CITY OF POMPANO BEACH
REQUEST FOR PROPOSALS
P-27-19

EMERGENCY AND ON CALL
UTILITY REPAIR SERVICES

RFP OPENING: June 13, 2019 2:00 P.M.
PURCHASING OFFICE
1190 N.E. 3RD AVENUE, BUILDING C (Front)
POMPANO BEACH, FLORIDA 33060

May 9, 2019

CITY OF POMPANO BEACH, FLORIDA

REQUEST FOR PROPOSALS
P-27-19
EMERGENCY AND ON CALL UTILITY REPAIR SERVICES

The City is seeking proposals from qualified firms to provide Emergency and On Call Utility Repair Services of Sanitary Sewers, Force Mains, Potable Water Mains, Reclaimed Water Mains, Raw Water Mains and Storm Sewers, inclusive of materials, restoration and all other required work.

The City will receive sealed proposals until **2:00 p.m. (local), June 13, 2019**. Proposals must be submitted electronically through the eBid System on or before the due date/time stated above. Any proposal received after the due date and time specified, will not be considered. Any uncertainty regarding the time a proposal is received will be resolved against the Proposer.

Proposer must be registered on the City's eBid System in order to view the solicitation documents and respond to this solicitation. The complete solicitation document can be downloaded for free from the eBid System as a pdf at: https://pompanobeachfl.ionwave.net/CurrentSourcingEvents.aspx. The City is not responsible for the accuracy or completeness of any documentation the Proposer receives from any source other than from the eBid System. Proposer is solely responsible for downloading all required documents. A list of proposers will be read aloud in a public forum.

Introduction

A. Scope Of Services

The City of Pompano Beach is seeking a maximum of two (2) qualified firms to demonstrate specific experience in utility system general repairs and emergency services. The contractor shall furnish, install and provide all labor and materials to complete repairs to the City's utility systems. The scopes of work will be performed on an "as needed basis" based on the established bid pricing. Individual purchase orders will be issued by the City as required.

Repairs will be made to the City's Water Distribution, Wastewater Collection and Storm Water Systems and generally consist of, but are not limited to, furnishing and installing various sizes of C-900 PVC pipe for gravity sewer main; ductile iron pipe, HDPE pipe and PCCP for force main and water distribution lines; various types of pipe for storm water conveyance; and concrete structures for the wastewater and storm water systems. Set up and monitoring of bypass pumping; dewatering systems; and restoration related to landscaping, asphalt and concrete work may also be required as needed. The work shall be performed at various locations throughout the City of Pompano Beach and surrounding service areas.

Each Proposer shall be thoroughly familiar with city standards. The City reserves the right to modify, replace or create new technical specifications and engineering standards as necessary at its sole discretion. City will notify the awarded Contractor when such a change is made.

The Scope addressed above is general in nature. Specific Scopes of Work will utilize these bid documents, technical specifications **(See Attachment 1 for Technical Specifications)** and the

Current Engineering Standards at the time of bid. The Standards can be viewed and/or downloaded at: http://pompanobeachfl.gov/pages/engineering.

B. Tasks/Deliverables

Should the City require an emergency repair, at the discretion of the City, one or both of the selected contractors will be asked to appear on site within four (4) hours to make an assessment of the efforts required to execute the repair.

At the City's discretion, one or both of the selected contractors will be given the opportunity to have a pre-work meeting with City staff to discuss their ability and proposed plan to execute the on call repairs.

C. Term of Contract

The Term of the Contract is for One (1) Year. The City shall have the option to renew this contract for an additional four (4) years on a year-to-year basis provided the vendor will maintain the original contract price structure.

D. Local Business Program

On March 13, 2018, the City Commission approved Ordinance 2018-46, establishing a Local Business Program, a policy to increase the participation of City of Pompano Beach businesses in the City's procurement process.

For purposes of this solicitation, "Local Business" will be defined as follows:

1. **TIER 1 LOCAL VENDOR.** POMPANO BEACH BUSINESS EMPLOYING POMPANO BEACH RESIDENTS. A business entity which has maintained a permanent place of business within the city limits and maintains a staffing level, within this local office, of at least ten percent who are residents of the City of Pompano Beach or includes subcontracting commitments to Local Vendors Subcontractors for at least ten percent of the contract value. The permanent place of business may not be a post office box. The business must be located in a non-residential zone, and must actually distribute goods or services from that location. The business must be staffed with full-time employees within the limits of the city. In addition, the business must have a current business tax receipt from the City of Pompano Beach for a minimum of one year prior to the date of issuance of a bid or proposal solicitation.

2. **TIER 2 LOCAL VENDOR.** BROWARD COUNTY BUSINESS EMPLOYING POMPANO BEACH RESIDENTS OR UTILIZING LOCAL VENDOR SUBCONTRACTORS. A business entity which has maintained a permanent place of business within Broward County and maintains a staffing level, within this local office, of at least 15% who are residents of the City of Pompano Beach or includes subcontracting commitments to Local Vendors Subcontractors for at least 20% of the contract value. The permanent place of business may not be a post office box. The business must be located in a non- residential zone, and must actually distribute goods or services from that location. The business must be staffed with full-time employees

within the limits of the city. In addition, the business must have a current business tax receipt from the respective Broward County municipality for a minimum of one year prior to the date of issuance of a bid or proposal solicitation.

3. **LOCAL VENDOR SUBCONTRACTOR.** POMPANO BEACH BUSINESS. A business entity which has maintained a permanent place of business within the city limits of the City of Pompano Beach. The permanent place of business may not be a post office box. The business must be located in a non-residential zone, and must actually distribute goods or services from that location. The business must be staffed with full-time employees within the limits of the city. In addition, the business must have a current business tax receipt from the City of Pompano Beach for a minimum of one year prior to the date of issuance of a bid or proposal solicitation.

You can view the list of City businesses that have a current Business Tax Receipt on the City's website, and locate local firms that are available to perform the work required by the bid specifications. The business information, sorted by business use classification, is posted on the webpage for the Business Tax Receipt Division: www.pompanobeachfl.gov by selecting the Pompano Beach Business Directory in the Shop Pompano! section.

The City of Pompano Beach is **strongly committed** to insuring the participation of City of Pompano Beach Businesses as contractors and subcontractors for the procurement of goods and services, including labor, materials and equipment. Proposers are required to participate in the City of Pompano Beach's Local Business Program by including, as part of their package, the Local Business Participation Form (Exhibit A,) listing the local businesses that will be used on the contract, and the Letter of Intent Form (Exhibit B) from each local business that will participate in the contract.

The required goal for this RFP is 10% for Local Vendor.

If a Prime Contractor/Vendor is not able to achieve the level of goal attainment of the contract, the Prime Vendor will be requested to demonstrate and document that good faith efforts were made to achieve the goal by providing the Local Business Unavailability Form (Exhibit C), listing firms that were contacted but not available, and the Good Faith Effort Report (Exhibit D), describing the efforts made to include local business participation in the contract. This documentation shall be provided to the City Commission for acceptance.

The awarded proposer will be required to submit "Local Business Subcontractor Utilization Reports" during projects and after projects have been completed. The reports will be submitted to the assigned City project manager of the project. The Local Business Subcontractor Utilization Report template and instructions have been included in the bid document.

Failure to meet Local Vendor Goal commitments will result in "unsatisfactory" compliance rating. Unsatisfactory ratings may impact award of future projects if a sanction is imposed by the City Commission.

The city shall award a Local Vendor preference based upon vendors, contractors, or subcontractors who are local with a preferences follows:

1. For evaluation purposes, the Tier 1 and Tier 2 businesses shall be a criterion for award in this Request for Proposal (RFP). No business may qualify for more than one tier level.

2. For evaluation purposes, local vendors shall receive the following preferences:

   a. Tier 1 business as defined by this subsection shall be granted a preference in the amount of five percent of total score.

   b. Tier 2 business as defined by this subsection shall be granted a preference in the amount of two and one-half percent of total score.

3. It is the responsibility of the awarded vendor/contractor to comply with all Tier 1&2 guidelines. The awarded vendor/contractor must ensure that all requirements are met before execution of a contract.

E. Required Proposal Submittal

Sealed proposals shall be submitted electronically through the eBid System on or before the due date/time stated above. Proposer shall upload response as one (1) file to the eBid System. The file size for uploads is limited to 100 MB. If the file size exceeds 100 MB the response must be split and uploaded as two (2) separate files.

Information to be included in the proposal: In order to maintain comparability and expedite the review process, it is required that proposals be organized in the manner specified below, with the sections clearly labeled:

Title page:
Show the project name and number, the name of the Proposer's firm, address, telephone number, name of contact person and the date.

Table of Contents:
Include a clear identification of the material by section and by page.

Letter of Transmittal:
Briefly state the Proposer's understanding of the project and express a positive commitment to provide the services described herein. State the name(s) of the person(s) who will be authorized to make representations for the Proposer, their title(s), office and E-mail addresses and telephone numbers. Please limit this section to two pages.

Fees & Costs:
Include a concise narrative with sufficient detail indicating the proposed approach to providing the required services, including a description of the types and qualities of service that would be provided. Provide a cost for each of the major services provided along with the estimated number of expected work hours for each qualified staff.

The low monetary Bid will NOT in all cases be awarded the Contract. Award will be made to the most responsive, responsible bidder whose Bid is the most advantageous to the City, price and other factors considered. The City reserves the right to reject any and all Bids and to waive technical errors as set forth in the proposal.

References:

Submit a client reference list, including a minimum of three (3) name of contact, and governmental entity, address, telephone number and type of service provided to each reference.

Local Businesses:
Completed Local Business program forms, Exhibits A-D.

Litigation:
Disclose any litigation within the past five (5) years arising out your firm's performance.

City Forms:
The RFP Proposer Information Page Form and any other required forms must be completed and submitted electronically through the City's eBid System.
The City reserves the right to request additional information to ensure the proposer is financially solvent and has sufficient financial resources to perform the contract and shall provide proof thereof of its financial solvency. The City may as at its sole discretion ask for additional proof of financial solvency, including additional documents post proposal opening, and prior to evaluation that demonstrates the Proposer's ability to perform the resulting contract and provide the required materials and/or services.

Reviewed and Audited Financial Statements:

Must be marked "CONFIDENTIAL" and uploaded separately from proposal.

Proposers shall be financially solvent and appropriately capitalized to be able to service the City for the duration of the contract. Proposers shall provide a complete financial statement of the firm's most recent audited financial statements, indicating organization's financial condition and uploaded as a separate file titled "Financial Statements" to the Response Attachments tab in the eBid System.

Financial statements provided shall not be older than twelve 12) months prior to the date of filing this solicitation response. The financial statements are to be reviewed and submitted with any accompanying notes and supplemental information. The City of Pompano Beach reserve the right to reject financial statements in which the financial condition shown is of a date twelve (12) months or more prior to the date of submittals.

The City is a public agency subject to Chapter 119, Florida's Public Records Law and is required to provide the public with access to public records, however, financial statements that are required as submittals to prequalify for a solicitation will be exempt from public disclosure.

The City reserves the right to request additional information to ensure the proposer is financially solvent and has sufficient financial resources to perform the contract and shall provide proof thereof of its financial solvency. The City may as at its sole discretion ask for additional proof of financial solvency, including additional documents post proposal opening, and prior to evaluation that demonstrates the Proposer's ability to perform the resulting contract and provide the required materials and/or services.

A combination of two (2) or more of the following may substitute for audited financial statements:

1) Bank letters/statements for the past 3 months

2) Balance sheet, profit and loss statement, cash flow report
3) IRS returns for the last 2 years
4) Letter from CPA showing profits and loss statements (certified)

F. Insurance

CONTRACTOR shall not commence services under the terms of this Agreement until certification or proof of insurance detailing terms and provisions has been received and approved in writing by the CITY's Risk Manager. If you are responding to a bid and have questions regarding the insurance requirements hereunder, please contact the City's Purchasing Department at (954) 786-4098. If the contract has already been awarded, please direct any queries and proof of the requisite insurance coverage to City staff responsible for oversight of the subject project/contract.

CONTRACTOR is responsible to deliver to the CITY for timely review and written approval/disapproval Certificates of Insurance which evidence that all insurance required hereunder is in full force and effect and which name on a primary basis, the CITY as an additional insured on all such coverage. **Such policy or policies shall be issued by United States Treasury approved companies authorized to do business in the State of Florida. The policies shall be written on forms acceptable to the City's Risk Manager, meet a minimum financial A.M. Best and Company rating of no less than Excellent, and be part of the Florida Insurance Guarantee Association Act. No changes are to be made to these specifications without prior written approval of the City's Risk Manager.**

Throughout the term of this Agreement, CITY, by and through its Risk Manager, reserve the right to review, modify, reject or accept any insurance policies required by this Agreement, including limits, coverages or endorsements. CITY reserves the right, but not the obligation, to review and reject any insurer providing coverage because of poor financial condition or failure to operate legally.

Failure to maintain the required insurance shall be considered an event of default. The requirements herein, as well as CITY's review or acceptance of insurance maintained by CONTRACTOR, are not intended to and shall not in any way limit or qualify the liabilities and obligations assumed by CONTRACTOR under this Agreement.

Throughout the term of this Agreement, CONTRACTOR and all subcontractors or other agents hereunder, shall, at their sole expense, maintain in full force and effect, the following insurance coverages and limits described herein, including endorsements.

A. Worker's Compensation Insurance covering all employees and providing benefits as required by Florida Statute, Chapter 440, regardless of the size of the company (number of employees) or the state in which the work is to be performed or of the state in which Contractor is obligated to pay compensation to employees engaged in the performance of the work. Contractor further agrees to be responsible for employment, control and conduct of its employees and for any injury sustained by such employees in the course of their employment.

B. Liability Insurance.

(1) Naming the City of Pompano Beach as an additional insured as City's interests may appear, on General Liability Insurance only, relative to claims which arise from

Contractor's negligent acts or omissions in connection with Contractor's performance under this Agreement.

(2) Such Liability insurance shall include the following checked types of insurance and indicated minimum policy limits.

Type of Insurance		**Limits of Liability**
GENERAL LIABILITY:		Minimum $5,000,000 Per Occurrence and $5,000,000 Per Aggregate
* Policy to be written on a claims incurred basis		
XX	comprehensive form	bodily injury and property damage
XX	premises - operations	bodily injury and property damage
XX	explosion & collapse hazard	
XX	underground hazard	
XX	products/completed operations hazard	bodily injury and property damage combined
XX	contractual insurance	bodily injury and property damage combined
XX	broad form property damage	bodily injury and property damage combined
XX	independent contractors	personal injury
XX	personal injury	
__	sexual abuse/molestation	Minimum $1,000,000 Per Occurrence and Aggregate
__	liquor liability	Minimum $1,000,000 Per Occurrence and Aggregate

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AUTOMOBILE LIABILITY:		Minimum $1,000,000 Per Occurrence and Aggregate. Bodily injury (each person) bodily injury (each accident), property damage, bodily injury and property damage combined.
XX	comprehensive form	
XX	owned	
XX	hired	
XX	non-owned	

REAL & PERSONAL PROPERTY		
__	comprehensive form	Agent must show proof they have this coverage.

UMBRELLA EXCESS LIABILITY			Per Occurrence	Aggregate
XX	umbrella excess liability	bodily injury and	$2,000,000	$2,000,000

property damage combined

CONTRACTOR may use Umbrella Excess Liability combined with General Liability to reach the City's minimum insurance requirement of $5,000,000.00 Per Occurrence and Per Aggregate. However, the General Liability must then be at a minimum of $3,000,000.00 per Aggregate and per occurrence.

PROFESSIONAL LIABILITY	Per Occurrence	Aggregate
__ * Policy to be written on a claims made basis	$1,000,000	$1,000,000

POLLUTION LIABILITY	Per Occurrence	Aggregate
XX * Policy to be written on a claims made basis	$2,000,000	$2,000,000

(3) If Professional Liability insurance is required, Contractor agrees the indemnification and hold harmless provisions of Section 12 of the Agreement shall survive the termination or expiration of the Agreement for a period of three (3) years unless terminated sooner by the applicable statute of limitations.

C. Employer's Liability. CONTRACTOR and all subcontractors shall, for the benefit of their employees, provide, carry, maintain and pay for Employer's Liability Insurance in the minimum amount of One Hundred Thousand Dollars ($100,000.00) per employee, Five Hundred Thousand Dollars ($500,000) per aggregate.

D. Policies: Whenever, under the provisions of this Agreement, insurance is required of the CONTRACTOR, the CONTRACTOR shall promptly provide the following:

(1) Certificates of Insurance evidencing the required coverage;

(2) Names and addresses of companies providing coverage;

(3) Effective and expiration dates of policies; and

(4) A provision in all policies affording CITY thirty (30) days written notice by a carrier of any cancellation or material change in any policy.

E. Insurance Cancellation or Modification. Should any of the required insurance policies be canceled before the expiration date, or modified or substantially modified, the issuing company shall provide thirty (30) days written notice to the CITY.

F. Waiver of Subrogation. CONTRACTOR hereby waives any and all right of subrogation against the CITY, its officers, employees and agents for each required policy. When required by the insurer, or should a policy condition not permit an insured to enter into a pre-loss agreement to waive subrogation without an endorsement, then CONTRACTOR shall notify the insurer and request the policy be endorsed with a Waiver of Transfer of Rights of Recovery Against Others, or its equivalent. This Waiver of Subrogation requirement shall not apply to any policy which includes a condition to the policy not specifically prohibiting such an endorsement, or voids coverage should CONTRACTOR enter into such an agreement on a pre-loss basis.

G. Selection/Evaluation Process

A Selection/Evaluation Committee will be appointed to select the most qualified firm(s). The Selection/Evaluation Committee will present their findings to the City Commission.

Proposals will be evaluated using the following criteria.

	Criteria	Point Range
1	**Experience and Expertise** • Previous related work experience and qualifications in the subject area of personnel assigned. • Demonstrates a clear understanding of scope of work and other technical or legal issues related to the project.	0-25
2	**References** • History and performance of firm/project team on similar projects. • References and recommendations from previous clients.	0-20
3	**Resources and Methodology** • Adequacy of amount of quality resources assigned to the project. • Overall approach to project. Consideration of services provided and approach to meeting goals and deadlines. • Financial resources.	0-25
4	**Cost** • Including the overall project-task budget and itemized cost breakdowns.	0-30
	Total	**0-100**

Additional 0-5% for Tier1/Tier2 Local Business will be calculated on combined scoring totals of each company.

NOTE:
Financial statements that are required as submittals to prequalify for a solicitation will be exempt from public disclosure; however, financial statements submitted to prequalify for a solicitation, and are not required by the City, may be subject to public disclosure.

Value of Work Previously Awarded to Firm (Tie-breaker) - In the event of a tie, the firm with the lowest value of work as a prime contractor on City of Pompano Beach projects within the last five years will receive the higher ranking, the firm with the next lowest value of work shall receive the next highest ranking, and so on. The analysis of past work will be based on the City's Purchase Order and payment records.

The Committee has the option to use the above criteria for the initial ranking to short-list Proposers and to use an ordinal ranking system to score short-listed Proposers following

presentations (if deemed necessary) with a score of “1” assigned to the short-listed Proposer deemed most qualified by the Committee.

Each firm should submit documentation that evidences the firm’s capability to provide the services required for the Committee’s review for short listing purposes. After an initial review of the Proposals, the City may invite Proposers for an interview to discuss the proposal and meet firm representatives, particularly key personnel who would be assigned to the project. Should interviews be deemed necessary, it is understood that the City shall incur no costs as a result of this interview, nor bear any obligation in further consideration of the submittal.

When more than three responses are received, the committee shall furnish the City Commission (for their approval) a listing, in ranked order, of no fewer than three firms deemed to be the most highly qualified to perform the service. If three or less firms respond to the RFP, the list will contain the ranking of all responses.

The City Commission has the authority to (including, but not limited to); approve the recommendation; reject the recommendation and direct staff to re-advertise the solicitation; or, review the responses themselves and/or request oral presentations and determine a ranking order that may be the same or different from what was originally presented to the City Commission.

Value of Work Previously Awarded to Firm (Tie-breaker) - In the event of a tie, the firm with the lowest value of work as a prime contractor on City of Pompano Beach projects within the last five years will receive the higher ranking, the firm with the next lowest value of work shall receive the next highest ranking, and so on. The analysis of past work will be based on the City's Purchase Order and payment records.

H. Hold Harmless and Indemnification

Proposer covenants and agrees that it will indemnify and hold harmless the City and all of its officers, agents, and employees from any claim, loss, damage, cost, charge or expense arising out of any act, action, neglect or omission by the Proposer, whether direct or indirect, or whether to any person or property to which the City or said parties may be subject, except that neither the Proposer nor any of its subcontractors will be liable under this section for damages arising out of injury or damage to persons or property directly caused by or resulting from the sole negligence of the City or any of its officers, agents or employees.

I. Right to Audit

Contractor's records which shall include but not be limited to accounting records, written policies and procedures, computer records, disks and software, videos, photographs, subcontract files (including proposals of successful and unsuccessful bidders), originals estimates, estimating worksheets, correspondence, change order files (including documentation covering negotiated settlements), and any other supporting evidence necessary to substantiate charges related to this contract (all the foregoing hereinafter referred to as "records") shall be open to inspection and subject to audit and/or reproduction, during normal working hours, by Owner's agent or its authorized representative to the extent necessary to adequately permit evaluation and verification of any invoices, payments or claims submitted by the contractor or any of his payees pursuant to the execution of the contract. Such records subject to examination shall also include, but not be limited to, those records necessary to evaluate and verify direct and

indirect costs (including overhead allocations) as they may apply to costs associated with this contract.

For the purpose of such audits, inspections, examinations and evaluations, the Owner's agent or authorized representative shall have access to said records from the effective date of this contract, for the duration of the Work, and until 5 years after the date of final payment by Owner to Consultant pursuant to this contract.

Owner's agent or its authorized representative shall have access to the Contractor's facilities, shall have access to all necessary records, and shall be provided adequate and appropriate work space, in order to conduct audits in compliance with this article. Owner's agent or its authorized representative shall give auditees reasonable advance notice of intended audits.

Contractor shall require all subcontractors, insurance agents, and material suppliers (payees) to comply with the provisions of this article by insertion of the requirements hereof in any written contract agreement. Failure to obtain such written contracts which include such provisions shall be reason to exclude some or all of the related payees' costs from amounts payable to the Contractor pursuant to this contract.

J. <u>Retention of Records and Right to Access</u>

The City of Pompano Beach is a public agency subject to Chapter 119, Florida Statutes. The Contractor shall comply with Florida's Public Records Law, as amended. Specifically, the Contractor shall:

a. Keep and maintain public records required by the City in order to perform the service;

b. Upon request from the City's custodian of public records, provide the City with a copy of requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes or as otherwise provided by law;

c. Ensure that public records that are exempt or that are confidential and exempt from public record requirements are not disclosed except as authorized by law;

d. Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and following completion of the contract if the Contractor does not transfer the records to the City; and

e. Upon completion of the contract, transfer, at no cost to the City, all public records in possession of the Contractor, or keep and maintain public records required by the City to perform the service. If the Contractor transfers all public records to the City upon completion of the contract, the Contractor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the Contractor keeps and maintains public records upon completion of the contract, the Contractor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the City, upon request from the City's custodian of public records in a format that is compatible with the information technology systems of the City.

K. Communications

No negotiations, decisions, or actions shall be initiated or executed by the firm as a result of any discussions with any City employee. Only those communications, which are in writing from the City, may be considered as a duly authorized expression on behalf of the City. In addition, only communications from firms that are signed and in writing will be recognized by the City as duly authorized expressions on behalf of firms.

L. No Discrimination

There shall be no discrimination as to race, sex, color, age, religion, or national origin in the operations conducted under any contract with the City.

M. Independent Contractor

The selected firm will conduct business as an independent contractor under the terms of this contract. Personnel services provided by the firm shall be by employees of the firm and subject to supervision by the firm, and not as officers, employees, or agents of the City. Personnel policies, tax responsibilities, social security and health insurance, employee benefits, purchasing policies and other similar administrative procedures applicable to services rendered under this agreement shall be those of the firm.

N. Staff Assignment

The City of Pompano Beach reserves the right to approve or reject, for any reasons, Proposer's staff assigned to this project at any time. Background checks may be required.

O. Contract Terms

The contract resulting from this RFP shall include, but not be limited to the following terms:

The contract shall include as a minimum, the entirety of this RFP document, together with the successful Proposer's proposal. Contract shall be prepared by the City of Pompano Beach City Attorney.

If the City of Pompano Beach defends any claim, demand, cause of action, or lawsuit arising out of any act, action, negligent acts or negligent omissions, or willful misconduct of the contractor, its employees, agents or servants during the performance of the contract, whether directly or indirectly, contractor agrees to reimburse the City of Pompano Beach for all expenses, attorney's fees, and court costs incurred in defending such claim, cause of action or lawsuit.

P. Waiver

It is agreed that no waiver or modification of the contract resulting from this RFP, or of any covenant, condition or limitation contained in it shall be valid unless it is in writing and duly executed by the party to be charged with it, and that no evidence of any waiver or modification shall be offered or received in evidence in any proceeding, arbitration, or litigation between the parties arising out of or affecting this contract, or the right or obligations of any party under it, unless such waiver or modification is in writing, duly executed as above. The parties agree that the provisions of this paragraph may not be waived except by a duly executed writing.

Q. Survivorship Rights

This contract resulting from this RFP shall be binding on and inure to the benefit of the respective parties and their executors, administrators, heirs, personal representative, successors and assigns.

R. Termination

The contract resulting from this RFP may be terminated by the City of Pompano Beach without cause upon providing contractor with at least sixty (60) days prior written notice.

Should either party fail to perform any of its obligations under the contract resulting from this RFP for a period of thirty (30) days after receipt of written notice of such failure, the non-defaulting part will have the right to terminate the contract immediately upon delivery of written notice to the defaulting part of its election to do so. The foregoing rights of termination are in addition to any other rights and remedies that such party may have.

S. Manner of Performance

Proposer agrees to perform its duties and obligations under the contract resulting from this RFP in a professional manner and in accordance with all applicable local, federal and state laws, rules and regulations.

Proposer agrees that the services provided under the contract resulting from this RFP shall be provided by employees that are educated, trained and experienced, certified and licensed in all areas encompassed within their designated duties. Proposer agrees to furnish the City of Pompano Beach with all documentation, certification, authorization, license, permit, or registration currently required by applicable laws or rules and regulations. Proposer further certifies that it and its employees are now in and will maintain good standing with such governmental agencies and that it and its employees will keep all license, permits, registration, authorization or certification required by applicable laws or regulations in full force and effect during the term of this contract. Failure of Proposer to comply with this paragraph shall constitute a material breach of contract.

T. Acceptance Period

Proposals submitted in response to this RFP must be valid for a period no less than ninety (90) days from the closing date of this solicitation.

U. RFP Conditions and Provisions

The completed proposal (together with all required attachments) must be submitted electronically to City on or before the time and date stated herein. All Proposers, by electronic submission of a proposal, shall agree to comply with all of the conditions, requirements and instructions of this RFP as stated or implied herein. All proposals and supporting materials submitted will become the property of the City.

Proposer's response shall not contain any alteration to the document posted other than entering data in spaces provided or including attachments as necessary. By submission of a response, Proposer affirms that a complete set of bid documents was obtained from the eBid System or from the Purchasing Division only and no alteration of any kind has

been made to the solicitation. Exceptions or deviations to this proposal may not be added after the submittal date.

All Proposers are required to provide all information requested in this RFP. Failure to do so may result in disqualification of the proposal.

The City reserves the right to postpone or cancel this RFP, or reject all proposals, if in its sole discretion it deems it to be in the best interest of the City to do so.

The City reserves the right to waive any technical or formal errors or omissions and to reject all proposals, or to award contract for the items herein, in part or whole, if it is determined to be in the best interests of the City to do so.

The City shall not be liable for any costs incurred by the Proposer in the preparation of proposals or for any work performed in connection therein.

V. Standard Provisions

1. Governing Law

   Any agreement resulting from this RFP shall be governed by the laws of the State of Florida, and the venue for any legal action relating to such agreement will be in Broward County, Florida.

2. Licenses

   In order to perform public work, the successful Proposer shall:
   Be licensed to do business in Florida, if an entity, and hold or obtain such Contractor' and Business Licenses if required by State Statutes or local ordinances.

3. Conflict Of Interest

   For purposes of determining any possible conflict of interest, each Proposer must disclose if any Elected Official, Appointed Official, or City Employee is also an owner, corporate officer, or an employee of the firm. If any Elected Official, Appointed Official, or City Employee is an owner, corporate officer, or an employee, the Proposer must file a statement with the Broward County Supervisor of Elections pursuant to §112.313, Florida Statutes.

4. Drug Free Workplace

   The selected firm(s) will be required to verify they will operate a "Drug Free Workplace" as set forth in Florida Statute, 287.087.

5. Public Entity Crimes

   A person or affiliate who has been placed on the convicted vendor list following a conviction for public entity crime may not submit a proposal on a contract to provide any goods or services to a public entity, may not submit a proposal on a contract with a public entity for the construction or repair of a public building or public work, may not submit proposals on leases of real property to public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant

under a contract with any public entity, and may not transact business with any public entity in excess of the threshold amount provided in Florida Statute, Section 287.017, for CATEGORY TWO for a period of 36 months from the date of being placed on the convicted vendor list.

6. Patent Fees, Royalties, And Licenses

If the selected Proposer requires or desires to use any design, trademark, device, material or process covered by letters of patent or copyright, the selected Proposer and his surety shall indemnify and hold harmless the City from any and all claims for infringement by reason of the use of any such patented design, device, trademark, copyright, material or process in connection with the work agreed to be performed and shall indemnify the City from any cost, expense, royalty or damage which the City may be obligated to pay by reason of any infringement at any time during or after completion of the work.

7. Permits

The selected Proposer shall be responsible for obtaining all permits, licenses, certifications, etc., required by federal, state, county, and municipal laws, regulations, codes, and ordinances for the performance of the work required in these specifications and to conform to the requirements of said legislation.

8. Familiarity With Laws

It is assumed the selected firm(s) will be familiar with all federal, state and local laws, ordinances, rules and regulations that may affect its services pursuant to this RFP. Ignorance on the part of the firm will in no way relieve the firm from responsibility.

9. Withdrawal Of Proposals

A firm may withdraw its proposal without prejudice no later than the advertised deadline for submission of proposals by written communication to the General Services Department, 1190 N.E. 3rd Avenue, Building C, Pompano Beach, Florida 33060.

10. Composition Of Project Team

Firms are required to commit that the principals and personnel named in the proposal will perform the services throughout the contractual term unless otherwise provided for by way of a negotiated contract or written amendment to same executed by both parties. No diversion or substitution of principals or personnel will be allowed unless a written request that sets forth the qualifications and experience of the proposed replacement(s) is submitted to and approved by the City in writing.

11. Invoicing/Payment

All invoices should be sent to City of Pompano Beach, Accounts Payable, P.O. Drawer 1300, Pompano Beach, Florida, 33061. In accordance with Florida

Statutes, Chapter 218, payment will be made within 45 days after receipt of a proper invoice.

12. Public Records

a. The City of Pompano Beach is a public agency subject to Chapter 119, Florida Statutes. The Contractor shall comply with Florida's Public Records Law, as amended. Specifically, the Contractor shall:

i. Keep and maintain public records required by the City in order to perform the service;

ii. Upon request from the City's custodian of public records, provide the City with a copy of requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided in Chapter 119, Florida Statutes or as otherwise provided by law;

iii. Ensure that public records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the contract term and following completion of the contract if the Contractor does not transfer the records to the City; and

iv. Upon completion of the contract, transfer, at no cost to the City, all public records in possession of the Contractor, or keep and maintain public records required by the City to perform the service. If the Contractor transfers all public records to the City upon completion of the contract, the Contractor shall destroy any duplicate public records that are exempt or confidential and exempt from public records disclosure requirements. If the Contractor keeps and maintains public records upon completion of the contract, the Contractor shall meet all applicable requirements for retaining public records. All records stored electronically must be provided to the City, upon request from the City's custodian of public records in a format that is compatible with the information technology systems of the City.

b. Failure of the Contractor to provide the above described public records to the City within a reasonable time may subject Contractor to penalties under 119.10, Florida Statutes, as amended.

PUBLIC RECORDS CUSTODIAN

IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT:

CITY CLERK

100 W. Atlantic Blvd., Suite 253
Pompano Beach, Florida 33060
(954) 786-4611
RecordsCustodian@copbfl.com

W. Questions and Communication

All questions regarding the RFP are to be submitted using the Questions feature in the eBid System. Questions must be received at least seven (7) calendar days before the scheduled solicitation opening. Oral and other interpretations or clarifications will be without legal effect. Addenda will be posted to the RFP solicitation in the eBid System, and it is the Proposer's responsibility to obtain all addenda before submitting a response to the solicitation.

X. Addenda

The issuance of a written addendum or posting of an answer in response to a question submitted using the Questions feature in the eBid System are the only official methods whereby interpretation, clarification, or additional information can be given. If any addenda are issued to this RFP solicitation the addendum will be issued via the eBid System. It shall be the responsibility of each Proposer, prior to submitting their response, to contact the City Purchasing Office at (954) 786-4098 to determine if addenda were issued and to make such addenda a part of their proposal. Addenda will be posted to the RFP solicitation in the eBid System.

Y. Contractor Performance Report

The City will utilize the Contractor Performance Report to monitor and record the successful proposer's performance for the work specified by the contract. The Contractor Performance Report has been included as an exhibit to this solicitation.

COMPLETE THE PROPOSER INFORMATION FORM ON THE ATTACHMENTS TAB IN THE EBID SYSTEM. PROPOSERS ARE TO COMPLETE THE FORM IN ITS ENTIRITY AND INCLUDE THE COMPLETED FORM IN YOUR PROPOSAL THAT MUST BE UPLOADED TO THE RESPONSE ATTACHMENTS TAB FOR THE RFP IN THE EBID SYSTEM.

PROPOSER INFORMATION PAGE

RFP _____, _____
(number) (RFP name)

To: The City of Pompano Beach, Florida

The below named company hereby agrees to furnish the proposed services under the terms stated subject to all instructions, terms, conditions, specifications, addenda, legal advertisement, and conditions contained in the RFP. I have read the RFP and all attachments, including the specifications, and fully understand what is required. By submitting this proposal, I will accept a contract if approved by the City and such acceptance covers all terms, conditions, and specifications of this proposal.

Proposal submitted by:

Name (printed) _____ Title _____

Company (Legal Registered) _____

Federal Tax Identification Number _____

Address _____

City/State/Zip _____

Telephone No. _____ Fax No. _____

Email Address _____

REQUESTED INFORMATION BELOW IS ON THE ATTRIBUTES TAB FOR THE RFP IN THE EBID SYSTEM. PROVIDE THIS INFORMATION ELECTRONICALLY.

VENDOR CERTIFICATION REGARDING SCRUTINIZED COMPANIES LISTS

Respondent Vendor Name: _____

Vendor FEIN: _____

Section 287.135, Florida Statutes, prohibits agencies from contracting with companies, for goods or services over $1,000,000, that are on either the Scrutinized Companies with Activities in Sudan List or the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List. Further, Section 215.4725, Florida Statutes, prohibits agencies from contracting (at any dollar amount) with companies on the Scrutinized Companies that Boycott Israel List, or with companies that are engaged in a boycott of Israel. As the person authorized to sign electronically on behalf of Respondent, I hereby certify by selecting the box below that the company responding to this solicitation is not listed on the Scrutinized Companies with Activities in Sudan List, the Scrutinized Companies with Activities in the Iran Petroleum Energy Sector List, or the Scrutinized Companies that Boycott Israel List. I also certify that the company responding to this solicitation is not participating in a boycott of Israel, and is not engaged in business operations in Syria or Cuba. I understand that pursuant to sections 287.135 and 215.4725, Florida Statutes, the submission of a false certification may subject company to civil penalties, attorney's fees, and/or costs.

