107374

BOROUGH OF DUBLIN

RESOLUTION NO. 84-09

DUBLIN BOROUGH RESOLUTION IMPOSING IMMEDIATE MORATORIUM AND BAN ON BUILDING CONSTRUCTION WITHIN BOROUGH

WHEREAS, Borough recognizes an actual and threatened shortage of water to the residents of the Borough of Dublin and the imperative need to implement and continue concerted measures to conserve water within the Borough; and

WHEREAS, the Delaware River Basin Commission has recently recommended the Borough to impose mandatory restrictions on water use within the Borough; and

WHEREAS, the Borough Council desires to take immediate steps to protect its water supply and conserve supplies to meet the most essential health and safety needs of its citizenry.

NOW, THEREFORE, be it resolved, in accordance with the Authority granted under the provisions of the Borough Code, that, effective immediately, and in effect until terminated or altered by further order of Council, a moratorium and ban on all building construction within the Borough is hereby declared and imposed, excepting, however, for single family, detached dwelling

units which are proposed for connection to existing and operating public water system.

Providing, further, that Borough recognizes that there may be certain circumstances where this moratorium may impose hardships upon a resident and/or property owner, in which event, said resident and/or property owner may apply to Council for relief.

In said event, applicant shall submit to Council the following required information:

(1) A map indicating the location of proposed construction.

(2) A written report prepared by a qualified hydrogeologist describing the expected effects of the proposed construction and water withdrawal on existing wells, flows of perennial streams and the long term lowering of ground water levels.

(3) A log showing the nature of subsurface material encountered during the construction and installation of the exploratory or production well(s).

(4) The detailed results of extended pump tests of not less than 48 hours duration, and records of observations

during such pump tests from representative monitoring wells. No pump tests shall be conducted without prior written approval of Council.

Upon receipt of the above required information and documentation, Council, after conference and hearing, shall determine if building permit should issue or not issue.

Before Council may issue permit, however, Applicant or sponsor of the proposed withdrawal shall demonstrate to Borough that:

(1) The proposed construction and water withdrawal, in conjunction with other existing withdrawals in the Borough, will not exceed safe withdrawal limits of the ground water basin, aquifer or aquifer system.

(2) The proposed withdrawal will not significantly impair or reduce the flow of perennial streams in the Dublin area.

(3) Existing ground water withdrawals will not be adversely impacted, or will be otherwise assured of adequate supplies in accordance with the following mitigation measures which Borough shall impose:

(a) providing an alternative water supply of adequate quantity and quality, to the affected well owner(s);

(b) providing financial compensation to the affected well owner(s) sufficient to cover the costs of acquiring an alternative water supply of adequate quantity or quality; or

(c) such other measures as the Borough shall determine to be just and equitable under the circumstances present in the case of any individual application.

RESOLVED this 18th day of June, 1984, by the Borough Council of Dublin, County of Bucks, Commonwealth of Pennsylvania.

s/Theodore P. Kohl
THEODORE P. KOHL, PRESIDENT

ATTEST:

s/Luther L. Wonsidler
LUTHER L. WONSIDLER, SECRETARY

Approved this 18th day of June, 1984.

s/Francis J. Rymdeika
FRANCIS J. RYMDEIKA, MAYOR

Appendix F

Borough of Dublin Water Use Regulations and Conservation Measures

ORDINANCE NO. 165

DUBLIN BOROUGH

AMENDMENT TO ORDINANCE ENTITLED WATER CONSERVATION AND WATER USAGE MONITORING ORDINANCE NO. 159

Amend Section 4.A. to read:

§4. Specifications - New Installations.

A. Water Closets Operated by Flush Tanks. The water consumption of water closets operated by flush tanks shall not exceed an average of 1.5 gallons per flush cycle over a range of test pressures from 20 to 80 psig. The fixture shall perform in accordance with the flushing test requirements cited of the ANSI A112.19.2M-1981 Vitreous China Plumbing Fixtures Standards. (Appendix "A")

ADOPTED this 3rd day of August, 1987.

DUBLIN BOROUGH COUNCIL

By: Theodore P. Roll
President

(S E A L) Attest: [signature]
Secretary

Approved thhis 3rd day of August, 1987.

[signature]
Mayor

AR000204

DUBLIN BOROUGH

WATER SYSTEM CONNECTION ORDINANCE NO. 164

SECTION 1. WATER CONNECTIONS REQUIRED. After the date of this Ordinance, if the ownership of land is transferred, or if land is subdivided, or if there is a land development, or if there is the erection of a new primary use structure on the land, and if the property either abuts any street or alley in which there is a Borough water main or in which a Borough water main may be constructed, or if the property is within one hundred fifty (150) feet of such a main, then, and in that event, all owners of such property shall make connection at their own expense to a Borough water line for the purpose of conducting water to such property. Any such property owner shall be given at least forty-five (45) days to comply with the requirement for connection of the property to the Borough water system. Upon failure of such owner to make such connection, the Borough may make the same and collect the cost thereof from the owner by a municipal claim or by an action of assumpsit.

SECTION 2. TAPPING/CONNECTION FEE. A fee shall be paid by and, if not paid, assessed against the property owner upon connection with the Borough water system.

SECTION 3. The dollar amount of fees required are contained in the schedule annexed to this Ordinance.

SECTION 4. ASSESSMENTS. The whole cost, or any part of the cost, of construction of new water mains or extension of existing water mains, whether such mains be located within or without the limits of the Borough and serving the properties abutting thereon, may be assessed by the Borough Council against the properties abutting along the line thereof by the front foot rule or the benefit rule, whichever amount is greater. In lieu of assessments, the Borough Council may enter into written agreements with developers to install portions of the public water system or permit the developer to install same, subject to Borough approval. Such assessments may be collected as other municipal claims are now by law collectible.

SECTION 5. OTHER CHARGES. The Borough Council or other authorized Borough official may assess charges against property owners for special services rendered, for damage to Borough-owned equipment or any other lawful activity, and such charges must be paid by said property owner. Upon failure of the property owner to pay such charges within a reasonable time after presentation of same, the water service may be turned off, or the claim may be collected in such manner as other municipal claims are now by law collected.

SECTION 6. CROSS-CONNECTIONS. No connections shall be made between pipes or containers carrying water supplied by the Borough and pipes or containers carrying water from any other source unless the proposed cross-connection has been approved by Borough Council and the Bucks County Department of Health and/or the Pennsylvania Department of Environmental Resources.

SECTION 7. Upon connection, all private wells shall be disconnected from service to each property, except unconnected wells may be used for agricultural and industrial purposes only upon permit granted for cause shown by Borough Council, provided the usage does not interfere with other wells or violate in any way any order or docket of the Pennsylvania Department of Environmental Resources or the Delaware River Basin Commission or other regulatory body.

SECTION 8. SEPARATE SERVICE LINES REQUIRED.

A. Each separate family or business shall be supplied through a separate service line except where existing private water distribution systems do not so provide, and providing separate service lines would not be feasible.

B. No owner or tenant of any premises supplied with water by the Borough will be allowed to supply other persons or families or other premises. Consumers who violate this

rule may have their water shut off after a notice of twenty-four (24) hours, and it may remain so until the Borough is satisfied that the rules and regulations will be observed.

SECTION 9. SERVICE LINES TO CURB.

A. The Borough will tap the main, insert corporation stop, install service line from main to curb and install curb stop and box, all of which shall remain the property of the Borough.

B. The Borough will be responsible for the maintenance and repair of the service line from the main to and including the curb stop and box.

C. Service lines will not be installed when the service line passes over or through premises which, at the time, may be the property of persons other than the owner of the premises to be supplied, unless the owner of the premises supplied assumes all liability and furnishes a right-of-way agreement in form satisfactory to Council or its duly-authorized representative.

SECTION 10. SERVICES LINES, CURB TO PREMISES.

A. The service line beyond the curb stop and the water meter shall be installed and maintained by and at the expense of the consumer. All leaks between curb box and meter must be repaired promptly by the property owner. The portion of

the service line installed by the consumer shall be installed to Borough specifications and shall not be covered until the tap on the main is made and service line is inspected and tested. If any defects in workmanship or material are found, the service shall not be turned on until such defects are remedied. All plumbing connections should be able to withstand a pressure of at least 150 pounds per square inch.

B. No service line shall be laid in the same trench with a sewer or gas service connection.

C. Plumber installation of meter shall be made at the time the final plumbing is completed.

D. The curb box shall be kept visible and accessible, and the service line from the curb to the premises shall be kept in good condition by the consumer under penalty of discontinuance of service by the Borough.

E. The Borough reserves the right to inspect the plumbing on any premises, and if it shall be found not in conformity with the rules of the Borough, to refuse water service until the objectionable or improper work is corrected.

F. All abandoned service pipes shall be immediately detached from the main pipe by the property owner, at his own expense, and he shall be liable for all damages that may arise by reason of any abandoned service pipe remaining attached to the water main in front of his property or wherever the same may be.

SECTION 11. METERS. The Borough, through its Water Department, will determine the location and size for all meters. The Borough will seal the meter to prevent tampering, and in no case or under no circumstances shall any consumer or other persons interfere with the water meter.

SECTION 12. LEAKS, DEFECTIVE PLUMBING OR WASTE.

A. The Borough shall not be liable for any damage resulting from leaks, broken pipes or from any other cause.

B. All water passing through a meter shall be charged for at the regular rate, plus applicable penalties for excessive use, and no allowance will be made for excessive consumption due to leaks or waste.

SECTION 13. OPENING, CLOSING OR INTERFERING WITH VALVES AND STOP COCKS. No person, except an employee of the Borough Water Department or other duly-authorized person, shall open, close or in any way interfere with any valve or stop cock in the Borough water system.

SECTION 14. CONNECTIONS OR OUTLETS BETWEEN MAIN AND METER NOT PERMITTED. No connections or outlet will be permitted on the service pipe or pipes supplying any premises between the street main and the meter. All water used must pass through the meter.

SECTION 15. TURNING OFF WATER.

A. The Borough Council, or its duly-authorized

representative, reserves the right at all times, after due notice, to shut off the water for non-payment of water bills and sewer bills or for neglect or refusal to comply with these rules and regulations and to assess such charges as may be determined by Borough Council for the resumption of service.

B. Service under an application may be discontinued for any of the following reasons:

(1) Misrepresentation to property or fixtures to be supplied or the use to be made of the water supply.

(2) Use of water for any property or purposes other than authorized.

(3) Waste of water.

(4) Failure to maintain in good order, connection, service lines, water meters or fixtures beyond the cuurb and owned by the applicant.

(5) Molesting any service pipe, meter, curb stop or seal or any appurtenance of the Borough water system.

(6) Vacancy of the premises.

(7) Violation of water Resolutions of the Borough.

(8) Failure to make payments of any charges against the property.

(9) Refusal of access to property for purpose of inspecting, reading, caring for or removing meters.

C. The Borough Council, or its duly-authorized representative, shall have the right to turn off the water without notice in case of breakdowns or for other unavoidable causes, or for the purpose of making necessary repairs, connections, etc. Reasonable notice will be given when practicable. In no case shall the Borough be liable for any damage or inconvenience suffered therefrom.

SECTION 16. SUPPLY OF WATER.

A. The Borough shall not be liable for a deficiency or failure in the supply when occasioned by shutting off water to make repairs or connections or from any failure throughout the water system.

B. The Borough Council, or its duly-authorized representative, reserves the right to restrict the supply of water as circumstances may require regardless of use for which intended, in case of scarcity, or whenever the public welfare may require it, and to provide for the distribution of the available supply in such manner as may be determined to be in the public welfare.

C. The use of water shall at all times be subject to Borough Ordinances and Resolutions regulating excessive and non-essential water use.

D. The Borough shall not be liable for any claim or damage arising from a shortage of water, the breaking of machinery or facilities, or any cause beyond its control.

E. It shall be expressly stated to parties receiving water service for private fire control or sprinkler systems that the Borough does not assume any liability as insurers of property or person, and that the agreement does not contemplate any special service, pressure, capacity or facility, and that the Borough hereby declares that the Borough shall be free and exempt from any and all claims or injuries to persons or property, or any other person or property, by reason of fire, water, failure to supply water, pressure or capacity as a condition of furnishing water.

F. The Borough may refuse to serve an applicant if it does not have adequate facilities to render the service desired; if the service is of such character that is likely to result in unfavorable service to other customers; if the applicant's installation of piping is regarded as hazardous or of such character that satisfactory service cannot be given; or for other cause.

G. When the premises are vacated, the consumer must give notice so that the water may be turned off, and he will be responsible for all charges for water service until such notice is given.

SECTION 17. CHANGING OF RULES AND REGULATIONS. The Borough Council reserves the right to change or amend, from time to time, rules and regulations for the use of water.

SECTION 18. VIOLATIONS, PENALTIES. With the exception of those sections of this Ordinance regarding non-payment of monies due the Borough for various services as set forth in this Ordinance where collection procedures have been outlined, and, in addition, to the turning off of water as provided in this Ordinance, any person who shall violate a provision of this Ordinance or shall fail to comply with any of the requirements thereof or who shall exceed the authorization of any permit issued under the provisions of this Ordinance shall, upon conviction thereof, be liable to pay a fine or penalty of not more than Three Hundred Dollars ($300.00) for each offense and in default of payment due, undergo imprisonment for a term not exceeding ninety (90) days. Each day that a violation continues, shall be determined a separate offense.

SECTION 19. CHANGES. The Borough Council may, from time to time by Ordinance, modify, add to, or remove from the provisions herein.

SECTION 20. REPEALER. All Ordinances or parts of Ordinances which are inconsistent herewith are hereby repealed to the extent necessary to give this Ordinance full effect.

SECTION 21. SEVERABILITY. If any sentence, clause, section or part of this Ordinance is for any reason found to be unconstitutional, illegal or invalid, such unconstitutionality, illegality or invalidity shall not affect or impair any of the

remaining provisions, sentences, clauses, sections or parts of this Ordinance. It is hereby declared as the intent of the Borough Council that this Ordinance would have been adopted had such unconstitutional, illegal or invalid sentence, clause, section or part thereof not been included herein.

ADOPTED this 3rd. day of AUGUST, 1987.

DUBLIN BOROUGH COUNCIL

By: _____
President

(S E A L)

Attest: _____
Secretary

Approved this 3rd. day of AUGUST, 1987.

_____
Mayor

DUBLIN BOROUGH

WATER SYSTEM CONNECTION ORDINANCE NO. 164

SCHEDULE OF FEES

CONNECTION FEE (Main to Curb)	$ 300.00
TAPPING FEE (Per Dwelling Unit or Equivalent)	350.00

DUBLIN BOROUGH

PROPOSED AMENDMENT TO PROPOSED ORDINANCE ENTITLED
"WATER CONSERVATION AND WATER USAGE
MONITORING ORDINANCE NO. 160 "

At #5, add a new paragraph to read:

"All wells shall be made accessible to Borough officials during normal working hours for the purpose of determining water levels, as often as is deemed necessary by the Borough, for the gathering of hydrological data."

ADOPTED this 6th day of October, 1986.

DUBLIN BOROUGH COUNCIL

By: Daniel L. Liccardi, Ed. L
President

(S E A L) Attest: Cynthia G. Alexander
Secretary

Approved this 6th day of October, 1986.

Mayor

ARO00217

DUBLIN BOROUGH

WATER CONSERVATION AND WATER USAGE
MONITORING ORDINANCE NO. 159

WHEREAS, as stated in the Comprehensive Plan dated September 3, 1985, the physical characteristics of Dublin's geology limit the rate of ground water recharge, Dublin Borough's water demand already exceeds the recommended 50% of normal recharge, and the Borough is under severe constraints by order of the Delaware River Basin Commission, as the same may be amended, in further proceedings; and

WHEREAS, the Council of Dublin Borough hereby finds and determines that in order to conserve and protect its water supply for the residential, commercial, industrial, agricultural and other users for the greatest public benefit, it is necessary to reduce the demand for water in the manner hereinafter set forth; and

WHEREAS, the purpose of this Ordinance is to insure the continued availability and service of water to Dublin Borough residents,

NOW, THEREFORE, pursuant to the Borough Code, and especially provisions found at 53 P.S. 46202 (39), 53 P.S. 4620 (24), 53 P.S. 46202 (17) and 53 P.S. 46202 (74) pertaining to control of streets, plumbing and wells, as well as its general powers,

BE IT ORDAINED BY THE COUNCIL OF DUBLIN BOROUGH AS FOLLOWS:

§1. Issuance of Plumbing and Building Permits Contingent on Meeting Standards.

No water, from public or private systems, shall be used for internal or external use for any residential, commercial, industrial, agricultural, recreational, governmental or public building or structure of any kind which is constructed or remodeled and in which plumbing, water piping or water fixtures are to be installed, extended or altered in any way, and for which a building permit is required to be obtained from Dublin Borough (or would be required but for any exemption from a permit requirement for public or governmental agencies), unless the new, extended or altered plumbing, water piping and other water using fixtures therein conform to the requirements and standards of §4 of this Ordinance.

§2. Water Waste Not Permitted.

No new plumbing, piping or water fixtures shall discharge water into any Borough street or drainage. (Sump pumps, washers, etc.) All properties, upon transfer, shall be brought into compliance with this section.

§3. Water Conserving Fixtures - Existing - Non-conforming to §4 Specifications.

Each resident or owner of existing property in Dublin Borough shall install in the water closets water-conserving devices, such as toilet dams, plastic containers filled with water, plastic bags such as those in the DER water conservation kit, or other suitable water-conserving devices, so that one gallon of water is displaced in the tank, thereby saving a minimum of one gallon of water per flush cycle.

Each resident or owner of existing property in Dublin Borough shall install water-conserving devices on all faucets and showerheads, such as flow restrictors, aerators, shower-savers, and the like, which conform to the discharge rates set in §4 of this Ordinance.

§4. Specifications - New Installations.

A. Water Closets Operated by Flush Tanks. The water consumption of water closets operated by flush tanks shall not exceed an average of 3.5 gallons per flush cycle over a range of test pressures from 20 to 80 psig. The fixture shall perform in accordance with the flushing test requirements cited in the ANSI A112.19.2M-1981 Vitreous China Plumbing Fixtures Standard. (Appendix "A")

B. Water Closets and Urinals Operated by Flushometers.

1. Water closet water consumption shall not exceed an average of 3.0 gallons per flush cycle over a range of test pressures from 20 to 80 psig or a maximum of 3.5 gallons per flush cycle at any one test pressure. The flushometer shall be adjusted according to manufacturer's specifications. The fixture shall perform in accordance with the flushing test requirements cited in the ANSI A112.19.2M-1981 Vitreous China Plumbing Fixtures Standard.

2. Urinal water consumption shall not exceed an average of 1.0 gallons per flush cycle over a range of test pressures from 20 to 80 psig or a maximum of 1.5 gallons per flush cycle at any one test pressure. The flushometer shall be adjusted according to manufacturer's specifications. The fixture shall perform in accordance with the flushing test requirements cited in the ANSI A112.19.2M-1981 Vitreous China Plumbing Fixtures Standards.

C. Showerheads. Showerhead discharge rates shall not exceed 2.75 gallons of water per minute over a range of test pressure from 20 to 80 psig. The fixture shall perform in accordance with the test requirements cited in the ANSI A112.18.1M-1979 Finished and Rough Brass Plumbing Fixture Fittings Standard. (Appendix "B")

D. Sink Faucets.

1. Kitchen sink faucet discharge rates shall not exceed 2.75 gallons of water per minute over a range of test pressure from 20 to 80 psig. The fixture shall perform in accordance with the test requirements cited in the ANSI A112.18.1M-1979 Finished and Rough Brass Plumbing Fixture Fittings Standard.

2. Residential lavatory sink faucet discharge rates shall not exceed 2.75 gallons of water per minute over a range of test pressure from 20 to 80 psig. The fixture shall perform in accordance with the test requirements cited in the ANSI A112.18.1M-1979 Finished and Rough Brass Plumbing Fixture Fittings Standards.

3. Non-residential faucets shall be either self-closing or metering faucets as described below:

a. Self-closing faucets shall not exceed an average discharge rate of 0.5 gpm between the pressures of 20 to 80 psig when tested in accordance with the discharge test procedure cited in the ANSI A112.18.M-19791 Finished and Rough Brass Plumbing Fixture Fittings Standard.

b. Metering faucets shall be field adjustable and set so that the discharge quantity shall not exceed .05 gallons of water per cycle.

E. Blowout Toilets and Urinals. Replacement of blowout toilets and urinal fixtures with the like type fixtures may be granted by local officials upon request where adequate justification of special need is provided.

F. Pressure Reducing Valve. Where the service water pressure to a building is expected to exceed 60 psi, a water pressure reducing valve with strainer shall be installed just downstream of the building's main valve so as to be accessible. The valve shall provide for pressure adjustment within the range of 50 to 60 psig. The valve shall conform to the requirements of A.S.S.E. Standard No. 1003, 1003-1 Performance Requirements for Water Pressure Reducing Valves for Domestic Water Supply Systems. (Appendix "C") Exemptions to this §4F are service lines to sill cocks, outside hydrants and main supply risers to buildings where pressure from the main does not exceed 60 psi at the fixture branches or at individual fixtures.

G. Any person(s) may apply to the Council for an exception to the terms of this Ordinance, which exception may be granted in the discretion of the Council, upon proof that some other device, system or procedure will save as much or more water as those set forth herein, or that those set forth herein cannot be complied with, without undue hardship.

§5. Water Meters.

Within ninety (90) days after the adoption of this Ordinance, water meters of a size and type approved by the Borough shall be installed on all buildings or structures, except residential buildings of three (3) or less dwelling units, equipped with a water supply system, public or private. The meter shall be accessible to Borough officials and employees for monitoring water consumption and shall be sealed by the Borough to prevent tampering.

Water meters shall also be installed on all new or replacement structures or buildings with plumbing before occupancy and shall be accessible to Borough officials and employees for monitoring water consumption and shall be sealed by the Borough to prevent tampering.

A water meter shall also be installed whenever real estate with a building or structure, equipped with a public or private water system, is transferred to a new owner. The meter shall be accessible to Borough officials and employees for monitoring water consumption and shall be sealed by the Borough to prevent tampering.

§6. Penalties.

Any person, firm or corporation who shall violate any provision of this Ordinance shall, upon conviction thereof, be sentenced to pay a fine of not more than three hundred dollars ($300.00), or to possible imprisonment for a term not to exceed thirty (30) days as provided in the Borough Code. Every day that a violation of this Ordinance continues shall constitute a separate offense.

§7. Changes.

The Borough Council may, from time to time, modify, add to, or remove from the standards and restrictions herein.

§8. Repealer.

All Ordinances or parts of Ordinances which are inconsistent herewith are hereby repealed to the extent necessary to give this Ordinance full effect.

§9. Severability.

If any sentence, clause, section or part of this Ordinance is for any reason found to be unconstitutional, illegal or invalid, such unconstitutionality, illegality or invalidity shall not affect or impair any of the remaining provisions, sentences, clauses, sections or parts of this Ordinance. It is hereby declared as the intent of the Borough Council that this Ordinance would have been adopted had such unconstitutional, illegal or invalid sentence, clause, section or part thereof not been included herein.

ADOPTED this 6th day of October, 1986.

DUBLIN BOROUGH COUNCIL

By: _____, Ed.D.
President

(S E A L) Attest: _____
Secretary

Approved this 6th day of October, 1986.

_____
Mayor

AR000222

BOROUGH OF DUBLIN

RESOLUTION NO. 86-02

DUBLIN BOROUGH RESOLUTION AMENDING RESOLUTION NO. 84-09, ADOPTED JUNE 18, 1984, "BAN ON BUILDING CONSTRUCTION WITHIN BOROUGH."

WHEREAS, Resolution No. 84-09 was adopted on June 18, 1984, to protect the water supply and conserve supplies to meet the most essential health and safety needs of the citizenry; and

WHEREAS, the results of the building ban are having a detrimental effect on the borough's financial well-being; and

WHEREAS, it has been determined that certain exceptions to to the total ban could be permitted without substantially affecting the original and continuing purpose of the ban which is to conserve and protect the borough's limited water resources,

NOW, THEREFORE, BE IT RESOLVED that the following amendment be adopted;

1. To the exception allowing construction of single-family dwellings which are proposed for connection to existing and operating public water system, the following exceptions be added:

a) Accessory Buildings or Building Additions which will not increase water use.

b) Relocation of existing commercial or industrial facilities from one location within the Borough to new or existing buildings; provided that it can be demonstrated to the satisfaction of Borough Council that proposed conservation measures will result in no significant increase in water use.

c) Other construction, where by conservation measures or other means, Council is convinced that there will be no significant impact on the Borough's water supply.

2. That in all other aspects not affected by this amendment, Resolution No. 84-06 be re-affirmed.

RESOLVED this 7th. day of April, 1986, A.D.

PRESIDENT OF COUNCIL

Daniel L. Ciccarelli

ATTEST:

Daniel L. Ciccarelli, President

Luther L. Wonsidler

Luther L. Wonsidler, Secretary

BOROUGH OF DUBLIN

ORDINANCE No. 150

AN ORDINANCE AMENDING DUBLIN BOROUGH ORDINANCE NO. 127, ADOPTED AUGUST 4, 1980, IMPOSING A SURCHARGE FOR EXCESSIVE USE OF WATER.

Section I. Be it ordained and enacted that Section 2 (3) of Dublin Borough Ordinance No. 127, adopted August 4, 1980, is hereby amended by addition of the following:

"A surcharge of 100% of the regular rate per 1,000 gallons shall be charged for all water used in excess of 60 gallons per person, per day".

Section II. Excepting as above amended and modified, Ordinance No. 127 is hereby ratified and confirmed in all other respects.

ORDAINED AND ENACTED this 4th. day of September, 1984, A.D.

ATTEST:

Theodore P. Kohl, President

Luther L. Wonsidler, Secretary

Approved this 4th. day of September, 1984, A.D.

Francis J. Rymdeika, Mayor

DESIGN DRAWINGS

Final

Water Treatment System
Operable Unit One
Dublin TCE Site

Bucks County
Pennsylvania

Prepared for the
U.S. Environmental Protection Agency
Region III
841 Chestnut Street
Philadelphia, Pennsylvania 19107

Prepared by

CH2M HILL

Reston, Virginia

March 1995

WDCR848/022.WP5/1

AR000225

DRAWINGS

(BOUND SEPARATELY)

DESIGN SPECIFICATIONS

Final

Water Treatment System
Operable Unit One
Dublin TCE Site

Bucks County
Pennsylvania

Prepared for the
U.S. Environmental Protection Agency
Region III
841 Chestnut Street
Philadelphia, Pennsylvania 19107

Prepared by

CH2M HILL

Reston, Virginia

March 1995

WDCR848/022.WP5/2

AR000227

Contract Documents

for the Construction of

Water Treatment System
Operable Unit One

Dublin TCE Site
Bucks County, Pennsylvania

Specifications

CH2M HILL
Reston, Virginia
March 1995

Project No. MAE63160.FD.TS
Work Assignment No. 90-47-3N53
Contract No. 68-W8-0090

Copy No. _____

CONTENTS

Pages

SPECIFICATIONS

Pages

END OF SECTION

SPECIFICATIONS

SECTION 01010
SUMMARY OF WORK

PART 1 GENERAL

1.1 DEFINITIONS

OWNER	U.S. Environmental Protection Agency, Region III; Pennsylvania Department of Environmental Resources; and the Borough of Dublin.
CONTRACTOR	The individual, partnership, firm, or corporation that enters into a contract with the OWNER.
ENGINEER	A representative of the CONTRACTOR.
SUBCONTRACTOR	The individual, partnership, firm, or corporation who enters into a direct contract with the CONTRACTOR.
SUB-SUBCONTRACTOR	The individual, partnership, firm, or corporation having a direct contract with the SUBCONTRACTOR or one of its subcontractors for a performance of a part of the work.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The completed Work will provide OWNER with a groundwater supply and treatment system for potable water and includes the supply and installation of the following:

1. Groundwater supply pump.
2. Diffused air stripper system.
3. Off-gas blower.
4. In-line duct heater.
5. Vapor phase carbon system.
6. Booster pump for treated water.
7. Sodium hypochlorite feed system.
8. Sequestering agent feed system.
9. Treatment system building.
10. Miscellaneous yard piping.
11. Emergency generator.
12. Associated instrumentation and controls, electrical, mechanical, building services, and site work.

B. The project also includes the following miscellaneous items:

1. Increasing the diameter and improving an existing groundwater supply well.
2. Abandonment of existing potable water wells at residences and businesses that will be connected to the public water supply.

3. Completion of water service connections at residences and businesses including disconnection of existing piping and equipment.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 01025
MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 PRICING

A. Unit Price Work: Includes all work required to abandon wells as described in Section 02595, WELL ABANDONMENT.

B. Lump Sum Work: Includes all work not specified as unit price work.

1.2 ADMINISTRATIVE SUBMITTALS

A. Schedule of Values: Submit schedule on SUBCONTRACTOR's standard form.

B. Application for Payment: In accordance with the General Conditions and as specified herein.

C. Final Application for Payment: As specified herein.

1.3 SCHEDULE OF VALUES

A. Format:

1. Prepare a separate schedule of values for each schedule of Work under the Agreement.
2. Unit Price Work: Reflect unit price breakdown in conformed Bid Form.
3. Lump Sum Work:
   a. Provide separate value for each item or task on the progress schedule. Break down Lump Sum Work amount by Divisions 2 through 16 with appropriate subdivision of each Specification section or as requested by ENGINEER.
   b. An unbalanced or front-end loaded schedule will not be acceptable.
   c. List separately such items as Bonds and insurance premiums, mobilization, demobilization and contract closeout, facility startup, and other appropriate Division 1 activities.
4. Summation of the complete schedule of values representing all Work under the Agreement shall equal the Contract Price.

1.4 APPLICATION FOR PAYMENT

A. Reference the General Conditions.

B. Transmittal Summary Form: Provided by OWNER. Attach one Summary Form with each detailed Application for Payment for each schedule, include Request for Payment of Materials and Equipment on Hand as applicable. Execute certification by authorized officer of SUBCONTRACTOR.

C. Use detailed Application for Payment Form suitable to ENGINEER.

1. Include accepted schedule of values for each schedule or portion of Work.
2. Form(s) to conform to the examples furnished by ENGINEER for Lump Sum Work, Unit Price Work, and materials on hand.
3. Include completed Well Abandonment form for payment for abandoning wells (see sample at end of section).

D. Preparation:

1. Round values to nearest dollar.
2. List each Change Order and Written Amendment executed prior to date of submission as separate line item. Totals to equal those shown on the Summary Sheet for each schedule as applicable.
3. Submit Application for Payment, including a Transmittal Summary Form and detailed Application for Payment Form for each schedule as applicable, a listing of materials on hand for each schedule as applicable, and such supporting data as may be requested by ENGINEER.

1.5 PAYMENT

A. General: Progress payments will be made monthly on the date established at the preconstruction meeting.

B. Payment for all Work shown or specified in the Contract Documents is included in the Contract Price. No measurement or payment will be made for individual items.

1.6 MEASUREMENT

A. Unit of measurement for well abandonment will be linear foot for the depth of each size well. Measurement will be determined by the ENGINEER in the field.

1.7 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS

A. Payment will not be made for following:

1. Loading, hauling, and disposing of rejected material.
2. Quantities of material wasted or disposed of in manner not called for under Contract Documents.
3. Rejected loads of material, including material rejected after it has been placed by reason of failure of SUBCONTRACTOR to conform to provisions of Contract Documents.
4. Material not unloaded from transporting vehicle.
5. *Defective* Work not accepted by OWNER.
6. Material remaining on hand after completion of Work.

1.8 PARTIAL PAYMENT FOR STORED MATERIALS AND EQUIPMENT

A. Partial Payment: Reference the General Conditions. No partial payments will be made for materials and equipment delivered or stored unless Shop

Drawings or preliminary operation and maintenance manuals are acceptable to ENGINEER.

B. Final Payment: Will be made only for materials incorporated in Work; remaining materials, for which partial payments have been made, shall revert to SUBCONTRACTOR unless otherwise agreed, and partial payments made for those items will be deducted from final payment.

1.9 FINAL APPLICATION FOR PAYMENT

A. Reference the General Conditions, Section 01700, CONTRACT CLOSEOUT, and as may otherwise be required in Contract Documents.

B. Prior to submitting final application, make acceptable delivery of required documents.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

WELL ABANDONMENT APPLICATION FOR PAYMENT						
Tax Map Number	**Owner's Name**	**Owner's Address**	**Well Diameter**	**Well Depth (LF)**	**Unit Price ($/LF)**	**Total Price**
			☐ 6" ☐ 8" ☐ 10" ☐ 12"			$
			☐ 6" ☐ 8" ☐ 10" ☐ 12"			$
			☐ 6" ☐ 8" ☐ 10" ☐ 12"			$
			☐ 6" ☐ 8" ☐ 10" ☐ 12"			$
			☐ 6" ☐ 8" ☐ 10" ☐ 12"			$
			☐ 6" ☐ 8" ☐ 10" ☐ 12"			$

SECTION 01040
COORDINATION

PART 1 GENERAL

1.1 SUBMITTALS

A. Statement of Qualification (SOQ) for land surveyor or civil engineer.

B. Photographs and other records of examination, as required herein.

1.2 UTILITIES

A. Coordinate Work with various utilities within Project limits in accordance with the General Conditions. Notify applicable utilities prior to commencing Work, if damage occurs, or if conflicts or emergencies arise during Work.

1. Philadelphia Electricity Company:
   a. Contact Person: Pennsylvania One-Call.
   b. Telephone: (800) 242-1776.
2. Bell of Pennsylvania (Telephone Company):
   a. Contact Person: Pennsylvania One-Call.
   b. Telephone: (800) 242-1776.
3. Dublin Borough Water and Sewer Authority:
   a. Telephone: (215) 249-3310.

1.3 SEQUENCE OF WORK

A. If a sequence is not specified, the SUBCONTRACTOR shall choose the appropriate construction sequence unless otherwise directed by the ENGINEER.

B. The following activities shall be performed in the sequence indicated.

1. Complete startup of the groundwater supply and treatment system including the supply well system, the treatment system building, all equipment housed in the building and adjacent to the building, and associated yard piping.
2. Complete water service connections as specified in Section 02662, WATER SERVICE CONNECTIONS.
3. Work specified in Section 02595, WELL ABANDONMENT, can be completed for a specific property only after the water service connection has been completed and accepted by the ENGINEER for that property.

1.4 PROJECT MEETINGS

A. General:

1. ENGINEER: Schedule physical arrangements for meetings throughout progress of Work, prepare meeting agenda with OWNER

and SUBCONTRACTOR input and distribute with written notice of each meeting, preside at meetings, record minutes to include significant proceedings and decisions, and reproduce and distribute copies of minutes within 5 days after each meeting to participants and parties affected by meeting decisions.

