

A RESOLUTION AUTHORIZING THE MAYOR AND DIRECTOR OF FINANCE TO ENTER INTO A CONTRACT WITH FECHKO EXCAVATING, LLC, FOR THE BRIARWOOD FORCE MAIN AREA AND WASTEWATER PUMPING STATION IMPROVEMENTS, WAIVING COMPETITIVE BIDDING, AND DECLARING AN EMERGENCY

WHEREAS, Richfield Furnace Run Associates, LLC ("Furnace Run"), Water and Sewer, LLC ("Water and Sewer"), and the Village entered into a Development and Construction Agreement dated December 18, 2020, wherein the Village agreed to complete, among other things, certain sanitary sewer public improvements ("Sanitary Sewer Improvements" for the benefit of the New Briarwood Subdivision; and

WHEREAS, the Development Agreement was assigned, clarified, and amended pursuant to an Ancillary Agreement to Development and Construction Agreement executed by and between Pulte and the Village, dated July 28, 2021; and

WHEREAS, under the Development Agreement and Ancillary Agreement, the Village was required to commence and complete the Sanitary Sewer Improvements by certain deadlines, which cannot be met without the Village acting immediately; and

WHEREAS, the Village and Pulte entered into a Reimbursement Agreement that extends the deadlines for the Village to commence and complete the Sanitary Sewer Improvements, but due to global supply chain issues, necessary components with extremely long lead times, must be ordered now in order to ensure the viability of the project; and

WHEREAS, because of the significant and potentially detrimental timing issues, the Village approached Fechko Excavating, LLC, ("Fechko") who is already performing work at the development site as Pulte's contractor, to obtain a proposal for performing the Sanitary Sewer Improvements for the Village; and

WHEREAS, Fechko submitted a proposal dated October 28, 2021, which is attached hereto and incorporated herein by reference as Exhibit A, for the Sanitary Sewer Improvements in an amount of \$1,818,037.32, which includes the purchase of the long-lead time components for the project; and

WHEREAS, the Village Engineer reviewed Fechko's \$1,818,037.32 proposal, which is significantly less than the \$2,200,000.00 engineer's estimate prepared by Arcadis on February 1, 2021, and has determined that Fechko's proposal is reasonable and in accordance with the approved contract documents and plans; and

WHEREAS, the Village received a reimbursable grant from the Northeast Ohio Regional Sewer District ("NEORS") in the amount of \$891,500.00 that will be applied toward payment of the project; and

WHEREAS, competitively bidding the Sanitary Sewer Improvements project will adversely impact the schedule and thereby cause irreparable harm to Pulte's home construction and occupancy, as well as the NEORS D grant and the Village's investment of time and resources into the project ; and

WHEREAS, Council determines that it is in the best interests of the Village and the overall project schedule to waive competitive bidding and authorize the Mayor and Director of Finance to enter into a contract with Fechko for the Sanitary Sewer Improvements.

NOW, THEREFORE, BE IT RESOLVED, by the Council of the Village of Richfield, County of Summit, State of Ohio that:

SECTION 1. The Mayor and the Director of Finance are authorized and directed to enter into an agreement with the Fechko Excavating, LLC in an amount not to exceed \$1,960,037.32, which includes Fechko's proposal of \$1,818,037.32 and a cash allowance of \$37,000.00 and contingency allowance of \$105,000.00.

SECTION 2. The requirements of competitive bidding are waived pursuant to Section 141.03(g) of the Village's Codified Ordinances.

SECTION 3. It is found and determined that all formal actions of this Council concerning and relating to the adoption of this Resolution were adopted in an open meeting of this Council, and that all deliberations of this Council and of any of its committees that resulted in such formal action were in meetings open to the public, in compliance with all legal requirements including Section 121.22 of the Ohio Revised Code.

SECTION 4. That this Resolution is declared to be an emergency measure necessary for the immediate preservation of the public health, safety and general welfare and for the further reason that it is immediately necessary to commence the project to ensure its viability; wherefore, provided this Resolution receives the affirmative vote of two-thirds of the members of Council elected or appointed, it shall take effect immediately upon its passage and execution by the Mayor; otherwise, it shall take effect and be in force from and after the earliest period allowed by law.

PASSED: 11-3-2021

[Signature]
President of Council

[Signature]
Mayor

Dated: 11/3/2021

ATTEST: [Signature]
Clerk of Council

**Contract Documents For
Village of Richfield
Briarwood Pump Station**

November 2021

Prepared by:



520 South Main Street, Suite 2531
Akron, Ohio 44311
Phone (330) 572-2100
Fax (330) 572-2101

Proposal for Briarwood Area Wastewater Pump Station Improvements, Contract A- General and Mechanical and Contract B - Electrical



FECHKO EXCAVATING, LLC.
 865 WEST LIBERTY STREET, SUITE 120
 MEDINA, OHIO 44256
 OFFICE: 330.722.2890
 FAX: 330.722.5701

PROPOSAL

DATE: 11/17/2021

Project Information

Customer:	Village of Richfield	Project:	Briarwood Area Wastewater Pump Station Improvements Contract A & B
	4410 West Streetsboro Road	Engineer:	ARCADIS U.S, INC.
	Richfield, OH 44286	Plan Date:	02/01/2021
		Addendum:	NA
Attn:	Brian Frantz, Director	Work Type:	PUMP STATION

PROPOSAL BID ITEMS

<u>BID ITEM</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>	<u>UNIT</u>	<u>LABOR UNIT PRICE</u>	<u>MATERIAL UNIT PRICE</u>	<u>TOTAL UNIT PRICE</u>	<u>BID TOTAL</u>
10	PRECONSTRUCTION VIDEO TAPING	1	LS	\$ 1,650.00	\$ -	\$ 1,650.00	\$ 1,650.00
40	6" FORCEMAIN DIRECTIONALLY DRILLED/OPEN CUT	6,066.00	LF	\$ 59.75	\$ 34.45	\$ 94.20	\$ 571,417.20
45	AIR RELEASE MANHOLE	3	EA	\$ 4,553.55	\$ 6,977.73	\$ 11,531.28	\$ 34,593.84
50	12" STEEL ENCASMENT W/6" FORCEMAIN	378	LF	\$ 114.21	\$ 135.80	\$ 250.01	\$ 94,503.78
60	PUMP STATION NO.1 - BRIARWOOD ROAD	1	LS	\$ 80,942.46	\$ 400,523.69	\$ 481,466.15	\$ 481,466.15
70	PUMP STATION NO.2 - STREETSBORO ROAD	1	LS	\$ 51,505.10	\$ 289,699.95	\$ 341,205.05	\$ 341,205.05
80	PUMP STATION NO.1 - BRIARWOOD ROAD - ELECTRIC	1	LS	\$ 31,000.00	\$ 95,959.80	\$ 126,959.80	\$ 126,959.80
90	PUMP STATION NO.2 - STREETSBORO ROAD - ELECTRIC	1	LS	\$ 30,000.00	\$ 93,659.80	\$ 123,659.80	\$ 123,659.80
100	TEMPORARY PAVEMENT	90	SY	\$ 23.52	\$ 31.11	\$ 54.63	\$ 4,916.70
110	FULL DEPTH PAVEMENT REPAIR - 9"	90	SY	\$ 45.59	\$ 119.41	\$ 165.00	\$ 14,850.00
150	SEWERS/DRAINS 6" AND SMALLER	1,000.00	LF	\$ 8.39	\$ 6.61	\$ 15.00	\$ 15,000.00
160	SEWERS/DRAINS 8" THRU 12"	150	LF	\$ 14.47	\$ 12.44	\$ 26.91	\$ 4,036.50
170	SEWERS/DRAINS 15" THRU 21"	50	LF	\$ 19.06	\$ 25.95	\$ 45.01	\$ 2,250.50
180	SEWERS/DRAINS 24" AND LARGER	25	LF	\$ 16.22	\$ 44.90	\$ 61.12	\$ 1,528.00
190	PERFORMANCE & MAINTENANCE BOND	1	LS	\$ 0.00	\$ 26,725.46	\$ 26,725.46	\$ 26,725.46
Grand Total							\$ 1,844,762.76

Proposal for Briarwood Area Wastewater Pump Station Improvements, Contract A- General and Mechanical and Contract B - Electrical

PROPOSAL NOTES:

- Utility Company Fees will be billed to the Village of Richfield through Fechko Excavating, LLC at cost without any markup as a Change Order.
- Based on Directional Drilling the Force main except where unfeasible.
- Using Ductile Iron Fittings for FM
- Based on Solid Block Retaining wall by Stone Strong, LLC. in lieu of Concrete. Detailed drawings to be provided by manufacturer for approval.
- Does not include any fence around Pump Stations. Railing over Retaining Wall is included.
- Plans does not show Internal/External Drop at the wet well and not included.
- Does not include Rock/Shale Excavation for Utilities
- Does not include Performance Bond, Inspection Fees and Utility Company Fees.

VALUE ENGINEERING ALTERNATES:

- Eliminating the Jack & Bore and Directionally Drilling the Force Main without casing pipe will save around \$59,000
- Eliminating the building and installing the components on a rack with weatherproof enclosures will save about \$55,000
- Plans call for the Auto Dialer equipment from Verbatim brand which requires a telephone service connection. There is an alternate (Mission Communications MyDro 150) which works on Cellular at the same equipment cost. Telephone company's fees would be the saving which is uncertain at this point.

CERTIFICATE OF OWNER' S FISCAL OFFICER

Date: 12-7-21

ATTEST:

I, Sandy Turk, Director of Finance of the Village of Richfield, hereby certify that money to finance this Contract has been appropriated for the purpose of the construction from those funds allocated to the BRIARWOOD PUMP STATION. At present these funds are in the accounts of the Village of Richfield established for the construction of this project. Funds totaling the amount of this contract are present in these amounts as of this date and are free from encumbrances.



Village of Richfield

G:\CIVIL\RICHFIELD VILLAGESPECS\02 - CERTIFICATE OF OFFICER.DOC

INFORMATION FOR AND INSTRUCTIONS TO BIDDERS

INDEX

SECTION	1	Site Visit	IB-1
	2	General	IB-1
	3	Technical Specifications	IB-1
	4	Proposals.....	IB-1
	5	Affidavits	IB-2
	6	Bid Guaranty and Contract Bond.....	IB-2
	7	Changes During Bidding	IB-3
	8	Certificate of Appropriations.....	IB-3
	9	Comparison of Proposals/Basis of Award	IB-3
	10	Notice of Award and Contract.....	IB-4
	11	Subcontractor List and Other Manufacturers	IB-4
	12	Notice to Proceed	IB-4
	13	Documents.....	IB-4
	14	Time of Completion	IB-5
	15	Bidders Qualifications	IB-5
	16	Standards and Substitutions	IB-5
	17	Wages	IB-5
	18	Payment	IB-6

INFORMATION FOR AND INSTRUCTIONS TO BIDDERS

Note: The information and requirements set forth in "Information For and Instructions To Bidders" are neither inclusive nor exclusive and a bidder shall not claim lack of notice because information or requirements are stated in the body of the Contract or specifications and not included herein.

Information as to time and place of receiving proposals, the requirements of the bidders' bid bond or certified check, the methods of obtaining Contract Documents and other pertinent facts is given in the Advertisement for Bids bound herein.

1. SITE VISIT

All bidders shall visit the site for the purpose of reviewing the conditions and to resolve any questions in the bid documents.

2. GENERAL

- a) Each bidder shall review the "Information For and Instructions to Bidders" general conditions, specifications, drawings and addenda in order to assume the responsibility of complying with all requirements.
- b) Each bidder shall visit the site to become familiar with existing conditions and the limitations and peculiarities under which this work will be performed. Failure to make this examination of the site will in no way relieve any Contractor from the necessity of furnishing materials or performing labor necessary and required to complete the work with the true intent of the drawings and specifications. No adjustments in the Contract will be made based on insufficient data or incorrect assumptions in regard to the nature, conditions or character of this work to be done under this Contract.
- c) The Contractor shall assume all risks resulting from any damages and claims which may arise from this Contract and shall "hold harmless" the Owner and Engineer from such claims and damages.

3. TECHNICAL DIVISION OF SPECIFICATIONS

Unless otherwise noted, construction materials and methods shall comply with the latest edition of the Ohio Department of Transportation (ODOT) Construction and Material Specifications, and all applicable OSHA requirements set forth for this type of construction. **Payment may not follow ODOT's pay items. See the plans for a description of pay items.**

4. PROPOSALS

~~Sealed proposals for this work will be received at the Village of Richfield Village Hall at 4410 W. Streetsboro Rd. in Richfield, Ohio, until 11:00 a.m., local time of the day set in the Advertisement for Bids at which hour the bids will be publicly opened and read. Each proposal must contain the full name of the party or parties making the proposal and of all persons interested therein.~~

~~No withdrawal or modification of the proposal will be permitted after it has been submitted.~~

~~Prices shall be entered in the space provided in the Form of Proposal in the Project Manual.~~

~~Failure to have performed satisfactorily any Contract previously awarded to the bidder by the owner be considered sufficient cause for the rejection of the bid. Persons bidding for the first time must submit written documentation proving sufficient financial and performance capabilities.~~

~~The proposal, with all papers contained therein, must be deposited unmutilated and without any change in the items or conditions which are stipulated in the proposal. This requirement shall not operate to debar a bidder from filing with the submitted proposal a separate statement of any desired effect, which statement will be considered on its merits. Exceptions must be listed separately and will be evaluated as such.~~

~~Signature to Proposal— If the bid is made by a firm or partnership, the name and place of residence of each member of the firm or partnership must be given. If made by a corporation, the person signing shall state under the laws of what state the corporation was chartered and the same and title of officer, or officers, having authority under the by laws or regulations to sign contracts. Anyone signing a proposal as agent must file with it legal evidence of authority to do so.~~

5. AFFIDAVITS

Each bidder who is a foreign corporation, that is, a corporation not chartered in Ohio but licensed to do business in Ohio, is required to submit with the bid an affidavit duly executed by an authorized officer of the corporation stating that said corporation has, in accordance with the Provisions of the Revised Code of the State of Ohio, obtained a certificate authorizing it to do business in the State of Ohio.

Each bid shall be accompanied by a properly executed non-collusion affidavit using the form provided in the documents.

6. BID GUARANTY AND CONTRACT BOND

Each proposal shall be accompanied by an approved Bid Guaranty in accordance with Section 153.571 of the Ohio Revised Code. The Bid Guaranty shall be in the form of a bond in the sum of 100% of the amount of the bid, or a certified check, cashier's check, or letter of credit payable to the Village of Richfield, Ohio in the sum of 10% of the total amount of the bid. If the bidder is awarded the Contract and subsequently fails to enter into the Contract, and fails to furnish the required documents within ten (10) days after notice of acceptance of the proposal is made, the Bid Guaranty shall be forfeited and the bonding company liable for a sum equal to ten percent (10%) of the total amount of the bid.

Where the Bid Guaranty is in the form of a certified check, cashier's check, or letter of credit, the bidder shall, after notice of acceptance of the proposal is made, and at the time of entering into the Contract, provide a Contract Bond in the sum of 100% of

the amount of the Contract for the faithful performance and completion of the contract.

The bond shall be executed by a satisfactory surety, guaranty or trust company or companies, authorized to do business in the State of Ohio and having an Ohio agent with authority to execute said bond. The bonding company shall furnish a copy of Power of Attorney, bearing the seal of the particular type of bond to be furnished.

The sufficiency of the security offered shall be determined by the Owner and in the event such is declared unsatisfactory by the Owner, the Contractor shall immediately furnish a new bond meeting the Owner's requirements.

7. CHANGES DURING BIDDING

During the bidding period, bidders may be furnished an addendum for changes, interpretation, or alterations of the plans and specifications. These changes or corrections, if any, shall be included in the work covered by the bid and shall become a part of the Contract Documents.

If any prospective bidder is in doubt as to the true meaning of any part of the plans or specifications or any other Contract Documents, the bidder may submit to the A & E a written request for an interpretation.

Any interpretation of the plans and specifications or Contract Documents will be made by addenda, copies of which will be mailed or delivered to each prospective bidder who has obtained a copy of the Contract Documents.

The Owner will not be responsible for any other interpretation. Failure of the bidder to receive any addenda or interpretations shall not relieve the bidder of any responsibility as all such addenda shall be on file in the office of the Owner and the A & E. In addition, addenda may be obtained from eblueprint.com. No addenda will be issued in the last three (3) calendar days immediately preceding the bid due date.

8. CERTIFICATE OF APPROPRIATIONS

The Contract, or any agreement subsidiary thereto, shall not be binding or of any force unless the Owner shall endorse thereon a certificate that there remains unexpended or in the process of collection and unapplied, an appropriation or fund applicable thereto and sufficient to pay the estimated expenses of completing this Contract or subsidiary agreement, as certified by the officers making the same.

9. COMPARISON OF PROPOSALS AND BASIS OF AWARD

~~The award will be based on a comparison of the relative merits of each offering. The Owner reserves the explicit right to select the successful bidder on the basis of the lowest and/or best bid considering the pertinent factors. Each bidder is invited to include with the proposal such additional information or data as the bidder may desire to substantiate the quality and merits of the offering. "Front loading" or unbalanced bids may be rejected. Bid award will be based on the Base Bid Grand Total.~~

10. NOTICE OF AWARD AND CONTRACT

Award and execution will be made as soon as practical following the date on which the proposals are opened. Failure to award and execute a Contract within this time will invalidate the entire bid procedures and all bids submitted, unless the time for awarding and executing the Contract is extended by mutual consent of the Owner, or the Owner's representative, and the bidder whose proposal the Owner accepts and with whom the Owner subsequently awards and executes a Contract. The best bid and Bid Guaranty will be retained until a Contract is signed.

Notification of award will be sent by mail to the successful bidder at which time the bidder will have ten (10) days to enter into a Contract.

If the successful bidder is a corporate body the bidder shall furnish at the time of execution of the Contract a resolution of the directors of the corporation, sealed with the corporation seal, and authorizing the officer signing to execute the Contract on behalf of the corporation. A copy of the above documents shall be attached to each copy of the Contract.

11. SUBCONTRACTORS LIST AND OTHER MANUFACTURERS

With the proposal, each bidder shall submit a list of Subcontractors that the bidder intends to employ on the work together with pertinent qualifications thereof.

With the proposal, each bidder shall submit a list of components and devices, other than incidental hardware, etc., which the bidder intends to use as part of the equipment and which is not of the bidders own manufacturer.

This list shall be considered as part of this proposal and shall not be subject to change except with the consent of the Owner.

12. NOTICE TO PROCEED

The Contractor, after execution of the Contract and upon request, is entitled to a notice to proceed from the Owner or the Owner's representative.

13. DOCUMENTS

The following documents are required with the proposal:

- a) Bidders Qualifications (BQ-1 thru BQ-3)
- b) Form of Proposal (including signature sheet with acknowledgment of addenda) (FP-1 thru FP-3)
- c) Bid Guaranty and Contract Bond (BG-1 thru BG-3 or B-1)
- d) Non-Collusion Affidavit (NC-1)
- e) Personal Property Tax Affidavit (Tax-1)
- f) Affidavit of authority to do business in the State of Ohio (FC-1)

- g) Subcontractor List (SUB-1)
- h) Material and Equipment List (ME-1)
- j) Completed State EEO Forms (EEO-1)

The following additional documents are required prior to the Owner executing the Contract:

- a) Contract (C-1 thru C-3)
- b) Contract Performance Bond including power of attorney, certificate of authority to do business in Ohio for Bonding Company, and financial statement for Bonding Company. (PB-1)
- c) Labor and Materialman's Bond (LM-1 thru LM-3)
- d) Certificate of Insurance
- e) Workman's Compensation Certificate

The Contract shall be executed in duplicate.

14. TIME OF COMPLETION / WORK LIMITATIONS

The Owner requires the work in this Contract to be completed in accordance with the following schedule and conditions:

All construction work is to be started within 30 days of the issuance of the Notice to Proceed and substantially completed by July 1, 2022. Contractor must work continuously to minimize the duration of construction.

Liquidated Damages of **\$500 PER DAY** shall be paid by the Contractor for each and every day of delay beyond the time stipulated in the proposal, including any interim completion dates.

15. BIDDERS QUALIFICATION

The bidder shall submit with their proposal, satisfactory evidence of qualifications and experience showing that they have a practical knowledge and experience record for the project as specified. Only those bidders having adequate financial and performance experience, in the opinion of the Engineer, shall be considered, and the Engineer's judgment shall be final. Experience and qualifications shall include evidence of the following:

- a) Show complete and satisfactory evidence of experience in the fabrication and installation of the work as specified.
- b) No bid will be considered from any bidder that is not actively engaged in the fabrication and installation of the items of work specified in the project.
- c) Subcontractors shall also list their experience and qualifications under "Bidders Qualifications".

16. STANDARDS-SUBSTITUTIONS

With the proposal, each bidder shall submit a list of any substitution of devices, component parts, or materials which the bidder proposes for consideration where such device, component part or material is not specified.

17. WAGES

“Prevailing Wages” are required on this project. Bidder shall obtain current prevailing wage rates from the State of Ohio Department of Commerce, division of labor & Worker Safety, Wage and Hour Bureau. A certified payroll report which clearly identifies the hourly wage, the overtime wages and fringe benefits paid shall be submitted with pay requests.

18. PAYMENT

Payment shall be based on the percentage of work completely installed and approved in accordance with the Contractor’s bid prices and schedule of values. The Contractor will be paid for the actual quantity of items installed per the plans. Items described by “as-directed” and quantities beyond the plan quantities must be pre-approved prior to installation. **Lien waivers will be required for all subcontractors and suppliers prior to the release of the retainer and final payment.**

BID GUARANTY AND
CONTRACT BOND

(Section 153.571 Ohio Revised Code)
(Used if 10% Bid Guaranty Check is not Submitted)

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned

(Name and Address)

as Principal and _____

(Name of Surety)

_____ as Surety, are hereby held and firmly bound unto the
Village of Richfield and Summit County, hereinafter called the Obligee, in the penal sum of
the dollar amount of the bid submitted by the Principal to the Obligee on

to undertake the project known as: _____

The penal sum referred to herein shall be the dollar amount of the Principal's bid to
the Obligee, incorporating any additive or deductive alternate proposals made by the
Principal on the date referred to above to the Obligee, which are accepted by the Obligee.
In no case shall the penal sum exceed the amount of

_____ Dollars (\$ _____)

(If the above line is left blank, the penal sum will be the full amount of the Principal's bid, including alternates. Alternatively, if completed, the amount stated must not be less than the full amount of the bid, including alternates in dollars and cents. A percentage is not acceptable.) For the payment of the penal sum well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that whereas the above named principal has submitted a bid on the above referred project:

NOW THEREFORE, if the Obligee accepts the bid of the Principal and the Principal fails to enter into a proper Contract in accordance with the bid, plans, details, specifications and bills of material; and in the event the Principal pays to the Obligee the difference not to exceed ten percent of the penalty hereof between the amount specified in the bid and such larger amount for which the Obligee may in good faith contract with the next lowest bidder to perform the work covered by the bid; or in the event the Obligee does not award the Contract to the next lowest bidder and resubmits the project for bidding, the Principal will pay the Obligee the difference not to exceed ten percent of the penalty hereof between the amount specified in the bid, or the costs, in connection with the resubmission of printing new contract documents, required advertising and printing and mailing notices to prospective bidders, whichever is less, then this obligation shall be void, otherwise to remain in full force and effect. If the Obligee accepts the bid of the Principal and the Principal within ten days after the awarding of the Contract, enters into a proper Contract in accordance with the bid, plans, details, specifications, and bills of material, which said Contract is made a part of this bond the same as though set forth herein; and

IF THE SAID Principal shall well and faithfully perform each and every condition of such Contract; and indemnify the Obligee against all damage suffered by failure to perform such Contract according to the provisions thereof and in accordance with the plans, details, specifications, and bills of material therefor; and shall pay all lawful claims of subcontractors, materialmen, and laborers, for labor performed and materials furnished in the carrying forward, performing or completing of said Contract; we agreeing and assenting that this undertaking shall be for the benefit of any materialman or laborer having a just claim, as well as for the Obligee herein; then this obligation shall be void; otherwise, the same shall remain in full force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

THE SAID Surety hereby stipulates and agrees that no modifications, omissions or additions, in or to the terms of said Contract or in or to the plans and specifications therefore shall in any way affect the obligations of said Surety on this bond, and it does hereby waive notice of any such modifications, omissions or additions to the terms of the Contract or to the work or to the specifications.

PRINCIPAL

BY: _____

TITLE: _____

SURETY COMPANY ADDRESS

Street

City, State, Zip

SURETY AGENT'S ADDRESS

Agency Name

BY: _____
Attorney-in-Fact

Street

City, State, Zip

G:\Civi\Richfield Village\Specs\06 - Bid Guar.doc

CONTRACTOR/MANUFACTURER/VENDOR
AFFIDAVIT OF COMPLIANCE WITH
OHIO REVISED CODE, SECTION 5719.042*

To: Village of Richfield
4410 W. Streetsboro Rd.
Richfield, Ohio 44286

Date _____

State of Ohio
County of Summit

I, _____, hereby make oath that:

1. I am the _____ of _____
(Authorized Representative)
_____, the firm that submitted the attached bid.
2. At the time the bid was submitted, the firm named above (was/was not) charged with delinquent personal property taxes on the general tax list of personal property in Summit County, Ohio.
3. (If Applicable) The amount of due and unpaid delinquent personal property taxes is \$ _____ and penalties and interest on the same are \$ _____.

Contractor

By (Authorized Representative)

Sworn to before me and subscribed in my presence at _____
this _____ day of _____ A.D., _____.

Notary Public

My Commission expires _____, 20____

*Sworn statement required by Ohio Revised Code as to the status of bidder's (company's) personal property taxes.

G:\Civil\Richfield Village\Specs\08 - Non-Delinquent Tax Affidavit.doc

NOTICE OF AWARD

To: Fechko Excavating LLC
865 West Liberty Street, Ste 120
Medina, Ohio 44256

Project Description: Briarwood Pump Station

The OWNER has considered the BID submitted by you for the above described WORK.
You are hereby notified that your BID has been accepted for the amount of:

\$1,844,762.76

You are required by the Information for Bidders to execute the two original copies of the Contract and furnish the required CONTRACTOR'S Performance BOND, Payment BOND and certificates of insurance within ten (10) calendar days from the date of this Notice to you.

If you fail to execute said Agreement and to furnish said BONDS within ten (10) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER'S acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this 7 day of December, 2021.

VILLAGE OF RICHFIELD, OHIO

By: Michael Wheeler

Title: mayor

Receipt of the above NOTICE OF AWARD is hereby acknowledged

this the _____ day of _____, _____.

By: _____

Title: _____

(email to DNEUMEYER@GPDGROUP.COM or fax to 330-572-2496)

G:\Civil\Richfield Village\Specs\12 - Notice of Award.doc

CONTRACT
FOR THE

VILLAGE OF RICHFIELD, OHIO
BRIARWOOD PUMP STATION

THIS AGREEMENT, made and entered into this Seventh day of December in the year Two Thousand and 21, by and between the VILLAGE OF RICHFIELD, OHIO, hereinafter called the "Party of the First Part" or "First Party" and FECHKO EXCAVATING LLC of the City of MEDINA, County of MEDINA, and State of OHIO, hereinafter called the "Party of the Second Part" or the "Contractor".

WITNESSETH: That the said party of the second part has agreed and by these presents does agree with the said party of the first part for the consideration herein written and contained in the proposal and other penalty expressed in a bond therein contained, to provide and/or install at FECHKO EXCAVATING LLC'S own proper cost and expense, all the necessary labor, superintendence, tools, materials and equipment of every description, and to carry out and complete to a good, firm and substantial workmanlike manner the design, construction, testing, completion, and supervision to complete delivery to the First Party as herein specified or required for the completion of the Contract, all in accordance with the plans on file in the office at the First Party, also in accordance with the specifications for this Contract as herein set forth, subject to such changes as may be made, from time to time, in accordance with the provisions therein, and also in full accord and compliance with the following:

Article 1: The Contractor agrees to begin work and prosecute the same with reasonable speed and diligence so as to insure the completion of the work of the Contract in accordance with the date stipulated in the proposal and to the satisfaction of the First Party.

Article 2: The Party of the First Part agrees to pay, and the Contractor agrees to accept as full compensation for all work done, for all labor and equipment furnished, for all costs and expenses incurred, furnished or suffered, in the full and complete performance of all acts and requirements incidental and necessary for the completion of the work of this Contract in accordance with the terms, conditions and provisions thereof, except EXTRA WORK, which shall be paid for under subsidiary agreement executed as provided in the Project Manual and except as may otherwise in this Contract be specifically provided, a sum equal to the following:

One Million Eight Hundred Forty-Four Thousand Seven Hundred Sixty-Two
Dollars and 76/100 cents

Article 3: If the Contractor shall fail to comply with any of the terms, conditions, provisions, or stipulations of this Contract according to the true intent and meaning thereof, then the Party of the First Part may avail itself of any or all remedies provided in that behalf of the Contract, and shall have the right and power to proceed in accordance with the provisions thereof.

Article 4: It is hereby agreed by the parties to this Agreement that the provisions contained in the "Advertisement", in "Information For and Instruction to Bidders", in the "Proposal", in the "Specifications", in the "General and Special Conditions", in the "Bond", in the "Drawings", shall constitute integral parts of the Agreement and collectively that they shall comprise and be known as the Contract.

Name and Address of each person, firm or company interested in the Contract:

Fechko Excavating LLC
865 W. Liberty Street, Ste. 120
Medina, Ohio 44256

IN WITNESS WHEREOF: The parties hereunto affixed their hands and seals the day and year first mentioned above.

The Village of Richfield

By Mike Wheeler 12/07/2021
Mike Wheeler, Mayor Date

by Sandy Jent 12/7/21
Finance/Clerk Date

Royce Fanta 12/7/2021
Witness Print Date

Royce Fanta 12/7/2021
Witness Print Date

[Signature] 12/7/2021
Witness Signature Date

[Signature] 12/7/2021
Witness Signature Date

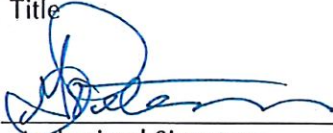
Approved as to legal form and correctness:

Alfredo V. Calles
Director of Law
Village of Richfield, Ohio

CONTRACTOR

By GREGORY PETERSEN
Authorized Individual Print

GENERAL MANAGER
Title


Authorized Signature Date

TINA MOWERY
Witness Print


Witness Signature Date

(If the Contractor is a corporation, there shall be attached a sealed resolution of the Directors empowering the officer signing to so act in behalf of the corporation.)

(To be executed in triplicate.)

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned _____
_____, as Principal and _____, as
Sureties, are hereby held and firmly bound unto the Village of Richfield, Ohio, in the penal sum of _____ Dollars
(\$ _____), for the payment which, well and truly to be made, we hereby jointly and
severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that whereas the above named Principal did
on the _____ day of _____, 20____, enter into a contract with the Village of Richfield, Ohio, for
the " _____ " which said contract is made a part of this bond the same as
though set forth herein;

Now, if the said Principal, _____, shall well and faithfully do and perform
the things agreed by the Principal to be done and performed according to the terms of said contract; and shall
pay all lawful claims of subcontractors, materialmen, and laborers, for labor performed and materials furnished
in the carrying forward, performing, or completing of said contract; we agreeing and assenting that this
undertaking shall be for the benefit of any materialman or laborer having a just claim, as well as for the Obligee
herein; then this obligation shall be void; otherwise the same shall remain in full force and effect; it being
expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall in no
event exceed the penal amount of this obligation as herein stated.

The said Surety hereby stipulates and agrees that no modifications, omissions, or additions, in or to the terms of
said contract or in or to the plans or specifications thereof shall in any way affect the obligations of said Surety
on its bond.

PROVIDE FURTHER, that no final settlement between the Village of Richfield, Ohio and the Contractor shall
abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

Signed this day of _____, 20_____.

Witness of Principal

PRINCIPAL: _____

By _____

Title: _____

SURETY: _____

Witness of Attorney-in-Fact

By: _____
Attorney-in-Fact
(Must be in Ohio)

(Facsimile signatures are not acceptable)

LABOR AND MATERIALMEN'S BOND

KNOW ALL MEN BY THESE PRESENTS, That we, _____, as Principal, and _____, as Surety, are held and firmly bound unto the Village of Richfield, Ohio (hereinafter called the Obligee) in the penal sum of _____ (\$ _____) lawful money of the United States, for the payment of which sum well and truly to be made we bind ourselves, our heirs, personal representatives, successors, and assigns, jointly and severally, firmly by these presents:

WHEREAS, said Principal has entered into a certain contract with said Obligee, dated _____, 20____, (hereinafter called the Contract) for _____ which contract and the specifications for said work shall be deemed a part hereof as fully as if set out herein.

NOW, THEREFORE, THE CONDITIONS OF THE OBLIGATION ARE SUCH that if said Principal and all subcontractors to whom any portion of the work provided for in said contract is sublet and all assignees of said Principal of such subcontractors, shall promptly make payment for all labor performed, services rendered, and materials furnished in the prosecution of the work provided for in said contract, or in any amendment or extension of, or addition to said contract, then the above obligation shall be void; otherwise to remain in full force and effect. PROVIDED, however, that this bond is subject to the following conditions and limitations.

- a. All persons who have performed labor, rendered services, or furnished materials or machinery as aforesaid, shall have a direct right of action against the Principal and Surety on this bond, which right of action shall be asserted in proceedings instituted in the State in which such labor was performed, services rendered or materials furnished under said contract in more than one State, then in any such States). Insofar as shall be asserted in a proceeding instituted in the name of the Obligee to the use and benefit of the person instituting such action and of all other persons having claims hereunder, and any other person having a claim hereunder, shall have the right to be made a party of such proceeding (but not later than one (1) year after the complete performance of said Contract and final settlement thereof) and to have such claim adjudicated in such action and judgment rendered thereon.
- b. The surety shall not be liable hereunder for any damages or compensation recoverable under any workers' compensation or employer's liability statute.
- c. In no event shall the Surety be liable for a greater sum than the penalty of this bond, or subject to any suit, action or proceeding thereon that is instituted later than one year after the complete performance of said Contract and final settlement thereof.
- d. As used herein, the term "person" refers to any person, firm, or corporation who has furnished materials or machinery to be used on or incorporated in the work or the prosecution thereof provided for in said contract or in any amendment or extension of or addition to said contract, and/or to any person engaged in the prosecution of the work provided for in said contract, or any amendment or extension of or addition to said contract, who is an agent, servant or employee of the Principal, or of any subcontractor, or of any assignee of said Principal, or of any subcontractor, and also anyone so engaged who performs the work of laborer or of a mechanic regardless of any contractual relationship between the principal of any subcontractor, or any assignee of said principal or of said Contractor, and such laborer or mechanic, but shall not include office employees not regularly stationed at the site of the work.

LABOR AND MATERIALMEN'S BOND

The said Surety, for value received, hereby stipulates and agrees that no charge, extension of time, alteration or addition to the terms of this contract or to the work to be performed thereunder or the specification accompanying the same, shall in any way effect its obligations 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.

SIGNED, SEALED AND DELIVERED IN TRIPLICATE THIS ____ day of ____ of _____, 20__.

INDIVIDUAL PRINCIPALS SIGN HERE

In the presence of:

_____	_____ (Seal)
_____	_____ (Seal)
_____	_____ (Seal)
_____	_____ (Seal)

(Corporate Principals Sign here)

Attest:

_____ By: _____

(Surety Sign Here)

Attest:

_____ By: _____

Approved this ____ day of _____, 20__.

By: _____
Obligee Attorney-in-fact

INSTRUCTIONS

1. The full name and residence of each individual party of the bond must be inserted in the first paragraph.
2. If the principal is a partnership, the full names of all partners must be inserted in the first paragraph which must recite they are the partners composing the partnership (to be named) and all partners must execute the bond as individuals.
3. The State of incorporation of each corporate party to the bond must be inserted in the first paragraph and bond must be executed under the corporate seal of said party attested by its secretary or other appropriate officer.
4. The date of the bond must not be prior to the date of the contract.
5. Attorney-in-Fact must be in Ohio.

G:\Civil\Richfield Village\Specs\15 - Labor Material Bond.doc

FINAL PROJECT DOCUMENTATION

PROJECT: Briarwood Pump Station

OWNER: Village of Richfield

CONTRACTOR: Fechko Excavating LLC

Before the final retainer can be processed, it is required that the enclosed forms and any related sign-offs and documents be submitted and documented in accordance with the provisions of the contract.

The list of the enclosed forms is as follows

1. Certificate of Substantial Completion (to be submitted at time of substantial completion).
2. Contractor's Certification of Completion
3. Consent of Surety Company for Final Payment
4. Affidavit of Final Acceptance Date and Correction Period
5. Contractor's Affidavit of Prevailing Wage

Please specify the project to which the documents apply and forward the City of Cleveland Heights, attn.: Joe Kickel. Submit items 2-5 along with the Final Pay Estimate.

CERTIFICATE OF SUBSTANTIAL COMPLETION

To: Village of Richfield

Project Title: Briarwood Pump Station

Project No.:

Contractor: Fechko Excavating

Date of Substantial Completion: ~~05/01/2022~~ 07/01/2022

Note here portions or parts of project not included in this certificate, otherwise this certificate shall be for entire project:

The work performed under this contract has been inspected by authorized representatives of the Owner, Contractor, and Engineer-Architect, and the Project (or specified part of the Project, as indicated above) is hereby declared to be substantially completed on the above date.

A tentative list of items to be completed or corrected is appended hereto. This list may not be exhaustive, and the failure to include an item on it does not alter the responsibility of the Contractor to complete all the Work in accordance with the contract documents.

GPD Group

By:

Engineer/Architect

Authorized Representative Date

The Contractor accepts the above Certificate of Substantial Completion and agrees to complete and correct the items on the tentative list within the indicated in the contract documents or as otherwise agreed.

By:

Contractor

Authorized Representative Date

The Owner accepts the project or specified part of the project as substantially complete and will assume full possession of the project or specified area of the project as of the date of substantial completion and assume the responsibility for heat, utilities, security, and insurance under the contract documents shall be as set forth under "Remarks" below.

By:

Owner

Authorized Representative Date

Remarks: (attach additional sheet, if necessary)

CONTRACTOR’S CERTIFICATION OF COMPLETION AND PAYMENT

To: Village of Richfield

Project Title: Briarwood Pump Station

Project No.:

From: Briarwood Pump Station

Date:

This is to certify that I _____ am an authorized official of _____ working in the capacity of _____ and have been properly authorized by said firm or corporation to sign the following statements pertaining to the subject contract:

I know of my own personal knowledge, and do hereby certify, that the work of the contract described above has been performed, and materials used and installed in every particular, in accordance with, and in conformity to, the contract drawings and specifications.

The contract work is now complete in all parts and requirements.

I understand that neither the determination by the Engineer-Architect that the work is complete, nor the acceptance thereof by the Owner, shall operate as a bar to claim against the Contractor under the terms of the guarantee provisions of the contract documents.

All previous progress payments received on account of the work have been applied on account to discharge Contractor’s obligations associated with prior applications for payment.

By: _____

Title: _____

Signature: _____

CONSENT OF SURETY FOR FINAL PAYMENT

Project Name:

Owner: Village of Richfield

Project No.:

Amount of Original Contract:

Amount of Final Contract:

In accordance with the provisions of the above-named contract between the Owner and the Contractor, the following named surety:

{surety name}
{surety address}
{surety address}

On the Payment Bond of the following named Contractor

{contractor name}
{contractor address}
{contractor address}

Hereby approves of final payment to the Contractor, and further agrees that said final payment to the Contractor shall not relieve the Surety Company named herein of any of its obligations to the following named Owner as set forth in said Surety Company's bond:

IN WITNESS WHEREOF, the Surety Company has hereunto set its hand and seal this

_____ day of _____, 20____.

{surety company name}

Signature of Authorized Representative
ATTACH POWER OF ATTORNEY

Title: _____

**CONSENT OF SURETY FOR REDUCTION OF OR PARTIAL RELEASE OF
RETAINAGE**

In accordance with the provisions of the above-named contract between the Owner and the Contractor, the following named surety:

{surety name}
{surety address}
{surety address}

On the Bond of the following named Contractor:

{contractor name}
{contractor address}
{contractor address}

Hereby approves a reduction of/or partial release of retainage to the Contractor as set forth below:

\$ _____ Amount to be released

\$ _____ Amount to be retained

The Surety Company hereby agrees that such reduction of/or partial release of retainage to the Contractor shall not relieve said surety company of any of its obligations to the following named Owner as set forth in said Surety Company's bond:

IN WITNESS WHEREOF, the Surety Company has hereunto set its hand and seal this
_____ day of _____, 20____.

{surety company name}

Signature of Authorized Representative
ATTACH POWER OF ATTORNEY

Title: _____

AFFIDAVIT OF CORRECTION PERIOD UNDER SURETY BOND

STATE OF Ohio)
) SS:
COUNTY OF Summit)

{contractor's officer} being of lawful age and first duly sworn, deposes and states as follows:

1. I am President of {contractor}
2. I have personal knowledge of the factual assertions contained in this Affidavit.
3. That {contractor} was awarded the contract for:
{program name}
By the Village of Richfield.
4. The date of final acceptance of the work by Owner under the Contract is {date}.
(date)
5. Under the Contract, all correction of the work is to be completed within two (2) years from the date of the final acceptance by Owner of the work.
6. The correction period under the Contract will continue through and include {date}.
(date)

FURTHER AFFIANT SAYETH NAUGHT _____
Signature

SURETY ACKNOWLEDGEMENT OF CORRECTION PERIOD COVERED UNDER
BOND NO. _____

{surety company name}
{address}
{address}

By: _____
(Signature)

Date: _____

(Typed or printed name)

*Attach Power of Attorney

Bond Number _____

CONSTRUCTION PAYMENT BOND

CONTRACTOR: _____
(Name and Address)

SURETY: _____
(Name and Principal Place of Business)

OWNER: The Village of Richfield, 4410 W. Streetsboro Rd., Richfield, Ohio 44286

CONTRACT: _____

BOND AMOUNT: _____

CONTRACTOR AS PRINCIPAL

SURETY

Company: _____
(Corp. Seal)

Company: _____
(Corp. Seal)

Signature: _____

Signature: _____

Name and Title: _____

Name and Title: _____

CONTRACTOR AS PRINCIPAL

SURETY

Company: _____
(Corp. Seal)

Company: _____
(Corp. Seal)

Signature: _____

Signature: _____

Name and Title: _____

Name and Title: _____

IN WITNESS WHEREOF, this instrument is executed in _____ (number) counterparts, each one of which shall be deemed an original, this the ____ day of _____, 20__.

1. The CONTRACTOR and the surety, jointly and severally, bind themselves, their heirs, executors administrators, successors and assigns to the OWNER to pay for labor, materials, services, and equipment furnished for use in the performance of the Construction contract which is incorporated herein by reference.
2. With respect to the OWNER, this obligation shall be null and void if the CONTRACTOR:
 - 2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants, and
 - 2.2 Defends, indemnifies and holds harmless the OWNER from all claims, demands, liens or suits by any person or entity who furnished labor, materials, services, or equipment for use in the performance of

the Construction contract, provided the OWNER has promptly notified the CONTRACTOR and the surety at the address described in Paragraph 12) of any claims, demands, liens or suits to the CONTRACTOR and the Surety, and provided there is not OWNER Default.

3. With respect to Claimants, this obligation shall be null and void if the CONTRACTOR promptly makes payment, directly or indirectly, for all sums due.
4. The Surety shall have no obligation to Claimants under this Bond until:
 - 4.1 Claimants who are employed by or have a direct contract with the CONTRACTOR have given notice to the surety (at the address described in Paragraph

- 12) and sent a copy, or notice thereof, to the OWNER, stating that a claim is being made under this Bond and with substantial accuracy, the amount of the claim.
- 4.2 Claimants who do not have a direct contract with the CONTRACTOR:
- 4.2.1 Have furnished written notice to the CONTRACTOR and sent a copy, or notice thereof, to the OWNER, within 90 days after having last performed labor, last furnished materials, services or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was done or performed; and
- 4.2.2 Have either received a rejection in whole or in part from the CONTRACTOR, or not received within 30 days of furnishing the above notice any communication from the CONTRACTOR by which the CONTRACTOR has indicated the claim will be paid directly or indirectly; and
- 4.2.3 Not having been paid within the above 30 days, have sent a written notice to the Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to the OWNER, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the CONTRACTOR.
5. If a notice required by Paragraph 4 is given by the OWNER to the CONTRACTOR or to the Surety that is sufficient compliance.
6. When the Claimant has satisfied the conditions of Paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:
- 6.1 Send an answer to the Claimant, with a copy to the OWNER, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.
Pay or arrange for payment of any undisputed amounts
7. The Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.
8. Amounts owed by the OWNER to the CONTRACTOR under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any Construction Performance Bond by the CONTRACTOR furnishing and the OWNER accepting this Bond, they agree that all funds earned by the CONTRACTOR in the performance of the Construction Contract are dedicated to satisfy obligations of the CONTRACTOR and the Surety under this Bond, subject to the OWNER's priority to use the funds for the completion of the work.
9. The Surety shall not be liable to the OWNER, Claimants or others for obligations of the CONTRACTOR that are unrelated to the Construction Contract. The OWNER shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.
10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.
11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the work or part of the work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Subparagraph 4.1 or Clause 4.2 (iii), or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.
12. Notice to the Surety, the OWNER or the CONTRACTOR shall be mailed or delivered to the address shown on the signature page. Actual receipt of notice by Surety, the OWNER or the CONTRACTOR, however accomplished shall be sufficient compliance as of the date received at the address shown on the signature page.
13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. The intent is, that this Bond shall be construed as a statutory bond and not as a common law bond.
14. Upon request by any person or entity appearing to be a potential beneficiary of his Bond, the CONTRACTOR shall promptly furnish a copy of this Bond or shall permit a copy to be made.
15. DEFINITIONS
- 15.1 CLAIMANT: An individual or entity having a direct contract with the CONTRACTOR or with a Subcontractor of the CONTRACTOR to furnish labor, materials or equipment for use in the performance of the Contract. The intent of this Bond

shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the CONTRACTOR and the CONTRACTOR's Subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

- 15.2 CONSTRUCTION CONTRACT: The agreement between the OWNER and the CONTRACTOR identified on the signature page, including all Contract Documents and changes thereto.
- 15.3 OWNER DEFAULT: Failure of the OWNER, which has neither been remedied nor waived, to pay the CONTRACTOR as required by the Construction Contract or to perform and complete or comply with the other terms thereof.
- 15.4 BOND AMOUNT: The Construction Contract amount identified on the signature page of this document.

MAINTENANCE BOND

KNOW ALL MEN BY THESE PRESENTS, that we, _____, as Principal, and _____, a _____ organized under the laws of the State of Ohio, with principal office at _____ as Surety, are held and firmly bound unto the _____ (hereinafter called the Obligee) in the penal sum of _____ (\$ _____) Dollars for the payment of which, well and truly to be made, we do hereby bind ourselves, our heirs, executives, administrators, successors, and assigns, jointly and severally, firmly by these presents:

DATED this _____, day of _____, 20__.

WHEREAS, said Principal has entered into a certain contract with the Obligee above named for _____ and,

WHEREAS, the work called for under said contract has now been completed and accepted by said Obligee:

NOW, THEREFORE, THE CONDITION OF THE OBLIGATION IS SUCH, That if said Principal shall, for a period of 2 years from and after the _____ day of _____, 20__ , indemnify the Obligee against any loss or damage directly arising by reason of any defect in the material or workmanship which may be discovered within the period aforesaid, then this obligation shall be void; otherwise to remain in full force and virtue in law.

PROVIDED, HOWEVER, that in the event of any default on the part of said Principal, written statement of the particular facts showing such default and the date thereof shall be delivered to the Surety by registered mail, at _____, Ohio, promptly and in any event within ten (10) days after the Obligee or his representative shall learn of such default, and that no claim, suit, or action by reason of any default of the Principal shall be brought hereunder after the expiration of thirty days from the end of the maintenance period as herein set forth.

(Principal) (Seal)

(Title)

(Surety Name)

By: _____
Obligee Attorney-in-fact

NOTICE TO PROCEED

To: Fechko Excavating LLC
865 W. Liberty Street
Medina, Ohio 44256

Date: _____
Project: Briarwood Pump Station

You are hereby notified to commence WORK in accordance with the Agreement dated _____, 20__ on or before _____, 20__ and you are to complete the WORK within _____ consecutive calendar days thereafter. The date of completion of all WORK is therefore _____, 20__

VILLAGE OF RICHFIELD

By: _____

Title: _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED

is hereby acknowledged :

this _____ Day of _____, 20__

(Contractor)

By: _____

Title: _____

CONTRACT CHANGE ORDER

ORDER NO.
DATE

CONTRACT FOR _____

OWNER

Village of Richfield

To _____

(Contractor)

You are hereby requested to comply with the following changes from the contract plans and specifications:

Description of Changes (Supplemental Plans and Specifications Attached)	DECREASE in Contract Price	INCREASE in Contract Price
<p>TOTALS</p> <p>NET CHANGE IN CONTRACT PRICE</p>	<p>\$ _____</p> <p>\$ _____</p>	<p>\$ _____</p> <p>\$ _____</p>

JUSTIFICATION:

The amount of the Contract will be (Decreased) (Increased) By The Sum Of: _____ Dollars (\$ _____).

The Contract Total Including this and previous Change Orders Will Be: _____ Dollars (\$ _____).

The Contract Period Provided for Completion Will Be (Increased) (Decreased) (Unchanged): _____ Days.

This document will become a supplement to the contract and all provisions will apply hereto.

Requested _____	_____
(Owner)	(Date)
Recommended _____	_____
(Owner's Architect/Engineer)	(Date)
Accepted _____	_____
(Contractor)	(Date)

GENERAL CONDITIONS

INDEX

Article 1	Contract Documents	GC-2
2	Engineer	GC-3
3	Owner.....	GC-6
4	Contractor	GC-7
5	Subcontractor.....	GC-11
6	Separate Contracts.....	GC-14
7	Miscellaneous Provisions	GC-15
8	Time.....	GC-17
9	Payments and Completion	GC-18
10	Protection of Persons and Property	GC-23
11	Insurance	GC-24
12	Changes in the Work.....	GC-25
13	Uncovering and Correction of Work.....	GC-27
14	Termination of the Contract	GC-28

GENERAL CONDITIONS

ARTICLE 1

CONTRACT DOCUMENTS

1.1 Definitions

1.1.1 The Contract Documents

The Contract Documents consist of the Agreement, the Conditions of the Contract (General and Special Conditions), the Proposal, Information For and Instructions to Bidders, the Drawings, the Specifications, all Addenda issued prior to execution of the Contract, and all Modifications thereto. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a written interpretation issued by the Engineer pursuant to Sub-paragraph 1.2.5, or (4) a written order for a minor change in the Work issued by the Engineer pursuant to Paragraph 12.3. A Modification may be made only after execution of the Contract.

1.1.2 The Contract

The Contract Documents form the Contract. The Contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification as defined in Subparagraph 1.1.1.

1.1.3 The Work

The term Work includes all labor necessary to produce the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in such construction.

1.1.4 The Project

The project is the total construction designed by the Engineer of which the Work performed under the Contract Documents may be the whole or a part.

1.2 Execution, Correlation, Intent and Interpretations

1.2.1 By executing the Contract, the Contractor represents that he has visited the site, familiarized himself with the location conditions under which the Work is to be performed, and correlated his observations with the requirements of the Contract Documents.

1.2.2 The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. The intention of the Documents is to

include all labor, materials, equipment and other items as provided in Subparagraph 4.4.1 necessary for the proper execution and completion of the Work. It is not intended that Work not covered under any heading, section, branch, class or trade of the Specifications shall be supplied unless it is required elsewhere in the Contract Documents or is reasonably inferable therefrom as being necessary to produce the intended results. Words, which have well-known technical or trade meanings are used herein in accordance with such recognized meanings.

- 1.2.3 The organization of the Specifications into divisions, sections, and articles, and the arrangement of the Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.
- 1.2.4 Written interpretations necessary for the proper execution or progress of the Work, in the form of drawings or otherwise will be issued with reasonable promptness by the Engineer and in accordance with any schedule agreed upon. Either party to the Contract may make written request to the Engineer for such interpretations. Such interpretations shall be consistent with and reasonably inferable from the Contract Documents, and may be affected by Field Order.

1.3 Copies Furnished and Ownership

- 1.3.1 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, one (1) copy of the Drawings and Specifications.
- 1.3.2 All Drawings, Specifications and copies thereof furnished by the Engineer are and shall remain his property. They are not to be used on any other project.

ARTICLE 2

ENGINEER

2.1 Definition

- 2.1.1 The Engineer is the person or organization identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Engineer means the Engineer or his authorized representative.
- 2.1.2 Nothing contained in the Contract Documents shall create any contractual relationship between the Engineer and the Contractor.

2.2 Administration of the Contract

- 2.2.1 The Engineer will provide general administration of the Contract, including performance of the functions hereinafter described.

- 2.2.2 The Engineer will be the Owner's representative during the furnishing and installation and until final payment. The Engineer will have authority to act on behalf of the Owner to the extent provided in the Contract Documents, unless otherwise modified by written instrument, which will be shown to the Contractor. The Engineer will advise and consult with the Owner, and all of the Owner's instructions to the Contractor shall be issued through the Engineer.
- 2.2.3 The Engineer shall at all times have access to the Work wherever it is in preparation and progress. The Contractor shall provide facilities for such access so the Engineer may perform his functions under the Contract Documents.
- 2.2.4 The Engineer will make periodic visits to the site to familiarize himself generally with the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. On the basis of his on-site observations as the Engineer, he will keep the Owner informed of the progress of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work of the Contractor. The Engineer will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Engineer will not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, and he will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents.
- 2.2.5 Based on such observations and the Contractor's Applications for Payment, the Engineer will determine the amounts owing to the Contractor and will issue Certificates for Payment in such amounts, as provided in Paragraph 9.4.
- 2.2.6 The Engineer will be, in the first instance, the interpreter of the requirements of the Contract Documents and the judge of the performance hereunder by both the Owner and Contractor. The Engineer will, within a reasonable time, render such interpretations, as he may deem necessary for the proper execution or progress of the Work.
- 2.2.7 Claims, disputes and other matters in question between the Contractor and the Owner relating to the execution or progress of the Work or the interpretation of the Contract Documents shall be referred initially to the Engineer for decision, which he will render in writing within a reasonable time.
- 2.2.8 All interpretations and decisions of the Engineer shall be consistent with the intent of the Contract Documents. In his capacity as interpreter and judge, he will exercise his best efforts to insure faithful performance by both the Owner and the Contractor and will not show partiality to either.
- 2.2.9 Any claim, dispute or other matter that has been referred to the Engineer except any which have been waived by the making or acceptance of final payment as provided in Subparagraph 9.7.5 shall be subject to arbitration upon the written demand of either party. However, no demand for arbitration of any such claim, dispute or other matter may be made until the earlier of:

- 2.2.9.1 The date on which the Engineer has rendered his written decision, or the tenth day after the parties have presented their evidence to the Engineer or has been given a reasonable opportunity to do so, if the Engineer has not rendered his written decision by that date.
- 2.2.10 If a decision of the Engineer is made in writing and states that it is final but subject to appeal, no demand for arbitration of a claim, dispute or other matter covered by such decision may be made later than thirty days after the date on which the party making the demand received the decision. The failure to demand arbitration within said thirty days' period will result in the Engineer's decision becoming final and binding upon the Owner and the Contractor. If the Engineer renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence but will not supersede any arbitration proceedings unless the decision is acceptable to the parties concerned.
- 2.2.11 The Engineer will have authority to reject Work, which does not conform to the Contract Documents. Whenever, in his reasonable opinion, he considers it necessary or advisable to insure the proper implementation of the intent of the Contract Documents, he will have authority to require special inspection or testing of the Work in accordance with Subparagraph 7.8.2, whether or not such Work be then fabricated, installed or completed. However, neither the Engineer's authority to act under this Subparagraph 2.2.11, nor any decision made by him in good faith either to exercise or not to exercise such authority shall give rise to any duty or responsibility of the A & E to the Contractor, any Subcontractor, any of their agents or employees, or any other person performing any of the Work.
- 2.2.12 The Engineer will review Shop Drawings and Samples as provided in Subparagraphs 4.13.1 through 4.13.8 inclusive.
- 2.2.13 The Engineer will prepare Change Orders in accordance with Article 12, and will have authority to order minor changes in the Work as provided in Subparagraph 12.3.1.
- 2.2.14 The Engineer will conduct inspections to determine the dates of Substantial Completion and Final Completion, will receive and review written guarantees and related documents required by the Contract and assembled by the Contractor and will issue a final Certificate for Payment.
- 2.2.15 The duties, responsibilities and limitations of authority of the Engineer as the Owner Representative during construction as set forth in Articles 1 through 14 inclusive of these General Conditions will not be modified or extended without written consent of the Owner, the Contractor and the Engineer.
- 2.2.16 The Engineer will not be responsible for the acts or omissions of the Contractor, any Subcontractors, or any of their agents or employees, or any other persons performing any of the Work.
- 2.2.17 In case of the termination of the employment of the Engineer, the Owner shall appoint an Engineer against whom the Contractor makes no reasonable objection,

whose status under the Contract Documents shall be that of the former Engineer. Any dispute in connection with such appointment shall be subject to arbitration.

ARTICLE 3

OWNER

3.1 Definition

3.1.1 The Owner is the person or organization identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Owner means the Owner or his authorized representative.

3.2 Information and Services Required of the Owner

3.2.1 The Owner shall furnish all surveys describing the physical characteristics, legal limits and utility locations for the site of the Project, either directly or through the Engineer.

3.2.2 The Owner shall secure and pay for easements for permanent structures or permanent changes in existing facilities.

3.2.3 Information or services under the Owner's control shall be furnished by the Owner with reasonable promptness to avoid delay in the orderly progress of the work.

3.2.4 The Owner shall issue instructions to the Contractor through the Engineer.

3.2.5 The foregoing is in addition to other duties and responsibilities of the Owner enumerated herein and especially those in respect to Payment and Insurance in Articles 9 and 11 respectively.

3.3 Owner's Right to Stop the Work

3.3.1 If the Contractor fails to correct defective Work or persistently fails to supply materials or equipment in accordance with the Contract Documents, the Owner may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated.

3.4 Owner's Right to Carry Out the Work

3.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, or fails to perform any provision of the Contract, the Owner may, after seven days' written notice to the Contractor and without prejudice to any other remedy he may have, make good such deficiencies. In such case, an appropriate Change Order shall be issued deducting from the payments then or thereafter due the Contractor, the cost of correcting deficiencies, including the cost of the Engineer additional services made necessary by such default, neglect or failure. The Engineer must approve both such action and the amount charged to the Contractor. If the payments then or thereafter due the Contractor are not

sufficient to cover such payment, the Contractor shall pay the difference to the Owner.

ARTICLE 4

CONTRACTOR

4.1 Definition

4.1.1 The Contractor is the person or organization identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Contractor means the Contractor or his authorized representative.

4.2 Review of Contract Documents

4.2.1 The Contractor shall carefully study and compare the Contract Documents and shall at once report to the Engineer any error, inconsistency or omission he may discover. The Contractor shall not be liable to the Owner or the Engineer for any damage resulting from any such errors, inconsistencies or omissions in the Contract Documents. The Contractor shall do no Work without Drawings, Specifications or Modifications.

4.3 Supervision and Construction Procedures

4.3.1 The Contractor shall supervise and direct the Work, using his best skill and attention. He shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract.

4.4 Labor and Materials

4.4.1 Unless otherwise specifically noted, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, transportation, and other facilities and services necessary for the proper execution and completion of the Work.

4.4.2 The Contractor shall, at all times, enforce strict discipline and good order among his employees and shall not employ on the Work any unfit person or anyone not skilled in the task assigned to him.

4.5 Warranty

4.5.1 The Contractor warrants to the Owner and the A & E that all materials and equipment furnished under this Contract will be new unless otherwise specified, and that all Work will be of good quality, free from faults and defects and in conformance with the Contract Documents. All Work not so conforming to these standards may be considered defective. If required by the Engineer, the

Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

4.6 Taxes

4.6.1 The Contractor shall pay all sales, consumer use and other similar taxes required by law, except as the Owner is exempted and specifically noted.

4.7 Permits, Fees and Notices

4.7.1 The Contractor shall secure and pay for all permits, governmental fees and licenses necessary for the proper execution and completion of the Work, which are applicable at the time, the bids are received. It is not the responsibility of the Contractor to make certain that the Drawings and Specifications are in accordance with applicable laws, statutes, building codes and regulations.

4.7.2 The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and orders of any public authority bearing on the performance of the Work. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, he shall promptly notify the Engineer in writing, and any necessary changes shall be adjusted by appropriate modification. If the Contractor performs any Work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Engineer, he shall assume full responsibility therefore and shall bear all costs attributable thereto.

4.8 Cash Allowances

4.8.1 Not Applicable

4.9 Superintendent

4.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during the progress of the Work. The superintendent shall be satisfactory to the Engineer and shall not be changed except with the consent of the Engineer unless the superintendent proves to be unsatisfactory to the Contractor and ceases to be in his employ. The superintendent shall represent the Contractor and all communications given to the superintendent shall be as binding as if given to the Contractor. Important communications will be confirmed in writing. Other communication will be so confirmed on written request in each case.

4.10 Responsibility for Those Performing the Work

4.10.1 The Contractor shall be responsible to the Owner for the acts and omissions of all his employees and all Subcontractors, their agents and employees, and all other persons performing any of the Work under a contract with the Contractor.

4.11 Contractor's Construction Schedules

- 4.11.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Engineer information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised bi-weekly, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.
 - 4.11.2 The Contractor shall prepare and keep current, for the Engineer's approval, a schedule of submittals which is coordinated with the Contractor's construction schedule and allows the Engineer reasonable time to review submittals.
 - 4.11.3 The contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Engineer.
- 4.12 Drawings and Specifications at the Site
- 4.12.1 The Contractor shall maintain, at the site for the Owner, one copy of all Drawings, Specifications, Addenda, approved Shop Drawings, Change Orders and other Modifications, in good order and marked to record all changes made during construction. These shall be available to the Engineer. The Drawings, marked to record all changes made during construction, shall be delivered to the Engineer for the Owner upon completion of the Work.
- 4.13 Shop Drawings and Samples
- 4.13.1 Shop Drawings are drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are prepared by the Contractor or any Subcontractor, manufacturer, supplier or distributor, and which illustrate some portion of the Work.
 - 4.13.2 Samples are physical examples furnished by the Contractor to illustrate materials, equipment or workmanship, and to establish standards by which the Work will be judged.
 - 4.13.3 The Contractor shall review, stamp with his approval and submit four copies (2-Owner, 1-Engineer, 1-Contractor), with reasonable promptness and in orderly sequence so as to cause no delay in the Work or in the work of any other contractor, all Shop Drawings and Samples required by the Contract Drawings or subsequently by the Engineer as covered by Modifications. Shop Drawings and Samples shall be properly identified as specified, or as the Engineer may require. At the time of submission, the Contractor shall inform the Engineer in writing of any deviation in the Shop Drawings or Samples from the requirements of the Contract Documents.
 - 4.13.4 By approving and submitting Shop Drawings and Samples, the Contractor thereby represents that he has determined and verified all field measurements, field construction criteria, materials, catalog numbers, and similar data, or will do so, and that he has checked and coordinated each Shop Drawing and Sample with the requirements of the Work and of the Contract Documents.

- 4.13.5 The Engineer will review and approve Shop Drawings and Samples with reasonable promptness so as to cause no delay, but only for conformance with the design concept of the Project and with the information given in the Contract Documents. The Engineer approval of a separate item shall not indicate approval of an assembly in which the item functions.
- 4.13.6 The Contractor shall make any corrections required by the Engineer and shall resubmit the required number of corrected copies of Shop Drawings or new Samples until approved. The Contractor shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections requested by the Engineer on previous submissions.
- 4.13.7 The Engineer's approval of Shop Drawings or Samples shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents unless the Contractor has informed the Engineer in writing of such deviation at the time of submission and the Engineer has given written approval to the specific deviation, nor shall the Engineer's approval relieve the Contractor from responsibility for errors or omissions in the Shop Drawings or Samples.
- 4.13.8 No portion of the Work requiring a Shop Drawing or Sample submission shall be commenced until the submission has been approved by the Engineer. All such portions of the Work shall be in accordance with approved Shop Drawings and Samples.
- 4.14 Use of Site
 - 4.14.1 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with any materials or equipment.
- 4.15 Cutting and Patching of Work
 - 4.15.1 The Contractor shall do all cutting, fitting or patching of his Work that may be required to make its several parts fit together properly, and shall not endanger any Work by cutting, excavating or otherwise altering the Work or any part of it.
- 4.16 Cleaning Up
 - 4.16.1 The Contractor, at all times, shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. At the completion of the Work, he shall remove all his waste materials and rubbish from and about the Project as well as all his tools, construction equipment, machinery and surplus materials, and shall clean all glass surfaces and leave the Work "broom-clean" or its equivalent, except as noted otherwise.
 - 4.16.2 If the Contractor fails to clean up, the Owner may do so and the cost thereof shall be charged to the Contractor as provided in Paragraph 3.4.

4.17 Communications

4.17.1 The Contractor shall forward all communications to the Owner through the Engineer.

4.18 Indemnification

4.18.1 The Contractor shall indemnify and hold harmless the Owner and the Engineer and their agents and employees from and against all claims, damages, losses and expenses, including attorneys' fees arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself, including the loss or use resulting therefrom, and (2) is caused in whole or in part by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone, for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

4.18.2 In any and all claims against the Owner or the A & E or any of their agents or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts any of them may be liable, the indemnification obligation under this Paragraph 4.18 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor of any Subcontractor under workmen's compensation acts, disability benefit acts or other employee benefit acts.

4.18.3 The obligations of the Contractor under this Paragraph 4.18 shall not extend to the liability of the Engineer, his agents or employees arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications, or (2) the giving of or the failure to give directions or instructions by the A & E, his agents or employees provided such giving or failure to give is the primary cause of the injury or damage.

ARTICLE 5

SUBCONTRACTORS

5.1 Definition

5.1.1 A Subcontractor is a person or organization that has a direct contract with the Contractor to perform any of the Work at the site. The term Subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Subcontractor or his authorized representative.

5.1.2 A Sub-subcontractor is a person or organization that has a direct or indirect contract with a Subcontractor to perform any of the Work at the site. The term

Sub-subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Sub-subcontractor or an authorized representative thereof.

- 5.1.3 Nothing contained in the Contract Documents shall create any contractual relation between the Owner or the Engineer and any Subcontractor or Sub-subcontractor.

5.2 Award of Subcontracts and Other Contracts for Portions of the Work

- 5.2.1 Unless otherwise specified in the Contract Documents or in the Information For and Instructions to Bidders, the Contractor, as soon as practicable after the award of the Contract, shall furnish to the Engineer in writing for acceptance by the Owner and the Engineer, a list of the names of the Subcontractors proposed for the principal portions of the Work. The Engineer shall promptly notify the Contractor in writing if either the Owner or the Engineer, after due investigation, has reasonable objection to any Subcontractor on such list and does not accept him. Failure of the Owner or the Engineer to make objection promptly to any Subcontractor on the list shall constitute acceptance of such Subcontractor.

- 5.2.2 The Contractor shall not contract with any Subcontractor or any person or organization (including those who are to furnish materials or equipment fabricated to a special design) proposed for portions of the Work designated in the Contract Documents or in the Information For and Instructions to Bidders, or, if none is so designated, with any Subcontractor proposed for the principal portions of the Work who has been rejected by the Owner and the Engineer. The Contractor will not be required to contract with any Subcontractor or person or organization against whom has a reasonable objection.

- 5.2.3 If the Owner or Engineer refuses to accept any Subcontractor or person or organization on a list submitted by the Contractor in response to the requirements of the Contract Documents or the Information For and Instructions to Bidders, the Contractor shall submit an acceptable substitute and the Contract Sum shall be increased or decreased by the difference in cost occasioned by such substitution and an appropriate Change Order shall be issued; however, no increase in the Contract Sum shall be allowed for any such substitution unless the Contractor has acted promptly and responsively in submitting for acceptance any list or lists of names as required by the Contract Documents or the Information For and Instructions to Bidders.

- 5.2.4 If the Owner or the Engineer requires a change of any proposed Subcontractor or person or organization previously accepted by them, the Contract Sum shall be increased or decreased by the difference in cost occasioned by such change and an appropriate Change Order will be issued.

- 5.2.5 The Contractor shall not make any substitution for any Subcontractor or person or organization that has been accepted by the Owner and the Engineer, unless the substitution is acceptable to the Owner and the Engineer.

5.3 Subcontractual Relations

- 5.3.1 All work performed for the Contractor by a Subcontractor shall be pursuant to an appropriate agreement between the Contractor and the Subcontractor (and where appropriate between Subcontractors and Sub-subcontractors), which shall contain provisions that:
- 5.3.1.1 preserve and protect the rights of the Owner and the Engineer under the Contract with respect to the Work to be performed under the subcontract so that the subcontracting thereof will not prejudice such rights;
 - 5.3.1.2 require that such Work be performed in accordance with the requirements of the Contract Documents;
 - 5.3.1.3 require submission to the Contractor of applications for payment under each subcontract to which the Contractor is a party in reasonable time to enable the Contractor to apply for payment in accordance with Article 9.
 - 5.3.1.4 require that all claims for additional costs, extensions of time, damages or delays or otherwise with respect to subcontracted portions of the Work shall be submitted to the Contractor (via any Subcontractor or Sub-subcontractor where appropriate) in sufficient time so that the Contractor may comply in the manner provided in the Contract Documents for like claims by the Contractor upon the Owner;
 - 5.3.1.5 waive all rights the contracting parties may have against one another for damages caused by fire or other perils covered by the property insurance described in the Special Conditions, except such rights as they may have to the proceeds of such insurance if held by the Owner as trustee as described in the Special Conditions; and
 - 5.3.1.6 obligate each Subcontractor specifically to consent to the provisions of this Paragraph 5.3.

5.4 Payments to Subcontractors

- 5.4.1 The Contractor shall pay each Subcontractor upon receipt of payment from the Owner, an amount equal to the percentage of completion allowed to the Contractor on account of such Subcontractor's Work, less the percentage retained from payments to the Contractor. The Contractor shall also require each Subcontractor to make similar payments to his Subcontractors.
- 5.4.2 If the Engineer fails to issue a Certificate for Payment for any cause which is the fault of the Contractor and not the fault of a particular Subcontractor, the Contractor shall pay that Subcontractor on demand made at any time after the Certificate for Payment should otherwise have been issued, for his Work to the extent completed, less the retained percentage.

- 5.4.3 The Contractor shall pay each Subcontractor a just share of any insurance moneys received by the Contractor under Article 11, and he shall require each Subcontractor to make similar payments to his Subcontractors.
- 5.4.4 The Engineer may, on request and at his discretion, furnish to any Subcontractor, if practicable, information regarding percentages of completion certified to the Contractor on account of Work done by such Subcontractors.
- 5.4.5 Neither the Owner nor the Engineer shall have any obligation to pay or to see to the payment of any moneys to any Subcontractor except as may otherwise be required by law.

ARTICLE 6

SEPARATE CONTRACTS

6.1 Owner's Right to Award Separate Contracts

- 6.1.1 The Owner reserves the right to award other contracts in connection with other portions of the Project under these or similar conditions of the Contract.

6.2 Mutual Responsibility of Contractors

- 6.2.1 The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their work, and shall properly connect and coordinate his Work with theirs.
- 6.2.2 If any part of the Contractor's Work depends for proper execution or results upon the work of any other separate contractor, the Contractor shall inspect and promptly report to the Engineer any apparent discrepancies or defects in such work that renders it unsuitable for such proper execution and results. Failure of the Contractor so to inspect and report shall constitute an acceptance of the other contractor's work as fit and proper to receive his Work, except as to defects which may develop in the other separate contractor's work after the execution of the Contractor's Work.
- 6.2.3 Should the Contractor cause damage to the work or property of any separate contractor on the Project, the Contractor shall, upon due notice, settle with such other contractor by agreement or arbitration, if he will so settle. If such separate Contractor sues the Owner or initiates an arbitration proceeding on account of any damage alleged to have been so sustained, the Owner shall notify the Contractor who shall defend such proceedings at the Owner's expense, and if any judgment or award against the Owner arises therefrom, the Contractor shall pay or satisfy it and shall reimburse the Owner for all attorneys' fees and court or arbitration costs which the Owner has incurred.

6.3 Cutting and Patching Under Separate Contracts

- 6.3.1 The Contractor shall be responsible for any cutting, fitting and patching that may be required to complete his Work except as otherwise specifically provided in the Contract Documents. The Contractor shall not endanger any work of any other contractors by cutting, excavating or otherwise altering any work and shall not cut or alter the work of any other contractor except with the written consent of the Engineer.
- 6.3.2 Any costs caused by defective or ill-timed work shall be borne by the party responsible therefore.
- 6.4 Owner's Right to Clean Up
 - 6.4.1 If a dispute arises between the separate contractors as to their responsibility for cleaning up as required by Paragraph 4.16, the Owner may clean up and charge the cost thereof to the several contractors as the Engineer shall determine to be just.

ARTICLE 7

MISCELLANEOUS PROVISIONS

- 7.1 Governing Law
 - 7.1.1 The Contract shall be governed by the law of the place where the Project is located.
- 7.2 Successors and Assigns
 - 7.2.1 The Owner and the Contractor each bind himself, his partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party in respect to all covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract or sublet it as a whole without the written consent of the other, nor shall the Contractor assign any moneys due or to become due to him hereunder, without the previous written consent of the Owner.
- 7.3 Written Notice
 - 7.3.1 Written notice shall be deemed to have duly been served if delivered in person to the individual or member of the firm or to an office of the corporation for whom it was intended, or if delivered at or sent by registered or certified mail to the last business address known to him who gives the notice.
- 7.4 Claims for Damages
 - 7.4.1 Should either party to the Contract suffer injury or damage to person or property because of any act or omission of the other party or any of his

employees, agents or others for whose acts he is legally liable, claim shall be made in writing to such other party within a reasonable time after the first observance of such injury or damage.

7.5 Performance Bond and Labor and Material Payment Bond

7.5.1 The Owner shall have the right to require the Contractor to furnish bonds covering the faithful performance of the Contract and the payment of all obligations arising hereunder if and as required in the Information For and Instructions to Bidders or elsewhere in the Contract Documents.

7.6 Rights and Remedies

7.6.1 The duties and obligations imposed by the Contract Documents and the rights and remedies available hereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law.

7.7 Royalties and Patents

7.7.1 The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and shall save the Owner harmless from loss on account thereof, except that the Owner shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified, but if the Contractor has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Engineer.

7.8 Tests

7.8.1 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to be inspected, tested or approved, the Contractor shall give the Engineer timely notice of its readiness and of the date arranged so the Engineer may observe such inspection, testing or approval. The Contractor shall bear all costs of such inspections, tests and approvals unless otherwise provided.

7.8.2 If after the commencement of the Work, the Engineer determines that any Work requires special inspection, testing or approval which Subparagraph 7.8.1 does not include, he will, upon written authorization from the Owner, instruct the Contractor to order such special inspection, testing or approval, and the Contractor shall give notice as in Subparagraph 7.8.1. If such special inspection or testing reveals a failure of the Work to comply (1) with the requirements of the Contract Documents, or (2) with respect to the performance of the Work, with laws, ordinances, rules, regulations or orders of any public authority having jurisdiction, the Contractor shall bear all costs thereof, including the Engineer additional services made necessary by such

failure; otherwise the Owner shall bear such costs, and an appropriate Change Order shall be issued.

7.8.3 Required certificates of inspection, testing or approval shall be secured by the Contractor and promptly delivered by him to the Engineer.

7.8.4 If the Engineer wishes to observe the inspections, tests or approvals required by this Paragraph 7.8, he will do so promptly, and where practicable, at the source of supply.

7.8.5 Neither the observations of the Engineer in his administration of the construction contract, nor inspection, tests or approvals by persons other than the Contractor shall relieve the Contractor from his obligations to perform the Work in accordance with the Contract Documents.

7.9 Interest

7.9.1 Any moneys not paid when due to either party under this Contract shall bear interest at the legal rate at the place of the Project.

7.10 Mediation

7.10.1 All claims, disputes and other matters in question arising out of, or relating to, this Contract or the breach thereof, except for claims which have been waived by the making or acceptance of final payment as provided by Subparagraph 9.7.5, shall be decided by mediation by the American Arbitration Association unless the parties mutually agree otherwise.

7.10.2 Notice of the demand for mediation shall be filed in writing with the other party to the Contract and with the American Arbitration Association, and a copy shall be filed with the Engineer. The demand for mediation shall be made within the time limits specified in Subparagraphs 2.2.9 and 2.2.10 where applicable, and in all other cases within a reasonable time after the claim, dispute or other matter in question has arisen, and in no event shall it be made after the date when institution or legal or equitable proceedings based on such claim, dispute or other matter in question would be barred by the applicable statute of limitations.

7.10.3 The Contractor shall carry on the Work during any mediation proceedings, unless otherwise agreed by him and the Owner in writing.

TIME

8.1 Definitions

8.1.1 The Contract Time is the period of time allotted in the Contract Documents for completion of the work.

- 8.1.2 The date of commencement of the Work is the date established in a notice to proceed. If there is no notice to proceed, it shall be the date of the Agreement or such other date as may be established therein.
 - 8.1.3 The date of Substantial Completion of the Work or designated portion thereof is the Date certified by the Engineer when construction is sufficiently complete, in accordance with the Contract Documents, so the Owner may occupy the Work or designated portion thereof for the use for which it is intended.
 - 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day.
- 8.2 Progress and Completion
- 8.2.1 All time limits stated in the Contract Documents are of the essence of the Contract.
 - 8.2.2 The Contractor shall begin the Work on the date of commencement as defined in Subparagraph 8.1.2. He shall carry the Work forward expeditiously with adequate forces and shall complete it within the Contract Time.
 - 8.2.3 If a date or time of completion is included in the Contract, it shall be the Date of Substantial Completion as defined in Subparagraph 8.1.3, including authorized extensions thereto, unless otherwise provided.
- 8.3 Delays and Extensions of Time
- 8.3.1 If the Contractor is delayed at any time in the progress of the Work by any act or neglect of the Owner or the Engineer, or by any employee of either, or by any separate contractor employed by the Owner, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in transportation, unavoidable casualties or any causes beyond the Contractor's control, or by delay authorized by the Owner pending arbitration, or by any cause which the Engineer determines may justify the delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Engineer may determine.
 - 8.3.2 All claims for extension of time shall be made in writing to the Engineer no more than seven days after the occurrence of the delay; otherwise they shall be waived. In the case of continuing cause of delay, only one claim is necessary.
 - 8.3.3 If no schedule or agreement is made stating the dates upon which written interpretations as set forth in Subparagraph 1.2.4 shall be furnished, then no claim for delay shall be allowed on account of failure to furnish such interpretations until fifteen days after demand is made for them, and not then unless such claim is reasonable.
 - 8.3.4 This Paragraph 8.3 does not exclude the recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9

PAYMENTS AND COMPLETION

9.1 Contract Sum

9.1.1 The Contract Sum is stated in the Agreement and is the total amount payable by the Owner to the Contractor for the performance of the Work under the Contract Documents.

9.2 Schedule of Values

9.2.1 Before the first Application for Payment, the Contractor shall submit to the Engineer a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Engineer may require. This schedule, unless objected to the Engineer, shall be used as a basis for reviewing the Contractor's Application for Payment.

9.3 Progress Payments and Retainage

9.3.1 At least ten days before each progress payment falls due, the Contractor shall submit to the Engineer an itemized Application for Payment, supported by such data substantiating the Contractor's right to payment as the Owner or the Engineer may require.

9.3.2 At the time for payment to the Contractor, the Owner shall review for approval a full, accurate, and detailed estimate of the various kinds of labor performed and materials furnished under the Contract with the amount due for each and the aggregate amount. This estimate shall include the amounts of the preceding estimate, and the amount of labor and materials furnished since the last estimate.

