SECTION 050
SUMMARY OF WORK

PART 1. DESCRIPTION

1.01 Scope of Work includes, but is not limited to the following:

i. Materials and equipment testing to verify compliance with specifications and applicable standards, as well as manufacturer's recommendations.
ii. Mobilization and demobilization.
iii. Equipment, materials, labor, supervision, inspection, regulatory compliance, customer communication, and coordination with owner, as necessary for minimizing the impact of this project upon the normal activities in the neighborhood, pedestrian and vehicular access to all residences, water supply services.
iv. Equipment, materials, labor, supervision and coordination with regulatory agencies and owner, for the Storm Water Pollution Prevention Plan (SWPPP) creation and its maintenance throughout the project construction period.
v. In addition to sections i.- iv., (above) work shall be constructed to Los Alamos Counties written Specifications and or Reference Drawings. Should a conflict arise between contract document information on RFP's, IFB's, or specifications, LAC's drawing will prevail.

PART 2. WORK PERFORMED BY OWNER

2.01 Owner shall provide the staff required to operate all valves and equipment needed for any utility service interruptions necessary during the execution of the project. The Contractor shall coordinate with Owner for the performance of any temporary modifications to utility systems necessary for this project to be executed. Contractor shall do so at the appropriate time, and providing a minimum 48-hour advanced notice to the Owner.

PART 3. WORK SEQUENCE

3.01 Sequence

A. The Contractor shall prepare and submit for the Owners approval a work sequence plan. Once approved, the contractor shall execute the plan, and resubmit for the owner's approval any revisions needed to this plan.

B. Contractor shall maintain water supply services at all times, with the exception of very specific interruption periods approved, a minimum of 48 hours in advance, by owner. All water lines shall be flushed, disinfected and tested for Chlorine residual, prior to their reconnection into the public water distribution system.

C. Contractor shall test all materials, parts and equipment installed as part of this project; start up the system, before turning it to the Owner for beneficial occupancy. Coordination and costs of temporary utility services necessary for the testing, start-up and initial operation of the renovated lift station shall be the sole responsibility of the Contractor.

PART 4 INCIDENTAL WORK

4.01 Incidental Work

A. Contractor shall provide, as part of the contract price, all labor, superintendence, machinery, equipment, supplies, temporary utility services, third party compliance testing and analysis, necessary to complete the various items of work in accordance with these contract documents, to provide a complete, functional and ready-to-use installation.

B. Contractor shall, as part of their contract price, properly isolate the existing SCADA equipment, and later furnish new conduit and wiring and incidentals needed to re-connect it to the new equipment and control panel.

C. Contractor shall, as part of the contract price, acquire all necessary approvals for access to all project sites.

D. Contractor shall, as part of this contract price, furnish all environmental protection including, but not limited to all necessary work to prevent storm water and other environmental pollution on any construction site or adjacent areas, as well as anywhere in the vehicle and pedestrian routes used by the contractor's vehicles and equipment.

E. Contractor shall be responsible for the restoration, reseeding/replanting and cleanup of any areas affected by the project, including any work and materials and labor necessary to return the project site(s) to its original state (prior to construction), by removing all evidence of construction debris, repairing all damage to vegetation, landscapes and finished ground surfaces, scarifying any hard-pack and driven-over earth areas, reseeding any areas disturbed by the contractor's construction activities, and installing erosion protection as indicated on the drawings, or as required by Contractor's SWPPP.

F. Contractor is responsible to attend, at no additional cost to the Owner, the following meetings:

    a. Preconstruction meeting to be scheduled by owner
    b. Weekly progress meetings on site.
    c. Special and final field observation meetings when requested or scheduled by the Owner.
    d. Construction coordination meetings requested or scheduled by DPU-operations.
    e. Stakeholder/utility customer meetings when deemed necessary by DPU to keep them informed or to resolve unanticipated concerns.

END OF SECTION

SECTION 100
UTILITIES MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Measurement and payment for Bid Items shall be specified in this Section.

B. Work to be performed under this contract will be paid for on a Unit Price or Lump Sum basis under the appropriate Bid Items in the Bid Schedule. All costs for Work shown on Drawings or described in Specifications, as incidental to the Contract shall be included in the Contract Price. A claim by the Contractor for extra compensation for an item shown on the Drawings or described in the Specifications will not be considered for any reason, including but not limited to the claim that it does not fall within the scope of one of the Bid Items. All work covered under the Standard Specifications shall be paid as outlined in this Section, NOT as indicated in the Standard Specifications.

C. Contractor shall, within 15 days of receipt of Notice to Proceed, submit a schedule of values for all lump sum bid items.

D. General scope of work under each bid item includes all labor and materials required for construction of completely functional and operational facilities as shown on the Drawings and Specifications.

E. GENERAL. The total base bid price shall cover all work required by the contract documents for construction of a completely functional and operational facility. If the alternate bid is selected then the total alternate bid price shall cover all work required by the contract documents for construction of a completely functional and operational facility All costs in connection with the proper and successful completion of the work, including furnishing all materials, equipment, supplies, appurtenances; providing all construction plans, equipment, and tools; and performing all necessary labor and supervision to fully complete the work in accordance with these contract documents shall be included in the unit and lump sum prices bid. All work not specifically set forth as a pay item in the bid proposal shall be considered a subsidiary obligation of Contractor and as such, all cost connection therewith shall be incidental to and included in the bid prices.

F. ESTIMATED QUANTITIES. All estimated quantities for unit price items stipulated in the bid proposal are approximate and are to be used only (a) as a basis for estimating the probable cost of the work and (b) for the purpose of comparing the bids submitted for the work. The actual amounts of the work done and materials furnished under unit price items may differ from the estimated quantities. The basis of payment for work and materials will be the actual amount of work done and materials furnished at the unit price bid. If actual quantities exceed or are less than estimated quantities, Contractor will not be eligible for a unit price adjustment or increase in contract time.

G. INSTALLATION OF LINES AND CONNECTION TO LINES. Trench location shown on plans may change based on actual location of existing utilities and structures. All descriptions of connections to existing lines are based on available information. Field verifications of connections are required and changes in fitting type and/or locations for connections may be required. No additional cost will be allowed for changes in fittings from those designated unless the work is significantly more difficult. No additional costs will be allowed for working near or installing under or over utilities or structures that are accurately located on the ground in accordance with New Mexico Excavation Law. No additional cost will be allowed for working near or installing under or over or removing abandoned utilities or structures, which are typically not located. Underground Facilities as defined in Section 9.1.1.GG. are active facilities and do not include abandoned facilities.

H. MEASUREMENT AND PAYMENT. All measurements and payments will be based on completed work performed in strict accordance with the Drawings and Specifications and in accordance with the contract-unit prices and schedule values. Incidental work and items not listed in the contract-unit price schedule will not be paid for separately, but will be included in the payment for the listed item or items to which the incidental work applies. Measurement and payment for lump sum items shall be full compensation for all labor, equipment, materials, testing, and incidentals necessary to perform the work in accordance with these contract documents, and shall include all else incidental thereto for which separate payment is not provided under other items.

BASE BID

Item No. 1 – Description
Payment shall be made on a lump sum basis as noted in the Bid Schedule.

Item No. 2 – Description
This item shall include all labor, materials, equipment, and incidentals required for the …, as indicated in these contract documents. Payment shall be made on a Lump Sum basis as noted in the Bid Schedule.

Item No.3 – Description
Item shall include all labor, materials, equipment, and incidentals required for the…
Payment shall be made on a Lump Sum basis as noted in the Bid Schedule.

Item No. 4 – Mobilization / Demobilization
Shall include all costs for Contractor's mobilization and demobilization, insurance and bond, construction permits and fees, job trailers, site administration expenses, utilities and plant site repair and cleanup for the Project. Shall include all costs for contract close out, site clean-up, and all costs associated with Contractor's demobilization from site. Payment shall be on a Lump Sum basis as noted in the Bid Schedule.

Item No. 5 – Uninterrupted Access Water Services to all Residences
Item shall include all labor, materials, equipment, inspections, temporary utility services and incidentals required for providing uninterrupted pedestrian and vehicular access, and water supply services to all residences affected by this project's execution, with the exception of specifically instances pre-approved by the Owner. Contractor shall request approval of service interruption plans, not less than 48 hours in advance of the event. Payment shall be made on a Lump Sum basis as noted in the Bid Schedule.

Item No.6 – Description

This item shall include all labor, materials, equipment, inspections, coordination, and incidentals required for the removal and replacement of all asphalt concrete surfaces and the underlying 6 inches of basecourse, as necessary to complete the installation of the new PRV vault and assembly in accordance with these contract documents. Payment shall be made on the basis of square yards (SY) of asphalt surfaces removed.

Item No.7 – Rock Excavation

This item shall include all labor, materials, equipment, inspections, coordination, and incidentals necessary to perform any rock excavation as defined in these documents, which may have not been identified prior to execution. Payment shall be made on the basis of cubic yard of rock excavated, up to a volume equal to the outside dimensions of the vault, plus one lineal foot in each dimension.

Item No. 8 – Storm Water Pollution Prevention Planning, Implementation and Maintenance

This item shall include all equipment, materials, labor, inspections, supervision, regulatory coordination, public relations, and any incidental items that may be required for the design, installation and maintenance of the SWPPP, as required by applicable provisions of the Clean Water Act.

END OF SECTION

SECTION 101
GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 INCLUDED

A. Applicable codes, ordinances, rules and regulations, administrative requirements, coordination with Department of Public Utilities (DPU), easements, approved construction drawings, testing, inspection, contractor qualifications and acceptance of public utility infrastructure.

1.2 APPLICABLE CODES, ORDINANCES AND RULES AND REGULATIONS

A. Department of Public Utilities Rules and Regulation, Revised May 17, 2006

B. Los Alamos County Code of Ordinances, Chapter 16 Development Code

C. Los Alamos County Code of Ordinances, Chapter 40 Utilities

D. New Mexico Administrative Code, Title 14 Housing and Construction

E. 49 Code of Federal Regulations, Part 191

F. 49 Code of Federal Regulations, Part 192

1.3 CONTRACTOR QUALIFICATIONS

A. Licenses: Contractors performing work on new or existing public utility infrastructure shall be licensed by the State New Mexico Construction Industries Department.

1. GF-9 or GF-98: Required for gas, water and sewer work. Electric ductbank, vaults and pull boxes only (no installation or handling of wire, terminating, grounding etc.).

2. EL-1J: Required for electric overhead and underground distribution and transmission lines.

B. Specific training, certifications, qualifications, manufacturer certifications listed in the individual specifications required to perform work.

1.4 COORDINATION WITH DEPARTMENT OF PUBLIC UTILITIES (DPU)

A. Notification: The contractor shall notify all customers and the Department of Public Utilities 4 calendar days in advance of any service disruption due to work performed by the contractor. Contractor shall notify affected customers with a door hanger approved by the DPU.

B. Permits: A penetration permit issued by the DPU is required for all connections to an existing gas, water and sewer main. The contractor shall complete the permit and coordinate the work with the Engineering Department and the Gas/Water/Sewer Department at least 48 hours before performing the work. The permit must be signed by the contractor, a representative of the Engineering Department and Gas/Water/Sewer

Department 48 hours prior to performing work. If the work will impact or take place on a water transmission line, a representative of the Water Production department must sign the permit.

C. Functions performed by Department of Public Utilities (DPU).

1. Gas

a. Gas valves shall only be operated by DPU.

b. Connections to existing gas mains shall be performed by DPU or contractor personnel with applicable Operator Qualifications (OQ) and who are a member of an approved Drug and Alcohol Program in accordance with U.S. Department of Transportation Pipeline Safety Regulations. If approved prior to connection, DPU may directly supervise, with OQ qualified personnel, the contractor personnel making the connections.

c. DPU will provide materials and install residential service lines upon completion of service request form, approval of plans and payment of applicable fees.

d. DPU will connect service and install meter only after New Mexico Construction Industries Division inspection and approval is obtained.

2. Water

a. Water system valves shall only be operated by DPU staff.

b. Water utility meters will be provided and installed by DPU.

3. Sewer

a. Service connections to existing sewer main shall be performed by DPU.

4. Electric

a. All primary terminations in the distribution system shall be completed by DPU unless otherwise stated in DPU approved plans.

b. DPU will provide and install electric meters.

c. DPU will provide materials and install residential service lines upon completion of service request form, approval of plans and payment of applicable fees.

d. DPU will connect service only after New Mexico Construction Industries Division inspection and approval is obtained.

1.5 APPROVED CONSTRUCTION DOCUMENTS

A. Construction drawings must be prepared by a Professional Engineer licensed in the state of New Mexico.

B. Construction drawings must be approved for construction by the DPU Engineering Department.

1.6 EASEMENTS

A. All public utility infrastructure shall be constructed in utility easements or right-of-way.

B. Easements and right-of-way shall be granted and filed in the office of the Los Alamos County Clerk prior to beginning construction.

C. Prior to construction all easements and right-of-way in which public utility infrastructure will be constructed must be staked by a Professional Surveyor licensed in the state of New Mexico.

1.7 TESTING, INSPECTION AND ACCEPTANCE OF INFRASTRUCTURE

A. All tests required in the individual sections of these specifications shall be completed by the contractor and at the expense of the contractor. Any infrastructure that fails a test must be corrected and retested until a passing test is achieved. All cost associated with correcting infrastructure that fails test and cost of re-testing is the responsibility of the contractor.

B. DPU shall inspect all new public infrastructure. Contractor is responsible for coordinating the inspections with DPU. Improvements that are buried before DPU has inspected shall be exposed for inspection by the contractor and at the expense of the contractor.

C. Locate wire installed on new public infrastructure shall be verified for continuity as follows:

1. Contractor shall verify continuity with own equipment.

2. When contractor has verified all of tracing wire is continuous, contractor shall make arrangements through Project Manager to have Gas/Water/Sewer Department (GWS) staff verify the continuity of the locate wire.

3. Contractor shall demonstrate continuity, in the presence of DPU staff, by locating with own equipment while GWS staff verifies continuity with own equipment and verifies accuracy of as-built drawings.

4. Locations identified where no continuity is found shall be repaired by contractor.

D. Inspection fees as required by DPU and Regulations Fee Schedule, current version, shall be paid prior to beginning construction.

E. Acceptance of public infrastructure shall occur as follows:

1. Public utility infrastructure constructed as part of a new development shall be accepted in accordance with Los Alamos County Code of Ordinances, Chapter 16 Development Code, Section 16-238 Acceptance.

2. Public utility infrastructure constructed by a DPU capital improvement project by means of competitive bid shall be accepted when the terms of the construction contract associated with the work have been satisfied.

END OF SECTION

SECTION 102
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Required submittals.

B. Submittal procedure.

C. Definition of submittal types for construction.

1.2 REQUIRED SUBMITTALS

A. Provide submittals as indicated in each specific specification section.

1.3 SUBMITTAL PROCEDURE

A. Review submittals prior to transmittal to determine and verify field measurements, field construction criteria, manufacturers' catalog numbers, and conformance of submittals with Contract Documents. To certify compliance with these specifications:

1. Routing Sheet provided in this section shall be attached to all submittals. Form must be completed in its entirety, signed and dated.

B. For any proposed deviation from the Contract Documents, submit a written request to the Project Manager.

C. Submit for review to Project Manager the following number of copies of submittals:

1. 2 Copies for Department of Public Utilities use.
2. Additional number of copies for Contractor use as determined by the Contractor.

D. Submittal Clarity:

1. Contractors Submittal No. on the routing sheet shall be a successive numbering system.
2. Drawings shall be clear and legible.
3. Manufacturer's Literature: Submit a minimum of one original of all manufacturers' printed material. Remaining number of submittals may be reproductions. Reproductions of original material shall be clear and legible.

E. A partial submittal consists of only a portion of the total required for a project. This is acceptable when it is prudent to submit for review certain submittals before the remaining submittals are available. Submit all items concurrently for which, due to coordination concerns, a simultaneous review is required. Include a

separate Routing Sheet indicating the submittals transmitted with each numbered submittal package.

F. After review of the submittal package the "Action Code" will be indicated on the Routing Sheet and returned to the Contractor. Review of submittals will be indicated on each Routing Sheet by appropriate signature, stamp, and date. The number of copies of each submittal noted above for Los Alamos County use will be retained and the balance will be returned to the Contractor. The Contractor shall allow a minimum of 10 calendar days for return of submittals.

G. The Department of Public Utilities will utilize the following "Action Codes" to indicate the status of submittals resulting from the review, and the action required of the Contractor.

1. A - Reviewed. No comments.
2. B – Reviewed And Noted. Make corrections noted. Resubmission not required.
3. C – Reviewed And Not Accepted. Revise and resubmit.

H. Use a Routing Sheet with all resubmittals indicating each item's submittal number and type suffixed "R1" for the first resubmittal, "R2" for the second resubmittal, and so forth.

I. Do not fabricate products or begin Work that requires submittals before such submittals are approved.

1.4 DEFINITIONS OF SUBMITTAL TYPES FOR CONSTRUCTION

A. Calculations: The methods and results of calculations in documented form where specified.

B. Catalog Data: Standard printed information on materials, products and systems, which shows performance characteristics, dimensions, material of fabrication, and other characteristics necessary to assure conformity with the design requirements. Where other items or information not related to the work of this project are included in the literature submitted, the item(s) and/or information applicable to this project shall be clearly marked.

C. Certifications: A written statement, signed by a qualified party, attesting that items or services are in accordance with specified requirements. Typically, this written statement is accompanied by additional information to substantiate the statement.

D. Installation Instructions: Manufacturer's instructions, step-by-step if necessary, showing the field installation of parts, components, equipment, and other similar items.

E. Material List/Parts List/Design Mixes: A list of system or material components.

F. Performance Data/Curves: Performance data and/or curves for the proposed equipment to show compliance with contract documents.

G. Samples/Colors: Samples, including colors, of proposed materials.

H. Shop Drawings: Drawings necessary to show fabrication details to ensure compliance with contract documents.

I. Test Reports: Results of specified test requirements.

J. Wiring Diagrams: Drawings showing the point-to-point wiring of a piece of equipment or between pieces of equipment in a system.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

END OF SECTION

CONTRACTOR SUBMITTAL ROUTING SHEET
DEPARTMENT OF PUBLIC UTILITIES

PROJECT:	Contractor's Submittal No.: Date: Product Description:
CONTRACTOR:	Dates of any previous submissions:
Supplier:	Manufacturer:
Specification No.:	Drawing Nos.:

Are there any deviations to the contract documents? ☐ No ☐ Yes (explain and identify)

CONTRACTOR'S CERTIFICATION: This submittal has been reviewed by the Contractor in compliance with the CONTRACT DOCUMENTS. Any deviations to the CONTRACT DOCUMENTS are identified above. If this is a resubmittal, any changes other than those specifically called for by the PROJECT MANAGER on previous submittals are specifically identified on the sheet(s) directly following this form.

Signed: **Date:**

LOS ALAMOS COUNTY ACTION

Date Received:	No. Copies Received:
Date Returned:	No. Copies Returned:

A	REVIEWED for general conformity with DRAWINGS and SPECIFICATIONS. No comments, approved for construction.	**By:** **Date:**
B	REVIEWED AND NOTED for general conformity with DRAWINGS and SPECIFICATIONS. Make corrections as noted, resubmittal not required.	**By:** **Date:**
C	REVIEWED AND NOT ACCEPTED. Not in conformity with DRAWINGS and SPECIFICATIONS. Revise and resubmit.	**By:** **Date:**

PROJECT MANAGER'S COMMENTS, IF ANY:

SECTION 103
COMPLIANCE REQUIREMENTS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Erosion and Sediment Control

B. Site Stabilization

C. Spill Control and Response

D. Debris Control

E. Dust Suppression

F. Traffic Control

1.2 QUALITY ASSURANCE

A. Submit per Section 102 Submittal Procedures, manufacturer's data, materials certifications, certified seed mix, Storm Water Pollution Prevention Plan (SWPPP), erosion and sediment control best management practices, traffic control plans and applicable appurtenances to complete work in this section.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 EROSION AND SEDIMENT CONTROL

A. General Requirements

1. Contractor shall supply, install and maintain all erosion and sediment control measures, stabilization and structural controls, and other protective measures through the use of Best Management Practices (BMPs) including silt fences, straw bales, compost socks, or other approved methods, prior to any earth disturbing activity. Standard Details, Section 7000 contains drawings for installation of BMPs.

2. Maintain BMPs in accordance with manufacturer's recommendations.

3. Disturb only the minimum amount of soil necessary. Contractor shall take suitable precautions to protect existing trees, shrubs and other natural vegetation during construction. Project Manager must approve any trees to be removed.

B. Projects Where Soil Disturbance Is Greater Than One Acre (SWPPP Required)

1. All provisions in subsection 3.1, A. General Requirements stated above apply.

2. Contractor shall prepare for review and acceptance by Project Manager a Storm Water Pollution Prevention Plan (SWPPP) in compliance with all requirements set by Environmental Protection Agency (EPA) National Pollution Discharge Elimination System for projects where soil disturbance is greater than one acre.

3. Contractor and County, as co-operators, shall each submit a Notice of Intent to the EPA Storm Water Notice Processing Center (http://cfpub.epa.gov/npdes/stormwater/enoi.cfm).

4. Contractor shall manage the SWPPP by supplying and installing all erosion and sediment control measures, stabilization and structural controls, and other protective measures through the use of Best Management Practices (BMPs) including silt fences, straw bales, compost socks, or other approved methods, prior to any earth disturbing activity.

5. Contractor shall conduct and document storm water inspections, maintain a soil disturbance log during construction and maintain records as required by EPA. Inspections shall be documented on the attached form provided on pages 5 and 6 of this section.

6. Contractor shall amend the SWPPP as required by EPA.

7. Contractor shall submit a Notice of Termination (NOT) following project completion and final stabilization, as defined by the EPA, is achieved.

3.2 SITE STABILIZATION

A. Contractor shall stabilize all disturbed areas not covered by asphaltic or concrete pavement, and replace to a condition equal or better than it existed before the project. Contractor shall re-plant vegetation with same species and varieties, or with DPU-approved equivalent plantings. No area disturbed by the work in this project shall be left as barren soil. After re-planting, Contractor shall care for the new plantings through one full growing season after Owner's acceptance of the completed project.

B. Site stabilization work shall be acceptable to the Project Manager.

3.3 SPILL CONTROL AND RESPONSE

A. In the event of a spill, contractor shall immediately notify the Owner's representative and the applicable State regulatory agencies. The Contractor shall be responsible for all remediation costs associated with any spill that may occur at the site during the execution of this project. Remediation shall be performed in full compliance with applicable local, state and federal laws.

B. Contractor shall store all fuels, lubricants, chemical storage, material stockpiles, and other potential pollutants in a designated area on-site, and provide secondary containment and controls including berming lined with an impervious material, covering, or other appropriate BMPs.

3.4 DEBRIS CONTROL & DISPOSAL

A. Contractor shall use good housekeeping practices to keep sites free of construction debris and trash, and provide containers for deposit of debris and trash. Contractor shall dispose of all waste materials generated from the construction including materials demolished, unsuitable excavated debris and construction debris in compliance with applicable local state and federal regulations.

B. No vehicle shall be driven on any public road unless the vehicle is constructed, loaded, secured or covered in a manner that will prevent any of its load from dropping, shifting, leaking, or otherwise escaping.

C. Contractor shall securely fasten all load covers to vehicles prior to driving on public roads so that the covering does not come loose or become a hazard to others.

D. No construction or sanitary waste, or trash shall be buried on-site.

E. Contractor's concrete truck washout area shall be approved in advance by Project Manager. If necessary, special provisions shall be made by contractor, as needed to protect property and the environment.

3.5 DUST SUPPRESSION

A. Contractor is responsible for supplying and applying potable water as needed for dust control throughout the project. Apply all liquids in a manner that does not result in runoff.

B. Commercial dust control products may be approved in a case by case basis.

C. Use means necessary to control dust on and near the work, and on and near off-site areas, if such dust is caused by the contractor's operations during performance of the work, or if resulting from the condition in which the contractor leaves the site.

D. Thoroughly moisten surfaces as required to prevent dust being a nuisance to the public, neighbors, and personnel performing other work on the site.

3.6 TRAFFIC CONTROL

A. A temporary traffic control plan shall be prepared by the contractor for any work that will impact vehicular or pedestrian traffic. Contractor shall submit two copies of all necessary traffic control and detour plans for the approval of the County Traffic Engineering Department. Approval of such plans may take up to 10 working days. Contractor shall resubmit to the Traffic Engineer any revisions to the plans that may be needed after the plans had been approved.

B. Traffic control devices shall be properly maintained and inspected daily by the Contractor throughout the duration of the project.

C. Contractor shall designate a Traffic Control Supervisor, who shall be available for call outs 24 hours per day.

D. The Traffic Control Supervisor shall be certified in Work-zone Traffic Control.

E. Traffic Control Supervisor shall perform on site inspections of work zone twice daily and once nightly if traffic control devices will be in place during night hours.

F. Contractor shall provide construction documentation and coordination, to include daily reports on inspections of barricade and maintenance schedules, for all projects lasting more than one week.

G. Traffic plans shall conform to the latest edition of the Manual of Uniform Traffic Control Devices (latest edition) and may be required to follow AASHTO safety recommendations.

H. Temporary Concrete Barriers shall be used where open trenches are within 6 feet of driving lanes. End sections of the temporary concrete barrier must be angled away from the traveled way.

I. Traffic Control Devices shall be kept in clean condition, and washing of equipment shall be part of its placement and maintenance.

J. Contractor shall obliterate any conflicting striping or temporary striping as part of the traffic control item.

END OF SECTION

National Pollutant Discharge Elimination System (NPDES)
Storm Water Pollution Prevention Plan (SWPPP) Inspection Checklist
Los Alamos County Department of Public Utilities

Project Title: _____

Project Location: _____

Inspector/Inspection Date: _____

Weather

Current: _____

Last 24 Hours: _____

Date of Last Rainfall _____

Amount of Last Rainfall _____

Chemicals Stored On Site: _____

Method of Chemical Containment: _____

Soil Disturbance Log Status: _____

Assessment of Best Management Practices (BMPs)

Part A. Erosion Prevention - Note condition and corrective actions for deficiently applied BMPs

1. Construction Access – Trackout, Street Clean	☐ OK ☐ Deficient
2. Soil Stabilization - Signs of Erosion, Gullies, Slope Failures, Rills	☐ OK ☐ Deficient
3. Slope Protection – Plastic Condition, Grass Growing, Hydroseed Condition, Matting	☐ OK ☐ Deficient
4. Perimeter Control - Clearing Limits Marked, Silt Fences, Swales	☐ OK ☐ Deficient
5. Conveyances Stable – Ditches, Check Dams Intact, Sand Bags, Slope Drains	☐ OK ☐ Deficient
6. Temporary Erosion and Sediment Control Management - Revisions Required	☐ OK ☐ Deficient

7. Water Management - Infiltration, Clean/Dirty Water Separated, Offsite Water Bypassed	☐ OK ☐ Deficient
8. Outlet Protection – Stabilized	☐ OK ☐ Deficient

Part B. Sediment Control - Note condition and corrective actions for deficiently applied BMPs

1. Storm water Detention and Monitoring	☐ OK ☐ Deficient
2. BMP Maintenance	☐ OK ☐ Deficient
3. Inlet Protection	☐ OK ☐ Deficient
4. Dust Control	☐ OK ☐ Deficient
5. Spill Prevention	☐ OK ☐ Deficient
6. Condition of Discharge Water	☐ OK ☐ Deficient

Other/Continued Comments, Conditions, Corrective Actions, and Observations:

SECTION 104
UNDERGROUND FACILITIES STAKING REQUIREMENTS

PART 1 GENERAL

1.1 WORK INCLUDED

This section provides the requirements for the construction staking of public utility infrastructure works.

1.2 QUALITY ASSURANCE

Utility staking is contingent upon the completion of the following by the owner/developer:

A. Right-of-way and easements establishing legal access for new utility infrastructure shall be granted and filed in the office of the Los Alamos County Clerk prior to beginning construction.

B. Right-of way, easements, lot corners and lot boundaries shall be staked by a New Mexico Licensed Professional Surveyor when utility infrastructure will be constructed within or adjacent to an established legal boundary to prevent encroachments and ensure legal access to facilities is maintained.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. The contractor is responsible for completion and maintenance of all construction staking necessary to complete the work, consistent with standard survey practices in the State of New Mexico.