2. Representatives of OWNER, SUBCONTRACTOR, and Sub-Subcontractors shall attend meetings, as needed.

B. Preconstruction Conference:

1. To be held at site within 20 days after execution of the contract but before any work at the site has begun.
2. SUBCONTRACTOR shall be prepared to discuss the following subjects, as a minimum:
   a. Preliminary progress schedule, preliminary schedule of Submittal submissions, preliminary schedule of values, procedures for handling submittals, and methods of processing applications for payment and maintaining required records.
   b. Status of Bonds and insurance.
   c. Sequencing of critical path work items.
   d. Project changes and clarification procedures.
   e. Use of site, access, office and storage areas, security and temporary facilities.
   f. Major product delivery and priorities.
   g. SUBCONTRACTOR's safety plan and representative.
3. Attendees may include but not be limited to:
   a. OWNER's representatives.
   b. SUBCONTRACTOR's office representative.
   c. SUBCONTRACTOR's resident superintendent.
   d. SUBCONTRACTOR's quality control representative.
   e. Sub-Subcontractor's representatives whom SUBCONTRACTOR may desire or ENGINEER may request to attend.
   f. ENGINEER's representatives.
   g. Others as appropriate.

C. Preliminary Schedules Acceptability Review Meeting:

1. Hold within 10 days following preconstruction conference with SUBCONTRACTOR, ENGINEER, and others as appropriate.
2. No progress payment will be made to the SUBCONTRACTOR until schedules are submitted and acceptable to the ENGINEER.

D. Progress Meetings:

1. ENGINEER will schedule regular progress meetings at site, conducted weekly to review Work progress, progress schedule, Shop Drawing and Sample submissions schedule, Application for Payment, contract modifications, and other matters needing discussion and resolution.
2. Attendees will include:
   a. OWNER's representative(s), as appropriate.
   b. SUBCONTRACTOR, Sub-Subcontractors, and Suppliers, as appropriate.
   c. ENGINEER's representative(s).
   d. Others as appropriate.

E. Quality Control and Coordination Meeting(s):

1. Scheduled by ENGINEER on regular basis and as necessary to review test and inspection reports, and other matters relating to quality control of Work and work of other contractors.
2. Attendees will include SUBCONTRACTOR, SUBCONTRACTOR's designated quality control representative, selected Sub-Subcontractors and Suppliers, and ENGINEER's representatives.

F. Process Instrumentation and Control System Coordination Meetings: As specified in Section 13400, INSTRUMENTATION AND CONTROL SYSTEMS (PICS).

G. Preinstallation Meetings:

1. When required in individual Specification sections, convene at site prior to commencing Work of that section.
2. Require attendance of entities directly affecting, or affected by, Work of that section.
3. Notify ENGINEER 4 days in advance of meeting date.
4. Provide suggested agenda to ENGINEER to include reviewing conditions of installation, preparation and installation or application procedures, and coordination with related Work and work of others.

H. Other Meetings: In accordance with Contract Documents and as may be required by OWNER and ENGINEER.

1.5 PHYSICAL CONDITIONS

A. Exercise reasonable care to verify locations of existing subsurface structures and Underground Facilities, proceeding in accordance with the General Conditions.

B. Thoroughly check immediate and adjacent areas subject to excavation by visual examination (and by electronic metal and pipe detection equipment, as necessary) for indications of subsurface structures and Underground Facilities.

C. Make exploratory excavations where existing Underground Facilities or structures may potentially conflict with proposed Underground Facilities or structures. Conduct exploratory excavations in presence of ENGINEER and sufficiently ahead of construction to avoid possible delays to SUBCONTRACTOR's Work.

1.6 REFERENCE POINTS AND SURVEYS

A. ENGINEER's Responsibilities:

1. Establish bench marks convenient to Work and at least every 500 feet on pipelines and roads.
2. Establish horizontal reference points or coordinate system with bench marks and reference points for SUBCONTRACTOR's use as necessary to lay out Work.

B. Dimensions for lines and elevations for grades of structures, appurtenances, and utilities are indicated on Drawings, together with other pertinent information required for laying out Work. If conditions vary from those indicated, notify ENGINEER immediately, who will make minor adjustments required.

C. ENGINEER may perform checks to verify accuracy of SUBCONTRACTOR's layout Work and that completed Work complies with Contract Documents.

D. SUBCONTRACTOR's Responsibilities:

1. Provide additional survey and layout required.
2. Locate and protect reference points prior to starting site preparation.
3. Notify ENGINEER at least 3 working days in advance of time when grade and line to be provided by others will be needed.
4. In event of discrepancy in data or staking provided by ENGINEER, request clarification before proceeding with Work.
5. Preserve and leave undisturbed control staking until ENGINEER has completed checks it deems necessary.
6. Re-establish reference points resulting from destruction by SUBCONTRACTOR's operations.
7. Retain professional land surveyor or civil engineer registered in state of Project who shall perform or supervise engineering surveying necessary for additional construction staking and layout.
8. Maintain complete accurate log of survey Work as it progresses as a Record Document.
9. On request of ENGINEER, submit documentation.
10. Provide competent employee(s), tools, stakes, and other equipment and materials as ENGINEER may require to:
    a. Establish control points, lines, and easement boundaries.
    b. Check layout, survey, and measurement Work performed by others.
    c. Measure quantities for payment purposes.
11. Cooperate with ENGINEER so that checking and measuring may be accomplished with least interference to SUBCONTRACTOR's operations.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 CUTTING, FITTING, AND PATCHING

A. General:

1. Cut, fit, adjust, or patch Work and work of others, including excavation and backfill as required, to make Work complete.
2. Restore existing work, Underground Facilities, and surfaces that are to remain in completed Work including concrete-embedded piping, conduit, and other utilities as specified and as shown.
3. Make restorations with new materials and appropriate methods as specified for new Work of similar nature; if not specified, use best

recommended practice of manufacturer or appropriate trade association.

4. Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces and fill voids.
5. Remove specimens of installed Work for testing when requested by ENGINEER.

END OF SECTION

SECTION 01092
ABBREVIATIONS

PART 1 GENERAL

1.1 REFERENCE TO STANDARDS AND SPECIFICATIONS OF TECHNICAL SOCIETIES

A. Reference to standards and specifications of technical societies and reporting and resolving discrepancies associated therewith shall be as provided in the General Conditions and as may otherwise be required herein and in the individual Specification sections.

B. Work specified by reference to the published standard or specification of a government agency, technical association, trade association, professional society or institute, testing agency, or other organization shall meet the requirements or surpass the minimum standards of quality for materials and workmanship established by the designated standard or specification.

C. Where so specified, products or workmanship shall also meet or exceed the additional prescriptive or performance requirements included within the Contract Documents to establish a higher or more stringent standard of quality than that required by the referenced standard.

D. Where two or more standards are specified to establish quality, the product and workmanship shall meet or exceed the requirements of the most stringent.

E. Where both a standard and a brand name are specified for a product in the Contract Documents, the proprietary product named shall meet or exceed the requirements of the specified reference standard.

F. Copies of standards and specifications of technical societies:

1. Copies of applicable referenced standards have not been bound in these Contract Documents.
2. Where copies of standards are needed by the SUBCONTRACTOR, obtain a copy or copies directly from the publication source and maintain in an orderly manner at the site as Work site records, available to the SUBCONTRACTOR's personnel, Sub-Subcontractors, OWNER, and ENGINEER.

1.2 ABBREVIATIONS

A. Abbreviations for trade organizations and government agencies: Following is a list of construction industry organizations and government agencies to which references may be made in the Contract Documents, with abbreviations used.

1. AA Aluminum Association
2. AABC Associated Air Balance Council
3. AAMA American Architectural Manufacturers Association

4.	AASHTO	American Association of State Highway and Transportation Officials
5.	ACI	American Concrete Institute
6.	AFBMA	Anti-Friction Bearing Manufacturers' Association
7.	AGA	American Gas Association
8.	AGMA	American Gear Manufacturers' Association
9.	AI	Asphalt Institute
10.	AISC	American Institute of Steel Construction
11.	AISI	American Iron and Steel Institute
12.	AITC	American Institute of Timber Construction
13.	ALS	American Lumber Standards
14.	AMA	Acoustical Materials Association
15.	AMCA	Air Movement and Control Association
16.	ANSI	American National Standards Institute
17.	APA	American Plywood Association
18.	API	American Petroleum Institute
19.	APWA	American Public Works Association
20.	AREA	American Railway Engineering Association
21.	ARI	Air Conditioning and Refrigeration Institute
22.	ASA	American Standards Association
23.	ASAE	American Society of Agricultural Engineers
24.	ASCE	American Society of Civil Engineers
25.	ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
26.	ASME	American Society of Mechanical Engineers
27.	ASTM	American Society for Testing and Materials
28.	AWI	Architectural WoodWork Institute
29.	AWPA	American Wood Preservers' Association
30.	AWPB	American Wood Preservers Bureau
31.	AWPI	American Wood Preservers' Institute
32.	AWS	American Welding Society
33.	AWWA	American Water Works Association
34.	BHMA	Builders Hardware Manufacturers' Association
35.	CBMA	Certified Ballast Manufacturers' Association
36.	CDA	Copper Development Association
37.	CGA	Compressed Gas Association
38.	CIPRI	Cast Iron Pipe Research Institute
39.	CISPI	Cast Iron Soil Pipe Institute
40.	CMAA	Crane Manufacturers' Association of America
41.	CRSI	Concrete Reinforcing Steel Institute
42.	CS	Commercial Standard
43.	CSA	Canadian Standards Association
44.	CSI	Construction Specifications Institute
45.	CTSS	Caltrans Standard Specification
46.	EJCDC	Engineers Joint Contract Documents' Committee
47.	ETL	Engineering Test Laboratories
48.	FCC	Federal Communications Commission
49.	FEMA	Federal Emergency Management Agency
50.	FGMA	Flat Glass Marketing Association
51.	FM	Factory Mutual
52.	Fed. Spec.	Federal Specifications
53.	FS	Federal Specification
54.	GA	Gypsum Association
55.	HI	Hydraulic Institute

56.	HMI	Hoist Manufacturers' Institute
57.	ICBO	International Conference of Building Officials
58.	ICEA	Insulated Cable Engineers' Association
59.	IEEE	Institute of Electrical and Electronics Engineers, Inc.
60.	IES	Illuminating Engineering Society
61.	IFI	Industrial Fasteners Institute
62.	ISA	Instrument Society of America
63.	ISO	Insurance Service Office
64.	JIC	Joint Industry Conferences of Hydraulic Manufacturers
65.	MIA	Marble Institute of America
66.	Mil. Sp. or MIL	Military Specification
67.	MS	Military Specifications
68.	MMA	Monorail Manufacturers' Association
69.	NAAMM	National Association of Architectural Metal Manufacturers
70.	NACE	National Association of Corrosion Engineers
71.	NBHA	National Builders' Hardware Association
72.	NEC	National Electrical Code
73.	NEMA	National Electrical Manufacturers' Association
74.	NESC	National Electric Safety Code
75.	NFPA	National Fire Protection Association
76.	NHLA	National Hardwood Lumber Association
77.	NHPMA	Northern Hardwood and Pine Manufacturer's Association
78.	NLMA	National Lumber Manufacturers' Association
79.	NRCA	National Roofing Contractors Association
80.	NSF	National Sanitation Foundation Testing Laboratory
81.	NSPE	National Society of Professional Engineers
82.	NTMA	National Terrazzo and Mosaic Association
83.	NWWDA	National Wood Window and Door Association
84.	OECI	Overhead Electrical Crane Institute
85.	OSHA	Occupational Safety and Health Act (both Federal and State)
86.	PCI	Prestressed Concrete Institute
87.	PEI	Porcelain Enamel Institute
88.	PPI	Plastic Pipe Institute
89.	PS	Product Standards Section—U.S. Department of Commerce
90.	RMA	Rubber Manufacturers' Association
91.	SAE	Society of Automotive Engineers
92.	SCPRF	Structural Clay Products Research Foundation
93.	SDI	Steel Deck Institute
94.	SDI	Steel Door Institute
95.	SIGMA	Sealed Insulating Glass Manufacturing Association
96.	SJI	Steel Joist Institute
97.	SMACNA	Sheet Metal and Air Conditioning Contractors National Association
98.	SPI	Society of the Plastics Industry
99.	SSPC	Steel Structures Painting Council
100.	SWI	Steel Window Institute
101.	TEMA	Tubular Exchanger Manufacturers' Association
102.	TCA	Tile Council of America
103.	UBC	Uniform Building Code

104.	UFC	Uniform Fire Code
105.	UL	Underwriters Laboratories Inc.
106.	UMC	Uniform Mechanical Code
107.	US	U.S. Bureau of Standards
108.	USBR	Bureau of Reclamation
109.	WCLIB	West Coast Lumber Inspection Bureau
110.	WWPA	Western Wood Products Association

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 01300
SUBMITTALS

PART 1 GENERAL

1.1 GENERAL

A. Reference the General Conditions.

B. Inquiries: Direct to ENGINEER regarding procedure, purpose, or extent of Submittal.

C. ENGINEER's Authorization: At any time, ENGINEER may authorize changes to procedures and requirements for Submittals, as necessary to accomplish specific purpose of each Submittal. Such authorization will be by Field Order or Work Change Directive.

D. Timeliness: Schedule and make submissions in accordance with requirements of individual Specification sections and in such sequence as to cause no delay in Work or in work of other contractors.

E. Identification of Submittals:

1. Complete, sign, and transmit with each Submittal package, one Transmittal of SUBCONTRACTOR's Submittal Form attached at the end of this section.
2. Submittal Number Format: SSSSS-NN-V.
   a. SSSSS: Representing specification section number.
   b. NN: Submittal number (01 through 99).
   c. V: Resubmission version with sequential alphabetic suffix.
3. Format: Orderly, indexed with labeled tab dividers.
4. Show date of submission and dates of previous submissions.
5. Show Project title and OWNER's contract identification and contract number.
6. Show names of SUBCONTRACTOR, Sub-Subcontractor or Supplier, and manufacturer as appropriate.
7. Identify, as applicable, Contract Document section and paragraph to which Submittal applies.
8. Clearly identify revisions from previous submissions.

F. Incomplete Submittal Submissions:

1. At ENGINEER's sole discretion, ENGINEER will either (i) return the entire Submittal for SUBCONTRACTOR's revision/correction and resubmission, or (ii) retain portions of the Submittal and request submission/resubmission of specified items or as noted thereon.
2. Submittals which do not clearly bear SUBCONTRACTOR's specific written indication of SUBCONTRACTOR review and approval of Submittal or which are transmitted with an unsigned or uncertified submission form or as may otherwise be required under Contract Documents, will be returned to SUBCONTRACTOR unreviewed for resubmission in accordance with Contract Documents.

3. Delays, resequencing or other impact to Work resulting from SUBCONTRACTOR's submission of unchecked or unreviewed, incomplete, inaccurate or erroneous, or nonconforming Submittals, which will require SUBCONTRACTOR's resubmission of a Submittal for ENGINEER's review, shall not constitute a basis of claim for adjustment in Contract Price or Contract Times.

G. Nonspecified Submissions: Submissions not required under these Contract Documents and not shown on submissions will not be reviewed and will be returned to SUBCONTRACTOR.

H. Disposition of Submittals, Except Shop Drawings and Samples: ENGINEER will review, stamp, and indicate requirements for resubmission or acceptance on Submittal as follows:

1. Accepted:
   a. Acceptance of other Submittals will indicate that Submittal conforms to intent of Contract Documents as to form and substance.
   b. SUBCONTRACTOR may proceed to perform Submittal related Work.
   c. One copy furnished OWNER.
   d. One copy for ENGINEER's file.
   e. Two copies returned to SUBCONTRACTOR, one for onsite records.
2. Rejected as Noted (Revise/Correct or Develop Replacement and Resubmit):
   a. Revise/correct in accordance with ENGINEER's comments and resubmit.
   b. One copy to ENGINEER's file.
   c. One copy returned to SUBCONTRACTOR appropriately annotated.
   d. Remaining copy will be destroyed.

I. ENGINEER's Review: ENGINEER will act upon SUBCONTRACTOR's Submittal and transmit response to SUBCONTRACTOR not later than 30 days after receipt, unless: (i) specified otherwise or (ii) accepted by ENGINEER as set forth in Paragraph ENGINEER's Duties below and identified on current accepted submissions. Resubmittals will be subject to the same review time.

J. ENGINEER's Duties:

1. Review Submittals with reasonable promptness and in accordance with current accepted submissions.
   a. No adjustment of Contract Times or Price will be allowed due to ENGINEER's review of Submittals, unless all of following criteria are met:
      1) SUBCONTRACTOR has notified ENGINEER in writing that timely review of Submittal in question is critical to progress of Work, and has received ENGINEER's written acceptance to reflect such on current accepted submissions and progress schedule. Written agreement by the ENGINEER to reduce the above Submittal review time

will be made only for unusual and SUBCONTRACTOR-justified reasons. Acceptance of a progress schedule containing Submittal review times less than specified above or less than agreed to in writing by ENGINEER will not constitute ENGINEER's acceptance of the review times.

2) ENGINEER has failed to review and return first submission of a Submittal within agreed time indicated on current accepted schedule of submissions or, if no time is indicated thereon, within 30 days.

3) SUBCONTRACTOR demonstrates that delay in progress of Work is directly attributable to ENGINEER's failure to return Submittal within time indicated and accepted by ENGINEER.

b. No adjustment of Contract Times or Price will be allowed due to delays in progress of Work caused by rejection and subsequent resubmission of Submittals, including multiple resubmissions.

2. Review, return for correction, reject, or accept or approve Submittals submissions only as set forth in applicable paragraphs of General Conditions.
3. Stamp and indicate requirements for resubmission and acceptance or approval of Submittal submission.
4. Return Submittals to SUBCONTRACTOR for distribution or revision and resubmission.
5. Transmit to SUBCONTRACTOR without review Submittal submissions received directly from Subcontractors, Suppliers, manufacturers, and nonrequired submissions from SUBCONTRACTOR.

1.2 ADMINISTRATIVE SUBMITTALS

A. Description: Submittals required by Contract Documents that are not Shop Drawings or Samples, or that do not reflect quality of product or method of construction. Administrative Submittals may include, but will not be limited to those Submittals identified below.

B. Copies: Submit five.

C. Applications for Payment (and Cash Allowance Data and Values): Meet requirements of Section 01025, MEASUREMENT AND PAYMENT.

D. Construction Photographs: In accordance with Section 01040, COORDINATION, and as may otherwise be required in the Contract Documents.

E. Progress Reports and Quantity Charts: As may be required in Section 01310, PROGRESS SCHEDULES.

F. Schedules:

1. Progress Schedule(s): Meet the requirements of Section 01310, PROGRESS SCHEDULES.
2. Schedule of Values: Meet requirements of Section 01025, MEASUREMENT AND PAYMENT.

3. Submissions:
   a. Prepare and submit, preliminary list of submissions grouped by Contract Document article/paragraph number or Specification section number, with identification, numbering and tracking system as specified under Paragraph Identification of Submittals and as approved by ENGINEER.
   b. Include only the following required submissions:
      1) Shop Drawings and Samples.
      2) Training plans.
      3) Test procedures.
      4) Operation and maintenance manuals.
      5) Record documents.
      6) Specifically required certificates, warranties, and service agreements.
      7) Listing of Specifications and products for which substitutes or "or-equals" will be proposed.
   c. Identify items for which SUBCONTRACTOR anticipates proposing substitute or "or-equal" products or methods.
   d. Coordinate with progress schedule and prepare submissions to show for each clearly identified Submittal, at a minimum, the following:
      1) Estimated submission date to ENGINEER.
      2) Specifically requested and clearly identified review time if shorter than that set forth herein for ENGINEER, with justification for such request and critical dates Submittals will be needed from ENGINEER.
      3) For first 6-month period from the date the Contract Times commence or following any update or adjustment of the submissions, the estimated submission date shall be week, month, and year; for submissions beyond 6-month time period, show closest month and year.
   e. Submit to ENGINEER monthly (i) updated list if changes have occurred, otherwise submit a written communication confirming existing list, and (ii) adjusted submissions reflecting submission activity planned for forthcoming 6-month time period and beyond. Coordinate with progress schedule updates.

G. Training Materials: Meet the requirements of Section 01640, MANUFACTURERS' SERVICES.

H. Submittals Required by Laws and Regulations and Governing Agencies:

1. Submit promptly notifications, reports, certifications, payrolls, and otherwise as may be required, directly to the applicable federal, state, or local governing agency or their representative.
2. Transmit to ENGINEER for OWNER's records one copy of correspondence and transmittals (to include enclosures and attachments) between SUBCONTRACTOR and governing agency.

1.3 SHOP DRAWINGS

A. Description: All drawings, diagrams, schedules, specified design related submittals, and other data or information to illustrate a portion of the work.

B. Excessive Review: Review of the first submission and two resubmissions of Shop Drawings, test procedures, training plans, and O&M manuals will be performed by ENGINEER and ENGINEER's Consultants, as appropriate, at no cost to SUBCONTRACTOR. Subsequent additional resubmissions of such Submittals will be reviewed by ENGINEER and ENGINEER's Consultants, however ENGINEER will document work hours and other expenses required to perform such additional review(s) and SUBCONTRACTOR shall reimburse CONTRACTOR for these costs.

C. Substitute and "Or-Equal" Items: Meet requirements of General Conditions and Section 01600, MATERIAL AND EQUIPMENT.

D. Copies: Submit six and one reproducible, except copyrighted documents.

E. Submit Shop Drawings to ENGINEER in accordance with General Conditions and as specifically required by individual Specification sections for equipment and materials to be furnished under these Contract Documents.

F. Identify and Indicate:

1. Pertinent Drawing sheet(s) and detail number(s), products, units and assemblies, and system or equipment identification or tag numbers.
2. Critical field dimensions and relationships to other critical features of Work.
3. Each deviation or variation from Contract Documents.

G. Resubmissions: Clearly identify each correction or change made.

H. Foreign Manufacturers: When proposed, include following additional information:

1. Names and addresses of at least two companies closest to Project that maintain technical service representatives.
2. Complete inventory of spare parts and accessories for each piece of equipment.

I. Preparation:

1. Format: Schedule for and combine Shop Drawings required for submission in each Specification section or division into a single Submittal package.
2. Present in a clear and thorough manner and of sufficient detail to show kind, size, arrangement, and function of components, materials, and devices and compliance with Contract Documents. Identify details by reference to sheet and detail, and schedule or room numbers shown on Drawings.
3. Reproducible Copy:
   a. Preferred Minimum Sheet Size: 8-1/2- by 11-inch and 11- by 17-inch pages, suitable for photocopying.
   b. Larger than 11- by 17-Inch Sheets: 22-inch by 34-inch preferred, mylar or sepias suitable for copying in a blueprint machine.

4. Piping Systems: Drawn to scale.
5. Product Data: Clearly mark each copy to identify pertinent products or models and show performance characteristics and capacities, dimensions and clearances required, wiring or piping diagrams and controls, and external connections, anchorages, and supports required.
6. Equipment and Component Titles: Identical to title shown on Drawings.
7. Manufacturer's standard schematic drawings and diagrams as follows:
   a. Modify to delete information that is not applicable to Work.
   b. Supplement standard information to provide information specifically applicable to Work.

J. Design Data:

1. Provide an appropriately licensed professional engineer to perform design, oversee preparation of Shop Drawings, manufacturing, and installation, as appropriate, and to stamp and certify Shop Drawings conform with design requirements and requirements of Laws and Regulations and governing agencies.
2. When specified, provide Project-specific information as required and as necessary to clearly show calculations, dimensions, logic and assumptions, and referenced standards and codes upon which design is based.

K. Disposition: ENGINEER will review, mark, and stamp Shop Drawings as appropriate and distribute marked-up copies as noted.

1. Approved as Submitted (for incorporation in Work):
   a. One copy furnished OWNER.
   b. One copy retained in ENGINEER's file.
   c. Remaining copies will be returned to SUBCONTRACTOR appropriately annotated.
      1) One copy to be kept on file as record document at SUBCONTRACTOR's office at site.
      2) Remaining copies for SUBCONTRACTOR's office file, Subcontractors, or Suppliers.
   d. SUBCONTRACTOR may begin to implement (i) activities to incorporate specific product(s) or (ii) Work covered by Shop Drawing as shown on approved Shop Drawing.
2. Approved as Noted (for incorporation in Work):
   a. One copy furnished OWNER.
   b. One copy retained in ENGINEER's file.
   c. Remaining copies will be returned to SUBCONTRACTOR appropriately annotated.
      1) One copy to be kept on file as a record document at SUBCONTRACTOR's office at the site.
      2) Remaining copies for SUBCONTRACTOR's office file, Subcontractors, or Suppliers.
   d. SUBCONTRACTOR may begin to implement (i) activities to incorporate product(s) or (ii) Work covered by Shop Drawing and in accordance with ENGINEER's notations on Shop Drawing.
   e. Revise copies of Submittal data in operation and maintenance manuals according to exceptions as noted.

3. Disapproved:
   a. Revise/Correct and Resubmit or Develop Replacement and Submit:
      1) One copy retained in ENGINEER's file.
      2) One copy will be returned to SUBCONTRACTOR appropriately annotated.
      3) Remaining copies, if any, will be destroyed.
      4) SUBCONTRACTOR is responsible to revise, correct, and to resubmit Shop Drawing (in same manner and quantity as specified for original submission).
   b. Shop Drawing is not approved.
4. Incomplete:
   a. Complete and Submit or Resubmit Missing Portion(s):
      1) ENGINEER will retain copies of incomplete Submittal and transmit a written list of deficiencies.
      2) SUBCONTRACTOR shall submit specified item(s) to correct the incomplete Submittal.
   b. Shop Drawing is not approved.

1.4 SAMPLES

A. Copies: Submit two, unless otherwise specified in individual Specification section or in sufficient quantity and of size to enable examination as required and to establish quality or equality thereof.

B. Procedure: Submit in accordance with current accepted submissions so as not to delay Work and with sufficient time to allow examination.

C. SUBCONTRACTOR: Responsible for safe and proper delivery of Samples and to prepay cartage charges. Submit additional Samples as may be required.

D. Identification: Clearly indicate Specification section, source, location, date taken, by whom, certification as required and other appropriate information to facilitate ENGINEER's review.

E. Use: Approved Sample items may be incorporated into Work when no longer needed by ENGINEER for reference.

1.5 QUALITY CONTROL SUBMITTALS

A. Certificates:

1. Manufacturer's Certificate of Compliance:
   a. When specified in individual Specification sections or where products are specified to a recognized standard or code, submit prior to shipment of product or material to the site.
   b. ENGINEER may permit use of certain materials or assemblies prior to sampling and testing if accompanied by accepted certification of compliance.
   c. Signed by product manufacturer certifying that materials, manufacture, and product specified conforms to or exceeds specified requirements and intent for which product will be used.

Submit supporting reference data, affidavits, and certifications as appropriate.

d. May reflect recent or previous test results on material or product, but must be acceptable to ENGINEER.

2. Certificates of Successful Testing or Inspection: Submit when testing or inspection is required by Laws and Regulations or governing agency or specified in the individual Specification sections.
3. Manufacturer's Certificate of Proper Installation: As required in Section 01640, MANUFACTURERS' SERVICES. Coordinate with Section 01650, FACILITY STARTUP.

B. Operation and Maintenance Manual: As required in Section 01430, OPERATION AND MAINTENANCE DATA.

C. Statements of Qualification: Evidence of qualification, certification, or registration. As required in these Contract Documents to verify qualifications of professional land surveyors, engineers, materials testing laboratories, specialty Subcontractors, trades, specialists, consultants, installers, and other professionals.

D. Field Samples: Provide as required by individual Specifications and as may be required by ENGINEER during progress of Work.

E. Written Test Reports of Each Test and Inspection: As a minimum, include the following:

1. Date of test and date issued, Project title and number, testing laboratory name, address, and telephone number, and name and signature of laboratory inspector.
2. Date and time of sampling or inspection and record of temperature and weather conditions.
3. Identification of product and Specification section, location of Sample, test or inspection in the Project, type of inspection or test with referenced standard or code, certified results of test.
4. Compliance with Contract Documents, and identifying corrective action necessary to bring materials and equipment into compliance.
5. Provide an interpretation of test results, when requested by ENGINEER.

1.6 CONTRACT CLOSEOUT SUBMITTALS

A. In accordance with Section 01700, CONTRACT CLOSEOUT.

1.7 SUPPLEMENTS

A. The supplements listed below, following "END OF SECTION," are part of this Specification.

1. Forms: Transmittal of SUBCONTRACTOR's Submittal

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

CH2M HILL **TRANSMITTAL OF SUBCONTRACTOR'S SUBMITTAL**
(ATTACH TO EACH SUBMITTAL) DATE:_____

TO:_____
_____
_____
_____
_____

Submittal No.:_____
☐ New Submittal ☐ Resubmittal
Previous Submittal No.:_____
Project:_____
Project No.:_____
Specification Section No.:_____
(Cover only one section with each transmittal)
Schedule Date of Submittal:
_____

FROM:_____
Contractor
_____
_____
_____

SUBMITTAL TYPE: ☐ Shop Drawing ☐ Administrative ☐ Sample
☐ Quality Control ☐ Contract Closeout ☐ "Or-Equal"/Substitute

The following items are hereby submitted:

Number of Copies	Description of Item Submitted (Type, Size, Model Number, Etc.)	Spec. Para. No.	Drawing or Brochure Number	Contains Variation to Contract	
				No	Yes

SUBCONTRACTOR hereby certifies that (i) SUBCONTRACTOR has complied with the requirements of Contract Documents in preparation, review, and submission of designated Submittal and (ii) the Submittal is complete and in accordance with the Contract Documents and requirements of laws and regulations and governing agencies.

By:_____
SUBCONTRACTOR (Authorized Signature)

AR000256

SECTION 01310
PROGRESS SCHEDULES

PART 1 GENERAL

1.1 SUBMITTALS

A. Submit with Each Progress Schedule Submission:

1. SUBCONTRACTOR's certification that progress schedule submission is the actual schedule being utilized for execution of the Work and certification by all Sub-Subcontractors with 5 percent or more of Work that they concur with SUBCONTRACTOR's progress schedule submission.
2. Four Legible Copies of the Progress Schedule: For each computer generated schedule submission.
3. Disk file compatible with Primavera Project Planner (P3) or software approved by ENGINEER.

B. Preliminary Progress Schedule: Submit no later than preconstruction conference.

C. Progress Schedule: Submit adjusted schedule or confirm validity of current schedule with each monthly Application for Payment and at such other times as necessary to reflect: i) progress of Work to within 5 working days prior to submission; ii) changes in Work scope and activities modified since submission; iii) delays in Submittals or resubmittals, deliveries, or Work; iv) adjusted or modified sequences of Work; v) other identifiable changes; and vi) revised projections of progress and completion.

D. Narrative Progress Report: Submit with each monthly submission of progress schedule.

1.2 PROGRESS OF THE WORK

A. If SUBCONTRACTOR fails to complete activity by its latest scheduled completion date and this failure may extend Contract Times (or Milestones), SUBCONTRACTOR shall, within 7 days of such failure, submit a written statement as to how SUBCONTRACTOR intends to correct nonperformance and return to the acceptable current progress schedule. Actions by SUBCONTRACTOR to complete Work within Contract Times (or Milestones) will not be justification for adjustment to Contract Price or Contract Times.

B. CONTRACTOR may order SUBCONTRACTOR to increase plant, equipment, labor force or working hours if SUBCONTRACTOR fails to: (i) complete a critical scheduled activity by its latest Milestone completion date, or (ii) satisfactorily execute Work as necessary to prevent delay to the overall completion of the Project.

1.3 PRELIMINARY PROGRESS SCHEDULE

A. As a minimum, submit two bar charts or preliminary network analysis diagrams as follows:

1. 90-Day Plan: Show major initial activities including, but not limited to, mobilization, permits, submittals for early product procurement and long lead time items, initial site work, and other activities anticipated in the first 90-day period of the Contract Time.
2. Project Overview Plan: Show major components of the Work and the sequence relations between major components and subdivisions of major components. The chart shall indicate the relationship and time frames in which the various facilities will be made substantially complete and placed into service in accordance with the Project Milestones. Sufficient detail shall be included for the identification of subdivisions of major components into such activities as:
   a. Excavation.
   b. Foundation subgrade preparation.
   c. Foundation concrete.
   d. Completion of all structural concrete.
   e. Major mechanical Work.
   f. Major electrical Work.
   g. Instrumentation and control Work.
   h. Other important work for each major facility within the overall Work scope.

   Planned durations and start dates shall be indicated for each Work item subdivision. Each major component and subdivision component shall be accurately plotted on time scale sheets not to exceed 11 inches by 17 inches in size. Not more than four sheets shall be employed to represent this overview information.

B. The preliminary progress schedule, when accepted by the ENGINEER, will be the initially acceptable schedule.

1.4 PROGRESS SCHEDULE

A. General:

1. Schedule(s) shall reflect Work logic sequences, restraints, delivery windows, review times, Contract Times, and Milestones set forth in the Agreement and Section 01040, COORDINATION, and shall begin with the date of Notice to Proceed and conclude with the date of Final Completion.
2. The schedule requirement herein is the minimum required. SUBCONTRACTOR may prepare a more sophisticated schedule if such will aid SUBCONTRACTOR in execution and timely completion of Work.
3. Base schedule on standard 5-day Work week.
4. When bar chart or network analysis schedules are specified, use Primavera Project Planner (P3) latest version or a compatible and approved software.
5. Adjust or confirm schedules on a monthly basis.
6. Float time is a Project resource available to both parties to meet contract Milestones and Contract Times.

7. Use of float suppression techniques such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited, and use of float time disclosed or implied by use of alternate float-suppression techniques shall be shared to proportionate benefit of OWNER and SUBCONTRACTOR.
8. Pursuant to above float-sharing requirement, no time extensions will be granted nor delay damages paid until a delay occurs which (i) impacts Project's critical path, (ii) consumes available float or contingency time, and (iii) extends Work beyond contract completion date.
9. If SUBCONTRACTOR provides an accepted schedule with an early completion date, CONTRACTOR reserves the right to reduce Contract Times to match the early completion date by issuing a deductive Change Order at no change in Contract Price.

B. Format:

1. Bar Chart Schedule, on maximum 11-inch by 17-inch sheet size to include at least:
   a. Identification and listing in chronological order of those activities reasonably required to complete Work, including, but not limited to, subcontract Work, major equipment design, fabrication, factory testing and delivery dates, move-in and other preliminary activities, equipment and equipment system test and startup activities, Project closeout and cleanup, and specified Work sequences, constraints, and Milestones, including Substantial Completion date(s). Listings to be identified by Specification section number.
   b. Identify: (i) horizontal time frame by year, month, and week, (ii) duration, early-start, and completion for each activity and subactivity, and (iii) critical activities and Project float.
   c. Subschedules to further define critical portions of the Work.
   d. Monthly Schedule Submissions: Show overall percent complete, projected and actual, and completion progress by listed activity and subactivity.

1.5 NARRATIVE PROGRESS REPORT

A. Include, as a minimum:

1. Summary of Work completed during the past period between Narrative Progress Reports.
2. Work planned during the next period.
3. Explanation of differences between summary of Work completed and Work planned in previously submitted Narrative Progress Report.
4. Current and anticipated delaying factors and their estimated impact on other activities and completion Milestones.
5. Corrective action taken or proposed.