9.3.3 If the payments are to be made on account of materials or equipment not incorporated in the Work but delivered and suitably stored at the site, or at some other location agreed upon in writing, such payments shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials or equipment or otherwise protect the Owner's interest including applicable insurance and transportation to the site.

9.3.4 The Contractor warrants and guarantees that title to all Work, materials and equipment covered by an Application for Payment, whether incorporated in the Project or not, will pass to the Owner upon receipt of such payment by the Contractor, free and clear of all liens, claims, security interests or encumbrances, hereinafter referred to in this Article 9 as "liens"; and that no Work, materials or equipment covered by an Application for Payment will have been acquired by the Contractor or by any other person performing the Work at the site of furnishing materials and equipment for the Project, subject to an

agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or such other person.

- 9.3.5 The Contractor shall be paid an amount equal to 92% of the estimated value of all work completed up to 50% of the contract value, excluding change orders.

9.4 Certificates for Payment

- 9.4.1 If the Contractor has made Application for Payment as above, the Engineer will, with reasonable promptness but not more than seven days after the receipt of the Application, issue a Certificate for Payment to the Owner, with a copy to the Contractor, for such amount as he determines to be properly due, or state in writing his reasons for withholding a Certificate as provided in Subparagraph 9.5.1.

- 9.4.2 The issuance of a Certificate for payment will constitute a representation by the Engineer to the Owner, based on his observations at the site as provided in Subparagraph 2.2.4 and the data comprising the Application for Payment, that the Work has progressed to the point indicated; that, to the best of his knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to the results of any subsequent tests required by the Contract Documents, to minor deviations from the Contract Documents correctable prior to completion, and to any specific qualifications stated in his Certificate); and that the Contractor is entitled to payment in the amount certified. In addition, the Engineer's final Certificate for Payment will constitute a further representation that the conditions precedent to the Contractor's being entitled to final payment as set forth in Subparagraph 9.7.2 have been fulfilled. However, by issuing a Certificate for Payment, the Engineer shall not thereby be deemed to represent that he has made exhaustive or continuous on-site inspections to check the quality or quantity of the Work or that he has reviewed the construction means, methods, techniques, sequences or procedures, or that he has made any examination to ascertain how or for what purpose the Contractor has used the moneys previously paid on account of the Contract Sum.

- 9.4.3 After the Engineer has issued a Certificate for Payment, the Owner shall make payment in the manner provided in the Agreement.

- 9.4.4 No certificate for a progress payment, nor any progress payment, nor any partial or entire use of occupancy of the Project by the Owner, shall constitute an acceptance of any Work not in accordance with the Contract Documents.

9.5 Payments Withheld

- 9.5.1 The Engineer may decline to approve an Application for Payment and may withhold his Certificate in whole or in part, to the extent necessary reasonably to protect the Owner, if in his opinion he is unable to make representations to

the Owner as provided in Subparagraph 9.4.2. The Engineer may also decline to approve any Application for Payment or, because of subsequently discovered evidence or subsequent inspections, he may nullify the whole or any part of any Certificate for Payment previously issued, to such extent as may be necessary in his opinion to protect the Owner from loss because of:

- 9.5.1.1 defective Work not remedied;
- 9.5.1.2 third party claims filed or reasonable evidence indicating probable filing of such claims;
- 9.5.1.3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- 9.5.1.4 reasonable doubt that the Work can be completed for the unpaid balance of the Contract Sum;
- 9.5.1.5 damage to another contractor;
- 9.5.1.6 reasonable doubt that the Work will not be completed within the Contract Time; or,
- 9.5.1.7 unsatisfactory prosecution of the Work by the Contractor.

9.5.2 When the above grounds in Subparagraph 9.5.1 are removed, payment shall be made for amounts withheld because of them.

9.6 Failure of Payment

9.6.1 If the Engineer should fail to issue any Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner should fail to pay the Contractor within seven days after the date established in the Agreement any amount certified by the Engineer or awarded by arbitration, then the Contractor may, upon seven additional days' written notice to the Owner and the Engineer, stop the Work until payment of the amount owing has been received.

9.6.2 Payment on Application for Payment certified by the Engineer and approved by the Owner shall be made within thirty (30) days of the date of such approval. If the Owner should fail to make payment within this time, there shall be allowed to the Contractor, in addition to any other remedies available by law, interest on such moneys. The rate of such interest shall be the average of the prime interest rate established at the commercial banks in the city of over one hundred thousand population that is nearest the construction site.

9.6.3 Payment of retained moneys shall be made within thirty (30) days from date of authorization for payment. If not made, there shall be allowed to the Contractor, in addition to other remedies allowed by law, interest on the

retained moneys. This interest shall be in addition to any interest earned in the escrow account. Interest rate shall be determined as in Sub-paragraph 9.6.2.

9.7 Substantial Completion and Final Payment

- 9.7.1 When the Contractor determines that the Work or a designated portion thereof acceptable to the Owner is substantially complete, the Contractor shall prepare for submission to the Engineer a list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. When the Engineer, on the basis of an inspection, determines that the Work is substantially complete, he will then prepare a Certificate of Substantial Completion which shall establish the Date of Substantial Completion, shall state the responsibilities of the Owner and the Contractor for maintenance, heat, utilities and insurance, and shall fix the time within which the Contractor shall complete the items listed therein. The Certificate of Substantial Completion shall be submitted to the Owner and the Contractor for their written acceptance of the responsibilities assigned to them in such Certificate.
- 9.7.2 Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the A & E will promptly make such inspection and, when he finds the Work acceptable under the Contract Documents and the Contract fully performed, he will promptly issue a final Certificate for Payment stating that to the best of his knowledge, information and belief, and on the basis of his observations and inspections, the Work has been completed in accordance with the terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor, and noted in said final Certificate, is due and payable.
- 9.7.3 Neither the final payment nor the remaining retained percentage shall become due until the Contractor submits to the Engineer (1) an Affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or his property might in any way be responsible, have been paid or otherwise satisfied, (2) consent of surety, if any, to final payment and (3), if required by the Owner, other data establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of liens arising out of the Contract, to the extent and in such form as may be designated by the Owner. If any Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify him against any such lien. If any such lien remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.
- 9.7.4 If, after Substantial Completion of the Work final completion thereof is materially delayed through no fault of the Contractor, and the Engineer so confirms, the Owner shall, upon certification by the Engineer and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not

fully completed or corrected is less than the retainage stipulated in the Contract Documents and, if bonds have been furnished as required in Subparagraph 7.5.1, the written consent of the surety to the payment of the balance due for the portion of the Work fully completed and accepted shall be submitted by the Contractor to the Engineer prior to certification of such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

9.7.5 The making of final payment shall constitute a waiver of all claims by the Owner except those arising from:

9.7.5.1 unsettled liens;

9.7.5.2 faulty or defective Work appearing after Substantial Completion;

9.7.5.3 failure of the Work to comply with the requirements of the Contract Documents; or

9.7.5.4 terms of any special guarantee required by the Contract Documents.

ARTICLE 10

PROTECTION OF PERSONS AND PROPERTY

10.1 Safety Precautions and Programs

- 10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work.

10.2 Safety of Persons and Property

- 10.2.1 The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:

- 10.2.1.1 all employees on the Work and all other persons who may be affected thereby;
- 10.2.1.2 all the Work and all materials and equipment to be incorporated therein, whether in storage on or off site, under the care, custody or control of the Contractor or any of his Subcontractors or Sub-subcontractors; and
- 10.2.1.3 other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

- 10.2.2 The Contractor shall comply with all applicable laws, ordinances, rules, regulations and lawful orders of any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. He shall erect and maintain, as required by existing conditions and progress of the Work, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent utilities.

- 10.2.3 When the use of storage of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.

- 10.2.4 All damage or loss to any property referred to in Clause 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, any Subcontractor, any Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable, shall be remedied by the Contractor, except damage or loss attributable to faulty Drawings or Specifications or to the acts or omissions of the Owner or Engineer or anyone employed by either of them or for whose acts either of them may be liable, and not attributable to the fault of negligence of the Contractor.

- 10.2.5 When an estimate is allowed on account of material delivered to the site of the Work or other approved location for storage, such material becomes the

property of the Owner under the Contract; however, if such material or equipment is stolen, damaged, or destroyed by casualty before being used, the Contractor will be responsible for its replacement.

10.2.6 The Contractor shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated in writing by the Contractor to the Owner and the Engineer.

10.3 Emergencies

10.3.1 In any emergency affecting the safety of persons or property, the Contractor shall act, at his discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be determined as provided in Article 12 for Changes in the Work.

ARTICLE 11

INSURANCE

11.1 Contractor's Liability Insurance

11.1.1 The Contractor shall purchase and maintain such insurance as will protect him from claims set forth below which may arise out of or result from the Contractor's operations under the Contract, whether such operations be by himself or by any Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

11.1.1.1 claims under workmen's compensation, disability benefit and other similar employee benefit acts;

11.1.1.2 claims for damages because of bodily injury, occupational sickness or disease or death of his employees;

11.1.1.3 claims for damages because of bodily injury, sickness or disease, or death of any person other than his employees;

11.1.1.4 claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person; and

11.1.1.5 claims for damages because of injury to or destruction of tangible property, including loss of use resulting therefrom.

11.1.2 The insurance required by Subparagraph 11.1.1 shall be written for not less than any limits of liability specified in the Contract Documents, or required by

law, whichever is greater, and shall include contractual liability insurance as applicable to the Contractor's obligations under Paragraph 4.18.

- 11.1.3 Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These Certificates shall contain a provision that coverage afforded under the policies will not be canceled until at least fifteen days prior to written notice has been given to the Owner.

11.2 Owner's Liability Insurance

- 11.2.1 The Owner at his option, shall be responsible for purchasing and maintaining his own liability insurance and, may purchase and maintain such insurance as will protect him against claims, which may arise from operations under the Contract.

11.3 Loss of Use Insurance

- 11.3.1 The Owner, at his option, may purchase and maintain such insurance as will insure him against loss of use of his property due to fire or other hazards, however caused.

ARTICLE 12

CHANGES IN THE WORK

12.1 Change Orders

- 12.1.1 The Owner, without invalidating the Contract, may order Changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and the Contract Time being adjusted accordingly. All such Changes in the Work shall be authorized by Change Order, and shall be executed under the applicable conditions of the Contract Documents.
- 12.1.2 A Change Order is a written order to the Contractor signed by the Owner and the Engineer, issued after the execution of the Contract, authorizing a Change in the Work or an adjustment in the Contract Sum or the Contract Time. Alternatively, the Change Order may be signed by the Engineer alone, provided he has written authority from the Owner for such procedure and that a copy of such written authority is furnished to the Contractor upon request. A Change Order may also be signed by the Contractor if he agrees to the adjustment in the Contract Sum or the Contract Time. The Contract Sum and the Contract Time may be changed only by Change Order.
- 12.1.3 The cost or credit to the Owner resulting from a Change in the Work shall be determined in one or more of the following ways:

- 12.1.3.1 by mutual acceptance of a lump sum properly itemized;

12.1.3.2 by unit prices in the Contract Documents or subsequently agreed upon; or

12.1.3.3 by cost and mutually acceptable fixed or percentage fee.

12.1.4 If none of the methods set forth in Subparagraph 12.1.3 is agreed upon, the Contractor, provided he receives a Change Order, shall promptly proceed with the Work involved. The cost of such Work shall then be determined by the Engineer on the basis of the Contractor's reasonable expenditures and savings, including, in the case of an increase in the Contract Sum, a reasonable allowance for overhead and profit. In such cases and also under Clause 12.1.3.3 above, the Contractor shall keep and present, in such form as the Engineer may prescribe, an itemized accounting together with appropriate supporting data. Pending final determination of cost to the Owner, payments on account shall be made on the Engineer's Certificate for Payment. The amount of credit to be allowed by the Contractor to the Owner for any deletion or change, which results in a net decrease in cost will be, the amount of the actual net decrease as confirmed by the Engineer. When both additions and credits are involved in any one change, the allowance for overhead and profit shall be figured on the basis of net increase, if any.

12.1.5 Should concealed conditions encountered in the performance of the Work below the surface of the ground be set at variance with the conditions indicated by the Contract Documents or should unknown physical conditions below the surface of the ground of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract, be encountered, the Contract Sum shall be equitably adjusted by Change Order upon claim by either party made within twenty days after the first observance of the conditions.

12.1.6 If the Contractor claims that additional costs involved because of (1) any written interpretation issued pursuant to Subparagraph 1.2.4, (2) any order by the Owner to stop the Work pursuant to Paragraph 3.3 where the Contractor was not at fault, or (3) any written order for a minor change in the Work issued pursuant to Paragraph 12.3, the Contractor shall make such claim as provided in Paragraph 12.2.

12.2 Claims for Additional Cost

12.2.1 If the Contractor wishes to make a claim for an increase in the Contract Sum, he shall give the A & E written notice thereof within seven days after the occurrence of the event giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the Work, except in an emergency endangering life or property in which case the Contractor shall proceed in accordance with Subparagraph 10.3.1. No such claim shall be valid unless so made. If the Owner and the Contractor cannot agree on the amount of the adjustment in the Contract Sum, it shall be determined by the Engineer. Any change in the Contract Sum resulting from such claim shall be authorized by Change Order.

12.3 Minor Changes in the Work

12.3.1 The Engineer shall have authority to order minor changes in the Work not involving an adjustment in the Contract Sum or an extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes may be effected by Field Order or by other written order. Such changes shall be binding on the Owner and the Contractor.

12.4 Field Orders

12.4.1 The Engineer may issue written Field Orders which interpret the Contract Documents in accordance with Subparagraph 1.2.4 or which order minor changes in the Work in accordance with Paragraph 12.3 without change in Contract Sum or Contract Time. The Contractor shall carry out such Field Orders promptly.

ARTICLE 13

UNCOVERING AND CORRECTION OF WORK

13.1 Uncovering of Work

13.1.1 If any Work should be covered contrary to the request of the Engineer, it must, if required by the Engineer, be uncovered for his observation and replaced, at the Contractor's expense.

13.1.2 If any other Work has been covered which the Engineer has not specifically requested to observe prior to being covered, the Engineer may request to see such Work and it shall be uncovered by the Contractor. If such Work be found in accordance with the Contract Documents, the cost of uncovering and replacement shall be, by appropriate Change Order, charged to the Owner. If such Work be found not in accordance with the Contract Documents, the Contractor shall pay such costs unless it be found that this condition was caused by a separate contractor employed as provided in Article 6, and in that event the Owner shall be responsible for the payment of such costs.

13.2 Correction of Work

13.2.1 The Contractor shall promptly correct all Work rejected by the Engineer as defective or as failing to conform to the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear all cost of correcting such rejected Work, including the cost of the Engineer additional services thereby made necessary.

13.2.2 If, within one year after Date of Substantial Completion or within such longer period of time as may be prescribed by law or by the terms of any applicable

special guarantee required by the Contract Documents, any of the Work is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovering of the condition.

- 13.2.3 All such defective or non-conforming Work under Subparagraphs 13.2.1 and 13.2.2 shall be removed from the site if necessary, and the Work shall be corrected to comply with the Contract Documents without cost to the Owner.
 - 13.2.4 The Contractor shall bear the cost of making good all work of separate contractors destroyed or damaged by such removal or correction.
 - 13.2.5 If the Contractor does not remove such defective or non-conforming Work within a reasonable time fixed by written notice from the Engineer, the Owner may remove it and may store the materials or equipment at the expense of the Contractor. If the Contractor does not pay the cost of such removal and storage within ten days thereafter, the Owner may, upon ten additional days' written notice, sell such Work at auction or at private sale and shall account for the net proceeds thereof, after deducting all the costs that should have been borne by the Contractor including compensation for Engineer's additional services. If such costs of sale do not cover all costs, which the Contractor should have borne, the difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.
 - 13.2.6 If the Contractor fails to correct such defective or non-conforming Work, the Owner may correct it in accordance with Paragraph 3.4.
- 13.3 Acceptance of Defective or Non-conforming Work
- 13.3.1 If the Owner prefers to accept defective or non-conforming Work, he may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect an appropriate reduction in the Contract Sum, or, if the amount is determined after final payment, it shall be paid by the Contractor.

ARTICLE 14

TERMINATION OF THE CONTRACT

14.1 Termination by the Contractor

- 14.1.1 If the Work is stopped for a period of thirty days under an order of any court or other public authority having jurisdiction, or as a result of an act of government such as a declaration of a national emergency making material unavailable,

through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing any of the Work under a contract with the Contractor, or if the Work should be stopped for a period of thirty days by the Contractor for the Engineer's failure to issue a Certificate of Payment as provided in Paragraph 9.6 or for the Owner's failure to make payment thereon as provided in Paragraph 9.6, then the Contractor may, upon seven days' written notice to the Owner and the Engineer, terminate the Contract and recover from the Owner payment for all Work executed and for any proven loss sustained upon any materials, equipment, tools, construction equipment and machinery, including reasonable profit and damages.

14.2 Termination by the Owner

- 14.2.1 If the Contractor is adjudged bankrupt, or if he makes a general assignment for the benefit of his creditors, or if a receiver is appointed on account of his insolvency, or if he persistently or repeatedly refuses or fails, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials, or if he fails to make prompt payment to Subcontractors or for materials or labor, or any public authority having jurisdiction or otherwise is guilty of a substantial violation of a provision of the Contract Documents, then the Owner, upon certification by the Engineer that sufficient cause exists to justify such action, may, without prejudice to any right or remedy and after giving the Contractor and his surety, if any, seven days' written notice, terminate the employment of the Contractor and take possession of the site and of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor and may finish the Work by whatever method he may deem expedient. In such case, the Contractor shall not be entitled to receive any further payment until the Work is finished.
- 14.2.2 If the unpaid balance of the Contract Sum exceeds the costs of finishing the Work, including compensation for the Engineer's additional services, such excess shall be paid to the Contractor. If such costs exceed such unpaid balance, the Contractor shall pay the difference to the Owner. The costs incurred by the Owner as herein provided shall be certified by the Engineer.

SPECIAL CONDITIONS

INDEX

Article 1	Definitions and Standards	SC-2
2	Liquidated Damages	SC-4
3	Executive Order Compliance	SC-4
4	Federal Regulations	SC-4
5	Scope of Work	SC-4
6	Temporary Facilities and Use of Site	SC-5
7	Other Contracts and Operations	SC-7
8	Clean Up.....	SC-7
9	Miscellaneous Provisions	SC-7
10	Guarantees.....	SC-8
11	Insurance Limits	SC-8
12	Payment Procedure	SC-11
13	Wage Rates	SC-11

SPECIAL CONDITIONS

ARTICLE 1

DEFINITIONS AND STANDARDS

1.1 Definitions

- 1.1.1 Owner Village of Richfield, Ohio acting through their duly authorized representative.
- 1.1.2 Engineer Architects-Engineers, the firm of Glaus, Pyle, Schomer, Burns And DeHaven, employed for this work and as representative of the Owner and as further defined in the General Conditions.
- 1.1.3 Contract All covenants, terms and stipulations contained in all the Contract Documents.
- 1.1.4 Contractor The party of the second part entering into Contract with the Owner for performance of this work or his properly authorized agent.
- 1.1.5 Approved Equal Approved by the A & E.
- 1.1.6 Work Labor or materials or both.
- 1.1.7 Substantial Completion The date of substantial completion of the project is the date when the construction is sufficiently completed, in accordance with the plans and specifications, as modified by any change orders agreed to by the parties, so that the Owner may use the facility.

1.2 Standards

All equipment, materials and labor required to complete the work specified in the Contract Documents shall be in strict accordance with the applicable requirements of the latest editions and interim amendments of the following standards:

- 1.2.1 ASTM The American Society for Testing Materials
- 1.2.2 AIA The American Institute of Architects
- 1.2.3 ASME The American Society of Mechanical Engineers
- 1.2.4 IEEE Institute of Electrical and Electronic Engineers
- 1.2.5 NEMA National Electrical Manufacturers Association

1.2.6	AWS	American Welding Society
1.2.7	NEC	National Electric Code
1.2.8	NESC	National Electric Safety Code
1.2.9	ANSI	American National Standards Institute
1.2.10	AASHO	American Association of State Highway Officials
1.2.11	SAE	Society of Automotive Engineers
1.2.12	IPCEA	Insulated Power Cable Engineers Association
1.2.13	APE	American Petroleum Institute
1.2.14	AWWA	American Water Works Association
1.2.15	UL	Underwriters' Laboratories
1.2.16	ACI	American Concrete Institute
1.2.17	ODOT	State of Ohio Department of Transportation Construction and Material Specifications
1.2.18	AISC	American Institute of Steel Construction
1.2.19	AISI	American Iron and Steel Institute
1.2.20	SSPC	Steel Structures Painting Council
1.2.21	NBFU	National Board of Fire Underwriters
1.2.22	NFPA	National Fire Protection Association
1.2.23	OSHA	Occupational Safety and Health Association
1.2.24	EPA OEPA	Environmental Protection Agency Ohio Environmental Protection Agency
1.2.25	ODOH	Ohio Department of Health
1.2.26	DOT	Department of Transportation
1.2.27	DOT	Ohio Building Code

ARTICLE 2

LIQUIDATED DAMAGES

See "TIME OF COMPLETION" in the Information for and Instructions to Bidders Section and Form of Proposal Section of the Contract Documents/Specifications.

ARTICLE 3

3.1 The Contractor agrees that he will comply with the provisions of:

- 3.1.1 Executive Order 11246, September 24, 1965, relating to equal employment opportunities and with applicable rules, regulations and procedures prescribed pursuant thereto.
- 3.1.2 Title VI of the Civil Rights Act of 1964 (78 Stat. 25; Public Law 88-352), providing that no person in the United States shall, because of race, color, or national origin, be excluded from participating in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance (Sec. 601), and to the implementing regulation issued by the Secretary of the Interior with the approval of the President (43 CFR Part 17).

ARTICLE 4

FEDERAL REGULATIONS

4.1 Social Security Act

- 4.1.1 The Contractor shall be and remain an independent contractor with respect to all services performed hereunder and agrees to and does hereby accept full and exclusive liability for the payment of any and all contributions or taxes for social security, unemployment insurance, or old age retirement benefits, pensions, or annuities now or hereafter imposed under any State or Federal law which are measured by the wages, salaries, or other remuneration paid to persons employed by the Contractor on work performed under the terms of this Contract, and further agrees to obey all lawful rules and regulations and to meet all lawful requirements which are now or hereafter may be issued or promulgated under said respective laws by any duly authorized State or Federal officials; and each said Contractor also agrees to indemnify and save harmless the Owner, from any such contributions or taxes or liability therefore.

ARTICLE 5

SCOPE OF WORK

5.1 Scope of Work for All Divisions

- 5.1.1 The work described in the specifications consists of furnishing all of the labor, appliances, and services necessary to complete the work shown or reasonably inferred on the drawings and/or described in the specifications, and all materials and equipment to be incorporated at the construction for a complete and operable installation for the Owner's use. All excess materials, containers, etc. shall be removed from the job site at the completion of the work.

ARTICLE 6

TEMPORARY FACILITIES, USE OF SITE AND SITE CONDITIONS

6.1 Field Facilities

6.1.1 The Contractor shall be responsible for the following:

- 6.1.1.1 Provide and maintain an adequate number of portable fire extinguishers.
- 6.1.1.2 Temporary sanitary facilities for the use of all personnel in compliance with all Local and State of Ohio Health Codes. Remove the facilities at the completion of work.
- 6.1.1.3 Provide a lockable field office complete with desks, cabinets, plan rack, laydown table, electric and telephone (land line or cellular) service.
- 6.1.1.4 Provide a lockable storage trailer or shed for the storage and protection of construction materials.
- 6.1.1.5 Provide temporary electric power as needed.
- 6.1.1.6 Containerized drinking water and paper supply for the use of construction personnel.
- 6.1.1.7 Dumpster/trash or roll off box container for the collection and disposal of demolition and construction waste.

6.2 Watchman

6.2.1 The Contractor shall provide the services of a watchman if such becomes necessary to protect the work, or to protect the public from hazardous conditions arising from the work.

6.3 Dust, Unnecessary Noise and Burning

6.3.1 The movement and use of machinery and equipment and the handling of materials and conduct of the work shall be such as to avoid and eliminate unnecessary noise, dirt, and dust.

6.3.2 No burning of refuse or other materials shall be permitted on the site.

6.4 Existing Structures

6.4.1 The Contract Documents indicate the existing structures insofar as they have been determined, but the information is not guaranteed to be correct or complete. Unless otherwise indicated in the Contract Documents or unless otherwise taken care of by the Owner thereof, all utilities and all structures of any nature, whether below or above ground, that may be affected by the work, shall be protected and maintained by the Contractor and shall not be disturbed or damaged during the progress of the work; provided that should the Contractor disturb, disconnect or damage any utility or any structure, all expenses of whatever nature arising from such disturbance or the replacement or repair thereof shall be borne by the Contractor.

6.5 Use of Premises

6.5.1 Roads shall be used by the Contractors and Suppliers as directed by the Engineer. Damage of the grounds, resulting from hauling, storage of materials, or other activity connected with the work, shall be repaired by the Contractor at his expense, to the satisfaction of the Engineer.

6.6 Handling of Materials

6.6.1 The Contractor shall make his own arrangements for the handling of materials. The Owner will not accept deliveries for or sign for Contractor's equipment. This will be the sole responsibility of the Contractor. Shipment will only be received during normal working hours.

6.7 Protecting Work and Materials

6.7.1 Materials and Equipment stored at the site or elsewhere shall be protected at all times from physical injury and from weather, dirt and water. Housing platforms and racks shall be used for the proper storage of such materials. The Contractor shall take all precautions to protect all work from any condition of weather.

ARTICLE 7

OTHER OPERATIONS

7.1 The Contractor shall coordinate his work and schedule with the Owners operation and personnel on the site.

ARTICLE 8

CLEAN UP

- 8.1 Cleaning Up
 - 8.1.1 The Contractor shall be responsible for the collection and removal of rubbish, debris, cartons, etc., in accordance with the General Conditions, Article 4.16 and 6.4.
 - 8.1.2 At the completion of the work, the Contractor shall remove all rubbish that has accumulated, and shall leave the work area clean.

ARTICLE 9

MISCELLANEOUS PROVISIONS

- 9.1 State, Federal and Local Taxes
 - 9.1.1 Materials purchased for use of consumption in connection with the proposed work will be exempt from the State of Ohio Sales Tax as provided for in Section 5739.02 of the Revised Code of Ohio and also from the state of Ohio Use Tax, Section 5741.01. Purchases by the Contractor of expendable items such as form lumber, tools, oils, greases, fuel or equipment rentals are subject to the application of the Ohio Sales or Use Tax.
- 9.2 Drawings
 - 9.2.1 The drawings accompanying this specification indicate the general arrangement expected. The Engineer may request material revision to the detailed design drawings submitted by the Contractor to secure better access, operation or maintenance. Where such changes affect the cost of the work, the price shall be adjusted as indicated.
- 9.3 Standards-Substitutions
 - 9.3.1 Those articles, devices, materials, forms of construction, fixtures, etc., named in the specifications to denote the kind and quality required, whether or not the word "or equal" is used, shall be known as "Standards" and all proposals shall be based on the same. Where the bidder is required to name a supplier or subcontractor in his proposal, no deviation will be permitted from such listings.

ARTICLE 10

GUARANTEES

- 10.1 Guarantees
 - 10.1.1 The Contractor shall provide guarantees in accordance with the General Conditions, Articles 9.3.4 and 13.2.2.

10.1.2 The attention of all bidders is directed to the conditions that the Contractor and his Surety will be held responsible to the Owner that all items of equipment installed under this Contract fully meet the design and in actual operation satisfactorily perform the functions for which installed. Further, that the Owner may withhold final payment until such performance and operation is demonstrated.

10.2 Personnel Protection

10.2.1 The Contractor shall agree not to solicit or recruit the Owner's personnel during the term of this Contract. The Contractor shall agree that any former employee of the Owner that becomes employed by the Contractor during the term of this Contract shall not be used on this project.

ARTICLE 11

INSURANCE LIMITS

11.1 Public Liability, Property Damage and Automobile Insurance

11.1.1 The Contractor shall take out and maintain during the life of this Contract, at his own expense, such insurance as prescribed herein and in the General Conditions, Article 11.

11.1.2 Certificates of insurance shall be submitted to the Owner through the Engineer in accordance with the minimum limits described.

11.2 Builder's Risk Insurance (Property Insurance)

11.2.1 The Contractor shall take out and maintain during the life of the Contract, comprehensive builder's risk insurance with extended coverage and coverage for vandalism and malicious mischief in an amount equal to the Contract price. The insurance shall protect the Owner and the Contractor, and shall include coverage, for damage or loss to the work and to appurtenances, all materials, supplies, equipment, construction plant, and temporary structures arising from fire, explosion, wind, earthquake, smoke, aircraft and lightning. No exclusions shall be authorized except that the policy may be made subject to the standard nuclear clause. The policy of insurance or certified copy thereof shall be delivered to the Owner prior to the commencement of construction.

CONTRACTORS PROJECT INSURANCE

Project:

Owner: Village of Richfield

Date: Start of work to Final Completion

The Contractor is hereby instructed to include the following insurance for this project.

A. CONTRACTOR'S LIABILITY INSURANCE

1. Workers' Compensation

State and Employers Liability
Employer's Liability

Statutory
\$500,000
\$500,000 - Each Accident
\$500,000 - Disease, Policy limit
\$500,000 - Disease, Each employee

2. General Liability (including Premises-Operations; Independent Contractors' Protective; Products and Completed Operations; Broad Form Property Damage):

- (a) Bodily Injury:
\$1,000,000 - Each Occurrence
\$2,000,000 - Aggregate
- (b) Property Damage
\$1,000,000 - Each Occurrence
\$2,000,000 - Aggregate
- (c) Products and Completed Operations Insurance shall be maintained for a minimum period of 3 years after final payment and the Contractor shall continue to provide evidence of such coverage to the Owner on an annual basis during the aforementioned period.
- (d) Property Damage Liability Insurance shall include coverage for the following hazards:
X (Explosion)
C (Collapse)
U (Underground)
- (e) Contractual Liability (Hold Harmless Coverage):
Bodily Injury
\$1,000,000 - Each Occurrence
Property Damage:
\$1,000,000 - Each Occurrence
- (f) Personal Injury
\$2,000,000 - Aggregate

(g) If the General Liability policy includes a General Aggregate, such General Aggregate shall be not less than \$2,000,000. Policy shall be endorsed to have General Aggregate apply to this Project only.

3. Umbrella Excess Liability
\$1,000,000 Over primary insurance
\$10,000 Retention
4. Automobile Liability (owned, non-owned, hired):
\$1,000,000 Combined Single Limit for bodily injury and property damage liability
5. Other Insurance:

Coverage:	Amount:
Automobile Liability - Non-Owned & Hire Car	Included in above Auto Liability Limits
Broad Form General Liability Coverage	Included in General Liability Limits
Uninsured & Under Insured Motorists Coverage	At Contractor's discretion

B. PROPERTY INSURANCE

The Contractor shall purchase the following:

All-Risk

In the names of the Owner, Architect/Engineer, Contractor, Subcontractor and Sub-subcontractors as their interests may appear with limits as follows:

Amount equal to the Contract Sum for the Work.

C. OTHER INSTRUCTIONS RELATED TO INSURANCE

The Village of Richfield shall be named as additional insured in regards to the Contractor's auto, general and umbrella liability insurance policies.

ARTICLE 12

PAYMENT PROCEDURE

12.1 Payment Procedure

12.1.1 The Contractor shall submit for payment on standard Application for Payment forms furnished by the Engineer, or such other forms as may be designated by the Owner. The

payment forms shall reflect a detailed schedule of values equaling the amounts shown on the bid forms on the Form of Proposal and must be approved by the Engineer.

- 12.1.2 Application for Payments shall be due in the office of the Engineer at the first of the month, and shall be acted upon within seven days. After approval by the Owner, payment shall be made within thirty days of certification by the Engineer.

ARTICLE 13

WAGE RATES

13.1 Wage Rates

- 13.1.1 "Prevailing Wages" are required on this project.

G:\CIVIL\RICHFIELD VILLAGE\SPECS\22 - SPECIAL CONDITIONS.DOC

BRIARWOOD AREA WASTEWATER PUMPING STATION IMPROVEMENTS

**CONTRACT A - GENERAL AND MECHANICAL
CONTRACT B - ELECTRICAL**

VILLAGE OF RICHFIELD, OHIO

2021

SUPPLEMENTARY CONDITIONS

ARTICLE 1 - STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY

1.01 CONTRACTOR shall comply with Ohio EPA General Permit No. OHC000005, effective April 23, 2018, "GENERAL PERMIT AUTHORIZATION FOR STORM WATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITY UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM" as subsequently set forth (60 pages). Information, and a copy of permit and forms are available at:

<http://epa.ohio.gov/dsw/storm/index>

[Storm Water Program](#)

1.02 OWNER has submitted a Notice of Intent (NOI) for Coverage Under OEPA General Permit and paid the associated fee.

1.03 Contract A Contractor shall be responsible for preparing the SWP3 and for submitting the Co-permittee NOI. The SWP3 must be completed prior to OWNER's submittal of the NOI, and at least 21 days prior to commencement of construction activities.

- A. Contract B Contractor shall each also submit a Co-permittee NOI, and shall comply with the SWP3 prepared by contract A Contractor.

1.04 The conditions of the NPDES construction storm water General Permit shall be met throughout the duration of the Project. The location and timing of erosion and sedimentation control items shall be field adjusted to prevent significant impact on receiving streams. Implementation of the SWP3 shall continue throughout the duration of the Project. Reasonable attempts should be made to minimize the total area of disturbed land.

1.05 CONTRACTOR is responsible for all storm water control maintenance, inspection, and record-keeping required under Part III.G.2, Subparts h and i of the General Permit.

ARTICLE 2 - OHIO DEPARTMENT OF TRANSPORTATION PERMIT REQUIREMENTS

2.01 OWNER has submitted applications and received approval from the State of Ohio Department of Transportation for permits to work within state highway right-of-ways. Copies of the following approved permits are included at the end of these Supplementary Conditions.

- A. Permit No. PERMIT 21-11127, dated 03-02-2021.
- B. Permit No. PERMIT 21-11134, dated 04-19-2021.

2.02 CONTRACTOR shall be responsible for complying with the General Provisions and Supplemental Specifications included in each of the approved permits.

ARTICLE 3 - SUMMIT COUNTY ENGINEER'S OFFICE REQUIREMENTS

3.01 CONTRACTOR shall furnish a bond in the amount of \$3000.00, as required by the County of Summit Engineer, for a permit to open the road within the limits of Richfield Township. This Bond shall remain in effect for a period of one year. A 'BOND FOR ROAD OPENING PERMIT (5589.31)' form is included at the end of these Supplementary Conditions.

3.02 CONTRACTOR shall be responsible for paying all inspection fees, as required by the County of Summit Engineer, for Work located in Local right-of ways. Inspections fees, current for March 2021, are as follows:

- A. Rate for Inspection personnel: \$45.96 per hour.
- B. Rate for Inspection vehicle: \$10.00 per day.

3.03 CONTRACTOR shall be responsible for following Summit County Engineer's backfill and restoration requirements and pavement replacement standards. Details are included at the end of these Supplementary Conditions.

Fechko Excavating to submit all Summit County Engineer inspection fees to the Village of Richfield for reimbursement

Issuance Date: April 23, 2018
Effective Date: April 23, 2018
Expiration Date: April 22, 2023

Ohio EPA APP 07 18
Entered Directors Journal

OHIO ENVIRONMENTAL PROTECTION AGENCY

**GENERAL PERMIT AUTHORIZATION FOR STORM WATER DISCHARGES ASSOCIATED
WITH CONSTRUCTION ACTIVITY UNDER THE NATIONAL POLLUTANT
DISCHARGE ELIMINATION SYSTEM**

In compliance with the provisions of the federal Water Pollution Control Act, as amended (33 U.S.C. Section 1251 et. seq. hereafter referred to as "the Act") and the Ohio Water Pollution Control Act [Ohio Revised Code ("ORC") Chapter 6111], dischargers of storm water from sites where construction activity is being conducted, as defined in Part I.B of this permit, are authorized by the Ohio Environmental Protection Agency, hereafter referred to as "Ohio EPA," to discharge from the outfalls at the sites and to the receiving surface waters of the state identified in their Notice of Intent ("NOI") application form on file with Ohio EPA in accordance with the conditions specified in Parts I through VII of this permit.

It has been determined that a lowering of water quality of various waters of the state associated with granting coverage under this permit is necessary to accommodate important social and economic development in the state of Ohio. In accordance with OAC 3745-1-05, this decision was reached only after examining a series of technical alternatives, reviewing social and economic issues related to the degradation, and considering all public and intergovernmental comments received concerning the proposal.

This permit is conditioned upon payment of applicable fees, submittal of a complete NOI application form, development (and submittal, if applicable) of a complete Storm Water Pollution Prevention Plan (SWP3) and written approval of coverage from the director of Ohio EPA in accordance with Ohio Administrative Code ("OAC") Rule 3745-38-02.



Craig W. Butler
Director

Total Pages: 60

I certify this to be a true and accurate copy of the official documents as filed in the records of the Ohio Environmental Protection Agency.


By:  asseler Date: 4-23-18

TABLE OF CONTENTS

PART I. COVERAGE UNDER THIS PERMIT

- A. Permit Area
- B. Eligibility
- C. Requiring an individual NPDES permit or an alternative general NPDES permit
- D. Permit requirements when portions of a site are sold
- E. Authorization
- F. Notice of Intent Requirements

PART II. NON-NUMERIC EFFLUENT LIMITATIONS

- A. Erosion and Sediment Controls
- B. Soil Stabilization
- C. Dewatering
- D. Pollution Prevention Measures
- E. Prohibited Discharges
- F. Surface Outlets
- G. Post-Construction Storm Water Management Controls

PART III. STORM WATER POLLUTION PREVENTION PLAN (SWP3)

- A. Storm Water Pollution Prevention Plans
- B. Timing
- C. SWP3 Signature and Review
- D. Amendments
- E. Duty to inform contractors and subcontractors
- F. Total Maximum Daily Load (TMDL) allocations
- G. SWP3 Requirements

PART IV. NOTICE OF TERMINATION REQUIREMENTS

- A. Failure to notify
- B. When to submit an NOT
- C. How to submit an NOT

PART V. STANDARD PERMIT CONDITIONS

- A. Duty to comply
- B. Continuation of an expired general permit
- C. Need to halt or reduce activity not a defense
- D. Duty to mitigate
- E. Duty to provide information
- F. Other information
- G. Signatory requirements
- H. Certification
- I. Oil and hazardous substance liability
- J. Property rights
- K. Severability
- L. Transfers
- M. Environmental laws
- N. Proper operation and maintenance
- O. Inspection and entry
- P. Duty to Reapply
- Q. Permit Actions
- R. Bypass
- S. Upset
- U. Reporting Requirements

PART VI. REOPENER CLAUSE

PART VII. DEFINITIONS

APPENDICES

- A. Big Darby Creek Watershed
- B. Portions of the Olentangy Watershed
- C. Intensity for Calculation of Water Quality Flow (WQF)

PART I. COVERAGE UNDER THIS PERMIT

A. Permit Area.

This permit covers the entire State of Ohio. Appendices A and B of this permit contain additional watershed specific requirements for construction activities located partially or fully within the Big Darby Creek Watershed and portions of the Olentangy River Watershed. Projects within portions of the Olentangy River watershed shall seek coverage under this permit following the expiration of OHCO00002 (May 31, 2019).

B. Eligibility.

1. Construction activities covered. Except for storm water discharges identified under Part I.B.2, this permit may cover all new and existing discharges composed entirely of storm water discharges associated with construction activity that enter surface waters of the state or a storm drain leading to surface waters of the state.

For the purposes of this permit, construction activities include any clearing, grading, excavating, grubbing and/or filling activities that disturb one or more acres. Discharges from trench dewatering are also covered by this permit as long as the dewatering activity is carried out in accordance with the practices outlined in Part III.G.2.g.iv of this permit.

Construction activities disturbing one or more acres of total land or will disturb less than one acre of land but are part of a larger common plan of development or sale that will ultimately disturb one or more acres of land are eligible for coverage under this permit. The threshold acreage includes the entire area disturbed in the larger common plan of development or sale.

This permit also authorizes storm water discharges from support activities (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) provided:

- a. The support activity is directly related to a construction site that is required to have NPDES permit coverage for discharges of storm water associated with construction activity;
 - b. The support activity is not a commercial operation serving multiple unrelated construction projects and does not operate beyond the completion of the construction activity at the site it supports;
 - c. Appropriate controls and measures are identified in a storm water pollution prevention plan (SWP3) covering the discharges from the support activity; and
 - d. The support activity is on or contiguous with the property defined in the NOI (offsite borrow pits and soil disposal areas, which serve only one project, do not have to be contiguous with the construction site).
2. Limitations on coverage. The following storm water discharges associated with construction activity are not covered by this permit:

- a. Storm water discharges that originate from the site after construction activities have ceased, including any temporary support activity, and the site has achieved final stabilization. Industrial post-construction storm water discharges may need to be covered by an NPDES permit;
 - b. Storm water discharges associated with construction activity that the director has shown to be or may reasonably expect to be contributing to a violation of a water quality standard; and
 - c. Storm water discharges authorized by an individual NPDES permit or another NPDES general permit.
3. Waivers. After March 10, 2003, sites whose larger common plan of development or sale have at least one, but less than five acres of land disturbance, which would otherwise require permit coverage for storm water discharges associated with construction activities, may request that the director waive their permit requirement. Entities wishing to request such a waiver must certify in writing that the construction activity meets one of the two waiver conditions:
- a. Rainfall Erosivity Waiver. For a construction site to qualify for the rainfall erosivity waiver, the cumulative rainfall erosivity over the project duration must be five or less and the site must be stabilized with a least a 70 percent vegetative cover or other permanent, non-erosive cover. The rainfall erosivity must be calculated according to the method in U.S. EPA Fact Sheet 3.1 Construction Rainfall Erosivity Waiver dated January 2001 and be found at: http://epa.ohio.gov/portals/35/permits/USEPAfact3-1_s.pdf. If it is determined that a construction activity will take place during a time period where the rainfall erosivity factor is less than five, a written waiver certification must be submitted to Ohio EPA at least 21 days before construction activity is scheduled to begin. If the construction activity will extend beyond the dates specified in the waiver certification, the operator must either: (a) recalculate the waiver using the original start date with the new ending date (if the R factor is still less than five, a new waiver certification must be submitted) or (b) submit an NOI application form and fee for coverage under this general permit at least seven days prior to the end of the waiver period; or
 - b. TMDL (Total Maximum Daily Load) Waiver. Storm water controls are not needed based on a TMDL approved or established by U.S. EPA that addresses the pollutant(s) of concern or, for non-impaired waters that do not require TMDLs, and equivalent analysis that determines allocations for small construction sites for the pollutant(s) of concern or that determines that such allocations are not needed to protect water quality based on consideration of existing in-stream concentrations, expected growth in pollutant contributions from all sources, and a margin of safety. The pollutant(s) of concern include sediment or a parameter that addresses sediment (such as total suspended solids, turbidity or siltation) and any other pollutant that has been identified as a cause of impairment of any water body that will receive a discharge from the construction activity. The operator must certify to the director of Ohio EPA that the construction activity will take place, and storm water discharges will occur, within the drainage area addressed by the TMDL or equivalent analysis. A written waiver certification must be submitted to Ohio EPA at least 21 days before the construction activity is scheduled to begin.

4. Prohibition on non-storm water discharges. All discharges covered by this permit must be composed entirely of storm water with the exception of the following: discharges from firefighting activities; fire hydrant flushings; potable water sources including waterline flushings; irrigation drainage; lawn watering; routine external building washdown which does not use detergents; pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used; air conditioning condensate; springs; uncontaminated ground water from trench or well point dewatering and foundation or footing drains where flows are not contaminated with process materials such as solvents. Dewatering activities must be done in compliance with Part II.C and Part III.G.2.g.iv of this permit. Discharges of material other than storm water or the authorized non-storm water discharges listed above must comply with an individual NPDES permit or an alternative NPDES general permit issued for the discharge.

Except for flows from firefighting activities, sources of non-storm water listed above that are combined with storm water discharges associated with construction activity must be identified in the SWP3. The SWP3 must identify and ensure the implementation of appropriate pollution prevention measures for the non-storm water component(s) of the discharge.

5. Spills and unintended releases (Releases in excess of Reportable Quantities). This permit does not relieve the permittee of the reporting requirements of Title 40 of the Code of Federal Regulations ("CFR") Part 117 and 40 CFR Part 302. In the event of a spill or other unintended release, the discharge of hazardous substances in the storm water discharge(s) from a construction site must be minimized in accordance with the applicable storm water pollution prevention plan for the construction activity and in no case, during any 24-hour period, may the discharge(s) contain a hazardous substance equal to or in excess of reportable quantities.

40 CFR Part 117 sets forth a determination of the reportable quantity for each substance designated as hazardous in 40 CFR Part 116. The regulation applies to quantities of designated substances equal to or greater than the reportable quantities, when discharged to surface waters of the state. 40 CFR Part 302 designates under section 102(a) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, those substances in the statutes referred to in section 101(14), identifies reportable quantities for these substances and sets forth the notification requirements for releases of these substances. This regulation also sets forth reportable quantities for hazardous substances designated under section 311(b)(2)(A) of the Clean Water Act (CWA).

C. Requiring an individual NPDES permit or an alternative NPDES general permit.

1. The director may require an alternative permit. The director may require any operator eligible for this permit to apply for and obtain either an individual NPDES permit or coverage under an alternative NPDES general permit in accordance with OAC Rule 3745-38-02. Any interested person may petition the director to take action under this paragraph.

The director will send written notification that an alternative NPDES permit is required. This notice shall include a brief statement of the reasons for this decision, an application form and a statement setting a deadline for the operator to file the application. If an operator fails to submit an application in a timely manner as required by the director under this paragraph, then coverage, if in effect, under this permit is automatically terminated at the end of the day specified for application submittal.

2. Operators may request an individual NPDES permit. Any owner or operator eligible for this permit may request to be excluded from the coverage of this permit by applying for an individual permit. The owner or operator shall submit an individual application with reasons supporting the request to the director in accordance with the requirements of 40 CFR 122.26. If the reasons adequately support the request, the director shall grant it by issuing an individual NPDES permit.
3. When an individual NPDES permit is issued to an owner or operator otherwise subject to this permit or the owner or operator is approved for coverage under an alternative NPDES general permit, the applicability of this permit to the individual NPDES permittee is automatically terminated on the effective date of the individual permit or the date of approval for coverage under the alternative general permit, whichever the case may be.

D. Permit requirements when portions of a site are sold

If an operator obtains a permit for a development, and then the operator (permittee) sells off lots or parcels within that development, permit coverage must be continued on those lots until a Notice of Termination (NOT) in accordance with Part IV.B is submitted. For developments which require the use of centralized sediment and erosion controls (i.e., controls that address storm water runoff from one or more lots) for which the current permittee intends to terminate responsibilities under this permit for a lot after sale of the lot to a new owner and such termination will either prevent or impair the implementation of the controls and therefore jeopardize compliance with the terms and conditions of this permit, the permittee will be required to maintain responsibility for the implementation of those controls. For developments where this is not the case, it is the permittee's responsibility to temporarily stabilize all lots sold to individual lot owners unless an exception is approved in accordance with Part III.G.4. In cases where permit responsibilities for individual lot(s) will be terminated after sale of the lot, the permittee shall inform the individual lot owner of the obligations under this permit and ensure that the Individual Lot NOI application is submitted to Ohio EPA.

E. Authorization

1. Obtaining authorization to discharge. Operators that discharge storm water associated with construction activity must submit an NOI application form and Storm Water Pollution Prevention Plan (SWP3) if located within the Big Darby Creek watershed or portions of the Olentangy watershed in accordance with the requirements of Part I.F of this permit to obtain authorization to discharge under this general permit. As required under OAC Rule 3745-38-06(E), the director, in response to the NOI submission, will notify the applicant in writing that he/she has or has not been granted general permit coverage to discharge storm water associated with construction activity under the terms and conditions of this permit or that the applicant must apply for an individual NPDES permit or coverage under an alternate general NPDES permit as described in Part I.C.1.

2. No release from other requirements. No condition of this permit shall release the permittee from any responsibility or requirements under other environmental statutes or regulations. Other permit requirements commonly associated with construction activities include, but are not limited to, section 401 water quality certifications, isolated wetland permits, permits to install sanitary sewers or other devices that discharge or convey polluted water, permits to install drinking water lines, single lot sanitary system permits and disturbance of land which was used to operate a solid or hazardous waste facility (i.e., coverage under this NPDES general permit does not satisfy the requirements of OAC Rule 3745-27-13 or ORC Section 3734.02(H)). The issuance of this permit is subject to resolution of an antidegradation review. This permit does not relieve the permittee of other responsibilities associated with construction activities such as contacting the Ohio Department of Natural Resources, Division of Water, to ensure proper well installation and abandonment of wells.

F. Notice of Intent Requirements

1. Deadlines for notification.
 - a. Initial coverage: Operators who intend to obtain initial coverage for a storm water discharge associated with construction activity under this general permit must submit a complete and accurate NOI application form, a completed Storm Water Pollution Prevention Plan (SWP3) for projects within the Big Darby Creek and portions of the Olentangy river watersheds and appropriate fee at least 21 days (or 45 days in the Big Darby Creek watershed and portions of the Olentangy watershed) prior to the commencement of construction activity. If more than one operator, as defined in Part VII of this general permit, will be engaged at a site, each operator shall seek coverage under this general permit prior to engaging in construction activities. Coverage under this permit is not effective until an approval letter granting coverage from the director of Ohio EPA is received by the applicant. Where one operator has already submitted an NOI prior to other operator(s) being identified, the additional operator shall request modification of coverage to become a co-permittee. In such instances, the co-permittees shall be covered under the same facility permit number. No additional permit fee is required.
 - b. Individual lot transfer of coverage: Operators must each submit an individual lot notice of intent (Individual Lot NOI) application form (no fee required) to Ohio EPA at least seven days prior to the date that they intend to accept responsibility for permit requirements for their portion of the original permitted development from the previous permittee. Transfer of permit coverage is not granted until an approval letter from the director of Ohio EPA is received by the applicant.
2. Failure to notify. Operators who fail to notify the director of their intent to be covered and who discharge pollutants to surface waters of the state without an NPDES permit are in violation of ORC Chapter 6111. In such instances, Ohio EPA may bring an enforcement action for any discharges of storm water associated with construction activity.
3. How to submit an NOI. Operators seeking coverage under this permit must submit a complete and accurate Notice of Intent (NOI) application using Ohio EPA's electronic application form which is available through the Ohio EPA eBusiness Center at: <https://ebiz.epa.ohio.gov/>. Submission through the Ohio EPA eBusiness Center will

require establishing an Ohio EPA eBusiness Center account and obtaining a unique Personal Identification Number (PIN) for final submission of the NOI. Existing eBusiness Center account holders can access the NOI form through their existing account and submit using their existing PIN. Please see the following link for guidance:

<http://epa.ohio.gov/dsw/ebs.aspx#170669803-streams-guidance>. Alternatively, if you are unable to access the NOI form through the agency eBusiness Center due to a demonstrated hardship, the NOI may be submitted on a paper NOI form provided by Ohio EPA. NOI information shall be typed on the form. Please contact Ohio EPA, Division of Surface Water at (614) 644-2001 if you wish to receive a paper NOI form.

4. **Additional notification.** NOIs and SWP3s are considered public documents and shall be made available to the public in accordance with Part III.C.2. The permittee shall make NOIs and SWP3s available upon request of the director of Ohio EPA, local agencies approving sediment and erosion control plans, grading plans or storm water management plans, local governmental officials, or operators of municipal separate storm sewer systems (MS4s) receiving drainage from the permitted site. Each operator that discharges to an NPDES permitted MS4 shall provide a copy of its Ohio EPA NOI submission to the MS4 in accordance with the MS4's requirements, if applicable.
5. **Re-notification.** Existing permittees having coverage under the previous generations of this general permit shall have continuing coverage under OHC000005 with the submittal of a timely renewal application. Within 180 days from the effective date of this permit, existing permittees shall submit the completed renewal application expressing their intent for continued coverage. In accordance with Ohio Administrative Code (OAC) 3745-38-02(E)(2)(a)(i), a renewal application fee will only apply to existing permittees having general permit coverage for 5 or more years as of the effective date of this general permit. Permit coverage will be terminated if Ohio EPA does not receive the renewal application within this 180-day period.

Part II. NON-NUMERIC EFFLUENT LIMITATIONS

You shall comply with the following non-numeric effluent limitations for discharges from your site and/or from construction support activities. Part III of this permit contains the specific design criteria to meet the objectives of the following non-numeric effluent limitations. You shall develop and implement the SWP3 in accordance with Part III of this permit to satisfy these non-numeric effluent limitations.

- A. Erosion and Sediment Controls.** You shall design, install and maintain effective erosion controls and sediment controls to minimize the discharge of pollutants. At a minimum, such controls shall be designed, installed and maintained to:
 1. Control storm water volume and velocity within the site to minimize soil and stream erosion;
 2. Control storm water discharges, including both peak flowrates and total storm water volume, to minimize erosion at outlets and to minimize downstream channel and streambank erosion;
 3. Minimize the amount of soil exposed during construction activity;

4. Minimize the disturbance of steep slopes;
 5. Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls shall address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting storm water runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site;
 6. If feasible, provide and maintain a 50-foot undisturbed natural buffer around surface waters of the state, direct storm water to vegetated areas to increase sediment removal and maximize storm water infiltration. If it is infeasible to provide and maintain an undisturbed 50-foot natural buffer, you shall comply with the stabilization requirements found in Part II.B for areas within 50 feet of a surface water; and
 7. Minimize soil compaction and, unless infeasible, preserve topsoil.
- B. Soil Stabilization.** Stabilization of disturbed areas shall, at a minimum, be initiated in accordance with the time frames specified in the following tables.

Table 1: Permanent Stabilization

Area requiring permanent stabilization	Time frame to apply erosion controls
Any areas that will lie dormant for one year or more	Within seven days of the most recent disturbance
Any areas within 50 feet of a surface water of the state and at final grade	Within two days of reaching final grade
Other areas at final grade	Within seven days of reaching final grade within that area

Table 2: Temporary Stabilization

Area requiring temporary stabilization	Time frame to apply erosion controls
Any disturbed areas within 50 feet of a surface water of the state and not at final grade	Within two days of the most recent disturbance if the area will remain idle for more than 14 days
Any disturbed areas that will be dormant for more than 14 days but less than one year, and not within 50 feet of a surface water of the state	Within seven days of the most recent disturbance within the area For residential subdivisions, disturbed areas must be stabilized at least seven days prior to transfer of permit coverage for the individual lot(s).
Disturbed areas that will be idle over winter	Prior to the onset of winter weather

Where vegetative stabilization techniques may cause structural instability or are otherwise unobtainable, alternative stabilization techniques must be employed. Permanent and temporary stabilization are defined in Part VII.

- C. Dewatering.** Discharges from dewatering activities, including discharges from dewatering of trenches and excavations, are prohibited unless managed by appropriate controls.
- D. Pollution Prevention Measures.** Design, install, implement and maintain effective pollution prevention measures to minimize the discharge of pollutants. At a minimum, such measures must be designed, installed, implemented and maintained to:
1. Minimize the discharge of pollutants from equipment and vehicle washing, wheel washwater, and other washwaters. Washwaters shall be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;
 2. Minimize the exposure of construction materials, products, and wastes; landscape materials, fertilizers, pesticides, and herbicides; detergents, sanitary waste and other materials present on the site to precipitation and to storm water; and
 3. Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures.
- E. Prohibited Discharges.** The following discharges are prohibited:
1. Wastewater from washout of concrete, unless managed by an appropriate control;
 2. Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;
 3. Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance; and
 4. Soaps or solvents used in vehicle and equipment washing or all other waste water streams which could be subject to an individual NPDES permit (Part III.G.2.g).
- F. Surface Outlets.** When discharging from sediment basins utilize outlet structures that withdraw water from the surface, unless infeasible. (Note: Ohio EPA believes that the circumstances in which it is infeasible to design outlet structures in this manner are rare. Exceptions may include time periods with extended cold weather during winter months. If you have determined that it is infeasible to meet this requirement, you shall provide documentation in your SWP3 to support your determination.)
- G. Post-Construction Storm Water Management Controls.** So that receiving stream's physical, chemical and biological characteristics are protected, and stream functions are maintained, post-construction storm water practices shall provide long-term management of runoff quality and quantity.

PART III. STORM WATER POLLUTION PREVENTION PLAN (SWP3)

A. Storm Water Pollution Prevention Plans.

A SWP3 shall be developed for each site covered by this permit. For a multi-phase construction project, a separate NOI shall be submitted when a separate SWP3 will be prepared for

subsequent phases. SWP3s shall be prepared in accordance with sound engineering and/or conservation practices by a professional experienced in the design and implementation of standard erosion and sediment controls and storm water management practices addressing all phases of construction. The SWP3 shall clearly identify all activities which are required to be authorized under Section 401 and subject to an antidegradation review. The SWP3 shall identify potential sources of pollution which may reasonably be expected to affect the quality of storm water discharges associated with construction activities. The SWP3 shall be a comprehensive, stand-alone document, which is not complete unless it contains the information required by Part III.G of this permit. In addition, the SWP3 shall describe and ensure the implementation of best management practices (BMPs) that reduce the pollutants and impact of storm water discharges during construction and pollutants associated with the post-construction land use to ensure compliance with ORC Section 6111.04, OAC Chapter 3745-1 and the terms and conditions of this permit.

B. Timing.

An acceptable SWP3 shall be completed and submitted to the applicable regulated MS4 entity (for projects constructed entirely within a regulated MS4 area) prior to the timely submittal of an NOI. Projects within the Big Darby Creek and portions of the Olentangy watersheds must submit a SWP3 with the NOI. The SWP3 shall be updated in accordance with Part III.D. Submission of a SWP3 does not constitute review and approval on the part of Ohio EPA. Upon request and good cause shown, the director may waive the requirement to have a SWP3 completed at the time of NOI submission. If a waiver has been granted, the SWP3 must be completed prior to the initiation of construction activities. The SWP3 must be implemented upon initiation of construction activities.

In order to continue coverage from the previous generations of this permit, the permittee shall review and update the SWP3 to ensure that this permit's requirements are addressed within 180 days after the effective date of this permit. If it is infeasible for you to comply with a specific requirement in this permit because (1) the provision was not part of the permit you were previously covered under, and (2) because you are prevented from compliance due to the nature or location of earth disturbances that commenced prior to the effective date of this permit, you shall include documentation within your SWP3 of the reasons why it is infeasible for you to meet the specific requirement.

Examples of OHC000005 permit conditions that would be infeasible for permittees renewing coverage to comply with include:

- OHC000005 post-construction requirements, for projects that obtained NPDES construction storm water coverage and started construction activities prior to the effective date of this permit;
- OHC000005 post-construction requirements, for multi-phase development projects with an existing regional post-construction BMP issued under previous NPDES post-construction requirements. This only applies to construction sites authorized under Ohio EPA's Construction Storm Water Permits issued after April 20, 2003;
- OHC000005 post-construction requirements, for renewing or initial coverage and you have a SWP3 approved locally and you will start construction within 180 days of the effective date of this permit;

- Sediment settling pond design requirements, if the general permit coverage was obtained prior to April 21, 2013 and the sediment settling pond has been installed; or
- Case-by-case situations approved by the Director.

C. SWP3 Signature and Review.

1. Plan Signature and Retention On-Site. The SWP3 shall include the certification in Part V.H, be signed in accordance with Part V.G., and be retained on site during working hours.
2. Plan Availability
 - a. On-site: The plan shall be made available immediately upon request of the director or his authorized representative and MS4 operators or their authorized representative during working hours. A copy of the NOI and letter granting permit coverage under this general permit also shall be made available at the site.
 - b. By written request: The permittee must provide the most recent copy of the SWP3 within 7 days upon written request by any of the following:
 - i. The director or the director's authorized representative;
 - ii. A local agency approving sediment and erosion plans, grading plans or storm water management plans; or
 - iii. In the case of a storm water discharge associated with construction activity which discharges through a municipal separate storm sewer system with an NPDES permit, to the operator of the system.
 - c. To the public: All NOIs, general permit approval for coverage letters, and SWP3s are considered reports that shall be available to the public in accordance with the Ohio Public Records law. The permittee shall make documents available to the public upon request or provide a copy at public expense, at cost, in a timely manner. However, the permittee may claim to Ohio EPA any portion of an SWP3 as confidential in accordance with Ohio law.
3. Plan Revision. The director or authorized representative may notify the permittee at any time that the SWP3 does not meet one or more of the minimum requirements of this part. Within 10 days after such notification from the director or authorized representative (or as otherwise provided in the notification), the permittee shall make the required changes to the SWP3 and shall submit to Ohio EPA the revised SWP3 or a written certification that the requested changes have been made.

D. Amendments.

The permittee shall amend the SWP3 whenever there is a change in design, construction, operation or maintenance, which has a significant effect on the potential for the discharge of pollutants to surface waters of the state or if the SWP3 proves to be ineffective in achieving the

general objectives of controlling pollutants in storm water discharges associated with construction activity. Amendments to the SWP3 may be reviewed by Ohio EPA in the same manner as Part III.C.

E. Duty to inform contractors and subcontractors.

The permittee shall inform all contractors and subcontractors not otherwise defined as “operators” in Part VII of this general permit who will be involved in the implementation of the SWP3 of the terms and conditions of this general permit. The permittee shall maintain a written document containing the signatures of all contractors and subcontractors involved in the implementation of the SWP3 as proof acknowledging that they reviewed and understand the conditions and responsibilities of the SWP3. The written document shall be created, and signatures shall be obtained prior to commencement of earth disturbing activity on the construction site.

F. Total Maximum Daily Load (TMDL) allocations.

If a TMDL is approved for any waterbody into which the permittee’s site discharges and requires specific BMPs for construction sites, the director may require the permittee to revise his/her SWP3. Specific conditions have been provided in Appendix A (for the Big Darby Creek Watershed) and Appendix B (for portions of the Olentangy river watershed).

G. SWP3 Requirements.

Operations that discharge storm water from construction activities are subject to the following requirements and the SWP3 shall include the following items:

1. Site description. Each SWP3 shall provide:
 - a. A description of the nature and type of the construction activity (e.g., low density residential, shopping mall, highway, etc.);
 - b. Total area of the site and the area of the site that is expected to be disturbed (i.e., grubbing, clearing, excavation, filling or grading, including off-site borrow areas);
 - c. A measure of the impervious area and percent imperviousness created by the construction activity (existing, new and total impervious area after construction);
 - d. Storm water calculations, including the volumetric runoff coefficients for both the pre-construction and post- construction site conditions, and resulting water quality volume; design details for post-construction storm water facilities and pretreatment practices such as contributing drainage areas, capacities, elevations, outlet details and drain times shall be included in the SWP3; and if applicable, explanation of the use of existing post-construction facilities. Ohio EPA recommends the use of data sheets (see Ohio’s Rainwater and Land Development manual and Ohio EPA resources for examples);
 - e. Existing data describing the soil and, if available, the quality of any discharge from the site;

- f. A description of prior land uses at the site;
- g. A description of the condition of any on-site streams (e.g. prior channelization, bed instability or headcuts, channels on public maintenance, or natural channels);
- h. An implementation schedule which describes the sequence of major construction operations (i.e., designation of vegetative preservation areas, grubbing, excavating, grading, utilities, infrastructure installation and others) and the implementation of erosion, sediment and storm water management practices or facilities to be employed during each operation of the sequence;
- i. The name and/or location of the immediate receiving stream or surface water(s) and the first subsequent named receiving water(s) and the areal extent and description of wetlands or other special aquatic sites at or near the site which will be disturbed, or which will receive discharges from disturbed areas of the project. For discharges to an MS4, the point of discharge to the MS4 and the location where the MS4 ultimately discharges to a stream or surface water of the state shall be indicated;
- j. For subdivided developments, a detail drawing of individual parcels with their erosion, sediment or storm water control practices and/or a typical individual lot showing standard individual lot erosion and sediment control practices.

A typical individual lot drawing does not remove the responsibility to designate specific erosion and sediment control practices in the SWP3 for critical areas such as steep slopes, stream banks, drainage ways and riparian zones;
- k. Location and description of any storm water discharges associated with dedicated asphalt and dedicated concrete plants covered by this permit and the best management practices to address pollutants in these storm water discharges;
- l. A cover page or title identifying the name and location of the site, the name and contact information of all construction site operators, the name and contact information for the person responsible for authorizing and amending the SWP3, preparation date, and the estimated dates that construction will start and be complete;
- m. A log documenting grading and stabilization activities as well as amendments to the SWP3, which occur after construction activities commence; and
- n. Site map showing:
 - i. Limits of earth-disturbing activity of the site including associated off-site borrow or spoil areas that are not addressed by a separate NOI and associated SWP3;
 - ii. Soils types for all areas of the site, including locations of unstable or highly erodible and/or known contaminated soils;

- iii. Existing and proposed contours. A delineation of drainage watersheds expected during and after major grading activities as well as the size of each drainage watershed, in acres;
- iv. The location of any delineated boundary for required riparian setbacks;
- v. Conservation easements or areas designated as open space, preserved vegetation or otherwise protected from earth disturbing activities. A description of any associated temporary or permanent fencing or signage;
- vi. Surface water locations including springs, wetlands, streams, lakes, water wells, etc., on or within 200 feet of the site, including the boundaries of wetlands or stream channels and first subsequent named receiving water(s) the permittee intends to fill or relocate for which the permittee is seeking approval from the Army Corps of Engineers and/or Ohio EPA;
- vii. Existing and planned locations of buildings, roads, parking facilities and utilities;
- viii. The location of all erosion and sediment control practices, including the location of areas likely to require temporary stabilization during site development;
- ix. Sediment traps and basins noting their sediment storage and dewatering (detention) volume and contributing drainage area. Ohio EPA recommends the use of data sheets (see Ohio EPA's Rainwater and Land Development manual and website for examples) to provide data for all sediment traps and basins noting important inputs to design and resulting parameters such as their contributing drainage area, disturbed area, detention volume, sediment storage volume, practice surface area, dewatering time, outlet type and dimensions;
- x. The location of permanent storm water management practices (new and existing) including pretreatment practices to be used to control pollutants in storm water after construction operations have been completed along with the location of existing and planned drainage features including catch basins, culverts, ditches, swales, surface inlets and outlet structures;
- xi. Areas designated for the storage or disposal of solid, sanitary and toxic wastes, including dumpster areas, areas designated for cement truck washout, and vehicle fueling;
- xii. The location of designated construction entrances where the vehicles will access the construction site; and
- xiii. The location of any areas of proposed floodplain fill, floodplain excavation, stream restoration or known temporary or permanent stream crossings.

2. Controls. In accordance with Part II.A, the SWP3 shall contain a description of the controls appropriate for each construction operation covered by this permit and the operator(s) shall implement such controls. The SWP3 shall clearly describe for each major construction activity identified in Part III.G.1.h: (a) appropriate control measures and the general timing (or sequence) during the construction process that the measures will be implemented; and (b) which contractor is responsible for implementation (e.g., contractor A will clear land and install perimeter controls and contractor B will maintain perimeter controls until final stabilization). The SWP3 shall identify the subcontractors engaged in activities that could impact storm water runoff. The SWP3 shall contain signatures from all of the identified subcontractors indicating that they have been informed and understand their roles and responsibilities in complying with the SWP3. Ohio EPA recommends that the primary site operator review the SWP3 with the primary contractor prior to commencement of construction activities and keep a SWP3 training log to demonstrate that this review has occurred.

Ohio EPA recommends that the erosion, sediment, and storm water management practices used to satisfy the conditions of this permit should meet the standards and specifications in the most current edition of Ohio's Rainwater and Land Development (see definitions) manual or other standards acceptable to Ohio EPA. The controls shall include the following minimum components:

- a. Preservation Methods. The SWP3 shall make use of practices which preserve the existing natural condition as much as feasible. Such practices may include: preserving existing vegetation, vegetative buffer strips, and existing soil profile and topsoil; phasing of construction operations to minimize the amount of disturbed land at any one time; and designation of tree preservation areas or other protective clearing or grubbing practices. For all construction activities immediately adjacent to surface waters of the state, the permittee shall comply with the buffer non-numeric effluent limitation in Part II.A.6, as measured from the ordinary high water mark of the surface water.
- b. Erosion Control Practices. The SWP3 shall make use of erosion controls that provide cover over disturbed soils unless an exception is approved in accordance with Part III.G.4. A description of control practices designed to re-establish vegetation or suitable cover on disturbed areas after grading shall be included in the SWP3. The SWP3 shall provide specifications for stabilization of all disturbed areas of the site and provide guidance as to which method of stabilization will be employed for any time of the year. Such practices may include: temporary seeding, permanent seeding, mulching, matting, sod stabilization, vegetative buffer strips, phasing of construction operations, use of construction entrances and the use of alternative ground cover.
- i. **Stabilization.** Disturbed areas shall be stabilized in accordance with Table 1 (Permanent Stabilization) and Table 2 (Temporary Stabilization) in Part II.B of this permit.
- ii. **Permanent stabilization of conveyance channels.** Operators shall undertake special measures to stabilize channels and outfalls and prevent erosive flows. Measures may include seeding, dormant seeding (as defined in the most current edition of the Rainwater and Land

Development manual), mulching, erosion control matting, sodding, riprap, natural channel design with bioengineering techniques or rock check dams.

- c. Runoff Control Practices. The SWP3 shall incorporate measures which control the flow of runoff from disturbed areas so as to prevent erosion from occurring. Such practices may include rock check dams, pipe slope drains, diversions to direct flow away from exposed soils and protective grading practices. These practices shall divert runoff away from disturbed areas and steep slopes where practicable. Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel to provide non-erosive flow velocity from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected.
- d. Sediment Control Practices. The plan shall include a description of structural practices that shall store runoff allowing sediments to settle and/or divert flows away from exposed soils or otherwise limit runoff from exposed areas. Structural practices shall be used to control erosion and trap sediment from a site remaining disturbed for more than 14 days. Such practices may include, among others: sediment settling ponds, sediment barriers, earth diversion dikes or channels which direct runoff to a sediment settling pond and storm drain inlet protection. All sediment control practices must be capable of ponding runoff in order to be considered functional. Earth diversion dikes or channels alone are not considered a sediment control practice unless those are used in conjunction with a sediment settling pond.

The SWP3 shall contain detail drawings for all structural practices.

- i. **Timing.** Sediment control structures shall be functional throughout the course of earth disturbing activity. Sediment basins and perimeter sediment barriers shall be implemented prior to grading and within seven days from the start of grubbing. They shall continue to function until the upslope development area is stabilized with permanent cover. As construction progresses and the topography is altered, appropriate controls shall be constructed, or existing controls altered to address the changing drainage patterns.
- ii. **Sediment settling ponds.** A sediment settling pond is required for any one of the following conditions:
- Concentrated or collected storm water runoff (e.g., storm sewer or ditch);
 - Runoff from drainage areas, which exceed the design capacity of silt fence or other sediment barriers; or
 - Runoff from drainage areas that exceed the design capacity of inlet protection.

The permittee may request approval from Ohio EPA to use alternative controls if the permittee can demonstrate the alternative controls are equivalent in effectiveness to a sediment settling pond.

In accordance with Part II.F, if feasible, sediment settling ponds shall be dewatered at the pond surface using a skimmer or equivalent device. The sediment settling pond volume consists of both a dewatering zone and a sediment storage zone. The volume of the dewatering zone shall be a minimum of 1800 cubic feet (ft³) per acre of drainage (67 yd³/acre) with a minimum 48-hour drain time. The volume of the sediment storage zone shall be calculated by one of the following methods:

Method 1: The volume of the sediment storage zone shall be 1000 ft³ per disturbed acre within the watershed of the basin. OR

Method 2: The volume of the sediment storage zone shall be the volume necessary to store the sediment as calculated with RUSLE or a similar generally accepted erosion prediction model.

Accumulated sediment shall be removed from the sediment storage zone once it exceeds 50 percent of the minimum required sediment storage design capacity and prior to the conversion to the post-construction practice unless suitable storage is demonstrated based upon over-design. When determining the total contributing drainage area, off-site areas and areas which remain undisturbed by construction activity shall be included unless runoff from these areas is diverted away from the sediment settling pond and is not co-mingled with sediment-laden runoff. The depth of the dewatering zone shall be less than or equal to five feet. The configuration between inlets and the outlet of the basin shall provide at least two units of length for each one unit of width ($\geq 2:1$ length:width ratio); however, a length to width ratio of 4:1 is recommended. When designing sediment settling ponds, the permittee shall consider public safety, especially as it relates to children, as a design factor for the sediment basin and alternative sediment controls shall be used where site limitations would preclude a safe design. Combining multiple sediment and erosion control measures in order to maximize pollutant removal is encouraged.

- iii. **Sediment Barriers and Diversions.** Sheet flow runoff from denuded areas shall be intercepted by sediment barriers or diversions to protect adjacent properties and water resources from sediment transported via sheet flow. Where intended to provide sediment control, silt fence shall be placed on a level contour downslope of the disturbed area. For most applications, standard silt fence may be substituted with a 12-inch diameter sediment barrier. The relationship between the maximum drainage area to sediment barrier for a particular slope range is shown in the following table:

Table 3 Sediment Barrier Maximum Drainage Area Based on Slope

Maximum drainage area (in acres) to 100 linear feet of sediment barrier	Range of slope for a particular drainage area (in percent)
0.5	< 2%
0.25	≥ 2% but < 20%
0.125	≥ 20% but < 50%

Placing sediment barriers in a parallel series does not extend the size of the drainage area. Storm water diversion practices shall be used to keep runoff away from disturbed areas and steep slopes where practicable. Diversion practices, which include swales, dikes or berms, may receive storm water runoff from areas up to 10 acres.

- iv. **Inlet Protection.** Other erosion and sediment control practices shall minimize sediment laden water entering active storm drain systems. All inlets receiving runoff from drainage areas of one or more acres will require a sediment settling pond.
 - v. **Surface Waters of the State Protection.** If construction activities disturb areas adjacent to surface waters of the state, structural practices shall be designed and implemented on site to protect all adjacent surface waters of the state from the impacts of sediment runoff. No structural sediment controls (e.g., the installation of silt fence or a sediment settling pond) shall be used in a surface water of the state. For all construction activities immediately adjacent to surface waters of the state, the permittee shall comply with the buffer non-numeric effluent limitation in Part II.A.6, as measured from the ordinary high water mark of the surface water. Where impacts within this buffer area are unavoidable, due to the nature of the construction (e.g., stream crossings for roads or utilities), the project shall be designed such that the number of stream crossings and the width of the disturbance within the buffer area are minimized.
 - vi. **Modifying Controls.** If periodic inspections or other information indicates a control has been used inappropriately or incorrectly, the permittee shall replace or modify the control for site conditions.
- e. Post-Construction Storm Water Management Requirements. So that receiving stream's physical, chemical and biological characteristics are protected, and stream functions are maintained, post-construction storm water practices shall provide long-term management of runoff quality and quantity. To meet the post-construction requirements of this permit, the SWP3 shall contain a description of the post-construction BMPs that will be installed during construction for the site and the rationale for their selection. The rationale shall address the anticipated impacts on the channel and floodplain morphology, hydrology, and water quality. Post-construction BMPs cannot be installed within a surface water of the state (e.g., wetland or stream) unless it is authorized by a CWA 401 water quality certification, CWA 404 permit, or Ohio EPA non-jurisdictional wetland/stream program approval. Note: local jurisdictions may have more stringent post-construction requirements.

Detail drawings and maintenance plans shall be provided for all post-construction BMPs in the SWP3. Maintenance plans shall be provided by the permittee to the post-construction operator of the site (including homeowner associations) upon completion of construction activities (prior to termination of permit coverage). Maintenance plans shall ensure that pollutants collected within structural post-construction practices are disposed of in accordance with local, state, and federal regulations. To ensure that storm water management systems function as

designed and constructed, the post-construction operation and maintenance plan shall be a stand-alone document which contains: (1) a designated entity for storm water inspection and maintenance responsibilities; (2) the routine and non-routine maintenance tasks to be undertaken; (3) a schedule for inspection and maintenance; (4) any necessary legally binding maintenance easements and agreements; (5) construction drawings or excerpts showing the plan view, profile and details of the outlet(s); (6) a map showing all access and maintenance easements; and (7) for table 4a/4b practices, provide relevant elevations and associated volumes that dictate when removal of accumulated sediments must occur. Permittees are responsible for assuring all post-construction practices meet plan specifications and intended post-construction conditions have been met (e.g., sediment removed from, and sediment storage restored to, permanent pools, sediment control outlets removed and replaced with permanent post-construction discharge structures, and all slopes and drainageways permanently stabilized), but are not responsible under this permit for operation and maintenance of post-construction practices once coverage under this permit is terminated.

Post-construction storm water BMPs that discharge pollutants from point sources once construction is completed may in themselves need authorization under a separate NPDES permit (one example is storm water discharges from regulated industrial sites).

Construction activities that do not include the installation of any impervious surface (e.g., park lands), abandoned mine land reclamation activities regulated by the Ohio Department of Natural Resources, stream and wetland restoration activities, and wetland mitigation activities are not required to comply with the conditions of Part III.G.2.e of this permit. Linear construction projects (e.g., pipeline or utility line installation) which do not result in the installation of additional impervious surface are not required to comply with the conditions of Part III.G.2.e of this permit. However, linear construction projects shall be designed to minimize the number of stream crossings and the width of disturbance, and to achieve final stabilization of the disturbed area as defined in Part VII.M.1.

For all construction activities that will disturb two or more acres of land or will disturb less than two acres that are part of a larger common plan of development or sale which will disturb two or more acres of land, the post construction BMP(s) chosen shall be able to manage storm water runoff for protection of stream channels, stream stability, and water quality. The BMP(s) chosen must be compatible with site and soil conditions. Structural post-construction storm water treatment practices shall be incorporated into the permanent drainage system for the site. The BMP(s) chosen must be sized to treat the water quality volume (WQ_v) and ensure compliance with Ohio's Water Quality Standards in OAC Chapter 3745-1. The WQ_v shall be equivalent to the volume of runoff from a 0.90-inch rainfall and shall be determined using the following equations:

$$WQ_v = R_v * P * A / 12 \quad \text{(Equation 1)}$$

where:

- WQ_v = water quality volume in acre-feet
- R_v = the volumetric runoff coefficient calculated using equation 2
- P = 0.90 inch precipitation depth
- A = area draining into the BMP in acres

$$R_v = 0.05 + 0.9i \quad \text{(Equation 2)}$$

where i = fraction of post-construction impervious surface

An additional volume equal to 20 percent of the WQ_v shall be incorporated into the BMP for sediment storage. Ohio EPA recommends BMPs be designed according to the methodology described in the most current edition of the Rainwater and Land Development manual or in another design manual acceptable for use by Ohio EPA.

The BMPs listed in Tables 4a and 4b below are considered standard BMPs approved for general use. However, communities with a regulated MS4 may limit the use of some of these BMPs. BMPs shall be designed such that the drain time is long enough to provide treatment but short enough to provide storage for successive rainfall events and avoid the creation of nuisance conditions. The outlet structure for the post-construction BMP shall not discharge more than the first half of the WQ_v in less than one-third of the drain time. The WQ_v is the volume of storm water runoff that must be detained by a post-construction practice as specified by the most recent edition of the Rainwater and Land Development manual.

Post-construction practices shall be sized to treat 100% of the WQ_v associated with their contributing drainage area. If there is an existing post-construction BMP that treats runoff from the disturbed area and the BMP meets the post-construction requirements of this permit, no additional post-construction BMP will be required. A regional storm water BMP may be used to meet the post-construction requirement if: (1) the BMP meets the design requirements for treating the WQ_v ; and (2) a legal agreement is established through which the regional BMP owner or operator agrees to provide this service in the long term. Design information for such facilities such as contributing drainage areas, capacities, elevations, outlet details and drain times shall be included in the SWP3.