B. Clearing and grubbing shall be completed prior to staking.

C. Staking utility infrastructure items, when grading has not been completed to final grades or final subgrade. Stakes indicating grade cut or fills shall be placed as necessary to ensure that utility infrastructure be constructed at the proper depth when final grading is complete. All infrastructure not installed to the proper depth, due to lack of staking or incorrect staking, shall be removed and replaced at the proper depth at the Contractor’s expense.

D. Subgrade stakes: subgrade stakes shall be considered correct as long as they are within 0.2'. However, care shall be exercised by the Contractor when staking a utility location, in that a greater degree of precision may be necessary.

E. The burial depths and tolerances specified or drawn elsewhere in these construction standards for each specific utility shall be met.

F. Contractor shall stake location and finished grade in all pertinent features, including but not limited to, roadways, curb and gutter, sidewalks, drainage structures,

signage, retaining walls that are necessary for placement of utility components as specified.

G. Offset distance: Contractor shall select a horizontal distance between trench and stake of about 10’ to 15’, which will ensure that stakes are protected from damage during trenching operations. The stakes may be placed adjacent to the contractor's sub grade stakes if the offset distance is adequate, or may, in fact, be the same if so marked.

H. Stake interval: stakes shall be placed as required in order to ensure that the trench will be properly aligned and at all utility components such as vaults, pedestals, transformers, manholes, clean-outs, meter sets, fire hydrants, changes in direction, fitting location, valve location and other utility components that require to be placed at a specified location and depth. In no case shall staking intervals be less than 50’. The interval may have to be decreased to 25’ or less on curves or where site conditions otherwise dictate.

I. Although the center location on small electric boxes and property line structures are normally adequate, in most cases, it will be necessary to stake two corners on the larger boxes. When a box is to be placed against the back face of a sidewalk or any other critical location, care must be exercised to ensure adequate precision in staking.

END OF SECTION

SECTION 202
EXCAVATION, TRENCHING AND BACKFILL

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This section covers trenching and backfill requirements for buried gas, water and sewer piping systems, as well as electric and communication conduits.

B. This section also covers requirements for excavation and for compaction of succeeding layers after backfill has been placed around pipe, electric conduits, communication conduits, under manholes, surrounding manholes, under vaults, surrounding vaults, beneath equipment bases where detailed in drawings, as well as backfill associated with structures to be abandoned in place.

1.2 RELATED WORK

A. Section 301 Gas Systems

B. Section 401 Underground Ductbank Systems

C. Section 501 Sewer Systems

D. Section 502 Sewer Manholes

E. Section 601 Water Systems

1.3 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the general designation only.

B. American Society for Testing and Materials (ASTM) Publications:

D - 1557 Moisture-Density Relations of Soils and Soil Aggregate Mixtures

D - 2419 Sand Equivalent Value of Soils and Fine Aggregate

D - 2487 Classification of Soils for Engineering Purposes

C. State of New Mexico Excavation Law: Chapter 62, Article 14 NMSA 1978, 2001 Amendment, and all amendments in place at the time of construction.

1.4 QUALITY ASSURANCE

A. Percentage of compaction specified shall be the minimum acceptable. The percentage represents the ratio of the dry density of the compacted backfill material to the maximum dry density of the material as determined by the procedure set forth in ASTM Designation D1557.

1.5 GENERAL REQUIREMENTS

A. EXISTING UTILITIES

1. The protection of active utility lines shown on the Plans or otherwise made known to the Contractor shall be the responsibility of the Contractor, prior to and during excavation. Active utility lines shown to be removed, retired, or abandoned in place shall be protected until the replacement utility lines are in place and ready to begin service or be otherwise activated. Any damaged utility, shall be repaired

or replaced at the Contractor's expense. Potholing, as may be required to verify utility locations, shall also be the responsibility of the Contractor. Hand digging shall be performed at any time the excavation is within 18 inches of a live utility line per New Mexico Excavation Law. Contractor shall be responsible for contacting all utility companies and coordinating any work that requires relocation or abandonment of existing utilities.

2. Abandoned utility lines shall be cut and capped on both ends of the abandoned section.

3. If active utility lines are encountered and are not shown on the Plans or otherwise made known to the Contractor, promptly take necessary steps to assure no utility services are interrupted.

4. If any utility service is interrupted as a result of work under this section, immediately contact The Department of Public Utilities at 662-8130, or Police Dispatch at 662-8222, to restore service by repairing the damaged utility at Contractor's expense.

5. Existing utilities, whether or not shown on the drawings, and believed to interfere with the installation of permanent facilities being constructed under this contract, Contractor shall immediately send written notification to the Project Manager for direction.

6. Contractor shall not proceed with permanent repair or relocation of any existing utilities until written instructions are received from the Department of Public Utilities.

B. PROTECTION OF PERSONS & PROPERTY

1. Contractor shall install all necessary underpinning, shoring, lagging, cribbing, and bracing of ample strength to support adjoining soils, paving and structures. All such items shall be so constructed that they will not interfere with the building of any structural elements, and shall be removed upon completion of the work.

2. Contractor shall barricade open depressions and holes occurring as part of this work, and post warning lights on property adjacent to or with public access, all in compliance with County-approved traffic control plan.

3. Contractor shall protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by operations of Contractor.

4. Contractor shall install fences and barricades to secure the area from the public.

5. Contractor shall maintain access to areas adjacent to the project site(s) at all times.

6. Contractor shall maintain and/or replace all bench marks, monuments, construction stakes and other reference points. Any property boundary pins, survey monuments or survey benchmarks disturbed or damaged by the contractor shall be replaced at the expense of the contractor, by a surveyor licensed in the state of New Mexico.

7. Contractor shall repair or restore damage to any portion of the work resulting from movement of the sides or bottom of trenches or other excavation which is

attributable to the Contractor's acts or omissions, whether sides are braced or not.

C. SHORING

1. The Contractor shall be solely responsible for all bracing and shoring in compliance with all local, state and federal laws.

D. DEWATERING

1. Contractor shall remove all water, including rain water, encountered during trenching and substructure work to an approved location by pumps, drains, and other approved methods.

2. Contractor shall keep excavations and site construction area free from extraneous water.

E. DUST CONTROL:

1. Contractor shall use any and all means necessary to control dust on and near the work, and on and near off-site areas, if such dust is caused by the Contractor's operations during performance of the Work, or if resulting from the condition in which the Contractor leaves the site.

2. Thoroughly moistening surfaces as required to prevent dust from becoming a nuisance to the public, neighbors, and personnel performing other work on the site shall be the responsibility of the Contractor, throughout the construction period.

F. TRENCHING IN ROCK

2. Unless Trenching in Rock is specifically listed as a bid item, all trenching under this contract shall be considered incidental to pipe, conduit, or ductbank installation. Excavation in Rock items, as defined elsewhere in this contract, shall apply only to excavation work needed for underground structures other than pipes and conduits, such as manholes and vaults. No additional payment shall be made for incidental trenching and backfilling in rock.

3. Material excavated during trenching that may not suitable for backfilling and compaction, in accordance with the specifications in this contract, shall be disposed off-site, in compliance to applicable regulations. Suitable material shall be imported for backfill.

4. The Owner shall provide pertinent information to the contractor, following all appropriate subsoil investigations conducted on the project site, prior to project bidding. Contractor may, at contractor's expense, expand on the scope of such subsoil investigations.

5. Payment for trenching and backfilling shall be made in accordance with the specific bid item. When trenching and backfilling is considered incidental to pipe and conduit installation, bid item shall include the cost of trenching itself, regardless of subsoil materials, removal of spoils not suitable for backfilling and importation of suitable backfill material.

PART 2 PRODUCTS

2.1 BACKFILL MATERIALS

A. Backfill Materials are those materials placed in the trench between the bedding material to the top of the trench or to below specified base course under roadways or those material used to fill excavations for subsurface structures. On-site native material used as backfill shall be select material free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, frozen, deleterious, or objectionable materials, free of stones or lumps exceeding 3 inches in greatest dimension satisfactory to the Project Manager.

B. Soft, wet, plastic soils which may be expansive, clay soils having a natural in place water content in excess of 30%, soils containing more than 5% (by weight) fibrous organic materials, and soils having a plasticity index greater than 30 shall be considered unsuitable for use as backfill.

C. In the event that native materials not meet the requirements specified for bedding material or backfill, or if the specified field compaction cannot be obtained, contractor shall import suitable material at no additional cost to the owner.

D. The removal, hauling, and disposal of unsuitable material, such as rocks, pavement, concrete, demolished structures, debris, or other extraneous items shall be the responsibility of the Contractor, and shall be performed at no additional cost to the owner. Securing the site and coordinating with the respective agencies or disposal site owners shall also be the responsibility of the Contractor to do at no additional cost to the owne,r and in accordance with applicable environmental regulations.

2.2 PIPE BEDDING MATERIAL

A. Pipe bedding, a minimum 4 inches below bottom of pipe and six inches above the top of the pipe shall be permeable material with a maximum particle size of 0.5 inches in any dimension, with no sharp rocks. Portion passing No. 200 sieve shall be 50% maximum. Contractor shall provide a submittal for bedding material for approval by the Project Manager, prior to installing such bedding material.

2.3 TRENCHES ON PAVED SURFACES

A. Existing pavement surfaces shall be neatly saw-cut, removed and disposed of by Contractor in a lawful manner and at the Contractor's expense, as necessary for trenching operations to take place. Removed pavement or asphalt shall never be used as backfill. Paved surfaces shall be replaced upon backfilling the trench, in compliance with Los Alamos County Public Works Department Construction Standards. Asphalt and base course thickness shall be as detailed in plans, or at a minimum match existing concrete pavement or asphalt and basecourse section.

PART 3 EXECUTION

3.1 GENERAL TRENCHING AND EXCAVATING

A. Trenches may be excavated either by hand, or by machine. Trenches shall be cut with vertical sides, and shall be of sufficient width to provide adequate space for working therein. When applicable such space shall have adequate clear distance when shoring is used, so that pipe can be properly placed and aligned in conformity with the plans. Trench sides shall be parallel to and at equal distance from the center-line of the pipe, when aligned as shown on drawings.

B. Pipe trenches shall be excavated to a depth below the bottom of the pipe sufficient to provide for pipe bedding materials as required by Section 2.2.

C. Where a trench has been excavated below the designed grade, the bottom of the trench shall be refilled to proper subgrade with approved material well compacted in place, in an approved manner.

D. No more than 150 feet of trench shall be opened at any one time unless approved by the Project Manager.

E. If practical, no trench or holes shall be left open overnight. Use steel plating to protect open trenches overnight.

F. Excavation for thrust blocks shall be neat to the line and dimensions shown or called for on the plans.

G. Provide for dewatering trenches and excavations and subsequent control of ground water, utilizing such pumps or other equipment as may be necessary to control ground water and seepage until backfilling is completed.

H. The contractor shall remove and legally dispose of all excess excavated material and demolition debris.

3.2 GENERAL BEDDING

A. Utilities shall be laid on a firm layer of firm bedding material, per section 2.2 A, not less than four (4) inches in depth as shown or as noted on the plans and detail drawings. Compact as specified herein.

B. Upon completion of bedding operations and, prior to the installation of pipe or appurtenances, notify the Project Manager who will then inspect the bedding layer. Pipe laying shall not commence until the bedding has been approved. Upon completion of placement of 6” of bedding above pipe or conduit notify the Project Manager who will then inspect.

3.3 GENERAL BACKFILLING

A. Backfill shall be as shown on the plans. Place in 8-inch maximum lifts. Bring up evenly on each side, and for the full length of the structure. Ensure that no damage is done to structures or protective coatings thereon. Compact each loose lift as specified in Paragraph “General Compaction” before placing the next lift. Where unacceptable settlements occur in trenches and pits due to improper compaction, excavate to the depth necessary to rectify the problem, then backfill and compact the excavation as specified herein and restore the surface to the required elevation.

B. No backfill shall be placed until the line has been inspected and bedding approved.

3.4 GENERAL COMPACTION

A. Use hand-operated plate type vibratory or other suitable hand tampers in areas not accessible to larger rollers or compactors. Contractor shall avoid damaging structures, pipes and protective pipe coatings. Compaction shall be in accordance with the following unless otherwise specified. If necessary, the Contractor's selected equipment and construction procedure shall be altered, changed or modified in order to meet the specified compaction requirements.

B. Initial bedding shall be carefully packed under the haunches of the pipe and brought up simultaneously on both sides so as to prevent any displacement of the pipe from its true alignment. Bedding shall be compacted in layers not more than eight (8) inches in thickness in a manner that will preclude moving the pipe, to not less than 85%, and 95% within road right of ways, and as specified.

C. Backfill above the bedding shall be placed in loose lifts not exceeding eight (8) inches in thickness before compaction, and compacted by the use of pneumatic tampers or other mechanical means approved. Water or dry, as required, to bring the soils as close as practicable to the optimum moisture content for proper compaction. Compaction equipment or methods that produce horizontal or vertical earth pressures that may cause excessive displacement or may damage the pipeline will not be permitted.

D. Backfill will be inspected during placement. Backfill not compacted in accordance with these specifications shall be recompacted, or removed as necessary and replaced to meet specified requirements prior to proceeding with the work.

E. Contractor is responsible for protection and maintenance of work during construction and until the project is accepted. The contractor will not be paid an additional amount for such work.

F. Open excavations and backfilled trenches that have not been paved shall be protected from moisture that may sacrifice compaction or backfill quality. Basecourse or asphalt shall not be placed on subgrade or backfill that is visibly saturated. Saturated subgrade and backfill shall be removed, replaced, recompacted per these specifications and demonstrated to be in conformance with these specifications by testing performed by an approved testing laboratory at the expense of the contractor. Frequency and location of this testing will be determined by the Project Manager.

3.5 GENERAL BRACING AND SHORING

A. The Contractor shall furnish, place and maintain such bracing and shoring as may be required to support the sides of the excavations for the proper protection of workmen; to facilitate the work; and to prevent damage to or adversely affect adjacent structures, facilities, landscaping, or pavement.

B. Upon completion of the work, all bracing and shoring shall be removed.

3.6 FIELD QUALITY CONTROL

A. Compaction test are required to be performed by a qualified material testing Laboratory provided by the Contractor and at the expense of the Contractor, and test results shall be provided to the engineer directly from the laboratory.

B. Definition of road prism in these specifications is all subsurface material directly below paving, sidewalk, curb, valley gutter, roadway islands, landscaping and bar ditches within a road right of way.

C. Compaction requirements and test schedule:

1. Trenches under road prism 95% compaction required for bedding and backfill. Minimum of one field density test for each compacted 12” layer of trench backfill for each 200 linear feet of trench.

2. Trenches under road prism 95% compaction required. Minimum of one field density test for each 12” compacted layer of trench backfill for each trench less than 200 linear feet.

3. Trenches crossings under road prism 95% compaction required. Minimum of one field density test for each 12” compacted layer of trench backfill at each trench road crossing.

4. Trenches not under road prism 85% compaction required. Minimum of one field density test for each 12” compacted layer of trench backfill for each 200 linear feet of trench.

5. Trenches not under road prism 85% compaction required. Minimum of one field density test for each 12” compacted layer of trench backfill for each trench less than 200 linear feet.

6. New manholes, pull boxes or vaults, 95% compaction required. Minimum of one field density test for each 12” compacted layer of backfill for each structure.

7. Manhole bases, pull box bases, transformer pads, vault bases and switch pads 95% compaction required. Minimum of one field density test of prepared subgrade.

D. If backfill has been placed, that is below the specified density, provide additional compaction with subsequent retesting until successful compaction is achieved at no cost to the owner.

3.7 DUST ALLEVIATION AND CONTROL

A. Contractor shall be responsible for and shall provide pollution and dust abatement and control measures satisfactorily during the course of the work. Water trucks shall be equipped with a directional spray nozzle.

3.8 FINISH OPERATIONS

A. Pipes shall be laid to finished grades indicated on the plans.

B. Contractor shall dispose of all surplus material or material unsuitable for filling or grading off the site in a legal manner at no additional cost to the owner.

C. Satisfactorily restore any existing improvements, paving, landscaping, and other utilities disturbed during the course of constructing the improvements.

D. Existing traffic markings and control devices damaged or disturbed during construction shall be replaced or repaired to the satisfaction of the Project Manager.

END OF SECTION

SECTION 203
HORIZONTAL DIRECTIONAL DRILLING

Part 1 GENERAL

1.1 WORK INCLUDED

A. Supplying all labor, materials, equipment and incidentals required to install pipe line and conduits as shown on the drawings by the horizontal directional drilling (HDD) method.

1.2 RELATED WORK

A. Section 202 Excavation, Trenching and Backfill

B. Section 301 Gas Systems

C. Section 401 Underground Ductbank Systems

D. Section 501 Sewer Systems

E. Section 601 Water Systems

F. Section 702 Grout

1.3 QUALITY ASSURANCE

A. Installation Plan:

1. At least 15 days prior to the scheduled start of any HDD, submit in accordance with Section 102 Submittal Procedures Contractor shall submit his detailed installation plan to the Project Manager. Review will be for information only. Contractor remains responsible for adequacy and safety of construction means, methods and techniques. Submittals shall consist of design drawings, calculations and related supplemental information describing in detail the design concept for all HDD operations.

2. The plan shall also include a listing of major equipment and qualifications of supervisory personnel and a description of the methods to be used. HDD contractor shall be trained and certified by manufacturer to operate the horizontal directional drilling equipment. HDD contractor shall designate a drilling supervisor who shall remain onsite and be in responsible charge throughout the drilling operation. The supervisor shall have performed HDD or supervised directional drilling for a minimum of 10,000 linear feet of pipe.

3. The plan shall include the piping materials to be placed in the bore that meet the specifications, with manufacturer recommended and approved joints for installation by horizontal directional drilling.

B. Variations in Plan or Profile: The Contractor may request changes to the proposed vertical and horizontal alignment of the installation and the location of the entry and exit points. Proposed changes shall be submitted in writing to the Department of Public Utilities and receive approval of the Project Manager prior to construction. In no case shall the installation have less bury than the minimum specified. Approved changes will be at no additional cost to the owner.

C. Alignment: The proposed plan and profile installation locations are based on alignments to accommodate acquired easements, to avoid obstructions, and to properly maintain

operation flow velocities.

D. Qualifications: Directional drilling and pipe installation shall be done only by an experienced Contractor specializing in directional drilling with at least five (5) years experience in this work. Furthermore, the Contractor shall have installed directionally drilled pipe at least as large as 8 inches in diameter and successfully installed at least 10,000 feet.

Part 2 PRODUCTS

2.1 PRODUCTS

A. Drilling fluid shall be bentonite. Technical criteria for bentonite shall be as given in API Specification 13A, Specification for Oil Well Drilling Fluids Material for fresh water drilling fluids. Any modification to the basic drilling fluid involving additives must describe the type of material to be used and be included in Contractor's drilling plan presented to the Project Manager. The Owner retains the right to sample and monitor the waste drilling mud, cuttings and water.

PART 3 EXECUTION

3.1 EXECUTION

A. The Contractor shall install the pipelines by means of horizontal directional drilling. The Contractor shall assemble, support, and pretest the pipeline prior to installation in the directional drill tunnel.

1. Horizontal directional drilling shall consist of the drilling of a small diameter pilot hole from one end of the alignment to the other, followed by enlarging the hole diameter for the pipeline insertion. The exact method and techniques for completing the directionally drilled installation will be determined by the Contractor, subject to the requirements of these Specifications.

2. The Contractor shall prepare and submit a plan to the Project Manager for approval for insertion of the pipe into the opened bore hole. This plan shall include pullback procedure, ballasting, use of rollers, side booms and side rollers, coating protection, internal cleaning, internal gauging, hydrostatic tests, dewatering, and purging.

3. The required piping shall be assembled in a manner that does not obstruct adjacent roadways, sidewalks or public activities. The Contractor shall erect temporary fencing around the entry and exit pipe staging areas.

B. Pipes and conduits installed by horizontal directional drilling shall be tested as required by the specification for the utility type and pipe material installed.

C. Tolerances

1. Pipe installed by the horizontal directional drilled method must be located in plan as shown on the Drawings or specified, and must be no shallower than shown on the Drawings or specified unless otherwise approved in writing by the Project Manager. The Contractor shall plot the actual horizontal and vertical alignment of the pilot bore at intervals not exceeding 30 feet. This "as built" plan and profile shall be updated as the pilot bore is advanced. The Contractor shall at all times provide and maintain instrumentation that will accurately locate the pilot hole and measure drilling fluid flow and pressure. The Contractor shall grant the

Project Manager access to all data and readout pertaining to the position of the bore head and the fluid pressures and flows. When requested, the Contractor shall provide explanations of this position monitoring and steering equipment. The Contractor shall employ experienced personnel to operate the directional drilling equipment and, in particular, the position monitoring and steering equipment. No information pertaining to the position or inclination of the pilot bores shall be withheld from the Project Manager.

2. Each exit point shall be located as shown with an over-length tolerance of 10 feet for directional drills of 1,000 linear feet or less and an alignment tolerance of 5 feet left/right with due consideration of the position of the other exit points and the required permanent easement. The alignment of each pilot bore must be approved by the Project Manager before pipe can be pulled. If the pilot bore fails to conform to the above tolerances, the Project Manager may, at his option, require a new pilot boring to be made.

3. After the pipe is in place, cleaning pigs shall be used to remove residual water and debris. After the cleaning operation, the Contractor shall provide and run a sizing pig to check for anomalies in the form of buckles, dents, excessive out-of-roundness and any other deformations. The sizing pig run shall be considered acceptable if the survey results indicate that there are no sharp anomalies (e.g. dens, buckles, gouges, and internal obstructions) greater than 2 percent of the nominal pipe diameter, or excessive ovality greater than 5 percent of the nominal pipe diameter. For gauging purposes, dent locations are those defined above which occur within a span of five feet or less. Pipe ovality shall be measured as the percent difference between the maximum and minimum pipe diameters. For gauging purposes, ovality locations are those defined above which exceed a span of five feet.

D. Ream and Pullback

1. Reaming: Reaming operations shall be conducted to enlarge the pilot after acceptance of the pilot bore. The number and size of such reaming operations shall be conducted at the discretion of the Contractor.

2. Pulling Loads: The maximum allowable pull exerted on the pipelines shall be measured continuously and limited to the maximum allowed by the pipe manufacturer so that the pipe or joints are not over stressed.

3. Torsion and Stresses: A swivel shall be used to connect the pipeline to the drill pipe to prevent torsional stresses from occurring in the pipe.

4. The lead end of the pipe shall be closed during the pullback operation.

5. Pipeline Support: The pipelines shall be adequately supported by rollers and side booms and monitored during installation so as to prevent over stressing or buckling during the pullback operation. Such support/rollers shall be spaced as required, on centers, and the rollers to be comprised of a non-abrasive material arranged in a manner to provide support to the bottom and bottom quarter points of the pipeline allowing for free movement of the pipeline during pullback and to avoid surface damage to the pipe or conduit.

6. The contractor shall at all times handle the pipe in a manner that does not over stress the pipe. If the pipe is buckled or otherwise damaged, the damaged section shall be removed and replaced by the Contractor at his expense. The Contractor shall take appropriate steps during pullback to ensure that the pipe

will be installed without damage.

E. Handling Drilling Fluids And Cuttings

1. During the drilling, reaming, or pullback operations, the Contractor shall make adequate provisions for handling the drilling fluids, or cuttings at the entry and exit pits. These fluids must not be discharged to a waterway. When the Contractor's provisions for storage of the fluids or cuttings on site are exceeded, these materials shall be hauled away to a suitable legal disposal site. After completion of the directional drilling work, the entry and exit pit locations shall be restored to original conditions. The Contractor shall comply with all contract provisions.

2. Pits constructed at the entry or exit point area shall be so constructed to completely contain the drill fluid and prevent its escape to surrounding areas.

3. The Contractor shall utilize drilling tools and procedures which will minimize the discharge of any drill fluids. The Contractor shall comply with all mitigation measures listed in the contract documents and elsewhere in these Specifications.

4. To the extent practical, the Contractor shall maintain a closed loop drilling fluid system.

5. As part of the installation plan specified herein before, the Contractor shall submit a drilling fluid plan which details types of drilling fluids, cleaning and recycling equipment, estimated flow rates, and procedures for minimizing drilling fluid escape.

6. The Horizontal Directional Drilling operation is to be operated in a manner to eliminate the discharge of water, drilling mud and cuttings to the surrounding land during the construction process. All excavated pits used in handling drilling mud during the drilling operation shall be lined to prevent the migration of drilling fluids and/or ground water. Liner type shall be provided in the installation plan and approved by the Project Manager.

END OF SECTION

SECTION 204
BORE AND JACKING

PART 1 GENERAL

1.1 WORK INCLUDED

A. Furnish all labor, materials, equipment, supplies and incidentals required and install casing pipe and carrier pipe by jacking and boring at the location shown on the Drawings and as specified herein.

B. Work shall be done in strict accordance with the details shown on the Drawings and as specified herein and in accordance with all State and local laws, regulations and requirements.

C. The work shall include, but not be limited to the following: steel casing pipe, skids, casing seals, coatings, location markers, vents and miscellaneous appurtenances as required to complete the installation.

D. Furnish the services of a licensed professional engineer registered in the State in which the work is located, to prepare jacking designs and submittals.

E. Furnish special insurance, traffic control and any other requirements imposed by the owner of the right(s)-of-way over the work.

1.2 RELATED WORK

A. Section 202 Excavation, Trenching and Backfill

B. Section 301 Gas Systems

C. Section 401 Underground Ductbank Systems

D. Section 501 Sewer Systems

E. Section 601 Water Systems

F. Section 702 Grout

1.3 SUBMITTALS

A. Submit to Project Manager, in accordance with Section 102 Submittal Procedures complete shop drawings and product data for casing pipe, carrier pipe, fittings and related appurtenances. Submit a laying schedule showing stationing, elevations, pipe classes and class coding.

B. At least 15 days prior to the scheduled start of any jacking operations, submit in accordance with Section 102 Submittal Procedures the proposed methods of jacking. Review will be for information only. Contractor remains responsible for adequacy and safety of construction means, methods and techniques. Submittals shall consist of design drawings, calculations and related supplemental information describing in detail the design concept for all jacking operations. Submittals shall be prepared by a licensed professional engineer, registered in the State of New Mexico, having a minimum of 5 years of professional experience in the design and construction of jacking systems. Submittals shall include as a minimum the following:

1. Shop drawings showing size, location and design calculations for reaction

blocks and jacking pits.

2. Number and capacities of jacks.

3. Size, arrangement and installation of soil stabilization and dewatering equipment with details reflecting where groundwater will be directed during construction.

4. Detailed descriptions of equipment, materials, sequence and procedures for jacking steel sleeve with shield including provisions for standby and backup equipment.

5. Revisions to shop drawings, as necessary, to accommodate field conditions and/or compliance as specified herein.

C. Should the owner of a right-of-way over the work require approval of jacking designs and shop drawings, furnish submittals to that owner and obtain the necessary approvals prior to furnishing the submittals specified above.

1.4 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

B. American Welding Society (AWS)

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.5 QUALITY ASSURANCE

A. Steel casing pipe shall be the product of a single domestic manufacturer. Pipe shall be tested and inspected at the foundry as required by the standard specifications to which the material is manufactured. Submit in accordance with Section 102 Submittal Procedures certificates of such tests, results and satisfactory approvals.

B. Welders shall be certified in accordance with standards of the AWS. Submit current certifications prior to the start of fieldwork to Project Manager.

1.6 DELIVERY, STORAGE AND HANDLING

A. Care shall be taken in loading, transporting and unloading to prevent injury to the pipe or coatings. Pipe shall not be dropped. Any damage to the pipe coatings shall be repaired, per the manufacturer’s recommendation, at no additional cost to the Owner.

B. All pipe shall be subjected to a careful inspection prior to being installed. If any pipe fails to meet the requirements specified herein, it shall be removed and replaced with satisfactory pipe at no additional cost to the Owner.

1.7 PROJECT/SITE REQUIREMENTS

A. Discharge from dewatering operations shall be directed into approved receiving basins in accordance with all applicable regulatory requirements.