I Certify

☐

VENDOR CERTIFICATION REGARDING SCRUTINIZED COMPANIES LISTS

Respondent Vendor Name: _____

Vendor FEIN: _____

Section 215.4725, Florida Statutes, prohibits agencies from contracting (at any dollar amount) with companies on the Scrutinized Companies that Boycott Israel List, or with companies that are engaged in a boycott of Israel. As the person authorized to sign electronically on behalf of Respondent, I hereby certify by selecting the box below that the company responding to this solicitation is not listed on the Scrutinized Companies that Boycott Israel List. I also certify that the company responding to this solicitation is not participating in a boycott of Israel, and is not engaged in business operations in Syria or Cuba. I understand that pursuant to sections 287.135 and 215.4725, Florida Statutes, the submission of a false certification may subject company to civil penalties, attorney's fees, and/or costs.

I Certify

☐

Exhibit – Contractor Performance Report

City of Pompano Beach, Purchasing Division
1190 N.E. 3rd Avenue, Building C
Pompano Beach, Florida, 33060

CITY OF POMPANO BEACH
CONTRACTOR PERFORMANCE REPORT

1. Report Period: from _____ to _____

2. Contract Period: from _____ to _____

3. Bid# & or P.O.#: _____

4. Contractor Name: _____

5. City Department: _____

6. Project Manager: _____

7. Scope of Work (Service Deliverables): _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Exhibit – Contractor Performance Report

CATEGORY	RATING	COMMENTS
1. Quality Assurance/Quality Control - Product/Services of high quality - Proper oversight - Communication	Poor =1 Satisfactory =2 Excellent =3	
2. Record Keeping -Accurate record keeping -Proper invoicing -Testing results complete	Poor =1 Satisfactory =2 Excellent =3	
3. Close-Out Activities - Restoration/Cleanup - Deliverables met - Punch list items addressed	Poor =1 Satisfactory =2 Excellent =3	
4. Customer Service - City Personnel and Residents - Response time - Communication	Poor =1 Satisfactory =2 Excellent =3	
5. Cost Control - Monitoring subcontractors - Change-orders - Meeting budget	Poor =1 Satisfactory =2 Excellent =3	
6. Construction Schedule - Adherence to schedule - Time-extensions - Efficient use of resources	Poor =1 Satisfactory =2 Excellent =3	
SCORE	**_____**	**ADD ABOVE RATINGS/DIVIDE TOTAL BY NUMBER OF CATEGORIES BEING RATED**

RATINGS

Poor Performance (1.0 – 1.59)*: Marginally responsive, effective and/or efficient; delays require significant adjustments to programs; key employees marginally capable; customers somewhat satisfied.*

Satisfactory Performance (1.6 – 2.59)*: Generally responsive, effective and/or efficient; delays are excusable and/or results in minor program adjustments; employees are capable and satisfactorily providing service without intervention; customers indicate satisfaction.*

Excellent Performance (2.6 – 3.0): *Immediately responsive; highly efficient and/or effective; no delays; key employees are experts and require minimal direction; customers expectations are exceeded.*

Would you select/recommend this contractor again? _____ Yes _____ No

Please attach any supporting documents to this report to substantiate the ratings that have been provided.

_____	_____	_____
Ratings completed by (print name)	Ratings completed by signature	Date
_____	_____	_____
Department Head (print name)	Department Head Signature	Date
_____	_____	_____
Vendor Representative (print name)	Contractor Representative Signature	Date

Comments, corrective actions etc., use additional page if necessary:

_____

_____

_____

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City of Pompano Beach Florida

Local Business Subcontractor Utilization Report

Project Name (1)		Contract Number and Work Order Number (if applicable) (2)	
Report Number (3)	Reporting Period (4) to	Local Business Contract Goal (5)	Estimated Contract Completion Date (6)
Contractor Name (7)		Contractor Telephone Number (8) ( ) -	Contractor Email Address (9)
Contractor Street Address (10)	Project Manager Name (11)	Project Manager Telephone Number (12) ( ) -	Project Manager Email Address (13)

Local Business Payment Report

Federal Identification Number (14)	**Local Subcontractor Business Name** (15)	**Description of Work** (16)	**Project Amount** (17)	**Amount Paid this Reporting Period** (18)	**Invoice Number** (19)	**Total Paid to Date** (20)
Total Paid to Date for All Local Business Subcontractors (21) **$**						0.00

I certify that the above information is true to the best of my knowledge.

Contractor Name – Authorized Personnel (print) (22)	Contractor Name – Authorized Personnel (sign) (23)	Title (24)	Date (25)

Local Business Subcontractor Utilization Report Instructions

Box (1) **Project Name –** Enter the entire name of the project.

Box (2) **Contract Number (work order) –** Enter the contract number and the work order number, if applicable (i.e., 4600001234, and if work order contract include work order number – 4600000568 WO 01).

Box (3) **Report Number -** Enter the Local Business Subcontractor Utilization Report number. Reports must be in a numerical series (i.e., 1, 2, 3).

Box (4) **Reporting Period -** Enter the beginning and end dates this report covers (i.e., 10/01/2016 – 11/01/2016).

Box (5) **Local Contract Goal -** Enter the Local Contract Goal percentage on entire contract.

Box (6) **Contract Completion Date -** Enter the expiration date of the contract, (not work the order).

Box (7) **Contractor Name -** Enter the complete legal business name of the Prime Contractor.

Box (8) **Contractor Telephone Number -** Enter the telephone number of the Prime Contractor.

Box (9) **Contractor Email Address -** Enter the email address of the Prime Contractor.

Box (10) **Contractor Street Address –** Enter the mailing address of the Prime Contractor.

Box (11) **Project Manager Name -** Enter the name of the Project Manager for the Prime Contractor on the project.

Box (12) **Project Manager Telephone Number –** Enter the direct telephone number of the Prime Contractor's Project Manager.

Box (13) **Project Manager Email Address –** Enter the email address of the Prime Contractor's Project Manager.

Box (14) **Federal Identification Number –** Enter the federal identification number of the Local Subcontractor(s).

Box (15) **Local Subcontractor Business Name** – Enter the complete legal business name of the Local Subcontractor(s).

Box (16) **Description of Work –** Enter the type of work being performed by the Local Subcontractor(s) (i.e., electrical services).

Box (17) **Project Amount –** Enter the dollar amount allocated to the Local Subcontractor(s) for the entire project (i.e., amount in the subcontract agreement).

Box (18) **Amount Paid this Reporting Period** – Enter the total amount paid to the Local Subcontractor(s) during the reporting period.

Box (19) **Invoice Number** – Enter the Local Subcontractor's invoice number related to the payment reported this period.

Box (20) **Total Paid to Date** – Enter the total amount paid to the Local Subcontractor(s) to date.

Box (21) **Total Paid to Date for All Local Subcontractor(s)** – Enter the total dollar amount paid to date to all Local Subcontractors listed on the report.

Box (22) **Contractor Name Authorized Personnel (print)** – Print the name of the employee that is authorized to execute the Local Subcontractor Utilization Report.

Box (23) **Contractor Name Authorized Personnel (sign)** – Signature of authorized employee to execute the Local Subcontractor Utilization Report.

Box (24) **Title –** Enter the title of authorized employee completing the Local Subcontractor Utilization Report.

Box (25) **Date –** Enter the date of submission of the Local Subcontractor Utilization Report to the City.

REQUESTED INFORMATION BELOW IS ON LOCAL BUSINESS PROGRAM FORM ON THE BID ATTACHMENTS TAB. BIDDERS ARE TO COMPLETE FORM IN ITS ENTIRITY AND INCLUDE COMPLETED FORM IN YOUR PROPOSAL THAT MUST BE UPLOADED TO THE RESPONSE ATTACHMENTS TAB IN THE EBID SYSTEM.

CITY OF POMPANO BEACH, FLORIDA
LOCAL BUSINESS PARTICIPATION FORM

Solicitation # & Title: _____ Prime Contractor's Name: _____

Name of Firm, Address	Contact Person, Telephone Number	Type of Work to be Performed/Materials to be Purchased	Contract Amount

LOCAL BUSINESS EXHIBIT "A

LOCAL BUSINESS EXHIBIT "B"
LETTER OF INTENT TO PERFORM AS A LOCAL SUBCONTRACTOR

RFP Number_____

TO: _____
(Name of Prime or General Bidder)

The undersigned City of Pompano Beach business intends to perform subcontracting work in connection with the above contract as (check below)

_____ an individual _____ a corporation

_____ a partnership _____ a joint venture

The undersigned is prepared to perform the following work in connection with the above Contract, as hereafter described in detail:

_____

_____

_____

_____

_____

_____

_____

_____

_____

at the following price: _____

_____ _____
(Date) (Name of Local Business Contractor)

_____
(address)

_____
(address City, State Zip Code)

BY: _____
(Name)

LOCAL BUSINESS EXHIBIT "B"

LOCAL BUSINESS EXHIBIT "C"
LOCAL BUSINESS UNAVAILABILITY FORM

RFP #_____

I,_____
(Name and Title)

of_____, certify that on the _____day of

_____, _____, I invited the following LOCAL BUSINESS(s) to bid work
(Month) (Year)

items to be performed in the City of Pompano Beach:

Business Name, Address	Work Items Sought	Form of Bid Sought (i.e., Unit Price, Materials/Labor, Labor Only, etc.)

Said Local Businesses:

___ Did not bid in response to the invitation

___ Submitted a bid which was not the low responsible bid

___ Other:_____

Name and Title: _____

Date: _____

Note: Attach additional documents as available.

LOCAL BUSINESS EXHIBIT "C"

LOCAL BUSINESS EXHIBIT "D"
GOOD FAITH EFFORT REPORT LOCAL BUSINESS PARTICIPATION

RFP #_____

1. What portions of the contract have you identified as Local Business opportunities?

_____

_____

_____

_____

2. Did you provide adequate information to identified Local Businesses? Please comment on how you provided this information.

_____

_____

_____

3. Did you send written notices to Local Businesses?

____ Yes ____ No

If yes, please include copy of the notice and the list of individuals who were forwarded copies of the notices.

4. Did you advertise in local publications?

____ Yes ____ No

If yes, please attach copies of the ads, including name and dates of publication.

5. What type of efforts did you make to assist Local Businesses in contracting with you ?

_____

_____

7. List the Local Businesses you will utilize and subcontract amount.

_____ $_____

_____ $_____

_____ $_____

8. Other comments: _____

_____

LOCAL BUSINESS EXHIBIT “D” – Page 2

_____

_____

_____

LOCAL BUSINESS EXHIBIT “D”

TIER 1/TIER 2 COMPLIANCE FORM

IN ORDER FOR YOUR FIRM TO COMPLY WITH THE CITY'S LOCAL BUSINESS PROGRAM AS A TIER 1 OR TIER 2 VENDOR, BIDDERS MUST COMPLETE THE INFORMATION BELOW AND UPLOAD THE FORM TO THE RESPONSE ATTACHMENTS TAB IN THE EBID SYSTEM.

TIER 1 LOCAL VENDOR

_____ My firm has maintained a permanent place of business within the city limits and maintains a staffing level, within this local office, of at least 10 % who are residents of the City of Pompano Beach.

And/Or

_____ My firm has maintained a permanent place of business within the city limits and my submittal includes subcontracting commitments to Local Vendors Subcontractors for at least 10 % of the contract value.

Or

_____ My firm does not qualify as a Tier 1 Vendor.

TIER 2 LOCAL VENDOR

_____ My firm has maintained a permanent place of business within Broward County and maintains a staffing level, within this local office, of at least 15% who are residents of the City of Pompano Beach

And/Or

_____ My firm has maintained a permanent place of business within Broward County and my submittal includes subcontracting commitments to Local Vendors Subcontractors for at least 20% of the contract value.

Or

_____ My firm does not qualify as a Tier 2 Vendor.

I certify that the above information is true to the best of my knowledge.

_____ _____

(Date) (Name of Firm)

BY: _____

(Name)

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PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the subsurface investigation work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

B. The subsurface investigation for conditions of the project site is the sole responsibility of the CONTRACTOR. In preparing the Bid, the CONTRACTOR shall make all subsurface or surface investigations necessary to provide proper background and knowledge to determine the nature and extent of work required.

C. CITY or CITY'S Representative provides no subsurface information, and makes no warranties or guarantees concerning the nature of materials to be encountered on the site.

1.03 RELATED WORK

A. Section 02110 - Clearing.

B. Section 02200 - Earthwork.

C. Section 02400 - Storm Drainage Facilities.

D. All applicable sections under Divisions 1, 2, 3, and 4.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section; it shall be included in the price of all other work.

END OF SECTION 02010

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the site demolition work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

1.03 RELATED WORK

A. Section 02200 - Earthwork.

B. All applicable Sections under Divisions 1, 2, 3, and 4.

1.04 QUALITY ASSURANCE

A. CONTRACTOR Qualifications: Minimum of five years experience in demolition of comparable nature.

B. Requirements of All Applicable Regulatory Agencies:

1. All applicable Building Codes and other Public Agencies having jurisdiction upon the work.

1.05 SUBMITTALS

A. Permits and notices authorizing building demolition.

B. Certificates of severance of utility services.

C. Permit for transport and disposal of debris.

D. Demolition procedures and operational sequence for review and acceptance by ENGINEER.

1.06 JOB CONDITIONS

A. Existing Conditions

1. The demolition work shall be done as indicated on the construction plans.

2. Remove all demolition debris from the site the same day the work is performed. Leave no deposits of demolished material on site over night.

3. Structural demolition, excavation, backfill and compaction as indicated in drawings.

B. Protection:

1. Erect barriers, fences, guardrails, enclosures, and shoring to protect personnel, structures, and utilities remaining intact.
2. Protect designated trees and plants from damages.
3. Use all means necessary to protect existing objects and vegetation designated to remain, and, in the event of damage, immediately make all repairs, replacements and dressings to damaged plants necessary, to the approval of the ENGINEER at no additional cost to the CITY.

C. Maintaining Traffic:

1. Ensure minimum interference with roads, streets, driveways, sidewalks, and adjacent facilities.
2. Do not close or obstruct streets and sidewalks without written approval from the ENGINEER.
3. If required by governing authorities, provide alternate routes around closed or obstructed traffic ways.

D. Dust Control:

1. Use all means necessary for preventing dust from demolition operations from being a nuisance to adjacent property CITY'S. Methods used for dust control are subject to approval by the ENGINEER prior to use.

E. Burning:

1. On-site burning will not be permitted.

1.07 GENERAL ITEMS

A. Scope of work shall comprise the following: Provide all labor, materials, necessary equipment and services to complete the demolition and clearing work, as indicated on the contract plans, and as specified herein.

B. The CONTRACTOR shall provide references to the CITY to demonstrate a minimum of five years experience in demolition of a comparable nature. Current occupational licenses held by CONTRACTOR shall be submitted to CITY.

C. The CONTRACTOR shall be responsible for adherence to all applicable codes of all regulatory agencies having jurisdiction upon the works.

1.08 PRE-DEMOLITION MEETING

A. A meeting shall be held with the CITY or CITY'S representative at the jobsite to describe intended demolition and cleaning procedures and schedules. This shall include identifying access routes for bringing necessary equipment in, removing debris from site, and designation of any trees, drives or other items to remain.

1.09 EXISTING CONDITIONS

A. The CONTRACTOR shall become thoroughly familiar with the site, and of existing utilities and their connections, and note all conditions, which may influence the work.

B. By submitting a bid, the CONTRACTOR affirms that CONTRACTOR has carefully examined the site and all conditions affecting work. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.

C. The CITY shall be responsible for removal of all hazardous materials such as asbestos, chemicals, etc., from the site prior to CONTRACTOR mobilizing on site. The CITY shall be notified immediately should the CONTRACTOR discover any further hazardous materials during demolition.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 INSPECTION

A. Contractor shall verify that structures to be demolished are discontinued in use and ready for removal.

B. Contractor shall not commence work until all conditions and requirements of all applicable public agencies are complied with.

3.02 PREPARATION

A. Arrange for, and verify termination of utility services to include removing meters and capping lines.

B. Notification: Notify the CITY at least three full working days prior to commencing the work of this Section.

3.03 CLARIFICATION

A. The drawings do not purport to show all objects existing on the site.

B. Before commencing the work of this Section, verify with the CITY all objects to be removed and all objects to be preserved.

3.04 SCHEDULING

A. Schedule all work in a careful manner with all necessary consideration for the public and the CITY.

B. Avoid interference with the use of, and passage to and from, adjacent facilities.

3.05 DISCONNECTION OF UTILITIES

A. Before starting site operations, disconnect or arrange for the disconnection of all affected utility service.

1. Arrange and pay for disconnecting, removing, capping, and plugging utility services. Disconnect and stub off. Notify affected utility company in advance and obtain approval before starting this work.

2. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction.

3. Place markers to indicate location of disconnected services.

4. On-site drainage structures and drain fields shall be removed in their entirety by methods approved by the CITY'S representative.

3.06 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

A. Utility Services: Maintain existing offsite utilities, keep in service, and protect against damage during demolition operations.

B. Prevent movement or settlement of adjacent structures. Provide and place bracing or shoring and be responsible for safety and support of structures. Assume liability for such movement, settlement, damage, or injury.

C. Cease operations and notify CITY immediately if safety of adjacent structures appears to be endangered. Take precautions to properly support structures. Do not resume operations until safety is restored.

D. Prevent movement, settlement, damage, or collapse of adjacent services, sidewalks, driveways and trees. Assume liability for such movement, settlement, or collapse. Promptly repair damage at no cost to the CITY.

E. Ensure safe passage of persons around areas of demolition.

3.07 MAINTAINING TRAFFIC

A. Do not interfere with use of adjacent buildings and facilities. Maintain free and safe passage to and from. Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed travel ways if required by governing authorities.

3.08 POLLUTION CONTROLS

A. Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

B. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations as directed by the CITY or their representative or governing authorities. Return adjacent areas to condition existing prior to start of work.

3.09 INSPECTION AND PREPARATION

A. Verify that structures to be demolished are discontinued in use and ready for removal.

B. Do not commence work until all conditions and requirements of all applicable public agencies are complied with.

C. Arrange for, and verify termination of utility services to include removing meters and capping lines.

D. The drawings do not purport to show all objects existing on the site; at the pre-demolition meeting before commencement of the work, verify with the CITY all objects to be removed and all objects to be preserved.

3.10 DEMOLITION

A. Pull out any existing utility lines designated for abandonment, irrigation, electrical lines, pull boxes and splice boxes, MAS'S and catch basins to be removed and all other objects designated to be removed or interfering with the work. Contact the utility company or agency involved for their requirements for performing this work. All removed equipment and materials shall be removed from the work area the same day as removed.

B. Remove all debris from the site and leave the site in a neat, orderly condition to the full acceptance of the ENGINEER, or the CITY. No debris shall be left on the site over night.

C. Clear and Grub and dispose of all trees, shrubs and other organic matter not otherwise addressed on tree removal and relocation plans and specifications.

3.11 DEMOLITION OF SITE STRUCTURES

A. Demolish all site structure items designated to be removed or which are required to be removed to perform the work. This item does not include buildings.

3.12 REMOVAL OF DEBRIS AND DISPOSAL OF MATERIAL

A. Material resulting from demolition and not scheduled for salvaging shall become the property of the CONTRACTOR and shall be removed from site and legally disposed of off-site. Disposal

shall be timely, performed as promptly as possible and not left until the final cleanup. Material shall not be left on the job site for more than 60 days.

B. Remove from site contaminated, vermin infested, or dangerous materials encountered and disposed of by safe means so as not to endanger health of workers and public.

C. Burning of removed materials from demolished structures will not be permitted on-site.

3.13 COMPLETION OF WORK

A. Leave the site in a neat, orderly condition to the full acceptance of the CITY.

B. Dirt remaining after demolition shall be graded level and compacted, in preparation for filling operations to follow demolition. Trenches shall be filled in layers of 12" maximum thickness and compacted in accordance with the technical specifications applicable to backfilling of trenches.

3.14 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section, it shall be included in the lump sum price bid for items associated with the demolition.

END OF SECTION 02050

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the clearing work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

B. Under this section, the CONTRACTOR shall do all clearing, grubbing, root-raking, and necessary clean-up operations in connection with the construction of the work and its related site work.

C. The work shall consist of the removal and disposal of trees, stumps, roots, limbs, brush, fences, asphalt, etc. from all project areas as designated on the drawings as specified herein, and as directed by the ENGINEER on the site.

D. The CONTRACTOR shall remove all refuse, asphalt pavement, concrete pavement, glass, metal, stone, plaster, lumber, paper materials, and any and all trash found in clearing and adjacent areas as directed by the ENGINEER.

E. The CONTRACTOR shall furnish all services, labor, transportation, materials, and equipment necessary for the performance of these operations. All clearing and cleanup operations shall be accomplished to the complete satisfaction of the ENGINEER.

F. The CONTRACTOR shall strip all existing topsoil and stockpile it on-site in locations approved by the CITY'S Representative. All topsoil material shall be stockpiled within a haul distance of 3,000 feet.

1.03 RELATED WORK

A. Section 02010 - Subsurface Investigation

B. Section 02200 - Earthwork.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 TREE REMOVAL AND TREE PRESERVATION

A. No trees shall be removed if located outside of the right-of-way and dedicated easement.

B. Within the rights-of-way and easements, no trees with a trunk diameter of 3" or greater at 4-1/2" above grade shall be removed without the approval of the ENGINEER with the exception of Australian Pines, Meleleuca or Florida Holly. Trees shall be evaluated on an individual basis in accordance with following:

a. Type and size of tree.
b. Proximity to proposed and/or existing utility lines and/or exfiltration trench.
c. Change in adjacent grades for swale excavation.
d. Proximity to proposed sidewalk.
e. Proximity to proposed edge of roadway.
f. Living condition of the tree.

C. If trees are determined to remain, Biobarrier shall be installed in accordance with the Biobarrier detail as shown on the Landscape Plans.

3.02 MEASUREMENT AND PAYMENT

A. Measurement and payment for this item will be made per square yard and will include grading of swales per Section 02210.

END OF SECTION 02110

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the dewatering work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

1.03 RELATED WORK

A. Section 02200 - Earthwork

B. Section 02400 - Storm Drainage Facilities

C. Section 02401 - Exfiltration Trench Drains

D. Section 02221 - Excavation and Backfilling for Utilities

E. Section 02601 - Subterranean Structures

F. Section 02610 - Piping, General Section

PART 2 - PRODUCTS

2.01 EQUIPMENT

Dewatering, where required, may include the use of temporary reservoirs and diking, well points, sump pumps, temporary pipelines for water disposal, rock or gravel placement, and other means. Standby pumping equipment must be maintained on the job site and operate within any local noise ordinance limits. All safety requirements, fencing, etc. shall be installed and maintained by the CONTRACTOR.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. The CONTRACTOR shall provide all equipment necessary for dewatering. It shall have on hand, at all times, sufficient pumping equipment and machinery in good working condition and shall have available, at all times, competent workmen for the operation of the pumping equipment. Adequate standby equipment shall be kept available at all times to insure efficient dewatering and maintenance of dewatering operation during power failure.

B. Dewatering for structures and pipelines shall commence when groundwater is first encountered, and shall be continuous until such times as water can be allowed to rise in accordance with the provisions of this Section or other requirements.

C. At all times, site grading shall promote drainage. Surface runoff shall be diverted from excavations, Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and be pumped or drained by gravity from the excavation to maintain a bottom free from standing water.

D. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation.

E. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with pea rock at no additional cost to the CITY.

F. The CONTRACTOR shall maintain the water level below the bottom of excavation in all work areas where groundwater occurs during excavation construction, backfilling, and up to acceptance.

G. The CONTRACTOR shall prevent flotation by maintaining a positive and continuous removal of water. The CONTRACTOR shall be fully responsible and liable for all damages which may result from failure to adequately keep excavations dewatered.

H. If well points or wells are used, they shall be adequately spaced to provide the necessary dewatering and shall be sand-packed and/or other means used to prevent pumping of fine sands or silts from the subsurface. A continual check by the CONTRACTOR shall be maintained to ensure that the subsurface soil is not being removed by the dewatering operation.

I. The CONTRACTOR is responsible for pot holing the sewer service laterals before well pointing. The CITY will mark the general location; however CONTRACTOR must visually verify the location.

J. The CONTRACTOR shall dispose of water from the WORK in a suitable manner without damage to adjacent property. CONTRACTOR shall be responsible for obtaining any permits that may be necessary to dispose of water. No water shall be drained into work built or under construction without prior consent of the ENGINEER. Water shall be filtered using a silt box or another approved method to remove sand and fine-sized soil particles before disposal into any drainage system. The ENGINEER prior to being used shall approve dewatering disposal points. Storm drains used by the CONTRACTOR for dewatering shall be cleaned by a jet vac, or other method approved by the ENGINEER after dewatering is complete.

K. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures, pipelines, and sewers.

L. Dewatering of trenches and other excavations shall be considered, as incidental to the construction of the WORK and all costs thereof shall be included in the various contract prices in the Bid Forms, unless a separate bid item has been established for dewatering.

M. The CONTRACTOR shall submit a dewatering plan to the ENGINEER for review. The CONTRACTOR is advised that the Broward County Department of Planning and Environmental Protection (BCDPEP) and/or SFWMD may require that a dewatering plan, prepared by a State of Florida licensed Professional Engineer or Registered Professional Geologist. The CONTRACTOR will be responsible for obtaining any necessary dewatering permit including but not limited to Broward County Department of Planning and Environmental Protection (BCDPEP) and SFWMD.

N. The CONTRACTOR is advised that the BCDPEP may have identified contaminated sites within 1/4-mile radius of the project site. The CONTRACTOR may be required to provide testing and monitoring of the dewatering operations, and to institute dewatering methods and controls, as required by BCDPEP.

3.02 QUALITY CONTROL

A. It shall be the sole responsibility of the CONTRACTOR to control the rate and effect of the dewatering in such a manner as to avoid all objectionable settlement and subsidence.

B. All dewatering operations shall be adequate to assure the integrity of the finished project and shall be the responsibility of the CONTRACTOR.

C. Where critical structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at frequent intervals to detect any settlement, which may develop. The responsibility for conducting the dewatering operation in a manner, which will protect adjacent structures and facilities, rests solely with the CONTRACTOR. The cost of repairing any damage to adjacent structures and restoration of facilities shall be the responsibility of the CONTRACTOR.

3.03 CONTRACTOR SUBMITTALS

Prior to commencement of excavation, the CONTRACTOR shall submit a detailed plan and operation schedule for dewatering of excavations. The CONTRACTOR may be required to demonstrate the system proposed and to verify that adequate equipment, personnel, and materials are provided to dewater the excavations at all locations and times. The CONTRACTOR's dewatering plan is subject to review by the ENGINEER and regulatory agencies.

3.04 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section. It shall be included in the appropriate unit price bid.

END OF SECTION 02140

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the Earthwork, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

B. Including but not necessarily limited to the following:

1. Excavation, including demucking

2. Backfilling

3. Filling

4. Grading, general site and building pads

5. Compaction

C. There shall be no classification of excavation for measurement of payment regardless of materials encountered.

D. The work of this Section includes all earthwork required for construction of the WORK. Such earthwork shall include, but not be limited to, the loosening, removing, loading, transporting, depositing, and compacting in its final location of all materials wet and dry, as required for the purposes of completing the work specified in the Contract Documents, which shall include, but not be limited to, the furnishing, placing, and removing of sheeting and bracing necessary to safely support the sides of all excavation; all pumping, ditching, draining, and other required measures for the removal or exclusion of water from the excavation; the supporting of structures above and below the ground; all backfilling around structures and all backfilling of trenches and pits; the disposal of excess excavated materials; borrow of materials to makeup deficiencies for fills; and all other incidental earthwork, all in accordance with the requirement of the Contract Documents.

1.03 RELATED WORK

A. Section 02050 - Demolition.

B. Section 02210 - Site Grading.

C. All applicable sections of Division 1, 2, 3, and 4.

1.04 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Codes: All codes, as referenced herein, are specified in Section 01090, "Reference Standards".

B. Commercial Standards:

ASTM D 422	Method for Particle-Size Analysis of Soils.
ASTM D 698	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5-lb (2.49-kg) Rammer and 12-in (304.8-mm) Drop.
ASTM D 1556	Test Method for Density of Soil in Place by the Sand Cone Method.
ASTM D 1557	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.54-kg) Rammer and 18-in (457-mm) Drop.
ASTM D 1633	Test Method for Compressive Strength of Molded Soil-Cement Cylinders.
ASTM D 2419	Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
ASTM D 2487	Classification of Soils for Engineering Purposes.
ASTM D 2901	Test Method for Cement Content of Freshly-Mixed Soil-Cement.
ASTM D 2922	Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
ASTM D 4253	Test Methods for Maximum Index Density of Soils Using a Vibratory Table.
ASTM D 4254	Test Methods for Minimum Index Density of Soils and Calculation of Relative Density.

1.05 SUBSOIL INFORMATION

A. There are no representations of any type made as to subsurface conditions.

1.06 SITE INSPECTION

A. CONTRACTOR shall visit the site and acquaint with all existing conditions. CONTRACTOR shall investigate the site and subsurface conditions with no cost to the CITY if CONTRACTOR chooses to. Such subsurface investigations shall be performed only under time schedules and arrangements approved in advance by the CITY'S Representative and ENGINEER.

1.07 TOPOGRAPHIC INFORMATION

A. The existing grades shown on the drawings are approximate only and no representation is made as to their accuracy or consistency. The CONTRACTOR shall verify all existing grades to the extent necessary to insure completion of the job to the proposed grades indicated on the drawings.

1.08 DISPOSAL OF SURPLUS OR UNSUITABLE MATERIAL

A. Unsuitable material encountered during the course of construction shall be removed from the construction site at the expense of the CONTRACTOR. Unsuitable material shall not be stockpiled on-site. All suitable material shall be stockpiled on-site at areas designated by the ENGINEER.

1.09 BENCH MARKS AND MONUMENTS

A. CONTRACTOR shall employ a registered surveyor to lay out lines and grades as indicated. A surveyor registered in the State of Florida shall establish benchmarks. Benchmarks shall be permanent and easily accessible and maintained and replaced if disturbed or destroyed. All benchmarks shall be NAVD.

1.10 UTILITIES

A. Before starting site operations, disconnect or arrange for the disconnection of all utility services designated to be removed in accordance with Section 02050 "Demolition".

B. Locate all existing active utility lines traversing the site and determine the requirements for their protection. Preserve in operating condition all active utilities adjacent to or traversing the site and/or designated to remain.

C. Observe rules and regulations governing respective utilities in working under requirements of this section. Adequately protect utilities from damage, remove or replace as indicated, specified or required. Remove, plug or cap inactive or abandoned utilities encountered in excavation. Record the location of all utilities.

1.11 QUALITY ASSURANCE

A. A SOILS ENGINEER may be retained by the CITY to observe performance of work in connection with excavating, filling, grading, and compaction. The CONTRACTOR shall re-adjust all work performed that does not meet technical or design requirements but make no deviations from the Contract documents without specific and written acceptance of the ENGINEER.

B. Where soil material is required to be compacted to a percentage of maximum density, the maximum density at optimum moisture content will be determined in accordance with ASTM D 1557. Where cohesionless, free draining soil material is required to be compacted to a percentage of relative density, the calculation of relative density will be determined in accordance with ASTM D 4253 and D 4254. Field density in-place tests will be performed in accordance with ASTM D 1556, ASTM D 2922, or by such other means acceptable to the ENGINEER.

C. In case the tests of the fill or backfill show non-compliance with the required density, the CONTRACTOR shall accomplish such remedy as may be required to insure compliance. Subsequent testing to show compliance shall be by a testing laboratory selected by the CITY and shall be at the CONTRACTOR's expense.

D. Particle size analysis of soils and aggregates will be performed using ASTM D 422.

E. Determination of sand equivalent value will be performed using ASTM D 2419.

F. Unified Soil Classification System: References in these specifications to soil classification types and standards are set forth in ASTM D 2487. The CONTRACTOR shall be bound by all applicable provisions of said ASTM D 2487 in the interpretation of soil classifications.

G. Requirements of all applicable building codes and other public agencies having jurisdiction upon the work.

PART 2 - PRODUCTS

2.01 SUITABLE FILL AND BACKFILL MATERIAL REQUIREMENTS

A. General: Fill, backfill, and embankment materials shall be suitable selected or processed clean, fine earth, rock, or sand, free from grass, roots, brush, or other vegetation.

B. Fill and backfill materials to be placed within 6 inches of any structure or pipe shall be free of rocks or unbroken masses of earth materials having a maximum dimension larger than 3 inches.

C. Suitable Materials: Soils not classified as unsuitable as defined in Paragraph entitled, "Unsuitable Material" herein, are defined as suitable materials and may be used in fills, backfilling, and embankment construction subject to the specified limitations. In addition, when acceptable to the ENGINEER, some of the material listed as unsuitable may be used when thoroughly mixed with suitable material to form a stable composite.

D. Suitable materials may be obtained from on-site excavations, may be processed on-site materials, or may be imported. If imported materials are required to meet the requirements of this Section or to meet the quantity requirements of the project the CONTRACTOR shall provide the imported materials at no additional expense to the CITY, unless a unit price item is included for imported materials in the bidding schedule.

E. The following types of suitable materials are designated and defined as follows:

1. Type A (one inch minus granular backfill): Crushed rock, gravel, or sand with 100 percent passing a 1-inch sieve and a sand equivalent value not less than 50.

2. Type B (one half inch minus granular backfill): Crushed rock, gravel, or sand with 100 percent passing a 1/2-inch sieve and a sand equivalent value not less than 50.

3. Type C (sand backfill): Sand with 100 percent passing a 3/8-inch sieve, at least 90 percent passing a number 4 sieve, and a sand equivalent value not less than 30.

4. Type D (coarse rock backfill): Crushed rock or gravel with 100 percent passing a 1-inch sieve and not more than 10 percent passing a Number 4 sieve.

5. Type E (pea gravel backfill): Crushed rock or gravel with 100 percent passing a 1/2-inch sieve and not more than 10 percent passing a Number 4 sieve.

6. Type F (coarse drainrock): Crushed rock or gravel meeting the following gradation requirements:

Sieve Size	Percentage Passing
2-inch	100
1-1/2-inch	90-100
1-inch	20-55
3/4-inch	0-15
No. 200	0-3

7. Type G (aggregate base): Crushed rock aggregate base material of such nature that it can be compacted readily by watering and rolling to form a firm, stable base for pavements. At the option of the CONTRACTOR, the grading for either the 1-1/2-inch maximum size or 3/4-inch maximum size shall be used. The sand equivalent value shall be not less than 22, and the material shall meet the following gradation requirements.

	Percentage Passing	
Sieve Size	1-1/2 inch Max.	3/4-inch Max.
2-inch	100	-
1-1/2 inch	90-100	-
1-inch	-	100
3/4-inch	50-85	90-100
No. 4	25-45	35-55
No. 30	10-25	10-30
No. 200	2-9	2-9

8. Type H (graded drainrock): Drainrock shall be crushed rock or gravel, durable and free from slaking or decomposition under the action of alternate wetting or drying. The material shall be uniformly graded and shall meet the following gradation requirements.

Sieve Size	Percentage Passing
1-inch	100
3/4-inch	90-100
3/8-inch	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

The drainrock shall have a sand equivalent value not less than 75. The finish-graded surface of the drainrock immediately beneath hydraulic structures shall be stabilized to provide a firm, smooth surface upon which to construct reinforced concrete floor slabs. The CONTRACTOR shall use, at its option, one of the asphalt types listed below:

	Type 1	Type 2	Type 3
Designation	SC-70	SC-250	RS-1
Spray Temperature (°F)	135-175	165-200	70-120
Coverage (gal/ sq yd)	0.50	0.50	0.50

If the surface remains tacky, sufficient sand shall be applied to absorb the excess asphalt.

9. Type I: Any other suitable material as defined herein.

10. Type J (cement-treated backfill): Material which consists of Type H material, or any mixture of Types B, C, G and H materials which has been cement-treated so that the cement content of the material is not less than 5 percent by weight when tested in accordance with ASTM D 2901. The ultimate compressive strength at 28 days shall be not less than 400 psi when tested in accordance with ASTM D 1633.

