded, exterior type Douglas Fir; face adjacent to concrete Grade B or better
- C. Fiberboard: FS LL-B-810, Type IX, tempered, waterproof, screen back, concrete form hardboard
- D. Lumber: Straight, uniform width and thickness: and free from knots, offsets, holes, dents, and other surface defects
- E. Chamfer strips: Clear, white pine, surface against concrete planed
- F. Form coating: The Burke Company "Burke Release #1," Industrial lubricants "Nox-Crete Form Coating," L & M "Debond," Protex "Pro-Cote," Richmond "Rich Cote," or equal
- G. Form ties: Removable end, permanently embedded body types with waterstops not requiring auxiliary spreaders, with cones on both ends, embedded portion 1 inch minimum back from concrete face. If not provided with threaded ends, constructed

for breaking off ends without damage to concrete. The Burke Company "Burke Penta-Tie System" or equal

2.2 REINFORCING STEEL

- A. Per Section 03 21 00 Reinforcing Steel

2.3 CONCRETE

- A. Cement: ASTM C150, Type I/II
- B. Fly ash: ASTM C618, Class C or Class F, except loss on ignition not more than 5 percent
- C. Fine aggregate: Clean, natural sand, ASTM C33; no manufactured or artificial sand
- D. Coarse aggregate: Crushed rock, natural gravel, or other inert granular material, ASTM C33 except clay and shale particles no more than 1 percent. Free of all materials deleteriously reactive with alkalis in the cement in an amount to cause excessive expansion of concrete
- E. Water: Clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances that may be deleterious to concrete or steel. Provide mixing water free from deleterious amounts of chloride ion for prestressed concrete or for concrete which will contain aluminum embedments including that portion of the mixing water contributed in the form of free moisture on the aggregates
- F. Admixtures:
 - 1. Acceleration: High range water reducer
 - 2. Retarder: ASTM C494, Type D; Grace "Duratard-HC," Master Builders "MC-HC," Protex "Protard," Sika Chemical "Plastiment," or equal
 - 3. Plasticizer: ASTM C494, Type A; Grace "WRD A-HC," Sika Chemical "Plastocrete," or equal
 - 4. Air entraining agent: ASTM C260; Grace "Darex AEA," Master Builders "MB-VR," Protex "AES," Sika Chemical "AEK," or equal

2.4 WATERSTOPS

- A. NOT USED

2.5 ACCESSORIES

- A. Expansion joint filler: ASTM D1751, asphalt impregnated fiber board, 1/2 inch thickness unless indicated otherwise

- B. Expansion and contraction joint shear bar grease: No-Ox-Id "A Special," axle grease, or equal
- C. Membrane curing compound:
 - 1. General use: Curing compound conforming to ASTM C309
 - 2. For floor slabs: Reference Section 3.19
 - 3. In potable water chambers: Sodium silicate, certified by the manufacturer as suitable for potable water use
- D. Bonding Admixture and Bonding Agent: Sika "Sikalatex" bonding admixture and agent or Tamms "Akkro-7T" bonding admixture and Tamms "Tamms Bond" bonding agent, or equal
- E. Floor Hardener: NOT USED

2.6 MIXES

- A. Design concrete mix within the limits specified
- B. Comply with ASTM C94
- C. Cement Content:
 - 1. Minimum Portland cement, lbs. per cubic yard for concrete containing a water reducing admixture
 Coarse Aggregate Size from No. 4 Sieve to:

<u>Concrete Slump</u>	<u>1/2 inch</u>	<u>3/4 inch</u>
2 inch	573	545
3 inch	592	564
4 inch	611	583
 - 2. Contractor shall substitute fly ash for 15 – 20 percent of cement at a ratio of the specific gravity of cement divided by specific gravity of fly ash
- D. Water/Cementitious Material (Cement and Fly Ash) Ratio: Less than or equal to 0.45
- E. Slump: 4 inch maximum:
 - 1. As low as possible consistent with proper handling and thorough compaction
- F. Volume Ratio of Fine to Total Aggregates:

<u>COARSE AGGREGATE SIZE</u>	<u>MINIMUM RATIO</u>	<u>MAXIMUM RATIO</u>
1/2 inch	0.40	0.55
3/4 inch	0.35	0.50

- G. Initial Set: 5-1/2 hours \pm 1 hour after water and cement are added to the aggregates as determined by ASTM C403:
 - 1. Adjust retarder or accelerator quantities to compensate for temp and job condition variations
- H. Volumetric Air Content:
 - 1. Maximum 6 percent \pm 1 percent after placement
 - 2. Vary air content with maximum aggregate, ASTM C94, Table 3
- I. Admixtures: Content, batching method, and time of introduction in accordance with the manufacturer's recommendations for compliance with this specification:
 - 1. Include a water reducing admixture
 - 2. Calcium chloride content shall not exceed 0.05 percent of the cement content by weight
- J. Strength: Compressive strength as determined by ASTM C39:

<u>AGE</u>	<u>MINIMUM STRENGTH</u>
7 days	3,000 psi
28 days	4,500 psi
- K. Consistency: Uniform slump, suitable for the placement conditions with aggregate floating uniformly throughout the concrete mass, flowing sluggishly when vibrated or spaded
- L. Adjust mix as required to meet specifications

2.7 CONCRETE TOPPING AND FILL

- A. NOT USED

2.8 COLORED PATTERNED CONCRETE

- A. Matching integral color shall be used as a supplement, but not as a color hardener.
- B. Color Hardener: Specially formulated for installation of patterned concrete, grade "HEAVY DUTY". Color shall match existing adjacent colored concrete or as approved by OWNER.
- C. Color curing compound shall comply with ASTM C309 and with all applicable air pollution regulations.

2.9 FABRICATION

- A. Reinforcing Steel: Accurately formed, fabricated in accordance with ACI 315 and 318 except as specified or indicated on drawings, free from rust, scale and contaminants which will reduce bond

2.10 SOURCE QUALITY CONTROL

- A. Test the proposed concrete mix for each size and gradation of aggregates and each consistency intended for use in the project
- B. Aggregates:
 - 1. Sample and test according to ASTM C33
 - 2. Determine bulk specific gravity in accordance with ASTM C127 and C128
- C. Compression tests:
 - 1. Prepare 2 sets of compression test cylinders from each proposed concrete mix, 4 cylinders per set
 - 2. Test 1 set of 4 cylinders at 7 days, the other at 28 days
 - 3. Make, cure and store in accordance with ASTM C192
 - 4. Test in accordance with ASTM C39
- D. Slump test: ASTM C143
- E. Total air content: ASTM C231
- F. Fly Ash: Supplier's chemical composition and physical analysis test
- G. Initial set test:
 - 1. In accordance with ASTM C403
 - 2. Test at 70 degrees F and 90 degrees ambient
 - 3. Test at 70 degrees F on mix including specific plasticizing and entraining admixtures
 - 4. Test at 90 degrees F on mix including specified retarding and air entraining admixtures

5. Fly ash: Supplier's chemical composition and physical analysis test

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify site conditions under provisions of Section 01 10 00, Summary of Work.
- B. Verify requirements for concrete cover over reinforcement
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete

3.2 PREPARATION

- A. Prepare previously placed concrete by cleaning with steel brush or sandblasting and applying bonding agent in accordance with manufacturer's instructions
- B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, and insert steel dowels with epoxy resin system

3.3 FORMS

- A. Design to produce hardened concrete to the shape, lines, and dimensions indicated on the drawings
- B. Conform to ACI 347 as modified herein
- C. Surfaces exposed to view:
 1. Prefabricated plywood panel forms, job-built plywood forms, or forms lined with plywood or fiberboard
 2. Laid out in a regular and uniform pattern with long dimensions vertical and joints aligned
 3. Produce finished surfaces free from offsets, ridges, waves, and concave or convex areas
 4. Maximum deviation from a true plane: 1/8 inch within 6 feet
- D. Plywood or lined forms are not required for surface normally submerged or not normally exposed to view
- E. Other type of forms may be used for surfaces not restricted to plywood or lined forms as backing for form lining
- F. Provide forms above all extended footings; flat segmental forms, 2 foot maximum width, may be used for curved surfaces 25 feet minimum diameter

- G. When placing concrete against rock, remove all loose pieces of rock and clean exposed surface with high pressure hose
- H. Provide substantial forms sufficiently tight to prevent leakage of mortar
- I. Brace or tie forms to maintain desired position, shape, and alignment during and after concrete placement
- J. Size and space wailers, studs, internal ties and other form supports so proper working stresses are not exceeded
- K. Form concrete column supported beams and slabs so column forms may be removed without disturbing beam and slab form supports
- L. Where the top of a wall will be exposed to weathering, stop form on at least 1 side at true line and grade
- M. Locations to be finished to a specified elevation, slope, or contour, bring form to true line and grade and provide a wooden guide strip at the proper location in the forms for finishing the top surface with a screed or template
- N. Provide temporary opening at the bottom of columns and wall forms and wherever necessary for cleaning and inspection
- O. Install form ties on exposed surfaces in uniformly spaced vertical and horizontal rows
- P. Provide chamfer strips to bevel salient edges and corners. Do not provide for top edges of walls and slabs to be tooled or for edges to be buried
- Q. Do not remove or disturb until concrete has attained sufficient strength to safely support all dead and live loads
- R. Leave shoring beneath beams and slabs in place and reinforce as required for construction equipment and materials
- S. Maintain forms in place for a minimum of 72 hours for length of curing time in accordance with ACI 306/306R when temperature is 45 degrees F and below
- T. Remove forms carefully to prevent surface gouging, corner or edge breakage and other drainage

3.4 REINFORCING STEEL

- A. Per Section 03 21 00 Reinforcing Steel and as follows:
- B. Where reinforcement is placed in two layers, place bars in upper layer directly above bars in lower layer

- C. Do not use brick, plywood or other porous material to support footing steel off the ground. Small precast concrete “adobe” blocks that provide minimum clearances are acceptable.
- D. Splices:
 - 1. As specified or indicated on the drawings
 - 2. Splices at other locations will be acceptable, if approved by Engineer
 - 3. Do not weld or tack weld reinforcing steel except where specifically indicated on drawings
 - 4. Remove and replace steel upon which any unauthorized welding has been performed
 - 5. In foundation slabs, splice bars at mid-span

3.5 EMBEDMENTS

- A. Accurately position and securely anchor in forms, anchor bolts, steel shapes, conduit, sleeves, masonry anchorages, and other materials to be embedded in concrete
- B. Electrical Conduits:
 - 1. Install under reinforcing steel in slabs with only 1 layer of steel
- C. Anchor bolts:
 - 1. Unless installed in pipe sleeves, provide sufficient threads on anchor bolts to permit a nut on the concrete side of the form or template
 - 2. Install a second nut on the other side of the form or template
 - 3. Adjust the nuts to hold the bolt rigidly in the proper position
- D. Clean embedments before installation
- E. Clean concrete spatter and other foreign substances from surfaces not in contact with concrete

3.6 TRANSPORTING MIXED CONCRETE

- A. Transporting of mixed concrete shall conform to ACI 305R
- B. Do not exceed manufacturer's guaranteed capacity of truck agitators. Maintain the mixed concrete in a thoroughly mixed and uniform mass during hauling
- C. Do not incorporate additional mixing water into the concrete during hauling or after arrival at the delivery point, unless ordered by the Engineer. If additional water is to be incorporated into the concrete, revolve the drum not less than 30 revolutions at mixing speed after the water is added and before placing concrete

- D. Furnish a water measuring device in good working condition, mounted on each transit mix truck, for measuring the water added to the mix on the site by the Engineer
- E. Provide delivery ticket and comply with delivery requirements of this section

3.7 PLACING CONCRETE

- A. Place concrete in accordance with ACI 301 and ASTM 94/C 94M-09
 - 1. Concrete shall be finally placed within 90 minutes of the time that the concrete was batched as identified on the batch ticket provided with each individual concrete load. Failure to start placement of concrete within this time frame shall be cause for the Engineer to reject that specific concrete load
- B. Notify Engineer not less than 24 hours in advance of the times and places at which contractor intends to place concrete
- C. Predetermine limits at each pour and place all concrete within limits of pour in one continuous operation
- D. Rigidly secure forms, reinforcing steel, embedment, and anchor bolts in proper position
- E. Remove all mud, water, ice, snow, frozen material, and debris from space to be occupied by concrete
- F. Clean surfaces encrusted with dried concrete from previous concrete operations
- G. Convey to the point of final deposit by methods which will prevent separation or loss of ingredients
- H. Place concrete in final position without being moved laterally more than 5 feet
- I. Place concrete in approximately horizontal layers of proper depth for proper compaction, not more than 2 feet
- J. Place subsequent layer while the preceding layer is still plastic
- K. Place and compact concrete in wall or column forms before placing any reinforcing steel in the system to be supported by the walls and columns
- L. Top finish concrete when thoroughly settled
- M. Remove all laitance, debris, and surplus water from the tops of the forms by screeding, scraping or other effective means
- N. Overfill the forms for walls whose tops will be exposed to the weather and screed off the excess after the concrete has settled

- O. Allow concrete in walls and columns to settle at least 2 hours before concrete is placed in structural systems to be supported by the walls and columns

3.8 BONDING TO HARDENED CONCRETE

- A. Place new concrete on rough, clean, damp faces of existing concrete
- B. Remove surface mortar to expose aggregate
- C. Clean hardened concrete of all foreign substances, including curing compound, washed with clean water, and keep saturated for 24 hours preceding placement of fresh concrete
- D. Apply bonding agent for bonding to hardened concrete

3.9 COMPACTION

- A. Thoroughly compact concrete during and immediately after placement
- B. Work concrete around all reinforcements and embedments and into the corners of the forms
- C. Use mechanical vibrators which will maintain 9,000 cycles per minutes when immersed in the concrete, 1-1/2 hp motor minimum

3.10 COLD WEATHER CONCRETING

- A. Per Section 03 30 10 Cold Weather Concrete Procedures and the following:
- B. Conform to ACI 306/306R, except as modified herein
- C. Minimum concrete temp at the time of mixing:

<u>Outdoor Temp at Placement (in shade)</u>	<u>Concrete Temp at Mixing</u>
Below 30 degrees F	70 degrees F
Between 30 degrees F and 45 degrees F	60 degrees F
- D. Do not place heated concrete which is warmer than 80 degrees F
- E. If freezing temp are expected during curing, maintain the concrete temp at or above 50 degrees F for 5 days or 70 degrees F for 3 days with forms in place
- F. Do not allow concrete to cool suddenly
- G. Do not water cure during cold weather. Use membrane forming curing

3.11 HOT WEATHER CONCRETING

- A. Per Section 03 30 20 Hot Weather Concreting Procedures and the following:
- B. Conform to ACI 305/305R, except as modified herein
- C. At air temp of 90 degrees F and above keep concrete as cool as possible during placement and curing
- D. Do not allow concrete temperature to exceed 80 degrees F at placement
- E. Prevent plastic shrinkage cracking due to rapid evaporation of moisture
- F. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 lbs. per sq ft per hour as determined from ACI 305, Fig 2.1.4

3.12 CONSTRUCTION JOINTS

- A. As indicated on the drawings or designated by Engineer. The Contractor shall also submit plans showing location of all construction joints for approval by the Engineer
- B. Install construction joints in beams and slabs perpendicular to the planes of their surfaces
- C. Install construction joints in concrete flatwork at the same interval as the adjoining flatwork.

3.13 WATERTIGHT JOINTS

- A. NOT USED

3.14 EXPANSION AND CONTRACTION JOINTS

- A. Contraction joints:
 - 1. Provide as designated by Engineer
 - 2. Seal accessible edges
- B. Expansion material:
 - 1. Provide as indicated on drawings
 - 2. Firmly bond to previously poured joint. Face with a suitable adhesive
 - 3. Pour new concrete directly against joint filler
 - 4. Seal accessible edges

3.15 FINISHING UNFORMED SURFACES

- A. Float finish buried or permanently submerged concrete not forming an integral of a structure except as required to attain surface elevations, contours and freedom from laitance
- B. Screed and initial float finish followed by additional floating, and troweling as required, all other surfaces
- C. Screeding:
 - 1. Screed concrete surfaces to the proper elevation and contours with all aggregates completely embedded in mortar
 - 2. Surface free of irregularities of height or depth more than 1/4 inch measured from a 10 foot straightedge
- D. Broom finish:
 - 1. Broom finish exterior slabs and exterior concrete sidewalk for a non-slip surface
 - 2. Broom after second floating and at right angles to normal traffic
- E. Troweling:
 - 1. Steel trowel surfaces designated by the Town of Erie of the Engineer
 - 2. Trowel to produce a dense, smooth, uniform surface free from blemishes and trowel marks

3.16 CURING AND PROTECTION

- A. Protect concrete from moisture loss at relatively constant temperature for at least 7 days after placement except that the time period for curing by saturation for concrete being protected from low temp shall be 1 day less than the duration of low temp protection
- B. Cure concrete by methods which will keep concrete surfaces adequately wet during curing, in accordance with ACI 308
- C. Maintain rate of temperature change less than 5 degrees F in any one (1) hour period
- D. Water curing:
 - 1. Begin water saturation as quickly as possible after initial set
 - 2. Regulate water application to provide complete surface coverage with a minimum of runoff
 - 3. Interrupt the application of water to walls for grout cleaning only over the area being cleaned at the time and do not permit the surface to become dry during such an interruption
- E. Membrane curing:

1. Membrane curing compound may be used in lieu of water curing on concrete which will not be covered later with mortar or concrete
2. Spray apply membrane curing compound at not more than:
 - a. General use: 300 sf per gal recommended
3. Cover unformed surfaces within 30 minutes of final finishing
4. If forms are removed before the end of the curing period, immediately apply curing compound to the formed surface before they dry out
5. Protect curing compound against abrasion during the curing period

3.17 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements
- B. Repair or replacement of defective concrete will be determined by the Engineer
- C. Repair defects in formed concrete surfaces within 24 hours of removing forms
- D. Replace defective concrete within 48 hours
- E. Cut out and remove to sound concrete honeycombed or otherwise defective concrete
- F. Cut edges square to avoid feathering
- G. Comply with Chapter 9, ACI 301
- H. Perform repair work so as not to interfere with thorough curing of adjacent concrete
- I. Adequately cure repair work

3.18 FINISHING FORMED SURFACES

- A. Remove fins and other surface projections from all formed surfaces except exterior surfaces that will be in contact with earth backfill and are not specified to be dampproofed
- B. Use a power grinder, if necessary, to remove projections and provide a flush surface
- C. Remove fins and fill tie hole on surfaces exposed to view:
 1. Clean, dry and fill tie holes with epoxy grout
 2. Finish flush to match the texture of adjacent concrete
- D. Grout cleaning under provisions of Chapter 10, ACI 301:
 1. Grout clean surfaces including exterior and interior foundation walls exposed to view (except interior of water retaining structures) to produce a smooth uniform surface free of marks, voids, surface glaze and cement dust

2. Use non-shrink grout mix with bonding agent. Dampen surface and apply with cork or rubber float

3.19 FLOOR HARDENER

- A. Apply hardener to all uncovered concrete floors which will be subject to foot traffic
- B. Application procedure of curing/hardening compound:
 1. Apply after finishing operations and the disappearance of visible surface water
- C. Application procedure of 2 coats when curing/hardening compound is used:
 1. First coat: At end of curing period before any traffic is permitted on floor
 2. Second coat: After floor is cleaned, in preparation for final inspection
- D. Apply in accordance with manufacturer's recommendations

3.20 FIELD QUALITY CONTROL

- A. Field testing will be performed in accordance with ACI 301
- B. Provide field testing under provisions of Section 01 45 00:
 1. Contractor shall coordinate and schedule all tests to determine compliance of concrete materials in accordance with the specifications
 2. The OWNER shall pay for all initial field and laboratory testing, to determine compliance of materials in accordance with this Section and Section 01 45 00. All retests due to initial failed test shall be paid for by the CONTRACTOR.
- C. Field control test:
 1. Testing services shall be provided in conformance with ACI 301, 1.6.4.3 Concrete Construction Inspector Level II, submit certification for technician under provisions of Section 01 33 00.
 2. Make tests in presence of Engineer
 3. Provide all equipment, supplies, and the services of one or more employees, as required
 4. The test frequencies specified are minimum. Additional tests may be performed as required by the job conditions
- D. General:
 1. All concrete tests shall be taken at point of placement per ACI 301, 4.2.2.2 and 4.2.2.4.
 2. Once the slump and air loss during pumping can be determined, acceptance or rejection of concrete based on slump and air can then be determined at the delivery point with Engineers approval.
 3. Engineer may require periodic checks at the point of placement to ensure no change in slump and air at point of placement

4. Concrete placement shall not commence until all tests specified below have been performed unless directed otherwise by Engineer.
- E. Slump:
1. Testing shall comply with ASTM C143 and ASTM C39
 2. Frequency: 1 per truck, minimum
 3. Once consistency of quality has been established, testing of each truck may be reduced as directed by the Engineer
- F. Air content:
1. Testing shall comply with ASTM C143 and ASTM C39
 2. Frequency: 1 per truck, minimum
- G. Ambient Air Temperature:
1. Testing shall comply with ASTM C143 and ASTM C39
 2. Frequency: 1 per truck, minimum
- H. Concrete Temperature:
1. Testing shall comply with ASTM C143 and ASTM C39
 2. Frequency: 1 per truck, minimum
- I. Unit Weight:
1. Testing shall comply with ASTM C143 and ASTM C39
 2. Frequency: 1 per truck, minimum
- J. Compression tests:
1. Make one set of 6 cylinders each day when up to 50 cubic yards have been placed
 2. Make one additional set of 6 cylinders for each additional 50 cubic yards or each major pour placed in one day
 3. Test two cylinders in each set at 7 days
 4. Test two cylinders in each set at 28 days
 5. The other two cylinders to be used as directed by Engineer at any time
 6. Engineer will evaluate in accordance with ACI 214 and 318
 7. Make, cure, store, and deliver cylinders in accordance with ASTM C31
 8. Test in accordance with ASTM C39
 9. Mark or tag each set of test cylinders with the date and time of day the cylinders were made, the location in the work where the concrete represented by the cylinders was placed, the delivery truck or batch number, the air content, and the slump
- K. Storage facilities for concrete test cylinders:
1. Including water necessary, a specially prepared box with high-low thermometer and thermostatically controlled heating devices in accordance with ASTM C31
- L. Failure of test cylinder results:

1. Upon failure of 28-day test cylinder results, the Engineer may require the Contractor, at his expense, to obtain and test at least three 4-inch diameter cored samples from area in question
2. Concrete will be considered adequate if average of three core tests is at least 85 percent of, and if no single core is less than 75 percent of, the specified 28-day strength
3. In the event an area is found to be structurally unsound, the Engineer may order removal and replacement of concrete as required. The cost of the core tests and removal and replacement of defective concrete shall be borne by the Contractor
4. Fill all core holes as specified for repairing defective concrete

END OF SECTION

SECTION 03 30 10 - COLD WEATHER CONCRETING PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

- A. This Section covers requirements for placement and preparation for cast-in-place concrete and appurtenances under cold weather conditions.

1.2 RELATED SECTIONS

- A. Section 03 30 00 - Cast-In-Place Concrete

1.3 DEFINITIONS

- A. Cold Weather Conditions: Any period when for more than three successive days the mean daily temperature falls below 40 degrees Fahrenheit (F), or any day when the temperature is expected to fall or falls below freezing.

1.4 SUBMITTALS

- A. Not less than 30 days prior to expected placement of concrete under cold weather conditions, a complete procedure shall be submitted for review covering all aspects of protection of concrete and its ingredients from the detrimental effects of cold weather.
- B. Concrete placement during cold weather shall not commence prior to return of the procedure marked "Reviewed".

1.5 PRODUCT DELIVERY, HANDLING, AND STORAGE

The concrete temperature, during placement in cold weather, shall not be less than 50 degrees F. Temperature measurements of the concrete as delivered to the jobsite shall confirm this requirement.

PART 2 PRODUCTS

2.1 MATERIALS

Water and aggregates may be preheated for cold weather placement; however, their temperature shall not exceed 150 degrees F. All methods and equipment for heating of water and aggregate shall be subject to the approval of the ENGINEER and shall conform to ACI 306.

PART 3 EXECUTION

3.1 CONCRETE PLACEMENT

- A. No concrete shall be placed on frozen ground.
- B. The ground, against which concrete is to be poured, must be protected against freezing after its preparation, or the concrete placement shall be delayed until the ground has fully thawed out.
- C. When temperatures are expected to be below 32 degrees F the night before the concrete is placed, then all reinforcing steel, forms and the ground shall be preheated, for a minimum of 12 hours, under a minimum temperature of 50 degrees F.
- D. When temperatures are expected to be below 40 degrees F any time before the concrete has reached a strength of 1,000 pounds per square inch (psi), the concrete must be adequately protected against frost damage by heating blankets, straw or insulation materials for a minimum of 7 days or until at least 1,000 psi concrete strength has been reached. Provide adequate means to maintain the temperature in the area where concrete is being placed at either 70 degrees F for 3 days or 50 degrees F for 5 days after placing. Keep protections in place and intact at least 24 hours after artificial heat is discontinued. The concrete temperature shall at no time fall below 40 degrees F based on recording temperature monitors placed at a maximum of 50 feet on centers, each way, and around the circumference of the floor, wall, roof slab, and wall-footing. CONTRACTOR shall provide heat as required to keep the concrete temperature as specified throughout the entire curing period of 7 days.
- E. Weather prediction made by the nearest NOAA station, and corrected for the local elevation and environmental conditions, may be used to determine whether cold weather protection shall be required. Thermometers will be used by the ENGINEER and these readings shall determine whether cold weather protection shall be required and whether cold weather protection is adequate.
- F. When combustion type heaters are used to maintain concrete temperatures within an enclosure, the exhaust gases shall be vented from the heater to the outside atmosphere so that the concrete is not exposed to the products of combustion.
- G. Protect all concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with the requirements of ACI 306 and as herein specified.
- H. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat all water and aggregates before mixing as required to obtain a concrete mixture temperature of not less than 50 degrees F, and not more than 80 degrees F, at point of placement.

- I. Do not use frozen materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials. Ascertain that forms, reinforcing steel and adjacent concrete surfaces are entirely free of frost, snow, and ice before placing concrete.

END OF SECTION

SECTION 03 30 20 - HOT WEATHER CONCRETING PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

- A. This Section covers requirements for placement and preparation for cast-in-place concrete and appurtenances under hot weather conditions.
- B. During hot weather conditions, any or all the methods specified herein for temperature control of concrete shall be used as required to maintain the concrete temperature below the limits specified.

1.2 RELATED SECTIONS

- A. Section 03 30 00 - Cast-In-Place Concrete

1.3 DEFINITIONS

- A. Hot Weather Conditions: Any combination of high air temperature, low relative humidity and wind velocity tending to impair the quality of fresh or hardened concrete or otherwise resulting in abnormal concrete properties.

1.4 SUBMITTALS

- A. Not less than 30 days prior to expected placement of concrete under hot weather conditions, a complete procedure shall be submitted for review covering the aspects of protection of concrete and its ingredients from the detrimental effects of hot weather.
- B. Concrete placement during hot weather shall not commence prior to the return of the procedure marked "Reviewed".

1.5 PRODUCT DELIVERY, HANDLING, AND STORAGE

- A. Aggregate piles, cement bins, and batch plant bins shall be shaded from the direct rays of the sun.
- B. Aggregate piles shall be cooled by wetting and evaporation. Aggregate wetting shall be performed in such a manner that it will not cause wide variations in moisture content impairing slump uniformity.

1.6 QUALITY ASSURANCE

Comply with the provisions of the following codes, specifications and standards, except as

otherwise shown or specified.

- American Concrete Institute - ACI 305

PART 2 PRODUCTS

2.1 MATERIALS

A. Batching and Mixing

1. Concrete mix water shall be refrigerated, or ice shall be added to the mix up to 100 percent of the water requirement. Ice, when introduced into the mixer, shall be in such form that it will be completely melted and dispersed throughout the mix at the completion of the mixing time. Ice may be used provided the water equivalent of the ice is calculated to the total amount of mixing water. The mixing time shall be held to the minimum practicable consistent with producing concrete meeting the specified requirements.
2. All methods and equipment for cooling of water and aggregate shall be subject to the approval of the ENGINEER and shall conform to ACI 305.

PART 3 EXECUTION

3.1 TEMPERATURE CONTROL OF CONCRETE

A. General Practices and Measures

The following list of practices and measures, as described in ACI 305, may be used to reduce or avoid the potential problems of hot weather concreting:

1. Use concrete materials and proportions with satisfactory records in field use under hot weather conditions.
2. Use cool concrete.
3. Use a concrete consistency that permits rapid placement and effective consolidation.
4. Transport, place, consolidate, and finish the concrete with least delay.
5. Plan the job to avoid adverse exposure of the concrete to the environment; schedule placing operations during times of the day or night when weather conditions are favorable.

6. Protect the concrete against moisture loss at all times during placing and during its curing period.

B. Concrete Temperature

The temperature of concrete, as delivered at the time and location of placement, shall not exceed 90 degrees Fahrenheit under any conditions. The temperature of concrete as delivered at the time and location of placement under the following combined ambient conditions, except concrete that will be deposited within wall or column forms, shall not exceed the following temperatures:

Relative humidity		Ambient temperature		Maximum concrete temperature
less than:	80%	greater than:	90°F	100°F
	70%		90°F	95°F
	60%		90°F	90°F
	50%		90°F	85°F
	40%		90°F	80°F
	30%		80°F	75°F
	20%		75°F	70°F

3.2 DELIVERY

Concrete shall be placed in the Construction within 90 minutes after the completion of mixing.

3.3 PREPARATION FOR PLACING

- A. Elevated forms and reinforcing steel for beams and similar members shall be cooled by fog spraying and evaporation immediately prior to placing concrete. Forms shall be free of standing water when concrete is placed herein.
- B. Cover reinforcing with water-soaked burlap such that the steel temperature does not exceed the ambient air temperature immediately before embedment in concrete.
- C. Wet form thoroughly before placing concrete.

3.4 PLACING

- A. Concrete shall be placed in shallower layers than under normal weather conditions, if necessary, to assure coverage of the previous layer while it will respond readily to vibration.
- B. Do not use retarding admixtures unless otherwise accepted in mix design. Wet forms thoroughly before placing concrete.

3.5 FINISHING

Fog spray shall be used during finishing operations whenever necessary to avoid surface plastic-shrinkage cracking. Fog spray shall also be used after finishing and before the specified curing is commenced to avoid surface plastic-shrinkage cracking.

3.6 PROTECTION AND CURING

Forms shall be kept covered and continuously moist. Once forms are loosened and during form removal, concrete surfaces shall be protected from drying and shall be kept continuously wet by fog spraying or other approved means.

END OF SECTION

SECTION 03 49 00 - FIBROUS CONCRETE REINFORCING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Secondary reinforcement of normal weight concrete flatwork including aprons and sidewalks

1.2 RELATED SECTIONS

- A. Section 03000—Concrete

1.3 REFERENCES

- A. BOCA—National Building Codes
- B. SBCCI—Standard Building Code
- C. ICBO—Uniform Building Code
- D. Council of American Building Officials: All adopted supplements
- E. ACI 211—Standard Practices for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
- F. ACI 318—Building Code Requirements for Reinforced Concrete
- G. ACI 544—State of the Art Report of Fiber Reinforced Concrete
- H. ACI 544.2R—Measurement of Properties of Fiber Reinforced Concrete
- I. Underwriters Laboratories (UL) report File No. R8534-11
- J. ASTM C-1116—Fiber-Reinforced Concrete and Shotcrete
- K. ASTM C-1018—Test Method for Flexural Toughness and First-Crack Strength of Fiber-Reinforced Concrete (Using Beam with Third-Point Loading)
- L. ASTM C-94—Ready-Mixed Concrete

1.4 SUBMITTALS

A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00.

1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements

B. Product Data: Provide manufacturers catalog data indicating proposed fibrous concrete reinforcement materials with test data and physical properties. Include copies of manufacturer's batching and mixing instructions

C. Certification: Provide certificate prepared by concrete supplier under provisions of Section 01 45 00 stating that approved fibrous concrete reinforcement materials were added to each batch of concrete at specified rate

D. Provide project references indicating satisfactory performance of fiber reinforcing material with an experience period of no less than 5 years under same trade name and manufacturer

1.5 QUALITY ASSURANCE

A. Comply with all requirements of local building codes and all supplements as adopted by governing agency in which jurisdiction concrete is placed

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 5 years experience

PART 2 PRODUCTS

2.1 MANUFACTURER'S

A. Fibermesh Company

B. Or accepted substitution

2.2 MATERIAL

A. 100 percent virgin polypropylene, fibrillated fibers containing no reprocessed olefin:

1. Specific gravity: 0.9 min

2. Tensile strength: 80-110 kips per square inch
3. Fiber length: 3/4 inch
4. Water absorption: Less than 1 percent

PART 3 EXECUTION

3.1 CONCRETE MIXING

- A. Add fibrous concrete reinforcement to concrete materials at the batch plant at a rate of 1.5 pounds per cubic yard
- B. Mix concrete in accordance with fiber reinforcement manufacturer's recommendations for uniform and complete distribution:
 1. Mix at high speed for five minutes

3.2 CONCRETE PLACING AND FINISHING

- A. When shown on the drawings or approved by the OWNER, fibrous reinforcing may be utilized.
- B. Place and finish concrete materials under provisions of Section 03 30 00 for all exterior concrete flatwork.

3.3 MANUFACTURER'S FIELD SERVICE

- A. Provide the services of a qualified technical representative to instruct the concrete supplier in proper batching and mixing of materials to be provided

END OF SECTION

SECTION 03 60 00 - GROUTING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes all work necessary to form, mix, place, cure, repair, finish, and do all other work as required to produce finished grout, in accordance with the requirements of the Contract Documents.
- B. Work covered in this Section includes:
 - 1. Grouting
 - 2. Removal of loose and spalling grout and concrete
 - 3. Anchoring, patching, grouting, and sealing

1.2 RELATED SECTIONS

- A. Section 03 30 00 - Cast-In-Place Concrete

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Specifications, codes, and standards shall be as specified in Section 03 30 00, Cast-In-Place Concrete and as referred to herein.
- B. Commercial Standards:
 - 1. CRD-C 621—, Corps of Engineers Specification for Non-Shrink Grout
 - 2. ASTM C109—Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or 50-mm Cube Specimens)”
 - 3. ASTM C531—Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes”
 - 4. ASTM C579—Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes”
 - 5. ASTM C827—Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures”

1.4 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00.

1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- B. Product Data: Provide manufacturer's catalog sheet for material indicating test data and physical properties
 1. Non-shrink, nonmetallic grout
 2. Epoxy/grout adhesive
- C. Manufacturer's Installation Instructions: Containing instructions and recommendations on the mixing, handling, placement, and appropriate uses for each type of non-shrink and epoxy grout used in the work.
- D. Certified Test Results: Verifying the compressive strength, shrinkage, and expansion requirements specified herein.

1.5 QUALITY ASSURANCE

- A. Conform to applicable industry standard, Corps of Engineers, Specification CRD-C 621—Specification for non-shrink grout

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of Section 01 61 00
- B. Coordinate shipping, handling, storage, and protection with manufacturer
- C. Accept products and components on site in factory packing. Inspect for damage. Comply with manufacturers installation instructions
- D. Protect products and accessories from physical damage including effects of weather, water, and construction debris
- E. Provide manufacturer's storage instructions, storage and protection of products and accessories shipped to site along with shipped materials
- F. Deliver in sealed units. Identify each unit with project name; material name and type
- G. If in bags, store stacked no more than two bags high

1.7 ENVIRONMENTAL CONDITONS

- A. Refer to Section 01 61 00 for general design requirements of this site

- B. Project location: Erie, CO ; Elevation: 5,045 feet AMSL

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Non-Shrink, Non-Metallic Grout:
 - 1. Master Builders—Masterflow 928
 - 2. Burke—Non-Ferrous Non-Shrink
 - 3. L & M Inc.—Crystex
 - 4. M.R. Meadows—Sealtight 588
 - 5. Sonneborn—SonogROUT G.P.
 - 6. Tamms—TammsgROUT 621
 - 7. Sika—SikaGrout 212
 - 8. Or equal
- B. Epoxy/Grout Adhesive:
 - 1. Master Builders—Concresive 1380
 - 2. Hilti Hit—HY-150
 - 3. Sika—Sikadur 32 Hi-Mod LPL
 - 4. Or accepted substitution

2.2 MATERIALS

- A. Non-Shrink, Non-Metallic Grout: Factory premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, capable of developing minimum compressive strength of 4000 psi in one day and 8000 psi in 7 days
- B. Epoxy/grout adhesive:
 - 1. Two components consisting of a resin and hardener
 - 2. Each component furnished in separate tubes within cartridge

- C. Water: Clean and free from deleterious substances

PART 3 EXECUTION

3.1 PREPARATION

A. Non-Shrink, Non-Metallic Grout:

1. Clean concrete surface to receive grout
2. Saturate concrete with water for 24 hours prior to grouting and remove excess water just prior to placing grout
3. Cold weather conditions:
 - a. Warm concrete, substrate and base plate to 40 degrees F, or above; store grout in warm area
 - b. Follow manufacturer's recommendations for cold weather application
4. Hot weather conditions:
 - a. Use cold mixing water and cool base plate if possible; store grout in cool area
 - b. Follow manufacturer's recommendations for hot weather application
5. Apply to clean, sound surface
6. Apply latex bonding agent to hardened concrete, mix-in-grout, or as directed by Engineer

B. Epoxy Grout Adhesive: Apply only to clean, dry, sound surface

3.2 APPLICATION

A. Non-Shrink, Non-Metallic Grout:

1. Mix in a mechanical mixer
2. Use no more water than necessary to produce flowable grout
3. Provide expansion joints on long pours
4. Provide air vents where necessary to eliminate air pockets
5. Place in accordance with manufacturer's instructions

6. Completely fill all spaces and cavities below the top of baseplates
 7. Provide forms where baseplates and bedplates do not confine grout
 8. Where exposed to view finish grout edges smooth
 9. Except where a slope is indicated on the Drawings, finish edges flush at the baseplate, bedplate, member or piece of equipment
 10. Protect against rapid moisture loss by immediately covering with wet rags and polyethylene sheets or curing compound
 11. Wet cure grout for 7 days, minimum
 12. Maintain the temperature at a minimum of 40 degrees F until grout reaches 3000 psi
 13. After placement of grout, eliminate excessive external vibration
- B. Epoxy/grout adhesive:
1. Drill hole to proper diameter and depth
 2. Clean hole removing laitance and debris
 3. Dispense adhesive into hole
 4. Insert dowel or threaded rod, slowly turning during insertion
 5. Obtain manufacturer's field technical assistance as required to insure proper placement

3.3 SCHEDULE

- A. Non-Shrink, Non-Metallic Grout:
1. General use as acceptable to Engineer
 2. Grouting of column and equipment baseplates
- B. Epoxy/grout adhesive:
1. Grouting of dowels and anchor bolts into existing concrete

PART 4 FIELD QUALITY CONTROL

4.1 Field testing will be performed in accordance with ACI 301

4.2 Provide field testing under provisions of Section 01 45 00:

- A. Contractor shall coordinate and schedule all tests to determine compliance of grout materials in accordance with the specifications
- B. The OWNER shall pay for all initial field and laboratory testing, to determine compliance of materials in accordance with this Section and Section 01 45 00. All retests due to initial failed test shall be paid for by the CONTRACTOR,

4.3 FIELD CONTROL TEST:

- A. Testing services shall be provided in conformance with ACI 351, submit certification for technician under provisions of Section 01 33 00.
- B. Make tests in presence of Engineer
- C. Provide all equipment, supplies, and the services of one or more employees, as required
- D. The test frequencies specified are minimum. Additional tests may be performed as required by the job conditions

4.4 GENERAL:

- A. All grout tests shall be taken at point of placement.
- B. Engineer may require periodic checks at the point of placement to ensure no change in slump at point of placement
- C. Grout placement shall not commence until all tests specified below have been performed unless directed otherwise by Engineer.

A.Consistency:

- 1. Testing shall comply with ASTM C827
- 2. Frequency: 1 per batch, minimum
- 3. Once consistency of quality has been established, testing of each batch may be reduced as directed by the Engineer

B. Ambient Air Temperature:

- 1. Testing shall comply with ASTM C143 and ASTM C39
- 2. Frequency: 1 per batch, minimum

C. Grout Temperature:

1. Testing shall comply with ASTM C143 and ASTM C39
2. Frequency: 1 per batch, minimum

A. Compression tests:

1. Make one set of 6 cubes each day when up to 50 cubic yards have been placed
2. Make one additional set of 6 cubes for each additional 50 cubic yards or each major pour placed in one day
3. Test two cubes in each set at 7 days
4. Test two cubes in each set at 28 days
5. The other two cubes to be used as directed by Engineer at any time
6. Engineer will evaluate in accordance with ACI 351, 214 and 318
7. Make, cure, store, and deliver cylinders in accordance with ACI 351
8. Test in accordance with ASTM C109 and C1107
9. Mark or tag each set of test cubes with the date and time of day the cubes were made, the location in the work where the grout represented by the cubes was placed, the delivery truck or batch number, the air content, and the slump

B. Storage facilities for concrete test cubes:

1. Including water necessary, a specially prepared box with high-low thermometer and thermostatically controlled heating devices in accordance with ASTM C31

C. Failure of test cube results:

1. Upon failure of 28-day test cube results, the Engineer may require the Contractor, at his expense, to obtain and test at least three 4-inch diameter cored samples from area in question
2. Grout will be considered adequate if average of three core tests is at least 85 percent of, and if no single core is less than 75 percent of, the specified 28-day strength
3. In the event an area is found to be structurally unsound, the Engineer may order removal and replacement of grout as required. The cost of the core tests and removal and replacement of defective concrete shall be borne by the Contractor
4. Fill all core holes as specified with non-shrink grout

END OF SECTION

SECTION 09 90 00 - PAINTING AND COATING

PART 1 GENERAL

1.1 THE REQUIREMENT

- A. Work under this Section shall include the protective coating of all specified surfaces including all surface preparation, pretreatment, coating application, touch-up of factory coated surfaces, protection of surfaces not to be coated, cleanup, and appurtenant work, all in accordance with the requirements of the Contract Documents.
- B. This specification is applicable to coated pipe, steel, concrete, and other surfaces listed in the coating schedule at the end of this section.
- C. The Coating System Schedules summarize the surfaces to be coated, the required surface preparation, and the coating systems to be applied. Coating notes on the drawings are used to show exceptions to the schedules, to show or extend the limits of coating systems, or to clarify or show details for application of the coating systems.
- D. Related Work Specified in Other Sections -- Shop coatings and/or factory finishes on fabricated or manufactured equipment may be specified in other divisions. Some items with factory finishes, or corrosion resistant finishes may be scheduled or directed to be painted by the ENGINEER to unify a wall finish or color scheme, at the ENGINEER's discretion.
- E. Exclusions -- Do not coat the following surfaces unless specified or directed elsewhere: Stainless steel, aluminum, copper, brass, bronze, and other corrosion-resistant material (except for valve bodies and piping); Electrical switch-gear and motor control centers having factory finish; Fencing; Multiple coated factory finished baked enamel or porcelain products; Concealed areas such as ducts, piping, conduits, and items specified elsewhere for special linings and coatings.
- F. Damaged Factory Finish -- If directed by the ENGINEER, refinish the entire exposed surfaces of equipment chipped, scratched, or otherwise damaged in shipment or installation.
- G. All coating coming in contact with potable water shall be NSF approved.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Comply with the provisions of the following codes, specifications and standards, except as otherwise shown or specified.