Table 4a Extended Detention Post-Construction Practices with Minimum Drain Times

Extended Detention Practices	Minimum Drain Time of WQ_v
Wet Extended Detention Basin ^{1,2}	24 hours
Constructed Extended Detention Wetland ^{1,2}	24 hours
Dry Extended Detention Basin ^{1,3}	48 hours
Permeable Pavement – Extended Detention ¹	24 hours
Underground Storage – Extended Detention ^{1,4}	24 hours
Sand & Other Media Filtration - Extended Detention ^{1, 5}	24 hours

Notes:

1. The outlet structure shall not discharge more than the first half of the WQv in less than one-third of the drain time.
2. Provide a permanent pool with a minimum volume equal to the WQv and an extended detention volume above the permanent pool equal to 1.0 x WQv.
3. Dry basins must include a forebay and a micropool each sized at a minimum of 0.1 x WQv and a protected outlet, or include acceptable pretreatment and a protected outlet.
4. Underground storage must have pretreatment for removal of suspended sediments included in the design and documented in the SWP3. This pretreatment shall concentrate sediment in a location where it can be readily removed. For non-infiltrating, underground extended detention systems, pretreatment shall be 50% effective at capturing total suspended solids according to the testing protocol established in the Alternative Post-Construction BMP Testing Protocol.
5. The WQv ponding area shall completely empty between 24 and 72 hours.

Table 4b Infiltration Post-Construction Practices with Maximum Drain Times

Infiltration Practices	Maximum Drain Time of WQv
Bioretention Area/Cell ^{1,2}	24 hours
Infiltration Basin ²	24 hours
Infiltration Trench ³	48 hours
Permeable Pavement – Infiltration ³	48 hours
Underground Storage – Infiltration ^{3,4}	48 hours

Notes:

1. Bioretention soil media shall have a permeability of approximately 1 – 4 in/hr. Meeting the soil media specifications in the Rainwater and Land Development manual is considered compliant with this requirement. Bioretention cells must have underdrains unless in-situ conditions allow for the WQv (surface ponding) plus the bioretention soil (to a depth of 24 inches) to drain completely within 48 hours.
2. Infiltrating practices with the WQv stored aboveground (bioretention, infiltration basin) shall fully drain the WQv within 24 hours to minimize nuisance effects of standing water and to promote vigorous communities of appropriate vegetation.
3. Subsurface practices designed to fully infiltrate the WQv (infiltration trench, permeable pavement with infiltration, underground storage with infiltration) shall empty within 48 hours to recover storage for subsequent storm events.
4. Underground storage systems with infiltration must have adequate pretreatment of suspended sediments included in the design and documented in the SWP3 in order to minimize clogging of the infiltrating surface. Pretreatment shall concentrate sediment in a location where it can be readily removed. Examples include media filters situated upstream of the storage or other suitable alternative approved by Ohio EPA. For infiltrating underground systems, pretreatment shall be 80% effective at capturing total suspended solids according to the testing protocol established in the Alternative Post-Construction BMP Testing Protocol.

Small Construction Activities. For all construction activities authorized under this permit which result in a disturbance less than 2 acres, a post-construction practice shall be used to treat storm water runoff for pollutants and to reduce adverse impacts on receiving waters. The applicant must provide a justification in the SWP3 why the use of table 4a and 4b practices are not feasible. The justification must address limiting factors which would prohibit the project going forward should table 4a and 4b practices be required. Please note that additional practices selected will require approval from the regulated MS4. The use of green infrastructure BMPs such as runoff reducing practices is also encouraged.

Transportation Projects. The construction of new roads and roadway improvement projects by public entities (i.e., the state, counties, townships, cities, or villages) may implement post-construction BMPs in compliance with the current version (as of the effective date of this permit) of the Ohio Department of Transportation's "Location and Design Manual, Volume Two Drainage Design" that has been accepted by Ohio EPA as an alternative to the conditions of this permit.

Offsite Mitigation of Post-Construction. Ohio EPA may authorize the offsite mitigation of the post-construction requirements of Part III.G.2.e of this permit on a case by case basis provided the permittee clearly demonstrates the BMPs listed in Tables 4a and 4b are not feasible and the following criteria are met: (1) a maintenance agreement or policy is established to ensure operations and treatment long-term; (2) the offsite location discharges to the same HUC-12 watershed unit; and (3) the mitigation ratio of the WQv is 1.5 to 1 or the WQv at the point of retrofit, whichever is greater. Requests for offsite mitigation must be received prior to receipt of the NOI application.

Previously Developed Areas - Ohio EPA encourages the redevelopment of previously graded, paved or built upon sites through a reduction of the WQv treatment requirement. For a previously developed area, one or a combination of the following two conditions shall be met:

- A 20 percent net reduction of the site's volumetric runoff coefficient through impervious area reduction with soil restoration or replacing impervious roof area with green roof area (for these purposes green roofs shall be considered pervious surface) or
- Treatment of 20 percent of the WQv for the previously developed area using a practice meeting Table 4a/4b criteria.

Where there is a combination of redeveloped areas and new development, a weighted approach shall be used with the following equation:

$$WQv = P * A * [(Rv_1 * 0.2) + (Rv_2 - Rv_1)] / 12 \quad (\text{Equation 3})$$

where

P = 0.90 inches

A = area draining into the BMP in acres

Rv₁ = volumetric runoff coefficient for existing conditions (current site impervious area)

Rv₂ = volumetric runoff coefficient for proposed conditions (post-construction site impervious area)

Post-construction practices shall be located to treat impervious areas most likely to generate the highest pollutant load, such as parking lots or roadways, rather than areas predicted to be cleaner such as rooftops.

Runoff Reduction Practices. The size of structural post-construction practices used to capture and treat the WQv can be reduced by incorporating runoff

reducing practices into the design of the site's drainage system. The approach to calculate and document runoff reduction is detailed in the Rainwater and Land Development Manual. BMP-specific runoff reduction volumes are set by specifications in the Rainwater and Land Development Manual for the following practices:

- Impervious surface disconnection
- Rainwater harvesting
- Bioretention
- Infiltration basin
- Infiltration trench
- Permeable pavement with infiltration
- Underground storage with infiltration
- Grass swale
- Sheet flow to filter strip
- Sheet flow to conservation area

A runoff reduction approach may be used to meet the groundwater recharge requirements in the Big Darby Creek Watershed. The runoff reduction practices used for groundwater recharge may be used to reduce the WQv requirement, see appendix A for details on groundwater recharge requirements.

In order to promote the implementation of green infrastructure, the Director may consider the use of runoff reducing practices to demonstrate compliance with Part III.G.2.e of this permit for areas of the site not draining into a common drainage system of the site, e.g., sheet flow from perimeter areas such as the rear yards of residential lots, low density development scenarios, or where the permittee can demonstrate that the intent of pollutant removal and stream protection, as required in Part III.G.2.e of this permit is being addressed through non-structural post-construction BMPs based upon review and approval by Ohio EPA.

Use of Alternative Post-Construction BMPs. This permit does not preclude the use of innovative or experimental post-construction storm water management technologies. Alternative post-construction BMPs shall previously have been tested to confirm storm water treatment efficacy equivalent to those BMPs listed in Tables 4a and 4b using the protocol described in this section. BMP testing may include laboratory testing, field testing, or both.

Permittees shall request approval from Ohio EPA to use alternative post-construction BMPs on a case-by-case basis. To use an alternative post-construction BMP, the permittee must demonstrate that use of a BMP listed in Tables 4a and 4b is not feasible and the proposed alternative post-construction BMP meets the minimum treatment criteria as described in this section. The permittee shall submit an application to Ohio EPA for any proposed alternative post-construction BMP. Where the development project is located within a regulated municipal separate storm sewer system (MS4) community, the use of an alternative practice requires pre-approval by the MS4 before submittal of the

Ohio EPA permit application. Ohio EPA requires that approvals for alternative post-construction BMPs are finalized before permittees submit an NOI for permit coverage.

In addition to meeting sediment removal criteria, the discharge rate from the proposed alternative practice shall be reduced to prevent stream bed erosion and protect the physical and biological stream integrity unless there will be negligible hydrological impact to the receiving surface water of the state. Discharge rate is considered to have a negligible impact if the permittee can demonstrate that one of the following three conditions exist:

- i. The entire WQv is recharged to groundwater;
- ii. The larger common plan of development or sale will create less than one acre of impervious surface;
- iii. The storm water drainage system of the development discharges directly into a large river with drainage area equal to 100 square miles or larger upstream of the development site or to a lake where the development area is less than 5 percent of the watershed area, unless a TMDL has identified water quality problems into the receiving surface waters of the state.

If the conditions above that minimize the potential for hydrological impact to the receiving surface water of the state do not exist, then the alternative post-construction BMP must prevent stream erosion by reducing the flow rate from the WQ_v. In such cases, discharge of the WQ_v must be controlled. A second storm water BMP that provides extended detention of the WQ_v may be needed to meet the post-construction criteria.

Alternative Post-Construction BMP Testing Protocol. For laboratory testing, the alternative BMP shall be tested using sediment with a specific gravity of 2.65, a particle size distribution closely matching the distribution shown in Table 5, and total suspended sediment (TSS) concentrations within 10% of 200 mg/L (180 mg/L – 220 mg/L TSS). For an alternative BMP to be acceptable, the test results must demonstrate that the minimum treatment rate is 80% TSS removal at the design flow rate for the tested BMP.

Table 5 Particle Size Distribution for Testing Alternative Post-Construction BMPs

Particle Size (microns)	Percent Finer (%)
1,000	100
500	95
250	90
150	75
100	60
75	50
50	45
20	35
8	20
5	10
2	5

- For field testing, the alternative BMP shall be tested using storm water runoff

from the field, not altered by adding aggregate or subjecting to unusually high sediment loads such as those from unstabilized construction disturbance. The storm water runoff used for field testing shall be representative of runoff from the proposed installation site for the alternative BMP after all construction activities have ceased and the ground has been stabilized. The influent and effluent TSS concentrations of storm water runoff must be collected in the field. For an alternative BMP to be acceptable, the test results must demonstrate the minimum treatment rate is 80% TSS removal for influent concentrations equal to or greater than 100 mg/L TSS. If the influent concentration to the proposed alternative BMP is less than 100 mg/L TSS in the field, then the BMP must achieve an average effluent concentration less than or equal to 20 mg/L TSS.

- Testing of alternative post-construction BMPs shall be performed or overseen by a qualified independent, third-party testing organization;
- Testing shall demonstrate the maximum flow rate at which the alternative post-construction BMP can achieve the necessary treatment efficacy, including consideration for the potential of sediment resuspension;
- Testing shall demonstrate the maximum volume of sediment and floatables that can be collected in the alternative post-construction BMP before pollutants must be removed to maintain 80% treatment efficacy;
- Testing shall indicate the recommended maintenance frequency and maintenance protocol to ensure ongoing performance of the alternative post-construction BMP.

The alternative post-construction BMP testing protocol described in this section is similar to testing requirements specified by the New Jersey Department of Environmental Protection (NJDEP) for storm water Manufactured Treatment Devices (MTD) and therefore testing results certified by NJDEP shall be accepted by Ohio EPA. For examples of BMPs that have been tested using New Jersey Department of Environmental Protection's procedures, see the website: www.njstormwater.org.

Another nationally recognized storm water product testing procedure is the Technology Assessment Protocol – Ecology (TAPE) administered by the State of Washington, Department of Ecology. The TAPE testing procedure describes testing to achieve 80% TSS removal using a sediment mix with a particle size distribution with approximately 75% of the mass of the aggregate with particle diameters less than 45 microns. Overall, this particle size distribution is finer than the distribution in Table 5. Therefore, if TAPE testing results are available for a proposed alternative post-construction BMP, those results shall be accepted by Ohio EPA. The State of Washington, Department of Ecology website is <https://ecology.wa.gov/>.

Alternative BMPs that utilize treatment processes such as filtering or centrifugal separation, rather than a detention and settling volume, must be designed to ensure treatment of 90 percent of the average annual runoff

volume. For the design of these BMPs, the water quality flow rate (WQF) considered equivalent to the Water Quality Volume (WQv) shall be determined utilizing the Rational Method (Equation 4) with an intensity (i) appropriate for the water quality precipitation event. This intensity shall be calculated using the table given in Appendix C.

$$WQF = C * i * A \quad \text{(Equation 4)}$$

Where

WQF = water quality flow rate in cubic feet per second (cfs)
C = rational method runoff coefficient
i = intensity (in/hr)
A = area draining to the BMP (acres)

Alternative post-construction BMPs may include, but are not limited to: vegetated swales, vegetated filter strips, hydrodynamic separators, high-flow media filters, cartridge filters, membrane filters, subsurface flow wetlands, multi-chamber treatment trains, road shoulder media filter drains, wetland channels, rain barrels, green roofs, and rain gardens. The Director may also consider non-structural post-construction approaches.

- f. Surface Water Protection. If the project site contains any streams, rivers, lakes, wetlands or other surface waters, certain construction activities at the site may be regulated under the CWA and/or state isolated wetland permit requirements. Sections 404 and 401 of the Act regulate the discharge of dredged or fill material into surface waters and the impacts of such activities on water quality, respectively. Construction activities in surface waters which may be subject to CWA regulation and/or state isolated wetland permit requirements include, but are not limited to: sewer line crossings, grading, backfilling or culverting streams, filling wetlands, road and utility line construction, bridge installation and installation of flow control structures. If the project contains streams, rivers, lakes or wetlands or possible wetlands, the permittee shall contact the appropriate U.S. Army Corps of Engineers District Office. (CAUTION: Any area of seasonally wet hydric soil is a potential wetland - please consult the Soil Survey and list of hydric soils for your County, available at your county's Soil and Water Conservation District. If you have any questions about Section 401 water quality certification, please contact the Ohio Environmental Protection Agency, Section 401 Coordinator.)

U.S. Army Corps of Engineers (Section 404 regulation):

- Huntington, WV District (304) 399-5210 (Muskingum River, Hocking River, Scioto River, Little Miami River, and Great Miami River Basins)
- Buffalo, NY District (716) 879-4330 (Lake Erie Basin)
- Pittsburgh, PA District (412) 395-7155 (Mahoning River Basin)
- Louisville, KY District (502) 315-6686 (Ohio River)

Ohio EPA 401/404 and non-jurisdictional stream/wetland coordinator can be contacted at (614) 644-2001 (all of Ohio)

Concentrated storm water runoff from BMPs to natural wetlands shall be converted to diffuse flow before the runoff enters the wetlands. The flow should be released such that no erosion occurs downslope. Level spreaders may need to be placed in series, particularly on steep sloped sites, to ensure non-erosive velocities. Other structural BMPs may be used between storm water features and natural wetlands, in order to protect the natural hydrology, hydroperiod, and wetland flora. If the applicant proposes to discharge to natural wetlands, a hydrologic analysis shall be performed. The applicant shall attempt to match the pre-development hydroperiods and hydrodynamics that support the wetland. The applicant shall assess whether their construction activity will adversely impact the hydrologic flora and fauna of the wetland. Practices such as vegetative buffers, infiltration basins, conservation of forest cover, and the preservation of intermittent streams, depressions, and drainage corridors may be used to maintain wetland hydrology.

g. Other controls.

- i. **Non-Sediment Pollutant Controls.** In accordance with Part II.E, no solid (other than sediment) or liquid waste, including building materials, shall be discharged in storm water runoff. The permittee must implement all necessary BMPs to prevent the discharge of non-sediment pollutants to the drainage system of the site or surface waters of the state or an MS4. Under no circumstance shall wastewater from the washout of concrete trucks, stucco, paint, form release oils, curing compounds, and other construction materials be discharged directly into a drainage channel, storm sewer or surface waters of the state. Also, no pollutants from vehicle fuel, oils, or other vehicle fluids can be discharged to surface waters of the state. No exposure of storm water to waste materials is recommended. The SWP3 must include methods to minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, and sanitary waste to precipitation, storm water runoff, and snow melt. In accordance with Part II.D.3, the SWP3 shall include measures to prevent and respond to chemical spills and leaks. You may also reference the existence of other plans (i.e., Spill Prevention Control and Countermeasure (SPCC) plans, spill control programs, Safety Response Plans, etc.) provided that such plan addresses conditions of this permit condition and a copy of such plan is maintained on site.
- ii. **Off-site traffic.** Off-site vehicle tracking of sediments and dust generation shall be minimized. In accordance with Part II.D.1, the SWP3 shall include methods to minimize the discharge of pollutants from equipment and vehicle washing, wheel washwater, and other washwaters. No detergents may be used to wash vehicles. Washwaters shall be treated in a sediment basin or alternative control that provides equivalent treatment prior to discharge.
- iii. **Compliance with other requirements.** The SWP3 shall be consistent with applicable State and/or local waste disposal, sanitary sewer or septic system regulations, including provisions prohibiting waste disposal by

open burning and shall provide for the proper disposal of contaminated soils to the extent these are located within the permitted area.

- iv. **Trench and ground water control.** In accordance with Part II.C, there shall be no turbid discharges to surface waters of the state resulting from dewatering activities. If trench or ground water contains sediment, it shall pass through a sediment settling pond or other equally effective sediment control device, prior to being discharged from the construction site. Alternatively, sediment may be removed by settling in place or by dewatering into a sump pit, filter bag or comparable practice. Ground water which does not contain sediment or other pollutants is not required to be treated prior to discharge. However, care must be taken when discharging ground water to ensure that it does not become pollutant-laden by traversing over disturbed soils or other pollutant sources.
- v. **Contaminated Sediment.** Where construction activities are to occur on sites with contamination from previous activities, operators shall be aware that concentrations of materials that meet other criteria (is not considered a Hazardous Waste, meeting VAP standards, etc.) may still result in storm water discharges in excess of Ohio Water Quality Standards. Such discharges are not authorized by this permit. Appropriate BMPs include, but are not limited to:
- The use of berms, trenches, and pits to collect contaminated runoff and prevent discharges;
 - Pumping runoff into a sanitary sewer (with prior approval of the sanitary sewer operator) or into a container for transport to an appropriate treatment/disposal facility; and
 - Covering areas of contamination with tarps or other methods that prevent storm water from coming into contact with the material.

Operators should consult with Ohio EPA Division of Surface Water prior to seeking permit coverage.

- h. **Maintenance.** All temporary and permanent control practices shall be maintained and repaired as needed to ensure continued performance of their intended function. All sediment control practices must be maintained in a functional condition until all up-slope areas they control are permanently stabilized. The SWP3 shall be designed to minimize maintenance requirements. The applicant shall provide a description of maintenance procedures needed to ensure the continued performance of control practices.
- i. **Inspections.** The permittee shall assign "qualified inspection personnel" to conduct inspections to ensure that the control practices are functional and to evaluate whether the SWP3 is adequate and properly implemented in accordance with the schedule proposed in Part III.G.1.h of this permit or whether additional control measures are required. At a minimum, procedures in a SWP3 shall provide that all controls on the site are inspected:

- after any storm event greater than one-half inch of rain per 24-hour period by the end of the next calendar day, excluding weekends and holidays unless work is scheduled; and
- once every seven calendar days.

The inspection frequency may be reduced to at least once every month for dormant sites if:

- the entire site is temporarily stabilized or
- runoff is unlikely due to weather conditions for extended periods of time (e.g., site is covered with snow, ice, or the ground is frozen).

The beginning and ending dates of any reduced inspection frequency shall be documented in the SWP3.

Once a definable area has achieved final stabilization, the area may be marked on the SWP3 and no further inspection requirements shall apply to that portion of the site.

Following each inspection, a checklist must be completed and signed by the qualified inspection personnel representative. At a minimum, the inspection report shall include:

- i. the inspection date;
- ii. names, titles, and qualifications of personnel making the inspection;
- iii. weather information for the period since the last inspection (or since commencement of construction activity if the first inspection) including a best estimate of the beginning of each storm event, duration of each storm event, approximate amount of rainfall for each storm event (in inches), and whether any discharges occurred;
- iv. weather information and a description of any discharges occurring at the time of the inspection;
- v. location(s) of discharges of sediment or other pollutants from the site;
- vi. location(s) of BMPs that need to be maintained;
- vii. location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location;
- viii. location(s) where additional BMPs are needed that did not exist at the time of inspection; and
- ix. corrective action required including any changes to the SWP3 necessary and implementation dates.

Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of or the potential for pollutants entering the drainage system. Erosion and sediment control measures identified in the SWP3 shall be observed to ensure that those are operating correctly.

Discharge locations shall be inspected to ascertain whether erosion and sediment control measures are effective in preventing significant impacts to the receiving waters. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site vehicle tracking.

The permittee shall maintain for three years following the submittal of a notice of termination form, a record summarizing the results of the inspection, names(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the SWP3 and a certification as to whether the facility is in compliance with the SWP3 and the permit and identify any incidents of non-compliance. The record and certification shall be signed in accordance with Part V.G. of this permit.

- i. **When practices require repair or maintenance.** If the inspection reveals that a control practice is in need of repair or maintenance, with the exception of a sediment settling pond, it shall be repaired or maintained within 3 days of the inspection. Sediment settling ponds shall be repaired or maintained within 10 days of the inspection.
 - ii. **When practices fail to provide their intended function.** If the inspection reveals that a control practice fails to perform its intended function and that another, more appropriate control practice is required, the SWP3 shall be amended and the new control practice shall be installed within 10 days of the inspection.
 - iii. **When practices depicted on the SWP3 are not installed.** If the inspection reveals that a control practice has not been implemented in accordance with the schedule contained in Part III.G.1.h of this permit, the control practice shall be implemented within 10 days from the date of the inspection. If the inspection reveals that the planned control practice is not needed, the record shall contain a statement of explanation as to why the control practice is not needed.
3. Approved State or local plans. All dischargers regulated under this general permit must comply, except those exempted under state law, with the lawful requirements of municipalities, counties and other local agencies regarding discharges of storm water from construction activities. All erosion and sediment control plans and storm water management plans approved by local officials shall be retained with the SWP3 prepared in accordance with this permit. Applicable requirements for erosion and sediment control and storm water management approved by local officials are, upon submittal of a NOI form, incorporated by reference and enforceable under this permit even if they are not specifically included in an SWP3 required under this permit. When the project is located within the jurisdiction of a regulated municipal separate storm sewer system (MS4), the permittee shall certify that the SWP3 complies with the requirements of the storm water management program of the MS4 operator.
4. Exceptions. If specific site conditions prohibit the implementation of any of the erosion and sediment control practices contained in this permit or site-specific conditions are such that implementation of any erosion and sediment control practices contained in this permit will result in no environmental benefit, then the permittee shall provide justification for rejecting each practice based on site conditions. Exceptions from implementing the erosion and sediment control standards contained in this permit will be approved or denied on a case-by-case basis.

The permittee may request approval from Ohio EPA to use alternative methods to satisfy conditions in this permit if the permittee can demonstrate that the alternative methods are sufficient to protect the overall integrity of receiving streams and the watershed. Alternative methods will be approved or denied on a case-by-case basis.

PART IV. NOTICE OF TERMINATION REQUIREMENTS

A. Failure to notify.

The terms and conditions of this permit shall remain in effect until a signed Notice of Termination (NOT) form is submitted. Failure to submit an NOT constitutes a violation of this permit and may affect the ability of the permittee to obtain general permit coverage in the future.

B. When to submit an NOT.

1. Permittees wishing to terminate coverage under this permit shall submit an NOT form in accordance with Part V.G. of this permit. Compliance with this permit is required until an NOT form is submitted. The permittee's authorization to discharge under this permit terminates at midnight of the day the NOT form is submitted. Prior to submitting the NOT form, the permittee shall conduct a site inspection in accordance with Part III.G.2.i of this permit and have a maintenance plan in place to ensure all post-construction BMPs will be maintained in perpetuity.
2. All permittees shall submit an NOT form within 45 days of completing all permit requirements. Enforcement actions may be taken if a permittee submits an NOT form without meeting one or more of the following conditions:
 - a. Final stabilization (see definition in Part VII) has been achieved on all portions of the site for which the permittee is responsible (including, if applicable, returning agricultural land to its pre-construction agricultural use);
 - b. Another operator(s) has assumed control over all areas of the site that have not been finally stabilized;
 - c. A maintenance plan is in place to ensure all post construction BMPs are adequately maintained in the long-term;
 - d. For non-residential developments, all elements of the storm water pollution prevention plan have been completed, the disturbed soil at the identified facility have been stabilized and temporary erosion and sediment control measures have been removed at the appropriate time, or all storm water discharges associated with construction activity from the identified facility that are authorized by the above referenced NPDES general permit have otherwise been eliminated. (i) For residential developments only, temporary stabilization has been completed and the lot, which includes a home, has been transferred to the homeowner; (ii) final stabilization has been completed and the lot, which does not include a home, has been transferred to the property owner; (iii) no stabilization has been implemented on a lot, which includes a home, and the lot has been transferred to the homeowner; or

- e. An exception has been granted under Part III.G.4.

C. How to submit an NOT.

To terminate permit coverage, the permittee shall submit a complete and accurate Notice of Termination (NOT) form using Ohio EPA's electronic application form which is available through the Ohio EPA eBusiness Center at: <https://ebiz.epa.ohio.gov/>. Submission through the Ohio EPA eBusiness Center will require establishing an Ohio EPA eBusiness Center account and obtaining a unique Personal Identification Number (PIN) for final submission of the NOT. Existing eBusiness Center account holders can access the NOT form through their existing account and submit using their existing PIN. Please see the following link for guidance: <http://epa.ohio.gov/dsw/ebs.aspx#170669803-streams-guidance>. Alternatively, if you are unable to access the NOT form through the agency eBusiness Center due to a demonstrated hardship, the NOT may be submitted on paper NOT forms provided by Ohio EPA. NOT information shall be typed on the form. Please contact Ohio EPA, Division of Surface Water at (614) 644-2001 if you wish to receive a paper NOT form.

PART V. STANDARD PERMIT CONDITIONS.

A. Duty to comply.

The permittee shall comply with all conditions of this permit. Any permit noncompliance constitutes a violation of ORC Chapter 6111 and is grounds for enforcement action.

Ohio law imposes penalties and fines for persons who knowingly make false statements or knowingly swear or affirm the truth of a false statement previously made.

B. Continuation of an expired general permit.

An expired general permit continues in force and effect until a new general permit is issued.

C. Need to halt or reduce activity not a defense.

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

D. Duty to mitigate.

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

E. Duty to provide information.

The permittee shall furnish to the director, within 10 days of written request, any information which the director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee

shall also furnish to the director upon request copies of records required to be kept by this permit.

F. Other information.

When the permittee becomes aware that he or she failed to submit any relevant facts or submitted incorrect information in the NOI, SWP3, NOT or in any other report to the director, he or she shall promptly submit such facts or information.

G. Signatory requirements.

All NOIs, NOTs, SWP3s, reports, certifications or information either submitted to the director or that this permit requires to be maintained by the permittee, shall be signed.

1. These items shall be signed as follows:
 - a. For a corporation: By a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:
 - i. A president, secretary, treasurer or vice-president of the corporation in charge of a principal business function or any other person who performs similar policy or decision-making functions for the corporation; or
 - ii. The manager of one or more manufacturing, production or operating facilities, provided, the manager is authorized to make management decisions that govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;
 - b. For a partnership or sole proprietorship: By a general partner or the proprietor, respectively; or
 - c. For a municipality, State, Federal or other public agency: By either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes (1) the chief executive officer of the agency or (2) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of U.S. EPA).
2. All reports required by the permits and other information requested by the director shall be signed by a person described in Part V.G.1 of this permit or by a duly authorized representative of that person. A person is a duly authorized representative only if:

- a. The authorization is made in writing by a person described in Part V.G.1 of this permit and submitted to the director;
 - b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of manager, operator of a well or well field, superintendent, position of equivalent responsibility or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and
 - c. The written authorization is submitted to the director.
3. Changes to authorization. If an authorization under Part V.G.2 of this permit is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Part V.G.2 of this permit must be submitted to the director prior to or together with any reports, information or applications to be signed by an authorized representative.

H. Certification.

Any person signing documents under this section shall make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

I. Oil and hazardous substance liability.

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities or penalties to which the permittee is or may be subject under section 311 of the CWA or 40 CFR Part 112. 40 CFR Part 112 establishes procedures, methods and equipment and other requirements for equipment to prevent the discharge of oil from non-transportation-related onshore and offshore facilities into or upon the navigable surface waters of the state or adjoining shorelines.

J. Property rights.

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

K. Severability.

The provisions of this permit are severable and if any provision of this permit or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

L. Transfers.

Ohio NPDES general permit coverage is transferable. Ohio EPA must be notified in writing sixty days prior to any proposed transfer of coverage under an Ohio NPDES general permit. The transferee must inform Ohio EPA it will assume the responsibilities of the original permittee transferor.

M. Environmental laws.

No condition of this permit shall release the permittee from any responsibility or requirements under other environmental statutes or regulations.

N. Proper operation and maintenance.

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit and with the requirements of SWP3s. Proper operation and maintenance requires the operation of backup or auxiliary facilities or similar systems, installed by a permittee only when necessary to achieve compliance with the conditions of the permit.

O. Inspection and entry.

The permittee shall allow the director or an authorized representative of Ohio EPA, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;
2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit;
3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment); and
4. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

P. Duty to Reapply.

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit.

Q. Permit Actions.

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

R. Bypass.

The provisions of 40 CFR Section 122.41(m), relating to "Bypass," are specifically incorporated herein by reference in their entirety. For definition of "Bypass," see Part VII.C.

S. Upset.

The provisions of 40 CFR Section 122.41(n), relating to "Upset," are specifically incorporated herein by reference in their entirety. For definition of "Upset," see Part VII.GG.

T. Monitoring and Records.

The provisions of 40 CFR Section 122.41(j), relating to "Monitoring and Records," are specifically incorporated herein by reference in their entirety.

U. Reporting Requirements.

The provisions of 40 CFR Section 122.41(l), relating to "Reporting Requirements," are specifically incorporated herein by reference in their entirety.

PART VI. REOPENER CLAUSE

If there is evidence indicating potential or realized impacts on water quality due to any storm water discharge associated with construction activity covered by this permit, the permittee of such discharge may be required to obtain coverage under an individual permit or an alternative general permit in accordance with Part I.C of this permit or the permit may be modified to include different limitations and/or requirements.

Permit modification or revocation will be conducted according to ORC Chapter 6111.

PART VII. DEFINITIONS

- A. "Act" means Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub. L. 92-500, as amended Pub. L. 95-217, Pub. L. 95-576, Pub. L. 96-483, Pub. L. 97-117 and Pub. L. 100-4, 33 U.S.C. 1251 et. seq.
- B. "Bankfull channel" means a channel flowing at channel capacity and conveying the bankfull discharge. Delineated by the highest water level that has been maintained for a sufficient period of time to leave evidence on the landscape, such as the point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial or

the point at which the clearly scoured substrate of the stream ends and terrestrial vegetation begins.

- C. "Bankfull discharge" means the streamflow that fills the main channel and just begins to spill onto the floodplain; it is the discharge most effective at moving sediment and forming the channel.
- D. "Best management practices (BMPs)" means schedules of activities, prohibitions of practices, maintenance procedures and other management practices (both structural and non-structural) to prevent or reduce the pollution of surface waters of the state. BMP's also include treatment requirements, operating procedures and practices to control plant and/or construction site runoff, spillage or leaks, sludge or waste disposal or drainage from raw material storage.
- E. "Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.
- F. "Channelized stream" means the definition set forth in Section 6111.01 (M) of the ORC.
- G. "Commencement of construction" means the initial disturbance of soils associated with clearing, grubbing, grading, placement of fill, or excavating activities or other construction activities.
- H. "Concentrated storm water runoff" means any storm water runoff which flows through a drainage pipe, ditch, diversion or other discrete conveyance channel.
- I. "Director" means the director of the Ohio Environmental Protection Agency.
- J. "Discharge" means the addition of any pollutant to the surface waters of the state from a point source.
- K. "Disturbance" means any clearing, grading, excavating, filling, or other alteration of land surface where natural or man-made cover is destroyed in a manner that exposes the underlying soils.
- L. "Drainage watershed" means for purposes of this permit the total contributing drainage area to a BMP, i.e., the "watershed" directed to the practice. This would also include any off-site drainage.
- M. "Final stabilization" means that either:
 - 1. All soil disturbing activities at the site are complete and a uniform perennial vegetative cover (e.g., evenly distributed, without large bare areas) with a density of at least 70 percent cover for the area has been established on all unpaved areas and areas not covered by permanent structures or equivalent stabilization measures (such as the use of mulches, rip-rap, gabions or geotextiles) have been employed. In addition, all temporary erosion and sediment control practices are removed and disposed of and all trapped sediment is permanently stabilized to prevent further erosion; or

2. For individual lots in residential construction by either:
 - a. The homebuilder completing final stabilization as specified above or
 - b. The homebuilder establishing temporary stabilization including perimeter controls for an individual lot prior to occupation of the home by the homeowner and informing the homeowner of the need for and benefits of, final stabilization. (Homeowners typically have an incentive to put in the landscaping functionally equivalent to final stabilization as quick as possible to keep mud out of their homes and off sidewalks and driveways.); or
 3. For construction projects on land used for agricultural purposes (e.g., pipelines across crop or range land), final stabilization may be accomplished by returning the disturbed land to its pre-construction agricultural use. Areas disturbed that were previously used for agricultural activities, such as buffer strips immediately adjacent to surface waters of the state and which are not being returned to their pre-construction agricultural use, must meet the final stabilization criteria in (1) or (2) above.
- N. “General contractor” – for the purposes of this permit, the primary individual or company solely accountable to perform a contract. The general contractor typically supervises activities, coordinates the use of subcontractors, and is authorized to direct workers at a site to carry out activities required by the permit.
- O. “Individual lot NOI” means a Notice of Intent for an individual lot to be covered by this permit (see Part I of this permit).
- P. “Larger common plan of development or sale”- means a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under one plan.
- Q. “MS4” means municipal separate storm sewer system which means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels or storm drains) that are:
 1. Owned or operated by the federal government, state, municipality, township, county, district(s) or other public body (created by or pursuant to state or federal law) including special district under state law such as a sewer district, flood control district or drainage districts or similar entity or a designated and approved management agency under section 208 of the act that discharges into surface waters of the state; and
 2. Designed or used for collecting or conveying solely storm water,
 3. Which is not a combined sewer and
 4. Which is not a part of a publicly owned treatment works.
- R. “National Pollutant Discharge Elimination System (NPDES)” means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits and enforcing pretreatment requirements, under sections 307, 402, 318 and 405 of the CWA. The term includes an "approved program."

- S. “Natural channel design” means an engineering technique that uses knowledge of the natural process of a stream to create a stable stream that will maintain its form and function over time.
- T. “NOI” means notice of intent to be covered by this permit.
- U. “NOT” means notice of termination.
- V. “Operator” means any party associated with a construction project that meets either of the following two criteria:
1. The party has day-to-day operational control of all activities at a project which are necessary to ensure compliance with a SWP3 for the site and all permit conditions including the ability to authorize modifications to the SWP3, construction plans and site specification to ensure compliance with the General Permit, or
 2. Property owner meets the definition of operator should the party which has day to day operational control require additional authorization from the owner for modifications to the SWP3, construction plans, and/or site specification to ensure compliance with the permit or refuses to accept all responsibilities as listed above (Part VII.V.1).

Subcontractors generally are not considered operators for the purposes of this permit. As set forth in Part I.F.1, there can be more than one operator at a site and under these circumstances, the operators shall be co-permittees.

- W. “Ordinary high water mark” means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.
- X. “Owner or operator” means the owner or operator of any “facility or activity” subject to regulation under the NPDES program.
- Y. “Permanent stabilization” means the establishment of permanent vegetation, decorative landscape mulching, matting, sod, rip rap and landscaping techniques to provide permanent erosion control on areas where construction operations are complete or where no further disturbance is expected for at least one year.
- Z. “Percent imperviousness” means the impervious area created divided by the total area of the project site.
- AA. “Point source” means any discernible, confined and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or the floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.

- BB. “Qualified inspection personnel” means a person knowledgeable in the principles and practice of erosion and sediment controls, who possesses the skills to assess all conditions at the construction site that could impact storm water quality and to assess the effectiveness of any sediment and erosion control measures selected to control the quality of storm water discharges from the construction activity.
- CC. “Rainwater and Land Development” is a manual describing construction and post-construction best management practices and associated specifications. A copy of the manual may be obtained by contacting the Ohio Department of Natural Resources, Division of Soil & Water Conservation.
- DD. “Riparian area” means the transition area between flowing water and terrestrial (land) ecosystems composed of trees, shrubs and surrounding vegetation which serve to stabilize erodible soil, improve both surface and ground water quality, increase stream shading and enhance wildlife habitat.
- EE. “Runoff coefficient” means the fraction of total rainfall that will appear at the conveyance as runoff.
- FF. “Sediment settling pond” means a sediment trap, sediment basin or permanent basin that has been temporarily modified for sediment control, as described in the latest edition of the Rainwater and Land Development manual.
- GG. “State isolated wetland permit requirements” means the requirements set forth in Sections 6111.02 through 6111.029 of the ORC.
- HH. “Storm water” means storm water runoff, snow melt and surface runoff and drainage.
- II. “Steep slopes” means slopes that are 15 percent or greater in grade. Where a local government or industry technical manual has defined what is to be considered a “steep slope,” this permit’s definition automatically adopts that definition.
- JJ. “Stream edge” means the ordinary high water mark.
- KK. “Subcontractor” – for the purposes of this permit, an individual or company that takes a portion of a contract from the general contractor or from another subcontractor.
- LL. “Surface waters of the state” or “water bodies” means all streams, lakes, reservoirs, ponds, marshes, wetlands or other waterways which are situated wholly or partially within the boundaries of the state, except those private waters which do not combine or effect a junction with natural surface or underground waters. Waters defined as sewerage systems, treatment works or disposal systems in Section 6111.01 of the ORC are not included.
- MM. “SWP3” means storm water pollution prevention plan.
- NN. “Upset” means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment

facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

- OO. “Temporary stabilization” means the establishment of temporary vegetation, mulching, geotextiles, sod, preservation of existing vegetation and other techniques capable of quickly establishing cover over disturbed areas to provide erosion control between construction operations.

- PP. “Water Quality Volume (WQ_v)” means the volume of storm water runoff which must be captured and treated prior to discharge from the developed site after construction is complete.

Appendix A
Big Darby Creek Watershed

CONTENTS OF THIS APPENDIX

- A.1 Permit Area
- A.2 TMDL Conditions
- A.3 Sediment Settling Ponds and Sampling
- A.4 Riparian Setback Requirements
- A.5 Riparian Setback Mitigation
- A.6 Groundwater Recharge Requirements
- A.7 Groundwater Recharge mitigation

Attachment A-A: Big Darby Creek Watershed Map

Attachment A-B: Stream Assessment and Restoration

A.1 Permit Area.

This appendix to Permit OHC00005 applies to the entire Big Darby Creek Watershed located within the State of Ohio. Please see Attachment A for permit area boundaries.

A.2 TMDL Conditions.

This general permit requires control measures/BMPs for construction sites that reflect recommendations set forth in the U.S. EPA approved Big Darby Creek TMDL.

A.3 Sediment Settling Ponds and Sampling

Sediment settling ponds additional conditions. The sediment settling pond shall be sized to provide a minimum sediment storage volume of 134 cubic yards of effective sediment storage per acre of drainage and maintain a target discharge performance standard of 45 mg/l Total Suspended Solids (TSS) up to a 0.75-inch rainfall event within a 24-hour period. Unless infeasible, sediment settling ponds must be dewatered at the pond surface using a skimmer or equivalent device. The depth of the sediment settling pond must be less than or equal to five feet. Sediment must be removed from the sediment settling pond when the design capacity has been reduced by 40 percent (This is typically reached when sediment occupies one-half of the basin depth).

Silt Fence and Diversions. For sites five or more acres in size, the use of sediment barriers as a primary sediment control is prohibited. Centralized sediment basins shall be used for sites 5 or more acres in size. Diversions shall direct all storm water runoff from the disturbed areas to the impoundment intended for sediment control. The sediment basins and associated diversions shall be implemented prior to the major earth disturbing activity.

The permittee shall sample in accordance with sampling procedures outlined in 40 CFR 136. Sampling shall occur as follows:

- i. Occur at the outfall of each sediment settling pond associated with the site. Each associated outfall shall be identified by a three-digit number (001, 002, etc.);
- ii. The applicable rainfall event for sampling to occur shall be a rainfall event of 0.25-inch to a 0.75-inch rainfall event to occur within a 24-hour period. Grab sampling shall be initiated at a site within 14 days, or the first applicable rainfall event thereafter, once upslope disturbance of each sampling location is initiated and shall continue on a quarterly basis. Quarterly periods shall be represented as January - March, April - June, July - September and October - December. Sampling results shall be retained on site and available for inspection.

If any sample is greater than the performance standard of 45 mg/l TSS, the permittee shall modify the SWP3 and install/implement new control practice(s) within 10 days to ensure the TSS performance standard is maintained. Within 3 days of improvement(s), or the first applicable rainfall event thereafter, the permittee shall resample to ensure SWP3 modifications maintain the TSS performance standard target.

For each sample taken, the permittee shall record the following information:

- the outfall and date of sampling;
- the person(s) who performed the sampling;
- the date the analyses were performed on those samples;
- the person(s) who performed the analyses;
- the analytical techniques or methods used; and
- the results of all analyses.

Both quarterly and sampling results following a discharge target exceedance shall be retained on site and available for inspection.

A.4 Riparian Setback Requirements.

The SWP3 shall clearly delineate the boundary of required stream setback distances. No construction activity shall occur, without appropriate mitigation, within the delineated setback boundary except activities associated with restoration or recovery of natural floodplain and channel form characteristics as described in Attachment B, storm water conveyances from permanent treatment practices and approvable utility crossings. Such conveyances must be designed to minimize the width of disturbance. If intrusion within the delineated setback boundary is necessary to accomplish the purposes of a project, then mitigation shall be required in accordance with Appendix A.5 of this permit. Streams requiring protection under this section are defined as perennial, intermittent or ephemeral streams with a defined bed, bank or channel. National Resources Conservation Service (NRCS) soil survey maps should be used as one reference and the presence of a stream requiring protection should also be confirmed in the field. Any required setback distances shall be clearly displayed in the field prior to any construction related activity.

Riparian setbacks distance shall be delineated based upon one of the following two methods:

- i. The setback distance shall be sized as the greater of the following:

1. The regulatory 100-year floodplain based on FEMA mapping;
2. A minimum of 100 feet from the top of the streambank on each side; or
3. A distance calculated using the following equation:

$$W = 133DA^{0.43} \quad (\text{Equation 1, Appendix A})$$

where:

DA = drainage area (mi²)

W = total width of riparian setback (ft)

W shall be centered over the meander pattern of the stream such that a line representing the setback width would evenly intersect equal elevation lines on either side of the stream.

If the DA remains relatively constant throughout the stretch of interest, then the DA of the downstream edge of the stretch should be used. Where there is a significant increase in the DA from the upstream edge to the downstream edge of the area of interest, the setback width shall increase accordingly.

- ii. **Stream Restoration with 100 feet (each side) Riparian Setback.** Each stream segment within the proposed site boundaries can be assessed in accordance with Attachment B, Part 1. In the event the stream segment is classified as a "Previously Modified Low Gradient Headwater Stream", the permittee has the option to restore the stream segment in accordance with Attachment B and include a 100-foot water quality setback distance from the top of the streambank on each side. In the event the stream segment exceeds the minimum criteria in Attachment B to be classified as a "Previously Modified Low Gradient Headwater Stream," this Appendix A, Attachment B may be considered on a case-by-case basis.

No structural sediment controls (e.g., the installation of sediment barriers or a sediment settling pond) or structural post-construction controls shall be used in a surface water of the State or the delineated setback corridor.

Previously developed projects (as defined in Part III.G.2.e.) located within the delineated setback boundary are exempt from Riparian Setback Mitigation (A.5) provided the proposed project does not further intrude into the delineated setback boundary.

Linear transportation projects which are caused solely by correcting safety related issues, mandates of modern design requirements and/or resulting from other mitigation activities are exempt from Riparian Setback Mitigation (Appendix A, A.5) if less than one acre of total new right-of-way is associated with the project.

A.5 Riparian Setback Mitigation.

The mitigation required for intrusion into the riparian setback shall be determined by the horizontal distance the intrusion is from the stream. Up to three zones will be used in determining the required mitigation. Zone 1 extends from 0 to 25 feet from the stream edge. Zone 2 extends from 25 to 100 feet from the stream edge, and Zone 3 extends from 100 feet to the outer edge of the setback corridor. Intrusion into these zones will require the following mitigation within the same Watershed Assessment Unit (12-digit HUC scale):

- i. Four times the total area disturbed in the stream and within Zone 1 of the site being developed shall be mitigated within Zone 1 of the mitigation location.
- ii. Three times the area disturbed within Zone 2 of the site being developed shall be mitigated within Zones 1 and/or 2 of the mitigation location.
- iii. Two times the area disturbed within Zone 3 of the site being developed shall be mitigated within any zone of the mitigation location.

In lieu of mitigation ratios found within in this section, linear transportation projects which result in total new right-of-way greater than one acre and less than two acres, which are caused solely by correcting safety related issues, mandates of modern design requirements and/or resulting from other mitigation activities, shall provide Riparian Setback Mitigation at a ratio of 1.5 to 1.

All mitigation shall, at a minimum, include conserved or restored setback zone and should be designed to maximize the ecological function of the mitigation. Including mitigation at the stream edge along with associated setback areas is one way to maximize ecological function. Mitigation shall be protected in perpetuity by binding conservation easements or environmental covenants which must be recorded within 6 months of receiving permit authorization. Granting of binding conservation easements or environmental covenants protected in perpetuity for land outside of disturbed area but within a required riparian setback counts towards required mitigation.

Mitigation may also be satisfied by approved pooled mitigation areas and in-lieu fee sponsored mitigation areas. Mitigation resulting from State or Federal environmental regulations may be adjusted in recognition of these requirements.

A.6 Groundwater Recharge Requirements.

The SWP3 shall ensure that the overall site post-development groundwater recharge equals or exceeds the pre-development groundwater recharge. The SWP3 shall describe the conservation development strategies, BMPs and other practices deemed necessary by the permittee to maintain or improve pre-development rates of groundwater recharge. Pre-development and post-development groundwater recharge shall be calculated using the following equation:

i. $Vre_x = A_x * Dre_x / 12$ (Equation 2, Appendix A)

where:

- X = represents a land use and hydrologic soil group pair
- Vre_x = volume of total annual recharge from land use-soil group X (in acre-ft)
- Dre_x = depth of total annual recharge associated with land use-soil group X from Tables 1 or 2 (in inches)
- A_x = area of land use-soil group X (in acres)

Table A-1 values should be used for land where the underlying geology indicates a potential for downward migration of groundwater. Table A-1 values represent the combined total groundwater recharge potential including groundwater contribution to stream baseflow and to the underlying bedrock aquifer. The potential for downward migration can be determined from a comparison of the potentiometric maps for the glacial and bedrock aquifers. Use Table A-2 when this potential is unlikely to exist. Detailed potentiometric maps for the Franklin county portion of the Darby watershed, and coarse potentiometric maps for the Darby watershed outside of Franklin County and hydrologic soil group data are available at:
http://www.epa.state.oh.us/dsw/permits/GP_ConstructionSiteStormWater_Darby.aspx.

Table A-1 (Appendix A) Annual Average Expected Total Groundwater Recharge³

Land Use	Density (DU ¹ /acre)	% Impervious	Recharge (inches) by Hydrologic Soil Group ²			
			A	B	C	D
Woods / Forest	-	-	17.0	16.6	15.6	14.6
Brush	-	-	17.0	16.6	15.6	14.6
Meadow	-	-	17.0	16.5	15.4	14.4
Managed Wood	-	-	16.9	16.0	14.7	13.4
Pasture	-	-	16.5	15.9	14.4	13.0
Row Crop	-	-	15.8	14.2	11.9	8.1
Urban Grasses	-	-	15.7	15.7	14.2	12.7
Low Density Residential	0.5	12%	15.7	15.7	14.2	12.7
Low Density Residential	1	20%	14.8	14.8	13.7	12.2
Medium Density Residential	2	25%	11.5	11.5	11.5	11.5
Medium Density Residential	3	30%	11.2	11.2	11.2	11.2
Medium Density Residential	4	38%	9.6	9.6	9.6	9.6
High Density Residential	≥5	65%	7.3	7.3	7.3	7.3
Commercial & Road Right-of-Way ⁴	-	90%	4.3	4.3	4.3	4.3

¹ DU = Dwelling Units

² Hydrologic soil group designations of A/D, B/D, and C/D should be considered as D soils for this application.

³ These values apply when recharge of the aquifer is expected; recharge to the bedrock aquifer can be expected when the potentiometric head of the glacial aquifer is greater than the bedrock aquifer.

⁴ The 4.3 infiltration value may only be used for an area as a whole (includes impervious and pervious areas) which includes a minimum of 10 percent pervious area. If all land uses (pervious and impervious) are tabulated separately, then impervious areas have 0 inches of recharge.

Table A-2 (Appendix A) Annual Average Expected Baseflow Recharge³

Land Use	Density (DU ¹ /acre)	% Impervious	Recharge (inches) by Hydrologic Soil Group ²			
			A	B	C	D
Woods / Forest	-	-	11.8	11.4	10.7	9.9
Brush	-	-	11.7	11.4	10.7	9.9
Meadow	-	-	11.8	11.3	10.6	9.8
Managed Wood	-	-	11.7	11.0	10.0	9.1
Pasture	-	-	11.3	11.0	9.9	8.9
Row Crop	-	-	11.1	10.1	9.0	6.2
Urban Grasses	-	-	11.2	11.2	10.3	9.3
Low Density Residential	0.5	12%	11.2	11.2	10.3	9.3
Low Density Residential	1	20%	9.5	9.5	9.0	8.6
Medium Density Residential	2	25%	7.8	7.8	7.8	7.8
Medium Density Residential	3	30%	7.6	7.6	7.6	7.6
Medium Density Residential	4	38%	6.5	6.5	6.5	6.5
High Density Residential	≥5	65%	5.0	5.0	5.0	5.0
Commercial & Road Right-of-Way ⁴	-	90%	2.9	2.9	2.9	2.9

¹ DU = Dwelling Units

² Hydrologic soil group designations of A/D, B/D, and C/D should be considered as D soils for this application.

³ These values apply when no recharge of the aquifer is expected.

⁴ The 2.9 infiltration value may only be used for an area as a whole (includes impervious and pervious areas) which includes a minimum of 10 percent pervious area. If all land uses (pervious and impervious) are tabulated separately, then impervious areas have 0 inches of recharge.

Table A-3 (Appendix A) Land Use Definitions

Land Use	Definition
Woods / Forest	Areas dominated by trees. Woods are protected from grazing and litter and brush adequately cover the soil.
Brush	Brush, weeds, grass mixture where brush is the major element and more than 75% of the ground is covered.
Meadow	Continuous grass, protected from grazing, generally mowed for hay.
Managed Wood	Orchards, tree farms, and other areas planted or maintained for the production of fruits, nuts, berries, or ornamentals.
Pasture	Pasture, grassland, or range where at least 50% of the ground is covered and the area is not heavily grazed.
Row Crop	Areas used to produce crops, such as corn, soybeans, vegetables, tobacco, and cotton.
Urban Grasses	Vegetation (primarily grasses) planted in developed settings for recreation, erosion control, or aesthetic purposes. Examples include parks, lawns, golf courses, airport grasses, and industrial site grasses.
Residential	Areas with a mixture of constructed materials and vegetation; the average % imperviousness and number of dwelling units per acre to determine the appropriate density is specified.
Commercial	Includes infrastructure (e.g. roads, railroads, etc.) and all highly developed areas not classified as High Intensity Residential.

- ii. The pre-development ground water recharge volume shall be calculated by determining the area of each land use-soil type pairing on the site of interest. The recharge associated with each such pairing multiplied by the area will give the pre-development volume of total groundwater

recharge. The same shall be done for the post-development land use-soil type pairings.

Any activity that is expected to produce storm water runoff with elevated concentrations of carcinogens, hydrocarbons, metals, or toxics is prohibited from infiltrating untreated storm water from the area affected by the activity. The groundwater recharge mitigation requirement for areas affected by such activities must be met by methods which do not present a risk of groundwater contamination. The following land uses and activities are typically deemed storm water hotspots:

Vehicle salvage yards and recycling facilities

- vehicle service and maintenance facilities (i.e. truck stops, gas stations)
- fleet storage areas (i.e. bus, truck)
- industrial sites subject to industrial storm water permitting requirements
- bulk terminals
- marinas
- facilities that generate or store hazardous materials
- other land uses and activities as designated by individual review

The following land uses and activities are not normally considered hotspots:

- residential streets and rural highways
- residential development
- institutional development
- commercial and office developments
- non-industrial rooftops
- pervious areas, except golf courses and nurseries

The applicant may use structural BMPs within drinking water source protection areas for community public water systems only to the extent that the structural BMP(s) does not cause contaminants in the recharge waters to impact the ground water quality at levels that would cause an exceedance of the drinking water Maximum Contaminant Levels (OAC Section 3745-81 and 3745-82). To obtain a map of drinking water source protection areas for community public water systems contact Ohio EPA's Division of Drinking and Ground Waters at (614) 644-2752.

Linear transportation projects which are caused solely by correcting safety related issues, mandates of modern design requirements and/or resulting from other mitigation activities are exempt from Groundwater Recharge Mitigation (Appendix B, A.7) if less than one acre of total new right-of-way is associated with the project.

Protection of open space (infiltration areas) shall be by binding conservation easements that identify a third-party management agency, such as a homeowners' association/condominium association, political jurisdiction or third-party land trust.

A.7 Groundwater Recharge Mitigation.

If the post-development recharge volume is less than the pre-development recharge volume, then mitigation will be required. Two options are available for most applications:

- i. The preferred method is to convert additional land to land use with higher recharge potential. The difference in groundwater recharge between the existing and converted land use recharge is the amount which can be used as recharge credit. Off-site Groundwater Recharge Mitigation shall occur within the same Watershed Assessment Unit (12-digit HUC scale) as the permitted site and preferably up-gradient and within a 2-mile radius.

Mitigation shall be protected in perpetuity by binding conservation easements or environmental covenants which must be recorded within 6 months of receiving permit authorization. Granting of binding conservation easements or environmental covenants protected in perpetuity for land outside of the disturbed area, but within a required riparian setback counts towards required mitigation.

Mitigation may also be satisfied by approved pooled mitigation areas and in-lieu fee sponsored mitigation areas.

- ii. On-site structural and non-structural practices may also be used to achieve groundwater mitigation requirements by retaining and infiltrating on-site a minimum volume of storm water runoff based on the area and hydrologic soil groups of disturbed soils. If these infiltrating practices are incorporated upstream of the water quality volume treatment practice, the volume of groundwater being infiltrated may be subtracted from the water quality volume for the purpose of meeting post-construction requirements. The on-site retention requirement is determined by the following formula:

$$V_{\text{retention}} = A_{\text{HSG-A}} * 0.90 \text{ in} + A_{\text{HSG-B}} * 0.75 \text{ in} + A_{\text{HSG-C}} * 0.50 \text{ in} + A_{\text{HSG-D}} * 0.25 \text{ in}$$

(Equation 3, Appendix A)

Where,

$V_{\text{retention}}$ = volume of runoff retained onsite using an approved infiltration practice

$A_{\text{HSG-x}}$ = area of each hydrologic soil group within the disturbed area

Table A-4: Hydrologic Soil Groups and On-site Retention Depth per Acre

Hydrologic Soil Group	HSG A	HSG B	HSG C	HSG D
Retention Depth (inches)	0.90	0.75	0.50	0.25

Retention volume ($V_{\text{retention}}$) provided by selected practices shall be determined using the runoff reduction method criteria as outlined in Part III.G.2.e, Ohio EPA's Runoff Reduction spreadsheet and supporting documentation in the Rainwater and Land Development manual. Hydrologic soil group (HSG) areas are to be determined by using the current version of SURRGO or Web Soil Survey soils information.

Appendix A Attachment A: Big Darby Creek Watershed



A more detailed map can be viewed at:
http://www.epa.state.oh.us/dsw/permits/GP_ConstructionSiteStormWater_Darby.aspx

Appendix A Attachment B

Part 1 Stream Assessment

This assessment will determine if a stream is considered a previously channelized, low-gradient headwater stream (a drainage ditch) which would be applicable for stream restoration in lieu of protecting a setback as per Appendix A. A.4.i and ii.

In the event the assessment of the stream, meets all the criteria listed below, restoration (provided 401/404 permits are authorized) as depicted in Part 2 of this attachment, may be a means of reducing the setback distance required by A.4.i. (Appendix A).

Previously Channelized Low-Gradient Headwater Streams (drainage ditches) shall for the purposes of this permit be defined as having all of the following characteristics:

- Less than 10 square miles of drainage area
- Low gradient and low stream power such that despite their straightened and entrenched condition incision (down-cutting) is not evident
- Entrenched, entrenchment ratio < 2.2
- Straight, sinuosity of the bankfull channel < 1.02

Part 2 Restoration

Restoration shall be accomplished by any natural channel design approach that will lead to a self-maintaining reach able to provide both local habitat and watershed services (e.g. self-purification and valley floodwater storage).

- a. Construction of a floodplain, channel and habitat via natural channel design;
- b. Floodplain excavation necessary to promote interaction between stream and floodplain;
- c. Include a water quality setback of 100 feet from top of the streambank on each side.

The primary target regardless of design approach shall be the frequently flooded width, which shall be maximized, at 10 times the channel's self-forming width. Five times the self-forming channel width may still be acceptable particularly on portions of the site if greater widths are achieved elsewhere.

Appendix B Olentangy River Watershed

CONTENTS OF THIS APPENDIX

- B.1 Permit Area
- B.2 TMDL Conditions
- B.3 Riparian Setback Requirements
- B.4 Riparian Setback Mitigation

Attachment B-A: Area of Applicability for the Olentangy Watershed (Map)

Attachment B-B: Stream Assessment and Restoration

B.1 Permit Area.

This appendix to Permit OHC00005 applies to specific portions of the Olentangy River Watershed located within the State of Ohio. The permit area includes the following 12-digit Hydrologic Unit Codes (HUC-12) within the Olentangy River Watershed:

12-Digit Hydrologic Unit Codes

12-Digit Hydrologic Unit Codes (HUC)	Narrative Description of Sub-Watershed
05060001 09 01	Shaw Creek
05060001 09 02	Headwaters Whetstone Creek
05060001 09 03	Claypool Run-Whetstone Creek
05060001 10 07	Delaware Run-Olentangy River
05060001 11 01	Deep Run-Olentangy River
05060001 11 02 (Only portion as depicted in Attachment A)	Rush Run-Olentangy River

Please see Attachment A (Appendix B) for permit area boundaries. An electronic version of Attachment A can be viewed at http://epa.ohio.gov/dsw/permits/GP_ConstructionSiteStormWater_Olentangy.aspx

B.2 TMDL Conditions.

This general permit requires control measures/BMPs for construction sites that reflect recommendations set forth in the U.S. EPA approved Olentangy TMDL.

B.3 Riparian Setback Requirements.

The permittee shall comply with the riparian setback requirements of this permit or alternative riparian setback requirements established by a regulated MS4 and approved by Ohio EPA. The SWP3 shall clearly delineate the boundary of required stream setback distances. The stream setback shall consist of a streamside buffer and an outer buffer. No construction activity shall occur, without appropriate mitigation, within the streamside buffer except activities associated with storm water conveyances from permanent treatment practices, approvable utility crossings and restoration or recovery of floodplain and channel form characteristics as described in Attachment B. Storm water conveyances must be designed to minimize the width of disturbance.

Construction activities requiring mitigation for intrusions within the outer buffer for the Olentangy River mainstem and perennial streams are described in Appendix B.4.

If intrusion within the delineated setback boundary is necessary to accomplish the purposes of a project, then mitigation shall be required in accordance with Appendix B.3. of this permit. Streams requiring protection under this section have a defined bed and bank or channel and are defined as follows:

- The Olentangy River mainstem;
- Perennial streams have continuous flow on either the surface of the stream bed or under the surface of the stream bed;
- Intermittent streams flow for extended periods of time seasonally of a typical climate year; and
- Ephemeral streams are normally dry and only flow during and after precipitation runoff (episodic flow).

National Resources Conservation Service (NRCS) soil survey maps should be used as one reference and the presence of a stream requiring protection should also be confirmed in the field. Any required setback distances shall be clearly displayed in the field prior to any construction related activity.

Riparian setbacks shall be delineated based upon one of the following two methods:

- i. The required setback distances shall vary with stream type as follows:
 - a. The setback distances associated with the mainstem of the Olentangy River shall consist of:
 - (1) A streamside buffer width of 100 feet as measured horizontally from the ordinary high water mark per side; and
 - (2) An outer buffer width sized to the regulatory 100-year floodplain based on FEMA mapping. No impervious surfaces shall be constructed without appropriate mitigation and moderate to substantial fill activities with no impervious surface may require appropriate mitigation pending an individual approval by Ohio EPA.
 - b. The setback distance associated with perennial streams, other than the Olentangy mainstem, shall consist of:
 - (1) A streamside buffer width of 80 feet per side measured horizontally from the ordinary high water mark; and
 - (2) An outer buffer width sized to the regulatory 100-year floodplain based on FEMA mapping. In the event the regulatory 100-year floodplain is not established, the outer buffer width shall be calculated using the following equation and measured horizontally from the ordinary high water mark. No impervious surfaces, structure, fill, or activity that would impair the floodplain or stream stabilizing ability of the outer buffer shall occur without appropriate mitigation:

$$W = 143DA^{0.41} \quad (\text{Equation 1 Appendix B})$$

where:

DA = drainage area (mi²)

W = total width of riparian setback (ft)

W shall be centered over the meander pattern of the stream such that a line representing the setback width would evenly intersect equal elevation lines on either side of the stream.

If the DA remains relatively constant throughout the stretch of interest, then the DA of the downstream edge of the stretch should be used. Where there is a significant increase in the DA from the upstream edge to the downstream edge of the area of interest, the setback width shall increase accordingly.

- c. The setback distance associated with intermittent streams and ephemeral streams shall be a streamside buffer width of 30 feet per side measured horizontally from the centerline of the stream. No outer buffer is required for intermittent and ephemeral streams.
- ii. Stream Restoration with 100 feet (each side) Riparian Setback. Each stream segment within the proposed site boundaries can be assessed in accordance with Attachment B. In the event the stream segment is classified as a "Previously Modified Low Gradient Headwater Stream", the permittee has the option to restore the stream segment in accordance with Attachment B and include a 100 feet water quality setback distance from the top of the streambank on each side. In the event the stream segment exceeds the minimum criteria in Attachment B to be classified as a "Previously Modified Low Gradient Headwater Stream", this may be considered on a case-by-case basis.

No structural sediment controls (e.g., the installation of sediment barriers or a sediment settling pond) or structural post-construction controls shall be used in a stream or the streamside buffer. Activities and controls that would not impair the floodplain or stream stabilizing ability of the outer buffer can be considered.

Redevelopment projects (i.e., developments on previously developed property) located within the delineated setback boundary is exempt from Riparian Setback Mitigation (B.3) provided the proposed project does not further intrude the delineated setback boundary.

B.4 Riparian Setback Mitigation.

The mitigation required for intrusion into the riparian setback of the **Olentangy River mainstem or perennial streams** shall be determined by the horizontal distance the intrusion is from the stream. Up to three zones will be used in determining the required mitigation. Zone 1 extends from 0 to 30 feet from the stream edge. Zone 2 extends

from 30 feet to the outer edge of the streamside buffer. Zone 3 extends from the outer edge of the streamside buffer to the outer edge of the outer buffer. Intrusion into these zones will require the following mitigation within the same Watershed Assessment Unit (12-digit HUC scale). Alternative mitigation, within the permit area, may be considered on a case-by-case basis:

1. Four (4) times the total area disturbed in the stream within Zone 1 of the site being developed shall be mitigated; or, two (2) times the total area disturbed in the stream within Zone 1 shall be mitigated within the watershed of the immediate receiving stream, and the entire required setback of the site shall be protected by binding conservation easements or environmental covenants.
2. Three (3) times the area disturbed within Zone 2 of the site being developed shall be mitigated within Zones 1 and/or 2 of the mitigation location; or, one and one-half (1.5) times the total area disturbed within Zone 2 shall be mitigated within the watershed of the immediate receiving stream, and the entire required setback of the site shall be protected in perpetuity by binding conservation easements or environmental covenants.
3. Two (2) times the area to be mitigated within Zone 3 of the site being developed shall be mitigated within any Zone of the mitigation location; or, one (1) times the total area to be mitigated within any zone shall be mitigated within the watershed of the immediate receiving stream, and the entire required setback of the site shall be protected in perpetuity by binding conservation easements or environmental covenants.

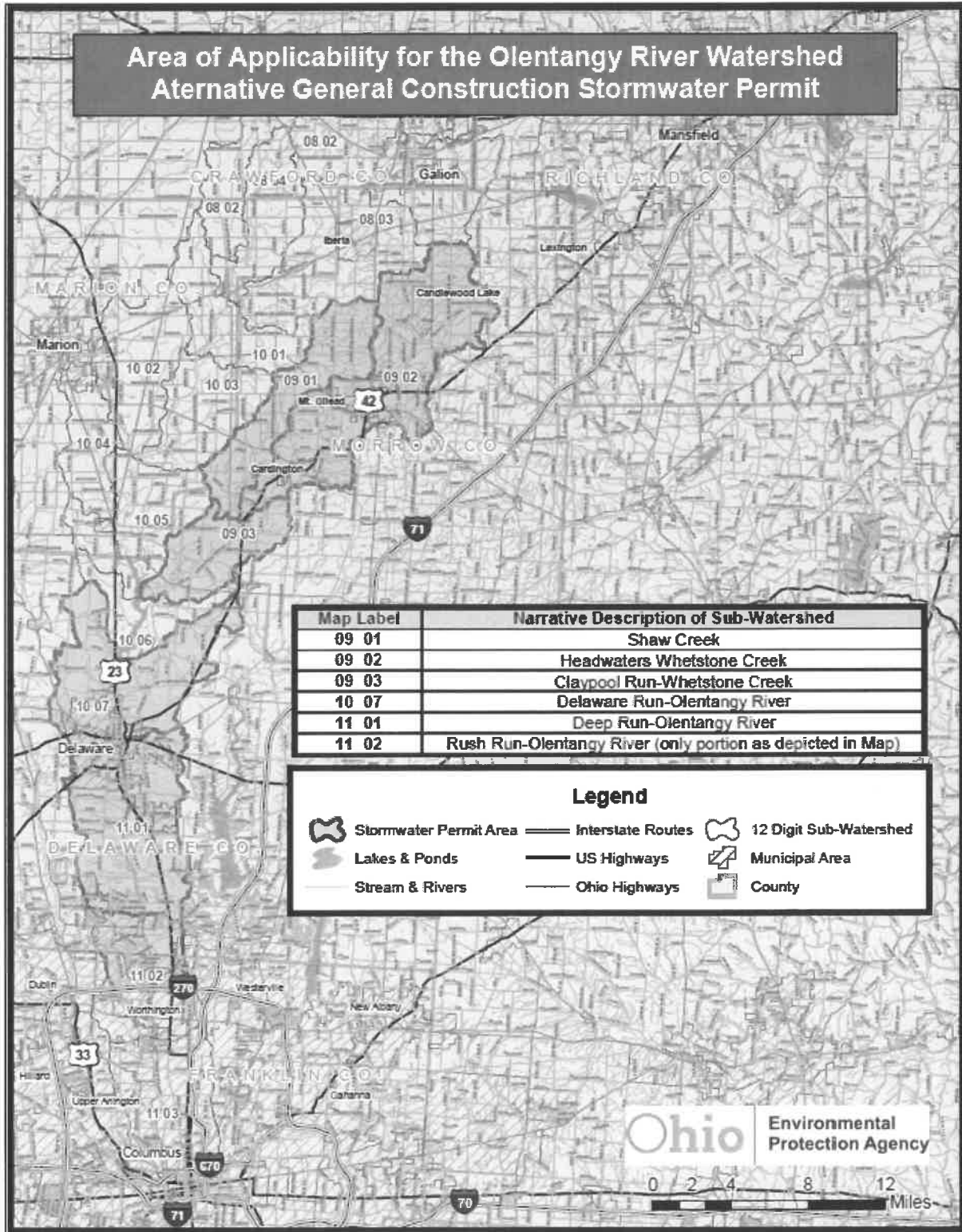
The mitigation required for intrusion into the riparian setback of an **intermittent stream** shall be four (4) times the total area disturbed within the riparian setback of the site being developed shall be mitigated; or two (2) times the total area disturbed within the riparian setback shall be mitigated within the watershed of the immediate receiving stream, and the entire required setback of the site shall be protected in perpetuity by binding conservation easements or environmental covenants.

The mitigation required for intrusion into the streamside buffer of an **ephemeral stream** shall be two (2) times the total area disturbed within the riparian setback of the site being developed shall be mitigated; or one (1) times the total area disturbed within the riparian setback shall be mitigated within the watershed of the immediate receiving stream, and the entire required setback of the site shall be protected in perpetuity by binding conservation easements or environmental covenants.

All mitigation shall, at a minimum, include conserved or restored setback zone, and should be designed to maximize the ecological function of the mitigation. Including mitigation at the stream edge along with associated setback areas is one way to maximize ecological function. Mitigation shall be protected in perpetuity by binding conservation easements or environmental covenants which must be recorded within 6 months of permit authorization. Granting of binding conservation easements or environmental covenants protected for land outside of disturbed area, but within a required riparian setback counts towards required mitigation.

Mitigation may also be satisfied by approved pooled mitigation areas and in-lieu fee sponsored mitigation areas. Mitigation resulting from State or Federal environmental regulations may be adjusted in recognition of these requirements.

Appendix B Attachment A Applicable Portions of the Olentangy Watershed



A more detailed map can be viewed at:
http://epa.ohio.gov/dsw/permits/GP_ConstructionSiteStormWater_Olentangy.aspx

Appendix B Attachment B

Part 1 Stream Assessment

This assessment will determine if a stream is considered a previously channelized, low-gradient headwater stream (a drainage ditch) which would be applicable for stream restoration in lieu of protecting an outer 'no build' setback as per Appendix B B.2i. and ii.

In the event the assessment of the stream meets all the criteria listed below, restoration as depicted in Part 2 of this attachment or natural channel design could be performed, provided 401/404 permits are authorized, and may be a means of reducing the setback distance required by B.2.i. (Appendix B).

Previously Modified, Low-Gradient Headwater Streams shall, for the purposes of this permit, be defined as having all of the following characteristics:

- Less than 10 square miles of drainage area;
- Low gradient and low stream power such that incision (down-cutting) is not evident;
- Entrenched such that the ratio of the frequently flooded width to the bankfull width is less than 2.2; and
- Straight with little or no sinuosity present such that the ratio of the bankfull channel length to the straight-line distance between two points is less than 1.02.

Part 2 Restoration

Restoration shall be accomplished by any natural channel design approach that will lead to a self-maintaining reach able to provide both local habitat and watershed services (e.g. self-purification and valley floodwater storage).

- a. Construction of a floodplain, channel and habitat via natural channel design;
- b. Floodplain excavation necessary to promote interaction between stream and floodplain;
- c. Include a water quality setback of 100 feet from top of the streambank on each side.

The primary target shall be a frequently flooded width of 10 times the channel's self-forming width. Five times the self-forming channel width may be acceptable if sufficient elements of natural channel design are included in the restoration project.

Appendix C Rainfall Intensity for Calculation of Water Quality Flow (WQF)

DURATION t_c (minutes)	WATER QUALITY INTENSITY [i_{wq}] (inches/hour)	DURATION t_c (minutes)	WATER QUALITY INTENSITY [i_{wq}] (inches/hour)
5	2.37	33	0.95
6	2.26	34	0.93
7	2.15	35	0.92
8	2.04	36	0.90
9	1.94	37	0.88
10	1.85	38	0.86
11	1.76	39	0.85
12	1.68	40	0.83
13	1.62	41	0.82
14	1.56	42	0.80
15	1.51	43	0.78
16	1.46	44	0.77
17	1.41	45	0.76
18	1.37	46	0.75
19	1.33	47	0.74
20	1.29	48	0.73
21	1.26	49	0.72
22	1.22	50	0.71
23	1.19	51	0.69
24	1.16	52	0.68
25	1.13	53	0.67
26	1.10	54	0.66
27	1.07	55	0.66
28	1.05	56	0.65
29	1.03	57	0.64
30	1.01	58	0.64
31	0.99	59	0.63
32	0.97	60	0.62

Note: For $t_c < 5$ minutes, use $i = 2.37$ in/hr; for $t_c > 60$ minutes, use $i = 0.62$ in/hr. For all other t_c , use the appropriate value from this table.

MR 509
Permit No. PERMIT 21-11127

Office Use Only

State of Ohio
Department of Transportation
Permit

County or Jurisdiction SUM
Rte SR303
Log Pt 2.97
Acc Cat

[1] Subject to all terms, conditions, and restrictions printed, written below and on the reverse side hereof, or attached,

Name: Village of Richfield
Address: 4410 W Streetsboro Road Richfield OH 44286
Company Phone: 330 659-9201

is hereby granted a permit under Section 5515.01 and 5515.02 of Ohio Revised Code, and permission to perform work necessary in the manner described and at the location indicated in the following or attached to this permit.

Utility - (see attached sheet)

Description of Work:

[2] This permit shall be in the possession of employees on site at all times who are in charge of the work and shall be shown, upon request, to any employee of the Department of Transportation.

Contact ODOT Representative 3 days before work begins, also contact ODOT Representative when work is completed for final inspection. **Failure to notify the ODOT Representative could result in work stoppage!**

[3] No work authorized by this permit shall begin until the permittee has contacted and received instructions from

Frank Phillips
330-786-4907
Email Address: frank.phillips@dot.ohio.gov

NOTE: Any work performed by the permittee may be stopped if this requirement is not met.

[4] Prior to any excavation in the highway right-of-way, the Ohio811 <https://www.oups.org/excavators> must be contacted in accordance with ORC Section 3781.25 to 3781.32. Ohio811 can be reached at 1-800-362-2764 or 811.

[5] **If your utility is above ground in any way, you must mark your utility with a fluorescent colored marker that corresponds with the universal OUPS color code. The marker must be no shorter than six feet in height and you must maintain the marker. Guide wires must be marked a fluorescent yellow. Failure to do so will result in no reimbursement for damage to your property.**

[6] All work requiring men or vehicles within ODOT right of way shall comply with all applicable requirements of the Ohio Manual of Traffic Control Devices and Item 614 (Maintaining Traffic) of the Construction and Material Specifications, latest editions. Failure to comply with these requirements will be cause for immediate revocation or suspension of the permit until the proper traffic control devices have been provided.

[7] The permittee accepts the conditions, terms, and requirements printed, written on, or attached to this permit and understands that failure to comply fully with those conditions, terms, and requirements or any change in the use of the permit inconsistent with its terms and conditions will be considered a violation and cause for suspension, revocation, or annulment of the permit thereby rendering the permit illegal and subject to appropriate Department action, up to an including removal of the installation at the permittee's expense.

[8] Performance Bond Required? Yes No Company _____
Effective Date _____ Expiration Date _____ Amount \$ _____

[9] This permit shall be void if the work described herein does not comply with the conditions, terms, and requirements applicable to this permit, and if the work is not completed by 08/31/2021

Dated 03/02/2021

Rev 8/3/2020

(See Other Side)

**General Provisions Applicable to All Permits
(Sections 5515.01 and 5515.02 of O.R.C.)**

- [1] This permit is not a substitute for satisfying the rights or obligations of any other party who may have an interest in the underlying fee interest.
- [2] The granting of this permit does not convey to the permittee or to the property served any rights, title, or interest in state highway rights of way or in the design or operation of the state highway; or in any way abridge the right of the Director of the Department of Transportation in his jurisdiction over state highways. If, in the process of any future work or for the benefit of the traveling public, it becomes necessary, in the opinion of the Director of Transportation to order the removal, reconstruction, relocation, or repair of any of the fixtures, or work performed under this permit, said removal, reconstruction, relocation, or repair shall be wholly at the expense of the owners thereof or the permittee and be made as directed by the Director of Transportation. Such changes in the state highway design or operation, necessary for improved safety and operation or for the benefit of the traveling public, shall not require a permit modification since the permit confers no private rights to the permittee over the control of the state highway.
- [3] The District Deputy Director acts for and on behalf of the Director in issuing and carrying out the provisions of all permits. The District Deputy Director has full authority to ensure that all provisions of the permit are met and to reject any materials, design, and workmanship that do not meet applicable Department standards. The District Deputy Director, at his/her discretion, may require a performance bond or certified check as a prerequisite to the issuance of a permit.
- [4] Failure on the part of the permittee to comply fully with the provisions and conditions of the permit will be cause for suspension, revocation, or annulment of the permit thereby rendering the permit illegal and subject to appropriate Departmental action. By accepting the permit, the permittee agrees to comply with all conditions, terms, and restrictions printed or written on or attached to the permit. If the permittee performs any work contrary to the conditions of the permit or to the instructions of the District Deputy Director and, after due notice, fails to correct the problem, the Department of Transportation may, with or without notice, correct such work and the permittee shall reimburse the Department for the costs.
- [5] The permittee shall indemnify and hold harmless the State of Ohio, Department of Transportation, its officers, representatives and assigns, from any and all loss, liability, damages, litigation costs, and claims for injury or death to any person, property, or business caused by or resulting from any act, omission, event, consequence, or occurrence, negligent or otherwise of the permittee, his employees, or assigns as a result of the issuance of this permit.
- [6] All work authorized under the permit shall be performed to the Department's satisfaction, and the entire expense shall be borne by the permittee. No work shall be performed until the permittee has contacted the Department's appointed representative named on the permit and received instructions. The Department's representative may inspect all work covered by the permit, or the Department reserves the right, during the time any or all of the work is being performed, to appoint an inspector over the work who shall represent the interest of the State on the work and any compensation arranged for shall be paid wholly by the permit holder. Work not in compliance shall be halted and the District Deputy Director shall be notified of the cause. The permittee shall be notified of the Department's action and its causes, and given an opportunity to correct the problem.
- [7] Failure to complete all work within the time specified on the permit shall void the permit, thereby making the permit illegal and subject to appropriate Departmental action. The permittee may request an extension in writing from the District Office, explaining why the extension is necessary and when the work is expected to be completed.
- [8] All work infringing on the pavement or shoulders shall comply with applicable standards and requirements regarding traffic control devices. Failure to comply will be cause for revocation or suspension of the permit. Any closure of lanes or shoulders shall be described in terms of location, duration, time of day, etc. Such work shall not begin until all traffic control devices are in place.
- [9] If any grading, sidewalk, or other work allowed by a permit interferes with the drainage of the highway in any way, such catch basins and outlets as necessary shall be constructed to take proper care of said drainage.

[10] Upon completion of the work, the permittee shall leave the highway clean of all rubbish, excess materials, temporary structures and equipment, and all parts of the highway shall be left in a condition acceptable to the Department. Upon satisfactory completion of the work authorized by the permit, the Department's appointed representative shall complete the Permit Inspection Certificate, Form No. MR 678 certifying that the permittee has complied with the terms of the permit.

[11] Except as herein authorized, no excavation shall be made or obstacle placed within the limits of the highway so as to interfere with the travel over the road.

[12] All pole lines are to be built in accordance with Rule 4901:3-1-08 of Ohio Administrative Code promulgated and enforced by the Public Utilities Commission of Ohio.

[13] The permittee shall comply with the Air Pollution requirements of Rule 3745-17-08 of the Ohio Administrative Code promulgated and enforced by the Ohio Environmental Protection Agency.

[14] The permittee certifies that he or she is fully authorized to sign this permit. This permit shall apply to and be binding upon the permittee and his/her successors in interest. No change in ownership of the underlying property or of the facility owned by permittee shall in any way alter the permittee's obligations under this permit.

[15] The permittee(s) for herself/himself/themselves/itself, her/his/their/its personal representatives, and her/his/their/its successors in interest and assigns, as a part of the consideration hereof, do/does hereby covenant and agree that:

(1) No person on the grounds of race, color, national origin, sex, age, or disability shall be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination in the use of the above described property.

(2) In the construction of any improvements on, over, or under the above described property and the furnishing of services thereon, no person on the grounds of race, color, national origin, sex, age, or disability shall be excluded from the participation in, be denied the benefits of, or be otherwise subjected to discrimination.