B. Furnish and maintain all traffic control and establish and maintain all safety procedures on adjacent highways during the jacking operation.

C. Inspect the locations where jacking operations will be conducted and the casing pipe

is to be installed, verify the conditions under which the work will be performed, and provide all necessary details, whether shown or specified on the Drawings or not, for the orderly prosecution of the work.

D. Jacking operations shall not result in measurable settlement, movement, or cracking of roadways or adjacent structures. If any movement or settlement occurs which causes or might cause damage to roadways or structures over, along, or adjacent to the work, jacking operations shall stop immediately except for those activities which will assist in making the work secure and prevent further movement, settlement, or damage. Jacking operations may resume only after all necessary precautions have been taken to prevent further movement, settlement, or damage.

E. Roadways and structures damaged by jacking operations shall be repaired or replaced as necessary to restore them to their condition prior to beginning jacking operations at no additional cost to the Owner.

1.8 DEFINITIONS

A. Casing pipe shall mean the outer sleeve that is installed by the jack and bore method.

B. Carrier pipe shall mean the pipe inserted within the casing pipe and which acts as the conveyor of liquid or gas.

C. Jacking pit shall mean the pit at which the boring and jacking equipment is installed and from which both the casing pipe and carrier pipe are launched.

D. Exit pit shall mean the pit located at the end of the casing pipe remote from the jacking pit at the point where the carrier pipe emerges from the casing pipe.

PART 2 PRODUCTS

2.1 MATERIALS

A. Steel Casing Pipe

1. Steel casings shall be of leakproof construction and shall conform to the requirements of ASTM A53 (ASTM A139 Grade "B") and shall be protected inside and outside by a black bituminous coating a minimum of 10 mils thick.

2. The inside diameter of the casing pipe shall be at least 2-in greater than the largest outside diameter of the carrier pipe, joints, or couplings, for carrier pipe less than 6-in in diameter; and at least 4-in greater for carrier pipe 6-in and over in diameter. It shall, in all cases, be large enough to allow the carrier pipe to be removed subsequently without disturbing the casing pipe or roadway subgrade.

3. Casing pipes shall have the minimum nominal diameters and wall thicknesses as specified herein. The following table shows the casing size and thickness as related to outside diameter of a ductile iron carrier pipe.

Steel Casing Diameter and Wall Thickness (Inches)	Ductile Iron Carrier Pipe (Inches)
14" Schedule 30	6"
16" Schedule 30	8"
18" Standard Class	10"
22" Standard Class	12"
24" Schedule 20	14"
26" Schedule 20	16"
30" 0.375" Wall	18"
36" 0.375" Wall	24"

B. Carrier Pipe

1. Pipe shall be shown as on the drawings and as specified. Pipe shall have a restrained joints approved by the pipe manufacturer for installation in a casing that allows the pipe to be removed by pulling back from either the jacking pit or exit pit.

C. Casing Spacers And Casing End Seals

1. Casing spacer shall be plastic or stainless steel with non-metallic runners manufactured by Pipeline Seal & Insulator; Cascade Waterworks Manufacturing; CCI Pipeline Systems; Advanced Products & Systems, Inc.; or approved equal.

2. Casing end seal shall be watertight manufactured by Pipeline Seal & Insulator; Cascade Waterworks Manufacturing; CCI Pipeline Systems; Advanced Products & Systems, Inc.; or approved equal.

2.2 SURFACE PREPARATION AND SHOP COATINGS

A. Steel casing pipe shall be protected inside and outside by a shop applied black bituminous coating with a minimum thickness of 10 mils.

PART 3 EXECUTION

3.1 PREPARATION

A. Notify Owner at least 7 days in advance of the planned start of work.

B. Jacking pit subgrades shall be kept continuously free from ground and surface waters during jacking operations

3.2 INSTALLATION

A. Refer to standard drawing 2008 Jack and Bore.

B. Excavate jacking pit and provide excavation supports as required. Excavation support shall extend a sufficient depth below the invert of the steel casing pipe to resist any

pressure developed by the soil outside the jacking pit. Excavation support shall extend at least 4 feet above existing grade.

C. Furnish a level concrete slab at the bottom of the jacking pit. Steel rails or beams shall be embedded in the concrete slab for placement and alignment of each piece of casing pipe or carrier pipe during installation operations.

D. Furnish, install and remove, to the extent required, thrust blocks or such other provisions as may be required in driving the casing pipe or carrier pipe forward.

E. Maintain proper alignment and elevation of the casing pipe consistently throughout the jacking operation. Tolerances for installation of the casing pipe shall be as follows:

1. Elevation: to grades indicated on plans plus or minus 2 inches.
2. Plan Location: plus or minus 1 foot.

E. Jacking operations for the casing pipe shall be continuous and precautions shall be taken to avoid interruptions.

F. Carrier pipe shall be supported within the casing pipe. The load of the carrier pipe shall be distributed along the casing by casing spacers. The number of, and spacing of casing spacers shall be per the manufacturers recommendations for the carrier pipe used.

G. Steel casing pipe sections shall have beveled ends with a single v-groove and shall be full penetration butt welded on the outside of the casing. All joints of the steel casing shall be butt welded prior to being subjected to the jacking operation. The welded joints shall be wire brushed and painted with bitumastic enamel coating.

H. Earth or rock augers shall not exceed the outside diameter of the casing pipe by more than ¼ of an inch.

I. After the casing pipe has been completely installed, thoroughly clean the interior of the casing pipe and remove all excess material leaving a smooth interior throughout.

J. Install casing vents as detailed on the drawings. Casing vents shall be installed with vent piping directed toward the edge of the right-of-way unless otherwise shown on the Drawings.

K. The exit pit shall be excavated up to the casing pipe. Excavation support shall be provided as required. Sufficient room shall be provided to continue installation of carrier pipe, fittings and all necessary connections to the system.

L. The carrier pipe shall be installed within the casing using insulators as specified. Carrier pipe shall be installed from the jacking pit end of the casing. Each joint shall be made and thoroughly checked prior to being inserted into the casing.

M. Upon completion of installation of the carrier pipe inside the casing pipe, provide suitable restrained caps or plugs at each joint outside the end of the casing pipe and hydrostatically test the carrier pipe to 150 psi for 30 minutes. There shall be no allowable leakage. Remove the carrier pipe from the casing and remake leaking joints. Repeat hydrostatic test until there are no leaks in the carrier pipe within the casing. This testing is in addition to any other testing requirements specified elsewhere in these specifications.

N. Fill void between casing pipe and carrier pipe completely with sand in one continuous uninterrupted operation in a manner to prevent the occurrence of any voids between the casing pipe and the carrier pipe.

O. Fill void between casing pipe and earth with cement grout in one continuous uninterrupted operation in a manner to prevent the occurrence of any voids between the casing pipe and the earth. Cement grout shall conform to the requirements of Section 702 Grout.

P. Furnish concrete markers installed flush with grade at each end of the casing pipe showing size of casing pipe, depth from grade to top of casing pipe and located on the center line of the casing.

3.3 SITE RESTORATION

A. At the conclusion of all jacking operations, remove excavation support systems for jacking pits.

B. Following pipe installation and backfill operations, restore the profile of the right-of-way to its original condition.

C. Remove all equipment, supplies, excess excavation materials and miscellaneous items associated with the jacking operation and leave the site in a clean condition.

D. If required by the Owner of the right-of-way, coordinate and schedule a final inspection of the work by the Owner of the right-of-way.

END OF SECTION

SECTION 205
ROCK AND BOULDER EXCAVATION

PART 1 GENERAL

1.1 WORK INCLUDED

A. Furnish all labor, materials, equipment and incidentals required and excavate and dispose of rock and boulders.

1.2 RELA TED WORK

A. Section 202 Excavation, Trenching and Backfill

1.3 DEFINITIONS

A. Rock: Any Large mass of stone, bedrock, ledge rock, or rock fragments greater than 1 cubic yard in volume which cannot be excavated with a standard backhoe, JD 410G or equivalent, with rock teeth, or which requires continuous, chemical expanders, jack hammering or other special procedures.

B. Boulder: Stone or boulders greater than eight (8) cubic-feet in volume.

C. Rock Excavation: The removal of materials as defined above, upon having their existence verified by the Project Manager.

D. Boulder Excavation: The removal of any material defined as boulder or stones or boulders above shall be classified as rock excavation.

PART 2 EXECUTION

2.1 ROCK EXCAVATION

A. Rock excavation may be performed by jack hammering, expansive chemical splitting, or other similar process.

B. Blasting shall only be used as the last recourse and only after written authorization by the Owner.

2.2 BOULDER EXCAVATION

A. Boulders and rock fragments may be reduced in size by rock excavation methods to simplify removal.

2.3 DISPOSAL OF ROCK AND BOULDERS

A. Rock and boulders may be crushed and screened for reuse in the work, provided that the resultant materials meet the requirements for backfill as specified in Section 202 Excavation, Trenching and Backfill.

B. Unused rock and boulders shall be removed and disposed of off-site in a legal manner.

END OF SECTION

SECTION 301
GAS SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Supply all labor, materials, equipment and incidental work required to install and test new gas lines, fittings and apparatus not specifically mentioned herein or noted on the plans, but which are incidental and necessary to complete the work specified.

1.2 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification. The publications are referenced in the text only by their general designation only. Specifications and Standards:

B. Specifications and Standards:

1. New Mexico Natural Gas Code

2. 49 CFR Part 191 - U.S. Department of Transportation: Annual Reports, Incident Reports And Safety Related Condition Reports

3. 49 CFR Part 192 - U.S. Department of Transportation: Transportation of Natural and Other Gas by Pipe Line

4. ASA B 31- U.S.A. Standard Code for Pressure Piping

5. API-5L - American Petroleum Institute Code for Steel and Iron (Seamless and Welded) Line Pipe

6. API 1104 - American Petroleum Institute, Standard for Welding Pipe Lines and Related Facilities

7. API 6D – Specifications for Pipeline Valves

8. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot Dipped Zinc Coated, Welded, and Seamless

9. ASTM D2513 – Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings

10. ASTM D2683 – Socket-Type Polyethylene Fittings for Outside Diameter controlled Polyethylene Pipe and Tubing

11. ASTM D3261 – Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

12. ASTM D3350 –For Polyethylene PE 2708 and PE 4710-PE100

13. ASTM F1055 – Standard Specifications for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing

14. ASME/ANSI 16.1 & 16.5 – Pipe Flanges and Flange Fittings

15. ASME/ANSI B31.8 – Gas Transmission and Distribution Piping Systems

16. ASME - Boiler and Pressure Vessel Codes

1.3 QUALITY ASSURANCE

A. Gas mains, services and appurtenances shall be subject to pressure tests with air or inert gas.

B. Gas mains and appurtenances shall be pigged prior to connection to existing systems.

C. Submit manufacturer's data on the pipe material, fittings, valves and service material in accordance with Section 102 Submittal Procedures.

D. The Department of Public Utilities engineer may require manufacturer's certificates showing conformance with this specification for any of the pipe materials, fittings, valves and appurtenances delivered to the job site.

1.5 OPERATOR QUALIFICATIONS AND DRUG AND ALCHOHOL POLICY

A. All personnel making the connection or otherwise performing any operation or maintenance, including excavation and backfill, on gas facilities containing natural gas must be Operator Qualified for the covered task or directly supervised by an Operator Qualified person and must be in an approved Drug and Alcohol testing program in accordance with Part 192 - U.S. Department of Transportation: Transportation of Natural and Other Gas by Pipe Line.

1.6 JOB CONDITIONS

A. Comply and conform with the conditions and requirements indicated and specified under Section 202 Excavation, Trenching and Backfill.

PART 2 – PRODUCTS

2.1 PIPE AND FITTING MATERIALS

A. Steel Pipe: Steel pipe shall conform to API-5L Specification Grade B or better. Pipe shall have beveled ends for welding. Buried steel pipe shall be coated and above ground steel pipe painted with approved alkyd urethane paint or equivalent or other means of protection.

1. Approved manufacturers of steel pipe or approved equivalent:

a. California Steel Industries, Inc.
P.O. Box 5080
14000 San Bernardino Avenue
Fontana, CA 92335

b. United States Steel Corporation
600 Grant Street, Pittsburgh
Pennsylvania 15219

2. Approved manufacturers of paint:

a. Sherwin Williams Company
816 First St NW

Albuquerque, NM 87102

b. Krylon Products Group
101 W. Prospect Ave
Cleveland, OH 44115

B. Steel Pipe Fittings and Specials: Fittings and specials for threaded steel pipe shall be malleable and conform to Federal Specification WW-P-521b. Fittings and specials for plain-end steel pipe shall be steel butt-weld fittings conforming to American Standard B16.9.

1. Approved manufacturers or approved equivalent:

a. Dobson Global Inc.
5650 East Ponce de Leon Ave.
Stone Mountain, GA 30083.

b. Weldbend Corporation
6600 South Harlem Ave
Argo, Illinois 60501.

C. Polyethylene Pipe and Fittings:

Material. The pipe and fitting manufacture shall use virgin resin, 0% regrind, in the production of MDPE and HDPE pipe and fittings.

MDPE materials used for the manufacture of polyethylene pipe and fittings shall be PE 2708 MDPE meeting cell classification 234373E per ASTM D 3350; and shall be listed in PPI (Plastics Pipe Institute) TR-4 with standard grade HDB ratings of 1250 psi at 73°F and 800 psi at 140°F. All MDPE pipe and fittings materials shall be yellow in color.

HDPE materials used for the manufacture of polyethylene pipe and fittings shall be PE 4710/PE 100 meeting the cell classification of 445574C and 445576C per ASTM D3350; and shall be listed in PPI (Plastics Pipe Institute) TR-4 with standard grade HDB ratings of 1600 psi at 73°F and 1000 psi at 140°F. The material shall also be listed in the same PPI document as a PE 100 with a MRS (Minimum Required Strength) of 10 Mpa (1450 psi) at 20°C (68°F). Pipe shall be black with Yellow Strips.

Polyethylene Pipe. Pipe shall be manufactured and tested in accordance with ASTM D 2513 incorporated by reference in 49 CFR Part 192.

Pipe should be marked with a 1-Dimension bar code and a 16-Digit alpha numeric code that identifies the manufacturer, production run number, date of manufacture, pipe type and material grade per ASTM F 2897.

Polyethylene Fittings. Polyethylene fittings shall be manufactured and tested in accordance with ASTM D 2513 incorporated by reference in 49 CFR Part 192.

Fittings should be marked with a 2-Dimension DataMatrix code that identifies the manufacturer, production run number, date of manufacture, fitting type and material grade per ASTM F 2897.

Storage of Plastic pipe, time limits per **§192.321 (g) (1) LAC** must be able to demonstrate that the cumulative aboveground exposure of the pipe does not exceed the manufacturer's recommended maximum period of exposure or 2 years, whichever is less.

1. Approved Manufacturers or approved equivalent:

a. Chevron Phillips Chemical Performance Pipe
5085 W. Park Blvd., Suite 500
Plano, TX 75093

b. PolyPipe, Inc.
P.O. Box 390
Gainesville, Texas 76241

c. USPoly Company
4501 W 49th Street
Tulsa, Oklahoma 74107

D. HDPE & MDPE to coated steel transition fitting: Steel end shall be weld end API-5L standard wall thickness pipe coated with Fusion- Bonded Epoxy coating and mechanically connected to MDPE or HDPE pipe that meets the above MDPE or HDPE specifications in 2.1.C 1 & 2.

1. Approved Manufacturers or approved equivalent:

a. Central Plastics Company
39605 Independence
Shawnee, Okla. 74801

b. R.W. Lyall & Company, Inc.
2665 Research Drive
Corona, CA 92882-6918

E. Excess flow valves to be installed on all new and replacement service lines. Refer to section “R” of LAC O&M manual.

Approved vendor or approved equal.

a. Central Plastics Company

F. Heat Fusion Joining: Butt, socket, saddle fusion joints and electrofusion joints shall be made using procedures that have been qualified in accordance with Title 49, CFR, Part 192.283. The manufacturer shall provide qualified fusion procedures. The Department of Public Utilities and the Contractor shall ensure that persons making heat fusion joints are qualified to make heat fusion joints in accordance with Title 49, CFR, Part 192.285. The Department of Public Utilities and the Contractor shall maintain records of qualified personnel, and shall certify that training was received not more than 12 months before commencing construction. Contractor shall demonstrate his procedure to the Department of Public Utilities (DPU) and perform a sample weld, witnessed by the DPU, for testing.

2.2 VALVES AND VALVE BOXES

A. Valves shall be provided with plastic slip type traffic valve boxes and cast iron traffic covers with “gas” cast thereon, set in a concrete base as shown and dimensioned on the detail on the plans. Upper tube size and bell area shall be appropriate for type of valve and valve size.

B. Valves in steel systems shall be iron-body or steel, 175 psi working pressure non- lubricated ball valves, or other approved valves conforming to American Petroleum Institute Standard No. 6D, or equivalent, including the air test. Steel valves shall be flanged, weld end, or screwed and shall be approved by the Project Manager for the use intended. `

C. Polyethylene valves shall be used in all polyethylene systems and shall be SDR 11 full port HDPE or MDPE and be compatible with the polyethylene pipe.

1. Approved manufacturers or approved equivalent:

a. Flowserve Nordstrom Valves
1511 Jefferson Street
Sulphur Springs, Texas 75482

b. Kerotest Manufacturing Corp.
5500 Second Avenue
Pittsburgh, PA 15207

2.3 GAS SERVICES

A. New and replacement gas service lines shall be approved polyethylene pipe 3/4” iron pipe size (IPS) diameter or larger depending on the gas load to be served. Service lines of ½” copper tubing size (CTS) can be used for insertion in steel pipe if the distance and gas load will allow its use.

B. Service lines shall be connected to polyethylene mainlines by use of compatible

polyethylene molded saddle or electrofusion tapping tee. Service lines connected to steel mainlines shall be connected by use of welded steel Mueller Autoperf Service Tees with 3/8 inch perforator or equivalent.

C. Anodeless type risers for polyethylene service lines compatible with the service line pipe size shall be used for the meter riser.

1. Approved Manufacturers or approved equivalent:

a. R.W. Lyall & Company, Inc
2665 Research Drive,
Corona, CA 92882-6918

b. Perfection Corporation
222 Lake St.
Madison, Ohio 44057-3189

D. Riser meter valve shall be Mueller 175 psig Luboseal Lockwing Meter Valve or approved equal.

E. Gas service lines may be under concrete slabs if the edges of the concrete slabs are a minimum of 2 feet from any building. The 2 foot space must be earth or gravel with no impervious material. Gas service lines that are parallel to building shall be 5 feet from any building and 2 feet from property lines, unless alternate plans are reviewed and approved by the Department of Public Utilities engineer. No gas lines are allowed under any structures other than concrete or paved areas as stated above.

F. Gas service lines shall not be laid under concrete slabs that are connected to structures if the gas service line is closer than 20 feet, without a triple felt expansion joint over the gas line and at the point where the concrete slab connects to the building. There shall be an open area in the concrete min 12 X 12 inches where the gas service riser exits the ground. In all cases the footing of the building must be lower than the gas line in the area of the concrete slab.

2.4 GAS REGULATOR STATIONS

A. Flanged Ball Valve 150 ANSI Steel or Ductile Iron

1. Approved manufacturers or approved equivalent:

a. Balon Corporation
3245 S. Hattie
Oklahoma City, OK 73129

b. Kerotest Manufacturing Corp.
5500 Second Avenue
Pittsburgh, PA 15207

B. Flowgrid Gas Regulator: Flanged 150 ANSI standard single port 2” or 2” X 1” depending on flow requirements with Series 20 Pilot Regulator and pilot filter.

1. Recommended manufacturer:

a. Mooney Controls
40 West Gregson Ave
Salt lake City, Utah 84115

C. Flanged Ductile Iron or Steel Strainer 150 ANSI.

1. Approved manufacturers or approved equivalent:

a. Mueller Steam Specialty
1491 NC Hwy 20 W
St. Pauls, NC 28384

b. Kerotest Manufacturing Corp.
5500 Second Avenue
Pittsburgh, PA 15207

D. ¼" Threaded Steel or Stainless Steel Needle valve.

1. Approved manufacturers or approved equivalent:

a. Balon Corporation
3245 S. Hattie
Oklahoma City, OK 73129

b. Kerotest Manufacturing Corp.
5500 Second Avenue
Pittsburgh, PA 15207

E. 3/8" Stainless steel tubing .035" wall thickness.

1. Approved manufacturers or approved equivalent:

a. Swagelok Company
29500 Solon Road
Solon, OH 44139

b. Eagle Stainless
10 Discovery Way
Franklin, MA 02038

F. Steel pipe shall meet requirements of 2.1 A & B. Wall thickness shall be standard pipe. Above ground steel pipe shall be painted and underground pipe coated in accordance with 3.2, D.

2.5 LOCATING WIRE & WARNING TAPE

A. Locate wire shall be installed on all gas mains and service lines beneath the pipe. Locate wire must be electrically continuous along mains and service lines. Locate wire shall be accessible at each valve box and at each service riser. The locator wire shall be terminated above ground at each non-corrodible service riser and shall be secured to the riser with cable ties.

B. Locating wire shall be solid copper, ten (10) gauge type electrical wire with solid yellow jacket. All locate wire splices shall be connected with copper wire split nuts or other approved mechanical connector, waterproofed with sealing compound, and wrapped in electric tape. Locate wire must be raised in a test box every 500 feet, in all valve boxes, and in all locations where gas lines end.

C. Locator wires, which distribute protective direct current, shall be connected to all underground steel components by thermite welding or brazing. The locator wire systems with anodes must be tested for electrical continuity as they are installed. A short section of wire may be brazed to the steel components before installation. This permits connections to the locator wire with an approved wire connector. All bare metal at thermite welds shall be field coated.

D. Warning tape shall be installed above all gas mains and gas service lines. The warning tape shall be installed 12 inches below grade directly above the gas pipeline. The warning tape should be yellow in color and have permanently printed in black letters, "Caution: Buried Gas Line Below". The warning tape should be 6 inches in width and 5 Mil in thickness and have aluminum foil backing.

2.8 PIPE BEDDING AND BACKFILL MATERIAL

A. Shall conform to Section 202 Excavation, Trenching and Backfill of these Specifications except for particle size that shall conform to B below.

B. Gas pipe bedding material placed as showing on drawings and shall be sandy soil that contains no sharp rocks or rounded rocks larger in diameter than ½ inch. Protective sleeves of PE pipe may be used in lieu of bedding material for service lines.

PART 3 – EXECUTION

3.1 TRENCHING, BACKFILLING AND SHORING

A. Shall conform to Section 202 Excavation, Trenching and Backfill of these Specifications.

B. Minimum trench width shall be the same as the outside diameter of the gas pipe plus 6 inches on each side of pipe.

3.2 PIPE INSTALLATION

A. Installation: New gas mains shall have a typical 3 feet of cover to the top of pipe and new gas service lines shall have a typical 2 feet of cover to the top of pipe. If field conditions such as consolidated rock, utility conflicts or other similar circumstances exist then, only upon approval of the DPU for a change in the standard installation, the minimum cover to the top of pipe for gas mains shall be 24 inches and for gas service lines shall be 18 inches. Pipe, valves, fittings and appurtenances shall be installed in accordance with the best practice, and in conformance with the applicable requirements of the API and ASTM Standards.

B. Clearance: Gas mains and service lines shall be installed with enough clearance from any underground structure or utility to allow proper maintenance and to protect against damage that might result from proximity to other structures. The typical separation clearance shall be 12 inches. The minimum, only upon approval of the DPU for a change in the standard installation, shall be 4 inches.

C. Handling: Pipe, valves, and fittings shall be carefully handled during hauling, unloading, and placing operations, so as to avoid breakage or damage. Strap type slings shall be used for lifting and placing; no chains or hooks will be permitted. Broken or damaged pipe or appurtenances will be rejected by the Project Manager and shall thereupon be removed from the work and replaced. Avoid pushing or pulling around sharp objects. Any scratch deeper than 10 percent of the minimum pipe wall thickness of polyethylene pipe shall be cut out. Any area kinked or buckled shall be removed. Pipe should be dragged so that it is not touching the concrete or hard surface and must be supported with soft, non-abrasive material such as wood or sandbags, etc. Pipe shall not be stored in the sunlight more than six months.

A. Coating:

1. Buried steel pipe shall be coated with a mill applied coating or approved hand applied coating.

2. Any coating that is not firmly bonded to the pipe shall be removed. A draw knife or similar tool can be used to clean the pipe to the bare metal surface. The entire area to be coated shall be thoroughly cleaned of all foreign substances including, but not limited to, weld splatter, burrs, slag, oil, grease, frost, moisture, rust, and scale. Do not use kerosene or other oily solvents when removing oil and grease. All frost and moisture shall be removed from the pipe by wiping with a rag and/or heating if necessary. Heat may be applied with an oxygen-acetylene or butane torch.

3. After the gas line has been cleaned, the primer shall overlap any adjacent mill coating for a distance of at least 2 inches.

4. Cold applied tape shall be used in conjunction with primer to effectively protect metal surfaces of underground gas lines that are not sufficiently mill coated. The tape is available in widths from 2 through 12 inches. Each wrap shall overlap the preceding wrap by approximately ½ inch. The tape should be spirally wrapped and shall extend at least 2 inches over the mill coating on steel to steel connections, and approximately 2 inches over the PE pipe on polyethylene to steel connections. To avoid tape pull-back, the final wrap shall be applied using less tension and the last few inches of the tape shall have primer applied to the underside.

5. All coatings shall be electrically tested for holidays by a method approved by the DPU.

B. Cutting: Pipe cutting, where necessary, shall be done in a neat and workmanlike manner without damage to the pipe. Cutting shall be done by means of an approved type of mechanical cutter.

C. Cathodic Protection:

1. Magnesium anodes are installed on all buried new steel gas pipes for the purpose of providing protective direct current for the steel segments of buried gas lines. Anodes shall be packaged in cloth bags. When the anodes are packaged in an additional paper wrap, this wrap shall be removed prior to installation but the anode shall be installed with the cloth bag intact.

2. Cathodic protection on bare or poorly coated Steel is considered attained at a minimum of -0.85 volt. A higher value of -1.00 volt is recommended on well coated pipe. These potentials are to be taken with the half-cell directly over the pipe and shall be considered the minimum for adequate protection by anode.

3. When services or extensions are added to protected mains, the protection level of the system shall be checked before and after the work is completed with a half-cell. The results of the final check must appear on the record of installation. If the protection level is low, check the effect of an additional anode with the Current Requirements Probe. Report on shorted conditions not corrected on job.

4. All new coated pipe must be insulated from bare or unprotected pipe.

5. The anode should be laid in a hole of sufficient length and width 16 inches below the pipe and 3' horizontally clear of the pipe and backfilled with well compacted moistened soil. For installations on risers, use a post hole digger to excavate a hole 16 inches or more from the riser with a trench from the hole to the riser to accommodate the anode lead wire. Holes and trenches should be deep enough to allow 1 foot of cover. For steel pipe installations, the anodes solid copper lead wires must be thermite welded to the pipe. All thermite welds, anode lead wires, steel fittings, bare portions of mill wrapped pipe, and any other exposed metal in a buried system must be coated per section 3.2.D.

6. The person in charge shall record the quantity, size, pipe to soil reading, and location of the installed anodes and submit to the Project Manager.

D. Alignment: All pipe shall be accurately laid in conformity with the prescribed lines and grades as established by the Project Manager. Each length shall be jointed to the preceding section as specified.

E. Pipe Deflections: Joints in bends should be avoided. Radius of bends shall not exceed twenty (20) times the diameter of the pipe. Where there is a bend in the joint, the bending radius shall not exceed 125 times the pipe diameter.

Example: Bends without joints:
1 1/4" Diameter = 25" R or 2'- 1"
2" Diameter = 40" R or 3'- 4"
4" Diameter = 80" R or 6'- 8"

Bends with joints:
1 1/4" Diameter = 156" = 13'-0"
2" Diameter = 250" = 20'-10"
4" Diameter = 500" = 41'-8"

F. Jointing: All polyethylene gas pipe shall be fused. All steel pipe shall be welded except for threaded or flanged joints for valves, meters, regulators, or other joints.