11. Type K (topsoil): Stockpiled topsoil materials, which have been obtained at the site by removing soil to a depth not exceeding 2 feet. Removal of the topsoil shall be done after the area has been stripped of vegetation and debris as specified.

12. Type L (Class I crushed stone): Manufactured angular, granular crushed stone, rock, or slag, with 100 percent passing a 1-inch sieve and less than 5 percent passing a Number 4 sieve.

13. Type M (aggregate subbase): Crushed rock aggregate subbase material that can be compacted readily by watering and rolling to form a firm stable base. The sand equivalent value shall be not less than 18 and shall meet the following gradation requirements.

Sieve Size	Percentage Passing
3-inch	100
2-1/2 inch	87-100
No. 4	35-95
No. 200	0-29

14. Type N (trench plug): Low permeable fill material, a non-dispersible clay material having a minimum plasticity index of 10.

2.02 UNSUITABLE MATERIAL

A. Unsuitable soils for fill material shall include soils which, when classified under ASTM D 2487, fall in the classifications of Pt, OH, CH, MH or OL.

B. In addition, any soil, which cannot be compacted sufficiently to achieve the percentage of maximum density specified for the intended use, shall be classed as unsuitable material.

2.03 USE OF FILL, BACKFILL, AND EMBANKMENT MATERIAL TYPES

A. The CONTRACTOR shall use the types of materials as designated herein for all required fill, backfill, and embankment construction hereunder.

B. Where these Specifications conflict with the requirements of any local agency having jurisdiction, or with the requirements of a material manufacture, the ENGINEER shall be immediately notified. In case of conflict therewith, the CONTRACTOR shall use the most stringent requirement, as determined by the ENGINEER.

C. Fill and backfill types shall be used in accordance with the following provisions:

1. Embankment fills shall be constructed of Type I material, as defined herein, or any mixture of Type I and Type A through Type H materials.

2. Pipe zone backfill, as defined under "Pipe and Utility Trench Backfill" herein, shall consist of the following materials for each pipe material listed below. Where pipelines are installed on grades exceeding 4 percent, and where backfill materials are graded such that there is less than 10 percent passing a Number 4 sieve, trench plugs of Type J or N material shall be provided at maximum intervals of 200 feet or as shown on the Drawings.

   a. Mortar coated pipe, concrete pipe, and uncoated ductile iron pipe shall be provided Type A, B, C, D, E, or L pipe zone backfill material.

   b. Coal tar enamel coated pipe, polyethylene encased pipe, tape wrapped pipe, and other non-mortar coated pipe shall be backfilled with Type C pipe zone backfill material.

   c. Plastic pipe and vitrified clay pipe shall be backfilled with Type L pipe zone backfill material.

3. Trench zone backfill for pipelines as defined under "Pipe and Utility Trench Backfill" shall be Type I backfill material or any of Types A through H backfill materials or any mixture thereof, except that Type K material may be used for trench zone backfill in agricultural areas unless otherwise shown or specified.

4. Final backfill material for pipelines under paved area, as defined under "Pipe and Utility Trench Backfill" shall be Type G backfill material. Final backfill under areas not paved shall be the same material as that used for trench backfill, except that Type K material shall be used for final backfill in agricultural areas unless otherwise shown or specified.

5. Trench backfill and final backfill for pipelines under structures shall be the same material as used in the pipe zone, except where concrete encasement is required by the Contract Documents.

6. Aggregate base materials under pavements shall be Type G material constructed to the thickness shown or specified. Where specified or shown, aggregate subbase shall be Type M Material.

7. Backfill around structures shall be Type I material, or Types A through Type H materials, or any mixture thereof.

8. Backfill materials beneath structures shall be as follows:

   a. Drainrock materials under hydraulic structures or other water retaining structure with underdrain systems shall be Type H material.

   b. Under concrete hydraulic structures or other water retaining structures without underdrain systems, Types G or H materials shall be used.

   c. Under structures where groundwater must be removed to allow placement of concrete, Type F material shall be used.

   d. Under all other structures, Type D, E, G, or H material shall be used.

9. Backfill used to replace pipeline trench over-excavation shall be a layer of Type F material with a 6-inch top filter layer of Type E material or filter fabric to prevent migration of fines for wet trench conditions or the same material as used for the pipe zone backfill if the trench conditions are not wet. Filter fabric shall be Mirafi 140 N, Mirafi 700X, or equal.

10. The top 6 inches of fill on reservoir roofs, embankment fills around hydraulic structures, and all other embankment fills shall consist of Type K material, topsoil.

2.04 EMBANKMENT

A. The maximum sizes of rock, which will be permitted in the completed fill areas, are as follows:

Depth Below Finish Grade	Maximum Allowable Diameter
Top 4 inches	1 inch
4 inches to 12 inches	3-1/2 inches
12 inches to 2 feet	6 inches
2 feet to 4 feet	12 inches
4 feet to 8 feet	24 inches
Below 8 feet	36 inches

B. Embankments shall be constructed of material containing no muck, stumps, roots, brush, vegetable matter, rubbish or other material that will not compact into a suitable and enduring roadbed, and material designated as undesirable shall be removed from the site. Where embankments are constructed adjacent to bridge end bents or abutments, rock larger than 3-1/2 inches in diameter shall not be placed within three feet of the location of any abutment.

C. Fill material containing debris, sod, and biodegradable materials shall not be used as fill in construction areas.

D. Fill material required for the building pads and for pavement subgrade shall be granular fill, free of organic material.

E. Fill material required for pervious and sodded areas shall have a maximum organic component of 10%. CONTRACTOR shall provide, at CONTRACTOR'S cost, organic content test results for approval by the ENGINEER.

PART 3 - EXECUTION

3.01 JOB CONDITIONS

A. Protection: Use all means necessary to protect existing objects and vegetation. In the event of damage, immediately make all repairs, and replacements necessary to the acceptance of the CITY'S Representative and ENGINEER at no cost to the CITY.

3.02 BACKFILL, FILLING & GRADING

A. Grades:

1. Cut, backfill, fill and grade to proper grade levels indicated. The proposed grades shown on the drawings are for establishing a finished grade over the site.

B. Filling:

1. Fill material shall be placed in horizontal layers and spread to obtain a uniform thickness.

2. After compaction, layers of fill are not to exceed twelve (12) inches for cohesive soils or eight (8) inches for non-cohesive soils.

3.03 STRUCTURE, ROADWAY, AND EMBANKMENT EXCAVATION

A. General: Except when specifically provided to the contrary, excavation shall include the removal of all materials of whatever nature encountered, including all obstructions of any nature that would interfere with the proper execution and completion of the work. The removal of said materials shall conform to the lines and grades shown or ordered. Unless otherwise provided, the entire construction site shall be stripped of all vegetation and debris, and such material shall be removed from the site prior to performing any excavation or placing any fill. The CONTRACTOR shall furnish, place, and maintain all supports and shoring that may be required for the sides of the excavations, and all pumping, ditching, or other measure for the removal or exclusion of water, including taking care of storm water, groundwater, and wastewater reaching the site of the work from any source so as to prevent damage to the work or adjoining property. Excavations shall be sloped or otherwise supported in a safe manner in accordance with applicable State safety requirements and the requirements of OSHA Safety and Health Standards for Construction (29CFR1926).

B. Excavation Beneath Structures and Embankments: Except where otherwise specified for a particular structure or ordered by the ENGINEER, excavation shall be carried to the grade of the bottom of the footing or slab. Where shown or ordered, areas beneath structures or fills shall be over-excavated. The subgrade areas beneath embankments shall be excavated to remove not less than the top [6 inches] of native material and where such subgrade is sloped, the native material shall be benched. When such over excavation is shown, the CONTRACTOR shall perform both over-excavation and subsequent backfill to the required grade. When such over-excavation is not shown but is ordered by the ENGINEER, such over-excavation and any resulting backfill will be paid for under a separate unit price bid item if such bid item has been established; otherwise payment will be made in accordance with a negotiated price. After the required excavation or over-excavation has been completed, the exposed surface shall be scarified to a depth of 6 inches, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain density as specified in Paragraph 3.14.I.

C. Excavation Beneath Paved Areas: Excavation under areas to be paved shall extend to the bottom of the aggregate base or subbase, if such base is called for; otherwise it shall extend to the paving thickness. After the required excavation has been completed, the top 12 inches of exposed surface shall be scarified, brought to optimum moisture content, and rolled with heavy compaction equipment to obtain density as specified in Paragraph 3.14.I. The finished subgrade shall be even, self-draining, and in conformance with the slope of the finished pavement. Areas that could accumulate standing water shall be regraded to provide a self-draining subgrade.

D. Notification of ENGINEER: The CONTRACTOR shall notify the ENGINEER at least 3 days in advance of completion of any structure excavation and shall allow the ENGINEER a review period of at least one day before the exposed foundation is scarified and compacted or is covered with backfill or with any construction materials.

3.04 PIPELINE AND UTILITY TRENCH EXCAVATION

A. General: Unless otherwise shown or ordered, excavation for pipelines and utilities shall be open-cut trenches. Trench widths shall be kept as narrow as is practical for the method of pipe zone densification selected by the CONTRACTOR, but shall have a minimum width at the bottom of the trench equal to the outside diameter of the pipe plus 24 inches for mechanical compaction methods and 18 inches for water consolidation methods. The maximum width at the top of the pipe shall be equal to the outside diameter of the pipe plus 36 inches for pipe diameters 18 inches and larger and to the outside diameter of the pipe plus 24 inches for pipe diameters less than 18 inches, or as shown on the Drawings.

B. Trench Bottom: Except when pipe bedding is required, the bottom of the trench shall be excavated uniformly to the grade of the bottom of the pipe. The trench bottom shall be given a final trim, using a string line for establishing grade, such that each pipe section when first laid will be continually in contact with the ground along the extreme bottom of the pipe. Rounding out the trench to form a cradle for the pipe will not be required. Excavations for pipe bells and welding shall be made as required.

C. Open Trench: The maximum amount of open trench permitted in any one location shall be 300 feet, or the length necessary to accommodate the amount of pipe installed in a single day, whichever is greater. All trenches shall be fully backfilled at the end of each day or, in lieu thereof, shall be covered by heavy steel plates adequately braced and capable of supporting

vehicular traffic in those locations where it is impractical to backfill at the end of each day. The above requirements for backfilling or use of steel plate will be waived in cases where the trench is located further than 100 feet from any traveled roadway or occupied structure. In such cases, however, barricades and warning lights meeting OSHA requirements shall be provided and maintained.

D. Trench Over-Excavation: Where the Drawings indicate that trenches shall be over-excavated, they shall be excavated to the depth shown, and then backfilled to the grade of the bottom of the pipe.

E. Over-Excavation: When ordered by the ENGINEER, whether indicated on the Drawings or not, trenches shall be over-excavated beyond the depth shown. Such over-excavation shall be to the depth ordered. The trench shall then be backfilled to the grade of the bottom of the pipe. All work specified in this Section shall be performed by the CONTRACTOR when the over-excavation ordered by the ENGINEER is less than 6 inches below the limits shown. When the over-excavation ordered by the ENGINEER is 6 inches or greater below the limits shown, additional payment will be made to the CONTRACTOR for that portion of the work which is located below said 6-inch distance. Said additional payment will be made under separate unit price bid items for over-excavation and bedding if such bid items have been established; otherwise payment will be made in accordance with a negotiated price.

F. Where pipelines are to be installed in embankment or structure fills, the fill shall be constructed to a level at least one foot above the top of the pipe before the trench is excavated.

3.05 OVER-EXCAVATION NOT ORDERED, SPECIFIED, OR SHOWN

A. Any over-excavation carried below the grade ordered, specified, or shown, shall be backfilled to the required grade with the specified material and compaction. The CONTRACTOR at its own expense shall perform such work.

3.06 EXCAVATION IN LAWN AREAS

A. Where excavation occurs in lawn areas, the sod shall be carefully removed, kept damp, and stockpiled to preserve it for replacement. Excavated material may be placed on the lawn; provided that a drop cloth or other suitable method is employed to protect the lawn from damage. The lawn shall not remain covered for more than 72 hours. Immediately after completion of backfilling and testing of the pipeline, the sod shall be replaced and lightly rolled in a manner so as to restore the lawn as near as possible to its original condition. CONTRACTOR shall provide new sod if stockpiled sod has not been replaced within 72 hours.

3.07 EXCAVATION IN VICINITY OF TREES

A. Except where trees are shown to be removed, trees shall be protected from injury during construction operations. No tree roots over 2 inches in diameter shall be cut without express permission of the ENGINEER. Trees shall be supported during excavation by any means previously reviewed and approved by the ENGINEER.

3.08 ROCK EXCAVATION

A. Rock is defined as follows:

1. Rock shall be classified as material having a blow count in excess of 30 blows per foot from a Standard Penetration Test (ASTM D-1586) and exceeding 1000 psi from an Unconfined Compression Strength Test (ASTM D-2938); and,
2. General Excavation - Any material that cannot be excavated with a single-toothed ripper drawn by a crawler tractor having a minimum draw bar pull rated at not less than 71,000 lbs. (Caterpillar D9N or equivalent), and occupying an original volume of at least 2 cubic yards or more; and,

3. Trench Excavation - Any material that cannot be excavated with a backhoe having a break out force rated at not less than 44,000 lbs. (Caterpillar 235D or equivalent), and occupying an original volume of at least 2 cubic yards.

B. Rock excavation shall include removal and disposal of the following: (1) all boulders measuring 1/3 of a cubic yard or more in volume; (2) all rock material in ledges, bedding deposits, and unstratified masses which cannot be removed without systematic drilling and blasting; (3) concrete or masonry structures which have been abandoned; and (4) conglomerate deposits which are so firmly cemented that they possess the characteristics of rock as described in Paragraph 3.09(A).

C. Said rock excavation shall be performed by the CONTRACTOR; provided, that should the quantity of rock excavation be affected by any change in the scope of the work, an appropriate adjustment of the contract price will be made under a separate bid item if such bid item has been established; otherwise payment will be made in accordance with a negotiated price.

D. Explosives and Blasting: Blasting will not be permitted, except by express permission of the ENGINEER on a case-by-case basis. The use of explosives will be subject to the approval and regulations of all agencies having jurisdiction. If blasting is utilized at the site of the WORK, the CONTRACTOR shall take all precautions and provide all protective measures necessary to prevent damage to property and structures or injury to person. Prior to blasting, the CONTRACTOR shall secure all permits required by law for blasting operations and shall provide any additional hazard insurance required by the CITY. The CONTRACTOR shall have a fully qualified and experienced blasting foreman in charge of all blasting operations.

E. The CONTRACTOR will be held responsible for all and shall make good any damage caused by blasting or resulting from its possession or use of explosives on the WORK.

F. All operations involving the handling, storage, and use of explosives shall be conducted in accordance with the requirements of the OSHA Standards for Construction, and in accordance with all local laws and regulations.

3.09 DISPOSAL OF EXCESS EXCAVATED MATERIAL

A. The CONTRACTOR shall remove and dispose of all excess excavated material at a site within the CITY limits, selected by the CONTRACTOR and reviewed by the ENGINEER.

3.10 DISPOSAL OF UNSUITABLE EXCAVATED MATERIAL

A. The CONTRACTOR shall remove and dispose of all unsuitable excavated material. This shall include muck, tree roots, rocks, garbage, debris, or any other material designated as unsuitable by Paragraph 2 of this Section. Disposal shall be at a site selected by the CONTRACTOR that is designated as an approved disposal site for the unsuitable material.

3.11 BACKFILL - GENERAL

A. Backfill shall not be dropped directly upon any structure or pipe. Backfill shall not be placed around or upon any structure until the concrete has attained sufficient strength to withstand the loads imposed. Backfill around water retaining structures shall not be placed until the structures have been tested, and the structures shall be full of water while backfill is being placed.

B. Except for drainrock materials being placed in over-excavated areas or trenches, backfill shall be placed after all water is removed from the excavation.

3.12 PLACING AND SPREADING OF BACKFILL MATERIALS

A. Backfill materials shall be placed and spread evenly in layers. When compaction is achieved using mechanical equipment the layers shall be evenly spread so that when compacted each layer shall not exceed 6 inches in thickness.

B. During spreading each layer shall be thoroughly mixed as necessary to promote uniformity of material in each layer. Pipe zone backfill materials shall be manually spread around the pipe so that when compacted the pipe zone backfill will provide uniform bearing and side support.

C. Where the backfill material moisture content is below the optimum moisture content water shall be added before or during spreading until the proper moisture content is achieved.

D. Where the backfill material moisture content is too high to permit the specified degree of compaction the material shall be dried until the moisture content is satisfactory.

3.13 COMPACTION - GENERAL

A. Compact each layer of fill in designated areas with approved equipment to achieve a maximum density at optimum moisture, AASHTO T 180 - latest edition.

1. Building Pads: compaction shall be to 98% of maximum density, unless otherwise shown on the drawings or specifications. Building pads shall be within plus or minus one-tenth (0.1) of a foot of the elevations shown on the plans.

2. Refer to Sections 02513 Asphaltic Concrete Paving and 02515 Portland Cement Concrete Paving for compaction requirements in the affected areas.

3. Under landscaped area, compaction shall be to density as specified in Paragraph 3.14.I., unless otherwise shown on the Drawings.

B. No backfill shall be placed against any masonry or other exposed building surface until permission has been given by the CITY'S Representative, and in no case until the masonry has been in place seven days.

C. Heavy construction equipment will not be permitted within ten (10) feet of any masonry or other exposed building surface.

D. Compaction in limited areas shall be obtained by the use of mechanical tampers or approved hand tampers. When hand tampers are used, the materials shall be deposited in layers not more than four inches thick. The hand tampers used shall be suitable for this purpose and shall have a face area of not more than 100 square inches. Special precautions shall be taken to prevent any wedging action against masonry, or other exposed building surfaces.

3.14 COMPACTION OF FILL, BACKFILL, AND EMBANKMENT MATERIALS

A. Each layer of Types, A, B, C, G, H, I, and K backfill materials as defined herein, where the material is graded such that at least 10 percent passes a No. 4 sieve, shall be mechanically compacted to the specified percentage of maximum density. Equipment that is consistently capable of achieving the required degree of compaction shall be used and each layer shall be compacted over its entire area while the material is at the required moisture content.

B. Each layer of Type D, E, F, and J backfill materials shall be compacted by means of at least 2 passes from a flat plate vibratory compactor. When such materials are used for pipe zone backfill, vibratory compaction shall be used at the top of the pipe zone or at vertical intervals of 24 inches, whichever is the least distance from the subgrade.

C. Type L material requires mechanical spreading and placement to fill voids but does not require mechanical compaction or vibration.

D. Fill on reservoir and structure roofs shall be deposited at least 30 days after the concrete roof slab has been placed. Equipment weighing more than 10,000 pounds when loaded shall not be used on a roof. A roller weighing not more than 8,000 pounds shall be used to compact fill on a roof.

E. Flooding, ponding, or jetting shall not be used for fill on roofs, backfill around structures, backfill around reservoir walls, for final backfill materials, or aggregate base materials.

F. Pipe zone backfill materials that are granular may be compacted by a combination of flooding and vibration using concrete vibrators or by jetting, when acceptable to the ENGINEER.

G. Pipeline trench zone backfill materials, containing 5 percent or less of material passing a No. 200 sieve, may be compacted using flooding and jetting or vibration if the CONTRACTOR uses effective procedures that yield the specified compaction test results. Flooding and jetting shall not be done in such a manner that the pipe or nearby utilities are damaged, in areas of poorly draining or expansive soils, or where the use of the procedure is prohibited by any agency having jurisdiction over the street or right-of-way. Approved jet pipes or immersible vibrators shall be used so that each backfill layer is saturated and consolidated to its full depth before the next layer is placed. Jet pipes shall be kept at least 6 inches away from the pipe where the backfills being consolidated and 2 feet away from other pipes or utilities.

H. Equipment weighing more than 10,000 pounds shall not be used closer to walls than a horizontal distance equal to the fill at that time. Hand operated power compaction equipment shall be used where use of heavier equipment is impractical or restricted due to weight limitations.

I. Compaction Requirements: The following compaction test requirements shall be in accordance with AASHTO T-180. Where agency or utility company requirements govern, the highest compaction standards shall apply.

Location or Use of Fill	Percentage of Maximum Density
Pipe zone backfill portion above bedding for flexible pipe.	98
Pipe zone backfill bedding and over-excavated zones under bedding/pipe for flexible pipe, including trench plugs.	98
Pipe zone backfill portion above bedding for rigid pipe.	98
Pipe zone backfill bedding and over-excavated zones under bedding/pipe for rigid pipe.	98
Final backfill, beneath paved areas or structures	98
Final backfill, not beneath paved areas or structures	95
Trench zone backfill, not beneath paved areas or structures, including trench plugs	95
Embankments	98
Embankments, beneath paved areas or structures	98
Backfill beneath structures, hydraulic structures	98
Backfill around structures	98

Location or Use of Fill	Percentage of Maximum Density
Topsoil (Type K material)	80
Aggregate base or subbase Type G or M material)	98

J. Trench Backfill Requirements: the pipe has been structurally designed based upon the trench configuration specified herein.

K. The CONTRACTOR shall maintain the indicated trench cross section up to a horizontal plane lying 6 inches above the top of the pipe.

L. If, at any location under said horizontal plane, the CONTRACTOR slopes the trench walls or exceeds the maximum trench widths indicated in the Contract Documents, the pipe zone backfill shall be "improved" or the pipe class increased as specified herein, at no additional cost to the CITY. "Improved" backfill shall mean sand-cement backfill or other equivalent materials acceptable to the ENGINEER.

M. If the allowable deflection specified for the pipe is exceeded, the CONTRACTOR shall expose and reground or replace the pipe, repair all damaged lining and coating, and reinstall the pipe zone material and trench backfill as specified at no additional expense to the CITY.

3.15 PIPE AND UTILITY TRENCH BACKFILL

A. Pipe zone Backfill: The pipe zone is defined as that portion of the vertical trench cross-section lying between a plane 6 inches below the bottom surface of the pipe, i.e., the trench subgrade, and a plane at a point 6 inches above the top surface of the pipe. The bedding for flexible pipe is defined as that portion of pipe zone backfill material between the trench subgrade and the bottom of the pipe. The bedding for rigid pipe is defined as that portion of the pipe zone backfill material between the trench subgrade and a level line which varies from the bottom of the pipe to the springline as shown.

B. Bedding shall be provided for all sewers, drainage pipelines, and other gravity flow pipelines. Unless otherwise specified or shown, for other pipelines the bedding may be omitted if all the following conditions exist.

1. The pipe bears on firm, undisturbed native soil, which contains only particles that will pass a one-inch sieve.

2. The trench excavation is not through rock or stones.

3. The trench subgrade soils are classified as suitable fill and backfill materials per Paragraph 2.01.

4. The trench subgrade soils have, as a maximum, a moisture content that allows compaction.

C. Where bedding is required, after compacting the bedding the CONTRACTOR shall perform a final trim using a stringline for establishing grade, such that each pipe section when first laid will be continually in contact with the bedding along the extreme bottom of the pipe. Excavation for pipe bells and welding shall be made as required.

D. The pipe zone shall be backfilled with the specified backfill material. The CONTRACTOR shall exercise care to prevent damage to the pipeline coating, cathodic bonds, or the pipe itself during the installation and backfill operations.

E. Trench Zone Backfill: After the pipe zone backfill has been placed as specified above, and after all excess water has completely drained from the trench, backfilling of the trench zone may proceed. The trench zone is defined as that portion of the vertical trench cross-section lying between a plane 6 inches above the top surface of the pipe and a plane at a point 18 inches below the finished surface grade, or if the trench is under pavement, 18 inches below the roadway subgrade. If flooding, ponding, or jetting is used the pipe shall be filled with water to prevent flotation.

F. Final Backfill: Final backfill is all backfill in the trench cross-sectional area within 18 inches of finished grade, of if the trench is under pavement, all backfill within 18 inches of the roadway subgrade.

3.16 EMBANKMENT CONSTRUCTION

A. The area where an embankment is to be constructed shall be cleared of all vegetation, roots and foreign material. Following this, the surface shall be moistened, scarified to a depth of 6 inches, and rolled or otherwise mechanically compacted as specified in Paragraph 3.14.I. Embankment fill material shall be placed and spread evenly in approximately horizontal layers. Each layer shall be moistened or aerated, as necessary. Unless otherwise approved by the ENGINEER, each layer shall not exceed 6 inches of compacted thickness. The embankment fill and the scarified layer of underlying ground shall be compacted to 95 percent of maximum density under structures and paved areas, and 90 percent of maximum density elsewhere.

B. When an embankment fill is to be made and compacted against hillsides or fill slopes steeper than 4:1, the slopes of hillsides or fills shall be horizontally benched to key the embankment fill to the underlying ground. A minimum of 12 inches normal to the slope of the hillside or fill shall be removed and recompacted as the embankment fill is brought up in layers. Material thus cut shall be recompacted along with the new fill material at the CONTRACTOR's expense. Hillside of fill slopes 4:1 or flatter shall be prepared in accordance with Paragraph A, above.

C. Where embankment or structure fills are constructed over pipelines, the first 4 feet of fill over the pipe shall be constructed using light placement and compaction equipment that does not damage the pipe. Heavy construction equipment shall maintain a minimum distance from the edge of the trench equal to the depth of the trench until at least 4 feet of fill over the pipe has been completed.

3.17 CORRECTION OF GRADE

A. Bring to required grade levels areas where settlement, erosion or other grade changes occur.

3.18 MAINTENANCE AND PROTECTION OF WORK

A. While construction is in progress adequate drainage for the roadbed shall be maintained at all times.

The CONTRACTOR shall maintain all earthwork construction throughout the life of the contract, unless otherwise provided, and shall take all reasonable precautions to prevent loss of material from the roadway due to the action of wind or water. CONTRACTOR shall repair at

CONTRACTOR'S expense, except as otherwise provided herein, any slides, washouts, settlement, subsidence, or other mishap which may occur prior to final acceptance of the work.

All channels excavated as a part of the contract work shall be maintained against natural shoaling or other encroachments to the lines, grades, and cross sections shown on the plans, until final acceptance of the project.

3.19 AS-BUILT SURVEY

A. At the completion of the work and prior to final inspection of the area, the CONTRACTOR shall provide the ENGINEER with an as-built topographic survey made by a registered Surveyor, of the State of Florida.

B. The surveyor is to certify on the survey whether or not the as-built conditions conform to the elevations shown on the Drawings to within plus or minus two-hundredth (0.02) of a foot.

3.20 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section, it shall be included in the unit price per square yard bid for compaction of subgrade when constructing new roads and shall be included in the cost of all other work called out in the bid schedule requiring earth work.

END OF SECTION 02200

SECTION 02210
SITE GRADING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

A. The work covered by this section shall include all labor, equipment, services and materials necessary for bringing the entire site to elevations shown in the plans. The work included in this section shall include all necessary excavations for streets, ditches and swales. It shall include the construction of embankments and fills by the loading, movement, deposition and compaction of suitable fill materials resulting from above listed excavations. It shall include stockpiling of any excess material to an on-site location as specified by the CITY.

B. It shall include rough grading within the roadways and parking lots to the elevations or cross-section details shown on the drawings.

C. It shall include the erection and maintenance of any barricades that are required for accident prevention and property protection.

D. It shall include removal and legal disposal of muck, rock boulders or any foreign material interfering with construction.

1.03 RELATED WORK

A. Section 02110 - Clearing

B. Section 02200 - Earthwork

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 GENERAL

A. The CONTRACTOR shall be familiar with all work to be performed as specified and shown on the Drawings. CONTRACTOR shall ascertain where all excavation will be required and shall be solely responsible for all excavating to complete the Contract.

3.02 PAYMENT

A. No extra payment will be allowed for type or classification of material in excavation.

3.03 MATCHING EXISTING GRADES

A. Where existing roadbed surfaces are not at the elevation required prior to subgrade compaction, the CONTRACTOR shall perform any such excavation, filling, earthmoving and grading as may

be necessary to attain the proper compacted subgrade elevation before proceeding with base course construction.

3.04 UNSUITABLE MATERIAL

A. All muck, large rocks and boulders encountered during the work under this Contract shall be removed and legally disposed of in a manner approved by the CITY'S Representative.

3.05 EXCAVATION

A. All excavation shall be unclassified regardless of material encountered.

B. The CONTRACTOR shall make probings or sounding for subsurface rock to ascertain its location and depth.

C. It shall be the CONTRACTOR's responsibility to be familiar with soil conditions on the site. Borings, in addition to those provided by others, if any, shall be acquired by the CONTRACTOR, at the CONTRACTOR's expense.

D. Any wet excavated materials shall be drained before hauling or moving.

3.06 EMBANKMENT (FILL)

A. Embankment shall be constructed from suitable materials resulting from roadway or site excavation or approved materials furnished from off-site borrow areas.

B. Embankments shall be placed in successive layers of not more than eight inches in thickness, measured loose, for the full width of the embankment.

C. Each layer of the material used in the formation of roadbed embankments shall be compacted at optimum moisture content to a density as specified in Section 02200, Paragraph 3.14.I.

D. The existing material on the site may vary as to stability. The CONTRACTOR shall be familiar with the soil characteristics by site inspection borings, probings, etc., prior to bidding, as to the subsurface character of the material.

E. All unstable soil shall be removed and shall be replaced by material approved by the ENGINEER.

3.07 GRADING

A. The material excavated shall be transported and spread over the entire work site and shall be graded so that the finished grade shall be within $\pm$0.1 feet of the grades indicated by the grade stakes and control point elevations shown on the plans and by the cross-sections. Due to the minimal slope of the roadways, swale grades shall be within $\pm$0.05 feet of the grades indicated on the plans.

B. The disposal of large rocks in excess of 8", within roadways and parking areas is prohibited. Where allowable, the disposal of large rocks by burial in areas designated by the ENGINEER shall have a minimum 30 inches of cover below finished grade elevation.

3.08 FINISH GRADING

A. Following completion of the paving work, all swales, etc., adjacent to the roadway shall be shaped and graded to the elevations and cross-sections shown on the drawings. The finished surface shall be maintained until seeding and mulching work is completed.

3.09 SURVEYS

A. All initial surveys, including detail construction stakes, will be furnished by the CONTRACTOR.

B. The CONTRACTOR will carefully maintain bench marks, monuments, stakes and other reference points, and if disturbed or destroyed, be replaced as directed at the CONTRACTOR's expense.

3.10 MEASUREMENT AND PAYMENT

A. Measurement and payment for this item will be made per square yard and will include clearing of the swales per Section 02110.

END OF SECTION 02210

SECTION 02221
EXCAVATION AND BACKFILLING FOR UTILITIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

A. The work shall consist of furnishing all materials, labor and equipment for excavation, trenching and backfilling for utilities. "Utilities" shall include storm water drains, culverts, water mains, gravity sewers, sewage force mains and appurtenant structures.

1.03 RELATED WORK

A. 02050 - Demolition

B. 02200 - Earthwork

C. 02210 - Site Grading

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.01 EXCAVATION

A. General: This work shall consist of the excavation of whatever substances shall be encountered to the depths as shown on the plans. Excavated materials not required for fill or backfill shall be removed from the work site as directed by the ENGINEER and shall be considered to be a part of the bid price of the utility pipe for which excavation and backfill is required.

B. Excavation for structures and other accessories shall have a minimum clearance of twelve inches and a maximum clearance of twenty-four inches on all sides.

C. Excavation shall not be carried below the required depths as indicated by the plans. Excess excavation below the required level shall be backfilled at the CONTRACTOR's expense with sharp sand, gravel or other suitable material thoroughly compacted and approved by the ENGINEER.

D. Any unstable soil shall be removed and shall be replaced by material acceptable to the ENGINEER. The removal and replacement of such unstable soil shall be considered to be part of the bid price of the pipe for which excavation and backfill is required.

E. Water shall not be permitted to accumulate in the excavated area. It shall be removed by pumping or other means as approved by the ENGINEER. The removal of water shall be considered to be a part of the bid price of the pipe for which excavation and backfill is required.

Well points, pumps or other approved means shall be used to keep the ground water sufficiently low in the opinion of the ENGINEER to permit the placing of concrete, masonry or pipe in first class condition, and sufficiently long thereafter to protect the concrete, masonry or joints against washing or damage.

The CONTRACTOR shall also use such other means as may be necessary to keep the excavation in satisfactory condition for the construction of the work, and the use of well points, or other approved method, will not relieve the CONTRACTOR of CONTRACTOR'S responsibility to make structures water tight.

F. Banks and trenches shall be vertical unless shown otherwise on plans. The width of the trench shall be no less than 8" and no more than twelve inches, or as approved by the ENGINEER, on each side of the pipe bell for pipe up to 16" diameter. Bell holes shall be accurately excavated by hand.

G. If the bottom of the trench is rock, the excavation shall be carried eight inches below the invert of the pipe and backfilled with thoroughly compacted sharp sand, gravel or other suitable material approved by the ENGINEER.

H. Rock excavation shall include any rock encountered, which cannot be removed with a 3/4-yard backhoe under normal operating conditions. Rock excavation shall be incidental to construction of all piping systems and no separate payment will be made.

I. Whenever it is necessary, in the interest of safety, to brace or shore the sides of the trench, such bracing or shoring shall be considered to be part of the bid price of the pipe for which excavation and backfill is required.

The CONTRACTOR shall furnish, put in place and maintain such sheeting, bracing, as may be required to support the side of the excavation, and to prevent any movement which can in any way damage the work or endanger adjacent structures. If the ENGINEER is of the opinion that supports are insufficient, the ENGINEER may order additional supports. The compliance with such order shall not release the CONTRACTOR from CONTRACTOR'S responsibility for the sufficiency of the sheeting. The CONTRACTOR shall leave all sheeting in place. The ENGINEER may require sheeting to be cut off at any specified elevation, but in no case will any sheeting be left closer than two (2) feet below the natural surface, nor cut off below the elevation of the top of the pipe.

3.02 BACKFILLING

A. After pipes, structures and other appurtenances have been installed, the trench or opening shall be backfilled with material free from large stones or clods of a quality acceptable to the ENGINEER.

B. Backfill around the pipe and to a point twelve inches above the top of the pipe shall be placed in six inch layers compacted with 20 pound hand tampers or mechanical tampers suitable for this purpose. Backfilling shall follow lying closely, and shall not be more than one hundred (100) feet behind completed lying. Backfill over pipe shall be carefully placed by experienced labor and thoroughly consolidated without shock to the pipe, and carried up uniformly on both sides of the pipe. No backfilling with bulldozers will be permitted adjacent to pipe line.

C. Within roadway right-of-ways, or within areas where pavements are to be constructed over the pipe, the remainder of the trench shall be placed in six-inch layers (compacted thickness) and shall be compacted to that as noted in Section 02200. CONTRACTOR will be responsible for correcting settlement in all backfilled areas whether under the pavement or otherwise.

D. In areas where no pavement is to be constructed, the backfill above the twelve inch line above the pipe shall be compacted to a firmness approximately equal to that of the soil adjacent to the pipe trench or to that as noted in Section 02200. Backfill below the 12-inch line shall be compacted in 6-inch layers (compacted thickness) and shall be compacted to 98% of maximum density as determined by AASHTO T-180.

3.03 EXPLOSIVES

A. The use of explosives will not be permitted.

3.04 PAYMENT AND MEASUREMENT

A. No separate payment is provided for work covered by this Section. All costs in connection with Excavation and Backfilling, including testing, shall be included in the bid price of any item for which excavation and backfilling is required.

END OF SECTION 02221

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the work, as indicated on the drawings, as specified herein or both.

B. Including but not necessarily limited to the following:

1. Topsoil Stripping.

2. Topsoil Mixing and Spreading.

C. There shall be no classification of excavation for measurement of payment regardless of materials encountered.

1.03 RELATED WORK

A. Section 02110 - Clearing.

B. Section 02200 - Earthwork.

C. Section 02210 - Site Grading.

PART 2 - PRODUCTS

2.01 TOPSOIL

A. Topsoil shall be obtained from any previously established stockpile on site, to the extent that suitable material is available.

B. Additional topsoil, if required, shall be obtained by mixing existing on-site sandy fill with imported muck or compost.