1.6 CLAIMS FOR ADJUSTMENT OF CONTRACT TIMES

A. Reference General Conditions.
B. Where ENGINEER has not yet rendered formal decision on SUBCONTRACTOR's claim for adjustment of Contract Times, and parties are unable to agree as to amount of adjustment to be reflected in progress schedule, SUBCONTRACTOR shall reflect that amount of time adjustment in progress schedule as ENGINEER may accept as appropriate for the interim. It is understood and agreed that such interim acceptance by ENGINEER will not be binding and will be made only for purpose of continuing to schedule Work, until such time as formal decision as to an adjustment, if any, of the Contract Times acceptable to the ENGINEER has been rendered. SUBCONTRACTOR shall revise progress schedule prepared thereafter in accordance with ENGINEER's formal decision.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 01430
OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 DEFINITIONS

A. Maintenance Operation: As used in the Maintenance Summary Form is defined to mean any routine operation required to ensure satisfactory performance and longevity of equipment. Examples of typical maintenance operations are lubrication, belt tensioning, adjustment of pump packing glands, and routine adjustments.

B. System and Subsystem: Refer to Section 01650, FACILITY STARTUP.

1.2 QUALITY CONTROL SUBMITTALS

A. Operation and Maintenance Manuals: As required in this section and as may be required in the individual Specification sections.

1.3 QUALITY ASSURANCE

A. Manuals for equipment and systems shall be prepared by equipment manufacturer or system Supplier.

1.4 OPERATION AND MAINTENANCE MANUAL–GENERAL

A. Prepare data in the form and format of an instructional manual for use by Borough of Dublin, Pennsylvania, personnel and on electronic media.

B. Manual Format:

1. Size: 8-1/2 inches by 11 inches.
2. Paper: 20-pound minimum, white for typed pages.
3. Text: Manufacturer's printed data, or neatly typewritten.
4. Drawings:
   a. Provide reinforced punched binder tab, bind in with text.
   b. Reduced to 8-1/2 inches by 11 inches, or 11 inches by 17 inches folded to 8-1/2 inches by 11 inches.
   c. Where reduction is impractical, fold and place in 8-1/2-inch by 11-inch envelopes bound in text.
   d. Suitably identify Specification section and product on Drawings and envelopes.
5. Three-hole punch data for binding and composition; arrange printing so that punched holes do not obliterate data.
6. Provide fly-leaf for each separate product, or each piece of operating equipment, with typed description of product and major component parts of equipment and provide with heavy section dividers with numbered plastic index tabs.

7. Provide each manual with title page, and typed table of contents with consecutive page numbers. Place contents of entire set, identified by volume number, in each binder.
8. Cover: Identify each volume with typed or printed title "OPERATION AND MAINTENANCE MANUAL, VOLUME NO.," if applicable, and list:
   a. Project title.
   b. Designate the system or equipment for which it is intended.
   c. Identity of separate structure as applicable.
   d. Identity of general subject matter covered in manual. Identity of equipment number and Specification section.
9. Assemble and bind material in same order as specified, as much as possible.
10. Prepare material in manuals suitable for reproduction, copy clarity, and quality equal to original. Photocopying of material will be acceptable, except for material containing photographs.

C. Binders:

1. Preliminary Manuals: Heavy paper covers.
2. Final Manuals: Commercial quality, substantial, permanent, three-ring binders with durable, cleanable, plastic binders.

D. Table of contents neatly typewritten, arranged in a systematic order:

1. SUBCONTRACTOR, name of responsible principal, address, and telephone number.
2. List of each product required to be included, indexed to content of each volume.
3. List with Each Product: Name, address, and telephone number of Sub-Subcontractor, Supplier, installer, and maintenance contractor, as appropriate.
   a. Identify area of responsibility of each.
   b. Provide local source of supply for parts and replacement.
4. Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.

E. Product Data:

1. Include only those sheets that are pertinent to specific product.
2. Clearly annotate each sheet to:
   a. Identify specific product or part installed.
   b. Identify data applicable to installation.
   c. Delete references to inapplicable information.

F. Drawings: Supplement product data with drawings as necessary to clearly illustrate:

1. Relations of component parts of equipment and systems.
2. Control and flow diagrams.
3. Coordinate drawings with Project record documents to assure correct illustration of completed installation.

4. Do not use Project record documents as maintenance manual drawings.

G. Instructions and Procedures: Within text, as required to supplement product data.

1. Handling, storage, maintenance during storage, assembly, erection, installation, adjusting, testing, operating, shutdown in emergency, troubleshooting, maintenance, interface, and as may otherwise be required.
2. Organize in a consistent format under separate heading for each different procedure.
3. Provide a logical sequence of instructions for each procedure.
4. Provide information sheet for operating personnel, including:
   a. Proper procedures in the event of failure.
   b. Instances that might affect the validity of warranties or Bonds.

H. Warranties, Bonds, and Service Agreements: In accordance with Section 01700, CONTRACT CLOSEOUT.

1.5 MANUALS FOR EQUIPMENT AND SYSTEMS

A. Furnish an operation and maintenance manual for each item of equipment or system as specified in the individual Specification sections in the quantity listed in Article MANUAL SUBMISSION REQUIREMENTS.

B. Content for each unit (or common units) and system, as appropriate, complete including controls, accessories, and appurtenances.

1. Description of Unit and Component Parts:
   a. Function, normal operating characteristics, and limiting conditions.
   b. Performance curves, engineering data, nameplate data, and tests.
   c. Complete nomenclature and commercial number of replaceable parts.
2. Operating Procedures:
   a. Startup, break-in, routine, and normal operating instructions.
   b. Test procedures and results of factory tests where required.
   c. Regulation, control, stopping, and emergency instructions.
   d. Shutdown instructions for both short and extended durations.
   e. Summer and winter operating instructions, as applicable.
   f. Safety precautions.
   g. Special operating instructions.
   h. Installation instructions.
3. Maintenance and Overhaul Procedures:
   a. Routine operations.
   b. Guide to troubleshooting.
   c. Disassembly, removal, repair, reinstallation, and reassembly.
4. Installation Instructions: Including alignment, adjusting, calibrating, and checking.

5. Original manufacturer's parts list, illustrations, detailed assembly drawings showing each part with part numbers and sequentially numbered parts list, and diagrams required for maintenance.
   a. Preventive maintenance and overhaul instructions.
   b. Predicted life of parts subject to wear.
   c. Items recommended to be stocked as spare parts and ordering instructions.
   d. Identify installed spares and other provisions for future work (e.g., reserved panel space, unused components, wiring, terminals).
6. Grease/Oil Points: Instructions and diagrams.
7. Manufacturer's printed operating and maintenance instructions.
8. Description of operation sequence by control manufacturer.
9. List of electrical relay settings, and control and alarm contact settings.
10. Electrical interconnection wiring diagram, including control and lighting systems.
11. As-installed control diagrams by control manufacturer.
12. Results of field functional and performance tests as required.
13. SUBCONTRACTOR's coordination drawings and as-installed, color-coded piping diagrams.
14. Charts of valve tag numbers, with the location and function of each valve.
15. Original manufacturer's recommended spare parts list, manufacturer's current prices, and recommended quantities to be maintained in storage.
16. Other data as required under individual Specification sections.

C. Content for each electric or electronic item or system, as appropriate:

1. Description of Unit and Component Parts:
   a. Function, normal operating characteristics, and limiting conditions.
   b. Performance curves, engineering data, nameplate data, and tests.
   c. Complete nomenclature and commercial number of replaceable parts.
   d. Interconnection wiring diagrams, including all control and lighting systems.
2. Circuit Directories of Panelboards:
   a. Electrical service.
   b. Controls.
   c. Communications.
3. As-installed, color-coded, wiring diagrams.
4. Operating Procedures:
   a. Routine and normal operating instructions.
   b. Sequences required.
   c. Safety precautions.
   d. Special operating instructions.
5. Maintenance Procedures:
   a. Routine operations.
   b. Guide to troubleshooting.
   c. Adjustment and checking.
   d. List of relay settings, control and alarm contact settings.

6. Manufacturer's printed operating and maintenance instructions.
7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.
8. Other data as required under pertinent sections of the Specifications.

D. Prepare and include additional data when the need for such data becomes apparent during instruction of Borough of Dublin personnel.

E. Additional Requirements for Operating and Maintenance Data: See individual Specification sections.

1.6 MANUAL SUBMISSION REQUIREMENTS

A. Manuals for Equipment and Systems:

1. Manual Outline: Submit detailed outline of each manual prior to preparation of Preliminary Manuals.
2. Preliminary Manuals: Deliver three preliminary copies prior to the shipment date for equipment, system, subsystem, or component. Include copy of warranties, Bonds, and service agreements if specified. No partial payments will be made for equipment or systems on hand or installed until preliminary manuals have been submitted.
   a. ENGINEER will review and determine adequacy of content, organization, quality, and fulfillment of requirements of the Contract Documents.
   b. Disposition: In accordance with Section 01300, SUBMITTALS.
   c. If Acceptable:
      1) One copy will be returned to SUBCONTRACTOR.
      2) One copy will be retained in ENGINEER's file.
   d. If Unacceptable:
      1) Two copies will be returned to SUBCONTRACTOR with ENGINEER's comments for revision.
      2) One copy will be retained in ENGINEER's file.
      3) Resubmit three revised preliminary copies for ENGINEER's review.
3. Final Manuals: Submit six final copies not less than 30 days prior to equipment or system field testing or startup.
   a. If final manuals differ from accepted preliminary manuals, submit two copies of any necessary supplemental material, with instructions for insertion, for conforming ENGINEER's copies of preliminary manuals to final manuals.
   b. ENGINEER will compare final manuals with accepted preliminary manuals.
   c. If identical, or otherwise acceptable, SUBCONTRACTOR will be so notified.
      1) One copy will be transmitted to Borough of Dublin.
      2) Five copies will be held for later transmittal to Borough of Dublin.
   d. If rejected, all six copies will be returned to SUBCONTRACTOR for revision; or all copies will be retained

by ENGINEER and the necessary revision data will be requested from SUBCONTRACTOR, at ENGINEER's option.

e. Submit six copies, with instructions for insertion and for revising final manuals of:
   1) Field functional and performance test results, if required, signed by manufacturer's authorized representative.
   2) Final Maintenance Summary Forms as accepted by ENGINEER.
   3) Any revisions found desirable during instruction of Borough of Dublin personnel.
   4) Revised table of contents, as applicable.

1.7 MAINTENANCE SUMMARY

A. Fill out and complete in the order and format of the Maintenance Summary Form bound at the end of this section and described below.

1. Each Maintenance Summary may take as many pages as required.
2. Use only 8-1/2-inch by 11-inch size paper.
3. Use typewriter or electronic printing.

B. Compile an individual Maintenance Summary for each equipment item, respective unit or system, and for components or subunits.

1. Include detailed lubrication instructions and diagrams showing points to be greased or oiled; recommend type, grade, and temperature range of lubricants and frequency of lubrication.
2. All spare parts data to be consistent with manufacturer's Bill of Materials/Parts List furnished in O&M manuals. "Unit" is the unit of measure for ordering the part, e.g., each, lot of 3, box of 100, etc. The term "Quantity" is the number of units recommended. The term "Unit Cost" is the purchase price of a unit at the time the Equipment Data Form is completed.

C. Preliminary Summaries: Submit three copies with, but as a separate submission from, respective operation and maintenance manual.

1. ENGINEER will review.
   a. One copy will be returned to SUBCONTRACTOR with comments.
   b. One copy will be retained for ENGINEER's file.
   c. No partial payments will be made for equipment or systems on hand or installed until preliminary Maintenance Summaries have been submitted to ENGINEER.
2. The manufacturer's standard form will not be an acceptable substitute.

D. Final Summaries: Submit eight final copies not less than 30 days prior to equipment or system field testing or startup with instructions for insertion into the respective final operations and maintenance manual.

1.8 SUPPLEMENTS

A. The supplements listed below, following "END OF SECTION," are part of this Specification.

1. Forms: Maintenance Summary Form.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

MAINTENANCE SUMMARY FORM

PROJECT:_____ CONTRACT NO._____

1. EQUIPMENT ITEM_____

2. MANUFACTURER_____

3. EQUIPMENT/TAG NUMBER(S)_____

4. WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS)_____

5. NAMEPLATE DATA (hp, voltage, speed, etc.)_____

6. MANUFACTURER'S LOCAL REPRESENTATIVE

   a. Name_____ Telephone No._____

   b. Address_____

7. MAINTENANCE REQUIREMENTS

Maintenance Operation Comments	**Lubricant Frequency**	**(If Applicable)**
List briefly each maintenance operation required and refer to specific information in manufacturer's standard maintenance manual, if applicable. (Reference to manufacturer's catalog or sales literature is not acceptable.)	List required frequency of each maintenance operation.	Refer by symbol to lubricant list required.

8. LUBRICANT LIST

Reference Symbol	Shell	Standard Oil	Gulf	Arco	Or Equal
List symbols used in No. 7 above.	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.				

9. RECOMMENDED SPARE PARTS FOR OWNER'S INVENTORY

Part No.	Description	Unit	Quantity	Unit Cost
Note: Identify parts provided by this contract with two asterisks.				

SECTION 01500
CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SUBMITTALS

A. Administrative Submittals: Copies of permits and approvals for construction as required by Laws and Regulations and governing agencies.

1.2 MOBILIZATION

A. Reference the General Conditions.

B. Mobilization shall include, but not be limited to, these principal items:

1. Obtaining required permits.
2. Moving SUBCONTRACTOR's plant and equipment required for first month operations onto site.
3. Installing temporary construction power, wiring, and lighting facilities.
4. Providing onsite communication facilities, including telephones.
5. Providing onsite sanitary facilities and potable water facilities as specified and as required by Laws and Regulations, and governing agencies.
6. Arranging for and erection of SUBCONTRACTOR's work and storage yard.
7. Posting OSHA required notices and establishing safety programs and procedures.
8. Having the SUBCONTRACTOR's superintendent at the site full time.
9. Submitting of initially acceptable schedules.

C. Use area designated for SUBCONTRACTOR's temporary facilities as shown on Drawings.

1.3 PERMITS

A. Permits, Licenses, or Approvals: Obtain in accordance with the General Conditions and retain onsite.

1.4 PROTECTION OF WORK AND PROPERTY

A. Reference the General Conditions.

B. Comply with OWNER's safety rules while on OWNER's property.

C. Keep ENGINEER informed of serious accidents on the site and related claims.

D. Use of Explosives: No blasting or use of explosives will be allowed on the site.

PART 2 PRODUCTS

2.1 ENGINEER'S FIELD OFFICES

A. Furnish equipment specified under the article for the exclusive use of ENGINEER and its representatives.

B. Ownership of equipment furnished under this article will remain, unless otherwise specified, that of the SUBCONTRACTOR.

C. Equipment furnished shall be new or like new in appearance and function.

D. Minimum Features:

1. 110-volt lighting and wall plugs.
2. Fluorescent ceiling lights.
3. Electric heating and self-contained air conditioning unit, properly sized for Project locale and conditions. Provide ample electric power to operate installed systems.
4. Railed stairways and landings at entrances.
5. Exterior Door(s):
   a. Number: Two.
   b. Type: Solid core.
   c. Lock(s): Cylindrical; keyed alike.
6. Number of Windows: Two.
7. Minimum Interior Height: 8 feet.

E. Trailer Type Mobile Structure: One.

F. Floor Space: Minimum 320 square feet.

G. All-metal frame; all-metal exterior, sides, and roof; and insulated double walls, floor, and roof.

H. Security guard screens on all windows.

I. Portable toilet to be installed outside of trailer.

J. Blinds or drapes on all windows.

K. Work Surface: One, 30 inches by 10 feet at desk height.

L. Office Equipment:

1. Bottled Water Service: One, with cooler capable of producing hot water and cold water.
2. Paper Cup Dispenser with Cups: One each.
3. Paper Towel Dispenser with Towels: One each.
4. Desk: One, steel, 30 inches by 60 inches.

5. Swivel Chair: One.
6. Folding Table: One, 36 inches by 72 inches.
7. Steel Folding Chairs: Four.
8. Drafting Table: One, 3 feet by 6 feet.
9. Drafting Stool: One.
10. Four-Drawer Steel File with Lock: One, legal width.
11. Drawing Rack with Drawing Hangers: Two each.
12. Bookcase: Two each, 36 inches wide by 48 inches high.
13. Wastepaper Basket: Two.
14. Clothes Rack: One.
15. First-Aid Kit: One.
16. Carbon Dioxide (10-Pound) Fire Extinguisher: One.
17. Telephone: Two, with two incoming/outgoing lines, Touch-Tone, with conference speaker, and 12-foot coiled handset cord.
18. Facsimile (Fax) Machine, AT&T 3520, with connecting cables.

2.2 PROJECT SIGN

A. Provide and maintain an 8-foot wide by 4-foot high sign constructed of 3/4-inch exterior high density overlaid plywood. Sign shall bear the name of Project, EPA, Subcontractor, Contractor, and other participating agencies. Lettering shall be blue applied on a white background by an experienced sign painter. Paint shall be exterior type enamel. The lettering, detail, and location of sign will be provided by the Contractor.

PART 3 EXECUTION

3.1 ENGINEER'S FIELD OFFICE

A. Make available for ENGINEER's use prior to the start of Work at site, to remain on the site for a minimum of 30 days after final acceptance of the Work.

B. Locate where directed by ENGINEER; level, block, tie down, skirt, and relocate when necessary and approved. Construct on proper foundations, provide proper surface drainage and connections for utility services.

C. Provide minimum 100 square feet of gravel or crushed rock base, minimum depth of 4 inches, at each entrance.

D. Raise grade under field office, as necessary, to an elevation adequate to avoid flooding.

E. Provide sanitary facilities in compliance with state and local health authorities.

F. Exterior Door Keys: Furnish two sets of keys.

G. Telephone:

1. Provide number of incoming lines equal to that specified for the telephone type.

2. Provide appropriate jacks; locate as directed by the ENGINEER.
3. Provide all wiring necessary for a completed telephone system.

H. Computer: Provide all required connecting cables and plugs.

I. Maintain in good repair and appearance, and provide weekly cleaning service and replenishment, as required, of paper towels, paper cups, hand soap, toilet paper, first-aid kit supplies, and bottled water.

J. Replenish, as needed, facsimile paper, typewriter and calculator ribbon, and duplicator paper and toner.

3.2 TEMPORARY UTILITIES

A. Power: No electric power is available at the site. Make arrangements to obtain and pay for electrical power used until final payment and acceptance by the OWNER, unless otherwise recommended by ENGINEER at Substantial Completion.

B. Lighting: Provide temporary lighting at least to meet all applicable safety requirements to allow erection, application or installation of materials and equipment, and observation or inspection of the Work.

C. Heating, Cooling, and Ventilating:

1. Provide as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation of materials, and to protect materials, equipment, and finishes from damage due to temperature or humidity. Costs for temporary heat shall be borne by the SUBCONTRACTOR responsible for constructing the structure or building as specified in Section 01010, SUMMARY OF WORK.
2. Provide adequate forced air ventilation of enclosed areas to cure installed materials, to dispense humidity, and to prevent hazardous accumulations of dust, fumes, vapors, or gases.
3. Pay all costs of installation, maintenance, operation, removal, and fuel consumed.
4. Provide portable unit heaters, complete with controls, oil- or gas-fired, and suitably vented to outside as required for protection of health and property.
5. If permanent natural gas piping is used for temporary heating units, do not modify or reroute gas piping without approval of utility company. Provide separate gas metering as required by utility.

D. Water: No construction or potable water is available at the site. Make arrangements for and bear costs of providing water required for construction purposes and for drinking by construction personnel during the Project construction.

E. Sanitary and Personnel Facilities: Provide and maintain facilities for SUBCONTRACTOR's employees, Sub-Subcontractors, and all other onsite

employer's employees. Service, clean, and maintain facilities and enclosures.

F. Telephone Service:

1. Arrange and provide onsite telephone service for SUBCONTRACTOR's use during construction. Pay all costs of installation and monthly bills.
2. Arrange and provide ENGINEER's telephone system. Pay for all installation and basic monthly billing charges. SUBCONTRACTOR shall pay ENGINEER's long distance telephone charges from a $300 monthly allowance. At Project completion, the difference between total actual long distance charges and the cumulative amount of this allowance will be adjusted by Change Order.

G. Fire Protection: Furnish and maintain on the site adequate firefighting equipment capable of extinguishing incipient fires. Comply with applicable parts of the National Fire Prevention Standard for Safeguarding Building Construction Operations (NFPA No. 241).

3.3 PROTECTION OF WORK AND PROPERTY

A. General:

1. Perform Work within rights-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
2. Maintain in continuous service all existing oil and gas pipelines, underground power, telephone or communication cable, water mains, irrigation lines, sewers, poles and overhead power, and all other utilities encountered along the line of work, unless other arrangements satisfactory to owners of said utilities have been made.
3. Where completion of Work requires temporary or permanent removal and/or relocation of an existing utility, coordinate all activities with owner of said utility and perform all work to their satisfaction.
4. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.
5. Keep fire hydrants and water control valves free from obstruction and available for use at all times.
6. In areas where the SUBCONTRACTOR's operations are adjacent to or near a utility such as gas, telephone, television, electric power, water, sewer, or irrigation system and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection thereof have been made by the SUBCONTRACTOR.
7. Notify property owners and utility offices which may be affected by the construction operation at least 2 days in advance.
   a. Before exposing a utility, obtain utility owner's permission. Should service of utility be interrupted due to the SUBCONTRACTOR's operation, notify proper authority

immediately. Cooperate with said authority in restoring service as promptly as possible and bear costs incurred.

8. Do not impair operation of existing sewer systems. Prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, or other sewer structures. Maintain original site drainage wherever possible.

B. Site Security:

1. Security Fence:
   a. Erect a temporary security fence where shown on the Drawings. Maintain the fence throughout the construction period. Obtain the ENGINEER's written permission before removal of temporary security fencing.
   b. Provide and maintain additional temporary security fences as necessary to protect the Work and SUBCONTRACTOR-furnished products not yet installed.

C. Tree and Plantings:

1. Protect from damage and preserve trees, shrubs, and other plants outside the limits of the Work and within the limits of the Work which are designated on the Drawings to remain undisturbed.
   a. Where practical, tunnel beneath trees when on or near the line of trench.
   b. Employ hand excavation as necessary to prevent tree injury.
   c. Do not stockpile materials or permit traffic within drip lines of trees.
   d. Provide and maintain temporary barricades around trees.
   e. Water vegetation as necessary to maintain health.
   f. Cover temporarily exposed roots with wet burlap, and keep the burlap moist until soil is replaced around the roots.
   g. No trees, except those specifically shown on Drawings to be removed, shall be removed without written approval of the ENGINEER.
   h. Dispose of removed trees in a legal manner off the site.
2. The balling and burlapping of trees indicated for replacement shall conform to the recommended specifications set forth in the American Standards for Nursery Stock, published by American Association of Nurserymen. All balls shall be firm and intact and made-balls will not be accepted. Handle ball and burlap trees by the ball and not by the top.
3. In the event of damage to bark, trunks, limbs, or roots of plants that are not designated for removal, treat damage by corrective pruning, bark tracing, application of a heavy coating of tree paint, and other accepted horticultural and tree surgery practices.
4. Replace each plant that dies as a result of construction activities.

D. Existing Structures: Where SUBCONTRACTOR contemplates removal of small structures such as mailboxes, signposts, and culverts that interfere with SUBCONTRACTOR's operations, obtain approval of property owner

and ENGINEER. Replace those removed in a condition equal to or better than original.

E. Finished Construction: Protect finished floors and concrete floors exposed as well as those covered with composition tile or other applied surfacing.

F. Waterways: Keep ditches, culverts, and natural drainages continuously free of construction materials and debris.

G. Dewatering: Construct, maintain, and operate cofferdams, channels, flume drains, sumps, pumps, or other temporary diversion and protection works. Furnish materials required, install, maintain, and operate necessary pumping and other equipment for the environmentally safe removal and disposal of water from the various parts of the Work. Maintain the foundations and parts of the Work free from water.

H. Archaeological Finds:

1. General: Be watchful for potential archaeological artifacts. Should finds of an archaeological or paleontological nature be made within the limits of the site, immediately notify ENGINEER and proceed in accordance of the General Conditions. If finds are discovered, the area extending out to an 85-foot radius will be deemed a preliminary protection area. Continue Work in areas outside of the preliminary protection area without interruption.
2. Archaeological Finds: Evidence of human occupation or use of an area within the contract limits prior to the Year 1840. Evidence may consist of skeletons, stone, or other utensils, or evidence of habitations or structures.
3. Paleontological Finds: Evidence of prehistoric plant or animal life, such as skeletons, bones, fossils, or casts and other indications such as pictographs.
4. ENGINEER may order Work stopped in other areas if, in ENGINEER's opinion, the find is more extensive than may appear from uncovered material.
5. Protection of Finds:
   a. Cover, fence, or otherwise protect finds until notice to resume Work is given.
   b. Cover finds with plastic film held in place by earth, rocks, or other weights placed outside the find. Should additional backfilling be necessary for safety or to prevent caving, place backfill material loosely over the plastic film.
   c. Sheet or shore as necessary to protect excavations underway. Place temporary fence to prevent unauthorized access.
   d. Dewater finds made below the water table as necessary to protect construction Work underway. Divert groundwater or surface runoff away from find by ditching or other acceptable means.
6. Removal of Finds:
   a. All finds shall be considered as the property of the land owner. Do not remove or disturb finds without the ENGINEER's written authorization.

b. Should OWNER elect to have a find removed, provide equipment, labor, and material to permit the safe removal of the find without damage. Provide transportation for delivery to individuals, institutions, or other places as the OWNER may find desirable, expedient, or required by law.

7. Time and Compensation:
   a. Should this contract be delayed beyond the required time of completion because of a stop-Work order issued under the provisions of this section, the time of completion will be appropriately extended by Change Order.
   b. Should the need for labor, materials, or equipment be required under this article, it shall be considered as extra Work in accordance with the General Conditions.

I. Endangered Species:

1. Take precautions necessary and prudent to protect native endangered flora and fauna.
2. Notify ENGINEER of construction activities that might threaten endangered species or their habitats.
3. ENGINEER will mark areas known as habitats of endangered species prior to commencement of onsite activities.
4. Additional areas will be marked by ENGINEER, as other habitats of endangered species become known during construction.

3.4 TEMPORARY CONTROLS

A. Air Pollution Control:

1. Minimize air pollution from construction operations.
2. Burning of waste materials, rubbish, or other debris will not be permitted on or adjacent to the site.
3. Conduct operations of dumping rock and of carrying rock away in trucks to cause a minimum of dust. Give unpaved streets, roads, detours, or haul roads used in the construction area a dust-preventive treatment or periodically water to prevent dust. Strictly adhere to applicable environmental regulations for dust prevention.
4. Provide and maintain temporary dust-tight partitions, bulkheads, or other protective devices during construction to permit normal operation of existing facilities. Construct partitions of plywood, insulating board, plastic sheets, or similar material. Construct partitions in such a manner that dust and dirt from demolition and cutting will not enter other parts of existing building or facilities. Remove temporary partitions as soon as the need no longer exists.

B. Noise Control:

1. Provide acoustical barriers so noise emanating from tools or equipment will not exceed legal noise levels.
2. Noise Control Plans: Proposed plan to mitigate construction noise impacts and to comply with noise control ordinances including method of construction, equipment to be used, and acoustical treatments.

C. Water Pollution Control:

1. Divert sanitary sewage and nonstorm waste flow interfering with construction and requiring diversion to sanitary sewers. Do not cause or permit action to occur which would cause an overflow to an existing waterway.
2. Prior to commencing excavation and construction, obtain ENGINEER's agreement with detailed plans showing procedures intended to handle and dispose of sewage, groundwater, and stormwater flow, including dewatering pump discharges.
3. Comply with procedures outlined in U.S. Environmental Protection Agency manuals entitled, "Guidelines for Erosion and Sedimentation Control Planning" and "Implementation, Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity," and "Erosion and Sediment Control—Surface Mining in Eastern United States."
4. Do not dispose of volatile wastes such as mineral spirits, oil, chemicals, or paint thinner in storm or sanitary drains. Disposal of wastes into streams or waterways is prohibited. Provide acceptable containers for collection and disposal of waste materials, debris, and rubbish.

D. Erosion, Sediment, and Flood Control: Provide, maintain, and operate temporary facilities to control erosion and sediment releases, and to protect Work and existing facilities from flooding during construction period.

3.5 STORAGE YARDS AND BUILDINGS

A. Coordinate requirements with Section 01600, MATERIAL AND EQUIPMENT.

B. Temporary Storage Yards: Construct temporary storage yards for storage of products that are not subject to damage by weather conditions.

C. Temporary Storage Buildings:

1. Provide environmental control systems that meet recommendations of manufacturers of equipment and materials stored.
2. Arrange or partition to provide security of contents and ready access for inspection and inventory.
3. Store combustible materials (paints, solvents, fuels, etc.) in a well-ventilated and remote building meeting safety standards.

3.6 TRAFFIC REGULATION

A. Traffic Safety and Access:

1. Comply with rules and regulations of the city, state, borough, and county authorities regarding closing or restricting the use of public streets or highways. No public or private road shall be closed, except by written permission of the proper authority. Assure the least possible obstruction to traffic and normal commercial pursuits.

2. Where traffic will pass over backfilled trenches before they are paved, maintain top of trench to allow normal vehicular traffic to pass over. Provide temporary access driveways where required. Cleanup operations shall follow immediately behind backfilling.
3. When flagmen and guards are required by regulation or when deemed necessary for safety, furnish them with approved orange wearing apparel and other regulation traffic control devices.
4. Traffic control procedures and devices used on all local, county, and state rights-of-way shall meet the requirements of the applicable current laws and regulations for traffic control. See Article TRAFFIC REGULATION.
5. Provide snow removal to facilitate normal vehicular traffic on public or private roads affected by construction. Perform snow removal promptly and efficiently by means of suitable equipment whenever necessary for safety, and as may be directed by proper authority.
6. Notify the fire department and police department before closing any street or portion thereof. Notify said departments when the streets are again passable for emergency vehicles. Do not block off emergency vehicle access to consecutive arterial crossings or dead-end streets, in excess of 300 linear feet, without written permission from the fire department. Conduct operations with the least interference to fire equipment access, and at no time prevent such access.
7. Subcontractor shall leave its night emergency telephone number or numbers with the police department, so that contact may be made easily at all times in case of barricade and flare trouble or other emergencies.
8. Maintain postal service facilities in accordance with the requirements of the U.S. Postal Service. Move mailboxes to temporary locations designated by the Service, and on completion of work in each area replace them in their original location and in a condition satisfactory to the Service.

B. Traffic Control:

1. Prior to starting work at project site, SUBCONTRACTOR shall submit traffic routing plans to the CONTRACTOR for review and approval. The traffic routing plan shall be in conformance with Pennsylvania Department of Transportation Publication No. 203. The traffic control plan shall include the following minimum:
   a. Sequences of construction affecting the use of roadways.
   b. Time required for each phase of the work.
   c. Provisions for decking over excavations or phasing of operations, or a combination of these two methods, to provide necessary access.
   d. Signing, barricading, and striping to provide:
      1) Passages for pedestrians.
      2) Number and width of vehicular lanes over and adjacent to trenches and other excavations.
2. This provision shall not be construed as preventing the Subcontractor from proceeding with mobilization of plant and equipment, and from placing orders for materials upon receipt of Notice to Proceed.

Subcontractor shall not be entitled to delays due to "DISAPPROVED" traffic routing plans.

C. Detour Striping: Five days prior to starting work on each sequence of the project where detour striping is required, notify the Pennsylvania Department of Transportation and/or the Borough of Dublin so the State or Borough, as appropriate, can approve the detour striping. The Subcontractor shall clean the pavement in the area to be marked and have personnel available to adjust barricading for the detour modification. When detour striping is no longer needed, notify Pennsylvania Department of Transportation and the Borough of Dublin and sandblast off temporary detour lane markings which would not conform to permanent existing striping.

D. Signs and Equipment:

1. Furnish at the site, or convenient to and immediately available to the site, the following signs and equipment:
   a. Barricades, as required by the Pennsylvania Department of Transportation Publication No. 203, in sufficient quantity to safeguard the public and the work.
   b. Portable "TOW-AWAY—NO STOPPING" signs, placed where approved by Borough and State police department.
   c. Traffic cones, to delineate traffic lanes to guide and separate traffic movements.
   d. A minimum of two high-level warning flag units, in advance of traffic approaching the work, each displaying three flags mounted at a height of 9 feet.
   e. A minimum of four "ROAD CONSTRUCTION AHEAD" signs, size 48 inches by 48 inches, placed in conspicuous locations, in advance of the work, and facing approaching traffic.
   f. A minimum of two "DETOUR" signs, right arrow or left arrow, placed as approved by Contractor.
   g. A minimum of two "RIGHT" or "LEFT LANE CLOSED AHEAD" signs, placed in advance of the lane to be closed.
2. Spacing of all signs shall conform to the requirements of the Pennsylvania Department of Transportation Publication 203.
3. Signs and equipment shall conform to requirements of the Pennsylvania Department of Transportation Publication 203.

E. Coordination: The SUBCONTRACTOR shall coordinate the traffic routing work with that of other forces working in the same or adjacent areas. Proposed traffic routing changes shall be subject to review by the CONTRACTOR, the Pennsylvania Department of Transportation, and the Borough of Dublin, and shall be considered a revision to the approved traffic routing plan.

3.7 PARKING AREAS

A. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, OWNER's operations, or construction operations.

B. Provide parking facilities for personnel working on the Project.

3.8 CLEANING DURING CONSTRUCTION

A. General:

1. Wet down exterior surfaces prior to sweeping to prevent blowing of dust and debris. At least weekly, sweep all floors (basins, tunnels, platforms, walkways, roof surfaces), and pick up all debris and dispose.
2. Provide approved containers for collection and disposal of waste materials, debris, and rubbish. At least at weekly intervals, dispose of such waste materials, debris, and rubbish offsite.
3. At least weekly, brush sweep the entry drive and roadways, and all other streets and walkways affected by Work and where adjacent to Work.

END OF SECTION

SECTION 01600
MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.1 DEFINITIONS

A. Products:

1. New items for incorporation in the Work, whether purchased by SUBCONTRACTOR, CONTRACTOR, or OWNER for the Project, or taken from previously purchased stock and may also include existing materials or components required for reuse.
2. Includes the terms material, equipment, machinery, components, subsystem, system, hardware, software, and terms of similar intent and is not intended to change the meaning of such other terms used in the Contract Documents as those terms are self-explanatory and have well recognized meanings in the construction industry.
3. Items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.

1.2 DESIGN REQUIREMENTS

A. Provide systems, equipment, and components, including supports and anchorages, in accordance with the provisions of the National Building Code (BOCA) 1993 edition.

1. Wind, snow load, and seismic design criteria shall be as specified on Drawing S-1.

1.3 SUBMITTALS

A. Administrative Submittals:

1. List of all proposed substitute or "or-equal" items/methods.
2. Schedule of factory tests required by Contract Documents. Identify tests for which ENGINEER's presence has been specified.

B. Quality Control Submittals:

1. Factory Tests: As specified in the individual Specifications.
   a. Procedures: Preliminary outlines.
      1) Final Accepted Procedures: Prior to start of factory testing.
   b. Test Documentation: Results of successful testing, including certification of procedures and results.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Altitude: Provide materials and equipment suitable for installation and operation under rated conditions at 500 feet above sea level.

B. Provide equipment and devices installed outdoors or in unheated enclosures capable of continuous operation within an ambient temperature range of 0 degrees F to 100 degrees F.

1.5 PREPARATION FOR SHIPMENT

A. When practical, factory assemble products. Matchmark or tag separate parts and assemblies to facilitate field assembly. Cover machined and unpainted parts that may be damaged by the elements with a strippable protective coating.