1. "Architectural Specification Manual" by the Painting and Decorating Contractors of America (PDCA), 333 Taylor Avenue North, Seattle, Washington 98109.
 2. "Systems and Specifications" - Volume 2 of Steel Structures Painting Council (SSPC).
 3. NSF International (NSF) Standard No. 61.
- B. References herein to "NACE" shall mean the published standards of the National Association of Corrosion Engineers, P.O. Box 986, Katy, TX 77450.
- C. Pipe Coating Commercial Standards
- | | |
|----------------|---|
| ANSI/AWWA C105 | Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids. |
| ANSI/AWWA C203 | Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied. |
| ANSI/AWWA C205 | Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4-inch and Larger - Shop Applied |
| ANSI/AWWA C209 | Cold Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Pipelines. |
| ANSI/AWWA C210 | Liquid Epoxy Coating for Exterior and Interior of Steel Pipe. |
| ANSI/AWWA C213 | Fusion Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines. |
| ANSI/AWWA C214 | Tape Coating systems for the Exterior of Steel Water Pipelines. |
- D. Federal Specifications
- | | |
|------------------|--|
| DOD-P-23236A(SH) | Military Specification, Paint Coating Systems, Steel Ship Tank, Fuel and Salt Water Ballast. |
|------------------|--|

1.3 CONTRACTOR SUBMITTALS

- A. Coating Materials List -- The CONTRACTOR shall provide a coating materials list which indicates the manufacturer and the coating number, keyed to the coating systems herein. The number of copies to submit shall be as specified within Section 01 33 00, Submittal Procedures.
- B. Coating Manufacturer's and Applicator Information -- For each coating system to be used the CONTRACTOR shall submit, the following listed data.

1. Manufacturer's data sheet for each product used, including statements on the suitability of the material for the intended use.
2. Manufacturer's instructions and recommendations on surface preparation and application.
3. Colors available for each product and each coat.
4. Compatibility of shop and field applied coatings (where applicable).
5. Material safety data sheet (MSDS) for each product used.
6. The manufacturer's recommended products and procedures for field coating repairs and field preparation of field cut pipe ends.
7. The name of the proposed coating applicator shop along with certification that the applicator shop is qualified and equipped to apply the coatings systems as specified.
8. Certificate -- Submit manufacturer's certificate of compliance with the specifications and standards signed by a representative in the manufacturer's employ.
9. Samples -- Provide painted surface areas at the job for approval of main color selections, or submit sample on 12-inch sample of substrate using required finish system at ENGINEER's discretion.

1.4 QUALITY ASSURANCE

- A. Painter Qualifications -- The Painting/Coating CONTRACTOR must be capable of performing the various items of work as specified. The Painting/Coating CONTRACTOR shall furnish a statement covering experience on similar work, a list of machinery, plant and other equipment available for the proposed work, and a financial statement, including a complete statement of the Painter/Coating CONTRACTOR's financial ability and experience in performing similar painting and coating work. The Painting/Coating CONTRACTOR shall have a minimum of 5 years practical experience and a successful history in the application of the specified products to concrete/steel surfaces. Upon request, the Painting/Coating CONTRACTOR shall substantiate this requirement by furnishing a list of references, which shall include jobs of similar nature.
- B. The CONTRACTOR shall give the ENGINEER a minimum of 7 days advance notice of the start of any field surface preparation work of coating application work, and a minimum of 7 days advance notice of the start of any shop surface preparation work.
- C. All such work shall be performed only in the presence of the ENGINEER, unless the ENGINEER has granted prior approval to perform such work in its absence.

- D. Inspection by the ENGINEER, or the waiver of inspection of any particular portion of the work, shall not relieve the CONTRACTOR of its responsibility to perform the work in accordance with these Specifications.
- E. Surface Preparation -- Evaluation of blast cleaned surface preparation work will be based upon comparison of the blasted surfaces with the standard samples available from the NACE, using NACE standard TM-01-70.
- F. Scaffolding shall be erected and moved to locations where requested by the ENGINEER to facilitate inspection. Additional illumination shall be provided by the CONTRACTOR to cover all areas to be inspected.
- G. Paint Products -- No request for substitution shall be approved which decreases the film thickness designated or the number of coats to be applied, or which offers a change from the generic type of coating specified. Painting shall be done at such times as the CONTRACTOR and ENGINEER may agree upon in order that dust-free and neat work be obtained. All painting shall be in strict accordance with the manufacturer's instructions and shall be performed in a manner satisfactory to the ENGINEER.
- H. Manufacturer's Representative -- Require coating manufacturer's representative to be at job site when the first day's coating application is in progress and periodically during progress of the work.
- I. Labels -- Deliver to the job site in the original sealed containers with manufacturer's name, product name, type of product, manufacturer's specification or catalog number or federal specification number, and instructions for reducing where applicable.
- J. Colors -- Colors will be selected from manufacturer's standard colors as reviewed by ENGINEER and approved by the OWNER. Colors for special coatings that are limited in their availability and color selection will be chosen on the basis of manufacturer's standard colors, provided that the manufacturer's product line represents a color range comparable to similar products of other manufacturers.
- K. Flame Spread -- Provide paint materials which will result in a Class II finish for all coated surfaces in exit corridors, and a Class III finish for all other interior rooms or areas.
- L. Film Thickness Testing -- On ferrous metals, the dry film coating thickness shall be measured in accordance with the SSPC "Paint Application Specification No. 2" using a magnetic-type dry film thickness gauge such as Mikrotest model FM, Elcometer model 111/1EZ, or approved equal. Each coat shall be tested for the correct thickness. No measurements shall be made until at least 8 hours after application of the coating. On non-ferrous metals and other substrates, the coating thicknesses shall be measured at the time of application using wet film gage readings and destructive film thickness tests.

- M. Inspection Device -- The CONTRACTOR shall furnish, until final acceptance of such coatings, inspection devices in good working condition for the detection of holidays and measurement of dry-film thicknesses of protective coatings. Dry-film thickness gauges shall be made available for the ENGINEER'S use at all times while coating is being done, until final acceptance of such coatings. The CONTRACTOR shall provide the services of a trained operator of the holiday detection devices until the final acceptance of such coatings.
- N. Holiday Testing -- The CONTRACTOR shall holiday test all coated ferrous surfaces. Areas which contain holidays shall be marked and repaired or recoated in accordance with the coating manufacturer's printed instructions and then retested.
 - 1. Coatings With Thickness Exceeding 20 Mils -- For surfaces having a total dry film coating thickness exceeding 20 mils: pulse-type holiday detector such as Tinker & Rasor Model AP-W, D.E. Stearns Co. Model 14/20, or approved equal shall be used. The unit shall be adjusted to operate at the voltage required to cause a spark jump across an air gap equal to twice the specified coating thickness.
 - 2. Coatings With Thickness of 20 Mils or Less -- For surfaces having a total dry film coating thickness of 20 mils or less: Tinker & Rasor Model M1 nondestructive type holiday detector, K-D Bird Dog, or approved equal shall be used. The unit shall operate at less than 75 volts. For thicknesses between 10 and 20 mils, a non-sudsing type wetting agent, such as Kodak Photo-Flo, or equal, shall be added to the water prior to wetting the detector sponge.

1.5 DELIVERY, HANDLING, AND STORAGE

- A. Deliver in labeled containers as specified above and store in a locked room accessible for inspection. Comply with fire and health regulations.
- B. Provide adequate heat and forced mechanical ventilation for health, safety, and drying requirements. Use explosion proof equipment. Provide face masks.
- C. Protect adjacent surfaces with suitable masking and drop cloths as required. Remove cloths or waste from the project daily.
- D. Apply to surfaces under recommended environmental conditions and within the limitations established by the material manufacturer. Do not apply coating in snow, rain, fog or mist; or when the relative humidity exceeds 85 percent; or to damp or wet surfaces, unless otherwise permitted by the coating manufacturer's printed instructions. Coating application may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.

1.6 PROTECTION

- A. Follow all safety recommendations of manufacturer regarding ventilation and danger from explosion or breathing paint fumes or skin exposure, and all applicable O.S.H.A. and other regulations.
- B. Protect surface adjacent to work being coated from overspray, drips or other damage.

1.7 EXTRA STOCK

Provide one gallon of each type and color, fully labeled, at completion of job.

PART 2 PRODUCTS

2.1 GENERAL

- A. Definitions -- The terms "paint," "coatings," or "finishes" as used herein, shall include surface treatments, emulsions, enamels, paints, epoxy resins, tape, and all other protective coatings, excepting galvanizing or anodizing, whether used as a pretreatment, primer, intermediate coat, or finish coat. The term "DFT" means minimum dry film thickness.
- B. General -- Coating materials shall be sealed in containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer, all of which shall be plainly legible at the time of use.
- C. The CONTRACTOR shall use coating materials suitable for the intended use and recommended by their manufacturer for the intended service.
- D. Compatibility -- In any coating system only compatible materials from a single manufacturer shall be used in the work. Particular attention shall be directed to compatibility of primers and finish coats. If necessary, subject to the approval of the ENGINEER, a barrier coat shall be applied between existing prime coat and subsequent field coats to ensure compatibility.
- E. Colors -- All colors and shades of colors of all coatings shall be as selected or specified by the ENGINEER. Each coat shall be of a slightly different shade, to facilitate inspection of surface coverage of each coat. Finish colors shall be as selected from the manufacturer's standard color samples by the ENGINEER. Color pigments shall be lead free.
- F. Protective Coating Materials -- Products shall be standard products produced by recognized manufacturers who are regularly engaged in production of such materials for essentially identical service conditions. Where requested, the CONTRACTOR shall

provide the ENGINEER with the names of not less than 10 successful applications of the proposed manufacturer's products demonstrating compliance with this specification requirement.

- G. Substitute or "Or-Equal" Submittals -- Unless otherwise specified, materials are from the catalogs of the companies listed herein. Materials by other manufacturers are acceptable provided that they are established as being compatible with and of equal quality to the coatings of the companies listed. The CONTRACTOR shall provide satisfactory documentation from the firm manufacturing the proposed substitute or "or equal" material that said material meets the specified requirements and is equivalent or better than the listed materials.
- H. The cost of all testing and analyzing of the proposed substitute materials that may be required by the ENGINEER shall be paid by the CONTRACTOR. If the proposed substitution requires changes in the contract work, the CONTRACTOR shall bear all such costs involved and the costs of allied trades affected by the substitution.

2.2 INDUSTRIAL COATING SYSTEMS

A. General

Provide and apply the industrial coatings systems which follow as listed in the coating schedule, as required by these specifications and as directed by the ENGINEER. Coat all existing and new exposed interior or exterior surfaces and submerged and intermittently submerged surfaces as indicated, except as specifically excluded in Part 1 of this section or on the drawings or finish schedules. Coating System Numbers listed below shall be used as the Coating System code letter, and shall be used on any coating submittals or correspondence.

B. Industrial coating systems shall be as follows

1. Coating System 100

- a. Location -- Exposed, unprimed, non-galvanized, non-submerged metal surfaces, both interior and exterior including piping, and structural steel.
- b. Surface Preparation -- As specified herein.
- c. Coating System -- Apply prime coat and topcoat, 4.0-6.0 mils each coat of Tnemec Series 66-2 Hi-Build Epoxoline, or approved equal. Color as selected by Owner.

2. Coating System 101

- a. Location -- Exposed metal surfaces, shop primed, both interior and exterior including piping, railings, ladders, steel doors, and any other metal items not otherwise specified.
 - b. Surface Preparation -- As specified herein.
 - c. Coating System -- Apply shop prime coat 3.0 mils DFT Tnemec Series 90-97 Tneme-Zinc, one coat 4.0 - 6.0 mils DFT Tnemec Series 66 Hi-Build Epoxoline, and 3.0 - 4.0 mils DFT of Tnemec Series 175 Endura Shield, or approved equal. Color as selected by Owner.
3. Coating System 102
- a. Location -- Unprimed or non-galvanized, continuously or intermittently submerged metal items, both interior and exterior including piping, structural steel, and all other metal items not otherwise specified.
 - b. Surface Preparation -- As specified herein.
 - c. Coating System -- Prime, intermediate and topcoat, 4.0-6.0 mils each coat of Tnemec Series 20 Pota-Pox, or approved equal. Color as selected by Owner.
4. Coating System 103
- a. Location -- Vertical concrete walls, exterior, below finish grade, not exposed to view.
 - b. Surface Preparation -- As specified herein.
 - c. Paint System -- Apply two coats 9.0-10.0 mils each, Carboline Bitumastic 50, or approved equal.
5. Coating System 104
- a. Location -- Non-submerged, exposed to view, PVC piping.
 - b. Surface Preparation -- As specified herein.
 - c. Coating System -- Apply one coat, 4.0-6.0 mils Tnemec Series 66-2 Hi-Build Epoxoline, or approved equal. Color as selected by Owner.

2.3 SPECIAL PIPE AND SEVERE SERVICE COATING SYSTEMS

A. General

The following coatings are for buried pipe and surfaces used in severe service conditions. The manufacturers' products listed in this paragraph are materials which

satisfy the material descriptions of this paragraph and have a documented successful record for long term submerged or severe service conditions. Proposed substitute products will be considered as indicated within the paragraph entitled " 'Or-Equal' Clause" in Section 01 10 00, Summary of Work.

B. Special pipe and severe service coating systems shall be as follows

1. Coating System 200 -- Cement Mortar Coating

- a. Location -- Exterior surfaces of buried steel pipe and fittings, non-galvanized.
- b. Surface Preparation - As specified herein.
- c. Coating System -- A 1-1/2-inch minimum thickness mortar coating reinforced with 3/4-inch galvanized welded wire fabric shall be provided. The cement mortar shall contain no less than 1-part Type V cement to 3 parts sand. The cement mortar shall be cured by a curing compound meeting the requirements of "Liquid Membrane-Forming Compounds for Curing Concrete" ASTM C 309-81, Type II, white pigmented, or by enclosure in an 8-mil thick polyethylene sheet with all joints and edges lapped by at least 6 inches. At the ENGINEER's discretion, the hot applied coal tar epoxy coating may be used as the curing membrane for the mortar coating.

2. Coating System 201 -- Hot Applied Coal Tar Epoxy Coating

- a. Location -- Exterior surface of concrete pipe and cement-mortar coated pipe and fittings.
- b. Surface Preparation -- As specified herein.
- c. Coating System -- The hot applied coal tar epoxy shall be a solvent free 100 percent solids coal tar epoxy chemically compatible with hydrating cement and suitable for application on moist surfaces of freshly placed cement mortar or concrete and properly prepared cured surfaces. The coal tar epoxy coating material shall be Amercoat 1972B or approved equal. The finish coal tar epoxy coating shall have a minimum DFT of 26 mils.

3. Coating System 202 -- Coal-Tar Epoxy Coating System

- a. Location -- Exterior surface of buried steel pipe, fittings, and other ferrous surfaces.
- b. Surface Preparation -- As specified herein.
- c. Coating System -- High build, two-component amine or polyamide cured coal-tar epoxy shall have a solids content of at least 68 percent by volume, suitable

as a long term coating of buried surfaces, and conforming to AWWA C210. Prime coats are for use as a shop primer only. Prime coat shall be omitted when both surface preparation and coating are to be performed in the field. The coal-tar epoxy coating system shall include:

- 1) Prime coat (DFT = 1-1/2 mils), Amercoat 83HS, Tnemec P66, or equal.
- 2) Finish coats (Two or more, DFT = 18 mils), Amercoat 78 HB, Tnemec 46 H-413, or equal.
- 3) Total system DFT = 19-1/2 mils.

4. Coating System 203 -- Fusion Bonded Epoxy

- a. Location -- Ferrous surfaces of sleeve couplings, steel pipe, and fittings.
- b. Surface Preparation -- As specified herein.
- c. Coating System -- The coating material shall be a 100 percent powder epoxy applied in accordance with the ANSI/AWWA C213 "AWWA Standard for Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines". The coating shall be applied using the fluidized bed process.
 - 1) Liquid Epoxy -- For field repairs, the use of a liquid epoxy will be permitted, applied in not less than three coats to provide a DFT 16 mils. The liquid epoxy shall be a 100 percent solids epoxy recommended by the powder epoxy manufacturer.
 - 2) Coating (DFT = 16 mils), Scotchkote 203, or equal.
 - 3) Total system DFT = 16 mils.

5. Coating System 204 -- Hot, Coal-Tar Enamel

- a. Location -- Exterior surfaces of buried steel pipe and fittings, non-galvanized.
- b. Surface Preparation - As specified herein
- c. Coating System -- Coal-Tar Enamel materials and procedures shall be in accordance with ANSI/AWWA C203. This system shall consist of a primer layer, coal-tar enamel layer, coal-tar saturated non-asbestos felt outer wrap, and a finish coat. Total system DFT = 188 mils.

6. Coating System 205 -- Hot Applied Tape

- a. Location -- Exterior surfaces of buried steel pipe and fittings, non-galvanized.

- b. Surface Preparation -- As specified herein.
 - c. Coating System -- Tape coating materials and procedures shall be in accordance with ANSI/AWWA C203. This system shall consist of a cold-applied liquid primer and heated coal-tar base tape. Total system DFT = 50 mils.
7. Coating System 206 -- Cold Applied Tape
- a. Location -- Exterior surfaces of buried steel pipe and fittings, non-galvanized.
 - b. Surface Preparation -- As specified herein.
 - c. Coating System -- Tape coating materials and procedures shall be in accordance with ANSI/AWWA C209. Prefabricated tape shall be Type II. The system shall consist of a primer layer, inner layer tape of 35 mils, and an outer layer tape of 35 mils. Total system DFT = 70 mils.
8. Coating System 207 -- PVC Tape
- a. Location -- Small galvanized steel pipe and fittings.
 - b. Surface Preparation -- As specified herein.
 - c. Coating System -- Prior to wrapping pipe with PVC tape, the pipe and fittings shall be primed using a primer recommended by the PVC tape manufacturer. After being primed, the pipe shall be wrapped with a 20-mil adhesive PVC tape, half lapped for a total thickness of 40 mils.
9. Coating System 208 -- Mastic
- a. Location -- Pipe and fitting joints, and general buried surface coating repair and touch up.
 - b. Surface Preparation - As specified herein.
 - c. Coating System -- Mastic shall be a one-part solvent drying heavy bodied thixotropic synthetic elastomeric coating with chemically inert resins and fillers and an average viscosity of 650,000 CPS at 77 degrees Fahrenheit (F), thereby requiring generous applications by hand or trowel. Total coat thickness shall be 30 mils, minimum. Mastic shall be Protecto Wrap 160 H or approved equal and be fully compatible with pipeline coating systems.
10. Coating System 209 -- Polyethylene Encasement
- a. Location -- Ductile iron, steel and concrete cylinder pipe and fittings
 - b. Surface Preparation -- None required.

- c. Coating System -- Except as otherwise specified, application of polyethylene encasement shall be in accordance with ANSI/AWWA C105 using Method C.

PART 3 EXECUTION

3.1 STORAGE, MIXING, AND THINNING OF MATERIALS

- A. Manufacturer's Recommendations -- Unless otherwise specified herein, the coating manufacturer's printed recommendations and instructions for thinning, mixing, handling, applying, and protecting its coating materials, for preparation of surfaces for coating, and for all other procedures relative to coating shall be strictly observed.
- B. All protective coating materials shall be used within the manufacturer's recommended shelf life.
- C. Storage and Mixing -- Coating materials shall be protected from exposure to cold weather, and shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Coatings of different manufacturers shall not be mixed together.

3.2 SURFACE PREPARATION STANDARDS

- A. The following referenced surface preparation specifications of the Steel Structures Painting Council shall form a part of this specification.
 - 1. Solvent Cleaning (SSPC-SP1) -- Removal of oil, grease, soil, salts, and other soluble contaminants by cleaning with solvent, vapor, alkali, emulsion, or steam.
 - 2. Hand Tool Cleaning (SSPC-SP2) -- Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, by hand chipping, scraping, sanding, and wire brushing.
 - 3. Power Tool Cleaning (SSPC-SP3) -- Removal of loose rust, loose mill scale, loose paint, and other loose detrimental foreign matter, by power tool chipping, descaling, sanding, wire brushing, and grinding.
 - 4. White Metal Blast Cleaning (SSPC-SP5) -- Removal of all visible rust, oil, grease, soil, dust, mill scale, paint, oxides, corrosion products, and foreign matter by blast cleaning.
 - 5. Commercial Blast Cleaning (SSPC-SP6) -- Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 33 percent of each square inch of surface area.

6. Brush-Off Blast Cleaning (SSPC-SP7) -- Removal of all visible oil, grease, soil, dust, loose mill scale, loose rust, and loose paint.
7. Near-White Blast Cleaning (SSPC-SP10) -- Removal of all visible oil, grease, soil, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except that staining shall be limited to no more than 5 percent of each square inch of surface area.
8. High- and Ultra High- Pressure Water Jetting (SSPC-SP12): Water jetting at high- or ultra-high-pressure to prepare a surface for recoating using pressure above 10,000 pounds per square inch (psi).
9. Surface Preparation of Concrete (SSPC-SP-13) - Surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems.
10. Industrial Blast Cleaning (SSPC-SP14): Blast cleaning to remove all visible oil, grease, dust and dirt, when viewed without magnification

3.3 CORRECTIONS AND CLEANUP

At completion any damaged, de-laminated or defaced coated surfaces shall be touched up, restored, and left in first class condition. Any coated or finished surfaces damaged in fitting or erection shall be restored. If necessary, an entire wall shall be refinished rather than spot finished. Upon completion and prior to final acceptance, all equipment and unused materials accumulated in the coating process shall be removed from the site and any spillage, spatter spots or other misplaced coating material shall be removed in a manner which will not damage surfaces. Perform required patching, repair, and cleaning to the satisfaction of the ENGINEER. Cooperate and coordinate work with the work of other trades in the removal and replacement of hardware, fixtures, covers, switch plates, etc., as required for coating.

3.4 SURFACE PREPARATION

A. General

Prepare all surfaces scheduled to receive new coating systems, as required to provide for adequate bonding of the specified coating system to the substrate material. Request review of prepared surfaces by the ENGINEER prior to proceeding. For existing coated surfaces, hand wash with cleaner or product recommended by coating manufacturer to properly prepare existing surface and provide for bonding of coating specified to follow. Remove any loose, peeling or flaking coating, or mildewed areas. Surface preparation minimums shall be as follows:

1. Exposed metal items, non-submerged, unprimed, non-galvanized both interior and exterior, including: piping, structural steel and all other metal items not otherwise

specified, shall undergo surface preparation in accordance with SSPC-SP6, "Commercial Blast Cleaning".

2. Exposed metal items, shop primed, both interior and exterior including: piping, steel doors, steel ladders to be painted, and railings, and all other metal items not otherwise specified, shall undergo surface preparation in accordance with SSPC-SP1, "Solvent Cleaning"; SSPC-SP2, "Hand Tool Cleaning"; and SSPC-SP3, "Power Tool Cleaning" as may be required to remove grease, loose, or peeling or chipped paint.
3. Metal items, unprimed or non-galvanized, continuously or intermittently submerged, both interior and exterior including: piping, structural steel, and all other metal items not otherwise specified, shall undergo surface preparation in conformance with SSPC-SP10, "Near-White Blast Cleaning".
4. Stainless Steel – Non-submerged and submerged, exposed piping and fittings, both interior and exterior shall undergo surface preparation in accordance with SSPC-SP1, "Solvent Cleaning".
5. Polyvinyl Chloride (PVC) – Non-submerged, both interior and exterior, process piping and plumbing, shall be lightly sanded prior to application of the specified coating system to follow.
6. Non-submerged Concrete - Clean all concrete surfaces of dust, form oil, curing compounds, or other incompatible matter. Etch and prime if required by manufacturer for specified coating products to follow. Allow minimum 28-day cure of concrete prior to application of coating systems.
7. Concrete Masonry Units -- Repair all breaks, cracks and holes with concrete grout. The surface must be free of dirt, dust, loose sand and other foreign matter. Brush clean. Allow minimum 28-day cure of concrete joint mortar and repair grout prior to application of coatings system.

3.5 PRIME COATING

- A. Exposed Steel -- Prime coat all exposed steel in accordance with SSPC PS 13.01 for epoxy-polyamide coating systems. Prime coats shall be applied following completion of surface preparation requirements as specified in paragraph 3.4.A.1 above.
- B. Galvanized Metal -- After surface preparation specified above, prime galvanized metal items receiving paints as specified with Tnemec Series 66 Hi-Build Epoxaline or equal, verifying with manufacturer before application the compatibility with coatings specified to follow.
- C. Shop Primed Metal -- Where indicated on the plans or coating schedule and following the surface preparation procedures specified in paragraph 3.4.A.2 above, the

CONTRACTOR shall apply intermediate and topcoats of the specified paint system to shop primed metal. The CONTRACTOR shall verify with the manufacturer(s) representative of the item(s) to be painted, before application, the compatibility of shop primers with the specified intermediate and topcoat coating systems.

- D. Non-Shop Primed Metal and Piping -- Prime coat all exposed metal and piping, except stainless steel, received at job site following completion of surface preparation requirements as specified in paragraph 3.4.A.1 above. Prime paint in accordance with SSPC PS No. 13.01 for epoxy-polyamide primers. Epoxy-polyamide primers shall conform to the standards set forth in SSPC Paint Specification No. 22.
- E. Cast-In-Place Reinforced Concrete -- After surface preparation specified above, prime coat concrete as specified in the coating schedule found elsewhere in the specifications.
- F. Concrete Masonry Units -- After surface preparation specified above, prime coat as specified in the coating schedule found elsewhere in the specifications.

3.6 FIELD PRIME

Wherever shop priming has been damaged in transit or during construction, the damaged area shall be cleaned and touched up with field primer specified herein or returned to the shop for resurfacing and re-priming, at the ENGINEER's discretion. Metal items delivered to the job site unprimed shall be cleaned and primed as specified herein.

3.7 APPLICATION

- A. Thickness -- Apply coatings in strict conformance with the manufacturer's application instructions. Apply each coat at the rate specified by the manufacturer to achieve the dry mil thickness specified. If material must be diluted for application by spray gun, build up more coating to achieve the same thickness as undiluted material. Correct apparent deficiency of film thickness by the application of an additional coat.
- B. Porous Surfaces -- Apply paint to porous surfaces as required by increasing the number of coats or decreasing the coverage as may be necessary to achieve a durable protective and decorative finish.
- C. Blast cleaned ferrous metal surfaces shall be painted before any rusting or other deterioration of the surface occurs. Blast cleaning shall be limited to only those surfaces that can be coated in the same working day.
- D. Coatings shall be applied in accordance with the manufacturer's instructions and recommendations, and this Section, whichever has the most stringent requirements.

- E. Special attention shall be given to edges, angles, weld seams, flanges, nuts and bolts, and other places where insufficient film thicknesses are likely to be present. Use stripe coating for these areas.
- F. Special attention shall be given to materials which will be joined so closely that proper surface preparation and application are not possible. Such contact surfaces shall be coated prior to assembly or installation.
- G. Ventilation -- Adequately ventilate enclosed rooms and spaces during painting and drying periods.
- H. Drying Time -- Do not apply next coat of coat until each coat is dry. Test non-metallic surfaces with moisture meter. The manufacturer's recommended drying time shall mean an interval under normal condition to be increased to allow for adverse weather or drying conditions. Coating manufacturer's representative shall verify by cure testing, complete cure of coatings systems used for immersion service.

3.8 COATING SCHEDULE

Coating Schedule

<u>Item</u>	<u>Location</u>	<u>Material</u>	<u>Coating System</u>
Fire Hydrants and Bollards	Exterior Above Grade	Iron	Coating System 100
Buried Water Distribution Pipe and Fittings	Buried	Iron	Coating System 202 and 209
Buried Water Valves	Buried	Iron	Coating System 202
Precast concrete manholes and vaults	Exterior vertical surfaces in contact with the earth	Concrete	Coating System 103

NOTES: 1. Fusion bonded epoxy [ANSI/AWWA C213] can be substituted for coal tar epoxy. Potable water epoxy, NSF approved, shall be used for all surfaces in contact with potable water.

END OF SECTION

SECTION 31 05 13 - SOILS FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes range of soil and subsoil materials intended to be referenced by other sections, generally for fill and grading purposes. Materials are indicated by "Type" to assist in referencing from other sections and on Drawing notes.
- B. Section includes:
 - 1. Subsoil materials
 - 2. Topsoil materials

1.2 RELATED SECTIONS

- A. Section 31 05 16 – Aggregates for Earthwork
- B. Section 31 10 00 – Site Clearing
- C. Section 31 22 13 – Rough Grading
- D. Section 31 23 16 – Excavation
- E. Section 31 23 17 – Trenching
- F. Section 31 23 18 – Rock Removal
- G. Section 31 23 23 – Fill

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
 - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
- B. ASTM International (ASTM):
 - 1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))
 - 1. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
 - 2. ASTM D1556—Test Methods for Density and Unit Weight of Soil in place by Sand-Cone Method

3. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
4. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.4 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00.
 1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- B. Product Data: Submit sufficient data to verify compliance with specifications to include all materials and accessories including but not limited to:
 1. Topsoil
- C. Design Data:
 1. Soil:
 - a. Allowable bearing pressure at foundation and slab bearing elevations
 - b. Modulus of Subgrade reaction for design of pavements
 - c. Maximum expected heave and settlement
 - d. Maximum horizontal pressure for below grade walls given as a fluid equivalent
 - e. Maximum stable slope
- D. Manufacturer's Shop Test Reports
 1. Submit certified copies of shop test reports at least 10 days before delivery of materials
 2. Reports shall include:
 - a. Source of supply for each material
 - b. Description of material tested

- c. Date of sampling
- d. Date of testing
- e. Test procedure used
- f. Results of testing performed
 - 1) At a minimum provide graphs for all moisture density curves and swell tests

3. Submit reports for the following materials tests for each material and source proposed to be used:

a. Backfill, Structural fill – Native (S1)

- 1) Gradation
- 2) Atterberg Limits
- 3) USCS Classification
- 4) Compaction Curve

b. Structural Fill – Imported (S2)

- 1) Gradation
- 2) Atterberg Limits
- 3) USCS Classification
- 4) Swell
- 5) Compaction Curve

E. Certificates:

- 1. Certify Products meet or exceed specified requirements.

F. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading.

G. Manufacturer's Field Reports

1. Field Test Procedure: Test procedure to be submitted prior to conducting the test. Include forms for data collection, description of all sample collections, and analyses required
2. Field Test Report:
 - a. Provide reports detailing results of the tests. Indicate compliance or non-compliance with Contract Documents. Identify corrective action for materials which fails to pass field tests

1.5 QUALITY ASSURANCE

- A. Furnish materials of each type from same source throughout the Work.
- B. Soil Testing:
 1. Soil sampling and testing to be completed by an independent laboratory approved by the Engineer.
 2. Frequency of testing shall be determined by the Engineer.
 3. All soil testing shall be paid for by the Contractor.
- C. Compaction Tests:
 1. Maximum density at optimum moisture content determined by ASTM D698 And ASTM D1557
 2. In-place density in accordance with Nuclear Testing Method, ASTM D6938 or ASTM 1556.
- D. Soil Classification: All imported materials shall be classified in accordance with ASTM D2487.

PART 2 PRODUCTS

2.1 SUBSOIL MATERIALS

- A. Subsoil Type S1, Select Native Material:
 1. Select earth obtained from on-site excavations approved for use by Engineer.
 2. Graded.
 3. Free of peat, humus, vegetative matter, organic matter and rocks larger than 3 inches in diameter.

4. Processed as required to be placed in thickness as prescribed and at the optimum moisture content to obtain level of compaction required by these specifications.
5. Native on site lean clay
 - a. USCS classification as CL
 - 1) Plastic Index < 27
 - 2) Liquid Limit < 50
6. Native on site sands and gravels
 - a. USCS classification as SC
 - 1) Plastic Index < 24
 - 2) Liquid Limit < 39
 - b. USCS classification as GC
 - 1) Plastic Index < 33
 - 2) Liquid Limit < 50
 - c. USCS classification as GP, GW-GM, SM, and SW-SM
 - 1) Gradation:

Sieve Size (Inch)	Percent Passing by Weight
3	100
No. 200	<28

- B. Subsoil Type S2, Imported Fill Material:
 1. Imported earth approved for use by Engineer.
 2. Imported sands and gravels
 - a. USCS classification as GP, GW-GM, SM, and SW-SM
 - 1) Swell under 500 psf surcharge load: < 1.0%

- 2) Plastic Index < 15
- 3) Liquid Limit < 30
- 4) Gradation:

Sieve Size (Inch)	Percent Passing by Weight
3	100
No. 40	>85
No. 200	<35

2.2 TOPSOIL MATERIALS

A. Topsoil Type TS1, Select Native Topsoil Material:

- 1. Top 6 - 12 inches of existing soil containing organic matter.
- 2. Engineer decision shall be final as to determination of what material is topsoil quality.
- 3. Graded.
- 4. Free of roots, rocks larger than 1/2-inch subsoil, debris, large weeds, and foreign matter.
 - a. Screening: Single screened.

B. Topsoil Type TS2, Imported Topsoil Material:

- 1. Imported borrow.
- 2. Friable loam.
- 3. Reasonably free of roots, rocks larger than 1/2-inch, subsoil, debris, large weeds, and foreign matter.
 - a. Screening: Single screened.
- 4. Acidity range (pH) of 5-1/2 to 7-1/2.
- 5. Containing minimum of 4 percent and maximum of 25 percent inorganic matter.

2.3 SPOILS

- A. All excess material not suitable or not required for backfill and grading shall be hauled off site and disposed of at a location provided by the Contractor and approved by the Engineer.
- B. Make arrangements for disposal of the material at no additional cost to the Owner.
- C. Landfill permit to be obtained by the Contractor and provided to Engineer prior to commencement of disposal.

2.4 SOURCE QUALITY CONTROL

- A. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D698, ASTM D1557 and ASTM 2487
- B. When tests indicate materials do not meet specified requirements, change material or vary compaction methods and retest. Additional testing shall be completed and paid for by the Contractor with no reimbursement by the Owner.
- C. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 EXCAVATION

- A. Excavate material of every nature and description to the lines and grades as indicated on the Drawings and/or as required for construction of facilities.
- B. Site within clearing limits shall be stripped of topsoil as required to obtain additional topsoil necessary to complete Work indicated in the Drawings or as specified.
- C. When practical, do not excavate wet topsoil.
- D. Stockpile excavated material meeting requirements for subsoil materials and topsoil materials.
- E. Remove excess excavated subsoil and topsoil not intended for reuse from Site.
- F. Remove excavated materials not meeting requirements for subsoil materials and topsoil materials from Site.

3.2 STOCKPILING

- A. Stockpile soils at locations shown in the Drawings or at locations as approved by Engineer for redistribution as specified.

1. Site may not have sufficient area to stockpile excavated material that will be required for fill later in the project. If additional stockpile area is required to complete the Project on schedule, arrange off-site stockpile areas.
 2. No additional payments will be made for stockpiling excavated materials off-site.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
 - C. Separate differing materials with dividers or stockpile apart to prevent mixing.
 - D. Prevent intermixing of soil types or contamination.
 - E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
 1. Grade surface of stockpiles to prevent ponding of water.
 2. Cover stockpiles to minimize the infiltration of water.
 - F. Stockpile unsuitable and/or hazardous materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.3 STOCKPILE CLEANUP

- A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.
- B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

PART 4 FIELD QUALITY CONTROL

- A. Provide under provisions of Section 01 45 00 for field inspections and testing
- B. All material and backfill must comply with the requirements of these specifications and be approved by Engineer prior to placement
- C. The OWNER shall pay for all initial field and laboratory testing, to determine compliance of earthwork materials in accordance with this Section and Section 01 45 00. All retests due to initial failed test shall be paid for by the CONTRACTOR,
- D. Contractor to coordinate all tests necessary to demonstrate compliance of native and import materials with these specifications
- E. Geotechnical testing services shall test and inspect earthwork before further construction work is performed.

END OF SECTION

SECTION 31 05 16 - AGGREGATES FOR EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes a range of coarse and fine aggregate materials intended to be referenced by other Sections, generally for fill and grading purposes. Materials are indicated by "Type" to assist in referencing from other Sections and in Drawing notes.
- B. Section Includes:
 - 1. Coarse aggregate materials
 - 2. Fine aggregate materials

1.2 RELATED SECTIONS

- A. Section 31 05 13 – Soils for Earthwork
- B. Section 31 22 13 – Rough Grading
- C. Section 31 23 17 – Trenching
- D. Section 31 23 19 – Dewatering
- E. Section 31 23 23 – Fill
- F. Section 32 11 23 – Aggregate Base Courses
- G. Section 33 31 10 – Sanitary Utility Sewerage Piping
- H. Section 33 11 10 – Water Utility Distribution and Transmission Piping
- I. Section 33 41 10 – Storm Utility Drainage Piping

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO M147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses
 - 2. AASHTO T27 - Sieve Analysis of Fine and Coarse Aggregates
 - 3. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
 - 3. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
 - 4. AASHTO TP61 - Standard Method of Test for Determining the Percentage of Fracture in Coarse Aggregate

- B. ASTM International (ASTM):
1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
 2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))
 3. ASTM D1556—Test Methods for Density and Unit Weight of Soil in place by Sand-Cone Method
 4. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
 5. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)
 6. ASTM D4254—Test Methods for Minimum Index Density and Unit Weight of Soils and Calculations of Relative Density
 7. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
 8. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.4 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00.
1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- B. Product Data: Submit sufficient data to verify compliance with specifications to include all materials and accessories
- C. Design Data:
1. Soil:

- a. Allowable bearing pressure at foundation and slab bearing elevations
- b. Modulus of Subgrade reaction for design of pavements
- c. Maximum horizontal pressure for below grade walls given as a fluid equivalent
- d. Maximum stable slope

D. Manufacturer's Shop Test Reports

- 1. Submit certified copies of shop test reports at least 10 days before delivery of materials
- 2. Reports shall include:
 - a. Source of supply for each material
 - b. Description of material tested
 - c. Date of sampling
 - d. Date of testing
 - e. Test procedure used
 - f. Results of testing performed
 - 1) At a minimum provide graphs for all moisture density curves and swell tests
- 3. Submit reports for the following materials tests for each material and source proposed to be used:
 - a. Graded gravel 1-1/2 inch minus (A1) and Graded gravel 3/4 inch minus (A2)
 - 1) Gradation
 - 2) Atterberg Limits
 - 3) USCS Classification
 - b. Washed 3/8 pea gravel (A3) and Squeegee (A4)
 - 1) Gradation

- c. Crushed granular base (A5)
 - 1) Gradation
 - 2) Atterberg Limits
 - 3) USCS Classification
 - 4) Unit Weight
 - 5) R-Value

- E. Certificates:
 - 1. Certify Products meet or exceed specified requirements.

- F. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading.

- G. Manufacturer's Field Reports
 - 1. Field Test Procedure: Test procedure to be submitted prior to conducting the test. Include forms for data collection, description of all sample collections, and analyses required
 - 2. Field Test Report:
 - a. Provide reports detailing results of the tests. Indicate compliance or non-compliance with Contract Documents. Identify corrective action for materials which fails to pass field tests

1.5 QUALITY ASSURANCE

- A. Furnish each aggregate material from single source throughout the Work.

- B. Aggregate Testing:
 - 1. Aggregate sampling and testing to be completed by an independent laboratory approved by the Engineer.
 - 2. The frequency of testing shall be determined by the Engineer.
 - 3. All initial aggregate testing shall be paid for by the OWNER. All retesting shall be paid for by the Contractor.

- C. Compaction Tests:
 - 1. Unit weight determined by ASTM D4254.
 - 2. In-place density in accordance with Nuclear Testing Method, ASTM D1556.
- D. Aggregate Classification: All imported materials shall be classified in accordance with ASTM D2487.

PART 2 PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

- A. Coarse Aggregate Type A1, Dense-Graded Aggregate:

- 1. Graded gravel—1-1/2 inch minus
 - a. Type: CDOT No. 4 crushed aggregate
 - b. Plastic Index < 6
 - c. Liquid Limit < 30
 - d. Gradation:

Sieve Size (Inch)	Percent Passing by Weight
2	100
1-1/2	90-100
1	20-55
3/4	0-15
3/8	0-5

- B. Coarse Aggregate Type A2, Granular Drain Backfill Material:.