C. Topsoil, whether obtained from stockpile, or mixed as described in "B" above, shall be sandy loam, and shall have the following characteristics:

1. 95% of topsoil shall pass a 2-mm. sieve.

2. Topsoil shall be free of stones 1" in longest dimensions, earth clods, plant parts, and debris.

3. Organic matter content shall be 4% to 12% of total dry weight.

4. pH and nutrient content shall be adjusted as necessary to conform to recommendations made by testing laboratory. (See 2.01 (D))

D. Samples shall be submitted to CITY for testing. Test shall indicate compliance with the specifications and recommendations as to the type and quantity of soil additives required to bring the nutrient content and pH to satisfactory levels for planting specified plant material. Tests shall be required at a rate of one per 500 cubic yards of material placed, for the first 5,000 cubic yards of material, and may be reduced at the ENGINEER discretion thereafter. Sampling shall be done in the presence of the ENGINEER. The CONTRACTOR shall be responsible for the cost of testing.

PART 3 - EXECUTION

3.01 JOB CONDITIONS

A. Protection: Use all means necessary to protect existing objects and vegetation. In the event of damage, immediately make all repairs, and replacements necessary to the acceptance of the ENGINEER.

3.02 FILLING AND GRADING:

A. Topsoil shall be spread in a uniform 2" layer after compaction, over all sodded and pervious areas, and finished to grades shown on the plans, making allowance, where necessary, for sod. Grades shown include 0.2' for thickness of sod in all sodded areas.

3.03 MEASUREMENT AND PAYMENT

A. Topsoil shall be measured and paid for by the square yard of actual top soil in place as more specifically discussed and described in SECTION 01025 for MEASUREMENT AND PAYMENT.

END OF SECTION 02284

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the “INFORMATION TO BIDDERS”, “STANDARD FORM OF AGREEMENT”, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the Storm Drainage Facilities work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

1.03 RELATED WORK

A. Section 02110 - Clearing

B. Section 02200 - Earthwork

C. Section 02601 - Subterranean Structures

1.04 CLEARING

A. Clearing or installation of pipe and all drainage structures shall be confined within the working limits of the trenches. Trees, utility poles, survey monuments, underground and overhead utilities shall be suitably protected and preserved.

1.05 EXISTING UTILITIES

A. Furnish temporary support, adequate protection and maintenance of all underground and surface utility structures, drains, sewers, cables, etc., and other obstructions encountered in the progress of the work.

B. When the grade of alignment of the pipe is obstructed by existing utility structures, such as conduits, ducts, pipes, branch connections to water or sewer mains, and other obstructions, the obstructions shall be permanently supported, relocated, removed or reconstructed by the CONTRACTOR in cooperation with the owners of such structures. The ENGINEER shall make no deviation from the required line or grade except as directed in writing.

C. It shall be the responsibility of the CONTRACTOR to notify the owners of existing utilities in the area of construction a minimum of 48 hours prior to any excavation adjacent of such utilities, so that field locations of said utilities may be established.

D. It shall be the responsibility of the contractor to maintain positive drainage on the surface and to ensure that the existing under ground drainage system continues to function as intended during the construction of the new drainage system. The contractor shall submit a plan to maintain the existing drainage patterns and under ground system for the approval of the ENGINEER prior to beginning any work on the existing or new drainage systems.

PART 2 - PRODUCTS

2.01 PIPE

A. REINFORCED CONCRETE CULVERT PIPE:

1. A reputable manufacturer, engaged in the full time business of manufacturing concrete pipe, shall produce the concrete pipe. Pipe manufacturer shall produce the pipe from an approved, permanent plant acceptable to the ENGINEER.

2. All concrete pipe shall be reinforced and shall conform to the requirements of A.S.T.M. C-76. Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe." Pipe shall be Class III. Pipe shall have an interior surface, which is smooth, uniform and free from rough spots, irregularities and projections. Nominal pipe lengths shall be 8' unless authorized otherwise by the CITY'S Representative. Lifting holes will not be permitted.

3. Concrete pipe shall be either bell or spigot, unless approved by ENGINEER.

4. Internal rubber gasket joints will be used at CONTRACTOR'S option. The internal rubber gasket joint shall be supplied by the pipe manufacturer and shall be completely compatible in every respect with the pipe furnished. The pipe manufacturer shall install the rubber gasket on the inside of the bell or groove on the pipe at the plant. All materials and accessories for the rubber gasket joint and the methods of jointing shall be in strict conformance with the pipe manufacturer's direction and recommendation. Joint must be completely watertight.

5. Cement grout joints shall be completely water tight and acceptable to the CITY'S Representative. A full bed of mortar shall be placed in the bell and/or groove and on the tongue and/or spigot. The annular space in the pipe joint shall be wiped with cement mortar to insure the joint is filled and to present a smooth surface. The complete exterior periphery of the joint shall have a standard cement grout diaper joint. Diaper shall be installed within the aid of an approved cloth ring. Cement mortar joints shall be made in the dry. Mortar and grout shall be one part Portland Cement to two parts by weight of sand. Mortar shall have enough water to make a stiff mixture that can be molded and worked. Cement mortar joints shall not be covered until inspected and approved by the CITY'S Representative.

2.02 SUBMITTALS.

A. Submit copies of product and material information and data.

PART 3 - EXECUTION

3.01 EXCAVATIONS

A. Trenches shall be kept as nearly vertical as possible and, if required, shall be properly sheeted and braced. Where, in the opinion of the ENGINEER, damage could result from withdrawing

sheeting, the sheeting shall be left in place. Not more than 100 feet of trench shall be opened at any one time or in advance of pipe laying unless permitted by the ENGINEER.

1. Except in rock, water-bearing earth or where a granular or concrete base is to be used, mechanical excavation of trenches shall be stopped above the final grade elevation so that the pipe may be laid on a firm, undisturbed native earth bed. If over digging occurs, all loosened earth shall be removed and the trench bottom brought back to grade with granular material.

2. Excavations and trenches in rock shall be carried to a depth of not less than 12" below the pipe bottom. This space shall be filled with granular material or washed rock.

3. Width of trenches shall be such as to provide adequate space for placing and jointing pipe properly, but in every case the trench shall be kept to a minimum width.

4. Any unstable soil encountered shall be removed and replaced with gravel, crushed rock or rock and sand suitably compacted.

3.02 PREPARATION TO TRENCH BOTTOM

A. Water shall not be allowed in the trenches while the trench bottom is being prepared or while pipe is being installed, unless directed by the ENGINEER.

B. A continuous trough shall be shaped to receive the bottom quadrant of the pipe barrel. Bell holes shall be excavated so that after placement, only the barrel of the pipe receives bearing pressure from the trench bottom.

C. Preparation of the trench bottom and placement of the pipe shall be placed in the trench bottom a minimum of 8" below the bottom of the pipe, and a trough as described above shall be formed to uniformly support the bottom quadrant of the pipe barrel.

3.03 INSTALLATION OF DRAINAGE PIPE

A. Pipe shall be protected during handling against impact shocks and free falls. Pipe shall be kept clean at all times and no pipe shall be used that does not conform to the Specifications.

B. The laying of the pipe shall be commenced at the lowest point with spigot ends pointing in the direction of flow. All pipes shall be laid with ends abutting and true to line and grade. They shall be laid in accordance with manufacturer's requirements as approved by the ENGINEER.

C. Pipe shall be laid accurately to the line and grade as designated on the plans. Preparatory to making pipe joints, all surfaces of the portions of the pipe to be jointed or of the factory made jointing material shall be clean and dry. Lubricant, primers, adhesive, etc., shall be used as recommended by the pipe or joint manufacturer's specifications. The jointing materials or factory-fabricated joints shall then be placed, fitted, joined and adjusted in such a manner as to obtain a water tight line. As soon as possible after the joint is made, sufficient backfill material shall be placed along each side of the pipe to prevent movement of pipe off line and grade.

D. The exposed ends of all pipes shall be suitably plugged to prevent earth, water, or other substances from entering the pipe when construction is not in progress.

3.04 BACKFILLING TRENCHES

A. No trenches or excavations shall be backfilled until the trench and installation has been inspected and written approval given by the CITY'S Representative. Under no circumstances shall water be permitted to rise in unbackfilled trenches after pipe has been placed. Trenches shall be backfilled with approved material, free of large clods, stones or rocks and carefully deposited in layers not to exceed 6 inches until enough fill has been placed to provide a cover of not less than 1' above the pipe. Each layer shall be placed, then carefully and uniformly tamped, so as to eliminate the possibility of pipe displacement. The remainder of backfill materials shall then be placed, moistened and compacted in 6 inch layers to density as specified in Section 02200, Paragraph 3.14.I.

B. Whenever the trenches have been improperly filled or if settlement occurs, they shall be refilled, compacted, smoothed off and made to conform to grade. Unless otherwise directed or shown on the plans, backfill in trenches in or through roadways shall be made as specified above, except that the entire fill above 1' over the pipe shall be deposited in layers not to exceed 8" in thickness, moistened, and compacted to density equal to or greater than that of adjacent material so that pavement can be placed immediately.

3.05 CONCRETE ENCASEMENT OF DRAINAGE PIPE

A. Trenches in which encasement for pipe are to be placed, may be excavated completely with mechanical equipment. Prior to formation of the encasement, temporary supports consisting of timber wedges or masonry shall be used to support the pipe in place. Temporary supports shall have minimum dimensions and shall support the pipe at no more than two places, one at the bottom of the barrel of the pipe adjacent to the shoulder of the socket and the other near the spigot end.

3.06 DRAINAGE STRUCTURES

A. All structures shall be built to the line and grade shown on drawings. All reinforced concrete work shall be in strict conformance with the concrete specifications contained herein. After erection of the forms and placing of the steel, the CONTRACTOR must have inspection and approval from the ENGINEER before placing any concrete. After removal of the forms, the CONTRACTOR shall backfill around each structure with approved granular fill. The fill shall be placed in layers not exceeding 8" in depth measured loose and compacted to density as specified in Section 02200, Paragraph 3.14.I. No defects of any kind in the pipe section will be accepted. All pipe stubs shall be made of the same type of pipe. Pipe stubs shall be sealed with a concrete plug, water tight. The ends of the pipes, which enter masonry, shall be neatly cut to fit the inner face of the masonry. Cutting shall be done before the pipes are built in.

3.07 INSPECTION

A. All storm sewers shall be lamped and physically inspected by the ENGINEER prior to acceptance of the work. Repairs or misalignment shown necessary by the tests shall be corrected at the

CONTRACTOR'S expense. All sewers shall be thoroughly cleaned before being placed into use and shall be kept clean until final acceptance by the ENGINEER.

3.08 RESTORATION OF SURFACES AND/OR STRUCTURES

A. The CONTRACTOR shall restore and/or replace paving, curbing, sidewalks, fences and survey points, or any other disturbed surfaces or structures to a condition equal to that before the work was begun and to the satisfaction of the ENGINEER. Relative to restoration of surfaces and/or structures, the CONTRACTOR shall comply with all requirements of governing agencies including CITY, county and state.

3.09 ABANDONMENT OF PIPELINE IN PLACE

A. All drainage pipelines or structures shown on the drawings to be abandoned in place shall be properly cut and plugged after new mains and provisions for proper drainage are installed. The pipeline shall be filled with concrete one foot from end of pipe as specified in Division 3 - Concrete, and section 03010. Excavation, backfill, and restoration shall be executed in accordance with requirements for removing existing and installing new pipelines.

3.10 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on the actual quantities installed as more specifically discussed and described in SECTION 01025 for MEASUREMENT AND PAYMENT.

END OF SECTION 02400

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the Exfiltration Trench System work, as indicated on the Drawings,, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

1.03 RELATED WORK

A. Section 02221 - Excavation and Backfilling for Utilities

B. Section 02400 - Storm Drainage Facilities

C. Section 02601 - Subterranean Structures

1.04 EXISTING UTILITIES

A. Locate and stake all existing underground utilities that may be in the area of the Drainage System.

1.05 SUBMITTALS

A. Submit Plan Drawings showing the locations of all piping and underground utilities that may be in conflict with the Drainage System.

B. Submit samples of the 3/4" washed rock for approval.

C. Submit samples and product data of filter fabric.

PART 2 - PRODUCTS

2.01 DRAINAGE PIPE AND BALLAST ROCK

A. Drainage pipe shall be in conformance with material as specified in Section 02400 and have the maximum number of perforations allowable per the manufacturers recommendations.

B. Ballast rock shall be from fresh water and washed free of deleterious matter.

2.02 FILTER FABRIC

A. Filter fabric shall be a non woven fabric consisting of polypropylene fibers treated to resist biological degradation.

B. Manufacturers or Equal

1. Amoco Propox 4545
2. Trevira 1115
3. Mirafi 140 NC

PART 3 - EXECUTION

3.01 INSTALLATION

A. Lay out Exfiltration Trench System as shown on the Plans.

B. The bottom of the trench shall provide a minimum of 12" of ballast rock below the drain pipe.

C. Drain pipes shall terminate a minimum of two feet beyond the end of the trench.

D. Cover temporary pipe ends with No. 10 galvanized or aluminum screen with openings no larger than 1/2" x 1/2".

E. Bottom, sides and top of trench to be lined with trench lining material with a minimum of 2 feet of overlap at the top of the trench.

F. A minimum of 4 feet of solid drain pipe shall be installed between drainage structures and the beginning of the trench.

3.02 CLEANUP

A. Remove all excess rock, liner and pipe from the site.

3.03 MEASUREMENT AND PAYMENT

Measurement and payment will be based on the actual quantities installed as more specifically discussed and described in SECTION 01025 for MEASUREMENT AND PAYMENT.

END OF SECTION 02401

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. The work specified in this Section consists of the construction of concrete sidewalk in accordance with these Specifications and in conformity with the lines, grades, dimensions and notes shown on the plans.

1.03 RELATED WORK

A. Section 02110 - Clearing

B. Section 02200 - Earthwork

C. Section 02515 - Portland Cement Concrete Paving

D. Section 03010 - Concrete

E. Section 03300 - Cast-In-Place Concrete

F. Section 03370 - Concrete Curing

PART 2 - PRODUCTS

2.01 CONCRETE

A. Concrete shall be Class I Concrete, with a minimum compressive strength of 3,000 psi in accordance with Section 345, Florida Department of Transportation Standard Specifications for Road and Bridge Construction.

2.02 FORMS

A. Forms for this work shall be made of either wood or metal and shall have a depth equal to the plan dimensions for the depth of concrete being deposited against them. They shall be straight, free from warp or bends, and of sufficient strength when staked, to resist the lateral pressure of the concrete without displacement from lines and grade. Forms shall be cleaned each time they are used and shall be oiled prior to placing the concrete.

2.03 SUBGRADE AND GRADING

A. Excavation shall be made to the required depth, and the foundation material upon which the sidewalk is to be set shall be compacted to a firm, even surface, true to grade and cross-section, and shall be moist at the time that the concrete is placed.

2.04 JOINTS

A. Contraction joints may be of the open type or may be sawed. Staking a metal bulkhead in place and depositing the concrete on both sides shall form open type contraction joints. After the concrete has set sufficiently to preserve the width and shape of the joint, the bulkhead shall be removed. After the sidewalk has been finished over the joint, the slot shall be edged with a tool having a 1/2-inch radius.

If the CONTRACTOR elects to saw the contraction joints, a slot approximately 1/8 inch wide and not less than 1-1/2 inches deep shall be cut with a concrete saw after the concrete has set, and within the following periods of time:

Contraction joints shall be constructed at not more than 20-foot intervals, and shall be in place within 12 hours after finishing.

PART 3 - EXECUTION

3.01 PLACING

A. The concrete shall be placed in the forms to the required depth and shall be vibrated and spaded until mortar entirely covers its surface.

3.02 FINISHING

A. Screeding: The concrete shall be struck-off by means of a wood screed, used perpendicular to the forms, and floated in order to obtain the required grade and remove surplus water and laitance.

B. Surface requirements: The concrete shall be given a broom finish. The surface variations shall not be more than 1/4 inch under a ten-foot straightedge, nor more than 1/8 inch on a five-foot transverse section. The exposed edge of the slab shall be carefully finished with an edging tool having a radius of 1-1/2 inch.

3.03 CURING

A. The concrete shall be continuously cured for a period of at least 72 hours. Curing shall be commenced after finishing has been completed and as soon as the concrete has hardened sufficiently, to permit application of the curing material without marring the surface.

B. Wet burlap, white-pigmented curing compound, waterproof paper or polyethylene sheets may be used for the curing of grey concrete only.

3.04 COLORED CONCRETE (NOT USED)

A. Colored – Conditioned Concrete shall be placed, finished, and cured in strict accordance with applicable requirements of this Section and Sections 03010, 03370, and the requirements of the chosen manufacturer.

3.05 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on the actual quantities installed as more specifically discussed and described in Section 01025 for MEASUREMENT AND PAYMENT.

END OF SECTION 02510

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

A. This section of the specifications covers the control and general conduct of asphalt paving construction for roads, parking, walks and court areas.

B. All work within the right-of-way shall be constructed using materials and methods in accordance with the drawings, Broward County and Florida Department of Transportation Standard Specifications for Road and Bridge Construction.

C. Provide all labor, materials, necessary equipment and services to complete the Asphaltic Concrete Paving work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

D. Including, but not necessarily limited to the following:

1. Preparation of subgrade.
2. Installation and compaction of base course.
3. Spreading of asphalt surface course.

1.03 RELATED WORK

A. Section 02200 - Earthwork

B. Section 02400 - Storm Drainage Facilities

C. Section 02515 - Portland Cement Concrete Paving

1.04 TRAFFIC CONTROL

A. The CONTRACTOR shall provide and maintain access to and from all properties along the line of CONTRACTOR’S work. The CONTRACTOR shall also provide temporary bypasses and maintain them in a safe and usable condition whenever the public cannot do detouring of traffic to parallel routes without hardship or excessive increases in travel.

1.05 SPECIAL SUBGRADE CONDITIONS

A. When special subgrade conditions are encountered for which these "Asphaltic Concrete Paving Specifications" are not applicable, portions of these specifications shall be deleted or revised to provide a properly finished paved surface. A requested revision or deletion of the specifications shall be accompanied with reports and laboratory tests on existing field conditions. Any change from these "Asphaltic Concrete Paving Specifications" shall be approved by the ENGINEER and shall be in effect only for a specified area or paving project.

1.06 QUALITY ASSURANCE

A. D.O.T. Standard Specifications.

1. Work and materials shall conform to all applicable requirements of Florida Department of Transportation "Standard Specifications for Road and Bridge Construction - 1982" (referred to herein as D.O.T.).

B. American Society for Testing and Materials.

1. ASTM 3515-80 "Standard Specification for Hot-Mixed, Job Laid, Bituminous Paving mixtures."

1.07 SUBMITTALS

A. Provide copies of materials, notarized certificates of compliance signed by material producer and CONTRACTOR, certifying that each material item complies with, or exceeds, specified requirements.

1.08 JOB CONDITIONS

A. Apply prime and tack coats when ambient temperature is above 50 degrees, and when temperature has not been below 35 degrees for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

B. Construct asphalt concrete surface course only when atmospheric temperature is above 40 degrees, and when base is dry. Base course may be placed when air temperature is above 30 degrees, and rising.

1.09 LOCATIONS, LAYOUT AND GRADES

A. Locate and layout paved areas and right-of-ways with reference to benchmarks, property lines or buildings according to the drawings and as accepted by the ENGINEER.

B. Determine locations of paved edges and right-of-way line from surveyor's permanent reference monuments and information on the drawings.

C. Where permanent reference monuments are not available, obtain proper line locations from authorities having jurisdiction.

D. Establish and maintain required lines and elevations.

PART 2 - PRODUCTS

2.01 FILL

A. All fill shall be clean rock and sand (maximum rock size = 1 inch).

B. Fill shall be compacted thoroughly as per Section 02200 - Earthwork.

2.02 LIMEROCK

A. Limerock shall be obtained from pits for which all overburden has been removed previous to blasting and shall show no tendency to air slake and must undergo the following chemical requirements.

		Percent
1.	Carbonates of Calcium	Min.70.0 (Miami Limerock) and Magnesium. 95.0 (Ocala Limerock)
2.	Oxides of Iron and Aluminum	Max. 2.0
3.	Organic Matter	Max. 0.5

4. Any constituents of other than the above shall be silica or inert material.

5. The material shall be crushed to such size that not less than 97% shall pass a 3-1/2" sieve and it shall be graded uniformly down to dust. All fine material shall consist entirely of dust of fracture.

6. Limerock from on-site may be used if the material meets the requirements of this section of the specifications.

B. All limerock shall comply with requirements set forth under D.O.T. Section 911.

C. Equipment: The equipment for constructing the rock base shall be in first class working condition and shall include:

1. Three wheel roller weighing not less than ten tons.

2. Self-propelled blade grader weighing not less than three tons. The wheelbase shall be not less than fifteen feet and blade length not less than ten feet.

3. Scarifiers shall have teeth space not to exceed 4-1/2 inches.

   a. Provision for furnishing water at the construction site by tank or hose at a rate not less than 50 gallons per minute.

2.03 PRIME COAT

A. Prime coat shall be Grade RC-70, cut-back asphalt, D.O.T. Section 916-2.

B. Prime coat shall have full compatibility with surface treatment asphalt.

C. The bituminous material shall conform to the requirements of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Section 300-2.

D. The sand for cover shall be clean dry sand.

2.04 TACK COAT

A. The bituminous material to be used for the tack coat shall conform to the requirements of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Section 300-2.

2.05 ASPHALT

A. The asphaltic concrete surface course shall be in accordance with Broward County, Florida Department of Transportation Standard Specifications for Type S-1 and Type S-3 Asphaltic Concrete Surface Course.

B. Pavement within public road right-of-way, which has been disturbed by this construction, shall be replaced with the same type and thickness to match the existing pavement section.

C. General composition of mixtures:

1. The aggregate in the asphaltic concrete shall be crushed stone and manufactured sand screening of natural sand or combination of both when necessary to meet requirements of composition of mix. All aggregate shall have a Los Angeles abrasion loss of less than 40%.

2. The mineral aggregate shall be so graded, and the prescribed constituents, prepared as hereinafter set out, shall be combined in such proportions as to produce a mixture conforming to the following general composition limits by weight:

Constituent	Passing Sieve	S-1 Percent by Weight	S-3 Percent by Weight
Course Aggregate	3/4"	100	100
	1/2"	80-100	100
	3/8"	75-93	88-100
	No. 4	47-75	60-90
Total Course Aggregate	No. 10	31-53	40-70
Fine Aggregate	No. 40	19-35	20-45
	No. 80	7-21	10-30
Filler	No. 200	2-6	2-6

	Percent Constituent	by Weight
Total Fine Aggregate and Filler No. 10	100	100
Total Mineral Aggregate	100	100
Total Mix	100	100
Total Mineral Aggregate	91-95	
Asphalt Cement	5-9*	
(Bitumen) Total Mix	100	

*For highly absorptive aggregates the upper limit may be raised.

2.06 SEAL COATING

A. Homogeneous mixture of emulsified coal tar pitch, asbestos, sand and other inert fillers. It shall be easily remixed if settlement occurs in storage (except in the case of freezing). It shall be capable of application and complete coverage by rubber squeegee, brush, or approved mechanical method, to the surface of bituminous pavements at the spreading rate of point two (.2) to point three (.3) gallons per square yard in two (2) coats.

B. Approved product: "TARFEX" manufactured by Bitucote Products Co. or approved equal.

PART 3 - EXECUTION

3.01 BARRICADES

A. Provide substantial temporary barricades around all areas of operation and maintain until work under this section is completed and approved.

B. Install temporary traffic markers, signals, and signs as per Broward County Highway Construction and Engineering Services Division Standard Specification to:

1. Eliminate potentially hazardous conditions.

2. Maintain adequate traffic patterns free of conflict with work under this Contract.

3.02 PREPARATION OF SUBGRADE

A. This work consists of bringing the bottom of excavations and top of embankments of the roadway between the outer limits of the shoulders or base course to a surface conforming to the grades, lines, and cross sections shown on the plans. The subgrade shall be of uniform density ready to receive the rock base of the paving course.

B. All soft and yielding material and other portions of the subgrade which will not compact readily shall be removed and replaced with suitable material and the entire subgrade brought to line and grade to provide a foundation of uniform compaction and supporting power.

C. Stumps, roots, and other deleterious organic matter encountered in the preparation of the subgrade shall be removed.

D. Where fills are required on areas covered or partly covered by existing paving, the entire area of such existing paving shall be scarified to a depth of at least six inches, and the scarified material spread evenly over the area to be filled to a width not less than that of the proposed paving.

E. Material for fills shall consist of sand or other suitable material approved by the ENGINEER free from stumps, roots, brushes, and other deleterious organic matter.

F. Where fill is more than one foot (1') in depth, the backfill material above the ground water table shall be compacted on one (8") depth lifts. Each individual layer of fill under the rock base shall have a density as specified in Section 02200, Paragraph 3.14.I. unless shown otherwise on the plans. Each individual layer of fill under the shoulder area shall have a density as specified in Section 02200, Paragraph 3.14.I., unless shown otherwise on the plans.

G. The bottom of all excavated areas and the top of all fills where rock base is to be constructed shall be thoroughly compacted by rolling. Water shall be used to insure thorough compaction. The stability of the top 12 inch thickness of the subgrade immediately under the base, for the full base width plus one foot (1') on each side, shall be at least LBR 40 as determined by AASHTO T-180.

H. Bring subgrade, which has been properly filled and shaped to a firm unyielding surface, by rolling an entire area with an approved vibratory power roller weighing a minimum of 10 tons.

1. Thoroughly compact area inaccessible to the roller with approved hand tamper.

2. Apply water sufficiently to compact the subgrade where the subgrade is of a dry, sandy nature and cannot be rolled.

I. The subgrade shall be maintained free from ruts, depressions or other irregularities until rock base material is spread.

J. For all roads and streets other than State Highway, the stabilized subgrade shall have a minimum Limerock Bearing Ratio (LBR) of 40, unless otherwise noted on the plans.

K. Where the bearing value of the existing subgrade is adequate without addition of stabilizing material, the subgrade shall be scarified and disked, harrowed, bladed or tilled for removal of boulders, roots, etc. to assure uniformity and thorough mixing of material to the full width and depth of required stabilization. The compacted subgrade shall conform to the lines, grades and cross-section shown on the plans.

L. Test subgrade for crown and elevation after preparation and immediately before base of paving course is laid.

1. Remove or add material and compact to bring to a correct elevation and uniform bearing if the subgrade is found not to be at the specified elevation at all points.

2. Adjust the manhole rims, catch basin frames and valve boxes where necessary to match proposed finish grade.

3.03 CONSTRUCTION OF BASE COURSE

A. This work consists of construction of lime rock base course for the asphaltic concrete wearing surface. The base course shall be constructed on the prepared subgrade in a 8" thick limerock bases constructed in two four inch lifts as shown on the drawings. Twelve (12) inch thick limerock bases shall be constructed in two six-inch lifts. The limerock base shall be a minimum LBR of 100.

B. Spreading Rock: The rock shall be transported to the points where it is to be used over rock previously placed, and dumped on the end of the preceding spread. It shall then be spread uniformly with hand tools, or mechanical equipment. In no case shall rock be dumped directly on the subgrade. No hauling shall be done over the subgrade.

C. Compacting Rock

1. Following spreading, the rock shall be rolled with a three wheel roller weighing not less than ten tons, water being added as required, until the entire depth of base is compacted into a dense unyielding mass.

2. No greater area of rock base shall be placed during any one day than that which can be rolled and compacted on the same day.

D. Finishing Base

1. After watering and rolling, the entire surface shall be thoroughly scarified to a depth not less than four inches (4") and shaped to exact crown and cross section, re-watered and again thoroughly rolled. Rolling shall continue until the entire depth of base is bonded and compacted into a dense, unyielding mass, true to grade and cross section.

a. Any irregularities, which may develop in the surface during such finishing, shall be corrected by the removal or addition of rock as the case may be.

b. If at any time the subgrade material becomes churned up and mixed with the base rock, the CONTRACTOR shall dig out and remove the mixture, reshape and compact the subgrade and replace the materials removed with clean rock which shall be watered and rolled until satisfactorily compacted.

c. Where cracks or checks appear in the base either before or after priming, which in the opinion of the ENGINEER would impair the structural efficiency of the base course, the CONTRACTOR shall remove such cracks or checks by re-scarifying, reshaping, watering, rolling and adding rock where necessary.

d. During final compacting operations, if grading of any areas is necessary to obtain the true grade and cross section, the compacting operations for such areas shall be completed prior to making the density tests on the finished base.

E. Inferior Rock: If in the opinion of the ENGINEER at any time during the progress of the work, rock of inferior quality is being delivered to the construction site, a laboratory analysis of the rock shall be made. Should the results of such tests indicate that the rock does not conform to specifications, the CONTRACTOR shall, at CONTRACTOR's own expense, remove such inferior material from the area indicated and deliver and spread satisfactory rock on said area.

F. Testing Surface: The finished surface of the rock base shall be true to the required cross section. Any irregularities in the grade greater than 1/4", as determined by placing a ten foot straight edge parallel with the centerline, shall be corrected by scarifying to a depth of three inches (3"), removing or adding rock as may be required and again watering, rolling, and compacting the scarified area. In testing the surface for irregularities, the measurements under the straight edge shall not be taken in small holes caused by individual pieces of rock having been pulled out by the road grader.

G. Thickness Determination: Thickness of the base shall be measured by intervals as required by the ENGINEER. Measurements shall be taken at various points on the cross section. The measurements shall be taken in holes through the base of not less than three inches (3") in diameter. Where the base is more than 1/2" less than the required compacted thickness, the CONTRACTOR shall correct such areas by scarifying and adding rock. The affected areas shall then be watered, rolled and brought to a satisfactory state of completion, and of required thickness and cross section.

H. Density: Density determinations shall be made by the CONTRACTOR or at intervals required by the ENGINEER. An average required density shall be as specified in Section 02200, Paragraph 3.14.I. No section of base shall be accepted when more than 10% of tests fall below 98% of maximum density and in no case shall a density of less than 96% of maximum be accepted.

I. Testing: The CONTRACTOR shall coordinate with ENGINEER for all testing. One test shall be made in accordance with AASHTO, T-180 for each class of material in the subgrade and base.

1. In place density tests in accordance with AASHTO T-147 shall be made in the locations shown on the plans. Two copies of the test reports will be sent directly to the ENGINEER for evaluation.

2. Any material, which fails to meet these specifications, shall be removed, replaced, and retested, all at the CONTRACTOR's expense.

3. Tests shall be taken at least every 1,000 square yards and taken at locations and lifts as directed by the ENGINEER.

3.04 PRIME COAT FOR BASE COURSE

A. Cleaning the prepared base:

1. Before any bituminous material is applied, all loose material: dust, dirt, caked clay and foreign matter which might prevent proper bond with the existing surface shall be moved to the shoulders, to the full width of the treatment, by means of revolving brooms or approved mechanical sweepers and by mechanical blowers, of approved types, supplemented by hand sweeping. Dust and other loose materials not removed by mechanical means shall be removed with hand brooms. Particular care shall be taken to clean the outer edges of the strip to be treated in order to insure that the prime coat will adhere. Sweeping and blowing shall be continued until all the loose dust and dirt is removed from the surfaces.

2. Application of bituminous material shall be made during the same day surface has been swept and as soon as practical thereafter.

B. Application for prime coat:

1. The bituminous material shall be applied to the clean dry surface of the rock base at such temperature as will insure uniform distribution. The amount applied will be at the rate of approximately 0.10 to 0.20 gallons per square yard of base area. The application shall be made by means of self-propelled pressure distributor operating under a pressure not less than 20 pounds per square inch. Application of bituminous material shall be made on only one-half of the width of base at one time.

2. The primed base shall then be covered with a uniform layer of clean sand, and kept thoroughly and uniformly covered by additional sand or sweeping until it shows no signs of picking up under traffic. For a period of one week after priming, the CONTRACTOR shall again broom any area where insufficient cover sand or excess of bituminous material causes "bleeding" and, if necessary, spread additional sand on such area.

C. Prime coat finish: After prime has cured or sat and been sanded, the shoulder shall be shaped to conform to all grade lines and cross sections and the entire area shall be rolled and compacted with a rubber tired roller or a power roller before asphalt surface is laid on the finished base.

3.05 BITUMINOUS TACK COAT

A. Before applying any bituminous material, all loose material: dust, dirt and foreign material, which might prevent proper bond with the existing surface, shall be removed for the full width of the application.

B. Application for tack coat:

1. The surface to receive the tack coat shall be clean and dry. The tack coat shall be clean and dry. The tack coat shall be applied with a pressure distributor except that on small jobs, if approved by the ENGINEER, the application may be made by other approved mechanical methods or by hand methods. The pressure distributor shall operate at a pressure not less than 20 pounds per square inch and at a consistency such that it can be properly pumped and sprayed uniformly over the surface.

2. The bituminous material shall be applied in a thin uniform layer. The rate of application shall be between 0.02 and 0.10 gallon per square yard. The tack coat shall be applied

sufficiently in advance of the laying of the wearing surface to permit drying, but shall not be applied so far in advance that it might lose adhesiveness as a result of being covered with dust or other foreign material. The tack coat surface shall be kept free from traffic until the wearing surface is laid.

3.06 ASPHALTIC CONCRETE WEARING SURFACE COURSE

A. Cleaning and preparing base:

1. Prior to the laying of the asphaltic concrete, the base of pavement to be covered shall be cleaned of all loose deleterious material by the use of power brooms or blowers. A tack coat shall be applied on all pavements. The tack coat shall not be applied so far in advance of laying operations as to allow shifting and sand or weather conditions to nullify its effectiveness.

2. After the surface has been thoroughly cleaned, all holes shall be filled with asphaltic concrete, if necessary, and thoroughly compacted to conform to the existing surface and to form a smooth surface.

B. Placing asphaltic concrete: The asphaltic concrete surface course shall be applied after the tack coat may be permitted a reasonable time for drying but not to an extent that the tack coat is allowed to lose its adhesiveness.

1. Machine spreading: Upon arrival the mixture shall be dumped into the approved mechanical spreader and immediately spread and struck off to the full width required and to such appropriate loose depth for each successive course that when the work is completed the required weight of the mixture per square yard or the specified thickness will be secured. An excessive amount of mixture shall be carried ahead of the screen at all times. Hand raking shall be done behind the machine as required.

2. Hand spreading: In limited areas, where, on account of irregularities or unavoidable obstacles, the use of mechanical spreading and finishing equipment is impractical, the mixture may be spread by hand, when so authorized by the ENGINEER.

3. The mixture shall be laid only when the surface to be covered is dry and only when weather conditions are suitable.

4. All structures which will be in actual contact with asphaltic mixture, including the face or surface of curbs or gutters and their vertical faces of existing pavements, shall be painted with a uniform coating of asphalt material to provide a closely bonded, watertight joint.

5. Where necessary, due to the traffic requirements, the mixture shall be laid in strips in such manner as to provide for the passage of traffic.

6. Any mixtures caught in transit by a sudden rain may be laid at the CONTRACTOR's risk. In no case shall the mixture be laid while rain is falling or when there is water on the surface to be covered.

7. The depth of the layer being spread shall be gauged as directed, and where the thickness fails to average the specified thickness, immediate steps shall be taken to correct the depth.

8. Before any rolling is started, the course surface shall be checked, any inequalities adjusted, and all drippings, fat sand accumulations from the screed and fat spots from any source shall be removed and replaced with satisfactory material.

9. Straight-edging and back patching shall be done after initial completion has been obtained and while the material is still hot. Any irregularity greater than 1/4" either longitudinally or traversely shall be corrected at this time.

10. No skin patching shall be done. When a depression is to be corrected while the mixture is hot, the surface shall be well scarified before the addition of fresh mixture. If irregularities occur and are not corrected while the mixture is still hot, the irregularities shall be cut out the full depth of the layer and replaced with fresh mixture.

C. Compacting mixture: After the spreading, the mixture shall be rolled when it has set sufficiently or come to the proper condition to be rolled, and when the rolling does not cause undue displacement or shoving.