B. Package products to facilitate handling and protect from damage during shipping, handling, and storage. Mark or tag outside of each package or crate to indicate its purchase order number, bill of lading number, contents by name, name of Project and SUBCONTRACTOR, equipment number, and approximate weight. Include complete packing lists and bills of materials with each shipment.

C. Spare Parts, Special Tools, Test Equipment, Expendables, and Maintenance Materials:

1. Furnish as required by the Specifications prior to (i) starting functional testing as set forth in Section 01650, FACILITY STARTUP, or (ii) operation of the equipment by the OWNER, or (iii) 75 percent Project completion, whichever occurs first.
2. Properly package to avoid damage, in original cartons insofar as possible. Replace parts damaged or otherwise inoperable.
3. Firmly fix to, and prominently display on, each package.
   a. Minimum 3-inch by 6-inch manila shipping tag with the following information printed clearly:
      1) Manufacturer's part description and number.
      2) Applicable equipment description.
      3) Quantity of parts in package.
      4) Equipment manufacturer.
      5) Applicable Specification section.
      6) Name of SUBCONTRACTOR.
      7) Project name.
4. Deliver materials to site.

D. Protect equipment from exposure to the elements and keep thoroughly dry and dustfree at all times. Protect painted surfaces against impact, abrasion, discoloration, or other damage. Grease or oil all bearings and similar items.

E. Request a minimum 7-day advance notice of shipment from manufacturers.

F. Factory Test Results: Reviewed and accepted by ENGINEER before product shipment as required in individual Specification sections.

1.6 DELIVERY AND INSPECTION

A. Deliver products in accordance with the accepted current progress schedule and coordinate to avoid conflict with Work and conditions at the site. Deliver anchor bolts and templates sufficiently early to permit setting prior to placement of structural concrete.

B. Deliver products in undamaged condition, in manufacturer's original container or packaging, with identifying labels intact and legible. Include on label date of manufacture and shelf life, where applicable. Include UL labels on products so specified.

C. Unload products in accordance with manufacturer's instructions for unloading, or as specified. Record the receipt of products at the site. Inspect for completeness and evidence of damage during shipment.

D. Remove damaged products from the site and expedite delivery of identical new undamaged products and remedy incomplete or lost products to provide that specified, so as not to delay the progress of the Work.

1.7 HANDLING, STORAGE, AND PROTECTION

A. Handle products in accordance with the manufacturer's written instructions, and in a manner to prevent damage. Store products, upon delivery, in accordance with manufacturer's instructions, with labels intact and legible, in approved storage yards or sheds provided in accordance with Section 01500, CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS. Provide manufacturer's recommended maintenance during storage, installation, and until products are accepted for use by OWNER.

B. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration. Keep running account of products in storage to facilitate inspection and to estimate progress payments for products delivered but not installed in the Work.

C. Store electrical, instrumentation, and control products, and equipment with bearings in weathertight structures maintained above 60 degrees F. Protect electrical, instrumentation, and control products, and insulation against moisture, water, and dust damage. Connect and operate continuously all space heaters furnished in electrical equipment.

D. Store fabricated products aboveground, on blocking or skids, and prevent soiling or staining. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter. Cover products that are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.

E. Store finished products that are ready for installation in dry and well ventilated areas. Do not subject to extreme changes in temperature or humidity.

F. Hazardous Materials: Prevent contamination of personnel, the storage building, and the site. Meet the requirements of the product specifications, codes, and manufacturer's instructions.

1.8 SUBSTITUTE AND "OR-EQUAL" PRODUCTS

A. Meet the requirements of the General Conditions, the Specification sections, and as set forth herein.

B. Listing of proposed substitute or "or-equal" items or methods.

1. With consideration of the additional evaluation time necessary for ENGINEER's review of such items, indicate for each item the review status (either substitute or "or-equal") and estimated submission date.
2. SUBCONTRACTOR, in indicating the review status of the proposed item, acknowledges that the time shown for ENGINEER's review on the current accepted schedule is sufficient only to allow ENGINEER to accomplish review for the status indicated and not sufficient to perform both a review for "or-equal" status and a subsequent review for substitute status on the same product.
3. ENGINEER may return unreviewed those submissions (i) not shown on the current accepted schedule, (ii) for which the review status differs from that indicated on the accepted list unless previously approved in writing by ENGINEER, (iii) not in accordance with the General Conditions and as specified herein, (iv) which are incomplete, or (v) which are uncertified, in which case SUBCONTRACTOR shall provide the specified product.

C. Submit seven copies of proposed substitute or "or-equal" item/method, to include all supporting data to allow ENGINEER's review. Complete, sign, and transmit with each proposed substitute or "or-equal" item/method submission.

D. Disposition of "Or-Equal" Item: In accordance with Article SHOP DRAWINGS in Section 01300, SUBMITTALS, or in accordance with following paragraph.

E. Disposition of Substitute Item/Method:

1. Accepted: ENGINEER will evidence such acceptance by recommendation of a Change Order for SUBCONTRACTOR, CONTRACTOR, and OWNER execution. Such Change Order will accompany ENGINEER's evaluation and acceptance of SUBCONTRACTOR's proposed substitute.
2. Rejected:
   a. One copy retained by ENGINEER.
   b. One copy returned to SUBCONTRACTOR with a commentary by ENGINEER.

c. Remaining copies will be destroyed.
d. SUBCONTRACTOR shall provide item specified in Contract Documents.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide manufacturer's standard materials suitable for service conditions unless otherwise specified in the individual Specifications.

B. Where product specifications include a named manufacturer, with or without model number, and also include performance requirements, named manufacturer's products must meet the performance specifications.

C. Like items of products furnished and installed in the Work shall be end products of one manufacturer and of the same series or family of models to achieve standardization for appearance, operation and maintenance, spare parts and replacement, and manufacturer's services and implement same or similar process instrumentation and control functions in same or similar manner.

D. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

E. Provide interchangeable components of the same manufacturer, for similar components, unless otherwise specified.

F. Equipment, Components, Systems, Subsystems: Design and manufacture with due regard for health and safety of operation, maintenance, and accessibility, durability of parts, and shall comply with applicable OSHA, state, and local health and safety regulations. .

G. Safety Guards: Provide for all belt or chain drives, fan blades, couplings, or other moving or rotary parts. Cover rotating part on all sides. Design for easy installation and removal. Use 16-gauge or heavier; galvanized steel, aluminum coated steel, or galvanized or aluminum coated 1/2-inch mesh expanded steel. Provide galvanized steel accessories and supports, including bolts. For outdoors application, prevent entrance of rain and dripping water.

H. Provide materials and equipment listed by UL wherever standards have been established by that agency.

I. Equipment Finish:

1. Provide manufacturer's standard finish and color, except where specific color is indicated.
2. If manufacturer has no standard color, provide equipment with light gray color.

J. Special Tools and Accessories: Furnish to OWNER, upon acceptance of equipment, all accessories required to place each item of equipment in full operation. These accessory items include, but are not limited to, adequate oil and grease (as required for first lubrication of equipment after field testing), light bulbs, fuses, hydrant wrenches, valve keys, handwheels, chain operators, special tools, and other spare parts as required for maintenance.

K. Lubricant: Provide initial lubricant recommended by equipment manufacturer in sufficient quantity to fill lubricant reservoirs and to replace consumption during testing, startup, and operation until final acceptance by OWNER.

2.2 FABRICATION AND MANUFACTURE

A. General:

1. Manufacture parts to U.S.A. standard sizes and gauges.
2. Two or more items of the same type shall be identical, by the same manufacturer, and interchangeable.
3. Design structural members for anticipated shock and vibratory loads.
4. Use 1/4-inch minimum thickness for steel that will be submerged, wholly or partially, during normal operation.
5. Modify standard products as necessary to meet performance Specifications.

B. Lubrication System:

1. Require no more than weekly attention during continuous operation.
2. Convenient and accessible. Oil drains with bronze or stainless steel valves and fill plugs easily accessible from the normal operating area or platform. Locate drains to allow convenient collection of oil during oil changes without removing equipment from its installed position.
3. Provide constant-level oilers or oil level indicators for oil lubrication systems.
4. For grease type bearings, which are not easily accessible, provide and install stainless steel tubing; protect and extend tubing to convenient location with suitable grease fitting.

2.3 SOURCE QUALITY CONTROL

A. Where Specifications call for factory testing to be witnessed by ENGINEER, notify ENGINEER not less than 14 days prior to scheduled test date, unless otherwise specified.

B. Calibration Instruments: Bear the seal of a reputable laboratory certifying that instrument has been calibrated within the previous 12 months to a standard endorsed by the National Institute of Standards and Technology (NIST).

C. Factory Tests: Perform in accordance with accepted test procedures and document successful completion.

PART 3 EXECUTION

3.1 INSPECTION

A. Inspect materials and equipment for signs of pitting, rust decay, or other deleterious effects of storage. Do not install material or equipment showing such effects. Remove damaged material or equipment from the site and expedite delivery of identical new material or equipment. Delays to the Work resulting from material or equipment damage which necessitates procurement of new products will be considered delays within SUBCONTRACTOR's control.

3.2 INSTALLATION

A. Equipment Drawings show general locations of equipment, devices, and raceway, unless specifically dimensioned.

B. No shimming between machined surfaces is allowed.

C. Install Work in accordance with NECA Standard of Installation, unless otherwise specified.

D. Repaint painted surfaces that are damaged prior to equipment acceptance.

E. Handle, install, connect, clean, condition, and adjust products in accordance with manufacturer's instructions and as may be specified. Retain a copy of manufacturers' instruction at site, available for review at all times.

F. For material and equipment specifically indicated or specified to be reused in the Work:

1. Use special care in removal, handling, storage, and reinstallation to assure proper function in the completed Work.
2. Arrange for transportation, storage, and handling of products that require offsite storage, restoration, or renovation. Include costs for such Work in the Contract Price.

3.3 FIELD FINISHING

A. In accordance with Section 09900, PAINTING.

3.4 ADJUSTMENT AND CLEANING

A. Perform required adjustments, tests, operation checks, and other startup activities.

3.5 LUBRICANTS

A. Fill lubricant reservoirs and replace consumption during testing, startup, and operation prior to acceptance of equipment by OWNER.

END OF SECTION

SECTION 01640
MANUFACTURERS' SERVICES

PART 1 GENERAL

1.1 DEFINITIONS

A. Reference Section 01650, FACILITY STARTUP.

B. Person-Day: One person for 8 hours within regular SUBCONTRACTOR working hours.

1.2 SUBMITTALS

A. Training Schedule: Submit not less than 21 days prior to start of equipment installation and revise as necessary for acceptance.

B. Preliminary Training Plan: Submit within 60 days after Notice to Proceed.

C. Final Training Plan: Submit after training coordination meeting.

D. Training Materials:

1. Submit written outlines of proposed training sessions not less than 21 days prior to scheduled training.
2. Furnish complete training materials, to include operation and maintenance data as required in this section to be retained by each trainee.

E. Quality Control Submittals: When specified in the individual Specifications, submit:

1. Manufacturer's Certificate of Proper Installation: On form appended to this section.

1.3 QUALIFICATION OF MANUFACTURER'S REPRESENTATIVE

A. Authorized representative of the manufacturer, factory trained, and experienced in the technical applications, installation, operation, and maintenance of respective equipment, subsystem, or system. Representative subject to acceptance by ENGINEER. No substitute representatives will be allowed unless prior written approval by ENGINEER has been given.

1.4 FULFILLMENT OF SPECIFIED MINIMUM SERVICES

A. Where manufacturers' services are specified, furnish manufacturer's qualified representative. Where time is necessary in excess of that stated in the Specifications for manufacturers' services, additional time required to perform the specified services shall be considered incidental work.

B. Schedule manufacturer's onsite services to avoid conflicting with other onsite testing or other manufacturer's onsite services.

1. Determine that all conditions necessary to allow successful testing have been met before scheduling services.

C. Only those days of service approved by ENGINEER will be credited to fulfill the specified minimum services.

D. If specified, manufacturer's onsite services shall include as a minimum:

1. Assistance during installation to include observation, guidance, instruction of SUBCONTRACTOR's assembly, erection, installation or application procedures.
2. Inspection, checking, and adjustment as required for equipment to function as warranted by manufacturer and necessary to furnish written approval of installation.
3. Revisiting the site as required to correct problems and until installation and operation are acceptable to ENGINEER.
4. Resolution of assembly or installation problems attributable to, or associated with, respective manufacturer's products and systems.
5. Assistance during functional and performance testing and startup demonstration, and until product acceptance by the OWNER.
6. Training of Borough of Dublin personnel in the operation and maintenance of respective product as required herein.
7. Completion of Manufacturer's Certificate of Proper Installation (form enclosed at end of this section) with applicable certificates for proper installation and initial, interim, and final test or service.

1.5 TRAINING SCHEDULE

A. List specified equipment and systems with respective manufacturers that require training services of manufacturers' representatives and show:

1. Estimated dates for installation completion.
2. Estimated training dates to allow for multiple sessions when several shifts are involved.

B. Adjust training schedule to ensure training of appropriate personnel as deemed necessary by Borough of Dublin, and to allow full participation by manufacturers' representatives. Adjust schedule for interruptions in operability of equipment.

C. Coordinate with Section 01310, PROGRESS SCHEDULES and Section 01650, FACILITY STARTUP.

1.6 TRAINING PLAN

A. Preliminary Training Plan: If specified, and within 60 days after Notice of Award, submit for each proposed course:

1. Title and objectives.
2. Training schedule.
3. Prerequisite training and experience of attendees.
4. Recommended types of attendees (e.g., managers, engineers, operators, maintenance).
5. Course description and outline of course content.

6. Duration.
7. Location (e.g., training center or site).
8. Format (e.g., lecture, self-study, demonstration, hands-on).
9. Instruction materials and equipment requirements.

B. Final Training Plan: Submit the following after training coordination meeting, if specified.

1. Updated versions of course descriptions from preliminary training plan.
2. Who will attend each course.
3. Schedule of training courses including dates, durations, and locations of each class.
4. Detailed course schedule for each day showing time allocated to each topic.
5. Resumes of instructors providing the training.

1.7 TRAINING OPERATIONS PERSONNEL

A. Furnish trained, articulate personnel to coordinate and expedite training, to be present during training coordination meetings with OWNER, and familiar with operation and maintenance manual information specified in Section 01430, OPERATION AND MAINTENANCE DATA.

B. Furnish manufacturers' representatives for detailed classroom and onsite hands-on training to Borough of Dublin personnel on operation and maintenance of specified product (system, subsystem, component) and as may be required in applicable Specifications.

1. Manufacturer's Representative: Familiar with facility operation and maintenance requirements as well as with specified equipment.

C. Prestartup Training:

1. Coordinate training sessions with Borough of Dublin operating personnel and manufacturers' representatives, and with submission of operation and maintenance manuals in accordance with Section 01430, OPERATION AND MAINTENANCE DATA.
2. Complete at least 14 days prior to actual startup.

D. Post-Startup Training: If required in Specifications, furnish and coordinate training of Borough of Dublin's operating personnel by respective manufacturer's representatives.

1.8 SUPPLEMENTS

A. The supplements listed below, following "END OF SECTION," are part of this Specification.

1. Forms: Manufacturer's Certificate of Proper Installation.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

OWNER_____ EQPT SERIAL NO.:_____

EQPT TAG NO.:_____ EQPT/SYSTEM:_____

PROJECT NO.:_____ SPEC. SECTION:_____

I hereby certify that the above-referenced equipment/system has been:

(Check Applicable)

- ☐ Installed in accordance with Manufacturer's recommendations.
- ☐ Inspected, checked, and adjusted.
- ☐ Serviced with proper initial lubricants.
- ☐ Electrical and mechanical connections meet quality and safety standards.
- ☐ All applicable safety equipment has been properly installed.
- ☐ System has been performance tested, and meets or exceeds specified performance requirements. (When complete system of one manufacturer)

Comments:_____

_____

_____

_____

_____

_____

_____

I, the undersigned Manufacturer's Representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate his equipment and (iii) authorized to make recommendations required to assure that the equipment furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained herein is true and accurate.

Date:_____, 19____

Manufacturer:_____

By Manufacturer's Authorized Representative:_____

(Authorized Signature)

SECTION 01650
FACILITY STARTUP

PART 1 GENERAL

1.1 DEFINITIONS

A. Reference Section 01640, MANUFACTURERS' SERVICES.

B. Facility Startup: Includes putting Project in operating order, cleaning, adjusting and balancing equipment, initial operation (startup) of equipment item, operating equipment, starting systems, operation of systems, testing of equipment and systems, and demonstration and verification of the completed facility as a unit.

C. Functional Test: A test or tests in the presence of the ENGINEER to demonstrate that the installed equipment or system meets manufacturer's installation and adjustment requirements and other requirements specified including, but not limited to, noise vibration, alignment, speed, proper electrical and mechanical connections, thrust restraint, proper rotation, and initial servicing.

D. Operation Period: The operation period begins when the facility has been successfully started up as defined under Paragraph Startup Test Period and has met all Substantial Completion requirements.

E. Performance Test: A test performed in the presence of the ENGINEER and after any required functional test specified, to demonstrate and confirm that the equipment and/or system meets the specified performance requirements.

F. Significant Interruption: May include any of the following events:

1. Failure of SUBCONTRACTOR to maintain qualified onsite startup personnel as scheduled
2. Failure to meet specified performance for more than 3 consecutive hours.
3. Failure of any critical equipment unit, system, or subsystem that is not satisfactorily corrected within 5 hours after failure.
4. Failure of noncritical unit, system, or subsystem that is not satisfactorily corrected within 8 hours after failure.
5. As may be determined by ENGINEER.

G. Startup Test Period:

1. Startup of the entire facility or any portion thereof includes coordinated operation of the facilities by the SUBCONTRACTOR, Sub-Subcontractors, operating personnel, and manufacturer's representatives for equipment items and systems after all required functional tests have been completed and those performance tests deemed necessary for the safe operation of the entire facility have been completed.

2. Startup of the entire facility or any portion thereof shall be considered complete when, in the opinion of the ENGINEER, the facility or designated portion has operated in the manner intended for 5 continuous days without significant interruption. This period is in addition to any training, functional, or performance test periods specified elsewhere. A significant interruption will require the startup then in progress to be stopped and restarted after corrections are made.

H. System: The overall process, or a portion thereof, that performs a specific function. A system may consist of two or more subsystems as well as two or more types of equipment.

1.2 SUBMITTALS

A. Administrative Submittals:

1. Functional and performance test schedules and plan for equipment, units, and systems at least 14 days prior to start of related testing. Include test plan, procedures, and log format.
2. Schedule and plan of facility startup activities at least 21 days prior to commencement.

B. Quality Control Submittals:

1. Manufacturer's Certificate of Proper Installation as required.
2. Test Reports: Functional and performance testing, in format acceptable to ENGINEER and certification of functional and performance test for each piece of equipment or system specified.
3. Operation and maintenance data as specified in Section 01430, OPERATION AND MAINTENANCE DATA.
4. Certifications of Calibration: Testing equipment.

1.3 SUBCONTRACTOR FACILITY STARTUP RESPONSIBILITIES

A. General: Demonstrate proper installation, adjustment, function, performance, and operation of equipment, systems, control devices, and required interfaces individually and in conjunction with process instrumentation and control system.

1.4 OWNER/ENGINEER FACILITY STARTUP RESPONSIBILITIES

A. General:

1. Review SUBCONTRACTOR's test plan and schedule.
2. Witness each functional or performance test.
3. Provide water, power, chemicals, and other items as required for testing, unless otherwise indicated.

B. Startup Test Period:

1. Operate process units and devices, with support of SUBCONTRACTOR.

2. Provide sampling, labor, and materials as required and provide laboratory analyses.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 TESTING PREPARATION

A. General:

1. Complete Work associated with the unit and related processes before testing, including related manufacturer's representative services.
2. Furnish related operating and maintenance manuals, and spare parts and special tools as specified before testing any unit or system.
3. Furnish qualified manufacturer's representatives when required to assist in testing.
4. Utilize the Manufacturer's Certificate of Proper Installation Form from Section 01640, MANUFACTURERS' SERVICES, supplemented as necessary, to document functional and performance procedures, results, problems, and conclusions.
5. Schedule and attend pretest (functional and performance) meetings related to test schedule, plan of test, materials, chemicals, and liquids required, facilities' operations interface, ENGINEER and OWNER involvement.
6. Designate and furnish one or more persons to be responsible for coordinating and expediting SUBCONTRACTOR's facility startup duties. The person or persons shall be present during facility startup meetings and shall be available at all times during the facility startup period.
7. Provide temporary valves, gauges, piping, test equipment and other materials and equipment required to conduct testing.

B. Cleaning and Checking: Prior to starting functional testing:

1. Calibrate testing equipment for accurate results.
2. Inspect and clean equipment, devices, connected piping, and structures so they are free of foreign material.
3. Lubricate equipment in accordance with manufacturer's instructions.
4. Turn rotating equipment by hand and check motor-driven equipment for correct rotation.
5. Open and close valves by hand and operate other devices to check for binding, interference, or improper functioning.
6. Check power supply to electric-powered equipment for correct voltage.
7. Adjust clearances and torques.
8. Test piping for leaks.
9. Balance HVAC systems, measuring airflow (cfm) static pressure, and component pressure losses. Furnish typed report documenting results of balancing.
10. Obtain completion of applicable portions of Manufacturer's Certificate of Proper Installation in accordance with Section 01640, MANUFACTURERS' SERVICES.

C. Ready-to-test determination will be by ENGINEER based at least on the following:

1. Notification by SUBCONTRACTOR of equipment and system readiness for testing.
2. Acceptable testing plan.
3. Acceptable operation and maintenance manuals incorporating review comments.
4. Receipt of Manufacturer's Certificate of Proper Installation, if specified.
5. Adequate completion of Work adjacent to, or interfacing with, equipment to be tested.
6. Availability and acceptability of manufacturer's representative, when specified, to assist in testing of respective equipment, and satisfactory fulfillment of other specified manufacturers' responsibilities.
7. Equipment and electrical tagging complete.
8. All spare parts and special tools delivered to OWNER.

3.2 FUNCTIONAL TESTING

A. General:

1. Begin testing at a time mutually agreed upon by the ENGINEER, manufacturer's representative(s), and SUBCONTRACTOR.
2. Notify in writing OWNER, ENGINEER, manufacturer's representative at least 10 days prior to scheduled date of functional tests.
3. Separate items of equipment demonstrated to function properly during subsystem testing may require no further functional test if documentation of subsystem testing is acceptable to ENGINEER.
4. Conduct functional test until each individual component item or system has achieved 1 continuous hour of satisfactory operation. Demonstrate all operational features and controls function during this period while in automatic modes.
5. If, in ENGINEER's opinion, each system meets the functional requirements specified, such system will be accepted as conforming for purposes of advancing to performance testing phase, if required. If, in ENGINEER's opinion, functional test results do not meet requirements specified, the systems will be considered as nonconforming.
6. Performance testing shall not commence until the equipment or system meets functional tests specified.

3.3 PERFORMANCE TESTING

A. General:

1. Begin testing at time mutually agreed upon by the ENGINEER, manufacturers' representative(s), and SUBCONTRACTOR, as appropriate.
   a. ENGINEER will be present during test.
   b. Notify ENGINEER at least 14 days prior to scheduled date of test.
2. Follow approved testing plan and detailed procedures specified.

3. Source and type of fluid, gas, or solid for testing shall be as specified.
4. Unless otherwise indicated, furnish all labor, materials, and supplies for conducting the test and taking all samples and performance measurements.
5. Prepare performance test report summarizing test method. Include test logs, pertinent calculations, and certification of performance.

3.4 STARTUP TEST PERIOD

A. Test Reports: As applicable to the equipment furnished, certify in writing that:

1. Necessary hydraulic structures, piping systems, and valves have been successfully tested,
2. Equipment systems and subsystems have been checked for proper installation, started, and successfully tested to indicate that they are operational,
3. Systems and subsystems are capable of performing their intended functions,
4. Facilities are ready for intended operation.

B. Attend planning meetings and arrange for attendants by key major equipment manufacturer representatives as required by the Contract Documents.

C. Designate and furnish one or more persons to be responsible for coordinating and expediting SUBCONTRACTOR's facility startup duties.

D. When facility startup has commenced, schedule remaining Work so as not to interfere with or delay the completion of facility startup. Support the facility startup activities with adequate staff to prevent delays and process upsets. This staff shall include, but not be limited to, major equipment and system manufacturers' representatives, Sub-Subcontractors, electricians, instrumentation personnel, millwrights, pipefitters and plumbers.

E. Supply and coordinate specified manufacturer's facility startup services.

F. Make adjustments, repairs, and corrections necessary to complete facility startup.

G. After the facility is operating, complete the testing of those items of equipment, systems, and subsystems which could not be or were not adequately or successfully tested prior to startup test period.

3.5 CONTINUOUS OPERATIONS

A. ENGINEER will accept equipment and systems as substantially complete and ready for continuous operation only after successful facility startup is completed and documented, disinfection is complete, and reports submitted, and manufacturers' services completed for training of Borough of Dublin operations personnel.

END OF SECTION

SECTION 01700
CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 CONTRACT CLOSEOUT SUBMITTALS

A. Reference: In accordance with the General Conditions and as may be otherwise required in the Contract Documents.

B. Record Documents: As required in Section 01720, RECORD DOCUMENTS.

C. Operations and Maintenance Manuals: In accordance with Section 01430, OPERATION AND MAINTENANCE DATA, and as required in the individual Specification sections.

D. Certificates of Testing and Inspection: As required in the General Conditions, these General Requirements sections, and the individual Specification sections.

E. Certificate of Substantial Completion.

F. Special Bonds, Special Warranties, and Service Agreements:

1. Form of Submittals:
   a. Bind in commercial quality, 8-1/2 by 11-inch three-ring side binders with hardback, cleanable, plastic covers.
   b. Label cover of each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address, and telephone number of SUBCONTRACTOR and equipment Supplier; and name of responsible principal.
   c. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the Specification section in which specified, and the name of the product or Work item.
   d. Separate each warranty or Bond with index tab sheets keyed to the Table of Contents listing. Include full information, using separate typed sheets as necessary. List Subcontractor, Supplier, and manufacturer, with name, address, and telephone number of responsible principal.
2. Preparation for Submission:
   a. Obtain notarized warranties and Bonds, executed in duplicate by responsible Sub-Subcontractors, Suppliers, and manufacturers, within 10 days after completion of the applicable item or Work. Except for items put into use with OWNER's permission, leave date of beginning of time of warranty until the date of Substantial Completion is determined.
   b. Retain warranties, Bonds, and service agreements until time specified for submission.

3. Time of Submission:
   a. Within 10 days after the date of Substantial Completion and prior to submission of final Application for Payment.
   b. For item of Work when acceptance is delayed beyond date of Substantial Completion, submit within 10 days after ENGINEER's written acceptance, listing the date of acceptance as the beginning of the warranty period.

G. Certificates or Evidence of Insurance: As required in the General Conditions.

H. Consent of Surety to Final Payment: As required in the General Conditions.

I. Releases or Waivers of Liens and Claims: As required in the General Conditions.

J. Written Releases from Agreements with Others:

1. Before final payment will be authorized, SUBCONTRACTOR shall furnish the CONTRACTOR written releases from property owners or public agencies where side agreements or special easements have been made, or where SUBCONTRACTOR's operations have not been kept within the OWNER's construction right-of-way.
2. In the event SUBCONTRACTOR is unable to secure written releases, inform the CONTRACTOR of the reasons.
   a. OWNER, CONTRACTOR, or its representatives will examine the site, and CONTRACTOR will direct SUBCONTRACTOR to complete Work that may be necessary to satisfy terms of the easement.
   b. Should SUBCONTRACTOR refuse to perform this Work, CONTRACTOR reserves the right to have it done by separate contract and deduct the cost of same from the Contract Price, or require the SUBCONTRACTOR to furnish a satisfactory Bond in a sum to cover legal claims for damages.
   c. When CONTRACTOR is satisfied that Work has been completed in agreement with the Contract Documents and terms of easements, the right is reserved to waive the requirement for written release if: (i) SUBCONTRACTOR's failure to obtain such statement is due to the grantor's refusal to sign, and this refusal is not based upon any legitimate claims that SUBCONTRACTOR has failed to fulfill the terms of the easement, or (ii) SUBCONTRACTOR is unable to contact or has had undue hardship in contacting the grantor.

K. Spare parts and special tools.

L. Other Required Submittals: In accordance with the Contract Documents.

1.2 FINAL APPLICATION FOR PAYMENT

A. Submit the final Application for Payment in accordance with procedures and requirements stated in the General Conditions, Section 01025,

MEASUREMENT AND PAYMENT, and as may otherwise be specified herein.

1.3 FINAL INSPECTION

A. Reference the General Conditions.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 FINAL CLEANING

A. At completion of Work or of a part thereof and immediately prior to SUBCONTRACTOR's request for certificate of Substantial Completion; or if no certificate is issued, immediately prior to SUBCONTRACTOR's notice of completion, clean entire site or parts thereof, as applicable.

1. Leave the Work and adjacent areas affected in a cleaned condition satisfactory to OWNER and ENGINEER.
2. Remove grease, dirt, dust, paint or plaster splatter, stains, labels, fingerprints, and other foreign materials from exposed surfaces.
3. Repair, patch, and touch up marred surfaces to specified finish and match adjacent surfaces.
4. Clean all windows.
5. Clean and wax wood, vinyl, or painted floors.
6. Broom clean exterior paved driveways and parking areas.
7. Hose clean sidewalks, loading areas, and others contiguous with principal structures.
8. Rake clean all other surfaces.
9. Remove snow and ice from access to buildings.
10. Replace air-handling filters and clean ducts, blowers, and coils of ventilation units operated during construction.
11. Leave water courses, gutters, and ditches open and in condition satisfactory to ENGINEER.

B. Vacuum clean all interior building areas and spaces and continue on as-needed basis or not less than once per week, until Substantial Completion.

C. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.

D. OWNER will assume responsibility for cleaning as of the date of Substantial Completion.

END OF SECTION

SECTION 01720
RECORD DOCUMENTS

PART 1 GENERAL

1.1 SUBMITTALS

A. Quality Control Submittals: Written procedures for maintaining and markup of record documents.

B. Contract Closeout Submittal:

1. Record Documents: Submit prior to application for final payment.

1.2 QUALITY ASSURANCE

A. Furnish qualified and experienced person, whose duty and responsibility shall be to maintain record documents.

B. Accuracy of Records:

1. Coordinate changes within record documents, making legible and accurate entries on each page of Specifications and each sheet of Drawings and other documents where such entry is required to show change.
2. Purpose of Project record documents is to document factual information regarding aspects of Work, both concealed and visible, to enable future modification of Work to proceed without lengthy and expensive site measurement, investigation, and examination.

C. Make entries within 24 hours after receipt of information that a change in Work has occurred.

D. Prior to submitting each request for progress payment, request ENGINEER's review and approval of current status of record documents. Failure to properly maintain, update, and submit record documents may result in return of CONTRACTOR's Application for Payment by ENGINEER.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Maintain record documents completely protected from deterioration, loss, and damage until completion of Work.

B. In event of loss of recorded data, use means necessary to again secure data to ENGINEER's acceptance.

1. Such means shall include, if necessary in ENGINEER's opinion, removal and reconstruction of covering materials, at no cost to CONTRACTOR or OWNER.

PART 2 PRODUCTS

2.1 RECORD DOCUMENTS

A. Promptly following commencement of Contract Times, secure from ENGINEER at no cost to SUBCONTRACTOR, one complete set of Contract Documents. Drawings will be full size.

PART 3 EXECUTION

3.1 MAINTENANCE OF RECORD DOCUMENTS

A. General:

1. Delete ENGINEER title block and seal from all documents.
2. Label or stamp each record document with title, "RECORD DOCUMENTS," in neat large printed letters.
3. Record information concurrently with construction progress and within 24 hours after receipt of information that change has occurred. Do not cover or conceal Work until required information is recorded.

B. Preservation:

1. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
2. Make documents and Samples available at all times for observation by ENGINEER.

C. Making Entries on Drawings:

1. Using an erasable colored pencil (not ink or indelible pencil), clearly describe change by graphic line and note as required.
   a. Color Coding:
      1) Green when showing information deleted from Drawings.
      2) Red when showing information added to Drawings.
      3) Blue and circled in blue to show notes.
   b. Modifications: Note sequential numbers representing modification inside flag with date following outside flag.
2. Date entries.
3. Call attention to entry by "cloud" drawn around area or areas affected.
4. Legibly mark to record actual changes made during construction, including, but not limited to:
   a. Depths of various elements of foundation in relation to finished first floor data if not shown or where depth differs from that shown.
   b. Horizontal and vertical locations of existing and new Underground Facilities and appurtenances, and other underground structures, equipment, or Work. Reference to at least two measurements to permanent surface improvements.
   c. Location of internal utilities and appurtenances concealed in the construction referenced to visible and accessible features of the structure.

d. Locate existing facilities, piping, equipment, and items critical to the interface between existing physical conditions or construction and new construction.
e. Changes made by Addenda and Field Orders, Work Change Directive, Change Order, Written Amendment, and ENGINEER's written interpretation and clarification using consistent symbols for each and showing appropriate document tracking number.

5. Dimensions on Schematic Layouts: Show on record drawings, by dimension, the centerline of each run of items such as are described in previous subparagraph above.
   a. Clearly identify the item by accurate note such as "cast iron drain," "galv. water," and the like.
   b. Show, by symbol or note, vertical location of item ("under slab," "in ceiling plenum," "exposed," and the like).
   c. Make identification so descriptive that it may be related reliably to Specifications.
6. Specifications: Legibly mark and record for each product the description of actual product installed if differs from that specified, including:
   a. Manufacturer, trade name, and catalog model number of each product and item of equipment actually installed.

D. Make entries in pertinent other documents as accepted by ENGINEER.

E. If documents are not accepted by ENGINEER, secure a new copy of that document from ENGINEER at ENGINEER's usual charge for reproduction and handling, and carefully transfer change data to new copy to acceptance of ENGINEER.

END OF SECTION

SECTION 02100
SITE PREPARATION

PART 1 GENERAL

1.1 DEFINITIONS

A. Interfering or Objectionable Material: Trash, rubbish, and junk; vegetation and other organic matter, whether alive, dead, or decaying; topsoil.

B. Clearing: Removal of interfering or objectionable material lying on or protruding above ground surface.

C. Grubbing: Removal of vegetation and other organic matter including stumps, buried logs, and roots greater than 2 inches caliper to a depth of 6 inches below subgrade.

D. Stripping: Removal of topsoil remaining after applicable scalping is completed.

E. Project Limits: Areas, as shown or specified, within which Work is to be performed.

1.2 SCHEDULING AND SEQUENCING

A. Prepare site only after adequate erosion and sediment controls are in place. Limit areas exposed uncontrolled to erosion during installation of temporary erosion and sediment controls.

B. Install temporary fencing where shown prior to starting other work.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 GENERAL

A. Clear, grub, and strip areas actually needed for waste disposal, borrow, or site improvements within limits shown or specified.