(3) The above described property shall be used in a manner that at all times is in compliance with all other requirements imposed by or pursuant to Title 49, Code of Federal Regulations, U.S. DOT, Subtitle A, Office of the Secretary, Part 21, Non-discrimination in Federally-assisted programs of the U.S. DOT — Effectuation of Title VI of the Civil Rights Act of 1964, and as said Regulations may be amended.

(4) In the event that this instrument grants a lease, license, or permit and any of the above non-discrimination covenants is breached, then the State of Ohio, Department of Transportation, shall have the unfettered right to terminate the lease, license or permit and to re-enter and repossess the above-described property and hold the same as if said lease, license or permit had never been made or issued.

(5) In the event that this instrument grants a fee or easement interest and any of the above non-discrimination covenants is breached, the State of Ohio, Department of Transportation, shall have the unfettered right to re-enter the above described property, and said property will thereupon revert to and vest in and become the absolute property of the State of Ohio and its successors and assigns for the use and benefit of the Department of Transportation.

(6) In the event that this instrument grants a lease, fee or easement interest, all of the foregoing non-discrimination covenants shall be and are covenants running with the land.

This permit is granted subject to the following attached conditions:

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION
Supplemental Specifications

PERMIT 21-11127

To bore under IR 77 to install a 6" force main in 12" steel encasement in Summit County at location and offsets as shown on plans

1. **The ODOT Intelligent Transportation System (ITS) Infrastructure and devices are not currently listed in the Ohio Utility Protection Services (OUPS) program. Please send a copy of the OUPS ticket or locate request to the ODOT ITS Section via email to CEN.ITS.LAB@dot.ohio.gov, in order to get the ITS utility infrastructure marked.**
2. If the depth of any excavation is deeper than the distance from edge of the SR 303 pavement to the roadside face of excavation, sheeting shall be shall be driven into place and bracing used, unless strong box or equivalent is used as per ODOT specifications.
3. If sheeting is used, sheeting shall be left in place and shall be cut off at least 2 foot below the proposed finished surface or subgrade in paved areas.
4. If strong box is used, the following conditions shall apply:
 - a. All excavations must be made from within the walls of the strong box.
 - b. At no time shall trench remain open without support of strong box.
 - c. Strong box must be installed as per driving method.
5. Concrete barrier shall be used at the bore and receiving pit excavations and shall comply with ODOT Standard Drawing MT 95.41.
6. Traffic shall be maintained according to the Ohio Manual of Uniform Traffic Control Devices. Traffic shall be maintained at all times. Work zones shall be limited as not to impede the traveling public.
7. All excavations shall be backfilled with suitable material and compacted to ODOT specifications.
8. Care must be taken not to disturb other utilities.
9. Any reconstruction of ODOT facilities shall meet the requirements of the current ODOT Construction and Material Specifications Manual and Standard Drawing.
10. No field changes permitted without prior ODOT approval.
11. ODOT shall have jurisdiction over any work in the ODOT right of way and has the authority to suspend any work for non-compliance of permit.
12. If any problems occur during the construction of this facility, all work must stop and ODOT notified immediately at (330) 786-4840.
13. Maintain positive drainage.
14. No storage of equipment or materials within the ODOT right of way shall be permitted at any time.
15. No stringing of pipe within the ODOT right of way shall be permitted.
16. No surface discharge of any liquids within the ODOT right of way shall be permitted.

PERMIT 21-11127

17. Traffic shall be maintained at all times. Work zones shall be limited as not to impede the traveling public; road closures shall not be permitted.
18. All disturbed right of way shall be restored to its original condition or better and seed and mulched as per Item #659, ODOT Specification.
19. Any non-metallic pipe installed underground, inside the ODOT right of way, must be equipped with tracer wire.
20. An Ohio EPA Section 401 Water Quality Certification, U.S. Army Corps of Engineers Section 404 Waterway Permit and/or a NPDES Permit may be required for the proposed work. The permittee shall contact the appropriate agencies and obtain any necessary permits for this work.
21. Except as authorized under the permit, no excavation shall be made, or obstacles placed within the limits of the highway in such a manner as to interfere with travel over the road.
22. If grading or other work done under the permit interferes with the drainage of the highway in any manner, catch basins and outlets shall be constructed to properly handle the highway drainage.
23. All the work contemplated under the permit shall be done under the supervision and to the satisfaction of ODOT and the entire expense shall be borne by the party to whom the permit is issued.
24. Upon completion of the work under the permit, the highway is to be left clear of all rubbish, excess materials, temporary structures or equipment.
25. The permit applicant will abide by current State and/or local laws pertaining to storm water pollution prevention and/or erosion control.
26. The right is reserved by the Department to appoint an inspector who shall represent the interests of the State during the installation of the facility. Any compensation arranged for such inspection service shall be paid wholly by the permit holder.
27. Prior to any excavation in the highway right of way, the permit holder must contact the Ohio Utilities Protection Service (OUPS) and the Oil and Gas Producers Underground Protection Service (OGPUPS) and request all existing underground utility facilities be marked.
28. The acceptance of a permit, or the performance of any work under the permit, constitutes an agreement between ODOT and the party to whom the permit is granted. Compliance with all conditions and restrictions included with the permit is mandatory.
29. **If your utility is above ground in any way, you must mark your utility with a fluorescent colored marker that corresponds with the universal OUPS color code. The marker must be no shorter than six feet in height and you must maintain the marker. Guide wires must be marked a fluorescent yellow. Failure to do so will result in no reimbursement for damage to your property.**

The provisions and conditions as outlined in this permit shall be applicable to the work to be done under this permit, including maintaining traffic and the use of barricades with lights for the safety of the traveling public, according to the requirements set forth in the Ohio Manual of Uniform Traffic Control Devices, unless otherwise herein stipulated. This work to be performed at no cost to the State of Ohio. This permit is not a substitute for satisfying the rights of any other party that may have an interest in the underlying fee.

MR 509
Permit No. PERMIT 21-11134

Office Use Only

State of Ohio
Department of Transportation
Permit

County or Jurisdiction SUM
Rte SR303
Log Pt 3.066-3.455
Acc Cat

[1] Subject to all terms, conditions, and restrictions printed, written below and on the reverse side hereof, or attached,

Name: Village of Richfield
Address: 4410 W Streetsboro Road Richfield OH 44286
Company Phone: 330 659-9201

is hereby granted a permit under Section 5515.01 and 5515.02 of Ohio Revised Code, and permission to perform work necessary in the manner described and at the location indicated in the following or attached to this permit.

Utility - (see attached sheet)

Description of Work:

[2] This permit shall be in the possession of employees on site at all times who are in charge of the work and shall be shown, upon request, to any employee of the Department of Transportation.

Contact ODOT Representative 3 days before work begins, also contact ODOT Representative when work is completed for final inspection. **Failure to notify the ODOT Representative could result in work stoppage!**

[3] No work authorized by this permit shall begin until the permittee has contacted and received instructions from

Frank Phillips
330-786-4907
Email Address: Frank.Phillips@dot.ohio.gov
(Authorized ODOT Employee)

NOTE: Any work performed by the permittee may be stopped if this requirement is not met.

[4] Prior to any excavation in the highway right-of-way, the Ohio811, <https://www.oups.org/excavators> must be contacted in accordance with ORC Section 3781.25 to 3781.32. Ohio811 can be reached at 1-800-362-2764 or 811.

[5] If your utility is above ground in any way, you must mark your utility with a fluorescent colored marker that corresponds with the universal OUPS color code. The marker must be no shorter than six feet in height and you must maintain the marker. Guide wires must be marked a fluorescent yellow. Failure to do so will result in no reimbursement for damage to your property.

[6] All work requiring men or vehicles within ODOT right of way shall comply with all applicable requirements of the Ohio Manual of Traffic Control Devices and Item 614 (Maintaining Traffic) of the Construction and Material Specifications, latest editions. Failure to comply with these requirements will be cause for immediate revocation or suspension of the permit until the proper traffic control devices have been provided.

[7] The permittee accepts the conditions, terms, and requirements printed, written on, or attached to this permit and understands that failure to comply fully with those conditions, terms, and requirements or any change in the use of the permit inconsistent with its terms and conditions will be considered a violation and cause for suspension, revocation, or annulment of the permit thereby rendering the permit illegal and subject to appropriate Department action, up to an including removal of the installation at the permittee's expense.

[8] Performance Bond Required? Yes No Company _____
Effective Date _____ Expiration Date _____ Amount \$ _____

[9] This permit shall be void if the work described herein does not comply with the conditions, terms, and requirements applicable to this permit, and if the work is not completed by 10/31/2021

Dated 04/19/2021

Rev 8/3/2020

(See Other Side)

**General Provisions Applicable to All Permits
(Sections 5515.01 and 5515.02 of O.R.C.)**

- [1] This permit is not a substitute for satisfying the rights or obligations of any other party who may have an interest in the underlying fee interest.
- [2] The granting of this permit does not convey to the permittee or to the property served any rights, title, or interest in state highway rights of way or in the design or operation of the state highway; or in any way abridge the right of the Director of the Department of Transportation in his jurisdiction over state highways. If, in the process of any future work or for the benefit of the traveling public, it becomes necessary, in the opinion of the Director of Transportation to order the removal, reconstruction, relocation, or repair of any of the fixtures, or work performed under this permit, said removal, reconstruction, relocation, or repair shall be wholly at the expense of the owners thereof or the permittee and be made as directed by the Director of Transportation. Such changes in the state highway design or operation, necessary for improved safety and operation or for the benefit of the traveling public, shall not require a permit modification since the permit confers no private rights to the permittee over the control of the state highway.
- [3] The District Deputy Director acts for and on behalf of the Director in issuing and carrying out the provisions of all permits. The District Deputy Director has full authority to ensure that all provisions of the permit are met and to reject any materials, design, and workmanship that do not meet applicable Department standards. The District Deputy Director, at his/her discretion, may require a performance bond or certified check as a prerequisite to the issuance of a permit.
- [4] Failure on the part of the permittee to comply fully with the provisions and conditions of the permit will be cause for suspension, revocation, or annulment of the permit thereby rendering the permit illegal and subject to appropriate Departmental action. By accepting the permit, the permittee agrees to comply with all conditions, terms, and restrictions printed or written on or attached to the permit. If the permittee performs any work contrary to the conditions of the permit or to the instructions of the District Deputy Director and, after due notice, fails to correct the problem, the Department of Transportation may, with or without notice, correct such work and the permittee shall reimburse the Department for the costs.
- [5] The permittee shall indemnify and hold harmless the State of Ohio, Department of Transportation, its officers, representatives and assigns, from any and all loss, liability, damages, litigation costs, and claims for injury or death to any person, property, or business caused by or resulting from any act, omission, event, consequence, or occurrence, negligent or otherwise of the permittee, his employees, or assigns as a result of the issuance of this permit.
- [6] All work authorized under the permit shall be performed to the Department's satisfaction, and the entire expense shall be borne by the permittee. No work shall be performed until the permittee has contacted the Department's appointed representative named on the permit and received instructions. The Department's representative may inspect all work covered by the permit, or the Department reserves the right, during the time any or all of the work is being performed, to appoint an inspector over the work who shall represent the interest of the State on the work and any compensation arranged for shall be paid wholly by the permit holder. Work not in compliance shall be halted and the District Deputy Director shall be notified of the cause. The permittee shall be notified of the Department's action and its causes, and given an opportunity to correct the problem.
- [7] Failure to complete all work within the time specified on the permit shall void the permit, thereby making the permit illegal and subject to appropriate Departmental action. The permittee may request an extension in writing from the District Office, explaining why the extension is necessary and when the work is expected to be completed.
- [8] All work infringing on the pavement or shoulders shall comply with applicable standards and requirements regarding traffic control devices. Failure to comply will be cause for revocation or suspension of the permit. Any closure of lanes or shoulders shall be described in terms of location, duration, time of day, etc. Such work shall not begin until all traffic control devices are in place.
- [9] If any grading, sidewalk, or other work allowed by a permit interferes with the drainage of the highway in any way, such catch basins and outlets as necessary shall be constructed to take proper care of said drainage.

[10] Upon completion of the work, the permittee shall leave the highway clean of all rubbish, excess materials, temporary structures and equipment, and all parts of the highway shall be left in a condition acceptable to the Department. Upon satisfactory completion of the work authorized by the permit, the Department's appointed representative shall complete the Permit Inspection Certificate, Form No. MR 678 certifying that the permittee has complied with the terms of the permit.

[11] Except as herein authorized, no excavation shall be made or obstacle placed within the limits of the highway so as to interfere with the travel over the road.

[12] All pole lines are to be built in accordance with Rule 4901:3-1-08 of Ohio Administrative Code promulgated and enforced by the Public Utilities Commission of Ohio.

[13] The permittee shall comply with the Air Pollution requirements of Rule 3745-17-08 of the Ohio Administrative Code promulgated and enforced by the Ohio Environmental Protection Agency.

[14] The permittee certifies that he or she is fully authorized to sign this permit. This permit shall apply to and be binding upon the permittee and his/her successors in interest. No change in ownership of the underlying property or of the facility owned by permittee shall in any way alter the permittee's obligations under this permit.

[15] The permittee(s) for herself/himself/themselves/itself, her/his/their/its personal representatives, and her/his/their/its successors in interest and assigns, as a part of the consideration hereof, do/does hereby covenant and agree that:

(1) No person on the grounds of race, color, national origin, sex, age, or disability shall be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination in the use of the above described property.

(2) In the construction of any improvements on, over, or under the above described property and the furnishing of services thereon, no person on the grounds of race, color, national origin, sex, age, or disability shall be excluded from the participation in, be denied the benefits of, or be otherwise subjected to discrimination.

(3) The above described property shall be used in a manner that at all times is in compliance with all other requirements imposed by or pursuant to Title 49, Code of Federal Regulations, U.S. DOT, Subtitle A, Office of the Secretary, Part 21, Non-discrimination in Federally-assisted programs of the U.S. DOT — Effectuation of Title VI of the Civil Rights Act of 1964, and as said Regulations may be amended.

(4) In the event that this instrument grants a lease, license, or permit and any of the above non-discrimination covenants is breached, then the State of Ohio, Department of Transportation, shall have the unfettered right to terminate the lease, license or permit and to re-enter and repossess the above-described property and hold the same as if said lease, license or permit had never been made or issued.

(5) In the event that this instrument grants a fee or easement interest and any of the above non-discrimination covenants is breached, the State of Ohio, Department of Transportation, shall have the unfettered right to re-enter the above described property, and said property will thereupon revert to and vest in and become the absolute property of the State of Ohio and its successors and assigns for the use and benefit of the Department of Transportation.

(6) In the event that this instrument grants a lease, fee or easement interest, all of the foregoing non-discrimination covenants shall be and are covenants running with the land.

This permit is granted subject to the following attached conditions:

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION
Supplemental Specifications

PERMIT 21-11134
Village of Richfield

To bore under SR 303 and install approximately 75 ft. of 12-inch diameter steel casing and install a 6-inch sanitary carrier pipe in Summit County at location, offsets and depth as shown on plans. To install a 6-inch diameter sanitary sewer force main along SR 303 from milepost 3.066 to milepost 3.455 in Summit County at location, offsets, and depth as shown on plans. **This permit only applies to the work along SR 303 within the mileposts referenced above. The remainder of the work along SR 303 is in the Village of Richfield and the Village of Richfield should be contacted for any permitting for that work.**

1. **The ODOT Intelligent Transportation System (ITS) Infrastructure and devices are not currently listed in the Ohio Utility Protection Services (OUPS) program. Please send a copy of the OUPS ticket or locate request to the ODOT ITS Section via email to CEN.ITS.LAB@dot.ohio.gov, in order to get the ITS utility infrastructure marked.**
2. **Open cutting of the State Route pavement will not be permitted.**
3. All pits (Bore/Receiving/Service, Etc.) are to be placed as far as possible from the edge of pavement and shall not be any closer than a distance equal to one time the depth of the pit (1:1).
4. If the depth of any excavation is deeper than the distance from edge of the SR 303 pavement to the roadside face of excavation, sheeting shall be driven into place and bracing used, unless strong box or equivalent is used as per ODOT specifications.
5. If sheeting is used, sheeting shall be left in place and shall be cut off at least 2 feet below the proposed finished surface or subgrade in paved areas.
6. If strong box is used, the following conditions shall apply:
 - a. All excavations must be made from within the walls of the strong box.
 - b. At no time shall trench remain open without support of strong box.
 - c. Strong box must be installed as per driving method.
7. Traffic shall be maintained according to the Ohio Manual of Uniform Traffic Control Devices. Traffic shall be maintained at all times. Work zones shall be limited as not to impede the traveling public. Road closures shall not be permitted.
8. Care must be taken not to disturb other utilities.
9. Any reconstruction of ODOT facilities shall meet the requirements of the current ODOT Construction and Material Specifications Manual and Standard Drawings.
10. All excavations within the ODOT right of way shall be backfilled with suitable material and compacted to ODOT specifications.
11. Portable concrete barrier used to protect bore and receiving pit excavations shall follow Standard Construction Drawing MT 95.41 requirements for end treatments and flare rates.
12. Mounding of dirt over trenches/excavations will not be permitted. Preliminary cleanup will be required while working and unsuitable material hauled away.
13. In case work must be suspended because of inclement weather or other reason, the trench shall be backfilled to within 3 inches of the surrounding surfaces.

PERMIT 21-11134
Village of Richfield

14. If any problems occur during the installation of this facility all work must stop and ODOT notified immediately at (330) 786-4840.
15. Maintain positive drainage.
16. No field changes permitted without prior ODOT approval.
17. ODOT shall have jurisdiction over any work in the ODOT right of way and has the authority to suspend any work for noncompliance of permit.
18. All trenched drive approaches shall be backfilled with granular material compacted to ODOT specifications. Surface shall be replaced in kind.
19. Provisions shall be made to allow for ingress and egress for all adjoining property owners.
20. Provisions shall also be made for pedestrian access through the work areas, e.g. Temporary Aggregate Walks, etc. Also, temporary fencing to keep pedestrians out of the areas of excavation shall be provided.
21. After each day's work the pavement shall be cleaned and scraped with equipment and broomed with tractor broom.
22. Uniformed police officers shall be on duty during contractors working hours to assist in the control of traffic when necessary or as directed by ODOT.
23. No storage of equipment or materials within the ODOT right of way shall be permitted at any time.
24. No stringing of pipe within the ODOT right of way shall be permitted.
25. No surface discharge of any liquids within the ODOT right of way shall be permitted.
26. All disturbed right of way shall be restored to its original condition or better and seed and mulched as per Item #659., ODOT specifications.
27. Copy of permit must be on construction site at all times during work hours.
28. Except as authorized under the permit, no excavation shall be made, or obstacles placed within the limits of the highway in such a manner as to interfere with travel over the road.
29. If grading or other work done under the permit interferes with the drainage of the highway in any manner, catch basins and outlets shall be constructed to properly handle the highway drainage.
30. All the work contemplated under the permit shall be done under the supervision and to the satisfaction of ODOT and the entire expense shall be borne by the party to whom the permit is issued.
31. Upon completion of the work under the permit, the highway is to be left clear of all rubbish, excess materials, temporary structures or equipment.
32. The permit applicant will abide by current State and/or local laws pertaining to storm water pollution prevention and/or erosion control.
33. The right is reserved by the Department to appoint an inspector who shall represent the interests of the State during the installation of the facility. Any compensation arranged for such inspection service shall be paid wholly by the permit holder.

PERMIT 21-11134
Village of Richfield

34. Prior to any excavation in the highway right of way, the permit holder must contact the Ohio Utilities Protection Service (OUPS) and the Oil and Gas Producers Underground Protection Service (OGPUPS) and request all existing underground utility facilities be marked.
35. The acceptance of a permit, or the performance of any work under the permit, constitutes an agreement between ODOT and the party to whom the permit is granted. Compliance with all conditions and restrictions included with the permit is mandatory.

The provisions and conditions as outlined in this permit shall be applicable to the work to be done under this permit, including maintaining traffic and the use of barricades with lights for the safety of the traveling public, according to the requirements set forth in the Ohio Manual of Uniform Traffic Control Devices, unless otherwise herein stipulated. This work to be performed at no cost to the State of Ohio. This permit is not a substitute for satisfying the rights of any other party that may have an interest in the underlying fee.



EXISTING STRUCTURES

— — — — —	SEWERS	+	STREET SIGN
— — — — —	WATER MAINS	+	STOP SIGN
— — — — —	GAS	+	FENCE LINE
— — — — —	BURIED TELEPHONE LINES	+	MONUMENT
— — — — —	BURIED ELECTRICAL LINES	+	PROPERTY PIN (IRON PIN FOUND)
⊙	MANHOLE	⊙	MAILBOX
⊙	CATCH BASIN	⊙	PKSET
⊙	CURB INLET	⊙	CENTER LINE
⊙	WATER CURB STOP & BOX	⊙	BASELINE & STATION
⊙	MAIN LINE GAS VALVE	⊙	R/W LINE
⊙	WATER MAIN VALVE & VALVE BOX	⊙	STUMP
⊙	WATER HYDRANT	⊙	HEDGE ROW
⊙	WATER METER	⊙	TREES
⊙	GAS METER	⊙	TREES (TO BE REMOVED)
⊙	TELEPHONE POLE	⊙	EVERGREENS
⊙	POWER POLE & GUY WIRE	⊙	SHRUBS & BUSHES
⊙	LIGHT POLE	⊙	TEST BORE
		⊙	HEADWALL

PROPOSED STRUCTURES

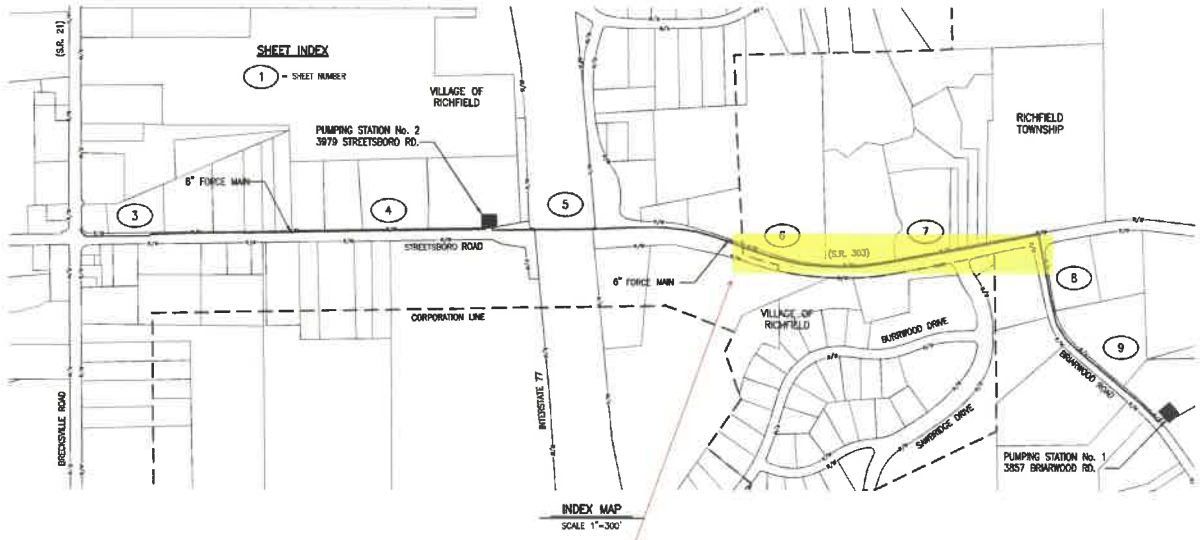
— — — — —	WATER MAIN
⊙	MANHOLE
⊙	CATCH BASIN
⊙	PLUG
⊙	SILT FENCE
⊙	PIPAP (1/4" THICK)

ABBREVIATIONS

BLDG	BUILDING
BL	BASELINE
BM	BENCHMARK
CL	CENTERLINE
CI	CURB INLET
COMM	COMMUNICATION
CPP	CONTROL
DIP	DUCTILE IRON PIPE
DR	DIMENSION RATIO
ELEC	ELECTRIC
EL	ELEVATION
FM	FORCE MAIN
HDPE	HIGH DENSITY POLYETHYLENE
HORIZ	HORIZONTAL
ID	INSIDE DIAMETER
LF	LINEAL FEET
LT	LEFT
MH	MANHOLE
RJ	RESTRAINED JOINTS
RT	RIGHT
RCP	REINFORCED CONCRETE PIPE
SM	SANITARY
STL	STEEL
STM	STORM
SM	SANITARY
VCP	VITRIFIED CLAY PIPE
VERT	VERTICAL
WAT	WATER
WM	WATER MAIN

GENERAL NOTES

1. MAXIMUM DIP FORCE MAIN DEFLECTION SHALL NOT EXCEED 3 DEGREES.
2. NATURAL GAS SERVICES ARE TO BE EXPECTED AT EACH PARCEL. CONTRACTOR SHALL LOCATE AND AVOID DISTURBANCE. ANY DAMAGE TO THESE CONNECTIONS SHALL BE REPAIRED TO THE FULL SATISFACTION OF THE OWNER UTILITY AT THE EXPENSE OF THE CONTRACTOR.
3. ROOF DRAINS AND OTHER CLEAN WATER CONNECTIONS TO SANITARY SEWERS ARE PROHIBITED.
4. WATER SERVICE CONNECTIONS ARE TO BE EXPECTED AT PARCELS WITH WATER MAINS IN RIGHT OF WAY. CONTRACTOR SHALL LOCATE AND AVOID DISTURBANCE. ANY DAMAGE TO THE WATER SERVICE CONNECTION SHALL REQUIRE COMPLETE REPLACEMENT FROM WATER MAIN TO CURB STOP. ALL WORK SHALL BE AS APPROVED AND IN ACCORDANCE WITH THE REQUIREMENTS OF THE CITY OF CLEVELAND, DIVISION OF WATER. ALL REPAIRS AND COSTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.



INDEX MAP
SCALE 1"=300'

INDEX

1. RICCV001 COVER SHEET
 2. RICND001 SHEET INDEX AND NOTES
- STREETSBORO ROAD**
3. RICUS001 6" FM STA 00+00 TO 10+00
 4. RICUS002 6" FM STA 10+00 TO 21+00
 5. RICUS003 6" FM STA 21+00 TO 32+00
 6. RICUS004 6" FM STA 32+00 TO 43+00
 7. RICUS005 6" FM STA 43+00 TO 52+00
- BARRWOOD ROAD**
8. RICUS006 6" FM STA 0+00 TO 8+00
 9. RICUS007 6" FM STA 6+00 TO 12+00
- PUMPING STATION AND DETAILS**
10. RICSP001 PUMPING STATION No. 1 SITE PLAN
 11. RICRW001 PUMPING STATION No. 1 RETAINING WALL DETAILS
 12. RICSP002 PUMPING STATION No. 2 SITE PLAN
 13. RICPD001 PUMPING STATION DETAILS
 14. RICMD001 MANHOLE AND AIR RELEASE DETAILS
 15. RICMD002 MISCELLANEOUS DETAILS
- ELECTRICAL**
16. RICSL001 ELECTRICAL SYMBOL LEGEND AND NOTES
 17. RICSP001 PUMPING STATION No. 1 SITE PLAN
 18. RICSP002 PUMPING STATION No. 2 SITE PLAN
 19. RICPE001 PUMPING STATION No. 1 AND No. 2 ELECTRICAL PLANS
 20. RICOLE001 ONE LINE DIAGRAMS
 21. RICDTE001 ELECTRICAL DETAILS
 22. RICDTE002 ELECTRICAL DETAILS
 23. RICDCE001 CONDUIT AND CABLE SCHEDULE

SURVEY DATUM
NA83 OHIO STATE PLANES, NORTH ZONE, US FOOT

Date/Time : Thu, 04 Feb 2021 : 2:50pm
 Path/Name : C:\Projects\CL001055.B004\Drawings\INDEX.dwg
 © 2008 ARCADIS U.S., Inc.

		SCALE	SCALE				BRIARWOOD AREA WASTEWATER PUMPING STATION IMPROVEMENTS RICHFIELD, OHIO	PROJECT MANAGER S. ABOUABDALLAH	LEAD DESIGN PROF. M. CARLIO	CHECKED BY S. ABOUABDALLAH	DRAWN BY M. CARLIO	
								SHEET TITLE SHEET INDEX AND NOTES				
												PROJECT NUMBER CL001055.B004
												DRAWING NUMBER RICIN001
												SHEET 2 OF 23

Notes for Figure 6H-3—Typical Application 3
Work on the Shoulders

Guidance:

1. *A SHOULDER WORK sign should be placed on the left side of the roadway for a divided or one-way street only if the left shoulder is affected.*

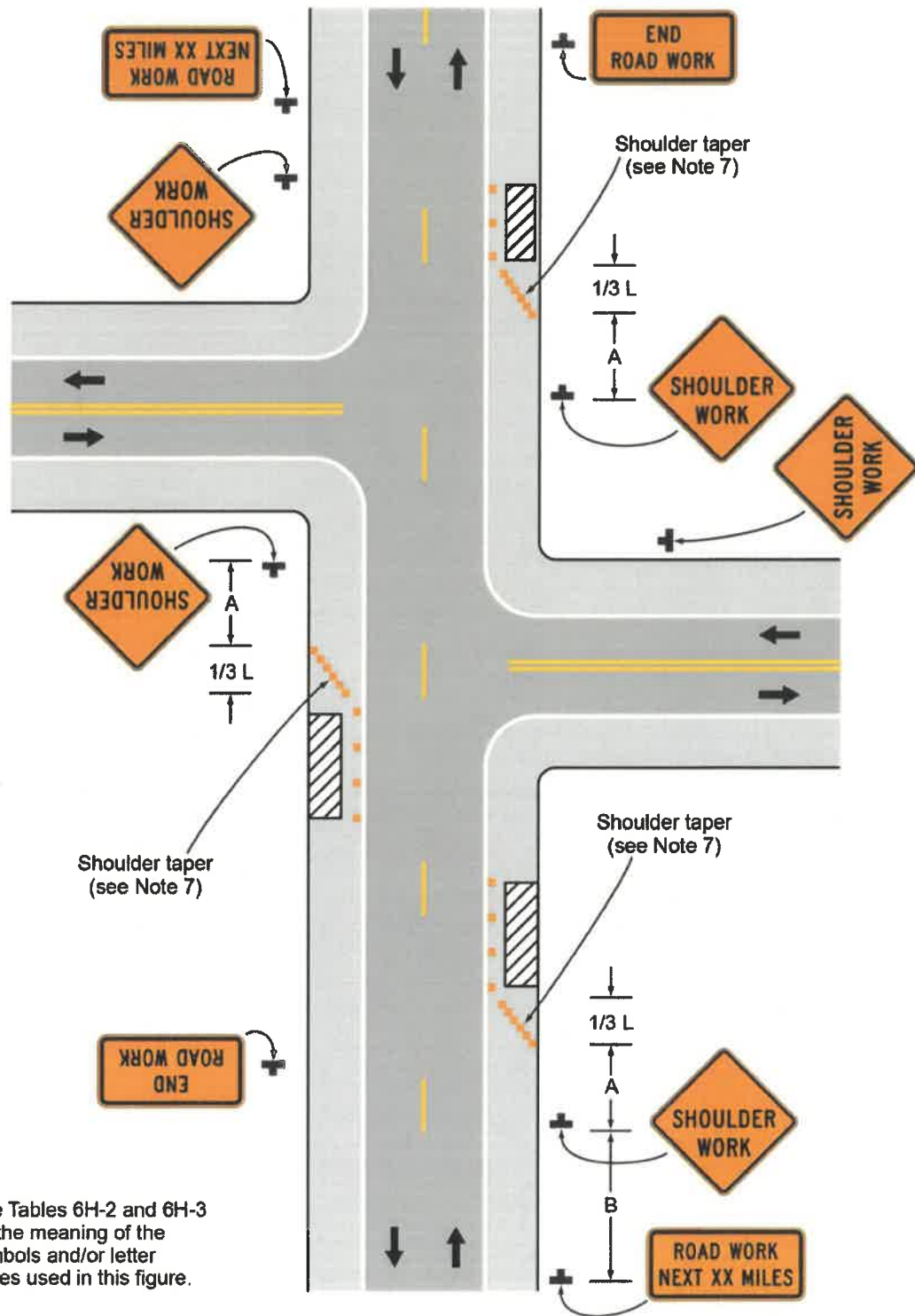
Option:

2. The Workers symbol signs may be used instead of SHOULDER WORK signs.
3. The SHOULDER WORK AHEAD sign on an intersecting roadway may be omitted where drivers emerging from that roadway will encounter another advance warning sign prior to this activity area.
4. For short-duration operations of 60 minutes or less, all signs and channelizing devices may be eliminated if a vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.
5. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

6. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**
7. **When paved shoulders having a width of 8 feet or more are closed, at least one advance warning sign shall be used. In addition, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the work space and direct vehicular traffic to remain within the traveled way.**

Figure 6H-3. Work on the Shoulders (TA-3)



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 3

Notes for Figure 6H-10—Typical Application 10
Lane Closure on a Two-Lane Road Using Flaggers

Option:

1. For low-volume situations with short work zones on straight roadways where the flagger is visible to road users approaching from both directions, a single flagger, positioned to be visible to road users approaching from both directions, may be used (see Chapter 6E).
2. The ROAD WORK AHEAD and the END ROAD WORK signs may be omitted for short-duration operations.
3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:

4. *The buffer space should be extended so that the two-way traffic taper is placed before a horizontal (or crest vertical) curve to provide adequate sight distance for the flagger and a queue of stopped vehicles.*

Standard:

5. **At night, flagger stations shall be illuminated, except in emergencies.**

Guidance:

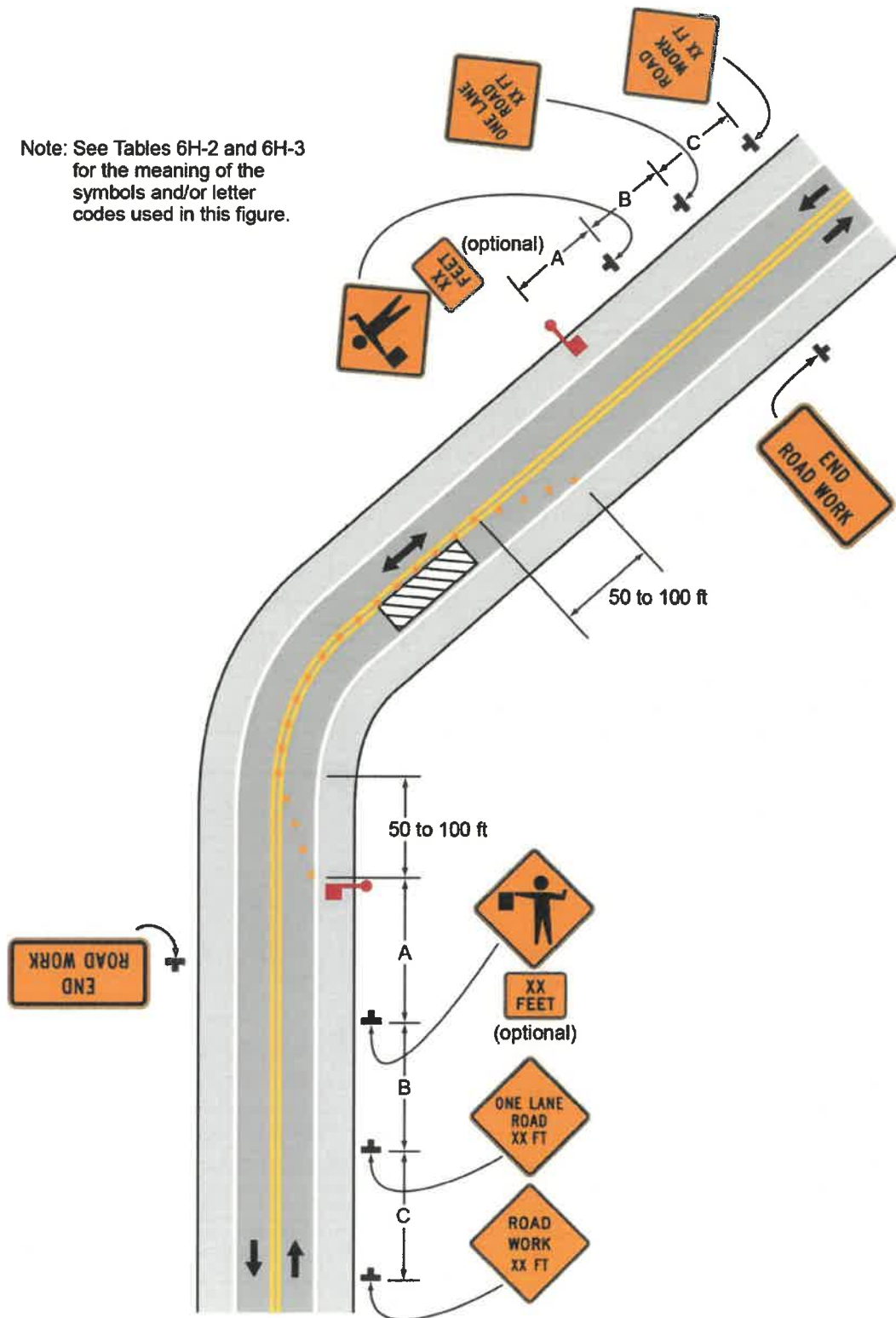
6. *When used, the BE PREPARED TO STOP sign should be located between the Flagger sign and the ONE LANE ROAD sign.*
7. *When a grade crossing exists within or upstream of the transition area and it is anticipated that queues resulting from the lane closure might extend through the grade crossing, the TTC zone should be extended so that the transition area precedes the grade crossing.*
8. *When a grade crossing equipped with active warning devices exists within the activity area, provisions should be made for keeping flaggers informed as to the activation status of these warning devices.*
9. *When a grade crossing exists within the activity area, drivers operating on the left-hand side of the normal center line should be provided with comparable warning devices as for drivers operating on the right-hand side of the normal center line.*
10. *Early coordination with the railroad company or light rail transit agency should occur before work starts.*

Option:

11. A flagger or a uniformed law enforcement officer may be used at the grade crossing to minimize the probability that vehicles are stopped within 15 feet of the grade crossing, measured from both sides of the outside rails.

Figure 6H-10. Lane Closure on a Two-Lane Road Using Flaggers (TA-10)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.



Typical Application 10

Table 6H-2. Meaning of Symbols on Typical Application Diagrams
























	Arrow board		Shadow vehicle
	Arrow board support or trailer (shown facing down)		Sign (shown facing left)
	Changeable message sign or trailer		Surveyor
	Channelizing device		Temporary barrier
	Crash cushion		Temporary barrier with warning light
	Direction of temporary traffic detour		Traffic or pedestrian signal
	Direction of traffic		Truck-mounted attenuator
	Flagger		Type 3 barricade
	High-level warning device (Flag tree)		Warning light
	Longitudinal channelizing device		Work space
	Luminaire		Work Vehicle
	Pavement markings that should be removed for a long-term project		

Table 6H-3. Meaning of Letter Codes on Typical Application Diagrams

Road Type	Distance Between Signs (Feet) **		
	A	B	C
Urban (low speed) *	100	100	100
Urban (high speed) *	350	350	350
Rural	500	500	500
Expressway / Freeway	1,000	1,500	2,640

* Speed category to be determined by highway agency.

** The column headings A, B, and C are the dimensions shown in Figures 6H-1 through 6H-46. The A dimension is the distance from the transition or point of restriction to the first sign. The B dimension is the distance between the first and second signs. The C dimension is the distance between the second and third signs. (The "first sign" is the sign in a three-sign series that is closest to the TTC zone. The "third sign" is the sign that is furthest upstream from the TTC zone.)

Table 6H-4. Formulas for Determining Taper Lengths

Speed (S)	Taper Length (L) in Feet
40 mph or less	$L = \frac{WS^2}{60}$
45 mph or more	$L = WS$

Where: L = taper length in feet
W = width of offset in feet
S = posted speed limit, or off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph

BOND FOR ROAD OPENING PERMIT (5589.31)

KNOW ALL MEN BY THESE PRESENTS, that we _____ as Principal and _____ as Surety are held and firmly bound unto the County of Summit, State of Ohio in the penal sum of \$_____ for payment of which, well and truly to be made, we do bind ourselves, our successors, agents, heirs, executors, and administrators jointly severally and firmly by these presents on this _____ day of _____, 20____.

The condition of this obligation is such that the said Principal has made application to the County of Summit Engineer for a permit to open the road located at _____ for the purpose of _____
_____ for the term beginning on _____ and ending on _____, and whereas the permit is issued pursuant to Revised Code 5589.31:

NOW, THEREFORE, if the said Principal fully observes all of the provisions of the law and the regulations and instructions of the County of Summit and the County of Summit Engineer pertaining to such road opening and closing and if said Principal completes all work to the satisfaction of the County of Summit Engineer within the terms specified in this Bond and if said Principal holds harmless and indemnifies the County of Summit and the County of Summit Engineer from all damages or claims of damages, actions, suits, costs, expenses or liability of whatsoever nature including attorney's fees arising out of or allegedly arising out of the Principal's activities under said permit, then this obligation shall be void; otherwise to be and remain in full force and effect and payable upon demand of the County Engineer. This Bond is not revocable and cannot be cancelled for any reason by Principal or Surety without the express written approval of the County of Summit Engineer.

WITNESS:

Name

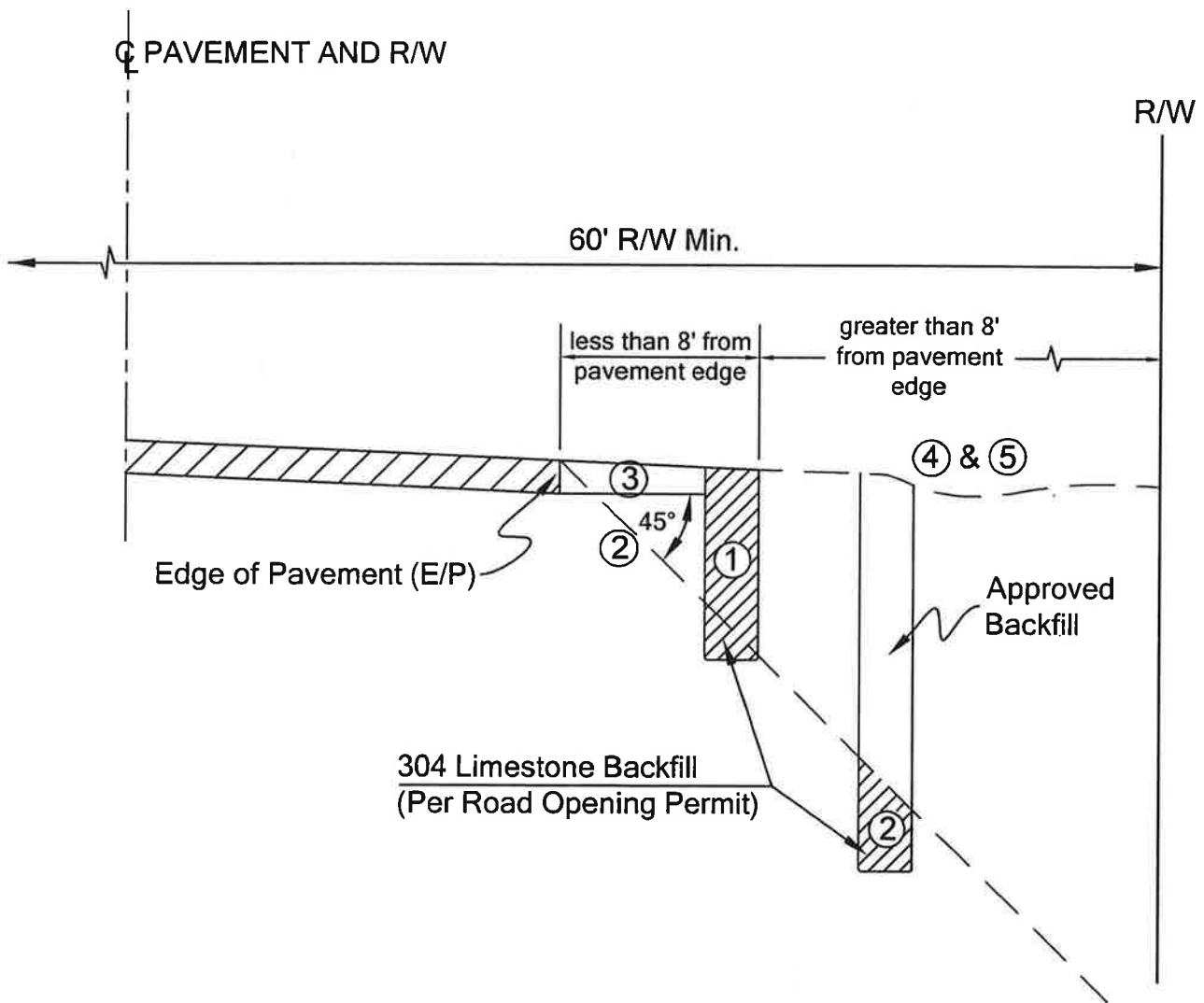
Principal

Address

Name

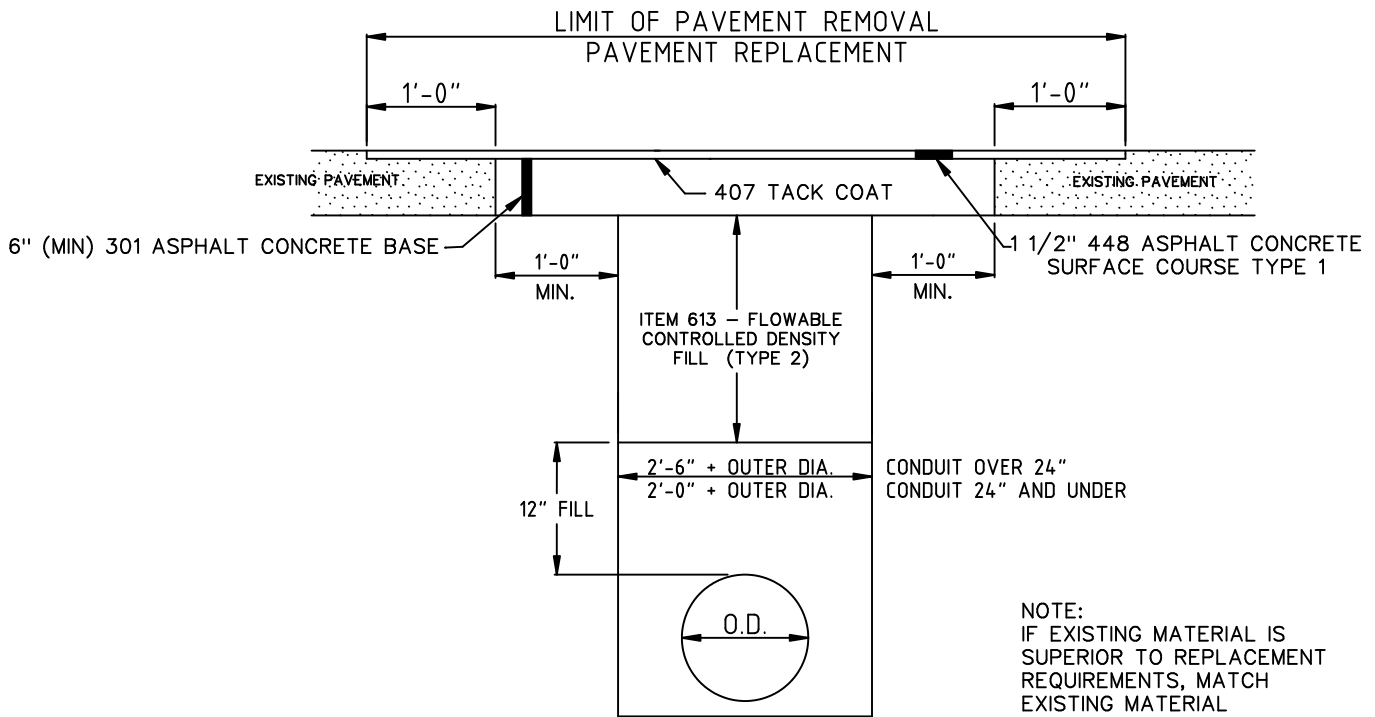
Surety (If Required)

Address



- ① Backfill Requirements for Excavation Within 8 Feet of E/P = All 304 Limestone.
- ② Backfill Requirement For Excavations Greater Than 8 Feet From E/P = 304 Limestone Below A 45° Line Starting At E/P.
- ③ Restore Equipment Damaged Berm To Original Or Better Condition With The Minimum Material Being 304 Limestone.
- ④ Existing Drainage Ditches To Be Maintained and Fully Restored.
- ⑤ ODOT Items 653 And 659 - Topsoil, Seeding And Mulching Of Disturbed Areas.

Summit County Engineer
Road Opening Permit
Backfill and Restoration Requirements



SUMMIT COUNTY PAVEMENT REPLACEMENT STANDARD

SECTION 01011

SUMMARY OF PROJECT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and other Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Project - Work covered by all Contract Documents.
- B. Contract description.
- C. Contract A - General and Mechanical.
- D. Contract B - Electrical.
- E. CONTRACTOR use of Site.

1.3 PROJECT - WORK COVERED BY ALL CONTRACT DOCUMENTS

- A. Work of the two prime contracts comprises the Project, for the furnishing and installation of two submersible pumping stations and approximately 6,450 linear feet of 6-inch force main and appurtenances.

1.4 CONTRACT DESCRIPTION

- A. Perform Work included in the Contract under a separate, stipulated price contract with OWNER as described in the Agreement.
- B. Work of each separate Contract is identified in the following Articles and on Drawings.

1.5 CONTRACT A - GENERAL AND MECHANICAL

- A. Division 1 - General Requirements: All Sections included.
- B. Provide all Work identified in Divisions 2 through 17, except Work specifically assigned to other contractors in Article 1.6 through 1.8.

1.6 CONTRACT B - ELECTRICAL

- A. Division 1 - General Requirements: All Sections included.
- B. Division 2 - Sitework:
 - 1. Section 02225 – Trenching and Backfilling: Power and communication utilities.
- C. Division 7 - Thermal and Moisture Protection:
 - 1. Section 07900 - Joint Sealers: Firestopping.

SECTION 01039

COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and other Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Coordination and Project Conditions.
- B. Staking.
- C. Pre-construction conference.
- D. Progress meetings.
- E. Pre-installation meetings.
- F. Equipment electrical characteristics and components.
- G. Cutting and patching.
- H. Alteration Project procedures.

1.3 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of the various Sections of the Specifications in compliance with the requirements of paragraph 7.02 of the General Conditions to ensure efficient and orderly sequence of installation of interdependent construction elements.
- B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate Work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate space requirements, supports, and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. Coordinate completion and clean-up of Work of separate Sections in preparation for Substantial Completion.
- E. After OWNER occupancy of premises, coordinate access to Site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of OWNER's activities.

1.4 STAKING

- A. Give ENGINEER at least 5 working days prior notice of need for staking reference points and furnish necessary stakes.

- B. Confirm drawing dimensions and elevations.
- C. Establish elevations, lines, and levels from reference points, utilizing recognized engineering survey practices.
- D. During construction, furnish stakes and competent ENGINEER's helpers for checking elevations, lines, and levels deemed necessary by ENGINEER.

1.5 PRE-CONSTRUCTION CONFERENCE

- A. OWNER will schedule a conference after Notice of Award.
- B. Attendance Required: OWNER, ENGINEER, Authorities having jurisdiction over the Work (if available), Utilities, CONTRACTOR, CONTRACTOR's Superintendent, and major Subcontractors.
- C. Agenda:
 - 1. Submission of insurance certificates.
 - 2. Distribution of Contract Documents.
 - 3. Submission of schedule of values, schedule of Shop Drawings and Sample submittals, and progress schedule.
 - 4. Designation of personnel representing the parties in Contract, ENGINEER, and others as appropriate.
 - 5. Procedures and processing of field decisions, submittals, substitute and "or-equals", Applications for Payments, Change Orders, and Contract Closeout procedures.
 - 6. Scheduling.
 - 7. Use of premises by OWNER and CONTRACTOR.
 - 8. OWNER's requirements.
 - 9. Permits.
 - 10. Stormwater management, and erosion and sediment control.
 - 11. Construction facilities and controls provided by OWNER.
 - 12. Temporary utilities provided by OWNER.
 - 13. Staking.
 - 14. Security and housekeeping procedures.
 - 15. Procedures for testing.
 - 16. Procedures for maintaining Record Documents.
 - 17. Requirements for start-up of equipment.
 - 18. Inspection and acceptance of equipment put into service during construction period.
 - 19. CONTRACTOR's safety representative.
 - 20. ARCADIS Construction Site Health and Safety Plan.
- D. ENGINEER will record minutes and distribute copies within 2 days after meeting to participants and those affected by decisions made.

1.6 PROGRESS MEETING

- A. Contract A Contractor to schedule and administer meetings throughout progress of the Work at maximum monthly intervals or as otherwise deemed necessary by OWNER or ENGINEER.
- B. Contract A Contractor to make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, give 72 hours prior notice.
- C. Attendance Required: Contract A and B Contractors' job superintendent and office representative managing job, major Subcontractors and Suppliers, OWNER, ENGINEER, as appropriate to agenda topics for each meeting.

D. Agenda:

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

- E. Contract A Contractor to record minutes and distribute copies within 2 days after meeting to participants and those affected by decisions made.

PART 2 PRODUCTS

2.1 EQUIPMENT ELECTRICAL CHARACTERISTICS AND COMPONENTS

- A. Motors: See Section 16220, NEMA MG1 Type. Specific motor type is specified in individual Specifications Sections.
- B. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Size terminal lugs to NFPA 70, include lugs for terminal box.
- C. Control Panels: See Section 16160. Specific control panel requirements are specified in individual Specification Sections.

PART 3 EXECUTION

3.1 CUTTING AND PATCHING

- A. Perform Work wherever possible to eliminate cutting and patching. Where not possible, employ skilled and experienced installer to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements which affect:
 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. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:
 1. Fit the several parts together, to integrate with other Work.
 2. Uncover Work to install or correct ill-timed Work.
 3. Remove and replace defective and non-conforming Work.
 4. Remove samples of installed Work for testing.
 5. Provide openings in elements of Work for penetrations of mechanical and electrical work.

- D. Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- E. Cut masonry and concrete materials using masonry saw or core drill.
- F. Restore Work with new materials in accordance with requirements of Contract Documents.
- G. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- 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 hazardous substances or conditions exposed during the Work to OWNER and ENGINEER for decision or remedy in accordance with paragraph 4.06 of the General Conditions.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and other Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Shop Drawings.
- D. Samples.
- E. Certificates.
- F. Manufacturer's instructions.

1.3 SUBMITTAL PROCEDURES

- A. As a minimum, Submittals are required for those items as indicated in the Equipment and Material Checklist included at the end of Section 01600 (page CL-1). Submittals for additional items shall be submitted when deemed necessary by ENGINEER.
- B. Transmit each submittal with ENGINEER accepted form.
- C. Identify Project, CONTRACTOR, Subcontractor or Supplier; pertinent drawing and detail number, and Specifications Section number, as appropriate.
- D. Apply CONTRACTOR's stamp, signed or initialed certifying that review, approval, verification of materials and equipment required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite the Project, and deliver to ENGINEER at business address. Coordinate submission of related items.
- F. For each submittal for review, allow a minimum of 15 working days excluding delivery time to and from CONTRACTOR.
- G. Identify variations from Contract Documents and material, equipment or system limitations which may be detrimental to successful performance of the completed Work.
- H. Provide space for CONTRACTOR and ENGINEER review stamps.
- I. When revised for resubmission, identify all changes made since previous submission.

- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- K. Submittals not requested will not be recognized or processed.

1.4 CONSTRUCTION PROGRESS SCHEDULE

- A. Contract A Contractor to develop and maintain progress schedule in compliance with paragraph 7.02 of the General Conditions, and the following:
 - 1. Submit four copies of preliminary progress schedule at pre-construction conference.
 - 2. Revise and resubmit as required.
 - 3. Submit revised schedule with each Application for Payment, identifying changes since previous version.
 - 4. Submit a computer-generated horizontal bar chart with separate line for each portion of Work or operation, identifying first work day of each week.
 - 5. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
 - 6. Indicate estimated percentage of completion for each item of Work at each submission.
 - 7. Provide Contract B Contractor with six copies each of the approved progress schedule and each revised progress schedule thereafter.
- B. Contract B Contractor to cooperate with the Contract A Contractor in, and attend such meetings as requested by the Contract A Contractor for the development and maintaining of the progress schedule.

1.5 SHOP DRAWINGS

- A. Submit working drawings of piping; detail drawings of steel reinforcing, both bars and mesh, showing size and arrangement; details of machinery, apparatus and materials; dimensional drawings, ladder-type schematic diagrams, connection diagrams and other data for all electrically operated equipment, and all communication, instrumentation, control, and related equipment; and layout drawings of the complete electrical work. Drawings shall designate the complete installation and shall be suitable for coordinating work of the various trades.
- B. Layout drawings for electrical work shall include all underground, concealed, and exposed conduits, and shall show locations and sizes of conduit runs, sizes and number of wires, pull and junction boxes, outlets, lighting fixtures, panelboards, motor starter switchboards, motor controls, switches, control stations, disconnects, etc., and will be used by ENGINEER to verify the location and size of conduit, wire and equipment. Layout drawings shall be submitted early. No Work shall proceed until such drawings have been returned (with review stamp affixed) by ENGINEER.
- C. Shop Drawings shall include all information on electrical components and characteristics, appropriate curve data at various operating and efficiency levels, manufacturer's motor data sheets, hardware and accessories. Electrical characteristics include electrical power supply required and electrical loading information. Shop Drawings will not be reviewed and returned until all such information is received.
- D. Submit the number of copies which CONTRACTOR requires, up to a maximum of six, plus two copies which will be retained by ENGINEER (maximum total of eight copies).
- E. CONTRACTOR may utilize Contract Drawings with necessary details marked thereon for electrical conduit layout drawings. However, the Drawings must have CONTRACTOR's title block in lieu of ENGINEER's title block.

- F. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- G. For factory-primed and factory-finished materials and equipment to be field-painted, indicate coatings manufacturer and type; for completely factory-finished materials and equipment not to be field-painted, indicate coatings manufacturer and type, and include full range of manufacturer's standard colors for finish color selection by OWNER.
- H. After review distribute in accordance with the Submittal Procedures article above and provide copies for Record Documents described in Section 01700 - Contract Closeout.

1.6 SAMPLES

- A. Submit Samples for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Submit Samples for selection to illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices, and, for finishes, submit Samples from the full range of manufacturer's standard colors, in custom colors selected, and textures, and patterns for OWNER selection. Coordinate Sample submittals for interfacing Work.
- C. Include identification on each Sample, with full Project information.
- D. Submit the number of Samples which CONTRACTOR requires, plus one which will be retained by ENGINEER. Samples are required for those items as specified in individual Specifications Sections. Samples for additional items shall be submitted when deemed necessary by ENGINEER.
- E. Reviewed Samples which may be used in the Work are indicated in individual Specifications Sections.
- F. Samples will not be used for testing purposes unless specifically stated in the Specifications Section.

1.7 CERTIFICATES

- A. When specified in individual Specifications Sections, submit certification by the manufacturer, installation/application subcontractor, or CONTRACTOR to ENGINEER, in quantities specified for Shop Drawings.
- B. Indicate material or equipment conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or equipment but must be acceptable to ENGINEER.

1.8 MANUFACTURER'S INSTRUCTIONS

- A. Keep one copy of manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing on Site. Maintain with Record Documents as required under Section 01700.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and other Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Quality assurance - control of installation.
- B. Tolerances.
- C. References and standards.
- D. Testing services.
- E. Manufacturers' field services.
- F. Electrical materials and equipment.
- G. Examination.

1.3 QUALITY ASSURANCE - CONTROL OF INSTALLATION

- A. Monitor quality control over Suppliers, manufacturers, materials, equipment, services, Site conditions, and workmanship to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, manufacturer's instructions shall take precedence.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on Shop Drawings or as instructed by the manufacturer.
- G. Secure materials and equipment in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.4 TOLERANCES

- A. Monitor fabrication and installation tolerance control of materials and equipment to produce acceptable Work. Do not permit tolerances to accumulate.

- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from ENGINEER before proceeding.
- C. Adjust materials and equipment to appropriate dimensions; position before securing in place.

1.5 REFERENCES AND STANDARDS

- A. For materials, equipment, or workmanship specified by association, trade, 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 for receiving bids, except where a specific date is established by code.
- C. Obtain copies of standards where required by Specifications Sections.
- D. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of ENGINEER shall be altered from the Contract Documents by mention or inference otherwise in any reference document.
- E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.
- F. Specifications Format: These Specifications are organized into Divisions and Sections in general conformance with the 16 Divisions of The Construction Specification's Institute's "1995 Masterformat", plus a Division 17 for Instrumentation. Text is generally written in imperative mood and streamlined form. This imperative language is directed to CONTRACTOR, unless specifically noted otherwise. The words "shall", "shall be", and "shall comply with", depending upon context, are included by inference where a colon (:) is used within sentences or phrases.
 - 1. A reference within a Section of the Specifications to another Section of the Specifications using the word "follow" means that the part of the Work to be provided under the Section including the reference is to be in accordance with the requirements specified in the referenced Section.
 - 2. A reference within a Section of the Specifications to another Section of the Specifications using the word "see" means that the requirements specified for Work provided under the referenced Section includes Work related to that part of the Work provided under the Section including the reference.

1.6 TESTING SERVICES

- A. OWNER will appoint, employ, and pay for specified services of an independent firm to perform testing for compliance with compaction requirements, for cast-in-place concrete, and as otherwise required by ENGINEER.
- B. Testing and source quality control may occur on or off the Site.
- C. Reports will be submitted by the independent firm to ENGINEER and CONTRACTOR, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
 - 1. Submit reports within 7 days of performing tests.

- D. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. Notify ENGINEER and independent firm 24 hours prior to expected time for operations requiring services.
 - 2. Make arrangements with independent firm and pay for additional samples and tests required for CONTRACTOR's use.
- E. CONTRACTOR shall be responsible for, and shall pay for:
 - 1. Additional testing expenses resulting from CONTRACTOR's failure to advise ENGINEER and independent firm 24 hours in advance of operations.
 - 2. Additional testing expenses resulting from changes in CONTRACTOR's schedule after independent firm has been notified that testing is required, canceled, or modified.
- F. Testing does not relieve CONTRACTOR to perform Work to Contract requirements.
- G. Re-testing required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by ENGINEER. Payment for re-testing will be charged to CONTRACTOR by deducting testing charges from the Contract Price.

1.7 MANUFACTURER'S FIELD SERVICES

- A. When specified in individual Specifications Sections, require material or equipment suppliers or manufacturers to provide qualified staff personnel to observe Site conditions, conditions of surfaces and installation, and quality of workmanship as applicable, and to initiate instructions when necessary.
- B. Report observations and Site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- C. Prior to leaving the Project and for each visit, complete a Manufacturer's Service Representative's Report (page SR-1) as included at the end of this Section. Copies of the Report will be available for use on the Project.

PART 2 PRODUCTS

2.1 ELECTRICAL MATERIALS AND EQUIPMENT

- A. All electrical materials and equipment shall be manufactured, tested, and installed in accordance with the following:
 - 1. National Electrical Code (NEC).
 - 2. Underwriters Laboratories, Inc. (UL).
 - 3. National Electrical Manufacturer's Association (NEMA).
 - 4. American National Standards Institute (ANSI).
- B. CONTRACTOR shall submit proof, if requested by ENGINEER, that the materials and equipment provided under this Contract meet UL requirements in regard to fire and casualty hazards.
- C. All electrical materials and equipment shall display a UL label.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual Specifications Sections.
- D. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- E. Complete feeder insulation and ground tests required under Section 16960 prior to any operational testing of appurtenant equipment.

END OF SECTION

MANUFACTURER'S SERVICE REPRESENTATIVE'S REPORT

Project _____ CONTRACTOR _____

Name and address of Manufacturer _____

_____ Phone No. _____

* Name of Representative _____

Address of Contact _____ Phone No. _____

Items covered by Inspection _____

Contractor's Representative Present _____

Owner's Representative Present _____

Date or Dates of Inspection _____

Time of Day _____ (Inspection Started) _____ (Inspection Completed)

Were Manufacturer's Drawings, Operation Instructions and Spare Parts Lists on the job at or prior to Inspection?
_____ Yes _____ No. If answer is no, list deficiencies.

** Description of operation accomplished under supervision of Manufacturer's Representative or problems encountered _____

** Recommendations made by Manufacturer's Representative _____

Manufacturer's Representative's Signature _____

Is a return visit recommended or needed: _____ yes _____ no

If so, how soon? _____

Instruct Plant Personnel in operation and maintenance of equipment? _____ yes _____ no

ENGINEER (Authorized Signature)

OWNER (Authorized Signature)

- * Attach company or representative's card
- ** Use second sheet if additional space required

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and other Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Submittals.
- B. Mobilization.
- C. Temporary utilities.
- D. Barriers.
- E. Environmental controls.
- F. Maintaining traffic.
- G. Maintenance of flow and drainage.
- H. Protection of installed work.
- I. Security.
- J. Haul routes.
- K. Parking.
- L. Progress cleaning and waste removal.
- M. CONTRACTOR's field offices and sheds.
- N. ENGINEER's office - Contract A Contractor only.
- O. Storage and removal of excavated material.
- P. Removal of temporary utilities, facilities, and controls.
- Q. Replacements.
- R. De-watering requirements for trenches and other excavations.
- S. Prohibited construction activities.

1.3 SUBMITTALS

- A. Refer to individual Articles for requirements.

1.4 MOBILIZATION

- A. Perform preparatory Work and operations for the assembling and setting up necessary for Work on the Project, such as shops, plants, storage areas, sanitary facilities, moving in of personnel and equipment, incidentals to the Project, and any other facilities, as required by the Specifications and special requirements of the Contract Documents, as well as by Laws and Regulations in effect at the Site.
- B. Perform demobilization to remove the items and equipment specific to the Project.

1.5 TEMPORARY UTILITIES

- A. Arrange for and pay for all temporary utilities required for the Work and for temporary facilities on the Site, which for Contract A shall include ENGINEER's office.

1.6 BARRIERS

- A. Provide, erect, and maintain barricades, suitable and sufficient warning lights, and take all necessary precautions for the protection of the public. All barricades and obstructions shall be illuminated at night for the full period of reduced visibility and at least from sunset to sunrise.
- B. Provide barriers to prevent unauthorized entry to construction areas, to allow for OWNER's use of Site, for public access to existing buildings, and to protect existing facilities and adjacent properties from damage from construction operations.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, Site, and structures from damage.
- E. Erect protective barricades around all visible survey monuments that are in or adjacent to the construction area and as noted on Drawings prior to actual construction. Protect from damage or loss, any other monument or property corner stake, pin, or marker discovered or uncovered during progress of the Work, and notify ENGINEER in writing as to the exact location. Replace each survey monument, property corner, right-of-way, or other marker damaged or destroyed by CONTRACTOR's forces using a licensed surveyor, employed by and at the expense of CONTRACTOR. Provide OWNER and ENGINEER certification by the surveyor as to the replacement of the marker.

1.7 ENVIRONMENTAL CONTROLS

- A. Provide and maintain methods, equipment, and temporary construction as necessary to provide controls over environmental conditions along the route of construction and related areas under CONTRACTOR's control as required to comply with Laws and Regulations governing noise, dust, water, pollution, and erosion control, and the requirements of these Contract Documents. In the event of conflict between the requirements of these Contract Documents and Laws and Regulations, the more restrictive shall apply.
- B. Temporary environmental controls, as applicable to soil erosion and sediment control, shall comply with the NPDES Construction General Permit Part III.G – SWP3 Requirements and shall be installed in accordance with standards and specifications in the most recent version of ODNR Rainwater and Development manual. Particular attention shall be given to the following:
 - 1. Where heavy construction equipment is no longer needed, either final grade and seed or temporary seed to prevent soil erosion.
 - 2. No area where construction is complete shall sit for longer than 30 days without being seeded.

3. Silt barriers shall stay in place and be maintained until grass has grown so soil will not erode.
- C. Control dust and dirt on a daily basis in the streets, sidewalks, and drives within the limits of the Project and haul roads leading to or away from the Project that are used by CONTRACTOR, Subcontractors, and Suppliers. If not complied with in a satisfactory manner, all Work, except clean-up operations will be stopped immediately until complied with to the satisfaction of OWNER and ENGINEER. Methods of control shall include, but are not limited to:
1. Sweep streets and haul roads using an automatic self-contained mechanical sweeper with integral water spray and vacuum equipment.
 2. Remove excessive dirt on streets by means of hand shoveling or appropriate mechanical equipment, and sweep area as in method above.
 3. Clean sidewalks and driveways using shovels and hand brooms or approved mechanical equipment.
 4. If authorized or directed by OWNER or ENGINEER, control remaining dust in accordance with ODOT Item 616.
- D. Control air quality and equipment noise through:
1. Except as permitted by OWNER or these Specifications, limit construction activities to daytime hours.
 2. Providing construction equipment with mufflers and intake silencers recommended by equipment manufacturer.
 3. Equipping all construction vehicles with proper emissions control equipment.
 4. Periodically checking all operating equipment and machinery for proper tuning to minimize exhaust emissions and noise.
- E. See Drawings for Environmental Protection Measures and Notes.

1.8 MAINTAINING TRAFFIC

- A. Scope:
1. CONTRACTOR shall keep all streets and traffic ways open for passage of traffic and pedestrians during the Work, unless otherwise approved by owner of the street, traffic way, or right-of-way, as applicable.
 - a. Two-way traffic shall be maintained at all times.
 - b. Provide maintenance of traffic plan to ENGINEER for review and approval prior to start of construction.
 - c. Provide signage, lights, barricades, etc., as appropriate for maintenance and protection of traffic. Refer to the Contract Drawings for additional requirements.
 2. Unless otherwise shown or indicated in the Contract Documents, maintenance and protection of traffic shall be in accordance with the following:
 - a. Item 614 of State of Ohio Department of Transportation (ODOT) Construction and Material Specifications, latest edition.
 - b. ODOT Current Maintaining Traffic (MT) Standard Construction Drawings (SCD).
- B. Coordination:
1. Coordinate with owner of the highway or street right-of-way, as applicable, for maintenance and protection of traffic requirements.
 2. Give required advance notice to fire departments, police departments, and other emergency services as applicable of proposed construction operations.
 3. Give reasonable notice to owners or tenants of private property who may be affected by construction operations. At least one-half of the pavement width shall be left in passable condition when pipes are being installed across streets or highways.

- C. Submittals: submit the following:
 - 1. Detailed plan, procedures, and sequencing for maintaining and protecting traffic in accordance with the Contract Documents and requirements of authorities having jurisdiction. Include in the submittal the following:
 - a. Traffic staging plan, and construction sequencing as applicable to maintenance and protection of traffic.
 - b. Product data, including manufacturer's catalog information and specifications, for temporary signage, temporary signals, temporary illumination devices, and other products to be utilized in maintaining and protecting traffic.
 - 2. Submit to the ENGINEER for review and approval at least 10 days before Work begins at the Site.
- D. When required to cross, obstruct or temporarily close a street or traffic way, provide and maintain suitable detours, or other acceptable temporary expedient for the accommodation of traffic. Closings shall be for shortest duration practical, and passage shall be restored immediately after completion of filling and temporary paving.
- E. Provide signs, signals, barricades, flares, lights and other equipment, service, and personnel required to regulate and protect all traffic and warn of hazards. Such Work shall comply with requirements of OWNER and authorities having jurisdiction at the Site. Remove temporary equipment and facilities when no longer required, and restore grounds to original or to specified conditions, as applicable.
- F. Hydrants, valves, fire alarm boxes, postal boxes and delivery service boxes, and other facilities that may require access during construction shall be kept accessible for use.
- G. Traffic Control Personnel:
 - 1. When construction operations encroach on traffic lanes, furnish qualified and suitably-equipped traffic control personnel as required for regulating traffic and in accordance with requirements of authorities having jurisdiction. Traffic control personnel shall use appropriate flags or mobile signs.

1.9 MAINTENANCE OF FLOW AND DRAINAGE

- A. Where existing sewers are encountered and are interfered with, flow shall be maintained by connection into other sewers with the approval of ENGINEER, by providing temporary conduit to maintain flow through the trench or other excavation, or by temporarily pumping to a satisfactory outlet, and shall not be pumped, bailed, or flumed over the street or ground surface.
- B. Existing field tile drains shall be free to drain at all times.
- C. Maintain drainage in new and existing structures as required to protect the Work and existing facilities.
- D. Maintain drainage on the Site where construction operations alter the existing conditions.
- E. Maintain excavations free of water.
- F. Provide, operate, and maintain pumping equipment.

1.10 PROTECTION OF INSTALLED WORK

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

1.11 SECURITY

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

1.12 HAUL ROUTES

- A. CONTRACTOR shall obtain approval from OWNER for the use of local streets and roads as haul routes.
- B. Haul routes will be reviewed by representatives of OWNER and CONTRACTOR prior to construction to determine the condition of the streets and roads and after the Project is completed in order to determine the amount of restoration required of CONTRACTOR.
- C. Haul routes will be established on the conditions that all hauling will comply with established legal load limits and that all State and local traffic laws will be obeyed. Maximum legal truck capacity shall be posted on or listed in trucks.

1.13 PARKING

- A. Provide temporary gravel surface parking areas to accommodate construction personnel.
- B. When Site space is not adequate, provide additional off-site parking.
- C. Do not allow vehicle parking on existing pavement.
- D. Designate one parking space each for OWNER and ENGINEER located at ENGINEER's office.

1.14 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain Site in a clean and orderly condition.

1.15 CONTRACTOR'S FIELD OFFICES AND SHEDS

- A. Office: Weather-tight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture, drawing rack, drawing display table, and other equipment and facilities deemed necessary by CONTRACTOR.
- B. Provide space for progress meetings, with table and chairs to accommodate six persons.
- C. Locate offices and sheds a minimum distance of 30 feet from existing and new structures.

1.16 ENGINEER'S OFFICE - CONTRACT A CONTRACTOR ONLY

- A. Submittals: Detailed list of office equipment and services to be provided.
- B. Provide a weather-tight building (office) having floor space of not less than 200 square feet and equipped with windows, electricity, heating facilities, air conditioner, sanitary facilities, first aid kit, fire extinguisher, plan table, plan rack, file cabinet, desk, and two chairs for sole use of ENGINEER.
- C. Internet Access: Obtain and pay for Internet service until removal of the field office, with unlimited (untimed) Internet access. Set up system and appurtenances required and verify functionality in the field office. Internet service shall be one of the following, listed in order of preference; provide a lower type of access only when higher levels are unavailable:
 - 1. Fiber-optic or cable connection with appropriate modem and appurtenances.
 - 2. DSL: Minimum 6 megabits per second (Mbps) symmetrical digital subscriber line. Provide dedicated telephone line for Internet access.
 - 3. Mobile Broadband Wireless 3G Network: Provide the following for ENGINEER's sole use:
 - a. Mobile broadband wireless router. Product and Manufacturer: Linksys Wireless-G Router for Mobile Broadband, or equal.
 - b. Mobile broadband air-card for field office. Product and Manufacturer: Sierra Wireless 597E, Novatel Merlin EX720, or equal.
 - c. Mobile broadband wireless 3G network service by AT&T, Verizon, Sprint, or equal, with minimum speed of 600 Kbps.
 - d. Router and air-card will remain CONTRACTOR's property upon removal of field office from the Site.
- D. Furnish and maintain an all-in-one machine (print/copy/fax/scan). Install as directed by manufacturer. Provide and maintain a sufficient supply of the proper sizes and types of paper and toner cartridges.
- E. Maintain office until Substantial Completion, or an earlier date when approved by ENGINEER.

1.17 STORAGE AND REMOVAL OF EXCAVATED MATERIAL

- A. Remove all excess excavated material which has been stockpiled at the Site, and which will not be used for backfill or other fill purposes, from the Project area within 48 hours. Limit size and maintain stockpiles of excavated material in such a manner that they will not block existing drainage or be hazardous to pedestrian or vehicular traffic in any way. The limitation relative to the stockpiling of all excavated material shall be controlled by OWNER and ENGINEER. In the event CONTRACTOR fails to remove excess excavated material as required above, or fails to satisfactorily modify his operations relative to the stockpiling of excavated materials upon order of OWNER or ENGINEER, all Work except clean-up operations will be stopped, and remain stopped, until the order of OWNER or ENGINEER has been complied with.

- B. The removal and disposal of surplus excavated material shall be the responsibility of CONTRACTOR. Provide OWNER with any surplus material OWNER desires. CONTRACTOR shall not be required to haul such material for a greater distance than would be required to otherwise dispose of the material.
- C. Place silt barriers around long term stockpiles of soil as well as along the down slope, or drainage course, and portions of staging sites.
- D. Do not place excavated materials next to or against trees.

1.18 REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Final Application for Payment inspection.
- B. Remove underground installations to a minimum depth of 3 feet. Grade Site to match adjacent ground.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore permanent facilities used during construction to original condition.

1.19 REPLACEMENTS

- A. Replace existing pavements, driveways, parking areas, curbs, gutters, berm stone, sidewalks, water lines, gas lines, sewers, catch basins, headwalls, drains, field tile, conduit pipes, cables, fences, grassed areas, and other existing facilities removed or otherwise disturbed in carrying out the Work in as good a condition as found and to the approval of OWNER.
- B. Existing mail boxes and traffic signs in the line of construction shall be removed and erected in temporary locations in a manner satisfactory to OWNER, and after completion of construction, moved to and re-erected in their original locations.
- C. Existing fences, decorative walls, advertising signs, and other such existing features in the line of construction shall be removed, stored, protected, and re-erected in their original locations unless otherwise directed by OWNER.
- D. All materials broken or disturbed to such an extent as to require replacement shall be replaced with new material at the expense of CONTRACTOR.
- E. Exception to the above shall be made in the case of Work and materials for which payment will be made under Sections subsequently specified and at the appropriate unit prices included in the Contract.
- F. Work and materials shall be in accordance with applicable requirements of these Contract Documents and, where not included herein, the requirements of applicable ODOT Items as approved by ENGINEER.
- G. In any event, CONTRACTOR shall be liable for any damage to public or private property caused by movement of equipment or by other operations and shall repair or replace, to the condition existent prior to the Work, any public or private property damaged by his operations.

1.20 DEWATERING REQUIREMENTS FOR TRENCHES AND OTHER EXCAVATIONS

- A. Any person installing any well, well point, pit or other device used for the purpose of removing ground water from an aquifer shall complete and file a Well Log and Drilling Report form with the Ohio Department of Natural Resources, Division of Water, within 30 days of the well completion in accordance with the Ohio Revised Code Sections 1521.01 and 1521.05. In addition, any such facility that has a capacity to withdraw waters of the state in an amount greater than 100,000 gallons per day from all sources shall be registered by OWNER with the chief of the Division of Water, Ohio Department of Natural Resources, within 3 months after the facility is completed in accordance with Section 1521.16 of the Ohio Revised Code. For copies of the necessary well log, drilling report, or registration forms, please contact: Ohio Department of Natural Resources, Division of Water; 2045 Morse Road, Building B; Columbus, OH 43229-6693; Ph: 614.265.6740. Also, any well, well point, pit, or other device installed for the purpose of lowering the ground water level to facilitate construction of this Project shall be properly abandoned in accordance with the provisions of this plan or as directed by the director or his representative.