- 1. Graded gravel—3/4 inch minus
 - a. Type: CDOT No. 6 crushed aggregate
 - b. Plastic Index < 6
 - c. Liquid Limit < 30
 - d. Gradation:

Sieve Size (Inch)	Percent Passing by Weight
1	100
3/4	90-100
1/2	20-55
3/8	0-15
No. 4	0-5

C. Washed 3/8 inch pea gravel Type A3, Pipe Zone Bedding:

1. Gradation:

Sieve Size (Inch)	Percent Passing by Weight
1/2	95-100
3/8	<5

D. Squeegee Type A4, Pipe Zone Bedding:

1. Gradation:

Sieve Size (Inch)	Percent Passing by Weight
3/8	100
No. 4	85-100
No. 8	30-70
No. 16	5-40
No. 30	0-15
No. 50	0-10
No. 100	0-5
No. 200	<1

E. Crushed Granular Base Type A5:

1. For paving and road surfacing.
2. In accordance with CDOT requirements
3. Type: CDOT No. 6 crushed aggregate
4. R-value: 78 minimum
5. Dry unit weight: 120 pcf minimum at 98% compaction ASTM D698
6. Plastic Index < 6
7. Liquid Limit < 30
8. Gradation:

Sieve Size (Inch)	Percent Passing by Weight
1	100
3/4	90-100
1/2	20-55
3/8	0-15
No. 4	0-5

2.2 SOURCE QUALITY CONTROL

- A. Aggregate Material - Testing and Analysis: Perform in accordance with ASTM C136 and ASTM D1556
- B. When tests indicate materials do not meet specified requirements, change material and retest. Additional testing shall be completed and paid for by the Contractor with no reimbursement by the Owner.

PART 3 EXECUTION

3.1 STOCKPILING

- A. Stockpile materials imported to site as shown in the Drawings or at locations as approved by Engineer for redistribution as specified.
- B. Separate different aggregate materials with dividers or stockpile individually to prevent mixing.
- C. Prevent intermixing of aggregate types or contamination.

D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

1. Grade surface of stockpiles to prevent ponding of water.
2. Cover stockpiles to minimize the infiltration of water.

3.2 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

B. When borrow area is indicated, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

END OF SECTION

SECTION 31 10 00 - SITE CLEARING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes clearing site of incidental paving and curbs, debris, grass, trees, and other plant life in preparation for site or building excavation work.

1.2 RELATED SECTIONS:

- A. Section 01 56 39 – Temporary Tree and Plant Protection
- B. Section 02 41 00 - Demolition
- C. Section 31 22 13 - Rough Grading
- D. Section 31 23 18 - Rock Removal

1.3 DEFINITIONS

- A. Clearing: Removal of interfering or objectionable material lying on or protruding above ground surface.
- B. Grubbing: Removal of vegetation and other organic matter including stumps, buried logs, and roots greater than 2-inch caliper to a depth of 12 inches below subgrade.
- C. Interfering or Objectionable Material: Trash, rubbish, and junk; vegetation and other organic matter, whether alive, dead, or decaying; topsoil.
- D. Limits of Disturbance: Work area boundary as shown on the Plans.
- E. Root Wad: Tree stump and root mass including all roots greater than 1-inch diameter.
- F. Stripping: Removal of topsoil remaining after applicable scalping is completed.

1.4 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00.
 - 1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- B. Clearing, Grubbing, and Stripping Plan: Drawings clearly showing proposed limits to clearing, grubbing, and stripping activities at Site.

- C. Certification or disposal permit for landfill and/or waste disposal site.
- D. A copy of written permission of private property owners, with copy of fill permit for said private property, as may be required for disposal of materials.

1.5 QUALITY ASSURANCE

- A. Existing Conditions: Determine the extent of Work required and limitations before proceeding with Work.
- B. Obtain Engineer's approval of staked clearing, grubbing, and stripping limits prior to commencing clearing, grubbing, and stripping.
- C. Conform to applicable local, state, and federal codes for environmental requirements and disposal of debris,
 - 1. Burning on project site will not be permitted.
 - 2. Use of herbicides will not be permitted.
- D. Permits: The Contractor is responsible for obtaining all necessary permits required for completion of the Work described in this Section.
- E. Protection of Persons and Property: Meet all federal, state, and local safety requirements for the protection of laborers, other persons, and property in the vicinity of the work and requirements of the General Provisions.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Existing Materials: All materials, equipment, miscellaneous items, and debris involved, occurring or resulting from demolition, clearing, and grubbing work shall become the property of the Contractor at the place of origin, except as otherwise indicated in the Drawings or specifications.
- B. Wound Paint: Emulsified asphalt formulated for use on damaged plant tissues.

PART 3 EXECUTION

3.1 GENERAL

- A. Clear, grub, and strip areas needed for waste disposal, borrow, or Site improvements within limits shown in approved Clearing, Grubbing, and Stripping Plan.
- B. Remain within the property lines at all times.

- C. Do not injure or deface vegetation or structures that are not designated for removal.

3.2 EXAMINATION

- A. Verify existing plant life designated to remain is tagged or identified.
- B. Identify waste and salvage areas for placing removed materials.

3.3 PREPARATION

- A. Carefully coordinate the work of this Section with all other work and construction.
- B. Call Local Utility Line Information service at 1-800-922-1987, not less than three working days before performing Work.
- C. Request underground utilities to be located and marked within and surrounding construction areas.
 - 1. Disconnect or arrange for disconnection of utilities (if any) affected by required work.
 - 2. Keep all active utilities intact and in continuous operations.
- D. Prepare Site only after:
 - 1. Erosion and sediment controls are in place.
 - a. Limit areas exposed uncontrolled to erosion during installation of temporary erosion and sediment controls and in compliance with Mile High Flood Control District Urban Storm Drainage Criteria Manuals and ESC Permits.
 - 2. Tree and vegetation protection is installed.
 - a. Protect existing site improvements, trees, and shrubs to remain to preclude damage during construction.
 - b. Follow the provisions set forth in 01 56 39, Temporary Tree and Plant Protection for all temporary tree and plant protection measures.
 - 3. Temporary fencing is installed along the Limits of Disturbance.
 - 4. Notification of utility agencies; disconnect or arrange for disconnection of utilities (if any) affected by required work. Keep all active utilities intact and in continuous operation.

3.4 PROTECTION

- A. Utilities: Locate, identify, and protect utilities located by utilities and indicated in the Drawings to remain from damage.
- B. Survey control: Protect benchmarks, survey control points, and existing structures from damage or displacement.
- C. Preservation and Trimming of Trees, Shrubs, and Other Vegetation:
 - 1. Avoid injury to trees, shrubs, vines, plants, grasses, and other vegetation growing outside of the areas to be cleared and grubbed and those trees and shrubs designated to be preserved.
 - 2. Protect existing trees and shrubs against cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of roots by stockpiling construction materials, excavated materials, excess foot or vehicular traffic, and parking of vehicles within drip line.
 - 3. Provide temporary guards, as necessary, to protect trees and vegetation to be left standing.
 - 4. Temporarily cover exposed roots with wet burlap to prevent roots from drying out; cover with earth as soon as possible.
 - 5. Provide protection for roots and limbs over 1-1/2-inch diameter cut during construction operations. Coat cut faces with emulsified asphalt.
 - 6. Repairable damage to trees and shrubs designated to remain shall be made by a professional tree surgeon approved by the Engineer. Cost shall be borne by the Contractor.
- D. Landscaped Areas:
 - 1. When any portion of the Work crosses private property or landscaped areas, excavate topsoil separately and pile it on the opposite side of the trench from the subsoil.
 - 2. Conduct Work in a manner that will restore original conditions as nearly as practicable.
 - 3. Remove and replace any trees, shrubs, plants, sod, or other vegetative material as needed to complete Work.

4. All shrubs or plants shall be balled by experienced workers, carefully handled and watered, and replaced in their original positions without damage. Sod shall be handled in a similar manner.
 5. Wherever sod cannot be saved and restored, the ground must be reseeded or resodded and cared for until a stand of grass is reestablished.
 6. Plants or shrubs killed or destroyed shall be replaced and paid for by the Contractor.
 7. It is the intent of this paragraph that the Contractor shall leave the surface and plantings in substantially the same conditions as before the Work is undertaken.
- E. Miscellaneous Site Features: Protect all existing miscellaneous site features from damage by excavating equipment and vehicular traffic, including but not limited to existing structures, fences, mailboxes, signs, sidewalks, paving, and curbs.
- F. Repair and Replacement:
1. Damaged items, including but not restricted to those noted above, shall be repaired or replaced with new materials as required to restore damaged items or surfaces to a condition equal to and matching that existing prior to damage or start of work of this contract.
 2. Any damage to existing facilities or utilities to remain as caused by the Contractor's operations shall be repaired at the Contractor's expense.

3.5 LIMITS

- A. As follows, but not to extend beyond Limits of Disturbance and within the approved disturbance limits in the Environmental Zones:
1. Excavation: 5 feet beyond top of cut slopes.
 2. Trench Excavation: 6 feet from trench centerline, regardless of actual trench width.
 3. Fill:
 - a. Clearing and Grubbing: 5 feet beyond toe of permanent fill slopes.
 - b. Stripping: 2 feet beyond toe of permanent fill slopes.
 4. Structures: 15 feet outside of new structures foundation.
 5. Roadways: Clearing, grubbing, scalping, and stripping 5 feet from roadway shoulders in unimproved areas.
 6. Other Areas: As shown.

- B. Remove rubbish, trash, and junk from entire area within the Limits of Disturbance as material is generated. Stockpiling shall not be permitted without written approval of Owner.

3.6 CLEARING AND GRUBBING

- A. Clear and grub areas within limits shown in approved Clearing, Grubbing, and Stripping Plan.
- B. Except in areas to be excavated, all holes resulting from the clearing and grubbing operations shall be backfilled and compacted in accordance with the applicable sections of these Specifications.
- C. Clearing:
 - 1. Remove trees, saplings, snags, stumps, shrubs, brush, vines, grasses, weeds, and other vegetative growth within the clearing limits shown in the Drawings, except those trees and shrubs noted to remain in the Drawings or as directed by the Engineer.
 - 2. Clearing shall be performed in such a manner as to remove all evidence of the presence of vegetative growth from the surface of the project site and shall be inclusive of sticks and branches of thickness or diameter greater than 3/8-inch and of grasses, weeds, exceeding 12 inches in height except as otherwise indicated.
 - 3. Clear undergrowth and deadwood, without disturbing subsoil.
- D. Grubbing: Clear areas required for access to site and execution of Work and remove all stumps, root wads, and roots over 1-inch diameter to the following depths:
 - 1. Future Structures and Building Areas 24 Inches
 - 2. Roads and Parking Areas 18 Inches
 - 3. All other Areas 12 Inches

3.7 TREE REMOVAL

- A. Exercise care in cutting, felling, trimming, and handling of those trees shown for removal to prevent damage to neighboring trees and structures to remain.
- B. Tree Salvage: As shown on the Plans.
- C. No trees may be removed unless approved and permitted by the Engineer.
- D. Do not top trees unless otherwise specified or approved by Owner in writing.

- E. Refer to Section 01 56 39, Temporary Tree and Plant Protection for tree protection requirements.

3.8 REMOVAL AND DISPOSAL

- A. Native vegetation may be mulched and used on Site; if approved by OWNER. Bid proposal to be based on disposal off site.
- B. Asphalt and Gravel Surfaces:
 - 1. Asphalt, concrete, and gravel surfaces designated for removal shall be done to full depth.
 - 2. Asphalt, concrete, and gravel removed at Site may be reused at Site where shown in the Drawings or following approval of the Engineer.
 - 3. Haul removed asphalt, concrete, and gravel which is unsuitable for reuse or that exceeds quantity required.
- C. Remove debris, rock, abandoned piping, and extracted plant life from Site.
- D. Remove from the Site all debris, materials, equipment, and items found thereon and materials and debris resulting from the Work, except as otherwise indicated.
 - 1. All existing improvements designated on the Drawings or specified to be removed including but not limited to structures, pipelines, walls, footings, foundations, slabs, pavements, curbs, fencing, and similar structures occurring above, at, or below existing ground surface shall be included in the Work.
 - 2. Unless otherwise specified, any resulting voids shall be thoroughly cracked out for drainage and backfilled with suitable excavated or imported material compacted to the density of the adjacent soil.
- E. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.
- F. Do not burn or bury materials on site. Leave site in clean condition.
- G. Removal: All material resulting from demolition, clearing and grubbing, and trimming operations shall be removed from the Site and disposed of in a lawful manner. Materials placed on property of private property owners shall be by written permission only.
- H. Cleanup: During and upon completion of work, promptly remove all unused tools and equipment, surplus materials, and debris.

- I. Adjacent areas shall be returned to their existing condition prior to the start of Work.

3.9 CLEANUP

- A. During the time Work is in progress, make every effort to maintain the Site in a neat and orderly condition.
- B. All refuse, broken pipe, excess fill material, cribbing, and debris shall be removed as soon as practicable.
- C. Should the Work not be maintained in a satisfactory condition, the Owner may cause the work to stop until the cleanup of the Work has been done to the satisfaction of the Engineer.
- D. The Work will not be considered complete or the final payment certificate issued until all rubbish, unused material, or equipment shall have been removed and the premises left in a condition satisfactory to the Owner and the Engineer.

END OF SECTION

SECTION 31 22 13 - ROUGH GRADING

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes rough grading and filling associated with contouring of Site in preparation for subsequent site work.

B. Section Includes:

1. Excavating topsoil
2. Excavating subsoil
3. Cutting, grading, filling, and rough contouring of Site

1.2 RELATED SECTIONS:

- A. Section 01 45 00 - Quality Control
- B. Section 31 05 13 - Soils for Earthwork
- C. Section 31 05 16 - Aggregates for Earthwork
- D. Section 31 10 00 - Site Clearing
- E. Section 31 23 16 - Excavation
- F. Section 31 23 17 - Trenching
- G. Section 31 23 18 - Rock Removal
- H. Section 31 23 23 - Fill

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

B. ASTM International (ASTM):

1. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))

3. ASTM D1556—Test Methods for Density and Unit Weight of Soil in place by Sand-Cone Method
4. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
5. ASTM D2419 - Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
6. ASTM D2434 - Standard Test Method for Permeability of Granular Soils (Constant Head)
7. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
8. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

1.4 PERFORMANCE AND DESIGN REQUIREMENTS:

A. Regulatory requirements:

1. Comply with all requirements established in the State Construction Dewatering Permit, including settling and treatment of dewatering flows, as required to prevent contamination of adjacent rivers, creeks, and drainage ways

B. Site conditions:

1. Subsurface Conditions

- a. A Geotechnical exploration at the site has not been performed. Foundation, grading, slope stabilization and other geotechnical recommendations shall be provided during construction by the *OWNERS* geotechnical subconsultant whose qualifications shall be in compliance with Section 01 45 00.
- b. The recommendations shall be based upon on site observations at the specific designated locations of construction. Conditions may vary at locations away from excavations or borings.
- c. If conditions encountered during construction vary from those indicated in these Contract Documents, immediately notify the Engineer in writing.

1.5 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00.
 - 1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- B. Manufacturer's Shop Test Reports
 - 1. Submit certified copies of shop test reports at least 10 days before delivery of materials
 - 2. Reports shall include:
 - a. Source of supply for each material
 - b. Description of material tested
 - c. Date of sampling
 - d. Date of testing
 - e. Test procedure used
 - f. Results of testing performed
 - 1) Gradation
 - 2) Atterberg Limits
 - 3) USCS Classification
 - 4) Moisture and Density Relationship (i.e. Proctor Curve)
 - 5) R-Value (For soils within 12-inches of pavement bearing elevation)
- C. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading.
- D. Manufacturer's Field Reports

1. Field Test Procedure: Test procedure to be submitted prior to conducting the test. Include forms for data collection, description of all sample collections, and analyses required
2. Field Test Report:
 - a. Provide reports detailing results of the tests. Indicate compliance or non-compliance with Contract Documents. Identify corrective action for materials which fails to pass field tests

1.6 QUALITY ASSURANCE (NOT USED)

PART 2 PRODUCTS

2.1 MATERIALS

- A. Subsoil Fill: Type S1 and S2 as specified in Section 31 05 13, Soils for Earthwork.
- B. Topsoil: As specified in Section 31 05 13, Soils for Earthwork.
 1. Type TS1, Select Native Topsoil Material, as may be available.
 2. TS2, Imported Topsoil Material, as may be required.
- C. Structural Fill:
 1. Type S2, as specified in Section 31 05 13, Soils for Earthwork
 2. A1, A2 and A5, as specified in Section 31 05 16, Aggregates for Earthwork. Size of aggregate as shown in the Drawings
- D. Granular Fill: Type A2, Granular Drain Backfill Material as specified in Section 31 05 16, Aggregates for Earthwork. Size of aggregate as shown in the Drawings

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify survey benchmark and intended elevations for the Work are as indicated on Drawings.

3.2 PREPARATION

- A. Call Local Utility Line Locating Service not less than 3 working days before performing Work.

1. Request underground utilities to be located and marked within and surrounding construction areas.
 2. Notify Engineer of any potential conflicts resulting from utility locations and the Drawings.
 3. Notify utility company to remove and relocate utilities, as may be necessary.
- B. Identify required lines, levels, contours, and datum.
- C. See Section 31 10 00, Site Clearing for additional requirements in protection of existing utilities, survey control, plant life, and landscaped areas in coordination with the Work of this Section.

3.3 TOPSOIL EXCAVATION

- A. Excavate and stockpile topsoil as specified in Section 31 05 13, Soils for Earthwork.

3.4 SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be further excavated, re-landscaped, or re-graded as shown in the Drawings.
- B. When wet subsoil must be excavated and is to be reused on site for the Work, process wet material to obtain optimum moisture content.
- C. Stockpile excavated material in area designated onsite in accordance with Section 31 05 13, Soils for Earthwork.
- D. When excavating through roots, perform Work by hand and cut roots in accordance with the recommendations of an arborist.
- E. Benching Slopes: Horizontally bench existing slopes greater than 1:3 to key placed fill material to slope to provide firm bearing.
- F. Stability: Replace damaged or displaced subsoil as specified for fill.

3.5 FILLING

- A. General:
1. Vertical curves or roundings at abrupt changes in slope shall be established as approved by Engineer.
 2. Bring all graded areas to a relatively smooth, even grade and slope by blading or dragging. Remove high spots and fill depressions.

B. Fill areas to contours and elevations shown in the Drawings with unfrozen materials.

C. Topsoil Fill:

1. Scarify prepared subgrade to depth of 4 inches immediately prior to placing topsoil.
2. Place topsoil in areas to be seeded to depths indicated in the Drawings, minimum depth of 4 inches.
3. Place topsoil material loose; do not compact, do not place in wet or muddy conditions.

D. Place material in continuous layers as follows:

1. Subsoil Fill: Maximum 8 inches compacted depth.
2. Structural Fill: Maximum 8 inches compacted depth.
3. Granular Fill: Maximum 8 inches compacted depth.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Slope grade away from building minimum 2 percent slope for minimum distance of 10 feet, unless noted otherwise.

G. Make grade changes gradual. Blend slope into level areas.

H. Repair or replace items indicated in the Drawings to remain which are damaged by excavation or filling to original condition or better. All costs shall be borne by the Contractor.

PART 4 FIELD QUALITY CONTROL

A. Provide field testing under provisions of Section 01 45 00:

1. Contractor shall coordinate and schedule all tests to determine compliance of materials in accordance with the specifications
2. The OWNER shall pay for all initial field and laboratory testing except for performing of proof rolling, to determine compliance of materials in accordance with this Section and Section 01 45 00. All retests due to initial failed test shall be paid for by the CONTRACTOR,
3. The CONTRACTOR shall provide, pay for and perform all proof rolling.

B. Top Surface of Subgrade: Plus or minus 0.5-inch from required elevation.

C. All fill, embankment material, and backfill must comply with the requirements of these specifications and be approved by Engineer prior to placement

D. Independent geotechnical agency shall test and inspect all subgrades and fill layers before further construction work is performed.

E. Paving:

1. One initial gradation test for crushed granular base (A5) plus (1) one additional test for every 500 cubic yards of material placed
2. One initial Atterberg limits tests for crushed granular base (A5) plus (1) one additional test for every 500 cubic yards of material placed
3. One R-value test for crushed granular base (A5) plus (1) one additional test for every 500 cubic yards of material placed, ASTM D2844
4. Proof Roll test of entire surface area for all subbase and base courses

F. Fills and Embankment:

1. One initial gradation test for each type of material plus (1) one additional test for every 1000 cubic yards of each material
2. One initial Atterberg limits tests for each type of material plus (1) one additional test for every 1000 cubic yards of each material
3. One initial swell test for each type of imported structural fill material plus (1) one additional test for every 1000 cubic yards of each material
4. One moisture-density relationship test for every 250 cubic yards, ASTM D698 for cohesive soils in landscape areas and D1557 in for cohesive soils in roadways or within 5 feet of structures, on each type of fill material placed
5. One relative density/unit weight relationship test for every 250 cubic yards, ASTM D4254 for granular soils, on each type of fill material placed
6. One in-place compaction test for each 2000 sf and every 1.5 feet of vertical lift of material placed, ASTM D2922 or D1556 and D3017
7. Ten (10) additional in-place compaction tests at the discretion of the Engineer, ASTM D2922 of D1556 and D3017

G. Pipe Embedment and Backfill:

1. One initial gradation test for each type of material plus (1) one additional test for every 1000 cubic yards of each material
2. One initial Atterberg limits tests for each type of material plus (1) one additional test for every 1000 cubic yards of each material
3. Daily penetrometer testing of flowable fill material
4. Two moisture-density relationship tests, ASTM D1557 or ASTM D1556, or 2 relative density tests, ASTM D4254, as appropriate for each type of embedment on backfill material proposed
5. One in-place compaction test every 50 lineal feet of trench in the compacted embedment zone and at every 1.5 feet of vertical lift of backfill materials, ASTM D2922 or D1556 and D3017
6. One in-place compaction test near top of trench for trench depth of 2 feet or less, ASTM D2922/D3017
7. Five (5) additional in-place compaction tests at the discretion of the Engineer, ASTM D2922/D3017

END OF SECTION

SECTION 31 23 16 - EXCAVATION

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes excavation required for general excavation not specified elsewhere. Excavating for utilities outside building is included in Section 31 23 17, Trenching.
- B. Section Includes:
 - 1. Excavating for building foundations
 - 2. Excavating for paving, roads, and parking areas
 - 3. Excavating for slabs-on-grade
 - 4. Excavating for site structures
 - 5. Excavating for landscaping

1.2 RELATED SECTIONS

- 1. Section 01 45 00 - Quality Control
- 2. Section 02 41 00 - Demolition
- 3. Section 31 05 13 - Soils for Earthwork
- 4. Section 31 05 16 - Aggregates for Earthwork
- 5. Section 31 10 00 - Site Clearing
- 6. Section 31 23 17 - Trenching
- 7. Section 31 23 18 - Rock Removal
- 8. Section 31 23 19 - Dewatering
- 9. Section 31 23 23 - Fill
- 10. Section 31 50 00 - Excavation Support and Protection
- 11. Section 33 11 10 - Water Utility Distribution and Transmission Piping.

1.3 DEFINITIONS

- A. Common Excavation: All excavation required for Work, regardless of the type, character, composition, or condition of the material encountered. Common Excavation shall further include all debris, junk, broken concrete, and all other material. All excavation shall be classified as Common Excavation, unless provided as Rock for under Section 31 23 18, Rock Removal.
- B. Common Material: All soils, aggregate, debris, junk, broken concrete, and miscellaneous material encountered in Common Excavation, excluding rock as defined in Section 31 23 18, Rock Removal.
- C. Concrete Excavation: The removal of pieces of concrete larger than 1 cubic yard in volume that requires drilling, splitting and breaking methods. Concrete excavation includes materials composed of Portland cement other than manholes, precast vaults, or sewer pipe.
- D. Exploratory Excavation: The removal and replacement of material from locations shown on the Drawings, or as directed for the purpose of investigating underground conditions.
- E. Overbreak: Material beyond and outside of the slope limits established by the Owner's Representative, which becomes displaced or loosened during excavation.
- F. Pothole Excavation: Pothole excavation is the removal and replacement of all materials via coring, vacuum extraction, or similar method, not classified as exploratory excavation, for the purposes of locating an underground utility or structure and to investigate underground conditions.
- G. Spoils: Materials excavated from the Site that will not be incorporated into the work.
- H. Unsuitable Materials: See Spoils.

1.4 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00.
 - 1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
 - 2. Contractors proposed site use and stockpile location plan.

1.5 QUALITY ASSURANCE

- A. Allowable Tolerances: Final grades shall be plus or minus 0.1-foot.
- B. Provide adequate survey control to avoid unauthorized over-excavation.
- C. Weather Limitations:
 - 1. Material excavated when frozen or when air temperature is less than 32 degrees Fahrenheit (F) shall not be used as fill or backfill until material completely thaws.
 - 2. Material excavated during inclement weather shall not be used as fill or backfill until after material drains and dries sufficiently for proper compaction.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 EXAMINATION

- A. Field verify the location of all underground utilities, pipelines and structures prior to excavation

3.2 PREPARATION

- A. Prior to commencing work in this Section, become familiar with site conditions. In the event discrepancies are found, notify the Engineer as to the nature and extent of the differing conditions.
- B. Call Local Utility Line Locating Service not less than 3 working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
 - 2. Coordinate with and notify utility companies should it be necessary to remove or relocate facilities.
- C. Identify required lines, levels, contours, and datum.
- D. See Section 31 10 00, Site Clearing for additional requirements in protection of existing utilities, survey control, plant life, and landscaped areas in coordination with Work in this Section.

3.3 SITE CONDITIONS

- A. Quantity Survey: The Contractor shall be responsible for calculations for quantities and volume of cut and fill from existing site grades to finish grades established under this contract as indicated in the Drawings or specified and shall include the cost for all earthwork in the total basic bid.
- B. Dust Control: Must meet all federal, state, and local requirements. Protect persons and property from damage and discomfort caused by dust. Water surfaces as necessary and when directed by Engineer to quell dust.
- C. Soil Control: Soil shall not be permitted to accumulate on surrounding streets or sidewalks nor to be washed into sewers.

3.4 PERFORMANCE—GENERAL

- A. Protect adjacent structures, utilities and surrounding areas from damage during excavation, filling, and backfilling
 - 1. Conduct operations in such a manner that existing street facilities, utilities, railroad tracks, structures, and other improvements, which are to remain in place, will not be damaged. Furnish and install cribbing and shoring or whatever means necessary to support material around existing facilities, or to support the facilities themselves, and maintain such supports until no longer needed.
 - 2. Open slopes shall not be cut within 30 feet of any existing spread footings unless approved by the Engineer.
- B. Avoid overbreaks. Overbreak is incidental to the Work, except in cases where the Owner's Representative determines that such overbreak was unavoidable.
- C. Excavation in rock or rocky cuts:
 - 1. Once completed, thoroughly test the slopes with bars or other approved means to remove all loose, detached, broken, or otherwise unstable material.
 - 2. Remove boulders and rock up to **1/2 cubic yard** measured by volume per the requirements of this Section.
 - 3. Remove larger boulders and rock material as specified in Section 31 23 18, Rock Removal.

4. Remove jutting points. Scale slopes using mine scaling rods or other approved methods to remove loose or overhanging materials and provide a safe, trim, neat, and stable condition.
 5. Dispose of the materials removed under this subparagraph in the same manner as other excavated material.
- D. Remove all exposed roots, debris, and all stones more than 3 inches in size which are loose or could become loosened.
 - E. Protect work from erosion or other similar types of damage until the project has been completed
 - F. Do not backfill or construct fills during freezing weather. Backfill or construct fills only when ground temperature is 35 degrees F or higher and the air temperature is 35 degrees F and rising
 - G. Do not use frozen materials, snow, or ice in any backfill or fill area
 - H. Do not backfill or construct fill on frozen surfaces
 - I. Protect excavated material from becoming frozen
 - J. Do not remove trees from outside excavation or fill areas unless authorized by the Engineer; protect from permanent damage by construction activities
 - K. Provide temporary bridges for roadways, walkways, driveways, etc.
 - L. Perform work in a safe and proper manner with appropriate precautions against hazard
 - M. Provide adequate working space and clearances for work performed within excavations and for installation and removal of concrete forms
 - N. Do not undercut excavation faces for extended footings, utilities, pipes or otherwise
 - O. Clean subgrades of loose material before concrete, asphalt, subbase, paving or granular material is placed thereon
 - P. Except as otherwise authorized, indicated, or specified, replace all material excavated below the bottom of concrete walls, footings, slabs on grade and foundations with concrete placed at the same time and monolithic with the concrete above

- Q. Except where exterior surfaces are to be dampproofed, concrete structures that do not have footings that extend beyond the outside face of exterior walls may be placed directly against excavation faces without outer forms
- R. Round tops of cut slopes in soil to not less than a 6-foot radius, provided such rounding does not extend off-site, outside of easements, outside of rights-of-way, or adversely impacts facilities, adjacent property, or completed Work.
- S. Notify Engineer of unexpected subsurface conditions.
- T. Stockpile excavated material in area(s) designated on or off site in accordance with Section 31 05 13, Soils for Earthwork.

3.5 PREPARATION

- A. In accordance with Section 02 41 00 and Section 31 10 00 and the following:
- B. Clear sites to be occupied by permanent construction of roots, brush, and other objectionable material and debris
- C. Remove debris, all trees, underbrush, stumps, roots and other combustible materials from site daily and dispose of off-site; on-site burning is not permitted
- D. Do not use open burning

3.6 PRESERVATION OF PLANTS AND TREES

- A. Do not remove vegetation or trees outside fill or excavated areas, except as authorized by Engineer
- B. Protect plants and trees left standing from permanent damage by construction operation per Section 01 56 39
- C. Trim standing trees as directed by Engineer

3.7 SHEETING, SHORING AND BRACING

- A. Provide proper and substantial sheeting, shoring, and bracing, per Section 31 50 00

3.8 DEWATERING

- A. Provide and maintain adequate dewatering equipment to remove and dispose of surface and groundwater entering excavations, trenches, and per Section 31 23 19
- B. Keep each excavation dry during subgrade preparation and continually thereafter until the structure to be built, paving to be placed or the pipe to be installed is

completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result

- C. Dewater excavations which extend to or below groundwater by lowering and keeping the groundwater level beneath such excavation at least 12 inches below the bottom of the excavation
- D. Divert surface water or otherwise prevent it from entering excavated areas or trenches to the extent practical without damaging adjacent property
 - 1. Maintain all drainage pipes, keep clean and free of sediment during construction and final cleanup
 - 2. Contractor to obtain and comply with conditions of a CDPHE construction dewatering permit

3.9 SOIL STABILIZATION

- A. Thoroughly compact and consolidate subgrades for concrete structures, precast structures, and utility trench bottoms so they remain firm, dense and intact during required construction activities
- B. Remove all mud and muck during excavation
- C. Allow no more than 2 inch depth of mud or muck to remain in excavation prior to placing crushed rock
- D. Reinforce subgrades with graded gravel if they become mucky during construction activities
- E. Finished elevation of stabilized subgrades are to be at or below subgrade elevations indicated on Drawings

3.10 OVERLOT GRADING

- A. Location: General site grading, not under foundations, structures, pavement or concrete flat work.
- B. Subgrade Preparation:
 - 1. Remove soft or otherwise unsuitable material, and replace with suitable material
 - 2. Moisture condition and then recompact.
 - 3. Native On Site Materials

- a. Compact to 90 percent of standard Proctor density 0 to +3% optimum moisture content, ASTM D698

3.11 BUILDINGS AND OTHER STRUCTURES

- A. Location: As required to accommodate building foundations, slabs on grade, equipment pads and sidewalks
- B. Excavation:
 1. Excavations below foundations are to be oversized at least 3 feet beyond footing edges.
 2. Excavate soils down to the native sands or if in native clay, remove clay to a minimum of 3 feet below the bearing elevation. Machine slope banks to stable configuration
 3. Grade top perimeter of excavation to prevent surface water from draining into excavation
 4. Excavate with heavy duty conventional excavation equipment
 5. Minimize extent of excavation where possible
 6. Over excavate unsuitable materials as directed by Engineer
 7. Correct areas over excavated with suitable on-site material, gravel fill or concrete as directed by Engineer
- C. Subgrade Preparation:
 1. Remove soft or otherwise unsuitable material, and replace with suitable material
 2. Moisture condition and then recompact
 3. Compact to 98 percent of standard Proctor density \pm 2% optimum moisture content, ASTM D698

3.12 PAVEMENT

- A. Location: For roadways, concrete flat work, drives and parking area per the lines, grades, cross sections and dimensions indicated on Drawings
- B. Excavation:
 1. Excavate unsuitable materials

2. Excavate soils to a minimum of 12-inches below the subbase of the pavement.
 3. Remove soft or otherwise unsuitable material, and replace with suitable material
- C. Subgrade Preparation:
1. Scarify the exposed surface to a depth of at least 8-inches, moisture condition, and then recompact.
 2. Compact to 95 percent of modified Proctor density within 2 percent (+/-) optimum moisture content, ASTM D1557

PART 4 FIELD QUALITY CONTROL

- A. Provide under provisions of Section 01 45 00 for field inspections and testing
1. Contractor shall coordinate and schedule all tests to determine compliance of materials in accordance with the specifications
 2. Contractor shall coordinate the visual inspection and approval of all bearing surfaces by Engineer before installing subsequent work.
 3. The OWNER shall pay for all initial inspections, field and laboratory testing, to determine compliance of materials in accordance with this Section and Section 01 45 00. All reinspections and retests due to initial failed test shall be paid for by the CONTRACTOR,

END OF SECTION

SECTION 31 23 17 - TRENCHING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes the requirements for excavation and backfill of all utilities, including installation of pipe bedding, pipe zone backfill, trench backfill, and related Work as shown on the Drawings and as specified.
- B. Section includes:
 - 1. Excavating trenches for pipe, utility vaults, and other utilities.
 - 2. Compacted fill from top of utility bedding to final grades.
 - 3. Trench and utility vault backfilling and compaction.
- C. Related Sections
 - 1. Section 01 45 00 - Quality Control
 - 2. Section 03 30 00 - Cast-In-Place Concrete
 - 3. Section 31 05 13 - Soils for Earthwork
 - 4. Section 31 05 16 - Aggregates for Earthwork
 - 5. Section 31 10 00 - Site Clearing
 - 6. Section 31 22 13 - Rough Grading
 - 7. Section 31 23 16 - Excavation
 - 8. Section 31 23 18 - Rock Removal
 - 9. Section 31 23 23 - Fill
 - 10. Section 31 23 24 - Flowable Fill
 - 11. Section 33 11 13 - Water Utility Distribution and Transmission Piping
 - 12. Section 33 31 10 - Sanitary Utility Sewerage Piping

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials:

1. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
- B. ASTM International (ASTM):
1. ASTM C403 - Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance
 2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))
 3. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
 4. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
 5. D4832, Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders

1.3 DEFINITIONS

- A. Controlled Low Strength Material (CLSM): Also referred to as Flowable Fill. Lean cement concrete fill. A self-compacting, cementitious material.
- B. Flexible Pipe: For the purposes of these Specifications, tubing or pipe constructed of polyvinyl chloride (PVC) and high-density polyethylene (HDPE) are considered flexible pipes.
- C. Geosynthetics: Geotextiles, geogrids, geomembranes, and drainage composite materials.
- D. Imported Material: Materials obtained from sources offsite, suitable for specified use.
- E. Lift: Loose (uncompacted) layer of material.
- F. Obstructions: Items which may be encountered during utility and vault trenching which do not require replacement.
- G. Optimum Moisture Content:
1. Determined in accordance with ASTM Standard specified to determine maximum dry density for relative compaction.

2. Determine field moisture content on basis of fraction passing 3/4-inch sieve.
- H. Pipe Bedding: Trench backfill zone for full trench width which extends from the bottom outside surface of the pipe to a minimum of 6 inches below the bottom outside surface of pipe, conduit, cable, or duct bank to the trench foundation so as to uniformly support the barrel of the pipe.
 - I. Pipe Zone: Trench backfill zone for full trench width which extends from the bottom outside surface of the pipe to a minimum of 12 inches above the top outside surface of pipe, conduit, cable, or duct bank.
 - J. Pothole Excavations: Removal and replacement of all materials via coring, vacuum extraction, or similar method for the purposes of locating an underground utility or structures and to investigate underground conditions.
 - K. Prepared Trench Bottom: The bottom of the trench on which the pipe bedding is to lie, and which provides support for the pipe.
 - L. Relative Compaction: Ratio, in percent, of as-compacted field dry density to laboratory maximum dry density as determined in accordance with ASTM Standards.
 - M. Rigid Pipe: For the purposes of these Specifications, pipe constructed of ductile iron, steel, concrete, and clay pipes are considered rigid pipes.
 - N. Sewer, Pipes, and Mains: Conduits of circular or other geometric shapes, used to convey liquids or gases, or other material.
 - O. Trench Backfill: Trench backfill zone for full trench width extending from the top of the pipe zone to pavement base rock, ground surface, or other surface material.
 - P. Soil Stabilization: Removal of unsuitable material and replacement with specified material for support of a pipe, main, conduit, structure, or appurtenances.
 - Q. Utility: Any buried pipe, duct, conduit, or cable.
 - R. Well-Graded: A mixture of particle sizes with no specific concentration or lack thereof of one or more sizes that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids.

1.4 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00.

1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- B. Product Data: Submit sufficient data to verify compliance with specifications to include all materials and accessories including but not limited to:
1. Geotextile fabric, indicating fabric and construction
 2. Marking tapes
 3. Tracer wire
 4. Connectors for tracer wire and/or marking tapes
 5. Tracer wire locate boxes
 6. Marker balls
 7. Locator stations
 8. Ground wires
 9. Plastic or copper markers for service laterals.
- C. Manufacturer's Shop Test Reports
1. Submit certified copies of shop test reports at least 10 days before delivery of materials
 2. Reports shall include:
 - a. Source of supply for each material
 - b. Description of material tested
 - c. Date of sampling
 - d. Date of testing
 - e. Test procedure used
 - f. Results of testing performed
 - 1) At a minimum provide graphs for all moisture density curves and swell tests
 3. Submit reports for the following materials tests for each material and source proposed to be used:
 - a. Backfill, Structural fill - Native, Graded gravel 1-1/2 inch minus and Graded gravel ¾ inch minus

- 1) Gradation
 - 2) Atterberg Limits
 - 3) USCS Classification
 - b. Structural Fill – Imported
 - 1) Gradation
 - 2) Atterberg Limits
 - 3) USCS Classification
 - 4) Swell
 - c. Washed 3/8 pea gravel and Squeegee
 - 1) Gradation
 - d. Crushed granular base
 - 1) Gradation
 - 2) Atterberg Limits
 - 3) USCS Classification
 - 4) Unit Weight
 - 5) R-Value
- D. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading.
- E. Manufacturer's Field Reports
 1. Field Test Procedure: Test procedure to be submitted prior to conducting the test. Include forms for data collection, description of all sample collections, and analyses required
 2. Field Test Report:
 - a. Provide reports detailing results of the tests. Indicate compliance or non-compliance with Contract Documents. Identify corrective action for materials which fails to pass field tests

1.5 QUALITY ASSURANCE

A. Allowable Tolerances: Final grades shall be plus or minus 0.1-foot.

1.6 QUALIFICATIONS (NOT USED)

PART 2 PRODUCTS

2.1 MARKING TAPE

A. Detectable:

1. Solid aluminum foil, visible on unprinted side, encased in protective high visibility, inert polyethylene plastic jacket.
2. Foil Thickness: Minimum 0.35 mils.
3. Laminate Thickness: Minimum 5 mils.
4. Width: 6 inches.
5. Identifying Lettering: Minimum 1-inch high, permanent black lettering imprinted continuously over entire length.
6. Joining Clips: Tin or nickel-coated furnished by tape manufacturer.
7. Manufacturers and Products:
 - a. Reef Industries; Terra Tape, Sentry Line Detectable
 - b. Mutual Industries; Detectable Tape
 - c. Presco; Detectable Tape
 - d. Or approved equal

B. Color: In accordance with APWA Uniform Color Code for Temporary Marking of Underground Facilities and as specified in NEMA Z535.1, Safety Color Code.

Color	Facility
Red	Electric power lines, cables, conduit, and lightning cables
Orange	Communicating alarm or signal lines, cables, or conduit
Yellow	Gas, oil, steam, petroleum, or gaseous materials
Green	Sewers and drain lines
Blue	Potable water
Purple	Reclaimed water, irrigation, and slurry lines

2.2 ELECTRONIC LOCATING MATERIALS

A. Marker Balls:

1. Exterior Material: High-density polyethylene.
2. Size: Maximum 4-1/2 inches in diameter.
3. Range: Locatable with standard electronic marker locating devices at depths up to 5 feet.
4. Field Type: Spherical RF field regardless of orientation.
5. Contain no floating or movable parts, and no batteries or active components.
6. Color: Provide colored marker balls per Article 2.03 B above.
7. Manufacturer and Product: Omni Marker Model 162 (green), Omni Marker Model 161 (blue), or approved equal.

B. Tracer Wire:

1. Direct burial No. 12 AWG solid, annealed copper-clad steel (CCS) high strength tracer wire.
2. Tensile Breaking Load: 380-pound average.
3. Jacket:
 - a. High molecular weight high-density polyethylene complying with ASTM D1248, 30-volt rating.
 - b. Color: Provide in colors per Article 2.03 B above.
4. Manufacturer and Product: Copperhead Industries; LLC, 12 CCS high strength reinforced tracer wire, or approved equal.