B. Do not injure or deface vegetation that is not designated for removal.

C. Protect trees as specified in Section 01500, CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.

3.2 LIMITS

A. As follows, but not to extend beyond Project limits.

1. Trench Excavation: 4 feet from trench centerline, regardless of actual trench width.

2. Fill:
   a. Clearing and Grubbing: 5 feet beyond toe of permanent fill.
   b. Stripping: 2 feet beyond toe of permanent fill.
3. Structures: 15 feet outside of new structures.
4. Other Areas: As shown.

B. Remove rubbish, trash, and junk from entire area within Project limits.

3.3 TEMPORARY FENCE

A. Design to prevent unauthorized access to the construction site and install where shown. Maintain throughout duration of construction.

3.4 CLEARING

A. Clear areas within limits shown or specified.

B. Fell trees so that they fall away from facilities and vegetation not designated for removal.

C. Cut stumps not designated for grubbing flush with ground surface.

D. Cut off shrubs, brush, weeds, and grasses to within 2 inches of ground surface.

3.5 GRUBBING

A. Grub areas within limits shown or specified.

3.6 STRIPPING

A. Strip areas within limits to a depth of 6 inches. Do not remove subsoil with topsoil.

3.7 DISPOSAL

A. Clearing and Grubbing Debris:

1. Dispose of debris offsite.
2. Woody debris may be chipped. Chips may be sold to SUBCONTRACTOR's benefit. Dispose of chips that are unsaleable or unsuitable for landscaping or other uses with unchipped debris.
3. Limit offsite disposal of clearing and grubbing debris to locations that are approved by federal, state, and local authorities, and that will not be visible from Project.

B. Strippings:

1. Dispose of strippings that are unsuitable for topsoil or that exceed quantity required for topsoil offsite.
2. Stockpile topsoil in sufficient quantity to meet Project needs. Dispose of excess strippings as specified for clearing and grubbing.

END OF SECTION

SECTION 02205
EXCAVATION

PART 1 GENERAL

1.1 SUBMITTALS

A. Shop Drawings:

1. Excavation Plan, Detailing:
   a. Methods and sequencing of excavation.
   b. Proposed locations of stockpiled excavated material.
   c. Proposed onsite and offsite spoil disposal sites.
   d. Numbers, types, and sizes of equipment proposed to perform excavations.

1.2 QUALITY ASSURANCE

A. Provide adequate survey control to avoid unauthorized overexcavation.

1.3 WEATHER LIMITATIONS

A. Material excavated when frozen or when air temperature is less than 32 degrees F shall not be used as fill or backfill until material completely thaws.

B. Material excavated during inclement weather shall not be used as fill or backfill until after material drains and dries sufficiently for proper compaction.

1.4 SEQUENCING AND SCHEDULING

A. Clearing, Grubbing, and Stripping: Complete applicable Work specified in Section 02100, SITE PREPARATION, prior to excavating.

B. Dewatering: All excavation will be above the groundwater table. Dewatering will not be allowed except for removal of rain water accumulated in excavations.

C. Excavation Support: Install and maintain as necessary to support sides of excavations and prevent detrimental settlement and lateral movement of existing facilities, adjacent property, and completed Work.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 GENERAL

A. Excavate to lines, grades, and dimensions shown and as necessary to accomplish Work. Excavate to within tolerance of plus or minus 0.1 foot except where dimensions or grades are shown or specified as maximum or

minimum. Allow for forms, working space, granular fill, topsoil, and similar items, wherever applicable. Trim to neat lines where concrete is to be deposited against earth.

B. Excavate 6 inches beneath all structures to allow for granular fill. Place granular fill as specified in Section 02215, FILL AND BACKFILL.

C. Under slabs-on-grade, excavate all topsoil and soft surface material within the influence zone until the harder underlying silt is encountered, or to a maximum depth of 2 feet. Deeper excavation will be allowed as approved by the ENGINEER in the existing spoil area.

D. Do not overexcavate without written authorization of ENGINEER.

E. Remove or protect obstructions as shown and as specified in Section 01500, CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS, Article PROTECTION OF WORK AND PROPERTY.

3.2 UNCLASSIFIED EXCAVATION

A. Excavation is unclassified. Complete all excavation regardless of the type, nature, or condition of the materials encountered.

3.3 TRENCH WIDTH

A. Minimum Width of Trenches:

1. Single Pipes, Conduits, Direct-Buried Cables, and Duct Banks:
   a. Less than 4-Inch Outside Diameter or Width: 18 inches.
   b. Greater than 4-Inch Outside Diameter or Width: 18 inches greater than outside diameter or width of pipe, conduit, direct-buried cable, or duct bank.
2. Multiple Pipes or Conduits in Single Trench: 18 inches greater than aggregate width of pipes, conduits, cables, duct banks, plus space between.
3. Increase trench widths by thicknesses of sheeting.

B. Maximum Trench Width: Unlimited, unless otherwise shown or specified, or unless excess width will cause damage to existing facilities, adjacent property, or completed Work.

3.4 STOCKPILING EXCAVATED MATERIAL

A. Stockpile excavated material that is suitable for use as fill or backfill until material is needed.

B. Post signs indicating proposed use of material stockpiled. Post signs that are readable from all directions of approach to each stockpile. Signs should be clearly worded and readable by equipment operators from their normal seated position.

C. Confine stockpiles to within easements, rights-of-way, and approved work areas. Do not obstruct roads or streets.

D. Do not stockpile excavated material adjacent to trenches and other excavations unless excavation sideslopes and excavation support systems are designed, constructed, and maintained for stockpile loads.

E. Do not stockpile excavated materials near or over existing facilities, adjacent property, or completed Work, if weight of stockpiled material could induce excessive settlement.

3.5 DISPOSAL OF SPOIL

A. Dispose of excavated materials, which are unsuitable or exceed quantity needed for fill or backfill, offsite.

B. Dispose of debris resulting from removal of organic matter, trash, refuse, and junk as specified in Section 02100, SITE PREPARATION, for clearing and grubbing debris.

END OF SECTION

SECTION 02215
SUBGRADE PREPARATION

PART 1 GENERAL

1.1 DEFINITIONS

A. Optimum Moisture Content: As defined in Section 02220, FILL AND BACKFILL.

B. Prepared Ground Surface: Ground surface after completion of clearing and grubbing, scalping of sod, stripping of topsoil, excavation to grade, and scarification and compaction of Subgrade.

C. Relative Compaction: As defined in Section 02220, FILL AND BACKFILL.

D. Subgrade: Layer of existing soil after completion of clearing, grubbing, scalping of topsoil prior to placement of fill, roadway structure or base for floor slab.

1.2 SEQUENCING AND SCHEDULING

A. Complete applicable Work specified in Sections 02100, SITE PREPARATION and 02205, EXCAVATION, prior to Subgrade preparation.

1.3 QUALITY ASSURANCE

A. Notify ENGINEER when Subgrade is ready for compaction and testing.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Prepare Subgrade when unfrozen and free of ice and snow.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 GENERAL

A. Keep Subgrade free of water, debris, and foreign matter during compaction or Proof-Rolling.

B. Bring Subgrade to proper grade and cross-section and uniformly compact surface.

C. Do not use sections of Prepared Ground Surface as haul roads. Protect prepared Subgrade from traffic.

D. Maintain Prepared Ground Surface in finished condition until next course is placed.

3:2 COMPACTION

A. Under Pavement Structure, Floor Slabs On Grade, or Granular Fill Under Structures: Compact the upper 12 inches to minimum of 95 percent Relative Compaction as determined in accordance with ASTM D698-78.

3.3 MOISTURE CONDITIONING

A. Dry Subgrade: Add water, then mix to make moisture content uniform throughout.

B. Wet Subgrade: Aerate material by blading, discing, harrowing, or other methods, to hasten drying process.

3.4 CORRECTION

A. Soft or Loose Subgrade: Over excavate as specified in Section 02205, EXCAVATION, and replace with granular fill, as specified in Section 02220, FILL AND BACKFILL.

B. Unsuitable Material: Over excavate as specified in Section 02205, EXCAVATION, and replace with granular fill, as specified in Section 02220, FILL AND BACKFILL.

END OF SECTION

SECTION 02220
FILL AND BACKFILL

PART 1 GENERAL

1.1 DEFINITIONS

A. Relative Compaction:

1. Ratio, in percent, of as-compacted field dry density to laboratory maximum dry density as determined in accordance with ASTM D698-78.
2. Apply corrections for oversize material to either as-compacted field dry density or maximum dry density, as determined by ENGINEER.

B. Optimum Moisture Content:

1. Determined in accordance with ASTM Standard specified to determine maximum dry density for Relative Compaction.
2. Determine field moisture content on basis of fraction passing 3/4-inch sieve.

C. Prepared Ground Surface: Ground surface after completion of required demolition, clearing and grubbing, scalping of sod, stripping of topsoil, excavation to grade, and subgrade preparation.

D. Completed Course: A course or layer that is ready for next layer or next phase of Work.

E. Lift: Loose (uncompacted) layer of material.

F. Geosynthetics: Geotextiles, geogrids, or geomembranes.

G. Well-Graded:

1. A mixture of particle sizes with no specific concentration or lack thereof of one or more sizes.
2. Does not define numerical value that must be placed on coefficient of uniformity, coefficient of curvature, or other specific grain size distribution parameters.
3. Used to define material type that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids.

H. Influence Area: Area within planes sloped downward and outward at 60-degree angle from horizontal measured from:

1. 1 foot outside outermost edge at base of foundations or slabs.
2. 1 foot outside outermost edge at surface of roadways or shoulder.
3. 0.5 foot outside exterior at spring line of pipes or culverts.

I. Borrow Material: Material from required excavations or from designated borrow areas on or near site.

J. Selected Backfill Material: Materials available onsite that ENGINEER determines to be suitable for specific use.

K. Imported Material: Materials obtained from sources offsite, suitable for specified use.

L. Structural Fill: Fill materials as required under structures, pavements, and other facilities.

M. Embankment Material: Fill materials required to raise existing grade in areas other than under structures.

N. Standard Specifications: When referenced in this section, shall mean Pennsylvania Department of Transportation, Publication 408/90, Specifications.

1.2 SUBMITTALS

A. Samples: Imported Material taken at source.

B. Quality Control Submittals:

1. Catalog and manufacturer's data sheets for compaction equipment.
2. Certified test results from independent testing agency.

1.3 QUALITY ASSURANCE

A. Notify ENGINEER when:

1. Structure is ready for backfilling, and whenever backfilling operations are resumed after a period of inactivity.
2. Soft or loose subgrade materials are encountered wherever embankment or site fill is to be placed.
3. Fill material appears to be deviating from Specifications.

1.4 SEQUENCING AND SCHEDULING

A. Complete applicable Work specified in Sections 02100, SITE PREPARATION; 02205, EXCAVATION; and 02215, SUBGRADE PREPARATION, prior to placing fill or backfill.

B. Backfill against concrete structures only after concrete has attained 70 percent of design strength. Obtain ENGINEER's acceptance of concrete work and attained strength prior to placing backfill.

C. Do not place granular fill, subbase, or surfacing until after subgrade has been prepared as specified in Section 02215, SUBGRADE PREPARATION.

PART 2 PRODUCTS

2.1 SOURCE QUALITY CONTROL

A. Gradation Tests: As necessary to locate acceptable sources of Imported Material.

2.2 EARTHFILL

A. Excavated material from required excavations and designated borrow sites, free from rocks larger than 3 inches, from roots and other organic matter, ashes, cinders, trash, debris, and other deleterious materials.

2.3 GRANULAR FILL

A. Crushed stone or gravel, PDOT No. 2A as specified in Section 703 of the Standard Specifications.

2.4 GRAVEL

A. AASHTO No. 57 coarse aggregate as specified in Section 703 of the Standard Specifications.

2.5 PIPE BASE AND ZONE MATERIAL

A. See Section 15060, PLANT PIPING AND PLUMBING - GENERAL.

2.6 TRENCH BACKFILL MATERIAL ABOVE PIPE ZONE

A. Earthfill.

2.7 WATER FOR MOISTURE CONDITIONING

A. Free of hazardous or toxic contaminates, or contaminants deleterious to proper compaction.

PART 3 EXECUTION

3.1 GENERAL

A. Keep placement surfaces free of water, debris, and foreign material during placement and compaction of fill and backfill materials.

B. Place and spread fill and backfill materials in horizontal Lifts of uniform thickness, in a manner that avoids segregation, and compact each Lift to specified densities prior to placing succeeding Lifts. Slope Lifts only where necessary to conform to final grades or as necessary to keep placement surfaces drained of water.

C. During filling and backfilling, keep level of fill and backfill around each structure even. Do not use large compaction equipment within 5 feet of foundations or building walls to prevent excessive lateral pressure on them.

D. Do not place fill or backfill, if fill or backfill material is frozen, or if surface upon which fill or backfill is to be placed is frozen.

E. If pipe or conduit is to be laid within fill or backfill:

1. Fill or backfill to an elevation 2 feet above top of item to be laid.
2. Excavate trench for installation of item.
3. Install bedding, if applicable, as specified in Section 02225, TRENCH BACKFILL.
4. Install item.
5. Backfill envelope zone and remaining trench, as specified in Section 02225, TRENCH BACKFILL, before resuming filling or backfilling specified in this section.

F. Tolerances:

1. Final Lines and Grades: Within a tolerance of 0.1 foot unless dimensions or grades are shown or specified otherwise.
2. Grade to establish and maintain slopes and drainage as shown. Reverse slopes are not permitted.

G. Settlement: Correct and repair any subsequent damage to structures, pavements, slabs, piping, and other facilities, caused by settlement of fill or backfill material.

3.2 BACKFILL UNDER AND AROUND STRUCTURES

A. Under Facilities: Within Influence Area beneath structures, slabs, pavements, piping, conduits, and other facilities, backfill with granular fill, unless otherwise shown. Place granular fill in Lifts of 6-inch maximum thickness and compact each Lift to minimum of 95 percent Relative Compaction as determined in accordance with ASTM D698-78.

B. Other Areas: Backfill with earthfill to lines and grades shown, with proper allowance for topsoil thickness where shown. Place in Lifts of 6-inch maximum thickness and compact each Lift to minimum 95 percent Relative Compaction as determined in accordance with ASTM D698-78.

3.3 BACKFILL IN PIPE ZONE

A. As specified in Section 15060, PLANT PIPING AND PLUMBING - GENERAL.

3.4 TRENCH BACKFILL ABOVE PIPE ZONE

A. Backfill with earthfill to lines and grades shown with proper allowance for surface restoration where shown. Place in 8-inch maximum loose lifts and compact each lift to minimum 95 percent Relative Compaction as determined in accordance with ASTM D698-78.

3.5 BACKFILL BENEATH SLABS ON GRADE

A. Excavate soft materials as specified in Section 02205, EXCAVATION.

B. Place geotextile as specified in Section 02246, GEOTEXTILES.

C. Backfill with granular fill. Place granular fill in lifts of 6-inch maximum thickness and compact each Lift to a minimum of 95 percent Relative Compaction as determined in accordance with ASTM D698-78.

3.6 SITE TESTING

A. Gradation:

1. Two samples or more often as determined by ENGINEER, if variation in gradation is occurring, or if material appears to depart from Specifications.
2. If test results indicate material does not meet Specification requirements, terminate material placement until corrective measures are taken.
3. Remove material placed in Work that does not meet Specification requirements.

B. In-Place Density Tests: In accordance with ASTM D2922-81. During placement of materials, test as follows:

1. Granular Fill: 2 tests per lift within Influence Area of Treatment Building.
2. Trench Backfill Above Pipe Zone: At 200-foot intervals for each lift.
3. Backfill Around Structures: As directed by the ENGINEER.

3.7 GRANULAR BASE COURSE AND SURFACING

A. Place and Compact as specified in Section 02555, ASPHALT PAVEMENT.

3.8 REPLACING OVEREXCAVATED MATERIAL

A. Replace excavation carried below grade lines shown or established by ENGINEER as follows:

1. Beneath Footings: Granular fill.
2. Beneath Fill or Backfill: Same material as specified for overlying fill or backfill.
3. Beneath Slabs-On-Grade: Granular fill.
4. Trenches:
   a. Unauthorized Overexcavation: Either trench stabilization material or granular pipe base material, as specified in Section 02225, TRENCH BACKFILL.
   b. Authorized Overexcavation: Trench stabilization material, as specified in Section 02225, TRENCH BACKFILL.

3.9 PLACING FILL OVER GEOTEXTILE

A. General:

1. Place fill over Geosynthetics with sufficient care so as not to damage them.
2. Place fill only by back dumping and spreading only.
3. Dump fill only on previously placed fill.
4. While operating equipment, avoid sharp turns, sudden starts or stops that could damage Geosynthetics.

B. Hauling: Operate hauling equipment on minimum of 3 feet of covering.

C. Spreading:

1. Spreading equipment shall be track mounted.
2. Operate spreading equipment on minimum of 12 inches of fill over Geotextile.
3. Spread fill in same direction as unseamed overlaps to avoid separation of seams and joints.
4. Flatten wrinkles of geotextiles in direction of spreading.
5. Maintain proper overlap of unseamed Geotextile.

D. Compaction: Compact fill only after uniformly spread to full thickness shown.

END OF SECTION

SECTION 02246
GEOTEXTILES

PART 1 GENERAL

1.1 DEFINITIONS

A. Fabric: Geotextile, a permeable geosynthetic comprised solely of textiles.

B. Minimum Average Roll Value (MinARV): Minimum of series of average roll values representative of geotextile furnished.

C. Maximum Average Roll Value (MaxARV): Maximum of series of average roll values representative of geotextile furnished.

D. Nondestructive Sample: Sample representative of finished Work, prepared for testing without destruction of Work.

E. Overlap: Distance measured perpendicular from overlapping edge of one sheet to underlying edge of adjacent sheet.

F. Seam Efficiency: Ratio of tensile strength across seam to strength of intact geotextile, when tested according to ASTM D4884-90.

.2 SUBMITTALS

A. Shop Drawings: Manufacturer material specifications and product literature.

B. Quality Control Submittals: Certifications from each geotextile manufacturer that furnished products have specified property values. Certified property values shall be either minimum or maximum average roll values, as appropriate, for geotextiles furnished.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver each roll with sufficient information attached to identify it for inventory and quality control.

B. Handle products in manner that maintains undamaged condition.

C. Do not store products directly on ground. Ship and store geotextile with suitable wrapping for protection against moisture and ultraviolet exposure. Store geotextile in a way that protects it from elements. If stored outdoors, elevate and protect geotextile with waterproof cover.

1.4 SCHEDULING AND SEQUENCING

A. Where geotextile is to be laid directly upon ground surface, prepare subgrade as specified in Section 02215, SUBGRADE PREPARATION, first.

B. Notify ENGINEER whenever geotextiles are to be placed. Do not place geotextile without ENGINEER's approval of underlying materials.

PART 2 PRODUCTS

2.1 NONWOVEN GEOTEXTILE

A. Pervious sheet of polyester, polypropylene, or polyethylene fabricated into stable network of fibers that retain their relative position with respect to each other. Nonwoven geotextile shall be composed of continuous or discontinuous (staple) fibers held together through needle-punching, spun-bonding, or thermal-bonding, or resin-bonding.

B. Geotextile Edges: Selvaged or otherwise finished to prevent outer material from pulling away from geotextile.

C. Unseamed Sheet Width: Minimum 6 feet.

D. Physical Properties: Conform to requirements in Table No. 2.

TABLE NO. 2
PHYSICAL PROPERTY REQUIREMENTS FOR NONWOVEN GEOTEXTILE

Property	Requirement	Test Method
Nominal Weight (per square yard)	8 oz/sq yd MinARV	ASTM D3776-84
Mullen Burst Strength	210 psi, MinARV	ASTM D3786
Grab Tensile Strength	130 lb, MinARV	ASTM D4632-86
Puncture Strength	40 lb, MinARV	ASTM D4833-88
Trapezoid Tear Strength	40 lb, MinARV	ASTM D4533-85

E. Amoco 4508, or equal.

PART 3 EXECUTION

3.1 LAYING GEOTEXTILE

A. Lay and maintain geotextile smooth and free of tension, folds, wrinkles, or creases.

3.2 JOINTS

A. Unseamed Joints:

1. Overlapped.
2. Overlap, unless otherwise shown: Foundation/Subgrade Stabilization: Minimum 18 inches.

3.3 SECURING GEOTEXTILE

A. Secure geotextile during installation as necessary with sand bags, or other means approved by ENGINEER.

3.4 PLACING PRODUCTS OVER GEOTEXTILE

A. Before placing material over geotextile, notify ENGINEER. Do not cover installed geotextile until after ENGINEER provides authorization to proceed.

B. If tears, punctures, or other geotextile damage occurs during placement of overlying products, remove overlying products as necessary to expose damaged geotextile. Repair damage as specified in Article REPAIRING GEOTEXTILE.

3.5 SILT FENCE APPLICATIONS

A. Install geotextile in one-piece, or continuously sewn to make one-piece, for full length and height of fence, including portion of geotextile buried in toe trench.

B. Install bottom edge of sheet in toe trench and backfill in a way that securely anchors geotextile in trench.

C. Securely fasten geotextile to wire mesh backing and each support post in a way that will not result in tearing of geotextile when fence is subjected to service loads.

D. Promptly repair or replace silt fence that becomes damaged.

3.6 REPAIRING GEOTEXTILE

A. Repair or replace torn, punctured, flawed, deteriorated, or otherwise damaged geotextile. Repair damaged geotextile by placing patch of undamaged geotextile over damaged area and at least 18 inches in all directions beyond damaged area. Remove interfering material as necessary to expose damaged geotextile for repair.

3.7 REPLACING CONTAMINATED GEOTEXTILE

A. Protect geotextile from contamination that would interfere, in ENGINEER's opinion, with its intended function. Remove and replace contaminated geotextile with clean geotextile.

END OF SECTION

SECTION 02555
ASPHALT CONCRETE PAVEMENT

PART 1 GENERAL

1.1 DEFINITIONS

A. Combined Aggregate: All mineral constituents of an asphalt concrete mix, including mineral filler and separately sized aggregates.

B. Standard Specifications: When referenced in this section shall mean Pennsylvania Department of Transportation, Publication 408/90, Specifications.

1.2 SUBMITTALS

A. Shop Drawings: Job-mix formula for pavements.

B. Quality Control Submittals:

1. Manufacturer's Certificate of Compliance for the following materials:
   a. Aggregate: Gradation.
   b. Asphalt for Binder: Type and grade.
   c. Prime Coat: Type and grade of asphalt.
   d. Tack Coat: Type and grade of asphalt.
   e. Mixes: Conforms to job-mix formula.
2. Manufacturer's Certificate of Proper Installation.
3. Certification of conformance to Standard Specifications.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Temperature:

1. Do not apply asphalt materials or place asphalt mixes when ground temperature is lower than 50 degrees F, air temperature is lower than 40 degrees F, or application surface is wet.
2. Measure ground and air temperature in shaded areas away from heat sources or wet surfaces.

PART 2 PRODUCTS

2.1 BASE COURSE

A. Crushed stone or gravel, PDOT No. 3A as specified in Section 703 of Standard Specifications.

2.2 AGGREGATE

A. As specified in Section 401 of Standard Specification for hot plant mix bituminous pavement.

2.3 MINERAL FILLER

A. As specified in Section 703 of Standard Specifications.

2.4 PRIME COAT

A. Cut-back Petroleum Asphalt, Class MC-30, conforming to Section 461 of Standard Specifications.

2.5 TACK COAT

A. Emulsified asphalt, Class E-6, conforming to Section 460 of Standard Specifications.

2.6 BLOTTER MATERIAL

A. As specified in Section 461 of Standard Specifications.

2.7 BITUMINOUS SURFACE COURSE MIXTURE

A. Bituminous Concrete: Type ID-2, as specified in Section 401 of Standard Specifications.

2.8 ASPHALT CEMENT

A. Asphalt cement to be used in the asphalt concrete mixture shall be Grade AC-20, as specified in Section 702 of Standard Specifications.

PART 3 EXECUTION

3.1 GENERAL

A. Construction shall be in accordance with Section 401 of Standard Specifications except as modified and supplemented herein.

B. Shoulders: Construct to lines, grades, and cross-sections shown.

C. Traffic Control: Minimize inconvenience to traffic, but keep vehicles off freshly treated or paved surfaces to avoid pickup and tracking of asphalt.

3.2 CONTROL OF LINE AND GRADE

A. Provide and maintain intermediate control, independent of the underlying base to meet finish surface grades and minimum thickness.

3.3 SUBGRADE PREPARATION

A. Prepare subgrade in accordance with Section 02215, SUBGRADE PREPARATION.

3.4 BASE COURSE

A. Place base course material in 6-inch lift and compact to not less than 100 percent relative compaction.

3.5 PRIME COAT

A. Apply as specified in Section 461.3 of Standard Specifications.

3.6 ASPHALT CONCRETE PAVEMENT PLACEMENT

A. Lay asphalt concrete over prepared base in a single lift to a total compacted thickness of 2 inches.

B. Collect and dispose of segregated aggregate from raking process. Do not scatter material over finished surface.

3.7 CONNECTIONS WITH EXISTING FACILITIES

A. Where asphalt concrete pavement connects to the existing roadway surface, modify existing roadway profile to produce a smooth riding connection to existing facility.

B. Sawcut existing pavement as shown to provide a clean, vertical contact.

C. Paint edges of contact surfaces (curbs, manhole frames, sawcut edge of existing pavement), before laying pavement, with tack coat or paving asphalt cement to provide watertight joints. Do not stain adjacent surfaces not intended to be coated.

3.8 JOINTS

A. Offset longitudinal joints in roadway pavements, so longitudinal joints in wearing layer coincides with pavement centerlines and lane divider lines.

B. Form transverse joints by cutting back on previous day's run to expose full vertical depth of layer.

3.9 COMPACTION

A. Uniformly compact each course until there is no further evidence of consolidation and roller marks are eliminated.

3.10 TOLERANCES

A. Conduct measurements for conformity with crown and grade immediately after initial compression. Correct variations immediately by removal or addition of materials and by continuous rolling.

B. Tolerance Measurements:

1. In accordance with Section 401.3 of the Standard Specifications.
2. Finished grade shall not vary more than 0.02 feet.

C. Correct deviations in excess of specified tolerances by addition of asphalt concrete mixture to low places or removal of material from high places.

D. Wearing surface may be removed and replaced to achieve a satisfactory finish surface, if surface of completed pavement deviates by more than twice the specified tolerances.

3.11 SEAL COAT

A. Apply seal coat to finished surface at longitudinal and transverse joints, joints at abutting structures, areas where the asphalt concrete was placed by hand, and other areas in which a seal coat is judged necessary.

B. Maintain surfaces which are to be sealed free of holes, dry, and clean of dust and loose material.

C. Seal in dry weather and when the temperature is above 35 degrees F.

D. Heat the asphalt for sealing to not less than 300 degrees F, and not more than 350 degrees F.

E. Fill cracks over 1/16 inch in width with an asphalt-sand slurry prior to sealing.

F. If seal is to be placed on fresh portland cement concrete or asphalt concrete containing moisture, apply a tack coat of emulsified asphalt at the rate of 0.06 to 0.10 gallons per square yard before applying the seal coat.

G. Place the seal coat in as many applications as necessary to obtain a completed thickness of 3/16 inch, without running.

H. Extend the seal coat 1 foot on each side of the joint, or a minimum of 1 foot beyond the limits of the area to receive seal.

END OF SECTION

SECTION 02595
WELL ABANDONMENT

PART 1 GENERAL

1.1 WORK INCLUDED

A. This section covers the Work, materials, and equipment necessary for abandonment of residential and commercial supply wells, complete.

1.2 GENERAL

A. The primary approach for abandoning wells shall be to follow the applicable state Well Abandonment Guidelines established by PADER Bureau of Topographic and Geologic Survey.

B. The attached table contains location and construction information for the 78 residential and commercial supply wells to be abandoned. Tabulated depths range from 90 to 600 feet, but depth data for many of the wells were not available.

C. It is anticipated that all 78 wells contain steel surface casings installed to competent bedrock. Below the surface casings, the wells exist as uncased bedrock boreholes of varying depths.

D. Abandonment of the wells consists of removing the existing pump, piping, and electrical conduit, grouting the hole from the bottom to within 5 feet of the ground surface, cutting off the steel surface casing 1 to 2 feet below ground surface, and restoring the ground surface to its original condition.

E. If well abandonment techniques described herein are inappropriate to site conditions, then the ENGINEER shall recommend other techniques as approved by the EPA and PADER.

1.3 SUBMITTALS

A. Contract Closeout Submittals: Well Abandonment Records.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. All equipment shall be in good operating condition and operated and maintained in strict conformance with manufacturer's recommendations.

B. The SUBCONTRACTOR shall have the appropriate equipment and trained personnel to perform the work as specified.

C. Provide all tools, grout, water, bentonite, and other necessary equipment and materials for abandoning wells. SUBCONTRACTOR shall provide all equipment necessary for decontamination, including a mobile, hot water, high-pressure washer.

2.2 GROUT SEAL

A. The cement used to make the expansive cement-bentonite grout seal shall conform to ASTM C150, Type I or II. The bentonite shall be in powder form and be without additives.

PART 3 EXECUTION

3.1 GENERAL

A. Coordinate the start of well abandonment work with the ENGINEER. It also shall be the responsibility of the SUBCONTRACTOR to schedule the abandonment work at each well with the respective well owner.

3.2 EQUIPMENT DECONTAMINATION

A. All downhole equipment to be used during well abandonment shall be decontaminated using a hot water high-pressure washer prior to use at each well. Decontamination shall take place at a location where decontamination fluids will not directly enter wells or surface waters. Decontamination fluids shall be contained and disposed of by the SUBCONTRACTOR.

3.3 ABANDONMENT

A. Begin abandonment by removing the existing pump and associated piping and wiring within the casing. If abandonment takes place inside a structure occupied by humans and/or animals, well material shall be placed on plastic to prevent direct contact with the ground surface. The submersible well pump and piping shall be decontaminated by the SUBCONTRACTOR using the procedures discussed in paragraph 3.1.B of this specification. If the pumps are to be removed from the property for decontamination at a central area, each pump shall be labelled with the pump owner's name and address. The removed and decontaminated submersible pump shall remain the property of the well owner. All piping, wiring, well caps, and other equipment shall be disposed of by the SUBCONTRACTOR.

B. SUBCONTRACTOR shall note the diameter of the surface casing to determine the water-level depth and sound the well to determine its total depth. This information shall be used to determine the quantity of grout needed to abandon the well and payment for the work. This information shall also be recorded on an abandonment log for the well.

C. Prepare the cement-bentonite grout by proportioning no more than 7 gallons of water per 94-pound bag of Portland cement; 3 to 4 pounds of bentonite per bag of cement shall be used to reduce shrinkage. The grout must be mixed to a smooth consistency using a pump or portable mechanical mixer and shall be free of lumps and other defects, including materials other than cement, bentonite, and water.

D. The SUBCONTRACTOR shall pump the grout into each well through decontaminated tremie pipe extended to the bottom of the hole. Continue pumping until the grout is within 5 feet of the top of the hole. Add grout to the hole to maintain its level as the grouting pipe is withdrawn. If loss of grout into subterranean caverns occurs, the hole shall be filled to just

below the cavern, bridged above the cavern, and filled from the bridge to within 5 feet of the surface.

E. The SUBCONTRACTOR shall make a reasonable effort to tremie the grout into each well at a rate that does not result in the discharge of groundwater from the well casing to the surface. Any groundwater discharged from each well while pumping grout shall be contained by the SUBCONTRACTOR and prevented from coming into contact with the ground surface. The contained groundwater shall be transported to a central storage tank or container to be provided by the SUBCONTRACTOR. The method of groundwater disposal will be determined by the ENGINEER.

F. If the well is in an unpaved area, the SUBCONTRACTOR shall restore the area by cutting off the surface casing 1 to 2 feet below ground surface and backfilling the remaining hole with soil and restore the surface to its original condition. If a valve box has been installed, it shall be removed and disposed of by the SUBCONTRACTOR.

G. If the well is in a paved or concreted area, the SUBCONTRACTOR shall restore the area by cutting off the surface casing 1 to 2 feet below ground surface and backfilling the hole with concrete to near ground surface. Finish the backfilling by topping off the concrete with the surfacing to match existing (i.e., asphalt or concrete). If a valve box has been installed, the chamber cover shall be removed and the box filled with concrete prior to resurfacing.

H. Water piping from the well casing to the house shall be capped at the well casing and left in the ground. Well discharge piping entering the house shall be disconnected from the house distribution system and capped in accordance with Section 02662, WATER SERVICE CONNECTIONS.

I. Electrical feed from the house to the well pump shall be cut at the well casing and left in the ground. Feed wires shall be disconnected at the circuit breaker and capped.

J. Abandonment methods and sealants shall be approved by the ENGINEER prior to use.

3.4 ABANDONMENT RECORDS

A. A water well completion report form shall be completed by the SUBCONTRACTOR for each abandoned well and filed within 30 days of abandonment with the PADER Bureau of Topographic and Geologic Survey. P.O. Box 8453, Harrisburg, Pennsylvania 17105-8453, phone: (717) 787-5828. This report shall be complete and accurate in order to provide detailed records for possible future reference and to demonstrate that the hole was properly sealed. The information included on the report shall consist of, but not be limited to, the following:

1. Well abandonment Sub-subcontractor's company name and personnel
2. Date of abandonment
3. Well location map and location by smallest legal subdivision
4. Well identification number, if applicable

5. Well use
6. Abandonment procedure
7. Depth and diameter of hole
8. Consistency, quantity, and depth of grout
9. Static water level and depth
10. Surface restoration procedure

END OF SECTION

RESIDENTIAL AND COMMERCIAL SUPPLY WELL ABANDONMENT DATA SUMMARY
DUBLIN TCE SITE
DUBLIN, PENNSYLVANIA

Tax Map No.	Street Address	Owner Name	Property Description[1]	No. Wells[2]	Depth[3] (ft)	Diameter[4] (in)	Proposed Future Use[5]	Well Location[6]	Comments
4-087	111 Elephant Rd	Hope	R	1	N/A	N/A	A	N/A	
4-086	113 Elephant Rd	Miller	R	1	N/A	N/A	A	N/A	
4-076	114 Elephant Rd	Slaymaker	R,I	2	460 *	N/A	A	O (SL/S)	
					115 *	6	A	I	
4-083	115 Elephant Rd	Conrad	R	1	170 *	N/A	A	O (BL)	
4-075	116 Elephant Rd	Black	R	2	160 *	N/A	A	O (SL/S)	
					N/A	N/A	A	O (FL)	
4-082	119 Elephant Rd	Hess	R	1	N/A	N/A	A	O (SL/S)	
2-019	139 Elephant Rd	Meyers	R	1	245 *	N/A	A	O (SL/S)	
2-018	141 Elephant Rd	Moyer	R	1	N/A	N/A	A	N/A	Well taken out of service in 1992.
2-010	146 Elephant Rd	Moyer	R,C	1	250 *	6	A	N/A	
2-017	149 Elephant Rd	Fair	R	1	N/A		A	I	Well in basement between house and garage.
2-011	150 Elephant Rd	Detweiler	R	1	290*	6	A	O (FL)	
2-016	151 Elephant Rd	Sulpizio	R	1	N/A	N/A	A	N/A	
2-012	152 Elephant Rd	Rush	R	1	350*	6	A	O (FL)	
2-015-001	153 Elephant Rd	Hager	R	1	470 *	N/A	A	O (SL/S)	
2-013	154 Elephant Rd	Fretz	R	1	95 *	N/A	A	I	Well in basement pit on south side of house.