1.21 PROHIBITED CONSTRUCTION ACTIVITIES

- A. Disposing of excess of unsuitable excavated material in wetlands or flood plains **even with the permission of the property owner**;
- B. Locating stockpile storage areas in environmentally sensitive areas;
- C. Indiscriminate, arbitrary, or capricious operation of equipment in any streams or stream corridors, any wetlands, any surface waters, or outside the easement limits;
- D. Pumping of sediment-laden water from trenches or other excavations directly into any surface waters, any stream corridors, any wetlands, or storm sewers; all such water shall be properly filtered or settled to remove silt prior to release;
- E. Discharging pollutants such as chemicals, fuels, lubricants, bituminous materials, raw sewage and other harmful waste into or alongside of rivers, streams, impoundments, or into natural or man-made channels leading thereto;
- F. Disposing of trees, brush and other debris in any stream corridor, any wetlands, any surface waters, or at unspecified locations;
- G. Open burning of project debris without a permit;
- H. Discharging injurious silica dust concentrating into the atmosphere resulting from breaking, cutting, chipping, drilling, buffing, grinding, polishing, shaping or surfacing closer than 200 feet to places of residences or commercial, professional, quasi-public or public places of human occupation;
- I. Storing construction equipment and vehicles and/or stockpiling construction materials on property, public or private, not previously specified on the plans by the engineer for such purposes;
- J. Running well point or pump discharge lines through private property or public property and rights-of-way without the written permission of the property owner and the consent of the ENGINEER;
- K. Operations entailing the use of vibratory hammers or compactors outside the hours of 8:00 am and 5:00 pm or outside the hours allowed for construction by local ordinances or regulations; and
- L. Closing off clear access to any public alley, street, road, avenue or boulevard without the prior consent of municipal officials and the engineer, and closing clear access:

1. by fire protection equipment and emergency vehicles;
2. by the public to any commercial or professional place of business, quasi-public or public establishment, or place or residence; or
3. by vehicles to driveways without the provision of alternative means of building ingress and egress.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and other Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Materials and equipment.
- B. Transportation and handling.
- C. Storage and protection.
- D. Material and equipment options.
- E. Substitutes and "or-equal" items.
- F. Equipment and Material Checklist.

1.3 MATERIALS AND EQUIPMENT

- A. For the purpose of standardization, equipment of any one type shall be the products of one manufacturer.
- B. Do not use secondhand or salvaged materials and equipment whether removed from existing premises or from another source, except as specifically permitted by the Contract Documents.
- C. Provide interchangeable components of the same manufacture for components being replaced.

1.4 TRANSPORTATION AND HANDLING

- A. Transport and handle materials and equipment in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure that materials and equipment comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle materials and equipment by methods to prevent soiling, disfigurement, or damage.

1.5 STORAGE AND PROTECTION

- A. Store and protect materials and equipment in accordance with manufacturer's instructions.
- B. Store with seals and labels intact and legible.
- C. Store sensitive materials and equipment in weather-tight, climate-controlled enclosures in an environment favorable to product.

- D. For exterior storage of fabricated materials and equipment, place on sloped supports above ground.
- E. Cover materials and equipment subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of materials and equipment.
- F. Store loose granular materials on solid, flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- G. Provide equipment and personnel to store materials and equipment by methods to prevent soiling, disfigurement, or damage.
- H. Arrange storage of materials and equipment to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.
- I. Provide lubricants and perform initial lubrication and all subsequent lubrication until Substantial Completion. Lubricants and lubrication shall be in accordance with equipment manufacturer's instructions.
- J. Limit size and maintain stockpiles of construction materials in such a manner that they will not block existing drainage or be hazardous to pedestrian or vehicular traffic in any way. The limitation relative to the stockpiling of construction materials shall be controlled by OWNER and ENGINEER. In the event CONTRACTOR fails to satisfactorily modify his operations relative to the stockpiling of construction materials upon order of OWNER or ENGINEER, all Work except clean-up operations will be stopped, and remain stopped, until the order of OWNER or ENGINEER has been complied with.
- K. Do not place stored materials next to or against trees.

1.6 MATERIAL AND EQUIPMENT OPTIONS

- A. Materials and Equipment Specified by Reference Standards or by Description Only: Any material or equipment meeting those standards or description.
- B. Materials and Equipment Specified by Naming One or More Manufacturers: Materials and equipment of manufacturers named and meeting Specifications, no options or substitutions allowed.
- C. Materials and Equipment Specified by Naming One or More Manufacturers with a Provision for Or As Approved: Submit a request for consideration of any manufacturer not named in accordance with the following Article.

1.7 SUBSTITUTES AND "OR-EQUAL" ITEMS

- A. ENGINEER will consider requests for substitute and "or-equal" items only within 30 days after date of OWNER-CONTRACTOR Agreement. Requests thereafter for use of substitute and "or-equal" items will be considered by ENGINEER only if the specified item becomes unavailable through no fault of CONTRACTOR.
- B. Submit written application for use of substitute and "or equal" items. Written application shall be by completion of an APPLICATION FOR USE OF "OR-EQUAL" ITEM or an APPLICATION FOR USE OF SUBSTITUTE ITEM, as applicable and as included at the end of this Section.

1.8 EQUIPMENT AND MATERIAL CHECKLIST

- A. Refer to EQUIPMENT AND MATERIAL CHECKLIST at end of this Section for items requiring Shop Drawings, manufacturer's start-up services, spare parts, and operation and maintenance manuals. Requirements over and above those included in the General Conditions and this and other Sections of Division 1 shall be as included in the individual Specifications Sections.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

APPLICATION FOR USE OF "OR-EQUAL" ITEM

TO: _____

PROJECT: Briarwood Area Wastewater Pumping Station Improvements

SPECIFIED ITEM:

Page	Paragraph	Description
------	-----------	-------------

A. The undersigned requests consideration of the following as an "or-equal" item in accordance with Article 6.05 of the General Conditions.

B. Change in Contract Price (indicate + or -) \$ _____

C. Attached data includes product description, specifications, drawings, photographs, references, past problems and remedies, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified. For consideration of the attached data as SHOP DRAWINGS, submittal shall be in accordance with the requirements of Section 01300.

D. Signature: _____

Firm: _____

Address: _____

Telephone: _____ Date: _____

Attachments: _____

For use by ENGINEER:

- _____ Accepted as evidenced by affixed SHOP DRAWING REVIEW stamp.
- _____ Accepted as evidenced by included CHANGE ORDER.
- _____ Not accepted as submitted. See Remarks.
- _____ Acceptance requires completion of submittal as required for SHOP DRAWINGS.
- _____ Not accepted. Do not resubmit.

By: _____ Date: _____

Remarks: _____

APPLICATION FOR USE OF SUBSTITUTE ITEM

TO: _____

PROJECT: Briarwood Area Wastewater Pumping Station Improvements

SPECIFIED ITEM:

Page	Paragraph	Description
A.		The undersigned requests consideration of the following as a substitute item in accordance with Article 6.05 of the General Conditions. _____
B.		Change in Contract Price (indicate + or -) \$ _____
C.		Attached data includes product description, specifications, drawings, photographs, references, past problems and remedies, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified. For consideration of the attached data as SHOP DRAWINGS, submittal shall be in accordance with the requirements of Section 01300.
D.		Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments are correct:

1. The proposed substitute does not affect dimensions shown on Drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on other contractors, the construction schedule, or specified warranty requirements. (If proposed substitution affects construction schedule, indicate below using + or -.)

_____ CONSECUTIVE CALENDAR DAYS

4. Maintenance and service parts will be locally available for the proposed substitution.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item, and agrees to reimburse the OWNER for the charges of the ENGINEER for evaluating this proposed substitute item.

E. Signature: _____

Firm: _____

Address: _____

Telephone: _____ Date: _____

Attachments: _____

For use by ENGINEER:

- _____ Accepted as evidenced by affixed SHOP DRAWING REVIEW stamp.
- _____ Accepted as evidenced by included CHANGE ORDER.
- _____ Not accepted as submitted. See Remarks.
- _____ Acceptance requires completion of submittal as required for SHOP DRAWINGS.
- _____ Not accepted. Do not resubmit.

By: _____ Date: _____

Remarks: _____

EQUIPMENT AND MATERIAL CHECKLIST

SECTION NO.	EQUIPMENT OR MATERIAL	SHOP * DRAWINGS REQUIRED	SHOP ** DRAWING SUBMITTAL DATE	MFR'S START-UP SERVICES REQUIRED	SPARE PARTS REQUIRED	O&M MANUAL REQUIRED
DIVISION 2 - SITEWORK						
02050	Preconstruction Videotape and Report	X				
02220	CDF III Material	X				
	Earth Fill A (Subsoil)	X				
02225	Granular Backfill Material	X				
02225	Controlled Density Fill (CDF)	X				
02410	Pumping Station – Submersible Type with Valve Vault and Appurtenances	X		X		X
02576	Pavement Replacement Products	X				
02607	Manholes, Catch Basins, Frames and Castings	X				
02666	Force Main Affidavit	X				
	Bedding Material	X				
02732	Pipe Sewer Affidavit	X				
	Bedding Materials	X				
	Pipe Sewer – Fittings and Appurtenances	X				
02930	Seed Mixture	X				
DIVISION 3 – CONCRETE						
03301	Concrete Mix	X				
	Concrete Materials – Admixture	X				
	Reinforcing Details	X				
DIVISION 11 - EQUIPMENT						
11410	Odor Control System	X		X	X	X
11907	Submersible Pumps and Controls	X		X	X	X
DIVISION 16 – ELECTRICAL						
16111	Conduit Installation Drawings	X				
16441	Safety Switches	X				X
16470	Panelboards	X				X
16691	Transient/Surge Protection	X				X
DIVISION 17 – INSTRUMENTATION						
17124	Float Switches	X			X	
17190	Instrumentation and Control Panel	X		X	X	X
17191	Door-Mounted Panel Components	X				X
17192	Interior-Mounted Panel Components	X			X	X
17660	Automatic Dialing Alarm System	X		X	X	X

* For Items marked "LIST", a typed list of equipment, manufacturer and catalog number is acceptable. For items marked "NAME", Shop Drawings not required if manufacturer named in Specifications; if other than named, see requirements for Substitutes and "Or-Equal" Items, Paragraph 6.05 of General Conditions. For all items, manufacturer's installation instructions as required under Section 01300 shall accompany the equipment or material when delivered to the Project Site, or when delivered and suitably stored at another approved location.

** CONTRACTOR may use a copy of this form for the Shop Drawing schedule required by Paragraph 2.05.B of the General Conditions and enter dates in this column for submittal of Shop Drawings to ENGINEER.

SECTION 01650

START-UP

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and other Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Starting equipment and systems.
- B. Manufacturers' start-up services.

1.3 STARTING EQUIPMENT AND SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify ENGINEER 7 days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up with CONTRACTOR's personnel in accordance with manufacturers' instructions.

1.4 MANUFACTURERS' START-UP SERVICES

- A. Furnish competent factory-trained service representatives to supervise or inspect the installation; test, align, adjust and calibrate the equipment and systems as necessary; and instruct plant personnel in their operation and maintenance (Manufacturer's Start-Up Services).
- B. Manufacturer's Start-Up Services are required for those items as indicated in the Equipment and Material Checklist included at the end of Section 01600 (page CL-1). Additional requirements for Manufacturer's Start-Up Services, if any, shall be as specified in the individual Specifications Sections.
- C. Submit qualifications of manufacturer's service representative to ENGINEER 30 days in advance of arrival on Project. Manufacturer's service representative subject to approval of ENGINEER.
- D. Notify ENGINEER a minimum of 72 hours prior to the arrival of the service representatives on the Project.
- E. Prior to leaving the Project and for each visit, manufacturer's service representative shall complete a Manufacturer's Service Representative's Report as included at the end of Section 01400 (page SR-1). Copies of the Report will be available for use on the Project.

- F. OWNER shall have the right to audio/video tape all sessions regarding equipment and system operation and maintenance instructions.
- G. Manufacturer's start-up services shall be provided as required until operation of the equipment is satisfactory to ENGINEER at no additional cost to OWNER.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and other Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Adjusting.
- D. Record Documents.
- E. Operation and maintenance data.
- F. Spare parts.
- G. Warranties and Bonds.

1.3 CLOSEOUT PROCEDURES

- A. Comply with requirements of Contract Documents for Substantial Completion. A sample CERTIFICATE OF SUBSTANTIAL COMPLETION is included at the end of this Section.
- B. Provide submittals to ENGINEER that are required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Price, previous payments, and sum remaining due.
- D. Comply with requirements of Contract Documents for final payment and acceptance. A sample NOTICE OF ACCEPTABILITY OF WORK is included at the end of this Section.

1.4 FINAL CLEANING

- A. Execute final cleaning prior to final Project assessment.
- B. Clean Site; sweep paved areas, rake clean landscaped surfaces.
- C. Remove waste and surplus materials, rubbish, and construction facilities from the Site.

1.5 ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

1.6 RECORD DOCUMENTS

- A. Maintain on Site one set of the following Record Documents:
 - 1. Drawings (annotated to show all changes made during construction).
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed Shop Drawings and Samples.
 - 6. Manufacturers' instructions for assembly, installation, and adjusting.
 - 7. Testing Reports.
 - 8. Manufacturers' Service Representative's Reports.
- B. Ensure entries are complete and accurate, enabling future reference by OWNER.
- C. Store Record Documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Drawings: Legibly show in red all changes made during construction as required by RECORD DRAWINGS CONTENTS LIST included at the end of this Section (pages RD-1 and RD-2). At time of submittal to ENGINEER, include certification that the Record Drawings, as submitted, show all changes made during construction as required by the Contract Documents by completing an AFFIDAVIT FOR RECORD DRAWINGS, also included (page RD-3).
- F. Submit documents to ENGINEER with request for issuance of a Certificate of Substantial Completion.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit four copies of an Operation and Maintenance (O&M) Manual furnished by the manufacturer and giving complete data on the equipment, including parts list and lubrication instructions, for those items indicated in the EQUIPMENT AND MATERIAL CHECKLIST included at the end of Section 01600 (page CL-1).
- B. Submit to ENGINEER for review no later than 30 days prior to the arrival of the factory-trained service representative, when Manufacturer's Start-Up Services as included in Section 01650 are required for the equipment.

1.8 SPARE PARTS

- A. Provide spare parts in quantities specified in individual Specifications Sections. See EQUIPMENT AND MATERIAL CHECKLIST at end of Section 01600.
- B. Deliver to Site, properly labeled and packaged for extended storage, and place in location as directed; obtain receipt prior to final payment.

1.9 WARRANTIES AND BONDS

- A. Provide duplicate copies.
- B. Execute and assemble transferable warranty documents from Subcontractors, Suppliers, and manufacturers.
- C. Submit prior to final Application for Payment.

- D. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

RECORD DRAWINGS CONTENTS LIST

The following is a list of items to use when compiling Record Drawings. A general rule to follow when compiling Record Drawings is that any important deviations from original Drawings made during construction shall be noted on Record Drawings.

I. TITLE SHEET

- A. Prime CONTRACTOR - Name and Address.
 - 1. Any Major Subcontractors - Name and Address.
- B. Resident Project Representative.
- C. Buried or concealed materials used on Project.
- D. For all valves, indicate the number of turns to open and indicate direction to open (clockwise or counter-clockwise).
- E. A bold note to indicate that the set of plans are "Record Drawings".

II. FORCE MAIN CONSTRUCTION

- A. Show unusual connections to existing mains in detail. (Schematic, where necessary).
- B. Show correct horizontal alignment and grade, including centerline elevations for all mains installed to grade.
- C. Show correct stationing of tees, bends (horizontal and vertical), valves, air release valves, blow-off chambers.
- D. Show perpendicular distances from hydrant to water main and from hydrant to watch valve. If connection to water main is by a parallel or over the main tee, so indicate this on the Record Drawings.
- E. Show correct beginning and ending stationing and type of encasement pipes. Note type of annular space fill material used.

III. PAVEMENT CONSTRUCTION

- A. Show correct top and invert elevations for catch basins, inlets, M.H.'s installed where changes are greater than 0.25 feet.
- B. Show corrected stationing and horizontal location dimension for all piping and structures.

IV. SEWER CONSTRUCTION

- A. Show distance between manholes. (Center to center of M.H. lids to the nearest foot).
- B. Show correct elevations for inverts and manhole tops (inverts to the nearest hundredth and tops to the nearest tenth).
- C. Show correct stationing for manholes.
- D. Show correct horizontal location dimension for sewers.

V. BUILDING/STRUCTURE CONSTRUCTION

- A. Show changes in location of buildings and permanent benchmark elevations.
- B. Show changes in building dimensions greater than 3 inches and note changes in construction materials.
- C. Add notes on Drawings to refer to Shop Drawings where possible to identify changes in structural steel, etc.
- D. Show major changes in location of equipment. Add notes on Drawings to refer to Shop Drawings for detail changes in equipment.
- E. Show changes in schematics.
- F. Show major changes in grading plan.

- G. For yard piping, show changes in location, material, elevation and size. Indicate the type of piping support in excavated areas. For manholes and catch basins, show changes in location and elevation.
- H. For process piping, show changes in location, material, elevation and size.

VI. ELECTRICAL WORK

- A. Revise the following on Record Drawings:
 - 1. Accurately record final routing of all ductbanks and handhole locations including dimensions from buildings or other fixed objects as reference points.
 - 2. Accurately record actual routing of all conduits installed in floor slab or otherwise concealed.
 - 3. Overhead circuits and pole line locations as applicable.
 - 4. Show actual locations of grounding electrodes.
 - 5. Show all panels, control stations, load centers, etc., locations.
 - 6. Revise motor control center elevation views as required.
 - 7. Show branch circuit arrangements on a typed legend for panelboards provided under this Project. Correct existing field legends where modifications are made to existing panelboards.
 - 8. Revise control schematics to reflect final electrical identification for wire numbers, terminal numbers, components, etc.
 - 9. Revise one-line diagram as required.
 - 10. Revise process and instrumentation diagrams (P&ID), if applicable.
- B. Revise the following Shop Drawing submittals to indicate as-built conditions:
 - 1. Layout drawings.
 - 2. Motor control centers.
 - 3. Variable frequency controllers.
 - 4. Instrumentation systems.
 - 5. Control panels.

VII. DETAIL SHEETS

- A. Any details not used or not applicable shall be so noted. Example - If three alternates for pavement are on detail sheet, the two not used shall be so noted. (Box and cross out unused details).

VIII. ALL CONSTRUCTION (FORCE MAIN, PAVEMENT, SEWER AND BUILDING)

- A. Denote any area where any existing utility was repaired, replaced or relocated. Show correct location if plan location was incorrect.
- B. Note and accurately locate all existing underground utilities encountered during construction, whether shown on Drawings or not.

**AFFIDAVIT
FOR RECORD DRAWINGS**

_____, CONTRACTOR on _____
(Contractor) (Project Title per Contract Documents)

_____, hereby certifies that the enclosed Record Drawings show all changes made during construction, as specified under RECORD DOCUMENTS in Section 01700 of the Contract Documents.

By: _____
CONTRACTOR (Authorized Signature)

Sworn to and subscribed before me this _____ day of _____, _____

NOTARY PUBLIC

CERTIFICATE OF SUBSTANTIAL COMPLETION

PROJECT Briarwood Area Wastewater Pumping Station Improvements
(Title per Contract Documents)

DATE OF ISSUANCE _____

OWNER Village of Richfield

OWNER'S CONTRACT NO. (if applicable) _____

CONTRACTOR _____

ENGINEER ARCADIS U.S., Inc.

This Certificate of Substantial Completion applies to all Work under the Contract Documents or to the following specified parts thereof:

To Village of Richfield
OWNER

And To _____
CONTRACTOR

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR, and ENGINEER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on

DATE OF SUBSTANTIAL COMPLETION

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by CONTRACTOR within _____ days of the above date of Substantial Completion.

The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities, insurance and warranties and guarantees shall be as follows:

RESPONSIBILITIES:

OWNER: _____

CONTRACTOR: _____

The following documents are attached to and made a part of this Certificate:

(For items to be attached see definition of Substantial Completion as supplemented and other specifically noted conditions precedent to achieving Substantial Completion as required by Contract Documents.)

This certificate does not constitute an acceptance of Work not in accordance with the Contract Documents nor is it a release of CONTRACTOR's obligation to complete the Work in accordance with the Contract Documents.

Executed by ENGINEER on _____, _____.

ARCADIS U.S., Inc.
ENGINEER

By: _____
(Authorized Signature)

CONTRACTOR accepts this Certificate of Substantial Completion on _____, _____.

CONTRACTOR

By: _____
(Authorized Signature)

OWNER accepts this Certificate of Substantial Completion on _____, _____.

Village of Richfield
OWNER

By: _____
(Authorized Signature)

NOTICE OF ACCEPTABILITY OF WORK
(To Accompany Final Payment Request)

PROJECT Briarwood Area Wastewater Pumping Station Improvements
(Title Per Contract Documents)

OWNER Village of Richfield

OWNER'S CONTRACT NO. (if applicable) _____

CONTRACTOR _____

CONSTRUCTION CONTRACT DATE _____

ENGINEER ARCADIS U.S., Inc.

To Village of Richfield
OWNER

And To _____
CONTRACTOR

The Undersigned hereby gives notice to the above OWNER and CONTRACTOR that the completed Work furnished and performed by CONTRACTOR under the above Contract is acceptable expressly subject to the provisions of the related Contract Documents and the terms and conditions set forth on the reverse side hereof.

(Authorized Signature)
ARCADIS U.S., Inc.

Dated:

_____ , _____

(Reverse side of Notice)

CONDITIONS OF NOTICE OF ACCEPTABILITY OF WORK

The Notice of Acceptability of Work (Notice) on the front side of this sheet is expressly made subject to the following terms and conditions to which all persons who receive said Notice and rely thereon agree:

1. Said Notice is given with the skill and care ordinarily used by members of the engineering profession practicing under similar conditions at the same time and in the same locality.
2. Said Notice reflects and is an expression of the professional judgment of ENGINEER.
3. Said Notice is given as to the best of ENGINEER's knowledge, information and belief as of the date hereof.
4. Said Notice is based entirely on and expressly limited by the scope of services ENGINEER has been employed by OWNER to perform or furnish during construction of the Project (including observation of CONTRACTOR's Work) under ENGINEER's Agreement with OWNER and under the Contract referenced on the reverse hereof, and applies only to facts that are within ENGINEER's knowledge or could reasonably have been ascertained by ENGINEER as a result of carrying out the responsibilities specifically assigned to ENGINEER under ENGINEER's Agreement with OWNER and the Contract referenced on the reverse hereof.
5. Said Notice is not a guarantee or warranty of CONTRACTOR's performance under the Contract referenced on the reverse hereof nor an assumption of responsibility for any failure of CONTRACTOR to furnish and perform the Work thereunder in accordance with the Contract Documents

SECTION 02050

PRE-CONSTRUCTION VIDEOTAPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Pre-construction videotaping along the routes of construction for the proposed sewers, mains, and pumping station sites.
- B. Furnishing of DVDs and reports to OWNER.

1.3 UNIT PRICE – MEASUREMENT AND PAYMENT

- A. Pre-Construction Videotaping: By the lump sum price, complete.

1.4 DESCRIPTION OF WORK

- A. CONTRACTOR shall retain a photographer/videographer to perform pre-construction videotaping along routes of construction of the proposed force mains and pumping station sites. The purpose of this coverage shall be to accurately document the pre-construction condition of Site surface features.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 - 1. The pre-construction video tape documentation shall be done by a skilled commercial firm regularly engaged in the business of color audio-video construction documentation. Furnish such information as the ENGINEER deems necessary to determine the ability of the firm to produce professional video in accordance with contract specifications.

1.6 VIDEO DOCUMENTATION – GENERAL

- A. Videography:
 - 1. Video shall be high-resolution, high-quality video of the Site in standard DVD-R format.
 - 2. Video image shall have imprinted date and time that video was taken.
 - 3. Include audio narration, sufficient to explain the scenes shown.
 - 4. Provide three copies of each video disc.
 - 5. Label each video disc with appropriate project information. Include the following information on labels:
 - a. Project Title.
 - b. Location of project.
 - c. Month and year of coverage.

1.7 PRE-CONSTRUCTION VIDEO DOCUMENTATION

- A. Pre-construction Video Documentation:
 - 1. Provide pre-construction video of all work areas.
 - 2. Limits of Taping: Minimum of 50 feet each side and at the ends of the centerline of proposed force mains; pumping station sites.
 - 3. The surface features within the construction zone of influence shall include but not be limited to all visible roadways, pavements, curbs, driveways, sidewalks, culverts, headwalls, retaining walls, buildings, landscaping, trees, shrubbery and fences. Of particular concern shall be the existence of any faults, fractures, and or defects or other imperfections exhibited in the existing surface features.
 - 4. Identify houses and buildings by street number whenever possible, in such a manner that the progress of the taping and the proposed system may be located by a reference to the houses and buildings.
- B. If disagreement arises on condition of the Site and insufficient pre-construction photographic documentation was submitted prior to the disagreement, restore the grounds or area in question to extent directed by ENGINEER and to complete satisfaction of ENGINEER.

1.8 SUBMITTALS

- A. Submit the following:
 - 1. Pre-construction Video Documentation: Submit acceptable pre-construction video on DVD prior to mobilizing to and disturbing the Site. Provide pre-construction video documentation no later than first Application for Payment, unless other schedule is accepted by ENGINEER.
 - 2. Qualifications Statements:
 - a. When requested by ENGINEER, submit photographer qualifications and record of experience, prior to starting photographic documentation Work.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 02110

SITE CLEARING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Removal of surface debris.
- B. Removal of paving, curbs, and sidewalks.
- C. Removal of trees, shrubs, and other plant life.

1.3 REGULATORY REQUIREMENTS

- A. Comply with Laws and Regulations for environmental requirements, disposal of debris, burning debris on Site, and use of herbicides.
- B. Coordinate clearing work with Utility Companies.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify that existing trees, shrubs, and other plant life designated to remain are tagged or identified.

3.2 PROTECTION

- A. Locate, identify, and protect utilities that remain from damage.
- B. Protect trees, plant growth, and features designated to remain, as final landscaping.
- C. Protect benchmarks, survey control points, and existing structures from damage or displacement.

3.3 CLEARING

- A. Clear areas required for access to Site and execution of Work.
- B. Remove trees and shrubs indicated, stumps, and root system to a depth of 12 inches.
- C. Clear undergrowth and deadwood without disturbing subsoil.
- D. Remove surface debris.

3.4 REMOVAL

- A. Remove paving, curbs, and sidewalks as indicated. Neatly saw-cut remaining edges at right angle to surface.

3.5 DISPOSAL

- A. Dispose of debris, extracted plant life, and removed materials off Site in accordance with Laws and Regulations.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Soil materials.
- B. Removal of topsoil and subsoil.
- C. Cutting, grading, filling, compacting, and rough contouring the Site for structures, walks, pavements, and drainage.
- D. Final grade topsoil for seeding.

1.3 SHOP DRAWINGS

- A. Submit a sieve analysis and a proctor test report for Earth Fill A material.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

- A. Subsoil: (Earth Fill A).
 - 1. Excavated and reused material. Local borrow material.
 - 2. No on-site alluvial deposits or material containing organic matter.
 - 3. Well-graded throughout to avoid lenses, pockets, streaks, or layers of material differing materially in texture or gradation.
 - 4. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
 - 5. Contains no more than 20 percent by weight passing No. 200 sieve.
- B. Topsoil: (Earth Fill B).
 - 1. Excavated and reused material. Local borrow material.
 - 2. Graded.
 - 3. Free of roots, rocks larger than 1/2 inch, subsoil, debris, weeds, and foreign matter.
 - 4. Contains no greater than 20 percent nor less than 5 percent organic matter.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that survey benchmark and intended elevations for the Work are as indicated.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Locate, identify, and protect utilities.
- C. Protect plant life, lawns, and other features remaining as a portion of final landscaping.
- D. Protect benchmarks, survey control point, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 SOIL REMOVAL

- A. Remove topsoil from areas of construction, areas to be filled and graded, and other areas designated.
- B. Excavate subsoil to required lines, levels, and contours.
- C. Remove lumped soil, boulders, and rock.
- D. Stockpile excavated topsoil and subsoil material classified by ENGINEER as suitable for further use and remove material classified as unsuitable and material in excess of Project requirements.
- E. Do not excavate wet subsoil unless means available to process wet material to obtain optimum moisture content.
- F. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key placed fill material to slope to provide firm bearing.
- G. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

3.4 STOCKPILING

- A. Stockpile materials on-site at approved locations and so as not to impede the natural drainage in the area.
- B. Stockpile in sufficient quantities to meet Project requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.5 STOCKPILE CLEANUP

- A. Remove stockpile; leave area in a clean and neat condition. Grade Site surface to prevent free standing surface water. If approval given by OWNER, leave unused materials in a neat, compact stockpile.
- B. If a borrow area is indicated, leave area in a clean and neat condition. Grade Site surface to prevent free standing surface water.

3.6 SUBSOIL FILLING

- A. Have condition of foundation approved by ENGINEER prior to placing fill.
 - 1. Roll undisturbed subsoil foundation to determine the presence of soft spots.
 - 2. Remove soft spots and fill excavation as specified for subsoil at a price mutually agreed upon by OWNER and CONTRACTOR, and the Contract Price will be adjusted by Change Order.
 - 3. Give surface of repaired area a light harrowing to permit the knitting of the bottom layer of fill to the foundation.
- B. Fill areas to contours and elevations designated allowing for placement of topsoil.
- C. Do not place fill when either the material, the foundation, or the fill on which it would be placed is frozen or the moisture content is not within the acceptable range.
- D. Place fill material in continuous layers and mechanically compact. Maximum 6 inches per layer compacted depth.
- E. Maintain moisture content of fill materials as required to attain specified compaction density.
- F. Compact to 95 percent of maximum dry density, except under and within 5 feet of proposed pavements and under structures.
- G. Compact to 100 percent of maximum dry density under and within 5 feet of proposed pavements.
- H. Compact to 100 percent of maximum dry density all fill areas under structures.
- I. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise.
- J. Make grade changes gradual. Blend slope into level areas.

3.7 SUBSTRATE PREPARATION FOR TOPSOIL

- A. Eliminate uneven areas and low spots.
- B. Remove debris, roots, branches, stones in excess of 2 inches in size and lumps larger than 3 inches.
- C. Scarify surface to depth of 3 inches. Scarify in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

3.8 PLACING TOPSOIL

- A. Place topsoil to a nominal depth of 4 inches. Place topsoil during dry weather.
- B. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade.
- C. Remove roots, weeds, rocks, and foreign material while spreading.
- D. Manually spread topsoil close to plant life and structures to prevent damage.
- E. Compact placed topsoil to 90 percent of maximum dry density.
- F. Remove surplus subsoil and topsoil from Site.
- G. Leave stockpile area and Site clean and raked, ready for seeding.

3.9 FIELD QUALITY CONTROL

- A. Testing:
 - 1. Field In-Place Density Tests: ASTM D1556 (cone method) or ASTM D2922 (nuclear method).
 - 2. Compaction Testing: ASTM D698 (Standard Proctor).

- B. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

END OF SECTION

SECTION 02220

EXCAVATING AND BACKFILLING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Excavating for slabs-on-grade.
- B. Excavating for Site structures.
- C. Support of utilities across excavations.
- D. Backfilling Site structures to subgrade elevations.
- E. Fill under slabs-on-grade.
- F. Fill for over-excavation.
- G. Consolidation and compaction.
- H. De-watering.
- I. Temporary sheeting, shoring and bracing.
- J. Stone under slabs where indicated.

1.3 SHOP DRAWINGS

- A. Submit a sieve analysis and a proctor test report for Earth Fill A material and for C.D.F. III material.

PART 2 PRODUCTS

2.1 FILL MATERIALS

- A. Earth Fill A: Subsoil; follow Section 02200.
- B. Earth Fill B: Topsoil; follow Section 02200.
- C. Controlled Density Fill (C.D.F.): Three types as follows:
 - 1. C.D.F. I: Class II concrete; follow Section 03301.
 - 2. C.D.F. II:
 - a. Self-compacted, cementitious fill material consisting of cement, fly ash, fine aggregate and water.
 - b. Strength: 50 psi minimum compressive strength at 28 days.
 - c. Cement: Type I; follow Section 03301; minimum 50 pounds per cubic yard.
 - d. Fly Ash: Follow Section 03301; no limit on quantity.
 - e. Fine Aggregate: Follow Section 03301; no limit on quantity.

- f. Water: Potable; approximately 500 pounds per cubic yard.
- g. Mix design to be reviewed by ENGINEER.
- 3. C.D.F. III: Bank run sand and gravel, select sand or well graded crushed stone, free of organic materials and other deleterious substances. No rocks or lumps larger than 2 inches nor contain more than 13 percent by weight passing No. 200 sieve.

D. Class I Concrete: Follow Section 03301.

E. Stone: ODOT 703, Size 57 or 67. (Crushed limestone only; no slag permitted.)

F. Filter Fabric: ODOT 712.09, Type A.

G. Sand Fill: Natural or manufactured.

2.2 TEMPORARY SHEETING, SHORING AND BRACING

- A. The type of sheeting used, design, and method of installation, including embedment and bracing, shall be determined by CONTRACTOR.

PART 3 EXECUTION

3.1 PREPARATION

- A. Verify that survey benchmark and intended elevations for the Work are as indicated.
- B. Identify required lines, levels, contours, and datum locations.

3.2 EXCAVATING

- A. Remove topsoil; see Section 02200.
- B. Underpin adjacent structures which may be damaged by excavating Work.
- C. Excavate subsoil to accommodate slabs-on-grade, Site structures, and other construction operations. Foundations shall bear on undisturbed earth or as noted.
- D. Fill unauthorized excavations carried or found below the grades given with C.D.F. I or II.
- E. Comply with Laws and Regulations of authorities having jurisdiction to maintain stable excavations.
- F. Do not interfere with 45 degree bearing plane of foundations.
- G. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- H. Keep excavation dry. Supply, operate, and maintain necessary pumps, piping, etc., to perform Work. Maintain all building drainage.
- I. Hand-trim excavation. Remove loose material.
- J. Notify ENGINEER of unexpected subsurface conditions and discontinue affected Work in area until notified to resume Work.

- K. If, in ENGINEER's opinion, the subgrade is unsuitable, ENGINEER may direct that foundations be deepened, widened and/or lowered or that the unsuitable material be removed and replaced with C.D.F. of the type determined by ENGINEER.
- L. Stockpile excavated material in accordance with Section 02200; remove excess or unsuitable material from Site.

3.3 SUPPORT OF UTILITIES

- A. Support pipes, sewers, cables and conduits across excavated areas entering or leaving structures, with Class I concrete beams and supporting piers. Required beam sizes and reinforcement for span lengths and pipe depths are as shown on Drawings. Support all utilities exposed in excavated areas by such means to prevent damage and maintain use.
- B. The Contractor for each Contract shall provide utility supports for pipes, sewers, cables, and conduit previously installed across his excavation when his excavation extends below the grade of the utilities. For all other excavations, the Contractor installing the utilities shall be responsible for providing required supports.

3.4 BACKFILLING

- A. Verify structural ability of unsupported walls to support loads imposed by the fill. Provide temporary bracing as required.
- B. Encase piping laid below underside of slabs with C.D.F. I or II.
- C. Fill excavated trenches that occur within 45 degree line sloping out and down from toe of foundation slab with C.D.F. I or II.
- D. Do not use frozen material for backfill, or place backfill over porous, wet, frozen or spongy subgrade surfaces.
- E. Fill excavations adjacent to basement walls, retaining walls, and walls having earth on one side (excluding circular tanks) with Earth Fill A up to a point allowing for placement of topsoil, except where C.D.F. or drainage layers are called for. Compact to 95 percent of maximum density.
- F. Fill around circular tanks with Earth Fill A; compact to 95 percent of maximum density except where C.D.F. or drainage layers are called for.
- G. Place C.D.F. III in maximum 8 inch thick layers. Compact, as soon as possible after placing, to 100 percent of maximum density.
- H. Employ a placement and compaction method that does not disturb or damage other Work.
- I. Maintain backfill materials at a moisture content as required to attain specified compaction density.
- J. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.
- K. Make gradual grade changes. Blend slope into level areas.

3.5 FIELD QUALITY CONTROL

- A. Compaction Testing: ASTM D698 (Standard Proctor).

- B. Frequency of Compaction Tests:
 - 1. For Earth Backfill and C.D.F. III Backfill: Two tests per lift for areas up to 4,000 square feet, and one additional test per lift for each additional 2,000 square feet.
 - 2. No compaction testing required for C.D.F. I and C.D.F. II backfill.
 - 3. For any backfill not specifically indicated, CONTRACTOR to employ, at his expense, a testing laboratory approved by OWNER.

- C. If tests indicate Work does not meet specified requirements, remove Work; replace and retest.

3.6 PROTECTION

- A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.

- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

SECTION 02225

TRENCHING AND BACKFILLING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Excavating trenches for buried utilities and appurtenances.
- B. Backfilling and compaction from top of bedding to grade. (Bedding is included with the buried utility to be installed in the trench.)

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Granular Backfill and Controlled Density Fill (C.D.F.) by the cubic yard. Payment shall not exceed the quantity required from above the bedding material to the underside of the pavement surface for the maximum trench widths specified in Article 3.2 of this Section 02225 (centered over the buried utility) for the included types and sizes of buried utilities, and at structures, shall be limited to that area between the outside dimensions of the structure and vertical planes 2 feet beyond these dimensions on all sides. In computing the number of cubic yards for which payment will be made, assume the trench walls are vertical. Granular backfill and C.D.F. required for areas outside the limits defined shall be provided by and at CONTRACTOR's expense.

1.4 ADJUSTMENT PRICE - MEASUREMENT AND PAYMENT

- A. Additional excavating and backfilling performed at the written direction of ENGINEER below or beyond the lines and grades shown or specified will be paid for at the appropriate adjustment prices included in the Contract or, if not included, at a price mutually agreed upon by OWNER and CONTRACTOR, and the Contract Price adjusted by Change Order. Restrict measurement for excavating and backfilling to quantities required for the specified or shown depths of excavation, for the maximum trench widths specified or shown for the buried utility being installed, and at structures to that area within vertical planes passing 24 inches outside the outer limits of the structure.
- B. Wood supports and bracing required for protection of existing underground utilities not shown on the Drawings or marked at the time of construction by the Utility Owner will be paid for at the appropriate adjustment prices included in the Contract or, if not included, at a price mutually agreed upon by OWNER and CONTRACTOR, and the Contract Price adjusted by Change Order. Payment will be made for a length installed within an excavation having a width limited to 2 feet each side of the nominal inside diameter of the buried utility being installed for pipes, ducts, and conduits, and of the centerline for cables.

1.5 DEFINITIONS

- A. Buried Utility: Any buried pipe, duct, conduit, or cable.

1.6 SHOP DRAWINGS

- A. Submit a sieve analysis and a proctor test report for granular backfill material.

1.7 COORDINATION

- A. Verify Work at lower elevations is complete before placing higher elevation work.

PART 2 PRODUCTS

2.1 FILL MATERIALS

- A. Earth Backfill: Excavated earth material, finely divided and free of stones 3 inches or greater in any dimension to at least 3 feet above pipe top.
- B. Granular Backfill:
 - 1. ODOT Item 304 Limestone for up to 18 inches below the surface, except no slag permitted.
- C. Controlled Density Fill (C.D.F.): ODOT Item 613, Type I low strength mortar backfill.
- D. Topsoil:
 - 1. Excavated and reused material. Local borrow material.
 - 2. Graded.
 - 3. Free of roots, rocks larger than 1/2 inch, subsoil, debris, weeds, and foreign matter.
 - 4. Contains no greater than 20 percent nor less than 5 percent organic matter.

2.2 TIMBER SUPPORTS AND BRACING

- A. Native hardwood; supports minimum 6 inches square.

PART 3 EXECUTION

3.1 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Protect existing utilities in accordance with Article 3.5 of this Section.
- C. Protect plant life, lawns, and other features remaining as part of final landscaping. Protect existing trees and shrubs in accordance with Article 3.7 of this Section.
- D. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.
- E. In lawn areas and in farm fields, as determined by ENGINEER, remove and stockpile topsoil for replacement during backfilling.
- F. Prior to open trenches entering paved limits of a street, alley, driveway, or parking area, neatly cut the pavement for its full depth, then remove, and dispose of off-site.

3.2 EXCAVATION

- A. Excavate material encountered to subgrade elevations, indicated slopes, lines, depths and invert elevations required for utilities.
- B. Cut trenches to uniform widths sufficient to enable installation and allow inspection, unless otherwise specified, and to provide for the minimum cover specified.

- C. Do not interfere with 45 degree bearing plane of foundations.
- D. Provide trench protection in accordance with Article 3.6 of this Section.
- E. Hand-excavate and shape trench bottom to provide uniform bearing and support of the buried utility. Remove loose material.
- F. Use pavement protection such as matting or rubber tracks when using track-mounted equipment to protect pavement to remain.
- G. For Pipe Sewers:
 - 1. The trench width below the top of pipe level shall not exceed the dimensions specified in Section 02732 for the various types and sizes of pipe, and shall be at least 12 inches greater in width than the outside diameter of the pipe barrel. Whenever the maximum allowable trench width (below the top of pipe level) is exceeded for any reason, ENGINEER reserves the right to direct CONTRACTOR to use greater strength pipe, to modify the type of backfill, to embed the pipe in concrete, or to utilize a combination of these procedures, all at CONTRACTOR's expense.
 - 2. Excavate trenches in earth to a depth at least 1/8 the outside pipe diameter or 4 inches, whichever is greater, below the outside bottom of the pipe barrel and bell when the pipe is laid on its final grade.
- H. For Force Mains:
 - 1. Except where otherwise specifically required or permitted by ENGINEER, excavate trenches to a depth sufficient to provide not less than 4 feet of vertical cover over the outside top of the pipe barrel. However, install at a greater depth when shown on Drawings, when necessary to pass under other utilities or obstructions, or where necessary to prevent high points. When paralleling roadside ditches or streams, provide lateral cover at least equal to specified vertical cover.
 - 2. The width of the trench shall not be more than 24 inches greater than the outside pipe diameter, except at joints, where sufficient space shall be provided for properly making the joints without raising the length of pipe above the solid bottom of the trench. Care shall be taken to detect and remove stones and debris in the bottom of the trench which would damage the pipe or be detrimental to the proper bedding of the pipe, with removal to be for a depth of at least 6 inches below the bottom of the pipe.
- I. When water is encountered in the trench, de-water as required to maintain the water level at least 3 feet below the bottom of the trench on a continuous basis until ENGINEER allows removal of the de-watering system. Supply, operate, and maintain pumps, piping, etc., for the de-watering system.
- J. If in ENGINEER's opinion, the subgrade is not suitable to provide adequate foundation for the buried utility being installed, ENGINEER may direct that the unsuitable material be removed and replaced with approved granular material.

3.3 BACKFILLING

- A. Do not place heavy or large quantities of backfill material until backfilling has progressed to a depth of at least 3 feet over the top of the buried utility. Carefully place backfill material so as not to damage the joints or displace the buried utility.
- B. Backfill immediately following trenching and installation operations to reduce the possibility of damage to pavements and buried utilities, and as required to comply with Article 3.9 of this Section, and maintain backfilled areas in accordance with Article 3.8 of this Section.

- C. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- D. Backfill trenches coming within existing and proposed paved or stoned streets, alleys, driveways, and parking areas, and within existing and proposed sidewalks with granular material. Place the granular material in maximum 12 inch layers, loose measurement, and mechanically compact to not less than 100 percent of maximum density as determined in accordance with ASTM D698 (Standard Proctor).
- E. For trenches along and across existing and proposed paved or stoned streets, alleys, driveways, and parking areas, and along and across existing and proposed sidewalks, backfill any portion of the trenches falling within that area below a line drawn at 45 degrees to the horizontal from the surface at the edge of the pavement or sidewalk or back of curb and above the horizontal plane of the pipe embedment material with compacted granular backfill as specified above for trenches coming within same.
- F. Backfill trenches with compacted granular backfill to the invert elevation of existing buried utilities when the line of construction is along the existing, and to the invert elevation of other new buried utilities to be provided under the Contract as directed by ENGINEER.
- G. For backfilling trenches not requiring compacted granular material, replace as much of the excavated material as possible. Until backfilling has progressed to a depth of at least 3 feet over the top of the buried utility, use finely divided material, free of stones 3 inches or greater in any dimension, boulders and other harmful debris, and place in 6 inch layers, loose measurement, and compact by mechanical tamping. Place remainder of backfill in maximum 12 inch layers, loose measurement, and compact by mechanical tamping. In no case shall compaction be less than 90 percent of maximum density as determined in accordance with ASTM D698 (Standard Proctor), unless otherwise specified.
- H. Along weed or unsodded areas, grade the backfilled material to conform to the original ground profile.
- I. In lawn areas and in fields used for farming, replace topsoil removed and stockpiled prior to trenching and grade to conform to the original ground profile.
- J. In lawns and other areas where grass exists, as determined by OWNER or ENGINEER, provide a minimum of 4 inches of topsoil, grade the area, and make ready for seeding; follow Section 02930. If the existing replaced topsoil does not provide the required minimum depth, provide required additional topsoil.
- K. Regrade and reshape all road shoulders and all ditches and swales from existing high points to existing drainage structures or other outlets along the proposed improvement. Ditches which are reshaped shall have reasonable side slopes. Vertical or steep slopes will not be permitted. CONTRACTOR, OWNER and ENGINEER shall mutually agree and establish all ditch grades to be restored prior to construction.
- L. Backfill trenches to contours and elevations with unfrozen materials.
- M. Backfill areas remaining after removal and abandonment of existing facilities as specified for trenches.
- N. Maintain moisture content of fill materials as required to attain specified compaction density.
- O. Backfill to ditch elevations shown on Drawings.

3.4 FIELD QUALITY CONTROL

- A. OWNER or ENGINEER may check compaction of the backfill at any time.
- B. For compacted earth and granular backfill in trenches, OWNER may employ a testing laboratory to make tests on Site and will pay all costs for the first set of tests performed per lift. If compaction fails to meet Specifications, all succeeding tests for that lift shall be at expense of CONTRACTOR.

3.5 PROTECTION OF EXISTING UTILITIES

- A. Uncover and determine the elevation, size and materials of existing underground utilities along the route of construction, as shown on Drawings or marked at the time of construction by the Utility Owner, at least 200 feet in advance of pipe installation.
- B. Adequately support, shore up, or otherwise protect underground utilities whenever exposed in the trench. Extend supports a minimum of 12 inches into undisturbed earth each side of trench. Band or tie utility to bridging for its full length. Where bridging cannot be supported by a firm foundation, provide vertical support, including any lateral bracing necessary to provide firm support.
- C. While the Drawings indicate the location of existing utilities, in accordance with the best information presently available, neither OWNER nor ENGINEER assumes any responsibility for the accuracy of their location, size or materials, or that all utilities are shown. A listing of Utility Company contacts is included on Drawings.
- D. Plan excavation work to avoid damage to and minimize interference with existing underground utilities in the area. Maintain adequate clearance between cutting edge of excavating equipment and underground utility to avoid damage to utility.
- E. Above ground (aerial) utilities, including power, telephone and cable television, shall remain in service at all times. Any anticipated disruption of service shall be with the full knowledge of the Utility Company and required advance notice to affected users. Removal of guy wires and holding of poles shall be done as required to complete the Work, shall be as agreed upon by the Utility Company and CONTRACTOR, and shall be at the expense of CONTRACTOR.
- F. Arbitrary disruption of underground and aerial utility services will not be permitted.

3.6 TRENCH PROTECTION

- A. Provide trench protection using a trench box, wood sheeting and bracing, or such other method as determined by CONTRACTOR to maintain a stable excavation and comply with applicable Laws and Regulations.
- B. For wood sheeting and bracing use sound lumber suitable for the purpose intended, and arrange so as to support the trench walls and existing structures and utilities. Cut off sheeting to be left in place not less than 18 inches below ground surface.
- C. Sheeting and bracing may be removed at the discretion and responsibility of CONTRACTOR after placing and compacting backfill to a level at least 2 feet above the pipe top. Do not pull sheeting in increments exceeding 3 to 4 feet in order to avoid the danger of breaking the buried utility due to the weight of the backfill. Upon removal, immediately fill and recompact voids left due to such removal.
- D. Where necessary to drive sheeting below the pipe bottom, drive sheeting to an elevation as determined by ENGINEER and leave such sheeting in place from a point 2 feet above the top of the buried utilities.

3.7 PROTECTION, REMOVAL AND REPAIR OF TREES AND SHRUBS

- A. Consult with ENGINEER and obtain permission prior to removal of any tree, shrub, or limb not noted on Drawings to be removed well in advance of such removals. Such removals outside right-of-way or easement limits shall not be performed without written permission of property owner.
- B. Fell trees to be removed so as not to injure trees to remain.
- C. Remove stumps and roots to a minimum of 12 inches below grade.
- D. Take every precaution to prevent damage to trees and shrubs not noted to be removed.
- E. Carefully trim and shape trees, tree limbs and bushes located such that CONTRACTOR's equipment will damage same during construction. Squarely cut all limbs and branches. Replace trees and bushes other than those whose removal is approved by ENGINEER, which are destroyed or damaged to the extent that their continued life is impaired.
- F. Prior to Final Payment, employ a competent arborist to inspect all trees and shrubs along the Work line and to properly trim, prune, repair and protect any that have been damaged, and to designate those which have been so damaged as to require replacement.

3.8 MAINTENANCE OF TRENCHES AND EXCAVATIONS

- A. Maintain the backfilled trenches and other excavations at all times during the progress of the Work. In particular, keep those trenches or excavations within 15 feet of the edge of pavements or traveled roadways filled to the same level as the adjacent undisturbed ground. Immediately fill in any settlement which occurs during this period to prevent the possibility of accidents.

3.9 PROGRESS

- A. Complete backfilling operations within a reasonable distance of trenching and buried utility installation operations. The specific limitations of this paragraph shall be at the discretion of OWNER and ENGINEER, but the general intent is to require CONTRACTOR to minimize the inconvenience to nearby residents or businesses. OWNER and ENGINEER will be permitted to require CONTRACTOR to cease trenching and buried utility installation operations at such time as they feel that backfilling has not progressed satisfactorily. At no time shall the exposed trench length exceed 100 feet.

END OF SECTION

SECTION 02350

DIRECTIONAL DRILLING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Directional drilling for force main.
- B. Pipe and appurtenances within the limits for directional drilling.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Force Main Directionally Drilled: By the price per foot of pipe of sizes included in the Bid Items, including the furnishing and installation of the main line pipe and appurtenances within the limits for directional drilling, and the cost of necessary inspections, insurance, etc., required by governing authorities. Includes directionally drilled pipe, installed complete, except for portions of Work for which separate payment is made under this or other Sections.
- B. Upon installation, an amount equal to at least 3 percent of the price bid per foot of pipe will be withheld for completion of testing. Individual circumstances shall determine whether an amount in excess of the percentage indicated will be withheld. When items for which monies are withheld are completed, the amount withheld shall be appropriately reduced. Amounts withheld pursuant to this paragraph shall be in addition to retainage made pursuant to applicable requirements of the Contract Documents.

1.4 PROCESS DESCRIPTION

- A. Directional drilling is the process of directing a string of small pipe, known as a drill string, along a pre-determined profile to drill a pilot hole, enlarge the pilot hole, and pull the pipe into place. In general, the process uses a machine to rotate, advance and retract the drill string; a cutterhead for drilling the pilot hole; a backreamer to enlarge the pilot hole to the required diameter; a pulling head and bearing swivel to pull the pipe into place; a drill string head locating and guidance system; and drilling fluid to provide lubrication, remove the cuttings and spoil and maintain the integrity of the hole.

1.5 SUBMITTALS

- A. Comply with requirements for Shop Drawings; follow Section 01300.
- B. The CONTRACTOR shall prepare and submit for review and approval, prior to the start of construction, the following:
 - 1. Horizontal Directional Drilling Plan describing the equipment, methods, procedures (pilot hole drilling, insertion, reaming, pullback, coating protection, internal cleaning, internal gauging, hydrostatic tests, dewatering, purging, etc.), monitoring procedures (pressures, depth, alignment, placement, entrance and exit points, etc.), construction sequence and scheduling, contingency plans, and other items of concern to be performed during the horizontal directional drilling process. HDD Plan shall also include the following:

- a. Identification of the proposed directional drill limits and locations of pit excavations to install the proposed force main pipe.
 - b. A written description of the proposed drilling operations, including documentation of planned overcut.
 - c. A contingency plan to address the presence of obstructions (e.g., cobbles and boulders).
 - d. A list of back-up equipment that will be available during construction to allow the drill process to proceed in the event of equipment failure.
 - e. Contact information for a flowable fill/grouting contractor and ground penetrating radar (GPR) consultant and that will be on-call for emergency response to pavement distress and surface settlements that might result from the drilling operations.
 - f. Proposed methods for dealing with fractures, loss of grout, and other related problems where encountered.
2. Project Safety Plan.
 3. Submit arrangement drawings and technical specifications of the machine and equipment (including any modifications), three-year experience record with this type of machine and a copy of the manufacturer's operation manual for the machine.
 4. CONTRACTOR'S construction drawings, specifications, and contingency plans shall be submitted on the following items:
 - a. Complete details/calculations of the significant factors and constraints associated with directional drilling operations including, but not limited to, the necessary restraints required for HDPE pipe expansion and contraction, all drilling fluid mixtures and pressures, bit pressures, minimum and maximum bore hole pressures, hydrostatic tests and cleaning, and testing procedures.
 - b. Method of monitoring and controlling the specified line and grade of excavation including, but not limited to, the methods, procedures, reliability, and necessary equipment to be used during the directional drilling operations. Identify type of drilling fluid to be used during drilling operations.
 - c. Complete details of the muck/spoils containment, dewatering, drying, and removal methods, procedures, equipment, contingency plan and off-site disposal location. Contain drilling fluids in a lined pit or portable tank. Prevent drilling fluids from entering existing utilities and/or drainage systems.
 - d. Complete details of the methods, procedures and equipment arrangement to be used during the HDPE pipe storage, assembly, installation, cleaning, and testing.
 - e. Proposed contingency plans for the protection of the culvert, headwall, drainage way, utility lines, and other underground structures including, but not limited to, the complete details of the methods/procedures, equipment to be used, etc. for critical phases and areas of the directional drilling operations.
- C. Quality Control Methods: At least 10 days prior to the start of directional drilling, CONTRACTOR shall submit a description of his quality control methods he proposes to use in the directional drilling operations to the ENGINEER. The submittal shall describe:
1. Procedures for controlling and checking line and grade.
 2. Field forms for establishing and checking line and grade.
- D. ENGINEER will base the review of submitted details and data on the requirements of the completed work, safety of the work in regards to the public, potential for damage to public or private utilities and other existing structures and facilities, and the potential for unnecessary delay in the execution of the work. Such review shall not be construed to relieve the CONTRACTOR in any way of his responsibilities under the contract. CONTRACTOR shall not commence work on any items requiring CONTRACTOR'S construction drawings or other submittals until the drawings and submittals are reviewed and accepted by the ENGINEER.

1.6 QUALITY ASSURANCE

- A. Submit qualifications for installing pipe by directional drilling.
 - 1. The horizontal directional drilling (HDD) Contractor must demonstrate expertise in “trenchless” methods by providing a list of five utility references for which similar projects have been successfully completed with soil conditions similar to those encountered for this project. The references should include a name and telephone number where contact can be made to verify the Contractor’s capability. The Contractor must provide documentation showing successful completion of the projects used for reference. Conventional trenching experience will NOT be considered applicable.
 - 2. All supervisory personnel must be adequately trained and will have at least four years of experience in directional drilling. CONTRACTOR will have to submit the names and resumes of all supervisory field personnel prior to the start of construction.

1.7 REGULATORY REQUIREMENTS

- A. OWNER will secure necessary permits. Work not to begin before permit is issued.
- B. CONTRACTOR responsible for meeting the requirements of the governing authority, which may include approval of equipment to be used for installation of the pipe, and for notifying the governing authority prior to start of Work.
- C. OWNER and ENGINEER shall not be responsible for additional cost to CONTRACTOR for failure to meet governing authority’s requirements.

PART 2 PRODUCTS

2.1 FORCE MAIN PIPE

- A. Follow Section 02666 for HDPE pipe material specifications.

2.2 TRACER WIRES

- A. Copper, No. 6 AWG, Type RHW-2.

2.3 VALVE BOXES

- A. Coated cast iron, two-piece screw type, 5-1/4 inch shaft, approximately 10 inch long top section, approximately 15 inch long bottom section, plain lock cover.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that area for installation is ready to receive Work, and excavations, dimensions, and elevations are as indicated on Drawings.
- B. CONTRACTOR accepts full responsibility for CONTRACTOR’s conclusions relative to the nature and probable difficulties of the Work due to underground facilities and soil conditions.
- C. Beginning of installation means CONTRACTOR’s acceptance of existing conditions.

3.2 PREPARATION

- A. Notify governing authority.
- B. Establish drill staging area and pipe staging area as needed to accommodate workers, equipment, and drilling fluid containment, and to string, fuse, and inspect the pipe, while disturbing as little area as possible.
- C. Excavate entry and exit pits; follow Section 02225. Shore as required by Laws and Regulations.

3.3 INSTALLATION

- A. General:
 - 1. CONTRACTOR shall install the pipelines by means of horizontal directional drilling as shown, specified and as recommended by the manufacturer.
 - 2. CONTRACTOR shall be responsible for his means and methods of directional drilling construction and shall ensure the safety of the work, the CONTRACTOR'S employees, the public, and adjacent property, whether public or private.
 - 3. CONTRACTOR shall anticipate that portions of the drilled excavation will be below the groundwater table.
 - 4. The CONTRACTOR should be equipped with different bore heads that allow for drilling and steering in differing soil/groundwater conditions.
 - 5. CONTRACTOR shall comply with all local, state, and federal laws, rules, and regulations at all times to prevent pollution of the air, ground, and water.
 - 6. If there is a conflict between manufacturer's recommendations and the Drawings or Specifications, request instructions from ENGINEER before proceeding.
- B. Drilling Operations:
 - 1. Directional drilling/boring shall use techniques of creating or directing a borehole along a predetermined path to a specified target location. This must involve use of mechanical and hydraulic deviation equipment to change the boring course and must use instrumentation to monitor the location and orientation of the boring head assembly along a predetermined course.
 - 2. Drilling must be accomplished with fluid assisted mechanical cutting. The spoils must be transported from the job site and be properly disposed. Under NO circumstances will the drilling spoils be permitted to be disposed into waterways, sanitary, storm, or any other public or private drainage system.
 - 3. Steering shall be accomplished by the installation of an offset section of drill stem that causes the cutterhead to turn eccentrically about its centerline when it is rotating. When steering adjustments are required, the cutterhead offset section is rotated toward the desired direction of travel and the drill stem is advanced forward without rotation.
 - 4. Complete the drilling operations in a continuous operation within the roadway ROW. Ideally, complete the entire directional drilling process (i.e., pilot hole, reaming and pull-back) in a continuous operation so that borehole stability is maintained until the final production pipe is pulled into place.
 - 5. Maintain drilling fluid within the reamed hole and during pipe pull-back.
 - 6. Horizontal directional drilling contractor is required to perform down-hole pressure monitoring during boring operations.
- C. Tolerances:
 - 1. The CONTRACTOR shall at all times provide and maintain instrumentation that will accurately locate the pilot bore hole and measure drilling fluid flow and pressure.
 - 2. CONTRACTOR shall provide and grant ENGINEER access to all data and readout pertaining to the position of the bore head and fluid pressures and flows. No information pertaining to the position or inclination of the pilot bores shall be withheld from the ENGINEER.

- D. Ream and Pullback:
1. After an initial bore has been completed, a reamer will be installed at the termination/exit pit and the pipe will be pulled back to the starting/entry pit.
 2. Reaming operations shall be conducted to enlarge the pilot after acceptance of the pilot bore. The number and size of such reaming operations shall be conducted at the discretion of the CONTRACTOR.
 3. The maximum allowable pull exerted on the HDPE pipelines shall be measured continuously and limited to the maximum allowed by the pipe manufacturer so that the pipe or joints are not over stressed.
 4. A swivel shall be used to connect the pipeline to the drill pipe to prevent torsional stresses from occurring in the pipe.
 5. The lead end of the pipe shall be closed during the pullback operation.
 6. The pipelines shall be adequately supported by rollers and side booms and monitored during installations so as to prevent over stressing or buckling during the pullback operation.
 7. Support/Rollers shall be spaced at a maximum of 60 feet on centers, and the rollers to be comprised of a non-abrasive material arranged in a manner to provide support to the bottom and bottom quarter points of the pipeline allowing for free movement of the pipeline during pullback.
- E. Joining Pipe Sections (High Density Polyethylene Pipe Joints):
1. Polyethylene pipe and fittings shall be joined by the thermo butt-fusion process at 400°F – 450°F to produce a homogeneous, sealed, leak tight joint unless otherwise noted as flanged connections. Pipe lengths to be joined by thermo butt-fusion shall be of the same type, grade, and class of polyethylene compound and supplied from the same raw material supplier.
 2. Fusion process shall meet the requirements of ASTM D-3261.
 3. At the point of fusion, the outside diameter and minimum wall thickness shall meet the outside diameter and minimum wall thickness specifications of ASTM F-714.
- F. Tracer Wires:
1. Pull three tracer wires continuously along with the pipe.
 2. Install valve boxes at each end of pipe.
 3. Terminate tracer wires in valve boxes, looping wire near top for connection of locating equipment.
- G. Transitions from One Type of Pipe to Another:
1. Provide all necessary adapters, specials and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.
- H. After installation, testing and acceptance, of HDPE force main pipe, make connections to the ductile iron force main pipe.
- I. Backfill entry and exit pits; follow Section 02225.

3.4 FIELD QUALITY CONTROL

- A. Furnish, operate and maintain instrumentation that will accurately locate the pilot hole, measure drilling fluid flow discharge rate and pressure, and measure stresses on pipe during installation.
- B. ENGINEER shall have access to instruments, gages, and readings at all times.
- C. Maintain drilling logs including dates, times and locations, soil condition, drilling data such as depth, angle and rate of penetration, and utility crossings.
- D. Monitor and record use of drilling fluid.

- E. Monitor and record stresses imposed on pipe during pulling.
- F. Test tracer wires for continuity.
- G. Testing of HDPE Piping:
 - 1. Refer to Section 02666, Force Mains for testing specifications.
 - 2. All horizontal directional-drilled piping shall be cleaned and tested prior to any tie-in connections with associated piping.

3.5 RECORD DRAWINGS

- A. Base on the final course followed by the reamer and installed pipe.

END OF SECTION

SECTION 02360

STEEL ENCASEMENT PIPE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Steel encasement pipe for 6-inch force main.
- B. Pipe and appurtenances within steel encasement pipe.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Force Main Pipe in Steel Encasement Pipe: By the price per linear foot for steel encasement pipe of sizes included in the Bid items, installed by boring and jacking and including the furnishing and installation of the main line pipe within the encasement pipe, and the cost of necessary inspections, insurance, etc., required by governing authority. Includes steel encasement pipe and main line pipe, installed complete, except for portions of Work for which separate payment is made under this or other Sections.
- B. Upon installation by boring and jacking an amount equal to at least 3 percent of the bid price per linear foot will be withheld for completion of testing, seeding, and replacement of existing facilities, where payment therefor is not made under other Sections. Individual circumstances shall determine whether an amount in excess of the percentage indicated will be withheld. When items for which monies are withheld are completed, or partially completed, the amount withheld shall be appropriately reduced. Amounts withheld pursuant to this paragraph shall be in addition to retainage made pursuant to applicable requirements of the Contract Documents.

1.4 REGULATORY REQUIREMENTS

- A. OWNER will secure necessary permits. Work not to begin before permit is issued.
- B. CONTRACTOR responsible for meeting the requirements of the governing authority, which may include approval of equipment to be used for installation of the encasement pipe, and for notifying the governing authority prior to start of Work.
- C. OWNER and ENGINEER shall not be responsible for additional cost to CONTRACTOR for failure to meet governing authorities' requirements.

1.5 QUALIFICATIONS

- A. CONTRACTOR or any Subcontractor used to perform this function shall have a minimum of 5 years experience in the successful completion of bores in the sizes included for this Project, and with the subsurface conditions prevalent for this Project. A list of references shall be submitted and reviewed by ENGINEER prior to approval for performing said Work.

PART 2 PRODUCTS

2.1 STEEL ENCASEMENT PIPE

- A. Comply with ASTM A139, Grade B.
- B. Minimum Tensile Strength: 60,000 psi.
- C. Minimum Yield Strength: 35,000 psi.
- D. Wall Thickness: Indicated on Drawings.
- E. Exterior Coating: Bituminous.
- F. Joints: Fully welded on circumference.

2.2 FORCE MAIN PIPE

- A. Follow Section 02666.

2.3 PIPE BLOCKING AND APPURTENANCES

- A. Pipe Blocking: Casing chocks with a maximum of 1 inch between blocking and steel encasement pipe wall; chock width and spacing as instructed by manufacturer.
 - 1. Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Cascade Waterworks Manufacturing Company.
 - c. Power Seal Pipeline Products Corporation.
 - d. Or as approved.
 - 2. Materials: Polyethylene or stainless steel with a liner and UHMW polymer plastic runners.
- B. Fill: Grout as approved by governing authority.
- C. Bulkheads: Treated wood or redwood; 2 inches thick.
- D. End Seals: Wrap around type with sealed joint.
 - 1. Manufacturers:
 - a. Advance Products & Systems, Inc., Model AW.
 - b. Cascade Waterworks Manufacturing Company, Style CCES.
 - c. Or as approved.
 - 2. Materials: Synthetic rubber seal and Type T-304 stainless steel bands.

PART 3 EXECUTION

3.1 PREPARATION

- A. Apply exterior coating to steel encasement pipe a minimum of 48 hours prior to pipe installation.
- B. Notify governing authority.

3.2 STEEL ENCASUREMENT PIPE INSTALLATION

- A. Boring and Jacking:
 - 1. Install encasement pipe by boring and jacking to line and grade shown. A minimum distance of 5 feet from the edge of pavement is required unless shown otherwise on drawings.
 - 2. Excavate bore pit and receiving pit; follow Section 02225. Shore as required by Laws and Regulations.
 - 3. Boring operations shall be continuous; boring auger never to be more than 1 inch ahead of casing pipe during boring operations.
 - 4. Backfill Pits: Follow Section 02225.

3.3 MAIN LINE PIPE INSTALLATION

- A. Install main line pipe within encasement pipe; follow Section 02666 in so far as applicable.
- B. Block pipe in place using casing chocks; install at intervals as instructed by manufacturer (minimum three chocks each pipe); maintain proposed grade.
- C. Fill encasement pipe with grout. Place from one end.
 - 1. Main line pipe shall pass required testing before filling.
 - 2. Provide means to prevent over-pressurization of grout.
- D. Bulkhead each end of encasement pipe. Install a small pipe to drain any leakage within encasement pipe.
- E. Provide end seals; one at each end of encasement pipe.

END OF SECTION

SECTION 02410

PUMPING STATIONS - SUBMERSIBLE TYPE WITH VALVE VAULT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Submersible type pumping stations with valve vaults, and including:
 1. Site clearing.
 2. Earthwork.
 3. Retaining Wall (PS No. 1)
 4. Excavating and backfilling.
 5. Wet well with resilient connectors, steel supports, electrical handhole, and vent.
 6. Valve vault with manhole frame and cover, manhole steps, insulation, and vent.
 7. Station Enclosure.
 8. Anchor bolts and anchors.
 9. Submersible pumps with pump guide assemblies, pump access doors, and pump controls.
 10. Odor control system.
 11. Influent sewer and manholes.
 12. Catch basins and storm sewer pipes.
 13. Piping for pump discharges and drains.
 14. Force main.
 15. Concrete.
 16. Guard posts.
 17. Stone drive and parking area (PS No. 1).
 18. Asphalt drive and parking area (PS No. 2).
 19. Electrical.
 20. Painting.
 21. Seeding.

1.3 UNIT PRICE – MEASUREMENT AND PAYMENT

- A. Pumping Stations: By the lump sum price, complete, for each Pumping Station.

1.4 SUBMITTALS

- A. Shop Drawings for Precast Structures shall Include the Following:
 1. Design, including calculations and drawings.
 2. Concrete mix design.
 3. Joint sealing and pipe passage details.
 4. Setting instructions.
 5. Fabrication schedule and plant operations contact name and phone number.
- B. Shop Drawings for Station Enclosure shall include a detailed plan for the layout of the concrete slab and foundations which enclosure shall be anchored to. Plan shall be prepared and sealed by a Professional Engineer certified to practice in the State of Ohio. Details shall include: placement of anchor bolts, steel reinforcement placement and size, location of construction joints and penetrations, clearances, elevations and details.

- C. Furnish a manufacturer's affidavit indicating that the pipe, fittings, and valves have been manufactured and tested in accordance with requirements of the applicable referenced Standards, and the Project on which the material is to be used prior to construction.

1.5 DESIGN REQUIREMENTS

- A. Design precast structures to meet loading requirements of AASHTO Classification H-20.
- B. Minimum Lateral Earth Pressure: 60 pcf.

1.6 QUALITY ASSURANCE

- A. Precast Concrete Structures:
 - 1. Qualifications: The precaster shall be PCI-certified; design shall be sealed by a Professional Engineer licensed to practice in the State of Ohio.
 - 2. Inspections: ENGINEER reserves the right to inspect the precasting facility prior to and during fabrication, and to collect samples of materials during the fabrication process for testing. Manufacturer shall accommodate facility inspection and sample collection.
- B. Piping:
 - 1. Pipe and fittings to be appropriately marked for identification purposes.
 - 2. The materials and methods of manufacture, and completed pipes, fittings, and valves are subject to inspection and rejection at all times. OWNER and ENGINEER have the right to make inspections.
 - 3. Valve manufacturer's name, valve size, pressure rating, and direction of opening to be marked on valve.
- C. Stone Areas and Pavements: Comply with referenced ODOT Construction and Material Specifications Items and the requirements of this Section.

PART 2 PRODUCTS

2.1 EARTHWORK

- A. Soil Materials: Follow Section 02200.

2.2 RETAINING WALL

- A. Concrete: Follow Section 03301
- B. Handrails and Railings: Follow Section 05520

2.3 EXCAVATING AND BACKFILLING

- A. Fill Materials: Follow Section 02220.

2.4 WET WELL

- A. Walls:
 - 1. Precast reinforced concrete sections; comply with ASTM C478.
 - 2. Joints: Tongue and groove with rubber gaskets; comply with ASTM C443.
 - 3. Flexible Plastic Gasket Material: Federal Specification SS-S-210A and AASHTO M-198B; Hamilton-Kent Manufacturing Company, Concrete Sealants, Inc., or as approved.

- B. Top and Bottom Slabs: Class I concrete; follow Section 03301.
- C. Concrete Fill: Class II concrete; follow Section 03301.
- D. Resilient Connector: Comply with ASTM C923.
 - 1. Manufacturers:
 - a. A-Lok Products, Inc., A-Lok Connector.
 - b. National Pollution Control Systems, Inc., Kor-N-Seal.
 - c. Or as approved.
- E. Pipe Brace and Concrete Pipe Support Beam Angle:
 - 1. Structural steel; ASTM A36, galvanized to ASTM A123.
 - 2. Type 316 stainless steel expansion anchors.
- F. Electrical Handhole:
 - 1. Fabricate from Mill Finish Aluminum Plates and Shapes: ASTM B308, 6061-T6.
 - 2. Hardware: ASTM F593 Type 316, stainless steel.
 - 3. Rubber grommet at opening for electrical cables.
 - 4. Bituminous Coating: SSPC – Paint 12, solvent-type bituminous mastic, normally free of sulfur, compounded for 15 mil dry film thickness per coat.
- G. Vent:
 - 1. Schedule 40 black steel pipe, ASTM A53, Grade B with welded or flanged joints; or ductile iron pipe, AWWA C150 and C151, Class 50 with flange joints. Provide required wall casting. Provide outlet with a bronze wire screen, 0.063 inch diameter wire, 2 mesh size, mechanically held in place between two flanges.

2.5 VALVE VAULT

- A. Walls: As previously specified for wet well; follow Article 2.3.
- B. Top and Bottom Slabs: Class I reinforced concrete, follow Section 03301; or precast concrete, ASTM C478; design top slab for AASHTO Classification H-20 traffic loading.
- C. Manhole Frame and Cover:
 - 1. Manufacturers: East Jordan Iron Works, Cat. No. 2800 with solid lid, or as approved.
 - 2. Minimum total weight of 300 pounds, machined bearing surfaces, frame with 24-inch diameter clear opening.
- D. Manhole Steps:
 - 1. 1/2 inch diameter steel reinforcing rod continuous through entire length of legs and tread, encapsulated in a copolymer polypropylene plastic.
 - 2. Provide steps with notched tread ridge and retainer lugs on each side of tread ridge.
 - 3. Provide grab bar where indicated.
- E. Board Insulation System:
 - 1. System Manufacturers:
 - a. The Dow Chemical Co.,
 - b. Or as approved.
 - 2. Insulation: Thermax Light Duty.
 - a. Type: Polyisocyanurate, closed cell, glass fiber-reinforced.
 - b. Board Thickness: 2 inches unless indicated otherwise on Drawings.
 - c. Board Edges: Square.
 - d. Facing: Factory-applied 1.25 mil embossed aluminum foil sheet on backside, and 1.25 mil embossed white acrylic-coated aluminum sheet on front.

- e. Thermal Resistance: Aged R-value of 6.5 per inch, at 75 degrees F mean temperature.
 - f. Water Vapor Permeance: Less than 0.03 perms; ASTM E96.
 - g. Compressive Strength: 25 pounds per square inch, minimum; ASTM D1621.
 - h. Flexural Strength: 55 pounds per square inch, minimum; ASTM C203.
3. Adhesive: Construction adhesive as instructed by system manufacturer for application to concrete.
 4. Sealant: Polyurethane or silicone as instructed by system manufacturer.
 5. Sheet Anchors: PVC Interlock Joint Closures.
 - a. PVC male and female "T" strips for securing insulation to substrate.
 6. Edge Anchors: PVC J Channels)
 - a. PVC J channel for covering exposed board edges.
- F. Vent: Schedule 40 black steel pipe, ASTM A53, Grade B, with welded or flange joints; or ductile iron pipe, AWWA C150 and C151, Class 50 with flange joints. Provide required wall casting. Provide outlet with a bronze wire screen, 0.063 inch diameter wire, No. 2 mesh size, mechanically held in place between two flanges.

2.6 STATION ENCLOSURE

- A. Manufacturers:
 1. Warminster Fiberglass
 2. Or as approved.
- B. General:
 1. Building shall be one-piece, molded construction and include no embedded wood anywhere in the structure.
 2. Building shall be designed for wind loads of 150 mph, snow loads of 30 pounds per square foot, and seismic zone 4.
 3. Refer to Drawings for building dimensions.
- C. Housing:
 1. The housing shall be a one-piece molded fiberglass reinforced polyester with minimum wall, door and roof thickness of 1 inch; shall withstand winds of up to 150 mph when installed in accordance with manufacturer's instructions; Roof shall be pitched and have a snow rating of 30 lbs/ft²; shall have an insulation rating of R 7.2; and bear Underwriters Laboratories (UL) label. Finish color shall be forest green, and all material shall be UV resistant.
 2. The door shall be 36 inches wide by 78 inches high and have corrosion resistant hardware.
 3. Walls shall be adequate for the mounting of the field provided electrical panels and devices.
 4. Refer to Drawings for location/layout of field and factory installed components.
 5. All inside and outside edges of the enclosure shall be free of burrs.
- D. Factory Provided Components:
 1. One 60 ampere, two pole 120 volt safety switch to serve as main disconnect for all factory provided components.
 2. Two 120 volt incandescent fixtures, controlled by microswitch on the door.
 3. Two 20 ampere, 120 volt duplex GFCI receptacle.
 4. Two 1500 watt thermostat controlled heaters.
 5. One 120 volt thermostat controlled exhaust fan and motorized louver with bird and insect screens.
 6. All factory-provided components shall be shipped factory assembled and wired. No field wiring (except for incoming electrical service) shall be required in the field. Refer to Drawings for location of factory-provided components.

2.7 ANCHOR BOLTS AND ANCHORS

- A. Anchor Bolts Cast-In-Concrete:
 - 1. Comply with ASTM A307.
 - 2. 4 inch minimum hook.

- B. Anchors:
 - 1. Manufacturers:
 - a. Hilti Corporation, Kwik Bolt II.
 - b. ITW Ramset/Red Head, Trubolt Wedge Anchor.
 - c. The Powers Rawl Company, Inc., Power-Stud.
 - d. Or as approved.
 - 2. Expansion Type: Comply with Federal Specification FF-S-325 Group II, Type 4, Class I.
 - 3. Type 316 stainless steel for anchors exposed to weather, in contact with aluminum components, or in submerged conditions; zinc-plated, ASTM B633, for anchors in all other conditions.
 - 4. Minimum Embedment: 4 inches, unless otherwise indicated.

2.8 SUBMERSIBLE PUMPS

- A. Follow Section 11907; includes submersible pumps, pump guide assemblies, pump access doors, and pump controls.

2.9 ODOR CONTROL SYSTEM

- A. Follow Section 11410; includes chemical feed pumps, liquid storage tank, piping and controls.

2.10 INFLUENT SEWER AND MANHOLES

- A. Follow Section 02732; provide from wet well to first manhole upstream.
- B. Follow Section 02607 for Manholes.

2.11 CATCH BASINS AND STORM SEWERS

- A. Follow Section 02607.

2.12 PIPING

- A. Piping Schedule:

Application	Material
Submersible pumps discharge to and including connection with force main	Ductile Iron
Valve vault gravity sump drain to wet well	PVC

- B. Ductile Iron Pipe and Fittings:
 - 1. Pipe:
 - a. Buried: Designed in accordance with AWWA C150 and manufactured in accordance with AWWA C151; minimum Thickness Class 52; mechanical joint or push-on joint.
 - b. Exposed: AWWA C115 flanged joint.
 - 2. Fittings: AWWA C110 or C153.

3. Exterior Coating: Asphaltic material for buried and within wet well; factory-applied prime coat for all other. Buried fittings may be coated with a fusion-bonded epoxy coating in accordance with AWWA C116.
 4. Interior Lining: AWWA C104 cement mortar with seal coat, or AWWA C116 fusion-bonded epoxy coating.
 5. Joints:
 - a. Mechanical and Push-On: AWWA C111, rubber gasket, with restrained joints.
 - 1) Restrained Push-On: Completely boltless; McWane Push-On Restrained Joint Pipe, U.S. Pipe TR Flex, American Flex-Ring, or as approved.
 - 2) Restrained Mechanical: EBAA Iron, Inc. MEGALUG with Mega-Bond Coating System, or as approved, of ductile iron, and with a working pressure of at least 250 psi, and a minimum safety factor of 2:1.
 - b. Flanged: Appendix A of AWWA C115, and ANSI B16.1, Class 125; ductile iron flanges; zinc-plated bolts and nuts.
 - c. Bolted Joints: Bolt length shall be such that all threads of the nut will be engaged.
 6. Wall Castings:
 - a. Ductile iron; AWWA C110; coated and lined as specified for pipe.
 - b. Provide with integral water stop.
 - c. End Connections: As indicated on Drawings.
 - d. Length: As required for wall thickness.
 7. Polyethylene Encasement: AWWA C105 polyethylene tube; 2 inch wide, plastic-backed adhesive tape, bond to both metal surfaces and polyethylene tube.
 8. Pipe, Fittings, and Appurtenances: Manufactured in United States.
- C. PVC Pipe and Fittings:
1. Pipe: ASTM D1785, Schedule 80.
 2. Joints:
 - a. Socket: Solvent-welded.
 - b. Threaded: Taper pipe threads.
 - c. Flanged: One-piece solid design; compatible with ANSI B16.5, Class 160 metal flanges.
 3. Fittings:
 - a. Socket: ASTM D2467.
 - b. Threaded: ASTM D2464.
 4. Unions: O-ring seal type; transition type for joining dissimilar materials.
- D. Valves:
1. Plug Valves:
 - a. Type: Non-lubricated eccentric plug with resilient plug facings.
 - b. Body: Cast iron; ASTM A126, Class B.
 - c. Seat: Raised seat with 1/8 inch welded overlay of 90 percent pure nickel. Screw-in seats are not acceptable.
 - d. Plug: Cast iron; ASTM A126, Class B; cylindrical seating surface, faced with chloroprene or neoprene, as instructed by manufacturer based on type of service.
 - e. Bearings: Stainless steel sleeve type, permanently lubricated. Non-metallic bearings are not acceptable.
 - f. Shaft Seals: Multiple V-ring type, externally adjustable and repackable without removing bonnet.
 - g. Operator: Valves less than 6 inches, lever actuator. Equip valves 6 inches and larger with gear actuators and handwheel. Enclose gearing in semi-steel housing; provide seals on all shafts; support actuator shaft on permanently lubricated bronze bearings.
 - h. Manufacturers: DeZurik, PEC, or as approved.
 2. Swing Check Valves:
 - a. Type: Full opening swing type with outside lever and weight, suitable for horizontal or vertical installation. Clapper to swing completely clear of waterway.
 - b. Body: Cast Iron; ASTM A126, Class B.