1. The motion of the roller shall at all times be slow enough to avoid displacement and shall at once be corrected by the use of rakes and fresh mixture where required. The rolling shall include all transverse, longitudinal, and diagonal rolling, as may be necessary to obtain the maximum density.

2. The seal rolling with tandem steel rollers weighing from five to eight tons shall follow as close behind the spreader as is possible without picking up, or displacing or blistering the material.

3. Rolling with the self-propelled pneumatic-tired rollers shall follow as soon as possible and as close behind the seal rolling as the heat of the mixture will permit. The rolling shall be done while pavement temperature is between 175^{o} and 240^{o}F, and to such an extent that the self-propelled traffic roller shall cover every area of the surface with at least ten passes. Final rolling with tandem steel rollers shall be done after the rolling with self-propelled pneumatic tired rollers is completed. This final rolling shall be done before the pavement temperature is lower than 175^{o}F., and shall be continued until all roller marks or tire marks are eliminated.

4. Self-propelled pneumatic rollers shall be used for the rolling of patching and leveling courses. At the option of the CONTRACTOR, a steel-wheeled roller may be used to supplement the self-propelled pneumatic-tired rollers but not more than one steel-wheeled roller may be used in conjunction with the necessary number of self-propelled pneumatic-tired rollers. After final completion, the finished pavement shall at no point have a density less than 95% of the laboratory compacted density.

5. Rolling with the self-propelled pneumatic-tired roller shall proceed at a speed from six to twelve miles per hour and the rate of rolling shall not exceed 3,000 square yards per hour per roller. A sufficient number of self-propelled pneumatic-tired rollers shall be used so

that the rolling of the surface for the required number of 10 passes within this maximum rolling rate shall not delay any other phase of the placing operation and not result in excessive cooling of the mixture before the rolling is complete. In the event that the rolling is not properly maintained to schedule as outlined above, the laying operation shall be discontinued until the rolling operations are sufficiently caught up.

6. In all places inaccessible to a roller, such as adjacent to curbs, headers, gutters, bridges, MAS'S, etc., the required compaction shall be secured with tamps. Depressions, which may develop before the completion of the rolling, shall be remedied by loosening the mixture laid and adding new material to bring such depressions to a true surface.

7. Should any depressions remain after final compaction has been obtained, the mixture shall be removed sufficiently and new material added to form a true and even surface. All high spots, high joints and honeycombs shall be adjusted as directed by the ENGINEER.

8. The mixture, after compaction, shall be of the thickness shown on the plans. The surface, after compactions, at no place shall snow an excess of asphalt and any area showing such excess or other defect, shall be cut out and replaced with fresh mixture and immediately compacted to conform with the surrounding area. Any mixture which becomes loose or broken, mixed with dirt in the wearing course shall be removed and replaced with fresh mixture which shall be immediately compacted to conform with surrounding areas.

9. Gasoline or oil from rollers shall not be allowed to deposit on the pavement and any pavement damaged by such deposits shall be removed and replaced as directed by the ENGINEER.

10. Any mixture remaining unbonded after rolling shall be removed and replaced.

D. Protection of pavement: After the completion of the pavement, no vehicular traffic of any kind shall be permitted on the pavement until it has set sufficiently as approved by the ENGINEER.

3.07 ABUTTING EXISTING PAVING

A. Meet elevation of existing paving and structures, facilities and utilities where applicable by sawcutting and removing no less than two (2) feet from abuttment. Milling of asphalt for a width of two (2) feet is an alternative if approved by engineer. Do not cover access covers, manhole tops, water meters or other similar devices.

3.08 PAVEMENT EDGES

A. Make edges of paved area conform to details and sections as shown on drawings.

3.09 SEAL COATING

A. Preparation of surface: Pavement to be sealed must be sound and free of loose dust, dirt, stones, or other foreign matter:

1. Repair any breaks or holes.

2. Scrape off accumulations of oil or fuel drippings and scrub with detergent and water. Remove all traces of detergent.

3. Soft or damaged spots must be repaired.

4. Flush entire area with clean water.

5. Pavement should be damp (no puddles or excess water) when seal coating is applied.

B. MIXING: Stir seal coating to a uniform consistency, use no solvents for thinning. Dilute seal coating with ten (10) percent to twenty (20) percent clean water, stirring to uniform consistency.

C. Application:

1. Seal coat may be applied to dampened surface with a rubber squeegee, soft bristled push broom, or approved mechanized equipment.

2. Seal coating may be poured directly onto pavement in a ribbon or windrow. Squeegee is placed on pavement at a slight angle to edge line of pavement and pulled in a window along pavement in parallel lines, always working excess material toward bottom edge of squeegee.

3. Seal coating should be applied in two (2) thin coats. After first coat is completely dry to touch, a second coat may be applied at right angles to the first. Rate of application will depend on porosity of surface.

4. Allow to cure for twenty-four (24) hours before opening to traffic.

5. Do not apply seal coating when temperature is below fifty (50) degrees Fahrenheit, or falling, before sealer is dry, or rain appears imminent or forecast.

6. Apply in strict accord with manufacturers published instructions.

3.10 FIELD QUALITY CONTROL

A. Test in place asphalt concrete course for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by CITY'S Representative and ENGINEER.

1. In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:

a. Base Course: Not greater than 1/2" of specified thickness.
b. Surface Course: Not greater than 1/4" of specified thickness.

2. Test finished surface of each asphalt concrete course for smoothness, using 10' straight edge applied parallel with, and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness.

a. Base Course Surface: 1/4".
b. Wearing Course Surface: 1/8".

B. Check surface area at intervals as directed by the ENGINEER.

C. Finish grade shall be within ±0.01 feet of the grades indicated on the plans or ± 0.05 feet as long as no ponding of water is observed after final paving.

3.11 CLEAN UP

A. Remove all debris and excess material immediately from project site.

B. Take down all barricades and temporary traffic markers, signals and signs only after all work included in this section is finished and inspected, and only after so directed by the ENGINEER.

C. Leave project area clean, orderly and free of any hazardous conditions.

3.12 CONSTRUCTION OF SWALES

A. This work consists of regrading existing swales and construction of new swales adequate for conveying storm water along the right-of-way to catch basins. The swale shall be shaped according to the cross section shown on the plan. In areas adjacent to existing roadways all swales shall be regraded to match their existing condition prior to construction, unless otherwise noted.

B. Requirements: All soft and yielding material and other portions of the swale which will not compact readily shall be removed and replaced with suitable material and the entire swale area brought to the proper grade. Stumps, roots, and other deleterious organic matter encountered during the shaping for the swale shall be removed.

C. The bottom of all excavated areas and the top of all fills of swale areas shall be thoroughly compacted by rolling. Water shall be used as necessary to insure thorough compaction. The stability of the top 12" thickness of swale area shall be at least LBR 40 as determined by ASSHTO T-180. Sufficient stabilizing material shall be added to swale area soil as required to provide the specified stability.

D. The CONTRACTOR shall place sod over existing areas damaged by construction. The sod shall match the existing sod type in the affected areas.

3.13 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on the actual quantities installed as more specifically discussed and described in SECTION 01025 for MEASUREMENT AND PAYMENT.

END OF SECTION 02513

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the Portland Cement Concrete Paving work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

B. Including, but not necessarily limited to the following:

1. Fill, subgrade, and limerock base.

2. Concrete formwork.

3. Concrete reinforcement.

4. Expansion and contraction joints.

5. Concrete paving.

1.03 RELATED WORK

A. Section 02200 - Earthwork

B. Section 02513 - Asphaltic Concrete Paving - General

1.04 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Perform work in accordance with local building and other applicable codes.

B. Applicator Qualifications: Minimum of five years experience on 5 comparable concrete projects.

C. Inspection and Testing: Performed in accordance with Section 01410 unless otherwise specified.

1. Test cylinders - as per ASTM C-39.

a. Minimum of three (3) concrete test cylinders shall be taken for every 75 or less cubic yards of concrete placed.

b. Minimum of one (1) additional test cylinder shall be taken during any cold weather concreting, and be cured on job site under same conditions as the concrete it represents.

2. Slump test - as per ASTM C-143:

   a. Minimum of one (1) slump test shall be taken for each set of test cylinders taken.

1.05 SUBMITTALS

A. Test Reports: Reports of concrete compression, yield, air content, and slump tests.

B. Certificates:

1. Manufacturer's certification that materials meet specification requirements.

2. Material content per cubic yard of each class of concrete furnished.

   a. Dry weights of cement.
   b. Saturated surface-dried weights of fine and coarse aggregate.
   c. Quantities, type and name of admixtures.
   d. Weight of water.

3. Ready-mix delivery tickets, ASTM C-94.

C. Shop Drawings:

1. Show sizes and dimensions for fabrication and placing of reinforcing steel and bar supports.

2. Indicate bar schedules, stirrup spacing, and diagrams of bend bars.

3. Detail items of form systems affecting appearance of Architectural concrete surfaces such as joints, tie holes liners, patterns and textures. Show items in relation to entire form system.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size and length.

B. Handle and store materials to prevent contamination.

1.07 JOB CONDITIONS

A. Allowable concrete temperatures:

1. Hot weather: Maximum 90 degrees F as per ASTM C-94.

B. Do not place concrete during rain, unless protection is provided.

PART 2 - PRODUCTS

2.01 FILL

A. As specified in Section 02513 - Asphaltic Concrete Paving - general.

2.02 SUBGRADE

A. As specified in Section 02513 - Asphaltic Concrete Paving – general.

2.03 LIMEROCK BASE

A. As specified in Section 02513 - Asphaltic Concrete Paving - general.

2.04 READY-MIXED CONCRETE

A. Cement: ASTM C-150, normal Type 1.

B. Admixtures:

1. Air entraining: ASTM C-260.
2. Chemical: Type (as required) ASTM C-494.
3. Fly ash and pozzolans: ASTM C-618.

C. Coarse aggregate: Not less than 50% clean, hard, crushed stone conforming to requirements of Table 2, size number 467 ASTM C-33.

D. Slump Range: 2-4 inches - tested according to ASTM designation C143 (AASHTO T119).

E. Air content: 5% + 1%.

F. Mix proportioning:

1. 28 day compressive strength of cured laboratory samples 3,000 psi.
2. Minimum cement content 5-sacks/cubic yard.

G. Curing Material: Liquid membrane, ASTM C-309, Type 1.

H. Mixes:

1. ASTM C-94.
2. Mix concrete only in quantities for immediate use.
3. Do not retemper or use set concrete.

2.05 REINFORCEMENT

A. Reinforcing Steel Bars: 60 psi yield strength; deformed billet steel bars; ASTM A-615, plain finish.

B. Welded Steel Wire Fabric: Plain type, ASTM A-185, hot dip galvanized, plain finish.

C. Tie Wire: FS QQ-W-461-G, annealed steel, black, 16-gage minimum.

D. Bar Supports: Conform to "Bar Support Specifications," CRSI Manual of Standard Practice.

2.06 FORMWORK AND ACCESSORIES

A. Formwork: Matched, tight fitting and adequately stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of concrete, conform with ACU 347, Chapter 3, Material and Form Work.

B. Lumber:

1. Softwood framing lumber: Kiln dried, PS-20.

2. Boards less than 1-1/2 inch thick and 2 inches wide, used for basic forms and form liners: Kiln dried.

3. Grade marked by grading rules agency approved by American Lumber Standards Committee.

4. Light framing or studs for board or plywood forms, 2 inches to 4 inches width and thickness, construction standard grade.

5. Boards for basic forms, construction standard grade.

6. Board surface: Smooth.

C. Plywood:

1. Exterior type softwood plywood, PS 1-66.

2. Each panel stamped or branded indicating veneer grades, species, type and identification.

3. Wood faced plywood for Architectural concrete surfaces.

a. Panel veneer grades: B-C.
b. Mill-oiled sides and mill-sealed edges of panels.

D. Ties:

1. Material: Steel
2. Type: Snap ties
3. Depth of breakback: 1 in.
4. Maximum diameter, 1/4 in.

E. Form coatings:

1. Non-staining type.
2. Agent: Pine oil derivative.

2.07 EXPANSION AND CONTRACTION JOINTS

A. Minimum 3/4-inch thick asphaltic impregnated fiberboard as per ASTM D-1751.

2.08 OTHER

A. Water: Clean and potable.

PART 3 - EXECUTION

3.01 BARRICADES

A. Provide substantial temporary barricades around all areas of operation and maintain until work under this section is completed and approved.

B. Install temporary traffic, markers, signals, and signs as per D.O.T. Standard Specifications to:

1. Eliminate potentially hazardous conditions.

2. Maintain adequate traffic patterns free of conflict with work under this Contract.

3.02 PREPARATION OF SUBGRADE

A. Ensure rough grading has brought subgrade to required elevations.

B. Fill soft spots and hollows with additional fill.

C. Level and compact subgrade, to receive limerock base for concrete walks, curbs and gutters, to a density as specified in Section 02200, Paragraph 3.14.I.

3.03 FORMWORK

A. CONTRACTOR is responsible for the design, construction, removal and complete safety of formwork and shoring.

B. Form construction shall be provided to shape, lines dimensions of members shown: substantial, tight enough to prevent leakage, and properly braced or tied to maintain position and size, form sides and bottoms of members unless specifically excepted.

C. Fill voids of plywood joints with sealant and tool smooth.

D. Form vertical surfaces to full depth and securely position to required lines and levels. Ensure form ties are not placed so as to pass through concrete.

E. Arrange and assemble formwork to permit easy dismantling and stripping, and to prevent damage to concrete during formwork removal.

3.04 REINFORCING

A. Reinforce concrete curbs and gutters. Allow for minimum 1-1/2 inch concrete cover.

B. Do not extend reinforcing through expansion and contraction of joints. Provide dowelled joints through expansion and contraction joints, with one end of dowels fitted with capping sleeve to allow free movement.

3.05 FORMING EXPANSION AND CONTRACTION JOINTS

A. Place expansion and contraction joints at 20 foot intervals or as indicated on drawings. Where possible, make joints of curbs coincide with joints in paving slabs. When sidewalks abut building, provide continuous joint filled.

B. Fill joints with filler of required profiles set perpendicular to longitudinal axis of walks, curbs and gutters. Recess 1/2 inch below finished concrete surface.

3.06 INSPECTION

A. Assure that excavation and formwork are completed, and excess water is removed.

B. Check that reinforcement is secured in place.
C. Verify that expansion joint material, anchors, and other embedded items are secured in position.

3.07 PREPARATION FOR PLACEMENT

A. Notify the ENGINEER and other inspectors at least 36 hours prior to inspection.

B. Equipment forms, and reinforcing shall be clean and wet down, reinforcing firmly secured in place, runways set up and not resting on or displacing reinforcing.

3.08 PLACING CONCRETE

A. Place concrete, screed and wood float surfaces to a smooth and uniform finish, free of open texturing and exposed aggregate.

B. Avoid working mortar to surface.

C. Round all edges, including edges of expansion and contraction joints, with 1/2 inch of radius edging tool.

D. Where concrete curbs are adjacent to pavement slabs, make concrete curbs and gutters integral with slabs. Make expansion and contraction joints of curbs coincide with slab joints.

E. Ensure finished surfaces do not vary from true lines, levels or grade by more than 1/8 inch in 10 feet when measured with straightedge.

F. Apply curing compound on finished surfaces immediately after finishing. Apply in accordance with manufacturer's recommendations.

3.09 PROTECTION OF COMPLETED WORK

A. During curing period, protect concrete from damaging mechanical disturbances, water flow, loading, shock, and vibration.

3.10 CLEAN UP

A. Remove all debris and excess material immediately from project site.

B. Take down all barricades and temporary traffic markers, signals and signs only after all work included in this section is finished and inspected, and only after so directed by CITY'S Representative.

C. Leave project area neat, orderly and free of any hazardous conditions.

3.11 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on the actual quantities installed as more specifically discussed and described in SECTION 01025 for MEASUREMENT AND PAYMENT.

END OF SECTION 02515

SECTION 02577
PAVEMENT MARKING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

A. The work covered by this section shall include the furnishing of all labor, equipment and materials necessary to construct and install all pavement marking, striping and car stops in accordance with the plans and these specifications.

1.03 RELATED WORK

A. Section 02513 - Asphaltic Concrete Paving - General

B. Section 02515 - Portland Cement Concrete Paving

1.04 QUALITY ASSURANCE

A. Perform all work in accordance with the requirements of local agencies.

1.05 SUBMITTALS

A. Submit copies of product and material information and data..

PART 2 - PRODUCTS

2.01 Chlorinated rubber-alkyd type, as per Fed Spec. No. TT-P-115, Type III, or shall be Code T-1, conforming to Section 971-12.2 of the Florida Department of Transportation Standard Specifications.

1. Paint shall be factory mixed, quick drying and non-bleeding type.

2. Color shall be as per D.O.T. requirements.

3. Striping, arrows, lane markers and stop bars shall be provided with paint containing reflective additive.

2.02 Thermoplastic paint shall conform to the applicable Technical Specifications (Section 711) of the Florida Department of Transportation and Broward County Standards

2.03 Traffic paint shall conform to the applicable Technical Specifications (Section 710) of the Florida Department of Transportation and Broward County Standards

2.04 Car stops shall be of the size and dimensions shown on the plans. Concrete for car stops shall have a minimum compressive strength of 2,500 psi.

2.05 Reflectors shall be in accordance with Broward County Minimum Standards.

PART 3 - EXECUTION

3.01 TRAFFIC AND LANE MARKINGS

A. Sweep dust and loose material from the sealed surface.

B. Apply paint striping as indicated on the drawings, with suitable mechanical equipment to produce uniform straight edges.

1. Apply in not less than (2) two coats as per manufacturer's recommended rates of applications.

C. Protect pavement markings until completely dry in accordance with manufacturers recommendations.

3.02 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on the actual quantities installed as more specifically discussed and described in SECTION 01025 for MEASUREMENT AND PAYMENT.

END OF SECTION 02577

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this section.

1.02 WORK INCLUDED

A. The work covered by this section shall include the furnishing of all labor, equipment, services, materials, products and tests to perform all operations in connection with the construction of all new structures or modifications or abandonment of existing structures as shown on the plans, defined in these specifications and subject to the terms and conditions of this contract, including, but not limited to, maintenance access structure's (MAS's), catch basins, and inlets.

1.03 RELATED WORK

A. Section 02200 - Earthwork

B. Section 02221 - Excavation and Backfilling for Utilities

C. Section 02400 - Storm Drainage Facilities

1.04 SUBMITTALS

A. The CONTRACTOR shall furnish the ENGINEER shop drawings of the precast drainage structures and MAS's for approval. Shop drawings should illustrate all dimensions, reinforcements and specifications for the complete manual.

PART 2 - PRODUCTS

2.01 MORTAR

A. Mortar for use in constructing and plastering sewer structures shall conform to ASTM C-270, "Specifications for Mortar for Unit Masonry". A Portland cement-hydrated lime mixture or a masonry cement may be used provided that the same materials are used throughout the project.

B. Mortar materials shall be proportioned by volume and shall consist of one part Type II Portland Cement to two parts aggregate (sand). Portland Cement shall conform to ASTM C-150, "Specifications for Portland Cement". Aggregate shall conform to ASTM C-144, "Specifications for Aggregate for Masonry Units."

2.02 PRECAST CONCRETE MANHOLES

A. Precast manhole sections shall conform to ASTM C-478, Specifications for Precast Reinforce Concrete Manhole Sections as modified thereto. Concrete shall attain a minimum compressive strength of 4,000 psi at 28 days. Minimum wall thickness shall be 8 inches.

B. Unless otherwise specified on the plans, all joints shall be made with neoprene or rubber "O" ring compression joints; mastic joint sealing compound, or approved equal. After assembly, all joints shall be filled with mortar and pointed to provide a smooth surface without joint voids.

C. The base and walls that compose the bottom section of precast manholes shall be of monolithic construction, minimum 8 inches thick, and the edge of the base slab shall project a minimum 4 inches beyond the outside diameter of the wall.

D. Holes for piping shall be 6" inches larger than the outside diameter of the respective pipe. After the pipe is set, the void space between the pipe and the hole perimeter shall be completely filled with non-shrinking, quick-setting, waterproof cement mortar and struck smooth.

E. The minimum height of precast base section shall be 36 inches from the bottom of the base slab; however, no holes for piping shall be cast less than 8 inches from the top of the base section or less than 2 inches from the top of the base slab.

2.03 ENDWALLS, CATCH BASINS, INLETS AND JUNCTIONS BOXES

A. Endwalls, valve vaults, catch basins, inlets and junction boxes shall be constructed at the locations shown and to the dimensions indicated on site plans. Unless otherwise specified on the plans, inlets, junction boxes, catch basins, valve vaults and similar structures may be constructed of brick, concrete block, poured concrete or precast concrete. Precast catch basins shall conform to latest A.C.H.A. and P.C.A. specifications. Concrete shall have not less than 4,000-PSI compressive strength at 28 days.

B. Unless otherwise specified on the plans, all concrete for these structures shall be Class I concrete as specified in the Florida Department of Transportation "Standard Specifications for Road and Bridge Construction", latest revision, Section 345. Mortar for use in constructing and plastering shall be as previously set forth in this section.

C. Brick shall be solid hard-burned clay conforming to ASTM Serial C-32-73, Grade MA. Concrete brick shall conform to ASTM Serial C-55-75, Grade P-I. Concrete block shall conform to ASTM Serial C-90-78, Grade PI.

D. All brick or concrete block structures covered in this Section shall be plastered inside and outside with 1/2 inch of cement mortar. Inside surfaces shall be smooth and even.

E. Base slabs and walls of concrete structures shall be constructed in a continuous pour between expansion joints.

F. For each grate type inlet, two layers of Mirafi 140 fabric of "Poly Filter X" polypropylene material or approved equal, shall be sandwiched between 2 x 2 x 10/10 welded wire fabric cut to the grate size and attached to the underside of the grate. The sandwiched filter material shall be wired to the cross members of the grate each way on 4-inch centers. After inlet construction and the roadway construction is completed and the project site work (including landscaping) has been established, the filter material and fabric shall be removed with any retained silt or sand.

2.04 CASTINGS (INCLUDING FRAMES, COVERS AND GRATINGS)

A. Iron castings shall conform to ASTM A-48, "Specifications for Gray Iron Castings", and shall be Class 30. Frames and grates may be Class 20.

B. All castings shall be made of clean, even grain, tough grey cast iron. The castings shall be smooth, true to pattern and free from projections, san holes, warp and other defects. The horizontal surface of the frame cover seats and the under surface of the frame cover seat which rests upon the cover seat shall be machined. After machining, it shall not be possible to rock any after it has been seated in any position in its associated frame. Machining shall be required only on those frames and covers intended for vehicular traffic.

C. Bearing surfaces between cast frames, covers and grates shall be machined and fitted together to assure a true and even fit. Within areas of vehicular traffic, the frames, covers and gratings shall be machined-ground so that irregularity of contact will be reduced to a minimum and will be rattle-proof.

D. All manhole covers shall be provided with concealed pick holes. Manufacturer's name and catalog number shall be cast on all frames, covers, grates, etc. Covers shall be lettered "Storm Sewer" or "Sanitary Sewer" as applicable and shall be plainly visible. The manhole frames and covers shall be flush with finished grade.

E. Grates and covers for inlets shall be as shown on the plans, set to the grades indicated and conforming with the requirements of the castings described above. Grates shall be furnished complete with frames specifically constructed to provide full bearing at all points of contract.

PART 3 - EXECUTION

3.01 CHANNELS

A. Channels shall be accurately and smoothly formed in accordance with the plans. Channels shall be constructed of concrete with trowel-finished surfaces. The upper surface of the manhole shall be sloped toward the channels as shown.

B. Drop pipe at sanitary sewer MAS’s shall be installed when the difference in elevation between the pipe invert and the invert at the center of the manhole exceeds two feet (2'), or where directed by the ENGINEER. The drop manhole structure shall be built according to the plans and specifications.

C. After channels are formed and section joints are pointed, the interior of the sanitary sewer manhole shall be painted with two coats of Koppers Bitumastic 300-M (7 mils per coat) or approved equal. The exterior shall be painted in a similar manner, if required by local regulations.

D. Storm drainage structures are not required to be painted inside or outside. Provide finish and water proofing as specified in 3.02 and 3.03 below.

3.02 BRICKS

A. All bricks shall be thoroughly wetted before being laid. Brick shall be laid by the above shove joint method so as to bond them thoroughly into the mortar. Headers and stretcher courses shall

be so arranged as to bond and mass thoroughly. Joints shall be finished smooth and shall be not less than 1/4 inch or more than 1/2 inch in thickness.

3.03 MANHOLES AND OTHER STRUCTURES

A. All joints shall be finished watertight; all openings for sewers, frames, etc., in precast manhole access structures and catch basins shall be cast at time of manufacture. Spaces around all piping entering or leaving manhole access structures shall be completely filled with Embeco mortar or approved equal.

B. All mas's shall be set plumb to line and grade and shall rest on a firm carefully graded subgrade which shall provide uniform bearing under base.

C. Grout for manhole bottoms shall consist of broken block, brick and 2:1 cement mortar.

3.04 CLEANING AND MAINTENANCE

A. All structures shall be cleaned and maintained in workable condition until accepted by the ENGINEER

3.05 ABANDONMENT OF EXISTING STRUCTURES IN PLACE

A. All structures shown on the drawings to be abandoned in place shall be removed to a minimum of 3 feet below existing grade and properly filled with material as in section 02200 paragraph 3.14. Excavation, backfill, and restoration shall be executed in accordance with requirements for removing existing and installing new structures.

3.06 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on the actual quantities installed as more specifically discussed and described in SECTION 01025 for MEASUREMENT AND PAYMENT.

END OF SECTION 02601

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. The CONTRACTOR shall furnish and install all piping systems shown and specified, in accordance with the requirements of the Contract Documents. Each system shall be complete with all necessary fittings, hangers, supports, anchors, expansion joints, flexible connectors, valves, accessories, heat tracing, insulation, lining and coating, testing, disinfection, excavation, backfill and encasement, to provide a functional installation.

B. The piping shown is intended to define the general layout, configuration, routing, method of support, pipe size, and pipe type. The mechanical drawings are not pipe construction or fabrication drawings. It is the CONTRACTOR's responsibility to develop the details necessary to construct all mechanical piping systems, to accommodate the specific equipment provided, and to provide and install all spools, spacers, adapters, connectors, etc., for a complete and functional system.

1.03 RELATED WORK

A. Division 2 as applicable.

B. Section 02200 - Earthwork.

C. Section 02221 - Excavation and Backfilling Utilities

D. Section 02400 - Storm Drainage Facilities

E. Section 02601 - Subterranean Structures

1.04 REFERENCE STANDARDS

A. Codes: All codes, as referenced herein are specified in Section 01090, "Reference Standards".

B. Commercial Standards:

ANSI/ASME B1.20.1	Pipe Threads, General Purpose (inch).
ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and other Special Alloys.
ANSI/AWWA C207	Steel Pipe Flanges for Water Works Service, Sizes 4 in through 144 in.
ANSI/AWWA C606	Grooved and Shouldered Joints.

ANSI/AWS D1.1	Structural Welding Code.
ASTM A 307	Specification for Carbon Steel Bolts and Studs, 6,000 PSI Tensile.
ASTM A 325	Specification for High-Strength Bolts for Structural Steel Joints.
ASTM D 792	Test Methods for Specific Gravity and Density of Plastics by Displacement.
ASTM D 2000	Classification System for Rubber Products in Automotive Applications.

1.05 SUBMITTALS

A. The CONTRACTOR shall submit complete shop drawings and certificates, test reports, affidavits of compliance, of all piping systems, in accordance with the requirements in Section 01340, "Shop Drawings, Product Data and Samples", and as specified in the individual sections. The shop drawings shall include all necessary dimensions and details on pipe joints, fittings, fitting specials, valves, appurtenances, design calculations, and material lists. The submittals shall include detailed layout, spool, or fabrication drawings which show all pipe spools, spacers, adapters, connectors, fittings, and pipe supports necessary to accommodate the equipment and valves provided in a complete and functional system.

B. All expenses incurred in making samples for certification of tests shall be borne by the CONTRACTOR.

C. The CONTRACTOR shall submit as part of the shop drawings a certification from the pipe fabricator stating that all pipes will be fabricated subject to a recognized Quality Control Program. An outline of the program shall be submitted to the ENGINEER for review prior to the fabrication of any pipe

1.06 QUALITY ASSURANCE

A. Inspection: All pipes shall be subject to inspection at the place of manufacture. During the manufacture of the pipe, the ENGINEER shall be given access to all areas where manufacturing is in progress and shall be permitted to make all inspections necessary to confirm compliance with the Specifications.

B. Tests: Except where otherwise specified, all materials used in the manufacture of the pipe shall be tested in accordance with the applicable Specifications and Standards. [Welds shall be tested as specified.] The CONTRACTOR shall perform all tests at no additional cost to the CITY.

C. Welding Requirements: All welding procedures used to fabricate pipe shall be pre-qualified under the provisions of ANSI/AWS D1.1. Welding procedures shall be required for, but not necessarily limited to, longitudinal and girth or spiral welds for pipe cylinders, spigot and bell ring attachments, reinforcing plates and ring flange welds, and plates for lug connections.

D. Welder Qualifications: skilled welders, welding operators, and tackers who have had adequate experience in the methods and materials to be used shall do all welding. Welders shall be qualified under the provisions of ANSI/AWS D1.1 by an independent local, approved testing agency not more than 6 months prior to commencing work on the pipeline. Machines and electrodes similar to those used in the WORK shall be used in qualification tests. The CONTRACTOR shall furnish all material and bear the expense of qualifying welders.

1.07 MANUFACTURER'S SERVICE REPRESENTATIVE

A. Where the assistance of a manufacturer's service representative is advisable, in order to obtain perfect pipe joints, supports, or special connections, the CONTRACTOR shall furnish such assistance at no additional cost to the CITY

1.08 MATERIAL DELIVERY, STORAGE, AND HANDLING

A. All piping materials, fittings, valves, and accessories shall be delivered in a clean and undamaged condition and stored off the ground, to provide protection against oxidation caused by ground contact. All defective or damaged materials shall be replaced with new materials.

1.09 CLEANUP

A. After completion of the work, all remaining pipe cuttings, joining and wrapping materials, and other scattered debris, shall be removed from the site. The entire piping system shall be handed over in a clean and functional condition.

PART 2 - PRODUCTS

2.01 GENERAL

A. All pipes, fittings, and appurtenances shall be furnished in accordance with the requirements of the applicable Sections of Division 2 and as specified herein.

B. Lining: All requirements pertaining to thickness, application, and curing of pipe lining, are in accordance with the requirements of the applicable Sections of Division 2, unless otherwise specified.

C. Coating: All requirements pertaining to thickness, application, and curing of pipe coating, are in accordance with the requirements of the applicable Sections of Division 2, unless otherwise specified. Pipes above ground or in structures shall be field-painted as directed by the ENGINEER.

D. Grooved Piping Systems: Piping systems with grooved joints and fittings may be provided in lieu of screwed, flanged, welded, or mechanical joint systems for ductile iron yard piping. (All piping above and below ground within the property limits of treatment plants, pump stations, and similar installations). All grooved couplings on buried piping must be bonded. To assure uniform and compatible piping components, all grooved fittings, couplings, and valves shall be from the same manufacturer. The CONTRACTOR shall make the coupling manufacturer responsible for the selection of the correct style of coupling and gasket for each individual location.

2.02 PIPE FLANGES

A. Flanges: Where the design pressure is 150 psi or less, flanges shall conform to either ANSI/AWWA C207 Class D or ANSI B16.5 150-lb class. Where the design pressure is greater than 150 psi, up to a maximum of 275 psi, flanges shall conform to ANSI/AWWA C207 Class E, Class F, or ANSI B16.5 150-lb class. However, AWWA flanges shall not be exposed to test pressure greater than 125 percent of rated capacity. For higher test pressures, the next higher rated AWWA flange or an ANSI-rated flange shall be selected. Where the design pressure is greater than 275 psi up to a maximum of 700 psi, flanges shall conform to ANSI B16.5 300-lb class. Flanges shall have flat faces and shall be attached with boltholes straddling the vertical axis of the pipe unless otherwise shown. Attachment of the flanges to the pipe shall conform to the applicable requirements of ANSI/AWWA C207. Flanges for miscellaneous small pipes shall be in accordance with the standards specified for these pipes.

B. Blind Flanges: Blind flanges shall be in accordance with ANSI/AWWA C207, or with the standards for miscellaneous small pipes. All blind flanges for pipe sizes 12 inches and over shall be provided with lifting eyes in form of welded or screwed eyebolts.

C. Flange Coating: All machined faces of metal blind flanges and pipe flanges shall be coated with a temporary rust-inhibitive coating to protect the metal until the installation is completed.

D. Flange Bolts: All bolts and nuts shall conform to pipe manufacturers recommendations. Studs and bolts shall extend through the nuts a minimum of 1/4-inch. All-thread studs shall be used on all valve flange connections, where space restrictions preclude the use of regular bolts.

E. Insulating Flanges: Insulated flanges shall have boltholes 1/4-inch diameter greater than the bolt diameter.

F. Insulating Flange Sets: Insulating flange sets shall be provided where shown. Each insulating flange set shall consist of an insulating gasket, insulating sleeves and washers and a steel washer. Insulating sleeves and washers shall be one piece when flange bolt diameter is 1-1/2-inch or smaller and shall be made of acetal resin. For bolt diameters larger than 1-1/2-inch, insulating sleeves and washers shall be 2-piece and shall be made of polyethylene or phenolic. Steel washers shall be in accordance with ASTM A 325. Insulating gaskets shall be full-face.

G. Insulating Flange Manufacturers, or equal:

1. JM Red Devil, Type E;
2. Maloney Pipeline Products Co., Houston;
3. PSI Products, Inc., Burbank, California.

H. Flange Gaskets: Gaskets for flanged joints shall be full-faced, 1/16-inch thick compressed sheets of aramid fiber base, with nitrile binder and non-stick coating, suitable for temperatures to 700 degrees F, a pH of one to eleven, and pressures to 1000 psig. Blind flanges shall have gaskets covering the entire inside face of the blind flange and shall be cemented to the blind flange. Ring gaskets shall not be permitted.

I. Flange Gasket Manufacturers, or equal:

1. John Crane, style 2160;

2. Garlock, style 3000.

J. Water Stop Gasket: Water stop gaskets for HDPE pipe are to be used to seal and prevent the infiltration and exfiltration of water at manhole connections. The recommended minimum concrete structure hole diameter for a 18" pipe is to be 26.50". The pipe is to be cleaned prior to attaching the gasket which is to be positioned on the valley of the corrugation. The take up clamp screws are to be positioned 180 degrees from each other. A good quality bonding agent is required at the structures opening. Water stop gasket is to meet the requirements of ASTM C923.

2.03 THREADED INSULATING CONNECTIONS

A. General: Threaded insulating bushings, unions, or couplings, as appropriate, shall be used for joining threaded pipes of dissimilar metals and for piping systems where corrosion control and cathodic protection are involved.

B. Materials: Threaded insulating connections shall be of nylon, Teflon, polycarbonate, polyethylene, or other non-conductive materials, and shall have ratings and properties to suit the service and loading conditions.

2.04 MECHANICAL-TYPE COUPLINGS (GROOVED OR BANDED PIPE)

A. General: Cast mechanical-type couplings shall be provided where shown. The couplings shall conform to the requirements of ANSI/AWWA C606. All gaskets for mechanical-type couplings shall be compatible with the piping service and fluid utilized, in accordance with the coupling manufacturer's recommendations. The wall thickness of all grooved piping shall conform with the coupling manufacturer's recommendations to suit the highest expected pressure. To avoid stress on equipment, all equipment connections shall have rigid-grooved couplings, or harness sets in sizes where rigid couplings are not available, unless thrust restraint is provided by other means. The CONTRACTOR shall have the coupling Manufacturer's service representative verify the correct choice and application of all couplings and gaskets, and the workmanship, to assure a correct installation.