RESIDENTIAL AND COMMERCIAL SUPPLY WELL ABANDONMENT DATA SUMMARY
DUBLIN TCE SITE
DUBLIN, PENNSYLVANIA

Tax Map No.	Street Address	Owner Name	Property Description[1]	No. Wells[2]	Depth[3] (ft)	Diameter[4] (in)	Proposed Future Use[5]	Well Location[6]	Comments
2-015-002	155 Elephant Rd	Worthington	R	1	N/A	N/A	A	O (FL)	
2-014-001	156 Elephant Rd	Blichasz	R	1	N/A	N/A	A	O (FL)	
2-014	162 Elephant Rd	Stewart	R	1	N/A	N/A	A	O (FL)	
2-014-003	166 Elephant Rd	Vanderleeuw	R	1	N/A	N/A	A	N/A	
2-014-004	168 Elephant Rd	Smith	R	1	N/A	N/A	A	N/A	
5-001-003	172 Elephant Rd	Levy	R	1	N/A	N/A	A	N/A	
5-001-003	174 Elephant Rd	Levy	R	1	N/A	N/A	A	N/A	
4-011	100 Maple Ave	Shultz	R,C	1	N/A	N/A	A	O (SL/S)	
4-012	104 Maple Ave	Buchanan	R,C	1	100 *	N/A	A	O (BL)	
4-013	108 Maple Ave	Williams	R	1	N/A	N/A	A	O (SL/S)	Well installed by Dorn, Telford, PA 215/ 723-7566
4-014	110 Maple Ave	Moyer	R	1	N/A	N/A	A	O (BL)	Well is inadequate; water supplied by 114 Maple.
4-015	112 Maple Ave	Klembeth/Aust. Har.	C,I	1	N/A	N/A	A	O (SL/N)	Well not used; water supplied by 114 Maple.
4-016	114 Maple Ave	Klembeth	R	1	N/A	N/A	A	O (BL)	Well also supplies water to 110 and 112 Maple.
4-017	116 Maple Ave	Rice	R	1	N/A	N/A	A	O (SL/S)	Well is dry; water supplied from 118 Maple.
4-018	118 Maple Ave	Hilltown Invst.	R	1	N/A	N/A	A	O (SL/S)	Well also supplies water to 116 Maple.

RESIDENTIAL AND COMMERCIAL SUPPLY WELL ABANDONMENT DATA SUMMARY
DUBLIN TCE SITE
DUBLIN, PENNSYLVANIA

Tax Map No.	Street Address	Owner Name	Property Description[1]	No. Wells[2]	Depth[3] (ft)	Diameter[4] (in)	Proposed Future Use[5]	Well Location[6]	Comments
4-019	120 Maple Ave	Detweiler	R	1	N/A	N/A	A	O (BL)	
4-020	122 Maple Ave	Vasconez	R	1	310 *	N/A	A	O (SL/S)	
4-021	126-132 Maple Ave	Shaddinger	R	1	N/A	N/A	A	O (BL)	
4-022	134 Maple Ave	Morrison	R	1	N/A	N/A	A	N/A	
4-023	136 Maple Ave	Kohl	R	1	215 *	6	A	O (FL)	
4-008	104 Mill St	Agway Inc.	C (vacant bldg.)	1	200 *	6	A	O (BL)	
4-006	120 Mill St	Thompson	I	3	90 *	6	A	O (SL/N)	PW-1 : permanently out of service
					140 *	6	A	O (FL)	PW-2
					500	6	A	O (BL)	Fire Tower Well
4-088	101 S Main St	Hope/Dublin Inn	C	1	>90 *	N/A	A	O (BL)	
4-070	105 N Main St	DellaBadia	R,C	1	200 *	N/A	A	O (SL/E)	
4-010	106 N Main St	Knisley/Dairy Queen	C	1	100 *	N/A	A	O (FL)	
4-008-001	112 N Main St	Rhine/Gas Station	C	1	245 *	6	A	O (SL/S)	
4-071	113 N Main St	Hinsdale	R (vacant house)	1	N/A	N/A	A	N/A	
4-072	115 N Main St	Boyle	R	1	150 *	N/A	A	O (SL/S)	

RESIDENTIAL AND COMMERCIAL SUPPLY WELL ABANDONMENT DATA SUMMARY
DUBLIN TCE SITE
DUBLIN, PENNSYLVANIA

Tax Map No.	Street Address	Owner Name	Property Description[1]	No. Wells[2]	Depth[3] (ft)	Diameter[4] (in)	Proposed Future Use[5]	Well Location[6]	Comments
4-009	116 N Main St	Occhi	R	1	N/A	N/A	A	O (SL/S)	
4-073	117 N Main St	Buchanan	R	1	N/A	N/A	A	O (SL/S)	
4-074	119 N Main St	Hirst	R	1	N/A	N/A	A	O (SL/S)	
2-006	122 N Main St	Rufe	R	1	250 *	N/A	A	O (SL/S)	
2-009	123 N Main St	MODUTEC Inc.	I (vacant bldg.)	2	168 *	6	A	O (SL/S)	
					215 *	6	A	N/A	
2-005	124 N Main St	Meyers	R	1	225 *	N/A	A	O (BL)	
2-004	126 N Main St	Meyers	R,C	2	225 *	N/A	A	O (BL)	
					N/A	N/A	A	O (BL)	dry well
2-003	128 N Main St	Fluck	R	1	165 *	6	A	O (SL/S)	
2-032-001	130 N Main St	Moyer	R	2	240 *	6	A	O (BL)	Also supplies auto shop at 134 N. Main.
					140	N/A	A	O (BL)	farm well
2-008-002	131 N Main St	Evans/Post Office	C	0	-	-	-	-	Water supplied from 133 N. Main, well no. 1.
2-008	133 N Main St	McVaugh/Dublin Family Restaurant	C	2	N/A	N/A	A	O (SL/S)	Well also supplies 131 and 133 (rear) N. Main.
					200 *	N/A	A	O (BL)	Well also supplies 131 and 133 (rear) N. Main.
2-008-001	133R N Main St	Jacobs/Auto Supply	C	0	-	-	-	-	Water supplied from 133 N. Main, well no. 1.

RESIDENTIAL AND COMMERCIAL SUPPLY WELL ABANDONMENT DATA SUMMARY
DUBLIN TCE SITE
DUBLIN, PENNSYLVANIA

Tax Map No.	Street Address	Owner Name	Property Description[1]	No. Wells[2]	Depth[3] (ft)	Diameter[4] (in)	Proposed Future Use[5]	Well Location[6]	Comments
2-032-001B	134 N Main St	Moyer/Auto Body	C	0	-	-	-	-	Water supplied from 130 N. Main.
2-032	138 N Main St	Moyer	R,C	1	250 *	6	A	O (BL)	
2-007	139 N Main St	Bishop/Service Sta.	C	1	270 *	N/A	A	O (BL)	
2-032-002	142 N Main St	1st Fed S & L	C	1	300 *	6	A	O (FL)	
2-038	145 N Main St	Bucks Co. Bank	C	1	N/A	N/A	A	I	Well appears to be covered by building slab.
2-030-001	146 N Main St	Whistlewood Apartments	R	1	370	6	A	O	Well is on SE side of property between apartment buildings.
2-037	149 N Main St	Grady	R (vacant house)	1	310 *	N/A	A	O (BL)	
2-030	150 N Main St	Daniel	C (vacant lot)	N/A	N/A	N/A	A	O (SL/S)	House was demolished in 1991; unknown if well was properly abandoned.
2-036	153 N Main St	Myrick	R	1	90 *	N/A	A	O (SL/S)	
2-035	157-161 N Main St	Goldstein/Dublin Village Plaza	C	2	400	6	A	O (BL/SE)	Two wells operate alternately.
					600	6	A	O (BL/NE)	Two wells operate alternately.
2-031	164 N Main St	Bagel Jakes	C	1	N/A	N/A	A	O (SL/S)	
2-034-001	169 N Main St	7-11 Store	C (vacant bldg.)	1	N/A	N/A	A	O (BL)	
2-029-001	170 N Main St	G & T Company	R	1	450 *	8	A	O (BL)	

RESIDENTIAL AND COMMERCIAL SUPPLY WELL ABANDONMENT DATA SUMMARY
DUBLIN TCE SITE
DUBLIN, PENNSYLVANIA

Tax Map No.	Street Address	Owner Name	Property Description[1]	No. Wells[2]	Depth[3] (ft)	Diameter[4] (in)	Proposed Future Use[5]	Well Location[6]	Comments
2-034	173 N. Main St	Myers	R	1	N/A	N/A	A	I	Well under back porch in basement.
2-029-002	174 N Main St	Family Health	C	1	145 *	N/A	A	O (FL)	
2-034-002	179 N Main St	Crouthamel	R,C	1	190 *	N/A	A	O (FL)	
2-033	183 N Main St	Moyer/Dairy Farm	R,C,A	1	129	6	A	O (SL/N)	Well is between house and barn.
2-028-002	194 N Main St	Dublin Vol. Fire Co.	C	1	220	6	A	O (BL)	
TOTALS				78					

Explanation:
[1]Property description: R - residential; C - commercial; I - industrial; A - agricultural
[2]Number of supply wells on property
[3]Depth of well: N/A - depth data not available; * - depth data obtained from Geraghty & Miller
[4]Diameter of well: N/A - diameter data not available
[5]Proposed future use: A - well to be abandoned; M - well to be converted to a monitoring well; E - well to be converted to an extraction well; S - well to continue to be used for water supply
[6]Well location: O - outside building; I - inside building; (FL, BL, SL/N,S,E,W) - front lot, back lot, side lot/north, south, east, west

SECTION 02662
WATER SERVICE CONNECTIONS

PART 1 GENERAL

1.1 GENERAL

A. SUBCONTRACTOR shall complete final service connections for 71 residential, commercial, industrial, or agricultural properties listed on the Water Service Connection Schedule. Details for the service connections are shown on the Drawings. SUBCONTRACTOR shall disconnect existing piping, pressure tanks, and activated carbon filter systems to facilitate completing the service connections. A list of properties with point-of-entry and point-of-use carbon filters that must be disconnected and moved is presented in the Carbon Filter Data Summary. Carbon filters that are owned by the property owner (see Carbon Filter Data Summary) shall be left in service if specifically requested by the property owner.

B. All of the properties for which connections will be completed are currently served by private wells. Service connections will be made for two general types of configurations: for properties with basements and for properties with slabs on grade. A general description is provided below.

1. Properties with Basements:
   a. A service line from the water main to inside the basement was installed by others. SUBCONTRACTOR shall provide and install piping, valves, and meters for the connection of this existing service line to the existing water supply header that serves the property.
   b. In addition, four properties, as indicated on the schedule, require complete service connections from existing curb stops (located near the water main on Elephant Road) to the basement. SUBCONTRACTOR shall core drill a penetration in the basement wall and provide a leak tight seal. Use method approved by the ENGINEER. The remainder of work for these connections shall be as shown on the Drawings.
   c. See Detail 111 on Drawing C-5 for all basement service connections.
2. Properties with Slabs on Grade:
   a. A service line from the main to a location near the existing well was installed by others. SUBCONTRACTOR shall provide and install piping to connect this existing service line to the discharge line from the well. This connection will be made outdoors below grade to eliminate the need for a new slab penetration. A meter and valves will be installed indoors in an existing utility room. SUBCONTRACTOR shall disconnect and move piping and equipment as required and install new piping, valves, and meters for the new water service inside the existing utility room.
   b. Whistlewood Apartments (146 North Main Street): The existing water supply system for the apartments includes a well with a pump that discharges to an air stripper. Effluent from the stripper flows by gravity to a belowgrade holding tank. A pump

transfers water from the holding tank to pressure tanks from where it is distributed throughout the complex. For this service connection, SUBCONTRACTOR shall:

1) Connect the existing belowgrade water service pipe from the main (which has been terminated in the vicinity of the well) to the belowgrade discharge line from the holding tank.
2) Disconnect and remove pressure tanks in the utility room and install valves and meter as specified for other slab-on-grade properties.

c. See Detail 110 on Drawing C-5 for all slab-on-grade service connections.

C. The existing conditions at each property are different. The details shown on the drawings and the description of the work specified herein are general. The actual arrangement of new piping will vary at each location.

1.2 REFERENCE DRAWINGS

A. Drawings for the Dublin TCE Site Water Distribution System for Operable Unit 1 prepared by the United States Department of the Interior, Bureau of Reclamation, drawing numbers 1556-1-110-1 through 1556-1-110-7 are available for reference. The reference drawings show the location of the existing water service lines.

1.3 SUBMITTALS

A. Shop Drawings: Submit Manufacturer's specifications and catalog cuts for the meters.

B. Quality Control Submittal: Submit schedule for work at each property.

1.4 SUBCONTRACTOR'S RESPONSIBILITIES

A. Field verify the location of each existing piping, wells, pressure tanks, carbon filter systems, utility rooms, and other site specific information required to complete the work specified herein.

B. Disconnection, drainage, and relocation of the items listed below. All drainage shall be discharged to the sanitary sewer via a drain located on the property.

1. Piping as required.
2. One pressure tank for each well system.
3. Point-of-entry and point-of-use carbon filter systems as identified on the Carbon Filter Data Summary.

C. Perform connections at each property listed on the Water Service Connection Schedule. Some properties require multiple connections as specified on the schedule.

D. Test and disinfect piping as specified herein.

E. Surface Restoration: Restore all disturbed surfaces to their original condition.

F. Coordinate all work with the owner of the property on which work is performed. Work shall be performed during normal SUBCONTRACTOR hours at times approved by the property owner.

1.5 EQUIPMENT DISPOSITION

A. All removed piping shall become the property of the SUBCONTRACTOR and should be disposed in accordance with Federal, State, and Local regulations.

B. Prevent damage to pressure tanks and carbon filter systems which will remain on the property and will remain the property of their current owners.

1.6 COORDINATION

A. Each property's water system must be taken out of service to complete the water service connection. The maximum out-of-service time for each water system is 8 hours.

PART 2 PRODUCTS

2.1 SERVICE CONNECTIONS

A. Furnish components same size as nominal designation of service pipe. Connections shall be made as shown on the drawings and in accordance with Dublin Borough standards.

B. See Section 15060, PLANT PIPING AND PLUMBING - GENERAL.

C. See Section 15100, VALVES.

D. See Section 02220, FILL AND BACKFILL.

2.2 METERS

A. Furnish number of meters shown on the Water Service Connection Schedule.

B. Meter shall indicate total flow in 10 gallon increments.

C. Manufacturer and Model:

1. Badger Meter, Model P25.
2. Or equal.

PART 3 EXECUTION

3.1 PREPARATION

A. For properties with meters to be located in utility rooms (slab-on-grade), field verify that existing piping to be retained upstream of the pressure reducing valve is suitable for the new system. Notify ENGINEER immediately if piping is unsuitable.

3.2 INSTALLATION

A. See Section 15060, PLANT PIPING AND PLUMBING - GENERAL.

B. See Section 15100, VALVES.

C. See Section 02220, FILL AND BACKFILL.

D. See Section 02205, EXCAVATION.

E. Install meters in accordance with manufacturer's recommendations.

3.3 TESTING

A. Inspect service connections for leakage under normal system pressure. Joints shall be watertight before acceptance.

B. Inspect for leaks and repair before backfilling.

3.4 DISINFECTION

A. Disinfect new piping as specified in Section 02683, DISINFECTION OF WATER SYSTEMS.

END OF SECTION

WATER SERVICE CONNECTION SCHEDULE DUBLIN TCE SITE DUBLIN, PENNSYLVANIA							
Tax Map No.	**Street Address**	**Owner Name**	**Property Description[1]**	**No. Meters[2]**	**Proposed Service Connection Size (in)**	**Bldg. Construction[3]**	**Proposed Meter Location[4]**
4-087	111 Elephant Road	Hope	R	1	0.75	B	B
4-086	113 Elephant Road	Miller	R	1	0.75	B	B
4-076	114 Elephant Road	Slaymaker	R,I	1	0.75	B	B
4-083	115 Elephant Road	Conrad	R	1	0.75	B	B
4-075	116 Elephant Road	Black	R	1	1.0	B	B
4-082	119 Elephant Road	Hess	R	1	0.75	B	B
2-019	139 Elephant Road	Meyers	R	1	0.75	B	B
2-010	146 Elephant Road	Moyer	R,C	1	0.75	B	B
2-017	149 Elehant Road	Fair	R	1	0.75	B	B
2-011	150 Elephant Road	Detweiler	R	1	0.75	B	B
2-016	151 Elephant Road	Sulpizio	R	1	0.75	B	B
2-012	152 Elephant Road	Rush	R	1	0.75	B	B
2-015-001	153 Elephant Road	Hager	R	1	0.75	B	B
2-013	154 Elephant Road	Fretz	R	1	0.75	B	B
2-015-002	155 Elephant Road	Worthington	R	1	0.75	B	B
2-014-001	156 Elephant Road	Blichasz	R	1	0.75	B	B

WATER SERVICE CONNECTION SCHEDULE
DUBLIN TCE SITE
DUBLIN, PENNSYLVANIA

Tax Map No.	Street Address	Owner Name	Property Description[1]	No. Meters[2]	Proposed Service Connection Size (in)	Bldg. Construction[3]	Proposed Meter Location[4]
2-014	162 Elephant Road	Stewart	R	1	0.75	B	B
2-014-003	166 Elephant Road	Vanderleeuw	R	1	0.75[5]	B	B
2-014-004	168 Elephant Road	Smith	R	1	0.75[5]	B	B
5-001-003	172 Elephant Road	Levy	R	1	0.75[5]	B	B
5-001-003	174 Elephant Road	Levy	R	1	0.75[5]	B	B
4-011	100 Maple Avenue	Shultz	R,C	1	0.75	B	B
4-012	104 Maple Avenue	Buchanan	R,C	1	1.0	B	B
4-013	108 Maple Avenue	Williams	R	1	0.75	B	B
4-014	110 Maple Avenue	Moyer	R	1	0.75	B	B
4-015	112 Maple Avenue	Klembeth	C,I	1	0.75	B	B
4-016	114 Maple Avenue	Klembeth	R	1	1.0	B	B
4-017	116 Maple Avenue	Rice	R	1	0.75	B	B
4-018	118 Maple Avenue	Hilltown Invst.	R	1	1.5	B	B
4-019	120 Maple Avenue	Detweiler	R	1	0.75	B	B
4-020	122 Maple Avenue	Vasconez	R	1	0.75	B	B
4-021	126-132 Maple Avenue	Shaddinger	R	1	1.0	B	B

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WATER SERVICE CONNECTION SCHEDULE DUBLIN TCE SITE DUBLIN, PENNSYLVANIA							
Tax Map No.	**Street Address**	**Owner Name**	**Property Description[1]**	**No. Meters[2]**	**Proposed Service Connection Size (in)**	**Bldg. Construction[3]**	**Proposed Meter Location[4]**
4-022	134 Maple Avenue	Morrison	R	1	1.0	B	B
4-023	136 Maple Avenue	Kohl	R	1	0.75	B	B
4-008	104 Mill Street	Agway Inc.	C (vacant bldg.)	1	1.5	S	UR
4-006	120 Mill Street	Thompson	I	1	2.0	S	UR
4-088	101 South Main St.	Hope/Dublin Inn	C	1	1.0	B	B
4-070	105 North Main St.	DellaBadia	R,C	1	1.5	B	B
4-010	106 North Main St.	Knisley/Dairy Queen	C	1	0.75	S	UR
4-008-001	112 North Main St.	Rhine/Gas Station	C	1	0.75	S	UR
4-071	113 North Main St.	Hinsdale	R (vacant house)	1	0.75	B	B
4-072	115 North Main St.	Boyle	R	1	0.75	B	B
4-009	116 North Main St.	Occhi	R	1	0.75	B	B
4-073	117 North Main St.	Buchanan	R	1	0.75	B	B
4-074	119 North Main St.	Hirst	R	1	0.75	B	B
2-006	122 North Main St.	Rufe	R	1	0.75	B	B
2-009	123 North Main St.	MODUTEC Inc.	I (vacant bldg.)	1	2.0	B	B
2-005	124 North Main St.	Meyers	R	1	0.75	B	B

WATER SERVICE CONNECTION SCHEDULE
DUBLIN TCE SITE
DUBLIN, PENNSYLVANIA

Tax Map No.	Street Address	Owner Name	Property Description[1]	No. Meters[2]	Proposed Service Connection Size (in)	Bldg. Construction[3]	Proposed Meter Location[4]
2-004	126 North Main St.	Meyers	R,C	1	0.75	B	B
2-003	128 North Main St.	Fluck	R	1	0.75	B	B
2-032-001	130 North Main St.	Moyer	R	1	0.75	B	B
2-008-002	131 North Main St.	Evans/Post Office	C	1	0.75	S	UR
2-008	133 North Main St.	McVaugh/Dublin Family Restaurant	C	1	1.5	B	B
2-008-001	133R North Main St.	Jacobs/Auto Supply	C	1	0.75	S	UR
2-032-001B	134 North Main St.	Moyer/Auto Body	C	1	0.75	S	YR
2-032	138 North Main St.	Moyer	R,C	1	0.75	B	B
2-007	139 North Main St.	Bishop/Service Sta.	C	1	0.75	S	UR
2-032-002	142 North Main St.	1st Fed S & L	C	1	0.75	S	UR
2-038	145 North Main St.	Bucks Co. Bank	C	1	0.75	B	B
2-030-001	146 North Main St.	Whistlewood	R	1	6.0	S	UR
2-037	149 North Main St.	Grady	R (vacant house)	1	0.75	B	B
2-036	153 North Main St.	Myrick	R	1	1.0	B	B

WATER SERVICE CONNECTION SCHEDULE
DUBLIN TCE SITE
DUBLIN, PENNSYLVANIA

Tax Map No.	Street Address	Owner Name	Property Description[1]	No. Meters[2]	Proposed Service Connection Size (in)	Bldg. Construction[3]	Proposed Meter Location[4]
2-035	157-161 North Main St.	Goldstein/Dublin Village Plaza	C	1	6.0	S	UR
2-031	164 North Main St.	Bagel Jakes	C	1	1.0	S	UR
2-034-001	169 North Main St.	7-11 Store	C (vacant bldg.)	1	0.75	S	UR
2-029-001	170 North Main St.	G & T Company	R	1	1.5	S	UR
2-034	173 North Main St.	Myers	R	1	0.75	B	B
2-029-002	174 North Main St.	Family Health	C	1	1.0	S	UR
2-034-002	179 North Main St.	Crouthamel	R,C	1	0.75	B	B
2-033	183 North Main St.	Moyer/Dairy Farm	R,C,A	1	2.0	B	B
2-028-002	194 North Main St.	Dublin Vol. Fire Co.	C	1	2.0	B	B

Explanation:
[1]Property description: R - residential; C - commercial; I - industrial; A - agricultural
[2]Number of water use meters to be installed at the property
[3]Building construction: B - basement or crawl space, S - slab on grade
[4]Proposed meter location: B - basement or crawl space, UR - ground floor utility room
[5]SUBCONTRACTOR shall construct a complete service connection from the existing curb stop at the property line on Elephant Road to the building basement

AR000344

CARBON FILTER DATA SUMMARY
DUBLIN TCE SITE
DUBLIN, PENNSYLVANIA

Tax Map No.	Street Address	Owner Name	Property Description[1]	No. Wells[2]	POE Carbon Filters[3]	POU Carbon Filters[4]	Other Treatment	Comments
4-087	111 Elephant Road	Hope	R	1	X (P)			
4-086	113 Elephant Road	Miller	R	1	X (O)			
4-076	114 Elephant Road	Slaymaker	R,I	2	X (O)			One system treats both wells.
4-083	115 Elephant Road	Conrad	R	1				
4-075	116 Elephant Road	Black	R	2	X (P)			One system treats both wells.
4-082	119 Elephant Road	Hess	R	1	X (P)			
2-019	139 Elephant Road	Meyers	R	1	X (O)			
2-018	141 Elephant Road	Moyer	R	1				Connected to public water in 1992.
2-010	146 Elephant Road	Moyer	R,C	1	X (P)			
2-017	149 Elephant Road	Fair	R	1				
2-011	150 Elephant Road	Detweiler	R	1	X (P)			
2-016	151 Elephant Road	Sulpizio	R	1				
2-012	152 Elephant Road	Rush	R	1				
2-015-001	153 Elephant Road	Hager	R	1				
2-013	154 Elephant Road	Fretz	R	1				
2-015-002	155 Elephant Road	Worthington	R	1				

CARBON FILTER DATA SUMMARY
DUBLIN TCE SITE
DUBLIN, PENNSYLVANIA

Tax Map No.	Street Address	Owner Name	Property Description[1]	No. Wells[2]	POE Carbon Filters[3]	POU Carbon Filters[4]	Other Treatment	Comments
2-014-001	156 Elephant Road	Blichasz	R	1				
2-014	162 Elephant Road	Stewart	R	1				
2-014-003	166 Elephant Road	Vanderleeuw	R	1				
2-014-004	168 Elephant Road	Smith	R	1				
5-001-003	172 Elephant Road	Levy	R	1				
5-001-003	174 Elephant Road	Levy	R	1				
4-011	100 Maple Avenue	Shultz	R,C	1				
4-012	104 Maple Avenue	Buchanan	R,C	1	X (P)			
4-013	108 Maple Avenue	Williams	R	1				
4-014	110 Maple Avenue	Moyer	R	1				
4-015	112 Maple Avenue	Klembeth	C,I	1				
4-016	114 Maple Avenue	Klembeth	R	1				
4-017	116 Maple Avenue	Rice	R	1				
4-018	118 Maple Avenue	Hilltown Invst.	R	1	X (P)			
4-019	120 Maple Avenue	Detweiler	R	1				
4-020	122 Maple Avenue	Vasconez	R	1				
4-021	126-132 Maple Avenue	Shaddinger	R	1				

CARBON FILTER DATA SUMMARY
DUBLIN TCE SITE
DUBLIN, PENNSYLVANIA

Tax Map No.	Street Address	Owner Name	Property Description[1]	No. Wells[2]	POE Carbon Filters[3]	POU Carbon Filters[4]	Other Treatment	Comments
4-022	134 Maple Avenue	Morrison	R	1				
4-023	136 Maple Avenue	Kohl	R	1				
4-008	104 Mill Street	Agway Inc.	C (vacant bldg.)	1		X (P)		
4-006	120 Mill Street	Thompson	I	3				PW-1: permanently out of service
					X (P)			PW-2: in use
					X (P)			Fire Tower Well: in use
4-088	101 South Main St.	Hope/Dublin Inn	C	1				
4-070	105 North Main St.	DellaBadia	R,C	1	X (O)			
4-010	106 North Main St.	Knisley/Dairy Queen	C	1	X (P)			Treatment system proposed in June 1992.
4-008-001	112 North Main St.	Rhine/Gas Station	C	1				
4-071	113 North Main St.	Hinsdale	R (vacant house)	1	X (O)			
4-072	115 North Main St.	Boyle	R	1	X (O)			
4-009	116 North Main St.	Occhi	R	1	X (P)			
4-073	117 North Main St.	Buchanan	R	1	X (P)			
4-074	119 North Main St.	Hirst	R	1	X (O)			

CARBON FILTER DATA SUMMARY
DUBLIN TCE SITE
DUBLIN, PENNSYLVANIA

Tax Map No.	Street Address	Owner Name	Property Description[1]	No. Wells[2]	POE Carbon Filters[3]	POU Carbon Filters[4]	Other Treatment	Comments
2-006	122 North Main St.	Rufe	R	1	X (P)			
2-009	123 North Main St.	MODUTEC Inc.	I (vacant bldg.)	2				Wells not used for drinking water.
2-005	124 North Main St.	Meyers	R	1	X (P)			
2-004	126 North Main St.	Meyers	R,C	2	X (P)			One treatment system; one well is dry.
2-003	128 North Main St.	Fluck	R	1	X (O)			
2-032-001	130 North Main St.	Moyer	R	2	X (P)			residential well farm well
2-008-002	131 North Main St.	Evans/Post Office	C	0		X (P)		Obtains untreated water from 133 N. Main.
2-008	133 North Main St.	McVaugh/Dublin Family Restaurant	C	2	X (O)			One system treats both wells.
2-008-001	133R North Main St.	Jacobs/Auto Supply	C	0				Obtains untreated water from 133 N. Main; uses bottled drinking water.
2-032-001B	134 North Main St.	Moyer/Auto Body	C	0		X (P)		Obtains untreated water from 130 N. Main.
2-032	138 North Main St.	Moyer	R,C	1	X (P)			

CARBON FILTER DATA SUMMARY
DUBLIN TCE SITE
DUBLIN, PENNSYLVANIA

Tax Map No.	Street Address	Owner Name	Property Description[1]	No. Wells[2]	POE Carbon Filters[3]	POU Carbon Filters[4]	Other Treatment	Comments
2-007	139 North Main St.	Bishop/Service Sta.	C	1		X (P)		
2-032-002	142 North Main St.	1st Fed S & L	C	1		X (P)		
2-038	145 North Main St.	Bucks Co. Bank	C	1		X (P)		
2-030-001	146 North Main St.	Whistlewood	R	1			X (O)	Water treated by an air stripper.
2-037	149 North Main St.	Grady	R (vacant house)	1	X (O)			
2-030	150 North Main St.	Daniel	C (vacant lot)	0				vacant lot
2-036	153 North Main St.	Myrick	R	1	X (P)			
2-035	157-161 North Main St.	Goldstein/Dublin Village Plaza	C	2	X (P)			One system treats both wells.
2-031	164 North Main St.	Bagel Jakes	C	1				
2-034-001	169 North Main St.	7-11 Store	C (vacant bldg.)	1	X (P)			
2-029-001	170 North Main St.	G & T Company	R	1				
2-034	173 North Main St.	Myers	R	1				
2-029-002	174 North Main St.	Family Health	C	1	X (P)			
2-034-002	179 North Main St.	Crouthamel	R,C	1	X (P)			

CARBON FILTER DATA SUMMARY
DUBLIN TCE SITE
DUBLIN, PENNSYLVANIA

Tax Map No.	Street Address	Owner Name	Property Description[1]	No. Wells[2]	POE Carbon Filters[3]	POU Carbon Filters[4]	Other Treatment	Comments
2-033	183 North Main St.	Moyer/Dairy Farm	R,C,A	1	X (P)			
2-028-002	194 North Main St.	Dublin Vol. Fire Co.	C	1				

Explanation:
[1]Property description: R - residential; C - commercial; I - industrial; A - agricultural
[2]Number of supply wells on property
[3]Point-of-entry carbon filters
[4]Point-of-use carbon filters
(P) - treatment system provided and installed by PRP
(O) - treatment system provided and installed by owner

SECTION 02670
SUPPLY WELL RETROFITTING

PART 1 GENERAL

1.1 WORK INCLUDED

A. This section covers the work, materials, and equipment necessary for reaming and deepening the proposed supply well adjacent to the treatment system building, installing new casing and a pitless adaptor, and redeveloping and disinfecting the retrofitted well.

1.2 SUBMITTALS

A. Shop Drawings:

1. Description of well development.
2. Product Data:
   a. Drilling fluid additives.
   b. Casing.
   c. Grout seal additives.
   d. Pitless adaptor.

B. Samples: Grout seal bentonite.

C. Quality Control Submittals:

1. Manufacturer's Instructions: Preparing and applying chlorine solution for disinfection of wells.
2. Daily drilling log.
3. Manufacturer's Mill Certificate on steel casing prior to installation.
4. Drilling Fluid Additives: Certification that additives are suitable for water well applications.
5. Grout Seal Additives: Certification that additives are suitable for water well applications.

D. Contract Closeout Submittals: Final well log.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Deliver to site in bags or bulk and store and protect from contamination in accordance with AWWA A100-90.

1.4 SCHEDULING AND SEQUENCING

A. Notify ENGINEER of proposed drilling start date at least 5 working days before drilling begins. Notify ENGINEER of anticipated delays whenever they become apparent.

PART 2 PRODUCTS

2.1 PERMANENT SURFACE CASING

A. Permanent surface casing shall be constructed of 10-inch ID steel or wrought iron pipe. Well casing material other than steel or wrought iron must be resistant to the corrosiveness of the water and to the stresses to which it will be subjected during installation, grouting, and operation. Permanent surface casing shall have a minimum wall thickness of 0.365 inches (steel) or 0.372 inches (wrought iron). Permanent surface casing shall have a minimum weight per foot of 40.48 pounds (plain ends) or 41.85 (with threads and couplings). Surface casing shall be of new, first quality material, and be free of defects in material, workmanship, and handling. In general, the criteria established in AWWA Standard A-100-90 should be followed.

1. Ferrous casings shall:

   a. Be new pipe meeting ASTM or API specifications for water well construction.
   b. Have additional thickness and weight if minimum thickness is not considered sufficient to assure reasonable life expectancy of the well.
   c. Be capable of withstanding forces to which it is subjected.
   d. Have full circumferential welds or threaded pipe joints.

2. Non-ferrous casing shall meet appropriate ANSI/ASTM or NSF Standards for well casing applications as outlined in AWWA Standard A 100-90. Non-ferrous casing materials shall not impart any taste, odor, or toxic substances to the well water.

B. All casing joints shall be welded or threaded and coupled. The ends of plain end pipe shall be perfectly square and shall be furnished beveled for field butt welding. If threaded casing is used, threaded connections of the casing shall be sealed with Teflon tape.

C. Permanent surface casing shall be set in a borehole with a minimum diameter of 14 inches.

D. The permanent surface casing, threads, and couplings shall be free of any oils or grease.

2.2 PITLESS ADAPTER

A. Pitless adapter shall:

1. Be a Baker Monitor PS Industrial Pitless Unit or equal, for a 10-inch diameter well casing.
2. Be shop-fabricated from the point of connection with the well casing to the unit cap or cover.
3. Be of the length shown in the Drawings so that the top of the discharge outlet is located below the frost line and the top of the unit, with the cap off, is 18 inches above the final ground surface.
4. Be threaded or welded to the well casing.

5. Be of watertight construction throughout.
6. Be of materials and weight at least equivalent and compatible to the casing.
7. Have field connection to the lateral discharge from the pitless unit of threaded, flanged, or mechanical joint connection.

B. The design of the pitless adapter shall include:

1. Access to disinfect the well.
2. A properly constructed casing vent to the atmosphere. The vent shall terminate in a downturned position, at or above the top of the casing or pitless unit in a minimum 1.5-inch diameter opening covered with a 24 mesh, corrosion resistant screen. The pipe connecting the casing to the vent shall be of adequate size to provide rapid venting of the casing.
3. Two 2-5/8-inch contamination-proof entrance connections for electrical cable.
4. Facilities for the installation of a continuous water level measuring device as specified in Section 13401, PROCESS INSTRUMENTATION AND CONTROL SYSTEMS (PICS).
5. A cover at the upper terminal of the well that will prevent the entrance of contamination.
6. An inside diameter as great as that of the well casing to facilitate work and repair on the well or pump, and
7. Provisions for installing a check valve within the well casing as shown on the Drawings.
8. Connection to a 2-inch CPVC drop pipe.

C. If the connection to the casing is by field weld, the shop-assembled unit must be designed specifically for field welding to the casing. The only field welding permitted will be that needed to connect a pitless unit to the casing.