- c. Clapper: For valve sizes as follows:
 - 1) 4 Inches and Smaller: Bronze.
 - 2) 6 Inches through 12 Inches: Cast iron with bronze face.
 - 3) 14 Inches and Larger: Cast iron with rubber face.
 - d. Hinge Pin: Stainless steel.
 - e. Outside Lever and Weight: Cast iron.
 - f. Manufacturers:
 - 1) M&H Valve Company.
 - 2) Mueller Company.
 - 3) Or as approved.
3. Ball Check Valves, Plastic:
- a. Type: True union design; suitable for horizontal or vertical installation.
 - b. Body and Ball: PVC.
 - c. Seats and Seals: EPDM or Viton as instructed by manufacturer for intended service.
 - d. Manufacturers:
 - 1) Asahi/America.
 - 2) Chemtrol.
 - 3) Or as approved.
- E. Pipe Sleeves:
- 1. Material: Standard weight steel pipe or 18 gage galvanized steel.
 - 2. Integral waterstop collar.
 - 3. Size:
 - a. Diameter: Large enough to allow for movement due to expansion and contraction. Allow for continuous insulation wrap.
 - b. Length: Flush with wall or floor, unless otherwise indicated.
- F. Mechanical Type Seal:
- 1. Manufacturers: Pipe Seal International, Link-Seal, service designation S; or as approved.
 - 2. Design: Modular mechanical type, consisting of interlocking synthetic rubber links, shaped to fill the annular space between the pipe and sleeve.
 - 3. Size: As instructed by manufacturer based on pipe size and opening size.
 - 4. Sealing Element: EPDM rubber.
 - 5. Pressure Plate: Glass-reinforced nylon plastic.
 - 6. Bolts and Nuts: Type 304 stainless steel.
- G. Pipe Couplings for Ductile Iron Pipe:
- 1. Manufacturers:
 - a. Baker Coupling Company, Inc., Series 200.
 - b. Dresser Industries, Style 38.
 - c. Smith-Blair, Inc., 411.
 - d. Or as approved.
 - 2. Type: AWWA C219, bolted-gasketed sleeve type.
 - 3. Components:
 - a. Steel middle ring.
 - b. Two steel followers.
 - c. Two-rubber compound, wedge-shaped gaskets suitable for service intended.
 - d. Track-head steel bolts and nuts.
 - 4. Size: As instructed by manufacturer based on pipe diameter.
 - 5. Finish: Factory-applied primer exterior; factory-applied epoxy coating interior.
- H. Pipe Supports:
- 1. Concrete Beams: Follow Section 02220.
 - 2. Concrete Piers: Class I concrete; follow Section 03301.

2.13 FORCE MAIN

- A. Follow Section 02666; provide from valve vault to and including connection with that provided under Section 02666.

2.14 CONCRETE

- A. Follow Section 03301.

2.15 GUARD POSTS

- A. ASTM A36, Schedule 40 black steel pipe.
- B. Concrete: Class I; follow Section 03301.

2.16 STONE DRIVE AND PARKING AREA

- A. Base Course: ODOT Item 304, except no slag permitted.
- B. Surface Course: ODOT Item 304, except no slag permitted.

2.17 ASPHALT DRIVE AND PARKING AREA

- A. Aggregate Base: ODOT Item 304, except no slag permitted.
- B. Prime Coat: ODOT Item 408.
- C. Asphalt Concrete Surface Course: ODOT Item 448, Type 1 Heavy.
- D. Bituminous Material for Contact Surfaces and Sealing Joints: ODOT Items 702.04 or 702.13.

2.18 ELECTRICAL MATERIALS

- A. Follow all Sections included in Division 16.

2.19 PAINTING

- A. Manufacturers:
 - 1. Carboline Company.
 - 2. ICI Paints (Devoe Coatings).
 - 3. The Sherwin-Williams Company.
 - 4. Tnemec Company, Inc.
 - 5. Or as approved.
- B. Materials:
 - 1. Coatings: Ready-mixed, except field-catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.
 - 2. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality. Use products compatible with painting materials and approved by paint manufacturer.
 - 3. Paint materials and equipment shall be compatible in use.
 - 4. Primer, Intermediate, and Finish coats shall all be from the same coatings manufacturer. Prime coats shall be compatible with and appropriate for use on surface to be coated.

- C. Colors:
 - 1. Colors will be selected by OWNER from manufacturer's standard colors.
- D. Paint Systems: Paint systems of The Sherwin-Williams Company are listed. Equivalent systems of other manufacturers previously specified are acceptable.
 - 1. Metal - Non-Submerged:
 - a. Prime Coat: Recoatable Epoxy Primer B67 Series, B67V5 Hardener, 3-6 mils dft.
 - b. First Coat: Hi-Solids Polyurethane B65-300 Series Color, B60V30 Hardener, 3-4 mils dft.
 - c. Second Coat: Hi-Solids Polyurethane B65-300 Series Color, B60V30 Hardener, 3-4 mils dft.
 - 2. Metal - Submerged:
 - a. Prime Coat: Targuard Coal Tar Epoxy B69B60 / B69V60, 8-12 mils dft.
 - b. First Coat: Targuard Coal Tar Epoxy B69B60 / B69V60, 8-12 mils dft.
 - 3. Plastic and Fiberglass:
 - a. Prime Coat: DTM Acrylic Gloss Coating B66-100 Series, 2.5-4 mils dft.
 - b. First Coat: DTM Acrylic Gloss Coating B66-100 Series, 2.5-4 mils dft.

2.20 SEEDING

- A. Follow Section 02930.

PART 3 EXECUTION

3.1 SITE CLEARING

- A. Follow Section 02110.

3.2 EARTHWORK

- A. Follow Section 02200.

3.3 EXCAVATING AND BACKFILLING

- A. Follow Section 02220.

3.4 WET WELL

- A. Construct base; follow Section 03301.
- B. Install wall sections plumb and level. Provide flexible plastic gasket material on the outside shoulder of all wall joints; install so as not to interfere with proper sealing of the rubber gaskets.
- C. Place concrete fill in bottom of wet well.
- D. Construct top slab; follow Section 03301.
- E. Install pipe brace and concrete pipe support beam angle.
- F. Install electrical handhole. Coat surfaces in contact with concrete with bituminous coating.
- G. Install vent plumb and level.

3.5 VALVE VAULT

- A. Place base on 6 inch stone leveling course.
- B. Install walls plumb and level.
- C. Install top slab.
- D. Place concrete fill in bottom of vault and slope to sump.
- E. Vent: Install plumb and level.
- F. Manhole Frame and Cover: Comply with manufacturer's instructions.
- G. Board Insulation System:
 - 1. Verify that substrate, adjacent materials, and insulation boards are dry and substrate is ready to receive insulation.
 - 2. Verify substrate surface is flat, free of honeycomb, fins, irregularities, materials, or substances that may impede proper installation.
 - 3. Insulation: Install as instructed by manufacturer and the following.
 - a. Install to ceiling before walls.
 - b. Mechanically attach female PVC "T" strips to substrate.
 - c. Apply continuous beads of adhesive to substrate, between strips.
 - d. Install boards with white side exposed.
 - e. Apply sealant to face of board adjacent to joint. Install male PVC "T" strips into female strips securing boards in place. Remove excess sealant.
 - f. Install J channel at all exposed edges of boards, including top edges of wall boards.
 - g. Apply sealant to joints at board cut-outs where J channel cannot be used.

3.6 STATION ENCLOSURE

- A. Enclosure shall be bolted to the concrete pad provided by CONTRACTOR, and installed per manufacturer's recommendations.

3.7 ANCHORS AND ANCHOR BOLTS

- A. Use expansion anchors in precast and cast-in-place concrete.

3.8 SUBMERSIBLE PUMPS

- A. Install pumps, guide assemblies, access doors, and controls; follow Section 11907.

3.9 ODOR CONTROL SYSTEM

- A. Install chemical feed pumps, liquid storage tank, piping and controls; follow Section 11410.

3.10 INFLUENT SEWER

- A. Follow Section 02732.

3.11 PIPING

- A. Examination:
 - 1. Verify location and elevation of wall castings and supports.

2. Inspect linings for damage.
3. Verify that polyethylene encasement is in place, where required, before backfilling.

B. Preparation:

1. Clean gaskets and all surfaces in contact with gaskets; comply with manufacturer's instructions.
2. Keep interior of pipe and fittings clean.
3. Prepare piping connections to equipment with flanges.

C. Pipe, Fittings, Valves and Accessories:

1. Install in accordance with manufacturer's instructions.
2. Pipe Supports: Follow Sections 02220 and 03301 and as indicated on Drawings.
3. Install wall castings in proper location and elevation before concrete and piping are in place. Boxing out of forms for later placement will not be permitted.
4. Install bell and spigot pipe with bell end in the direction of laying the pipe.
5. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
6. Provide access to valves and fittings.
7. Tighten flanged joints with all bolts taking equal stress.
8. Install valves plumb and level, free from distortion and strain from misaligned piping or equipment.
9. Install polyethylene encasement for all buried ductile iron pipe, fittings, and appurtenances. Comply with AWWA C105 Method A and manufacturer's instructions. Completely tape all overlaps and seams. Repair all rips, punctures, and other damage to the polyethylene.

D. Pressure and Leakage Tests: Provide all labor and equipment and clean water to complete the following piping testing:

1. Submersible Pump Discharge: Follow Section 02666.
2. Drains: Demonstrate free to drain; correct for free drainage.

3.12 FORCE MAIN

- A. Follow Section 02666.

3.13 GUARD POSTS

- A. Set post in concrete; crown top of foundation to shed water.
- B. Fill pipe with concrete, crown at top of pipe to shed water.

3.14 CONCRETE

- A. Follow Section 03301.

3.15 STONE DRIVE AND PARKING AREAS

- A. Prepare subgrade; comply with ODOT Item 203.
- B. Base Course: Comply with ODOT Item 304; 6 inches thick after compaction; two equal courses.
- C. Surface Course: Comply with ODOT Item 304; 2 inches thick after compaction.

3.16 ASPHALT DRIVE AND PARKING AREAS

- A. Prepare subgrade; comply with ODOT Item 203.

- B. Aggregate Base: Comply with ODOT Item 304; 6 inches thick after compaction.
- C. Prime Coat: Comply with ODOT Item 408; 0.35 gallons per square yard.
- D. Asphalt Concrete Surface Course: Comply with ODOT Item 448; 4 inches thick.
- E. Coat vertical contact faces of existing pavement, structures, etc., against which mix will be placed prior to placing mix, and seal all joints with bituminous material; comply with ODOT Items 401.14 and 401.17.

3.17 ELECTRICAL

- A. Follow all Sections included in Divisions 16 and 17.

3.18 PAINTING

- A. Examination:
 - 1. Verify that surfaces are ready for application of materials in accordance with the product manufacturer's instructions.
 - 2. Examine surfaces scheduled to be finished prior to commencement of Work. Report any condition that may potentially affect proper application.
 - 3. Measure moisture content of surfaces using appropriate method as instructed by the coating manufacturer. Do not apply finishes unless moisture content of surfaces are below the coating manufacturer's acceptable maximums.
- B. Preparation:
 - 1. Mask nameplates, descriptive data on pumps, motors and other equipment.
 - 2. Correct defects and clean surfaces which affect the Work.
 - 3. Seal marks which may bleed through surface finishes with sealer instructed by paint manufacturer.
 - 4. If mildew is encountered, remove by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
 - 5. Where surfaces are coated with bituminous coating that is not compatible with paint material, remove bituminous coating with abrasive blasting.
 - 6. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply manufacturer's required primer.
 - 7. Uncoated Steel and Iron Surfaces:
 - a. Welded areas shall be ground smooth per NACE Standard RP 0178.
 - b. Use abrasives for blast cleaning that are clean, uniformly graded, and free of oil, soluble salts, chlorides, or foreign matter which could contaminate the blasted surface. Size the abrasive to produce an anchor pattern profile height as required by the coating manufacturer.
 - c. Metal surfaces to be painted, and not factory-primed, shall be field-abrasive blasted in accordance with NACE-3 (SSPC-SP6), commercial blast, for non-immersion service; and in accordance with NACE-2 (SSPC-SP10), near-white blast, for immersion service, unless a higher degree of surface preparation is required by the manufacturer.
 - 8. Shop-Primed Steel Surfaces:
 - a. Remove loose primer and rust in accordance with SSPC-SP2 Hand Tool Cleaning or SSPC-SP3 Power Tool Cleaning. Feather edges to make touch-up patches inconspicuous. Clean surfaces in accordance with SSPC-SP1 Solvent Cleaning. Prime bare steel surfaces.
 - b. Retouch damaged areas of shop-primed items with compatible primer.
 - c. CONTRACTOR responsible for compatibility of shop primer with field-finish coats.
 - d. Plastic and Fiberglass: Solvent-wipe and scuff sand; apply test sample prior to application to ensure adhesion.

C. Application:

1. Comply with manufacturer's instructions.
2. Do not thin materials, except to comply with manufacturer's instructions.
3. Apply coatings to all surfaces with special attention to hard-to-reach areas such as between the legs of back-to-back angles. Apply each coat to achieve the specified dry film thickness.
4. Do not apply finishes to surfaces that are not dry.
5. Deficiencies in film or coating thickness shall be corrected by the application of an additional coat(s) of material at the expense of CONTRACTOR.
6. Apply each coat to a uniform smooth finish.
7. Special attention shall be given to ensure that edges, corners, crevices and welds receive a film or coating thickness equivalent to that of adjacent surfaces. At no time will wet-on-wet applications be permitted. The finished surfaces shall be free from runs, drips, ridges, waves, laps, brush marks and variations in color, texture and finish.
8. Apply each coat of paint slightly darker than the preceding coat unless otherwise approved.
9. Sand surfaces lightly between coats as required to achieve required finish.
10. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.

D. Painting Schedule:

1. Exposed piping, except not within wet well.
2. Structural steel.
3. Vents.
4. Guard posts.

3.19 SEEDING

- A. Follow Section 02930.

3.20 FIELD QUALITY CONTROL

- A. Operational Test: Demonstrate that all pumping station equipment is electrically, mechanically, structurally, and otherwise acceptable, and that it is safe, in optimum working condition, and conforms to the specified operating conditions by supplying sufficient clear water and operating station through several pumping cycles. During operation 1) observe and record operation of pumps, discharge gage readings, amperage draw, pump controls and liquid level controls, 2) check calibration of instrumentation equipment, test manual control devices, and automatic control systems, and 3) be alert to any undue noise, vibration, or other operational problems.
- B. Manufacturer's Start-Up Services: Provide for a minimum of one 8 hour day, per pump station.

END OF SECTION

SECTION 02576

EXISTING PAVEMENT AND SIDEWALK REPLACEMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. The permanent replacement of paved streets, alleys, driveways, and parking areas, and sidewalks which are damaged or removed during trenching or other operations.
- B. Temporary pavement.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Pavement Replacement: By the price per cubic yard for the respective pavement replacement materials included in the Bid items. No separate payment will be made for the following:
 - 1. Prime coats, tack coats, or coating and sealing.
 - 2. Preparations prior to pavement replacement.
 - 3. Replacement of pavement markings and markers.
 - 4. Replacement of shoulders, curbs, and curb drains.
- B. Sidewalk Replacement: By the price per square foot for concrete sidewalk replacement; relaying of brick sidewalks will be paid for at the price bid for concrete sidewalk replacement; replacement of other than concrete, sandstone or brick sidewalks will be paid for at the price bid for the appropriate type of pavement replacement material.
- C. Temporary Pavement: By the price per square yard.
- D. Measurement: Payment for temporary pavement and replacement of pavements and sidewalks at trenches limited to a width 2 feet each side of the inside diameter of the pipe installed and, at structures to an area equal to that defined by the largest outside dimensions of the structure plus 2 feet on all sides. Temporary pavement and the replacement of pavements and sidewalks beyond the lines of measurement to be at the expense of CONTRACTOR, unless otherwise specified.

1.4 ADJUSTMENT PRICE - MEASUREMENT AND PAYMENT

- A. Temporary pavement provided at the written direction of ENGINEER will be paid for at the appropriate adjustment price included in the Contract or, if not included, at a price mutually agreed upon by OWNER and CONTRACTOR, and the Contract Price adjusted by Change Order.
- B. Measurement: Payment for temporary pavement at trenches limited to a width 2 feet each side of the inside diameter of the pipe installed and, at structures to an area equal to that defined by the largest outside dimensions of the structure plus 2 feet on all sides. Temporary pavement beyond the lines of measurement to be at the expense of CONTRACTOR.

1.5 PROJECT CONDITIONS

- A. Gravel and stone roadways, driveways, and parking areas, and sidewalks are not classified as pavements. Replace to a condition similar to that existing before the start of the Project.
- B. Classify driveways and parking areas as pavements according to the materials of construction.
- C. If CONTRACTOR's operations require removal of the temporary pavement after initial placement, except removal immediately prior to permanent pavement replacement, place additional temporary pavement as specified at no additional cost to OWNER.
- D. For concrete pavements, if after all other preparation any remaining portion measures less than 5'-0" to the nearest joint, remove and replace same to the nearest joint, with payment made at the appropriate unit price included in the Contract.
- E. For sidewalk replacement, where any sidewalk falls within the pay limits specified above for pavement replacement, remove and replace the sidewalk for its full width, with payment made at the appropriate unit price included in the Contract.
- F. Classify sidewalks of other than concrete, sandstone, or brick as pavement and replace as specified for the appropriate type of pavement.
- G. Relay brick sidewalks in the same manner that existed prior to construction using removed brick in good condition. Do not relay broken or damaged bricks; replace with new matching existing.
- H. Place asphalt concrete pavement in accordance with the weather and temperature limitations of ODOT Item 401.05.
- I. Include the cost of removing existing pavements and sidewalks in the price bid for the appropriate item requiring removal.

1.6 QUALITY ASSURANCE

- A. Comply with 2010 ODOT Construction and Material Specifications.

1.7 REGULATORY REQUIREMENTS

- A. Sidewalk replacement shall include curb ramps meeting the requirements of The Americans with Disabilities Act (ADA) and the ODOT ADA compliant Curb Ramp Details.

PART 2 PRODUCTS

2.1 TEMPORARY PAVEMENT

- A. Asphalt Concrete for Maintaining Traffic: Comply with ODOT Item 614.13; minimum 2 inches thick.

2.2 PERMANENT PAVEMENT REPLACEMENT

- A. Asphalt Concrete Pavements:
 - 1. Driveways and Parking Areas:
 - a. 2 inches ODOT Item 448 Asphalt Concrete Surface Course, Type 1M, PG64-22.
 - b. 5 inches ODOT Item 301 Asphalt Concrete Base, PG64-22, commercial pavements only.
 - 2. Asphalt Concrete on Concrete or Brick Base Roadways:
 - a. 1-1/2 inches ODOT Item 448 Asphalt Concrete Surface Course, Type 1H, PG70-22M.

- b. 8 inches ODOT Item 452 Plain Portland Cement Concrete Pavement.
 - 3. Asphalt Concrete or Seal-Coated Roadways:
 - a. 1-1/2 inches ODOT Item 448 Asphalt Concrete Surface Course, Type 1H, PG70-22M.
 - b. 1-1/2 inches ODOT Item 448 Asphalt Concrete Intermediate Course, Type 1H, PG70-22M; may substitute surface course if approved by ENGINEER.
 - c. 6 inches ODOT Item 301 Asphalt Concrete Base Course, PG64-22.
 - 4. On aggregate base, apply ODOT Item 408 Prime Coat at rate of 0.35 gallons per square yard.
 - 5. On concrete base, apply ODOT Item 407 Tack Coat at rate of 0.10 gallons per square yard.
 - 6. Sealer for Contact and Mating Surfaces and Joints: Comply with ODOT Items 401.14 and 401.17. Apply coating of ODOT Item 702.04 or 702.13 material at 0.25 gallon per square yard.
 - 7. Pavement Sealer: As approved by ENGINEER.
- B. Concrete Pavements:
 - 1. Driveways and Parking Areas; Residential:
 - a. 6 inches ODOT Item 452 Plain Portland Cement Concrete Pavement.
 - 2. Concrete or Brick Roadways; Commercial Driveways and Parking Areas:
 - a. 8 inches ODOT Item 452 Plain Portland Cement Concrete Pavement.
 - 3. Reinforcement: Match existing.
 - 4. When thickness is greater than 6 inches, as determined by ENGINEER, furnish and install 5/8 inch hook bolts at 30 inches center-to-center where new abuts existing.

2.3 PAVEMENT MARKING AND MARKERS

- A. Match existing in location, type, size, color, and material; comply with appropriate ODOT 640 Items and Item 621.

2.4 CONCRETE SIDEWALK

- A. Concrete: Class I; follow Section 03301.
- B. Thickness: 4 inches, except at driveways.
- C. Expansion Joint Filler: Comply with ODOT Item 705.03.
- D. Ramp Bricks: 4 inches by 8 inches by 2-1/4 inches; comply with ADAAG Detectable Warnings (Truncated Domes); manufactured by Whitacre-Greer, Glenn Gery, or as approved.
- E. Sand: Natural.

2.5 SHOULDERS AND CURBS

- A. Shoulders: Aggregate Materials; comply with ODOT Item 411.
- B. Curbs: Concrete Materials, Class I; follow Section 03301.

PART 3 EXECUTION

3.1 TEMPORARY PAVEMENT

- A. Install temporary pavement upon completion of backfilling operations; comply with ODOT Item 614.
- B. Maintain temporary pavement until permanent pavement can be placed.

3.2 PERMANENT PAVEMENT REPLACEMENT

- A. Remove temporary pavement.
- B. Saw-cut existing pavement to a neat straight edge to a point 12 inches beyond each side of trench excavation.
- C. In concrete pavement, preserve any reinforcement so that it can be bent back into place.
- D. Excavate areas of replacement as required to allow for placement of pavement to thicknesses specified.
- E. Fill depressions with mechanically tamped, granular material to the proper elevations.
- F. Compacted aggregate shall have a firm, even surface. Scarify base and work aggregate in to obtain maximum keying as required.
- G. Asphalt Concrete Pavement: Install in accordance with ODOT Items 301 and 448, as applicable.
 - 1. Apply Prime Coat and Tack Coat in accordance with ODOT Items 408 and 407, as applicable.
 - 2. Seal faces of existing pavement, curb, structures, and other contact and mating surfaces against which mixture will be placed, and seal finished joints.
 - 3. Maximum Compacted Depth Per Lift: 3 inches at 92-95 percent compaction.
 - 4. Apply pavement sealer on driveways and parking areas, where existing is sealed, not less than 60 days after placement of permanent pavement. Apply between right-of-way and edge of roadway pavement.
- H. Concrete Pavement: Install in accordance with ODOT Item 452.
 - 1. Joints and Concrete Finish: Match existing.

3.3 PAVEMENT MARKINGS AND MARKERS

- A. Match existing; comply with appropriate ODOT 640 Items and Item 621.

3.4 CONCRETE SIDEWALK

- A. Comply with ODOT Item 608.03 and ODOT Curb Ramp Details.
- B. Install 1/2 inch mastic expansion strips at 25 foot intervals.
- C. Divide surface into equally spaced blocks at approximately 5'-0" intervals.
- D. Lay ramp bricks on 2 inch sand bed, with joints tight; sweep clean sand into all joints.

3.5 SHOULDERS AND CURBS

- A. Shoulders: Comply with ODOT Item 411.
- B. Curb: Comply with ODOT Item 609.

3.6 EXCESS MATERIALS

- A. Dispose of excess materials removed from trenches or otherwise to allow for replacements.

END OF SECTION

SECTION 02607

CATCH BASINS, MANHOLES AND COVERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Sanitary manholes and catch basins.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Precast Concrete Sections: ASTM C478.
- B. Cast-In-Place Concrete Sections: Follow Section 03301.
- C. Rubber Gasket Joints: ASTM C443.
- D. Manhole Steps: ASTM C478, aluminum or reinforced polypropylene.
- E. Castings: ASTM A48, Class 30B heavy duty, gray iron, coated with a waterbase asphalt paint (a non-toxic, non-flammable, and odorless asphalt emulsion that dries to a hard, black gloss finish).
- F. Mortar: ASTM C270, Type S with no masonry cement; compose using two parts Portland cement to two parts sand by volume.
- G. Stone Fill: Standard size No. 67 stone, or as otherwise approved.
- H. Sewer Pipe and Fittings: Same type as main sewer. Stoppers (plugs) to be specifically designed for use with the pipe and shall be water-tight, for permanent or temporary use, and removable without damaging pipe.
- I. Grout: Non-shrinking and non-corrosive.
 - 1. Manufacturers: Five Star Products, Inc., Five Star Grout; W.R. Meadows, Inc., Sealtight 588 Grout; or as approved.
- J. Resilient Connectors: ASTM C923; A-Lok Products, Inc., A-Lok Connector; National Pollution Control Systems, Inc.; Kor-N-Seal; or as approved.
- K. Flexible Couplings:
 - 1. Manufacturer: Fernco; or as approved.

2.2 COMPONENTS

- A. Bases: Base riser section with integral floor for sanitary manholes; concrete ring foundation for air release valve manholes; integral or separate base riser and base slab for all other manholes and catch basins. Provide resilient connectors for connecting pipes to manholes and catch basins;

openings for pipe for all other manholes to be pre-formed or cored by manufacturer, with openings exceeding pipe outside diameter by more than 6 inches cause for rejection. Provide transition sections, concrete fill, sumps, supports, and blocking as shown.

- B. Walls: Vertical precast concrete riser sections with rubber gasket joints. Provisions for connecting pipes to be as specified in 2.2.A.
- C. Tops: Eccentric cone top section narrowing down to a minimum 3 inch high vertical neck with an inside diameter of not less than 24 inches and outside diameter not less than that of grade rings, except reinforced flat slab top for storm manholes and catch basins too shallow to accommodate a cone section; design flat slab tops to withstand H-20 traffic loading and submit design calculations to ENGINEER upon request. Provide grade rings for a minimum height of 4 inches and a maximum height of 12 inches as required to set castings at proper elevation; ring inside diameter equal to the top section access opening, and outside diameter not less than the outside diameter of the casting frame.
- D. Reinforced Polypropylene Steps: Copolymer polypropylene plastic encapsulated 1/2 inch Grade 60 steel reinforcing rod, notched tread ridge and retainer lugs on each side of tread ridge, steel rod continuous through the entire length of legs and tread; steps of the press fit type driven into the concrete wall shall have a pullout resistance of at least 1,500 pounds per leg as evidenced by test data.
- E. Manhole Frames and Covers: Minimum total weight of 375 pounds, machined bearing surfaces, frame with 24 inch diameter clear opening and 7 inch height, cover with words "SANITARY SEWER" cast into top, and of the following types:
 - 1. Standard Frames and Covers: East Jordan Iron Works Cat. No. 1040 with Type A heavy duty solid cover, or as approved.
- F. Catch-Basin, including frame and grate, shall meet the requirement of ODOT 2-2-A.

PART 3 EXECUTION

3.1 PREPARATION

- A. Excavate trench for Work of this Section; follow Section 02225.
- B. Clean prior to installation.

3.2 INSTALLATION

- A. Install base with top surface level; install on cushion of approved compacted granular material.
- B. For pipe connections, except at resilient connectors, fill area between pipe and opening with grout.
- C. For mains, provide 1/2 inch thick Neoprene material around pipe prior to grouting.
- D. Install wall sections plumb and level. When walls include steps, install with steps in the center of a traffic lane or between lanes where possible when in pavement, and, when outside pavement, with steps located away from the pavement edge unless the manhole is within a ditch line, then locate steps on the high side of the ditch slope.
- E. Install stubs and plugs; follow Section 02732.
- F. Connect stubs to existing piping using flexible coupling connections.

- G. Set grade rings in a full bed of mortar. Mortar the interior of the grade rings to provide a smooth common surface from frame to top.
- H. Set casting frames firmly on top of grade rings with a full leveling bed of 1:1 cement mortar; in paved areas, make casting top flush with pavement surface; in unpaved streets and alley areas, set the cover not to exceed 1 inch above the ground surface. On right-of-way and in ditches, cover elevation shall be as approved by ENGINEER.
- I. If not integrally cast with the base, after pipe installation provide a Class II concrete invert having a depth equal to 1/2 the sewer pipe diameter and sloping upward toward the walls approximately 3 inches; trowel concrete smooth. Include drop connections in inverts; do not discharge on sloped portion. For concrete inverts integrally cast with the base, fill void between base and wall with Class II concrete to match top of shaped invert.
- J. After installation, apply an additional coat of water base asphalt paint on the tops of frames and covers.
- K. Backfill trench for Work of this Section; follow Section 02225.
- L. Repair all visible leakage in storm manholes and catch basins.

END OF SECTION

SECTION 02666

FORCE MAINS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Pipe, fittings, accessories, and bedding for force mains.
 - 1. Force mains installed by open cut shall be of ductile iron pipe with ductile iron fittings.
 - 2. Force mains installed in steel encasement pipe shall be of ductile iron pipe with ductile iron fittings.
 - 3. Force mains installed by directional drilling shall be of polyethylene pipe with ductile iron fittings.
- B. Valves and appurtenances.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Force Mains: By the price per linear foot for force mains of the sizes included in the Bid Items, and installed in open cut. Lengths shall include the length of pipe, fittings, and valves laid in the main line. Includes force mains, installed complete, except for portions of the Work for which separate payment is made under this or other Sections. Upon installation of pipe in open cut and completion of pipe embedment and backfilling operations, an amount equal to at least 10 percent of bid price per linear foot will be withheld for completion of testing, seeding, and replacement of existing facilities, where payment therefor is not made under other Sections. For other than open cut, the amount so withheld will be at least 3 percent of the price bid per linear foot. Individual circumstances shall determine whether an amount in excess of the percentage indicated will be withheld. When items for which monies are withheld are completed, or partially completed, the amount withheld shall be appropriately reduced. Amounts withheld pursuant to this paragraph shall be in addition to retainage made pursuant to applicable requirements of the Contract Documents.
 - 1. Force main within steel encasement pipe will be paid for as part of the Work under Section 02360.
 - 2. Force main directionally drilled will be paid for as part of the Work under Section 02350.
- B. Valves: By the price for each for the types of valves and appurtenances included in the Bid items.

1.4 DEFINITIONS

- A. Bedding: Material placed under, beside, and directly over pipe for the full width of the trench up to a distance of 6 inches over the top of the pipe barrel prior to subsequent backfill operations.

1.5 SUBMITTALS

- A. Manufacturer's Affidavit: The manufacturer shall furnish an affidavit indicating that all pipe, fittings, valves and appurtenances have been manufactured and tested in accordance with the requirements of the applicable referenced Standards. A copy of the affidavit indicating the Project on which the material is to be used shall be forwarded to ENGINEER prior to construction.

- B. For butt fusion joints, submit a printout giving all the parameters of each joint as required under paragraph 3.5.D.
- C. For polyethylene encasement, submit sample.

1.6 QUALITY ASSURANCE

- A. All pipes, fittings, valves, and appurtenances shall be appropriately marked for identification purposes. The materials and methods of manufacture, and completed pipes, fittings, valves, and appurtenances shall be subject to inspection and rejection at all times. OWNER and ENGINEER have the right to make inspections.

1.7 STORAGE AND PROTECTION

- A. At no time shall other pipes or material be placed in the pipes.
- B. Repair damage to pipe exterior and interior surfaces; pipe so damaged subject to rejection.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

- A. Ductile Iron Pipe and Fittings:
 - 1. Pipe: Designed in accordance with AWWA C150, minimum Thickness Class 52, with polyethylene encasement when buried; manufactured in accordance with AWWA C151; furnished in minimum nominal 18 foot laying lengths.
 - 2. Fittings: AWWA C110 or C153.
 - 3. Exterior Coating: Asphaltic material. Fittings may be coated with a fusion-bonded epoxy coating in accordance with AWWA C116.
 - 4. Interior Lining: AWWA C104 cement mortar with seal coat, or AWWA C116 fusion-bonded epoxy coating.
 - 5. Joints: AWWA C111, rubber gasket, push-on or mechanical type, with joints within the lengths noted on Drawings to be restrained type joints.
 - a. For bolted joints, bolt length shall be such that all threads of the nut will be engaged.
 - b. Restrained push-on joints shall be completely boltless; Clow Super-Lock, American Flex-Ring, U.S. Pipe TR Flex, or as approved. Restrained mechanical joints shall be MEGALUG with Mega-Bond Coating System as manufactured by EBAA Iron, Inc., or as approved, of ductile iron and with a working pressure of at least 250 psi and a minimum safety factor of 2:1.
- B. Polyethylene Pipe:
 - 1. Pipe: PE3408 high density polyethylene meeting ASTM D3350 cell classification 345464C for black and 345464E for color identification stripes; manufactured in accordance with ASTM D3035 for 3 inch diameter IPS and smaller, and ASTM F714 for 4 inch diameter IPS and larger; DR11, 160 psi pressure-rated.
 - a. CONTRACTOR shall determine pipe DR based on the proposed installation, but in no case shall it be such that the pressure rating of the pipe is less than specified.
 - 2. Fittings: Fittings such as couplings, wyes, tees, adapters, etc. for use in laying pipe shall have standard dimensions that conform to ASTM D3261.
 - a. Pipe and fittings shall be produced from identical materials, meeting the requirements of this Section, by the same manufacturer. Special or custom fittings may be exempted from this requirement.

- b. Pipe and fittings shall be pressure rated to meet the service pressure requirements specified by ENGINEER. Whether molded or fabricated, fittings shall be fully pressure rated to at least the same service pressure rating as the pipe to which joining is intended.
 - c. Molded fittings shall meet the requirements of ASTM D3261 and this Section. At the point of fusion, the outside diameter and minimum wall thickness of fitting butt fusion outlets shall meet the diameter and wall thickness specifications of the mating system pipe. Fitting markings shall include a production code from which the location and date of manufacture can be determined. The manufacturer shall provide an explanation of the production codes used.
 - d. Fabricated fittings shall meet the requirements of ASTM F2206 and this Section.
3. Joints:
- a. ASTM D-3621, butt fusion between plain ends of polyethylene pipe.
 - b. Install HDPE mechanical joint adapters by heat fusion to transition from HDPE piping to ductile iron piping as shown in Contract Drawings.
4. Marking:
- a. Each standard and random length of pipe and fitting in compliance with this standard shall be clearly marked with the following information.
 - b. ASTM or AWWA Standard Designation.
 - c. Pipe Size.
 - d. Class and Profile Number.
 - e. Production Code.
 - f. Standard Dimension Ratio (SDR).

2.2 POLYETHYLENE ENCASEMENT

- A. AWWA C105, 8 mil linear low-density polyethylene tube or 4 mil high-density, cross-linked polyethylene tube; 2 inch wide plastic-backed adhesive tape, bond to both metal surfaces and polyethylene film.

2.3 JOINT BOLTS AND NUTS

- A. Unless otherwise specified or noted, bolts and nuts on buried piping shall be low alloy steel cathodic to pipe with a minimum yield strength of 45,000 psi, and all other bolts and nuts shall be low carbon steel, ASTM A307, Grade B, zinc-plated.

2.4 BEDDING MATERIAL

- A. Fine excavated material except in paved areas.
- B. Standard Size No. 67 coarse crushed aggregate in paved areas.
- C. Concrete Encasement: Class I concrete; follow Section 03301.

2.5 GROUT

- A. Non-shrinking and non-corrosive; Five Star Products, Inc., Five Star Grout; W.R. Meadows, Inc., Sealtight 588 Grout; or as approved.

PART 3 EXECUTION

3.1 PREPARATION

- A. String pipe sections along the route of the mains so as to interfere least with pedestrian and vehicular traffic and to protect the pipe.

- B. Excavate trench for Work of this Section; follow Section 02225.
- C. Verify that polyethylene encasement is in place, where required, before placing bedding.

3.2 BEDDING

- A. Place bedding material at trench bottom and shape for accurate placement and proper support of pipe.
- B. Place in 6 inch layers, loose measurement, and compact by hand or mechanical tamping to not less than 95 percent of maximum density as determined in accordance with ASTM D698 (Standard Proctor).
- C. Carefully place and tamp so as not to damage or displace joints or pipe. Do not drop material directly on pipe.
- D. Maintain optimum moisture content of bedding material to attain required compaction density.
- E. Construct thrust blocks at fittings, dead ends, and valves as shown. Place against firm undisturbed soil. Provide straps and anchors as indicated; repair cuts and other damage to galvanized surfaces by applying two coats of galvanizing compound. Securely strap or block plugs and caps.
- F. Construct concrete encasement as shown.

3.3 INSTALLATION - PIPE AND FITTINGS

- A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Install force mains at a minimum 10 foot horizontal distance from water mains and at a minimum 18 inches vertical distance from water mains at their crossing, both as measured between the outside of pipe walls. At crossings, install one full length of force main pipe so both joints will be as far from the water main as possible.
- C. Install pipe in locations and at grades shown or specified, except as otherwise permitted or ordered by ENGINEER, to avoid existing or proposed utility lines or other obstructions encountered; to secure a more readily accessible position for trenching; or to facilitate the location of various pipe appurtenances; avoid high and low points in the main.
- D. Use suitable fittings, usually 1/8 bends, when abrupt grade changes of the pipe are necessary to avoid existing utilities or other obstructions, so as to secure an easy flow of liquid and to provide sufficient cover below same unless noted otherwise.
- E. Install ductile iron pipe per requirements of ANSI/AWWA C600.
- F. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- G. Deflect pipe joints in strict accordance with pipe manufacturer's instructions.
- H. Locate pipe to maintain a minimum clearance of 18 inches in all directions with respect to other utilities to allow for taps to be inserted.
- I. With push-on joints, wipe surfaces that contact rubber gasket clean and dry just prior to making joint. Use a lubricant in accordance with the manufacturer's instructions when making joint.

- J. With mechanical joints, brush surfaces that contact rubber gasket with soapy water to remove all sand and grit just prior to making joint.
- K. Make butt fusion joints in accordance with pipe manufacturer's and fusion machine manufacturer's instructions. The wall thickness of the adjoining pipes shall have the same DR at the point of fusion.
- L. Install polyethylene encasement for all ductile iron pipe, fittings, and appurtenances; comply with AWWA C105 Method A and manufacturer's instructions. Completely tape all overlaps and seams. Repair all rips, punctures and other damage to the polyethylene.
- M. Clean all pipes thoroughly inside and outside before lowering into trench; keep pipes clean during and after laying; and seal the pipe end with a water-tight plug when pipe laying is stopped for any reason.
- N. Provide access fittings to permit testing.
- O. When necessary to cut pipe at fittings, valves, or elsewhere, the remaining portions may be used to minimize the number of scrap pieces when the Work is complete; however, scrap pieces less than 5 feet in length shall not be used.
- P. Backfill trench for Work of this Section; follow Section 02225.
- Q. See Section 02360 for steel encasement pipe requirements.
- R. See Section 02350 for directional drilling requirements.

3.4 CONNECTIONS TO EXISTING PIPING AND STRUCTURES

- A. Provide cored opening in existing structure at proper location, insert pipe, and seal space between pipe and opening with grout.
- B. Provide 24 hours notice to ENGINEER and OWNER prior to making connections.
- C. Plan Work to reduce number of shut-offs and to minimize length of shut-off.
- D. Make connections at such times and using fittings as approved by OWNER and ENGINEER.
- E. A representative of OWNER shall operate existing valves. CONTRACTOR shall not operate existing valves.

3.5 FIELD QUALITY CONTROL

- A. OWNER or ENGINEER may check compaction of the bedding at any time.
- B. For compacted bedding in trenches, OWNER may employ a testing laboratory to make tests on Site and will pay all costs for the first set of tests performed per lift. If compaction fails to meet Specifications, all succeeding tests for that lift shall be at expense of CONTRACTOR.
- C. Check valve boxes after installation and remove stones, dirt, debris, and backfill material.
- D. Subject main to pressure and leakage test in accordance with Article 3.6 before connecting to existing mains and before making connections between new mains of differing pipe materials.

- E. For butt fusion joints, the fusion unit shall include a battery-operated data logger designed for field use and for providing complete fusion data documentation from the beginning to the end of the fusion process, ensuring joint integrity and reliability. Data logger shall:
 1. Record actual joint data, retrieve stored data recorded, print out joint data, and download data stored to a PC.
 2. Display total elapsed time, a resettable stopwatch, actual machine pressure, recommended machine pressure, and actual number of data points being recorded.
 3. Provide a summary plot indicating pressure used to seat the heater, if correct shift sequence was used, duration of the melt cycle, magnitude of the fusion pressure, and duration of the cool cycle.
 4. Provide a computer download printout giving all the parameters of each joint on one page.

3.6 PRESSURE AND LEAKAGE TEST

- A. For Mains of Ductile Iron Pipe Material: Perform in accordance with AWWA C600 and the following:
 1. Isolate main from adjacent existing main and new main of differing pipe materials, and apply pressure by pumping clean water from a container into the main via 1 inch corporation stops.
 2. Test pressure shall be 150 psi unless valves in existing mains are involved within section of new main being tested, in which case test pressure may be 100 psi if OWNER determines that the older existing valves may not seal properly; and shall not vary by more than ± 5 psi.
 3. Start pressure test in an afternoon and keep pressure on for 18 hours, and then maintain test pressure for an additional 2 hours by pumping water from the container into the main.
 4. At the end of the 2 hour period, measure the water used.
 5. Loss by leakage shall not exceed that as determined by the following formula:

$$L = \frac{SD\sqrt{P}}{148,000}$$

in which L is the allowable leakage in gallons per hour; S is the length of pipe tested in feet; D is the nominal diameter of the pipe in inches; and P is the average test pressure during the leakage test in pounds per square inch gage.

- 6. When testing against closed metal-seated valves, allow an additional leakage per closed valve of 0.0078 gallons/hour/inch of nominal valve size.
- 7. Pressure test at each side of intermediate valves at this time by shutting each valve, exhausting the pressure on one side, and applying the test pressure of 150 psi or more to the main on the opposite side of the valve for approximately 10 minutes as determined by ENGINEER. Repeat this procedure for each intermediate valve.
- B. For Mains of Polyethylene Pipe Material: Perform in accordance with the following:
 1. Isolate main from adjacent existing main and new main of differing pipe materials, and apply pressure by pumping clean water from a sterilized container into the main via 1 inch corporation stops.
 2. Remove all free air from the test section, and raise the pressure at a steady rate to 150 psi and allow to stand without makeup pressure for sufficient time, usually 2 to 3 hours, to allow for expansion of the pipe. Measure pressure as close as possible to the lowest point of the test section.
 3. After equilibrium is established, pressurize the test section to 150 psi, turn off the pump, and hold the final test pressure for 2 hours.

4. Measure the amount of water required to return the test section to 150 psi. Allowable amounts of water for expansion during the pressure test shall not exceed those in the following table:

ALLOWANCES FOR EXPANSION*
(U.S. Gallons per 100 Feet of Pipe)

Nominal Pipe Size (Inches)	2 Hour Test
6	0.60
8	1.0
10	1.30
11	2.0
12	2.3
14	2.8
16	3.3
18	4.3
20	5.5
22	7.0
24	8.8

* These allowances only apply to the test period and not to the initial expansion phase.

5. Under no circumstances shall the total time under test pressure exceed 8 hours. If a test is not completed due to leakage, equipment failure, etc., the test section shall be allowed to “relax” for 8 hours prior to the next test.
- C. If main and valves do not pass the leakage test, locate and repair the leak or leaks, and repeat testing procedure until successful. Repair visible leaks regardless of the amount of leakage.
- D. Pressure and leakage testing is responsibility of CONTRACTOR, who shall provide all materials, labor, and equipment, and pay for the total volume of water used.

3.7 COMPLETION OF TESTS

- A. After successful completion of testing, mains shall be flushed and cleaned and all connections made prior to acceptance.

END OF SECTION

SECTION 02687

SITE GAS LINES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Pipe and fittings for Site natural gas distribution.

1.3 RESPONSIBILITIES

- A. The following shall be performed by the Natural Gas Utility Company under the Allowance established in Section 01019:
 - 1. Construction of the proposed gas lines from the tap-ins to the regulators and meter sets at both Pumping Station sites.
- B. The following are not included in the established Allowance and shall be performed by CONTRACTOR:
 - 1. Furnishing and installation of the regulators.
 - 2. Construction of the proposed gas lines from the regulators to the generators.
 - 3. Furnishing and installation of secondary regulators to provide proper service to each generator.

1.4 ALLOWANCES

- A. Cash Allowance: Include under provisions in Section 01019.
- B. Submit Utility Company invoices for services rendered by the Utility Company for processing of the cash allowance.

1.5 DEFINITIONS

- A. Bedding: Material placed under, beside, and directly over pipe for the full width of the trench up to a distance of 6 inches over top of the pipe barrel, prior to backfilling.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with Utility Company standards.
- B. Welding Materials and Procedures: Conform to ASME Boiler and Pressure Vessel Code and applicable state regulations.
- C. Conform to NFPA 54 (Fuel Gas Code), and ANSI B31.2.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store valves in shipping containers with labeling in place.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

- A. Steel Pipe (Buried): ASTM A53, Schedule 40 black:
 - 1. Fittings: ANSI B16.11, forged steel, or ASTM A234 Grade WPB forged steel welding type.
 - 2. Joints: Welded.
 - 3. Coatings: Protect fittings, joints and pipe repair with cold-applied laminated tapes; The Tapecoat Company, Tapecoat CT or Tapecoat CT 10/40W, or as approved.
 - 4. Jackets: Epoxy type coating; 3M, Scotchkote 205 or 206W, or as approved.
 - 5. Cathodic Protection: Anode bag for each section of buried steel pipe, 9 pound magnesium anode bag of high purity magnesium alloy, No. 12 copper lead wire with type TW insulation, and dielectric unions installed where above ground and interior piping is connected to underground piping. Anode buried 2 feet from pipe at or below trench depth, lead wire attached to pipe by thermite weld process using a maximum charge of 15 grams.
- B. Polyethylene Pipe (Buried): ASTM D2513, SDR 11.5.
 - 1. Fittings: ASTM D2513 or ASTM D2683.
 - 2. Joints: Fusion-welded.
 - 3. Manufacturers: DuPont; Phillips Driscopipe, 8000; Oil Creek Plastics; or as approved.
- C. Steel Pipe (Exposed): ASTM A53, Schedule 40 black:
 - 1. Fittings: ANSI B16.3, malleable iron, ANSI B16.11, forged steel, or ASTM A234 Grade WPB, forged steel welding type.
 - 2. Joints: Threaded for 3 inches and smaller; welded for over 3 inches.

2.2 TRACE WIRE

- A. Insulated No. 14 copper, magnetic detectable conductor, APWA Uniform Color Code brightly colored plastic covering, imprinted indicating pipe service type; Griffolyn Co., Terratape "D"; Seton Name Plate Corp., Seton Metallic Detection Tape; or as approved.

2.3 VALVES

- A. Gas Cocks:
 - 1. Manufacturers: Neles-Jamesbury, Apollo, Watts, or as approved.
 - 2. Ball type, UL-listed for natural gas.

2.4 VALVE BOXES

- A. Cast iron, three-piece screw type, 5-1/4 inch shaft; heavy, neat fitting cover.
- B. Base shall cover the entire valve bonnet section.
- C. Length sufficient such that when installed, the cover top shall be flush with surrounding surface with each section properly engaged.

2.5 GAS METER

- A. Furnished and installed by Dominion East Ohio Gas.
- B. Natural Gas Meters:
 - 1. Capacities:
 - a. Flow Rates:
 - 1) Briarwood Road: 744 cfh.
 - 2) Streetsboro Road: 790 cfh.
 - b. Specific Gravity: 0.60.
 - c. Pressure Loss: 2-inch wg.

2.6 GAS PRESSURE REGULATORS

- A. Pressure Regulators:
 - 1. Manufacturers: Sensus, Model 143-80; Fisher; Schlumberger; or as approved.
 - 2. Valves: Single-stage, malleable iron body, corrosion-resistant pressure regulator with atmospheric vent, elevation compensator; threaded ends for 2 inches and smaller, flanged ends larger than 2 inches.
 - 3. Inlet gas pressure 2 psig; outlet gas pressure range from 7 inches wc to 15 inches wc; specific gravity 0.60.
 - a. Flow Rates:
 - 1) Briarwood Road: 744 cfh.
 - 2) Streetsboro Road: 790 cfh.
 - 4. Markings: Manufacturer's name and pressure rating marked on valve body.

2.7 BEDDING MATERIAL

- A. Bedding: Fine excavated material.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that equipment service connection and utility gas main size, location, and invert are as indicated.

3.2 PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs. Bevel plain end ferrous pipe over 3 inch diameter. Thread ferrous pipe 3 inch diameter and smaller.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections with threads and unions.
- D. Establish elevations of buried piping to ensure not less than 36 inches of cover in non-traveled areas and 48 inches of cover in driveways and parking areas.

3.3 INSTALLATION - BEDDING

- A. Excavate pipe trench in accordance with Section 02225 for Work of this Section. Hand-trim excavation for accurate placement of pipe to elevations indicated.
- B. Place bedding material at trench bottom and shape for accurate placement and proper support of pipe.
- C. Place bedding in 6 inch layers, loose measurement, and compact by hand or mechanical tamping to not less than 95 percent of maximum density as determined in accordance with ASTM D698 (Standard Proctor).
- D. Carefully place and tamp so as not to damage or displace joints or pipe. Do not drop material directly on pipe.
- E. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPING

- A. Maintain separation of gas line from other utility piping in accordance with governing code.
- B. Route piping in straight line.
- C. Install piping to conserve space and not interfere with use of Site space.
- D. Install piping to allow for expansion and contraction without stressing pipe or joints.
- E. Install cocks and other fittings.
- F. Lay pipe on bedding.
- G. Wrap couplings and fittings of steel pipe with polyethylene tape and heat-shrink over pipe.
- H. Backfill trench in accordance with Section 02225.
- I. Center and plumb valve box over valve. Set box cover flush with finished ground surface. Prevent shock or stress from being transmitted through valve box to valve or pipe.
- J. Paint valves and valve boxes with rust-inhibitive primer and one coat of epoxy paint.

3.5 SERVICE CONNECTIONS

- A. Anchor service main to exterior surface of concrete generator pad.
- B. Install service regulator adjacent to building wall in specified location.
- C. Install service regulator and riser pipe to prevent undue stress upon service pipe.
- D. Provide regulator vent with rain and insect-proof opening, terminating away from building openings.

3.6 FIELD QUALITY CONTROL

- A. OWNER or ENGINEER may check compaction of the bedding at any time.

- B. For compacted bedding in trenches, OWNER may employ a testing laboratory to make tests on Site and will pay all costs for the first set of tests performed per lift. If compaction fails to meet Specifications, all succeeding tests for that lift shall be at expense of CONTRACTOR.
- C. Check valve boxes after installation and remove stones, dirt, debris, and backfill material.

3.7 TESTING AND CODES

- A. After installation, piping tested and proved free of leaks in strict accordance with the requirements of the Ohio Mechanical Code. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to OWNER.
- B. Natural gas piping, valves, fittings, and appurtenances and their installation to meet requirements of:
 - 1. Title 29, Chapter XVII, Part 1910 of the Occupational Safety and Health Standards of the Code of Federal Regulations.
 - 2. NFPA No. 54 (Natural Gas).
 - 3. Ohio Mechanical Code.
 - 4. All other applicable State and Local regulations, as well as the requirements of the governing Gas Company.

END OF SECTION

SECTION 02732

PIPE SEWERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Pipe, fittings, accessories, and bedding for sanitary and storm sewers.
- B. Pipe sewers 24 inches in diameter and smaller shall be of PVC plastic pipe and fittings.

1.3 DEFINITIONS

- A. Bedding: Material placed under, beside and directly over the pipe for the full width of the trench and from the depths of excavation specified in Section 02225 up to the following:
 - 1. For all PVC plastic pipe and for all other pipe 21 inches in diameter and smaller, up to a horizontal plane a distance of 12 inches above the top of the pipe barrel.

1.4 SUBMITTALS

- A. Manufacturer's Affidavit: The manufacturer shall furnish an affidavit indicating that the pipe, fittings and appurtenances have been manufactured and tested in accordance with the requirements of the applicable referenced Standards. A copy of the affidavit indicating the Project on which the material is to be used shall be submitted as a Shop Drawing to ENGINEER prior to construction.
- B. Shop Drawings: Submit a sieve analysis and a proctor test report for granular bedding material.

1.5 QUALITY ASSURANCE

- A. All pipes, fittings and appurtenances shall be appropriately marked for purposes of identification. The materials and methods of manufacture, and the completed pipes, fittings and appurtenances shall be subject to inspection and rejection at all times. OWNER and ENGINEER have the right to make inspections.

1.6 REGULATORY REQUIREMENTS

- A. Sanitary Sewers: Furnish deflection test results to OWNER for submittal, as required, to the appropriate Ohio Environmental Protection Agency (OEPA) District Office.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

- A. PVC Plastic Pipe and Fittings:
 - 1. ASTM D3034 for 15 inch diameter and smaller.
 - 2. ASTM F679 with wall thickness T-1 only, ASTM F794 open profile (OP), ASTM F949, or ASTM F1803 closed profile (CP) for 18 inch diameter and larger.

3. Minimum pipe stiffness of 46 psi at 5 percent deflection when tested in accordance with ASTM D2412.
4. ASTM D3212 elastomeric gasket joint (integral bell), push-on type with bell designed to retain the gasket to prevent pull-out during making of the joint.
5. An exception shall be made for ASTM D3034 PVC plastic fittings 8 inch in size and smaller, with such fittings to have a minimum wall thickness of SDR 35 as defined in Section 7.4.1, and elastomeric joints and minimum socket depths in accordance with Sections 6.2 and 7.3.2.
 - a. Molded in one piece using ASTM D1784 having a cell classification of 12454-B or C.
 - b. ASTM F477 gaskets having a minimum cross sectional area of 0.20 square inches.

2.2 BEDDING MATERIAL

- A. Granular: ODOT Item 703, Size No. 67 coarse crushed aggregate, except no slag is permitted.

2.3 GROUT

- A. Non-shrinking and non-corrosive; Five Star Grout by Five Star Products, Inc.; Sealtight 588 Grout by W.R. Meadows, Inc.; or as approved.

PART 3 EXECUTION

3.1 PREPARATION

- A. Excavate trench in accordance with Section 02225 for Work of this Section, and so that the maximum allowable trench width at the top of the pipe does not exceed that given in the following table:

MAXIMUM ALLOWABLE TRENCH WIDTH (As measured at top of pipe)			
Pipe Diameter (inches)	All Pipe, except ASTM C76 Concrete Pipe*	ASTM C76 Concrete Pipe	
		Classes II, III & IV	Class V
4	2'-3"	-----	-----
6	2'-3"	-----	-----
8	2'-3"	-----	-----
10	2'-6"	-----	-----
12	2'-9"	2'-9"	3'-0"
18	3'-3"	3'-3"	3'-6"

* For PVC plastic pipe, the maximum allowable trench width at the top of the pipe is solely for the purpose of establishing limits for the payment of items based upon trench widths. The actual trench width used for installation may be in accordance with ASTM D2321

3.2 INSTALLATION - BEDDING

- A. Place bedding material at trench bottom and shape to conform to bottom quadrant of pipe barrel. Provide at least the minimum of bedding under pipe bells.
- B. ENGINEER reserves the privilege of altering the type of bedding material and regulating the exact grading of the bedding material depending upon the water characteristics of the trench.
- C. After pipe is laid, shovel place and tamp to fill all voids.

- D. Place in 6 inch layers, loose measurement, and compact by hand or mechanical tamping to not less than 95 percent of maximum density as determined in accordance with ASTM D698 (Standard Proctor).
- E. Carefully place and tamp so as not to damage or displace joints or pipe. Do not drop material directly on pipe.
- F. Maintain optimum moisture content of bedding material to attain required compaction density.

3.3 INSTALLATION - PIPE SEWERS

- A. Except where otherwise specifically required or permitted by ENGINEER, lay sewers in open trench, starting at the lowest point, with spigot ends pointing in the direction of flow.
- B. Install PVC plastic pipe and fittings in accordance with ASTM D2321 and the requirements of these Specifications.
- C. Lay pipe on bedding material with their full lengths true to line and grade with the aid of batterboards, grade pole and grade string, or other method approved by ENGINEER. When batterboards are used, set not less than three at 25 foot intervals and maintain in proper position at all times as a check on the accuracy of the grade line. When laser beam equipment is used, check equipment a minimum of twice daily, once in the A.M. and once in the P.M., in the presence of OWNER or ENGINEER to verify that equipment is maintaining the established line and grade, and when temperature and other atmospheric conditions prevent the laser beam from maintaining grade, provide additional ventilation through the pipeline by the use of blowers as instructed by the equipment manufacturer or as directed by ENGINEER.
- D. Immediately notify OWNER or ENGINEER of any misalignment of the pipe when laid in accordance with established cuts or elevations.
- E. Install pipe at a minimum 10 foot horizontal distance from water mains, and lay pipes at a minimum 18 inches vertical distance from water mains at their crossing, both as measured between the outside of the pipe walls. At crossings, install one full length of pipe so both joints will be as far from the main as possible.
- F. See Section 02607 for manhole and catch basin requirements.
- G. Backfill trench for Work of this Section; follow Section 02225.

3.4 CONNECTIONS TO STRUCTURES AND PIPES

- A. Connect new sewers to structures through stubs, wall castings, wall sleeves, etc., provided for same, or make an opening at the proper elevation in the wall of the structure, insert the pipe, and neatly and permanently close the opening around the pipe with grout.
 - 1. For polyethylene pipe, provide a water-tight seal around the pipe using grout or other material as instructed by the pipe manufacturer and approved by ENGINEER, and a coupling slipped over the pipe end against the manhole wall and fused in place for axial restraint.
- B. Make connections water-tight.
- C. Where necessary, reshape the bottoms of existing structures to give a smooth flow in all directions.
- D. Connect unlike types and sizes of pipe using proper adapter or connector by Fernco, Inc., Joints, Inc., or as approved.

3.5 FIELD QUALITY CONTROL

- A. OWNER or ENGINEER may check compaction of the bedding at any time.
- B. For compacted bedding in trenches, OWNER may employ a testing laboratory to make tests on Site and will pay all costs for the first set of tests performed per lift. If compaction fails to meet Specifications, all succeeding tests for that lift shall be at expense of CONTRACTOR.
- C. Test sanitary sewers for leakage; follow Section 02733.
- D. For storm sewers, repair all visible leakage.
- E. Deflection Test:
 - 1. Test 8 inch diameter and larger PVC plastic pipe for a maximum deflection of 5 percent not less than 30 days after final full backfill has been placed, as determined by ENGINEER. Pipe with a pipe stiffness of 200 psi or greater at 5 percent deflection, as determined in accordance with ASTM D2412, need not be tested for deflection if all pipe between two manholes is less than 12 feet below final grade.
 - 2. Conduct deflection tests with a representative of ENGINEER present.
 - 3. Repair or replace pipes exceeding a deflection of 5 percent and then retest until satisfactory test results are obtained. For sanitary sewers requiring retesting for deflection and previously tested for leakage, upon obtaining satisfactory deflection test results, retest the affected sewer section for leakage; follow Section 02733.
 - 4. Conduct tests by pulling an approved deflection probe, having a diameter not less than 95 percent of the base inside diameter or average inside diameter of the pipe depending on which is specified in the ASTM Specification, including the appendix, to which the pipe is manufactured, through the sewer line without mechanical pulling devices. Have a proving ring with an inside diameter equal to the outside diameter of the probe available at the time the probe is used to verify that the probe has the proper diameter by inserting the probe into the ring. The pipe shall be measured in accordance with ASTM D2122.
 - 5. Deflection Probe: By Wortco, Inc., Burke Concrete Accessories, Inc., or as approved; designed specifically for testing the deflection of the type and size of pipe subject to test, and complying with the following:
 - a. Odd number (no less than 9) of 1/2 inch by 3/16 inch bar stock runners equally spaced on edge around and welded to the circumference of two minimum 1/4 inch thick circular steel plates.
 - b. Distance between plates, out-to-out, of not less than 2 inches smaller than the nominal diameter of the pipe to be tested, with runners extending approximately 1-1/2 inches beyond each plate being bent inward for this distance at approximately 30 degrees.
 - c. Continuous 3/4 inch threaded rod through the center of the plates, having a hex nut drawn tight against the inside face of each plate, and extending each side as required for providing a 3/4 inch ferrule loop insert or similar piece for attaching the pulling medium.

END OF SECTION

SECTION 02733

SANITARY SEWER LEAKAGE TESTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Leakage testing of sanitary sewers for the entire length of the Work, including service connections and manholes.

1.3 PERFORMANCE REQUIREMENTS

- A. Perform leakage testing after deflection testing, where possible. If leakage testing is performed before deflection testing, a test section failing deflection testing shall be retested for leakage after acceptable deflection testing.
- B. Perform with representative of ENGINEER present.
- C. Judgment of ENGINEER's representative as to the acceptance of tests is final.

1.4 QUALITY ASSURANCE

- A. Perform leakage testing in accordance with the following ASTM Standards and the requirements of this Section. In the event of conflict, the requirements of the appropriate ASTM Standard take precedence.
 - 1. Infiltration or Exfiltration Testing: ASTM C969.
 - 2. Air Testing:
 - a. Plastic Pipe: ASTM F1417.
 - 3. Individual Joint Testing: ASTM C1103.
 - 4. Manhole Testing: ASTM C1244.

1.5 PROJECT CONDITIONS

- A. Test all sanitary sewers for leakage in accordance with the following:
 - 1. Conduct an infiltration test on the main line sewer when the pipe crown is covered with 2 feet or more of water at the highest point in the test section. Should ground water not provide sufficient head, flood the trench within the test section, bulkheading each end, to obtain or maintain the specified external head. (Also see 3. below.)
 - 2. When the pipe crown is covered with less than 2 feet of water, conduct an air test, or conduct an exfiltration test. (Also see 3. below.)
 - 3. For all main line sewers 8 inches through 27 inches in diameter tested by infiltration or exfiltration, also conduct an air test for the purpose of testing service connections, even when the pipe crown is covered with 2 feet or more of water. For such test, the internal air pressure shall never exceed 5.0 psi, and the acceptability of the test will be based on the maximum holding time specified for the size of the main line sewer.
 - 4. Provide water required to conduct infiltration and exfiltration tests.
- B. Test all manholes for leakage in accordance with Article 3.5.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PREPARATION

- A. Test each section of pipe for obstructions prior to testing for leakage using mandrels, solid cylinders, or balls with diameters of 95 percent of the pipe diameter. Remove obstructions.
- B. Determine ground water level by installing ground water gages in manholes as selected by ENGINEER. Gages shall consist of a rigid section of 1/2 inch diameter pipe, approximately 10 inches long, inserted horizontally through the manhole wall as near as possible to pipe crown, sealing any opening around the pipe water-tight, and a clear plastic tube attached to the pipe within the manhole and extended vertically to the top of the manhole. Prior to connecting the tube, blow air through the pipe with sufficient pressure to clear the line. Upon satisfactory completion of leakage testing, remove gages and permanently close openings in the manhole walls with non-shrink and non-metallic grout.
- C. Plugs used during leakage tests shall be of a length at least equal to the diameter of the pipe being tested to ensure a water-tight seal.

3.2 INFILTRATION TESTS

- A. The length of sewer subject to each test shall be the distance between two adjacent manholes as a minimum, 700 feet as a maximum, but shall be left to the discretion of ENGINEER.
- B. Isolate test section, and cap or plug all service connections and stubs within the section to prevent the entry of ground water.
- C. Measure infiltration by a V-notch weir located in the downstream manhole.
- D. Maintain test head for not less than 24 hours before a weir measurement is made.
- E. Maximum allowable leakage, including manholes, shall be 100 gallons per inch of diameter per mile of pipe per day.

3.3 EXFILTRATION TESTS

- A. The length of sewer subject to an exfiltration test shall be the distance between two adjacent manholes as a minimum, 700 feet as a maximum, but shall be left to the discretion of ENGINEER.
- B. Close upstream and downstream manhole inlets with water-tight plugs and fill the test section with water until the elevation of the water in the upstream manhole is 2 feet above pipe crown in the line being tested, or 2 feet above the existing ground water in the trench, whichever is higher.
- C. A standpipe may be used instead of the upstream manhole for providing the pressure head when approved by ENGINEER.
- D. Measure exfiltration by determining the amount of water required to maintain the initial water elevation for 1 hour from the start of the test.

- E. With absorptive pipe, begin the 1 hour period after allowing the water to stand for a minimum of 45 minutes to allow for saturation of the pipe.
- F. Maximum allowable leakage, including manholes, shall be 100 gallons per inch of diameter per mile of pipe per day.

3.4 AIR TESTS

- A. Conduct air tests after backfilling. CONTRACTOR may conduct air tests before backfilling the trench as a check for defects and workmanship, but such tests are at CONTRACTOR's option and are not a substitute for tests required after backfilling has been completed.
- B. Dampen walls of air permeable pipe prior to conducting air tests. Dampening of the pipe walls and obstruction testing may be accomplished at the same time by propelling a snug-fitting inflated ball or other approved device through the pipe with water.
- C. Sewers 27 Inches in Diameter and Smaller:
 - 1. Conduct an air test between each two consecutive manholes by plugging each end of the section to be tested and all pipe outlets in the section with suitable test plugs; one plug used at a manhole shall have an inlet tap or other provision for connecting an air hose from the air supply equipment.
 - 2. Pneumatic plugs shall be able to resist internal pressures without external blocking.
 - 3. The equipment shall include valves to control the rate at which air flows into the test section and pressure gages with minimum graduations of 0.1 psi and an accuracy of ± 0.04 psi to monitor the air pressure within the test section.
 - 4. Apply air pressure slowly to the test section until the pressure reaches 4.0 psi, plus an adjustment of 0.433 psi for each foot of ground water above the pipe crown in the line being tested. Internal air pressure, including adjustment for ground water, should never exceed 5.0 psi.
 - 5. When the pressure reaches 4.0 psi, plus adjustment for ground water, throttle the air supply so that the internal pressure is maintained between 4.0 and 3.5 psi for at least 2 minutes to permit temperature stabilization. When the pressure has stabilized and is at or above 3.5 psi, disconnect the air supply, start a stopwatch, and allow stopwatch to run until the pressure has dropped 1.0 psi.
 - 6. Calculate the permissible time allocated for the 1.0 psi pressure drop on the basis of the diameter and length of main sewer tested, no adjustment being made for service connections included in the test section. The air test for a section shall be considered acceptable if the time elapsed for the 1.0 psi pressure drop is equal to or greater than the time indicated, and shall be considered unacceptable if the elapsed time is less than that indicated in the following table:
 - a. For sewers of plastic pipe only:

MINIMUM HOLDING TIME IN MINUTES: SECONDS REQUIRED FOR 1.0 PSI PRESSURE DROP **								
PIPE DIAMETER	LENGTH OF MAIN LINE TESTED *							
	100'	150'	200'	250'	300'	350'	400'	450'
8"	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10"	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12"	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38

* Interpolate time for intermediate lengths.

** If the test section fails and service connections were included in the test, re-compute test time to include service connections in accordance with 9.6 of ASTM F1417.

3.5 MANHOLE TESTS

- A. Test each manhole after assembly and after all lift holes have been plugged with non-shrink grout and, at CONTRACTOR's option, before or after completing backfilling.
- B. Test by drawing a vacuum on the manhole using equipment specifically designed for such testing.
- C. Plug and brace pipes entering the manhole to prevent being drawn into the manhole.
- D. Place a test head with necessary gages and connections at the inside of the top of the cone section and seal in accordance with the manufacturer's instructions.
- E. Draw a vacuum of 10 inches of mercury and then shut the vacuum pump off.
- F. With valves closed, measure the time for the vacuum to drop to 9 inches. The test shall be successful if the time measured meets or exceeds the values indicated in the following table:

MINIMUM TEST TIMES IN SECONDS						
MANHOLE DEPTH	MANHOLE DIAMETER *					
	48"	60"	72"	84"	96"	108"
8' or less	20	26	33	40	48	56
10'	25	33	41	50	58	67
12'	30	39	49	59	69	79
14'	35	46	57	68	80	92
16'	40	52	65	77	91	104
18'	45	59	73	87	102	116
20'	50	65	81	97	113	129
22'	55	72	89	106	123	140
24'	59	78	97	116	135	152
26'	64	85	105	125	148	168
28'	69	91	113	135	157	179
30'	74	98	121	144	168	192

* When there is a transition involved, add the times for each size based on the depth associated with each size.

3.6 REPAIR/REPLACEMENT

- A. For any sewer test section failing to meet the limits of the Specifications, locate and remedy the defects causing the failure, retest the section, and continue repairs or replacement until the limits of the Specifications are satisfied.
- B. For sewers not accessible, should a test fail due to other than a leaking plug, conduct a closed circuit television inspection of the test section to determine the cause of the failure.
- C. When failure is the result of a leaking sewer joint, the joint may be chemically grouted.
- D. Television inspection and chemical grouting of sewer joints shall comply with all applicable "Recommended Specifications for Sewer Collection System Rehabilitation" of the National Association of Sewer Service Companies as approved by ENGINEER. Furnish OWNER video tapes of all television inspections.

- E. If a manhole test is unsuccessful, make repairs and retest until a satisfactory test is obtained.
- F. Repair all visible leakage in sewers and manholes, even though tests may have been satisfactory.

END OF SECTION

SECTION 02750

EXISTING SEWER AND DRAIN REPLACEMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.
- B. State of Ohio Department of Transportation Construction and Materials Specifications, 2005 Edition and Standard Construction Drawings identified on the plans.

1.2 SECTION INCLUDES

- A. Replacement of existing sewers and drains which must be removed or are damaged during trenching or other operations, and not noted to be removed or abandoned.
- B. Wood supports and bracing.
- C. Compacted granular material for pipe support.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

- A. Sewer and Drain Replacement: By the price per linear foot for the sizes included in the Bid items. Payment will be made only for sewers and drains not shown on Drawings or marked at the time of construction by the Utility Owner. Replacement of sewers and drains shown on the Drawings or marked at the time of construction by the Utility Owner and replacement of sewers and drains beyond the lines of measurement for sewers and drains not shown on Drawings or marked at the time of construction by the Utility Owner shall be made in a manner identical to that within the lines of measurement, but at the expense of CONTRACTOR.
 - 1. Measurement: Payment will be made for the length installed within an excavation having a width limited to 2 feet each side of the nominal inside diameter of the main line pipe being installed.
- B. Compacted Granular Material for Pipe Support: At the unit price included in the Contract for granular backfill under Section 02225 when approved by ENGINEER for supporting sewers and drains replaced when the sewers and drains replaced were not shown on Drawings or marked at the time of construction by the Utility Owner.
 - 1. Measurement: Payment will be limited to that provided within an excavation having a width limited to 2 feet each side of the nominal inside diameter of the main line pipe being installed and 12 inches each side of the replacement sewer or drain pipe barrel.

1.4 ADJUSTMENT PRICE - MEASUREMENT AND PAYMENT

- A. Wood supports and bracing for supporting sewers and drains replaced when required for sewers and drains not shown on Drawings or marked at the time of construction by the Utility Owner will be paid for at the appropriate adjustment price included in the Contract or, if not included, at a price mutually agreed upon by OWNER and CONTRACTOR, and the Contract Price adjusted by Change Order.
 - 1. Measurement: Payment will be made for a length installed within an excavation having a width limited to 2 feet each side of the nominal inside diameter of the main line pipe being installed.

PART 2 PRODUCTS

2.1 EXISTING MATERIALS

- A. Existing pipes, tiles, etc., in good condition and not damaged during removal may be relaid upon the approval of ENGINEER.

2.2 PIPING FOR SEWERS AND DRAINS

- A. Comply with applicable requirements of these Specifications for new construction and ODOT Item 603, using pipe with premium joints unless otherwise specified, as approved by ENGINEER. In the event of conflict, the requirements of these Specifications shall take precedence.
- B. Sanitary Sewers: Piping approved for use as sanitary sewer.
- C. Storm Sewer Drains: ODOT Item 707, as noted on Drawings.
- D. Perforated Pipe or Open Joint Tile: Replace with corrugated polyethylene pipe.
 - 1. Comply with AASHTO M252 or M294 with minimum pipe stiffness of 35 psi at 5 percent deflection.
 - 2. When approved by ENGINEER, replacements 12 feet or less in length may be made using PVC pipe complying with ASTM D3034, SDR35, or ASTM F679.
 - 3. Open-jointed replacements 12 inches in diameter and larger shall be Type SP (smooth inner liner with perforations).
 - 4. Drains in cultivated fields shall be replaced with perforated pipe only.
- E. Drain Discharges at Ditches or Other Watercourses: Replace with one standard length of galvanized, corrugated metal pipe.
- F. Connections: Connections between existing and replacement pipes, when of differing materials or with otherwise non-compatible joints, shall be made using banded neoprene couplings as manufactured by Fernco, Inc., Joints, Inc., or as approved.

2.3 WOOD SUPPORTS AND BRACING

- A. Material: Native hardwood.
- B. Size: Minimum 6 inches square.

2.4 COMPACTED GRANULAR MATERIAL

- A. Follow Section 02225 or Section 02732, as approved by ENGINEER.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Report to ENGINEER all existing sewers and drains exposed during trenching or other operations.

3.2 INSTALLATION

- A. Comply with applicable requirements of these Specifications for new construction and ODOT Item 603. In the event of conflict, the requirements of these Specifications shall take precedence.

- B. Support piping to withstand future settlement.
1. Wood Supports: Extend bridging into undisturbed earth a minimum of 12 inches each side of trench. Band or tie pipe to bridging for its full length. Where bridging cannot be supported by firm foundation, provide vertical support with lateral bracing as required for a firm substantial support.
 2. Compacted Granular Material: When approved by ENGINEER and with CONTRACTOR responsible for all testing for compaction, provide from above main line pipe embedment material to 12 inches above top of replacement pipe barrel.

END OF SECTION

SECTION 02840

SITE APPURTENANCES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Guard posts; excavation for posts; and concrete foundation for posts.

PART 2 PRODUCTS

2.1 GUARD POSTS

- A. ASTM A36, Schedule 40 black steel pipe.

2.2 CONCRETE

- A. Class I; follow Section 03301.

PART 3 EXECUTION

3.1 PREPARATION

- A. Excavate as required for post foundations and landscape stone areas. Follow Section 02220. Dispose of excavated material.

3.2 GUARD POST INSTALLATION

- A. Set post in concrete; crown top of foundation to shed water.
- B. Fill pipe with concrete; crown at top of pipe to shed water.

END OF SECTION

SECTION 02930

SEEDING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Preparation of topsoil.
- B. Fertilizing, seeding, mulching, and watering.
- C. Maintenance.

1.3 PROJECT CONDITIONS

- A. Seeding is required for all earth areas disturbed by CONTRACTOR's operations.
- B. Determination of residential and urban areas will be by ENGINEER.
- C. Provide steep embankment seed mixture and erosion control blanket on slopes 3:1 or greater unless otherwise directed by ENGINEER.
- D. Accomplish seeding by the hand application method or by the hydroseeding method:
 - 1. Hand Application Method: Follow all requirements of this Section, except Article 3.7.
 - 2. Hydroseeding Method: Follow all requirements of this Section, including Article 3.7.

1.4 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.

1.5 REGULATORY REQUIREMENTS

- A. Obtain fertilizer from a dealer or manufacturer whose brands and grades are registered or licensed by the State of Ohio, Department of Agriculture.
- B. Seeds to be approved by State of Ohio, Department of Agriculture, Division of Plant Industry.

1.6 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver grass seed in separate varieties, separately packaged or bagged, with labels or tags in accordance with ORC 907.03. Seed in damaged packaging is not acceptable.
- B. Deliver fertilizer in water-proof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 PRODUCTS

2.1 SEED MIXTURE

- A. Residential and Urban Area Seed Mixture:
 - 1. Kentucky Bluegrass (*Poa Pratensis*): 30 percent.
 - 2. Creeping Red Fescue Grass (*Festuco Rubra*): 30 percent.
 - 3. Annual Ryegrass (*Lolium Multiflorum*): 20 percent.
 - 4. Perennial Ryegrass (*Lolium Perenne*): 20 percent.

- B. Steep Embankment Area Seed Mixture:
 - 1. Supplier: Lofts Seed, Inc., Reclaim Conservation Mix - Dry Formula; or as approved.
 - 2. Ingredients:
 - a. Rebel II Tall Fescue: 40 percent.
 - b. Weeping Lovegrass: 20 percent.
 - c. Reliant Hard Fescue: 10 percent.
 - d. Jamestown II Chewing Fescue: 10 percent.
 - e. Palmer II Perennial Ryegrass: 10 percent.
 - f. White Clover: 5 percent.
 - g. Blackwell Switchgrass: 5 percent.

2.2 MULCHING MATERIALS

- A. For all areas, except on slopes 3:1 or greater, provide oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry; anchor in place.
 - 1. Mulch Anchoring: Fiber mulch or commercially available synthetic binder (non-asphaltic).

- B. For slopes 3:1 or greater, provide erosion control blankets.
 - 1. Manufacturers: PPS Packaging Company, XCEL Superior Erosion Control Blanket, or as approved.
 - 2. Description: Machine-produced mat of wood excelsior fibers, 80 percent of which are 6 inches or longer in length with a consistent width of fibers evenly distributed throughout the blanket, with a photo-degradable, extruded plastic netting covering the top and bottom of each blanket.
 - 3. Weight: 1.0 pounds per square yard.
 - 4. Accessories: 8 inch by 1 inch by 8 inch, 9 gage staples.

- C. Wood cellulose fiber specifically prepared for hydroseeding.

2.3 FERTILIZER

- A. Liquid or dry; recommended for grass, with 50 percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil to the following proportions: Nitrogen 12 percent, phosphoric acid 12 percent, soluble potash 12 percent.

2.4 WATER

- A. Clean, fresh and free of substances or matter which could inhibit vigorous growth of grass.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that prepared soil base is ready to receive Work of this Section.

3.2 PREPARATION OF TOPSOIL

- A. Prepare topsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, weeds and undesirable plants and their roots, clods, lumps, boulders, and stones.
- C. Scarify topsoil to a depth of 2 inches. Repeat cultivation in areas where equipment used for hauling has compacted topsoil.

3.3 FERTILIZING

- A. Apply fertilizer at a rate of 20 pounds per 1,000 square feet.
- B. Apply after smooth raking of topsoil.
- C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- D. Mix thoroughly into upper 2 inches of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

3.4 SEEDING

- A. Mix seed varieties in the presence of a representative of OWNER or ENGINEER.
- B. Apply seed at a rate of 5 pounds per 1,000 square feet for residential and urban mixtures, and 4 pounds per 1,000 square feet for steep embankment mixture. Apply evenly in two intersecting directions. Rake in lightly to cover seed to a depth of 1/4 inch.
- C. Do not seed areas in excess of that which can be mulched on same day.
- D. Do not sow immediately following rain, when ground is too dry, frozen or during windy periods.

3.5 MULCHING

- A. Apply mulching materials immediately following seeding.
- B. For all areas, except on slopes 3:1 or greater, apply mulch at a rate of 2 tons per acre for straw when seeding between March 15 and October 15, and at a rate of 3 tons per acre for straw when seeding between October 15 and March 15. Anchor mulch in place. Maintain clear of shrubs and trees.
- C. For slopes 3:1 or greater, roll erosion control blankets down slope vertically, making sure excelsior is in contact with soil; fasten with staples 2 feet horizontally and 3 feet vertically.

3.6 WATERING

- A. After each area has been mulched, apply water with a fine spray at a rate of 120 gallons per 1,000 square feet.

3.7 HYDROSEEDING

- A. Equipment: Hydraulic mulcher with hose and nozzle attachment.

- B. Tank mix seed, fertilizer and mulch to required slurry consistency.
- C. Application Rate per 1,000 Square Feet:
 - 1. Seed: 6 pounds.
 - 2. Fertilizer: Quantity required to yield 1 pound nitrogen.
 - 3. Mulch: 46 pounds.
- D. When applying materials, direct nozzle at the soil in a way to achieve maximum mixing of soil and seed.
- E. Protect all non-turf areas.
- F. Clean hydroseed mixture off all non-turf areas within 24 hours of application.