G. Threaded Joints: In jointing threaded pipe, an approved Teflon joint sealing compound shall be applied to the male threads, and the joint shall be tightened with wrenches that are suitable for the purpose and in a manner that will not damage the pipe. Threaded joints shall not be installed underground.

H. Welded Joints: Welded joints shall be made by metal arc-welding process or oxyacetylene welding process in accordance with API 1104, 18^{the} edition. Mechanical Joints: Mechanical connections shall be installed in accordance with published instructions of the pipe or coupling manufacturer.

I. Heat Fusion Joints: Butt, socket, and saddle fusion joints and electrofusion joints shall be made using procedures that have been qualified in accordance with Title 49, CFR, Part 192.283. The manufacturer shall provide qualified fusion procedures. The Department of Public Utilities and the Contractor shall ensure that persons making heat fusion joints are qualified for the task, in accordance with Title 49, CFR, and Part 192.285. The Department of Public Utilities and the contractor shall maintain records of qualified personnel, and shall certify that training was received not more than 12 months before commencing construction. Contractor shall demonstrate his procedure to the Department of Public Utilities and perform a sample weld, witnessed by the DPU, for testing.

J. PE Insertion: 49 CFR Part 192.321 (f) requires: Polyethylene pipe that is being encased must be inserted into the casing pipe in a manner that will protect the pipe. The leading edge of the polyethylene pipe must be closed before insertion. Casing shall be pigged when necessary before insertion of pipe with a test piece of PE pipe and examined for scratches. Any exposed PE piping must have selected backfill as required. Inserted pipe shall be padded where it emerges from casing to prevent sharp ends of casing from cutting pipe. Starting ditch lengths must be long enough to prevent kinking and allow for a funnel inserted in encasement to prevent scratching the pipe. Tracing wire shall be pulled in with the pipe. Pull tensions shall be monitored and the allowable tensile load (ATF) specified by the pipe manufacturer shall not be exceeded. When pipe is pulled through encasement, a waiting time as recommended by the manufacturer must be allowed so pipe will have time to shrink back to its original size before welding tap tees saddles, or butt fusion (jointing pipe).

K. Bearing: Pipe in the trench shall have continuous uniform bearing along its bottom, except at bell holes. Before lowering pipe into the trench, the Contractor shall remove all stakes, debris, loose rock and other hard material from the bottom of the trench.

L. Positioning: After the final positioning, the pipe shall be held in place in the trench with backfill material placed equally on both sides of the pipe at as many locations as are required to hold the pipe section in place. After joints are completed, the backfill material shall be redistributed and compacted as herein required.

M. Closure: When pipe laying is not in progress, all open pipe ends shall be closed with watertight plugs in a satisfactory manner. At the end of each day and when work is not in progress, the open ends of pipe installed in the line shall be closed with watertight plugs or caps.

N. Cleaning: Before placing mainline pipe in service, the interior of the pipe shall be carefully cleaned of all dirt and debris by pigging.

3.3 CONNECTIONS TO EXISTING SYSTEMS

A. Connections to existing systems shall not be made until the new mains have been satisfactorily cleaned, pressured tested, and penetration permits have been approved.

B. Connections between new work and existing gas lines shall require an approved penetration permit from the Department of Public Utilities. Contractor shall locate pipe and allow the Department of Public Utilities to verify locating wire continuity per Section 101 General Requirements of these specifications, and shall supply as built drawings showing exact location, test records, inspection records, and other required records before any connections are made.

C. Personnel making the connection or otherwise performing any operation or maintenance on gas facilities containing natural gas must be Operator Qualified for the covered task or directly supervised by an Operator Qualified person and must be in an approved Drug and Alcohol testing program in accordance with Part 192 - U.S. Department of Transportation: Transportation of Natural and Other Gas by Pipe Line.

3.4 PRESSURE AND LEAKAGE TESTS

A. Preparation:

1. The Contractor shall provide all necessary material equipment, and labor and shall perform all work required in connection with the testing of the gas system, as specified herein.

2. Air, inert gas pressure tests shall be made only after the trenches have been backfilled sufficiently to hold the pipe firmly in position, however backfilling is not mandatory during pressure test.

B. Procedure:

1. Any flaw disclosed by any test shall be repaired and satisfactorily retested.

2. Each section being tested shall be slowly filled with air or an inert gas. Each tested segment of pipe shall have the test pressure documented on a pressure recording chart or a pressure recording gauge. The test instruments shall meet the approval of the Department of Public Utilities and shall be subject to their inspection at all times during the test. If the Department of Public Utilities so requires, the test shall be made with instruments supplied by the Department of Public Utilities. Hand recording of test pressure from a non-recording device is not an acceptable procedure.

3. The Contractor shall prove the entire system of gas mains and service lines included in the contract to be gas tight by air or inert gas pressure to a minimum pressure of 95 psig for all systems that will operate up to a pressure of 60 psig and 155 psig for all systems that will operate up to a pressure of 100 psig. The test may be made on the system as a whole or on applicable sections. Smaller sections may be tested when backfilling of the trench is completed in each section in advance of the test.

4. The test shall continue for one (1) hour for each 30 cubic feet of volume, or fraction thereof, with a minimum of two (2) hours. The maximum test duration shall be twenty four (24) hours for steel pipe and eighteen (18) hours for polyethylene (PE) pipe.

5. The initial readings of the instruments for the test shall not be made for at least one (1) hour after the pipe has been subjected to the full test pressure. Neither the initial nor final reading shall be made during a time of rapid changes in the atmospheric conditions. The temperatures shall be representative of the of the actual trench conditions. There shall be no indication of reduction of pressure during the test after corrections have been made for changes in the atmospheric conditions in conformity with the relationship $T_1P_2 = T_2P_1$ in which T and P denote absolute temperature and pressure respectively and the subscripts denote initial and final readings.

6. During the test the entire system shall be completely isolated from all compressors and other sources of air pressure.

7. Service lines may be tested separately with a minimum fifteen (15) minute test duration using the same test equipment, pressure and procedure requirements listed above.

8. After the pipe section is tested, a written record must be prepared, placed and maintained in the record system of the Department of Public Utilities.

END of SECTION

SECTION 401
UNDERGROUND DUCTBANK SYSTEMS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Underground conduit system for electric power.

B. Underground conduit system for communications.

C. Pull boxes and vaults for electric power.

D. Pull boxes and vaults for communications.

1.2 DEFINITION

A. “Duct” as used herein, is a single enclosed raceway for conductors or cable.

B. “Conduit” is a structure containing one or more ducts.

C. “Conduit System” is the combination of conduit, conduits, manholes, handholes, and/or vaults joined to form an integrated whole.

1.3 REFERENCE STANDARDS

A. Publications noted in these specifications form a part of these specifications to the extent referenced. The publications are referred to in the text by the basic designation only.

B. Where reference is made to publications and standards, the revision in effect at the time of bid opening shall apply.

1.4 WORK PERFORMED BY THE DEPARTMENT OF PUBLIC UTILITIES (DPU)

A. The Department of Public Utilities shall terminate all primary conductors necessary to energize new distribution circuits. The Contractor shall install and terminate secondary or service conductors when specified and approved by Department of Public Utilities.

1.5 SUBMITTALS

Submit the following in accordance with Section 102 Submittal Procedures.

1. Catalog Data: Submit catalog data describing cable, pull boxes, pre-cast concrete vaults, manhole frames and lids, ladders, and cable racks. Include data substantiating that materials comply with specified requirements.

2. Catalog Data: Submit catalog data describing all PVC duct, fittings, couplings, terminations, associated conduit system materials and galvanized 90-degree bends.

3. Test Reports: Submit report of duct blockage and cable tests.

4. As-built drawings with details including burial depth, ductbank configuration, materials, lengths and stub up locations. The original design drawings are not to be submitted in the place of As-built drawings.

1.6 QUALITY ASSURANCE

A. Comply with the National Electrical Code (NEC) and National Electrical Safety Code (NESC) for components and installation.

B. Provide products that are listed and labeled by a Nationally Recognized Testing Laboratory (NRTL) for the application, installation condition, and the environment in which installed.

C. Provide products that are accepted by Rural Utility Service (RUS)

1.7 RECEIVING, STORING AND PROTECTING

A. Receive, store, and protect, and handle products according to NECA 1 – Standard Practices for Good Workmanship in Electrical Construction.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate the installation of the conduit or medium voltage cable with the Department of Public Utilities, two working days before beginning work.

B. Schedule inspection of each trench segment before bedding is placed.

C. Notify Project Manager 2 days before duct tests.

PART 2 PRODUCTS

2.1 PRODUCT OPTIONS AND SUBSTITUTIONS

A. All submittals must be approved by Department of Public Utilities engineer prior to installation. No substitutions will be made on previously approved items without new submittal approval.

2.2 RIGID GALVANIZED STEEL CONDUIT AND FITTINGS

A. Furnish rigid galvanized steel conduit (RGS) that meets the requirements of UL6 – *Rigid Metal Electrical Conduit* and ANSI C80.1 – *Rigid Steel Conduit, Zinc Coated*.

B. For rigid galvanized steel conduit and 90-degree elbows, furnish zinc-plated, threaded, malleable iron fittings and conduit bodies that meet the requirements of UL514B and ANSI/NEMA FB1.

2.3 RIGID NON-METALLIC CONDUIT AND FITTINGS

A. Furnish rigid non-metallic duct (PVC) that meets the requirements of UL651 – Schedule 40 and 80 PVC duct and NEMA TC 2 – Electrical Plastic Tubing and Conduit, ANSI C80.3.

B. For rigid non-metallic duct, furnish non-metallic, solvent-welded socket fittings that meet the requirements of UL514C – Non-Metallic Fittings for Conduit and Outlet Boxes, and NEMA TC 3 – PVC Fittings for Use with Rigid PVC Conduit and Tubing.

C. All non-metallic ducts will be solvent welded.

2.4 USE THE FOLLOWING DUCT MATERIALS:

1. Use electrical grade Schedule 40 PVC rigid non-metallic duct for electric conduit systems.

2. Use electrical grade Schedule 40 PVC rigid non-metallic duct for communication conduit systems.

3. Use long sweep tape-wrapped galvanized rigid steel 90 and 45-degree elbows, in electric conduit system and for elbow and riser where ducts turn up to the surface as indicated in drawings.

4. Use long sweep Schedule 40 PVC rigid non-metallic elbows in communication conduit systems.

2.5 DUCT SPACING

A. Lay ducts so that they remain in sequence and each layer remains distinct.

2.6 CORROSION PROTECTION TAPE

A. Furnish pressure-sensitive, 10 mil thick. PVC based tape for corrosion protection of metal duct and fittings. Manufacturer: 3M, Type 50 or approved equivalent.

2.7 UNDERGROUND WARNING TAPE

A. Furnish underground warning tape for underground conduit system.

B. Use 6 inch wide, 0.004 inch thick, polyethylene underground warning tape with the following background colors:

1. Electric: Red

2. Communication: Orange

C. Lettering shall be black and indicate the type service buried below.

1. Electric: "CAUTION ELECTRIC LINE BURIED BELOW"

2. Communications: "CAUTION COMMUNICATION LINE BURIED BELOW"

Manufacturer: Electromark, Utility Safeguard, LLC or approved equivalent.

2.8 DUCT CAPS

A. Duct caps are required on all unused ducts. The caps shall be designed to hold the pull string and seal the duct completely to prevent moisture intrusion.

B. Provide PVC end caps, which are glued securely on the end of the duct that will produce a positive seal in unused ducts against water and gas. Caps shall be made of schedule 40 PVC. Manufacturer: Carlon, Condux, Jackmoon USA, Inc or approved equivalent.

2.9 PRE-CAST PULL BOXES

A. Provide pre-cast polymer concrete pull boxes out of roads and subject to light traffic.

1. Electrical pull boxes will be specified by the Department of Public Utilities Engineer.

2. County Communication pull boxes with the following minimum outside dimensions: 48” x 48” x 48”.

3. Heavy Duty Covers should have design loading of H-10 or H-20; ASTM C 857-95, for incidental or non deliberate traffic areas. Not intended to be installed in roadways.

4. Manufacturer: Carson Industries, Quazite, New Basis, New Line

2.10 PRE-CAST CONCRETE VAULTS

A. Provide pre-cast concrete vaults in and out of roads and subject to specified traffic ratings.

1. Manholes will be ordered to comply with specified dimensions.
2. Provide grounding lugs attached to ½" grounding inserts.
3. Heavy Duty Covers should have design loading of H-20; ASTM C 857-95.
4. Construct manholes using 4000 psi concrete.
5. Provide watertight seal between all manhole components.
6. Provide pulling eyes within the vault as detailed in drawings.
7. Provide lifting eyes and hardware on all manhole components.
8. Provide PVC duct terminations as specified in project detail drawings.

2.11 VAULT ACCESSORIES

1. Provide removable ladder with all associated ladder hardware.
2. Provide Risers as specified with appropriate lifting hardware.
3. Provide 36" steel lid with "Electric" stamped finish.
4. Provide Unistrut rails cast into vault walls, two on each face, separated by 48".

PART 3 EXECUTION

3.1 PREPARATION

A. Install underground conduit systems according to the Department of Public Utilities Standards

B. Conduit system routing shown on Drawings is in approximate locations unless dimensioned. Route as required to complete the system.

1. Coordinate underground conduit system work to avoid interference with other projects and existing utilities.
2. Verify routing and termination locations of conduit system before excavation for rough in.

3. Verify that field measurements are as shown on Drawings and convey actual measurements to the as-built drawing set.

C. Position trench so envelope of conduit will have 12” minimum horizontal and vertical separations from parallel or perpendicular runs of other existing utility pipes or ducts.

D. Separations from existing utilities may be greater than 12”.

3.2 EXCAVATION AND BACKFILL

A. Per Section 202 Excavation, Trench and Backfill.

B. Make excavation for pull boxes, vaults, and duct to depth required by drawings and to provide solid bearing.

C. Make trenches of sufficient width to receive work to be installed and provide specified bedding coverage on sides.

3.3 UNDERGROUND CONDUIT INSTALLATION

A. Install the number and size of ducts as indicated on the Drawings.

B. Use the following duct materials:

1. Use electrical grade Schedule 40 PVC rigid non-metallic duct for electric conduit systems.

2. Use electrical grade Schedule 40 PVC rigid non-metallic duct for communication conduit systems.

3. Use long sweep tape-wrapped galvanized rigid steel 90 and 45-degree elbows, in electric conduit system and for elbow and riser where ducts turn up to the surface as indicated in drawings.

4. Use long sweep Schedule 40 PVC rigid non-metallic elbows in communication conduit systems.

C. Where ducts turn up into the surface, use RGS, IMC or PVC coated rigid steel elbows with minimum 36 in. radius; terminate in a coupling 6 in. above the inner surface in a pull box or 4 in. above the surface of equipment pad. Install zinc-plated malleable iron pipe plug in each unused duct stub-up.

D. For ducts installed through holes cut by the contractor in existing vault or manhole walls, pack opening with non-shrink grout. Feather the edge of the grout around each bell and conform to the curvature of the bell end. Remove sharp edges and projections and fill voids within 6 inches of bell ends.

E. Ground metallic risers exposed to contact according to the requirements of the Department of Public Utilities. Use exothermic welded connections for concealed grounding connections.

F. Make-up joints in underground ducts to be tight, driven home on both sides and thoroughly waterproof. On non-metallic ducts use manufacturer's recommended primer and solvent-cement. On metallic conduits, coat male threads with red colored, alkyd base, tank and structural primer that is suitable for galvanized steel; make up fittings wrench-tight.

G. Where metallic ducts are below grade, use plastic coated rigid steel conduit or tape wrap with corrosion protection tape, half-lapped.

H. Schedule inspection of each ductbank or ductbank segment before covering. Failure to obtain inspection by the Department of Public Utilities prior to backfill will result in re-excavation of segments not previously inspected.

I. Test each duct for blockage or deformation as follows.

1. Use a flexible mandrel/scraper not less than 12 in. long with a diameter approximately 1/4 in. less than the inside diameter of the duct.

2. Pull a mandrel and a brush with stiff bristles.

3. Replace any duct section found blocked.

4. Notify Project Manager 2 days before duct tests; submit written reports of tests to Project Manager.

J. Place underground warning tape in backfill 12 inches below finish grade.

K. Install measuring and pulling rope in each duct. Leave not less than 12 inches of slack at each end of the tape. Secure each end of tape with approved restraint method and glue PVC cap to seal non-metallic ducts.

L. Stub-Up Connections:

1. Use rigid steel duct or IMC for outdoor stub-up connections. Non-metallic duct may be used for indoor stub-up connections that are not subject to physical damage.

2. Extend ducts through concrete pad or floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs, and set flush with the finished floor or equipment pad.

3. Where equipment connections are not made under this Contract, install threaded insert plugs set flush with the floor.

M. Install corrosion protection tape on metal conduits and fittings in contact with soil using half-lapped wrappings.

3.4 PULL BOX AND VAULT INSTALLATION

A. Install pull boxes and vaults at locations indicated on the Drawings.

B. Make excavation of suitable dimensions so ducts enter pull box or vault at proper elevation. Refer to project detail drawings for approved excavation dimensions.

3.5 DUCT PLUGGING AND SEALING

A. Install solvent welded caps in both ends of all unused ducts.

END OF SECTION

SECTION 403
CONDUCTORS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install all conductors in underground conduit systems as required for the complete installation or re-installation for normal operation of all electrical distribution and associated equipment.

B. Per Section 102 Submittal Requirements, submit specifications to the Department of Public Utilities engineer for approval prior to purchasing any materials for installation in Los Alamos County.

1.2 RELATED WORK IN OTHER SECTIONS

A. Section 401 Underground Ductbank Systems

B. Section 402 Transformers

C. Section 404 Electric Metering Commercial And Industrial Conduit

1.3 REFERENCE STANDARDS

A. Publications noted in these specifications form a part of these specifications to the extent referenced. The publications are referred to in the text by the basic designation only.

B. Where reference is made to publications and standards, the revision in effect at the time of bid opening shall apply.

PART 2 - PRODUCTS

2.1 WIRES AND CABLES (600 VOLTS)

A. Secondary or service cables shall be 600 volt stranded aluminum in #2, 1/0, 4/0, 250 mcm and 350 mcm sizes. The insulation shall be Tree Resistant Cross-linked Polyethylene (TRXLPE). Several approved manufacturers are General Electric, Anaconda, Simplex, General Cable, Pirelli, Southwire or Okonite.

B. The cable shall be installed in a conventional duct system. Direct burial of cable is not permitted. The cable shall be selected and installed to meet expected demands.

Large single phase residential and three phase commercial services often require parallel runs of cable. Cable sizes must be approved by the Department of Public Utilities engineer prior to permit approval.

2.2 WIRES AND CABLES (12470 VOLT THRU 13800 VOLT) SPECIFY 15 KV CABLE

A. Primary cables shall be 15 KV stranded aluminum in #2, 1/0, 4/0 and 500 mcm sizes.

B. 15 KV cable shall consist of aluminum stranded conductor, shielded cable with 1/3 concentric neutral on three phase primary applications and full neutral on single phase primary applications. The voltage rating shall be 15,000 volts suitable for use on a 13,200 volt system. The temperature rating of the cable shall be 90 degree centigrade over a 40-degree ambient with 133 percent insulation level. The cables shall have an outer jacket of neoprene or other approved material, which shall be resistant to abrasion, weather, fire, oils, chemicals, heat and aging. The insulation shall be ethylene propylene rubber (EPR) or Tree Resistant Cross-linked Polyethylene (TRXLPE). Several approved manufacturers are General Electric, Anaconda, Simplex, General Cable, Pirelli, Southwire or Okonite.

C. The cable shall be installed in a conventional duct system. Direct burial of cable is not permitted. The cable shall be selected and installed to meet expected demands.

2.3 CONNECTORS AND LUGS

A. Solderless, compression, hex screw or bolt type pressure connectors, properly taped or insulated.

2.4 TAPE

A. Plastic tape, 8.5 mils minimum thickness, 1,000,000 ohms minimum insulation resistance, oil resistant vinyl backing, oil resistant acrylic adhesive, incapable of supporting combustion per ASTM 0-568 Test Method B.

2.5 PRIMARY TERMINATIONS AND SPLICES

A. The Department of Public Utilities shall provide all labor and material necessary for terminating primary voltage equipment unless otherwise noted on the design drawings.

PART 3 - EXECUTION

3.1 HANDLING AND STORAGE

A. On receipt, cable should be inspected for evidence of damage during shipment. If evidence of damage is found, a report should be made to the carrier. Inform the Department of Public Utilities engineer of any damage to conductors.

B. Personnel unloading cable should prevent equipment from coming in contact with conductors. Under no circumstance should the forks of a forklift come in contact with conductors or the protective wrap over the conductors. If a crane performs unloading, the operator should utilize a shaft through the spool. The

spools should never be dropped from the delivery vehicle to the ground.

C. Reels should be stored on hard ground where the flanges of the spool cannot penetrate the earth. The weight of the reel should never be supported on conductor surfaces. Reels should be stored away from construction activities and traffic. Reels should be stored away from chemicals and petroleum products.

D. Cable shall always have the ends capped to prevent moisture penetration.

3.2 CONDUIT SYSTEMS

A. A complete system of conductors shall be installed in the conduit systems. Conductors shall be run in separate conduits from conductors of other systems. All conductors of all systems shall be installed in raceway or conduit.

B. When leaving a metal raceway or duct in a cabinet, box, switch, enclosure, control enclosure or any other like member, conductors shall be protected by means of insulated bushings or bell end fittings.

C. Conductors may be run in multiple sizes #2 to 500 mcm inclusive provided all multiple conductors are the same size, length and type of insulation. Multiple runs are to be in separate ducts. Each duct to include one set of phase conductors, neutral and grounding conductors.

D. No splices or taps shall be made in any conductors except in hand holes, pull boxes, vaults, sectionalizing cabinets, manholes or splice boxes. No splice or tap will be made without written approval from the Department of Public Utilities engineer. All taps and splices shall be made with solderless connectors and insulated in such a manner that provides an effective insulation equal to that of the adjoining wire. Any splice or tap shall be made only on conductors, which are a component part of a single circuit properly protected by approved methods.

E. Before any wire is pulled into any conduit, the conduit shall be thoroughly swabbed in such a manner as to remove all foreign material and to permit the wire itself to be pulled in a clean, dry conduit. The Contractor shall use only approved wire pulling lubricants for pulling any wire. All conductors shall be pulled into their respective ducts without exceeding designed pulling tension limits.

3.3 CABLE TESTS (ABOVE 600 VOLTS)

A. After the contractor has completed the installation of the cables, they shall be tested to assure that all the material continues to possess the original characteristics as required by the governing codes and standards listed in these

specifications and as recommended by the cable manufacturer.

B. The contractor shall furnish all instruments, equipment and personnel required for the tests, which shall be conducted in the presence of the Owner or his authorized representative. These acceptance tests shall be in accordance with IPCEA-NEMA Standards after the cable is installed, but before line voltage is applied. The Department of Public Utilities engineer will determine whether the cable will be tested before or after its termination on equipment.

C. High Voltage (HI-POT) testing as described herein shall be performed on the new cable furnished by the Contractor, as well as any existing cable that is removed and reinstalled. Tests performed on the cable shall also include the associated splices. Test voltage levels shall not exceed 1.5 times the rated voltage of the cable. 15 KV cable shall be tested at maximum voltage of 22 KV.

D. Since the cable may be connected to other apparatus during tests, care shall be taken to avoid exceeding the breakdown voltage of any connected apparatus. Any damage to electrical equipment or apparatus shall be repaired by the Contractor at no additional charge.

E. A report of the tests shall be prepared and submitted to the Owner in triplicate. The report shall list the test equipment used, voltage, time applied for each cable and shall bear the signature of the Contractor and the person in charge of the tests. The Department of Public Utilities engineer must approve final test reports prior to placing conductors in service.

F. The Contractor shall provide the source of power as required for the test equipment.

3.4 PULL ROPE

A. In each empty duct, except underground conduits, install a 5/16” inch Polypropylene rope with minimum pull strength of 400 lb. Conduits will be cleaned and free of moisture prior to installation of pull rope. The conduit will be sealed to prevent the entrance of moisture and debris after the pull string is installed.

3.5 CABLE BENDS

A. Radius of bends not less than 10 times the outer diameter of the cable.

3.6 BUNDLING

A. In cabinets conductors shall be neatly and securely cabled in individual circuits, utilizing marlin twine, two ply lacing or nylon straps. Conductors will be color labeled Red, White and Blue.

3.7 CONDUCTOR PULL

A. Conductors shall not be pulled into conduits until after all backfill and concrete work is completed and all conduits have been swabbed out and pull ropes are installed.

B. The Department of Public Utilities engineer shall confirm that conduit installation conforms to approved design and confirm that design pulling tensions will not be exceeded.

3.8 FEEDER IDENTIFICATION

A. Tag feeder circuits in each enclosure with wrap around circuit designation labels where more than one feeder passes through or terminates in the enclosure.

3.9 CONNECTORS AND LUGS

A. Install with owner approved cable accessories according to manufacturer's recommendations.

3.10 PRIMARY CABLE INSTALLATION

A. The installation of primary cables (over 600 volts) shall be in accordance with the manufacturer's approved recommendations. The conductors shall be free of kinks and twists and all bends and turns shall be formed with a smooth radius of minimum dimensions recommended by the cable manufacturer. The cables shall be continuous between terminal boxes. The cables shall be fanned out and marked for phase identification at each splice or termination. Cable marking shall be by means of Brady "All Temperature" markers, or other approved means.

END OF SECTION

SECTION 501
SANITARY SEWERAGE SYSTEMS

PART 1 GENERAL

WORK INCLUDED

A. Sanitary wastewater piping, sewer service lines, fittings, and accessories.

1.1 SUBMITTALS

A. Product data for pipe, fittings and accessories per Section 102 Submittal Procedures.

PART 2 PRODUCTS

2.1 MATERIALS

A. Ductile Iron Gravity and Force Mains.

1. Pipe and Fittings.

a. Pipe AWWA C-151 bell and spigot push-on joint type pipe.

b. Fittings AWWA 153 Fittings shall be mechanical joint ductile iron per AWWA C110 full body or AWWA C153 Short body. Fittings shall be fusion-epoxy lined and coated per AWWA C116.

c. On force mains all fitting joints shall be mechanically restrained. Accepted mechanical restraints; Megalug by EBBA Iron Inc. or UNI-FLANGE by the Ford Meter Box CO., Inc.

d. In vaults and where indicated in drawings use flanged pipe and fittings.

e. Accepted manufacturers U.S. Pipe, Griffin Pipe or American Pipe.

B. PVC Non-Pressure Mains.

1. Pipe and Fittings.
   a. 15-inch and Smaller, per ASTM D3034, SDR 35 bell and spigot push-on type pipe.
   b. 18-inch and larger: per ASTM F679 bell and spigot push-on type pipe.

2. Joints.
   a. Internally cast bell with one rubber sealing ring per ASTM D3212 and F477. Lubricant shall be per Manufacturer's recommendations.

C. PVC Sewer Force Main

1. Pipe and Fittings.
   a. Class 150 C-900 PVC push-on joint type pipe.
   b. Fittings shall be mechanical joint ductile iron per AWWA C110 full body or AWWA C153 Short body. Fittings shall be fusion-epoxy lined and coated per AWWA C116.
   c. On force mains all fitting joints shall be mechanically restrained. Accepted mechanical restraints; Megalug by EBBA Iron, Inc. or UNI-FLANGE by the Ford Meter Box CO., Inc

D. High Density Polyethylene Pipe (HDPE).

1. Refer to specification Section 503 Polyethylene Pipe for Sewer and Effluent Water.

E. Sewer Service Lines.

1. Schedule 40 PVC pipe and fittings per ASTM D1785.

2. Solvent welded bell and spigot joints ASTM D2855 and ASTM D2564.

3. On existing mains: Service saddles for installation on existing SDR 35 PVC or clay sewer mains shall be a cast iron or ductile iron body with shop applied coating, stainless steel strap, bolts, nuts and washers, with rubber gasket per ASTM D2000 as detailed in drawing 5001. Saddle shall be approved by manufacturer for use on type of pipe being fastened to. Saddles shall be manufacturer by; The General Engineering Company; or approved equal.