2.3 GROUT SEAL

A. Bentonite: Pure sodium bentonite clay in powder form.

B. Portland Cement: Confirm to ASTM C150, Type I or Type II.

2.4 GROUT MIXES

A. Portland Cement: 94-pound bag of Type I or Type II.

B. Bentonite: 3 to 4 pounds per bag of cement.

C. Water: Not more than 6 gallons per bag of cement.

PART 3 EXECUTION

3.1 DRILLING EQUIPMENT

A. All equipment shall be in good operating condition and be operated and maintained in strict conformance with the manufacturer's recommendations.

B. SUBCONTRACTOR shall provide a drill rig and all applicable equipment capable of drilling a minimum 14-inch borehole to a depth of 40 feet for permanent surface casing installation. The drill rig must also be capable of reaming to a 10-inch diameter the existing 6-inch-diameter bedrock borehole from the base of the surface casing to the bottom of the existing well at a depth of 400 feet, and be capable of advancing a 10-inch-diameter borehole from 400 feet to a total depth of 450 feet.

C. If air rotary is used to advance the borehole, the compressed air source shall be proven to the SUBCONTRACTOR to be free of oil, water, or other contaminants by appropriate laboratory certification as approved by the ENGINEER. Water will be used only as required and as approved by the ENGINEER. Water provided by the SUBCONTRACTOR must be approved by the ENGINEER. Under no circumstances shall the SUBCONTRACTOR introduce drilling mud, additives, or fluids other than water into the borehole unless approved in advance by the ENGINEER.

D. All drilling equipment to be used during well modification must be decontaminated using a hot-water high-pressure washer prior to use at the well. SUBCONTRACTOR shall provide all equipment necessary for decontamination, including a mobile, hot-water, high-pressure washer.

3.2 EXISTING SURFACE CASING REMOVAL

A. Care must be taken not to introduce drilling fluids or other contaminants into the well as the existing casing is removed.

B. SUBCONTRACTOR shall remove existing 6-inch temporary surface casing from borehole using a method acceptable to the ENGINEER. It is believed that the casing was grouted into place using only a bentonite slurry. Pulling the casing or a combination of overdrilling and pulling should be sufficient for removal of the casing.

C. Extracted surface casing shall be disposed of by the SUBCONTRACTOR.

3.3 PERMANENT SURFACE CASING INSTALLATION

A. Care must be taken not to introduce drilling fluids, grout mixtures, or other contaminants into the well during installation of the 10-inch permanent surface casing.

B. Decontaminate all drilling equipment by steam-cleaning prior to the initiation of drilling.

C. SUBCONTRACTOR shall drill a minimum 14-inch diameter borehole from ground surface to a depth of approximately 40 feet. All drill cuttings generated during borehole reaming for surface casing installation will be contained and temporarily stored on clean thick-ply plastic sheets by the SUBCONTRACTOR until the results of the groundwater sampling outlined in Paragraph 3.4 (C) have been obtained. If the analytical results from all groundwater samples do not indicate the presence of TCE or other VOCs in the groundwater, the SUBCONTRACTOR may spread the drill cuttings evenly across the ground surface in the vicinity of the well, at specific locations approved by the ENGINEER. If the presence of TCE or other

VOCs is indicated in the groundwater samples, the ENGINEER will determine a disposal method and will provide additional funding for cuttings management as appropriate. For cost estimating purposes, the SUBCONTRACTOR should assume that the groundwater samples will NOT indicate the presence of TCE.

D. Install the 10-inch permanent surface casing in the hole plumb and straight. The casing must be installed in a manner that prevents leakage of the grout seal into the existing 6-inch-diameter well borehole. The SUBCONTRACTOR installation method must be approved by the ENGINEER prior to the initiation of work.

E. Casing lengths shall be joined watertight by a method appropriate to the material used, as selected by the ENGINEER, so that the resulting joint shall have the same structural integrity as the casing itself.

F. The standards of the American Welding Society shall apply for all welded joint casing and accessories.

G. Threaded and coupled joints shall be API or equivalent, made up so that when tight, all threads will be buried in the lip of the coupling.

H. Permanent surface casing shall be sealed in place by grouting from the bottom up. SUBCONTRACTOR shall pump grout through steam-cleaned tremie pipe extended to the bottom of the hole. Continue pumping until grout is up to the level where the pitless unit is connected to the surface casing. Add grout to the annulus to maintain its level as the grouting pipe is withdrawn. Grout in the surface casing annulus cannot be allowed to enter the existing 6-inch-diameter borehole below the surface casing.

I. Allow grout to set-up for at least 24 hours prior to reaming the borehole below the surface casing.

3.4 BOREHOLE REAMING

A. Decontaminate all drilling equipment by steam-cleaning prior to the initiation of drilling.

B. SUBCONTRACTOR shall ream the existing 6-inch-diameter bedrock borehole to a diameter of 10 inches from the base of the surface casing to a total depth of 400 feet. The 10-inch-diameter borehole will then be advanced an additional 50 feet to a total depth of 450 feet.

C. It is assumed that all groundwater discharged during the borehole reaming can be directed by the SUBCONTRACTOR into a natural drainage ditch located near the well. In order to discharge groundwater into the drainage ditch, it will be necessary for the SUBCONTRACTOR to obtain a temporary discharge permit from PADER. It is assumed that PADER will require periodic sampling of the groundwater being discharged for trichloroethene (TCE) as a condition of the permit. For purposes of cost estimation, the SUBCONTRACTOR shall assume that four (4) groundwater samples will be collected during borehole reaming for TCE analysis (detection limit of 2 μg/l or less). The SUBCONTRACTOR shall be responsible for conducting chemical analyses of the groundwater samples.

It shall be assumed that analytical results must be obtained and submitted to PADER within 30 days of the completion of the discharge. It is the responsibility of the SUBCONTRACTOR to obtain the PADER temporary discharge permit and to control the discharge of groundwater in accordance with the permit requirements. In addition, the SUBCONTRACTOR will prevent silt-laden discharge water from entering the ditch by employing a method acceptable to the ENGINEER to allow silt to settle out or be trapped prior to flow into the ditch.

D. All drill cuttings generated during borehole reaming or advancement of the borehole will be contained and temporarily stored on clean thick-ply plastic sheets by the SUBCONTRACTOR until the results of the groundwater sampling outlined in Paragraph 3.4 (C) above have been obtained. If the analytical results from all groundwater samples do not indicate the presence of TCE in the groundwater, the SUBCONTRACTOR may spread the drill cuttings evenly across the ground surface in the vicinity of the well, at specific locations approved by the ENGINEER. If the presence of TCE is indicated in the groundwater samples, the ENGINEER will determine a disposal method and will provide additional funding for cuttings management as appropriate. For cost estimating purposes, the SUBCONTRACTOR should assume that the groundwater samples will NOT indicate the presence of TCE.

3.5 LOGS

A. The SUBCONTRACTOR shall maintain up-to-date daily logs of drilling progress.

B. The SUBCONTRACTOR shall maintain Borehole Log containing:

1. Description of geologic materials from 400 to 450 feet below ground surface (bgs) and depth encountered.
2. Drilling rates from 400 to 450 feet (bgs).
3. Well yield with depth, noting depths at which yield increases.
4. Time, depth, and description of unusual occurrences or problems during drilling.
5. Diameter and length of casing installed.

C. Daily Log: Use Daily Drilling Report form located at the end of this section.

D. The SUBCONTRACTOR shall prepare a Final Well Log containing:

1. Geologic log.
2. Borehole diameters.
3. Depth to bottom of casing and bottom of borehole.
4. Diameters and wall thicknesses of casing.
5. Locations of water producing zones and estimates of the yield of each zone.
6. Other information from daily logs pertinent to well construction.

3.6 STRAIGHTNESS AND PLUMBNESS

A. The permanent surface casing and bedrock borehole shall be adequately plumb and straight so as not to interfere with the installation and operation of a permanent 6-inch submersible pump.

3.7 WELL DEVELOPMENT

A. The SUBCONTRACTOR shall develop the well until the water is free of sand and suspended solids, and the maximum production capacity of the well is achieved. All well development equipment must be thoroughly cleaned with a hot-water, high-pressure washer before being introduced into the well.

B. The well shall be developed by a combination of jetting and pumping, or by another method if approved in advance by the ENGINEER. The well shall be developed in accordance with AWWA A100-90.

C. It shall be assumed that all groundwater discharged during well development can be directed by the SUBCONTRACTOR into a natural drainage ditch located near the well. In order to discharge groundwater into the drainage ditch, it will be necessary for the SUBCONTRACTOR to obtain a temporary discharge permit from PADER. It is assumed that PADER will require periodic sampling of the groundwater being discharged for trichloroethene (TCE). For purposes of cost estimation, the SUBCONTRACTOR should assume that two (2) groundwater samples will be collected during well development for TCE analysis (detection limit of 2 μg/l or less). It is the responsibility of the SUBCONTRACTOR to obtain the PADER temporary discharge permit and to control the discharge of groundwater in accordance with the permit requirements. In addition, the SUBCONTRACTOR will prevent silt-laden discharge water from entering the ditch by employing a method acceptable to the ENGINEER to allow silt to settle out or be trapped prior to flow into the ditch.

3.8 PROTECTION OF WATER QUALITY

A. Prevent contaminated water, gasoline, or other harmful substances from entering well, either through opening or by seepage into ground.

B. Do not allow cuttings or drilling fluids to contaminate ground or surface water.

3.9 PITLESS UNIT INSTALLATION

A. The pitless unit shall be connected to the well casing at an elevation shown in the Drawings such that the discharge outlet is situated below the frost line and the top of the unit, with the cap off, is 18 inches above the final ground elevation.

B. The well casing grout shall not extend above the point at which the casing connects to the pitless unit.

C. The pitless unit shall be threaded or field welded to the top of the casing.

3.10 PUMP INSTALLATION AND ELECTRICAL CONNECTION

A. Specifications for the submersible pump are provided in Section 11064, SUPPLY WELL SUBMERSIBLE PUMP SYSTEM, and specifications for the water level measuring device are provided in Section 13401, PROCESS INSTRUMENTATION AND CONTROL SYSTEMS (PICS).

3.11 DISINFECTION

A. As specified in Section 02683, DISINFECTION OF WATER SYSTEMS.

3.12 CAPPING

A. Install well cap.

END OF SECTION

DAILY DRILLING REPORT

Date _____ Owner: _____

Well No.: _____

Casing/Hole Diameter _____-inch

Depth of Well

Start of Shift _____ feet

End of Shift _____ feet

Depth to Water (belowground)

Start of Shift _____ feet

End of Shift _____ feet

Log of Materials Encountered

Description	Depth From	Depth To

Remarks: (Character of drilling, casing added, miscellaneous work items)

_____

_____

_____

Driller: _____

Helper: _____

(Use other side for more comments)

SECTION 02683
DISINFECTION OF WATER SYSTEMS

PART 1 GENERAL

1.1 QUALITY CONTROL SUBMITTALS

A. Procedures and plans for disinfection and testing.

B. Type of disinfecting solution and method of preparation.

C. Qualifications: Independent testing agency.

D. Testing Agency:

1. Equipment: Certified calibrations, manufacturer's product data, and test procedures.
2. Sample Collection and Analysis Procedures for:
   a. Bacteriological Samples.
   b. Chlorine Samples.

E. Certified Bacteriological Test Results:

1. Facility(ies) tested is free from coliform bacteria contamination.
2. Forward results directly to ENGINEER.

F. Method of disposal for disinfecting wastewater.

1.2 QUALIFICATIONS

A. Independent Testing Agency: Certified in the State of Pennsylvania, with 10 years' experience in the field of water sampling and testing required for this Project. Calibrated testing instruments and equipment, and documented standard procedures for performing specified testing.

PART 2 PRODUCTS

2.1 WATER FOR DISINFECTION AND TESTING

A. Clean, uncontaminated, and potable.

2.2 CONTRACTOR'S EQUIPMENT

A. Furnish chemicals and equipment, such as pumps and hoses, to accomplish disinfection.

2.3 MIXING DISINFECTANT

A. Prepare "stock" solution by mixing any of following as described below. The purpose of the stock solution is to facilitate mixing and dilution to

ensure a uniform disinfecting solution. The SUBCONTRACTOR will not be required to mix a stock solution if a liquid chlorine gas feed system that can accurately feed a desired amount of chlorine to mix a final (dilute) disinfecting solution is used.

1. Liquid chlorine gas conforming to AWWA B301 and water mixture.
2. Dry chlorine gas conforming to AWWA B301.
3. Calcium hypochlorite conforming to AWWA B300 or sodium hypochlorite conforming to AWWA B303 powder or liquid and water mixture.

B. Feed dry chlorine gas through devices to regulate the rate of flow and ensure uniform diffusion of gas into water within the pipe or vessel being treated. Chlorinating devices for feeding chlorine gas solution or the gas itself shall prevent backflow of water into chlorine cylinder.

C. Use following proportions of hypochlorite or chlorine to water:

1. Chlorine Gas or Liquid (100 Percent Cl): 1 pound per 11.75 gallons water.
   a. Apply liquid chlorine gas-water solution by means of a solution feed chlorinating device.
2. Calcium Hypochlorite (65 to 70 Percent Cl): 1 pound per 7.5 gallons water.
   a. If calcium hypochlorite is used, first mix dry powder with water to make a thick paste, then thin to a 1 percent solution (10,000 ppm chlorine).
3. Sodium Hypochlorite (5.25 Percent Cl): 1 gallon per 4.25 gallons water.
   a. If sodium hypochlorite procedure is used, dilute the liquid with water to obtain a 1 percent solution.

PART 3 EXECUTION

3.1 GENERAL

A. Disinfect pumps, tanks, pipelines, and any other miscellaneous equipment installed or modified under this Project, intended to hold, transport, or otherwise contact potable water (flow stream i.d. W1) or any water that will become potable water (flow stream i.d. W, TW, CS, and SQA).

1. Disinfect new pipelines that connect to existing pipelines up to the point of connection.
2. Disinfect surfaces of materials that will contact pre-finished finished water, both during and following construction using spray method described below. Disinfect prior to contact with finished water. Take care to avoid recontamination following disinfection.

B. Prior to application of disinfectants, clean pipelines, tanks, and equipment of loose and suspended material. Flush pipelines, tanks, and equipment until clear of suspended solids and color. Use water suitable for flushing and disinfecting.

C. Conform to AWWA C651-92 for pipes and pipelines, C652-92 for tanks, and C654-87 for wells, except as modified in these Specifications.

D. Allow freshwater and stock disinfectant solution to flow into the pipe or vessel at a measured rate so that the chlorine-water solution is at the specified strength. Do not place concentrated commercial disinfectant in the pipeline or vessel before it is filled with water.

3.2 PIPING

A. Flushing:

1. Before disinfecting, flush all foreign matter from pipeline. Provide hoses, temporary pipes, ditches, and other conduits as needed to dispose of flushing water without damage to adjacent properties. Flushing velocities shall be at least 2.5 fps.
2. Flush pipelines through flushing branches and remove branches after flushing is completed. Operate valves during flushing process at least twice during each flush.
3. Flush service connections and hydrants. Flush distribution lines prior to flushing hydrants and service connections.

B. Disinfecting Solution: Chlorine-water solution having a free chlorine concentration of not less than 50 ppm.

C. Disinfecting Procedure: In accordance with AWWA C651-92, unless herein modified.

D. Point of Application:

1. Inject chlorine mixture into pipeline to be treated at beginning of line through corporation stop or suitable tap in top of pipeline.
2. Control water from existing system to flow slowly into pipeline during application of chlorine.
3. Control rate of chlorine solution flow in proportion to rate of water entering pipe so that combined mixture shall contain not less than 50 ppm of free available chlorine.
4. Prevent backflow of chlorine solution into line supplying water.

E. Retention Period:

1. Retain treated water in pipeline for at least 24 hours to destroy all nonspore-forming bacteria. At end of 24-hour period, disinfecting solution shall contain at least 10 ppm of free chlorine or the pipeline shall be recleaned, disinfecting solution shall be reapplied, and specified procedure repeated.
2. Operate valves, hydrants, and appurtenances during disinfection to ensure that disinfecting solution is dispersed into all parts of pipeline, including dead-ends and areas that otherwise may not be treated.
3. After disinfection, flush water from the permanent source until water through the pipeline is equal chemically and bacteriologically to permanent source of supply.

3.3 PUMPS

A. Disinfecting Solutions: Minimum free chlorine concentration of 200 ppm.

B. Disinfecting Procedure: In accordance with AWWA C653-87, unless herein modified.

C. Application:

1. Inject the disinfecting solution into the pump and associated piping and circulate for a minimum 2-hour period of time. At the end of the 2-hour period, the solution shall have a strength of at least 100 ppm free chlorine.
2. Operate valves and/or pump appurtenances during disinfection to ensure that the disinfecting solution is dispersed into all parts of the pumps and lines.
3. If the disinfecting solution contained in the pumps has a residual free chlorine concentration less than 100 ppm after the 2-hour retention period, reclean the pump, reapply disinfecting solution, and retest until a satisfactory test result is obtained.
4. After chlorination, flush the water from the pumps until the water through the units is chemically and bacteriologically equal to the permanent source of supply.

3.4 TANKS

A. Cleaning:

1. Clean interior surfaces using water under pressure before sterilizing. Isolate tank from system to prevent contaminating materials from entering the distribution system. Cleaning shall:
   a. Remove all deposits of foreign nature.
   b. Remove all biological growths.
   c. Clean the slopes, walls, top, and bottom.
   d. Avoid damage to the structure.
   e. Avoid pollution or oil deposits by workers and equipment.
2. Dispose of water used in cleaning in accordance with applicable regulations before adding disinfecting solution to the reservoir.

B. Disinfecting Procedure: In accordance with AWWA C652-92, unless herein modified.

1. Disinfect interior surfaces of tank and inlet and outlet pipelines by the application of chlorine. Wash and disinfect surfaces even though there may be no visible evidence of contamination.
2. Adapt procedure in Article MIXING DISINFECTANT to obtain residual chlorine concentrations required.
3. Disinfect in accordance with one of the following methods:
   a. Spray or brush a solution containing 200 ppm of free chlorine onto the interior surfaces of tank. Apply solution from the bottom up and to the entire structure. Allow to remain 3 hours or until dry before being rinsed off.

b. Fill tank with water containing at least 50 ppm of free chlorine. Hold solution for at least 3 hours, drain the structure, and fill with potable water.
c. Parts of structures, such as ceilings or overflows, that cannot be immersed by the second method above shall be spray or brush disinfected.

4. Drain previous chlorine solution and fill tank with chlorinated water to produce a free chlorine residual of 5 ppm after a retention period of 24 hours. After holding for 24 hours, drain the reservoir and fill with potable water.

3.5 SUPPLY WELL

A. Disinfection Procedures: In accordance with AWWA C654-87, unless herein modified.

1. After well has been completed and tested, it shall be cleaned of all foreign substances. Swab the inner lining using alkalies if necessary to remove oil, grease, or other extraneous matter.
2. Take care to prevent the entrance into well(s) of dirt or other contamination while installing pump(s).
3. Pump bowls, column, and air-line shall be thoroughly washed, first with clear water and then with a 50 ppm free chlorine solution immediately before being placed into the well.
4. Thoroughly wash the inside of the well casing above the water surface with 50 ppm free chlorine solution before installing the pump into the well.
5. Pour additional chlorine solution into the well in such volume and strength to result in a concentration of at least 50 ppm of free chlorine in all parts of the well.
6. Allow chlorine solution to stay in the well for 24 hours after the pump has been installed. Then pump solution out of the well and dispose in accordance with applicable regulations and as described in this section.

3.6 DISPOSAL OF DISINFECTING WASTEWATER

A. Do not allow flow into a waterway without neutralizing disinfectant residual.

1. See AWWA C652-92 for acceptable neutralization methods.

3.7 TESTING

A. Test Equipment:

1. Clean containers and equipment used in sampling and assure they are free of contamination.
2. Obtain sampling bottles with instructions for handling from an independent testing laboratory.

B. Chlorine Concentration Sampling and Analysis:

1. Sampling Frequency for Disinfecting Solution: One sample per pipe run or one sample per batch of disinfectant per day, whichever is less.
2. Residual Free Chlorine Samples: One sample per pipe run.
3. Sampling Locations: As approved by the ENGINEER.
4. Analysis to be performed by an independent test laboratory. Samples will be analyzed using the amperometric titration method for free chlorine as described in the latest edition of Standard Methods for Examination of Water and Wastewater.

C. For treated water (TW) and potable water (W1) piping not including water service connections: After pipelines have been cleaned, disinfected, and refilled with potable water, an independent laboratory will take water Samples and have them analyzed for conformance to bacterial limitations for public drinking water supplies. Samples shall be analyzed for coliform concentrations in accordance with the latest edition of Standard Methods for the Examination of Water and Wastewater.

1. A minimum of two samples on each of 2 consecutive days from each pipeline will be obtained and analyzed by standard procedures outlined by state and local regulatory agencies.
2. Sampling points will be representative as accepted by the ENGINEER.

D. If the minimum Samples required above are not bacterially negative, the disinfecting procedures and bacteriological testing shall be repeated on the respective facilities until bacterial limits are met.

END OF SECTION

SECTION 02831
PERMANENT CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 DEFINITIONS

A. Terms as defined in ASTM F552-88b.

1.2 SUBMITTALS

A. Shop Drawings

B. Quality Control Submittals:

1. Manufacturer's recommended installation instructions.
2. Evidence of Supplier and installer qualifications.

1.3 SCHEDULING AND SEQUENCING

A. Complete necessary site preparation and grading before installing chain link fence and gates.

PART 2 PRODUCTS

2.1 GENERAL

A. Match style, finish, and color of each fence component with that of other fence components.

B. SUBCONTRACTOR shall design and install temporary fencing in area shown. This specification applies to permanent fencing only.

2.2 CHAIN LINK FENCE FABRIC

A. Galvanized fabric conforming to ASTM A392-89, Class 1; galvanized after weaving.

B. Height: 72 inches.

C. Wire Gauge: No. 9.

D. Pattern: 2-inch diamond-mesh.

E. Diamond Count: Manufacturer's standard and consistent for fabric furnished of same height.

F. Loops of Knuckled Selvages: Closed or nearly closed with space not exceeding diameter of wire.

G. Wires of Twisted Selvages:

1. Twisted in a closed helix three full turns.
2. Cut at an angle to provide sharp barbs that extend minimum 1/4 inch beyond twist.

2.3 POSTS.

A. General:

1. Strength and Stiffness Requirements: ASTM F669-90a, Heavy Industrial Fence, except as modified in this section.
2. Steel Pipe: ASTM F1083-90.
3. Roll-Formed Steel Shapes: Roll-formed from ASTM A570-90, Grade 45, steel.
4. Lengths: Manufacturer's standard with allowance for minimum embedment below finished grade of 22 inches plus 3 inches for each 1 foot of fence height greater than 4 feet.
5. Protective Coatings:
   a. Zinc Coating: ASTM F1234-90a, Type A external and internal coating.

B. Line Posts:

1. Steel Pipe:
   a. Outside Diameter: 2.375-inch.
   b. Weight: 3.65 pounds per foot.
2. Roll-Formed Steel C Shape:
   a. Outside Dimensions: 2.25-inch by 1.625-inch.
   b. Weight: 2.70 pounds per foot.
3. Steel H-Section:
   a. Outside Dimensions: 2.25-inch by 1.70-inch.
   b. Weight: 3.26 pounds per foot.

C. End, Corner, Angle, and Pull Posts:

1. Steel Pipe:
   a. Outside Diameter: 2.875-inch.
   b. Weight: 5.79 pounds per foot.
2. Roll-Formed Steel Shape:
   a. Outside Dimensions: 3.5-inch by 3.5-inch.
   b. Weight: 5.10 pounds per foot.

D. Posts for Removable Fence Panels: As specified for end, corner, angle, and pull posts.

E. Posts for Swing Gates:

1. ASTM F900-84.
2. Roll-formed steel shapes may be substituted for steel pipe posts for gate leaf widths up to 6 feet and fabric heights up to 8 feet.
   a. Outside Dimensions: 3.5-inch by 3.5-inch.
   b. Weight: 4.85 pounds per foot.

2.4 TOP RAILS AND BRACE RAILS

A. Galvanized steel pipe or roll-formed steel C shapes.

B. Protective Coatings: As specified for posts.

C. Strength and Stiffness Requirements: ASTM F669-90a, Top Rail, Heavy or Light Industrial Fence.

D. Steel Pipe:

1. ASTM F1083-90.
2. Outside Diameter: 1.66-inch.
3. Weight: 2.27 pounds per foot.

E. Roll-Formed Steel C Shapes:

1. Roll formed from ASTM A570-90, Grade 45.
2. Outside Dimensions: 1.625-inch by 1.25-inch.
3. Weight: 1.40 pounds per foot.

2.5 FENCE FITTINGS

A. General: In conformance with ASTM F626-90, except as modified by this article.

B. Post and Line Caps: Designed to accommodate passage of top rail through cap, where top rail required.

C. Tension and Brace Bands: No exceptions to ASTM F626-90.

D. Tension Bars:

1. One-piece.
2. Equal in length to full height of fabric.

E. Truss Rod Assembly: 3/8-inch diameter.

2.6 TENSION WIRE

A. Aluminum-coated steel marcelled tension wire conforming to ASTM A824-86 Type I.

2.7 GATES

A. General:

1. Gate Operation: Opened and closed easily by one person.
2. Welded Steel Joints: Paint with zinc-based paint.
3. Chain Link Fabric: Attached securely to gate frame at intervals not exceeding 15 inches.

B. Swing Gates: ASTM F900-84.

1. Hinges:
   a. Furnished with large bearing surfaces for clamping in position.
   b. Designed to swing either 180 degrees outward, 180 degrees inward, or 90 degrees in or out, as shown, and not twist or turn under action of gate.
2. Latches: Plunger bar arranged to engage stop, except single gates of openings less than 10 feet wide may each have forked latch.
3. Gate Stops: Mushroom type or flush plate with anchors, suitable for setting in concrete.
4. Locking Device and Padlock Eyes: Integral part of latch, requiring one padlock for locking both gate leaves of double gates.
5. Hold-Open Keepers: Designed to automatically engage gate leaf and hold it in open position until manually released.

2.8 CONCRETE

A. Provide as specified in Section 03301, REINFORCED CONCRETE.

B. Materials: ASTM C387-87 packaged, dry, combined ingredients with Type I cement.

C. Mixing: In a clean metal container, mix entire package of dry materials by hand or machine. Following manufacturer's instructions, add clean water in sufficient quantity to produce a slump of 2 to 3 inches.

PART 3 EXECUTION

3.1 GENERAL

A. Install chain link fences and gates in accordance with ASTM F567-84, except as modified in this section, and in accordance with fence manufacturer's recommendations, as approved by ENGINEER. Erect fencing in straight lines between angle points.

B. Provide all necessary hardware for a complete fence and gate installation.

3.2 PREPARATION

A. Establish locations of fence lines, gates, and terminal posts.

3.3 POST SETTING

A. Driven posts are not acceptable.

B. Post Hole Depth:

1. Minimum 3 feet below finished grade.
2. 2 inches deeper than post embedment depth below finish grade.

C. Backfill post holes with concrete to 2 inches above finished grade.

D. Set posts with minimum embedment below finished grade of 22 inches plus 3 inches for each 1 foot of fence height greater than 4 feet, and with top rail at proper height above finished grade. Brace posts, as necessary, to maintain correct position and plumbness until concrete sets.

E. Before concrete sets, crown and finish top of concrete to readily shed water.

3.4 BRACING

A. Brace gate and corner posts diagonally to adjacent line posts to ensure stability.

3.5 TOP RAILS

A. Install top rail sleeves with springs at 105 feet maximum spacing to permit expansion in rail.

3.6 CHAIN LINK FABRIC

A. Do not install fabric until concrete has cured minimum 7 days.

B. Install fabric with twisted and barbed selvage at top.

3.7 GATES

A. Hang gates and adjust hardware so gates operate satisfactorily from open or closed position.

B. Set gate stops in concrete to engage center drop rod or plunger bar.

3.8 ELECTRICAL GROUNDING

A. Ground fences in accordance with applicable requirements of IEEE C2-90, National Electrical Safety Code.

3.9 FIELD QUALITY CONTROL

A. Gate Tests: Prior to acceptance of installed gates, demonstrate proper operation of gates under each possible open and close condition specified.

END OF SECTION

SECTION 03301
REINFORCED CONCRETE

PART 1 GENERAL

1.1 SUBMITTALS

A. Shop Drawings:

1. Reinforcing steel in accordance with CRSI 1990 Manual of Standard Practice and ACI SP-66.
2. Curing compound data.
3. Complete data on the concrete mix, including aggregate gradations and admixtures, in accordance with ASTM C94-90.

B. Quality Control Submittals:

1. Manufacturer's application instructions for curing compound.
2. Ready-mix delivery tickets for each truck in accordance with ASTM C94-90.

1.2 QUALITY ASSURANCE

A. Formwork: Unless otherwise specified, follow the recommendations of ACI 347-89.

B. Concrete and Reinforcement: Unless otherwise specified, meet the requirements of ACI 301-89 and 318/318R-89.

C. Hot Weather Concreting: Conform to ACI 305R-89.

D. Cold Weather Concreting: Conform to ACI 306R-88.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Do not place Concrete when the ambient temperature is below 40 degrees F or approaching 40 degrees F and air temperature less than 40 degrees F for the first 7 days, without special protection to keep Concrete above 40 degrees F.

B. Do not use curing compound where solvents in the curing compounds are prohibited by state or federal air quality laws. Use only water curing methods.

PART 2 PRODUCTS

2.1 CONCRETE

A. Ready-mixed meeting ASTM C94-90, Option A.

B. Portland Cement: ASTM C150-89, Type II.

C. Admixtures:

1. Air-Entraining: ASTM C260-86.
2. Water-Reducing: ASTM C494-90, Type A or D.

D. Mix Design:

1. Minimum Allowable 28-Day Compressive Field Strength: 4,000 psi when cured and tested in accordance with ASTM C31-90a and C39-86.
2. Coarse Aggregate Size: 1 inch and smaller.
3. Slump Range: 3 to 5 inches.
4. Air Entrainment: Between 3 and 6 percent by volume.
5. Water Reducers: Use in all concrete.

E. Mixing: Minimum 70 and maximum 270 revolutions of mixing drum. Nonagitating equipment is not allowed.

2.2 REINFORCING STEEL

A. Deformed Bars: ASTM A615-90, Grade 60.

B. Welded Wire Fabric: ASTM A497-90b.

2.3 ANCILLARY MATERIALS

A. Premolded Joint Filler: ASTM D994-71e, 1/2-inch thick, or as shown.

B. Roofing Felt: ASTM D226, Type II, 30-pound asphalt-saturated; or a tar-saturated roofing felt of equal quality.

C. Nonshrink Grout:

1. Color: To match concrete.
2. Manufacturers and Products:
   a. Master Builder Co., Cleveland, OH; Master Flow 928.
   b. Five Star Products Inc., Fairfield, CT; Five Star 100.

D. Curing Compound:

1. Material: Solvent based containing chlorinated rubber solids in accordance with ASTM C309-89e, with additional requirement that the moisture loss not exceed 0.030 gram per centimeter squared per 72 hours.
2. Manufacturers and Products:
   a. Master Builders Co.; Masterkure CR.
   b. Euclid Chemical Co.; Euco Super Floor Coat.

E. Clear Floor Hardener (Surface-Applied): Colorless, aqueous solution of zinc and magnesium fluosilicate with a minimum 2 pounds of crystals per gallon.

1. Manufacturers:
   a. Master Builders, Co., Cleveland, OH.

b. A. C. Horn, Inc., North Bergen, NJ.
c. Sonneborn, Minneapolis, MN.

PART 3 EXECUTION

3.1 FORMWORK

A. Form Materials:

1. Use hard plastic finished plywood for exposed areas, and new shiplap or plywood for unexposed areas.
2. Earth cuts may be used for forming footings.

B. Form Ties:

1. Fixed conical or spherical type inserts that remain in contact with forming material and allow for dry packing of form tie holes.
2. Ties shall withstand pressures and limit deflection of forms to acceptable limits.
3. Wire ties are not acceptable.

C. Construction:

1. In accordance with ACI 347-89.
2. Make joints tight to prevent escape of mortar and to avoid formation of fins.
3. Brace as required to prevent distortion during concrete placement.
4. On exposed surfaces locate form ties in uniform pattern or as shown.
5. Construct so ties remain embedded in the wall with no metal within 1 inch of concrete surface when forms, inserts, and tie ends are removed.

D. Form Removal:

1. Remove after concrete has attained 28-day strength, or approval is obtained in writing from ENGINEER.
2. Remove forms with care to prevent scarring and damaging the surface.

3.2 PLACING REINFORCING STEEL

A. Unless otherwise specified, place reinforcing steel in accordance with CRSI Recommended Practice for Placing Reinforcing Bars.

B. Splices and Laps:

1. Top Bars: Horizontal bars placed such that 12 inches of fresh concrete is cast below in single placement.
2. Horizontal wall bars are considered top bars.
3. See Drawings for top bar lap lengths and all other bar lap lengths.
4. Tie splices with 18-gauge annealed wire as specified in CRSI Standard.

3.3 COMPACTION

A. Vibrate concrete as follows:

1. Apply approved vibrator at points spaced not farther apart than vibrator's effective radius.
2. Apply close enough to forms to vibrate surface effectively but not damage form surfaces.
3. Vibrate until concrete becomes uniformly plastic.
4. Vibrator must penetrate freshly placed concrete and into previous layer of fresh concrete below.

3.4 CONSTRUCTION JOINTS

A. Locate as shown or as approved.

B. Maximum Spacing Between Construction Joints: 40 feet.

3.5 FINISHING

A. Floor Slabs and Tops of Walls:

1. Screed surfaces to true level planes.
2. After initial water has been absorbed, float with wood float and trowel with steel trowel to smooth finish free from trowel marks.
3. Do not absorb wet spots with neat cement.

B. Unexposed Slab Surfaces: Screed to true surface, bull float with wood float, and wood trowel to seal surface.

C. Tolerances: Floors shall not vary from level or true plane more than 1/4 inch in 10 feet when measured with a straightedge.

D. Exterior Slabs and Sidewalks:

1. Bull float with wood float, wood trowel, and lightly trowel with steel trowel.
2. Finish with broom to obtain nonskid surface.
3. Finish exposed edges with steel edging tool.
4. Mark walks transversely at 5-foot intervals with jointing tool.

3.6 FINISHING AND PATCHING FORMED SURFACES

A. Cut out honeycombed and *defective* areas.

B. Cut edges perpendicular to surface at least 1-inch deep. Do not feather edges. Soak area with water for 24 hours, then allow surface to drain free of standing water.

C. Patch with specified color matched nonshrink grout.

D. Finish surfaces to match adjacent concrete.

E. Cure grout as recommended by grout manufacturer.

F. Fill form tie holes with Nonshrink Grout.

3.7 PROTECTION AND CURING

A. Protect fresh concrete from direct rays of sunlight, drying winds, and wash by rain.

B. Keep concrete slabs continuously wet for a 7-day period. Intermittent wetting is not acceptable.

C. Use curing compound only where approved by ENGINEER. Cure formed surfaces with curing compound applied in accordance with manufacturer's directions as soon as forms are removed and finishing is completed.