B. Couplings for Steel Pipe, Manufacturers, or equal:

1. Gustin-Bacon (banded or grooved);
2. Victaulic Style 41 or 44 (banded, flexible);
3. Victaulic Style 77 or 07 (grooved).

C. Ductile Iron Pipe Couplings, Manufacturers, or equal:

1. Gustin-Bacon;
2. Victaulic Style 31.

Note: Ductile iron pipe couplings shall be furnished with flush seal gaskets.

2.05 SLEEVE-TYPE COUPLINGS

A. Construction: Sleeve-type couplings shall be provided where shown, in accordance with ANSI/AWWA C219 unless otherwise specified, and shall be of steel with steel bolts, without pipe stop, and shall be of sizes to fit the pipe and fittings shown. The middle ring shall be not less than 1/4-inch in thickness and shall be either 5 or 7 inches long for sizes up to and including 30

inches and 10 inches long for sizes greater than 30 inches, for standard steel couplings, and 16 inches long for long-sleeve couplings. The followers shall be single-piece contoured mill section welded and cold expanded as required for the middle rings. They shall be of sufficient strength to accommodate the number of bolts necessary to obtain adequate gasket pressures without excessive rolling. The shape of the follower shall be of such design as to provide positive confinement of the gasket. Buried sleeve-type couplings shall be epoxy-coated at the factory as specified.

B. Pipe Preparation: The ends of the pipe, where specified or shown, shall be prepared for flexible steel couplings. Plain ends for use with couplings shall be smooth and round for a distance of 12 inches from the ends of the pipe, with outside diameter not more than 1/64-inch smaller than the nominal outside diameter of the pipe. The middle ring shall be tested by cold-expanding a minimum of one percent beyond the yield point, to proof-test the weld to the strength of the parent metal. The weld of the middle ring shall be subjected to air test for porosity.

C. Gaskets: Gaskets for sleeve-type couplings shall be rubber-compound material that will not deteriorate from age or exposure to air under normal storage or use conditions. Gaskets for wastewater and sewerage applications shall be Buna "N," grade 60, or equivalent suitable elastomer. The rubber in the gasket shall meet the following specifications:

1. Color - Jet Black
2. Surface - Non-blooming
3. Durometer Hardness - 74 ± 5
4. Tensile Strength - 1000 psi Minimum
5. Elongation - 175 percent Minimum

The gaskets shall be immune to attack by impurities normally found in water or wastewater. All gaskets shall meet the requirements of ASTM D 2000, AA709Z, meeting Suffix B13 Grade 3, except as noted above. All gaskets shall be compatible with the piping service and fluid utilized.

D. Insulating Couplings: Where insulating couplings are required, both ends of the coupling shall have a wedge-shaped gasket which assembles over a rubber sleeve of an insulating compound in order to obtain insulation of all coupling metal parts from the pipe.

E. Restrained Joints: All sleeve-type couplings on pressure lines shall be harnessed unless thrust restraint is provided by other means. Harnesses shall be in accordance with the requirements of the appropriate reference standard, or as shown.

F. Manufacturers or Equal:

1. Dresser, Style 38;
2. Ford Meter Box Co., Inc., Style FC1 or FC3;
3. Smith-Blair, Style 411.

2.06 FLEXIBLE CONNECTORS

A. Flexible connectors shall be installed in all piping connections to engines, blowers, compressors, and other vibrating equipment, and where shown. Flexible connectors for service temperatures up to 180 degrees F shall be flanged, reinforced Neoprene or Butyl spools, rated for a working pressure of 40 to 150 psi, or reinforced, flanged duck and rubber, as best suited for the application. Flexible connectors for service temperatures above 180 degrees F shall be flanged

braided stainless steel spools with inner, annular, corrugated stainless steel hose, rated for minimum 150 psi working pressure, unless otherwise shown. The connectors shall be 9 inches long, face-to-face flanges, unless otherwise shown. The manufacturer shall approve the final material selection. The CONTRACTOR shall submit manufacturer's shop drawings and calculations.

2.07 EXPANSION JOINTS

A. All piping subject to expansion and contraction shall be provided with sufficient means to compensate for such movement, without exertion of undue forces to equipment or structures. This may be accomplished with expansion loops, bellow-type expansion joints, or sliding-type expansion joints. Expansion joints shall be of stainless steel, monel, rubber, or other materials, best suited for each individual service. The CONTRACTOR shall submit detailed calculations and manufacturer's shop drawings, guaranteeing satisfactory performance of all proposed expansion joints, piping layouts showing all anchors and guides, and information on materials, temperature and pressure ratings.

2.08 PIPE THREADS

A. All pipe threads shall be in accordance with ANSI/ASME B1.20.

PART 3 - EXECUTION

3.01 GENERAL

A. All pipes, fittings, and appurtenances shall be installed in accordance with the requirements of the applicable Section of Divisions 2. The lining manufacturer shall take full responsibility for the complete, final product and its application. All pipe ends and joints at screwed flanges shall be epoxy-coated, to assure continuous protection.

B. Where core drilling is required for pipes passing through existing concrete, core drilling locations shall be determined by radiograph of concrete construction to avoid damage to embedded raceways and rebars.

C. All exposed piping shall be painted. All piping to be painted shall be color coded in accordance with CITY'S standard color code. Color samples shall be submitted to ENGINEER for final color selection.

3.02 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on the actual quantities installed as more specifically discussed and described in SECTION 01025 for measurement and payment.

END OF SECTION 02610

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Provide all labor, materials, necessary equipment and services to complete the water distribution and wastewater transmission system work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

1.02 WORK INCLUDED

A. The CONTRACTOR shall provide all tools, supplies, materials, equipment, and labor necessary for furnishing, epoxy coating, installing, adjusting, and testing of all valves and appurtenant work, complete and operable, in accordance with the requirements of the Contract Documents. Where buried valves are shown, the CONTRACTOR shall furnish and install valve boxes to grade, with covers, extensions, and position indicators.

B. The provisions of this Section shall apply to all valves and valve operators specified in the various Sections and Division 2 of these Specifications except where otherwise specified in the Contract Documents. Valves and operators in particular locations may require a combination of units, sensors, limit switches, and controls specified in other Sections of these Specifications.

1.03 RELATED WORK

A. Section 02221 - Excavation and Backfilling for Utilities

B. Section 02610 - Piping, General

1.04 REFERENCE STANDARDS

A. Codes: All codes, as referenced herein, are specified in Section 01090, "Reference Standards".

B. Commercial Standards:

ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys.
ANSI/ASME B31.1	Power Piping.
ASTM A 36	Specification for Structural Steel.
ASTM A 48	Specification for Gray Iron Castings.
ASTM A 126	Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
ASTM A 536	Specification for Ductile Iron Castings.
ASTM B 61	Specification for Steam or Valve Bronze Castings.

ASTM B 62	Specification for Composition Bronze or Ounce Metal Castings.
ASTM B 148	Specification for Aluminum-Bronze Castings.
ASTM B 584	Specification for Copper Alloy Sand Castings for General Applications.
ANSI/AWWA C500	Gate Valves for Water and Sewerage Systems.
ANSI/AWWA C502	Dry-Barrel Fire Hydrants.
ANSI/AWWA C503	Wet-Barrel Fire Hydrants.
ANSI/AWWA C504	Rubber-Seated Butterfly Valves.
ANSI/AWWA C507	Ball Valves 6 Inches Through 48 Inches.
ANSI/AWWA C508	Swing-Check Valves for Waterwork Service, 2 Inches Through 24 Inches NPS.
ANSI/AWWA C509	Resilient-Seated Gate Valves for Water and Sewage Systems.
ANSI/AWWA C511	Reduced-Pressure Principle Backflow-Prevention Assembly.
ANSI/AWWA C550	Protective Interior Coatings for Valves and Hydrants.
SSPC-SP-2	Hand Tool Cleaning.
SSPC-SP-5	White Metal Blast Cleaning.

1.05 SUBMITTALS

A. Shop Drawings: Shop drawings of all valves and operators including associated wiring diagrams and electrical data, shall be furnished as specified in Section 01340, "Shop Drawings, Product Data and Samples".

B. Valve Labeling: The CONTRACTOR shall submit a schedule of valves to be labeled indicating in each case the valve location and the proposed wording for the label.

1.06 QUALITY ASSURANCE

A. Valve Testing: Unless otherwise specified, each valve body shall be tested under a test pressure equal to twice its design water-working pressure.

B. Bronze Parts: Unless otherwise specified, all interior bronze parts of valves shall conform to the requirements of ASTM B 62, or where not subject to dezincification, to ASTM B 584.

C. Certification**:** Prior to shipment, the CONTRACTOR shall submit for all valves over 12 inches in size, certified, notarized copies of the hydrostatic factory tests, showing compliance with the applicable standards of AWWA, ANSI, ASTM, etc.

PART 2 - PRODUCTS

2.01 VALVES, GENERAL

A. General: The CONTRACTOR shall furnish all valves, gates, valve-operating units, stem extensions, and other accessories as shown or specified. All valves and gates shall be new and of current manufacture. All shut-off valves, 6-inch and larger, shall have operators with position indicators. Where buried, these valves shall be provided with valve boxes and covers containing position indicators, and valve extensions. Shut-off valves mounted higher than 5 feet-6 inches above working level shall be provided with chain operators.

B. Valve Flanges: The flanges of valves shall be in accordance with Section 02610, "Piping, General".

C. Gate Valve Stems: Where subject to dezincification, gate valve stems shall be of bronze conforming to ASTM B 62, containing not more than 5 percent of zinc nor more than 2 percent aluminum. Gate valve stems shall have a minimum tensile strength of 60,000 psi, a minimum yield strength of 40,000 psi, and an elongation of at least 10 percent in 2 inches, as determined by a test coupon poured from the same ladle from which the valve stems to be furnished are poured. Where dezincification is not a problem, bronze conforming to ASTM B 584 may be used.

D. Protective Coating: Except where otherwise specified, ferrous surfaces, exclusive of stainless steel surfaces, in the water passages of all valves 4-inch and larger, as well as the exterior surfaces of all submerged valves, shall be coated with 2 part thermal setting epoxy coatings. Flange faces of valves shall not be epoxy coated. The valve manufacturer shall certify in writing that such coating has been applied and tested in the manufacturing plant prior to shipment, in accordance with these Specifications.

E. Valve Operators: Where shown, certain valves and gates shall be furnished with electric operators, provided by the valve or gate manufacturer. The same manufacturer shall furnish all operators of a given type. Where different manufacturers supply these operators, the CONTRACTOR shall coordinate their selection to provide uniformity of each type of electric operator. All valve operators, regardless of type, shall be installed, adjusted, and tested by the valve manufacturer at the manufacturing plant.

F. Valve Labeling: Except when such requirement is waived by the ENGINEER in writing, a label shall be provided on all shut-off valves exclusive of hose bibbs and chlorine cylinder valves. The label shall be of 1/16-inch plastic or stainless steel, minimum 2 inches by 4 inches in size, and shall be permanently attached to the valve or on the wall adjacent to the valve as directed by the ENGINEER. Valve labels shall be photographed and marked on the As-Built Drawings.

G. Nuts and Bolts: All nuts and bolts on valve flanges and supports shall be in accordance with manufacturers recommendations. Where submerged or buried, all nuts and bolts on valve flanges and valve bodies shall be stainless steel.

2.02 GATE VALVES

A. All buried gate valves shall be of the inside screw, non-rising stem type. Valves shall be capable of being repacked under line pressure. Valves 14-inch and larger installed vertical pipes with their stems horizontal shall be fitted with bronze slides, tracks, rollers, and scrapers to assist the travel of the gate assembly. Quick opening valves shall have quick opening levers and cams in lieu of handwheel operators.

B. Knife Gate Valves

1. Knife gate valves shall be provided with raised face and resilient seats for positive seating. Wetted parts shall be constructed of Type 316 stainless steel. Gates shall be finish-ground on both sides to prevent packing or seat damage. Valves 2 to 4 inches in size shall be furnished with cast stainless steel bodies; valves 6 to 24 inches in size shall be furnished with cast semi-steel bodies with stainless steel linings. Valve ends shall be of the flanged or wafer design, as shown. Gate guides and jams shall be steel. Actuator shall be handwheel. Port design shall be full-round.

2. Manufacturers or approved equal:

   a. Red Valve Company Inc.;
   b. DeZurik Corporation;
   c. Fabri-Valves;
   d. Rovang, Inc.

C. Resilient-Seated Gate Valves

1. Resilient-seated gate valves conforming to ANSI/AWWA C509 shall be provided. Resilient-seated gate valves shall have cast iron bodies with flanged, bell, or mechanical joint ends, rubber-coated cast iron disc, flanged bonnet, bronze stem, O-ring seals, and operators with handwheel or square nut, unless otherwise shown. Rubber and rubber composition materials (EPDM) shall be suitable for use in water chlorine or chloramines and in sanitary sewage.

2. Manufacturers or approved equal:

   a. Clow Valve Co.;
   b. Kennedy Valve;
   c. Mueller Company;
   d. M&H Valve

2.03 ECCENTRIC PLUG VALVES

A. Equipment Requirements: Plug valves shall be of the non-lubricated, eccentric type with resilient faced plugs, port areas for valves 20 inches and smaller shall be at least 80% of full pipe area. Port area of valves 24 inches and larger shall be at least 70% of full pipe area. The body shall be of semi-steel (ASTM A-126 C1.B) and shall have bolted bonnet, which gives access to the intervals of the valve. Seats shall be welded overlay of high nickel content or a stainless steel plate locked in the body cavity. If a plate is used, it shall be replaceable through the bonnet access. Bearings shall be permanently lubricated of stainless steel, bronze or teflon lined, fiberglass backed duralon. Bearing areas shall be isolated from the flow with grit seals. Valves shall have packing bonnets where the shaft protrudes from the grit seals. Valves shall have

packing bonnets where the shaft protruded from the valve and the packing shall be self-adjusting chevron type, which can be replaced without removing the bonnet. All nuts, bolts, springs and washers shall be stainless steel.

B. Valves shall be designed for a working pressure of 150 PSI. The valve and actuator shall be capable of satisfactory operation in either direction of flow against pressure drops up to and including 100 PSI (for plug valves over 12 inches in diameter). Valves shall be bubble tight in both directions at 100-psi differential.

C. Plug valves over 12" in diameter shall have worm gear operators. The operating mechanism shall be for buried service with a 2-inch square-operating nut.

D. Plug valves are to be installed with the sear pointed towards the upstream flow, when specified.

E. Manufacturers or approved equal:

1. Milliken Valve Co.

2. DeZurik Corporation.

3. Henry Pratt

2.04 BALL VALVES (4-INCH AND SMALLER)

A. General Requirements: Unless otherwise specified or shown, general purpose ball valves in sizes up to 4-inch shall have manual operators with lever or handwheel. Ferrous surface of 4-inch valves, which will be in contact with water, shall be epoxy-coated. All ball valves shall be of best commercial quality, heavy-duty construction.

B. Body: All ball valves up to 1-1/2 inch (incl.) in size shall have bronze or forged brass 2 or 3 piece bodies with screwed ends for a pressure rating of not less than 300 psi WOG (water-oil-gas). Valves 2-inch to 4-inch in size shall have bronze forged brass or steel 2 or 3 piece bodies with flanged ends for a pressure rating of 125 psi or 150 psi.

C. Balls: The balls shall be solid brass or chrome plated bronze, or stainless steel, with large or full openings.

D. Stems: The valves seats shall be of Polytetrafluoroethylene (PTFE) or Buna N, for bi-directional service and easy replacement.

E. Manufacturers or approved equal:

1. Jamesbury Corporation;

2. Jenkins Bros.;

3. Lunkenheimer Flow Control;

4. Wm. Powell Company;

5. Worcester Controls;

6. Valve Primer Corporation.

2.05 SWING CHECK VALVES (3-INCH AND LARGER)

General: Swing check valves for water, sewage, sludge, and general service shall be of the outside lever and spring or weight type, in accordance with ANSI/AWWA C 508 - Swing-Check Valves for Waterworks Service, 2 in. through 24 in. NPS, unless otherwise indicated, with full-opening passages, designed for a water-working pressure of 150 psi. They shall have a flanged cover piece to provide access to the disc.

B. Body: The valve body and cover shall be of cast iron conforming to ASTM A 126, with flanged ends conforming to ANSI B 16.1, or mechanical joint ends, as shown.

C. Disc: The valve disc shall be of cast iron, ductile iron, or bronze conforming to ASTM B 62.

D. Seat and Rings: The valve seat and rings shall be of bronze conforming to ASTM B 62 or B 148, or of Buna-N.

E. Hinge Pin: The hinge pin shall be of bronze or stainless steel.

F. Manufacturers or approved equal:

1. AFC.;

2. M& H

3. Danfoss Flo-Flex;

4. Mueller Company;

5. Clow.

2.06 AIR-VACUUM AND AIR-RELEASE VALVES

A. Air and Vacuum Valves: Air and vacuum valves shall be capable of venting large quantities of air while pipelines are being filled, and allowing air to re-enter while pipelines are being drained. They shall be of the size shown, with flanged or screwed ends to match piping. Bodies shall be of high-strength cast iron. The float, seat, and all moving parts shall be constructed of Type 316 stainless steel. Seat washers and gaskets shall be of a material insuring water tightness with a minimum of maintenance. Valves shall be designed for minimum 150-psi water-working pressure, unless otherwise shown.

B. Air-Release Valves: Air-release valves shall vent accumulating air while system is in service and under pressure and be of the size shown and shall meet the same general requirements as specified for air and vacuum valves except that the vacuum feature will not be required. They shall be designed for a minimum water-working pressure of 150 psi, unless otherwise shown.

C. Combination Air Valves: Combination air valves shall combine the characteristics of air and vacuum valves and air release valves by exhausting accumulated air in systems under pressure and releasing or re-admitting large quantities of air while a system is being filled or drained, respectively. They shall have the same general requirements as specified for air and vacuum valves.

D. Manufacturers or approved equal:

1. H-Tech;

2. Golden-Anderson Valve Division (GA Industries, Inc);

3. Crispin (Valve and Manufacturing Corporation).

2.07 CORPORATION STOPS (Ball Valve Type)

A. Unless otherwise shown, corporation stops shall be made of brass alloy for key operation, with screwed ends with corporation thread or iron pipe thread, as required. AWWA taper thread for inlet thread and compression type fittings for outlet.

B. Manufacturer or approved equal:

1. Ford Meter Box Company;

2. Cambridge Brass;

3. Mueller Company.

2.08 VALVE OPERATORS

A. Electric Motor Operators

1. All motorized valves shall be furnished by the CONTRACTOR through the valve manufacturers as a complete package. Motor driven valve operators shall be furnished and installed in accordance with the applicable requirements shown on the process and instrumentation diagrams and electrical elementary diagrams. Operators shall comply with AWWA requirements for electrical operators.

2. Electric operators including the motor, all required gearing, integral continuous duty rated reversing starter, AC line surge suppressors, controls and switches shall be as manufactured by Rotork, Limitorque, EIM; or approved equal.

3. The motorized operators for modulating service shall be furnished with an integral position indicator/transmitter/controller. The above unit shall be internally powered, factory calibrated and furnished with adjustable zero, span, gain and deadband controls.

4. The position indicator/transmitter shall provide a linear, isolated, 4-20 mA, 24 VDC output to remote instrumentation and controls proportional to 0-100 percent travel span. An external DC power source shall not be required.

5. The position controller shall accept a linear 4-20 mA, 24 VDC input signal proportional to 0-100 percent travel span and shall generate appropriate outputs to the reversing starter to open/close the valve until the desired portion has been reached as determined by the position feedback signal to the position controller. Input signal isolation shall be provided.

6. The controller shall be furnished with circuitry to "lock in the last position" upon loss of control signal. CONTRACTOR shall be responsible for proper transmitter/controller calibration in accordance with the manufacturer's recommendations.

7. Operator capacity shall be adequate to continuously operate the valve under all operating conditions. Unless otherwise indicated, or specified, motor operators shall be furnished complete with motors, limit switch operating mechanisms, travel limit switches, torque switches, transmitters, controllers, starters, lightening and surge suppression, terminal blocks, gear reducers, handwheel, gearing, necessary components, and incidental accessories as follows:

    a. All phases of the power supply shall be monitored. The contractor shall de-energize the motor upon detection of single phasing.

    b. Logic circuits shall be protected against spurious voltage spikes, using opto-isolators in circuits connected to any remote input or output signals.

8. Enclosure: The starter for 240 volt single phase motor operators and all local devices shall be mounted on a common NEMA 4 and PVC coated cast aluminum enclosure. The enclosure shall be permanently affixed to the valve operator housing.

9. Valve Stops: Valve stops for the operators shall be positive in action. Closing shall be complete, and opening full. Stops shall be field adjustable to the required settings. The torque switches shall prevent any excessive mechanical stress or electrical overloading any direction of travel.

10. Limit switches and gearing shall be an integral part of the motorized valve operator. The limit switch gearing shall be of the intermittent type, totally enclosed in its own gear case, grease lubricated to prevent direct and foreign matter from entering the gear train and shall be made of bronze or stainless steel. Limit switches shall be of the adjustable type capable of being adjusted to trip at any point between the normal position (full open, or full closed) and 75 percent of the travel to the opposite position.

11. Local (Motor) Devices: Local devices shall include, but not be limited to the following:

    a. Torque Switches: Torque switches, responsive to high torque encountered in either direction of travel. A torque switch, which has tripped due to mechanical load, shall not reset when the operator motor has come to a halt.

    b. Limit Switches: Travel limit switches, for opening and closing direction of travel. Contract operations shall be as indicated on the Drawings. If not shown on the Drawings, the operator shall be furnished with a minimum of two DPDT switches. All switches shall be furnished with 5-ampere contacts. Switches shall be connected such that when the valve is fully open, or fully closed, the "open" or "close" light

shall be illuminated. All limit switch contacts shall be wired out to a terminal strip so that the electrician in the field does not have to connect to the switches.

c. Local/remote selector switch with phase motor relay and auxiliary to provide dry contacts for collective indication of placement in the "remote" operating mode, the unit is powered, and that all safety/overload interlocks are satisfied to provide the above signal. For further requirements refer to electrical elementary control schematic.

d. Open/close push-button for local manual operation (modulating service).

e. Position indicator calibrated to 0-100 percent travel span.

f. Terminals for remote indication of full open, full closed and overload (torque).

12. Operating Unit Gearing: The actuator shall be double reaction unit with the capability of quickly changing the output speed with a gear change. The power gearing shall consist of generated spur or helical gears of heat-treated steel, and worm gearing where required by the type of operator. Quarter turn or traveling unit operators do not specifically require worm gearing. The worm shall be of hardened alloy steel and the worm gear shall be of alloy bronze. All power gearing shall be grease-lubricated. Ball or roller bearings shall be used throughout for all motor operators. A mechanical dial position indicator to display valve position in percent of valve opening shall be provided. The gearing shall comply with AWWA requirements.

13. Stem Nuts: The actuator for other than quarter turn valves shall have a stem nut of high tensile bronze or other material compatible with the valve stem and suited to the application. The nut arrangement, where possible, shall be of the two-piece type to simplify field replacement. The stem nut for rising stem valves must be capable of being removed from the top of the actuator without removing the actuator from the valve, disconnecting the electrical wiring, or disassembling any of the gearing within the actuator.

14. Manual Operation: A handwheel shall be provided for manual operation. The handwheel shall not relocate during hand operation nor shall a fused motor prevent manual operation.

15. When in manual operating position, the volt motor driven unit will remain in this position until motor is energized at which time the valve operator will automatically return to electric operation and shall remain in motor position until handwheel operation is desired. This movement from motor operation to handwheel operation shall be accomplished by a positive declutching knob or lever, which will disengage the motor and motor gearing mechanically not electrically. Hand operation must be reasonably fast and require no more than 100 lbs. of rim effort at the maximum required torque. It shall not be possible for the unit to be simultaneously in manual and motor operation.

16. 240 Volt Single Phase Motors: All motors on valves shall be designed for 240 volts 1-phase 60 Hz power. The motor shall be specifically designed for valve actuator service and shall be of high torque, squirrel cage reversible, totally enclosed, non-ventilated construction, with motor leads brought into the limit switch compartment without having external piping or conduit box. Motor insulation shall be NEMA Class B with maximum continuous temperature rating of 120˚ C (rise + ambient). Motors shall be sized to have a

rated running time at the rated running torque of 15 minutes without exceeding the temperature rating of the insulation system. Running load torque shall be not more than 20 percent of the rated seating/unseating torque.

17. Speed-torque curves for the motors and torque calculations for seating, unseating, and running conditions shall be submitted. The maximum valve torque (seating/unseating) shall be less than 50 percent of stall torque or starting torque potential of the motor whichever is greater.

18. Operator Type:

    Type A: Remote set point using a 4-20 mA analog signal

    a. Local Operation

        (1) LOCAL/REMOTE selector
        (2) OPEN/CLOSE push buttons
        (3) Position set-point potentiometer/indicator
        (4) LOCAL accepts local position set point
        (5) OPEN/CLOSE indication
        (6) Fault (torque) indication

    b. Remote operation

        (1) REMOTE - accept a remote 4-20 mA position set-point
        (2) Position transmitter 4-20mA signal to RTU
        (3) Available Ready of Auto to RTU
        (4) Fault torque status to RTU

19. Valve Closure Time: Valve closure time shall be 1 minute.

20. Spare Parts:

    a. The CONTRACTOR shall furnish loose, one unit valve operator, complete with all the devices specified herein and with all the features and characteristics similar to the equipment supplied in this Contract. The spare operator shall be delivered to the OWNER still in crates.

2.09 BUTTERFLY VALVES

1. General: Butterfly valves used for 12" diameter and larger ONLY. All valves shall meet or exceed ANSI/NSF 61, latest revision. All valves shall meet or exceed AWWA C-504, Class 150B, latest revision. Valves shall open left, or counterclockwise. Buried service valves shall have a 2" operating nut.

2. Body: Body and disc material shall be cast or ductile iron meeting or exceeding ASTM A126 (latest revision) or A536, latest revision. Seat and all rubber material shall be chloramine resistant.

3. Shaft: Shaft, nuts, screws, and hardware material shall be stainless steel (Type 304 minimum). Valve disc shall be rigidly attached to the shaft to eliminate any relative motion. Shaft shall be offset from the disc and body seats so that they do not intersect. Shafts of 3" diameter and smaller shall be one piece through the valve with factory set thruster(s) to center the disc in the seat. Shafts larger than 3" diameter shall be stub-shafts rigidly keyed to the disc. Stub-shafts shall be provided with an adjustable thruster(s) to move the disc and shaft assembly positively in either direction to center the disc in the seat

4. Coating: Except where otherwise specified, interior and exterior ferrous surfaces, exclusive of stainless steel surfaces, in all valves shall be coated with two-part thermosetting epoxy coating or fusion bonded epoxy coating. Flange faces of valves shall not be epoxy coated. The epoxy shall be suitable for use in potable water, reclaimed water, and wastewater.

5. Manufacturers or approved equal:

    1. Mueller
    2. Val-Matic
    3. Pratt
    4. Clow

PART 3 -EXECUTION

3.01 VALVE INSTALLATION

A. General: All valves, gates, operating units, stem extensions, valve boxes, and accessories shall be installed in accordance with the manufacturer's written instructions and as shown and specified. All gates shall be adequately braced to prevent warpage and bending under the intended use. Valves shall be firmly supported to avoid undue stresses on the pipe.

B. Access: All valves shall be installed to provide easy access for operation, removal, and maintenance and to avoid conflicts between valve operators and structural members or handrails.

C. Valve Accessories: Where combinations of valves, sensors, switches, and controls are specified, it shall be the responsibility of the CONTRACTOR to properly assemble and install these various items so that all systems are compatible and operating properly. The relationship between interrelated items shall be clearly noted on shop drawing submittals.

D. Butterfly Valves: All exposed butterfly valves shall be installed with a means of removing the complete valve assembly without dismantling the valve or operator.

3.02 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on the actual quantities installed as more specifically discussed and described in SECTION 01025 for MEASUREMENT AND PAYMENT.

END OF SECTION 02641

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the Water Systems work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

1.03 RELATED WORK

A. Section 02200 - Earthwork

B. Section 02221 - Excavation and Backfilling for Utilities

C. Section 04610 - Piping, General

D. Section 04641 - Valves, General

1.04 EXISTING UTILITIES

A. Furnish temporary support, adequate protection and maintenance of all underground and surface utility structures, drains, sewers, poles and other obstructions encountered in the progress of the work.

B. Where the grade or alignment of the pipe is obstructed by existing utility structure such as conduits, ducts, pipe branch connections to main sewers, or main drains, the obstruction shall be permanently supported, relocated, removed, or reconstructed by the CONTRACTOR in cooperation with the OWNERs of such utility structures. No deviation shall be made from the required line or grade except as directed by the ENGINEER.

PART 2 - PRODUCTS

2.01 PIPE

A. All metallic pipes shall have bituminous outside coating conforming to:

Viscosity, KU at 25^{o}	56-60
Flashpoint ^{o}F (TCC)	40^{o}F
Dry set to touch	6 minutes
Dry hard	22 minutes

B. Ductile iron pipe shall conform to ANSI/AWWA C151/A21.51 with pressure class 350 for 4" to 24" pipe and pressure class 250 for 30" to 60" pipe. Pipe shall be cement-lined and seal-coated in accordance with ANSI/AWWA C104/A21.4.

1. Unless otherwise indicated, all ductile iron pipes shall be factory lined and coated.

a. Lining: All pipes shall be cement mortar lined in accordance with AWWA Standard C104.

b. Coating: Unless specified otherwise, all pipe shall be coal-tar enamel coated outside to a dry film thickness of at least 1 mil with Koppers Bitumastic Tank Solution, or equal.

c. Repair: Anywhere that the coating is removed purposely or accidentally, the area shall be cleaned of any rust, grease and dirt and recoated to a minimum dry film as specified for the individual piece.

C. All PVC pipe shall be Class 150 D.R. 18 ANSI/AWWA C900 suitable for use at maximum hydrostatic working pressure of 250 PSI. All pipes must meet requirements as set forth and bare the National Sanitation Foundation seal for potable water pipe.

2.02 FITTINGS

A. The pressure rating shall be 350 PSI for fittings.

B. Fittings shall be ductile iron, meeting the ANSI/AWWA standard Specification C153-A21.53.

C. Fitting must be cement lined and seal coated per ANSI/AWWA C104/A21.4.0.

D. Flanged fittings shall conform to ASA Specifications for Class 125.

E. Ductile iron fittings shall conform to ANSI/AWWA standard specification C110-A21.10 latest revision.

2.03 JOINTS

A. BELL AND SPIGOT CONNECTIONS:

1. Joints in bell and spigot pipe shall be push-on, mechanical, or restrained mechanical joints in accordance with ANSI/ANWA Standard C-111/21.11, latest revision.

B. FLANGED CONNECTIONS:

1. All flanged pipe barrels shall comply with the physical and chemical requirements as set forth in the Handbook of Ductile Iron Pipe of the Ductile Iron Pipe Research Association. Flanges shall be in accordance with ANSI Specification B16.1 for Class 125 flanges. Bolts shall comply with ANSI Specification B18.2.

2. Before starting fabrication of the cast iron pipe and fittings, complete detailed working drawings shall be submitted by the CONTRACTOR for approval by the ENGINEER.

Such drawings shall show the piping layouts and contain schedules of all pipe, fittings, valves, expansion joints, hangers and supports and other appurtenances. Where special fittings are required, they shall be shown in large detail with all necessary dimensions. The drawings submitted shall show flanged jointed sections placed so as to be removed without disturbance to the main pipe sections.

3. Flanged pipe shall be faced and drilled to the American Standard drilling, unless special drilling is called for or required. Where tap or stud bolts are required, flanges shall be tapped. Flanges shall be accurately faced and drilled smooth and true, at right angles to the pipe axis and shall be covered with zinc dust and tallow or a rust preventive compound immediately after facing and drilling.

4. Flanged pipe with screwed-on flanges shall be furnished with long hubs and the flanges shall be screwed on the threaded end of the pipe in the shop and the face of the flange and end of pipe refaced together. There shall be no leakage through the pipe threads and the flanges shall be designed to prevent corrosion of the threads from outside.

5. Flanged joints shall be made with bolts or stud bolts and nuts. Bolts, stud bolts, and nuts shall conform to American Standard heavy dimensions; semi-finished with square or hexagonal heads and cold punched hexagonal nuts, meeting the requirements of ASTM Designation A-307. Bolt sizes shall be American Standard for the flanges specified, and bolts and nuts shall have good, true threads.

2.04 HYDRANTS

A. Fire hydrant shall have a 5 ¼“ main valve opening. Pumper nozzle to be 18” from finish grade. All hydrants to be installed with anchoring tee and control valve. Fire hydrant shall comply with ANSI/AWWA C502-85 latest revision. Hydrants shall be Mueller A-423, or Clow Medallion F-2545 or approved equal.

B. Fire hydrants installed that have not been placed into service shall be tagged with a sign approved by OWNER and City of Dania Beach to indicate that they are out of service.

2.05 WATER TAPS

A. Tapping Existing Pipelines.

1. Tapping sleeves shall be Mueller H 615 or approved equal. Tapping valves shall be Mueller H 667 or approved equal.

2. Cast iron tapping sleeve or tapping cross shall have mechanical joint connections. The flanged end for tapping valve shall include a recess to provide positive alignment of the tapping valve.

3. Tapping valves shall conform to AWWA C509 and C500 standards. An Affidavit of Compliance shall be furnished for the valves.

4. Tapping valves 16" and smaller shall be designed for operation in a vertical position with a vertical operating shaft. Tapping valves over 16" shall be designed for operation in a horizontal position and shall have a vertical operating shaft.

2.06 WATER SERVICES

A. Water services shall be polyethylene tubing, SDR 9, with a minimum working pressure of 200 psi.

B. All water service tubing and fittings shall be in conformance with "Broward County Water and Wastewater Services- Minimum Design and Construction Standards."

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Unloading Material: The CONTRACTOR shall exercise care in unloading and handling pipe, valves, fittings, and all other material. Dropping pipe from trucks and allowing pipe to roll against other pipe will not be permitted.

B. Excavation: Pipeline trenches shall be excavated to required depth as shown on the drawings or as directed by the ENGINEER. In general, water distribution lines shall have a minimum of 30" cover for DIP pipe. If rock is encountered, excavation shall be carried a minimum of 8" below bottom of pipe, and trench backfilled with sand or earth and thoroughly tamped. Width of trench shall be sufficient to allow laborers to perform all operations incidental to constructing the pipeline. Hand dug bell holes shall be provided to permit proper joint making. No section of pipe shall bear on rock or on placed blocking. All excavations will be dewatered to permit dry joints.

C. Work shall be properly braced where necessary. Where wood sheeting or certain designs of steel sheeting are used, the sheeting shall be cut off at a level two feet above the top of the installed pipe and that portion below that level shall be left in place. If interlocking steel sheeting of a design approved by the ENGINEER is used, it may be removed providing removal can be accomplished without disturbing the bedding or alignment of the pipe. Any damage to the pipe bedding, pipe or alignment of the constructed main caused by removal of sheeting shall be cause for rejection of the affected portion of the work.

3.02 PIPE

A. Installation of Pipe: All installation shall conform to AWWA C-600. Pipe shall not be rolled or pushed into the trench from the bank. Before pipe is lowered into the trench, it shall be thoroughly inspected by the CONTRACTOR, as necessary, to insure sound conditions and eliminate the possibility of leakage or bursting under test pressure.

B. Water mains shall be laid at least 6 feet horizontally (10 feet preferred) from any existing or proposed sewer mains. A vertical distance of at least 18" should be maintained when a sewer pipe crosses under a water main. If this is not possible, then the sewer pipe must be of water

main quality with 20-foot lengths of pipe centering on the point of crossing. If a crossing where the sewer is laid above a water line is unavoidable, then the above-mentioned precautions shall be observed regardless of the distance of vertical separation between water mains and sewer piping.

C. Pipes and valves, fittings, and all other materials showing defects shall not be used for construction. All such defective materials shall be removed from the construction site immediately. Before pipe is lowered into the trench, it shall be swabbed or brushed to insure that no dirt or foreign matter will be in the finished line.