4. On new mains: Service laterals shall be installed on new PVC gravity sewer mains by installing a SDR-35 gasketed directional tee with run sized to fit main and branch sized to fit sewer lateral. Service line shall transition to schedule 40 PVC pipe as detailed in drawing 5002.

5. Refer to specification Section 503 Polyethylene Pipe For Sewer and Effluent Water for HDPE gravity sewer service saddles.

F. Valves.

1. Valves shall be plug type, with hand lever actuator in vault applications, manufactured by DeZurick, Milliken, or approved as equivalent by DPU-engineer.

2. Combination air release and vacuum valves shall be installed where indicated on Contract Documents, at high points on force mains. Contractor shall avoid creating high point not indicated on contract documents. Combination air release and vacuum valves shall meet the requirements of AWWA C-512 and be approved by the manufacturer for use on pressure sewer systems. Shall have a minimum operation

pressure of 250 (psi), all stainless steel trim, cast iron single housing type body. Manufactured by APCO, VAL-MATIC, Crespin or approved equal.

G. Drain Pipe Adapter.

1. Neoprene coupling with stainless steel hose clamps sized specifically for the pipes to be joined.

PART 3 EXECUTION

3.1 INSTALLATION OF PIPE

A. Per Section 302 Excavation, Trenching and Backfill.

B. Contractor shall use rigid rubber gasket on exterior of pipe to seal pipe into grout at manholes.

C. Clean sewer lines of all sand, gravel, dirt, and other foreign materials after installation.

D. Service Lines shall be as indicated on contract documents. Minimum 2% slope for service lines.

E. Warning tape shall be installed above all gravity sewer mains, sewer force mains and sewer service lines. The warning tape shall be installed 12 inches below grade directly above the sewer pipeline. The warning tape should be green in color and have permanently printed in black letters, “Caution: Buried Sewer Line Below”. The warning tape should be 6 inches in width and 5 Mil in thickness.

F. Locate wire shall be installed on all sewer force mains. Locate wire shall be accessible at each valve vault, cleanout and manhole receiving force main discharge.

G. Locating wire shall be solid copper, ten (10) gauge type electrical wire with solid green jacket. All locate wire splices shall be connected with copper wire split nuts or other approved mechanical connector, waterproofed with sealing compound, and wrapped in electric tape. Locate wire must be raised in a test box every 500 feet and in all locations where sewer force main ends.

3.2 FIELD QUALITY CONTROL

A. Contractor shall provide all labor, equipment and materials required to perform all specified tests. Contractor shall coordinate for all test to be observed by a representative of the Department of Public Utilities.

B. Air Testing for Installed PVC Sewer Pipe shall be Per Uni-Bell Standard UNI-B-6.

1. Block off all manhole and line openings.

2. Introduce low pressure air into the plugged line until the internal line pressure is raised to approximately 4.0 pounds per square inch (psi). After a constant pressure of 4.0 (psi) is reached, the air supply shall be throttled to maintain that internal pressure for at least 2 minutes to permit the temperature of the entering air to equalize with the temperature of the pipe wall.

3. After the internal line pressure has stabilized at or above 3.5 (psi), start the test.

4. If the time shown in Table I, for the designated pipe size and length, elapses before the air pressure drops 1.0 (psi) the pipe section undergoing test has passed. Alternatively, if there has been no leakage after one hour of testing the pipe section undergoing test has passed.

5. Any section of pipe failing the test shall be corrected. The contractor shall, at his own expense, shall determine the source(s) of leakage and repair or replace all defective materials and/or workmanship to the satisfaction of the Project Manager. The repaired line shall then be retested and required to meet the requirements of this test.

C. Mandrel Test

1. Shall be performed on all PVC and HDPE mains.

2. No sooner than 30 days after placement and compaction of backfill, but prior to placement of permanent surface materials.

3. Use a rigid mandrel with diameter of at least 95% of the pipe's specified average inside diameter and a length of the mandrel circular portion at least equal to the nominal pipe diameter.

4. Pull the mandrel through the pipe by hand.

5. All pipe exceeding the 5% deflection shall be relaid or replaced by the Contractor at no additional cost to the Owner.

D. Grade Tolerances

1. Pipe shall be free from noticeable depressions or humps.

2. Invert elevations shall not exceed plus or minus 0.2 inches from elevations shown on Drawings or which can be computed from Drawings.

E. Contractor shall perform a video inspection of all PVC, HDPE and ductile iron sewer pipe installed from manhole to manhole. The video and a video log documenting the inspection shall be submitted to the Department of Public

Utilities for review prior to acceptance of public sewer lines. Video must be performed while introducing water into the pipe being viewed.

END OF SECTION

TABLE 1
MINIMUM SPECIFIED TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP
FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q = 0.0015

1	2	3	4	Specification Time for Length (L) Shown (min:sec)							
Pipe Diameter (in.)	Minimum Time (min:sec)	Length for Minimum Time (ft.)	Time for Longer Length (sec.)	100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46
42	39:48	57	41.883 L	69:48	104:42	139:37	174:30	209:24	244:19	279:13	314:07
48	45:34	50	54.705 L	91:10	136:45	182:21	227:55	273:31	319:06	364:42	410:17
54	51:02	44	69.236 L	115:24	173:05	230:47	288:29	346:11	403:53	461:34	519:16
60	56:40	40	85.476 L	142:28	213:41	284:55	356:09	427:23	498:37	569:50	641:04

Note: If there has been no leakage (zero psig drop) after one hour of testing, the test section shall be accepted and the test complete

LOS ALAMOS COUNTY DEPARTMENT OF PUBLIC UTILITIES
SEWER AIR TEST DATA SHEET

Identification of Pipe Installation (Job name, location, contract number, etc.)
_____
_____

Field Test Data: (To be filled in by the Inspector)

Date: _____

Specified Maximum Pressure Drop: **1 (psig)**

Identification of Pipe Material Installed _____

Pipe Under Test				**Spec. Time**	**Field Test Operations Data**					
Upstream MH Sta #	Downstream MH Sta #	Dia. (in.)	Length (ft.)	Refer to Table (min:sec)	Pressure Initially Raised to (psig)	Time Allowed for Pressure to Stabilize (min)	Start Test Pressure (psig)	Stop Test Pressure (psig)	Elapsed Time (min:sec)	Pass or Fail

Inspector's Name and Title: _____

Signature of Inspector: _____

If a section fails, the following items should be completed:

Identify section(s) that failed _____

Leak (was) (was not) located. Method used: _____

Description of leakage found: _____

Description of corrective action taken: _____

_____

For test results after repair refer to Test No. _____ Inspector _____

SECTION 502
SEWER MANHOLES

PART 1 GENERAL

1.1 WORK INCLUDED

A. Manholes for gravity flow sewers, energy dissipators, lift station wetwells, and lift station valve vaults, supplied and installed complete with steps, frames, covers, and other associated components.

1.2 RELATED WORK

A. Section 701 Cast-In-Place Concrete

B. Section 702 Grout

C. Section 501 Sanitary Sewer Systems

D. Section 503 Polyethylene Pipe for Sewer and Effluent Water

E. Section 504 Sewer Flow Control

F. Section 505 Lift Station Equipment

1.3 REFERENCED STANDARDS

A. The publications listed below form a part of this specification. The publications are referenced in the text by their general designation only.

B. ASTM C478 – Standard Specification for Precast Reinforced Concrete Manhole Sections

C. ASTM A48-07 – Standard Specification for Gray Iron Castings

D. ASTM C923-07 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals

E. ASTM D4101-07 - Standard Specification for Polypropylene Injection and Extrusion Materials

1.4 SUBMITTALS

A. Contractor shall submit shop drawings and product data for manhole sections, mastic sealants, pipe to manhole connections, steps and castings per Section 102 Submittal Procedures.

PART 2 PRODUCTS

2.1 MATERIALS

A. Precast Manhole Sections

1. Precast manhole section shall be constructed with concrete having a minimum 4,000 (psi) 28-day compressive strength and have a minimum wall thickness of 4". Precast sections shall meet the requirements of ASTM C478. Pre-fabricated materials other than concrete, may be acceptable, upon written approval, by the Owner, as being equivalent. Contractor shall submit complete information, including costs, on any proposed material substitution for approval by the Engineer's.

B. Gaskets

1. Mastic sealing compound per FS SS-S-210. Approved products; Kent Seal No. 2 by Hamilton Kent; CONSEAL CS 102 by Concrete Sealants Inc.; Butyl-Nek by CRETECO; BUTYL-LOK by ALOK Products, Inc.; or approved equal.

2. Flexible pipe to manhole connectors per ASTM C923 with hardness of 40 plus or minus 5 per ASTM D2240 (shore A durometer). Approved products; Kor-N-Seal by NPC; Z-LOK by A-LOK Products, Inc.; PSX or Cast-A Seal by Press-Seal Gasket Corp.; TYLOX by Hamilton Kent; or approved equal.

C. Castings

1. Standard manhole cast iron frame and cover per ASTM A48. Minimum combined weight of frame and cover 325 pounds. Cover shall have vent hole, monolithic lifting rod and "SEWER" cast in cover with letters a minimum of 1" in height. Approved products by Deeter Foundry, Inc.; Neenah Foundry Company; East Jordan Iron Works, Inc.; or approved equal.

D. Manhole Steps

1. Co-polymer polypropylene coated steel, ASTM D4101-07, Type II, Grade 16906, by MA Industries or approved equal.

PART 3 EXECUTION

3.1 FABRICATION

A. Manhole Section

1. Precast barrels, cone sections, base and cover.

2. Minimum inside diameter as indicated in drawings.

3. Manholes 6 feet deep and greater shall be provided with eccentric cones.

4. Manholes less than 6 feet deep shall be provided with flat concrete covers unless specified otherwise elsewhere.

5. Manholes steps shall be cast in manhole.

6. Keylock-type shall have pre-formed gaskets or mastic seal.

7. Manholes clear opening shall be 24” minimum unless shown otherwise in drawings.

8. Drop manholes shall be as indicated on drawings.

B. Manhole Height Adjustment

1. Contractor shall use precast grade adjustment rings, 12” maximum total adjustment height above cone or flat top to top of casting.

C. Placing Precast Manhole Sections

1. Section joints shall be cleaned before applying mastic or gasket seal, completed manholes shall be rigid and watertight.

2. Manhole sections with chipped or cracked joints shall not be accepted.

D. Preformed Gaskets and Flexible Pipe to Manhole Seals

1. Shall be installed in conformance with manufacturer’s recommendations.

E. Interior Manhole Finish

1. Contractor shall remove excess mastic, flush with precast sections. Mortar in joints and penetrations flush with precast sections and fill in any chipped areas with non-shrink grout.

2. Lift Station Wetwells: Shall receive finish in accordance with manufacturer’s recommendations in lift station wet wells from the following approved manufacturers:

a. Hi-Mil Coal Tar Epoxy by Sherwin Williams, 16 mils to 24 mils dry film thickness (DFT), over surface prepared per manufacturer’s recommendations.

b. ZEBRON 386, 100% solid polyurethane, 80 mils DFT. Corobond LT epoxy primer, 4 mils to 8 mils DFT, over surface prepared per manufacturer’s recommendations.

F. Manhole Invert

1. Construction shall conform with engineering drawings.

2. Concrete shall be placed in manhole's invert and form a smooth transition.

3. Invert shape shall conform to radius of pipe it connects.

4. Contractor shall remove all rough sections or sharp edges which tend to obstruct flow or impede or cause material to snag.

G. Drop Assemblies

1. Shall be constructed as shown on drawings with SDR 35 PVC or ductile iron pipe with gasketed fittings.

H. Pipe Stubouts for Present and Future Connections

1. Where indicated in drawings stubouts shall be constructed to enter manholes at invert with a smooth formed invert.

2. Length and slope of stub-out shall be as shown on drawings.

3. Watertight temporary plug shall be laced in all stub-outs brace plug against blow-off.

I. Manholes over existing sewers

1. Base shall be built around existing pipe with 4,000 psi Portland cement concrete, per Section 701 - Cast-in-Place Concrete. Form tongue joint to match barrels for water tight joint.

2. Wastewater flow shall be maintained in the affected lines at all times. Contractor shall obtain prior approval of proposed method for maintaining wastewater flow from Project Manager per section 504 Sewer Flow Control.

3. When breaking into an existing sewer, invert shall be reformed, to provide a smooth flow transition. Care shall be taken to keep debris from entering the existing sewer.

4. Area around new pipe shall be covered with non-shrink grout to ensure a watertight structure.

3.2 FIELD TESTING

A. Contractor shall coordinate the project manager's inspection of manhole grout, invert, pipe penetrations, manhole walls, steps, to verify their conformance with drawings and specifications.

B. Infiltration and Hydrostatic Testing

1. No running or dripping water shall be visible

2. Contractor shall repair all manholes that do not meet infiltration test.

3. Leakage: Less than 0.2 gph/ft above invert during the 24-hour period following the test.

4. Hydrostatic Testing shall be performed from a manhole on gravity lines when directed by the Project Manager as follows:

    a. Plug all inlets and outlets.

    b. Fill manhole to ¾ height with potable water.

    c. Allow water to stand for 24 hours.

END OF SECTION

SECTION 503
POLYETHYLENE PIPE FOR NON-POTABLE WATER

PART 1 GENERAL

1.1 WORK INCLUDED

A. This specification covers requirements for PE 3408 high-density polyethylene (HDPE) piping for non-potable water: gravity sewer systems, pressure sewer systems and pressure treated-effluent water systems. Supplying all labor, materials, equipment and incidentals required, install, flush and test new mains, fittings and parts as shown on the drawings and specified herein.

1.2 QUALITY ASSURANCE

A. Contractor shall submit manufacturer's data on the pipe material, fittings, valves and service material in accordance with Section 102 Submittal Procedures.

B. Owner's Project Manager may require manufacturer's certificates showing conformance with this specification for any of the pipe materials, fittings, valves and appurtenances delivered to the job site.

1.3 REFERENCED STANDARDS

A. The publications listed below form a part of this specification. The publications are referenced in the text only by their general designation only.

B. American Water Works Association (AWWA) Standards, latest publications.

C. ASTM D2683 – Socket-Type Polyethylene Fittings for Outside Diameter controlled Polyethylene Pipe and Tubing.

D. ASTM D3261 – Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

E. ASTM D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

F. PPI TR-3 – Policies and Procedures for Developing Recommended Hydro Static design Stresses for Thermoplastic Pipe Materials

G. PPI TR-4 – Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds

PART 2 PRODUCTS

2.2 POLYETHYLENE PIPE AND FITTINGS

A. Qualification of Manufacturers: The Manufacturer shall have manufacturing and quality assurance facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications. The Manufacturer's production facilities shall be open for inspection by the Project Manager.

B. Materials: Black PE materials used for the manufacture of polyethylene pipe and fittings shall be PE 3408 high density polyethylene meeting ASTM D 3350 cell classification 345464C and shall be Listed in the name of the pipe and fitting Manufacturer in PPI (Plastics Pipe Institute) TR-4 with a standard grade HDB rating of 1600 psi at 73°F. Color material, when used, shall be the same except for meeting ASTM D 3350 cell classification 345464E. The Manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.

C. Polyethylene Pipe:

1. Gravity sewer polyethylene pipe shall be IPS SDR-11 or unless otherwise specified. Sizes 4" and above shall be manufactured to the requirements of ASTM F714 and AWWA C906-99 (IPS).

2. Pipe in sizes 4" and above shall be manufactured to the requirements of ASTM F714 and AWWA C906-99 (IPS).

3. Approved manufacturers:

a. Chevron Phillips Chemical Performance Pipe
5085 W. Park Blvd., Suite 500
Plano, TX 75093

b. PolyPipe, Inc.
P.O. Box 390
Gainesville, Texas 76241

c. USPoly Company
4501 W 49th Street
Tulsa, Oklahoma 74107

D. Service Identification Stripes for Polyethylene Pipe:

1. Sewer gravity and pressure pipe shall be black with green color stripes co-extruded into the pipe outside surface.

2. Effluent pressure pipe shall be black with purple color stripes co-extruded into the pipe outside surface.

E. Polyethylene Fittings & Custom Fabrications: All fittings and custom fabrications

shall be pressure rated for the same internal pressure rating as the mating pipe.

F. Molded Fittings: Molded fittings shall be manufactured and tested in accordance with ASTM D 3261 and shall be so marked. Molded fittings shall be tested in accordance with AWWA C906.

G. Polyethylene Flange Adapters: Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion-joining machine without the use of a stub-end holder.

H. Back-up Rings & Flange Bolts: Flange adapters shall be fitted with ductile iron back-up rings that are pressure rated equal to or greater than the mating pipe. The back-up ring bore shall be chamfered or rounded to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 3 or higher of stainless steel construction.

2.2 LOCATE WIRE AND WARNING TAPE

A. Locate wire shall be installed on all pressure sewer mains or force mains, and effluent re-use water mains and service lines. Locate wire must be electrically continuous along mains and service lines. Locate wire shall be accessible at each valve box, vault and in each meter box. Locate wire in service cans shall extend to, and be fastened to the meter can cover. Locate wire shall be raised in a test box every 500 feet and at all locations where pressure sewer mains and effluent re-use water mains end.

B. Locating wire shall be solid copper, ten (10) gauge type electrical wire. All locate wire splices shall be connected with copper wire split nuts and wrapped in electric tape.

1. Sewer pressure mains: locate wire shall have a solid green jacket.

2. Effluent water mains: locates wire shall have a solid purple jacket.

C. Warning tape shall be installed 12” below grade above all sewer mains and effluent water mains and service lines.

1. Sewer: Warning tape shall be 6” wide, green in color, with lettering reading “CAUTION BURIED SEWER BELOW”.

2. Effluent water: Warning tape shall be 6” wide, purple in color, with lettering reading “CAUTION BURIED NON-POTABLE WATER BELOW”.

PART 3 EXECUTION

3.1 JOINING

A. Heat Fusion Joining: Joints between plain end pipes and fittings shall be made by butt fusion. Joints between the main and saddle branch fittings shall be made using saddle fusion. The butt fusion and saddle fusion procedures used shall be

procedures that are recommended by the pipe and fitting Manufacturer. The Contractor shall ensure that persons making heat fusion joints have received training in the Manufacturer's recommended procedure. The Contractor shall maintain records of trained personnel, and shall certify that training was received not more than 12 months before commencing construction. External and internal beads shall not be removed. Contractor shall demonstrate his procedure to the Department of Public Utilities (DPU) and perform a sample weld, witnessed by the DPU, for testing.

B. Joining by Other Means: Where indicated in the plans polyethylene pipe and fittings to be joined together or to other materials by means of flanged connections (flange adapters and back-up rings) or electro-fusion. When joining by other means, the installation instructions of the joining device manufacturer shall be observed.

3.2 INSTALLATION

A. General: When delivered, a receiving inspection shall be performed and any shipping damage shall be reported to the manufacturer within 7 days. Installation shall be in accordance with Manufacturer's recommendations and this specification. All necessary precautions shall be taken to ensure a safe working environment in accordance with all applicable safety codes and standards.

B. Excavation, Trenching and Backfill: Comply and conform with the conditions and requirements indicated and specified under Section 202 Excavation, Trenching and Backfill.

C. Flange Installation: Flange connections shall be installed in accordance with the Manufacturer's recommended procedure. Flanges shall be centered and aligned to the mating component before assembling and tightening bolts. In no case shall flange bolts be used to draw the connection into alignment. Bolt threads shall be lubricated, and flat washers should be used under the nuts. Bolts shall be evenly tightened according to the tightening pattern and torque step recommendations of the Manufacturer. At least 1 hour after initial assembly, flange connections shall be re-tightened following the tightening pattern and torque step recommendations of the Manufacturer. The final tightening torque shall be as recommended by the Manufacturer.

D. Handling: Pipe, valves, and fittings shall be carefully handled during hauling, unloading, and placing operations, so as to avoid breakage or damage. Strap - type slings shall be used for lifting and placing; no chains or hooks will be permitted. Broken or damaged pipe or appurtenances will be rejected by the Project Manager and shall thereupon be removed from the work and replaced. Avoid pushing or pulling around sharp objects. Any scratch deeper than 10 percent of the minimum pipe wall thickness of polyethylene pipe shall be cut out. Any area kinked or buckled shall be removed. Pipe should be dragged so that it is not touching the concrete or hard surface and must be supported with soft, non-abrasive material such as wood or sandbags, etc. Pipe shall not be stored in the sunlight more than six months.

E. Protection against shear and bending loads. In accordance with ASTM D 2774, connections shall be protected where an underground polyethylene branch or service pipe is joined to a branch fitting such as a service saddle, branch saddle or tapping tee on a main pipe, and where pipes enter or exit casings or walls. The area surrounding the connection shall be embedded in properly placed, compacted backfill, preferably in combination with a protective sleeve or other mechanical structural support to protect the polyethylene pipe against shear and bending loads.

3.3 FUSION QUALITY TESTING

A. Fusion Quality: The Contractor shall ensure the field set-up and operation of the fusion equipment, and the fusion procedure used by the Contractor's fusion operator while on site. Upon request by the Owner, the Contractor shall verify field fusion quality by making and testing a trial fusion. The trial fusion shall be allowed to cool completely; then test straps shall be cut out and bent strap tested in accordance with ASTM D 2657. If the bent strap test of the trial fusion fails at the joint, the field fusions represented by the trial fusion shall be rejected. The Contractor at his expense shall make all necessary corrections to equipment, set-up, operation and fusion procedure, and shall re-make the rejected fusions.

3.4 PRESSURE AND LEAK TESTING

A. General Requirements:

1. The Contractor shall provide all necessary materials, labor and equipment, and shall perform all work required in connection with the testing of the system in accordance with manufacturer's recommendations and as specified herein.

2. Hydrostatic pressure tests shall be made only after the trenches have been backfilled sufficiently to hold the pipe firmly in position.

3. Any flaw disclosed by any of the tests shall be repaired and satisfactorily re-tested.

4. Pressure Tests: Each section being tested shall be slowly filled with or water with care being taken on hydrostatic tests to expel all air from the pipe by such means as are necessary.

B. Hydrostatic Test Procedure:

1. Test Pressure: Shall be 1.5 times the operating pressure at the lowest elevation of the test section.

2. Hydrostatic leak test consists of filling pipe, an initial expansion phase, a test phase and depressurizing.

a. Fill the restrained test section completely with water and expel all air from the pipe by such means as are necessary.

b. Initial Expansion Phase: gradually pressurize the test section to test pressure and maintain test pressure for three (3) hours. During the initial expansion phase, pipe will expand slightly. Additional water will be required to maintain pressure. It is not necessary to monitor the amount of water added during the initial expansion phase.

c. Test Phase: Immediately following the initial expansion phase, reduce test pressure by 10 psi, and stop adding test liquid. If test pressure remains within 5% of the test pressure for one (1) hour, no leakage is indicated.

d. At the conclusion of the test, carefully depressurize the test section by controlled release of water.

3. Tests for PE pipe at 150 % of design pressure shall be per the pipe manufacturer's recommendations.

END OF SECTION

LOS ALAMOS COUNTY DEPARTMENT OF PUBLIC UTILITIES
HDPE SEWER AND EFFLUENT PIPE HYDROSTATIC TEST REPORT

PROJECT NAME: _____

CONTRACTOR: _____

LOCATION: _____

PIPE DESCRIPTION

	DIMENSION RATIO (DR)	NOMINAL PIPE SIZE (INCHES)	INSIDE DIAMETER (INCHES)	LENGTH (FEET)
TEST SEGMENT				

TEST PRESSURE

PRESSURE*: _____

- The greater of 150 psig or 1.5 times the operating pressure at the lowest elevation of the test section.

HYDROSTATIC TEST

1. EXPANSION PHASE (3 HOURS)

BEGIN: _____ PRESSURE: _____

END: _____

2. TEST PHASE (1 HOUR)

BEGIN: _____ PRESSURE (LESS 10 PSI): _____

END: _____ PRESSURE : _____

If test pressure remains within 5% of the TEST PHASE pressure for one (1) hour, no leakage is indicated.

PASSED: _____

FAILED: _____

OBSERVER_____ **DATE:**_____

SECTION 504
WASTEWATER FLOW CONTROL

PART 1 GENERAL

1.1 WORK INCLUDED

A. Section includes control of sanitary wastewater flow during complete stoppage or flow by-passing is required during work that affects existing wastewater collection system operations.

1.2 SUBMITTALS

A. Submit Drawings and complete design data showing methods and equipment to be utilized in sewer bypassing and dewatering per Section 102 Submittal Procedures. Include the following information.

1. Indicate location of temporary sewer plugs and bypass discharge lines on Drawings.

2. Capacities of pumps, prime movers, and standby equipment.

3. Standby power source.

4. Traffic control plan.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Contractor shall provide temporary pumping and power generation equipment and controls, conduits, and other equipment to allow uninterrupted wastewater flow during project execution.

1. Engines equipped with mufflers and/or enclose to keep noise level less than 53 dBA across the nearest residential property line.

2. Pumps and flow by-pass lines of adequate capacity and size for the anticipated peak-day flow in the facility where work is being performed.

B. Contractor shall maintain sufficient equipment and materials on-site to ensure continuous and successful flow by-pass and de-watering operations, as necessary to complete the project, and:

1. Keep standby pumps energized and operational at all times.

2. Maintain on site sufficient number of valves, tees, elbows, connections, tools, sewer plugs, piping, and other parts or system hardware to ensure immediate repair or modifications of any part of system as necessary.

C. All joints, and accessories shall be sized and designed to withstand at least twice the maximum system pressure, or 60 psi, whichever is greater.

PART 3 EXECUTION

3.1 PROTECTION

A. Contractor shall submit a by-pass plan, including the point of discharge, to be approved by the Project Manager, at least 48 hours in advance of by-pass/de-watering operations. No bypassing shall be allowed onto ground surface, waters of the United States, storm drains, or any point where bypassing may result in ground water contamination or public health and safety hazards.

B. In the event that wastewater accidentally overflow into the public storm water drainage system, street, or public structure or space, the contractor shall immediately stop the flow by-pass operations, notify Project Manager, and take any necessary action(s) to contain, disinfect the overflows and clean up in compliance with applicable laws and regulations, and to the satisfaction of Department of Public Utilities.

1. Accidental wastewater overflows onto private property, containment, disinfection and clean-up of the spill shall be done to the satisfaction of Department of Public Utilities.

2. Accidental overflows shall be immediately reported by the contractor to the Department of Public Utilities, at 662-8130, as well as to appropriate state, federal and local agencies.

3.2 APPLICATION

A. Plugging or Blocking: Sewer line plug shall be inserted into line, at a manhole upstream of the section subject of the work under contract. Plug shall be sized and designed so that the entire segment of sewer line can be isolated.

1. After work affecting the wastewater facility has been completed, flow shall be fully restored to its normal condition.

B. Pumping and Flow By-passing: For any pumping and flow by-passing operations required by the contract documents, or deemed necessary by the contractor (and approved by the DPU), to complete the work under contract, contractor shall supply pumps, energy sources (utility-based or portable) conduits, and other equipment necessary for uninterrupted wastewater flow around facility or sewer segment subject of this project.

1. By-pass pumping arrangements shall be made by the contractor to minimize inflows into the public sanitary wastewater system form

atmospheric precipitation or the contractor's wash-down operations. Covers, temporary storm water diversions, and other measures shall be part of the acceptable flow by-pass plan submitted by the contractor for the approval of the Project Manage.

2. All flow bypass equipment and fixtures shall have of sufficient capacity to handle anticipated peak-day wastewater flow rate.

3. Contractor shall construct bypass system with materials and fixtures that will prevent any leakage or accidental overflows during pumping operation.

3.3 CLEANING

A. All premises affected by the contractor's work shall be kept free from accumulations of waste materials, rubbish, and other debris resulting from flow by-pass operations.

B. Tools, construction equipment and machinery, and surplus materials, not directly associated with flow by-passing, shall be kept in owner-approved staging areas and removed from project sites daily.

C. Restore to original condition portions of site not designated for alterations by Contract Documents.

D. When by-pass pumping operations are complete, drain piping into sanitary sewer prior to disassembly.

END OF SECTION

SECTION 505
SEWER LIFT STATION

Part 1 GENERAL

1.1 WORK INCLUDED

A. Submersible pumps, controls, valves, piping, and other related accessories not specifically mentioned herein or noted on the plans, and which are incidental and necessary to complete the work and provide an operational lift station.
B. Refer to Department of Public Utilities standard drawing 5014, sheets 1 through 4.
C. Coordination of SCADA system by others per drawing 5014, sheet 4 of 4 and this specification.