C. Tracer Wire Connectors:

1. Waterproof, corrosion proof and suitable for No. 12 AWG solid core wire.
2. Prefilled with silicone and suitable for use with low-voltage tracer lines of less than 50 volts.
3. Lug Connectors:

- a. Waterproof plastic housing that encases the silicone prefilled lug terminals.
 - b. Manufacturer and Product: King Innovations; DryConn™ Direct Bury Lug or approved equal.
- 4. Twist Connectors:
 - a. Waterproof epoxy-filled packaging that encases the silicone prefilled twist connectors.
 - b. Manufacturer and Product: 3M Division; DBY Direct Bury Splice Kit 09053 connectors or approved equal.
- D. Ground Wire: No. 12 AWG bare solid copper wire.
- E. Locator Station:
 - 1. NOT USED

2.3 VISUAL IDENTIFICATION MATERIALS

- A. Tracer Wire Locate Boxes:
 - 1. NOT USED
- B. Plastic or Copper Markers for Utility Line Designation:
 - 1. Plastic or Copper Markers: Use markers of the type that requires installation to be recessed below grade.
 - a. Material: Plastic or copper. In new concrete, use “new construction” markers; in existing concrete use “retrofit” markers and use adhesive recommended by the manufacturer.
 - b. Plastic Pavement Markers:
 - 1) UV stabilized and fade resistant.
 - 2) Material: Meet or exceed a tensile strength of 3,500 psi, and meet test requirements as outlined in ASTM G53, Standard Practice for Light and Water Exposure of Nonmetallic Material.
 - 3) Color: Provide in color per Article 2.03 B above with the words, “WARNING, BURIED [UTILITY TYPE], Call Before You Dig,” molded to the top of marker.

- a) Provide wording for specific facility as approved by Owner.
- 4) Manufacturer and Product: Rhino Marking and Protective Systems; A-TAG pavement markers or approved equal.
- c. Copper Pavement Markers:
 - 1) Material: Copper material chosen by manufacturer.
 - 2) Diameter: 1-5/32-inch.
 - 3) Wording: Provide facility identification wording stamped on the top such as "NONPOTABLE WATER" as approved by Owner.
 - 4) Manufacturer and Product: Berntsen Concrete Marker; BP2-U or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Field verify the location of all underground utilities, pipelines and structures prior to excavation

3.2 PREPARATION

- A. Prior to commencing work in this Section, become familiar with site conditions. In the event discrepancies are found, notify the Engineer as to the nature and extent of the differing conditions.
- B. Call Local Utility Line Locating Service not less than 3 working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
 - 2. Coordinate with and notify utility companies should it be necessary to remove or relocate facilities.
- C. Identify required lines, levels, contours, and datum.
- D. See Section 31 10 00, Site Clearing for additional requirements in protection of existing utilities, survey control, plant life, and landscaped areas in coordination with Work in this Section.

3.3 SITE CONDITIONS

- A. Quantity Survey: The Contractor shall be responsible for calculations for quantities and volume of cut and fill from existing site grades to finish grades established under this contract as indicated in the Drawings or specified and shall include the cost for all earthwork in the total basic bid.
- B. Dust Control: Must meet all federal, state, and local requirements. Protect persons and property from damage and discomfort caused by dust. Water surfaces as necessary and when directed by Engineer to quell dust.
- C. Soil Control: Soil shall not be permitted to accumulate on surrounding streets or sidewalks nor to be washed into sewers.

3.4 PERFORMANCE—GENERAL

- A. Protect adjacent structures, utilities and surrounding areas from damage during excavation, filling, and backfilling
 - 1. Conduct operations in such a manner that existing street facilities, utilities, railroad tracks, structures, and other improvements, which are to remain in place, will not be damaged. Furnish and install cribbing and shoring or whatever means necessary to support material around existing facilities, or to support the facilities themselves, and maintain such supports until no longer needed.
 - 2. Open slopes shall not be cut within 30 feet of any existing spread footings unless approved by the Engineer.
- B. Avoid overbreaks. Overbreak is incidental to the Work, except in cases where the Owner's Representative determines that such overbreak was unavoidable.
- C. Excavation in rock or rocky cuts:
 - 1. Once completed, thoroughly test the slopes with bars or other approved means to remove all loose, detached, broken, or otherwise unstable material.
 - 2. Remove boulders and rock up to **1/2 cubic yard** measured by volume per the requirements of this Section.
 - 3. Remove larger boulders and rock material as specified in Section 31 23 18, Rock Removal.

4. Remove jutting points. Scale slopes using mine scaling rods or other approved methods to remove loose or overhanging materials and provide a safe, trim, neat, and stable condition.
 5. Dispose of the materials removed under this subparagraph in the same manner as other excavated material.
- D. Remove all exposed roots, debris, and all stones more than 3 inches in size which are loose or could become loosened.
 - E. Protect work from erosion or other similar types of damage until the project has been completed
 - F. Do not backfill during freezing weather. Backfill only when ground temperature is 35 degrees F or higher and the air temperature is 35 degrees F and rising
 - G. Do not use frozen materials, snow, or ice in any backfill
 - H. Do not backfill on frozen surfaces
 - I. Protect excavated material from becoming frozen
 - J. Do not remove trees from outside excavation unless authorized by the Engineer; protect from permanent damage by construction activities
 - K. Provide temporary bridges for roadways, walkways, driveways, etc.
 - L. Perform work in a safe and proper manner with appropriate precautions against hazard
 - M. Provide adequate working space and clearances for work performed within excavations and for installation of the improvements
 - N. Do not undercut excavation faces for extended footings, utilities, pipes or otherwise
 - O. Clean subgrades of loose material before concrete, asphalt, subbase, paving or granular material is placed thereon
 - P. Except as otherwise authorized, indicated, or specified, replace all material excavated below the bottom of concrete walls, footings, slabs on grade and foundations with concrete placed at the same time and monolithic with the concrete above
 - Q. Except where exterior surfaces are to be dampproofed, concrete structures that do not have footings that extend beyond the outside face of exterior walls may be placed directly against excavation faces without outer forms

- R. Notify Engineer of unexpected subsurface conditions.
- S. Stockpile excavated material in area(s) designated on or off site in accordance with Section 31 05 13, Soils for Earthwork.

3.5 PREPARATION

- A. In accordance with Section 02 41 00 and Section 31 10 00 and the following:
- B. Clear sites to be occupied by permanent construction of roots, brush, and other objectionable material and debris
- C. Remove debris, all trees, underbrush, stumps, roots and other combustible materials from site daily and dispose of off-site; on-site burning is not permitted
- D. Do not use open burning

3.6 PRESERVATION OF PLANTS AND TREES

- A. Do not remove vegetation or trees outside fill or excavated areas, except as authorized by Engineer
- B. Protect plants and trees left standing from permanent damage by construction operation per Section 01 56 39
- C. Trim standing trees as directed by Engineer

3.7 SHEETING, SHORING AND BRACING

- A. Provide proper and substantial sheeting, shoring, and bracing, per Section 31 50 00

3.8 DEWATERING

- A. Provide and maintain adequate dewatering equipment to remove and dispose of surface and groundwater entering excavations, trenches, and per Section 31 23 19
- B. Keep each excavation dry during subgrade preparation and continually thereafter until the structure to be built, paving to be placed or the pipe to be installed is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result
- C. Dewater excavations which extend to or below groundwater by lowering and keeping the groundwater level beneath such excavation at least 12 inches below the bottom of the excavation
- D. Divert surface water or otherwise prevent it from entering excavated areas or trenches to the extent practical without damaging adjacent property

1. Maintain all drainage pipes, keep clean and free of sediment during construction and final cleanup
2. Contractor to obtain and comply with conditions of a CDPHE construction dewatering permit

3.9 SOIL STABILIZATION

- A. Thoroughly compact and consolidate subgrades for concrete structures, precast structures, and utility trench bottoms so they remain firm, dense and intact during required construction activities
- B. Remove all mud and muck during excavation
- C. Allow no more than 2 inch depth of mud or muck to remain in excavation prior to placing crushed rock
- D. Reinforce subgrades with graded gravel if they become mucky during construction activities
- E. Finished elevation of stabilized subgrades are to be at or below subgrade elevations indicated on Drawings

3.10 MANHOLES, VAULTS, EQUIPMENT PADS AND OTHER UTILITY STRUCTURES

- A. Location: As required to accommodate building foundations, slabs on grade, equipment pads and sidewalks
- B. Excavation:
 1. Excavations below foundations are to be oversized at least 2 feet beyond footing edges.
 2. Excavate soils down to the native sands or if in native clay, remove clay to a minimum of 1 feet below the bearing elevation. Machine slope banks to stable configuration
 3. Grade top perimeter of excavation to prevent surface water from draining into excavation
 4. Excavate with heavy duty conventional excavation equipment
 5. Minimize extent of excavation where possible
 6. Over excavate unsuitable materials as directed by Engineer

7. Correct areas over excavated with suitable on-site material, gravel fill or concrete as directed by Engineer
- C. Subgrade Preparation:
1. Remove soft or otherwise unsuitable material, and replace with suitable material
 2. Moisture condition and then recompact
 3. Compact to 98 percent of standard Proctor density \pm 2% optimum moisture content, ASTM D698
- D. Backfill:
1. Materials
 - a. Subsoil Fill: Type S1 and S2 as specified in Section 31 05 13, Soils for Earthwork.
 - b. Type TS1, Select Native Topsoil Material, as may be available.
 - 1) TS2, Imported Topsoil Material, as may be required.
 - c. Structural Fill:
 - 1) Type S2, as specified in Section 31 05 13, Soils for Earthwork
 - 2) A1, A2 and A5, as specified in Section 31 05 16, Aggregates for Earthwork. Size of aggregate as shown in the Drawings
 - d. Granular Fill: Type A1 or A2, Granular Drain Backfill Material as specified in Section 31 05 16, Aggregates for Earthwork. Size of aggregate as shown in the Drawings
 2. Below foundations, slabs on grade, equipment pads and concrete flatwork
 - a. Compact to 98 percent of standard Proctor density \pm 2% optimum moisture content, ASTM D698 for cohesive soils
 - b. Compact to 70 percent of relative density/unit weight, ASTM D4254 for granular soils

3.11 PIPES AND CONDUITS

- A. Location: As required to accommodate piping and appurtenances that are not under foundations

B. Trench excavation:

1. Establish alignment and grade or elevation from offset stakes
2. Excavate trenches so pipes can be laid straight at uniform grade without dips or bumps, between the terminal elevations indicated on the Drawings
3. Grade top perimeter of excavation to prevent surface water from draining into excavation
4. Remove deleterious material including debris, organic matter, and rocks from floor of trench prior to placement of embedment
5. Comply with pipe specification sections regarding vertical and horizontal alignment and max joint deflection
6. Where grades or elevations are not indicated on the Drawings, excavate trenches to provide a minimum depth of backfill cover over the top of pipe:
 - a. 3 feet for water and process piping
 - b. 2 feet for gas piping and electrical duct banks
7. Increase depth as required at vertical curves and for clearance beneath existing pipes, conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades
8. Measure pipe cover depth vertically from top of pipe to finished ground or surface elevation
9. Do not open more trench in advance of pipe laying than is necessary to expedite the work; not more than 400 feet
10. Except where tunneling is indicated on the Drawings, specified, or permitted by Engineer, excavate trenches by open cut from the surface

C. Limiting trench widths:

1. Excavate to a width which will provide adequate working space and pipe clearances for proper pipe installation, jointing, embedment
2. If needed to reduce earth loads to prevent sliding, cut banks back on slopes which extend not lower than 1 foot above the top of the pipe
3. Stipulated minimum clearances are minimum clear distances, not minimum average distances

4. Limiting trench widths and permissible clearances from 6 inches above top of pipe to trench bottom for installed pressure and non-pressure piping

Pipe Size (inch)	Minimum Trench Width	Maximum Trench Width
4	1'-6"	2'-6"
6	1'-6"	2'-6"
8	1'-8"	2'-8"
10	2'-0"	3'-0"
12	2'-0"	3'-0"
16	2'-4"	3'-4"
18	2'-6"	4'-0"
24	3'-0"	5'-0"
36	4'-0"	6'-0"

5. If the width of the lower portion of the trench exceeds the max permitted, provide pipe of adequate strength, special pipe embedment, or arch concrete encasement as required by loading conditions and as determined by Engineer

D. Mechanical excavation:

1. Do not use where its operation would damage buildings, culverts, or other existing property, structures, or utilities above or below ground; hand excavate only in such areas
2. Use mechanical equipment of a type, design, and construction and operated so that:
 - a. Rough trench bottom elevation can be structural
 - b. Uniform trench widths and vertical sidewalls are obtained from 1 foot above the top of the installed pipe to the bottom of the trench
 - c. Trench alignment is such that pipe is accurately laid to specified alignment and is centered in the trench with adequate clearance between pipe and trench sidewalls

3. Do not undercut trench sidewalls
 4. Recompact trench bottom disturbed by excavation prior to placement of embedment material
 5. Except as otherwise required, excavate trenches below the underside of pipes as indicated in the Drawings to provide minimum of 6 inches of granular embedment material underneath pipe for foundation material
 6. Where in earth, trench bottoms for 6 inches and smaller pipe may be excavated below pipe subgrade and granular embedment provided or the trench may be graded to provide uniform and continuous support (between bell holes or end joints) of the installed pipe, Contractor's option
 7. Whenever so directed by Engineer, excavate to such depth below a grade as Engineer directs and bring the trench bottom to grade with such material as Engineer may direct
 8. Provide concrete, or other foundations made necessary by unstable soil as directed by Engineer
 9. Excavate to provide adequate clearance for tools and methods of pipe installation
 10. Do not allow any of bells or couplings to contact the trench bottom, walls, or granular embedment when pipe is joined
- E. Cuts in surface construction:
1. No larger than necessary to provide adequate working space
 2. Cut a clean groove not less than 12 inch deep along each side of trench or around perimeter of excavation area
 3. Remove pavement to provide shoulder not less than 1 foot wider than trench width
 4. Do not undercut trenches, resulting in bottom trench width greater than top widths
 5. Make pavement cuts to and between straight or accurately marked curved lines parallel to trench centerline or limits of excavation
 6. Remove pavement for connections to existing lines or structures only to the extent required for the installation, as determined by Engineer

7. Where the trench crosses the drives, walks, curbs, or other surface construction is within or partially within the limits of excavation, remove and replace the surface construction between saw cuts as specified for pavement
- F. Subgrade Preparation:
1. Remove soft or otherwise unsuitable material, and replace with suitable material
 2. Moisture condition and then recompact.
 - a. Compact to 98 percent of standard Proctor density \pm 2% optimum moisture content, ASTM D698 for cohesive soils
 - b. Compact to 70 percent of relative density/unit weight, ASTM D4254 for granular soils Backfill:
- G. Pipe Zone:
1. Pipe and fittings
 - a. Washed 3/8 pea gravel or squeegee no substitutions
 - b. Compacted to 70 percent relative density, ASTM D4254
- H. Trench Zone in landscape areas:
1. Backfill: Compact to 90 percent of standard Proctor density \pm 2% optimum moisture content, ASTM D698
 2. Structural fill: Compact to 90 percent of standard Proctor density \pm 2% optimum moisture content, ASTM D698
- I. Trench Zone under paved surfaces:
1. Backfill: Compact to 98 percent of standard Proctor density 0 to +3% optimum moisture content, ASTM D698
 2. Structural fill: Compact to 98 percent of standard Proctor density \pm 2% optimum moisture content, ASTM D698

3.12 MARKING TAPE

- A. Continuously install marking tape along centerline of all buried piping, install 24 inches below finished grade unless indicated otherwise on the drawings.

3.13 ELECTRONIC LOCATING FACILITY INSTALLATION

A. Marker Balls:

1. Install according to manufacturer's recommendations and as shown or directed and according to the following requirements:
 - a. Install marker balls directly above the pipe alignment at a depth no less than 3 feet and no more than 4-1/2 feet below final surface grade.
 - b. Install marker balls during trench backfill operations by placing the marker ball in compacted backfill.
 - c. Cover marker ball with a minimum of 6 inches of backfill and compact backfill before continuing trench backfill operations.
 - d. Install markers balls with trenchless pipe installations by core-drilling hole of a minimal diameter needed to allow clearance for placement of marker ball. Backfill with approved trench backfill, pavement base and pavement, as applicable.
2. Water Marker Ball Locations: Install at locations as required by Sewer Marker Ball Locations specified herein.
3. Sewer Marker Ball Locations:
 - a. Install marker balls directly above connection points, termination points and all fitting locations, and at a minimum spacing of 50 linear feet on sewers with a straight horizontal alignment.
 - b. Install marker balls at a minimum spacing of 25 lineal feet directly above sewer mains installed on a radius.
 - c. Install marker balls on new or reconstructed sewer service laterals, directly above the centerline of the end of the lateral at the curb, property line or other end of lateral location, as directed.
 - d. Install marker balls directly above every alignment change along sewer mains and service laterals.
 - e. Install marker balls directly above manholes for manholes with buried covers.

B. Tracer Wire and Terminal Appurtenances:

1. Tracer Wire:
 - a. Install as shown or directed directly over the pipe centerline and on top of the pipe zone in all sewer trenches, including mainline sewers, service laterals and storm sewer inlet leads.
 - b. Connect mainline and service lateral tracer wires using either an approved direct-bury lug connector or direct-bury twist connector.
 - c. Extend tracer wire to locator stations in manholes, locator boxes, storm inlets, or other visually identifiable terminal appurtenances, allowing for access with electronic locating equipment, as shown or directed and according to the following requirements:
2. Locator Stations:
 - a. Install locator stations as shown in the drawings and per the OWNER.
 - b. Extend the tracer wire from the pipe trench in one continuous piece into the locator station.
 - c. Leave 24-inches of coiled slack tracer wire inside of locator station approximately 3 inches below the lid or as directed by the OWNER.

3.14 VISUAL IDENTIFICATION FACILITIES

- A. Tracer Wire Locate Boxes: Install tracer wire locate boxes directly over service laterals at property line, service boundary, or other location as shown or directed by the Engineer.
- B. Plastic or Copper Markers for Utility Designation:
 1. Install plastic or copper markers in the concrete curb directly over the centerline of the pipe, as shown or directed by the Engineer or OWNER.
 2. Either plastic or copper markers may be used.

PART 4 INSTALLATION

4.1 BACKFILL-GENERAL;

- A. Loose or otherwise unsuitable material shall be removed prior to placement of new fill
- B. Spread and level material deposited in piles and windrows before compacting

- C. Maximum uncompacted thickness of layers – 8 inch loose lifts
- D. Do not deposit or compact backfill in areas that have excessive water. If excessive water is present, harrow, disc, blade, or otherwise work the layer to obtain the uniform moisture content and compact prior to placing the next lift of loose material unless approved otherwise by the Engineer
- E. Add water and harrow, disc, blade, or otherwise work each layer to obtain the uniform moisture content and adequate compaction
- F. Thoroughly compact each layer by rolling or other means acceptable to Engineer
- G. Compaction by inundation of water (i.e. jetting) not permitted
- H. Alter compaction methods if material fails to meet specified density
- I. Where a trench passes through a fill or embankment, place and compact fill or embankment to 12 inch above the top of the pipe before excavating the trench
- J. Method of placement shall be field verified
- K. Successfully demonstrate to Engineer proposed method of placement to achieve specified compaction density.
- L. Continue to place and compact material in horizontal layers as demonstrated

4.2 BACKFILL OVER STRUCTURES

- A. In addition to installation criteria for fills BACKFILL-GENERAL in Article 4.1.A
- B. Use methods which will not damage or overload structure
- C. Use rubber tired vehicles to extent practicable
- D. Do not use equipment with a loaded weight greater than 14,000 pounds
- E. Operate equipment to prevent impact loads on structure
- F. Distribute equipment loads with planks or a layer of earth or gravel 12 inch minimum, 36 inch max, thick
- G. Do not pile earth or gravel more than 3 feet deep
- H. Take special care to prevent damaging or disturbing structure or granular fill material

4.3 CRUSHED ROCK OR GRAVEL FILLS

- A. Place on suitably prepared subgrade and compact
- B. Where covered with concrete, grade gravel to required subgrade and cover with 40-mil polyethylene film

4.4 TRENCH BACKFILL

- A. In addition to installation criteria for fills BACKFILL-GENERAL in Article 4.1.A
- B. Compacted backfill:
 - 1. For full depth of trench above embedment
 - 2. Beneath pavements, surfacing, driveways, curbs, gutters, walks or other surface construction or structures
 - 3. In street or highway shoulders
 - 4. In established sodded areas
 - 5. Beneath fills and embankments
- C. Where the trench for 1 pipe passes beneath the trench of another pipe, compact the backfill for the lower trench to the bottom of the upper trench
- D. Increased layer thickness may be permitted for non-cohesive material if Contractor demonstrates to Engineer's satisfaction that specified compacted density will be achieved
- E. Use methods and equipment appropriate to the material to be compacted to prevent transmission of damaging loads to pipe
- F. Do not drop material more than 5 feet into trench unless cushioned by 2 feet minimum of backfill above pipe embedment
- G. Finish the top portion of backfill in landscape areas with at least 4 inch of topsoil

4.5 PIPE ZONE—GRANULAR MATERIAL

- A. Embed pipes above and below the bottom of pipe as indicated in the Drawings and as specified
- B. Spread and surface grade embedment material to provide continuous and uniform support beneath pipe at all points between pipe joints

- C. After grading, aligning, placing pipe in final position, and shoring home; deposit and compact sufficient embedment under and around each side of the pipe to hold the pipe in proper position and alignment during subsequent operations
- D. Place and compact embedment material uniformly and simultaneously on both sides of pipe to prevent lateral displacement
- E. Compact by slicing with shovel or vibrating as needed to achieve the specified material density
- F. Maximum uncompacted thickness of layers: 8 inches or spring line of pipe whichever is less

4.6 PIPE EMBEDMENT—FLOWABLE FILL MATERIAL

- A. Flowable backfill material where specified on Drawings, directed by or acceptable to Engineer
- B. Embed pipe above and below the bottom of pipe as indicated on the Drawings and as specified
- C. Flowable fill shall be placed as closely behind pipe laying operations as possible.
- D. Provide sand bags beneath pipe at all points between pipe joints to provide continuous and uniform support beneath pipe
- E. After placing sand bags, aligning, placing pipe in final position, and shoring home; deposit and vibrate flowable fill embedment material uniformly and simultaneously on both sides of pipe. Contractor is responsible for prevention of lateral displacement and flotation of pipe. Following placement of flowable backfill material, Contractor shall inspect interior of pipe to confirm horizontal and vertical displacement of pipeline has not occurred. Contractor to correct all displacements at no additional cost
- F. Soil backfill shall not be placed until the flowable fill embedment material has reached the initial set. If backfill is not to be placed over the flowable fill within 8 hours, a 6-inch cover of moist earth shall be placed over the flowable fill surface
- G. If the air temperature is 50 degrees F or less, the moist earth cover should be at least 18-inches thick. Flowable fill shall not be placed when the air temperature is below 40 degrees F unless the air temperature is 40 degrees F or more and the temperature is rising
- H. Flowable fill shall not be placed, if, in the judgment of the Owner or Engineer, weather conditions are unsuitable

- I. Flowable fill shall not be placed when the trench bottom or walls are frozen or contain frozen materials.

4.7 DRAINAGE MAINTENANCE

- A. Do not backfill trenches across roadways, drives, walks or other trafficways adjacent to drainage ditches or water courses prior to backfilling the trench on the upstream side of the trafficway to prevent impounding water after pipe is laid
- B. Backfill so that water does not accumulate in unfilled or partially filled trenches
- C. Remove materials deposited in roadway ditches or other water courses crossed by the trench line immediately after backfilling is completed and restore ditches and water courses to original section, grade, and contours
- D. Do not obstruct surface drainage any longer than necessary
- E. Provide and maintain temporary bridges and other structures across unfilled trenches as required to maintain traffic

4.8 PROTECTION OF TRENCH BACKFILL

- A. Where trenches are constructed in ditches or other water courses, protect backfill from erosion
- B. Install ditch checks where the ditch grade exceeds 1 percent:
 - 1. Minimum depth: 2 feet below the original ditch or water course bottom for the full bottom width
 - 2. Minimum width: 18 inches into the side slopes
 - 3. Minimum thickness: 12 inches

4.9 DISPOSAL OF EXCESS EXCAVATED MATERIALS

- A. Use excess excavated materials that comply with the material requirements of the Contract Documents in fills and embankments as required or as indicated on the Drawings to the extent needed
- B. Remove debris, junk, broken concrete, broken asphalt, rock, stones, stumps, logs, roots, and other unsuitable material from the site and dispose of it
- C. Except as otherwise permitted, dispose of excess excavated materials away from the site of the Work or as directed by Owner
- D. Distribute excess earth from excavations in areas approved by Owner and Engineer

- E. Carefully finish material thus distributed with a drag, blade machine, or other suitable tool to a smooth, uniform surface without obstructing drainage at any point
- F. Do not waste excess excavated material in the above manner within a railroad, public road, or highway right-of-way

4.10 PAVING

- A. After backfilling is completed and settled, bring subbase to grade to provide the paving section indicated in all areas to be paved with either hot bituminous asphalt, concrete or crushed stone paving
- B. Level surfaces to elevations and gradients indicated on Drawings
- C. Perform hand tamping in areas inaccessible to compaction equipment
- D. Maintain surface shape, elevation, smoothness and water content throughout the operation. Blade and add material if required
- E. If an excess water condition is encountered, rework topping and aerate to reduce moisture content
- F. After grading and compacting the subbase and prior to placing the crushed gravel base course, the entire subbase shall be proof-rolled with a heavily loaded, pneumatic-tired vehicle. The vehicle shall have a gross vehicle weight of at least 50,000 pounds with a loaded single axle weight of 18,000 pounds and a tire pressure of 100 psi. Areas which deform excessively, as determined by Engineer, under heavy wheel loads are not stable and shall be over excavated and replaced to achieve a stable subgrade. Alternate methods other than over excavation to mitigate deformation are not acceptable.
- G. After proof-rolling, install crushed gravel base
- H. Level surfaces of crushed gravel base to elevations and gradients indicated on Drawings
- I. Perform hand tamping in areas inaccessible to compaction equipment
- J. Maintain surface shape, elevation, smoothness and water content throughout the operation. Blade and add material if required
- K. If an excess water condition is encountered, rework topping and aerate to reduce moisture content

- L. After grading and compacting the crushed gravel base, prior to and the same day as placing the hot bituminous asphalt, concrete or crushed stone paving, the entire base shall be proof-rolled with a heavily loaded, pneumatic-tired vehicle. The vehicle shall have a gross vehicle weight of at least 50,000 pounds with a loaded single axle weight of 18,000 pounds and a tire pressure of 100 psi. Areas which deform excessively, as determined by Engineer, under heavy wheel loads are not stable and shall be over excavated and replaced to achieve a stable subgrade. Alternate methods other than over excavation to mitigate deformation are not acceptable.

4.11 FINAL GRADING

- A. After completion of all other outside work and after backfilling is completed and settled, bring to grade at the indicated elevations all areas of the site to be graded
- B. Graders and other power equipment may be used for final grading and slope dressing if the result is uniform and equivalent to hand work
- C. Grade all surfaces for effective drainage
- D. Provide a 2 percent minimum slope except as otherwise required
- E. Grade and surface to maintain gradient as indicated

4.12 SLOPE STABILIZATION

- A. Prepare disturbed areas for seeding
- B. Cover slopes with erosion control fabric where grade is 3H to 1V or greater or where indicated on the Drawings
- C. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 6 inch overlap minimum of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil
- D. Secure outside edges and overlaps at 48 inch intervals with 4-inch to 6-inch U-shaped type pins or wooden stakes as necessary to accommodate ground conditions
- E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil
- F. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches

4.13 EROSION CONTROL BARRIERS

- A. Place erosion control barriers where required and where directed by Engineer in accordance with requirements of approved site improvement plan
- B. Field locate barriers along slopes, next to water courses and downstream of disturbed areas to prevent surface runoff from eroding areas disturbed by Contractor during construction, to minimize the transport of suspended solids downstream or into adjacent streams, canals or ditches and to protect newly seeded areas
- C. Maintain and replace barriers as required for effective erosion control until satisfactory uniform plant growth is established as defined herein

4.14 STORMWATER MANAGEMENT PLAN

- A. Contractor shall be responsible for submission and obtaining permit for stormwater discharges associated with construction activity and complying with all conditions of the permit
- B. Reference Stormwater Management Plan included in these Contract Documents

4.15 SETTLEMENT

- A. Warranty for settlement of all fills, embankments, and backfills is stipulated in the General Conditions from Final Completion of Contract under which Work is performed
- B. Repair or replace within 30 days after notice by Engineer or Owner

PART 5 FIELD QUALITY CONTROL

- A. Provide under provisions of Section 01 45 00 for field inspections and testing
 - 1. Contractor shall coordinate and schedule all tests to determine compliance of materials in accordance with the specifications
 - 2. The OWNER shall pay for all initial inspections, field and laboratory testing, of earthwork materials (i.e. soils and aggregates) to determine compliance of materials in accordance with this Section and Section 01 45 00. All reinspections and retests due to initial failed test shall be paid for by the CONTRACTOR,
- B. All fill, embankment material, and backfill must comply with the requirements of these specifications and be approved by Engineer prior to placement

- C. Geotechnical testing services provided by OWNER shall test and inspect all subgrades and fill layers before further construction work is performed. All reinspections and retests due to initial failed testing shall be paid for by CONTRACTOR.
- D. Pipe Embedment and Backfill:
1. One initial gradation test for each type of material plus (1) one additional test for every 1000 cubic yards of each material
 2. One initial Atterberg limits tests for each type of material plus (1) one additional test for every 1000 cubic yards of each material
 3. Daily penetrometer testing of flowable fill material
 4. Two moisture-density relationship tests, ASTM D1557, or 2 relative density tests, ASTM D4253/D4254, as appropriate for each type of embedment on backfill material proposed, except granular embedment material
 5. One in-place compaction test every 50 lineal feet of trench in the compacted embedment zone and at every 1.5 feet of vertical lift of backfill materials, ASTM D2922/D3017 or ASTM D1556 as directed by Engineer
 6. One in-place compaction test near top of trench for trench depth of 2 feet or less, ASTM D2922/D3017 or ASTM D1556 as directed by Engineer
 7. Ten (10) additional in-place compaction tests at the discretion of the Engineer, ASTM D2922/D3017 or ASTM D1556 as directed by Engineer

END OF SECTION

SECTION 31 23 19 - DEWATERING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes temporary dewatering and surface water control systems for open excavations and utility trenches.
- B. Section includes:
 - 1. Dewatering systems.
 - 2. Surface water control systems.
 - 3. System operation and maintenance.
 - 4. Water disposal.

1.2 RELATED SECTIONS

- A. Section 31 05 16 - Aggregates for Earthwork
- B. Section 31 23 17 - Trenching

1.3 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00.
 - 1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- B. Dewatering Plan:
 - 1. Descriptions of proposed groundwater and surface water control facilities including, but not limited to, equipment; methods; standby equipment and power supply; pollution control facilities; discharge locations to be utilized; and provisions for immediate temporary water supply as required by this Section.
 - 2. Plan to be reviewed by the Engineer prior to the beginning of construction activities requiring dewatering. Review by the Engineer of the design shall not be construed as a detailed analysis of the adequacy of the dewatering system, nor shall any provisions of the above requirements be construed as relieving the Contractor of its overall responsibility and liability for the work.

1.4 DEFINITIONS

- A. Dewatering includes the following:
 - 1. Lowering of ground water table and intercepting horizontal water seepage to prevent ground water from entering excavations, trenches, tunnels, and /or shafts.
 - 2. Reducing piezometric pressure within strata to prevent failure or heaving of excavations, trenches, tunnels, and /or shafts.
 - 3. Disposing of removed water.
- B. Surface Water Control: Removal of surface water within open excavations.

1.5 QUALITY CONTROL

- A. All dewatering operations shall be adequate to assure the integrity of the finished project and shall be the responsibility of the Contractor.
- B. Provide all labor, materials, and equipment necessary to dewater trench and structure excavations, in accordance with the requirements of the Contract Documents.
- C. Secure all necessary permits to complete the requirements of this Section.
- D. Control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence.
- E. Where the critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at frequent intervals to detect any settlement which may develop.
 - 1. The responsibility for conducting the dewatering operation in a manner which will protect adjacent structures and facilities rests solely with the Contractor.
 - 2. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the Contractor.

PART 2 PRODUCTS

2.1 EQUIPMENT

- A. Dewatering, where required, may include the use of well points, sump pumps, temporary pipelines for water disposal, rock or gravel placement, and other means. Standby pumping equipment shall be maintained on the jobsite.

PART 3 EXECUTION

3.1 DEWATERING

- A. Provide all equipment necessary for dewatering.
 - 1. Have on hand, at all times, sufficient pumping equipment and machinery in good working condition.
 - 2. Have available, at all times, competent workers for the operation of the pumping equipment.
 - 3. Adequate standby equipment shall be kept available at all times to insure efficient dewatering and maintenance of dewatering operation during power failure.
- B. Dewatering for structures and pipelines shall commence when water is first encountered and shall be continuous until such times as water can be allowed to rise in accordance with the provisions of this Section or other requirements.
- C. Site Grading:
 - 1. At all times, site grading shall promote drainage.
 - 2. Surface runoff shall be diverted from excavations.
 - 3. Water accumulated in excavations shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and be pumped or drained by gravity from the excavation to maintain a bottom free from standing water.
- D. Dewatering shall at all times be conducted in such a manner as to preserve the bearing capacity of the soils.
- E. Maintain the water level a minimum of 12 inches below the bottom of excavation in all work areas.
- F. Flotation shall be prevented by maintaining a positive and continuous removal of water. The Contractor shall be fully responsible and liable for all damages which may result from failure to adequately keep excavations dewatered.
- G. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sand-packed and/or other means used to prevent pumping of fine sands or silts from the subsurface. A continual check shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.

- H. Dispose of water from the work in a suitable manner without damage to the environment or adjacent property. No water shall be drained into work built or under construction without prior consent of the Engineer. Water shall be filtered using an approved method to remove sand and fine sized soil particles before disposal into any drainage system.

- I. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines, and sewers.

END OF SECTION

SECTION 31 23 23 - FILL

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes backfilling required at building perimeter and site structures to subgrade elevations, fill under interior and exterior slabs-on-grade or pavement, and fill under landscaped areas. Backfilling for utilities within building proper is included within this section; backfilling for utilities outside building is included in Section 31 23 17, Trenching.
- B. Section includes:
 - 1. Backfilling building perimeter to subgrade elevations.
 - 2. Backfilling site structures to subgrade elevations.
 - 3. Fill under slabs-on-grade.
 - 4. Fill under paving.
 - 5. Fill for over-excavation.

1.2 RELATED SECTIONS

- A. Section 03 30 00 - Cast-In-Place Concrete
- B. Section 31 05 13 - Soils for Earthwork
- C. Section 31 05 16 - Aggregates for Earthwork
- D. Section 31 22 13 - Rough Grading
- E. Section 31 23 16 - Excavation
- F. Section 31 23 17 - Trenching
- G. Section 31 23 24 - Flowable Fill
- H. Section 33 11 10 - Water Utility Distribution and Transmission Piping
- I. Section 33 31 13 –Sanitary Utility Sewerage Piping

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials:
 - 1. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop.

1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.
- B. ASTM International (ASTM):
1. ASTM C403 - Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance
 2. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 2. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 3. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
 4. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
 5. ASTM D4832 - Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.

1.4 DEFINITIONS

- A. Controlled Low Strength Material (CLSM): Also referred to as Flowable Fill elsewhere in these Specifications. A self-compacted, cementitious material.
- B. Imported Material: Materials obtained from sources offsite, suitable for specified use.
- C. Lift: Loose (uncompacted) layer of material.
- D. Optimum Moisture Content: Moisture content at which the backfill material attains maximum density.
1. Determined in accordance with ASTM Standard specified to determine maximum dry density for relative compaction.
 2. Determine field moisture content on basis of fraction passing 3/4-inch sieve.

1.5 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00.
1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-

marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements

B. Manufacturer's Shop Test Reports

1. Submit certified copies of shop test reports at least 10 days before delivery of materials
2. Reports shall include:
 - a. Source of supply for each material
 - b. Description of material tested
 - c. Date of sampling
 - d. Date of testing
 - e. Test procedure used
 - f. Results of testing performed
 - 1) At a minimum provide graphs for all moisture density curves and swell tests
3. Submit reports for the following materials tests for each material and source proposed to be used:
 - a. Backfill, Structural fill - Native, Graded gravel 1-1/2 inch minus and Graded gravel 3/4 inch minus
 - 1) Gradation
 - 2) Atterberg Limits
 - 3) USCS Classification
 - b. Structural Fill – Imported
 - 1) Gradation
 - 2) Atterberg Limits
 - 3) USCS Classification
 - 4) Swell
 - c. Washed 3/8 pea gravel and Squeegee

- 1) Gradation
- d. Crushed granular base
 - 1) Gradation
 - 2) Atterberg Limits
 - 3) USCS Classification
 - 4) Unit Weight
 - 5) R-Value
- C. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading.
- D. Manufacturer's Field Reports
 - 1. Field Test Procedure: Test procedure to be submitted prior to conducting the test. Include forms for data collection, description of all sample collections, and analyses required
 - 2. Field Test Report:
 - a. Provide reports detailing results of the tests. Indicate compliance or non-compliance with Contract Documents. Identify corrective action for materials which fails to pass field tests

1.6 QUALITY ASSURANCE

- A. Allowable Tolerances: Final grades shall be plus or minus 0.1-foot.

PART 2 PRODUCTS

2.1 FILL MATERIALS

- A. Subsoil Fill: Type S1 and/or S2 as specified in Section 31 05 13, Soils for Earthwork.
- B. Imported Granular Fill:
 - 1. Coarse Aggregate Type A1, Dense-Graded Aggregate with gradation as specified in Section 31 05 16, Aggregates for Earthwork.

2. Coarse Aggregate Type A2, Granular Drain Backfill Material with gradation as specified in Section 31 05 16, Aggregates for Earthwork.
 3. Crushed Granular Base Type A5, Granular Material with gradation as shown specified in Section 31 05 16, Aggregates for Earthwork.
- C. Concrete:
1. Lean concrete as specified in Section 31 23 24, Flowable Fill, with compressive strength of 100 pounds per square inch (psi).
 2. Structural concrete as specified in Section 03 30 00, Cast-in-Place Concrete. Compressive strength as required by the application or as noted in the Drawings.
- D. Drain Rock: Coarse Aggregate Type A2, Granular Drain Backfill Material with gradation as specified in Section 31 05 16, Aggregates for Earthwork.
- E. Foundation Stabilization Material:
1. Coarse Aggregate Type A1, Dense-Graded Aggregate, as specified in Section 31 05 16, Aggregates for Earthwork.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Prior to Work in this Section, become familiar with Site conditions. In the event discrepancies are found, notify Engineer as to the nature and extent of the differing conditions.

3.2 SITE CONDITIONS

- A. Quantity Survey: The Contractor shall be responsible for calculations for quantities and volume of cut and fill from existing site grades to finish grades established under this contract as indicated in the Drawings or specified and shall include the cost for all earthwork in the total basic bid.
- B. Dust Control: Must meet all federal, state, and local requirements. Protect persons and property from damage and discomfort caused by dust. Water surfaces as necessary and when directed by Engineer to quell dust.
- C. Soil Control: Soil shall not be permitted to accumulate on surrounding streets or sidewalks nor to be washed into sewers.

3.3 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Control of Water:
 - 1. Excavated areas shall be kept free of water and frost.
 - 2. See Section 31 23 19, Dewatering for additional details.
- C. Compact subgrade to density requirements for subsequent backfill materials.
- D. Cut out soft areas of subgrade not capable of compaction in place and stabilize per Section 31 23 16.
- E. Proof roll to identify soft spots; fill and compact to density equal to or greater than requirements for subsequent fill material.
- F. Subgrade to be approved by Engineer prior to placement of structures and commencement of backfill activities.
- G. Do not allow or cause any work performed or installed to be covered up or enclosed prior to required tests and approvals. Should any Work be enclosed or covered up, uncover and replace at Contractor's expense.

3.4 BACKFILLING

- A. Backfill areas to contours and elevations shown in the Drawings with unfrozen materials.
- B. Do not place materials when weather conditions and/or moisture content prevent attainment of specified density.
- C. Maintain optimum moisture content of backfill materials to attain required compaction density.
- D. Employ placement method that does not disturb or damage other work.
- E. Mechanical tampers permitted in confined areas.
- F. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- G. Foundation Base for Structures:
 - 1. Bring excavation to required subgrade elevation shown in the Drawings.

2. Place foundation base material to required grade shown in the Drawings.
3. Place foundation base material in 6-inch lifts and compact to 98 percent of standard Proctor density \pm 2% optimum moisture content, ASTM D698.

H. Backfill for Structures:

1. Prior to placing backfill, remove forms, temporary construction, and debris below grade.
2. Backfill shall not be placed against poured concrete until 28 days have passed from completion of original concrete pour, unless otherwise approved by Engineer.
3. Heavy compactors and large pieces of construction equipment shall be kept away from any embedded wall a distance of at least 5 feet in order to avoid the build-up of excessive lateral pressures.
 - a. Over-compaction of fill near walls should be avoided.
4. Compaction within 5 feet of the walls shall be accomplished using hand-operated equipment.
5. The maximum particle size of granular material placed against buried structures shall be limited to no greater than 1-1/2-inch diameter.
6. Structural fill backfill material shall be brought up on all sides of the walls and footings in such a manner as to avoid adverse differential lateral earth pressures on the vertical surfaces.
 - a. For moderate- to heavy-weight compactors, a maximum loose lift thickness of 12 inches may be used upon successful demonstration to the Engineer of CONTRACTORS means and methods in achieving compliance with the installed moisture and density requirements.
 - b. For hand-operated or small compactors, a maximum loose lift thickness of 8 inches shall be used.
7. Particular care must be taken to avoid damage to the pipe connections.
8. Compact to 95 percent of standard Proctor density \pm 2% optimum moisture content, ASTM D698, unless otherwise specified or shown in the Drawings.