D. Pipe shall be laid on a flat bottom trench and backfill tamped to 6" above the top to the pipe. Pipe installation shall conform to "Type B Method" as adopted by Committee A-21 of the American Standards Association. A firm even bearing shall be provided throughout the length of each section of pipe. Pipe shall not bear on any unyielding structures, nor shall it support any other structures. All dead ends shall be plugged or capped, anchored and held in place with restrained joints as required. Except while work is in progress, all pipe openings shall be suitably plugged to prevent entrance of water or any foreign matter. Material deemed unstable for providing adequate support for pipe shall be removed and replaced by suitable material. Adequate backfill shall be deposited on the pipe to prevent floating. Any pipe, which has floated, shall be removed from the trench and reinstalled as directed by the ENGINEER.

E. Joints: All joints shall be suitable for the type of pipe being jointed and shall be made in accordance with manufacturer's recommendations.

1. Mechanical joints: Mechanical joints shall be of the stuffing box type. The gland, followed by the rubber gasket, shall be placed over the plain end of the pipe, which is inserted into the socket. The gasket is then pushed into position so that it is evenly seated in the socket. The gland shall be moved into position against the face of the socket, bolts inserted and made finger-tight. Bolts shall be tightened by a ratchet wrench suitable for the size of pipe being connected alternately, bottom, then top, etc., until the joint is completed.

2. Compression Pipe joints: Compression joints shall be a rubber seal joint, made pressure tight by a molded rubber gasket and lubricated to facilitate assembly. The joint shall be made tight by inserting the plan end into the bell after lubrication. Joints shall be made up as recommended by the manufacturer.

3. Flanged joints: Flanged joints shall be made with rubber gaskets. Bolts shall have rough square hands and hexagonal nuts and made to American Standard rough dimensions and shall be recommended size trimmed. Bolts shall be recommended size for the diameter of the pipe being jointed and shall be tightened as to distribute evenly the stress in the bolts and bring the pipe into alignment.

4. Threads shall be neatly cut with sharp tools and the jointing procedure shall conform with the best practices. Before jointing, all scale shall be reamed. All pipe shall be screwed with an application of graphite and engine oil or other approved pipe compound applied to the threads. This application shall be thoroughly wiped off the inside of every joint.

3.03 INSTALLATION OF FITTINGS

A. Applicable portions of these specifications shall apply to installation of fittings. Reaction of restrained joints shall be applied at bends and tees and where changes in pipe diameter occur at reducers or in fittings.

3.04 INSTALLATION OF FIRE HYDRANTS

A. All hydrants shall stand plumb and burial line shall be set at finished grade. The pumper nozzle shall be set at 18" above finished grade.

3.05 INSTALLATION OF VALVES

A. All valves shall stand plumb unless otherwise shown on the plans or directed by the OWNER's Representative. The operation of installing tapping sleeves and valves shall be done by an experienced organization that has been engaged in this type of work not less than one (1) year with a representative list of successful installations. All valves shall be tagged per BCWWS.

3.06 PRESSURE TESTS

A. After pipe has been adequately backfilled all laid pipes shall be subjected to hydrostatic pressure of 150 PSI. The duration of the pressure test shall not be less than two (2) hours. Test sections shall be limited to a maximum length of 2000 feet. Care shall be taken to insure that all air has been removed from the pipe previous to pressure tests. The CONTRACTOR shall provide such means of venting the pipe as are required. The CONTRACTOR shall replace any material or installation proving defective.

3.07 LEAKAGE TEST

A. After the main has been brought up to test pressure, it shall be held at this pressure and make up water shall be carefully measured by use of displacement meter or by pumping water from a vessel of known volume. The pipeline shall be walked and all visible joints inspected for leakage and movement of pipe. All visible leaks shall be repaired. Should any section of pipeline disclose joint leakage greater than that permitted, the CONTRACTOR shall at CONTRACTOR'S own expense, locate and repair the defective joints until leakage is within the permitted allowance.

B. The leakage test shall be conducted in accordance with AWWA Specification C-600, latest revision. Leakage shall be less than the number of gallons per hour as determined by the formula:

$$L = \frac{SD\,P^{1/2}}{148{,}000}$$

in which L equals the allowable leakage in gallons per hour, S is the pipe length of the main tested, D is the nominal diameter of the pipe in inches, and P is the average test pressure during the leakage test, in pounds per square inch, gauge. Length of test shall not be less than two (2) hours. Test pressure shall be 150% of working pressure at point of test but not less than 125% of normal working pressure at highest elevation . The test shall be conducted as directed by the ENGINEER.

3.08 BACKFILL

A. No trenches or excavations shall be backfilled until the trench and installation has been inspected and written approval given by the ENGINEER. All backfill shall be carefully placed to avoid movement of the pipeline. Backfill shall be free from rock, large stones, boulders, brush, or other unsuitable material. It shall be placed in the trench uniformly on both sides of the pipe for full width of the trench and to the horizontal diameter of the full length of the pipe. This backfill shall be thoroughly tamped to provide support free from voids.

B. Additional backfill shall then be placed between joints to an average depth of 12" over the top of the pipe where pipe is of 8" and smaller diameter, and 24" over larger pipe. Pipe joints shall remain exposed until completion of the pressure and leakage tests unless otherwise directed by the ENGINEER.

C. On completion of pressure and leakage tests, the exposed joints shall be backfilled to a depth of 12" above the top of the pipe. Backfill shall be carefully compacted until 12" of cover exists over the pipe. The remainder of the backfill shall then be placed and compacted thoroughly by puddling and tamping as required. Where directed, puddling and tamping may be omitted, and backfill shall be neatly rounded over the trench to a sufficient height to allow for settlement to grade after consolidation.

3.09 STERILIZATION OF COMPLETE PIPELINE

A. Before the final acceptance of complete pipeline, all requirements of the County and Broward County Public Health Unit (BCPHU) shall be satisfied. Satisfactory bacteriological test results from the CONTRACTOR shall be forwarded to the ENGINEER.

B. Prior to chlorination of mains, all dirt and foreign matter shall be removed by high velocity flushing through fire hydrants or other approved blow-offs. The main shall then be filled with a chlorine solution of at least 50 parts per million of chlorine and retained in the pipe not less than twenty-four (24) hours. Chlorine residual after retention period shall be not less than 30 parts per million. After chlorination, the mains shall be thoroughly flushed with potable water and required samples taken for bacteriological analysis. Sampling to be witnessed by the ENGINEER.

3.10 RESTORATION OF SURFACE AND/OR STRUCTURES

A. The CONTRACTOR shall restore and/or replace paving, curbing, sidewalks, fences, sod, survey points and other disturbed surfaces to a condition equal to that before the work was begun and to satisfaction of the ENGINEER, and shall furnish all labor and materials incidental thereto. Relative restoration of surfaces and/or structures, the CONTRACTOR shall comply with all governing agencies requirements including city, town, county and state.

3.11 CONNECTION TO EXISTING SYSTEM

A. The CONTRACTOR shall make proper arrangements for compliance with the regulations for connection to any existing distribution system with the OWNER of that system. Taps-in and connection will be made in strict accordance with the ENGINEER.

3.12 ABANDONMENT OF EXISTING PIPELINE

A. All water mains to be abandoned in place as shown on the drawings shall be cut and plugged after new mains and services are installed and service is properly restored to the homeowner. The pipeline shall be filled with concrete 12 inches from the end of the pipe as specified in Division 3 - Concrete, section 03010. Excavation, backfill and restoration shall be executed in accordance with the requirements of removing existing and installing new pipelines.

3.13 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on the actual quantities installed as more specifically discussed and described in SECTION 01025 for MEASUREMENT AND PAYMENT.

END OF SECTION 02713

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. The work under this Section shall consist of furnishing and installing sewer pipes and service connections and/or abandonment of pipelines in place as indicated on the plans and in accordance with these Specifications.

1.03 RELATED WORK

A. Section 02221 - Excavation and Backfilling for Utilities

B. Section 02601 - Subterranean Structures

C. Section 02610 - Piping - General

D. Section 02641 - Valves - General

PART 2 - PRODUCTS

2.01 PIPE

A. PVC plastic pipe and fittings for gravity sanitary sewers shall be un-plasticized, PVC Plastic Gravity Sewer Pipe conforming to ASTM D 3034 with SDR 26 (minimum pipe stiffness of 115 lbs/in/in) and integral wall bell and spigot joints for conveyance of domestic sewage. Sewer pipe, including laterals and fittings shall be of the same material composed of PVC plastic having a cell classification of 12454B or 12454C as defined in ASTM D 1784. Rubber sealing rings for pipe joints shall meet the requirements of ASTM D 1869. No solvent welded pipe will be permitted.

1. In addition to the above requirements, pipe shall also conform to the following tests:

   a. Drop Impact Test in accordance with ASTM D 2444.

   b. Pipe Stiffness Test in accordance with ASTM D2412.

   c. Acetone Immersion Test in accordance with ASTM D 2152.

B. PVC plastic gravity sewer pipe shall be as manufactured by Johns-Manville or approved equal. Prior to delivery of PVC plastic pipe to the jobsite, CONTRACTOR shall furnish the ENGINEER complete data from the manufacturer of the type of PVC pipe and fittings CONTRACTOR proposes to install.

C. C900 plastic gravity sewer pipe (or SDR 18) shall conform to ANSI/AWWA standard for pipes 4 inch through 12 inch made from class 12454-A or class 12454-B material. C-900 or C-905

plastic gravity sewer pipe will be required to be installed where the depth of installation is 12 foot or deeper. C-900 or C-905 plastic gravity sewer pipe (SDR 18) shall conform to ANSI/AWWA for pipe 14 inch through 48 inch made from class 12454-B material.

D. Ductile iron pipe shall be epoxy lined and conform to ANSI/AWWA standard C151/A21.51 and C150/A21.50.

1. DIP pipe shall conform with pressure class 350 for 4" through 24".

2.02 SUBMITTALS

A. Shop Drawings: Shop drawings of all sanitary sewerage system products and materials shall be furnished as specified in Section 01340, "Shop Drawings, Product Data and Samples"

2.03 FORCE MAIN

A. Pipe Material

1. Force main shall be Protecto 401 (or approved equal) epoxy lined ductile iron pipe as specified on the plans. All pipes material shall be in accordance with material specified in Section 02610 “Piping General”.

PART 3 - EXECUTION

3.01 SEWER INSTALLATION

A. All sewer pipes shall be true to line and grade with bells up grade. The sections of the pipe shall be so laid and fitted together that when complete, the sewer shall have a smooth and uniform invert. The pipe shall be maintained clean. All pipe shall be free from defects. Trenches shall be kept dry while the pipe is being laid.

B. Bedding of the pipe shall consist of well graded ASTM C33 #67 rock or better, requiring the bottom of the trench to be shaped to fit the bottom of the pipe for distance equal to one-half of the outside diameter of the pipe. Bell holes shall be deep enough to insure proper bearing of the pipe barrel on the bedding.

C. All joints shall be carefully fitted so as to ensure a tight waterproof joint. Joints shall not be covered until approved by the ENGINEER. The exposed end of all pipe shall be protected so as to prevent dirt or other debris from entering the pipe. Pipes shall be thoroughly flushed at the completion of the work.

D. SDR 26 shall be per ASTM D2321 with Class I embedment material.

E. A minimum cover of thirty (30) inches is required for DIP and thirty-six (36) inches for PVC pipe unless otherwise shown on the plan and approved by the ENGINEER.

3.02 SERVICE LATERAL CONNECTIONS

A. All connections, which are for future use, shall be properly capped. No pipe shall be cut for connections unless approved by the ENGINEER. Wyes for service connections shall be installed

as shown on the plans. The upper end of service connections shall be laid at a depth not less than 36 inches nor more than 48 inches below finish grade elevation, unless specifically noted otherwise on plans. All private property connections shall have a minimum slope of 1%. Additional cleanouts are required on all lateral connections over 75 feet in length. CONTRACTOR is to take all necessary measures to ensure that all private property connections to existing main are switched over the new sanitary sewer facilities prior to abandonment of existing main.

3.03 ABANDONMENT OF PIPELINE IN PLACE

A. All sanitary sewer gravity or force mains shown on the drawings to be abandoned in place shall be properly cut and plugged after new mains or services are installed and service is properly restored to the home owner. The pipeline shall be filled with concrete one foot from end of pipe as specified in Division 3 - Concrete, and Section 03010. Excavation, backfill, and restoration shall be executed in accordance with requirements for removing existing and installing new pipelines.

3.04 TESTS

A. After the joints have been inspected and approved, backfilling may be done until backfilled to one foot over the pipes. Backfilling shall be in accordance with Section 02221 of these Specifications.

B. After backfilling gravity sewers to the pavement rock base, the ENGINEER will "lamp" the lines between MAS. If this alignment is true and no pipes are broken or misaligned, the backfilling shall be completed. After the Engineer has determined that the pipe has been properly backfilled and sufficient time has passed to allow any settlement but not more than 30 days after backfill, a deflection test is to be performed on all sections of gravity pipeline between MAS. Refer to Paragraph I within this section for details on video deflection testing.

C. Tests for water tightness of gravity sewers shall be made by the CONTRACTOR in the presence of the ENGINEER. The sewer and connections shall not leak under the normal exterior ground water pressure at a rate in excess of 100 gallons per inch of diameter per mile per 24 hours for any section of line up to 15 inches in diameter. Special consideration shall be given to leakage allowance for sizes larger than 15 inches in diameter. Exfiltration from individual MAS shall not exceed 4 gallons in 24 hours. A maximum run of 3 MAS may be used per test.

D. Where the crown of the pipe is below the natural ground water table at the time and place of testing, the pipe shall be tested for infiltration. Suitable watertight plugs shall be installed and sections of pipe to be tested shall be pumped dry before start of the test. Where the crown of the pipe is above the natural water table, the pipe shall be tested for exfiltration by installing necessary plugs and filling pipes and MAS with water and maintaining a static head of water of two feet above the crown of the pipe during the test. Exfiltration tests shall be conducted on gravity lines, building and house lateral lines, unless waived by the ENGINEER. With sanitary sewers, the water level or internal pressure to be used for exfiltration tests shall be determined by the ENGINEER.

E. All visible leaks, regardless of results of infiltration tests, shall be repaired. All repairs shown necessary by the tests are to be made, broken or cracked pipe replaced, all deposits removed, the

sewer left true to line and grade and entirely clean, free from lumps of cement, protruding gaskets, bulkheads, etc., and ready for use before final acceptance is made.

F. Repair of any defects found in the system are to be completed at the expense of the CONTRACTOR.

G. On sanitary sewers, final infiltration and exfiltration tests shall be made by the CONTRACTOR at their expense after all limerock base installations are completed and the sewers are cleaned and ready for use.

H. The ENGINEER shall maintain a record showing date and time of inspection, calculation of allowable exfiltration or infiltration and amount of measured exfiltration or infiltration.

I. Video review of gravity sanitary sewer pipe will be performed by the ENGINEER and reviewed for compliance with Broward County Water and Wastewater Services (BCWWS) Minimum Standards. First lift of rock must be installed before the gravity sewer pipe is videoed and available for review and approval by the ENGINEER.

3.05 WARRANTY

A. Repair and replacement. Any repairs or replacement necessitated by mechanical failure due to faulty materials, improper installation or poor quality of work shall be completed within five (5) days after notification by the ENGINEER. At the expiration of this time, the OWNER shall be entitled to have work done by others at the expense of the CONTRACTOR. Such repair work done by others shall not void the warranty nor the responsibility of the CONTRACTOR for the balance of the installation by the CONTRACTOR.

3.06 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on actual quantities installed as more specifically discussed and described in SECTION 01025 of MEASUREMENT AND PAYMENT.

END OF SECTION 02722

SECTION 02723
SEWER LINE CLEANING AND INTERNAL TELEVISION INSPECTION

PART I -GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division I -General Requirements shall govern the work under this Section.

1.02 RELATED WORK

A. Section 02610 Piping, General.

B. Section 02722 Sanitary Sewer System.

1.03 SEQUENCE OF WORK

A. Clean sewer lines and maintenance access structures in accordance with this specification. The intent of sewer line cleaning is to remove all sludge, dirt, sand, rocks, grease, and other solids or semisolid material from the pipe so that defects are not obscured and to allow the water level to drop so that defects are visible. The pipe interior shall be clean enough to allow adequate viewing of the pipe during inspection. Since the success of the other phases of work depends a great deal on the cleanliness of the lines, the importance of this phase of the operation is emphasized. It is recognized that there are some conditions such as broken pipe and major blockages that prevent cleaning from being accomplished or where additional damage would result if cleaning were attempted or continued. Should such conditions be encountered, OWNER shall be notified within 24 hours and shall direct CONTRACTOR on how to proceed with those specific sewer segments. If, in the course of normal cleaning operations, damage does result from pre-existing and unforeseen conditions such as broken pipe, CONTRACTOR will not be held responsible.

B. After cleaning, the pipe sections shall be visually inspected by means of closed circuit television.

1. Inspect sewer interior using WinCan or approved equal. Provide hard copy of inspection logs.

2. Additional TV inspections may be required at other stages of operation, to meet requirements specified in Field Quality Control article.

1.04 WORK HOURS

A. Work will be performed during the hours of 7:00 a.m. to 4:00 p.m., Monday through Friday, unless nighttime work is indicated because of flow conditions or traffic control requirements. Nighttime work must be approved by OWNER and scheduled in coordination with the OWNER.

1.05 ENTRY ONTO PRIVATE PROPERTY

A. Before any entry onto private property is made, CONTRACTOR shall obtain permission from resident or business owner or manager. If resident or business owner/manager is not available, then CONTRACTOR shall leave a project door hanger requesting resident or business owner/manager to call CONTRACTOR to schedule a time for inspection. If CONTRACTOR encounters any difficulty in obtaining resident's or business owner/manager's permission to access the easement in order to perform the inspection, then CONTRACTOR shall contact OWNER for

assistance. In such cases, CONTRACTOR shall provide a minimum of two weeks notice to the OWNER prior to the need to access private property. CONTRACTOR is responsible for scheduling work such that this two-week notification period does not interfere with the overall work schedule.

1.06 SAFETY

A. CONTRACTOR shall be solely responsible for safety during the performance of all Work. CONTRACTOR shall not enter into any sewer segment where hazardous conditions may exist until such time as the source of those conditions is identified and eliminated by CONTRACTOR and/or OWNER. CONTRACTOR shall perform all work in accordance with the latest OSHA confined space entry regulations. CONTRACTOR shall coordinate his work with local fire, police and emergency rescue units.

B. CONTRACTOR shall be responsible for any damage to public or private property resulting from his/her televising activities and shall repair or otherwise make whole such damage at no cost to OWNER.

C. Inspection of pipelines shall be performed by experienced personnel trained in locating breaks, obstacles, and service connections by closed-circuit television inspection techniques.

PART 2 MATERIALS AND EQUIPMENT

2.01 SEWER LINE CLEANING EQUIPMENT

A. High-Velocity Hydraulic (Hydro-Cleaning) Equipment: Equipment shall be capable of removing dirt, grease, rocks, sand, roots, and other materials and obstructions from sewer lines and maintenance access structures.

B. Sewer line cleaning equipment shall have selection of two or more high-velocity nozzles.

C. Nozzles shall be capable of producing scouring action from 15 to 45 degrees in all size lines designated to be cleaned, with nozzle capable of producing flows from fine spray to solid stream.

D. Equipment shall carry its own water tank, auxiliary engines, and high pressure water pump.

E. Combination Unit Pump: Capable of pumping at least 80 gallons per minute (300 liters per minute) at 2,000 psi (13.8 MPa), measured at beginning of hose reel.

F. Water Pump: Able to run at 2,000 psi (13.8 MPa) while pulling full vacuum, completely independent from vacuum system, with ability to vary vacuum without affecting water pressure.

G. Do not use chemicals without written approval of the ENGINEER. Do not use chemical which may be considered hazardous or detrimental to organisms or equipment of wastewater treatment plant.

H. When water from fire hydrants is necessary, apply to OWNER for permission to use potable water source.

I. Provide temporary piping, valves, certified reduced pressure backflow preventors, equipment, and other items for handling potable water and wastewater.

J. Do not utilize water source until it has been approved for use by OWNER.

2.02 INTERNAL TELEVISION INSPECTION EQUIPMENT

A. DVD: 120 minute minimum, high-quality color, type DVD-R, DVD-RW, or DVD+R

1. Audio portion of composite DVD shall be sufficiently free from electrical interference and background noise to provide complete intelligibility of oral report.

2. Store in upright position with temperature range of 45 to 80 degrees F (7 to 27 degrees C) in an appropriate CD or DVD case to prevent scratches.

3. Identify each disk with tape labels showing Project's name, CONTRACTOR's name, and each maintenance access structure-to-maintenance access structure pipe segment of sewer line represented on DVD or provide an index or table of contents if more than one segment is on the disk.

B. Television Inspection Camera(s): Equipped with rotating head, capable of 90 degree rotation from horizontal and 360-degree rotation about its centerline.

1. Minimum Camera Resolution: 400 vertical lines and 460 horizontal lines.

2. Camera Lens: Not less than l40-degree viewing angle, with automatic or remote focus and iris controls.

3. Focal Distance: Adjustable through range of 6 inches (152 mm) to infinity.

4. Camera(s) shall be intrinsically safe and operative in 100 percent humidity conditions.

5. Lighting Intensity: Remote-controlled and adjusted to minimize reflective glare.

6. Lighting and Camera Quality: Provide clear, in-focus picture of entire inside periphery of sewer.

C. WinCAM or equal screen recording and editing application,

D. Footage Counter: Measures distance traveled by camera in sewer, accurate to plus or minus 2 feet (0.6 m) in 1,000 feet (305 m).

E. DVD Titling: Each segment shown on the DVD should have its own Chapter titled with the beginning and end point of the pipe segment.

F. Cable and Footage Counter: A minimum 1,500 feet of TV cable on the spool reel shall be provided. The TV cable will be supported by an equal length tag line for removal of the equipment from the pipeline.

PART 3 EXECUTION

A. Submit letter that identifies methods that will be used to remove sediment, debris, grease, scale, encrustations, loose concrete, and roots throughout section of sewer to be cleaned. Include the following:

1. Detailed explanation of cleaning process.

2. Schedule of activities.

3. References where identified cleaning method has been used successfully in the past by CONTRACTOR.

4. List of the actions to mitigate impact during cleaning operation.

5. Provide traffic control measures as required by the jurisdiction in which the work is located. In compliance with or in addition to the jurisdiction's requirements, flashing lights shall be used for all night work.

3.01 EXAMINATION

A. CONTRACTOR shall be aware of flow conditions, and be able to identify potential access problems to sewer access points.

3.02 APPLICATION

A. Clean designated sewer lines using approved methods and equipment.

1. Remove internal obstructions such as roots or gaskets by trenchless techniques when obstruction encountered prevents further pipe cleaning.

a. Provide special attention during cleaning operation to assure almost complete removal of roots from joints.
b. Procedures to remove internal obstructions may include use of equipment such as rodding machines, root saws, bucket machines and winches using root cutters, porcupines, and jet machines equipped with hydraulically driven cutters.

2. If cleaning of entire section cannot be successfully performed from one maintenance access structure, set up equipment at other maintenance access structure and attempt cleaning again.

a. If successful cleaning cannot be performed or equipment fails to traverse entire sewer line section, it will be assumed that major blockage exists.
b. Temporarily suspend cleaning effort and immediately notify the ENGINEER.
c. Upon removal of obstruction, complete cleaning operation.

3. Employ satisfactory precautions to protect sewer line from damage that might be inflicted by improper use of cleaning equipment.

a. Immediately notify the ENGINEER if fresh soil, pieces of pipe, or other visible signs of potential problems occur during cleaning operation.
b. Insure that water pressure created does not cause damage due to flooding of property being served by sewer section(s) involved.

B. Maintenance access structure cleaning: Include entire maintenance access structure interior, including maintenance access structure benches and walls. Incorporate into line cleaning operation by scouring walls with high velocity nozzle after pipe segment cleaning operation is complete.

Do not discharge sewage or solids removed from downstream maintenance access structures, onto streets, or into ditches, catch basins or storm drains.

3.03 CLEANING

A. Keep premises free from accumulations of waste materials, rubbish and other debris resulting from work

B. Remove waste materials, rubbish, and debris from and about premises.

C. Remove tools, construction equipment and machinery, and surplus materials.

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

3.04 INTERNAL TELEVISION INSPECTION: SEWER FLOW REQUIREMENTS

A. Do not exceed depth of flow shown in Table 1 for respective pipe sizes as measured in maintenance access structure when performing TV inspection.

B. When depth of flow at upstream maintenance access structure of sewer line section being worked is above maximum allowable for TV inspection, reduce flow to level shown in Table 1, by plugging or blocking of flow, or by pumping and bypassing of flow as specified.

TABLE 1
Maximum Depth of Flow for TV Inspection

Nominal Pipe Diameter	Maximum Depth of Flow
6" -10"	15 percent of pipe diameter
12" -24"	20 percent of pipe diameter

3.05 INSPECTION REQUIREMENTS

A. Access: OWNER and/or the ENGINEER shall have access to observe monitor and other operations at all times.

B. DVD Commentary: Record and edit the following information using WinCam or equal: narrative of location, direction of view, maintenance access structure numbers, pipe diameter and material, date, time of inspection, and location of laterals and other key features.

1. DVD shall visually display this information at beginning and end of each maintenance access structure-to-maintenance access structure pipe segment.

2. DVD between maintenance access structures shall visually display length in feet from starting point of given segment.

C. Sewer Identification: DVD and inspection documentation shall include sewer line and maintenance access structure identifiers shown on Drawings.

D. Image Perspective: Camera image shall be down center axis of pipe when camera is in motion.

1. Provide 360-degree sweep of pipe interior at points of interest, to more fully document existing condition of sewer.

2. Points of interest may include, but are not limited to the following: defects, cracks, voids, connections, encrustations, mineral deposits, debris, sediment, and any location determined not to be clean or part of an improper liner installation, and defects in liner that include, but are not limited to bumps, folds, tears, and dimples.

3. Cabling system employed to transport camera and transmit its signal shall not obstruct camera's view.

E. Sewer Reach Length: Physically measure and record length of each sewer reach from centerline of its terminal maintenance access structures.

F. Inspection Rate: Camera shall be pulled through sewer in either direction, but both inspections are to be in same direction. Maximum rate of travel shall be 30 feet (9 m) per minute when recording.

G. If during television operation, television camera will not pass safely through entire sewer line section being investigated, CONTRACTOR shall, at no additional cost to OWNER, set up equipment so that inspection can be performed from opposite (downstream) maintenance access structure. Where an obstruction is encountered and a reverse set up is required, the distance shall be entered into the log and verbally noted on the DVD video from which maintenance access structure the measurements are being made. If under the reverse set-up the camera again fails to pass through the entire sewer line section, inspection shall be considered complete. All obstructions in the sewer segment that prohibit passage of the television camera shall be immediately reported to the ENGINEER by CONTRACTOR referencing location and nature of the obstruction. No rehabilitation work shall proceed until CONTRACTOR receives direction from OWNER regarding removal of the obstruction.

H. Should CONTRACTOR's televising equipment become lodged in any sewer line, it shall be removed by CONTRACTOR at his expense. This shall include, if necessary, excavation and repair of the sewer, underground utility repairs, backfilling and surface restoration. CONTRACTOR shall re-televise any line segment in which his equipment became lodged after said equipment has been removed to demonstrate to the OWNER that no damage exists as a result of his televising operations.

I. Should bypass pumping or other form of sewage flow control be required by/of CONTRACTOR to facilitate sewer line televising, CONTRACTOR shall be solely responsible for providing all

labor, equipment and materials necessary to control the flow of sewage in and/or around sewer segment(s) being televised.

3.06 EVALUATION PROCEDURES

A. To evaluate if sags exist in the sanitary sewer pipe, water must be introduced into the pipe section to be televised. Pump/Add approximately 750 gallons of water into the terminal MAS or first upstream MAS to be cleaned and inspected. This volume of water can be modified based on the run of sanitary sewer pipe to be televised with the approval of the ENGINEER or OWNER (for example 10 to 50 gallons for a smaller section of pipe).

B. Once the cleaning nozzle reaches the upstream MAS, the water is to be turned off and then allow 15 minutes for the water introduced into the sanitary sewer pipe section to flow down before the line is televised.

3.07 FIELD QUALITY CONTROL

A. OWNER and/or the ENGINEER will review DVDs and logs to ensure compliance with requirements listed in this specification.

B. If sewer line, in sole opinion of OWNER and/or the ENGINEER, is not adequately clean, it shall be recleaned and the sewer line inspected by CONTRACTOR at no additional cost.

C. Quality Assurance: Submit one example DVD of previous sewer inspection work that shows operational and structural defects in sewers, complete with audio commentary and inspection log(s). Prior to submittal, finalize the DVD to prevent re-recording.

1. DVD and inspection logs will be reviewed to determine if quality of TV image is acceptable, and if defects were properly identified and documented.

2. Modify equipment and/or inspection procedures to achieve report material of acceptable quality.

3. Do not commence work prior to approval of report material quality by OWNER and/or the ENGINEER. Upon acceptance, report material shall serve as standard for remaining work.

D. Inspection Logs: Unless otherwise indicated, submit inspection logs that include the following as a minimum:

1. Project title

2. Name of BCWWS Project

3. Time of day

4. Zone atlas map number

5. Maintenance access structure to maintenance access structure pipe section

6. Upstream maintenance access structure number.

7. Downstream maintenance access structure number.

8. Pipe segment length

9. Pipe material

10. Line size

11. Compass direction of viewing

12. Direction of camera's travel

13. Pipe depth

14. Operator name

15. Tape counter reading at beginning and end of each maintenance access structure to maintenance access structure pipe segment.

16. Closest street address and street name on which sewer is located

17. Location (start and end counter distances in feet from the beginning maintenance access structure's centerline) and description of obstructions, structural defects, missing pieces of pipe, longitudinal and/or circumferential cracking, joint deterioration-including open and/or offset joints, ovality, leakage or evidence thereof, corrosion, erosion, break-in connections, protruding connections, mineral deposits, roots, previous repairs, grease/fats/oil deposits on pipe walls, sags, and other abnormalities with respect to the sewer's condition with counter distance in feet from the beginning maintenance access structure's centerline.

E. DVDs: Submit completed DVDs after cleaning. Prior to submittal, finalize the DVD to prevent re-recording. DVDs must be readable with standard viewing software such as Windows Media Player, and if a specific program is needed please submit for preapproval.

F. Maintain copy of all inspection documentation (DVDs, databases, and logs) for duration of Work and warranty period.

G. Digital Photographs: Digital format JPEG on standard CD or DVD photographs of all problems, severe defects or atypical observations shall be taken by CONTRACTOR or upon request of OWNER.

END OF SECTION 02723

PART I - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the “BIDDING REQUIREMENTS”, "FORM OF AGREEMENT", and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. The work covered by this section shall include the furnishing of all labor, equipment, services, materials, products and tests to perform all operations in connection with the construction of new interlocking concrete and/or brick pavers as shown on the plans, defined in these specifications, and subject to the terms and conditions of this contract.

1.03 RELATED WORK

A. Section 02200 – Earthwork

B. Section 03300 – Cast In Place Concrete

1.04 REFERENCE STANDARDS

A. All codes, as referenced herein are specified in Section 01090, "Reference Standards".

B. Commercial Standards:

ASTM C 33	Specification for Concrete Aggregates
ASTM C 136	Method for Sieve Analysis for Fine and Coarse Aggregate
ASTM C 140	Sampling and Testing Concrete Masonry Units
ASTM C 144	Standard Specification for Aggregate for Masonry Mortar
ASTM C 936	Specification for Solid Interlocking Concrete Paving Units
ASTM C 979	Specification for Pigments for Integrally Colored Concrete
ASTM D 698	Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 5.5-lb (2.49 kg) Rammer and 12 in. (305 mm) Drop
ASTM D 1557	Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 10-lb (4.54 kg) Rammer and 18 in. (457 mm) Drop
ASTM D 2940	Graded Aggregate Material for Bases or Subbases for Highways or Airports
ICPI	Technical Specifications & Technical Bulletins

1.05 QUALITY ASSURANCE

A. Installation shall be by a contractor and crew with at least one year of continuous experience in placing interlocking compressed concrete/brick paver units on projects of similar nature or dollar cost within the State of Florida.

B. Contractor shall hold current Basic Level Certificate from the Interlocking Concrete Pavement Institute contractor certification program.

C. Contractor shall conform to all local, state/provincial licensing and bonding requirements.

1.06 SUBMITTALS

A. Shop or product drawings, and product data

B. Full size samples of concrete paving units to indicate color and shape selections. Color will be selected by ENGINEER from manufacturer's available colors.

C. Sieve analysis for grading of bedding and joint sand

D. Test results from an independent testing laboratory for compliance of paving unit requirements to ASTM C 9361 or other applicable requirements

E. Manufacturer's certification of concrete pavers by ICPI as having passed applicable ASTM Standards.

F. Indicate layout, pattern, and relationship of paving joints to fixtures and project formed details

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver concrete/brick paver units to the site in steel banded, plastic banded, or plastic wrapped cubes capable of transfer by fork lift or clamp lift. Unload paver units at job site in such a manner that no damage occurs to the product.

B. Cover sand with secured waterproof covering to prevent exposure to rainfall or removal by wind.

C. Coordinate delivery and paving schedule to minimize interference with normal use of buildings adjacent to paving.

1.08 ENVIRONMENTAL CONDITIONS

A. Do not install sand or pavers during heavy rain or snowfall.

B. Do not install sand and pavers over frozen base materials.

C. Do not install frozen sand.

PART 2 - PRODUCTS

2.01 CONCRETE PAVERS

A. Supplied by 'Paver Module' or approved equal manufacturer who is a member of the Interlocking Concrete Pavement Institute (ICPI). Any approved equal must be approved by the OWNER for style and color.

1. Tri-Lock 4 ½" X 9" X 3 1/8" as per manufacturers catalog

2. On roadway crossings and parking lots, Color: Tan E2

3. On sidewalks, Color: Red / Tan / Charcoal E11

4. On parking lanes, Color: Grey / Charcoal E13

B. Meet the following requirements set forth in ASTM C 936, Standard Specification for Interlocking Concrete Paving Units:

1. Average compressive strength of 8,000 psi with no individual unit under 7,200 psi

2. Average absorption of 5% with no unit greater than 7% when tested in accordance with ASTM C 140.

3. Resistance to 50 freeze-thaw cycles when tested according to ASTM C 67

C. Pigment shall conform to ASTM C 979

2.02 BEDDING AND JOINT SAND

A. Clean, non-plastic, free from deleterious or foreign matter, natural or manufactured from crushed rock. Do not use limestone screenings or stone dust that do not conform to the grading requirements in Table 1. When concrete pavers are subject to vehicular traffic, the sands shall be as hard as practically available.

B. Sieve according to ASTM C 136

C. The bedding sand shall conform to the grading requirements of as shown in Table 1:

Table 1 - Grading Requirements for Bedding Sand (ASTM C-33)

Sieve Size	% Passing
3/8 in.	100
No. 4	95 to 100
No. 8	85 to 100

No. 16	50 to 85
No. 30	25 to 60
No. 50	10 to 30
No. 100	2 to 10

D. The joint sand shall conform to the grading requirements as shown in Table 2 below:

Table 2 - Grading Requirements for Joint Sand (ASTM C-144)

Seive Size	Natural Sand % Passing	Manufactured Sand % Passing
No. 4	100	100
No. 8	95 to 100	95 to 100
No. 16	70 to 100	70 to 100
No. 30	40 to 75	40 to 100
No. 50	10 to 35	20 to 40
No. 100	2 to 15	10 to 25
No. 200	0	0 to 10

2.03 EDGE RESTRAINTS

A. Edge restraints shall be cast in place concrete in accordance with Section 03300

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that subgrade preparation, compacted density, and elevations conform to the specifications.

B. Verify that geotextiles, if applicable, have been placed according to specifications and drawings.

C. Verify that aggregate base materials, thickness, compaction, surface tolerances, and elevations conform to the specifications.