1.2 REFERENCES

A. Hydraulic Institute Standards

B. National Electric Code Standards

1.3 SUBMITTALS

A. Submit the following product data per Section 102 Submittal Procedures.

1. Performance curves, pump and motor.

2. Materials of construction.

3. Dimensioned pump outline drawings.

4. Lift station drawing for accessories.

5. Detailed electrical data.

6. Control drawings and data.

7. Access cover drawing.

8. Warranty.

9. Installation instructions.

B. Two copies of Operation and Maintenance Manuals.

C. Submit equipment manufacturer representative's certification that installation was completed in conformance with manufacturer's recommendations and is ready for use as intended as discussed in Part 3 herein.

1.4 WARRANTY

A. In printed form and apply to all similar units.

B. Five years or 10,000 hours under municipal permanent installation policy to include parts and labor.

C. Manufacturer's authorized warranty repair station within 150 miles of this installation; service station to have been appointed by the manufacturer at least three years prior to this project's Bid date and to have service trucks with cranes for jobsite service and factory trained and certified service mechanics and technicians.

D. Manufacturer shall certify repair facilities. Manufacturer's authorized repair station shall have $100,000 minimum inventory of repair parts including O-rings, bearings, mechanical seals, motor stator, power cable, grommets, and fittings to be supplied under this job.

E. The aluminum access frames and covers shall carry a guarantee of 10 years against defects in material and/or workmanship.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

E. Flygt, Barnes or DPU-approved equivalent.

F. All pumps specified in this section shall be made by same manufacturer.

G. Motor and pump shall be designed and manufactured by the same source.

H. Pump manufacturer shall have a minimum of 5,000 units of similar type pumps, installed and operating for no less than five (5) years in the United States.

2.2 PUMP MATERIALS

A. Volute, Impeller, Motor Housing, Discharge Elbow, and Other: Gray cast iron ASTM A-48, Class 35 B, with smooth surfaces devoid of blow holes or other casting irregularities.

B. Shaft:

1. AISI 431 Stainless steel up to 100 HP. Stainless steel sleeves covering shafting constructed of lesser materials are not acceptable.

C. Motor:

1. Rotor bars and short circuit rings: Aluminum.

2. Stator winding and lead insulation; Class H monomer free polyester resin.

D. Mechanical Seal: Tandem seals with all seal faces to be solid sintered tungsten carbide featuring a nickel binder to cement tungsten-carbide particles together during sintering.

E. Wear Rings: Required if C impeller scheduled.

1. Case wear ring; Nitrile rubber molded with steel ring insert.

2. Impeller wear ring on 20 horsepower or larger pumps; ANSI 304 SS.

F. Cutters:

1. Stationary Cutters- Hardened 316 “L” Stainless Steel.

2. Rotary Cutter- Chrome alloyed cast iron.

G. All exposed nuts or bolts are constructed of AISI type 304 stainless steel or brass and are protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish.

2.3 PUMP CONSTRUCTION

A. Water Tight Seal: Nitrile rubber o-rings against machined surfaces.

B. Sealing of the pumping unit to the discharge connection, guided by two guide bars extending from the top of the station to the discharge connection.

C. Cable Entry Design:

1. Seal: Torque-free mechanical compression type with strain relief (epoxies, silicones, or other secondary sealing not acceptable), single grommet-type to 100 HP.

2. Junction chamber to be sealed from motor by a non-hydroscopic, feed-through-type terminal board and elastomer compression seal.

D. Pump Motor:

1. Air-filled, squirrel-cage rotor, induction type, shell-type design, housed in air-filled watertight chamber.

2. Stator shall be insulated by trickle impregnation to achieve a minimum 95% winding fill factor using monomer-free, moisture-resistant, polyester Class H resin rated for 180º C (356º F) and heat shrink fitted into the stator housing. Designs requiring use of bolts, pins, or other fastening devices requiring penetration of stator housing shall not be acceptable.

3. Sensors:

   a. Equipment shall have winding over-temperature switch in each phase. Set to open at a maximum of 140º C.

   b. Thermal switches shall be set to open at 125º C (260º F) and embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection, and shall be connected to the control panel. At 125ºC (260º F) the thermal switches shall open, stop the motor and activate an alarm.

4. Combined service factor shall be 1.15 and rated for operation at 40º C ambient temperature.

5. Pump Motor: Connections between cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to the terminal board. Connections via wire nuts or crimping devices shall not be acceptable.

6. All sensors shall be NEMA B design.

7. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31.

8. The motor shall have a voltage tolerance of plus or minus 10%.

E. Motor Cooling System:

1. For pumps up to 10.5 HP: Provide thermal radiators integrally cast into stator housing.

2. For pumps larger than 10.5 HP: Provide cooling jacket to allow circulation of pumped media or propylene glycol around motor housing.

F. Pump Shaft:

1. Rotates in two permanently lubricated ball bearings for pump sizes up to 100 HP.

   a. Upper bearing shall be single-row deep groove ball bearing up to 100 HP.

   b. Lower bearing shall be a two-row angular contact ball bearing up to 100 HP.

2. Completely isolated from pumped liquid.

3. Pump and motor shaft are the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable.

G. Minimum ABMA L10 Bearing Life: 50,000 hours at any point on head-capacity curve.

H. Mechanical Seals: Each pump is provided with a tandem mechanical shaft seal system consisting of two seal assemblies. The seals operate in a lubricant reservoir using FDA-approved, non-toxic paraffin oil, that hydro dynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, contains one stationary and one positively driven rotating ceramic ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing contains one stationary carbon seal ring and one positively driven rotating ceramic seal ring. Each seal interface is held in contact by its own spring system. The seals require neither maintenance nor adjustment, nor depend on direction of rotation for sealing. The position of both mechanical seals depends on the shaft. Mounting of the lower mechanical seal on the impeller hub is not an acceptable method. The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: shaft seals without positively driven rotating members; conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. No system requiring a pressure differential to offset pressure and to effect sealing will be used. Each pump is provided a lubricant chamber for the shaft sealing system, designed to prevent overfilling and to provide lubricant expansion capacity. Drain and inspection plug for this chamber will have a positive anti-leak seal, and shall be easily accessible from the outside. Seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load.

I. Impeller As scheduled:

1. N-type impeller: Dynamically balanced, semi-open, multi-vane, back-swept, non-clog with vanes of screw-shaped leading edges, RC45 hardness, self-cleaning by shearing action from grooves in the volute.

2. C-type impeller: Double shrouded, non-clogging design with long throughlets without acute turns.

3. M-type impeller: Semi-open, multi-channel impellers with integral grinder cutter in a single volute casing for liquids containing solids and fibers.

4. Impeller coating: Acrylic dispersion zinc phosphate primer or Alkyd resin primer.

J. Volute - As scheduled:

1. N-impeller: Volute bottom design shall be of sharp, spiral shaped grooves integrally cast into the suction side of the volute. Clearances shall be adjustable for wear.

2. C-impeller: Volute with non-concentric design, and smooth passage ways, large enough to pass any solids entering the impeller.

3. Volutes shall be constructed from a single-piece gray cast iron, Class 35B.

K. Each pump shall be equipped with submersible power cable to be:

1. Sized according to NEC and ICEA Standards.

2. Meets P-MSHA Approval.

3. Have at least 3 power leads, a ground lead, and a ground check lead.

4. Oil-resistant, chloroprene rubber jacket.

5. Long enough to reach the control box without the need of any splices.

L. Sliding guide bar bracket to be integral part of pump unit to guide on at least two rails. No portion of the pump or guidance system shall bear on the sump floor.

M. Discharge pump/elbow connection seal to be metal to metal. Diaphragm or O-ring type seals are not acceptable. Critical mating surfaces, where watertight sealing is required, shall be machined and fitted with Nitrile rubber O-rings. Fittings are the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides, without the requirement of a specific torque limit. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. Secondary sealing compounds, elliptical O-rings, grease or other devices are not used.

N. Bearings- The pump shaft rotates on two bearings. Motor bearings are permanently grease-lubricated. Sleeve or single row lower bearings are not acceptable and are not used.

2.4 PERFORMANCE

A. Pump Motor:

1. Non-overloading throughout pump curve.

2. Capable of fifteen evenly spaced starts per hour.

3. Capable of running dry indefinitely without damage.

4. Capable of continuous operation unsubmerged or under continuous submergence, to a depth of 65 feet without lose of watertight integrity.

5. Motors for use in NEC/500/501 hazardous areas and shall be FM, UL, or CSA listed for use in the area specified.

6. Designed for continuous duty handling pumped media of 40º C (104º F).

7. Motor horsepower is adequate so that each pump is non-overloading throughout the entire pump performance curve, from shut-off through run-out.

8. Power cable is capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.

2.5 PROTECTIVE COATING

A. Pump Exterior: Acrylic dispersion zinc phosphate primer with polyester resin paint finish.

B. Impeller: Acrylic dispersion zinc phosphate primer.

2.6 ACCESSORIES

A. Furnish the following accessories associated with pump installation. These accessories shall be furnished by the pump manufacturer and shall be provided for each pump:

1. 304 SS Upper and intermediate guide bar brackets.

2. 304 SS Safety chain hook.

3. 304 SS Cable holder.

4. 304 SS Cable support grips for motor cables and float cables.

5. 304 SS Anchorage.

6. Grip eye lifting system.

7. 304 SS Lifting chain, eye bolts, shackles, and anchor bolts for the discharge elbows.

8. Guide bars shall be of 304 SS pipe, size ¾ inch Schedule 40. The guide bars shall not support any portion of the weight of the pump.

9. Wet well access cover, when specified.

10. Pump hoist support mount.

B. Wet Well and Valve Vault General Work/Standards/Submittals, Products, Execution and Field Testing shall be according to Section 502 SEWER STRUCTURES.

1. Wet Well Interior Manhole Finish

a. Remove excess mastic flush with precast sections. Mortar in joints and penetrations flush with precast sections and fill in any chipped areas with non-shrink grout.

b. Finish for lift station wet wells shall be applied in accordance with manufacturer's recommendations. Spark test required. Inside of CI ring and cover shall be coated. Exposed pipe and conduit shall be coated. The inside of an aluminum or stainless steel cover shall be protected from interior coating.

Approved Manufacturers:

1) Zebron 386, 100% polyurethane, 125 mils DFT, Zebron low temperature Epoxy primer, 4-8 mils DFT, surface preparation per manufacturer's recommendations, cream color

2) Sauereisen SeverGard No. 210, 1/8 inch aggregate epoxy

3) Polibrid 705 by Carboline, 125 mils DFT

2. Wet Well and Valve Vault Access Cover

a. Materials: Structural aluminum cover and frame.

b. Hardware: Stainless Steel, equipped for padlock use.

c. Rail incorporated in frame.

d. 300 pounds per square foot rated or H-20 rated whichever is specified Refer to Schedule on drawing 5014, Sheet 1 of 4 for dimensions and load rating.

e. Size: Actual clear openings as recommended by pump manufacturer for the pumps being installed in wet well or as shown on contract documents.

f. Approved Manufacturers:

1) Flygt

2) USF Fabrication, Inc, Hialeah, FL

3) Halliday Products, Orlando, FL

4) Engineer approved equivalent

g. The access cover's frame shall be securely placed, mounted directly above the pumps. Doors shall be constructed of skid proof design, provided with stainless steel hinges and stainless steel fasteners. The doors shall open to 90 degrees and lock automatically in that position with a stainless steel positive locking arm and stainless steel release handle.

h. Door opening shall be spring assisted and equipped with a stainless steel lifting handle and stainless steel locking bar. The access covers for pumps shall be furnished with an attached nut rail for the upper guide bar brackets.

i. The wet well access cover shall include a fall-safe hatch feature designed to combine-covering of the hole per OSHA 1910.23 standard and fall through protection and controlled confined space entry. Aluminum grating shall be designed to withstand a minimum live load of 300 pounds per square foot, with a maximum deflection of 1/150th of the span. Aluminum safety grate openings shall be 5" x 5".

1) The safety grate opening arm shall also be equipped with a controlled confined space entry locking device (lock provided by others). Welding shall be in accordance with ANSI/AWS D1.290 Structural Welding Code for aluminum.

2) Design of the system must ensure that fall-through protection is in place after the door has been closed, thereby protecting the next operator.

B. Grip Eye Lifting System: Each submersible pump shall be furnished with one complete lift-chain positive recovery system consisting of the following components:

1. Pumps designed to automatically and firmly connect to the discharge connection, guided by two guide bars extending from the top of the station to the discharge connection.

2. Chain Sling: Continuous stainless steel chain (length as required for adequate slack) of high tensile strength, attached to lifting eye of pump. Stainless steel chain sized as required for hoisting the full weight of the pump, or 3/16 inch in diameter, whichever is more. Upper end of chain shall connect to safety chain hook under access cover.

3. A forged "grip eye" of wrought alloy steel, provided separately to connect to the end of the lifting cable or chain of the pump lift hoist.

4. A stainless steel shackle as part of the chain sling for connecting to the pump handle.

D. Ball Check Valves: Furnish and install non-clog Flygt HDL, or approved equivalent ball check valves, unless otherwise specified in these contract documents. Valves shall be installed inside cast-in-place, or pre-cast concrete valve vault. See Sewer Structures, Section 502 for more specific details. The ball valve shall consist of three components with only one moving part: body, cover, and ball. The ball shall clear the water way providing "full flow" equal to the nominal size. The ball shall be hollow steel with an exterior coating of nitrile rubber, it shall be resistant to grease, petroleum products, animal and vegetable

fats, diluted concentrations of acids and alkalines (pH 4–10), tearing and abrasion. Valve body and cover shall be of gray cast iron, Class 35. Flange drilling shall be according to ANSI B16.1, Class 125.

For installations where, regardless of the discharge pressure, the ball check valve is “chattering” or “noisy” or exhibits other behaviors or sounds indicating the valve is not operating properly during the initial startup or the first twelve months of the warrantee period – the contractor or manufacturer’s representative shall either 1) modify the ball to add weight using a method approved by DPU or 2) replace the ball check valve with a Cla-Val model 585LW lever & weight assisted swing check valve or equal approved by DPU.

E. Mix-flush system capable of cycling for a period between 20 seconds and 50 seconds. Materials will be cast iron for valve body, ball bearing steel for ball and nitrile rubber for membranes. Mix-flush manufacturer and pump manufacturer shall be the same.

F. Pipeline discharge pressure sensor and transmitter. Instrument shall be flush diaphragm type and have a local display DSI 100 indicator, accuracy at 0.5% of span, process connection 1 inch diameter BSPT threaded, AISI 316 stainless steel and 4–20 mAmp output signal. Pressure readings in PSI with display operating range from 0 – ”XX” PSI with “XX” being the pressure range appropriate to the specific station and with the appropriate low voltage power supply. Equipment shall be Indumart PTF 115.

G. Laser level transmitter shall be mounted on the top of the wet well where indicated on the Drawings. Penetration through top slab shall be per the Drawings. ABB Model LLT100 Laser Level Transmitter, 4-20 mAmp, heated window, through the glass HMI. Laser level transmitter shall be utilized whenever the location of the wet well is outside of a street or vehicular travel location.

H. Pressure level transmitter shall be set on the floor of the wet well, inside the casing pipe, where indicated on the Drawings. Penetration through top slab shall be per the Drawings. Mercoid Series PBLT 2 submersible level transducer. Pressure level transducer shall be utilized whenever the location of the wet well is located in the street or other vehicular travel location.

I. Plug valves: DeZurik PEC, or approved equivalent, eccentric-type with manual lever actuator.

J. Floats for primary wet well control (5 each) shall be Flygt Model ENM-10, or approved equal. Floats designed for use in a wastewater environment with hostile fluids and gases.

2.7 CONTROLS

A. Supplied by pump manufacturer or pump supplier.

B. Control panel type: Duplex-pump control panel as manufactured by Dynamic Motor Controls, Inc., St. Augustine, Florida, or approved equal.

C. One (1) year warranty on all components.

D. Primary pump control based off of wet well level control with laser level or pressure transducer. Backup pump control based off of wet well level control with floats. High water alarm signal shall initiate an automatic transfer from the primary pump control scheme (wet well level transducer) to the backup control scheme (floats). Level transducer control set points and float elevations shall be the same elevation. Pump control shall operate duplex / alternating submersible pumps as follows:

1. Low Water Alarm (first from bottom - # 1)
2. All Pumps Off (second from bottom - # 2)
3. Lead Pump On (third from bottom - # 3)
4. Lag Pump On (fourth from bottom - # 4)
5. High Water Alarm (fifth from bottom - # 5)

E. Control Panel Security Enclosure: Enclosure shall be NEMA 3R fabricated from 14 gage stainless steel. Panel shall include gasketed outer door, stainless steel hardware, removable back panel and dead front inner door fabricated from 0.080 Marine alloy aluminum. Front door shall have a total of 6 metallic snap latches (not screw clamp assemblies) – two each non-hinged edge spaced evenly mounted to ensure a snug dust tight door closure. Front door shall enable a padlock.

F. The pump controller shall utilize a microprocessor with a digital display to program and alternate up to three (3) pumps with high and low level alarms. The controller shall utilize at a minimum a 14 Bit analog input. The controller shall supply a 4-20 mAmp DC output signal. The 4-20 mA DC output signal shall be programmable from the front of the panel. The controller shall be an PD6060 ProVu Dual Input Process Meter by Precision Digital with Sun Bright outdoor display option or approved equivalent.

G. Two NEMA Size I (minimum) starters, rated for motor horsepower and 10 million full load electrical operations.

H. Two heavy duty E frame thermal magnetic circuit breakers shall be equipped with trip test button for short circuit protection. Two overloads, ambient- compensated, with external reset buttons mounted on hinged dead front panel. Set main power and ground lugs. Control transformer for 120 VAC primary and 24 VAC secondary.

I. Circuit breakers for each pump and one for control power circuit.

J. Main circuit breaker disconnect interlocked with panel door.

K. Panel to include lightning/surge protection: A lighting/surge arrestor shall be provided at the service entrance to the control panel. The unit shall be of the solid-state type and be able to clamp in five (5) nanoseconds and absorb up to 25 KA peak surge current during an occurrence. The unit shall have a surge life expectancy of 10,000 occurrences at 200 amps.

L. Panel to include three-phase monitor relay connected to the incoming side of the power input terminals. Phase monitor shall be manufactured by Diversified, or

approved as equal.

M. Panel to include a duplex alternator relay manufactured by Diversified, or approved equal.

N. Panel equipped with an external Bryant (or approved equivalent) generator receptacle, with transfer switch, to connect an emergency generator set. Generator set specifications are not part of these contract documents.

O. Panel equipped with one motor amp load meter for each pump.

P. Panel to include time delay function on lag pump start.

Q. All control circuits, including pilots and contactors, shall operate on 120 VAC.

R. Panel shall have switched light in panel for night visibility.

S. Any floats shall operate on 24 VAC.

T. Inner door shall include 2 x Hand/Off/Auto (HOA) switches, 2 x pump running green pilot lights, 2 x red pump fail pilots (lights shall be "push-to-test" type or a separate pilot light test circuit shall be provided), 2 x 6 digit elapsed time meters, 1 x alarm silence push button, 2 x overload reset push buttons along with the pump controller dual display for wet well level (feet) and pipeline discharge pressure (psi).

U. Condensation heater with thermostat shall be installed inside the control panel.

V. One heavy duty Ground Fault Interrupting (GFI) receptacle (20 Amp) shall be installed on the interior panel cover of the enclosure. One fluorescent light fixture with integral switch shall be mounted inside the enclosure between the outer door and inner operating panel to allow work on the panel at night.

W. High level shall be indicated by a NEMA 4X red lexan flashing alarm light mounted on the top and one side of the enclosure respectively.

X. 24 Volt power supply connection for SCADA control panel (by others). Coordinate location with contacts for remote indication below.

Y. Normally closed, dry, 5 amps at 120V ac contacts for remote indication (Refer to Section 2.7 below for SCADA Coordination:

1. HOA position
2. Power (kW and Amperage) from each pump and each pump leg
3. Running/off status
4. Pump Call Status
5. Level (based on Laser Level Transmitter)
6. Setpoints for lead lag operation (Lag On, Lead On, Pump(s) Off)
7. High Water, Low Water Alarm
8. Hours run time – Totalizer - each pump

9. Station Power Loss Alarm
10. Station Power Phase Loss Alarm
11. Pump Leakage Alarm
12. Pump Over Temp Alarm

Z. UL listing mark.

AA. Prewired and factory tested.

BB. All level control wiring shall be specially labeled as to function.

CC. Complete schematics and connection diagram shall be furnished, including single copy in panel inner door.

DD. The control panel shall start pumps step-wise on rising level and stop pumps simultaneously at low level.

EE. All electric components shall be NEMA standard.

2.8 SCADA

A. Roles and Responsibilities of Lift Station Contractor

1. Furnish and install the lift station control panel with the contacts for remote indication and power supply as specified in Section 2.7.X and 2.7.Y above. Control panel housing shall accommodate a 2" RMC conduit from SCADA panel. Locate SCADA interfaces per the lift station control panel orientation shown on Drawing 5014, Sheet 3 of 4.

2. Furnish and install the equipment panel slab and uni-strut mounting structure to accommodate the 24" x 24" SCADA panel per the lift station control panel orientation shown on Drawing 5014, Sheet 3 of 4.

3. Install the SCADA panel (furnished by others).

4. Furnish and install conduits from wet well and dry well to control panel per Drawing 5014, Sheet 3 of 4.

5. Furnish and install field devices and sensors and all conduit between field devices/sensors and control panel. Install conductors between field devices/sensors and control panel and terminations inside control panel necessary for the functioning of the station. Conduit and conductor installation and terminations between the control panel and the SCADA panel and between field devices/sensors solely related to SCADA, and not required for the functioning of the station, shall be by others.

FF. Roles and Responsibilities of SCADA system Installer. This work is identified in drawings as "By Others".

1. Furnish SCADA Panel (mounted by Contractor), complete with pre-

programmed PLC, cellular modem and cloud-based interface, ready for start-up and coordination with lift station control panel and field devices.

2. Integrate contacts from lift station control panel for remote indication and power supply as specified in Section 2.7.X and 2.7.Y above and additional parameters calculated by SCADA system listed below.

   a) HOA position
   b) Power (kW and Amperage) from each pump and each pump leg
   c) Running/off status
   d) Pump Call Status
   e) Level (based on Laser Level Transmitter)
   f) Setpoints for lead lag operation (Lag On, Lead On, Pump(s) Off)
   g) High Water, Low Water Alarm
   h) Hours run time – Totalizer - each pump
   i) Station Power Loss Alarm
   j) Station Power Phase Loss Alarm
   k) Pump Leakage Alarm
   l) Pump Over Temp Alarm
   m) Station Flow – formula calculated gallons per minute (gpm) based on tested pump capacity, run time and time of day station inflow (varying station inflow based on varying time of day)
   n) Station Pumped Volume Total– formula calculated based on tested pump capacity and run time (Gallons)

3. Install conductors from any SCADA only (not control) wet well and dry well field devices/sensors and complete terminations to SCADA panel per Drawing 5014, Sheet 3 of 4.

4. Complete connection of 2” RMC conduit from lift station control panel to SCADA panel. Install conductors from control panel to SCADA panel and complete terminations.

5. Furnish and install the SCADA antenna, finish conduit and antenna conductor from SCADA panel to antenna.

PART 3 EXECUTION

3.1 INSTALLATION

A. Pumps shall be installed in compliance with the manufacturer’s recommendations.

B. The installations shall be level, plumb, and accurate pump alignment to produce leak-proof pump connection which allows easy removal without entering wet well.

C. No splices shall be allowed in power cable.

D. All fasteners and miscellaneous steel in or exposed to the interior of the wet well or valve vault shall be 304 stainless steel to avoid corrosion and adequately sized and manufactured for the required strength.

E. When required, the PVC casing pipe for the wet well level pressure transducer shall be installed and braced with stainless steel support brackets and fasteners in a manner shown on the Drawings and adequate to support the casing pipe to the approval of DPU.

3.2 REQUIRED SUPPORT BY FIELD SERVICE REPRESENTATIVE

A. Qualified Field Service Representative (FSR) shall be available throughout the installation and start-up period, and furnish written report to the Department of Public Utilities, certifying that equipment was properly installed, fully functional, ready for use, and is operating as intended. Final report of successful startup shall include tested pump output and discharge pressure compared to design values and tested power requirements – for each pump.

B. FSR shall provide up to 8 hours of training to Owner's personnel on operation and maintenance as part of the installation at no additional cost to Owner.

C. Lift Station contractor shall coordinate the lift station start-up with the SCADA installer. Start-up and training shall include testing the SCADA equipment. SCADA installer must be present for testing and start-up of the lift station.

SCADA Installer: Will Boston
IOS-Tech
Office: 5752087770
Cell: 5754206631
wboston.iostech@gmail.com

3.3 SCHEDULE

A. Refer to Drawing 5014, Sheet 1 of 4 for equipment schedule.

1. Submersible pumps and motor model
2. Impeller type/size
3. Motor Horse-Power (HP) and RPM
4. Design and As-Built Tested operating point (flow & total dynamic head)
5. Power requirements (single-phase or three-phase)
6. Discharge Station pipe and Force Main pipe diameter, length and material
7. Wet well and valve vault access covers size and load rating.

END OF SECTION

SECTION 509
SEWER SLIP-LINING

PART 1 GENERAL

1.1 WORK INCLUDED

A. This specification covers requirements for the materials and equipment necessary for rehabilitation of sewer lines using slip-lining technology; the materials and equipment necessary for verifying a compliant installation.

1.2 QUALITY ASSURANCE

A. Contractor shall submit manufacturer's data on the pipe material, fittings, and service material in accordance with Section 102 Submittal Procedures.

B. Owner's Project Manager may require manufacturer's certificates showing conformance with this specification for any of the pipe materials, fittings, valves and appurtenances delivered to the job site.

1.3 REFERENCED STANDARDS

A. The publications listed below form a part of this specification. The publications are referenced in the text only by their general designation only.

B. American Water Works Association (AWWA) Standards, latest publications.

C. ASTM D2683 – Socket-Type Polyethylene Fittings for Outside Diameter controlled Polyethylene Pipe and Tubing.

D. ASTM D3261 – Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

E. ASTM D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

F. ASTM F585 Standard Practice for Insertion of Flexible Polyethylene Pipe into Existing Sewers.

G. PPI TR-3 – Policies and Procedures for Developing Recommended Hydro Static design Stresses for Thermoplastic Pipe Materials

H. PPI TR-4 – Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds

I. Los Alamos County Department of Public Utilities (DPU) Construction Standards.

PART 2 PRODUCTS

2.2 POLYETHYLENE PIPE AND FITTINGS

A. Qualification of Manufacturers: The Manufacturer shall have manufacturing and quality assurance facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications. The Manufacturer's production facilities shall be open for inspection by the Project Manager.

B. Materials:

1. Black PE materials used for the manufacture of polyethylene pipe and fittings shall be PE 3408 high density polyethylene meeting ASTM D 3350 cell classification 345464C.

2. Pipe materials shall be Listed in the name of the pipe and fitting Manufacturer in PPI (Plastics Pipe Institute) TR-4 with a standard grade HDB rating of 1600 psi at 73°F.

3. Color material, when used, shall be the same except for meeting ASTM D 3350 cell classification 345464E.

4. All High density Polyethylene pipe shall be close profile and have a minimum SDR rating of 35, and a minimum pipe stiffness of 46 psi.

5. All pipes shall be provided with joints, so that neither the outside diameter of the pipe is increased, nor the internal diameter of the pipe is decreased at the joint.

C. Cellular Concrete Grout:

1. Compressive Strength: 250 psi at 28-days; 100 psi at 24 hours minimum.

2. Foam Concentrate: ASTM C869.Pressure sewer and effluent water polyethylene pipe shall be IPS SDR-9. Sizes 4" and above shall be manufactured to the requirements of ASTM F714 and AWWA C906-99 (IPS).