PART 4 FIELD QUALITY CONTROL

- A. Provide under provisions of Section 01 45 00 for field inspections and testing
- B. All fill, embankment material, and backfill must comply with the requirements of these specifications and be approved by Engineer prior to placement
- C. The OWNER shall pay for all initial field and laboratory testing, to determine compliance of earthwork materials and compaction in accordance with this Section and Section 01 45 00. All retests due to initial failed test shall be paid for by the CONTRACTOR,
- D. Contractor to coordinate all tests necessary to demonstrate compliance of native and import materials with these specifications
- E. Geotechnical testing services shall test and inspect all subgrades and fill layers before further construction work is performed.
- F. Fills and Embankment:
 - 1. One initial gradation test for each type of material plus (1) one additional test for every 1000 cubic yards of each material
 - 2. One initial Atterberg limits tests for each type of material plus (1) one additional test for every 1000 cubic yards of each material
 - 3. One initial swell test for each type of imported structural fill material plus (1) one additional test for every 1000 cubic yards of each material
 - 4. One moisture-density relationship test for every 250 cubic yards, ASTM D1557, on each type of fill material placed
 - 5. One moisture-density relationship test for every 250 cubic yards, ASTM D698, on each type of fill material placed
 - 6. One in-place compaction test for each 2000 sf and every 1.5 feet of vertical lift of material placed, ASTM D2922/D3017 or ASTM D1556 as directed by Engineer
 - 7. Ten (10) additional in-place compaction tests at the discretion of the Engineer, ASTM D2922/D3017 or ASTM D1556 as directed by Engineer

END OF SECTION

SECTION 31 23 24 - FLOWABLE FILL

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes flowable lean concrete mix used for structure backfill, utility bedding and backfill and other subgrade Site Work. Applications also include filling abandoned structures and utilities that remain in place.
- B. Section Includes:
 - 1. Structure backfill
 - 2. Utility bedding
 - 3. Utility backfill
 - 4. Filling abandoned utilities

1.2 RELATED SECTIONS

- A. Section 33 11 50 - Existing Pipe Abandonment
- B. Section 31 23 16 - Excavation
- C. Section 31 23 17 - Trenching
- D. Section 31 23 23 - Fill
- E. Section 33 11 10 - Water Utility Distribution and Transmission Piping
- F. Section 33 31 10 - Sanitary Utility Sewerage Piping
- G. Section 33 41 10 - Storm Utility Piping

1.3 DEFINITIONS

- A. Flowable Fill: Also referred to as Controlled Low Strength Material (CLSM) elsewhere in the Specifications. Lean cement concrete fill.
- B. Utility: Any buried pipe, duct, conduit, manhole, tank, or cable.
- C. Batching: Weighing or volumetrically measuring the ingredients for a batch of cement and introducing the materials into the mixer.
- D. Mixing: The blending of the batched materials to achieve a uniform distribution of all ingredients as well as a uniform appearance of the cement.
- E. Transporting: Conveyance of the mixed cement from the discharge of the mixer to the point of placement.

- F. Placing: The act of depositing cement including the preparation of formwork or other surfaces to which the deposited cement will be placed against, consolidation, and finishing.
- G. Curing: The act of controlling moisture conditions within cement after placement to achieve the design strength and required finish conditions of the cement.

1.4 REFERENCE STANDARDS

A. American Concrete Institute

1. ACI 214 — Recommended Practice for Evaluating Compression Test Results of Field Concrete
2. ACI 304 — Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete
3. ACI 305/305R — Hot Weather Concreting
4. ACI 306/306R — Cold Weather Concreting
5. ACI 308 — Standard Practice for Curing Concrete
6. ACI 347 — Recommended Practice for Concrete Formwork

B. ASTM International (ASTM):

1. ASTM C33 — Concrete Aggregates
2. ASTM C39 — Test Method for Compressive Strength of Cylindrical Concrete Specimens
3. ASTM C138 — Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
4. ASTM C143 — Test Method for Slump of Hydraulic Cement Concrete
5. ASTM C150 — Standard Specification for Portland Cement
6. ASTM C173 — Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
7. ASTM C260 — Air Entraining Admixtures for Concrete
8. ASTM C332 — Standard Specification for Lightweight Aggregates for Insulating Concrete

9. ASTM C403 — Standard Specification for Penetration Resistance
10. ASTM C494 — Chemical Admixtures for Concrete
11. ASTM C495 — Standard Test Method for Compressive Strength of Lightweight Insulating Concrete
12. ASTM C618 — Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
13. ASTM D4832 — Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders
14. ASTM D5971 — Standard Practice for Sampling Freshly Mixed Controlled Low-Strength Material
15. ASTM D6023 — Standard Test Method for Density (Unit Weight), Yield, Cement Content, and Air Content (Gravimetric) of Controlled Low-Strength Material (CLSM)

1.5 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00.
 1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- A. Product Data: Submit sufficient data to verify compliance with specifications to include all materials and accessories including but not limited to:
 1. Cement
 2. Fly Ash
 3. Aggregate
 4. Accelerator Admixture
 5. Water Reducer Admixture
 6. Air Entrainment Admixture
- B. Design Data:
 1. Mix Design: For each mix design to be provided.

- a. Range of slump
 - b. Water added (gallons per cubic yard and total)
 - c. Cement added (lbs., cubic yards and total) and location of manufacture
 - d. Fly ash added (lbs., cubic yards and total) and location of manufacture
 - e. Specific gravity, gradation and soundness of each aggregate
 - f. Ratio of fine to total aggregate
 - g. Saturated surface dry weight of each aggregate (lbs. per cubic yard and total)
 - h. Dry unit weight of each aggregate (lbs. per cubic yard)
 - i. Water to cement ratio and tolerance
 - j. Admixture, active chemical ingredients and quantity (ounces per yard and total)
 - k. Air content and tolerance
 - l. Flowability
 - m. Compressive strength, 7, 28 and 200 days (lbs. per square inch)
 - n. Time of initial set (minutes)
- C. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading (i.e. delivery tickets).
- D. Manufacturer's Field Reports
- 1. Field Test Procedure: Test procedure to be submitted prior to conducting the test. Include forms for data collection, description of all sample collections, and analyses required
 - 2. Field Test Report:
 - a. Provide reports detailing results of the tests. Indicate compliance or non-compliance with Contract Documents. Identify corrective action for materials which fails to pass field tests

1.6 QUALITY ASSURANCE

- A. Manufacturer qualifications: A qualified ready mix manufacturer whose work has resulted in successful controlled low strength material production.
 - 1. Professional membership: Manufacturer shall be a member in good standing of either the National Ready Mixed Concrete Association or the Portland Cement Association.
 - 2. Experience: 5 years' successful experience in the manufacture of controlled low strength material for similar installation and quantity to this project.
 - 3. Maintenance proximity: Not more than 2 hours' normal travel time from Manufacturer's place of business to Project site.
 - 4. State and local licensed, commercial.
- B. Quality control testing qualifications: A third party independent testing firm to provide on-site and laboratory testing services.
 - 1. Personnel qualifications:
 - a. ACI level 2
 - 2. 5 years' experience and capable of conducting the testing indicated and that specializes in types of tests to be performed.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Coordinate with Contractor's work requiring access to site and staging areas to be provided.
 - 1. No trucking or moving of equipment or materials shall be permitted over revegetated areas.
- B. Weather limitations:
 - 1. Proceed with installation only when existing and forecasted weather conditions permit batching, placement and curing to be performed.
 - 2. Do not place controlled low strength material when the actual or anticipated evaporation rate equals or exceeds 0.2 lbs. per sq. ft. per hour as determined from ACI 305, Fig 2.1.4.
 - 3. Temperatures at time of placement shall be 35 degrees Fahrenheit and rising.
 - 4. Do not place on frozen subgrade.

5. Do not place when temperatures of 32 degrees Fahrenheit or lower are anticipated to occur before the initial set of the material, unless cold weather protection is provided per ACI 306/306R.
6. Perform work during favorable weather conditions according to manufacturer's written instructions and the requirements of ACI.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements before installing flowable fill to establish quantities required to complete the Work.

PART 2 PRODUCTS

2.1 CONTROLLED LOW STRENGTH MATERIAL

- A. Materials:
 1. Cement: Type II, ASTM C150
 2. Fly Ash: Class F, ASTM C618, except maximum loss on ignition not more than 5 percent
 3. Aggregates:
 - a. Fine Aggregate, ASTM C33
 - b. Coarse Aggregate, ASTM C33
 4. Water: Clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials, chloride ion, or other substances that may be deleterious to concrete, ASTM C 94
 5. Admixtures: Free of Calcium Chloride, ASTM C494
 - a. Acceleration: High range water reducer
 - b. Retarder: Type D; Grace "Daratard-HC," Master Builders "MC-HC," Protex "Protard," Sika Chemical "Plastiment," or equal
 - c. Plasticizer: Type A; Grace "WRD A-HC," Sika Chemical "Plastocrete," or equal
 - d. Air entraining agent (AEA): ASTM C260; Grace "Darex AEA," Master Builders "MasterAir VR 10," Protex "AES," Sika Chemical "AEK," or equal
- B. Proportions:

C. Flowable Backfill: Regular or quick set:

<u>Component</u>	<u>Regular Flowable Fill</u>	<u>Quick Set Flowable Fill</u>
Cement (Type II)	100 lbs.	50 lbs.
Fly Ash (Class F)	-0- lbs.	80 lbs.
Sand	1,845 lbs.	1,600 lbs.
Rock/Limestone	1,700 lbs.	1,755 lbs.
Water	417 lbs.	417 lbs.
Accelerator (Pozz. 20)	-0- oz	23-1/2 oz
AEA	-0- oz	45 oz

1. Maximum desired 28-day strength: 100 psi
2. Minimum desired 20-day strength: 50 psi
3. Batch plant mix design based on per cubic yard
4. Sand: AASHTO M6
5. Rock/Limestone: AASHTO No. 57 or 67

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of conditions:

1. Character and quantity of material:
 - a. Verify character of the subgrade and materials that will support, be encased by, filled with or otherwise come into contact with the controlled low strength material.
 - b. Determine quantity of material, and cost thereof, required for fills. Include in cost of work to be performed.
 - c. Include wasting of excess material, if required, in cost of work to be performed.
2. Examine the areas and conditions under which work will be performed.
3. Prior to beginning the work of this section, correct conditions detrimental to timely and proper completion of the work.
4. Areas to receive the controlled low strength material shall be free of standing water prior to placement.

5. Items to be encased shall be stabilized and secured prior to placement of the controlled low strength material.
6. Contractor shall take all precautions necessary to prevent, and shall be responsible for, floating of items that are to be encased with the controlled low strength material.

3.2 PREPARATION

A. General:

1. Prior to placing controlled low strength material:
 - a. Assure that all forms are installed, secured, prepared and are ready to receive the material.
 - b. Assure that high points are provided with air release vents.
 - c. Clean all trash, debris and deleterious material from the area that the material will be placed as well as the site of the work.

B. Soil:

1. Soil shall be prepared in accordance with Specification 31 23 16 and Specification 31 23 17 prior to placement of controlled low strength material.

C. Structures

1. Do not place controlled low strength material against walls until:
 - a. Walls have been cast full height of structure and concrete has reached the specified strength.
 - b. Connecting slabs and beams have been cast, and concrete has reached the specified strength.
2. Do not place controlled low strength material on top of buried structures until:
 - a. Concrete has reached full strength.
3. After inspection of foundation, walls, and pipes, place controlled low strength material symmetrically around structures to prevent eccentric loading of structures.
4. Place material on top of structure to prevent excessive point loading that exceeds the loading capacity of the structure.

- a. Contractor is responsible for damage to structures due to improper placement of materials.
- D. Structures, Manholes and Vaults to be abandoned in place
- 1. Flush, Drain and remove contents from structures prior to placing controlled low strength material.
 - 2. Remove obstructions, valves and appurtenances that are not to be abandoned in place.
 - 3. Provide and install materials and appurtenances necessary to plug holes and facilitate the placement of the controlled low strength material.
 - 4. Install air release devices at all high points to ensure that voids are not formed within piping during or after placement of controlled low strength material.

3.3 BATCHING AND DELIVERY

- A. Material shall be batched and delivered in accordance with AASHTO M157-86, Sections 8 through 11 except that the temperature requirements on 11.8 and 11.9 shall be waived.
- B. Water and admixture addition on the jobsite is permitted. The amount of water and admixture added shall be recorded. The controlled low strength material shall be mixed for a minimum of 30 revolutions after each addition of water or admixture. All additions shall be made prior to placing the controlled low strength material.

3.4 PLACEMENT

- A. Place in accordance with ACI 229R-99 Section 6.4, except as modified by this specification.
- B. Notify Engineer not less than 24 hours in advance of the times and places at which contractor intends to place controlled low strength material.

3.5 FIELD QUALITY CONTROL

- A. General
 - 1. Testing services shall be provided in conformance with ACI 301, 1.6.4.3 Concrete Construction Inspector Level II.
 - 2. Certification for technician and laboratory will be submitted to Engineer.
 - 3. Tests shall be performed in the presence of Engineer

4. Provide all equipment, supplies, and the services of one or more employees, as required.
 5. The test frequencies specified are minimum. Additional tests may be performed as required by the job conditions.
- B. Batch Records
1. Certified batch report for the plant shall have been performed within the last 2 years and shall be submitted.
 2. A batch ticket shall be generated and delivered with each truck and each batch that is produced from an on-site batching facility. A copy of each ticket shall be provided to the on-site QA/QC technician, the Owners representative and a copy submitted to the Engineer.
- C. Sampling:
1. Sampling shall be performed in accordance with ASTM D5971.
- D. Tests:
1. Confirmation tests:
 - a. Contractor's responsibilities:
 - 1) Control operations by confirmation tests to verify that work complies, and is complying at all times, with requirements specified in this Section concerning proportioning, batching, mixing, quality control, and testing.
 - 2) Cost of initial tests and initial mix design: Paid for by the Owner. Retests and subsequent mix designs shall be paid for by the CONTRACTOR.
 - 3) Qualifications of Contractor's testing laboratory: Perform confirmation testing by testing personnel and laboratory acceptable to the Engineer.
 - 4) Copies of confirmation test reports: Submit promptly to the Engineer.
 - b. Frequency of confirmation testing:
 - 1) Perform testing not less than the following:
 - a) Flowability:
 - (1) Testing shall comply with ASTM D6103

(2) Frequency: 1 per truck, 1 per batch and 1 per every 50 cubic yards of material placed, minimum

b) Slump:

(1) Testing shall comply with ASTM C143 and ASTM C39

(2) Frequency: 1 per truck, 1 per batch and 1 per every 50 cubic yards of material placed, minimum

(3) Once consistency of quality has been established, testing requirements may be reduced as directed by the Engineer

c) Unit Weight:

(1) Testing shall comply with ASTM D6023

(2) Frequency: 1 per truck, 1 per batch and 1 per every 50 cubic yards of material placed, minimum

d) Air content:

(1) Testing shall comply with ASTM D6023

(2) Frequency: 1 per truck, 1 per batch and 1 per every 50 cubic yards of material placed, minimum

(3) Once consistency of quality has been established, testing requirements may be reduced as directed by the Engineer

e) Ambient Air Temperature:

(1) Testing shall comply with ASTM C143 and ASTM C39

(2) Frequency: 1 per truck, 1 per batch and 1 per every 50 cubic yards of material placed, minimum

f) Controlled Low Strength Material Temperature:

(1) Testing shall comply with ASTM C143 and ASTM C39

(2) Frequency: 1 per truck, 1 per batch and 1 per every 50 cubic yards of material placed, minimum

c. Compression tests:

1) Testing shall comply with ASTM D4832

- 2) Make one set of 6 cylinders each day when up to 50 cu yds have been placed
 - 3) Make one additional set of 6 cylinders for each additional 50 cu yds or each major pour placed in one day
 - 4) Test two cylinders in each set at 7 days
 - 5) Test two cylinders in each set at 28 days
 - 6) The other two cylinders to be used as directed by Engineer at any time
 - 7) Engineer will evaluate in accordance with ACI 214 and 318
 - 8) Mark or tag each set of test cylinders with the date and time of day the cylinders were made, the location in the work where the concrete represented by the cylinders was placed, the delivery truck or batch number, the air content, and the slump
- d. Storage facilities for concrete test cylinders:
- 1) Including water necessary, a specially prepared box with high-low thermometer and thermostatically controlled heating devices in accordance with ASTM D4832
2. Retesting:
- a. Contractor bears the costs of retesting required to confirm and verify that remedial work has brought the work to within specified requirements.

END OF SECTION

SECTION 31 50 00 - EXCAVATION SUPPORT AND PROTECTION

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes shoring and support systems of all types necessary to protect existing utility facilities and new utility facilities.
- B. The Contractor is responsible for the selection and design of excavation support systems and the design of utility support systems in conformance with Federal, State, and City requirements and the minimum design criteria specified herein.
- C. Temporary shoring is to be installed for protection of the existing trees to remain, structures to remain, buried utilities to remain, adjacent roadways and walkways, and surrounding properties.
- D. Care must be taken during the planning and construction of earth support systems to minimize settlements and displacements of the shoring system itself and to surrounding properties.

1.2 RELATED SECTIONS

- A. Section 31 23 16, Excavation
- B. Section 31 23 17, Trenching
- C. Section 31 23 19, Dewatering
- D. Section 31 23 23, Fill
- E. Section 33 31 10, Sanitary Utility Sewerage Piping
- F. Section 33 11 10, Water Utility Distribution and Transmission Piping.
- G. Section 33 41 10, Storm Utility Drainage Piping

1.3 DESIGN CRITERIA

- A. Design excavation support systems and all components to support the earth pressures, unrelieved hydrostatic pressures, utility loads, equipment, traffic, railroad, and construction loads including impact, and other surcharge loads in such manner as will allow the safe and expeditious construction of the permanent structures to minimize ground movement or settlement, and to prevent damage to adjacent structures, roadways, railroads, and utilities.
- B. Design support members to resist the maximum loads expected to occur during the excavation and support removal stages.
- C. Design system so that water seepage is minimized. Provide dewatering and positive means for preventing sloughing and containing material behind lagging.

- D. Design system to prevent sloughing and to contain running sand and silt behind the lagging.
- E. Vertical support capacity shall be provided for wall systems and internal bracing elements for loads due to vertical force components and live loads on any portion of the system.

1.4 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00.
 - 1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- B. Excavation Support Systems
 - 1. Plans and details for trench and excavation support systems.
 - a. Shop drawings and supporting calculations shall meet the specified design criteria requirements and include the following:
 - 1) Arrangement, size, and details for individual excavation support system.
 - 2) Construction methods and sequencing to be used for the installation and removal of each excavation support system.
 - 3) Contingency plan for alternative procedures to be implemented if the excavation support system is found to perform unfavorably or if obstructions are encountered in the installation.
 - 2. Provide for Engineer review prior to the beginning of construction activities requiring such systems.
 - 3. No excavations shall be started until the submittal review is complete.
 - 4. Review by the Engineer of the submitted design shall not be construed as a detailed analysis of the adequacy of the support system, nor shall any provisions of the above requirements be construed as relieving overall responsibility and liability for the work.

1.5 QUALITY ASSURANCE

- A. Contractor is solely responsible for quality assurance of temporary shoring.

- B. At each excavation support system location, provide the following:
 - 1. Continual verification system is planned, executed, and maintained in accordance with applicable codes, regulations, and good construction practice.
 - 2. Systematic observation of suitability of shoring materials.
 - 3. Installation, excavation, settlement, and lateral deflection monitoring.
 - 4. Groundwater control.
 - 5. Adjacent construction activities.
 - 6. Other factors, as necessary.

1.6 CONTRACTOR QUALIFICATIONS

NOT USED.

1.7 PERMITTING

- A. Secure all permits necessary to complete the requirements of this Section.

PART 2 PRODUCTS

2.1 GENERAL

- A. Materials and equipment shall be safe and in good condition and shall conform to local, state, and federal codes.

PART 3 EXECUTION

3.1 GENERAL

- A. Provide sheeting, shoring, and other protection and support systems wherever required, in accordance with current local, state, and federal laws, codes, and ordinances.
- B. The Contractor is solely responsible for excavation protection and worker safety.
- C. The Contractor shall be solely responsible for the protection of existing utilities and structures. Under no circumstance shall work threaten the integrity (physical and operational) of these utilities and/or structures.

3.2 EXCAVATION SUPPORT SYSTEMS

- A. Provide proper and substantial sheeting, shoring, and bracing, as required, to prevent caving or sliding, to protect workmen and the Work, and to protect existing structures and facilities
- B. Water control measures shall be provided at all times in accordance with the requirements specified in Section 31 23 19, Dewatering.
- C. Design and build sheeting, shoring, and bracing to withstand all loads that might be caused by earth movement or pressure, and to be rigid, maintaining shape and position under all circumstances. Shoring shall be designed by a licensed professional engineer in the State of Colorado
- D. Do not brace sheeting left in place against the pipe, but support it in a manner that precludes concentrated loads or horizontal thrusts on pipe
- E. Cross braces installed above the pipe to support sheeting may be removed after pipe embedment is completed
- F. A company representative from the excavation support system shall be onsite during initial setup of the system. Install excavation support system in strict conformance with the representative's recommendations.

3.3 CONTINGENCY PLAN IMPLEMENTATION

- A. Excess movements or settlements: Work shall be stopped immediately and the causes of excess or detrimental movements evaluated if:
 - 1. Damage is noted to existing site features or surrounding properties.
 - 2. Shoring wall movements exceed the limits specified herein or per submitted calculations.
- B. Immediately notify the Engineer and begin the implementation of the approved contingency plan to mitigate the effects of settlement or movement occurred.

3.4 REMOVAL OF SUPPORT SYSTEMS

- A. Do not pull trench sheeting before backfilling unless pipe strength is sufficient, to carry trench loads based on trench width to the back of sheeting
- B. Removal of excavation support systems shall be performed in a manner that does not disturb or damage adjacent new or existing structures or utilities.
- C. Fill all voids immediately with specified backfill material.

- D. All damage to property resulting from removal shall be promptly repaired at no cost to the OWNER. The Engineer shall be the sole judge as to the extent and determination of the methods and materials for repair.

END OF SECTION

SECTION 32 11 23 - AGGREGATE BASE COURSES

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes construction of an aggregate subbase and base course for placement under asphalt or concrete paving, unit paving, or placed and left exposed.
- B. Section Includes:
 - 1. Aggregate subbase
 - 2. Aggregate base course

1.2 RELATED REQUIREMENTS:

- A. Section 31 05 16 - Aggregates for Earthwork
- B. Section 31 22 13 - Rough Grading
- C. Section 31 23 17 - Trenching
- D. Section 31 23 23 - Fill
- E. Section 32 12 16 - Asphalt Paving

1.3 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO M288 - Standard Specification for Geotextile Specification for Highway Applications
 - 2. T11, Standard Method of Test for Materials Finer Than 75 μ m (No. 200) Sieve in Mineral Aggregates by Washing
 - 3. T27, Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates
 - 4. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
 - 4. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
- B. ASTM International (ASTM):
 - 1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))

1. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))

1.4 DEFINITIONS

- A. Completed Course: Compacted, unyielding, free from irregularities and standing water, with smooth, tight, even surface, true to grade, line, and cross-section.
- B. Completed Lift: Compacted with uniform cross-section thickness.
- C. Keystone: Fine aggregate used to aid in binding of loose surface stone.

1.5 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00.
 1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- A. Product Data:
 1. Submit sufficient data to verify compliance with specifications to include all materials and accessories including but not limited to:
 2. Submit data for geotextile fabric and herbicide.
- B. Manufacturer's Shop Test Reports
 1. Submit certified copies of shop test reports at least 10 days before delivery of materials
 2. Reports shall include:
 - a. Source of supply for each material
 - b. Description of material tested
 - c. Date of sampling
 - d. Date of testing
 - e. Test procedure used
 - f. Results of testing performed
 - g. At a minimum provide graphs for all moisture density curves and swell tests
 3. Submit reports for the following materials tests for each material and source proposed to be used:

- a. Graded gravel
 - 1) Gradation
 - 2) Atterberg Limits
 - 3) USCS Classification
- b. Crushed granular base
 - 1) Gradation
 - 2) Atterberg Limits
 - 3) USCS Classification
 - 4) Unit Weight
 - 5) R-Value
- C. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading.
- D. Manufacturer's Field Reports
 - 1. Field Test Procedure:
 - a. Test procedure to be submitted prior to conducting the test. Include forms for data collection, description of all sample collections, and analyses required
 - 2. Field Test Report:
 - a. Provide reports detailing results of the tests. Indicate compliance or non-compliance with Contract Documents. Identify corrective action for materials which fails to pass field tests

1.6 QUALITY ASSURANCE

- A. Furnish each aggregate material from single source throughout the Work.

PART 2 PRODUCTS

2.1 SHOULDER AGGREGATE

- A. Of the size shown on the Plans.
- B. Coarse Aggregate: Type A1, Dense-Graded Aggregate as specified in Section 31 05 16, Aggregates for Earthwork.

2.2 CRUSHED GRANULAR BASE AGGREGATES

- A. Of the size shown on the Plans.
- B. Type A5, as specified in Section 31 05 16, Aggregates for Earthwork.

2.3 SOURCE QUALITY CONTROL

- A. Perform tests necessary to locate acceptable source of materials meeting specified requirements.
- B. Final approval of aggregate material will be based on test results of installed materials.
- C. Should separation of coarse from fine materials occur during processing or stockpiling, immediately change methods of handling materials to correct uniformity in grading.

2.4 EQUIPMENT

- A. Compaction Equipment: Adequate in design and number to provide compaction and to obtain specified density for each layer.

2.5 ACCESSORIES

- A. Geotextile Fabric: AASHTO M288; non-woven, polypropylene.

PART 3 EXECUTION

3.1 SUBGRADE PREPARATION

- A. Obtain Engineer's acceptance of subgrade before placing base course or surfacing material.
- B. Verify compacted substrate is dry and ready to support paving and imposed loads.
 - 1. Proof roll substrate with equipment approved by the Engineer in minimum two perpendicular passes to identify soft spots.
 - 2. Remove soft substrate and replace with compacted fill as specified in Section 31 23 23.

3.2 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

- B. Do not place base course or surfacing materials in snow or on soft, muddy, or frozen subgrade.

3.3 HAULING AND SPREADING

A. Hauling Materials:

1. Do not haul over surfacing in process of construction.
2. Loads: Of uniform capacity.
3. Maintain consistent gradation of material delivered; loads of widely varying gradations will be cause for rejection.

B. Spreading Materials:

1. Distribute material to provide required density, depth, grade, and dimensions with allowance for subsequent lifts.
2. Produce even distribution of material on prepared surface without segregation.
3. Should segregation of coarse from fine materials occur during placing, immediately change methods of handling materials to correct uniformity in grading.
4. Maintain consistent gradation of material. Widely varying gradation will be cause for rejection.

3.4 CONSTRUCTION OF COURSES

A. Untreated Aggregate Base Course:

1. If the required compacted depth of the base course exceeds 6 inches, construct it in two or more layers of nearly equal thickness. The maximum compacted thickness of any one layer shall not exceed 6 inches.
2. Completed Course Total Thickness: As shown on the Plans, 8-inch minimum.
3. Spread lift on preceding course to required cross-section. Place each layer in spreads as wide as practical and to the full width of the course before a succeeding layer is placed.
4. Lightly blade and roll surface until thoroughly compacted.
5. Add keystone to achieve compaction and as required when aggregate does not compact readily due to lack of fines or natural cementing properties, as follows:
 - a. Use 3/4-inch leveling course or surfacing material as keystone.

- b. Spread evenly on top of base course, using spreader boxes or chip spreaders.
 - c. Roll surface until keystone is worked into interstices of base course without excessive displacement.
 - d. Continue operation until course has become thoroughly keyed, compacted, and will not creep or move under roller.
6. Blade or broom surface to maintain true line, grade, and cross-section.
- B. Gravel Surfacing and Leveling Course:
1. Place shoulder aggregates in a single layer, or two or more layers of nearly equal thickness. The maximum compacted thickness of any one layer shall not exceed 9 inches.
 2. Spread on preceding course in accordance with cross-section shown.
 3. Blade lightly and roll surface until material is thoroughly compacted.
 4. Complete Total Thickness: As shown on the Plans, 8-inch minimum.

3.5 ROLLING AND COMPACTION

- A. Commence compaction of each layer of base immediately after spreading operations
- B. Compact to 95 percent of modified Proctor density within 2 percent (+/-) optimum moisture content, ASTM D1557
- C. Roll each layer of material until there is no appreciable reaction or yielding under the compactor before succeeding layer is applied.
- D. Shape and maintain the surface of each layer during compaction operations. Commence rolling at outer edges and continue toward center; do not roll center of road first.
- E. Apply water as needed to obtain specified densities.
- F. Place and compact each lift to the required density before succeeding lift is placed.
- G. Surface Defects: Remedy by loosening and rerolling. Reroll entire area, including surrounding surface, until thoroughly compacted.
- H. Finished surface shall be true to grade and crown before proceeding with surfacing.

3.6 SURFACE TOLERANCES

- A. Blade or otherwise work surfacing as necessary to maintain grade and cross-section at all times, and to keep surface smooth and thoroughly compacted.
- B. Finished Surface of Untreated Aggregate: Within plus or minus 0.04-foot of grade shown at any individual point.
- C. Overall Average: Within plus or minus 0.04-foot from crown and grade specified.

3.7 FIELD QUALITY CONTROL

- A. Provide under provisions of Section 01 45 00 for field inspections and testing
 - 1. Contractor shall coordinate and schedule all tests to determine compliance of materials in accordance with the specifications
 - 2. The OWNER shall pay for all initial inspections, field and laboratory testing except for proofrolling, to determine compliance of materials in accordance with this Section and Section 01 45 00. All reinspections and retests due to initial failed test shall be paid for by the CONTRACTOR,
- B.
- C. Geotechnical testing services provided by OWNER shall test and inspect all subgrades and fill layers before further construction work is performed. All reinspections and retests due to initial failed test shall be paid for by CONTRACTOR.
- D. Contractor shall provide, pay for and perform proofrolling.
- E. Paving:
 - 1. One initial gradation test for crushed granular base plus (1) one additional test for every 500 cubic yards of material placed
 - 2. One initial Atterberg limits tests for crushed granular base plus (1) one additional test for every 500 cubic yards of material placed
 - 3. One moisture-density relationship test for every 250 cubic yards, ASTM D1557, on each type of fill material placed
 - 4. One in-place compaction test every 5,000 square feet of paving and at every 1.0 feet of vertical lift of each backfill material, ASTM D2922/D3017 or ASTM D1556 as directed by Engineer
 - 5. One R-value test for crushed granular base plus (1) one additional test for every 500 cubic yards of material placed, ASTM D2844

6. Proof Roll test of entire surface area for all subbase and base courses
7. Five (5) additional in-place compaction tests at the discretion of the Engineer, ASTM D2922/D3017 or ASTM D1556 as directed by Engineer

END OF SECTION

SECTION 32 12 16 - ASPHALT CONCRETE PAVEMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aggregate base and asphaltic concrete paving for paving new roadways and patching existing asphalt roads

1.2 RELATED SECTIONS

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section:
- B. Section 01340—Shop Drawings, Product Data, and Samples
- C. Section 01400—Quality Control
- D. Section 01700—Contract Closeout
- E. Section 02200-Earthwork
- F. Section 03000-Concrete

1.3 REFERENCE STANDARDS

- A. ASTM C29 – Unit Weight and Voids in Aggregate
- B. ASTM C88 – Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
- C. ASTM C117 – Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing
- D. ASTM C128 – Specific Gravity Test and Absorption of Fine Aggregate
- E. ASTM C131 – Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- F. ASTM C136-Sieve or Screen Analysis of Fine and Coarse Aggregates
- G. ASTM D4 – Bitumen Content
- H. ASTM D5 – Penetration of Bituminous Materials
- I. ASTM D70 – Specific Gravity of Semi-Solid Bituminous Materials

- J. ASTM D93 – Flash Point by Pensky-Martens Closed Tester
- K. ASTM D113 – Ductility of Bituminous Materials
- L. ASTM D1188 – Bulk Specific Gravity of Compacted Bituminous Mixtures
- M. ASTM D1559 – Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
- N. ASTM D2041-Theoretical Maximum Specific Gravity of Bituminous Paving Mixtures
- O. ASTM D2170 – Kinematic Viscosity of Asphalts (Bitumens)
- P. ASTM D2172 – Quantities Extraction of Bitumens from Bituminous Paving Mixtures
- Q. ASTM D2419 – Sand Equivalent Value of Soils and Fine Aggregate
- R. ASTM D290 – Bituminous Mixing Plant Inspection
- S. ASTM D946 – Asphalt Cement for Use in Pavement Construction
- T. ASTM D692 – Course Aggregate for Bituminous Paving
- U. ASTM D1073 – Fine Aggregate for Bituminous Paving Mixtures
- V. ASTM D2026 – Cutback Asphalt (Slow-Curing Type)
- W. ASTM D2027 – Cutback Asphalt (Medium-Curing Type)
- X. ASTM D2028 – Cutback Asphalt (Rapid-Curing Type)
- Y. MS-2-Mix Design Method for Asphalt Concrete and Other Hot Mix Types -The Asphaltic Institute (AI)
- Z. State of Colorado, Department of Transportation (CDOT): State Department of Highways Standard Construction Specifications for Road and Bridge Construction, Latest Edition

1.4 DEFINITIONS (NOT USED)

1.5 SYSTEM DESCRIPTION (NOT USED)

1.6 PERFORMANCE AND DESIGN REQUIREMENTS (NOT USED)

1.7 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00. At the time the first submittal is made

under this section, include the addresses and phone numbers of nearest manufacturer's representative

1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- B. Product Data: Data: Submit sufficient data to verify compliance with specifications to include materials, assemblies, and accessories including but not limited to:
1. Asphaltic Cement
 2. Tack Coat
 3. Pavement Marking
- C. Design Data:
1. Contractor to coordinate representative sampling and delivery of samples of each material in each mix design by the approved independent testing agency and submit representative samples of each material in each mix design to independent testing agency so that laboratory testing and job-mix design can be prepared for asphaltic concrete paving and machine calibrations
 2. Submit laboratory reports for the following materials tests:
 3. Coarse and fine aggregate from each material source and each required grading:
 - a. Sieve analysis: ASTM C136 (AASHTO T19)
 - b. Unit weight of slag: ASTM C29 (AASHTO T19)
 - c. Soundness: ASTM C88 (AASHTO T104)
 - d. Sand equivalent: ASTM D2419 (AASHTO T176)
 - e. Abrasion of coarse aggregate: ASTM C131 (AASHTO T96)
 4. Asphalt cement for each penetration grade
 - a. Penetration: ASTM D5 (AASHTO T49)
 - b. Viscosity (Kinematic): ASTM D2170 (AASHTO T201)
 - c. Flash Point: ASTM D93 (AASHTO T48)
 - d. Ductility: ASTM D113 (AASHTO T51)
 - e. Solubility: ASTM D4 (AASHTO T44)
 - f. Specific gravity: ASTM D70 (AASHTO T43)
 - g. Performance Graded Asphalt Binder – AASHTO MP-1, CDOT table 702-1
 - h. Liquid Asphalt - AASHTO M81, M82; ASTM D2026
 - i. Emulsified Asphalt - AASHTO M140
 - j. Compaction - AASHTO T230
 - k. Stability and Flow - AASHTO T245
 - l. Hydrated Lime – ASTM C207, Type N
 - m. Mineral Fillers – AASHTO M17

5. Job-mix design mixtures for each material or grade:
 - a. Bulk specific gravity for fine aggregate: ASTM C128 (AASHTO T84)
 - b. Asphalt Content – CP-L 5120
 - c. Gradation – CP-31A, 31B
 - d. Fractured Faces and Void Content of Fine Aggregate – CP-45
 - e. Maximum Theoretical specific Gravity (Rice) – CP-51
 - f. Air Voids – CP-L 5115
 - g. Voids in Mineral Aggregate – CP-48
 - h. Lottman Stability – CPL-5109
 - i. Superpave Gyration, N_{DESIGN}
 6. Uncompacted asphalt concrete mix: Maximum specific gravity ASTM D2041 (AASHTO T209)
 7. Compacted asphalt concrete mix:
 - a. Bulk density: ASTM D1188 (AASHTO T166)
 - b. Marshall stability and flow: ASTM D1559
 8. Density and void analysis:
 - a. Provide each series of asphalt concrete mixture test specimens, in accordance with MS-2
 - b. Use Marshall method of mix design unless otherwise directed or acceptable to Engineer
- D. Manufacturer’s Shop Test Reports
1. Submit certified copies of shop test reports for each material sampled and tested as a part of the job mix design at same time as Design Data submittal
 2. Reports shall include:
 - a. Source of supply for each material
 - b. Description of material tested
 - c. Date of sampling
 - d. Date of testing
 - e. Test procedure used
 - f. Results of testing performed
- E. Certificates:
1. Manufacturer’s qualifications
 2. Asphalt plant inspection ASTM D290
- F. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading.

G. Manufacturer's Field Reports

1. Field Test Procedure: Test procedure to be submitted prior to conducting the tests. Include forms for data collection, description of all sample collections, and analyses required
2. Field Test Report: Provide reports detailing results of the tests. Indicate compliance or non-compliance with Contract Documents. Identify corrective action for materials which fails to pass field tests

H. Warranty

1. Materials and Defect's Warranty: submit warranty in accordance with warranty requirements herein. Submit warranty in accordance with requirements of Section 01600

3.8 QUALITY ASSURANCE

- A. Comply with all applicable requirements of local, county and other applicable regulatory agencies
- B. Comply with the applicable provisions of the Colorado Department of Transportation (CDOT) "Standard Specifications for Road and Bridge Construction" in accordance with hot mix asphalt pavement, except as specified herein

3.9 DELIVERY, STORAGE, AND HANDLING

- A. Transport mixture from mix plant in trucks with tight, clean, non-sticking compartments
- B. Coat hauling compartments with lime-water mixture to prevent sticking:
 1. Elevate and drain compartment of excess solution before loading mix
- C. Cover to protect from weather and prevent loss of heat when temperature is below 50 degrees F
- D. Provide insulated truck beds during temperature below 50 degrees F on long distance deliveries
- E. Contractor shall keep record of time and date of placement, temperature, and weather conditions.
- F. Provide a daily copy to Resident Representative and retain until completion and furnish copy to Engineer.

- G. Batch tickets from hot mix plant shall be sent out with each load produced that day with one copy provided daily to Resident Representative at the time of delivery. Batch tickets shall note, at a minimum, the following items:
 - 1. Mix identification
 - 2. Time batched
 - 3. Mass in load
 - 4. Cumulative mass produced that day

- H. If batching for multiple mix designs, a record is to be produced at day's end with one copy provided daily to the Resident Representative noting the following:
 - 1. Quantities of each mix produced
 - 2. Projects they were shipped to
 - 3. Any notations on waste between mixes to indicate cleaning out the plant.

3.10 ENVIRONMENTAL CONDITONS

- A. Project location: Erie, CO ; Elevation: 5,045 ft AMSL

3.11 WARRANTY

- A. Provide a two (2) year Contractor's Warranty, commencing with Substantial Completion or written owner acceptance and utilization.

- B. The Warranty provisions for the specified products included herein supersede conflicting provisions in other Sections of the Contract Documents

PART 3 PRODUCTS

3.1 MATERIALS

- A. Asphaltic Cement:
 - 1. Superpave Performance Graded Binder: ASTM D6373
 - 2. Superpave Performance Grade Binder designation: PG 64-22
 - 3. Homogeneous
 - 4. Free from water
 - 5. No tendency to foam when heated to 347 degrees F
 - 6. Shall meet requirements specified in section 702.01 of CDOT standard specifications.