3.8 MAINTENANCE

- A. Control growth of weeds.
- B. Protect and care for seeded areas until grass is a well established, uniform growth at least 4 inches high.
- C. Once established, remove excess mulch and mow grass to a height of between 1-1/2 and 2-1/2 inches. Do not cut more than 1/3 of grass blade at each mowing. Perform first mowing when seedlings are 40 percent higher than desired height.
- D. Neatly trim edges and hand clip where necessary.
- E. Immediately remove clippings after mowing and trimming. Do not let clippings lay in clumps.
- F. Reseed areas that do not show a prompt catch at intervals of 21 days until a uniform growth is established.
- G. Water to prevent grass and soil from drying out.
- H. Promptly inspect for and repair washouts or gullies after each rain.
- I. Continue maintenance as described in this Article 3.8 for 2 weeks after initial mowing.
- J. Reseed areas damaged due to acts of neglect by residents or vandalism only at the request and expense of OWNER.

END OF SECTION

SECTION 03301

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Formwork for cast-in-place concrete.
- B. Openings for other work.
- C. Form accessories.
- D. Reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.
- E. Cast-in-place concrete.
- F. Finishing and curing of horizontal and vertical concrete surfaces.

1.3 ADJUSTMENT PRICE - MEASUREMENT AND PAYMENT

- A. Providing of cast-in-place concrete and reinforcing steel in addition to that shown or specified at the written direction of ENGINEER will be paid for at the appropriate adjustment prices included in the Contract or, if not included, at prices mutually agreed upon by OWNER and CONTRACTOR, and the Contract Price will be adjusted by Change Order.

1.4 QUALITY ASSURANCE

- A. Comply with ACI 301-05 and ACI 318-08 unless specifically noted otherwise.

1.5 DEFINITIONS

- A. Exposed: Exposed to view by persons responsible for operation or maintenance of the structure.

PART 2 PRODUCTS

2.1 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of form marks.
 - 1. Plywood: U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
- B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

- C. Forms for Cylindrical Columns and Supports: Metal, fiberglass-reinforced plastic, or paper or fiber tubes. Paper or fiber tubes constructed of laminated plies using water-resistant adhesive with wax-impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist loads imposed by wet concrete without deformation.
- D. Earth Forms: Subject to ENGINEER's approval.
- E. Form Ties: Factory-fabricated removable or snap-off metal type designed to prevent form deflection and to prevent spalling concrete upon removal. Units to leave no metal closer than 1 inch to surface.
- F. Form Release Agent: Colorless mineral oil which will not stain concrete or absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete including curing compound, sealer, or water-proofing.

2.2 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615, 60 ksi yield grade, deformed billet steel bars, unfinished; or ASTM A616, 60 ksi yield grade, deformed rail steel bars, unfinished.
- B. Welded Wire Fabric: ASTM A185, plain wire, sheet form. Rolled fabric not permitted.

2.3 CONCRETE MATERIALS AND ADMIXTURES

- A. Cement: ASTM C150, Type I - Normal Portland type.
- B. Fine and Coarse Aggregates: ASTM C33 (normal weight aggregate); materials containing deleterious substances (spalling causing) are not acceptable.
- C. Water: Clean and not detrimental to concrete.
- D. Air Entrainment: ASTM C260; Master Builders Micro-Air, or as approved.
- E. Chemical: ASTM C494 Type A - Water-Reducing, Type B - Retarding, Type D - Water-Reducing and Retarding, Type F - Water-Reducing, High Range, Type G - Water-Reducing, High Range and Retarding; containing no chlorides; Master Builders, W.R. Grace, or as approved.
- F. Fly Ash: ASTM C618 Class F or C; loss on ignition less than 3 percent.

2.4 CURING MATERIALS

- A. Membrane Curing Compound: ASTM C309, Type I-D, Class B, clear with fugitive dye which disappears approximately 24 hours after exposure to sunlight; Spray-Cure Safe Cure Clear, Euclid Chemical Company Kurez DR, or as approved. Curing compound shall be compatible with coatings which are to be applied to the concrete surface.
- B. Absorptive Mats: Burlap-polyethylene, minimum 8 ounces per square yard bonded to prevent separation during handling and placing.
- C. Water: Potable, not detrimental to concrete.

2.5 ACCESSORIES

- A. Vapor Retarder: 10 mil thick clear polyethylene film.

- B. Non-Shrink Grout: Pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 5,000 psi in 28 days; Master Builders Masterflow 713, or as approved.
- C. Epoxy Grout: Two component, epoxy resin bonding system capable of developing a minimum bond strength of 1,100 psi in 48 hours; ASTM C881 Type IV, Grade 3, Class B and C; Euclid Chemical Company EUCO 452 GEL, or as approved.
- D. Joint Filler Type A: ASTM D994; asphalt-impregnated fiberboard or felt; W.R. Meadows Asphalt Joint, or as approved.
- E. Joint Filler Type B: ASTM D1752, pre-molded sponge rubber fully compressible with recovery rate of minimum 95 percent; W.R. Meadows Sponge Rubber, or as approved.

2.6 CONCRETE MIX

- A. Concrete Proportions: Comply with ACI 301, 4.2.
- B. Class I Concrete: Provide concrete to the following criteria:
 1. Compressive Strength (7 Day): 3,600 psi.
 2. Compressive Strength (28 Day): 4,500 psi.
 3. Water/Cement Ratio (Maximum): 0.42 by weight.
 4. Air Entrained: 6 percent, ± 1 percent.
 5. Fly Ash Content: Maximum 25 percent of cement content.
 6. Slump (Maximum): 3 inches (due to water).
 7. Mid or High Range Water Reducer: Add at Site to increase slump to 6 inches, $\pm 1-1/2$ inches.
- C. Class II Concrete: Provide concrete to the following criteria:
 1. Compressive Strength (28 Day): 2,500 psi.
 2. Fly Ash Content: Maximum 25 percent of cement content.
 3. Slump (Maximum): 6 inches.
- D. Mud Mat Concrete: Provide concrete to the following criteria:
 1. Compressive Strength (28 Day): 1,000 psi.

PART 3 EXECUTION

3.1 ERECTION - FORMWORK

- A. Align joints and make water-tight.
- B. Coordinate with Work of other Sections in forming and placing openings, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
- C. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- D. Provide 3/4" chamfer strips on all external corners, and on other edges as indicated.

3.2 PLACEMENT OF REINFORCEMENT

- A. Place, support, and secure reinforcement against displacement. Do not deviate from required position.

- B. Unless noted otherwise, maintain concrete cover for reinforcement as follows:

<u>Item</u>	<u>Coverage</u>
Column Ties and Beam Stirrups	1-1/2 inch
Footings and Concrete Formed Against Earth	3 inch
Slabs on Grade	2 inch
All Other	2 inch

- C. Lap splices to be in accordance with Lap Splice Dimension Table as indicated on Drawings or in accordance with ACI standards.
- D. Do not field-cut reinforcement without ENGINEER's permission.
- E. Bend all horizontal wall and beam bars around all corners unless otherwise indicated on Drawings.

3.3 GENERAL

- A. Use Class I concrete for structural concrete, and concrete for pavements, sidewalks and equipment bases; use Class II concrete for fillets and fills, and where indicated.
- B. Install vapor retarder under interior building slabs-on-grade. Lap joints minimum 6 inches and seal water-tight by taping edges and ends.
- C. Cut contraction joints within 12 hours after placement of concrete. Cut 1/4 depth of slab thickness. Locate joints as shown.
- D. Slope positively floors containing sumps, gutters, or floor drains.
- E. Provide 3 inch thick mud mats under all foundations and base slabs unless noted otherwise.
- F. Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces such as column pedestals, foundation walls, or as indicated. Use joint filler B and a sealant as specified in Section 07900.
- G. Verify construction joints and reinforcement are acceptable.
- H. Place epoxy grout in full accordance with manufacturer's instructions, including compressed air cleaning of all contact surfaces.

3.4 PLACING CONCRETE

- A. When Class I concrete arrives at the Project with slump below 3 inches, water may be added only if neither the maximum permissible water-cement ratio nor the maximum slump is exceeded. Slump adjustment, with water, shall be made only one time.
- B. Placement of concrete under water is not permitted.
- C. Advise the designated testing agency not less than 24 hours before operations to allow for completion of quality tests.

3.5 CONCRETE FINISHING

- A. Concrete Floor Surfaces: ACI 301, 5.3.4.2, floated finish.
1. Maximum Variation of Surface Flatness for Exposed Concrete Floors: 1/8 inch in 10 feet.

- B. Concrete Surfaces Not Exposed: ACI 301, 5.3.3.3.a, rough form finish.
- C. Exposed Formed Surfaces: ACI 301, 5.3.3.4.b, grout-cleaned finish.
- D. Exterior Traffic Surfaces: ACI 301, 5.3.4.2.d, broom finish.

3.6 CURING

- A. Horizontal Surfaces: Cure floor surfaces in accordance with ACI 301 using any of the following accepted procedures.
 - 1. Spraying: Spray water over floor slab areas and maintain wet for 7 days.
 - 2. Absorptive Mat: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place for 7 days.
 - 3. Membrane Curing Compound: Pavement, walks, and curbs only.
- B. Vertical Surfaces: Cure surfaces using any of the following accepted procedures.
 - 1. Formwork: Keep forms in place for 7 days.
 - 2. Membrane Curing Compound.

3.7 FIELD QUALITY CONTROL

- A. Tests of concrete slump, air content and strength will be made at the direction of ENGINEER. Samples for air content and strength should be taken as near as practical to the point of placement into the formwork or at a location which closely matches the handling conditions when the concrete is placed in the forms. Prior to the addition of a mid or high range water reducer, a slump test may be made from a sample taken from the very first concrete out of the load.

END OF SECTION

SECTION 05501

ANCHORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Anchors, including expansion, sleeve, and adhesive type.

PART 2 PRODUCTS

2.1 ANCHORS

- A. General Requirements:
 - 1. Anchors Exposed to Weather, in Contact with Aluminum Components, or in Submerged Conditions: Type 316 stainless steel.
 - 2. Anchors for All Other Conditions: Zinc-plated; ASTM B633.
- B. Expansion Anchors:
 - 1. Manufacturers:
 - a. Hilti Corporation, Kwik Bolt II.
 - b. ITW Ramset/Red Head, Trubolt Wedge Anchor.
 - c. The Powers Company, Inc., Power-Stud.
 - d. Or as approved.
 - 2. Comply with Federal Specification FF-S-325 Group II, Type 4, Class 1.
 - 3. Minimum Embedment: 4 inches, unless otherwise indicated.
- C. Sleeve Anchors:
 - 1. Manufacturers:
 - a. Hilti Corporation, HLC Sleeve Anchor.
 - b. ITW Ramset/Red Head, Dynabolt Sleeve Anchor.
 - c. The Powers Company, Inc., Lok/Bolt.
 - d. Or as approved.
 - 2. Comply with Federal Specification FF-S-325 Group II, Type 3, Class 3.
- D. Adhesive Anchors:
 - 1. Manufacturers:
 - a. ITW Ramset/Red Head, Epcon System, Ceramic 6 Epoxy.
 - b. The Powers Company, Inc., Power-Fast.
 - c. Simpson Strong Tie, Epoxy Tie SET.
 - d. Or as approved.
 - 2. Injection Gel:
 - a. Two component structural epoxy.
 - b. Comply with ASTM C881.
 - 3. Screen Tubes:
 - a. Use with hollow base materials.
 - b. Stainless steel screen.
 - 4. Minimum Embedment: 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's instructions.

3.2 ANCHORS

A. Use anchors as indicated.

END OF SECTION

SECTION 05520

HANDRAILS AND RAILINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Handrails, posts, and fittings.
- B. Toe plates.

1.3 DESIGN REQUIREMENTS

- A. Railing assembly, handrails, and attachments shall be capable of simultaneously withstanding a horizontal load of 50 pounds per linear foot applied at the top rail and a vertical load of 100 pounds per linear foot or a 200 pound concentrated load at any point or direction along the top rail.
- B. Posts:
 - 1. Single unspliced length.
 - 2. Spacing: Maximum 5'-0" center-to-center.
- C. Rails:
 - 1. Top Rail: Continuous wherever possible, attached to a minimum of three posts.
 - 2. Lower Rails: Single unspliced length between posts.
- D. Make provisions for expansion and contraction of top rails and toe plate. Expansion joints shall be placed at maximum 25 foot intervals and at all concrete expansion joints.
- E. Comply with OSHA and state and local codes.
- F. Railing shall be surface-mounted.

1.4 SHOP DRAWINGS

- A. Include plans showing location of handrail required for the Project with all necessary dimensions, and detail drawings showing standard handrail elevations, typical connections, anchoring systems, and expansion joints.
- B. Provide certified test results showing design requirements compliance.
- C. Test Data: Base assembly test results.

1.5 SAMPLES

- A. Submit one sample with connections at line posts, corner post, skewed connections, toe plate, and base connections.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Hollaender Manufacturing Company, Interna-Rail.
- B. Tuttle Aluminum and Bronze, TABCO 8000 rail.
- C. Thompson Fabricating, TUF Rail.

2.2 ALUMINUM RAILING SYSTEM

- A. Rails: 1-1/2 inch diameter, Schedule 40, ASTM B429 or B221, 6061-T6, 6105-T5, or 6063-T6 aluminum alloy, extruded pipe.
- B. Posts: 1-1/2 inch diameter, Schedule 80 or Schedule 40 with solid aluminum inserts (minimum 18 inches long), ASTM B241, 6061-T6 aluminum alloy, extruded pipe.
- C. Fittings: Elbows, T-shapes, wall brackets, escutcheons; machined aluminum.
- D. Splice Connectors: Concealed spigot; cast or machined aluminum.
- E. Mounting: Cast or extruded aluminum brackets, base flanges for horizontal surfaces, and angled base flanges for stair stringers and ramps.
- F. Hardware:
 - 1. Mechanically connect pipe and fittings together with stainless steel hardware. No pop rivets, sheet metal screws, or self-tapping screws permitted. No glued or welded connections permitted.
 - 2. Stainless steel for mounting on steel stairs and walkways.
 - 3. Stainless steel anchors for concrete and masonry; follow Section 05501.
- G. Toe Plates: Aluminum alloy; 1/4 inch by 4 inch plate, or 4 inch by 1 inch by 1/8 inch channel; with anchors or brackets.
- H. Aluminum Surfaces: Two-step anodized to clear color, Architectural Class I, minimum 0.7 mil thickness.
- I. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

2.3 FABRICATION

- A. Fit and shop-assemble components in largest practical sizes for delivery to Site.
- B. Fabricate components with joints tightly fitted and secured. Provide mechanical fittings to accommodate Site assembly and installation.
- C. Provide anchors, brackets, and base flanges required for mounting and anchoring railings.
- D. Exterior Components: Drill condensate drainage holes at bottom and low point of members at locations that will not encourage water intrusion.
- E. Make exposed joints butt-tight, flush, and hairline. Ease exposed edges to small uniform radius.

- F. Accurately form components to suit stairs and landings, to each other and to building structure.
- G. Accommodate for expansion and contraction of members and building movement without damage to connections or members.
- H. Wrap pipe in plastic wrap to protect finish. Maintain during fabrication, transportation, and erection.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, straight and true, accurately fitted, free from distortion or defects.
- C. Assemble with mechanical fittings to accommodate tight joints and secure installation.
- D. Mount and anchor railings in place with manufacturer's standard wall brackets and floor flanges using stainless steel hardware. Maintain recommended edge distances in accordance with manufacturer's instructions.
- E. Install toe plates straight and true with not more than 1/4 inch clearance above floor.
- F. At time approved by ENGINEER, remove protective wrap. Clean handrail with mild soap and water. Do not use solutions, steel wool, or abrasives.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Provide joint sealers and accessories for interior and exterior joints between different materials, perimeter joints at openings, and other areas as required to maintain the building in a water-tight and weather-tight condition and to allow for expansion and contraction.

1.3 SHOP DRAWINGS

- A. Through Penetration Firestopping: Submit, for approval, details of proposed through penetration firestopping system to building authority having plan review jurisdiction. Submit proof of approval to ENGINEER before commencing Work.

1.4 SAMPLES

- A. Provide Samples of each sealant type for color selection by OWNER.

1.5 CERTIFICATES

- A. Provide manufacturer's certification that the products will meet or exceed the specified requirements.

1.6 REGULATORY REQUIREMENTS

- A. All chemicals, substances, and materials added to or brought in contact with water in or intended to be used in a public water system or used for the purpose of treating, conditioning, altering, or modifying the characteristics of such water shall be shown by either the manufacturer, distributor, or purveyor to be non-toxic and harmless to humans when used in accordance with the formulation and concentration as specified by the manufacturer, and shall conform with the American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 60 or 61. Any organization certified by the American National Standards Institute may certify in writing that a product conforms with these standards.

PART 2 PRODUCTS

2.1 SEALANTS

- A. Polyurethane Sealant (Type A): Single component gun grade; minimum 1/4 inch joint width; ± 50 percent movement capability; Federal Specification TT-S-00230C, Type II, Class A, ASTM C920, Type S, Grade NS.
 - 1. Manufacturers:
 - a. Sikaflex - 15LM by Sika Corporation.
 - b. Vulkem 921 by Mameco International, Inc.
 - c. Or as approved.

- B. Polyurethane Sealant (Type B): Single component, pourable grade; minimum 1/4 inch joint width; ASTM C920 Type S, Grade P, Class 25; maximum 1 inch joint width; ± 25 percent movement capability; recommended for use in wastewater.
 - 1. Manufacturers:
 - a. Vulkem 45 by Mameco International, Inc.
 - b. Or as approved.
- C. Polyurethane Sealant (Type C): Single component, gun grade; minimum 1/4 inch joint width; maximum 1 inch joint width; ± 25 percent movement capability; paintable; Federal Specification TT-S-00230C, Type II, Class A.
 - 1. Manufacturers:
 - a. Sikaflex - 1a by Sika Corporation.
 - b. Or as approved.
- D. Fire and Smoke Stop Sealant (Type I): ASTM E84, UL1479, ASTM E814.
 - 1. Manufacturers:
 - a. Firetemp C1 Calk by Johns Manville International, Inc.
 - b. FS-ONE by Hilti Firestop Systems.
 - c. LBS Firestop Sealant by Nelson Firestop Products.
 - d. Or as approved.
 - 2. Through penetration firestopping system utilized requires approval of building authority having plan approval jurisdiction.

2.2 COMPATIBILITY

- A. Provide joint sealers, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2.3 ACCESSORIES

- A. Primer: Non-staining type as determined by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type as determined by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Closed-cell, polyethylene foam rods, in size as determined by sealant manufacturer for various joint widths.
- D. Bond Breaker: Pressure-sensitive tape as determined by sealant manufacturer to suit application.

2.4 COLOR

- A. Provide color of exposed joint sealers to match samples approved by ENGINEER.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that substrate surfaces and joint openings are ready to receive Work.
- B. Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

- A. Remove loose materials and foreign matter which might impair adhesion of sealant.
- B. Clean and prime joints in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions.
- D. Protect elements surrounding the Work of this Section from damage or disfiguration.

3.3 INSTALLATION

- A. Install sealant and related materials such as primers and joint backing materials in strict accordance with manufacturer's instructions.
- B. Measure joint dimensions and size materials to achieve width/depth ratios as instructed by the sealant manufacturer.
- C. Install bond breaker where joint backing is not used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- E. Apply sealant within stated application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Unless otherwise stated in manufacturer's instructions, tool joints concave.
- G. Install through penetration firestopping after approval, by building authority having plan approval jurisdiction, of system selected.

3.4 CLEANING

- A. Clean adjacent soiled surfaces.

3.5 JOINT SEALANT SCHEDULE

USE	SEALANT TYPE	
	SERVICE	
	BUILDING INTERIOR	EXPOSED TO WEATHER
Horizontal expansion joints in concrete	A	A
Vertical expansion joints in concrete	A	A
Horizontal contraction joint in concrete	B	B
Vertical contraction joint in concrete	C	C
Perimeter of doors, windows, louvers and similar materials	C	A
Openings around mechanical and electrical services penetrating fire rated floor or wall assemblies	I	

END OF SECTION

SECTION 11410

ODOR CONTROL SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Work under this Section includes and complete Bioxide chemical feed system for the control of hydrogen sulfide. The odor control system shall consist of a feed system, including chemical feed pumps, VersaDose® LT (VDLT) control system, liquid chemical storage tank, and all piping and appurtenances required to feed Bioxide into the wastewater system. The system shall also include one full load of Bioxide product to facilitate start-up and system optimization.

1.3 SYSTEM DESCRIPTIONS

- A. The system shall provide for bulk storage of Bioxide and metering of the Bioxide from the bulk storage tank to the wastewater collection system. The system shall contain controls as necessary to facilitate single discrete dosing profile (24 hour setpoints) that varies in 1-hour increments in a stepping fashion over a 24-hr period. A calibration cylinder shall be permanently installed to facilitate calibration of feed pumps.
- B. The Bioxide material shall utilize the inherent ability of the facultative bacteria normally present in wastewater to metabolize hydrogen sulfide and other odor-causing, reduced sulfur containing compounds. The material shall provide nitrate-oxygen to the wastewater to support this biochemical mechanism. This nitrate-oxygen shall be applied via nitrate salts. The material shall be chemically stable, allowing continuous removal of sulfide contributed by side streams downstream of the application point. As a result of the biochemical process, the material shall provide the additional benefit of biochemical oxygen demand (BOD) reduction in the wastewater.
- C. The purchase of Bioxide Plus products from Evoqua constitutes an implied license to practice the processes described in United States Patents #6,309,597, #7,087,172 and #7,285,217. Bioxide® is a registered trademark of Evoqua Water Technologies LLC.

1.4 SUBMITTALS

- A. The manufacturer shall submit complete shop drawings and engineering data including:
 1. Drawings showing plan and elevation views of the feed system.
 2. Control system layout drawing.
 3. Control system electrical diagram.
 4. Manufacturer's catalog information on major system components including: chemical feed pumps, feed controls, operator interface, and liquid chemical storage tank.
 5. Statement of design conditions and performance guarantee.
 6. Warranty statement.

- B. The manufacturer shall submit complete Operation and Maintenance Manuals including:
 - 1. Equipment installation instructions.
 - 2. Equipment start-up instructions.
 - 3. Equipment maintenance procedures.
 - 4. Trouble shooting guide.
 - 5. Information on hazards associated with the system and appropriate safety precautions.
 - 6. Individual operation and maintenance information on major system components.
 - 7. Material Safety Data Sheets for Bioxide.

1.5 DESIGN REQUIREMENTS

- A. All components of the feed system shall be provided by a single manufacturer who shall have sole source responsibility for the system. Manufacturer shall be Evoqua Water Technologies LLC.
- B. All components of the system shall be compatible with the conditions and chemicals to which they are subjected to during normal operation of the system. Compounds with the materials must be compatible include hydrogen sulfide and Bioxide solution.

1.6 WARRANTY

- A. Manufacturer shall warrant the system for 18 months from acceptance by OWNER. The manufacturer shall repair or provide replacement for any defective components under this warranty. In addition, the liquid chemical storage tanks shall be warranted for a period of 5 years.

1.7 DELIVERY

- A. Fabricated assemblies shall be shop assembled and properly matchmarked for ease of field erection.
- B. All components will be erected by the CONTRACTOR immediately upon receipt from the Manufacturer or stored in strict conformance with storage recommendations provided by the Manufacturer.
- C. Delivery shall be coordinated with the CONTRACTOR.

PART 2 PRODUCTS

2.1 BIOXIDE PRODUCT

- A. The material supplied shall be an aqueous solution of calcium nitrate containing a minimum of 3.5 pounds of nitrate-oxygen per gallon.
- B. Shall be capable of reducing the dissolved hydrogen sulfide concentration in wastewater to less than 0.1 mg/l and be free of any objectionable odor-producing compounds.
- C. Shall have a freezing point less than -10 degrees F and the pH of the material shall not be less than 4.0 nor greater than 7.5.
- D. The material shall not be listed as an Extremely Hazardous Substance under Section 302 of EPCRA, nor be listed as a CERCLA hazardous substance. The material shall be exempt from Federal DOT placard requirements.

- E. Recommended handling procedures for the material shall require protective gloves and safety glasses only. Any material recommending more sophisticated equipment during routine handling shall not be considered.

2.2 LIQUID CHEMICAL STORAGE TANK

- A. The chemical storage tank shall have the following capacity and dimensions (+/-5%):

Parameter	Value
Nominal Capacity	1,550 gallons
Diameter	7'-2"
Height	6'-10"

- B. The chemical storage tank shall be constructed of rotationally molded high-density cross-linked polyethylene (HDXLPE). No other material of construction will be acceptable.
- High density cross-linked polyethylene tanks shall be manufactured by the rotational molding process in accordance with ASTM D-1998-93 Standard Specification for Polyethylene Upright Storage Tanks.
 - Appearance. Finished vessel walls shall be as free as commercially practicable of visual defects that will impair the serviceability of the vessel.
 - Dimensions and Tolerance. The vessel diameter shall be measured externally. Measurement shall be taken in a vertical position.
 - Plastics. The polyethylene shall preferably be virgin material. Any use of regrind, recycled, or reprocessed materials or combinations of such materials shall not rely upon the performance data of their original constituents but must meet the requirements of this standard in its own right.
 - Fillers and Pigments. The plastic shall contain no fillers. All plastic shall contain an ultraviolet stabilizer. This stabilizer shall be compounded in the polyethylene. Pigments must be compounded at the same time of resin manufacture.
- C. Fittings:
- All fittings with the exception of the overflow protection site glass, shall be located on the tank top or dome. No penetration of the sidewall shall be made .
 - Plastic Fittings. Plastic fittings shall be "bulk-head" or "two-flange" style. All bolts shall be all thread design. Each bolt shall have a gasket, which is on the inside of the vessel .
 - Openings that are cut in vessel to install fittings shall not have sharp corners. Holes shall have minimum clearance to ensure the best performance of fittings .
 - For all flanged connectors, the flange drilling and bolting shall be in accordance with ANSI/ASME B-16.5 for 150-psi pressure class straddling the principle centerline of the vessel .
 - Manway covers shall be 10-24 inch diameter, dependent upon the tank dimensions, and have either a threaded or bolted cover or gasket.

2.3 CHEMICAL FEED PUMPS

- A. Provide Evoqua Water Technologies LLC Bellows Pumps. Each pump shall include motor, base, sealed bearings, flexible coupling and check valve filters.
- Model No.: 15907-001.
 - Quantity: Two.
 - Flow Range: 5-50 ml/min.
 - Maximum Discharge Pressure: 35 psi.

- B. Materials of Construction:
 - 1. Bellows: Polypropylene.
 - 2. Poppet Valves: EPT.
 - 3. O-Rings: EPT.
 - 4. Springs: Hastalloy C.
- C. The pumps shall be self-priming capable of suction lifts, when dry, up to 7 feet, and with bellows full, they shall prime up to 20 feet.
- D. Flow rate of each pump shall be adjustable by diameter of bellows, and adjustment of stroke length. A calibration cylinder and valves shall be installed to calibrate pump feed rates.
- E. Pump suction and discharge shall be 3/8 inch ID polypropylene barbed connection for T tubing. A 1-1/2" wye strainer shall be installed.
- F. Motor shall be totally enclosed 115 volt, 60 Hz, 0.034 HP, single-phase and shall be rated for continuous duty.

2.4 CONTROLS

- A. The operation of the chemical feed system shall be controlled from a control panel. All equipment control switches, pilot lights, controllers, etc., and the chemical feed pumps shall be housed in this panel. The control system shall be UL approved and shall bear the UL Listed Enclosed Industrial Control Panel Label.
- B. The control panel shall contain the following components:
 - 1. Two 24 hour time clocks.
 - 2. One 15 amp circuit breaker, 115 volt.
 - 3. One ground fault receptacle.
 - 4. Five on/off switches with LED indicator lights.
 - 5. Two chemical feed pumps.
 - 6. One cooling fan.
 - 7. Two dry contacts to receive signal from remote source.
 - 8. One Touch Screen Operator Interface with color display and integrated tank level indication.
 - 9. One HMI On/Off Soft Switch for auxiliary equipment.
 - 10. Two HMI Off/Auto Soft Switches for pump control.
 - 11. One set of Contacts with surge arrestor to accept Tank Level device.
- C. All control system design, fabrication and wiring shall conform to the standards of Underwriter's Laboratories, national Electrical Code, and any other applicable federal, state or local codes.
- D. The bellows pump shall be controlled by a three-position Hand/Off/Auto switch. When in the Auto position, the pump shall be controlled by a timer. The timer shall turn the pump on and off based upon preset time intervals. When in the Hand position, the pump shall run, regardless of the preset time interval. Either one or both chemical feed pumps may turn on or off at preset speeds and preset times.
- E. The control panel enclosure shall be constructed of Type 316 stainless steel and shall be rated NEMA 4X. It shall be equipped with a door with continuous hinge. The door shall be equipped with two latches and shall be capable of locking with a padlock. The enclosure shall be mounted on the control stand, which shall contain the heated calibration stand.

- F. The control panel enclosure shall be mounted on a Type 316 stainless steel control stand, which shall contain the calibration cylinder. A door shall be provided on the front of the control stand to access the calibration cylinder.
- G. A three-way valve shall be located at the top and bottom of the calibration cylinder to facilitate flow measurement. Instructions for use of the calibration cylinder shall permanently affixed to the interior of the enclosure.
- H. All manually operated controls shall be located on a panel behind the enclosure door. The panel shall be outfitted with a main power disconnect located on the control stand.
- I. Heater: The stand shall be heated via a thermostatically controlled heater.

2.5 SYSTEM OPERATION

- A. The chemical feed pumps shall be controlled by a two-position OFF/AUTO switch. The control system shall utilize 24 discrete dosing set points one setpoint for each hour of the day. The same 24 discrete dosing setpoint is then repeated and used for each day of the week.
 - 1. When in the AUTO position, the pump shall be controlled by the advanced dosing controller. The advanced dosing controller shall vary the feed rate in 1-hour increments as specified by the user. The pumps shall be turned on and off by the advanced dosing controller to match the specified dose curve.
 - 2. System shall automatically calculate the dose with either one pump or two pumps activated and the specified volume of product.
 - 3. If the tank level is in alarm condition (empty, low or high) relay contacts shall be energized.
 - 4. Automatic functions shall be protected by one-level security.
 - 5. The chemical dosing scheme shall be a stepping function from any given hour to another.
 - 6. Daily chemical dosing curve shall also be adjustable by a global setting to increase the feed rate percentage across all 24 daily set points.
 - 7. System shall have selectable High-Low-Empty digital output alarms and provide for remote customer lockout contacts for remote customer shutdown.
 - 8. Feed pumps shall have the capability to be interlocked with the sewage pumps and shall have the capability to be automatically shutdown on empty tank alarm.
 - 9. System shall calculate be capable of providing alarms for leak detection.

2.6 PIPING AND APPURTENANCES

- A. All suction and discharge piping shall be standard 1/2", Schedule 80 PVC. All valves, fittings, and connectors shall be Schedule 80 PVC.
- B. All fill line piping shall be 2" Schedule 80 PVC. All fill line valves, fittings, and connectors shall be Schedule 80 PVC.
 - 1. Fill line shall have a 2-inch stainless steel male camlock with 2-inch plastic female camlock cap.
- C. All chemical feed seals shall be compatible with the chemicals to be used in the regular operation, maintenance and cleaning of the feed system.
- D. All fittings shall be solvent-welded or threaded.
- E. A wye strainer shall be installed on the suction line.
- F. Level Indication: The manufacturer shall provide one pressure transducing tank level sensor which utilizes the VDLT control panel, as well as a mechanical reverse float level system.

PART 3 EXECUTION

3.1 SHOP TESTING

- A. Prior to shipping the system to the site, Manufacturer shall perform the following shop tests:
 - 1. Visual inspection of all equipment.
 - 2. Complete assembly, start-up and wet-test of feed pumps and calibration piping.

3.2 INSTALLATION

- A. Comply with manufacturer's instructions. All installation personnel shall be trained and qualified in the areas of plumbing, electrical work and instrumentation as required to complete the installation.
- B. Anchor, level, and grout equipment as required.

3.3 MANUFACTURER'S START-UP SERVICES

- A. Provide a minimum of one 8-hour day.

END OF SECTION

SECTION 11907

SUBMERSIBLE PUMPS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Submersible pumps.
- B. Pump guide assemblies.
- C. Pump access doors.
- D. Pump controls.

1.3 PERFORMANCE REQUIREMENTS

- A. Operating Conditions:

Pump No.	Pump Designation	Pump			Motor		
		Flow (GPM)	TDH (ft.)	Eff. (min.)	HP (max.)	RPM (nominal)	Electrical
P1 & P2	Wastewater Pumps, PS1	300	85	43	15	1800	460V, 3-Phase
		215*	92*				
		160	95				
P3 & P4	Wastewater Pumps, PS2	350	114	45	20	1800	460V, 3-Phase
		250*	123*				
		150	132				

* Design point.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility: In order to maintain a standard of compatibility, all pumps shall be provided by the same manufacturer.

1.5 SPARE PARTS

- A. One spare fuse for each fuse in pump control panel.
- B. One spare pilot light for each pilot light in pump control panel.
- C. One spare float switch with length of integral cord sufficient to replace longest provided.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. ITT-Flygt Corporation.
 - 1. PS1 – Model No. NP3127.930.
 - 2. PS2 – Model No. NP3153.095.
- B. Hydromatic.
 - 1. PS1 – Model No. H4HXP1500FC.
 - 2. PS2 – Model No. H4QXP2000FC.
- C. Or as approved.

2.2 SUBMERSIBLE PUMPS

- A. Design: Centrifugal submersible type, capable of handling unscreened solids-laden fluids without clogging, with a discharge elbow permanently installed in the wet well, and the pump to discharge elbow connection made automatically when pump is lowered into place, without the need for nuts or bolts, and without the need of personnel to enter the wet well. Pumps that bear directly on wet well floor are not acceptable.
- B. Casing, intermediate casing, impeller, motor frame to be gray cast iron, ASTM A48 Class 30 or 35, with castings having smooth surfaces, devoid of blow holes and other casting irregularities, and mating surfaces machined and fitted with O-rings where water-tight seal is required. Exposed bolts and nuts to be Type 304 stainless steel.
- C. Impeller shall be enclosed single- or double-vane, non-clog, dynamically balanced.
- D. Casing: End suction volute type, centerline discharge, single-piece design. Smooth fluid passages capable of handling all pumped media passing the impeller. Provide discharge with an ANSI B16.1, Class 125 flange. Provide casing with a steel insert ring.
- E. Bearings: Upper radial and lower thrust bearings, permanently grease or oil-lubricated, minimum B-10 life of 100,000 hours.
- F. Shaft: Machined, minimum AISI Type 303 stainless steel. Pump shaft is an extension of the motor shaft. Couplings are not acceptable.
- G. Mechanical Seals: Either a one-piece, double mechanical seal or two totally independent mechanical seals mounted in tandem.
 - 1. Double Mechanical Seal: Enclosed block design which incorporates both upper and lower sets of seal faces in one stainless steel unit. All seal faces to be tungsten carbide, and held in place by two independent sets of stainless steel coil springs immersed in an oil bath.
 - 2. Independent Mechanical Seals: Lower seal to consist of one stationary and one rotating tungsten carbide ring, and upper seal to consist of one stationary ceramic ring and one rotating carbon ring, with each seal interface held in contact by a stainless steel spring system. Provide system with a lubricant chamber.
- H. Motor: Designed for continuous duty, completely or partially submerged. Squirrel cage, induction, shell type design housed in either an air-filled or oil-filled, water-tight chamber, NEMA Design B, Class H insulation, Class I, Division 1, Group D explosion-proof. Combined service factor of 1.15. Protect motor from high temperatures and moisture intrusion by providing sensors for each in the motor housing which will shut down the pump and trip a warning light on the control panel.

- I. Power Cable: Sized according to NEC standards and of sufficient length to reach the junction box without splices. Oil-resistant outer jacket of chloroprene rubber capable of continuous submergence without loss of water-tight integrity to a depth of 65 feet. Provide cable with strain relief and a positive water-tight entry into the motor housing.
- J. Finishing: Completely factory-finish pump with manufacturer's standard corrosion-resistant coatings.
- K. Data Plate: Fabricate data plate from corrosion-resistant metal and mechanically attach to pump. Engrave the plate with the following:
 - 1. Manufacturer's name.
 - 2. Pump size.
 - 3. Serial number.
 - 4. Motor horsepower and speed.
 - 5. Impeller diameter.
 - 6. Capacity and head.

2.3 PUMP GUIDE ASSEMBLIES

- A. Pump guide assembly to consist of either guide rails or guide cables, a self-aligning sliding bracket, upper guide bracket, intermediate guide brackets (as required by manufacturer), lifting chain, and discharge elbow.
 - 1. Guide Rails and Guide Brackets: Type 304 stainless steel; rails designed to mount directly to discharge elbow at the floor and to the upper guide bracket at the top. Provide intermediate guide brackets for rail lengths over 15 feet.
 - 2. Guide Cables: Two stainless steel cables in parallel and tightly secured by an upper tension device and a hook on the lower side of the base elbow.
 - 3. Self-Aligning Sliding Bracket: Mounted on pump discharge with a machined mating flange which matches the discharge elbow. Sealing of the discharge connection is accomplished by a simple linear downward motion of the pump, culminating with the entire weight of the pumping unit supported entirely by the discharge elbow.
 - 4. Lifting Rope: Stainless steel cable of sufficient length to extend from the pump in the lowest position in the wet well to the connection on the top of the wet well. Provide a device at the top of the wet well to attach the cable to when not in use. Size cable according to pump weight. Coordinate upper cable end terminating device with OWNER.
 - 5. Discharge Elbow: Gray cast iron, ASTM A48, Class 30, designed to mount directly to wet well floor and to anchor and align guide rails/cables with ANSI B16.1, Class 125 flange and a machined mating surface such that the pump to discharge connection is made without the need for nuts or bolts.

2.4 PUMP ACCESS DOORS

- A. Load Rating: AASHTO H-20 wheel loading.
- B. Frame:
 - 1. Material: Extruded aluminum sections shaped to serve as a continuous drainage gutter with a 1-1/2 inch drain coupling.
 - 2. Anchors: Continuous anchor flange.
 - 3. Apply manufacturer's standard protective coating to surfaces of frame that will be in contact with concrete.
- C. Cover:
 - 1. Material: 1/4 inch mill finish aluminum diamond plate, reinforced with stiffening ribs.
 - 2. Hinges: Stainless steel; butt type with compression spring operators enclosed in telescopic tubes.

3. Hold Open Arm: Stainless steel; automatically locks door at 90 degree position; provide vinyl grip handle to release door for closing.
4. Lock: Stainless steel; slam type with fixed handle inside and removable key wrench outside.

D. Hardware and Fasteners: Type 316 stainless steel.

E. Accessories: Provide one key wrench for each door supplied.

2.5 PUMP CONTROLS

A. Control Panels:

1. Construction: NEMA 4X weather-proof stainless steel. Dead front with hinged inside panel for support of inner-door mounted components. Provide door with quick disconnect latches, lock hasp, lock, and six keys. Follow Section 16160.
2. Electrical Service to Panel: 480 volt, three-phase, three-wire, 60 Hz.
3. Main panel disconnect with external operating handle linked to thermal-magnetic main circuit breaker.
4. Adjustable magnetic trip type circuit breakers for protection of each motor.
5. Reduced voltage soft starters with integral overload protection for each pump motor. Provide one spare N.O. auxiliary contact for "Pump Running" and from the overload relay for remote alarm monitoring. See Specification 16484, Solid State Reduced Voltage Controllers.
6. Fused 120 V control circuit transformer (fused on all ungrounded legs) for the master control circuit. Master control circuit shall provide automatic level control and alternation of pumps. Control transformer shall be sized for a minimum of 300 VA, and rated for at least 200 percent of the calculated maximum control circuit loading.
7. HOA switch for each pump.
8. Inside panel-mounted, elapsed time meter for measuring hours and tenths of hours running time for each pump.
9. Provide a factory-mounted 3 kVA, 120/208 volt, three-phase, dry type transformer on the exterior side wall of the control panel. Transformer shall have a 115 degree C rise rating and shall be suitable for outdoor installation. Include two three-pole, thermal-magnetic circuit breakers for protection and disconnect of the transformer primary and secondary windings. Use transformer for support of 120 VAC loads internal and external to the control panel, excluding the pump control circuit.
10. Provide molded case circuit breakers for each of the following circuits.
 - a. Thermostat heating strips; 10 amperes.
 - b. Lighting fixture and duplex outlet; 15 amperes.
 - c. Auto-dialer; 15 ampere.
 - d. Two spare 15 ampere, single-pole circuit breakers.
11. Alternating relay to automatically alternate the pumps on each successive cycle of operation. Provide a three-position selector switch for selecting Pump No. 1 as lead, Pump No. 2 as lead, or selecting automatic alternation of the lead pump on each pump-down cycle.
12. Float switch actuated circuit for standard lead-lag pump-down control. Include circuitry to automatically start a lag pump if lead pump cannot keep up with inflow.
13. Connect float switches via intrinsically safe relays as manufactured by Gem, Warrick Controls, or as approved.
14. Connect winding overheat thermostats and seal fail circuits via intrinsically safe relays. If the seal fail system utilizes current detection across a probe assembly, coordinate with manufacturer for use of the proper seal-leak detection relay.
15. Provide the following time delay circuits in the control circuitry:
 - a. Time delay relays to prevent simultaneous starting of pumps.
 - b. Time delay relays for 60 second delay in activation and latching of the seal leak shutdown and alarm circuitry.
 - c. Time delay for 10 second delay in activation and latching of the winding overheat shutdown and alarm circuitry, for the purpose of avoiding relay race conditions during power-up.

- d. Anti-cycling time delay relay to prevent a pump from restarting within the first 3 minutes after it has shut down.
- 16. Provide terminals and dry contacts as shown on Drawings for the following signals:
 - a. Pump No. 1 Running.
 - b. Pump No. 2 Running.
 - c. Pump No. 1 Winding Overheat.
 - d. Pump No. 2 Winding Overheat.
 - e. Pump No. 1 Seal Failure.
 - f. Pump No. 2 Seal Failure.
 - g. High Level Alarm.
 - h. Low Level Alarm.
 - i. Pumping Station Power Failure.
 - j. Pump No. 1 Trouble – winding overheat, seal failure, and overload in parallel (dry contacts only).
 - k. Pump No. 2 Trouble – winding overheat, seal failure, and overload in parallel (dry contacts only).
- 17. Provide latching relays for each of the following alarms to energize inside panel mounted pilot lights and lock out the pump until manually reset by pressing the RESET pushbutton:
 - a. Pump No. 1 Windings Overheated.
 - b. Pump No. 2 Windings Overheated.
 - c. Water Present in Pump No. 1 Seal Chamber.
 - d. Water Present in Pump No. 2 Seal Chamber.
- 18. Provide a latching relay to energize inside panel mounted pilot lights and lock out all pumps on a low level alarm condition. Provide circuitry to automatically reset the alarm when the wet well level activates the “lead pump on” float. Low level lockout shall also be able to be manually reset by pressing the RESET pushbutton.
- 19. Do not latch the high level alarm circuit. High level alarm condition shall energize an inside panel mounted pilot light when the high level alarm condition is present.
- 20. Push buttons and selector switches: Heavy duty, oil-tight type
- 21. Pilot Lights: Push-to-test, 6.3 VAC, transformer-type pilot lights.
- 22. Identify each device with engraved plastic nameplates fastened with stainless steel screws. Pilot lights shall be green status “PUMP RUNNING” and red alarm “MOTOR WINDING OVERHEAT”, “HIGH WET WELL LEVEL”, “LOW WET WELL LEVEL”, and “WATER PRESENT IN SEAL CHAMBER”.
- 23. Two 250 watt, 120 volt, shielded heating strips (wired in series) connected through a thermostat to maintain temperature in the panel at 40 to 70 degrees F.
- 24. Fluorescent fixture with low temperature ballast and 15 watt lamp for interior illumination and a toggle switch for control of the fixture.
- 25. 20 ampere, 120 volt, duplex outlet mounted inside the panel connected to the incoming conductors.
- 26. Provide 480 VAC transient surge protection in the panel.
- 27. Ground lug properly sized for termination of the ground wire.
- 28. Connect incoming and outgoing wire and cable to a master numbered terminal strip. Provide permanent sleeve type wire markers for every wire leaving or entering a terminal.
- 29. Provide a permanently affixed tape on equipment and components within panel or an adjacent surface which identifies the device.
- 30. A placard shall be affixed to the inside surface of the access door of the panel displaying the connection legend and the circuit schematic. The schematic shall identify each wire, junction and termination with respect to corresponding terminals and connections in the panel. Devices and connections associated with, but exterior to, the panel shall be shown in phantom and appropriately identified. The schematic may be a miniature, plasticized copy of the connection schematic furnished, if suitable for display.

- B. Float Switches:
 - 1. Manufacturers:
 - a. Anchor Scientific, Inc., Eco-Float Model G.
 - b. Aurora/Hydromatic Pumps, 3900 Series.
 - c. ITT Flygt, Model ENM-10.
 - d. Warrick Controls, Series M.
 - e. Or as approved.
 - 2. Mechanical, non-mercury, micro-switch type float switch; minimum 2 amperes at 120 VAC non-inductive SPDT (Form C) contacts; integral, three-wire, oil-resistant, flexible cord of length required to run unspliced from switch to junction box.
 - 3. 1/8 inch nylon-coated stainless steel cable and 10 pound anchor attached to cable with stainless steel hardware for attachment of float switches; length sufficient so that cable freely hangs from top of wet well, and anchor is within 6 inches of bottom.

2.6 FACTORY INSPECTION

- A. Perform motor and cable insulation test for moisture content and insulation defects.
- B. Run pump dry to check for proper rotation and mechanical integrity.
- C. Run pump submerged for 30 minutes in water.
- D. Remove pump from water; perform motor and cable insulation test.
- E. A written report on the above shall be prepared by the test engineer, certified and submitted to ENGINEER.

2.7 FACTORY PERFORMANCE TEST

- A. Test each pump at the factory; submit certified performance curves to ENGINEER prior to shipment.
- B. Test each pump at no less than three head conditions including shut-off head and design head.
- C. Provide a standard NPSH curve based on testing of standard test pump.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Comply with manufacturer's instructions.
- B. Float Switches:
 - 1. Install float switches at elevations indicated.
 - 2. Install stainless steel cable and anchor assembly so that anchor freely hangs within 6 inches of well bottom, and so that float switches will be easily accessible for cleaning and replacement.
 - 3. Attach float switch cord to cable with nylon wire ties spaced 12 inches apart and starting 6 to 8 inches above top of switch.
 - 4. Terminate float wiring using normally open or normally closed configuration as required for proper operation. Cap the unused third wire in the junction box.

3.2 MANUFACTURER'S START-UP SERVICES

- A. Provide a minimum of two 8 hour days of service per pumping station.

END OF SECTION

SECTION 16111

CONDUIT

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Steel conduit and tubing.
- B. Liquid-tight flexible metal conduit.
- C. Explosion-proof, flexible metal couplings.
- D. Non-metallic conduit.
- E. Wireways.
- F. Expansion/deflection couplings for metallic conduit.
- G. Conduit sleeves and openings.
- H. Smoke and fire sealant materials.
- I. Wall seals.
- J. Mechanical type seals.
- K. Seal-off fittings
- L. Installation coatings.

1.3 PROJECT RECORD DOCUMENTS

- A. Accurately record actual routing of all conduits installed in floor slab or otherwise concealed.

1.4 PROJECT CONDITIONS

- A. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

PART 2 PRODUCTS

2.1 STEEL CONDUIT AND TUBING

- A. Manufacturers:
 - 1. Allied Tube & Conduit.
 - 2. Wheatland Tube Co.
 - 3. Western Tube & Conduit Corp.

4. Or as approved.
- B. Rigid Steel Conduit: Federal Specification WWC581D, ANSI C80.1, UL-listed, threaded, hot-dip galvanized conduit. Electro-plated conduit is not acceptable.
- C. Fittings (Couplings, Bushings, etc.):
1. Rigid Steel: Cast malleable iron, galvanized or cadmium-plated fittings conforming to Federal Specification WF408. Copper-free aluminum fittings are not acceptable.
 - a. Manufacturers:
 - 1) Appleton.
 - 2) Cooper/Crouse-Hinds.
 - 3) Thomas & Betts/Steel City.
 - 4) Or as approved.
- D. Conduit Bodies (Rigid Steel, IB's, T, etc.):
1. Threaded hub, malleable iron body and cover, with captive stainless steel screws, UL Standard 514.
 - a. Manufacturers:
 - 1) Appleton.
 - 2) Cooper/Crouse-Hinds.
 - 3) Hubbell/Killark.
 - 4) Or as approved.
 2. Use mogul units for conduit sizes larger than 2 inches.
- E. PVC-Coated Rigid Galvanized Steel Conduit:
1. Manufacturers:
 - a. Ocal, Inc.
 - b. Robroy Industries.
 - c. Or as approved.
 2. Federal Specification WWC581E, ANSI Specification C80.1 and UL 6. Hot-dip galvanized inside and outside, including the threads. PVC exterior coating 40 mils nominal thickness. Interior urethane coating of 2 mils.
 3. Accessories: All fittings and conduit bodies shall be PVC coated.

2.2 LIQUID-TIGHT FLEXIBLE METAL CONDUIT

- A. Manufacturers:
1. American Brass Company.
 2. American Flexible Conduit Company.
 3. ANAMET, Inc.
 4. Electri-Flex Company.
 5. International Metal Hose Company.
 6. Or as approved.
- B. Description: Interlocked flexible galvanized steel construction with liquid-tight PVC jacket, conforming to Federal Specification WF406 and UL 360.
- C. Fittings: Malleable iron, cadmium-plated fittings with compression type steel ferrule and neoprene gasket sealing rings with insulated throat, conforming to UL 514B.

2.3 EXPLOSION-PROOF FLEXIBLE METAL COUPLINGS

- A. Manufacturers:
1. Appleton.

2. Crouse-Hinds.
3. Or as approved.

B. Description: Liquid-tight, flexible, braided steel approved for NEC Class I, Division 1, Group D areas.

2.4 NON-METALLIC CONDUIT

A. Manufacturers:

1. Cantex.
2. Carlon Electrical Products.
3. Osburn Associates, Inc.
4. Robroy Industries.
5. Scepter.
6. Triangle/PWC, Inc.
7. Or as approved.

B. Polyvinyl Chloride (PVC) Conduit – Schedule 40:

1. Conforming to ASTM D1784, UL 651 and NEMA TC-2.
2. Rated for use with 90 degree C conductors.
3. Sunlight-resistant.
4. Fittings and Conduit Bodies: NEMA TC-3 and UL 651.

2.5 WIREWAYS

A. Manufacturers:

1. Hoffman Engineering Company.
2. Keystone Company.
3. Square D Company.
4. Or as approved.

B. Material: Sheet metal sized and shaped as needed.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireway as required for complete system.

D. Wireway Covers: Hinged type.

E. Finish: Galvanized after fabrication and provided with epoxy powder paint finish.

2.6 EXPANSION/DEFLECTION COUPLINGS FOR METALLIC CONDUIT

A. Manufacturers:

1. Crouse-Hinds.
2. O.Z./Gedney.
3. Thomas and Betts.
4. Or as approved.

B. Description: Coupling with insulating inner sleeve, integral hub bushings, flexible copper grounding strap and overall water-tight, flexible neoprene outer jacket with stainless steel jacket clamps.

C. Locations: Where conduits pass through expansion joints. Where axial contraction or expansion, angular misalignment, or parallel misalignment of rigid conduit is likely to occur.

- D. Movement accommodated without damaging conduit or conductors:
 - 1. Axial expansion or contraction up to 3/4 inch.
 - 2. Angular misalignment of the axis of coupled conduit runs in any direction to 30 degrees.
 - 3. Parallel misalignment of the axis of coupled conduit runs in any direction to 3/4 inch.

2.7 SMOKE AND FIRE SEALANT MATERIAL

- A. Manufacturers:
 - 1. 3M.
 - 2. Bio-Fire Seal.
 - 3. Flame Safe Fire Stop.
- B. ASTM E84-81A and UL 1479.

2.8 WALL SEALS

- A. Manufacturers: O-Z-Gedney, Type WSK Thruwall and Floor Seals, or as approved.
- B. Description: Wall seal used around conduit penetrations through basement walls of new structures or buildings. Wall seal is installed prior to the concrete wall pour.
- C. Wall Sleeve: High strength PVC pipe, epoxy-coated steel pipe, or high strength polyethylene pipe.
- D. Bodies and Pressure Clamps: Hot-dip galvanized malleable iron; provide two bodies and pressure clamps for each wall sleeve.
- E. Sealing Grommet: Neoprene; one for each body and pressure clamp assembly.
- F. Pressure Rings: PVC-coated steel; two for each sealing grommet.
- G. Bolts: Hot-dip galvanized.

2.9 MECHANICAL TYPE SEALS

- A. Description: Wall seal used around conduit penetrations through basement walls of existing structures or buildings. Wall seal is installed in a cored penetration through the existing wall.

2.10 SEAL-OFF FITTINGS

- A. Description: Seal fitting installed in conduit runs to prevent the passage of gases, vapors, or flames from one portion of the electrical installation to another.
- B. Quantity: Utilize in classified areas as required to comply with NEC 501.15.

2.11 INSTALLATION COATINGS

- A. Direct-Buried Metallic Conduit (Prior to Burial):
 - 1. Manufacturers:
 - a. DuPont Insulating Coatings.
 - b. Goodyear Adhesive No. 400.
 - c. Or as approved.

2. Description: Coating directly applied to direct-buried metallic conduits prior to placing in trench for the purpose of inhibiting corrosion.
- B. Outdoor Metallic Conduit Threads (Prior to Assembly):
1. Manufacturers:
 - a. CRC Chemicals, Lectra-Shield.
 - b. Emhart Corporation (Bostik Division), Never-Seez.
 - c. Ideal Industries, No. 40-640.
 - d. Or as approved.
 2. Description: Anti-seize and lubricating compound.
- C. Exposed Metallic Conduit Threads (After Assembly):
1. Manufacturers:
 - a. Clearco.
 - b. Crown.
 - c. Or as approved.
 2. Description: Anti-corrosive cold galvanizing compound. Meet AGA Standard 780-93a for repair of damaged and uncoated areas of hot-dip galvanized coatings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.

3.2 INSTALLATION

- A. General Conduit Installation:
1. Install conduit in accordance with NECA "Standard of Installation." Size raceways according to code but not smaller than indicated.
 2. Minimum Size: 3/4 inch trade size unless otherwise specified. Minimum 1 inch trade size for underground conduit.
 3. Ground and bond conduit; see Section 16170.
 4. Identify conduit; see Section 16195.
 5. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
 6. Do not install steel conduit in contact with aluminum where exposed to moisture.
 7. Space conduits installed against concrete surfaces 1/4 inch away from the surface by using clamp backs or conduit hangers.
 8. Unless otherwise specified in Division 1, where necessary to cut holes through existing walls for raceways, make necessary repairs to building structures. Match existing.
 9. Cut conduit square using saw or pipecutter; de-burr cut ends.
 10. Threaded Joints: Field-cut threads using conduit dies. Clean off all cuttings and oil; coat with a cold galvanizing compound. Recoat exposed threads with cold galvanizing compound after installation.
 11. Non-Metallic Conduit Joints: Wipe non-metallic conduit dry and clean before joining. Use cleaner/primer and full even coat of cement in accordance with manufacturer's instructions; allow joint to cure for a minimum of 20 minutes before disturbing.
 12. Where sections of the same conduit are exposed to different temperatures, seal the conduit to prevent condensation and passage of air from one area to the other.
 13. Do not allow moisture traps. Provide junction box with drain fitting at low points in conduit system.
 14. Provide suitable pull wire in each empty conduit; secure at both ends.

15. Provide suitable expansion coupling every 100 feet for straight runs of non-metallic rigid conduit.
16. Install expansion/deflection couplings on conduit raceways installed in slab where conduits pass through expansion joints.
17. Provide bonding jumpers across expansion/deflection couplings for metallic raceways.
18. Exposed conduit on building exteriors is not allowed unless approved by ENGINEER.
19. Repair damaged coatings of PVC-coated rigid conduit with repair kit and materials manufactured specifically for the purpose.
20. Coat all conduit threads which are not scheduled for painting with lubricating compound.
21. Repair all scratched galvanized surfaces and exposed outdoor conduit threads with cold galvanizing compound.

B. Conduit Use:

1. Underground Installation: See Section 16118.
2. Outdoor Locations, Exposed Above Grade:
 - a. Rigid steel or intermediate metal conduit.
 - b. Use PVC-coated rigid conduit or similar barrier protection at locations where conduit enters exposed outside concrete.
3. Indoor Locations:
 - a. Finished Areas: Concealed conduit.
 - b. Below Grade: Exposed conduit, supported away from wall.
 - c. Damp or Humid Environments: Rigid galvanized steel, supported off wall.
 - d. Termination to Motors, Transformers, and Vibrating Equipment: Liquid-tight, flexible metal conduit; length not to exceed 4 feet. Coordinate location of motor connection with trades responsible for providing motors.
 - e. Class I and Class II Hazardous Areas: Rigid steel conduit. Use seal-off fittings at transition to non-classified areas.
 - f. All Other Exposed Conduit: Rigid steel or intermediate metallic conduit.

C. Protecting Raceways against Corrosion:

1. Provide additional barrier protection for galvanized steel conduits which penetrate or come in contact with concrete surfaces in damp or wet locations. Use one of the following methods:
 - a. Use PVC-coated rigid steel conduit.
 - b. Use heavy-wall heat-shrink tubing around the conduit, between the conduit and the concrete.
 - c. Use clamp-back spacers for raceways installed along concrete walls.
2. Protective barrier shall be of a non-corrosive material, and shall prevent direct contact between the rigid steel conduit and the wet concrete. Barrier protection of conduit shall extend a minimum of 2 inches into the concrete and shall also cover the first 4 inches of exposed conduit.
3. Required Areas:
 - a. Provide for all conduits in contact with concrete, where the moisture from wet concrete combined with the concrete's high alkalinity can subject the raceway to an accelerated corrosion rate.
 - b. Required Areas Include the Following:
 - 1) Conduits which enter or exit outdoor concrete pads.
 - 2) Conduit floor penetrations in areas which may be sprayed or mopped.
 - 3) Conduit penetrations in basement walls and floors.
 - 4) Conduit penetrations in outdoor or underground concrete walls or floors.
 - 5) Conduits which enter floors that contain a sump area.
 - c. Conduit penetrations on indoor raised concrete pads do require additional barrier protection.

D. Conduit Routing:

1. Separate conduits carrying instrumentation wiring from conduits carrying power wiring by at least 6 inches.

2. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
 3. Route conduits around gratings, passage or walkway areas, and other obstructions to avoid tripping hazards and obstructions to equipment access areas.
 4. Exposed Conduit: Route parallel and perpendicular to walls.
 5. Above Suspended Ceilings: Route parallel and perpendicular to walls.
 6. Concealed Conduit: Route point-to-point.
- E. Conduit Bends:
1. Use factory elbows for 90 degree bends in metal conduit larger than 2 inches.
 2. No bend shall be greater than 90 degrees.
 3. Use conduit bodies to make sharp changes in direction.
 4. Medium and High Voltage Raceways:
 - a. Bend Radius: Not less than 48 inches.
 - b. Conduit Runs Less than 125 Feet in Length: No more than the equivalent of two 90 degree bends between pull points.
 - c. Conduit Runs 125 to 500 Feet in Length: No more than the equivalent of one 90 degree bend between pull points.
 - d. Conduit Runs Over 500 Feet in Length: No bends between pull points.
- F. Openings and Sleeves:
1. Provide conduit sleeves and/or box frames to provide openings for conduits which pass through interior floors and walls of new structures.
 2. Core conduit openings in existing interior walls and floors to the conduit outside diameter plus a minimum 1 inch additional diameter.
 3. Seal openings sleeved through fire walls with UL classified and approved sealant. Install penetration seal materials to maintain the fire rating of the wall or floor.
- G. Conduit Supporting and Hanging:
1. General:
 - a. Arrange supports to prevent misalignment during wiring installation.
 - b. Fasten conduit supports to building structure and surfaces; follow Section 16190.
 - c. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
 - d. Do not attach conduit to ceiling support wires.
 - e. Arrange conduit to maintain headroom and present neat appearance.
 - f. Support conduits away from walls that are likely to condensate.
 2. Individual Conduits:
 - a. Support individual conduits directly to structural steel with beam clamps.
 - b. Support individual horizontal conduits not larger than 1-1/2 inches in diameter to concrete walls by means of one-hole, malleable iron straps with clamp back spacers.
 - c. Support individual horizontal conduits larger than 1-1/2 inches in diameter by individual hangers and forged steel conduit strap for vertical runs.
 3. Groups of Conduits:
 - a. Construct conduit racks using galvanized steel channel and provide space on each for 25 percent additional conduits.
 - b. Attach groups of conduit to structural steel with galvanized steel channel attached with beam clamps. Attach conduit to channel with pipe clamps.
 - c. Attach groups of conduit to concrete with cast-in-place galvanized steel channel and anchors. Attach conduit to channel with pipe clamps.
 4. Suspended Support:
 - a. Attach horizontally suspended, single conduit plumb with a galvanized steel threaded rod not smaller than 3/8 inch diameter. Attach threaded rods to concrete with anchors and to structural steel with beam clamps. Attach conduit to threaded rod with clamps.

- b. Attach horizontally suspended groups of conduit plumb with galvanized steel channel suspended from galvanized steel threaded rods not smaller than 3/8 inch diameter. Attach threaded rods to concrete with anchors and to structural steel with beam clamps. Attach conduit to strut with pipe clamps.
 - c. Provide sufficient threading on hanger rods at each end to permit at least 2 inches of adjustment.
 - 5. Vertical Conduit Support:
 - a. Space supports not over 10 feet on centers for vertical conduits spanning open areas. Securely anchor conduit at each end, and install so as not to interfere with the installation and operation of equipment at the location.
 - b. Install conduit support bushings in vertical raceways at intervals stipulated by NEC.
- H. Conduit Terminations:
 - 1. Terminate conduit with insulated bushings.
 - 2. Bring conduit to shoulder of fittings; fasten securely.
 - 3. Use insulated grounding bushings with bonding jumpers for conduit terminations containing conductors No. 8 AWG or larger, to boxes with concentric or eccentric knockouts, and to conduits terminating in or under electrical power distribution cabinets and enclosures.
 - 4. For equipment subject to vibration, make connections using liquid-tight flexible conduit. Do not exceed 4 feet in length unless otherwise approved.
- I. Conduit Entrances Below Grade:
 - 1. Use wall seals where conduit penetrates foundation walls.
 - 2. Provide water-tight installation.
 - 3. Poured Walls: Set sleeves in formwork at proper elevation prior to concrete pour. Boxing out of forms for later placement is not acceptable.
 - 4. Existing Walls: Use mechanical type seals; core opening, install conduit and seal.
 - 5. Slope underground conduits such that water or moisture collecting in the conduit drains away from building.
 - 6. Install a "T" conduit with drain fitting at the lowest point of each raceway (or drain fitting on pullbox, if used at raceway entrance) with a minimum 1 inch trade size drain to nearest sump for all below grade conduit entrances into buildings.

END OF SECTION

SECTION 16118

DUCTBANK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Conduit.
- B. Bedding.
- C. Conduit spacers.

1.3 DEFINITIONS

- A. Bedding: Material placed under, beside, and directly over the underground conduits for the full width of the trench up to a distance of 6 inches over top of the conduit system, prior to backfilling.
- B. Ductbank: Underground raceway system located outside the perimeter of buildings, and consisting of conduit, conduit spacers, and bedding material.

1.4 SHOP DRAWINGS

- A. Ductbank: Indicate routing, size, raceway layout within ductbank, and reinforcement.

1.5 PROJECT CONDITIONS

- A. Ductbank routing is shown on Drawings in approximate locations unless dimensions are indicated. Locate as required to complete ductbank system.

PART 2 PRODUCTS

2.1 CONDUIT

- A. See Section 16111.

2.2 BEDDING

- A. Sand: Clean and graded, washed sand, all passing a No. 4 U.S. sieve, and conforming to ASTM C33 for fine aggregate.
- B. Concrete Encasement:
 - 1. Class I; follow Section 03301.
 - 2. Slump (Maximum): 3 inches.

2.3 CONDUIT SPACERS

- A. Manufacturers:
 - 1. Underground Devices, Inc.
 - 2. Cantex, Inc.
 - 3. Osburn Associates, Inc.
 - 4. Or as approved.
- B. Description: Window type, high impact plastic spacers for support of conduits.
- C. Wood forms are not acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that excavation, base material installation, and compaction is completed.
- B. Verify routing and termination locations of ductbank prior to excavation for rough-in.

3.2 INSTALLATION

- A. General:
 - 1. Excavate trench in accordance with Section 02225 for Work for this Section. Hand-trim excavation for accurate placement of ductbank to elevations indicated.
 - 2. Store soil excavated from gravel areas away from gravel area to avoid mixing of dirt and gravel. Use clean replacement gravel for top 4 inches of replacement fill.
 - 3. Shape trench bottom for accurate placement and proper support of ductbank.
 - 4. Backfill trenches; follow Section 02225.
 - 5. Compact areas where soil has been disturbed by construction before installing ductbanks.
 - 6. Install ductbank with minimum slope of 3 inches per 100 feet. Slope duct away from building entrances.
 - 7. Minimum Ductbank Cover: 30 inches below established grade. Install at greater depths when necessary to pass under other utilities or obstructions.
 - 8. Interface installation of underground warning tape with backfilling; see Section 16195.
- B. Conduit Use:
 - 1. Underground Conduit:
 - a. Minimum Size: 1 inch trade size.
 - 2. Conduits Carrying Power Conductors or Discrete Signal Wiring:
 - a. Straight Runs:
 - 1) Use Type EB-35 duct, Type DB-60 duct, or PVC Schedule 40 for concrete-encased conduits.
 - 2) Use PVC Schedule 40 for direct burial conduits in sand bedding.
 - b. Bends: Use rigid galvanized steel conduit for bends of 45 degrees or greater.
 - 3. Conduits Carrying Analog Signal Conductors or Communication Cables: Use rigid galvanized steel for entire length of installation.
 - 4. Transition Coupling (Rigid Galvanized Steel): Use female PVC adapter for transition; male PVC adapter with female coupling is not acceptable.

C. Raceways Within Ductbanks:

1. Minimum Spacing Between Raceways: 3 inches; 6 inches between power and instrumentation raceways.
2. Use a minimum bend radius of 36 inches for all ducts of 3 inches in diameter or larger.
3. Use suitable separators and chairs installed not greater than 5 feet on centers.
4. Band raceways together before placing backfilling.
5. Coat metallic conduit in sand bedding with corrosion-inhibiting coating; see Section 16111.
6. Provide suitable pull wire in each empty raceway.
7. Use suitable caps to protect installed raceways against entrance of dirt and moisture. Cap raceway at each interruption in assembly throughout the progress of Work.
8. Provide stainless steel, aluminum, phenolic, or other non-corrosive identification tags for all conduits in handholes, or where underground conduit enters a free-standing enclosure. Identify source and destination of conduit.

D. Raceway Cleaning: Prior to installation of conductors in ductbank raceway:

1. Pull a flexible mandrel having a diameter approximately 1/3 inches less than the inside diameter of the raceway through the entire run of each raceway.
2. Pull a stiff bristled brush through the entire run of each raceway. Repeat as necessary to remove all foreign material from raceway.
3. Swab raceways.

END OF SECTION

SECTION 16123

BUILDING WIRE AND CABLE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Building wire and cable.
- B. Service entrance cable.
- C. Non-linear motor load wiring.
- D. Shielded instrumentation cable.
- E. Wiring connectors.

1.3 SUBMITTALS

- A. Test Reports: Indicate procedures and values obtained.

1.4 PROJECT CONDITIONS

- A. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions. Include wire and cable lengths within 10 feet.
- B. Where wire and cable routing is not shown and destination only is indicated, determine exact routing and lengths required.

PART 2 PRODUCTS

2.1 BUILDING WIRE AND CABLE

- A. Manufacturers:
 - 1. BICC/General Cable.
 - 2. Okonite Company.
 - 3. Pirelli Cable.
 - 4. Or as approved.
- B. Description: Single-conductor insulated wire.
- C. Conductor: Stranded copper.
- D. Insulation Voltage Rating: 600 volts.
- E. Insulation: ANSI/NFPA 70; Type XHHW or THWN insulation for feeders and branch circuits larger than No. 6 AWG; Type THHN/THWN insulation for feeders and branch circuits No. 6 AWG and smaller.

2.2 SERVICE ENTRANCE CABLE

- A. Manufacturers:
 - 1. BICC Cable.
 - 2. Okonite Company.
 - 3. Pirelli Cable.
 - 4. Rome Cable Corporation.
 - 5. Or as approved.
- B. Description: ANSI/NFPA 70, Type USE.
- C. Conductor: Copper.
- D. Insulation Voltage Rating: 600 volts.
- E. Insulation: Type RHW.

2.3 NON-LINEAR MOTOR LOAD WIRING

- A. Manufacturers:
 - 1. Cablec Corporation.
 - 2. Okonite Company.
 - 3. Rome Cable Corporation.
 - 4. Or as approved.
- B. Description: RHW or TWH moisture-resistant and flame-retardant thermoset/thermoplastic.
- C. Conductor: Copper.
- D. Insulation Voltage Rating: 600 volts.
- E. Insulation Thickness: 45 mils, minimum.

2.4 SHIELDED INSTRUMENTATION CABLE

- A. 600 Volt Insulated Analog Signal Cable:
 - 1. Manufacturers: Alpha No. 5430, or as approved.
 - 2. Description: UL AWM Style 2501, two-conductor, stranded tinned copper, No. 18 AWG shielded cable with tinned copper drain wire.
 - 3. Insulation: PVC jacket rated for 600 volts.

2.5 WIRING CONNECTORS

- A. Wire Sizes No. 10 AWG and Smaller:
 - 1. Splices and Taps: 3M Scotchlok Type Y & R insulated spring connectors.
 - 2. Terminals: Thomas & Betts Stakon Series RA, RB, and RC insulated terminals. Use locking fork type for connection to terminal blocks and ring type for motor terminations.
- B. Wire Sizes No. 8 AWG Through 500 MCM:
 - 1. Splices: Thomas & Betts Series 53500 barrel-type, cast copper, heavy duty, two-way compression connector.
 - 2. Taps: Thomas & Betts Series 54700 color-keyed, C-type compression connector.

3. Lugs: Cast copper, heavy duty type:
 - a. Motor Terminations and Wire Sizes No. 8 AWG to 1/0 AWG: Thomas & Betts 53100 Series, one-hole type.
 - b. Wire Sizes 2/0 and Larger: Thomas & Betts 53200 Series, two-hole type.
4. Compression type connectors shall be installed using a hydraulic tool with correct die for circumferential or hexagon compressions.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that mechanical work likely to damage wire and cable has been completed.
- B. Verify that field measurements are as shown on Drawings.

3.2 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.
- B. Determine required separation between cable and other work.
- C. Determine cable routing to avoid interference with other work.

3.3 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Use stranded conductors for feeders and branch circuits No. 12 AWG and smaller to wiring devices.
- C. Use stranded conductors for control circuits.
- D. Use conductor not smaller than No. 12 AWG for power and lighting circuits.
- E. Use conductor not smaller than No. 14 AWG for control circuits and for discrete type instrumentation wiring.
- F. Use No. 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 100 feet.
- G. Pull all conductors into raceway at same time.
- H. Use suitable wire pulling lubricant for building wire No. 4 AWG and larger.
- I. Provide a properly sized equipment-grounding conductor in all raceways.
- J. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- K. Clean conductor surfaces before installing lugs and connectors.
- L. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- M. After making splice or tap, tape uninsulated conductors and connector with electrical tape (3M 33+) to 150 percent of insulation rating of conductor.

- N. Use connector sealing pack for all connections in outdoor or underground boxes.
- O. Do not terminate shielded instrumentation cable shield at field device. Trim shield and sleeve with heat-shrink tubing. Prevent shield from coming in contact with conductive surfaces at field device.

3.4 INTERFACE WITH OTHER PRODUCTS

- A. Identify wire and cable; see Section 16195.
- B. Identify each conductor with its circuit number or other designation indicated on Drawings.

3.5 FIELD QUALITY CONTROL

- A. Inspect wire and cable for physical damage and proper connection.
- B. Measure tightness of bolted connections and compare torque measurements with manufacturer's stated values.

END OF SECTION

SECTION 16130

BOXES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Outlet, pull, and junction boxes.

PART 2 PRODUCTS

2.1 CAST BOXES

- A. Manufacturers:
 - 1. Appleton.
 - 2. Crouse-Hinds.
 - 3. O-Z/Gedney.
 - 4. Or as approved.
- B. Type: Corrosion-resistant, Type FD, flat-flanged, cast device box with threaded hubs and external mounting lugs for securing box to surface.
- C. Mounting: Surface mount.
- D. Rating: Weather-proof and dust-tight.
- E. Material: Malleable cast iron.
- F. Covers: Malleable cast iron covers; include gasket and stainless steel screws.

2.2 NON-METALLIC BOXES

- A. Manufacturers:
 - 1. Carlon.
 - 2. Kraloy.
 - 3. Scepter.
 - 4. Or as approved.
- B. Type: Corrosion-resistant, F or FD Series, PVC-molded, surface-mounted boxes with grounding clips.
- C. Box Depth: 2 inches, minimum.
- D. Covers: Molded PVC covers; include gasket and stainless steel screws.

2.3 EXPLOSION PROOF BOXES

- A. Manufacturers:
 - 1. Appleton.
 - 2. Crouse-Hinds.
 - 3. Or as approved.
- B. Type: GUB or EJB junction boxes; size for application.
- C. Conduit Hubs: Factory-order quantity, size, and location of threaded hubs for application.
- D. Rating: NEMA 7; rated for Class I, Division 1, Group D areas.

2.4 LARGE PULL BOXES AND TERMINAL POST JUNCTION BOXES

- A. Manufacturers:
 - 1. Hoffman.
 - 2. Or as approved.
- B. Enclosure Type:
 - 1. Indoor Dry Areas: NEMA 12 with 14 gage minimum steel.
 - 2. Damp, Corrosive, or Outdoor Areas: NEMA 4X glass fiber-reinforced or stainless steel enclosure.
- C. Latches: External quick-release.
- D. Cover: Continuous side-hinge cover.
- E. Terminal Post Junction Boxes: Include terminal strip on panel back plate for support of all wiring entering and leaving box, plus 10 percent spare terminals.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify locations of outlets prior to rough-in.
- B. Cooperate with other trades to avoid conflict between the locations of conduit, outlets, equipment, ducts, plumbing and other building components.

3.2 INSTALLATION

- A. Box Use:
 - 1. Cast Boxes: Use in exterior and wet locations, basement areas, and for indoor surface-mounted boxes.
 - 2. Explosion-Proof Boxes: Use in area classified as hazardous (explosion-proof) areas.
 - 3. Large Pull Boxes: Use for surface-mounted installation where the required size exceeds standard cast box sizes.
 - 4. Non-Metallic Boxes: Use with non-metallic conduit systems.

B. General Installation:

1. Install boxes in accordance with NECA "Standard of Installation".
2. Install in locations as required for splices, taps, wire pulling, and equipment connections, and in compliance with regulatory requirements. Electrical boxes shown on Drawings are in approximate locations unless dimensioned.
3. Install boxes so that box covers are accessible at all times.
4. Set wall-mounted boxes at elevations to accommodate mounting heights.
5. Orient boxes to accommodate wiring devices.
6. Maintain headroom and present neat mechanical appearance.
7. Coordinate mounting heights and locations of outlets.
8. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices.
9. Support boxes independently of conduit.
10. Identify terminals and wiring in terminal post junction boxes. See Section 16195.
11. Install knockout closures in unused box openings.

3.3 INTERFACE WITH OTHER PRODUCTS

- A. Maintain isolation of separate conduits by installing separate pull boxes or sectionalized pull boxes for each conduit.
- B. Support boxes mounted on walls that are likely to condensate away from the wall using unistrut.
- C. Coordinate installation of outlet boxes for equipment connections.

3.4 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 16140

WIRING DEVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. AC switches.
- B. Receptacles.
- C. Wall plates.

1.3 SPARE PARTS

- A. Furnish two of each style, size, and finish wall plate.

PART 2 PRODUCTS

2.1 GENERAL PURPOSE AC SWITCHES

- A. Manufacturers:
 - 1. Single-Pole Switch:
 - a. Arrow Hart Cat. No. 1991.
 - b. Bryant Cat. No. 4901.
 - c. Hubbell Cat. No. 1221.
 - d. Or as approved.
 - 2. Three-Way Switch:
 - a. Arrow Hart Cat. No. 1993.
 - b. Bryant Cat. No. 4903.
 - c. Hubbell Cat. No. 1223.
 - d. Or as approved.
- B. Description: NEMA WD 1, heavy duty, AC only; general-use snap switch with toggle handle with compression terminals for backwiring.
- C. Color:
 - 1. Unfinished Areas: Gray.
 - 2. Finished Areas: Selected from manufacturer's standard colors.
- D. Ratings:
 - 1. Voltage: 120-277 VAC.
 - 2. Current: 20 amperes.

2.2 AC SWITCHES FOR CLASSIFIED AREAS

- A. Manufacturers:
 - 1. Appleton.

2. Crouse-Hinds.
 3. Or as approved.
- B. Type: Corrosion-resistant, explosion-proof tumbler switches rated for Class I, Division 1, Group D areas. Use Type EDS (factory-sealed) or Type EFS (in conjunction with external sealing fittings).
- C. Mounting: Surface mount.
- D. Rating: NEMA 7.
- E. Material: Malleable cast iron body and cover with front-operated handle. Include stainless steel cover screws.

2.3 CONVENIENCE RECEPTACLES

- A. Manufacturers:
1. Duplex Receptacle:
 - a. Arrow Hart Cat. No. 5362.
 - b. Bryant Cat. No. 362.
 - c. Hubbell Cat. No. 5362.
 - d. Or as approved.
 2. Duplex Corrosion-Resistant Receptacle:
 - a. Arrow Hart Cat. No. 5362CR.
 - b. Bryant Cat. No. 5362CR.
 - c. Hubbell Cat. No. 53CM62.
 - d. Or as approved.
 3. Ground Fault Circuit Interrupter Receptacle:
 - a. Arrow Hart Cat. No. GF5362.
 - b. Bryant Cat. No. GFR53FT.
 - c. Hubbell Cat. No. GF5362.
 - d. Or as approved.
- B. Description: NEMA WD 1, heavy duty, general-use receptacle with compression terminals for backwiring.
- C. Color:
1. Unfinished Areas: Gray.
 2. Finished Areas: Selected from manufacturer's standards.

2.4 WALLPLATES

- A. Unfinished Areas: Type 302/304 beveled stainless steel or malleable iron; include gasket.
- B. Weather-Proof Wall Switch Cover Plates: Clear silicone rubber bubble plate.
- C. In-use, Weather-proof Receptacle Cover: Carlon E9UDVCRN, or equal, non-metallic, non-conductive, corrosion-resistant, paintable, gasketed plastic cover. Cover shall be of the single gang, deep, vertical type rated for in-use protection with bottom entry cord.
- D. Mounting Screws: Stainless steel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that outlet boxes are installed at proper heights.
- B. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- C. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean debris from outlet boxes.

3.3 INSTALLATION

- A. Install in accordance with NECA "Standard of Installation".
- B. Install devices plumb and level.
- C. Install switches with OFF position down.
- D. All outdoor receptacles to be GFCI type.
- E. Use feed-through installation to protect no more than two additional downstream receptacles where multiple GFCI receptacles share the same branch circuit. Do not use feed-through GFCI protection for receptacles in different rooms. Label downstream receptacles as GFCI-protected.
- F. Connect wiring devices grounding terminal to branch circuit equipment grounding conductor.
- G. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.
- H. Coordinate locations of outlet boxes provided under Section 16130 to obtain mounting heights specified and indicated on Drawings.
- I. Install wall switch 48 inches above finished floor.
- J. Install convenience receptacle 18 inches above finished floor in unfinished areas.