3. Cement: ASTM C150.

4. Fly ash: ASTM C618, Class F, except loos of ignition shall not exceed 5%.

5. Water: Potable.

6. Admixtures: only as approved by foam concentrate manufacturer or Engineer.

D. Service Line Connections:

1. All service line connections shall be made of synthetic-rubber-based compounds, formulated to resist acids, alkalis, organic solvents and grease generally encountered in sanitary and storm wastewater. Contractor shall submit evidence of compliance with ASTM D543, with no weight loss under 1.0 N sulfuric acid, 1.0 N hydrochloric acid, or 1.0 N nitric acid. Materials shall show no etching, blistering, distortion or other evidence of chemical attack. Ultimate tensile strength shall be higher than 750 psi at 80°F, and elongation shall exceed 150%. Water absorption shall not exceed 4% when tested in accordance with ASTM D570, and hardness shall not exceed 55 in a 5 second reading interval, when tested in accordance with ASTM D2240, Type Hardness.

2. The completed joint shall comply with ASTM C425 for resilient sewer joints.

3. All compression bands shall be Series 316 SS. Nuts and bolts shall be Series 305 SS.

PART 3 EXECUTION

3.1 INSTALLATION

A. Cleaning: Prior to installation of the slip-liner pipe, Contractor shall thoroughly clean the existing sewer designated to receive the liner. Cleaning shall include removal of all debris, solids, roots, deposits, and other matter, which would interfere with the installation of the slip-liner pipe. Installation shall be in accordance with Manufacturer's recommendations and this specification. All necessary precautions shall be taken to ensure a safe working environment in accordance with all applicable safety codes and standards.

B. Inspection of Sewer: Contractor shall inspect the sewer that will receive the slip-liner pipe, using closed-circuit television (CCTV), to identify all structural defects, and accurately locate service connections.

C. Sewage Flow Maintenance: Contractor shall maintain uninterrupted wastewater flow in all affected lines while slip-liner pipes are installed. Any wastewater flow by-pass that may be necessary to maintain uninterrupted service shall be considered incidental to the work on this project, and no additional payment shall be made, unless otherwise indicated, or flow by-passing is specifically listed in the Bid Schedule. Unless otherwise specifically required, Contractor shall locate slip-liner insertion pits, so that disruption to existing utility operation, traffic and area businesses be minimized. When existing pre-cast manholes are used for slip-liner insertion, Contractor shall remove manhole frame, cover, cone, riser and manhole sections as necessary, and store them for re-installation once insertion has been completed. Sections of liner shall be field-connected above insertion pit using butt-fused joints, or jacking pipe sleeve joints. Contractor shall take any necessary precautions to prevent ragged edges of broken sewer pipe from scarring slip-liner as it is being pushed/pulled through sewer pipe.

Contractor shall seal the annular space between sewer and slip-liner pipes with the cellular concrete hereby specified. Contractor shall take appropriate precautions to avoid over-pressurization, buckling and floating of the slip-liner pipe during the grouting process. Contractor shall comply with pipe manufacturer's recommendations for grouting procedures and with grout manufacturer's procedures for placement of grout, grout pressures and grout quantity. Multiple grout lifts may be required to avoid buckling of the slip-liner pipe, and contractor shall take all precautions to avoid movement of the liner during grouting operations. No grout shall be placed before service connections have been restored.

D. Service Connections: Contractor shall re-connect all service connections, unless the Project Manager deems connection to be inactive or abandon. Contractor shall machine-core through slip liner pipe at each connection point. Contractor shall excavate and install a tee fitting with saddle configured to the outside diameter of the slip-liner, and tee length necessary to connect existing service pipe, Contractor shall bond saddle to outside of liner pipe per manufacturer's recommendations. To join pipes of dissimilar materials, contractor shall joint plain ends and connect the existing pipes and services using flexible pipe connectors equipped with stainless steel bands, and fastening devices as specified.

E. Manholes: Contractor shall cut the upper half of liner out at manholes, and as required to accommodate laterals and service connections at manholes. Manholes shall be reconstructed to match new invert elevations. Where existing manhole locations have been used as insert pits, contractor shall reconstruct precast manholes using salvaged materials. If existing manhole materials are not suitable for salvage, contractor shall reconstruct manhole using cast-in-place or new pre-cast concrete manhole elements.

3.2 TESTING AND ACCEPTANCE

A. General Requirements:

1. The Contractor shall provide the necessary labor, materials, and equipment, and shall perform all work required in connection with the testing of the system in accordance with manufacturer's recommendations and as specified herein.

2. Contractor shall submit four cellular concrete cylinders for each day's grouting operations. Testing shall occur at one (1) and twenty-eight (28) days.

3. Before installation is deemed substantially complete, Contractor shall provide the DPU with a DVD showing both pre and post-installation conditions, including the restored service connections. Any defective conditions shown on post-installation video shall be corrected by the contractor at its expense. After corrections are made, a new video shall be produced to show final conditions. Post installation DVD shall be submitted so that review can be made by the DPU, prior to acceptance of the project as substantially complete.

END OF SECTION

SECTION 601
WATER SYSTEMS

PART 1 GENERAL

1.1 WORK INCLUDED

A. Supplying all labor, materials, equipment and incidentals required, install, flush and disinfect and test new water mains, fittings and apparatus as shown on the drawings and specified herein.

1.2 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification. The publications are referenced in the text by their general designation only.

B. American Water Works Association (AWWA) Standards, latest publications.

1.3 QUALITY ASSURANCE

A. Water mains and appurtenances shall be subject to hydrostatic tests.

B. Water mains and appurtenances shall be properly disinfected prior to connection to existing system.

C. Submit manufacturer's data on the pipe material, fittings, valves and service material in accordance with Section 102 Submittal Procedures.

D. As-built drawings with details including burial depth, pipe and fitting configuration, materials and lengths. The original design drawings are not to be submitted in the place of As-built drawings.

E. The Project Manager may require manufacturer's certificates showing conformance with this specification for any of the pipe materials, fittings, valves and appurtenances delivered to the job site.

PART 2 PRODUCTS

2.1 PIPE AND FITTING MATERIALS

A. Water mains 4" to12" in diameter shall be Ductile Iron or PVC pressure pipe.

1. PVC, AWWA C900, DR-18 Class 150 pipe, push on bell end pipe. All gaskets of neoprene or other synthetic rubber per ASTM D412 and D395.

2. Ductile iron pipe, AWWA C151, Class 350 pipe, cement mortar lined per ANSI/AWWA C104 /A21.4-03. All gaskets of neoprene or other synthetic rubber per ASTM D412 and D395. All pipe shall be installed with polyethylene encasement per AWWA C105, minimum 8 mil thickness.

3. Fittings shall be mechanical joint ductile iron per AWWA C110 full body or C153 Short body.

4. In vaults where indicated in drawings ductile iron pipe and fittings shall meet the requirements above, and shall be flanged end pipe per AWWA C115.

B. Water mains 14" and Larger in diameter shall be Ductile Iron pipe.

1. Ductile iron pipe, AWWA C151, Class 250 pipe, cement mortar lined per ANSI/AWWA C104 /A21.4-03. All gaskets of neoprene or other synthetic rubber per ASTM D412 and D395. All pipe shall be installed with polyethylene encasement per AWWA C105, minimum 8 mil thickness.

2. Fittings shall be mechanical joint ductile iron per AWWA C110 full body or C153 Short body.

3. In vaults where indicated in drawings ductile iron pipe and fittings shall meet the requirements above, and shall be flanged end pipe per AWWA C115.

2.2 VALVES AND VALVE BOXES

A. Gate valves 4" to 12" shall conform to the requirements of AWWA C509 for resilient-seated valves. Stems shall be, fitted with a 2" x 2" square wrench nut and shall be manufactured to open counter-clockwise. Rated operating pressure of 250 (psi). Stem extensions shall be installed to bring the operating nut to within one (1) foot of finish grade where the depth from finished grade to operating nut exceeds four (4) feet. Gate valves shall be used for all valves and shall be fusion-epoxy lined and coated in conformance with the requirements AWWA Standard C-550. Manufactured by Mueller, AVK or approved equal.

B. Gate valves 14" to 24" shall conform to the requirements of AWWA C515 for resilient-seated valves. Stems shall be, fitted with a 2" x 2" square wrench nut and shall be manufactured to open counter-clockwise. Rated operating pressure of 250 (psi). Stem extensions shall be installed to bring the operating nut to within one (1) foot of finish grade where the depth from finished grade to operating nut exceeds four (4) feet. Gate valves shall be used for all valves and shall be fusion-epoxy lined and coated in conformance with the requirements AWWA Standard C-550. Manufactured by Mueller, AVK or approved equal.

C. Valve boxes shall be 5 ¼ " to 6" plastic body adjustable slip type with heavy duty cast iron lid and cover with "water" cast thereon. Cast iron lid set in a concrete collar as shown in drawings. Manufactured by ARMOUR Access boxes, Handley Industries, Inc., Bingham & Taylor Corp., or approved equal.

D. Inside vaults and where indicated in drawings, valves shall meet the requirements of A and B above, and shall be flanged end shall be flanged end pipe per AWWA C115 with hand wheel operator.

2.3 WATER SERVICES UP TWO (2) INCHES

A. Water service piping two (2) inches in diameter or less per AWWA C800-05, shall be Engle Method Cross Linked Polyethylene (PEX) or Type K copper. All PEX fittings shall be brass insertion fittings and approved for use by the pipe manufacturer. PEX piping by WIRSBO AQUAPEX or approved equal.

B. Water service valves and fittings two (2) inches in diameter or less per AWWA C800-05, shall be brass of the size and type called for in the drawings rated at 150 psi working pressure.

C. Meter boxes for 5/8" through 2" services shall be pre-fabricated as shown in the drawings. Meter can construction shall be per materials and size detailed in the drawings. When new meter box is located in an existing driveway or sidewalk the meter box shall be constructed with a concrete collar as detailed in drawings. Manufactured by Mueller, The Ford Meter Box Company, or approved equal.

D. Curb valves and curb boxes shall be constructed where shown on the drawings. Manufactured by Mueller, Ford Meter Box Company, A.Y. McDonald or approved equal. Curb boxes shall be 2" plastic body extension type with locking lid and plug manufactured by Mueller, Handley Industries, Inc., Bingham & Taylor Corp., or approved equal.

E. Service saddles two (2) inches in diameter or less shall be a double strap design with shop coated ductile iron body. Manufactured by Mueller, Ford Meter Box Company, A.Y. McDonald, JCM Industries or approved equal.

1. Saddles on C-900 PVC shall have wide stainless steel straps.

2. Saddles on ductile or cast iron pipe shall have two zinc plated, or equivalent, steel straps.

2.4 WATER SERVICES THREE (3") INCHES AND LARGER

A. All piping in meter vault shall be flanged ductile iron in accordance with section 2.1 of this specification.

B. All valves in meter vault shall be flanged in accordance with section 2.2 of this specification.

C. Meter vaults and construction shall be per materials and size detailed in the drawings.

2.5 FIRE HYDRANTS

A. Fire Hydrants conforming to AWWA C502; post type dry barrel design fusion epoxy lined and coated; 5 ¼" main valve opening; provided with two 2-1/2" and one 4-1/2" outlets with national standard threads; national standard 1-½" pentagon operating nut; breakaway stem and flange traffic feature; all fire hydrant heads, burys and extension spools shall be bolted with stainless steel bolts, and washers. Mueller Centurion A-423; Kennedy K81D; or American B-84-B-5.

B. All fire hydrant legs shall be six (6) inches in diameter, fully restrained with mechanical restraints.

C. All exterior metal parts of the hydrant from the ground up shall be factory painted with two coats of paint, or one coat of primer and one coat of paint of yellow color.

2.6 LOCATING WIRE & WARNING TAPE

A. Locate wire shall be installed on all water mains and service lines. Locate wire must be electrically continuous along mains and service lines. Locate wire shall be accessible at each fire hydrant, in each valve box and in each meter box. Locate wire in service cans shall extend to, and be fastened to the meter can cover. Locate wire must be raised in a test box every 500 feet and at all locations where water mains end. Locate wire must be raised in all valve boxes and at each fire hydrant. Text boxes manufactured by Handley Industries, Inc., Bingham & Taylor Corp., or approved equal.

B. Locating wire shall be solid copper, ten (10) gauge type electrical wire with solid blue jacket. All locate wire splices shall be connected with copper wire split nut, or approved other connection type, and wrapped in electric tape.

C. Warning tape shall be installed 12" below grade above all water mains and water service lines. Warning tape shall be 6" wide, blue in color, with lettering reading "CAUTION BURIED WATERLINE BELOW".

2.7 JOINT RESTRAINT

A. All joints will be mechanically restrained per schedule in drawings. Mechanical joint retainer glands and bell joint harnesses by EBBA Iron or The Ford Meter Box Company.

B. Concrete blocking will only be used where indicated in the drawings and when approved by the Project Manager.

2.8 AIR RELIEF AND VACUUM VALVES

A. Combination air release and vacuum valves shall meet the requirements of AWWA C-512. Shall have a minimum operation pressure of 250 (psi), all stainless steel trim, cast iron single housing type body. Manufactured by APCO, VAL-MATIC, Crespin or approved equal.

2.9 PRESSURE REDUCING VALVES

A. Pressure reducing valves shall be CLA-VAL 90-01, CLA-VAL 690-01 or approved equal, unless otherwise shown on these contract documents.

PART 3 – EXECUTION

3.1 EXCAVATION, TRENCHING AND BACKFILL

A. Shall conform to Section 202 Excavation, Trenching and Backfill of these Specifications.

3.2 PIPE INSTALLATION

A. Installation: Water mains shall have 4 feet minimum of cover to the top of pipe and water service lines shall have 3 feet minimum of cover to top of pipe. Pipe, valves, fittings and appurtenances shall be installed in accordance with the best practice, and in conformance with the applicable requirements of the AWWA Standards.

B. Handling: Pipe, valves, and fittings shall be carefully handled during hauling, unloading, and placing operations, so as to avoid breakage or damage. Straptype slings shall be used for lifting and placing; no chains or hooks will be permitted. Broken or damaged pipe or appurtenances will be rejected by the the Project Manager and shall thereupon be removed from the work and replaced.

C. Alignment: All pipe shall be accurately laid in conformity with the prescribed lines and grades as established by the Project Manager. Each length shall be jointed to the preceding section as specified, and after said jointing has been completed, there shall be no movement of the pipe in subsequent operations.

D. Pipe Deflections: The laying of pipe on curved alignment will be permitted up to one-half the deflection as recommended by the respective pipe manufacturer.

E. Cleaning: Before each new length of pipe is placed, the interior of the preceding pipe shall be carefully cleaned of all dirt and debris. When pipe laying is not in progress, all open pipe ends shall be closed with watertight plugs in a satisfactory manner.

F. Bearing: Pipe in the trench shall have continuous uniform bearing along its bottom, except at bell holes. Blocking used to support the pipe during laying shall be placed at the end of the section and shall be removed before laying the next section. Before lowering pipe into the trench, the Contractor shall remove all stakes, debris, loose rock and other hard material from the bottom of the trench.

G. Positioning: After the final positioning, the pipe shall be held in place in the trench with backfill material placed equally on both sides of the pipe at as many locations as are required to hold the pipe section in place. After joints are completed, the backfill material shall be redistributed and compacted as herein required.

H. Closure: At the end of each day and when work is not in progress, the open ends of pipe installed in the line shall be closed with watertight plugs or caps.

I. Thrust Blocking: When approved by the Project Manager, concrete thrust blocks of the form and dimensions shown or noted on the plans shall be provided at all changes in horizontal or vertical alignment and at such other points as may be called for on the plans. Thrust blocks shall be installed in strict conformance with the details shown or noted on the plans.

3.3 CONNECTIONS TO EXISTING SYSTEMS

A. Connections to existing systems shall not be made until the new mains have been satisfactorily disinfected and have passed all tests herein specified.

B. A penetration permit, per Section 101 General Requirements, of these specifications shall be obtained from the DPU's Project Manager, no less than 48 hours in advance of planned connection.

C. New or rehabilitated segments of line that will be subject to hydrostatic testing and disinfection tasks shall be totally insulated from the existing (live) system. In other words, the connection of a new or rehabilitated line shall only be allowed after all compliance testing, disinfection (and bac-T testing) have been completed and verified by Owner as satisfactory.

D. Locate wire shall be verified electrically continuous per Section 101 General Requirements, of these specifications.

E. All water valves on existing system shall be operated by DPU staff only.

3.4 HYDROSTATIC TEST OF PVC AND DUCTILE IRON PIPE

A. Preparation:

a. The Contractor shall provide all necessary material and equipment, and shall perform all work required in connection with the testing of the water system, as specified herein.

b. Hydrostatic and leakage tests shall be made only after the trenches have been backfilled sufficiently to hold the pipe firmly in position.

c. The Contractor shall provide all water necessary for filling, flushing, disinfection and any required tests including all labor and equipment required.

B. Procedure:

a. Hydrostatic test of all new PVC waterlines shall be completed by the contractor in conformance with AWWA C 605-5.

b. Hydrostatic test of all new Ductile Iron waterlines shall be completed by the contractor in conformance with AWWA C 600-5.

C. Test Pressure and Duration:

a. Test pressure shall be the greater of 150 (psi) or 1.5 times the operating pressure at the lowest elevation of the section being tested.

b. Hydrostatic test duration shall be 2 hours minimum.

D. Allowable Leakage:

a. When test results indicate leakage beyond what is allowed in AWWA C605-5 (PVC pipe) Contractor shall conduct a survey of the line, and repair any leaks found. Hydrostatic tests shall be repeated until satisfactory compliance with this specification is demonstrated. Contractor is responsible for any costs associated with the repair and re-test of pipelines.

b. When test results indicate leakage beyond that allowed in AWWA C600-5 (Ductile iron pipe), Contractor shall conduct a survey of the line, and any leaks found shall be repaired, after which the hydrostatic test shall be repeated until satisfactory conformance to this specification is demonstrated. Contractor is responsible for all cost to repair and re-test lines.

c. Hydrostatic test shall be documented on form provided on page 7.

3.5 DISINFECTION AND BACTERIOLOGICAL TEST

A. Disinfection:

a. Following the Hydrostatic Test and before being placed in service, all new water lines shall be chlorinated in accordance with the requirements of AWWA Standard C651-05. During disinfection water shall have a minimum 25 mg/L free chlorine concentration demonstrated by testing method approved by the Project Manager. The chlorinated water shall be retained in the main for 24 hours.

b. After chlorination has been satisfactorily completed, the lines shall be thoroughly flushed until the chlorine content in all parts of the system has been proven by test to have a chlorine concentration less than or equal to 1.0 mg/l.

c. It shall be the responsibility of the Contractor to lawfully dispose of the chlorinated water and flushing water, and avoid flooding or damage to adjacent properties or facilities.

B. Bacteriological Test:

a. After flushing the chlorine from the water system and prior to placing line in service, the Contractor shall engage the services of an approved commercial testing laboratory, to gather an approved number of representative water samples, the location and number of which shall be determined by the Project Manager. Bacteriological testing shall be completed in accordance with AWWA Standard C651-05.

b. No section of water systems will be allowed to be connected to the Department of Public Utilities existing water system when any sample of water tests indicates presence of coliform bacteria. Should the laboratory report show that any sample taken was not acceptable, Contractor shall re-chlorinate and test the water again as herein before specified. This process shall be repeated until satisfactory disinfection has been accomplished.

c. Contractor shall direct the laboratory to send the original report of Bacteriological Examination to the Project Manager.

END OF SECTION

DEPARTMENT OF PUBLIC UTILITIES
PVC AND DUCTILE IRON PIPE HYDROSTATIC TEST REPORT

PROJECT NAME: _____

CONTRACTOR: _____

LOCATION: _____

DATE: _____

OBSERVER: _____

PIPE DESCRIPTION

	MATERIAL	DIAMETER (INCHES)	LENGTH (FEET)
SEGMENT NO. 1			
SEGMENT NO. 2*			
SEGMENT NO. 3*			

* Only applies when there are segments of different size pipes being tested.

TEST PRESSURE

PRESSURE: _____

LEAKAGE

ALLOWABLE LEAKAGE FORMULA**: _____

ALLOWABLE LEAKAGE**: _____

ACTUAL LEAKAGE: _____

** PVC pipe from AWWA C605-05 / Ductile iron pipe from AWWA C600-05.

TIME (2 HOUR TEST)

BEGIN TEST: _____ PASSED: _____

END TEST: _____ FAILED: _____

NOTES:

SECTION 602
POLYETHYLENE PIPE FOR WATER SYSTEMS

PART 1 GENERAL

1.1 WORK INCLUDED

A. This specification covers requirements for PE 4710 high-density polyethylene (HDPE) piping for potable water distribution and transmission mains. Supplying all labor, materials, equipment and incidentals required, install, flush, disinfect, and test new water mains, fittings and apparatus as shown on the drawings and specified herein.

1.2 QUALITY ASSURANCE

A. Submit manufacturer's data on the pipe material, fittings, valves, and service material in accordance with Section 102 Submittal Procedures.

B. The Project Manager may require manufacturer's certificates showing conformance with this specification for any of the pipe materials, fittings, valves, and appurtenances delivered to the job site.

1.3 REFERENCED STANDARDS

A. The publications listed below form a part of this specification. The publications are referenced in the text by their general designation only.

B. American Water Works Association (AWWA) Standards, latest publications.

C. ASTM D2683 – Socket-Type Polyethylene Fittings for Outside Diameter controlled Polyethylene Pipe and Tubing.

D. ASTM D3261 – Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

E. ASTM D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

F. PPI TR-3 – Policies and Procedures for Developing Recommended Hydro Static design Stresses for Thermoplastic Pipe Materials

G. PPI TR-4 – Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds

PART 2 PRODUCTS

2.1 POLYETHYLENE PIPE AND FITTINGS

A. Qualification of Manufacturers: The Manufacturer shall have manufacturing and quality assurance facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications. The Manufacturer's production facilities shall be open for inspection by the Department of Public Utilities engineer.

B. Materials: Black PE materials used for the manufacture of polyethylene pipe and fittings shall be PE 4710 high density polyethylene meeting ASTM D 3350 cell classification

445574C and shall be Listed in the name of the pipe and fitting Manufacturer in PPI (Plastics Pipe Institute) TR-4 with a standard grade HDB rating of 1600 psi at 73°F. Color material, when used, shall be the same except for meeting ASTM D 3350 cell classification 445574. The material shall be listed and approved for potable water in accordance with NSF Standard 61. The Manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.

C. Polyethylene Pipe: Polyethylene pipe shall be have an SDR and pressure rating appropriate for the use and as approved by the DPU. Sizes 4" and above shall be manufactured to the requirements of ASTM F714 and AWWA C906-99 (IPS). Approved manufacturers are as follows:

1. Performance Pipe
A Division of Chevron Philips Chemical Company
5085 W. Park Blvd., Suite 500
Plano, TX 75093

2. Duraline, Inc.
2406 N. I-35
Gainesville, TX 76241

3. WL Plastics
3575 Lone Star Circle, Suite 300
Fort Worth, TX 76177

D. Service Identification Stripes For Polyethylene Pipe: Polyethylene pipe shall be black with blue color stripes co-extruded into the pipe outside surface.

E. Polyethylene Fittings & Custom Fabrications: All fittings and custom fabrications shall be pressure rated for the same internal pressure rating as the mating pipe.

F. Molded Fittings: Molded fittings shall be manufactured and tested in accordance with ASTM D 3261 and shall be so marked. Molded fittings shall be tested in accordance with AWWA C906.

G. Polyethylene Flange Adapters: Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion-joining machine without the use of a stub-end holder. All fasteners shall be steel bolts with stainless steel coating and torque rated.

H. Back-Up Rings & Flange Bolts: Flange adapters shall be fitted with ductile iron back-up rings that are pressure rated equal to or greater than the mating pipe. The back-up ring bore shall be chamfered or rounded to provide clearance to the flange adapter radius. Flange bolts and nuts shall be torque-rated Grade 3 or higher of stainless steel construction.

I. Valves and Valve Boxes: Valves and Valve Boxes shall be per 601 Section 2.2 The use of Polyethylene Valves is not permitted.

2.1 LOCATE WIRE & WARNING TAPE

A. Locate wire shall be installed on all water mains and service lines. Locate wire must be electrically continuous along mains and service lines. Locate wire in service cans shall extend to and be fastened to the meter can cover; leaving adequate slack to allow removal of the meter can lid without disturbing the locate wire connectivity. Locate wire must be raised in a test box at a minimum of every 500 feet and at all locations where water mains

end. Locate wire must be raised and accessible in a test box, at all valve boxes and meter cans, and each fire hydrant.

B. Locate wire shall be solid copper, ten (10) gauge type electrical wire with solid blue jacket. All locate wire splices shall be connected with epoxy capsule connector or other approved connection type, and wrapped in electric tape.

C. Warning tape shall be installed above all water mains and water service lines. Warning tape shall be locatable, at least 6" wide, blue in color, and with lettering reading "CAUTION BURIED WATERLINE BELOW".

PART 3 EXECUTION

3.1 JOINING

A. Heat Fusion Joining: Joints between plain end pipes and fittings shall be made by butt fusion. Joints between the main and saddle branch fittings shall be made using saddle fusion. The butt fusion and saddle fusion procedures used shall be procedures that are recommended by the pipe and fitting Manufacturer. The Contractor shall ensure that persons making heat fusion joints have current certification. The Contractor shall submit proof of certification to DPU prior to joining as specified in ASTM F-2620. The Contractor shall maintain records of trained personnel, and shall certify that training was received not more than 12 months before commencing construction. External and internal beads shall not be removed. Contractor shall demonstrate his procedure to the Department of Public Utilities (DPU) and perform a sample weld, witnessed by the DPU, for testing.

B. Joining by Other Means: Where indicated in the plans, polyethylene pipe and fittings are to be joined together or to other materials by means of flanged connections (flange adapters and back-up rings) or electrofusion. When joining by other means, the installation instructions of the joining device manufacturer shall be observed.

3.2 INSTALLATION

A. General: When delivered, a receiving inspection shall be performed and any shipping damage shall be reported to the manufacturer within 7 days. Installation shall be in accordance with Manufacturer's recommendations and this specification. All necessary precautions shall be taken to ensure a safe working environment in accordance with all applicable safety codes and standards.

B. Excavation, Trenching, and Backfill: Contractor shall comply with the conditions and requirements indicated and specified under Section 202 Excavation, Trenching and Backfill.

C. Flange Installation: Flange connections shall be installed in accordance with the Manufacturer's recommended procedure. Flanges shall be centered and aligned to the mating component before assembling and tightening bolts. In no case shall flange bolts be used to draw the connection into alignment. Bolt threads shall be lubricated, and flat washers should be used under the nuts. Bolts shall be evenly tightened according to the tightening pattern and torque step recommendations of the Manufacturer. At least 1 hour after initial assembly, flange connections shall be re-tightened following the tightening pattern and torque step recommendations of the Manufacturer. The final tightening torque shall be as recommended by the Manufacturer.

D. Handling: Pipe, valves, and fittings shall be carefully handled during hauling, unloading, and placing operations so as to avoid breakage or damage. Strap type slings shall be used

for lifting and placing; no chains or hooks will be permitted. Broken or damaged pipe or appurtenances will be rejected by the Project Manager and shall thereupon be removed from the work and replaced. Contractor shall avoid pushing or pulling around sharp objects. Any scratch deeper than 10 percent of the minimum pipe wall thickness of polyethylene pipe shall be cut out. Any area kinked or buckled shall be removed. Pipe should be dragged so that it is not touching the concrete or hard surface and must be supported with soft, non-abrasive material such as wood or sandbags, etc. Pipe shall not be stored in the sunlight for more than six months.

E. Protection against shear and bending loads: In accordance with ASTM D 2774, connections shall be protected where an underground polyethylene branch or service pipe is joined to a branch fitting such as a service saddle, branch saddle, or tapping tee on a main pipe and where HDPE pipe is joined to a different pipe material and where pipes enter or exit casings or walls. The area surrounding the connection shall be embedded in properly placed, compacted backfill, preferably (delete preferably) in combination with a protective sleeve or other mechanical structural support to protect the polyethylene pipe against shear and bending loads or utilizing other mechanical joint restraint fittings; approved by DPU.