- B. Aggregate for Asphaltic Concrete:
 - 1. Sound, angular crushed stone, crushed gravel, or crushed slag free from clay balls,

vegetable matter, or other deleterious materials: ASTM D692

2. Sand, stone, or slag screening: ASTM D1073
 3. Provide aggregate in gradations for courses to comply with Grade S as specified in section 703.04, table 703-3 of CDOT standard specifications, ASTM C136
 4. Percent wear: ASTM C131, less than 40 for aggregates retained in #10 sieve
- C. Tack Coat: Emulsified asphalt: SS-I or CSS-1h conforming to section 702.03 of CDOT standard specifications, ASTM D977

3.2 MIXES

- A. Determine full depth design mix based upon aggregates furnished:
1. Test mix by independent laboratory at Contractor's expense
 2. Grade dependent on temperature during placement
 3. Submit mix designs under provisions of Section 01 33 00 for review and acceptance by Engineer
- B. Submit mix design giving unit weight and to meet following requirements prior to placement of asphalt:

Property	S Mix	SX Mix
Superpave Ndesign Blows	100 (min)	100 (min)
Marshall Stability lbs	1600 (min)	1600 (min)
Flow, 0.01 inch	8-16	8-16
Voids Filled (percent by volume of mix)	65-75	65-75
Air Voids (percent by volume of mix)	3-5	3.5 –4.5
VMA, percent min.	14	14.6

- C. Establish single percentage passing each sieve size, single percent of asphalt and mix temperature
1. Maintain job mixes within following percentages of design mix:

Aggregates:	
#8 and larger	± 8 percent
#16-#100	± 6 percent
#200	± 2 percent
Asphalt Content	± 0.5 percent
Discharge Mix Temperature	± 20 degrees F

3.3 ACCESSORIES

- A. Pavement Marking. Specified pavement marking materials shall be as identified below:
 1. Thermoplastic meeting the requirements of CDOT Standard Specifications for Road and Bridge Construction 2011 edition except as modified herein
 2. Preformed plastic material shall conform to ASTM D 4505, Type 1, Grade E and shall have a minimum thickness of 1.5mm (60 mils)

PART 3 EXECUTION

3.1 GENERAL

- A. Do not apply when underlying surface is muddy, frozen or wet
- B. Do not place tack coat or asphaltic cement by spreading and finishing machine when ground temperature is below 50 degrees F and air temperature is below 40 degrees F and falling; Place when air temperature is above 40 degrees F and rising
- C. Do not apply pavement marking paint within 8 hours of fog or rain or when below 40 degrees F
- D. Provide flagmen, barricades, warning signs, and warning lights for movement of traffic and safety and to cause the least interruption of work

3.2 PREPARATION

- A. Prepare subgrade under provisions of Section 32 11 23.
- B. Loose and Foreign Material:
 1. Remove loose and foreign material from compacted subgrade surface immediately before application of prime coat and paving

2. Clean surface with mechanical sweeper, blowers, or hand brooms, until surfaces are free from dust

C. Moisture Content Maintenance:

1. Uniformly apply water over compacted and cleaned subbase surface as soon as practicable after preparing surface
2. Apply sufficient water to maintain moisture content of compacted subbase surface at level specified herein until paving operations begin. Do not flood the surface
3. Test subgrade for moisture and compaction within two hours prior to paving. Additional compaction testing may be required as determined by Engineer to confirm subgrade conditions

D. Tack Coat:

1. Dilute material with equal parts of water and apply to contact surfaces of previously constructed asphaltic concrete or Portland cement concrete and surfaces
2. Apply at rate of 0.05 to 0.15 gallons per square yard of surface area
3. Apply tack coat by brush to contact surfaces of curbs, gutters, manholes, and other structures projecting into or abutting asphaltic concrete pavement
4. Allow surfaces to dry until material is at condition of tackiness to receive pavement
5. Protect adjacent surfaces from tack coat material

3.3 RING/FRAME ADJUSTMENTS

- A. Set ring/frames of subsurface structures to final grade as a part of this work, include existing ring/frames and new ring/frames furnished under other work of project
- B. Placing Ring/Frames:
 1. Surround ring/frames set to elevation with a ring of compacted asphalt concrete base prior to paving
 2. Place asphalt concrete mixture up to 1 inch below top of ring/frame, slope to grade, and compact by hand tamping
- C. Adjust frames to proper position to meet paving
- D. If permanent covers are not in place, provide temporary covers over openings until completion of rolling operations

- E. Set ring/frames to grade, flush with surface of adjacent pavement with a tolerance of -0.25 inch to 0 inch below finished paving surface

3.4 PREPARING THE MIXTURE

- A. Comply with ASTM D995 for material storage, control, and mixing and for plant equipment and operation
- B. Stockpile:
 - 1. Keep each component of the various sized combined aggregates in separate stockpiles
 - 2. Maintain stockpiles so that separate aggregate sizes will not be intermixed and to prevent segregation
- C. Heating:
 - 1. Heat the asphalt cement at the mixing plant to viscosity at which it can be uniformly distributed throughout mixture
 - 2. Use lowest possible temperature to suit temperature viscosity characteristics of asphalt
 - 3. Do not exceed 350 degrees F.
- D. Aggregate:
 - 1. Heat-dry aggregates to acceptable moisture content
 - 2. Deliver to mixer at recommended temperature to suit penetration grade and viscosity characteristics of asphalt cement, ambient temperature, and workability of mixture
 - 3. Accurately weigh or measure dry aggregates and weigh or meter asphalt cement to comply with job-mix formula requirements
- E. Mix aggregate and asphalt cement to achieve 90-95 percent coated particles

3.5 EQUIPMENT

- A. Bituminous Pavers: Self-propelled, spreads without tearing surfaces, and controls pavement edges to true lines without use of stationary forms
- B. Rolling Equipment:
 - 1. Steel-wheel roller: Self-propelled, contact pressure of 250 to 350 psi per inch of width of roller wheel, equipped with adjustable scrapers and means for keeping wheel wet to prevent mix from sticking

2. Pneumatic-tired rollers: Self-propelled, contact pressure under each tire of 85 to 110 psi, wheels spaced so that one pass will accomplish one complete coverage equal to rolling width of machine, oscillating wheels. Remove and replace immediately tires picking up fines
- C. Hand Tools: Provide rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heaters, and other miscellaneous small tools

3.6 PLACING THE MIX

- A. Place asphalt concrete mixture on prepared surface, spread and strike-off using paving machine
- B. Maximum thickness per laying course: 2 inch
- C. Minimum temperature of 250 degrees F at time of placement
- D. Inaccessible and small areas may be placed by hand
- E. Conform to the grade, cross section, finish thickness, and density indicated
- F. Paver Placing:
1. Unless otherwise directed, begin placing at high side on one-way slope and in direction of traffic flow
 2. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips
 3. Place mixture in continuous operation as practicable
- G. Hand Placing:
1. Spread, tamp, and finish mixing using hand tools in areas where machine spreading is not possible as acceptable to Engineer
 2. Place mixture at a rate that will insure handling and compaction before mixture becomes cooler than acceptable working temperature
- H. Joints:
1. Construct joints to have same texture, density, and smoothness as adjacent sections of asphalt concrete course
 2. Clean contact surfaces free of sand, dirt, or other objectionable material and apply tack coat
 3. Offset transverse joints in succeeding courses not less than 24 inches
 4. Cut back edge of existing pavement or previously placed course to expose an even,

vertical surface for full course thickness

5. Offset longitudinal joints in succeeding courses not less than 6 inches
6. When the edges of longitudinal joints are irregular, honeycombed or inadequately compacted, cut back unsatisfactory sections to expose an even, vertical surface for full course thickness

3.7 COMPACTING THE MIX

- A. Provide pneumatic and steel-wheel type rollers to obtain the required pavement density, surface texture and ride ability
- B. Begin rolling operations when the mixture will bear weight of roller without excessive displacement
- C. Do not permit heavy equipment, including rollers to stand on finished surface before it has thoroughly cooled or set
- D. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers
- E. Breakdown Rolling:
 1. Accomplish breakdown or initial rolling immediately following rolling of transverse and longitudinal joints and outside edge
 2. Operate rollers as close as possible to paver without causing pavement displacement
 3. Check grade and smoothness after breakdown rolling
 4. Repair displaced areas by loosening at once with lutes or rakes and filling, if required, with hot loose material before continuing rolling
- F. Second Rolling:
 1. Follow breakdown rolling as soon as possible, while mixture is hot and in condition for compaction
 2. Continue second rolling until mixture has been thoroughly compacted
- G. Finish Rolling:
 1. Perform finish rolling while mixture is still warm enough for removal of roller marks by combination of steel and pneumatic rollers
 2. Continue rolling until roller marks are eliminated and course has attained specified density, and required surface texture and surface tolerances

- H. Patching:
 - 1. Remove and replace defective areas
 - 2. Cut-out and fill with fresh, hot asphaltic concrete
 - 3. Remove deficient areas for full depth of course
 - 4. Cut sides perpendicular and parallel to direction of traffic with edges vertical
 - 5. Apply tack coat to exposed surfaces before placing new asphaltic concrete mixture
 - 6. Compact by rolling to specified surface density and smoothness

3.8 REPAIRING EXISTING ASPHALTIC CONCRETE SURFACES

- A. Irregularities in the existing pavement or base shall be brought to uniform grade and cross section
- B. Cut sides of pavement area to be replaced perpendicular and parallel to direction of traffic
- C. Sub-base preparation:
 - 1. Prepare sub base under provisions of Section 32 11 23
- D. Paving:
 - 1. Apply prime coat to prepared sub base and tack coat against all abutting vertical concrete or bituminous surfaces as specified herein
 - 2. Place and compact asphalt concrete mixture in two equal layers to match the existing elevation and the total compacted thickness
 - 3. Apply asphalt emulsion tack coat between pavement layers as specified
- E. Compact mix as specified

3.9 MARKING ASPHALTIC CONCRETE PAVEMENT

- A. Remove dirt, sand, gravel and oil
- B. Cure asphaltic concrete before painting
- C. Apply paint with pressurized, self-contained paint machine
- D. Apply in straight line, 4 inches wide
- E. Layout markings with guide lines, templates and forms
- F. Apply at 1 gallon per 105 (± 5) square feet
- G. Provide striping color in traffic safety yellow
- H. Provide qualified technician for supervision

3.10 FIELD QUALITY CONTROL

- A. The OWNER shall pay for all initial field and laboratory testing to determine compliance of in-place asphaltic concrete paving materials and compaction in accordance with this Section and Section 01 45 00. CONTRACTOR shall pay for all retests and subsequent mix designs.
- B. Final surfaces of uniform texture, conforming to required grades and cross sections
- C. Test in-place for density, thickness, and surface smoothness
- D. Take not less than 4 inch diameter pavement specimens for each completed course from locations as directed by Engineer if required to confirm total thickness or for additional testing purposes
- E. Repair holes from test specimens as specified for patching defective work
- F. Minimum acceptable density of in-place subbase and base course materials is 98 percent of the recorded laboratory specimen density
- G. For each laying course, perform a minimum of two tests at each paving location. Immediately re-compact asphaltic concrete not conforming to acceptable density
- H. Remove and replace all sections not in conformance with density requirements
- I. Thickness: Variations from drawings:
 - 1. Surface course: 0 to -1/4 inch
 - 2. Remove and replace paving less than minimum thickness
- J. Surface Smoothness:
 - 1. Test using a 10 foot straight edge applied parallel to direction of drainage
 - 2. Advance straight edge five feet, maximum 1/4 inch per foot from nearest point of contact
 - 3. Do not permit pockets or depressions where water may pool
 - 4. Remove and replace areas, deficient in smoothness
 - 5. Overlay corrections may be permitted only if acceptable to Engineer
- K. Pavement shall be compacted to a density of 92 to 98 percent of the daily theoretical maximum specific gravity, determined according to CP 51. If more than one theoretical maximum specific gravity test is taken in a day, the average of the theoretical maximum specific gravity results will be used to determine the percent compaction. Field density determinations will be made in accordance with CP 44 or 81. Re-compact asphaltic

concrete not conforming to density standards to these specifications. Contractor as required shall cut test plugs, fill, and repair test holes at his expense. Sections not meeting the compaction criteria will be removed and replaced

L. Testing

1. Aggregate:

- a. One initial gradation test plus (1) one additional test for each day of Hot Bituminous Pavement production plus (1) one additional test for every 1000 tons of Hot Bituminous Pavement produced, CP-31A and CP-31B
- b. One initial fractured faces test plus (1) one additional test for each day of Hot Bituminous Pavement production plus (1) one additional test for every 1000 tons of Hot Bituminous Pavement produced, CP-45
- c. One initial aggregate moisture test plus (1) one additional test for each day of Hot Bituminous Pavement production plus (1) one additional test for every 2000 tons of Hot Bituminous Pavement produced, CP-60 Method B
- d. One initial bulk specific gravity test plus (1) one additional test for each day of Hot Bituminous Pavement production plus (1) one additional test for every 1000 tons of Hot Bituminous Pavement produced, AASHTO T85

2. Hot Bituminous Pavement:

- a. One initial asphalt content test plus (1) one additional test for each day of Hot Bituminous Pavement production plus (1) one additional test for every 500 tons of Hot Bituminous Pavement produced, CP-L 5120.
 - 1) The aggregate material following burn off shall then be tested by the independent laboratory for gradation in accordance with CP- 31A and CP-31B.
- b. One initial Maximum Theoretical Specific Gravity (Rice) test plus (1) one additional test for each day of Hot Bituminous Pavement production plus (1) one additional test for every 500 tons of Hot Bituminous Pavement produced, CP-51
- c. One initial bulk density test plus (2) two additional test for each day of Hot Bituminous Pavement paving plus (1) one additional test for every 500 tons of Hot Bituminous Pavement paving at the discretion of the Engineer, ASTM D1188 (AASHTO T166)
- d. One initial marshall stability and flow test plus (2) two additional test for each day of Hot Bituminous Pavement paving plus (1) one additional test for every 500 tons of Hot Bituminous Pavement paving at the discretion of the Engineer, ASTM D1559

3. Compaction Testing:

- a. The approved testing laboratory and personnel will perform quality assurance testing.
- b. The testing will be performed using a calibrated nuclear moisture-density gauge, corrected with cores in accordance with CP-44 and CP-81.
- c. In-place density testing shall not occur adjacent to longitudinal joints and shall be testing that is in addition to longitudinal joint density testing requirement
- d. Two (2) cores will be taken from each compacted lift (mat) of asphalt pavement to verify installed thickness. The specimens shall be reserved for bulk density testing at the discretion of the Engineer.
- e. Two in-place density test for each 2000 sf of each vertical lift of material placed
- f. Two longitudinal joint density test for each 5000 lf of each longitudinal joint of material placed
- g. Twenty (20) additional density tests at the discretion of the Engineer

3.11 CLEANING

- A. After completion of paving operations, clean surfaces of excess or spilled asphalt materials to the satisfaction of Engineer

3.12 PROTECTION OF FINISHED WORK

- A. After final rolling, do not permit vehicular traffic on asphalt concrete pavement until it has cooled and hardened and in no case sooner than 6 hours
- B. Provide barricades and warning devices as required to protect pavement and the general public

END OF SECTION

SECTION 32 91 21 - FINISH GRADING AND SEEDING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Topsoil
- B. Soil preparation
- C. Seeding and fertilizer
- D. Seed protection and slope stabilization
- E. Maintenance and warranty

1.2 RELATED SECTIONS

- A. Section 01 33 00 – Submittal Procedures
- B. Section 01 45 00 – Quality Control
- C. Section 31 23 16 – Excavation
- D. Section 31 23 23 – Fill
- E. Section 32 93 00 – Exterior Plants

1.3 REFERENCE STANDARDS

- A. FS O-F-241-Fertilizers, Mixed, Commercial
- B. American Association of Nurserymen-Standardized Plant Names

1.4 DEFINITIONS (NOT USED)

1.5 SYSTEM DESCRIPTION (NOT USED)

1.6 PERFORMANCE AND DESIGN REQUIREMENTS:

- A. Regulatory Requirements
 - 1. Comply with codes and ordinances of local regulatory agencies for fertilizer and herbicide composition and regulations of State of Colorado
 - 2. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture!

1.7 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00. At the time the first submittal is made under this section, include the addresses and phone numbers of nearest manufacturer's representative

1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- B. Product data: Submit sufficient data to verify compliance with specifications to include materials, plants, and accessories
1. Topsoil
 2. Soil Additives
 3. Grass Seed for each mixture to be installed
 4. Live seed analyses for each grass mixture, not more than 9 months old including percent of live seed, germination, all crop seeds in excess of 1 percent, inserts and weeds
 5. Erosion Control Fabric
 6. Silt Fence Fabric
- C. Design Data:
1. Submit soil amendment plan if soil tests are outside of specified limits, at the request of Engineer.
- D. Certificates:
1. Submit qualifications of applicator with landscaping license
 2. Submit certificate of compliance from regulatory authority
 3. Supplier's Certificate
 - a. At prior to delivery of materials to jobsite a certification letter from supplier stating compliance of the Pure Live Seed test with the project requirements
- E. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading.
- F. Manufacturer's Field Reports:
1. Field Test Procedure:
 - a. Contractor test procedure to be submitted at least 21 days prior to conducting the soil test. Include laboratory's instructions, checklist, forms for data collection, description of all sample collections, and analyses required
 2. Field Test Report:
 - a. Soil Test Field Reports assessed by independent 3rd party laboratory. Tests shall include pH and organic content of the soils.

- G. Warranty
 - 1. Provide a two (2) years Contractor's Warranty, commencing with Substantial Completion or written owner acceptance and utilization.
 - 2. The Warranty provisions for the specified products included herein supersede conflicting provisions in other Sections of the Contract Documents

1.8 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging
- B. Provide a certificate of the PLS test of the grass seed intended for the project
- C. Qualifications:
 - 1. Applicator: Company specializing in performing work of this section with landscaping license from State of Colorado
 - a. Experienced with type, elevation, topography and scale of work specified
 - b. Adequate equipment and personnel to perform work

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01 61 00
- B. Coordinate shipping, handling, storage, and protection with supplier and installer
- C. Accept products and components on site in factory packing in sealed containers. Inspect for damage. Seed in damaged packaging is not acceptable. Comply with suppliers installation instructions
- D. Deliver all commercial fertilizer (18-46-0) mixed in bags of the manufacturer, showing weight, chemical analysis and manufacturer name. Store in such a manner such that its effectiveness will not be impaired
- E. Provide supplier's storage instructions, storage and protection of products and accessories shipped to site along with shipped materials
- F. Protect products and accessories from physical damage including effects of weather, water, and construction
- G. Maintain and protect trees and shrubs not to be replanted within 4 hours

1.10 ENVIRONMENTAL CONDITONS

- A. Project location: Erie, CO; Elevation: 5,045 ft AMSL

1.11 MAINTENANCE SERVICE

1.12 WARRANTY

- A. All plant material and work accomplished under this section shall be guaranteed to provide a uniform stand of grass acceptable to the Owner at the end of a one (1) year time period from the completion of the Seeding and Erosion Control work

PART 2 PRODUCTS

2.1 MATERIALS

- A. Soil additives (fertilizer):
 1. Dry fertilizers: Primary element composition by weight of 6-10-5:
 - a. Nitrogen (N) six (6 percent) percent of which fifty (50 percent) percent inorganic, phosphoric acid (P20 S) ten (10 percent) percent, and potash (K20) five (5 percent) percent
 2. Commercial fertilizer: Primary element composition by weight of 18-46-0:
 - a. Nitrogen, eighteen (18 percent) percent, of which fifty (50 percent) percent is organic, and phosphoric acid (P20S), forty-six (46 percent) percent
 - b. These elements may be organic, inorganic, or a combination and shall be available according to the methods adopted by the Association of Official Chemists
 3. Dry, pelletized or granular, uniform in composition and a free flowing product. Do not use material which has caked, segregated, exceeded the expiration date of application, or be otherwise damaged
 4. Thoroughly mixed by the manufacturer. Clearly identify the contents of each container. Do not use materials and containers previously opened, exceeding the expiration date for application or otherwise damaged
- B. Grass Seed:
 1. Short Grass Mix A (Shortgrass Prairie Native):

Common Name	Variety	%	PLS Weight per Acre
Buffalograss	Native, Bison or Texoka	47 %	14 lbs.
Blue Gramma	Lovington, Alma, Native or Hachita	40 %	12 lbs.
Sand Dropseed	Common	13 %	4 lbs.
	Total:	100 %	30 lbs.

- a. Seeding Rate: Product comparison will be made on the basis of pure live seed. The formula to be used is (lbs. seed required = lbs. specified divided by % purity X % germination).
2. Seeding shall be performed between either October 30th to April 30th unless sufficient supplemental irrigation is provided and upon approval of OWNER, this seeding may be extended to June 15th.
3. Native Seed Mix B (Warm Season Short Prairie and Roadside):

Common Name	Variety	%	PLS Weight per Acre
Side Oats Gramma	Butte, Niner or El Reno	27 %	8 lbs.
Blue Gramma	Lovington, Alma, Native or Hachita	33 %	10 lbs.
Buffalograss	Native, Bison or Texoka	40 %	12 lbs.
	Total:	100 %	30 lbs.

- a. Seeding Rate: Product comparison will be made on the basis of pure live seed. The formula to be used is (lbs. seed required = lbs. specified divided by % purity X % germination).
 4. Seeding shall be performed between either April 1st to June 15th unless sufficient supplemental irrigation is provided and upon approval of OWNER, this seeding may be extended to July 31st.
 5. Provide the latest crop available in accordance with Colorado Department of Agriculture Seed Laws, Chapter 35, Article 27
- C. Topsoil:
1. Select onsite topsoil: Earth material of loose friable clay loam reasonably free of admixtures of subsoil, refuse stumps, roots, rocks, brush, weeds, or other material which can be detrimental to the proper development of site revegetation
 2. If adequate topsoil has not been stockpiled onsite, import additional material as necessary to provide uniform 4 inch thickness to all seeded areas
- D. Accessories:

1. Straw bales used for erosion control barriers: Wire or string wound and less than one year old. Do not use bales in an advanced state of deterioration regardless of age
2. Stakes for erosion control bales: No. 4 reinforcing steel or 2-inch by 2-inch wood stakes
3. Water: Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass
4. Mulching Material: Straw or onsite grasses from grubbing operation, dry, free from foreign matter detrimental to plant life
5. Erosion Control Fabric: Straw or coconut fiber combination blanket for temporary protection of sloped areas; 3/8 inch maximum thickness:
 - a. "S 150" as manufactured by North American Green
 - b. "S-2" as manufactured by Bon Terra America
 - c. Excelsior Mat 1
 - d. Or approved equal
6. Silt Fence Fabric: Woven polypropylene:
 - a. Mirafi 100X for "Envirofence" installations
 - b. Or approved equal

PART 3 EXECUTION

3.1 EXAMINATION

- A. Field verify the location of all underground utilities, pipelines and structures prior to excavation

3.2 GENERAL

- A. Do not prepare or seed frozen soils
- B. Perform seeding and planting only after preceding work establishing final ground surface is completed
- C. Do not remove or replant trees when ambient temperatures drop below 35 degrees F or above 90 degrees F
- D. Seed all areas of the entire site disturbed by construction
- E. Pattern for seeding and fertilization as required by field conditions. In no case shall revegetation occur within 30 days of the application of any chemical weed control substance

3.3 FINAL GRADING

- A. After completion of all other outside work and after backfilling is completed and settled, bring to grade at the indicated elevations all areas of the site to be graded
- B. Graders and other power equipment may be used for final grading and slope dressing if the result is uniform and equivalent to hand work
- C. Grade all surfaces for effective drainage
- D. Provide a 2 percent minimum slope except as otherwise required
- E. Grade and surface to maintain gradient as indicated

3.4 TREES AND SHRUBS

- A. Perform protection under the provisions of Section 01 56 39.

3.5 SEEDING

- A. Soil preparation:
 - 1. Uniformly place and spread topsoil removed during grubbing and stored on site. Provide minimum thickness of 4 inches to meet finished grade. Key topsoil to the underlying and surrounding material by the use of harrows, rollers or other equipment suitable for the purpose
 - 2. Apply water to the topsoil for compaction purposes in a fine spray by nozzles in such a manner that it will not wash or erode the newly placed soil
 - 3. Exercise care during soil preparation on all embankments so as not to disturb established ground cover. Areas disturbed during the soil preparation will be fertilized and seeded at the discretion of the Engineer in accordance with these documents
- B. Fertilization:
 - 1. Fertilizer for new seed areas: 18-46-0 commercial fertilizer. Apply in a dry form at a rate of 40 pounds per acre incorporated into the top four (4) inches of soil as of the seed bed preparation prior to seeding
 - 2. Do not proceed with fertilization in adverse weather and unsuitable ground conditions. Examples of these respective conditions may be wind, precipitation, frozen and until liable ground or conditions detrimental to the effectiveness of the application
 - 3. Apply fertilizer in a manner to assure uniform distribution, light watering is acceptable for dispersion

4. In cases where work progress is stopped due to the above conditions, fertilization will begin again, when appropriate conditions exist. The application will begin again with a reasonable overlapping of the previously applied area
- C. Seeding methods:
1. All seeding shall be installed by the drilling method
 2. Do not proceed with seeding in adverse weather and unsuitable ground conditions. Examples of these respective conditions may be wind, precipitation, frozen or until liable ground, or conditions detrimental to the effectiveness of the application.
 3. Drilling:
 - a. Accomplish seeding by means of an approved power drawn drill, followed by drag chains. The grass drill should be equipped with a satisfactory feeding mechanism, agitation, and double disk furrow openers. Equip drills with depth bands set to maintain a planting depth of approximately 1/2 inch and shall be set to space rows not more than 7 inches apart
 - b. If inspections indicate that strips wider than the specified space between the rows planted have been left or other areas skipped, the Engineer will require immediate resowing of seed in such areas at the Contractor's expense. The seeding mixture shown in the Materials Section applies at a pure live seed rate per acre
- D. Areas to be reseeded:
1. Reseed all areas that are damaged or disturbed by the Contractor's activities during the entire project scope
- E. Maintenance:
1. Maintain seeded areas until grass is well established and exhibits vigorous growing condition
 2. Fertilize the seeded areas once a uniform stand of grass has been established
 3. Maintain seeded areas immediately after placement until there is an acceptable uniform plant growth. Reseed areas that are not producing a uniform plant growth within five (5) weeks following seeding. Acceptable uniform plant growth shall be defined as that time when the scattered bare spots, not greater than 1/8 square foot in area, do not exceed three (3 percent) of the seeded area
 4. Areas that are seeded late in the fall planting season which are not producing acceptable uniform plant growth, as described above, shall be reseeded during the following spring planting season. If such a condition exists, and the Contractor has diligently, in the opinion of the Engineer, pursued the performance of his work, the Owner at his option, may extend the contract completion date and reduce contract retainage. Retainage may be reduced to less than five (5 percent) percent of the

total contract amount, but shall be at least two (2) times the estimated cost of obtaining the required growth in the indicated areas, plus areas which are susceptible to damage by winter kill, washout or other causes

- F. Seed protection and slope stabilization:
 - 1. Cover seeded slopes with erosion control fabric where grade is 3 to 1 or greater and where indicated on the Drawings and Section 32 93 00. Cover with mulch in all other areas
 - 2. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 6 inch overlap minimum of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil
 - 3. Secure outside edges and overlaps at 48 inch intervals with 4-inch to 6-inch V-shaped type pins or wooden stakes depending on ground condition
 - 4. Lightly dress slopes with topsoil to ensure close contact between fabric and soil
 - 5. At sides of ditches, lay fabric laps in direction of water flow. Lap end sand edges minimum 6 inches
 - 6. Maintain integrity of erosion control fabric until seed germination. If seed is washed out before germination, fertilize, reseed and restore affected areas

3.6 SLOPE STABILIZATION

- A. Prepare disturbed areas for seeding
- B. Cover slopes with erosion control fabric where grade is 3H to 1V or greater or where indicated on the Drawings
- C. Lay fabric smoothly on surface, bury top end of each section in 6 inch deep excavated topsoil trench. Provide 6 inch overlap minimum of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil
- D. Secure outside edges and overlaps at 48 inch intervals with 4-inch to 6-inch U-shaped type pins or wooden stakes as necessary to accommodate ground conditions
- E. Lightly dress slopes with topsoil to ensure close contact between fabric and soil
- F. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches

3.7 EROSION CONTROL BARRIERS

- A. Place erosion control barriers where required and where directed by Engineer in accordance with requirements of approved site improvement plan

- B. Field locate barriers along slopes, next to water courses and downstream of disturbed areas to prevent surface runoff from eroding areas disturbed by Contractor during construction, to minimize the transport of suspended solids downstream or into adjacent streams, canals or ditches and to protect newly seeded areas
- C. Maintain and replace barriers as required for effective erosion control until satisfactory uniform plant growth is established as defined herein

3.8 STORMWATER MANAGEMENT PLAN

- A. Contractor shall be responsible for submission and obtaining permit for stormwater discharges associated with construction activity and complying with all conditions of the permit
- B. Reference Stormwater Management Plan included in these Contract Documents

3.9 SETTLEMENT

- A. Warranty for settlement of all fills, embankments, and backfills is stipulated in the General Conditions from Final Completion of Contract under which Work is performed
- B. Repair or replace within 30 days after notice by Engineer or Owner

3.10 FIELD QUALITY CONTROL

- A. Soil Testing
 1. Conduct minimum of two (2) soil tests to confirm fertilizer type and application rates.
 2. pH range of 5.5 to 7, a minimum of 6 percent organic material content. Materials found outside this range will be rejected. Contractor will be required to submit soil amendment plan to bring soil within specifications limits.

END OF SECTION

SECTION 32 93 00 - EXTERIOR PLANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Trees
- B. Shrubs
- C. Plants
- D. Soil Preparation
- E. Tree Removal and Replanting
- F. Maintenance and Warranty

1.2 RELATED SECTIONS

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section.
- B. Section 01 33 00 – Submittal Procedures
- C. Section 01 45 00 – Quality Control
- D. Section 31 23 16 – Excavation
- E. Section 31 23 23 – Fill
- F. Section 32 91 21 – Finish Grading and Seeding

1.3 REFERENCE STANDARDS (NOT USED)

1.4 DEFINITIONS

- A. Finish grade: Elevation of finished surface of planting soil
- B. Planting soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments

- C. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill, before placing planting soil

1.5 SYSTEM DESCRIPTION (NOT USED)

1.6 PERFORMANCE AND DESIGN REQUIREMENTS:

A. Regulatory Requirements

- 1. Comply with codes and ordinances of local regulatory agencies for fertilizer and herbicide composition and regulations of State of Colorado
- 2. Provide certificate of compliance from authority having jurisdiction indicating approval of plantings

1.7 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00. At the time the first submittal is made under this section, include the addresses and phone numbers of nearest manufacturer's representative

- 1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements

- B. Product Data: Submit sufficient data to verify compliance with specifications to include materials, plants, and accessories:

- 1. Provide for each type of plant indicated
- 2. Planting Materials:
 - a. Top soil
 - b. Organic soil amendments
 - c. Fertilizer
 - d. Mulches
 - e. Weed control barrier
 - f. Stakes
 - g. Guy Wire
 - h. Hose
 - i. Wrapping material
 - j. Weed barrier

3. Maintenance Instructions: The landscape subcontractor shall recommend procedures to be utilized by the Owner for maintenance of exterior plants during the calendar year
- C. Design Data:
1. Submit soil amendment plan if soil tests are outside of specified limits, at the request of Engineer.
- D. Certificates:
1. Submit qualifications of installation landscape subcontractor
 2. Submit certificate of compliance from regulatory authority
 3. Supplier's Certificate
 - a. At time of, or prior to delivery of materials to jobsite a certification letter from supplier of the materials provided comply with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock"
- E. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading.
- F. Manufacturer's Field Reports:
1. Field Test Procedure: Contractor test procedure to be submitted at least 21 days prior to conducting the soil test. Include laboratory's instructions, checklist, forms for data collection, description of all sample collections, and analyses required
 2. Field Test Report:
 - a. Soil Test Field Reports assessed by independent 3rd party laboratory. Tests shall include pH and organic content of the soils.
- G. Warranty
1. Provide a two (2) year Contractor's Warranty, commencing with Substantial Completion or written owner acceptance and utilization.
 2. The Warranty provisions for the specified products included herein supersede conflicting provisions in other Sections of the Contract Documents

1.8 QUALITY ASSURANCE

- A. Installer qualifications: A qualified landscape installer who maintains an experienced full-time supervisor on Project site when exterior planting is in progress
- B. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock"

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate shipping, handling, storage, and protection with supplier and installer
- B. Deliver exterior plants after preparations for planting have been completed and install immediately. If planting is delayed more than twenty four hours after delivery, set exterior plants trees in shade, protect from weather and mechanical damage, and keep roots moist
- C. Accept products and components on site in factory packing. Inspect for damage. Comply with suppliers installation instructions
- D. Protect products and accessories from physical damage including effects of weather, water, and construction
- E. Provide supplier's storage instructions, storage and protection of products and accessories shipped to site along with shipped materials
- F. Maintain and protect trees and shrubs not to be replanted within 4 hours

1.10 ENVIRONMENTAL CONDITONS

- A. Project location: Erie, CO ; Elevation: 5,045 ft amsl

1.11 WARRANTY

- A. Provide a two (2) year Warranty commencing with Substantial Completion or written owner acceptance and utilization.
 - 1. Warranty: Warrant exterior plants against defects including death and unsatisfactory growth.
- B. If Subcontractor's Warranty specified herein is for a term greater than Contractor's Warranty, Subcontractor's Warranty shall continue to remain in

force and effect and available to Owner beyond the end of Contractor Warranty obligations.

- C. The Warranty provisions for the specified products and installation included herein supersede conflicting provisions in other Sections of the Contract Documents

PART 2 PRODUCTS

2.1 EXTERIOR PLANTS

- A. Tree and shrub material: Furnish nursery-grown trees and shrubs complying with ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement
- B. Provide balled and burlapped trees and containerized shrubs

2.2 PLANTING MATERIALS

- A. Topsoil:
 - 1. ASTM D 5268, pH range of 5.5 to 7, a minimum of 6 percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth
- B. Topsoil source:
 - 1. Reuse surface soil stockpiled on-site and supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Verify suitability of stockpiled surface soil to produce topsoil
 - 2. Amend existing in-place surface soil to produce topsoil. Verify suitability of surface soil to produce topsoil. Surface soil may be supplemented with imported or manufactured topsoil from off-site sources
- C. Organic soil amendments:
 - 1. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1/2-inch (13-mm) sieve

2. Peat: Sphagnum peat moss, partially decomposed, finely divided or granular texture, with a pH range of 3.4 to 4.8
 3. Wood derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials
- D. Fertilizer:
1. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid
 2. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid
 3. Commercial fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - a. Composition: 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight
 - b. Slow-Release fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition: 1) Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight
- E. Mulches:
1. Organic Mulch: Shredded bark
 2. Crushed Granite: 1/2-inch to 1 inch, plus or minus
- F. Weed-control barriers:
1. Nonwoven fabric: Polypropylene or polyester fabric, 3 oz. / sq. yd. (101 g/sq. m) minimum
 2. Woven fabric:
 - a. Landmaster or approved equal
- G. Stakes: Cedar, fir, hemlock or other accepted wood for bracing or support. Free from bark, loose knots, rot, cross grain, or other defects that may impair strength of stake.

1. Length, width, and depth as shown on drawings.
- H. Guy Wire: New, soft, stainless steel wire, free from bends and kinks.
1. Number 10 double strand wire
 2. 3/16 inch cable
 3. Provide eyebolts for connection to stakes as needed
 4. Provide turnbuckles for each guy wire
 5. Provide rubber sleeves over wire to protect trunks and branches
- I. Hose: 3/4 inch (inside diameter) black or tan, 2-ply rubber hose.
- J. Wrapping Material: Krinkle-Kraft tree wrapping paper or accepted equivalent.

2.3 PLANTING SOIL MIX

- A. Planting soil mix: Mix topsoil with the following soil amendments and fertilizers in the following quantities:
1. Ratio of loose compost to topsoil by volume: 4 cubic yards / 1,000 square feet
 2. Weight of commercial fertilizer per 1,000 Sq. Ft. (92.9 Sq. m): 5 lbs

PART 3 EXECUTION

3.1 EXTERIOR PLANTING

- A. Bed establishment:
1. Loosen subgrade of planting beds to a minimum depth of 8 inches (200 mm)
 2. Remove stones larger than 1 inch (25 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property
 3. Thoroughly blend planting soil mix off-site before spreading topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil mix

4. Spread planting soil mix to a depth of 4 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet
 5. Finish grading: Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades
- B. Trees and shrubs:
1. Pits and trenches: Excavate circular pits with sides sloped inward. Trim base leaving center area raised slightly to support root ball and assist in drainage. Do not further disturb base. Scarify sides of plant pit smeared or smoothed during excavation. Excavate approximately three times as wide as ball diameter
 2. Set trees and shrubs plumb and in center of pit or trench with top of root ball 1 inch (25 mm) above adjacent finish grades
 3. Balled and burlapped: Remove burlap and wire baskets from tops of root balls and partially from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation
 4. Container grown: Carefully remove root ball from container without damaging root ball or plant
 5. Organic Mulching: Apply 3 inch (75-mm) average thickness of organic mulch extending 12 inches (300 mm) beyond edge of planting pit or trench. Do not place mulch within 3 inches (75 mm) of trunks or stems
 6. Tree and shrub pruning: Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Shrub sizes indicated are sizes after pruning
- C. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged exterior planting
- D. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property

3.2 TREE REMOVAL AND REPLANTING

- A. Exercise care during removal of trees with spade. Tree spade shall be sized as required for removal of tree without significant damage or undue stress to the tree. Pull ground cover as necessary so as not to damage root system of tree
- B. Attempt to replant tree same day as removal where practical. If tree must be stored, use wire basket, liberally mulch around root ball, and maintain tree as required
- C. Replant trees in pits, partly filled with topsoil mixture, at a minimum depth of 6 inches under each tree
- D. Place bare root plant materials so roots lie in a natural position. Backfill soil mixture in 6 inch layers. Maintain tree in vertical position
- E. Saturate soil with water when the pit or bed is half full of top soil and again when full
- F. Watering basins:
 - 1. Construct a watering basin with a level bottom around each plant by sloping sides inward
 - 2. Size: Two feet greater than diameter of spread or roots
 - 3. Fill watering basins with bark mulch, 3 inch minimum
- G. Do not use any fertilizer on replanted trees for one year after replanting
- H. Plant support:
 - 1. Brace trees vertically with plant protector wrapped guy wires and stakes to the following:
 - a. Tree caliper: Tree support method
 - b. 2-4 inches: 3 guy wires (with eye bolts and turn buckles)
 - c. Over 4 inches: 4 guy wires (with eye bolts and turn buckles)
 - d. Drive stakes perpendicular into ground 3 feet at edge of roots

3.3 MAINTENANCE

- A. General:

1. Correct defective work as soon as possible after it becomes apparent and weather and season permit
 2. Adjust irrigation system as required
 3. As part of maintenance, provide protection and extermination measures against gophers, rabbits, or other rodents and repair damage caused by their activities
- B. Trees and Shrubs: Maintain plantings beginning immediately after each plant is planted and continuing until final acceptance for the landscape portion of the project is received. Maintain by watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease.
- C. Perennials, Ornamental Grasses and Ground Covers: Maintain until final acceptance is received by watering, weeding, fertilizing and other operations as required to establish healthy, viable plantings.

3.4 ADJUSTING AND CLEANING

- A. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
- B. Maintain the site in an orderly condition during the progress of Work. Continuously and promptly remove excess and waste materials; keep lawn areas, walks and roads clear. Store materials and equipment where directed. Immediately remove rejected materials from the property. Promptly remove equipment, surplus material, and debris and trash resulting from operations under this Contract upon completion and prior to initial acceptance of Work. Leave the site in a neat, orderly condition, and clean.

3.5 FIELD QUALITY CONTROL

- A. Soil Testing
1. Conduct minimum of two (2) soil tests to confirm fertilizer type and application rates.
 2. pH range of 5.5 to 7, a minimum of 6 percent organic material content. Materials found outside this range will be rejected. Contractor will be required to submit soil amendment plan to bring soil within specifications limits.

END OF SECTION

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SECTION 33 11 10 - WATER UTILITY DISTRIBUTION AND TRANSMISSION PIPING

PART 1 GENERAL

1.1 SUMMARY

- A. Work under this Section applies to furnishing and installation of pipe materials, fittings, and appurtenances normally encountered with water distribution including potable water and fire water systems.
- B. Section includes:
 - 1. Pipe and fittings
 - 2. Insulating flanged joints
 - 3. Tapping sleeves and valves
 - 4. Bedding and cover materials
- C. Related Requirements:
 - 1. General
 - a. Furnish and install all piping systems shown and specified in accordance with the requirements of the Contract Documents.
 - b. Each buried piping system shall be complete, with all necessary fittings, valves, accessories, lining and coating, testing, excavation, backfill and encasement, to provide a functional installation.
 - c. Piping layouts shown in the Drawings are intended to define the general layout, configuration, and routing for pipe, as well as the size and type of piping to be installed. The piping plans are not pipe construction or fabrication drawings.
 - d. The Contractor shall cause the Supplier of pipes, valves, fittings, and appurtenances to coordinate piping installation such that all equipment is compatible and is capable of achieving the performance requirements specified in the Contract Documents.
 - e. It is the Contractor's responsibility to develop the details necessary to construct all piping systems, to accommodate the specific equipment provided, and to provide and install all spools, spacers, adapters, connectors, valves, gaskets, fittings, appurtenances etc., for a complete and functional system.

1.2 RELATED SECTIONS

- A. Section 03 11 00 - Concrete Work
- B. Section 31 05 13 - Soils for Earthwork
- C. Section 31 05 16 - Aggregates for Earthwork
- D. Section 31 23 16 - Excavation
- E. Section 31 23 17 - Trenching
- F. Section 31 23 23 - Fill
- G. Section 31 23 24 - Flowable Fill
- H. Section 33 05 17 - Precast Concrete Valve Vaults and Meter Boxes
- I. Section 33 12 13 - Water Service Connections
- J. Section 33 12 16 - Water Utility Distribution Valves
- K. Section 33 12 19 - Fire Hydrants
- L. Section 33 13 00 - Testing & Disinfecting of Water Utility Piping

1.3 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO T99 - Standard Specification for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
 - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
- B. American Society of Mechanical Engineers (ASME):
 - 1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250
 - 2. ASME B16.5 - Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and other Special Alloys
 - 3. ASME B16.21 - Nonmetallic Flat Gaskets for Pipe Flanges
 - 4. ASME B31.10 - Standards of Pressure Piping
- C. ASTM International (ASTM):
 - 1. ASTM A36 - Standard Specification for Carbon Structural Steel
 - 2. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

3. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications
 4. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
 5. ASTM A536, Standard Specification for Ductile Iron Castings.
 6. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))
 6. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
 7. ASTM D1598 - Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
 8. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
 9. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
 10. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
 11. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
 12. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
 13. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- D. American Water Works Association (AWWA):
1. AWWA C104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
 2. AWWA C105 - Polyethylene Encasement for Ductile-Iron Pipe Systems
 3. AWWA C110 - Ductile-Iron and Gray-Iron Fittings
 4. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

5. AWWA C115 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
 6. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast
 7. AWWA C153 - Ductile-Iron Compact Fittings
 8. AWWA C219 - Bolted, Sleeve-Type Couplings for Plain-End Pipe
 9. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
 10. AWWA C606 - Grooved and Shouldered Joints
 11. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution
 12. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm) for Water Transmission and Distribution
- E. Manufacturers Standardization Society of the Valve and Fittings Industry:
1. MSS SP-60 - Connecting Flange Joints between Tapping Sleeves and Tapping Valves
- F. NSF International (NSF):
1. NSF Standard 61 - Drinking Water System Components – Health Effects
 2. NSF Standard 372 - Drinking Water System Components – Lead Content
- G. SUBMITTALS
- H. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00. At the time the first submittal is made under this section, include the addresses and phone numbers of nearest manufacturer's representative
1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- I. Product Data: Submit data on pipe materials, pipe fittings, restrained joint systems, and accessories.