D. Remove and replace concrete damaged by freezing.

3.8 FLOOR HARDENER

A. Use where noted or scheduled.

B. Follow manufacturer's application instructions.

3.9 FIELD TESTS

A. Evaluation of Concrete Field Strength: In accordance with ACI 318/318R-89.

END OF SECTION

SECTION 04230
REINFORCED UNIT MASONRY

PART 1 GENERAL

1.1 SUBMITTALS

A. Shop Drawings:

1. Information illustrating horizontal joint reinforcement.
2. Grout mix design proposed for use.

B. Samples: Individual Samples of each type of masonry unit to be used on Project.

C. Quality Control Submittals:

1. Method of placing grout.
2. Certified field test results within 5 days of performing specified tests.

1.2 QUALITY ASSURANCE

A. Mockups:

1. Lay up Sample panel for each type of masonry at the site.
2. Dimensions: Minimum 4 feet high by 4 feet long.
3. Leave intact after approval until acceptance of permanent masonry work and then remove.
4. Approved panels shall serve as basis of color, texture, bond, quality of finished joints, and for acceptance of permanent construction.
5. Demonstrate ability to keep insulation and grout isolated and in certain cells in any sequence of placement, and to demonstrate materials will be restricted to cells and bond beams intended to receive each material.
6. Construction shall show areas required to receive mortar, including webs on each side of each cell to prevent insulation from entering cells to receive grout or to prevent grout from entering cells to receive insulation.
7. Where bond beams are to be used, demonstrate proper placement of both insulation and grout to bond beam level, and proper placement of bond beam prior to placement of insulation and grout above bond beam level.
8. Demonstrate proper use of running bond.

B. Fog Spray: Provide demonstration, prior to starting Work, of fog spray nozzles for curing mortar.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Storage and Protection: Keep lime and other ingredients dry.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Temperature: Do not lay masonry when ambient temperature is below 32 degrees F on a rising temperature or below 40 degrees F on a falling temperature, or when there is a probability of such conditions occurring within 48 hours, unless written approval of procedures for protection from freezing is obtained.

B. Moisture Protection: Protect masonry construction from loss of moisture during curing period of 7 days when ambient air temperature is 90 degrees F or greater and when relative humidity is less than 50 percent.

PART 2 PRODUCTS

2.1 MASONRY UNITS

A. General:

1. Furnish or cut special shapes for corners, jambs, lintels, and other areas shown or required.
2. Special units shall match color and texture of standard units.
3. Where units are placed so end of a unit is exposed, such as at a corner or intersection, the exposed end of that block shall have surface to match color and texture of sides of other units.
4. Furnish sound, dry, clean units free of cracks, prior to placing in structure.
5. Vertical Cells to be Grouted: Capable of alignment sufficient to maintain clear, unobstructed continuous vertical cell measuring minimum 2 inch by 3 inch.
6. Masonry unit size and shape shall allow for all placement patterns to prevent materials such as grout or poured insulation from escaping from cell being filled to adjacent cells where material is not intended to be placed.

B. Structural Concrete Masonry Units (CMU):

1. ASTM C90-90, Type I for intermediate humidity conditions of use; normal weight.
2. Size: 16 inches long by 8 inches high by thickness shown on Drawings.
3. Color of Units: Natural.
4. Surface Texture on All Exposed Surfaces: Fine texture.

2.2 MORTAR AND GROUT MATERIALS

A. Cement: ASTM C150-89, Type I, portland cement.

B. Lime: ASTM C207-91, Type S hydrated.

C. Aggregates:

1. Mortar: ASTM C144-89, sand.
2. Grout: ASTM C404-87.

D. Water: Fresh, clean, potable.

E. Mortar Plasticizer Admixture:

1. Quantity of Admixture Per Mortar Batch: In accordance with the BOCA National Building Code/1993, Current Report and mortar type and strength.
2. Manufacturer and Product: American Colloid Co.; Easy/Spred Plasticizer.

2.3 REINFORCEMENT

A. Horizontal Joint Reinforcement:

1. Two parallel, ASTM A82-90a, No. 9 wires, galvanized in accordance with ASTM A153-82, weld connected to No. 9 perpendicular cross wire at 15 inches on center.
2. Reinforcement: Clean and free from loose rust, scale, and coatings that reduce bond.
3. Furnish special manufactured corner and wall intersection pieces.
4. Manufacturers:
   a. Dur-O-Wall National, Inc., Cedar Rapids, IA.
   b. AA Wire Products Co., Chicago, IL.

2.4 MORTAR

A. Proportions: ASTM C270-89, Type S. Freshly prepared and uniformly mixed in a ratio of 188 pounds portland cement, 7 pounds mortar plasticizer admixture, 800 pounds sand, and 9 gallons of water.

B. Mixing:

1. Machine mix in approved mixers.
2. Keep mixer drums clean and free of debris and dried mortar.
3. Mix by placing 1/2 water and 1/2 aggregate in operating mixer.
4. Add cement.
5. Add remaining aggregate and water and mix for at least 2 minutes.
6. Add lime and continue mixing as long as needed to secure a uniform mass, but no less than 3 minutes after addition of lime.
7. Time addition of admixture in accordance with manufacturer's instructions. Procedure used for adding it to mix shall provide good dispersion.
8. Follow manufacturer's instructions for mortar plasticizer admixture.

C. Color mortar to match masonry units.

1. Inert coloring pigments may be added but shall not exceed 6 percent by weight of cement.

2.5 GROUT

A. Proportions: Conform to ASTM C476-83 for coarse grout except as follows:

1. For Pouring: Fluid consistency (suitable for pouring without segregation) meeting requirements of ASTM C476-83.
2. For Pumping: Fluid consistency with minimum seven sacks of cement in each cubic yard.
3. Compressive Strength: Minimum 2,000 psi average at 28 days.

B. Mixing:

1. Onsite: Follow procedure specified in Article MORTAR.
2. Transit-Mixed Grout: Meet requirements of ASTM C476-83.
3. Add approved grout admixture in accordance with specified grout admixture manufacturer's recommendations, premix admixture with water and add resulting solution to grout mix and thoroughly mix. Do not exceed quantity of admixture recommended by manufacturer.

PART 3 EXECUTION

3.1 PREPARATION

A. Prepare surface contact area on foundation concrete for initial mortar placement by one of following methods:

1. Sandblasting foundation and reinforcing dowels after concrete has fully cured to remove laitance and spillage and to expose sound aggregate.
2. Water blasting foundation and reinforcing dowels after concrete has partially cured to remove laitance and spillage and to expose sound aggregate.
3. Green cutting fresh concrete with high pressure water and hand tools to remove laitance and spillage from foundation and reinforcing dowels and to expose sound aggregate.

B. Clean surfaces of loose material prior to initial mortar placement.

C. Prevent surface damage to foundation concrete that will be exposed to view outside of contact area.

3.2 LAYING REINFORCED MASONRY UNITS

A. General:

1. Conform to the Building Code applicable to this Project as supplemented by these Specifications.
2. Do not start laying masonry units unless foundation wall is plumb within 1/4 inch in 10 feet or not straight within 5/16 inch in 10 feet.
3. Finish Tolerances (Measured on Interior Surfaces):
   a. Maximum Permissible Variation From Plumb of Masonry Wall or of Line of Joints in Masonry Wall: 1/16 inch per foot of height, and 1/4 inch in the total height of the wall.
   b. Maximum Permissible Variation From Horizontal Line Along Base of Wall or for Lines of Horizontal Joints: 1/16 inch per block, 1/4 inch per 50 feet of wall with proportionately greater tolerance for longer walls up to 1/2 inch in total length of wall.
4. Place units with chipped edges or corners within permissible ASTM limits in wall such that chipped area is not exposed to view.

B. Wall Units:

1. General:
   a. If necessary to move a unit after once set in place, remove from wall, clean, and set in fresh mortar.
   b. Toothing of masonry units is not permitted.
2. Running Bond:
   a. Unless otherwise shown, lay up walls in straight, level, uniform courses using a running bond pattern.
   b. Place units for continuous vertical cells and mortar joints to prevent materials such as grout or poured insulation from escaping from cell being filled to adjacent cells where material is not intended to be placed.

C. Special Shapes:

1. Provide and place such special units as corner block, door jamb block, lintel block fillers, and similar blocks as may be required.
2. Use required shapes and sizes to work to corners and openings, maintaining proper bond throughout wall.

3.3 BUILT-IN ITEMS

A. Position door frames, windows, louvers, and other items to be built in the wall, and construct wall around them.

B. Install masonry anchors to secure items to wall.

C. Fill spaces around items with mortar or grout.

D. Do not place electrical, instrumentation, or water conduits in a cell containing reinforcement unless approved in writing by ENGINEER.

3.4 MORTAR JOINTS

A. General:

1. Straight, clean, with uniform thickness of 3/8 inch.
2. Horizontal and vertical mortar joints shall have full mortar coverage on face shells.
3. Vertical Head Joints:
   a. Butter well on each unit for a width equal to face shell of unit, shove tightly so mortar bonds well to both units.
   b. Solidly fill joints from face of block to at least the depth of face shell.
4. As units are laid, remove excess mortar from grout space of cells to be filled.
5. Place mortar before initial setting of cement takes place. Do not retemper mortar that has started to set.

B. Exposed Joints:

1. Tool joints exposed to view after final construction, unless otherwise noted or shown.
2. Cut joints flush and, as mortar takes its initial set, tool to provide a concave joint.
3. Perform tooling when mortar is partially set but still sufficiently plastic to bond.
4. Perform tooling with a tool which compacts mortar, pressing excess mortar out rather than dragging it out.
5. Rake out joints which are not tight at time of tooling, point, and then tool.
6. Rake and tool joints at split-face surfaces, interior and exterior.

3.5 REINFORCING

A. Foundation Dowels:

1. Size, number, and location of foundation dowels shall match vertical wall reinforcing, unless otherwise noted.
2. When foundation dowel does not line up as intended, with vertical core, do not slope more than 1 horizontal to 6 vertical to bring it into alignment.

B. Vertical Reinforcing:

1. Hold in position near the ends of bars by wire ties to dowels or by reinforcing positioners.
2. Hold in position at maximum intervals of 160 bar-diameters by reinforcing positioners.

C. Horizontal Reinforcing:

1. Lay on webs of bond beam units, and place as wall is built.

2. Lap reinforcing bars 48 bar-diameters minimum where spliced and wire tie together.
3. Minimum Bar Clearance: 1 bar-diameter from masonry and from additional parallel bars in same grout space.

D. Horizontal Joint Reinforcement:

1. Provide in addition to typical wall reinforcing steel.
2. Space maximum 16 inches apart, vertically.
3. Lap ends 6 inches minimum.
4. Use manufactured corner and other wall intersection pieces.

3.6 GROUTING

A. General:

1. Do not mix, convey, or place with equipment constructed of aluminum.
2. Secure vertical and horizontal reinforcement, ties, bolts, anchors, and other required embedments in place, inspect and verify before placing grout.
3. Grout beams over openings in one continuous operation.
4. Maintain vertical alignment in cells to provide a clear, unobstructed, continuous vertical cell measuring not less than 2 inches by 3 inches.
5. Place grout as soon as possible after mortar has set to reduce shrinkage cracking of vertical joints.
6. Vertical Reinforcement:
   a. First wire tie to foundation dowels, then build wall around it.
   b. Provide reinforcing positioners or approved cross-bracing to secure top of steel in place.
   c. Do not drop in vertical steel after block is laid unless reinforcing positioners are provided in the course above previously grouted course.

B. Grouting Requirements:

1. Solid Grouting Requirements: Space vertical grout barriers maximum 30 feet apart, extending full height of wall.
2. Partial Grouting Requirements:
   a. Walls Not Requiring Solid Grouting: Fill cells containing reinforcing steel and others as shown with grout.
   b. Construct cells to be filled to confine grout within cell.
   c. Cover tops of unfilled vertical cells under a bond beam with metal lath to confine grout fill to bond beam section.
3. Form horizontal construction joints between pours by stopping the grout pour 1-1/2 inches below a mortar joint except at a bond beam, stop the pour 1/2 inch below the top of the masonry unit.
4. Partial Grouting with Insulation Fill:
   a. Where cells of masonry units are to receive masonry fill insulation in some cells and to receive grout in some cells, provide continuous mortar on block webs on each side of cells to

be filled with grout to ensure that insulation will not enter grout cells.

b. Where bond beams are required together with both masonry fill insulation and grout, limit pours to less than 6 feet in height.

5. Place grout in lifts not to exceed 6 feet in height.
6. Fully embed horizontal steel by grout in an uninterrupted pour.
7. Do not construct wall more than one course above top of grout pour prior to placing grout.
8. Vibration:
   a. Use internal "pencil" type vibrator to thoroughly consolidate grout and reduce amount of air voids.
   b. After waiting sufficient time to permit the grout to become plastic, but before it has taken any set, reconsolidate grout.
   c. Waiting period will vary depending upon weather conditions and block absorption rates, but under "normal" weather conditions with average masonry units the waiting period should be between 30 to 60 minutes.
9. Cleanouts:
   a. Provide of sufficient size to permit cleaning of cell, positioning of reinforcing and inspection at bottom of every vertical cell containing reinforcing.
   b. Location: Concealed from view after final construction unless otherwise approved by ENGINEER.
   c. After wall has been inspected and approved and prior to grouting, cap cleanouts in a manner that will seal them from grout leakage and provide a flush finish.

3.7 FIELD QUALITY CONTROL

A. Provide adequate facilities for safe storage and proper curing of mortar and grout samples onsite for first 24 hours, and for additional time as may be required before transporting to test lab:

B. Provide masonry units for test samples required by ASTM C140-91.

C. Sample grout and mortar for strength testing at beginning of masonry work and at least once a day thereafter.

1. Field Compressive Test for Grout:
   a. Sample and test in accordance with the BOCA National Building Code/1993.
   b. On a flat nonabsorbent base, form a space approximately 3 inches by 3 inches by 6 inches high, twice as high as it is wide, using masonry units having the same moisture conditions as those being laid.
   c. Line space with permeable paper or porous separator so water may pass through liner into masonry units.
   d. Thoroughly mix or agitate grout to obtain a fully representative mix, place into molds in two layers, and puddle each layer with a 1-inch by 2-inch puddling stick to eliminate air bubbles.
   e. Level off and immediately cover molds and keep them damp until taken to the laboratory.

f. After 48 hours set, carefully remove masonry units and transport and place grout Samples in a fog room until tested.

2. Field Compressive Test for Mortar:
   a. Sample mortar for test in accordance with the BOCA National Building Code/1993.
   b. Spread mortar on masonry units 1/2-inch to 5/8-inch thick, allow to stand for 1 minute, then remove mortar and place in a 2-inch by 4-inch cylinder in two layers, compressing mortar into cylinder using flat end stick or fingers.
   c. Lightly tap mold on opposite sides, level off and immediately cover molds and keep them damp until taken to the laboratory.
   d. After 48 hours set, remove molds and place them in a fog room until tested in damp condition.

3.8 CLEANING

A. Immediately after completion of grouting, clean masonry surfaces, using clean water and fiber brushes, of excess mortar, grout spillage, scum, stains, dirt, and other foreign substances.

B. Clean walls not requiring painting or sealing such that there are no visible stains.

3.9 PROTECTION OF INSTALLED WORK

A. Do not allow grout and mortar stains to dry on face of exposed masonry.

B. When moisture protection is required, use light fog spray nozzles to cure mortar.

C. Protect tops of walls at all times. Cover tops of walls with waterproof paper when rain or snow is imminent and when Work is discontinued.

D. Adequately brace walls until walls and roof are completed.

E. Provide sufficient bracing to protect walls against damage from elements, including wind and snow.

F. Protect masonry against freezing for minimum 72 hours after being laid.

G. Protect masonry from damage until final acceptance of Work. Damaged units will not be accepted.

END OF SECTION

SECTION 05500
METAL FABRICATIONS AND CASTINGS

PART 1 GENERAL

1.1 DEFINITIONS

A. Submerged: A location at or below a point 1 foot 6 inches above maximum water surface elevation in water-holding basins and channels.

1.2 SUBMITTALS

A. Shop Drawings:

1. Metal fabrications, including welding and fastener information.
2. Specific instructions for all phases of installation including hole size, preparation, placement, procedures, and instructions for safe handling of anchoring systems.

B. Samples:

1. Epoxy Anchors: Two self-contained epoxy adhesive cartridges for each batch of epoxy delivered to site, for independent testing.
2. Color Samples of abrasive nosings.
3. Vinyl Ester Anchors: Two self-contained adhesive cartridges for each batch of adhesive delivered to site, for independent testing.

C. Quality Control Submittals:

1. Vinyl Ester and Epoxy Anchors:
   a. Manufacturer's Certificate of Compliance.
   b. Manufacturer's past project experience data.
   c. Test reports for each batch of vinyl ester or epoxy delivered to site.
   d. Manufacturer's Certificate of Qualification for installers.
   e. Current test data indicating that cured adhesive anchors meet or exceed design loads.
2. Welders: Evidence of certification.

1.3 QUALITY ASSURANCE

A. Qualifications:

1. Welders: Certified in accordance with AWS D1.1-92, Chapter 5.
2. Vinyl Ester and Epoxy Anchor Manufacturers: Experience on at least three similar projects within the last 3 years.
3. Vinyl Ester and Epoxy Anchor Installers: Trained and certified by manufacturer.

B. Regulatory Requirements:

1. Anchoring Systems:
   a. Current evaluation and acceptance reports by ICBO or other similar code organization.
   b. Acceptable for use in potable water structures by EPA and local health agencies or NSF.

C. Welding Procedures: Follow the requirements of AWS D1.1-92 and AWS D1.2-90.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Shipment:

1. Insofar as practical, factory assemble items specified herein.
2. Package and clearly tag parts and assemblies that are of necessity shipped unassembled, in a manner that will protect materials from damage, and facilitate identification and field assembly.

B. Storage of Epoxy Adhesive:

1. Store epoxy cartridges on pallets or shelving in a covered storage area.
2. Control temperature above 60 degrees F and dispose of cartridges if shelf life has expired.

C. Storage of Vinyl Ester Products:

1. Store components on pallets or shelving in a covered storage area with locking door.
2. Control temperature within 41 to 77 degrees F and dispose of product if shelf life has expired.

1.5 SPECIAL GUARANTEE

A. Manufacturer's extended guarantee or warranty, with OWNER named as beneficiary, in writing, as special guarantee. Special guarantee shall provide for correction, or at the option of the OWNER, removal and replacement of sidewalk doors found *defective* during a period of 5 years after the date of Substantial Completion. Duties and obligations for correction or removal and replacement of *defective* Work as specified in paragraph 13.12 of the General Conditions.

PART 2 PRODUCTS

2.1 MATERIALS

A. Unless otherwise indicated, meet the following requirements:

Item	ASTM Specification
Steel Shapes and Plates	A36-90
Steel Pipe	A501-89 or A53-90b, Type E or S, Grade B
Structural Steel Tubing	A500-90a, Grade B
Stainless Steel:	
Bars and Shapes	A276-91, AISI Type 316
Steel Plate, Sheet, and Strip	A167-91, AISI Type 316
Bolts and Threaded Rods	A193-90a, AISI Type 316, B8MN, B8M2, or B8M3
Nuts	A194-91, AISI Type 316, B8MN, B8M2, or B8M3
Steel Bolts and Nuts:	
Carbon Steel	A307-91 or A36-90
High-Strength	A325-91b, Type 3
Galvanized Steel Bolts and Nuts	A307-91 or A36-90, with A153-82 Zinc Coating, and ANSI B1.1-89
Eyebolts	A489-90
Threaded Rods	A36-90
Flat Washers (Unhardened)	F844-90; use A153-82 for Zinc Coating
Flat Washers (Hardened)	F436-91
Aluminum, Structural Shapes, and Plates	B209-90 and B308-90a, Alloy 6061-T6
Aluminum Bolts and Nuts	F468-90b, Alloy 2024-T4
Cast Iron	A48-83e, Class 35

B. Checkered Plates:

1. Steel: Federal Specification QQ-F-461, Class I, minimum 1/4 inch; galvanize after fabrication.
2. Aluminum: ASTM B209-90, Alloy 6061-T6, tread plate, thickness minimum 1/4 inch.

C. Anchor Bolts: As shown in FASTENER SCHEDULE at the end of this section and as specified in various equipment sections.

D. Anchor Bolt Sleeves:

1. High Density Polyethylene Plastic:
   a. Single unit construction with deformed sidewalls such that the concrete and grout lock in place.
   b. The top of the sleeve shall be self-threading to provide adjustment of the threaded anchor bolt projection.
   c. Material requirements:
      1) Plastic: High density polyethylene.
      2) Density: ASTM D1505-85e.
      3) Vicat Softening Point: ASTM D1525-87.
      4) Brittleness Temperature: ASTM D746-79.
   d. Manufacturer: Sinco West, Simi Valley, CA.
2. Fabricated Steel Sleeve: A36-90 steel.

E. Antiseizing Lubricant: Lubricant shall contain substantial amounts of molybdenum disulfide, graphite, mica, talc, or copper. Use Loc Tite Co., Permatex.

2.2 ANCHORING SYSTEMS FOR CURED CONCRETE

A. Wedge Anchors:

1. AISI Type 316 stainless steel throughout.
2. Manufacturers and Products:
   a. ITT Phillips Drill Div., Michigan City, IN.
   b. Hilti, Inc., Tulsa, OK; Hilti Super Kwik-Bolt, stud type.
   c. Wej-It Corp., Broomfield, CO; Wej-It.
   d. Molly Division of Emhart Corp., Temple, PA; Parabolt Concrete Anchors.

B. Expansion Anchors:

1. Self-drilling anchors, snap-off type or flush type.
2. Furnish anchors for use with galvanized bolts.
3. Nondrilling Anchors: Flush type for use with bolt, or stud type with projecting threaded stud.
4. Manufacturers and Product:
   a. ITT Phillips Drill Div., Michigan City, IN.
   b. Hilti, Inc., Tulsa, OK; Hilti HDI Drop-In anchors.

C. Epoxy Anchors:

1. Anchor Rod: Stainless steel threaded rod free of grease, oil, or other deleterious material with a 45-degree chisel point.
2. Epoxy Adhesive:
   a. ASTM C881-90, Type 1, Grade 3, Class A, B, or C.

b. Two-component, 100 percent solids, nonsag, paste, insensitive to moisture, designed to be used in adverse freeze/thaw environments and gray in color.
c. Cure Temperature, Pot Life, and Workability: Compatible for intended use and environmental conditions.

3. Mixed Epoxy Adhesive: Nonsag paste consistency, with ability to remain in a 1-inch diameter overhead drilled hole without runout, having the following properties:
   a. Slant Shear Strength, ASTM C881-90, No Failure In Bond Line, Dry/Moist Conditions: 5,000 psi.
   b. Compressive Strength, ASTM D695-90: 14,000 psi, minimum.
   c. Tensile Strength, ASTM D695-90: 4,500 psi.
   d. Heat Deflection Temperature, ASTM D648 E2-82: 135 degrees F, minimum.
4. Epoxy Adhesive Packaging:
   a. Disposable, self-contained cartridge system capable of dispensing both epoxy components in the proper mixing ratio, and fit into a manually or pneumatically operated caulking gun.
   b. Cartridge Markings: Include manufacturer's name, batch number, mix ratio by volume, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.
5. Manufacturers and Products:
   a. Adhesives Technology Corp.; Anchor-It Fastening Systems, HS 200 Epoxy Resin.
   b. ITW Ramset/Red Head; Epcon Ceramic 6 Epoxy Anchor System.
   c. Covert Operations; CIA Epoxy Anchors with viscosity to suit application.
   d. Rawlplug Co., Inc.; Rawl/Sika Foil Fast Epoxy Injection Gel System.

D. Vinyl Ester Adhesive Anchor Systems:

1. Two-component, insensitive to moisture, designed to be installed in adverse freeze/thaw environments.
2. Cure Temperature, Pot Life, and Workability: Compatible for intended use and anticipated environmental conditions.
3. Container Markings: Include manufacturer's name, product name, batch number, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.
4. Anchor Rods: Stainless steel threaded rods, sized by adhesive manufacturer for design loads required and adhesive system used.
5. Manufacturer and Product: Hilti, Inc.; HIT Doweling Anchor System (HIT C-100).

2.3 FABRICATION

A. General:

1. Finish exposed surfaces smooth, sharp, and to well-defined lines.

2. Furnish necessary rabbets, lugs, and brackets so work can be assembled in neat, substantial manner.
3. Conceal fastenings where practical; where exposed, flush countersink.
4. Drill metalwork and countersink holes as required for attaching hardware or other materials.
5. Round sharp edges to small uniform radius. Grind burrs, jagged edges, and surface defects smooth.
6. Material Thinner than 1/8 Inch: Either galvanize before fabrication in accordance with ASTM A525-91a, Coating Designation G210, or after fabrication in accordance with ASTM A123-89a, except the weight of zinc coating shall average minimum 1.2 ounces per square foot of actual surface area with no individual specimen having a weight of less than 1 ounce per square foot.

B. Materials: Use steel shapes unless otherwise noted.

C. Fabrication:

1. Fit and assemble in largest practical sections for delivery to site.
2. Fabricate as shown on Drawings and in accordance with ASTM A385-80.
3. Weld connections and grind exposed welds smooth. When required to be watertight, make welds continuous.
4. Use fasteners as shown or scheduled.
5. Grind cut edges smooth and straight.

D. Finish:

1. ASTM A123-89a hot-dip galvanize after fabrication, unless otherwise noted.
2. For items embedded in concrete, coat with System No. 2 as specified in Section 09900, PAINTING.
3. Galvanize components of bolted assemblies separately before assembly. Galvanizing of tapped holes is not required.
4. Prepare galvanized surfaces to be painted in the field approximately 48 to 72 hours before painting as specified in Section 09900, PAINTING, System No. 10, Galvanized Metal Conditioning.
5. Except for inlet grates not otherwise required to be welded, completely seal edges of tightly contacting surfaces, where galvanizing is required, by welding before galvanizing.

E. Watertight: Where required or shown, furnish rubatex gaskets of a type that is satisfactory for use in contact with sewage. Cover full bearing surfaces.

F. Fitting: Where movement of fabrications is required or shown, cut, fit, and align items for smooth operation. Make corners square and opposite sides parallel.

G. Accessories: Furnish as required for a complete installation. Fasten by welding or with stainless steel bolts or screws.

H. Aluminum:

1. Fabricate in accordance with the Aluminum Association Standards and manufacturers' recommendations as approved.
2. Grind smooth sheared edges exposed in finished work.

2.4 WELDING

A. Steel:

1. Meet requirements of ANSI/AWS D1.1-92 for techniques of welding employed, appearance, quality of welds made, and the methods of correcting *defective* work.
2. Meet visual acceptance standards of ANSI/AWS D1.1-92, paragraph 8.15.1.
3. Complete welding before applying finish.

B. Aluminum: Meet requirements of ANSI/AWS D1.2.

PART 3 EXECUTION

3.1 INSTALLATION OF METAL FABRICATIONS

A. General:

1. Install metal fabrications plumb or level, accurately fitted, free from distortion or defects.
2. Install rigid, substantial, and neat in appearance.
3. Erect steel in accordance with applicable portions of AISC Code of Standard Practice, except as modified.
4. Install manufactured products in accordance with manufacturer's recommendations.
5. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
6. Field weld components indicated.
7. Perform field welding in accordance with AWS D1.1-92.
8. Obtain ENGINEER approval prior to site cutting or making adjustments not scheduled.
9. After erection, apply prime or galvanize coating to welds, abrasions, and surfaces not in contact with concrete.

B. Erection Tolerances:

1. Maximum Variation from Plumb: 1/4 inch per story, noncumulative.
2. Maximum Offset from True Alignment: 1/4 inch.

C. Aluminum:

1. Erection: In accordance with the Aluminum Association specifications.
2. Do not remove mill markings from concealed surfaces.

3. Remove inked or painted identification marks on exposed surfaces not otherwise coated after installed material has been inspected and approved.

3.2 ANCHOR BOLTS

A. Accurately locate and hold anchor bolts in place with templates at the time concrete is placed.

B. Use sleeves for location adjustment and provide two nuts and one washer per bolt of same material as bolt. Minimum bolt size: 1/2-inch diameter by 12 inches long, unless otherwise shown.

3.3 ANCHORING SYSTEMS FOR CONCRETE

A. Begin installation only after concrete or masonry receiving anchors have attained design strength.

B. Do not install an anchor closer than six times its diameter to either an edge of concrete or masonry, or to another anchor, unless specifically shown otherwise.

C. Install in accordance with manufacturer's specific quality control submittal instructions. Hole diameters are critical to installation, use only drills recommended by anchor manufacturer. Follow manufacturer's safe handling instructions.

D. Epoxy Anchors: Do not install when temperature of concrete is below 35 degrees F or above 110 degrees F.

E. Follow specific manufacturer safe handling practices when handling and installing concrete anchors.

3.4 ELECTROLYTIC PROTECTION

A. Aluminum:

1. Where in contact with dissimilar metals, or embedded in masonry or concrete, protect surfaces as specified in Section 09900, PAINTING, System No. 27.
2. Allow paint to dry before installation of the material.
3. Protect painted surfaces during installation.
4. Should coating become marred, prepare and touch up in accordance with paint manufacturer's written instructions.

B. Where titanium equipment is in contact with concrete or dissimilar metals, provide full-face neoprene insulation gasket, 3/32-inch minimum thickness and 70 durometer hardness.

3.5 MANUFACTURERS' SERVICES

A. Epoxy and Vinyl Ester Anchors: Conduct site training of installation personnel for safe and proper installation, handling, and storage of epoxy or vinyl ester adhesive system. Notify ENGINEER of time and place for sessions.

3.6 FASTENER SCHEDULE

A. Provide fasteners as follows:

Service Use and Location	Product	Remarks
Anchor Bolts Cast Into Concrete for Equipment Bases:		
Nonsubmerged	Stainless steel bolts, unless otherwise specified with equipment	
Submerged	Stainless steel bolts with fusion bond coating unless otherwise specified with equipment	See System No. 29, Section 09900, PAINTING
Anchor Bolts Cast Into Concrete for Metal Fabrications and Structural Components:		
Dry or Protected Areas	Zinc-coated steel bolts	
Exterior, Wet, Washdown, and Chemical Handling Areas	Stainless steel bolts	
Anchors for Metal Components to Concrete; e.g., Electrical Panels and Equipment:		
Dry Areas	Expansion Anchors	
Wet and Damp Areas	Wedge anchors or stainless steel expansion anchors	
Submerged or Buried in Earth	Epoxy or adhesive anchors	
Connections for Steel Components and Fabrications:		
Exterior and Interior	High-strength zinc-coated steel bolts with hardened washers under head and nut	Use compressible washer type direct tension indicators
Connections for Steel and Wood Components:		
Exterior and Interior	Zinc-coated steel bolts	
Connections of Aluminum Components:		

Service Use and Location	Product	Remarks
Exterior and Interior	Stainless steel bolts	
All Others:		
Exterior and Interior	Stainless steel fasteners	

B. Antiseizing Lubricant: Use on all stainless steel threads.

C. Do not use epoxy anchors near fire or where ambient temperature will exceed 100 degrees F.

END OF SECTION

SECTION 06000
CARPENTRY

PART 1 GENERAL

1.1 QUALITY ASSURANCE

A. Lumber Grades and Wood Species: U.S. Product Standard PS 20-70 and the National Forest Products Association.

1. Wood Members: Requirements above and in "Design Values for Wood Construction", supplement to the 1977 edition of National Design Specification for Wood Construction, published by National Forests Products Association.
2. Identify each piece or bundle of lumber or other product with a recognized mark of the authority grading the product.

B. Plywood Grades: U.S. Product Standard PS 1-83. Identify each plywood panel with appropriate grade trademark of American Plywood Association.

C. Finish Carpentry: Quality Standards of Architectural Woodwork Institute (AWI) unless detailed otherwise.

D. Preservative and Pressure Treated Material: American Wood Preservers Association Standards (AWPA) and bear the American Wood Preservers Bureau (AWPB) quality mark designation.

1.2 DELIVERY, STORAGE, AND HANDLING

A. Place materials in dry storage areas immediately upon delivery.

B. Store materials 6 inches minimum aboveground on framework or blocking; cover with protective waterproof covering and provide adequate air circulation or ventilation.

C. Do not store seasoned materials in wet or damp portions of building.

D. Do not subject to extreme changes of temperature or humidity.

E. Protect sheet materials from corner breaks and surface damage while unloading.

PART 2 PRODUCTS

2.1 LUMBER

A. Framing Lumber: Dimensions given are nominal; surface four sides (S4S); moisture content not over 19 percent, unless specified otherwise; provide as follows:

Usage	Minimum Grade
Plates and nailers	Standard & Better or Stud Grade

B. Finish Lumber: Kiln-dried; average moisture content range as follows:

1. Exterior Work: 9 to 12 percent.
2. Interior Work: 6 to 11 percent.

C. Interior and Exterior Trim: Douglas fir, C Select Grade, or AWI Custom Grade.

2.2 PLYWOOD

A. Roof Sheathing: APA rated sheathing, EXT, 24/0 or greater, thickness as shown on Drawings.

2.3 PRESERVATIVE TREATED WOOD

A. Material: Waterborne salt preservatives; AWPA C2 and AWPB LP-2. Furnish sufficient amount for onsite application to sawed or cut surfaces.

2.4 ANCILLARY MATERIALS

A. Continuous Soffit Vent: 8-foot formed aluminum sections, flush or recess mounting, louvered design, 76 square inches of net free area per 8-foot section, as manufactured by Leslie-Locke, Lodi, OH.

B. Hardware: The BOCA National Building Code/1993.

1. Nails: Steel common nails for framing, sizes as shown; hot-dipped zinc-coated nails where exposed.
2. Bolts and Screws: ASTM A307-91, galvanized where exposed.
3. Framing Anchors: Simpson, Teco, or Bowman galvanized 18-gauge steel, complete with nails.
4. Provide fasteners and miscellaneous hardware required for assembling and anchoring finish woodwork.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces to receive carpentry items are prepared.

3.2 PREPARATION

A. Do not install finish interior woodwork until the building has been dried for at least 10 days.

3.3 ROUGH CARPENTRY ERECTION

A. Preservative Treated Wood:

1. Use for wood in contact with concrete masonry units.
2. Apply two brush coats of same preservative used in original treatment to all sawed or cut surfaces of treated lumber.

B. Plates:

1. Set plates level and flush with outside face as shown on the Drawings.
2. Anchor with 5/8-inch diameter bolt embedded at least 7 inches into the concrete masonry units with a minimum of two bolts per piece and with one bolt located within 12 inches of each end of one piece and spaced not more than 4 feet apart.

3.4 FINISH CARPENTRY INSTALLATION

A. General:

1. Lay out, cut, fit, and install finish carpentry items.
2. Anchor to ensure rigidity, tight fit, and permanence, and as shown.
3. Install items accurate to dimension, true to line, level, and square unless otherwise shown.
4. Install running trim in as long a length as practical.
   a. Miter corners of moldings.
   b. Anchor securely using finishing nails.
   c. Counter set nails 1/16-inch maximum for filling.
5. Follow manufacturer's instructions for installation of hardware, vents, framing anchors, and other items.
   a. Make Work neat and secure, developing full strength of components and providing intended function.

END OF SECTION