3.4 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.

3.5 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

3.6 CLEANING

- A. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION

SECTION 16160

CABINETS AND ENCLOSURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Construction and fabrication requirements for manufacturer and vendor control panels.

1.3 SHOP DRAWINGS

- A. Provide catalog sheets on all equipment provided including full model number of all components, listing of optional features being provided, voltage ratings, dimensional data, and manufacturer product specifications.
- B. Provide schematics and wiring diagrams representing all terminals, wiring, and components located within the panel; develop diagrams and Drawings utilizing latest version of AutoCAD software. Follow NFPA 79, Chapter 2-2, Diagrams.
 - 1. Provide ladder-logic diagrams with cross-referencing scheme for each relay and output device; include numbering string down power side of diagram.
 - 2. Utilize ANSI Y32.2 symbols for all field devices.
 - 3. Show functional descriptor for each device or component.
 - 4. Show alpha-numeric reference for all conductors and terminals.
 - 5. Show connections to devices located external to the panel in phantom.
- C. If control panel includes a programmable logic controller (PLC), provide PLC schematics for all I/O modules; follow format guidelines established in Appendix D of NFPA 79. Identify Rack, Group, and Module. Show position of all dip switch settings.
- D. Construction and Assembly: Provide information on the enclosure type, wall thickness, dimensions, doors, gaskets, finish, and structural support members.
- E. Panel Layout Drawings: Provide layout of panel interior and front panel-mounted devices, showing location of all equipment, relays, power supplies, terminal strips, and wire channels. Follow format guidelines established in Appendix D of NFPA 79.
- F. Installation Details: Provide footprints of panels and enclosures to show location of all conduit entrances. Provide information on panel anchoring and supports.

1.4 RECORD DOCUMENTS

- A. Submit all diagrams and drawings for the Shop Drawing submittal. Incorporate all field changes using CAD software. Submit CD containing all finalized drawing files.

PART 2 PRODUCTS

2.1 PANEL COMPONENTS

- A. Provide products suitable for operation under the following conditions.
 - 1. Ambient Operating Temperature: 5 to 40 degrees C, minimum. Provide environmental controls in outdoor cabinets to maintain ambient temperatures within the range of the panel component ratings.
 - 2. Supply Voltage: 90 to 110 percent of rated voltage, ± 2 percent of rated frequency.
 - 3. Impulse Voltage: 200 percent peak voltage up to 1 microsecond duration with a rise time of 500 nanoseconds to 500 microseconds.

2.2 ENCLOSURES

- A. Manufacturers:
 - 1. EPI - Electrical Enclosures.
 - 2. Hoffman.
 - 3. Or as approved.
- B. Conform to requirements of NEMA 250.
- C. Construction: As indicated; otherwise, NEMA 12, minimum for indoor enclosures; NEMA 4X for outdoor enclosures; NEMA 7 for enclosures located in hazardous areas.
- D. Sheet Steel: Minimum 14 gage thickness. Provide stiffeners, angles, and supports for components.
- E. Corrosion-Resistant Enclosures: Fiberglass-reinforced polyester or stainless steel.
- F. Covers: As indicated; otherwise, continuous hinge and gasketed. Include stainless-steel quick-release latches and stainless steel padlock hasp for NEMA 4X enclosures.
- G. Finishing:
 - 1. Painted Steel Panels: Finished with manufacturer's standard enamel over phosphatized surfaces inside and out; interior color to be white.
 - 2. Stainless Steel Panels: Unpainted smooth brushed finish.

2.3 ELECTRIC CONTROLS AND RELAYS

- A. Provide control switches, indicating lights, and relays; follow Section 16902.

2.4 POWER SUPPLIES

- A. Provide a disconnect and overcurrent protection for the incoming supply circuit.
- B. Provide control power transformers and power supplies for circuits and equipment rated at voltages other than the incoming supply circuit. Include overcurrent protection for all power supplies. Provide control power transformers; follow Section 16902.

2.5 MOTOR CONTROLLERS

- A. Follow Section 16484. Include overload protection, disconnect, and motor circuit short circuit protection.

2.6 WIRING

- A. Power Wiring: Stranded copper, Type MTW or Type THWN, minimum size No. 14 AWG, 600 volt insulation.
- B. Control Wiring: Stranded copper, Type MTW or SIS, minimum size No. 14 AWG, 600 volt insulation.
- C. Discrete Signal Wiring: Stranded copper, Type MTW, minimum size No. 16 AWG, 600 volt insulation.
- D. Analog Signal Wiring: Two-conductor stranded copper cable, Type CL3R. 100 percent foil shielding with No. 22 AWG tinned, stranded copper drain wire. 300 volt-rated PVC insulation.
- E. Insulation Color Code:
 - 1. Black: Line, load, and control circuits at line voltage.
 - 2. Red: AC control circuit at less than line voltage.
 - 3. Blue: DC control circuits.
 - 4. Yellow: Control circuits energized from an external source.
 - 5. Green: Equipment ground.
 - 6. White: Neutral or grounded circuit conductor.
- F. Provide terminal blocks for external wiring connections. Provide two spare terminals after every ten terminals. In addition, provide two spare terminals at the top and two spare terminals at the bottom of every terminal strip.
- G. Group and support conductors. Provide channel duct or plastic spiral wrap.

2.7 DIN MOUNTING RAIL

- A. Railings Mounted Between 3 Inches or Smaller Plastic Wireways: Allen-Bradley 1492-D125.
- B. Railings Mounted Between 4 Inches or Larger Plastic Wireways: Allen-Bradley 1492-DR6, or as approved, with 2-1/4 inch standoff.

2.8 IDENTIFICATION DETAILS

- A. Provide enclosure, wire, and component identification; see Section 16195.

PART 3 EXECUTION

3.1 FABRICATION

- A. Size enclosure to provide 20 percent spare space on panel back plate. Calculate spare space as the difference between the total surface area of the back plate less the footprint surface area of all equipment mounted to the back plate.
- B. Mount equipment within enclosure such that all status and diagnostic indicators are visible from the door side of the enclosure.
- C. Do not mount equipment or terminal strips on panel interior top, sides, or bottom unless approved by ENGINEER. Exception: Interior panel light may be mounted to the panel top.
- D. If control panel includes a PLC, arrange input/output cards in the PLC rack in the following left to right, top to bottom sequence: AC voltage discrete inputs, AC voltage discrete outputs, DC voltage discrete inputs, DC voltage discrete outputs, DC voltage/current analog inputs, DC voltage/current

analog outputs. Provide spare slot between each type of card as space in rack allows, unless otherwise indicated on Drawings.

- E. Utilize DIN No. 3 mounting rails for mounting of relays, terminals, and other components. Use 2-1/4 inch standoff DIN rails where railing is placed between 4 inch deep plastic wireways.

3.2 INTERFACE WITH OTHER SYSTEMS

- A. Utilize dry contacts for interfacing discrete signals with external systems.
- B. Pilot lamps, selector switches, and other devices located on the vendor control panel shall not be powered from external sources. Pilot lamps which provide "running" or "trouble" signals shall be designed to accept a single dry contact from the motor starter or external system. Pilot lamps shall be sourced from the same power as the vendor control panel. Selector switches on vendor control panels shall be wired to control relays to produce a single dry contact for control of each external motor load.
- C. Interfacing of discrete control signals, permissives, and lockout signals with external systems shall utilize dry contacts. The dry contacts shall be consolidated to a single terminal strip location within the vendor control panel, with identification that external control voltages exist on these terminals.
- D. Vendor control panels shall be designed to accept only one dry contact for monitoring each "running", "trouble", "permissive", and "in auto" signal provided by external systems. Additional dry contracts, if required, shall be produced within the vendor control panel by utilizing interposing relays.

3.3 DEMONSTRATION

- A. Provide complete functional testing of all cabinets, enclosures, circuits, and included equipment.

3.4 PROTECTION OF FINISHED WORK

- A. Lock out equipment until it is ready for demonstration.

END OF SECTION

SECTION 16170

GROUNDING AND BONDING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Rod electrodes.
- B. Exothermic connections.
- C. General grounding requirements.

1.3 PERFORMANCE REQUIREMENTS.

- A. Grounding System Resistance: 5 ohms.

PART 2 PRODUCTS

2.1 ROD ELECTRODE

- A. Manufacturers:
 - 1. Blackburn/Eritech.
 - 2. Copperweld Corporation.
 - 3. Or as approved.
- B. Material: Copper-clad steel.
- C. Diameter: 3/4 inch.
- D. Length: 10 feet.

2.2 EXOTHERMIC CONNECTIONS

- A. Manufacturers:
 - 1. Burndy.
 - 2. Cadweld.
 - 3. Or as approved.

2.3 GROUNDING ELECTRODE CONDUCTOR

- A. Material: Stranded copper.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

- A. Provide grounding and bonding as required to meet NEC 250.
- B. Service Entrance.
 - 1. Install main grounding electrode at nearest point to service entrance disconnect.
 - 2. Bond grounding electrode conductor to main grounding electrode. Bond grounding electrode conductor to neutral bus bar of main disconnect.
 - 3. Provide main bonding jumper at main disconnect to meet regulatory requirements.
 - 4. Provide supplemental grounding as shown on Drawings and as required to meet specified resistance to ground. Supplemental grounding shall connect to main grounding electrode.
- C. Separate Buildings and Structures:
 - 1. Install grounding electrode at nearest point to building/structure main disconnect.
 - 2. Bond grounding electrode conductor to grounding electrode. Bond grounding electrode conductor to building/structure main ground bus.
- D. Separately Derived Systems:
 - 1. Transformers:
 - a. Install additional rod electrodes for building transformers and bond to building grounding electrode system. Locate outside of building nearest to transformer location.
 - b. Provide grounding electrode conductor from transformer to nearest grounding electrode.
 - 2. Generators:
 - a. Where generators are wired to 3-pole transfer switches and provide four-wire service, the generator is NOT considered a separately derived system. The generator frame and equipment shall be grounded at the generator unit via a supplemental ground rod, but shall not be connected to the generator neutral. Generator neutral shall be wired to neutral lug in the automatic transfer switch.
- E. Underground Work:
 - 1. Cover all buried copper wire joints and splices with Kearney Aqua Seal.
 - 2. If rock is encountered while installing ground rods, grounding shall be provided using one of the following methods:
 - a. Drive ground rod at no more than a 45 degree angle as required to avoid rock.
 - b. Bury ground rod horizontally at a minimum depth of 36 inches below grade.
 - c. Bury metal strips of not less than 10 feet in total length, with total surface area (both sides) of not less than 5 feet square. Minimum burial depth shall be 30 inches. Ferrous metal strips shall not be less than 1/4 inch thick and non-ferrous metal electrodes shall not be less than 0.06 inches thick.
- F. Grounding Electrode System:
 - 1. Provide rod electrodes at each service or feeder entrance to a building or structure and where shown on Drawings. Include two rod electrodes at each outdoor transformer and a minimum of one rod electrode for each outdoor generator unit.
 - 2. Provide grounding electrode connections to all metal underground water piping which enters the building or structure in accordance with NEC 250.52(A)(1).
 - 3. Provide grounding electrode connection to structural metal framing of each building or structure in accordance with NEC 250.52(A)(2).
 - 4. Coordinate with installation of steel reinforcement systems in floor slabs and foundations to provide a grounding electrode connection to the rebar system near the building service entrance in accordance with NEC 250.52(A)(3).
 - 5. Provide grounding rings around buildings and structures where shown on Drawings.
 - 6. Connect all grounding electrode systems at each building or structure to form a common grounding electrode system.

- G. Supplemental Grounding:
 - 1. Provide supplemental grounding as shown on Drawings and as required to meet specified resistance to ground.
 - 2. If testing of the main grounding electrode for a building or structure fails to achieve the specified resistance to ground, install up to two additional rod electrodes to the main grounding electrode until specified resistance is met. Place additional rods at least 10 feet apart. Contact ENGINEER if specified resistance to ground is not met after completing the three-rod cluster.
- H. Equipment Grounding Conductor: Provide separate, insulated green conductor within each raceway. Terminate each end on suitable lug, bus, or bushing.
- I. Bonding of Equipment:
 - 1. Electrical Equipment: Provide grounding connections for non-current-carrying conductive materials enclosing electrical conductors or equipment as required to establish an effective ground-fault current path and to limit the voltage to ground on these materials.
 - 2. Conductive Materials: Connect electrically conductive materials that have the potential to become accidentally energized together and to the electrical supply source in a manner that establishes an effective ground-fault current path and limits the voltage to ground on these materials. Provide grounding in accordance to NEC 250.110 through 250.116.
 - 3. Piping Systems and Exposed Structural Steel: Provide bonding in accordance with NEC 250.104.
 - 4. Provide grounding and bonding connections using methods which avoid objectionable currents in the grounding system.

3.3 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- B. Ground Resistance Test: See Section 16960.

END OF SECTION

SECTION 16180

EQUIPMENT WIRING SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Electrical connections to equipment specified under other Sections.
- B. Provide power and control wiring including conduit, wire, relays, switches, and other devices necessary to properly operate equipment as specified, as shown on Drawings, and as required for OWNER's use.
- C. Work includes connection and interwiring of equipment and devices, unless connection and interwiring is specified as included under another Section.

1.3 COORDINATION

- A. Obtain and review Shop Drawings, product data, and manufacturer's instructions for equipment furnished under other Sections.
- B. Refer to electrical and mechanical drawings for quantities and locations of the respective equipment, including field-mounted devices to be hooked up to the respective equipment.
- C. Determine connection locations and requirements.
- D. Sequence rough-in of electrical connections to coordinate with installation schedule for equipment.
- E. Sequence electrical connections to coordinate with start-up schedule for equipment.

PART 2 PRODUCTS

2.1 CORDS AND CAPS

- A. Attachment Plug Construction: Conform to NEMA WD 1.
- B. Configuration: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
- C. Cord Construction: ANSI/NFPA 70, Type SO or SJO multi-conductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
- D. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Comply with equipment and device manufacturer's instructions for connections and interwiring, and size, type, and quantity of conductors.
- B. Verify that manufacturer's requirements meet regulatory requirements and requirements for proper installation and operation of equipment.
- C. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using liquid-tight, flexible conduit with water-tight connectors in damp or wet locations.
- C. Make wiring connections using wire and cable with insulation suitable for temperatures encountered in heat producing equipment.
- D. Provide receptacle outlet where connection with attachment plug is indicated. Provide cord and cap where field-supplied attachment plug is indicated.
- E. Provide suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- F. Install disconnect switches, controllers, control stations, and control devices as indicated.
- G. Modify equipment control wiring with terminal block jumpers as indicated.
- H. Provide interconnecting conduit and wiring between devices and equipment where indicated.
- I. Make sure connections are proper, secure, and tight.
- J. Secure and properly support wire bundles.

END OF SECTION

SECTION 16190
SUPPORTING DEVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Anchors and fasteners.
- B. Channel framing supports.

1.3 PRODUCT REQUIREMENTS

- A. Materials and Finishes: Provide corrosion-resistant materials suitable for the application.
- B. Provide materials, sizes, and types of anchors, fasteners, and supports to carry the load of equipment and conduit. Consider weight of wire in conduit when selecting products.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. B-Line Systems, Inc.
- B. Entrum Industries/Strut Tech.
- C. Thomas and Betts/Kindorf.
- D. Unistrut Corporation.
- E. Or as approved.

2.2 ANCHORS AND FASTENERS

- A. Use methods most appropriate for and compatible with substrate. Do not use methods which will cause structural damage.
 - 1. Concrete Structural Elements:
 - a. Precast insert system.
 - b. Expansion anchors.
 - c. Self-drilling anchors.
 - d. Epoxied anchors.
 - 2. Steel Structural Elements:
 - a. Beam clamps.
 - b. Welded fasteners.
 - 3. Hollow Masonry, Plaster, and Gypsum Board Partitions:
 - a. Toggle bolts.
 - b. Hollow wall fasteners.

4. Solid Masonry:
 - a. Expansion anchors.
 - b. Preset inserts.
5. Sheet Metal: Sheet metal screws.
6. Wood Elements: Wood screws or lag bolts.
7. Fiberglass Elements: Stainless steel bolts.

2.3 CHANNEL FRAMING SUPPORTS

- A. Use channel framing for equipment support.
 1. Minimum Size: 1-5/8 inch channel.
 2. Indoor, Dry Locations: Use electroplated, pre-galvanized, or hot-dip galvanized steel channel framing with a minimum 0.5 mil zinc coating.
 3. Indoor Damp Areas and Outdoor Locations:
 - a. Use fiberglass channel framing where suitable for weight of supported equipment.
 - b. Use stainless steel channel framing.
 4. Wet Environments: Use stainless steel channel framing in unheated, below-grade vaults and similar areas exposed to continuous wet conditions.
- B. Hardware (channel nuts, spring channel nuts, bolts, washers, etc):
 1. Indoor, Dry Locations: Galvanized steel hardware.
 2. All Other Areas: Stainless steel hardware.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
- C. Rigidly support fixtures and equipment from the building structure.
- D. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- E. Do not use spring steel clips and clamps.
- F. Do not use powder-actuated anchors.
- G. Obtain permission from ENGINEER before drilling or cutting structural members.
- H. Fabricate supports from channel framing. Use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring-lock washers under all nuts.
- I. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- J. In wet and damp locations, channel framing supports to stand cabinets and panelboards 1 inch off of surface.
- K. Touch up field-cut ends of galvanized steel supports with galvanizing repair paint.
- L. Seal all cut fiberglass channel ends and exposed FRP threads with fiberglass sealant.

END OF SECTION

SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Nameplates.
- B. Labels.
- C. Wire markers.
- D. Component markers.
- E. Conduit tags.
- F. Underground warning tape.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Description: Engraved three-layer laminated plastic, black letters on white background unless otherwise indicated.
- B. Locations: Each electrical distribution and control equipment enclosure, telemetry and control panel, motor control center, and control station.
- C. Letter Size:
 - 1. Use 1/8 inch letters for identifying individual equipment and loads unless otherwise indicated.
 - 2. Use 1/4 inch letters for identifying grouped equipment and loads unless otherwise indicated.

2.2 LABELS

- A. Embossed adhesive tape with 3/16 inch black letters on white background unless otherwise indicated.

2.3 WIRE MARKERS

- A. Description:
 - 1. Adhesive Labels: Combination white/transparent adhesive label, allowing for protective transparent overwrap of printed label.
 - 2. Wire Sleeves: Plastic sleeve type, white, printable and heat-shrinkable irradiated polyolefin for fast, permanent wire markers.
 - 3. Labels shall be printed using laser, inkjet, or dot-matrix printer. Hand-printed labels are not acceptable.

2.4 COMPONENT MARKERS

- A. Description: Permanently affixed tape or engraved nameplate uniquely identifying each control device within an enclosure with a number or code corresponding to the circuit diagram.
- B. Locate: On or adjacent to each control device and visible from panel front.

2.5 CONDUIT TAGS

- A. White on orange plastic tag, rectangular; 2-1/2 inches by 3-1/2 inches, minimum.

2.6 UNDERGROUND WARNING TAPE

- A. Manufacturers:
 - 1. Brady Company.
 - 2. Seton.
 - 3. Or as approved.
- B. Description: 3 inch wide plastic tape, detectable type, colored red with suitable warning legend describing buried electrical lines.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive nameplates and labels.

3.2 APPLICATION

- A. Install nameplates and labels parallel to equipment lines.
- B. Secure nameplate to equipment front using stainless steel screws.
- C. Identify feeders, branch circuits, and service entrance conductors by phase and system voltage using colored electrical tape:
 - 1. Phase A, 480 Volt System: Brown.
 - 2. Phase B, 480 Volt System: Orange.
 - 3. Phase C, 480 Volt System: Yellow.
 - 4. Phase A, 208 Volt System: Red.
 - 5. Phase B, 208 Volt System: Black.
 - 6. Phase C, 208 Volt System: Blue.
 - 7. Neutral, 277 Volt System: Gray.
 - 8. Neutral, 120 Volt System: White.
- D. Provide wire tags on all panelboard feeders and branch circuits to correspond with the circuit breaker identification number assigned to protect the feeder to branch circuit.
- E. Identify underground conduits using underground warning tape. Install one tape per trench at 10 to 12 inches below finished grade.
- F. Tag concealed conduits. Indicate source and destination of conduit.
- G. Attach tags to each conduit stub using laminated or stainless steel wire or self-locking nylon tie that will not deteriorate.

3.3 FIELD QUALITY CONTROL

- A. Verify that every identification marker corresponds with the respective terminal or connection code identification.
- B. Except for common connections, do not duplicate numbers, symbols, colors, or prints in the building.

END OF SECTION

SECTION 16210

ELECTRIC UTILITY SERVICE ENTRANCE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Establishment of permanent electric utility service to the Site.

1.3 RESPONSIBILITIES

- A. The following shall be performed by the Electric Utility Company under the Allowance established in Section 01019:
 - 1. New Electric Service:
 - a. Furnishing and installation of electric meter for mounting in CONTRACTOR-installed meter base.
 - b. Provide new service poles and guying systems as required to extend medium voltage aerial conductors to the utility transformers.
 - c. Provide fusible cutouts, lightning arrestors, crossarms, and other appurtenances for protection and support of medium voltage wiring systems on the primary side of the Utility Company's transformer.
 - d. Provide three-phase transformer bank for delivering rated secondary service ampacity and voltage requirements.
 - e. Provide termination of primary conductors to transformer.
 - f. Install final section of conduit riser and weatherhead and pull Contractor-provided secondary conductors through each.
 - g. Provide final connections for secondary service.
- B. The following are not included in the established Allowance and shall be performed by CONTRACTOR:
 - 1. New Electric Service:
 - a. Provide underground secondary conductors and raceway systems, including conduit riser on Utility pole to 10' above grade, with adequate conductor length for final pull by Utility, with 5' slack for final connection by Utility Company. Provide remaining conduit required and associated weatherhead to Utility company, for Utility installation.
 - b. Provide meter base for Utility Company's secondary service meter, as required by Utility Company.
 - c. Provide secondary service conductors from meter to weatherhead, including required spare length for pigtail connections.
 - d. Provide raceway systems as required to complete installation of the Utility Company's metering equipment.
 - e. Provide structural supports and channel framing as required to support metering equipment.
 - f. Provide ground rods and grounding system for meter pole, transformer, and main disconnect.
 - g. Provide underground trenching and backfill for new underground conduits.
 - h. Coordination and scheduling of utility work.

1.4 ALLOWANCES

- A. Cash Allowance: Include under provisions in Section 01019.
- B. Submit Utility Company invoices for services rendered by the Utility Company for processing of the cash allowance.

1.5 SYSTEM DESCRIPTION

- A. Electrical System Service Characteristics (Pumping Station No. 1 and No. 2):
 - 1. 480Y/277 volts.
 - 2. Three-phase.
 - 3. Four-wire.
 - 4. 60 Hz.

1.6 QUALITY ASSURANCE

- A. Electric Utility Company: First Energy.
 - 1. Pumping Station No. 1:
 - a. Email: ladkins@firstenergycorp.com.
 - b. Phone Number: 330.397.2337.
 - c. Contact Name: Leslie Adkins.
 - 2. Pumping Station No. 2:
 - a. Email: npound@firstenergycorp.com.
 - b. Phone Number: 330.342.1220.
 - c. Contact Name: Brian Pound.
- B. Perform Work in accordance with Utility Company's written requirements.

PART 2 PRODUCTS

2.1 METER BASES

- A. Manufacturers: Square D Company, or as approved by Utility Company.
- B. Coordinate with Utility Company for conformance to Utility Company's requirements.

2.2 DISCONNECT SWITCH

- A. Manufacturers: Square D Company, or as approved by Utility Company.
- B. Provide non-fused disconnect, upstream of meter, as required by Utility Company. Coordinate with Utility Company for conformance to Utility Company's requirements

PART 3 EXECUTION

3.1 PREPARATION

- A. Arrange with Electric Utility Company to obtain permanent electrical service to the Project.
- B. Review proposed hardware and equipment with Utility Company representatives prior to Shop Drawing review.
- C. Coordinate service installation work with OWNER to minimize downtime of existing facilities.

3.2 INSTALLATION

- A. Install electrical service and related metering equipment as required by Utility Company.
- B. Install pullwire in each empty conduit.

3.3 FIELD QUALITY CONTROL

- A. Test secondary voltages for line-to-line and line-to-ground potentials.
- B. Coordinate with Utility Company for adjustment of primary taps if secondary voltage is not within 2 percent of rated voltage under normal loading conditions.

END OF SECTION

SECTION 16211

TELEPHONE SERVICE ENTRANCE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Establishment of permanent telephone service to the Site.

1.3 RESPONSIBILITIES

- A. The following shall be performed by the Telephone Utility Company under the Allowance established in Section 01019:
 - 1. Provide telephone service conductors and telephone cable to the point of demarcation.
- B. The following are not included in the established Allowance and shall be performed by CONTRACTOR:
 - 1. Provide 2 inch RGS raceways and pull wire from telephone pedestal or telephone pole to point of demarcation.
 - 2. Telephone termination cabinets or backboards.
 - 3. Painting of plywood telephone system backboards.
 - 4. Premise Wiring: Provide all wiring systems downstream of the point of demarcation.
 - 5. Provide ground rod and grounding system for telephone service point.
 - 6. Provide underground trenching and backfill for new underground conduits.
 - 7. Coordination and scheduling of utility work.

1.4 ALLOWANCES

- A. Cash Allowance: Include under provisions in Section 01019.
- B. Submit Utility Company invoices for services rendered by the Utility Company for processing of the cash allowance.

1.5 SYSTEM DESCRIPTION

- A. Telephone System Service Characteristics:
 - 1. Dial-up lines: One, with opportunity to expand to three lines in the future.

1.6 QUALITY ASSURANCE

- A. Telephone Utility Company: Windstream Western Reserve, Inc.
 - 1. Address: 245 N. Main St., Hudson, OH 44236.
 - 2. Phone Number: 330.650.8000.
- B. Perform Work in accordance with Utility Company's written requirements.

PART 2 PRODUCTS

2.1 PREMISE TELEPHONE WIRING SYSTEMS

A. COPPER DATA CABLE AND WIRING DEVICES

1. Building Telephone Cables:
 - a. Manufacturers:
 - 1) AMP.
 - 2) Lucent Technologies.
 - 3) Or as approved.
 - b. Type: Category 6 UTP, No. 24 AWG, four-pair UTP, UL/NEC CMP rated, with plenum-rated PVC jacket. Individual conductors shall be FEP-insulated. Cable shall be supplied as 1000 foot reel-in-a-box. Cable shall be UL listed.
 - c. Transmission characteristics shall exceed those in the ANSI/TIA/EIA 568-B.2 commercial Building Wiring Standard.

PART 3 EXECUTION

3.1 PREPARATION

- A. Arrange with telephone utility companies to obtain permanent telephone service to the Project.
- B. Coordinate with telephone utility company for final location of demarcation box. Demarcation box provided and installed by telephone utility company.

3.2 INSTALLATION

- A. Connect telephone conduit to telephone utility company demarcation box.
- B. Install pullwire in each empty telephone conduit over 10 feet in length or containing a bend.

END OF SECTION

SECTION 16220

MOTORS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Single and three-phase, horizontal and vertical electric motors.

1.3 SHOP DRAWINGS

- A. Provide wiring diagrams with electrical characteristics and connection requirements.
- B. Indicate test results verifying nominal efficiency and power factor for three-phase motors, 5 HP and larger.
- C. For single and three-phase motors, 1/2 HP and larger, submit "Motor Data Sheet" at the end of this Section.

1.4 OPERATION AND MAINTENANCE DATA

- A. Include instructions for safe operating procedures.
- B. Include assembly drawings bearing data including replacement sizes and lubrication instructions.

1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable electrical code.
- B. Comply with applicable provisions of the Energy Policy Act of 1992.
- C. Comply with applicable provisions of NEMA MG-1-1993.
- D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect motors stored at the Site from weather and moisture by maintaining factory covers and suitable weather-proof covering.
- B. For extended outdoor storage, remove motors from equipment and store separately.

PART 2 PRODUCTS

2.1 SINGLE AND THREE-PHASE HORIZONTAL AND VERTICAL ELECTRIC MOTORS

- A. Manufacturers:
 - 1. General Electric.
 - 2. Reliance.
 - 3. U.S. Electrical Motors.
 - 4. Or as approved.
- B. Electrical Service:
 - 1. Motors Smaller than 1/2 HP: 115 volts, single-phase, 60 Hz, unless otherwise specified or noted.
 - 2. Motors 1/2 HP and Larger: 460 volts, three-phase, 60 Hz, unless otherwise specified or noted.
- C. Visible Nameplate: Indicate motor rated horsepower, rated voltage, number of phases, rated frequency, rated full load speed, full load amps, code letter, frame size, manufacturer's name, model number, and serial number or date code, service factor, rated temperature rise or the insulation system class, time rating, power factory, efficiency.
- D. Enclosure Type:
 - 1. Use open drip-proof, fully guarded in dry indoor locations.
 - 2. Use totally enclosed, non-ventilated (TENV) or totally enclosed, fan-cooled (TEFC) in outdoor locations, damp locations, and in spray-down areas.
 - 3. Use explosion-proof motors in Class I, Division 1 classified areas. Motors shall be UL approved and labeled for hazard classifications, with over-temperature protection.
 - 4. Use weather-protected, NEMA Type II only where specified.
- E. Service Factor: 1.15.
- F. Insulation:
 - 1. Motors With Open Drip-Proof Enclosures and Weather-Protected Enclosures Mounted Indoors: Type B.
 - 2. Totally Enclosed Motors, Motors Installed Outdoors, and Motors Driven by Non-Linear Voltage Sources such as Variable Frequency Drives: Type F. Designed to meet limits defined by MG-1, Part 31, 1993.
 - 3. Motors Driven by Non-Linear Voltage Sources: 1600 volt insulation. Motors shall be inverter-duty rated in accordance with NEMA MG-1, Part 31.
- G. Classification: NEMA Design B.
- H. Duty: Continuous duty operation in 40 degrees C environment.
- I. Efficiency: Provide energy efficient motors rated in accordance with NEMA MG-1-1993, Revision 1 guidelines for open and enclosed motors.
- J. Horsepower: As specified in other Sections.
- K. RPM: As specified in other Sections.

- L. Starting Codes:
 - 1. Motors Greater than 10 HP: Starting Code G or lower.
 - 2. 7.5 HP and 10 HP Motors: Starting Code H or lower.
 - 3. 3 HP and 5 HP Motors: Starting Code K or lower.
 - 4. Motors Under 3 HP: Starting Code M or lower.
- M. Frame: NEMA standard T-frames.
- N. Bearings:
 - 1. Type: Self-lubricating, anti-friction type bearings. Bearings shall be selected to meet the radial and axial forces of the application. Provide the following bearings unless otherwise specified:
 - a. Motors 50 HP and Under: Grease-lubricated ball bearings.
 - 2. Bearing Life: L-10 life rating of 20,000 hours in accordance with AFBMA Standards.
 - 3. Vertical motors shall be provided with thrust bearings adequate for all thrusts to which they can be subjected in operation.
- O. Winding Overheat Contacts: Provide normally closed thermostat for winding overheat protection for:
 - 1. Motors driven by non-linear voltage sources, such as variable frequency drives.
- P. Motor Heaters: Provide 120 VAC motor heaters on all motors installed in damp or wet environments which are used to drive non-continuous loads.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation.
- C. Check line voltage and phase, and ensure agreement with nameplate.
- D. Install totally enclosed motors with weep holes at bottom.

END OF SECTION

MOTOR DATA SHEET

MOTORS – DRIVEN EQUIPMENT _____

Manufacturer _____

Type _____

Enclosure _____

Frame Number _____

Horsepower Rating (HP) _____

Voltage, Phase, Frequency (V, Ph, Hz) _____

Speed – at Rated Full Load _____

Type of Bearings _____

Insulation Class _____

Starting Code Character _____

Full Load Efficiency _____

Full Load Power Factor _____

Service Factor _____

SECTION 16441

ENCLOSED SWITCHES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Enclosed safety switches.

1.3 SPARE PARTS

- A. Provide three of each size and type fuse installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Cutler-Hammer.
- B. General Electric.
- C. Siemens.
- D. Square D Company.
- E. Or as approved.

2.2 HEAVY DUTY ENCLOSED SWITCHES

- B. Non-Fusible Switch Assemblies: NEMA KS 1, Type HD load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Include electrical interlock (N.C.), snap switch type.
- C. Voltage and Ampere Rating: As indicated on Schedule.
- D. Short Circuit Rating: 10 kA for non-fusible disconnects, 100k for fusible disconnects.
- E. Enclosure: As indicated in Schedule.

2.3 ENCLOSED MOTOR STARTING SWITCHES

- A. General purpose, UL listed, manually operated, full voltage switch for disconnect of smaller horsepower induction motors and loads which meet the rating criteria below.
- B. Operator: Toggle type or rotary switch. Operator shall be lockable in the OFF position.

- C. Rating: Rated to support the following loads:
 - 1. 480 VAC Loads: Up to 10 HP, three-phase, or 3 HP, single-phase. Minimum continuous ampere rating of 20 amperes.
 - 2. 240 VAC Loads: Up to 7.5 HP, three-phase. Minimum continuous ampere rating of 20 amperes.
 - 3. 120 VAC, Single-Phase Loads: Up to 2 HP. Minimum continuous ampere rating of 20 amperes.
- D. Short Circuit Rating: 10 kA.
- E. Enclosure: As indicated in Schedule.

2.4 IDENTIFICATION

- A. Follow Section 16195.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install switches where indicated.
- B. Install switches 5 feet from operating handle to floor or finished grade unless otherwise noted.
- C. Provide adhesive label on inside door of each switch indicating UL fuse class and size for replacement.
- D. Provide interlock wiring from safety switch interlock snap switch to motor control circuit where designated in motor control schematics.

3.2 ENCLOSED SWITCH SCHEDULE

ESW-	EQUIPMENT	TYPE	AMP RATING	FUSE RATING	VOLTAGE RATING	POLES	NEMA ENCL.
1	Pumping Station No. 1 Pump 1	NF	60 A	--	600	3	4XSS
2	Pumping Station No. 1 Pump 2	NF	60 A	--	600	3	4XSS
3	Pumping Station No. 2 Pump 3	NF	60 A	--	600	3	4XSS
4	Pumping Station No. 2 Pump 4	NF	60 A	--	600	3	4XSS
5	Pumping Station No. 1 Utility Meter Disconnect	NF	100 A	--	600	3	4XSS
6	Pumping Station No. 2 Utility Meter Disconnect	NF	200 A	--	600	3	4XSS

ABBREVIATIONS

- FUS = Heavy Duty, Fusible
MSS = Motor Starting Switch
NF = Heavy Duty, Non-Fusible
4XSS = 4X, Stainless Steel
4XNM = 4X, Non-metallic

END OF SECTION

SECTION 16461

DRY TYPE TRANSFORMERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Dry type transformers.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Deliver transformers individually wrapped for protection and mounted on shipping skids.
- B. Accept transformers on Site. Inspect for damage.
- C. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- D. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 DRY TYPE TRANSFORMERS

- A. Manufacturers:
 - 1. ACME Electric.
 - 2. Cutler-Hammer.
 - 3. General Electric.
 - 4. Hevi-Duty.
 - 5. Siemens.
 - 6. Square D Company.
 - 7. Or as approved.
- B. Factory-assembled, air-cooled, dry type transformers; ratings as indicated on Schedule.
- C. Insulation System and Average Winding Temperature Rise:
 - 1. 1 to 15 kVA: Temperature Class 185 degrees C with winding rise of 115 degrees C.
 - 2. 16 to 500 kVA: Temperature Class 220 degrees C with winding rise of 150 degrees C.
- D. Case Temperature: Maximum 35 degrees C rise above ambient at warmest point.
- E. Winding Taps:
 - 1. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.

- 2. Transformers 15 kVA and Larger: NEMA ST 20. Minimum of four 2-1/2 percent full capacity primary taps.
- F. Sound Levels: As determined by NEMA or ANSI standards.
- G. Enclosure: Type As indicated on Schedule.
- H. Ventilation Openings: Designed to prevent accidental access to live parts in accordance with UL, NEMA, and NEC standards.
- I. Mounting: As indicated in Schedule.
- J. Vibration isolating pads.
- K. Coil Conductors: Continuous windings impregnated with non-hygroscopic, thermo-setting varnish and with terminations brazed or welded.
- L. Ground core and coil assembly to enclosure by means of a visible, flexible copper grounding conductor sized in accordance with NEMA, IEEE, and ANSI standards.
- M. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.
- N. Terminal Compartment: Located at the bottom of the transformer.
- O. Listed by Underwriters Laboratories, Inc., for the specified temperature rise.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are suitable for installing transformer supports.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide properly sized housekeeping pad. See Section 03301.
- C. Set transformer plumb and level.
- D. Use flexible conduit, 2 feet minimum length, for connections to transformer case; see Section 16111. Make conduit connection to side panel of enclosure.
- E. Mount transformers on vibration isolating pads suitable for isolating the transformer from the building structure.
- F. Provide grounding and bonding; see Section 16170.
- G. Mount with a minimum 3 inch clearance for air circulation.
- H. Identify each dry type transformer; see Section 16195.

3.3 FIELD QUALITY CONTROL

- A. Check for damage and tight connections prior to energizing transformer.
- B. Test transformer as required to verify proper installation and operation.
- C. Measure primary and secondary voltages and make appropriate tap adjustments.

3.4 DRY TYPE TRANSFORMER SCHEDULE

DTT-	TYPE	kVA RATING	PRIMARY VOLTAGE	SECONDARY VOLTAGE	PH	W	MTG.
1	Ventilated	15	480	120/240	1	3	Floor
2	Ventilated	15	480	120/240	1	3	Floor

END OF SECTION

SECTION 16470

BRANCH CIRCUIT PANELBOARDS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Branch circuit panelboards.
- B. Load centers.

1.3 SHOP DRAWINGS

- A. Indicate voltage, bus ampacity, ampacity of main lugs or circuit breaker, integrated short circuit ampere rating, and circuit breaker arrangement and sizes.

1.4 MAINTENANCE MATERIALS

- A. Panelboard Keys: Two of each.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Cutler-Hammer.
- B. General Electric.
- C. Siemens.
- D. Square D Company.
- E. Or as approved.

2.2 BRANCH CIRCUIT PANELBOARDS

- A. Type: NEMA PB 1, circuit breaker type; ampacity and number of poles as indicated in Schedule.
- B. Panelboard Bus: Copper ratings as indicated in Schedule. Provide copper equipment ground bar and neutral terminal bar (insulated from panel ground) in each panelboard.
- C. Minimum Integrated Short Circuit Rating: 10,000 AIC RMS symmetrical.
- D. Molded Case Circuit Breakers: NEMA AB 1; bolt-on type, thermal-magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers.

- E. Enclosure: NEMA PB 1, Type 1.
- F. Cabinet Box: 6 inches deep; 20 inches wide.
- G. Cabinet Front: Surface type with concealed trim clamps, concealed hinge, and flush lock, all keyed alike. Finish in manufacturer's standard gray enamel.

2.3 LOAD CENTERS

- A. Type: NEMA PB 1, circuit breaker type.
- B. Bus Rating: Copper ratings as indicated in Schedule. Provide copper equipment ground bar and solid neutral bar in each load center.
- C. Minimum Integrated Short Circuit Rating: 10,000 AIC RMS symmetrical.
- D. Molded Case Circuit Breakers: NEMA AB 1; bolt-on type, thermal-magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers.
- E. Enclosure: NEMA PB 1, Type 1.
- F. Cabinet Front: Hinged front access door with flush lock. Finish in manufacturer's standard gray enamel.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install panelboards in accordance with NEMA PB 1.1.
- B. Install panelboards plumb. Provide supports as required for secure installation. Follow Section 16190.
- C. Height: Center panelboard on wall at 50 inches above the floor. Lower as required to keep top of panelboard from exceeding 6 feet above floor.
- D. Provide filler plates for unused spaces in panelboards.
- E. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuitry changes required to balance phase loads.
- F. Provide engraved plastic nameplates; see Section 16195. Attach plates with corrosion-resistant screws.

3.2 FIELD QUALITY CONTROL

- A. Perform the following visual and mechanical inspections and related work:
 - 1. Inspect for defects and physical damage, labeling, and nameplate compliance with requirements of up-to-date drawings and panelboard schedules.
 - 2. Exercise and perform operational tests of all mechanical components and other operable devices in accordance with manufacturer's instruction manual.

3. Check panelboard mounting, area clearances, and alignment and fit of components.
4. Measure steady-state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION

SECTION 16476

ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Enclosed molded case circuit breaker disconnects.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Cutler-Hammer.
- B. General Electric.
- C. Siemens.
- D. Square D Company.
- E. Or as approved.

2.2 MOLDED CASE CIRCUIT BREAKERS

- A. Molded Case Circuit Breakers: NEMA AB 1. Integral thermal and instantaneous magnetic trip in each pole. Provide trip rating and voltage as shown in Schedule.

2.3 ENCLOSURES

- A. Rating: See Schedule.
- B. Handle Lock: Include provisions for sealing and padlocking in the "Off" position.
- C. Provide grounding lug in each enclosure.
- D. Provide products suitable for use as service entrance equipment.
- E. Finish using manufacturer's standard gray enamel finish.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install enclosed circuit breakers where indicated, in accordance with manufacturer's instructions.
- B. Install enclosed circuit breakers plumb. Provide supports; follow Section 16190.

- C. Height: 5 feet to operating handle.
- D. Provide engraved plastic nameplates; follow Section 16195.

3.2 FIELD QUALITY CONTROL

- A. Inspect each circuit breaker visually.
- B. Perform several mechanical ON-OFF operations on each circuit breaker.
- C. Verify circuit continuity on each pole in closed position.

3.3 ENCLOSED CIRCUIT BREAKER SCHEDULE

ECB-	EQUIPMENT	AIC	TRIP	VOLTAGE RATING	POLES	NEMA ENCL.
1	Service Entrance Rated Disconnect (Pumping Station No. 1)	42,000	100A	480	3	4XSS
2	Service Entrance Rated Disconnect (Pumping Station No. 2)	42,000	125A	480	3	4XSS

END OF SECTION

SECTION 16484

SOLID-STATE REDUCED VOLTAGE CONTROLLERS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Solid-state reduced voltage controllers.

1.3 SHOP DRAWINGS

- A. Include front and side views of enclosures with overall dimensions and weights shown conduit entrance locations and requirements and nameplate legends.
- B. Provide catalog sheets on controller, showing full model number, listing of all optional features being provided, voltage ratings, dimensional data, and manufacturer's product specifications.
- C. Provide schematics on controllers specific to this Project.

1.4 OPERATION AND MAINTENANCE DATA

- A. Operation Data: Include standard manufacturer instruction manuals for starting, operating, and programming controllers, and describe operating limits that may result in hazardous or unsafe conditions.
- B. Maintenance Data: Include standard manufacturer maintenance and troubleshooting manuals and a routine preventive maintenance schedule.

1.5 SPARE PARTS

- A. Provide one carton of ten lamps for each type of pilot light installed.
- B. One carton of ten fuses for each size used on control circuits.
- C. Three spare fuses for each size used in three-phase circuits.

PART 2 PRODUCTS

2.1 SOLID-STATE REDUCED VOLTAGE CONTROLLERS

- A. Manufacturers:
 1. Allen-Bradley.
 2. Cutler-Hammer.
 3. General Electric.
 4. Square D Company.
 5. Or as approved.

- B. Description: solid-state reduced voltage controller suitable for starting and operating a NEMA Design B, continuous duty motor at starting currents not exceeding 300 percent of the full load rating of the controller.
- C. Ratings:
 - 1. Rated Input Voltage: 480 volts, (± 10 percent), three-phase, 60 Hz.
 - 2. Motor Nameplate Voltage: 460 volts, three-phase, 60 Hz.
 - 3. SCR Voltage PIV Rating: 1600 volts.
 - 4. Operating Ambient: 0 degrees C to 40 degrees C.
 - 5. Minimum Efficiency at Full load: 96 percent.
 - 6. Minimum interrupt capacity of 42,000 AIC.
 - 7. Starts/Hour: 6 per hour at 40 degrees C ambient temperature.
- D. Design:
 - 1. Microprocessor-based programmable motor controller which controls the firing and phasing of SCRs to limit motor torque and starting current.
 - 2. Full-wave control; two SCRs per phase.
 - 3. Provide torque control for linear acceleration without external feedback devices.
 - 4. Energy-saving function.
- E. Enclosure: Mounted inside pump control panel.

2.2 PRODUCT OPTIONS AND FEATURES

- A. Load Controls:
 - 1. Hand Mode: Controller starts immediately.
 - 2. Auto Mode: Controller started by pump control panel Auto sequence.
- B. Keypad/Display Unit:
 - 1. Description: LCD with integral keypad and user prompt menu system. Minimum 40 character display.
 - 2. Functions:
 - a. Display of electrical and operational values.
 - b. Display of controller parameters.
 - c. Display of elapsed run time in hours.
 - 3. Provide one keypad/display unit front cover-mounted on each controller.
- C. Adjustable Parameters:
 - 1. Initial Voltage: 10-60 percent of full voltage.
 - 2. Current Limit: 100-400 percent of the controller's full load rating.
 - 3. Torque Ramp: 0-60 seconds linear torque acceleration.
 - 4. Voltage Boost: 50-100 percent of full voltage.
 - 5. Initial Torque: 10-100 percent of nominal motor torque.
 - 6. Torque Limit: 10-200 percent of nominal motor torque.
- D. Monitoring and Diagnostic Information:
 - 1. Electrical and Operational Values: Display motor current, elapsed run time, and output voltage.
 - 2. Diagnostic Information: Display all fault messages.
 - 3. Status Information: Display ready, starting/stopping, and run conditions.
- E. Control Inputs: Dry contact input for remote start/stop. Provide terminals for all incoming signal wiring.

- F. Monitoring Outputs:
 - 1. Provide auxiliary contact for remote indication of controller trip/failure.
 - 2. Provide auxiliary contact for remote indication that torque ramp is complete and motor is running.
 - 3. Rating: 3 amperes minimum at 120 VAC.
 - 4. Provide terminals for all outgoing field wiring.

- G. Motor and Controller Protection:
 - 1. Provide current-limiting fusing for SCRs.
 - 2. Provide protection against phase loss, phase reversal, underload, and phase fault conditions.
 - 3. Provide automatic reset and restoration of operation after a power failure.
 - 4. Provide separate overload trip settings for starting and run conditions.
 - a. Start: Trip at 300-500 percent of motor full load current (adjustable); set at 450 percent.
 - b. Running: Trip at 100-125 percent of motor full load current; set at 115 percent.
 - 5. Latch all alarm lockout conditions until manually reset.

- H. Overcurrent protection: provided in pump control panel.

- I. Output Isolation Contactor: Provide an output isolation contactor to isolate the motor from the controller when the motor is stopped. Rate contactor for full load current and supply voltage of motor.

- J. Electric Controls and Relays: Options and features as shown; follow Section 16902.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install controller within pump control panel in accordance with manufacturer's written instructions and NEMA ICS 3.1.
- B. Tighten accessible connections and mechanical fasteners after placing controller.
- C. Program overload protection limits in motor controllers to match installed motor characteristics.
- D. Provide engraved plastic nameplates complying with provisions of Section 16195.

3.2 FIELD QUALITY CONTROL

- A. Inspect completed installation of physical damage, proper alignment, anchorage, and grounding.

3.3 MANUFACTURER'S START-UP SERVICES

- A. Prepare and start systems. Provide programming for control parameters.
- B. Provide report indicating field test and inspection procedures and test results.
- C. Make final adjustments to installed drive to ensure proper operation of motor load.
- D. Demonstrate operation of controllers in automatic and manual modes.

3.4 CLEANING

A. Touch up scratched or marred surfaces to match original finish.

3.5 MOTOR CONTROLLER SCHEDULE

CONTROLLED EQUIPMENT	HP	CONSTRUCTION
Pumping Station No. 1 Submersible Pump #1	15	Mounted in Pump Control Panel
Pumping Station No. 1 Submersible Pump #2	15	Mounted in Pump Control Panel
Pumping Station No. 2 Submersible Pump #3	20	Mounted in Pump Control Panel
Pumping Station No. 2 Submersible Pump #4	20	Mounted in Pump Control Panel

END OF SECTION

SECTION 16496

ENCLOSED TRANSFER SWITCH

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Automatic transfer switch.
- B. Automatic sequence of operation.
- C. Enclosure.

1.3 SHOP DRAWINGS

- A. Provide catalog sheets showing voltage, switch size, ratings and size of switching and overcurrent protective devices, operating logic, short circuit ratings, dimensions, and enclosure details; indicate application conditions and limitations of use stipulated by testing agency specified under Regulatory Requirements.

1.4 OPERATION AND MAINTENANCE DATA

- A. Operation Data: Include instructions for normal operation of equipment and for operating equipment under emergency conditions.
- B. Maintenance Data: Include routine preventive maintenance and lubrication schedule. List special tools, maintenance materials, and replacement parts.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with service facilities within 100 miles of Project.

1.6 REGULATORY REQUIREMENTS

- A. Listed under UL Standard 1008.
- B. Conform to requirements of NFPA 70.
- C. Furnish products listed and classified by UL as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for purpose. Handle carefully to avoid damage to internal components, enclosure and finish.

PART 2 PRODUCTS

2.1 AUTOMATIC TRANSFER SWITCH

- A. Manufacturers:
 - 1. ASCO.
 - 2. Cummins/Onan.
 - 3. Kohler.
 - 4. Russelectric.
 - 5. Or as approved.
- B. Description: NEMA ICS 10-1993, automatic transfer switch.
- C. Configuration: Electrically operated, mechanically held in both positions.
- D. Service Conditions:
 - 1. Service Conditions: NEMA ICS 1.
 - 2. Temperature: 0 to 104 degrees F.
 - 3. Altitude: 1000 feet.
- E. Ratings:
 - 1. Voltage: 480 volts, three-phase, four-wire, 60 Hz.
 - 2. Switched Poles: Three.
 - 3. Load In-Rush Rating: Combination load.
 - 4. Continuous Rating: As shown on Drawings.
 - 5. Interrupting Capacity: 100 percent of continuous rating.
 - 6. Withstand Current Rating: 42,000 amperes RMS symmetrical, when used with molded case circuit breaker.

2.2 PRODUCT OPTIONS AND FEATURES

- A. Indicating Lights: Mount in cover of enclosure to indicate:
 - 1. NORMAL SOURCE AVAILABLE.
 - 2. ALTERNATE SOURCE AVAILABLE.
 - 3. SWITCH POSITION.
- B. Test Switch: Mount in cover of enclosure to simulate failure of normal source.
- C. Return to Normal Switch: Mount in cover of enclosure to initiate manual transfer from alternate to normal source.
- D. Transfer Switch Auxiliary Contacts: One normally open, normally closed, Form C.
- E. Normal Source Monitor: Monitor each line of normal source voltage and frequency; initiate transfer when voltage drops below 90 percent or frequency varies more than 3 percent Hz from rated nominal value.
- F. Alternate Source Monitor: Monitor alternate source voltage and frequency; inhibit transfer when voltage is below 90 percent or frequency varies more than 3 percent Hz from rated nominal value.
- G. Switched Neutral: Non-overlapping contact.
- H. Actuated by a single or double electrical operator momentarily energized and connected to the transfer mechanism by a simple overcenter type linkage.

- I. Capable of transferring successfully in either direction with 70 percent of rated voltage applied to the switch terminals.
- J. Normal and emergency contacts positively interlocked mechanically and electrically to prevent simultaneous closing. Mechanical interlock separate from operating mechanism so as to provide positive interlock in the event of operator failure.
- K. Main Contacts: Silver tungsten alloy protected by arcing contacts with magnetic blowouts on each pole. Mechanically locked in position in both the normal and emergency positions without the use of hooks, latches, magnets, or springs.
- L. Equip with a manual operator.
- M. All relays, timers, and accessories front-mounted and accessible for ease of maintenance.
- N. Control Wiring: Flame-retarding, 600 volt type SIS throughout with numbered sleeve type identification on each end, front-mounted and accessible.
- O. Three close differential relays, factory-set at 90 percent pickup, 80 percent dropout, and field-adjustable.
- P. Voltage balance/undervoltage relay, Basler BE4-47N27, or as approved.

2.3 AUTOMATIC SEQUENCE OF OPERATION

- A. Initiate Time Delay to Start Alternate Source Engine-Generator: Upon initiation by normal source monitor.
- B. Time Delay to Start Alternate Source Engine-Generator: 0 to 30 seconds, adjustable.
- C. Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.
- D. Time Delay Before Transfer to Alternate Power Source: 0 to 30 seconds, adjustable.
- E. Initiate Time Delay for Center Off: Upon reaching center off position.
- F. Time Delay for Center Off: 0 to 30 seconds, adjustable.
- G. Initiate Retransfer Load to Normal Source: Upon permission by normal source monitor.
- H. Time Delay Before Transfer to Normal Power: 0 to 30 seconds, adjustable; bypass time delay in event of alternate source failure.
- I. Time Delay Before Engine Shutdown: 0 to 30 minutes, adjustable, of unloaded operation.
- J. Engine Exerciser: Start engine every 30 days; run for 30 minutes before shutting down. Bypass exerciser control if normal source fails during exercising periods.
- K. Alternate System Exerciser: Transfer load to alternate source during engine exercising periods.

2.4 ENCLOSURE

- A. Enclosure: ICS 6-1993, Type 12.
- B. Finish: Manufacturer's standard gray enamel.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that surface is suitable for transfer switch installation.
- B. Verify measurements in the field.

3.2 PREPARATION

- A. Provide housekeeping pads; follow Section 03301.

3.3 INSTALLATION

- A. Install transfer switches in accordance with manufacturer's instructions.
- B. Provide engraved plastic nameplates; follow Section 16195.

3.4 MANUFACTURER'S START-UP SERVICES

- A. Program time delays and settings and make final adjustments for proper operation.
- B. Check voltage settings for proper operation.
- C. Provide report indicating field test and inspection procedures and test results.
- D. Manufacturer to provide system demonstration as required to verify proper installation and operation of switches and to demonstrate operation of transfer switch in normal and emergency modes.

END OF SECTION

SECTION 16620

PACKAGED ENGINE-GENERATOR SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Packaged natural gas engine-generator system.
- B. Engine.
- C. Generator.
- D. Coolant system.
- E. Exhaust system.
- F. Batteries and charging system.
- G. Line circuit breaker.
- H. Engine-generator control panel.
- I. Vibration isolators.
- J. Weather-protective sound attenuating enclosure.

1.3 SHOP DRAWINGS

- A. Provide engine-generator set dimensions, weights, design weight of vibration isolators being supplied, ventilation and combustion air requirements, fuel consumption rate curves at various loads, and fuel pressure requirements.
- B. Provide layout drawing of the engine-generator, showing location of the circuit breaker, control panel, battery/charger, and conduit entrance locations. Include dimensions of concrete pad.
- C. Provide electrical characteristics and connection requirements of generator, including subtransient reactance and temperature rise.
- D. Generator sizing documentation based on the starting load schedule, showing expected maximum voltage drop when starting listed step loads.
- E. Provide electrical diagrams, including schematics and interconnection diagrams for the control panel and all electrical components provided with the engine-generator set. Identify terminals utilized for auxiliary monitoring of generator status.

1.4 CERTIFICATES

- A. Manufacturer's Certificate: Certify that products meet or exceed specified requirements based upon testing performed at the factory.

1.5 OPERATION AND MAINTENANCE DATA

- A. Maintenance Data: Include instructions for routine maintenance, service manuals for engine, oil sampling and analysis for engine wear, and emergency maintenance procedures.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with NFPA 110.

1.7 QUALIFICATIONS

- A. Manufacturer: Domestic manufacturer currently engaged in the production of such equipment.
- B. Supplier: Factory-authorized supplier of specified manufacturer with complete parts and service department. It is the intent of these Specifications that the entire packaged engine-generator system be supplied by the same supplier; dealer-assembled units are not acceptable.

1.8 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 30, NFPA 70, NFPA 110, and NFPA 101.
- B. Furnish products listed and classified by UL as suitable for purpose specified and indicated.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to Site under provisions of Section 01600.
- B. Accept unit at Site on skids. Inspect for damage.
- C. Protect equipment from dirt and moisture by securely wrapping in heavy plastic.

1.10 MANUFACTURER WARRANTY

- A. Provide a 5 year manufacturer's warranty against defects in material and factory workmanship; effective immediately after manufacturer start-up services are completed. Warranty shall provide full coverage on all costs associated with the repair or replacement of defective parts, including material and labor costs.

1.11 MAINTENANCE MATERIALS

- A. Furnish one set of any unique tools required for preventive maintenance of the engine-generator system.

1.12 SPARE PARTS

- A. Provide two spare oil and air filters.
- B. Four keys for weather-proof enclosure doors and removable panels.
- C. One can of touch-up paint for engine-generator.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Caterpillar.
- B. Cummins Bridgeway.
- C. Generac.
- D. Kohler.
- E. Or as approved.

2.2 PACKAGED ENGINE-GENERATOR SYSTEM

- A. Description: NFPA 110, natural gas driven, engine-generator system to provide source of power for Level 2 applications.
- B. System Capacity: kW/kVA ratings as shown on Drawings, at elevation of 1000 feet above sea level, standby rating using engine-mounted radiator.
- C. Factory-assembled.
- D. Finish: Factory paint with one prime coat and two finish coats.
- E. Include lifting eyes on unit.
- F. Include factory-installed battery charger and receptacle.

2.3 ENGINE

- A. Type: Turbo-charged, stationary, water-cooled, in-line, or V-type, four-stroke cycle, internal combustion engine.
- B. Fuel System: Natural gas, supplied with a unit mounted electric solenoid fuel shutoff valve, flexible fuel line, and secondary fuel pressure regulator. Fuel supply pressure at the inlet of the generator pressure regulator shall be 7-15 inches wc.
- C. Air Cleaner: Panel-type, dry, single-stage air cleaner.
- D. Engine Speed: 1800 rpm.

- E. Governor: Isochronous type to maintain engine speed within 0.5 percent, steady-state.
- F. Engine Starting: DC starting system with positive engagement. Limit number and time duration of starts for overcrank protection. Include remote starting control circuit, with AUTO-MANUAL-OFF/RESET-REMOTE selector switch on engine-generator control panel.
- G. Engine Jacket Heater: Thermal circulation type water heater with integral thermostatic control, sized to maintain engine jacket water at 70 degrees F, and suitable for operation on 240 volts AC, single-phase.
- H. Radiator: Engine-mounted radiator using 50 percent solution of ethylene glycol coolant with propeller type fan, sized to maintain safe engine temperature in ambient temperature of 110 degrees F.
- I. Engine Accessories: Fuel particulate filter, lube oil filter, intake air filter, lube oil cooler, crankcase breather, oil filler in valve cover, dip stick, thermostat and housing, proportional vibration dampener, and gear-driven water pump. Include fuel pressure gage, water temperature gage, and lube oil pressure gage on engine-generator control panel.

2.4 GENERATOR

- A. Type: NEMA MG1, three-phase, four-wire, four-pole, twelve-lead, reconnectible, brushless, synchronous generator with permanent magnetic excitation. Include field excitation circuit breaker for inherent overload/short circuit protection.
- B. Rating: Minimum kW/kVA ratings as shown on Drawings, at 0.8 power factor, 480 volts, 60 Hz at 1800 rpm. Capable of starting the motor loads listed in the starting load schedule without exceeding 15 percent calculated voltage dip on starting of any load step. Increase generator kVA rating above the kVA rating shown on the Drawings if the voltage dip required cannot be met.
- C. Insulation Class: F or H.
- D. Temperature Rise: 130 degrees C.
- E. Enclosure: NEMA MG1, open drip-proof.
- F. Voltage Regulation: Include generator-mounted volts per Hz exciter-regulator to match engine and generator characteristics, with voltage regulation ± 1 percent from no load to full load. Include manual controls to adjust voltage drop, voltage level (± 5 percent) and voltage gain.

2.5 COOLANT SYSTEM

- A. Unit-mounted radiator with expansion tank of type and capacity as instructed by engine manufacturer.
- B. Circulate jacket water through the cooling system via an engine driven self-priming pump. Include solenoid shutoff valve for installation on the cooling water inlet, and connected to open when engine runs.
- C. Coolant: 50 percent solution of ethylene glycol.
- D. For after-cooled engines, cool after-cooler with jacket water or provide a separate factory-mounted cooling circuit for the after-cooler and a split core radiator. After-cooler systems not suitable for 110 degree F air cooling are not acceptable.

2.6 EXHAUST SYSTEM

- A. Silencer: Residential type critical silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, sized in accordance with engine manufacturer's instructions.
- B. Piping: Schedule 40 welded black steel pipe suitable for temperatures up to 1200 degrees F. Size in accordance with generator manufacturer's instructions. Provide rain shield on exhaust pipe opening.
- C. Condensation Trap: Provide condensation trap with manual drain valve at low point of exhaust piping.

2.7 BATTERIES AND CHARGING SYSTEM

- A. Batteries: Heavy duty, diesel-starting type lead-acid storage batteries, sized to start engine-generator set after completing four successive overcrank alarm conditions. Match battery voltage to starting system. Include necessary cables and clamps.
- B. Battery Tray: Treated for electrolyte resistance; constructed to contain spillage.
- C. Battery Charger: (Factory-mount inside weather-proof enclosure):
 - 1. Type: Float type charger; current-limiting design.
 - 2. Power Requirements: 120 VAC.
 - 3. Output Power: 12 or 24 VDC, dependent upon starting voltage required by engine-generator set.
 - 4. Indicators: DC ammeter, DC voltmeter.
 - 5. Alarm Contacts: Undervoltage dry contact.
 - 6. Automatic load regulation and DC voltage regulation.
 - 7. Protection: Automatic overload protection; fusing for AC input and DC output.

2.8 LINE CIRCUIT BREAKER

- A. NEMA AB 1, molded case circuit breaker on generator output with integral thermal and instantaneous magnetic trip in each pole, sized for 125 percent of the generator's full load current rating amperes.

2.9 ENGINE-GENERATOR CONTROL PANEL

- A. NEMA 250, Type 1 generator-mounted control panel enclosure with engine and generator controls and indicators. Include provisions for padlock and the following equipment and features:
 - 1. Frequency Meter: 45-65 Hz range.
 - 2. AC Output Voltmeter: 2 percent accuracy with phase selector switch.
 - 3. AC Output Ammeter: 2 percent accuracy with phase selector switch.
 - 4. Output voltage adjustment.
 - 5. Indicator Lamps for the Following:
 - a. Low oil pressure (red).
 - b. High water temperature (red).
 - c. Overspeed (red).
 - d. Overcrank (red).
 - e. Emergency stop (red).
 - f. Low battery voltage (red).
 - g. Low coolant level (red).
 - h. Generator switch not in Auto Mode (red).
 - i. Auxiliary pre-alarm (yellow).
 - j. System read (green).

6. Engine "Auto-Manual-Off/Reset-Stop" selector switch.
7. Engine running time meter.
8. Oil pressure gage.
9. Water temperature gage.
10. Additional visual indicators and alarms as required by NFPA 110.
11. Safety Devices: Engine shutdown on high water temperature, low oil pressure, overspeed, and engine overcrank.
12. Engine to start upon "loss of utility power" signal from the automatic transfer switch.
13. Remote Status and Alarm Contacts: Pre-wire SPDT dry contacts to terminal strip for each of the following status and alarm functions:
 - a. Generator Running (Provide three SPDT dry contacts).
 - b. Generator Trouble.
 - c. Low Battery (from battery charger).

2.10 SOUND ATTENUATING WEATHER-PROTECTIVE ENCLOSURE

- A. Reinforced steel housing mounted on a channel iron skid base, allowing access to control panel and service points with lockable doors and panels.
 1. Ventilation: Fixed louvers to allow adequate ventilation with all doors and panels closed.
 2. Key all doors alike.
 3. Provide means for external draining of oil and water.
 4. Finish: One coat primer and two finish coats.
- B. Enclosure shall be designed to reduce noise level to below 75 dBA within 23 feet of the enclosure.
- C. All package engine-generator system equipment as shown on the Drawings shall be installed inside this enclosure.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Mounting: Provide unit with structural steel base and mount on suitable spring-type vibration isolators.
- C. Concrete Pad:
 1. Provide concrete pad for engine-generator set; follow Section 03301.
 2. Size pad based upon manufacturer's footprint of engine-generator set.
- D. Engine:
 1. Provide initial fill of CD/SE classification lubrication oil as instructed by manufacturer.
 2. Install all filters.
- E. Cooling System:
 1. Provide initial fill of coolant.
 2. Install all interconnecting piping and supports necessary for completion the system installation.
- F. Exhaust System:
 1. Install condensation trap at low point of exhaust piping.
 2. Install vibration isolators at all locations where the exhaust system is supported by a building wall or ceiling.
- G. Repaint any portions of the finish damaged during installation.

3.2 ADJUSTING

- A. Adjust generator output voltage and engine speed.

3.3 CLEANING

- A. Clean engine and generator surfaces.

3.4 MANUFACTURER'S START-UP SERVICES

- A. Prepare and start standby generator unit for testing and demonstration.
- B. Provide report indicating field test and inspection procedures and test results.
- C. Coordinate with transfer switch operations for automatic starting and stopping of standby power system.

3.5 DEMONSTRATION

- A. Prepare and start systems in accordance with manufacturer's instructions.
- B. Provide systems demonstration for a minimum of 2 hours.
- C. Simulate power outage by interrupting normal source and demonstration that system operates to provide standby power.
- D. Provide full load test utilizing normal loading of plant connectable loads for 2 hours minimum. Simulate power failure (two times) including operation of transfer switch, automatic starting cycle, and automatic shutdown and return to normal. Document all transfer, cool down and return to normal times for OWNER's records as well as ampacity on each phase. Record the following:
 - 1. Amperes.
 - 2. Voltage.
 - 3. Coolant temperature.
 - 4. Frequency.
 - 5. Oil pressure.
- E. Exercise the engine-generator set once a week for 1/2 hour time duration until completion of the 30 day acceptance test. Provide all fuel for exercising.

3.6 LOAD SCHEDULE

- A. Pumping Station No. 1:

STEP	DESCRIPTION	LOAD	MOTOR STARTING CODE	STARTER TYPE (NOTE 1)	LOAD TORQUE (NOTE 2)
1	Miscellaneous Lighting/Power	7.5 KW			
1	Unit Heater	3.0 KW			
1	Exhaust Fan	3 HP	J	Line	VAR
2	Submersible Pump	15 HP	F	NL	VAR

B. Pumping Station No. 2:

STEP	DESCRIPTION	LOAD	MOTOR STARTING CODE	STARTER TYPE (NOTE 1)	LOAD TORQUE (NOTE 2)
1	Miscellaneous Lighting/Power	7.5 KW			
1	Unit Heater	3.0 KW			
1	Exhaust Fan	3 HP	J	Line	VAR
2	Submersible Pump	20 HP	F	NL	VAR

Note 1 Line: Across-the-line starter.
 NL: Ramped load with variable frequency controller or soft-starter (non-linear load).

Note 2 VAR: Variable torque load.
 CON: Constant torque load.

END OF SECTION

SECTION 16691

SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Transient surge protection for power distribution systems; provided as part of Pump Control Panel specified in Section 11907.

1.3 REGULATORY REQUIREMENTS

- A. Listed under UL Standard 1449, Latest Edition.

1.4 SHOP DRAWINGS

- A. Submit data showing maximum continuous operating voltage (MCOV), maximum surge current, voltage protection ratings (VPRs) for all modes, short circuit current rating (SCCR), and I-nominal rating (I-n).

PART 2 PRODUCTS

2.1 TRANSIENT SURGE PROTECTION

- A. Description: Transient surge protection unit mounted inside pump control panel.
- B. Manufacturers:
 - 1. Current Technologies CG Series.
 - 2. Cutler Hammer Clipper Power System Series.
 - 3. General Electric Tranquell Series.
 - 4. Siemens Sentron.
 - 5. Square D SurgeLogic.
 - 6. Or equal.
- C. Enclosure:
 - 1. Mount inside pump control panel. Fused switch or circuit breaker disconnect shall be mounted inside pump control panel. Indicator lights and surge counter shall be mounted on the front door of the control panel, visible to the operator.

2.2 RATINGS

- A. Modes of Protection:
 - 1. Three-Phase Wye-Connected Systems: 7 modes; L-L, L-N, N-G.
- B. Response Time: Under 1 nanosecond.
- C. UL labeled Type 1, intended for use without need for external or supplemental overcurrent protection.

- D. UL labeled with 20kA I-nominal (I-n) rating.
- E. UL labeled with 200kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing of SPD.
- F. Transient Control: "MOV" technology to clamp transients to a safe level.
- G. Maximum Continuous Operating Voltage (MCOV): 110 percent minimum rating.
- H. UL 1283 listed EMI filter with 40 dB minimum attenuation at 100 kHz.
- I. UL 1449 listed device (third edition).
- J. UL 1449 Listed Voltage Protection Ratings:
 - 1. VPR ratings shall not exceed the following for 480Y/277V systems:
 - a. L-L: 2500V.
 - b. L-N: 1200V.
 - c. L-G: 1200V.
 - d. N-G: 1200V.
- K. Maximum Single Impulse Current:
 - 1. System Voltages over 300 VAC: 100 kA per phase with 8x20 microsecond test waveform.
- L. Endurance Testing: Survive a minimum of 4,000 Category C3 pulses without failure.

2.3 ACCESSORIES

- A. Integral Fusing: Each MOV path shall be individually fused to protect against thermal runaway conditions.
- B. Status Indicators: Provide LED indicator lights for each phase to indicate that surge suppression devices are active. If provided, audible alarms must be able to be silenced.
- C. Surge Counter: Transient event surge counter with visible display.
- D. Alarm Contact: Provide a Form C dry contact for remote monitoring.

2.4 MANUFACTURER GUARANTEE

- A. Provide minimum 5 year manufacturer's warranty.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with applicable standards and manufacturer's instructions.
- B. Install SPD as close as possible to the electrical equipment.
- C. Install SPD units so that leads do not exceed 12 inches, with no bends in the connecting conduit system.
- D. Twist and wire tie conductors to reduce inductive effects.

3.2 SCHEDULE

UNIT	PROTECTED EQUIPMENT	VOLTAGE RATING
SPD (Pumping Station #1)	Pump Station #1 Control Panel (furnished and installed by pump manufacturer)	480/277V, 3-phase, 4-wire
SPD (Pumping Station #2)	Pump Station #2 Control Panel (furnished and installed by pump manufacturer)	480/277V, 3-phase, 4-wire

END OF SECTION

SECTION 16902

ELECTRIC CONTROLS AND RELAYS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Pushbutton and selector switches.
- B. Indicating lights.
- C. Magnetic control relays.
- D. Time delay relays.
- E. Control power transformers.

PART 2 PRODUCTS

2.1 PUSHBUTTONS AND SELECTOR SWITCHES

- A. Manufacturers:
 - 1. Allen-Bradley.
 - 2. Cutler-Hammer.
 - 3. General Electric.
 - 4. Siemens.
 - 5. Square D Company.
 - 6. Or as approved.
- B. Description: Heavy duty, oil-tight, NEMA style, NEMA Type 4/4X corrosion-resistant, 30.5 mm mounting hole and chrome ring nut. Refer to Drawings for operator type, color, and contact configuration. Provide additional contact blocks as required to provide number of contacts required.
- C. Stop and Reset Pushbuttons:
 - 1. Color: Red.
 - 2. Contacts: NEMA ICS 2, normally closed contact rated for 10 amperes continuous at 120 VAC.
 - 3. Guard: Full guard bezel on pushbutton to prevent accidental operation.
- D. Start Pushbuttons:
 - 1. Color: Black.
 - 2. Contacts: NEMA ICS 2, normally open contact rated for 10 amperes continuous at 120 VAC.
 - 3. Guard: Full guard bezel on pushbutton to prevent accidental operation.
- E. Selector Switches:
 - 1. Color: Black, standard knob.
 - 2. Contacts: NEMA ICS 2, contacts rated for 10 amperes continuous at 120 VAC. Select contact operation most suited to application.
 - 3. Type: Maintained type unless otherwise noted.

F. Legend Plates: PVC material; black with white lettering, secured behind ring nut.

2.2 INDICATING LIGHTS

A. Manufacturers:

1. Allen-Bradley.
2. Cutler-Hammer.
3. General Electric.
4. Siemens.
5. Square D Company.
6. Or as approved.

B. Description: Heavy duty, oil-tight, NEMA style, NEMA Type 4/4X corrosion-resistant, 30.5 mm mounting hole.

C. Type: 120 VAC, push-to-test with integral 6.3 VAC transformer.

D. Lamps: 6.3 VAC, 0.15 amperes.

E. Legend Plates: PVC material; black with white lettering, secured behind ring nut.

2.3 MAGNETIC CONTROL RELAYS

A. Manufacturers:

1. Allen-Bradley, Type HB.
2. Potter & Brumfield, Series KVP.
3. Square D Company, Type K.
4. Or as approved.

B. Description: NEMA ICS 2, Class A300.

C. Contacts: NEMA ICS 2, 3PDT or 4PDT, spade terminals.

D. Contact Ratings: NEMA ICS 2, 10 amperes continuous rating at 120 VAC.

E. Coil Voltage: 120 VAC, 60 Hz.

F. Include neon pilot light, manual operator, and square base.

2.4 TIME DELAY RELAYS

A. Manufacturers:

1. Allen-Bradley, Type HR.
2. Automatic Timing & Controls, Series 407.
3. Square D Company, Type JCK70.
4. Or as approved.

B. Description: NEMA ICS 2, solid-state, multi-range, time delay relay.

C. Functions: On-delay, off-delay, and interval timing.

D. Timing Range: From 1 second to 16 hours over at least five ranges.

E. Contacts: NEMA ICS 2, DPT, pin-style terminals.

- F. Contact Ratings: NEMA ICS 2, 5 ampere continuous rating at 120 VAC.
- G. Coil Voltage: 120 VAC, 60 Hz.
- H. Include tube base.

2.5 CONTROL POWER TRANSFORMER

- A. Manufacturers:
 - 1. Allen-Bradley.
 - 2. Cutler-Hammer.
 - 3. Siemens.
 - 4. Square D Company.
 - 5. Or as approved.
- B. Description: NEMA ST 1, machine tool transformer with isolated secondary winding and fusing on all ungrounded leads.
- C. Power Rating: Size for minimum 175 percent of calculated full load. Minimum 100 VA.
- D. Voltage Rating: As indicated, otherwise 480 volts primary, 120 volts secondary.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install individual relays and time delay relays in enclosures.
- C. Make electrical wiring interconnections as indicated.

END OF SECTION

SECTION 16960

ELECTRICAL EQUIPMENT TESTING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Electrical equipment test reports.

1.3 SUBMITTALS

- A. Motor Circuit Test Reports: Complete Motor Circuit Test Report for each three-phase motor 5 HP and above.
- B. Low Voltage Feeder Insulation Test Reports: Complete the Low Voltage Feeder Insulation Test Report for each single-phase and three-phase feeder rated 100 amperes and above.
- C. Ground Resistance Test Reports: Complete the Ground Resistance Test Report for each structure that receives a service or a feeder.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Use an ohmmeter for motor winding resistance testing. Perform in accordance with ohmmeter manufacturer's instructions.
- B. Use a ground resistance test instrument for ground resistance testing. Perform testing in accordance with test instrument manufacturer's instructions. Perform test in normally dry weather, not less than 48 hours after rainfall.
- C. Use a 1000 VDC megohms meter for low voltage insulation testing. Perform testing in accordance with megohms meter manufacturer's instructions.
- D. Replace conductors and cable which indicate poor insulation levels as determined by ENGINEER. Do not splice as a means of repair.
- E. Install additional ground rods as required to achieve specified ground resistance. See Section 16170.

3.2 REPORT FORMS

A. Motor Circuit Test Report:

Equipment _____ Location _____

Manufacturer _____ Frame _____

Horsepower _____ Phase _____ RPM _____ Service Voltage _____

Motor Overload _____ Manufacturer _____

Nameplate volts* _____ Running volts* _____

Nameplate amperes* _____ Running amperes* _____

Nameplate locked rotor amps _____ Nameplate power factor _____ % Nameplate efficiency _____ %

Insulation Class _____ Starting Code _____

Feeder runs from _____

Feeder Wire Size _____ Insulating Voltage Rating _____ Insulation Type _____

* Give armature/field for DC motors.

1. Motor Winding Resistance Test (multi-meter):

Winding	Resistance (ohms)
A to B	
B to C	
C to A	

2. Motor Feeder/Winding Insulation Test (Megohm Meter):
 - a. Perform the following test AFTER connecting the feeder to the motor.
 - b. Test from load side of motor controller.
 - c. Readings must be greater than 50 megohms.

Phase	Megohms at 1000 VDC
A to Ground	
B to Ground	
C to Ground	

Testing performed by _____ Date: _____

Testing Witnessed by _____

B. Feeder Insulation Test Report:

Perform test BEFORE terminating feeder to equipment.

Feeder runs from _____

Feeder runs to _____

Wire Size _____ Insulation Voltage Rating _____ Insulation Type _____

Readings must be greater than 50 megohms.

Phase	Megohms at 1000 VDC
A to Ground	
B to Ground	
C to Ground	

Testing performed by _____ Date: _____

Testing Witnessed by _____

COMMENTS

C. Grounding Test Report:

Type of Ground _____
(Single Rod or Multiple Rod – Provide Quantity)

Location _____

Date Installed _____

Weather Conditions (Temp, Humidity) _____

Date of Last Rain _____

Ground Resistance (ohms) _____

Testing performed by _____ Date: _____

Testing Witnessed by _____

COMMENTS

END OF SECTION

SECTION 17660

AUTOMATIC DIALING ALARM SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), and Division 1 Specifications Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Automatic dialers.

1.3 SPARE PARTS

- A. Provide five spare fuses for each type of fuse installed, including power supply fuse, battery fuses, and phone line fuses.
- B. Provide one spare input board.

PART 2 PRODUCTS

2.1 AUTOMATIC DIALERS

- A. Manufacturers:
 - 1. Verbatim VSS 8-channel, Catalog No. 301VSS-8C.
- B. Description: Microprocessor-based automatic dialer which digitally records status, alarm, and identification messages and stores them in solid-state memory.
- C. Inputs: Eight dry contacts individually configurable as normally open or normally closed, and as status or alarm. Status inputs do not initiate dialing sequence.
- D. Outputs: Four SPDT dry contact rated 5 ampere at 250 VAC, configurable as general alarm relay or to allow remote activation of output from telephone keypad.
- E. Features:
 - 1. Dialing: Pulse and tone.
 - 2. Programming: By local keypad or remotely from telephone keypad.
 - 3. Arming and Disarming: Automatic based upon time of day, day of week, and holiday schedule.
 - 4. Telephone Numbers Capacity: Eight lists of 8 numbers each, or four lists of 16 numbers each. Each input can be individually assigned to any one of the lists.
 - 5. Recorded Speech Capacity: 8 seconds per input channel message; 8 seconds for system identification message.
- F. Power Supply: 115 VAC, ± 10 percent.
- G. Battery Backup: Internal, 20 hours minimum at 86 degrees F.
- H. Enclosure: NEMA 12.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Locate in pumping station building.
- B. Make connections to field devices as indicated.
- C. Provide wire and terminal identification; follow Section 16195.

3.2 START-UP

- A. Provide complete configuration of unit for full operation. Coordinate with OWNER for specifics of operation.
- B. Configure inputs as indicated in the Schedule.

3.3 INPUT CONFIGURATION SCHEDULE

NO.	STATE	MESSAGE	MODE	ALARM DELAY (sec.)	SOURCE
1	N.O.	Pump #1 Trouble	Alarm	1	Pump C.P.
2	N.O.	Pump #2 Trouble	Alarm	1	Pump C.P.
3	N.O.	Loss of Utility Power	Alarm	1	ATS
4	N.O.	Generator Trouble	Alarm	1	Generator
5	N.O.	Spare			
6	N.O.	Spare			
7	N.O.	Spare			
8	N.O.	Spare			

END OF SECTION