- J. Lining and coating data.
- K. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- L. Manufacturer's handling, delivery, storage, and installation requirements.
- M. Field Quality-Control Submittals:
 - 1. Pipeline hydrostatic testing plan.
 - 2. Indicate results of Contractor-furnished tests and inspections.
- N. Preconstruction Photographs:
 - 1. Submit digital files of colored photographs of Work areas and material storage areas.

1.4 CLOSEOUT SUBMITTALS

- A. As-Built Drawings:
 - 1. Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.
 - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.5 QUALITY ASSURANCE

- A. Materials:
 - 1. Unless otherwise noted, all water works materials provided for the project shall be new, of first-class quality and shall be made by reputable manufacturers.
 - 2. All material of a like kind shall be provided from a single manufacturer unless otherwise approved by the Owner's Representative.
 - 3. All material shall be carefully handled and installed in good working order free from defect in manufacture, storage, and handling.
 - 4. All pipe and fittings shall be manufactured in the United States of America, unless otherwise approved by the Owner.
- B. Markings:

1. Pipes and Fittings: Mark each pipe and fitting at plant. Include date of manufacture, manufacturer's identification, specification standard, inside diameter of pipe, dimension ratio as applicable, pipe class as applicable, pipe number for laying purposes as applicable, and other information required for type of pipe.
 2. Bolting materials (washers, nuts, and bolts) shall be marked with material type.
- C. Testing:
1. Except where otherwise specified, all materials used in the manufacture of the pipe shall be tested in accordance with the applicable Specifications and Standards.

1.6 MATERIAL DELIVERY, STORAGE, AND HANDLING

- A. In accordance with manufacturer's written recommendations and as specified in these Contract Documents.
- B. Pipe, specials, and fittings delivered to Project Site in damaged condition will not be accepted.
- C. Storage:
1. Store and support pipe securely to prevent accidental rolling and to avoid contact with mud, water, or other deleterious materials.
 2. Pipe and fittings shall not be stored on rocks, gravel, or other hard material that might damage pipe. This includes storage area and along pipe trench.
 3. Do not store materials in direct sunlight.
 4. Gaskets: Do not allow contact with oils, fuels, petroleum, or solvents.
- D. Handling:
1. Pipe and appurtenances shall be handled in accordance with manufacturer's recommendations or requirements contained in this section or subsequent sections dealing with the specific pipe material, whichever is more stringent.
 2. Pipe shall be handled with proper equipment in a manner to prevent distortion or damage. Use of hooks, chains, wire ropes, or clamps that could damage pipe, damage coating or lining, or kink and bend pipe ends is not permitted.

3. Use heavy canvas, or nylon slings of suitable strength for lifting and supporting materials.
4. Lifting pipe during unloading or lifting into trench shall be done using two slings placed at quarter point of pipe section. Pipe may be lifted using one sling near center of pipe, provided pipe is guided to prevent uncontrolled swinging and no damage will result to pipe or harm to workers. Slings shall bear uniformly against pipe.

PART 2 PRODUCTS

2.1 WATER PIPING

A. General

1. All piping materials and specials shall meet the specifications of this Section and of the appropriate AWWA Standard Specifications. In the case of conflict, the more stringent specifications shall apply.
2. All coatings and materials specified herein which may come in contact with potable water shall conform to National Sanitation Foundation (NSF) Standard 61 and 372.
3. Minimum Pressure Ratings: Unless otherwise specified herein or shown in the Drawings, the minimum working pressure rating of all water works materials specified herein shall be 1-1/2 times the operating pressure or 150 pounds per square inch (psi) minimum.
4. Gaskets:
 - a. Material: Styrene Butadiene Rubber (SBR) composition.

B. PVC:

1. All PVC pressure pipe shall be manufactured with an integral bell design capable of receiving an elastomeric gasket.
2. All PVC pressure pipe shall be dimensionally compatible with standard cast/ductile iron fittings produced according to AWWA C110 or AWWA C153, as applicable.
3. Deflection:
 - a. PVC pressure pipe may be deflected both horizontally and vertically at the joints after assembly.

- b. Deflection by bending of the pipe rather than at the joints is not allowed.
 - c. The maximum pipe deflection shall not exceed one half of the manufacturer's stated joint deflection allowance.
- 4. Joints:
- 5. Push on, ASTM D3139 and F477:
 - a. Internally cast bell with one sealing ring
 - b. Designed to hold pipe in alignment, providing flexibility, separate the ends of pipe lengths, resist applied earth pressures, and provide fluid tightness
 - c. Rubber gaskets: ASTM D3139 and F477
- 6. Size: 4-inch through 12-inch diameter
 - a. Comply with AWWA C900, DR 18, Pressure Class 235, unless shown otherwise in the Drawings or specified elsewhere.
- 7. Size: 14-inch through 48-inch diameter
 - a. Comply with AWWA C905, DR 25, Pressure Class 165, unless shown otherwise in the Drawings or specified elsewhere.
- 8. Mechanical Restrained Joints:
 - a. For push-on pipe joint at pipe bells:
 - 1) Material:
 - a) Body: Ductile iron. Comply with ASTM A536.
 - b) Bell Restraint Systems: Corten steel tie rods.
 - 2) Coatings: Shop-applied liquid epoxy.
 - 3) Construction:
 - a) A split serrated ring shall be used behind the pipe bell. A split serrated ring shall also be used to grip the pipe and a sufficient number of bolts shall be used to connect the bell ring and the gripping ring.

- b) System shall be designed for a minimum 2 to 1 safety factor.
 - 4) Manufacturers:
 - a) 4-inch through 12-inch diameter: EBAA Iron, Inc. - Series 1900 Bell Restraint Harness.
 - b) 14-inch through 48-inch diameter: EBAA Iron, Inc. - Series 2800 Bell Restraint Harness.
- b. At mechanical joint fittings:
 - 1) Material: Ductile iron. Comply with ASTM A536.
 - 2) Coatings: Shop-applied liquid epoxy.
 - 3) Construction:
 - a) A split serrated ring shall be used behind the pipe bell. A split serrated ring shall also be used to grip the pipe and a sufficient number of bolts shall be used to connect the bell ring and the gripping ring.
 - b) System shall be designed for a minimum 2 to 1 safety factor.
 - 4) Fasteners:
 - a) T-bolts and nuts: High strength, low alloy steel.
 - b) Comply with AWWA C111.
 - 5) Manufacturers:
 - a) EBAA Iron, Inc. - Series 19MJ00
 - b) Romac Industries, Inc. – 470 Series Pipe Restraining System

2.2 FITTINGS:

- 1. Material: Ductile iron compact fittings: ANSI A21.53/AWWA C153:
 - a. Flanged joints, 4 inch to 48 inch: 250 psi rating
 - b. Flanged joints, 54 inch to 64 inch: 150 psi rating
 - c. Mechanical joints, 4 inch to 24 inch: 350 psi rating

- d. 30 inch to 48 inch: 250 psi
- B. Fittings used for joining ductile iron and PVC pipe shall be of the type, size, and strength designated on the Plans, elsewhere in the specifications.
 - 1. Fittings shall be mechanical joint, push-on type, flanged or plain-end as required and shown on the Drawings.
 - 2. All restraint systems and flanged fittings shall be provided with bolts and gaskets as specified herein.
- C. Pressure ratings: As specified for joining pipe above and as shown on the Drawings.
- D. Coating and Lining:
 - 1. Asphaltic exterior coating in accordance with AWWA Standard C110.
 - 2. Cement Mortar Lining: Comply with AWWA C104.
- E. Following information cast upon fittings:
 - 1. Manufacturer's identification.
 - 2. Country of manufacture.
 - 3. Pressure rating.
 - 4. For bends, number of degrees and/or fractions of a circle.
- F. Owner may require additional metallurgical documentation or other certifications.

2.3 NUTS, BOLTS, AND WASHERS:

- A. All bolts shall have heavy hex head with heavy hex nuts.
- B. For operating pressures greater than 150 psi:
 - 1. Bolts: Steel alloy composition. Comply with ASTM A193.
 - 2. Nuts: Comply with ASTM A194, Grade 2H.
 - 3. Washers: Comply with ASTM F436.
- C. For operation pressures of 150 psi or less:
 - 1. Bolts: Low-carbon steel composition. Comply with ASTM A307, Grade B.
 - 2. Nuts: Comply with ASTM A563A, Heavy Hex.
 - 3. Washers: Comply with ASTM F844.
- D. Higher-strength bolts with higher torque values as specified above for operation pressures greater than 150 psi shall not be used for assembly of flange joints including gray-iron flanges.

2.4 FLEXIBLE COUPLINGS

NOT USED

2.5 FLANGED COUPLING ADAPTERS

NOT USED

2.6 TAPPING SLEEVES AND VALVES

A. NOT USED

2.7 FLEXIBLE EXPANSION JOINTS

NOT USED

2.8 UNDERGROUND PIPE MARKERS

A. As specified in Section 31 23 17, Trenching.

2.9 CONCRETE ENCASEMENT AND CRADLES

As indicated in the drawings.

2.10 MATERIALS

A. Bedding and Cover:

1. Pipe Bedding: Coarse Aggregate Material Type A1, as specified in Section 31 05 16, Aggregates for Earthwork. Aggregate size as shown in the Drawings.
2. Pipe Zone Backfill: Coarse Aggregate Material Type A1, as specified in Section 31 05 16, Aggregates for Earthwork. Aggregate size as shown in the Drawings.
3. Trench Backfill from Pipe Zone to Finish Grade:
 - a. Material type varies by location, as shown in the Drawings.
 - b. Coarse Aggregate Material Type A1, as specified in Section 31 05 16, Aggregates for Earthwork. Aggregate size as shown in the Drawings.
 - c. Subsoil Type S1 and/or S2, as specified in Section 31 05 13, Soils for Earthwork.

2.11 ACCESSORIES

- A. Concrete for Thrust Restraints: As specified in Section 03 30 00 - Cast-in-Place Concrete.
- B. Manhole and Cover: As specified in Section 33 05 13- Manholes.
- C. Miscellaneous Steel Rods, Bolt, Lugs, and Brackets:
 - 1. Comply with ASTM A36 or ASTM A307.
 - 2. Grade A carbon steel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that existing utility water main size, location, and invert are as indicated on Drawings.

3.2 PREPARATION

- A. Preconstruction Site Photos:
 - 1. Take photographs along centerline of proposed pipe trench; minimum one photograph for each 50 feet of pipe trench.
 - 2. Show mailboxes, curbing, lawns, driveways, signs, culverts, and other existing Site features.
 - 3. Include Project name, date taken, and sequential number of each photograph in physical log or CD.
- B. Inspection:
 - 1. All pipe sections, specials, and jointing materials shall be carefully examined for defects.
 - 2. No piping or related materials shall be laid that is known to be defective. Any defective piece installed shall be removed and replaced with a new pipe section in a manner satisfactory to the Engineer at the Contractor's expense.
 - 3. Defective material shall be marked and removed from the job site before the end of the day.
- C. Pipe Cutting:

1. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.
 2. Use only equipment specifically designed for pipe cutting; use of chisels or hand saws is not permitted.
 3. Grind edges smooth with beveled end for push-on connections.
 4. Prior to assembly of field cut pipe, the reference mark shall be re-established with a pencil or crayon. The location of the reference mark at the proper distance from the bevel end shall be in accordance with the manufacturer's recommendations.
- D. Remove scale and dirt on inside and outside before assembly. Cleaning of each pipe or fitting shall be accomplished by swabbing out, brushing out, blowing out with compressed air, or washing to remove all foreign matter.
- E. Prepare pipe connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Bedding:

1. Excavation:
 - a. Excavate pipe trench as specified in Section 31 23 17, Trenching for Work of this Section.
 - b. All pipe trenches shall be excavated below the proposed pipe invert as required to accommodate the depths of pipe bedding material as scheduled on the Drawings.
 - c. Remove large stones or other hard matter which could damage pipe or impede consistent pipe bedding backfilling or compaction.
 - d. Trench base shall be inspected prior to placement of pipe.
 - e. Hand trim excavation for accurate placement of pipe to elevations as indicated on Drawings.
2. Dewater excavation as specified in Section 31 23 19, Dewatering to maintain dry conditions and to preserve final grades at bottom of excavation.
3. Provide sheeting and shoring as specified in Section 31 23 17, Trenching.

4. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 6 inches compacted depth and compact to 95 percent of maximum density.

B. Piping:

1. Install pipe according to AWWA C605.
2. Handle and assemble pipe according to manufacturer instructions and as indicated on Drawings.
3. Lift or roll pipe into position. Do not drop or drag pipe over prepared bedding.
4. Steel Rods, Bolt, Lugs, and Brackets: Coat buried steel with one coat of coal tar coating before backfilling.
5. Sanitary Sewer Separation:
 - a. Install new water lines and appurtenances in compliance with local and state regulations governing the horizontal and vertical separations between water and sewer facilities.
 - b. Variance:
 - 1) If a variance is proposed due to requested design revisions or if an existing facility has been installed at a different location or elevation than indicated on the Plans, submit written proposal for review and approval by the Engineer.
 - 2) Include the reason for the variance, type of material and condition of the sewer line, location of the water and sewer facilities, horizontal and vertical skin-to-skin clearances and corrective measures proposed.
 - 3) Each variance will be considered on a case-by-case basis.
 - 4) Review Time: Allow a minimum of 5 working days review and response to each proposal.
6. Install ductile iron fittings according to AWWA C600.
7. Joints:
 - a. Pipe jointing surfaces shall be clean and dry when preparing surfaces for joining.

- b. Lubricants, primers, adhesives, etc. shall be used as recommended by the pipe or joint manufacturer's specifications.
 - c. The jointing materials or factory-fabricated joints shall then be placed, fitted, joined, and adjusted in such a manner as to obtain a watertight joint.
 - d. Trenches shall be kept water-free and as dry as possible during bedding, laying and jointing.
 - e. As soon as possible after the joint is made, sufficient backfill material shall be placed along each side of the pipe to prevent movement of the pipe from any cause.
8. Flanged Joints: Not to be used in underground installations except within structures, unless shown otherwise in the Drawings.
9. Deflection:
- a. PVC pressure pipe may be deflected both horizontally and vertically at the joints after assembly.
 - b. Deflection by bending of the pipe rather than at the joints is not allowed.
 - c. The maximum pipe deflection shall not exceed one-half of the manufacturer's stated joint deflection allowance.
 - d. Set a laser, string line, or other approved alignment guide along the centerline of previously installed pipe to the point where pipe joint deflection is required. The approved alignment guide shall extend to the end of the proposed subsequent pipe length. A measurement will be taken from the alignment guide to the centerline of the subsequent pipe length to determine the amount of pipe joint deflection proposed. Measured deflection shall not exceed the specified allowable deflection for the purposes of aligning the pipe.
10. Install pipe and fittings to the line and grade specified on the Drawings, with joints centered, pipe properly supported and restrained against movement, and all valve stems plumb. Re-lay pipe that is out of alignment or grade.
11. High Points:
- a. Install pipe with no high points, unless otherwise shown in the Drawings.

- b. If unforeseen field conditions arise that necessitate high points, install air release valves as directed by Engineer.
- 12. Bearing:
 - a. Install pipe to have bearing along entire length of pipe.
 - b. Excavate bell holes to permit proper joint installation where necessary or as directed by Engineer.
 - c. Do not lay pipe in wet or frozen trench.
- 13. Prevent foreign material from entering pipe during placement.
- 14. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- 15. Close pipe openings with watertight plugs during Work stoppages.
- 16. All pipe ends which are to be permanently closed shall be plugged or capped and restrained against internal pressure.
- 17. Install access fittings to permit disinfection of water system performed under Section 33 13 00 – Testing and Disinfecting of Water Utility Piping.
- 18. Cover:
 - a. Where not indicated in the drawings establish elevations of buried piping with not less than 36 inches or more than 60 inches of cover.
 - b. Measure depth of cover from final surface grade to top of pipe barrel.
- 19. Pipe Markers:
 - a. Install as specified in Section 31 23 17, Trenching.
- C. Tapping Sleeves and Valves:
 - 1. As indicated on Drawings and according to manufacturer instructions.
- D. Polyethylene Encasement:
 - 1. Encase pipe fittings in polyethylene to prevent contact with surrounding backfill material.
 - 2. Comply with AWWA C105.

- E. Thrust Restraints:
1. Provide valves, tees, bends, caps, and plugs with concrete thrust blocks and mechanical thrust restraint devices at locations shown in the Drawings and as required to facilitate testing of lines.
 2. Pour concrete thrust blocks against undisturbed earth.
 3. Locate thrust blocks to ensure that pipe and fitting joints will be accessible for repair.
 4. Provide thrust restraint bearing area on subsoil as shown in details within the Drawings.
 5. Install tie rods, clamps, setscrew retainer glands, or restrained joints.
 6. Protect metal-restrained joint components against corrosion with polyethylene film as specified herein.
 7. Do not encase pipe and fitting joints to flanges.
- F. Backfilling:
1. Backfill of piping systems shall be as specified in Section 31 23 17, Trenching.
- G. Testing and Disinfection of Potable Water Piping System:
1. In accordance with AWWA C605, AWWA C651 and as specified in Section 33 13 00, Testing and Disinfecting of Water Utility Piping.
 2. All chlorinated water used in disinfection of the water main shall either be discharged through an approved connection to a public sanitary sewer system or shall be dechlorinated to limits acceptable by the Colorado Department of Public Health and Environment (CDPHE) prior to discharge into any storm drainage system or open drainage way.
 3. No chlorinated water shall be discharged into a storm drainage system or open drainage way without a dechlorination under a plan meeting CDPHE requirements.

3.4 FIELD QUALITY CONTROL

- A. Compaction Testing: See Section 31 23 17, Trenching for Compaction Testing requirements for piping trenches.

- B. Pressure Testing and Bacteriological Testing: See Section 33 13 00, Testing and Disinfection of Water Utility Piping.

END OF SECTION

SECTION 33 12 16 - WATER UTILITY DISTRIBUTION VALVES

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes valves and valve boxes for installation with buried water distribution and transmission main, including fire hydrants and tapping sleeves.
- B. Section Includes:
 - 1. Valves.
 - 2. Valve boxes.
 - 3. Valve operator extensions.
- C. Related Requirements:
 - 1. Section 03 30 00 - Cast-in-Place Concrete: Concrete for thrust restraints
 - 2. Section 33 11 10 - Water Utility Distribution and Transmission Piping: Piping trenching, backfilling, and compaction requirements.
 - 3. Section 33 12 13 - Water Service Connections: Pipe materials, fittings, and service connection appurtenances and installation requirements.
 - 4. Section 33 12 19 - Water Utility Distribution Fire Hydrants: Execution requirements for fire hydrants.
 - 5. Section 33 13 00 - Testing and Disinfecting of Water Utility Distribution: Flushing and disinfection requirements.

1.2 REFERENCE STANDARDS

- A. American Society of Mechanical Engineers (ASME):
 - 1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250
 - 2. ASME B16.5 - Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and other Special Alloys
 - 3. ASME 1.20.1 - General Purpose Pipe Threads (Inch)
- B. American Water Works Association (AWWA):
 - 1. AWWA C504 - Rubber-Seated Butterfly Valves, 3 In. Through 72 In.

2. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service
 3. AWWA C550 - Protecting Interior Coatings for Valves and Hydrants
 4. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances
 5. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings
- C. ASTM International (ASTM):
1. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings
 2. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications
- D. NSF International (NSF):
1. NSF 61 - Drinking Water System Components - Health Effects
 2. NSF 372 - Drinking Water System Components - Lead Content

1.3 COORDINATION

- A. The Contractor shall cause the Supplier of valves to coordinate installation such that all pipes, valves, fittings, appurtenances, and equipment are compatible and capable of achieving the performance requirements specified in the Contract Documents.
- B.

1.4 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00. At the time the first submittal is made under this section, include the addresses and phone numbers of nearest manufacturer's representative
1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- B. Product Data: Submit manufacturer's latest published literature. Include illustrations, installation and maintenance instructions, and parts lists.

- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer Instructions: Submit detailed instructions on installation requirements, including storage and handling procedures.
- E. Lining and coating data.
- F. Valve Labeling: Schedule of valves to be labeled indicating in each case the valve location and the proposed labeling for the valve.
- G. Certification of Valves Larger than 12 inches: Furnish certified copies of hydrostatic factory tests, indicating compliance with applicable standards.
- H. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
- I. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of valves.
- B. Operation and Maintenance Data: Submit information for valves.

1.6 QUALITY ASSURANCE

- A. Cast manufacturer's name, maximum working pressure, size of valve, and year of fabrication into valve body.
- B. Valve Testing: Each valve body shall be tested under a test pressure equal to twice its design water-working pressure.
- C. Certification: Prior to shipment, submit for all valves over 12 inches in diameter, certified, notarized copies of the hydrostatic factory tests, showing compliance with the applicable standards of AWWA, American National Standards Institute (ANSI), ASTM, etc. Valves tested and supplied shall be trackable and traceable by serial number, tagged or otherwise noted on valve, upon arrival to Site.
- D. Unless otherwise noted, all water works materials provided for the Project shall be new, of first-class quality and shall be made by reputable manufacturers.
- E. All material of a like kind shall be provided from a single manufacturer, unless otherwise approved by the Engineer.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves and accessories for shipment according to applicable AWWA standards.
- B. Seal valve and ends to prevent entry of foreign matter.
- C. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- D. Storage:
 - 1. Store materials in areas protected from weather, moisture, or other potential damage.
 - 2. Do not store materials directly on ground.
- E. Handle products carefully to prevent damage to interior or exterior surfaces.
- F. All defective or damaged materials shall be replaced with new materials at no cost to the Owner.

PART 2 PRODUCTS

2.1 GENERAL

- A. All materials in contact with potable water shall conform to ANSI/NSF Standard 61 and meet the "lead free" requirements of the Safe Drinking Water Act amendment, effective January 4, 2014, as per the lead content evaluation procedures outlined in NSF/ANSI Standard 372.1.
 - 1. All fittings shall either be cast or permanently stamped with markings identifying the item as complying with NSF 61 per the requirements of NSF 372 for "lead free".
 - 2. All brass in contact with potable water shall comply with ASTM B584.

2.2 RESILIENT WEDGE GATE VALVES

- A. As specified in Section 40 05 61, Gate Valves.
- B. Connecting Hardware:
 - 1. As specified in Article 2.3, Nuts, Bolts and Washers of Section 33 11 10, Water Utility Distribution and Transmission Piping.

C. Gaskets:

1. As required for the end connection types specified in Section 33 11 10, Water Utility Distribution and Transmission Piping.

2.3 RUBBER-SEATED BUTTERFLY VALVES

A. NOT USED

2.4 ACTUATORS

- A. Unless otherwise indicated, all valves shall be furnished with manual actuators.
- B. Actuators shall be sized for the valve design pressure in accordance with AWWA C504.
- C. All gear-assisted valves that are buried and submerged shall have the actuators hermetically sealed and grease-packed.
- D. All valves 6 inches to 30 inches in diameter may have traveling-nut actuators, worm-gear actuators, spur- or bevel-gear actuators, as appropriate for each valve.

2.5 VALVE BOXES

A. Provide all buried valves with valve boxes, covers and risers.

B. Valve Boxes:

1. Materials: Cast iron. ASTM A48 CLASS 20A
2. Construction:
 - a. Walls not less than 3/16-inch thick at any point.
 - b. Internal diameter not less than 5.25 inches.
 - c. Round base
3. Type: Two-piece adjustable screw style extension.
4. Manufacturers:
 - a. Tyler Pipe Series 6850.
 - b. Engineer approved equivalent.

C. Covers:

1. Construction:

- a. Prevents dislodging and rotation from traffic.
 - b. Allows a hand-held pry bar to be applied for easy removal.
- 2. Materials: Cast iron.
- 3. Lid Inscription: NON-POTABLE WATER.
- 4. Manufacturers: Matching that of valve box.
- D. Riser:
 - 1. Materials: Cast iron.
 - 2. Length as shown on details in the Drawings.

2.6 VALVE OPERATOR EXTENSIONS

- A. As shown in the Drawings.
- B. Provide operator extensions to a maximum of 48 inches below grade where depth to valve exceeds 72 inches.

2.7 ACCESSORIES

- A. Mechanical and Concrete Thrust Restraints: per Section 33 11 10.

PART 3 EXECUTION

3.1 PREPARATION

- A. Conduct operations to not interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures, utilities, and landscape in immediate or adjacent areas.
- B. Identify required lines, levels, contours, and datum locations.
- C. Locate, identify, and protect from damage utilities to remain.
- D. Access:
 - 1. All valves shall be installed to provide easy access for operation, removal, and maintenance.
 - 2. Avoid conflicts between valve operators and above grade construction such as structural members or handrails.
- E. Valve Accessories:

1. Where combinations of valves, sensors, switches, and controls are specified, it shall be the responsibility of the Contractor to properly assemble and install these various items so that all systems are compatible and operating properly.
2. The relationship between interrelated items shall be clearly noted on shop drawing submittals.

3.2 INSTALLATION

A. General:

1. All valves, operating units, stem extensions, valve boxes, and accessories shall be installed in accordance with the manufacturer's written instructions and as shown in the Drawings and as specified herein.
2. Valves shall be firmly supported to avoid undue stresses on the pipe.
3. Stem extensions shall be braced at no greater than 10 feet intervals and be provided with double universal joints to allow for misalignment, where applicable.

B. Perform trench excavation, backfilling, and compaction as specified in Section 31 23 17, Trenching.

C. Install valves in conjunction with pipe laying.

D. Set valves plumb.

E. Provide buried valves with valve boxes installed flush with finished grade.

1. Valves installed out of paved or otherwise hard-surfaced areas shall be set with a concrete collar at finished grade.
2. Concrete valve box collars shall be 18 inches square and be not less than 6 inches thick.

F. Disinfection of Water Piping System:

1. Flush and disinfect system as specified in Section 33 13 00, Testing and Disinfecting of Water Utility Distribution.

3.3 FIELD QUALITY CONTROL

A. Pressure test valving for water distribution system according to AWWA C600 and in accordance with Section 33 13 00, Testing and Disinfecting of Water Utility Distribution.

END OF SECTION

SECTION 33 13 00 - TESTING AND DISINFECTING OF WATER UTILITY PIPING

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes hydrostatic pressure testing, disinfection, and purity testing of potable water systems piping, fittings, valves, and domestic water services.
- B. Section Includes:
 - 1. Pressure testing and disinfection of potable water distribution and transmission piping systems and appurtenances.
 - 2. Testing and reporting of results.
- C. Related Requirements:
 - 1. Section 33 11 10 - Water Utility Distribution and Transmission Piping
 - 2. Section 33 12 16 - Water Utility Distribution Valves
 - 3. Section 33 12 19 - Fire Hydrants
 - 4. Section 33 12 13 - Water Service Connections

1.2 REFERENCE STANDARDS

- A. American Water Works Association (AWWA):
 - 1. AWWA B300 - Hypochlorites
 - 2. AWWA B301 - Liquid Chlorine
 - 3. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances
 - 4. AWWA C605 - Underground Installation of PVC and PVCO Pressure Pipe and Fittings
 - 5. AWWA C651 - Disinfecting Water Mains
 - 6. AWWA C655 - Field Dechlorination

1.3 PERFORMANCE AND DESIGN REQUIREMENTS:

- A. Regulatory requirements
 - 1. Conform to applicable code or state regulation for performing the work of this Section

1.4 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00. At the time the first submittal is

made under this section, include the addresses and phone numbers of nearest manufacturer's representative

1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- B. Product Data: Submit procedures, proposed chemicals, and treatment levels.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Pipeline Testing and Disinfection Plan: To be submitted for review and approval by the Engineer a minimum of 1 month before testing is to start. As a minimum, the plan shall include the following:
1. Testing schedule.
 2. Hydrostatic Testing Plan:
 - a. Narrative of the proposed process.
 - b. Proposed equipment to be used.
 - c. Disposal location for excess water used to fill mains.
 3. Disinfection Plan:
 - a. NOT USED
 4. Proposed testing locations.
 5. Proposed plan for water conveyance, including flow rates.
 6. Proposed plan for water control.
 7. Proposed plan for water disposal, including flow rates. Include proposed plan for dechlorination of water, including discharge points.
 8. Proposed measures to be incorporated in the project to minimize erosion while discharging water from the pipeline.

1.5 CLOSEOUT SUBMITTALS

- A. Disinfection Report:
1. NOT USED.

- B. Bacteriological report; record:
 - 1. NOT USED

1.6 QUALITY ASSURANCE

- A. Perform Work according to AWWA C651 and C652.

PART 2 PRODUCTS

2.1 EQUIPMENT

- A. All test equipment, chemicals for chlorination, temporary valves, bulkheads, or other water control equipment and materials shall be determined and furnished by the Contractor subject to the Engineer’s review. No materials shall be used which would be injurious to the construction or its future functions.
- B. All temporary thrust restraint and equipment and facilities required for hydrostatic testing will be considered incidental.
- C. As a minimum, furnish the following equipment and materials for the testing:

Amount	Description
2	Graduated containers approved by the Engineer.
1	Hydraulic pump approved by the Engineer with hoses, valves, and fittings as needed and required for the testing and disinfection of the facilities.
2	Pressure gauges with pressure range at least 120 percent greater than the required maximum test pressure with graduations in 2 pounds per square inch (psi) increments. Gauges shall have been calibrated with 90 days of pressure testing.

2.2 DISINFECTION CHEMICALS

- 1. NOT USED

2.3 DECHLORINATION CHEMICALS

- A. Chemicals:
 - 1. Comply with AWWA C655.

PART 3 EXECUTION

3.1 HYDROSTATIC TESTING OF WATER PIPING

- A. Make all necessary provisions for conveying water to the points of use and for the disposal of test water.
- B. No section of the pipeline shall be hydrostatically tested until backfill has been placed, compacted, and passed required density testing and all field-placed concrete or mortar has attained full strength.
 - 1. At the Contractor's option, early strength concrete may be used when the full-strength requirements conflict with schedule requirements.
 - 2. All such substitutions and installations shall be approved by the Engineer prior to installation.
- C. Provide 72-hour notification to the Engineer and Owner prior to conducting hydrostatic testing.
 - 1. Provide coordination and scheduling required for the Owner and Engineer to witness and provide necessary labor for operating Owner's existing system during hydrostatic testing and disinfecting procedures.
 - 2. The Contractor shall not operate any part of the existing water systems.
- D. Pipe Filling:
 - 1. Fill pipes slowly from the lowest elevation to highest point along test section with potable water.
 - 2. Take all required precautions to prevent entrapping air in the pipes.
 - 3. Allow for natural absorption of water by the lining of the pipe to occur.
 - 4. Apply specified test pressure by pumping.
- E. Testing of Mains:
 - 1. Ductile Iron: In accordance with AWWA C600.
 - 2. Polyvinyl chloride (PVC): In accordance with AWWA C605.
 - 3. General:
 - a. Tests shall be conducted under a hydrostatic test pressure not less than 1.5 times the stated anticipated maximum sustained working pressure of the

pipeline and not less than a minimum 150 psi, unless otherwise shown in the Drawings.

- b. In no case shall the test pressure exceed the rated working pressure for any joint, thrust restraint, valve, fitting, or other connected appurtenance of the test section.
 - c. Testing shall be performed by applying the specified test pressure by pumping.
 - d. Once the test pressure has been attained, the pump shall be valved off.
 - e. The test will be conducted for a 2-hour period with the allowable leakage not to exceed the value as calculated per the Allowable Leakage formula below.
 - f. During the test period, there shall be no appreciable or abrupt loss in pressure.
4. Allowable Leakage:
- a. Flanged Joints: Pipe, fittings, and valves with flanged joints shall be completely watertight. No leakage allowed.
 - b. Mechanical or Push-on Joints: Pipe, fittings and valves with rubber gasketed joints shall have a measured loss not to exceed the rate given in the following Allowable Leakage formula:

$$AL = \frac{LD(P)^{1/2}}{148,000}$$

In the above formula:

AL = Allowable leakage, in gallons per hour

L = Length of pipe tested, in feet

D = Nominal diameter of pipe, in inches

P = Average test pressure during the leakage test, in pounds per square inch.

5. Maintaining Pressure:
- a. During the test period, operate the pump as required to maintain pressure in the pipe within 5 psi of the specified test pressure at all times.
 - b. At the end of test period, operate the pump until the specified test pressure is again obtained.

- 1) The pump suction shall be in a clean, graduated barrel, or similar device or metered so that the amount of water required to restore the test pressure may be accurately measured.
 - c. The Engineer will determine the quantity of water required to maintain and restore the required pressure at the end of the test period.
 - d. Each hour's loss stands on its own and will not be averaged.
6. Defects, Leakage, Failure:
- a. If the test reveals any defects, leakage in excess of the allowable, or failure, furnish all labor, equipment, and materials required to locate and make necessary repairs.
 - b. Correct any visible leakage regardless of the allowable leakage specified above.
 - c. All leaks shall be repaired in a manner acceptable to the Engineer.
 - d. The testing of the line shall be repeated until a test satisfactory to the Engineer has been achieved.

3.2 FLUSHING OF WATER PIPING

- A. Flush all foreign matter from the pipeline, branches and services.
1. Provide at no additional cost to the Owner, hoses, temporary pipes, ditches, etc., as required to dispose of flushing water without damage to adjacent properties.
 2. Flushing velocities shall be at least 2.5 feet per second (fps).
 3. For large diameter pipe where it is impractical or impossible to flush the pipe at 2.5 fps velocity, clean the pipe in place from the inside by brushing and sweeping, then flush the line at a lower velocity.
- B. Disposal of any water containing chlorine shall be performed in accordance with the latest edition of AWWA C651 and C655, and all state or local requirements.
1. Disposal may be made into existing sanitary sewer systems providing approvals are obtained from the respective system owners.
 2. Any chlorinated water discharged to open stream channels must be dechlorinated prior to discharge to levels acceptable by the Colorado Department of Public Health and Environment (CDPHE).

3.3 FIELD QUALITY CONTROL

- A. Pressure testing to be performed in the presence of the ENGINEER.

END OF SECTION

SECTION 40 05 51.15 - GATE VALVES

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes gate valves for use in buried service. Coordinate with Section 33 12 16, Water Utility Distribution Valves.
- B. Section Includes:
 - 1. Resilient-seated gate valves.

1.2 RELATED SECTIONS

- A. Section 33 12 16, Water Utility Distribution Valves
- B. Section 33 11 10, Water Utility Distribution and Transmission Piping

1.3 REFERENCE STANDARDS

- A. American Society of Mechanical Engineers (ASME):
 - 1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings.
 - 2. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through 24 - Metric/Inch Standard.
 - 3. ASME B16.42 - Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300.
 - 4. ASME B1.20.1 - Pipe Threads, General Purpose (Inch).
- B. ASTM International (ASTM):
 - 1. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - 2. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
 - 3. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.
- C. American Water Works Association (AWWA):
 - 1. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service.
 - 2. AWWA C550 - Protecting Interior Coatings for Valves and Hydrants.

- D. NSF International (NSF):
 - 1. NSF/ANSI Standard 61 - Drinking Water System Components - Health Effects
 - 2. NSF/ANSI Standard 372 - Drinking Water System Components - Lead Content

1.4 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00. At the time the first submittal is made under this section, include the addresses and phone numbers of nearest manufacturer's representative
 - 1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- B. As required by Section 33 12 16 - Water Utility Distribution Valves.

PART 2 PRODUCTS

2.1 GENERAL

- A. All materials in contact with potable water shall conform to ANSI/NSF Standard 61 and meet the "lead free" requirements of the Safe Drinking Water Act amendment, effective January 4, 2014, as per the lead content evaluation procedures outlined in NSF/ANSI Standard 372.1.
 - 1. All fittings shall either be cast or permanently stamped with markings identifying the item as complying with NSF 61 per the requirements of NSF 372 for "lead free".
 - 2. All brass in contact with potable water shall comply with ASTM B584.

2.2 RESILIENT-SEATED GATE VALVES

- A. Description:
 - 1. Comply with AWWA C509.
 - 2. Minimum Pressure Rating:
 - a. Twelve-inch Diameter and Smaller: 200 pounds per square inch (gauge) (psig).
 - b. Sixteen-inch Diameter and Larger: 150 psig.
 - 3. End Connections: As shown in the Drawings.

- a. Standard mechanical joint ends comply with ANSI/AWWA C111.
4. Gear Actuators: Conforming to AWWA C509 for manual valves.
5. Linings and Coatings:
 - a. Corrosion-resistant fusion bonded epoxy conforming to AWWA C550 and NSF 61.
 - b. All internal and external ferrous surfaces.
 - c. Do not coat flange faces of valves.
6. Bi-directional flow.
- B. Operation:
 1. Non-rising stem.
 2. Open counterclockwise when viewing the valve from above, unless otherwise indicated in the Drawings.
 3. Buried Valves: All buried valves shall be provided with 2-inch square operating nuts.
- C. Materials:
 1. Wedge:
 - a. ASTM A126, cast iron or ASTM A536, ductile iron.
 - b. Fully encapsulated with molded rubber .
 2. Body and Bonnet:
 - a. ASTM A126, cast iron or ASTM A536, ductile iron.
 3. Stem, Stem Nuts, Glands, and Bushings: ASTM B584, bronze.
 4. Valve Body Bolting: Stainless steel.
- D. Manufacturers:
 1. Clow Valve Company.
 2. M&H Valve.
 3. U.S. Pipe.
 4. American Flow Control.
 5. Mueller Company.

2.3 SOURCE QUALITY CONTROL

- A. Testing: Test gate valves according to AWWA C509.

PART 3 EXECUTION

3.1 INSTALLATION

- A. As required by Section 33 12 16, Water Utility Distribution Valves.
- B. Install according to manufacturer's instructions.
- C. Support valves in plastic piping to prevent undue stresses on piping.

END OF SECTION

SECTION 40 05 78 - MISCELLANEOUS VALVES

PART 1 GENERAL

1.1 SUMMARY

- A. This Section includes miscellaneous valves not included in other Sections for use in buried service.
- B. Section Includes:
 - 1. Blow-off hydrant.

1.2 RELATED SECTION

- A. Section 33 11 10, Water Utility Distribution and Transmission Piping.

1.3 REFERENCE STANDARDS

- A. American Society of Mechanical Engineers (ASME):
 - 1. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings.
 - 2. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through 24 - Metric/Inch Standard.
 - 3. ASME B16.11 - Forged Fittings, Socket-Welding and Threaded.
 - 4. ASME B16.42 - Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300.
 - 5. ASME B1.20.1 - Pipe Threads, General Purpose (Inch).
- B. ASTM International (ASTM):
 - 1. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - 2. ASTM A536 - Standard Specification for Ductile Iron Castings.
 - 3. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.

1.4 COORDINATION

- A. Contractor shall be solely responsible to coordinate Work of this Section with piping, equipment, and appurtenances.

1.5 SUBMITTALS

- A. The following list of submittals are to be made under this section and in accordance with the provisions of Sections 01 33 00 and 01 45 00. At the time the first submittal is made under this section, include the addresses and phone numbers of nearest manufacturer's representative
 - 1. Provide a copy of any pertinent Drawings, this specification section and all related Sections and with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements
- B. Product Data:
 - 1. Submit manufacturer's latest published literature. Include illustrations, installation and maintenance instructions, and parts lists.
 - 2. Submit valve cavitation limits.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer Instructions: Submit installation instructions and special requirements, including storage and handling procedures.
- E. Lining and coating data.
- F. Valve Labeling Schedule: Indicate valve locations and nametag text.
- G. Certification of Valves Larger than 12 inches: Furnish certified copies of hydrostatic factory tests, indicating compliance with applicable standards.
- H. Source Quality-Control Submittals: Indicate results of factory tests and inspections.
- I. Field Quality-Control Submittals: Indicate results of Contractor-furnished tests and inspections, including factory-applied coatings.

1.6 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of valves and actuators.
- B. Operation and Maintenance Data: Submit information for valves.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Spare Parts:
 - 1. Furnish one set of manufacturer's recommended spare parts.

- B. Tools:
 - 1. Furnish special wrenches and other devices required for Owner to maintain equipment.
 - 2. Furnish compatible and appropriately labeled toolbox when requested by Owner.

1.8 QUALITY ASSURANCE

- A. Cast manufacturer's name, pressure rating, size of valve, and year of fabrication into valve body.
- B. Valve Testing: Each valve body shall be tested under a test pressure equal to twice its design water-working pressure.
- C. Certification: Prior to shipment, submit for all valves over 12 inches in diameter, certified, notarized copies of the hydrostatic factory tests, showing compliance with the applicable standards of AWWA, ANSI, ASTM, etc. Valves tested and supplied shall be trackable and traceable by serial number, tagged or otherwise noted on valve, upon arrival to Site.
- D. Maintain clearances as indicated on Drawings.
- E. Unless otherwise noted, all water works materials provided for the Project shall be new, of first-class quality and shall be made by reputable manufacturers.
- F. All material of a like kind shall be provided from a single manufacturer, unless otherwise approved by the Engineer.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- B. Store materials according to manufacturer instructions.
 - 1. Store materials in areas protected from weather, moisture, or other potential damage.
 - 2. Do not store materials directly on ground.
- C. Protection:
 - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.

2. Protect valve ends from entry of foreign materials by providing temporary covers and plugs.
 3. Provide additional protection according to manufacturer instructions.
- D. Handle products carefully to prevent damage to interior or exterior surfaces.
- E. All defective or damaged materials shall be replaced with new materials at no cost to the Owner.