3.3 FUSION QUALITY TESTING

A. Fusion Quality: The Contractor shall ensure the field set-up and operation of the fusion equipment, and the fusion procedure used by the Contractor's fusion operator while on site. Upon request by the Owner, the Contractor shall verify field fusion quality by making and testing a trial fusion. The trial fusion shall be allowed to cool completely; then test straps shall be cut out and bent strap tested in accordance with ASTM D 2657. If the bent strap test of the trial fusion fails at the joint, the field fusions represented by the trial fusion shall be rejected. The Contractor, at own expense, shall make all necessary corrections to equipment, set-up, operation, and fusion procedure, and shall re-make the rejected fusions.

3.4 PRESSURE AND LEAK TESTING

A. General Requirements:

1. The Contractor shall provide all necessary materials, labor, and equipment, and shall perform all work required in connection with the testing of the water system in accordance with manufacturer's recommendations and as specified herein.

2. Hydrostatic testing of water mains shall be kept separate from disinfection.

3. Potable water shall be used to clean and test the water mains.

4. Hydrostatic pressure tests shall be made only after the trenches have been backfilled sufficiently to hold the pipe firmly in position.

5. Any flaw disclosed by any of the tests shall be repaired and satisfactorily re-tested.

6. Pressure Tests: Each section being tested shall be slowly filled with water and care shall be taken during hydrostatic tests to expel all air from the pipe by such means as are necessary.

B. Hydrostatic Test Procedure:

1. Test Pressure: Shall be the greater of 150 psig or 1.5 times the operating pressure specified by the County.

2. Hydrostatic leak test consists of filling pipe, an initial expansion phase, a test phase, and depressurizing.

    a. Fill the restrained test section completely with water and expel all air from the pipe by such means as are necessary.

    b. Initial Expansion Phase: gradually pressurize the test section to test pressure and maintain test pressure for three (3) hours. During the initial expansion phase, pipe will expand slightly. Additional water will be required to maintain pressure. It is not necessary to monitor the amount of water added during the initial expansion phase.

    c. Test Phase: Immediately following the initial expansion phase, reduce test pressure by 10 psi, and stop adding test liquid. If test pressure remains within 5% of the test pressure for one (1) hour, no leakage is indicated.

    d. At the conclusion of the test, carefully depressurize the test section by controlled release of water.

3. Tests for PE pipe at 150% of design pressure shall be per the pipe manufacturer's recommendations.

3.5 DISINFECTION AND BACTERIOLOGICAL TEST

A. Disinfection for potable water lines:

a. Following the hydrostatic test and before being placed in service, all new water lines shall be chlorinated in accordance with the requirements of AWWA Standard C651-05. During disinfection, water shall have a minimum of 25 mg/L free chlorine concentration demonstrated by testing method approved by the Department of Public Utilities engineer. The chlorinated water shall be retained in the main for 24 hours.

b. After chlorination has been satisfactorily completed, the lines shall be thoroughly flushed until the chlorine content in all parts of the system has been proven by test to have a chlorine concentration less than or equal to 1.0 mg/L.

c. It shall be the responsibility of the Contractor to de-chlorinate and lawfully dispose of the chlorinated water and flushing water, and avoid flooding or damage to adjacent properties or facilities.

A. Bacteriological Test:

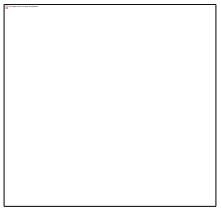
a. After flushing the chlorine from the water system and prior to placing line in service, the Contractor shall engage the services of an approved commercial testing laboratory to gather an approved number of representative water samples, the location and number of which shall be determined by the Department of Public Utilities engineer. Bacteriological testing shall be completed in accordance with AWWA Standard C651-05.

b. No section of water systems will be allowed to be connected to the County's existing water system when any sample of water tests indicates presence of coliform bacteria. Should the laboratory report show that any sample taken was

not acceptable, Contractor shall re-chlorinate and test the water again as specified herein. This process shall be repeated until satisfactory disinfection has been accomplished.

c. Contractor shall direct the laboratory to send the original report of Bacteriological Examination to the Project Manager.

END OF SECTION



DEPARTMENT OF PUBLIC UTILITIES
HYDROSTATIC TEST REPORT

PROJECT NAME: _____

CONTRACTOR: _____

LOCATION: _____

PIPE DESCRIPTION				
	DIMENSION RATIO (DR)	NOMINAL PIPE SIZE (INCHES)	INSIDE DIAMETER (INCHES)	LENGTH (FEET)
TEST SEGMENT				

TEST PRESSURE

PRESSURE*: _____

* The greater of 150 psig or 1.5 times the operating pressure at the lowest elevation of the test section.

HYDROSTATIC TEST

1. EXPANSION PHASE (3 HOURS)

BEGIN: _____ PRESSURE: _____

END: _____

2. TEST PHASE (1 HOUR)

BEGIN: _____ PRESSURE (LESS 10 PSI): _____

END: _____ PRESSURE : _____

If test pressure remains within 5% of the TEST PHASE pressure for one (1) hour, no leakage is indicated.	**PASSED:** _____
	FAILED: _____

OBSERVER_____ **DATE:**_____

SECTION 701
CAST IN PLACE CONCRETE

PART 1 GENERAL

1.1 WORK INCLUDED

A. Formwork, shoring, bracing, anchorage, reinforcing and accessories for cast in place vaults and manholes.

B. Concrete sidewalks, drive pads, curb and gutter, and median pavement.

C. Concrete utility pads, thrust blocks, valve box collars, manhole cover collars and fence posts.

D. Control, expansion, and contraction joint devices associated with concrete work.

1.2 RELATED WORK IN OTHER SECTIONS

A. Section 401 Underground Ductbank Systems

B. Section 502 Sewer Manholes

C. Section 601 Water Systems

D. Section 702 Grout

1.3 DEFINITIONS

A. Reinforced concrete is structural concrete reinforced with no less than the minimum amounts of steel reinforcement specified in ACI 318.

B. Plain concrete is structural concrete with no reinforcement or with less reinforcement than the minimum amount specified for reinforced concrete.

1.4 REFERENCES

A. Publications noted in these specifications shall form a part of these specifications to the extent referenced. The publications are referred to in the text by the basic designation only.

B. New Mexico Department of Transportation (NMDOT) Standard Specifications for Highway and Bridge Construction including any Supplemental or Interim Specifications.

C. All concrete work, products and materials conform to ACI 301 and other specific referenced publications and standards except where otherwise specified herein.

D. Where reference is made to publications and standards, the revision in effect at the time of bid opening shall apply.

1.5 SUBMITTALS

A. The contractor shall submit the following to the Project Manager, in accordance with Section 102 Submittal Procedures:

- Design mix of concrete: A request for approval of the concrete mix design shall be submitted to the Project Manager thirty (30) days minimum prior to concrete placement. Submit a mix design for each strength and type of concrete for approval. Each request shall be made in writing with a cover letter exhibiting the company name of the testing laboratory, company address and telephone number, signature and stamp of New Mexico Professional Engineer responsible for work.
- Laboratory test reports for each design mix.
- Batch Tickets.
- Shop Drawings: Indicate bar sizes, spacing, locations and quantities of reinforcing steel and welded wire fabric, bending and cutting schedules, supporting and spacing devices, spacing and location of dowels, spacing and location of water stops.
- Product Data: Provide data on joint devices (sealer and filler), attachment accessories, admixtures, rebar doweling anchorage, epoxy bonding compound, and water stops.
- Test reports of concrete field testing per Section 3.10, Field Quality Control.

1.6 QUALITY ASSURANCE

A. Contractor shall perform Work in accordance with ACI 301, 318, and 347, CRSI 63 and Manual of Practice, ANSI/ASTM A184.

B. The work shall be subject to inspection at all times by the Owner for the purpose of determining that the work is properly executed in accordance with this specification. Failure to detect defective workmanship or material during any interim inspection shall not constitute acceptance of workmanship and materials.

C. Work shall conform to ACI 305R when concreting during hot weather, as well as ACI 306R when concreting during cold weather.

D. Independent Testing Agency Qualifications shall be approved by the Department of Public Utilities, qualified according to ACI 301, ASTM C 1077 and ASTM E 329 for testing indicated.

1.7 DELIVERY, STORAGE AND HANDLING

A. Contractor shall not deliver concrete until vapor barrier, forms, reinforcement and embedded items are in place and ready for concrete placement. Job site storage of materials shall be in accordance with ACI 301, and contractor shall protect materials from contaminants such as grease, oil, and dirt.

B. Reinforcement: Contractor shall store reinforcement of different sized and shapes in separate piles on racks raised above the ground (to avoid excessive rusting); protect from contaminants such as grease, oil, and dirt; and ensure bar sizes can be accurately identified after bundles are broken and tags removed.

PART 2 PRODUCTS AND MATERIALS

2.1 FORM MATERIALS AND ACCESSORIES

A. Smooth-Formed Finished Concrete shall be constructed using form-facing panels that will provide continuous, true, and smooth concrete surfaces. Forms shall be furnished in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

    a. Metal form surfaces shall not contain irregularities, dents, or sags.

2. Prefabricated forms.

    a. Preformed Steel Forms: Minimum 16 gage matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

B. Form Ties: Contractor shall use snap off type, galvanized metal cone type with waterproofing washer free of defects that could leave holes larger than 1 in. in concrete surface.

C. Form Release Agent used shall be colorless mineral oil, which will not stain concrete, absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.

D. Corners shall be chamfered, wood strip type; ¾ x ¾ in. size where indicated in drawings.

E. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages shall be sized as required, and of sufficient strength and character to maintain formwork in place while placing concrete.

2.2 REINFORCING AND ACCESSORIES

A. Reinforcing Steel shall meet ASTM A 615, grade 60 deformed bars and stirrups; ties grade 40.

B. Welded Steel Wire Fabric shall meet ASTM A 185 Plain type in flat sheets.

C. Fabricate concrete reinforcing shall be in accordance with CRSI Manual of Practice.

D. Welding of reinforcing bars shall not be permitted.

E. Chairs, Bolsters, Bar Supports, Spacers shall be sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor barrier puncture. Special chairs, bolsters, bar supports, spacers adjacent to weather exposed concrete surfaces shall be plastic coated steel type; size and shape as required.

F. Tie Wire shall be minimum 16 gage annealed type.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C 150, Type I or Type II.

B. Fine and Coarse Aggregates: Conform to ASTM C 33.

C. Water: Potable water that is clean and not detrimental to concrete.

D. Fly Ash: Conform to ASTM C 618, type F. Fly ash.

2.4 ADMIXTURES

A. Air Entrainment: Conform to ASTM C260.

B. Chemical: Conform to ASTM C494.

2.5 ACCESSORIES

A. Bonding Agent: Polymer resin emulsion.

B. Vapor Barrier: 6 mil clear polyethylene film of type recommended for below grade application.

C. Joint Filler: ASTM D 1751; asphalt impregnated fiberboard or felt, 1/4 in. thick.

2.6 CONCRETE MIX

A. STANDARD MIX DESIGN

1. The standard mix design for the Department of Public Utilities shall contain from 20% to 30% by dry weight of total cementitious material Type F fly ash conforming to ASTM C 618 for mitigating the deleterious effects of alkali-silica reaction in concrete that is common with the silicious nature of aggregates found in northern New Mexico.

B. The compressive strength required for the various applications is indicated on the standard detail for the work. Contractor shall provide concrete meeting the following criteria:

1. 4,000 psi exterior concrete exposed to freezing and thawing.

a. Compressive strength, f'_c: 4,000 psi @ 28 days.

b. Maximum nominal aggregate size: 0.75 in.

c. Maximum water / cement ratio: 0.44.

d. Slump: 3 in. plus or minus 1 in. tolerance.

e. Air content: 4% to 6%.

2. 3,000 psi exterior concrete exposed to freezing and thawing.

a. Compressive strength, f'_c: 3,000 psi @ 28 days.

b. Maximum nominal aggregate size: 0.75 in.

c. Maximum water / cement ratio: 0.44.

d. Slump: 3 in. plus or minus 1 in. tolerance.

e. Air content: 4 to 6 percent.

C. Use accelerating admixtures in cold weather only when approved by the Project Manager. Use of admixtures will not relax cold weather placement requirements.

D. Use set retarding admixtures during hot weather only when approved by the Project Manager.

PART 3 EXECUTION

3.1 GENERAL

A. All concrete construction shall conform to applicable provision of ACI 301 unless otherwise specified herein.

3.2 EXAMINATION

A. Contractor shall verify the following

a. Lines, levels, block-outs, and centers before proceeding with formwork, and ensure that dimensions agree with the Drawings.

b. Anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

c. Erected formwork, shoring, and bracing is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

Concrete cover for reinforcement conforms to the drawings and to Section 3.4.B herein.

3.3 FORMWORK ERECTION

A. Formwork, shoring and bracing shall be erected to achieve design requirements and maintain tolerances in accordance with requirements of ACI 301 and ACI 347.

B. Bracing shall installed to ensure stability of formwork. Contractor shall shore or strengthen formwork subject to overstressing by construction loads.

C. Form joints shall be properly aligned, made watertight and kept to a minimum.

D. Installation shall provide formed openings where required for items to be embedded in or passing through concrete work.

E. Contractor shall locate and set in place items that cast directly into concrete.

F. All accessories shall be installed in accordance with manufacturer’s instructions, straight, level, and plumb. Items shall not be disturbed during concrete placement.

G. Where required, water stops shall be continuous without displacing reinforcement.

H. Forms or bracing shall not be removed until concrete has gained sufficient strength to carry its own weight and other imposed loads without excessive deflection or creep. Shoring under elevated slabs must remain in place for at least 7 days after concrete is placed.

I. Forms shall be carefully loosened, without the use of pry bars, hammers, or tools against finish concrete surfaces that are scheduled to be exposed.

3.4 REINFORCING PLACEMENT

A. Contractor shall place, support and secure reinforcement against displacement and shall not deviate from required position

B. Minimum concrete cover around reinforcing shall be as follows:

Item	**Minimum Cover, inches**
Formed Concrete Surfaces Exposed to Earth/Water/Weather:	
No. 5 bars and smaller, W31 or D31 wire and smaller	2
No. 6 through No. 18 bars, W45 or D45 wire	2
Footings and Base Slabs:	
At formed surfaces	2
At unformed surfaces and bottoms in contact with earth	3
Top of footings	2

C. PREPARATION

1. Previously placed concrete shall be prepared by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

3.6 PLACING CONCRETE

A. Concrete shall be placed in accordance with ACI 301.

B. Contractor shall notify the Project Manager a minimum of 24 hours prior to commencement of concreting operations.

C. Reinforcement, inserts, embedded parts, formed joint fillers, joint devices, water stops, and formwork shall not be disturbed during concrete placement.

D. Joint fillers, primer and sealant shall be installed in accordance with manufacturer’s instructions.

E. Joint filler shall extend from bottom of slab to within ¼ in. of finished slab surface.

F. Joint devices shall be installed in accordance with manufacturer’s instructions.

G. Concrete shall be placed continuously between predetermined expansion, control, and construction joints.

H. Screed floors on grade level, maintaining surface flatness of maximum 1/4 in. in 10 ft.

3.7 CONCRETE FINISHING

A. Formed concrete surfaces shall be left exposed with smooth rubbed finish.

B. Broom finish shall be performed on exterior sidewalks, vault tops, valve collars or other areas subject to pedestrian or vehicular traffic.

C. Concrete floor surfaces shall be finished in accordance with ACI 301.

D. New concrete finish shall match existing concrete or per Project Manager.

3.7 CURING AND PROTECTION

A. General.

1. Concrete shall be protected from premature drying, excessively hot or cold temperatures, immediately after placing.

2. Contractor shall comply with applicable practice and recommendations for hot weather concrete application from ACI 305R; for cold weather concrete applications from ACI 306R; for curing from ACI 308.

3.8 CONTROL/CONTRACTION JOINTS

A. Joints shall be provided where shown on drawings while concrete is still plastic.

3.9 FIELD QUALITY CONTROL

A. A certified testing agency shall be retained by the Contractor, to perform all required field-testing in accordance with ACI 301. Testing laboratory certification may be provided by Cement and Concrete Reference Lab (CCRL). All testing costs shall be incidental to the cost of the project.

1. Testing agencies for performing testing services on concrete materials shall meet the requirements of ASTM C 1077.

2. Field-testing of concrete shall be performed by an ACI Certified Concrete Field Testing Technician – Grade I.

B. Contractor shall submit proposed mix design of each class of concrete to the Project Manager for approval prior to commencement of work.

C. Contractor shall inform the Project Manager 48 hours in advance of field-testing to allow for witnessing of testing.

D. The Testing Agency shall perform the following tests and collect strength cylinders on one batch in every 20 cubic yards of concrete placed or once a day when less than 20 cubic yards is placed. Samples for Acceptance Testing are to be taken at the discharge from the transit mixer, except when using concrete pumps or conveyors to transport concrete to its final placement location. When

pumps or conveyors are used, the samples for acceptance tests shall be taken at the end of the pipe or last conveyor belt.

1. Sample concrete in accordance with ASTM C-172.
2. Record temperature of concrete in accordance with ASTM C 1064.
3. Perform slump test in accordance with ASTM C 143.
4. Perform air content test in accordance with ASTM C 231, pressure method.
5. Take 6 concrete strength test cylinders in accordance with ASTM C 31.

E. The Testing Agency shall test the strength test cylinders in accordance with ASTM C 39 at 7 days and 28 days.

3.10 CONCRETE ACCEPTANCE CRITERIA

A. Fresh Concrete

1. Temperature - Less than 90 degrees F.
2. Slump - per Section 2.6.
3. Air content - per Section 2.6.
4. Drum revolution counter - 100 to 300 revolutions within 1-1/2 hours after initial mixing.

B. Strength

1. Concrete strength is satisfactory if the average of all sets of 3 consecutive strength test results equal or exceed the specified 28 day strength f'_c and no individual strength test result falls below the specified 28 day strength f'_c by more than 500 psi.

C. Appearance

1. Free from honeycombs and embedded debris.

D. Construction requirements

1. Conforming to required lines, details, dimensions and tolerances specified for construction.

3.11 DEFECTIVE CONCRETE

A. Defective concrete is concrete not conforming to acceptance criteria in Section 3.10.

B. Contractor shall replace defective concrete not meeting strength criteria, at Contractor's expense. At the Contractor's expense, they may evaluate the concrete's in-place strength by testing 3 core samples for each strength test, wherever LAC-cured cylinders were more than 500 psi below f'_c, all in accordance with ACI 301 and ASTM C42. Core holes shall be filled in accordance with ACI 301.

C. Defective concrete not meeting appearance criteria shall be replaced at the Contractor's expense. The Project Manager may allow repair of defective concrete at Contractor's expense.

D. Concrete not in conformance with details, tolerances, and other construction requirements shall also be replaced at Contractor's expense.

END OF SECTION

SECTION 702
GROUT

PART 1 GENERAL

1.1 WORK INCLUDED

A. Furnish all labor, materials, equipment, and incidentals required, and install grout complete as shown on the Drawings and as specified herein.

1.2 RELATED WORK IN OTHER SECTIONS

A. Section 401 Underground Ductbank Systems

B. Section 502 Sewer Manholes

C. Section 601 Water Systems

D. Section 701 Reinforced Concrete

1.3 SUBMITTALS

A. Contractor shall submit, in accordance with Section 102 Submittals Procedures, shop drawings and product data showing materials of construction and details of installation for:

1 Commercially manufactured non-shrink cementitious grout. The submittal shall include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, and conformity to required ASTM standards and Material Safety Data Sheet.

2 Commercially manufactured non shrink epoxy grout. The submittal shall include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, and conformity to required ASTM standards and Material Safety Data Sheet.

3 Cement grout. The submittal shall include the type and brand of the cement, the gradation of the fine aggregate, and product data on any proposed admixtures and the proposed mix of the grout.

1.4 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes

2. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacings and Polymer Concretes

3. ASTM C827 - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures

4. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non shrink)

B. U.S. Army Corps of Engineers Standard (CRD)

1. CRD C-621 - Corps of Engineers Specification for Non-shrink Grout

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.5 QUALITY ASSURANCE

A. Qualifications

1. Grout manufacturer shall have a minimum of 10 years experience in the production and use of the type of grout proposed for the work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery of materials to the jobsite shall be made in original, unopened packages, clearly labeled with the manufacturer's name, product identification, batch numbers, and printed instructions.

B. Materials shall be stored in full compliance with the manufacturer's recommendations. Total storage time from date of manufacture to date of installation shall be limited to 6 months or the manufacturer's recommended storage time, whichever is less.

C. Material that becomes damp or otherwise unacceptable shall be immediately removed from the site and replaced with acceptable material at no additional expense to the Department of Public Utilities.

D. Non-shrink cement-based grouts shall be delivered as pre-blended, pre-packaged mixes that require only the addition of water to be applied.

E. Non-shrink epoxy grouts shall be delivered as pre-measured, pre-packaged, three component systems that require only blending as directed by the manufacturer before application.

1.7 DEFINITIONS

A. Non-shrink Grout: A commercially manufactured product that does not shrink in either the plastic or hardened state, is dimensionally stable in the hardened state and bonds to clean prepared surfaces.

PART 2 PRODUCTS

2.1 GENERAL

A. Like materials shall be the products of one manufacturer or supplier in order to provide standardization of appearance.

2.2 MATERIALS

A. Non-shrink Cementitious Grout

1. Non-shrink cementitious grouts shall meet or exceed the requirements of ASTM C1107, Grades B or C and CRD C-621. Grouts shall be portland cement based, contain a pre-proportioned blend of selected aggregates and shrinkage compensating agents, and shall require only the addition of water. Non-shrink cementitious grouts shall not contain expansive cement or metallic particles. The grouts shall exhibit no shrinkage when tested in conformity with ASTM C827. General purpose non-shrink cementitious grout shall be: SikaGrout 212 by Sika Corp.; Euco NS Grout by The Euclid Chemical Co.; FX-228 by Fox Industries; UNIGROUT by Universal Building Products; Five Star Grout by Five Star Products; or equal.

B. Nonshrink Epoxy Grout

1. Nonshrink epoxy-based grout shall be a pre-proportioned, three-component, 100 percent solids system consisting of epoxy resin, hardener, and blended aggregate. It shall have a compressive strength of 13,600 psi in 7 days when tested in conformity with ASTM C579 and have a maximum thermal expansion of 18 x 10^{-6} when tested in conformity with ASTM C531. The grout shall be Five Star HP Epoxy Grout by U.S. Grout Corp.; Sikadur 42 Grout-Pak by Sika Corp.; High Strength Epoxy Grout by the Euclid Chemical Co.; or equal.

C. Cement Grout

1. Cement grouts shall be a mixture of I-part portland cement conforming to ASTM C 150, Types I, II, or III and 1- to 2-parts sand conforming to ASTM C33 with sufficient water to place the grout. The water content shall be sufficient to impart workability to the grout but not to the degree that it will allow the grout to flow.

D. Water

1. Only potable water shall be used in the preparation of grouts for application.

PART 3 EXECUTION

3.1 PREPARATION

A. Grout shall be placed over cured concrete that has attained its full design strength unless otherwise approved by the Department of Public Utilities engineer.

B. Concrete surfaces to receive grout shall be clean and sound; free of ice, frost, dirt, grease, oil, curing compounds, laitance and paints, and free of all

loose material or foreign matter, which may effect the bond or performance of the grout.

C. Concrete surfaces shall be roughened by chipping, sandblasting, or other mechanical means to ensure bond of the grout to the concrete. Loose or broken concrete shall be removed. Irregular voids or projecting coarse aggregate need not be removed if they are sound, free of laitance, and firmly embedded into the parent concrete.

D. Air compressors used to clean surfaces in contact with grout shall be the oil-less type or equipped with an oil trap in the airline to prevent oil from being blown onto the surface.

E. Concrete surfaces shall be washed clean and then kept moist for at least 24 hours prior to the placement of cementitious or cement grout. Saturation may be achieved by covering the concrete with saturated burlap bags, use of a soaker hose, flooding the surface, or other method acceptable to the Project Manager. Upon completion of the 24-hour period, visible water shall be removed from the surface prior to grouting. The use of an adhesive bonding agent in lieu of surface saturation shall only be used when approved by the Project Manager for each specific location of grout installation.

F. Epoxy-based grouts do not require the saturation of the concrete substrate. Surfaces in contact with epoxy grout shall be completely dry before grouting.

G. Grout forms or other leak proof containment shall be constructed as required. Forms shall be lined or coated with release agents recommended by the grout manufacturer.

H. Grout forms shall be of adequate strength, securely anchored in place, and shored to resist the forces imposed by the grout and its placement.

I. Equipment shall be supported during alignment and installation of grout by shims, wedges, blocks or other approved means. The shims, wedges, and blocking devices shall be prevented from bonding to the grout by appropriate bond breaking coatings and removed after grouting unless otherwise approved by the Project Manager.

3.2 INSTALLATION - GENERAL

A. Mix, apply, and cure products in strict compliance with the manufacturer's recommendations and this section.

B. Have sufficient manpower and equipment available for rapid and continuous mixing and placing. Keep all necessary tools and materials ready and close at hand.

C. Maintain temperature of the grout during and after grouting as recommended by the grout manufacturer.

D. Take special precautions for hot weather or cold weather grouting as recommended

by the manufacturer when ambient temperatures and/or the temperature of the materials in contact with the grout are outside of the 60 and 90 degrees Fahrenheit range.

E. Install grout in a manner that will preserve the isolation between the elements on either side of the joint where grout is placed in the vicinity of an expansion or control joint.

3.3 INSTALLATION - CEMENT GROUTS AND NON-SHRINK CEMENTITIOUS GROUTS

A. Mix in accordance with manufacturer's recommendations.

B. Avoid mixing by hand. Mixing in a mortar mixer (with moving blades) is recommended. Before mixing wet the mixer and empty excess water. Add premeasured amount of water for mixing, followed by the grout. Begin with the minimum amount of water recommended by the manufacturer and then add the minimum additional water required to obtain workability. Do not exceed the manufacturer's maximum recommended water content.

C. Placements greater than 3-in in depth shall include the addition of clean washed pea gravel to the grout mix when approved by the manufacturer. Comply with the manufacturer's recommendations for the size and amount of aggregate to be added.

D. Place grout into the designated areas in a manner that will avoid segregation or entrapment of air. Do not vibrate grout to release air or to consolidate the material. Placement should proceed in a manner that will ensure the filling of all spaces and provide full contact between the grout and adjoining surfaces.

E. Place grout rapidly and continuously to avoid cold joints. Do not place cement grouts in layers. Do not add additional water to the mix after initial stiffening.

F. Begin curing immediately after form removal, cutback, and finishing. Keep grout moist and within its recommended placement temperature range for at least 24 hours after placement or longer if recommended by the manufacturer. Saturate the grout surface by use of wet burlap, soaker hoses, ponding, or other approved means. Provide sunshades as necessary. If drying winds inhibit the ability of a given curing method to keep grout moist, erect wind breaks until wind is no longer a problem or curing is finished.

3.4 INSTALLATION - NONSHRINK EPOXY GROUTS

A. Mix in accordance with the procedures recommended by the manufacturer. Do not vary the ratio of components or add solvent to change the consistency of the grout mix. Do not overmix. Mix full batches only to maintain proper proportions of resin, hardener, and aggregate.

B. Monitor ambient weather conditions and contact the grout manufacturer for special placement procedures to be used for temperatures below 60 or above 90 degrees F.

C. Place grout into the designated areas in a manner that will avoid trapping air. Placement methods shall ensure the filling of all spaces and provide full contact between the grout and adjoining surfaces.

D. Finish grout by puddling to cover all aggregate and provide a smooth finish. Break bubbles and smooth the top surface of the grout in conformity with the manufacturer's recommendations.

E. Epoxy grouts are self-curing and do not require the application of water. Maintain the formed grout within its recommended placement temperature range for at least 24 hours after placing, or longer if recommended by the manufacturer.

3.5 SCHEDULE

A. The following list indicates where the particular types of grout are to be used:

1. General purpose non-shrink cementitious grout: Use at all locations where non-shrink grout is called for on the Drawings.

2. Non-shrink epoxy grout: Use for the setting of anchor rods, anchor bolts and reinforcing steel in concrete and for all locations specifically indicated to receive epoxy grout.

3. Cement grout: Only use where cement grout is called for on the Drawings. It shall not be used when non-shrink grout is specifically called for on the Drawings.

END OF SECTION