PART 2 PRODUCTS

2.1 GENERAL

- A. All materials in contact with potable water shall conform to ANSI/NSF Standard 61 and meet the “lead free” requirements of the Safe Drinking Water Act amendment, effective January 4, 2014, as per the lead content evaluation procedures outlined in NSF/ANSI Standard 372.1.
1. All fittings shall either be cast or permanently stamped with markings identifying the item as complying with NSF 61 per the requirements of NSF 372 for “lead free”.
 2. All brass in contact with potable water shall comply with ASTM B584.

2.2 MUD VALVES

NOT USED

2.3 SOLENOID VALVES

NOT USED

2.4 AIR RELEASE VALVES

NOT USED

2.5 COMBINATION AIR/VACUUM VALVES

NOT USED

2.6 BLOW-OFF ASSEMBLIES

- A. Description:
1. Material: 100 percent low-lead brass.
 2. Inlet: 2-inch diameter female iron pipe (FIP) vertical straight inlet.

3. Outlet: 2-inch diameter male iron pipe (MIP).
 4. Operation:
 - a. By turning a top-mounted square operating nut.
 - b. Operation must seal drain outlet in all positions from 1/4-open to fully open.
 5. Accessories: Provide Owner with one operating wrench.
- B. Manufacturers:
1. Kupferle – Truflo #TF500 or approved equal.

2.7 FLAP VALVES

NOT USED

2.8 SHEAR GATES

NOT USED

2.9 BALL VALVES, 2 INCHES AND UNDER

NOT USED

2.10 SOURCE QUALITY CONTROL

- A. Testing Pressure-Reducing and Pressure-Sustaining Valves:
1. Leakage Testing:
 - a. Per Section 33 13 00 Testing and Disinfection of Water Utility Piping.
 2. Functional Testing:
 - a. Test each valve to verify specified performance.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install valves per manufacturer requirements and recommendations.
- B. Install all valves with valve seats level.
- C. Install protective strainers upstream of solenoid valves, pressure-reducing valves, and pressure-sustaining valves.

END OF SECTION



**Addendum Number 1
Erie Parkway Reuse Waterline Improvements
Town of Erie Project Number P21-287
September 2, 2021**

This addendum shall become a part of the contract documents as if originally included. All those submitting bids shall acknowledge receipt of addendum number 1 on your Bid Form.

1. Pages 3 – 6 of this addendum include minutes from the Pre-Bid Meeting held on September 1, 2021.
2. Page 7 of this addendum includes Town directives stated during the meeting; and Questions and Town Responses.
3. A video of the Pre-Bid Meeting will be made available on RMEPS as part of Addendum 1.
4. Response to Questions submitted after Pre-Bid Meeting:
 - a. Question: **Unit Price Bid Form**
The quantities for bid items 27 & 28 are currently listed as "0". Are bidders required to only input a unit price?
Answer: That is correct. It is not anticipated that these items will be needed, but we are looking to get unit prices for these in case they end up being needed.
 - b. Question: **Notice To Proceed (NTP) Date**
The anticipated NTP date of 10/18/21 is not feasible. Current market conditions are pushing the acquisition of material out 10-12 weeks from approved submittals. January 2022 is probably the best case scenario for being able to acquire all material. Is the Town open to a NTP date of January?

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Answer: Refer to As stated in Section 01 10 00 Summary of Work, Article 1.7 E.3.c:

c. Question: **Purple C900 PVC**

PVC has been difficult to acquire all year long. Purple PVC will be even more difficult to obtain, and the recent hurricane is only exacerbating current market conditions. Is the Town open to a ductile iron pipe option wrapped in purple poly? Again, the optimistic feedback is purple PVC would not be available until January 2022.

Answer: No, the Town will not accept ductile iron pipe option wrapped in purple poly.

All items in conflict with addendum number 1 are hereby deleted.

Zachary N. Ahinga

Zachary Ahinga
Project Manager

Town of Erie

zahinga@erieco.gov

ADDENDUM 1

Pre-Bid Meeting Minutes

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Pre-Bid Meeting Agenda

Erie Parkway Reuse Waterline Improvements
Project Number P21-287

Date: September 1, 2021

Time: 10:00 am

Location: ZOOM

<https://townoferie.zoom.us/j/89917645652?pwd=MDZhdERFN0RZK0tSQkEzVXNDNFA2dz09>

1. Attendance – This Zoom meeting is being recorded. Please rename yourself so it displays your name and organization (e.g., Zachary Ahinga – Town of Erie).
2. Introductions
 - Town of Erie
 - Project Manager: Zachary Ahinga
 - Town Engineer: David Pasic
 - Public Works Director: Todd Fessenden
 - Operations & Maintenance Division Manager: Jody Lambert
 - Design Consultant, Murraysmith, Inc.
 - Principal in charge: Matt Knight
 - Principal Engineer: Phil Sack
3. Description of Project
 - **Project Location:** The project location is shown on the Vicinity Map on the Cover Sheet of the Construction Plans.

Project Overview: Construction of a reuse waterline located in Erie Parkway between South Briggs Street and Powers Street. Work consists of installation of 1,460 LF of 8” and 12” reuse waterline, asphalt patching, traffic control, seeding, and site restoration.

4. Bid Opening
 - Bid must be received by **11:00 a.m., September 15, 2021.**
 - All bids must be submitted electronically using the portal at <https://www.bidnetdirect.com/colorado>. Bid results will be published on the RMEPS after the submittal deadline.

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ADDENDUM 1

- The required Bid documents must be received in the RMEPS submission portal on or before the Bid due date and time. Hardcopy submittals will not be accepted. It is the Bidder's sole responsibility to ensure all required Bid documents are submitted through RMEPS by the submission deadline. RMEPS does not allow for uploading Bid documents after the Bid due date and time has closed.
 - Bids will be time-stamped by RMEPS upon receipt. After uploading bid documents, Bidders must click the SUBMIT button. The Town will not accept uploads that are "saved" but not "submitted". To verify that a Bid has been submitted successfully, Bidders may contact BidNet Support or verify, via the Bid Management tab in Bidder's account, that the documents are not in "Draft" status. The Town does not have access to or control of the vendor side of RMEPS. If website or other problems arise during response submission, vendor MUST contact RMEPS to resolve issue prior to the response deadline. (800-835-4603).
5. Bid Submittal
- The bid submittal must include the Bid Form, Bid Schedule, and Bid Bond.
 - Note all requirements of BID FORM and INSTRUCTIONS TO BIDDERS (i.e., visit site to make sure you are absolutely familiar with requirements of the Work).
6. The construction survey is to be provided by the contractor.
7. Testing will be provided by the Town in accordance with the Contract Documents.
8. Questions regarding Bid Documents
- All questions after the Pre-bid meeting must be submitted via RMEPS
 - Bid Documents can only be modified by addendum.
 - Last Day for Questions – **September 8, 2021 at 1:00 p.m.**
 - Last Addendum will be issued (if needed) on – **September 10, 2021** if questions are submitted on, or before, **September 8, 2021.**
 - In the event that a significant issue arises after the last day for questions, call the Project Manager, Zachary Ahinga, at 303-926-2878. If it is determined to be a significant issue the bid opening may need to be delayed.
9. Subsurface Information
- Geotechnical soil borings from an adjacent past project is provided on the RMEPS and is provided as **Supplemental Information for information only**. It should be emphasized that these reports are not considered part of the Bid Documents, each Contractor shall make their own investigations as they deem necessary to completely understand the conditions.
 - **Note: Water table will likely vary due to seasonal variations. Contractor shall verify water table conditions and provide all dewatering as necessary. No additional payment will be made for changed conditions. Contractor shall obtain all necessary additional permits for their**

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dewatering activities.

10. Work Hours

- Work Hours – 7:00 am to 7:00 pm (or dusk), Monday through Friday. Work requiring inspection shall be between the hours of 7 am and 3:30 pm Monday through Friday.
- Lane closures are restricted to 9:00 a.m. to 4:00 p.m.

11. Sequencing of Work

- Contractor shall determine sequence around their limitations.
- Means and Methods – ALL MEANS AND METHODS FOR CONSTRUCTION WILL BE THE RESPONSIBILITY OF THE CONTRACTOR. Contractors bidding the project should have a thorough understanding of how they will construct the project, including all shoring, dewatering, excavation, sequencing, etc. with consideration for their operation.
- Weekend and holiday work requests must be submitted no later than 7:00 a.m. two business days prior to desired work dates and receive written approval prior to such date.

12. Project Schedule

- The Town has 60 days from the date of the Bid Opening to issue a Notice of Award. Anticipated Notice of Award – **September 29, 2021** (Subject to Change)
- Anticipated Notice to Proceed – **October 18, 2021** (Subject to Change)
- Substantial Completion – **122** calendar days from NTP.
- Final Completion – **30** calendar days from Substantial Completion.
- Retainage – The Town will withhold 5% of each payment as retainage until completion of the project. Retainage must be invoiced and will be released after completion of the project and a two-week advertisement period.

13. Permits and Licenses

- Contractor shall be responsible for all permitting and licenses.
- A Town of Erie Stormwater Quality permit is required – fee waived
- A construction dewatering permit is responsibility of contractor if needed.
- The contractor and all of the sub-contractors shall be licensed by the Town of Erie.

14. Stormwater Management Plan

- The Contractor is responsible for the preparation of their Stormwater Management Plan. The plan must be submitted to Town for review and acceptance prior to submitting to the State for approval.
- Contractor shall be responsible for the Town and State stormwater permit and closing out the permit after final stabilization.

15. Construction Access

- Erie Parkway, Powers Street and Briggs Street.
- Construction must stay within Town right-of-way, existing utility easements and

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Town property.

16. Project Meetings

- The Contractor shall plan on weekly Progress meeting for the duration of the project.
- Held either via Zoom, at the Contractor's field office or Town offices.

17. Pre-Construction Photos and Video are required

- Videos by Contractor – copies given to the Town.
- Photos by Contractor – copies given to the Town.

18. Construction Water

- Contractor is responsible for the cost of water.
- Hydrant-meter rental agreement can be found on the Town of Erie's website at this link <https://www.erieco.gov/DocumentCenter/View/548/Hydrant-Meter-Rental-Form?bidId=>

19. Existing Utilities

- Contact Colorado 811 prior to construction to locate all utilities.
- Contractor shall pothole all existing utilities.
- See Special Provisions Item 12.

20. Traffic Control

- Contractor will be responsible for submitting a traffic control plan for review prior to construction.
- Traffic Control plans shall be prepared for roadways.

21. Addendum Items

- Addendums will be posted on the RMEPS. It will be the Contractor's responsibility to check for addendums and provide addendums to their Sub-Contractors.
- The first addendum will be issued by **September 2, 2021**, which will include minutes to this meeting.
- The Last Addendum (if needed) will be issued by **September 10, 2021**.

22. Special Attention

- Please note all the requirements in the Special Provisions Section.
- Advance notifications to those within 500 feet of construction.
- Section 01 10 00 Summary of Work, Article 1.7.E.3.c regarding Issuance of Notice to Proceed
- Technical specification section describes measurement & payment for each bid item.

23. Bond and Insurance Requirements

- Bond and Insurance requirements are identified in the General Provisions, Part 6. Bonds, Insurance, and Indemnification
- Warranty Period – Two years from the date of final payment.

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24. Discussion

a. Town Engineer stated:

Most of this work will be within Town right-of-way within Erie Parkway, with that there will be a requirement to work with the Town to issue public communications, through the Town's Project Manager and the selected contractor for this project.; 2 weeks in advance of starting the work. Please be aware of that, it is making the Town's Project Manager aware as soon as you can so the Town can get an announcement out to our residents. See Special Provisions Section 19E.

b. Operations & Maintenance Division Manager stated:

Also on your Method of Handling Traffic (MHT or traffic control) since this work will be conducted through the Fall and Winter season all your MHTs need to accommodate managing your traffic controls even through snow storm events.

25. Questions

- Q1. Are we able to shut down the east bound lane (where the pipeline is to be constructed) on Erie Parkway during construction? Can we shut-down and have full access to that side of the road and we just have to open up again in the evening?
- R1. The response provided during the pre-bid meeting was not clear and the following clarifies as follows: The drawings indicate the Construction Limits. At least one lane must ALWAYS be open for each direction of Erie Parkway at all times. This applies even when the CONTRACTOR is crossing perpendicular or diagonal to Erie Parkway. In addition, lane closures shall be confined to the area designated as "Construction Limits" on the plans.
- Q2. I had a question about the testing, you say the testing is going to be conducted by the City, I think Special Conditions say that we are supposed to perform the testing is that compaction testing I assume?
- R2. The Town of Erie will be responsible for all materials testing for this project This will be clarified in Addendum 2.
- Q3. On your Bid Form you have some of the items ask to be written out and the other ones are just go off the Bid Schedule, are you going to require all the bid items to be written out like that?
- R3. We have the items that are Lump Sum to be written-out in word, and the rest of the items are unit price; and so the response is only the lump sum items listed are to be written out in words, and the rest would be indicated in the Bid Form.
- Q4. Can we get clarification on the work hours?
- R4. Refer to item 10. Work Hours in the meeting minutes above. In addition, if contractor is outside the roadway, then contractor can work 7:00 a.m. to 7:00 p.m.



Addendum Number 2
Erie Parkway Reuse Waterline Improvements
Town of Erie Project Number P21-287
September 10, 2021

This addendum shall become a part of the contract documents as if originally included. All those submitting bids shall acknowledge receipt of addendum number 2 on your Bid Form.

1. Response to Questions submitted during Pre-Bid Meeting not addressed in Addendum 1:

- a. Question: **Testing and Inspection**

Special Conditions say that contractor is supposed to perform the testing is that compaction testing?

Answer: See the following revised specifications:

010 10 00 Summary of Work
01 45 00 Quality Control
03 30 00 Cast-In-Place Concrete
03 60 00 Grouting
31 05 13 Soils for Earthwork
31 05 16 Aggregates for Earthwork
31 22 13 Rough Grading
31 23 16 Excavation
31 23 17 Trenching
31 23 23 Fill
31 23 24 Flowable Fill
32 11 23 Aggregate Base Courses
32 12 16 Asphalt Concrete Pavement

2. Response to Questions submitted after Pre-Bid Meeting and Addendum 1:

- a. Question: **Road Base and Asphalt Patching Thickness**

Can you confirm the required thickness for the road base and asphalt patching?

ADDENDUM 2

Answer: A geotechnical investigation has not been performed and the existing roadway section has not been confirmed at this time. Refer to Detail 20 on Sheet C-10.

b. Question: **Acceptable Temporary Surface**

Can you please specify what is considered an acceptable temporary surface (i.e. product and thickness) at the end of each working day?

Answer: Temporary surfaces must be capable of supporting normal traffic loading. Roadway grade steel plates are acceptable to the Town of Erie. Contractor shall provide submittal and coordinate with the Town of Erie on any anticipated use of temporary surfaces.

c. Question: **Is there a budget, union labor requirements, and start/end date?**

Answer: The Town does not share project budgets during the bid period; and there are no union labor requirements for this project. Refer to the Construction Contract Article 3 and Technical Specification Section 01 10 00 Summary of Work, Article 1.7 E.3.C for information on project timeline. Refer to Construction Contract Articles 5 and 6 regarding labor forces.

d. Question: **Bid Form and Unit-Price Bid Form Clarification**

There are two-line items for traffic control. One in the Lum Sum items and then one in the excel spreadsheet. Please clarify where you'd like us to fill out the traffic control line item.

Answer: Upon review of the documents there is only one line item for traffic control and it is to be provided on a lump sum basis. On page B-8 the price for traffic control is to be written. Traffic control is also on the Unit-Price Bid Form (page B-10) as well as the excel spreadsheet. Bidder can utilize either the Unit-Price Bid Form or the excel spreadsheet for indicating all prices.

All items in conflict with addendum number 2 are hereby deleted.


Zachary Ahinga
Project Manager
Town of Erie
zahinga@erieco.gov



To: Zachary Ahinga, Town of Erie

From: Matt Worland, Goodland Construction, Inc.

Re: Bid for Erie Parkway Reuse Waterline

Dear Zachary,

Thank you for bringing to our attention the discrepancy in bid amounts. This letter is to hereby accept the modification of bid items 17, 21 and 23 to correct the bid item totals. Goodland also confirms that the correct bid amount is \$536,804.

If you have any questions, please feel free to contact me.

Sincerely,

A handwritten signature in blue ink, appearing to read "Matt Worland", with a long, sweeping underline.

Matt Worland
President

From: Matt Worland <Matt@goodlandconstruction.com>
Sent: Thursday, September 23, 2021 1:20 PM
To: Zachary Ahinga
Cc: Ryan Neeley
Subject: RE: Town of Erie - Bid for Erie Parkway Reuse Waterline
Attachments: Erie Pkwy Reuse - Bid Modification.pdf

Hi Zachary,

Attached is the signed letter and will keep an eye out for the contract.

Thanks,

Matt Worland

GoodLand Construction, Inc.
760 Nile St. Golden, CO 80401
Office: 303-278-8100 | Mobile: 303-598-2250
GoodLandConstruction.com

From: Zachary Ahinga <zahinga@erieco.gov>
Sent: Thursday, September 23, 2021 1:13 PM
To: Matt Worland <Matt@goodlandconstruction.com>
Cc: Ryan Neeley <Ryan@goodlandconstruction.com>
Subject: FW: Town of Erie - Bid for Erie Parkway Reuse Waterline

Hello Matt: I received the attached letter. However, it does not appear that you signed the letter; please sign and resend. Also, I will be sending you the construction contract and specifications for your signature either late Friday (tomorrow) or early Monday morning, Sept. 27th. I will need the signed contract back to me by Noon on Sept. 28th; so that it is available for execution by the Town after the recommendation to award the construction contract to GoodLand is approved by the Town Board of Trustees on the evening of Sept. 28th.
Thank you,
Zachary Ahinga

From: Matt Worland <Matt@goodlandconstruction.com>
Sent: Wednesday, September 22, 2021 8:42 AM
To: Zachary Ahinga <zahinga@erieco.gov>
Cc: Ryan Neeley <Ryan@goodlandconstruction.com>
Subject: RE: Town of Erie - Bid for Erie Parkway Reuse Waterline

Hello Zachary,

Please see attached letter regarding the modification of bid amount.

Sincerely,

Matt Worland

GoodLand Construction, Inc.
760 Nile St. Golden, CO 80401
Office: 303-278-8100 | Mobile: 303-598-2250
GoodLandConstruction.com

From: Zachary Ahinga <zahinga@erieco.gov>
Sent: Tuesday, September 21, 2021 6:00 PM
To: Matt Worland <Matt@goodlandconstruction.com>
Cc: Ryan Neeley <Ryan@goodlandconstruction.com>
Subject: RE: Town of Erie - Bid for Erie Parkway Reuse Waterline

Hello Mr. Worland: As we discussed last week. GoodLand submitted a bid price totaling \$536,631.25. During review of GoodLands' bid the Town found that the math was incorrect. By keeping the unit price and quantity at the amounts your original bid indicated the Town determined that the total for bid items 17, 21 and 23 should be changed as shown in the tabulation below; and found the total bid price summed to \$536,804; as shown in the tabulation below. The Town requests a written statement on GoodLand Construction letterhead requesting the modification of the bid items 17, 21 and 23 to correct the bid item totals (as shown below) and confirmation that the total bid amount should be \$536,804. Please provide this document as soon as possible.

Please let me know if you have questions.

Thank you,

Zachary N. Ahinga, P.E. | Civil Engineer
Planning and Development - Engineering



Town of Erie
645 Holbrook Street | P.O. Box 750 | Erie, CO 80516
Phone: 303-926-2878 | Cell: 720-926-0788 | Fax: 303-926-2706
www.erieco.gov/1044/Engineering-Division | [Facebook](#) | [Twitter](#) | [LinkedIn](#)

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Erie Parkway Reuse Waterline (P21-287)						
Bid Tabulation						
September 15, 2021						
NO.	DESCRIPTION	QTY	UNITS	UNIT PRICE	% OF AVERAGE	EXTENSION
1	Mobilization and Demobilization	1	LS	\$ 20,000.00	60%	\$ 20,000.00
2	Traffic Control	1	LS	\$ 15,000.00	156%	\$ 85,000.00
3	Permitting	1	LS	\$ 2,000.00	26%	\$ 3,500.00
4	Erosion Control and Sediment Maintenance	1	LS	\$ 10,000.00	56%	\$ 12,500.00
5	Tree Retention and Protection	3	EA	\$ 150.00	74%	\$ 2,625.00
6	Remove and Dispose of Existing Asphalt	700	SY	\$ 10.00	43%	\$ 10,500.00
7	Remove and Dispose of Concrete Curb and Gutter	120	LF	\$ 12.00	11%	\$ 600.00
8	Remove and Dispose of Concrete Walk	45	SY	\$ 30.00	32%	\$ 675.00
9	Remove and Dispose of Stamped Concrete Median	7	SY	\$ 50.00	9%	\$ 105.00
10	Protect Existing Utility Lines at Crossings	8	EA	\$ 1,000.00	89%	\$ 12,000.00
11	Exported Spoils	400	CY	\$ 40.00	55%	\$ 16,000.00
12	C900 Reuse Water Main Piping	1460	LF	\$ 90.00	73%	\$ 200,020.00
13	Reuse Water Main Gate Valves	3	EA	\$ 5,000.00	68%	\$ 9,720.00
14	Blow-Off Valve	1	EA	\$ 5,000.00	89%	\$ 5,610.00
15	Ductile Iron Tee, 12"x8"	1	EA	\$ 4,500.00	89%	\$ 2,910.00
16	Ductile Iron Pipe Bend	8	EA	\$ 2,600.00	88%	\$ 12,040.00
17	Install Thrust Blocks	12	EA	\$ 3,000.00	88%	\$ 14,604.00
18	Connection to Existing Pipe	2	EA	\$2,500.00	93%	\$ 13,160.00
19	Imported Backfill	160	CY	\$40.00	91%	\$ 8,000.00
20	Aggregate Base Course	235	CY	\$ 36.00	72%	\$ 15,745.00
21	Hot Mix Asphalt (HMA) - PG 64-22	305	TONS	\$ 180.00	88%	\$ 63,440.00
22	Road Pavement Markings	1	LS	\$ 5,000.00	172%	\$ 16,500.00
23	Install Concrete Curb and Gutter	120	LF	\$ 30.00	44%	\$ 3,600.00
24	Install Concrete Walk	45	SY	\$ 90.00	54%	\$ 4,050.00
25	Install Colored and Stamped Concrete Median	7	SY	\$ 265.00	37%	\$ 1,400.00
26	Landscaping and General Surface Restoration	100	SY	\$ 40.00	13%	\$ 2,500.00
27	Groundwater Dewatering	0	MONTHS	\$ 10,000.00	147%	\$ -
28	Stabilization of Subgrade Soil	0	CY	\$ 10.00	104%	\$ -
	Contingency	15%		\$ 58,200.00		
	Contractor OH&P	15%		\$ 58,200.00		
						\$ 536,804.00
*Note: Highlighted cells display corrected subtotals based upon the quantity and unit price provided						

From: Matt Worland <Matt@goodlandconstruction.com>
Sent: Thursday, September 16, 2021 2:46 PM
To: Zachary Ahinga <zahinga@erieco.gov>
Cc: Ryan Neeley <Ryan@goodlandconstruction.com>
Subject: RE: Town of Erie - Bid for Erie Parkway Reuse Waterline

Hi Zachary,

Please see attached updated job references, subcontractor listing and preliminary schedule. I did notice some of the references got cutoff, unfortunately I'm heading out of town for the weekend and am not sure why. If you need clarifications, please let me know.

Financials to follow

Thanks!

Matt Worland

GoodLand Construction, Inc.
760 Nile St. Golden, CO 80401
Office: 303-278-8100 | Mobile: 303-598-2250
GoodLandConstruction.com

From: Zachary Ahinga <zahinga@erieco.gov>
Sent: Thursday, September 16, 2021 10:57 AM
To: Ryan Neeley <Ryan@goodlandconstruction.com>; Matt Worland <Matt@goodlandconstruction.com>
Subject: Town of Erie - Bid for Erie Parkway Reuse Waterline

Hello Mr. Neeley and Mr. Goodland:

Your bid is the apparent low bid for this project. I will be performing a reference check and evaluating your bid. I would like to obtain the following items:

- a. Names and resumes of staff personnel to be assigned to the work
- b. Financial Statement
- c. Proposed Construction Schedule & Sequence Plan
- d. Subcontractor Listing
- e. Additional past project list and reference that may indicate more waterline construction projects

Please use the attached form for items c. and d.

In addition, we found a discrepancy in the bid math resulting in the total bid price of \$ **536,804.00** .

I would like to schedule an online meeting to receive these items and have a brief discussion on your construction plan. Please let me know when you are available. The Town would like to take this item for award to the Sept. 28th Board of Trustee meeting, so receiving this information today is vital.

Thank you,

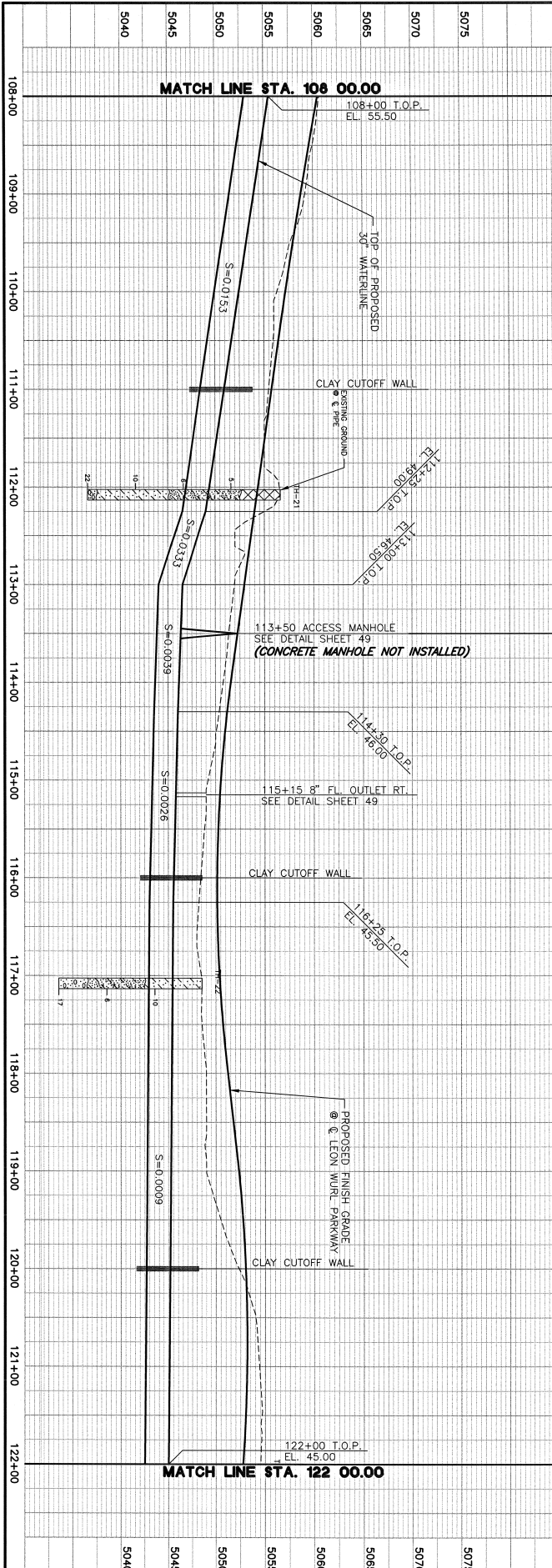
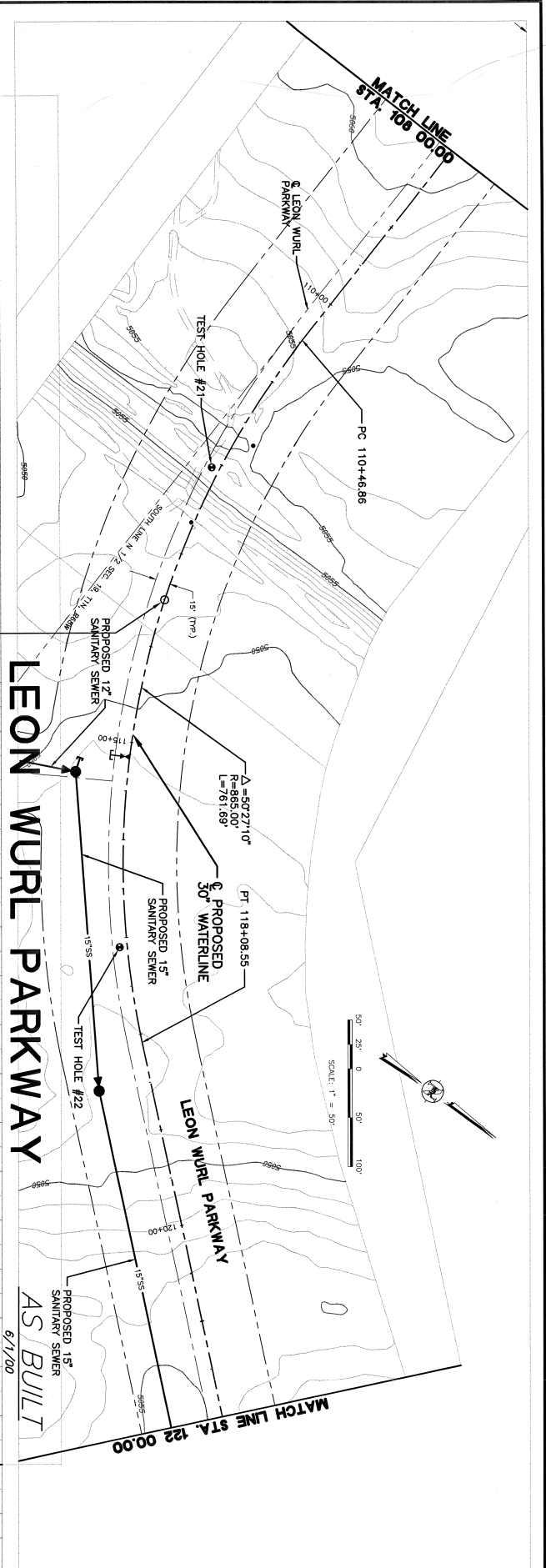
Zachary N. Ahinga, P.E. | Civil Engineer

Planning and Development - Engineering



Town of Erie
645 Holbrook Street | P.O. Box 750 | Erie, CO 80516
Phone: 303-926-2878 | Cell: 720-926-0788 | Fax: 303-926-2706
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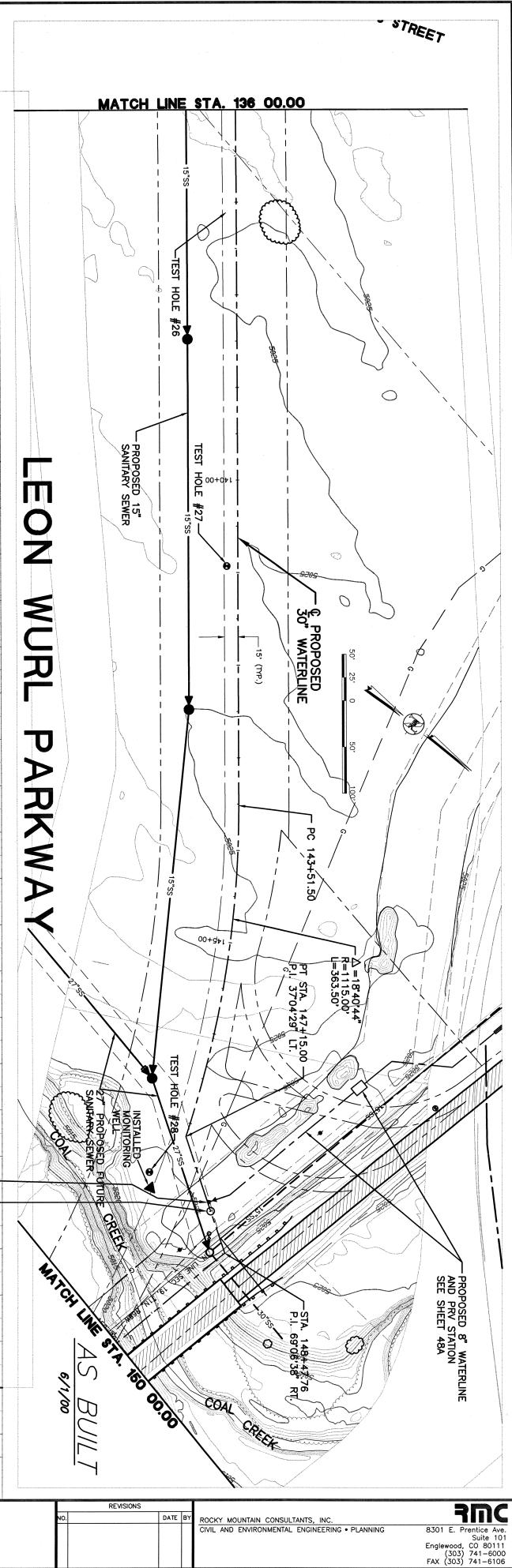
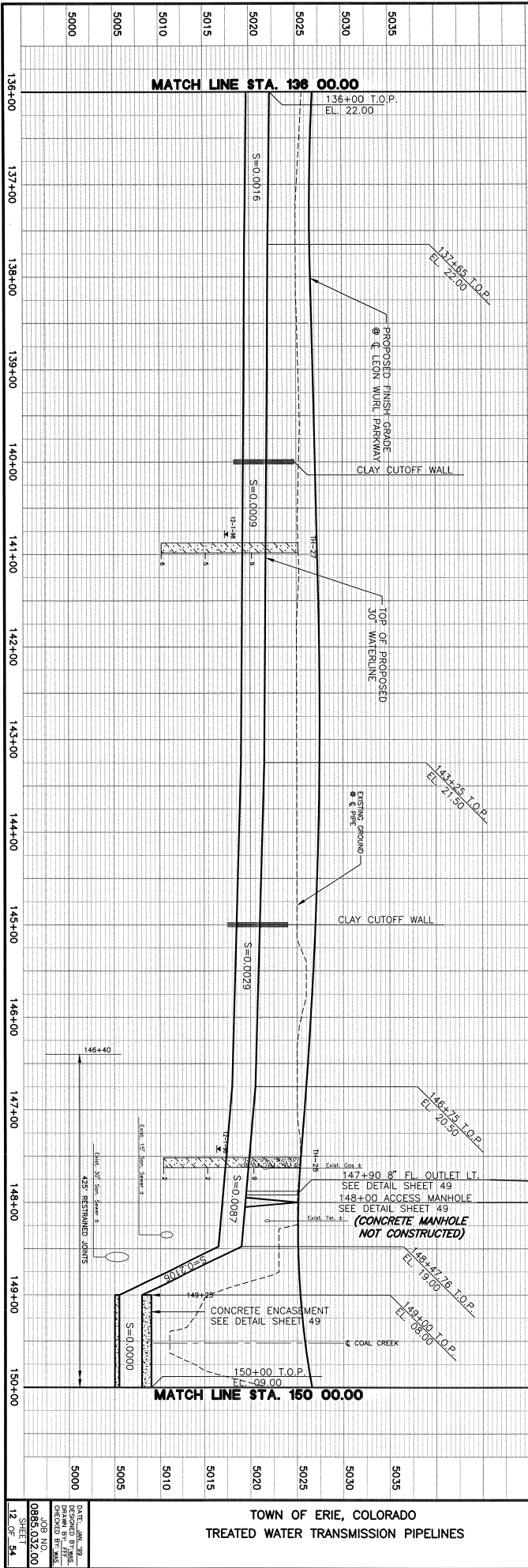
TOWN OF ERIE, COLORADO
TREATED WATER TRANSMISSION PIPELINES

DRAWN: JLN, 99
DESIGNED BY: JLN
CHECKED BY: JLN
JOB NO: 0885.032.00
SHEET NO: 10 OF 54

REVISIONS	
NO.	DATE BY

ROCKY MOUNTAIN CONSULTANTS, INC.
CIVIL AND ENVIRONMENTAL ENGINEERING • PLANNING
8301 E. Prentice Ave., Suite 101
Englewood, CO 80111
(303) 741-6000
FAX (303) 741-6106





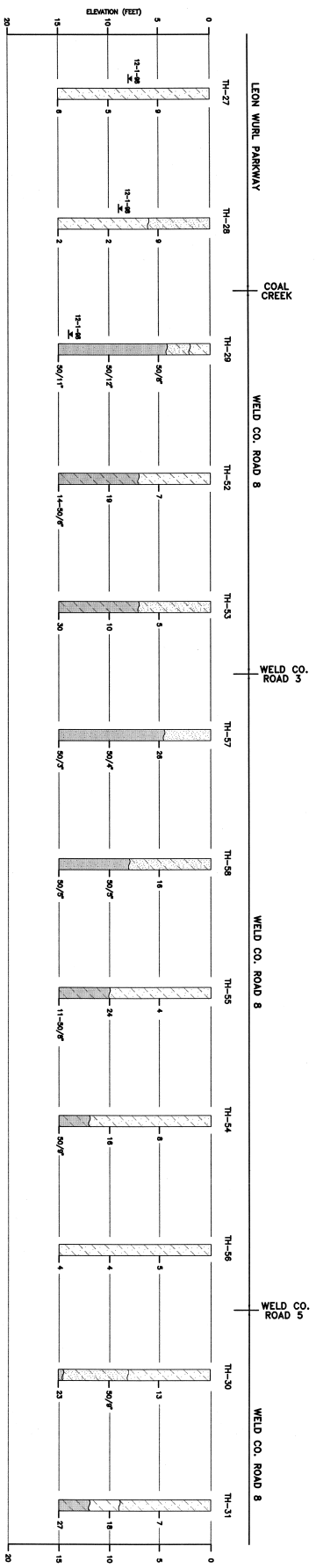
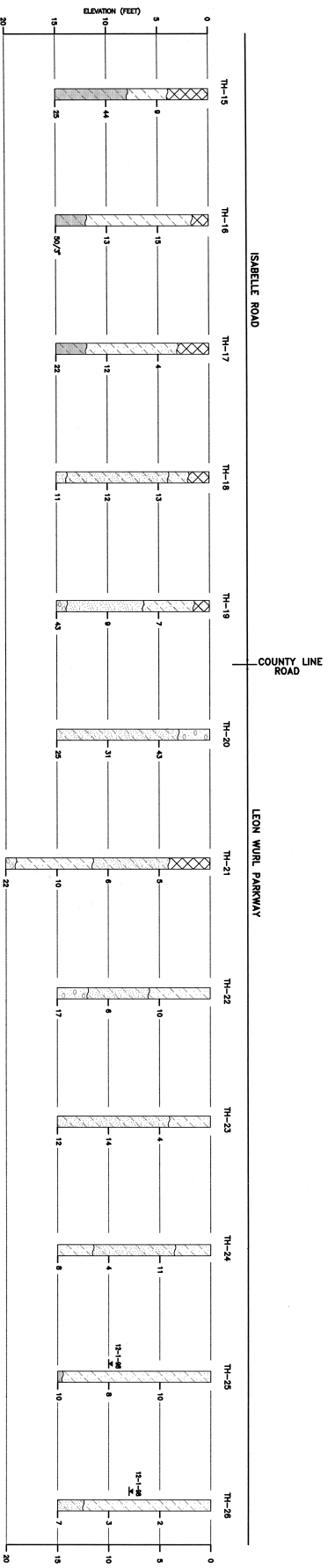
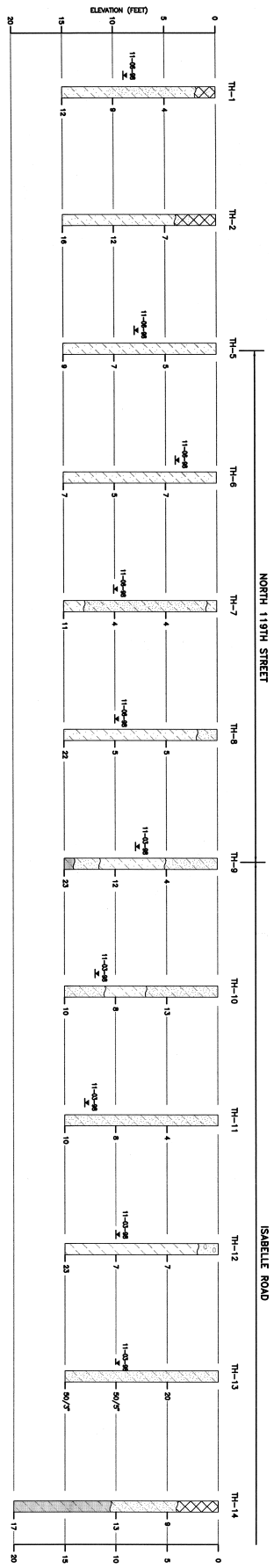
TOWN OF ERIE, COLORADO
TREATED WATER TRANSMISSION PIPELINES

NO.	REVISIONS	DATE	BY

ROCKY MOUNTAIN CONSULTANTS, INC.
CIVIL AND ENVIRONMENTAL ENGINEERING • PLANNING

RMC
8301 E. Prentice Ave.
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Englewood, CO 80111
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D.T.L. J.M. 39
P.L.M. 39
DRAWING BY R.M.S.
CHECKED BY M.W.S.
JOB NO. 0285.0322.00
12/27/09 54



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TOWN OF ERIE, COLORADO
TREATED WATER TRANSMISSION PIPELINES
SOIL BORING LOGS

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NO.	DATE BY

ROCKY MOUNTAIN CONSULTANTS, INC.
CIVIL AND ENVIRONMENTAL ENGINEERING • PLANNING



8301 E. Prentice Ave.
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Englewood, CO 80111
(303) 741-6000
FAX (303) 751-9106

DATE: JAN. 02
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SHEET
33 OF 54

Construction Drawings