D. Verify location, type, installation and elevations of edge restraints around the perimeter area to be paved

E. Verify that base is a dry, uniform, even surface at proper grade elevation.

3.02 INSTALLATION

A. Spread the bedding sand evenly over the base course and screed to a nominal 1 inch (25 mm) thickness, not exceeding 1-1/2 inch (40 mm) thickness. The screeded sand should not be disturbed. Place sufficient sand to stay ahead of the laid pavers. Do not use the bedding sand to fill depressions in the base surface.

B. Ensure that pavers are free of foreign material before installation.

C. Place the pavers in the pattern(s) as shown on the drawings. Maintain straight pattern lines.

D. Joints between the pavers on average shall be between 1/16 in. and 3/16 in. (2 mm to 5 mm) wide.

E. Fill gaps at the edges of the paved area with cut pavers or edge units.

F. Cut pavers to be placed along the edge with a double blade paver splitter or masonry saw.

G. Use a low amplitude, high frequency plate vibrator capable of at least 5,000 lbf (22 kN) compaction at a frequency of 75 hz - 100 hz.

H. Vibrate the pavers, sweeping dry joint sand into the joints and vibrating until they are full. This will require at least two or three passes with the vibrator. Do not vibrate within 3 ft (1 m) of the unrestrained edges of the paving units.

I. All work to within 3 ft of the laying face must be left fully compacted with sand-filled joints at the end of each day. Cover the laying face with plastic sheets overnight if not closed with cut and compacted pavers.

J. Sweep off excess sand when the job is complete.

K. The final surface elevations shall not deviate more than 3/8 in. (10 mm) under a 10 ft (3 m) long straightedge.

L. The surface elevation of pavers shall be 1/8 to 1/4 in. (3 to 6 mm) above adjacent drainage inlets, concrete collars or channels.

3.03 FIELD QUALITY CONTROL

A. After removal of excess sand, check final elevations for conformance to the drawings.

3.04 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on actual quantities installed as more specifically discussed and described in SECTION 01025 of MEASUREMENT AND PAYMENT.

END OF SECTION 02780

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Pipe and fittings, valves, sprinkler heads and accessories; and,

2. Irrigation control system.

1.03 WORK INCLUDED

A. The work is to include the furnishing of all labor, supplies, equipment and materials necessary to complete the installation of the pipe and fittings, valves, and sprinkler heads, controller, etc as shown on the Drawings as well as all other related responsibilities described in these Specifications and accompanying plans.

B. The system is a fully automatic system comprised of numerous zones operated by the controller. This system has been designed to provide 100% coverage. It is the responsibility of the Contractor to insure the entire system is installed according to applicable laws, rules, regulations and conventions.

1.04 RELATED WORK

A. Section 02110 – Clearing

B. Section 02200 – Earthwork

C. Section 02221 – Excavation and Backfilling for Utilities

D. Section 02610 – Piping, General

E. Section 02641 – Valves, General

F. Section 02900 – Landscape Work

1.05 REFERENCE STANDARDS

A. American Society of Testing and Materials

1. ANSI/ASTM D2282 – Acrylonitrile-Butadiene-Styrene (ABS) Plastic pipe (SDR-PR);

2. ANSI/ASTM D2564 – Solvent Cement for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings;

3. ASTM B32 – Solder Metal;

4. ASTM B42 – Seamless Copper Pipe, Standard Sizes;

5. ASTM B88 – Seamless Copper Water Tube;

6. ASTM D1784 – Rigid and Chlorinated Polyvinyl Compounds

7. ATSM D2235 – Solvent Cement for Acrylonitrile - Butadiene - Styrene (ABS) Plastic Pipe and Fittings;

8. ASTM D2466 – Polyvinyl Plastic Pipe Fittings, Schedule 40; and,

9. ASTM D2467 – Polyvinyl Plastic Pipe Fittings, Schedule 80.

B. FS O-F-506 – Flux, Soldering; Paste and Liquid.

C. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).

1.06 QUALITY ASSURANCE

A. Responsibility for Assuring Quality Work:

1. The CONTRACTOR's Superintendent shall be well versed in standard plumbing procedures, PVC assembly procedures, blueprint reading and coordination with other contracts or services in the project area.

2. All employees shall be competent and highly skilled in their particular job in order to properly perform the work assigned to them. The CONTRACTOR shall be responsible for maintaining the quality of material on the job throughout the duration of contract responsibility.

B. Requirements of Regulatory Agencies:

1. All work and materials shall be in full accordance with the latest rules and regulations of safety order of Division of Industrial Safety; the Florida Building Code, the Uniform Building Code and other applicable laws and regulations, including any regulatory authorities having jurisdiction, and Plumbing Codes; and,

2. Should the contract documents be at variance with the aforementioned rules and regulations, notify the OWNER for instructions before proceeding with work affected.

C. Testing:

1. Preliminary inspection of completed installation will be made prior to backfilling of trenches and during hydrostatic testing; and,

2. Final inspection shall be made in conjunction with the final inspection of lawn, shrub and tree planting.

D. Permits and Inspections:

1. Any permits for the installation or construction of any work included under this contract, which are required by any of the legally constituted authorities having jurisdiction, shall be obtained and paid for by the CONTRACTOR, each at the proper time; and,

2. The CONTRACTOR shall also arrange for and pay all costs in connection with any inspection and examination required by these authorities.

1.07 SUBMITTALS

A. Shop drawing or irrigation system design, including but not limited to piping, sprinkler heads, valves, wiring, and controls, if not provided in drawings.

B. CONTRACTOR shall furnish 2 manufacturer's service manuals to the OWNER. Manuals may be loose-leaf and shall contain complete drawings of all equipment installed showing components and catalog numbers together with the manufacturer's name and address.

C. Loose equipment to furnish: Loose irrigation equipment, operating keys and spare parts if shown on the drawings.

1. 3 quick coupler keys and matching swivel hose cells;

2. 2 valve keys for gate valves;

3. 2 keys for each controller;

4. 2 sets of special tools required for removing, disassembling and adjusting each type of sprinkler and valve supplied on this project; and,

5. 2 cover lifting tools for valve boxes.

D. Record Drawings:

The CONTRACTOR shall maintain one record set of blueline prints of the irrigation system in good condition at the site and mark on them the exact 'RECORD'. The CONTRACTOR shall make a daily record of all work installed during each day. Drawings shall indicate the exact location of check valves, gate valves, wire locations, head layout, automatic valves, quick couplers, irrigation, drainage piping, etc. Locations should be shown by the triangular system of measurements from easily identified permanent features, such as buildings, curbs, fences, walks, and by GPS, etc. Drawings shall show approved substitutions if any, of material including manufacturer's name and catalogue number. Drawings shall be to scale and all information shall be recorded in a neat, orderly way.

1. At the time of the irrigation mainline test, the CONTRACTOR shall provide a preliminary set of 'RECORD' drawings to the OWNER; and,

2. On or before the date of substantial inspection, the CONTRACTOR shall deliver 2 sets of As-Built drawings to the OWNER. The delivery of the prints shall not relieve the CONTRACTOR of the responsibility of furnishing required information that may have been omitted.

3. Immediately upon installation of any work which deviates from what is shown on the prints, the CONTRACTOR shall clearly indicate such changes in red pencil on the prints. Such changes shall include, but not be limited to, changes in (1) material, (2) sizes of material, (3) location, and (4) quantities. Dimensions shall be used where required such as, but not limited to underground utilities.

E. Substitutions:

1. The CONTRACTOR shall use materials as specified herein. Material other than that specified will be permitted only after written application by CONTRACTOR and written approval by the OWNER;

2. Substitutions will only be allowed when in the best interest of the OWNER; and,

3. The installation of any approved substitution is the CONTRACTOR's responsibility. Any changes required for installation of any approved substitution must be made to the satisfaction of the OWNER and without additional cost to the OWNER.

1.08 LOCATION

A. Bidders shall personally examine the sites and fully acquaint themselves with all of the existing conditions in order that no misunderstanding may afterwards arise as to the character or as to the extent of the work to be done; and, likewise, in order to advise and acquaint themselves with all precautions to be taken in order to avoid injury to persons or property of another. No additional compensation will be granted because of any unusual difficulties which may be encountered in the execution or maintenance of any portion of the work.

PART 2 - MATERIALS

All materials to be as specified below or approved equal.

2.01 PIPE

A. Pipe locations shown on the plan are schematic and shall be adjusted in field.

B. All PVC pipe shall be new and free from defects and shall be continuously marked indicating size, schedule, type and Department of Commerce Standard Reference. Pipe shall be furnished in standard length of 20 feet.

C. Main: Main line shall be solvent weld schedule 40 PVC pipe sized as noted on plans.

D. Laterals: All lateral pipe shall be Polyvinyl Chloride (PVC) 1120-1120, Class 160. Threaded connections shall be schedule 80 unless noted otherwise on the Plans or Specifications.

E. Galvanized Steel Pipe: All pressure mains which are exposed to possible damage, such as above ground, shall be threaded end, standard weight, Schedule 40 galvanized or coated steel.

F. Sleeves: All sleeves to be Polyvinyl Chloride (PVC) Schedule 40 and sized as twice the size of the pipe it is carrying.

G. Chaseways: All chaseways shall be PVC Schedule 40 and sized as needed for present and future use.

2.02 PIPE FITTINGS AND JOINTS

A. All PVC lateral pipe shall have PVC solvent weld Schedule 40 fittings and joints. The primer and solvent glue shall be compatible with the pipe and fittings. No male threaded PVC fittings are to be used, with the exception of street ells and riser adapters.

B. Galvanized steel pipe shall have threaded standard, 150 pound galvanized malleable fittings. All sprinkler heads shall be connected to the supply line with flexible pipe and ells, (Rainbird flex pipe and barbed ells O.A.F. or approved equal) or Schedule 80 swing joints as shown on the details.

C. Main line pipe joints shall be "belled" solvent-weld type.

2.03 SPRINKLER HEADS

A. Shrub heads and bubblers shall be installed on 1/2" schedule 40 PVC risers. Paint all risers with black paint. Shrub heads shall be installed to a standard height of 6" above plants, and shall be installed within planted masses to be less visible. Bubblers shall be installed at the base of trees for low level watering.

B. All pop-up heads shall be mounted on flexible type swing joints.

C. All pop up and shrub heads shall be pressure compensating.

D. Use screens in all heads.

2.04 IRRIGATION CONTROL WIRE

A. All irrigation control wire from the controller to the electric valve shall be UL approved PE irrigation control wire, single conductor insulated utilizing low density high molecular weight polyethylene insulation suitable for operating at 600 volts and conductor temperatures up to 60° C. The conductor shall be soft drawn bare copper meeting the requirements of ASTM Specification B-3 or B-8. Temperature rating shall be from –55° to +60° C. Thickness of insulation for conductor size 14 AWG through 12 AWG solid shall be 3/64 inches. Wire size, number and color as follows: #12 White for Common; #14 Red for Hotwires; #14 Yellow for Spares.

2.05 WIRE CONNECTORS

A. All splices in irrigation control wire shall be accomplished by using 3M Dry Direct Bury Splice Kit or approved equal.

2.06 SLEEVING AND CONDUIT

A. Sleeving and conduit shall be PVC, Schedule 40 for pipe sizes through 3 inches, and Class 160 for sizes 4 inches diameter or greater. Size as required by code or as shown on the Plan, whichever is larger in size. Electric conduit shall be gray PVC with Underwriters' Laboratories label.

2.07 RISERS

A. Risers to be Schedule 80 NPT riser threshold, height to be determined by use.

2.08 AUTOMATIC CONTROL VALVES

A. The automatic valves are to be Rainbird PEB series or approved equal.

2.09 GATE VALVES & ISOLATION VALVES

A. Gate valves 3 inches and smaller shall be Crane No. 438 (screwed end) with all bronze body, wedge disc and non-rising stem, or approved equal.

B. Isolation valves shall be iron body resilient seat gate valves with modified wedge disc NRS type, with slip on joint ends installed with thrust blocks.

2.10 VALVE BOXES

A. Valve boxes shall be made of Superflexon 1203 as manufactured by Nelson Irrigation or Ametek or approved equal. Boxes shall be 16 in. x 12 in. x 10 ¾ in. and black with a green cover marked "Irrigation" on top.

2.11 PAINT FOR RISERS

A. All risers to be painted black.

2.12 CONTROLLER

A. Controller shall be after Irrigation LEIT 4000 or approved equal with stainless steel enclosure as specified on Contract Documents.

2.13 VACUUM BREAKER

A. Unless specified on the plans, no vacuum breaker is required.

PART 3 - EXECUTION

3.01 GENERAL

A. The Irrigation Contractor shall carefully schedule his work with the Landscape Contractor and all other site developments.

B. Sleeves are required wherever piping or electrical wires are placed under paved surfaces. Install sleeves prior to commencement of paving.

C. No consideration will be given to any design changes. Should any changes be deemed necessary after award of contract, for proper installation and operation of the system, the OWNER shall negotiate such changes.

D. Lay out work as accurately as possible to the submitted shop drawings.

E. Full and complete coverage is required. CONTRACTOR shall make any necessary minor adjustments to layout as required to achieve full coverage of irrigated areas at no additional cost to the OWNER.

F. Where piping is shown on drawings to be under paved areas but running parallel and adjacent to planted areas, the intent is to install piping in planted areas. Do not install directly over another line in same trench.

G. It shall be the CONTRACTOR's responsibility to establish the location of all sprinkler heads in order to assure proper coverage of all areas. In no case shall spacing of sprinkler head exceed distances shown on the drawings and/or those specified. Pipe sizes shall conform to those shown on the drawings. No substitutions of smaller pipe sizes will be permitted, but substitutions of larger sizes may be approved. All pipe damaged or rejected because of defects shall be removed from the site at the time of said rejection, at not additional cost to the OWNER.

H. Install irrigation system after completion of site grading. The irrigation system shall be installed and completely operational three days prior to the installation of any planting operations.

3.02 PREPARATION

A. Layout of Main and Laterals: The sprinkler main lines and all laterals shall be laid out by the CONTRACTOR and approved by the OWNER or ENGINEER, prior to excavation. The sprinkler lines, as shown on the Plans, are drawn for clarity and are schematic in nature. No sprinkler lines shall be under paved areas unless in sleeves or specifically noted on the Plans. Any adjustment or site modification shall be done prior to the excavation operation.

B. Layout of Sprinkler Heads: All sprinkler heads locations shall be staked by the CONTRACTOR and approved by the OWNER or ENGINEER, prior to installation to insure uniformity and correctness to both pattern and coverage.

C. Valve Locations: The location of all valves shall be in landscape areas. The location of all valves shall be staked by the CONTRACTOR and approved by the OWNER or ENGINEER, prior to installation to insure ease of access for maintenance and to insure that they do not conflict with other elements on the project. Each valve shall be installed in a separate valve box. The valve locations shown on the plan are drawn for clarity and are schematic in nature. Sequence all valves so that the farthest valve from the P.O.C. operates first and the closest to the P.O.C. operates last.

D. Valve boxes must be placed a minimum of 12 inches and a maximum of 15 inches from the edge of pavement and the top of the box shall be 2 inches above finish grade. Valve boxes to be

installed in shrub beds only. Using 3 inches high number stencils, paint the valve number in white on the lid of each valve box.

E. Irrigation Plans: The irrigation system indicated on the drawings is drawn for clarity and is essentially diagrammatic. Spacing of the heads shown on the Plans shall not be modified unless approved in writing by the OWNER and ENGINEER.

3.03 TRENCHING

A. Perform all excavations as required for installation of work included under this Section, including shoring of earth banks, if necessary. Restore all surfaces, existing underground installation, etc., damaged or cut as a result of the excavations, to their original condition.

B. Should utilities not shown on the drawings be found during excavations, CONTRACTOR shall promptly notify the OWNER for instructions as to further action. Failure to do so will make the CONTRACTOR liable for any and all damage thereto arising from his operations subsequent to discovery of such utilities. Indicate such utility crossings on the record drawings promptly.

C. Trenches shall be open, vertical sided construction wide enough to provide free working space around work installed and to provide ample space for backfilling and compacting.

D. When 2 pipes are to be placed in the same trench, a 6 inch space is to be maintained between pipes. The CONTRACTOR shall not install 2 pipes with one directly above the other.

E. Backfill and compaction shall be in accordance with Section 02305, Excavation and Backfilling for Utilities. Depth of trenches shall be sufficient or provide a minimum cover above the top of the pipe as follows or as showing drawing if greater:

12 inches over non-pressure lateral lines
18 inches over non-pressure lateral lines under paving
18 inches over control wires
18 inches over sprinkler main line
24 inches over sprinkler main line under paving

F. The CONTRACTOR shall cut trenches for pipe to required grade lines and compact trench bottom to prove accurate grade and uniform bearing for the full length of the line.

G. All laterals and mainline shall be sufficiently sloped to provide positive drainage through drain valves.

H. The CONTRACTOR shall be held responsible for any damages caused by these operations and shall immediately repair or replace damaged parts.

3.04 INSTALLATION

A. Ground Level Areas: The CONTRACTOR shall do all necessary excavating and backfilling required for the proper installation of the work. Minimum depth of cover over lateral lines shall be 12 inches, over main line shall be 18 inches, over sleeving shall be 24 inches. Backfill material shall be clean fill. If existing material has rock, then clean sand must be used. In rocky areas, the trenching depth shall be two inches below normal trench depth to allow for a 2 inch bed of sand below the pipe. There shall be no rock in contact with PVC pipe. The CONTRACTOR

shall use backfilling equipment that will tamp backfill to its original density. The CONTRACTOR shall barricade or light the excavation to prevent hazards to the public. Objectionable materials such as coral rock, asphalt, limerock and bricks that are encountered during working operations, shall be removed from the project by the CONTRACTOR.

B. Modifications Due to Field Conditions: Conditions that occur on the site that cause the system to be modified, shall be presented as shop drawings by the CONTRACTOR and approved by the ENGINEER, prior to construction.

C. The existence and location of utilities (overhead, above ground and underground) shall be thoroughly investigated and verified by the CONTRACTOR before the work begins in the area of said utilities. The CONTRACTOR shall exercise care in digging and working so as not to damage utilities or endanger the safety and lives of people. Should overhead, above ground or underground obstructions be encountered which interfere with the work, the ENGINEER shall be consulted in order for a decision to be made on the relocation of the work to clear such obstruction. The CONTRACTOR shall be responsible for the immediate repair of any damage to utilities caused by the CONTRACTORs work.

D. PVC Sleeves and Electrical Conduit

1. All PVC sleeves shall be a minimum of twice (2x) the diameter of the pipe to be sleeved; and,

2. All PVC control wire conduit shall be of sufficient size to hold the required quantity of control and common wires. Electrical wires are not to be placed in the same sleeve with water pipes.

3.05 PVC PIPE ASSEMBLY

A. All PVC pipe shall be cut to the proper length prior to assembly. The cut shall be neat and square, 90 degrees to the axis of the pipe. Prior to assembly, the cut end shall be de-burred. The fitting and pipe end shall both be cleaned with a PVC High Etch Primer. This primer shall have a purple tint to aid in visual inspection.

B. A thin even flow coat of slow drying, heavy duty PVC solvent/glue shall be applied to both the inside of the fitting and the pipe mating surface.

C. The pipe shall be inserted into the fitting until it bottoms, then given a quarter turn to insure proper sealing. The pipe and fittings shall be out of service during the curing time as recommended by the manufacturer or 24 hours, whichever is longer. The finished joint shall be water-tight and shall have a strength equal to or greater than that of the pipe being joined. The direct tapping of PVC pipe or fittings shall not be permitted.

D. Threaded Joints for PVC Pipes

1. Use Teflon tape on all treaded PVC fittings;

2. Use strap-type friction wrench only. Do not use metal-jawed wrench; and,

3. At threaded joints between PVC and metal pipes, the metal shall contain the socket end and the PVC end shall contain the spigot. A metal spigot shall not, under any circumstances, be screwed into a PVC socket.

3.06 IRRIGATION CONTROL VALVES

A. Valves shall be carefully inspected during installation; they shall be opened wide and then tightly closed and tested for tightness. Special care shall be taken to prevent any foreign matter from becoming lodged in the valve seat. Valves shall be set plump at the locations indicated and in accordance with the details shown on the drawings.

B. Install control valves in valve boxes grouping together where practical. Place no closer than 12 inches to walk edges, buildings and walls.

C. Pressure regulating remote control valves shall be adjusted so that the most remote sprinkler heads operate at the pressure specified.

D. Valves shall be installed as shown in details and in accordance with manufacturer's instructions and the specifications.

3.07 QUICK COUPLING VALVES

A. Shall be set a minimum of 12 inches from walks, curbs or paved areas where applicable or as otherwise noted. Quick coupling valves shall be housed in valve boxes.

B. Valves shall be installed on 3 elbow PVC Schedule 80 swing joint assembly.

3.08 VALVE BOXES

A. Valve boxes shall be set flush with finish grade in lawn areas and ½ inch above finish grade in ground cover and shrub bed areas.

3.09 SPRINKLER HEADS

A. Sprinkler Heads: All sprinkler heads shall be installed as shown on the Drawings. Backfill around the sprinkler shall be free of rocks, roots, or debris. If finished grade has not been established, the line shall be temporarily capped at the head and a stake marker placed. After grading has been completed, the sprinkler head shall be set. The CONTRACTOR shall coordinate his operations with the various phases of the work. Adjust heads for proper coverage avoiding excess water on walks, walls and paving.

B. All sprinkler heads within a zone shall have matched precipitation rates.

C. All heads operating on one valve (zone) shall do so at the same pressure.

D. All heads shall be pop-up type heads. Permanent shrub risers are not permitted.

E. Do not mix different types of heads within zone.

F. Shrub beds and lawn areas are to be on separate valves (zones).

G. Place part-circle pop-up sprinkler heads 6 inches from edge of adjacent walks, curbs and mowing bands, or paved areas at time of installation.

H. All sprinkler nozzles shall be adjusted for the proper radius and direction of spray pattern. Make adjustments where possible to prevent overspraying into walks, pavement or buildings.

I. Sprinkler heads and quick coupling valves shall be set perpendicular to finished grade unless otherwise designated on the drawings.

3.10 DRAIN VALVES

A. All laterals shall be provided with manual drain valves.

B. The mainline shall be drained with manual drain valves.

C. Drain valves are to be provided at sufficient intervals to provide complete drainage of all piping.

3.11 AUTOMATIC CONTROLLER

A. The automatic controller shall be installed at the approximate location shown on the irrigation drawings. Solar power supply unless otherwise direct and then power supply will be provided by the Electrical Subcontractor.

B. All regulatory authorities having jurisdiction and other applicable codes shall take precedence in connecting the 110-volt electrical service to the controller.

C. Install per regulatory authority having jurisdiction code, manufacturer's latest printed instructions, and as detailed.

D. Connect remote control valves to controller in sequence to correspond with station setting beginning with 1, 2, 3, etc.

E. Affix controller name (i.e., 'Controller A') on inside of controller cabinet door with letters minimum of 1 inch high. Affix a non-fading copy of irrigation diagram to cabinet door below controller name. Irrigation diagram to be sealed between two sheets of 20 mil (minimum) plastic. Irrigation diagram shall be a reduced copy of the as-built drawing and shall show clearly all valves operated by the Controller, showing station number, valve size and type of planting irrigated.

3.12 CONTROL WIRING

A. Control Lines: All electric control lines shall be installed in the same trench with the pipe lines in a neat and orderly fashion. They shall be installed in the main and lateral trenching or in their own trenches, and where necessary, bundled together and taped every 5 feet.

B. Connections: any connections to existing pipe systems shall be made after consultation and approval of regulatory agencies.

C. All electrical equipment and wiring shall comply with regulatory authorities having jurisdiction and be installed by those skilled and licensed in the trade.

D. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible, and shall have a minimum of an 18 inch cover.

E. Control wires shall be installed to the side of the main line whenever possible. Placement over pipes is not permitted.

F. Where more than 1 wire is placed in a trench, the wiring shall be taped together at intervals of 10 feet.

G. An expansion curl shall be provided within 3 feet of each wire connection and at least every 100 feet of wire length on runs of more than 100 feet in length. Expansion curls shall be formed by wrapping at least 5 turns of wire around a 1 inch diameter pipe, then withdrawing pipe.

H. Control wire splices at remote control valves to be crimped and scaled with specified splicing materials. Line splices will be allowed only on runs of more than 500 feet and they must be located in 10 inch round splice boxes, which are green in color. The connector shall be 3MD BY splice kit by 3M Corporation, or 'Snip-Snap' connector by Imperial, or equal. Use one splice per connector sealing packs.

I. Wire: Tape and bundle control wires every 10 feet and run alongside mainline. At all turns in direction make a 2 foot coil or wire. At all valve boxes coil wire around a ¾ inch piece of PVC to make a coil using 30 inches of wire. Provide 1 spare for every 10 hot wires – a minimum of 2 extra. Number all wires, using an electrical book of numbers, according to the plans. Number wires in all valve boxes, junction boxes and at the controller.

3.13 SHUT-OFF VALVES

A. Shall be located in the following locations:

1. After backflow preventer and prior to main supply loop;

2. Between mainline and each remote control valves; and,

3. To be located within planting and lawn areas.

B. All shut-off valves shall be located in valve boxes.

3.14 CLOSING OF PIPE AND FLUSHING OF LINES

A. All testing shall be done under the supervision of the OWNER or ENGINEER. Submit written requests for inspections to the OWNER at least 3 days prior to anticipated inspection date.

1. Flushing: All lines shall be flushed prior to any installation of automatic sprinkler valves or sprinkler heads to remove all sand and other foreign matter with velocity of the flushing water not less than 4 feet per second. Flushing shall be terminated at the direction of the ENGINEER. The CONTRACTOR shall dispose of the flushing water without causing a nuisance or property damage.

2. Thoroughly flush out all water lines under a full head of water before installing heads, valves, quick couplers assemblies, etc. Maintain flushing for a minimum of three minutes at the valve located furthest from water supply;

3. After flushing, cap or plug all openings to prevent entrance of materials that would obstruct the pipe or clog heads. Leave in place until removal is necessary for completion of installation;

4. Test as specified below;

5. Upon completion of testing, complete assembly and adjust sprinkler heads for proper distribution; and,

6. All sprinkler heads and quick coupling valves shall be set perpendicular to finished grades unless otherwise designated on the drawings, or otherwise specified. Sprinkler heads adjacent to existing walls, curbs and other paved areas, shall be set to grade. Sprinkler heads, which are to be installed in lawn areas where the turf has not yet been established, shall be set 1 inch above the proposed finish grade. Heads installed in this manner will be lowered to grade when the turf is sufficiently established to allow walking on it without appreciable destruction. Such lowering of heads shall be done by this CONTRACTOR as part of the original contract with no additional cost to the OWNER.

3.15 TESTING

A. Pressure and Leakage Testing:

1. General: All pumps, gauges, and measuring devices shall be furnished, installed and operated by the CONTRACTOR and all such equipment and devices and their installation shall be approved by the ENGINEER.

2. Pressure Tests for Lines: Pressure piping installed under this contract shall be subjected to a pressure test after the pipe has been installed and partially backfilled for underground installations. Each pressure test shall be maintained for at least one hour at 150 psi during which time all joints shall be examined for leaks.

3. Before application of test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the CONTRACTOR shall install corporation cocks or fittings and valves at such points so the air can be expelled as the pipe system is slowly filled with water. After expulsion of air, the corporation cocks, or other blowoff devices shall be closed and the test pressure applied.

4. All exposed pipe, fittings, valves, and joints shall be carefully examined for leaks. All cracked, broken, or defective pipe, fittings, or valves discovered as a consequence of this pressure test shall be removed and replaced with sound material. All leaking, or defective joints shall be repaired, replaced, or corrected. After all necessary replacements and corrections, the test shall be repeated until satisfactory to the ENGINEER.

5. Leakage Testing for Pressure Piping: After completion of satisfactory pressure tests of piping, the lines shall be subjected to leakage tests. The duration of each leakage test

shall be at least two hours and the pressures maintained during each leakage test shall be as specified above for the pressure tests.

6. Leakage is defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water. The allowable limits for leakage of underground piping shall be determined by the following formula.

7. Allowable Limits for Leakage of Pressure Piping: The hydrostatic pressure tests shall be performed as hereinabove specified and no installation, or section thereof, will be acceptable until the leakage is less than the number of gallons per hour as determined by the formula:

$$L = \frac{SD(P)^{1/2}}{148{,}000}$$

in which,

L = Allowable leakage, in gallons per hour
S = Length of pipe being tested in feet
D = Nominal pipe diameter; in inches
P = Average test pressure during the test, in psi gauge

8. Water shall be supplied to the line during the test period as required to maintain the test pressure as specified. The quantity used, which shall be compared to the above allowable quantity, shall be measured by pumping from the calibrated container.

9. Where leakage exceeds the allowable limit, the defective pipe or joints shall be located and repaired. If the defective portions cannot be located, the CONTRACTOR shall remove and reconstruct as much of the work as is necessary in order to conform to the specified limits. No additional payment will be made for the correction of defective work, or to damage to other parts of the work resulting from such corrective work.

B. Balancing and Adjustment: The CONTRACTOR shall balance and adjust the various components of the sprinkler system so the overall operation of the system is most efficient. This includes a synchronization of the controllers, part circle sprinkler heads, and individual station adjustments on the controllers.

3.16 INSPECTION

A. The CONTRACTOR shall maintain proper facilities and provide safe access for inspection to all parts of the work.

B. Irrigation inspection shall consist of a minimum of:

1. Mainline pressure test;
2. Coverage test; and,
3. Final irrigation inspection.

C. If the laws, ordinances or any public authority require any work to be specifically tested or approved, the CONTRACTOR shall give the OWNER 3 days notice of its readiness for inspection.

D. The CONTRACTOR shall be solely responsible for notifying the OWNER where and when such work is in readiness for testing.

E. If any work should be covered up without approval of the OWNER it must be uncovered, if required, for examination at CONTRACTOR's expense.

F. No inspection will commence without 'Record' drawings and without completing previously noted corrections, or without preparing the system for inspection.

3.17 BACKFILL AND COMPACTING

A. After system is operating and required tests and inspections have been made, backfill excavations and trenches.

B. Backfill for all trenches, regardless of the type of pipe covered, shall be compacted to the requirements of Section 02221, Excavation and Backfilling for Utilities.

C. Within all planting and lawn areas the existing 4 inch layer of topsoil shall be restored to its original condition and finish grade. After backfilling, the CONTRACTOR shall dispose of surplus earth offsite.

3.18 RESPONSIBILITY PRIOR TO FINAL ACCEPTANCE

A. The CONTRACTOR shall be responsible for maintenance until the inspection for completion and final acceptance. The responsibilities include the following:

B. Repair of all damage to installed material and equipment as needed.

C. Adjustment of all sprinkler heads with regard to proper height after landscape installation, arc coverage, radius and operation at least once a week.

D. The system shall be operational at least one month prior to Substantial Completion. Once a week after Substantial Completion, the CONTRACTOR shall clean, repair and adjust all valves and other controls. Also, check to insure that they are opening and closing properly.

E. Once a week the controllers shall be checked to insure that the clocks have the right time, that the program is properly set and that is properly operating all of the valves correctly. Following inspections, the pump enclosure is to be locked.

END OF SECTION 02810

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. The work included in this section consists of furnishing all labor, supplies equipment and materials necessary to complete the installation of all landscaping as shown on the Plans as base bid including the installation of sod and seeding as shown, as well as all other related responsibilities as described in these Specifications and accompanying plans.

B. Installation: All plant materials included shall be of the specific size and quality indicated on the plans and in these specifications and shall be installed in strict accordance with sound nursery practices and shall include maintenance and watering for all work outlined on the plans and specifications until final acceptance.

C. Quantities and Locations: The ENGINEER reserves the right to adjust the number and locations of the designated types and species to be used at any of the locations shown in order to provide for any modifications which might become necessary.

1.03 RELATED WORK

A. Section 02050 - Demolition

B. Section 02210 - Site Grading

C. Section 02284 - Topsoil

D. Section 02910 - Sodding

1.04 QUALITY ASSURANCE

A. Responsibility for Assuring Quality Work: The CONTRACTOR'S Superintendent shall be well versed in Florida plant material, planting operations, blue print reading, and coordination with other performing contracts or services in the job area.

All employees shall be competent and highly skilled in their particular job in order to properly perform the work assigned to them. The CONTRACTOR shall be responsible for maintaining the quality of the material on the job throughout the duration of the CONTRACT.

B. Correct Grade of Plants: In the event that it becomes apparent that any nursery supplying plants for this work has knowingly and consistently represented the grade of plants as being higher than their actual grades as determined under these provisions, all plants already delivered from such sources shall be removed from the job at the CONTRACTOR'S expense, and no further plants will be accepted from such nursery until written evidence is submitted and confirmed that all

material for delivery has been inspected and approved by inspectors of the State Plant Board as being of the grade as represented.

C. Authority for Nomenclature, Species, Etc.: All plant material shall conform to the names given in Hortus Third, 1976 edition. Names of varieties not included therein conform generally with names accepted in the nursery trade.

D. Grade Standards: All plant materials shall be nursery grown except where specified as collected material, and shall comply with all required inspections, grading standards and plant regulations as set forth by the Florida Department of Agriculture's "Grades and Standards for Nursery Plants" revised 1973, or with any superseding specifications that may be called for on the Plans or in the Specifications. ALL PLANTS NOT LISTED IN THE GRADES AND STANDARDS FOR NURSERY PLANTS, shall conform to a Florida No. 1 as to: (1) Health and Vitality, (2) Condition of Foliage, (3) Root System, (4) Freedom from Pest or Mechanical Damage, (5) Heavily Branched and Densely Foliated according to the accepted normal shape of the species, or sport, (6) Form and branching habit.

E. Balled and Burlapped (B&B) and Wire Balled and Burlapped (WB&B) Plants: These plants shall be properly protected until they are planted. The plant shall be handled only by the earth ball and not be the plant itself.

Any (B&B) or (WB&B) plant which shows evidence of having handled by a method other than the method outlined above, and resulting in a cracked or broken ball or of the roots being loosened within the ball shall be rejected.

For plants grown in soil of loose texture, which does not readily adhere to the root system, (especially in the case of large plant material), WB&B plants may be specified. For WB&B plants, before plant is removed from the hole, sound hog wire shall be placed around the burlapped ball and looped and tensioned until the burlapped ball is substantially packaged by the tightened wire netting, such as to prevent disturbing of the loose soil around the roots during handling. Any wire, synthetic material or chemically treated material will be removed from the rootball at planting time, all ties shall be removed from the rootball and around the trunk at planting.

F. Container Grown Plants (CG): Any Container Grown (CG) plants, which have became "pot bound" or for which the top system is out of proportion (larger) to the size of the container, will not be acceptable.

With metal containers, unless the root-ball system slips easily and unbroken from the can, a nursery can-cutter shall be used to slit the can in such a way that the can may be opened fully.

CG plants shall not be removed from the can until immediately before planting, and with all due care to prevent damage to the root system.

G. Submit to the ENGINEER the names and locations of nurseries proposed as sources of acceptable plant material. The ENGINEER reserves the right to visit the nursery to inspect and/or select the specified material.

H. The ENGINEER will be included in the hand selecting of all Live Oaks for the project.

1.05 DELIVERY, STORAGE AND HANDLING

A. Inspection and Transporting: Movement of nursery stock shall comply with all Federal, State, and local laws and regulations. Therefore, required inspection certificates shall accompany each shipment, and shall be filed with the ENGINEER.

Wrap root balls with burlap. Wire wraps burlap if root ball is not sufficiently compacted. Palms will not require burlap wrapping if the following requirements are met:

1. Dug from marl or heavy soil that adheres to roots and retains shape without shattering.

2. Moistened material used to cover ball and roots not exposed to wind and sun.
3. Transport material on vehicles large enough to allow plants not to be crowded. Plants shall be covered to prevent wind damage during transit and shall be kept moist, fresh and protected at all times. Such protection shall encompass the entire period, which the plants are in transit, being handled, or are in temporary storage.

B. All plant material shall not remain on the work site longer than two (2) days prior to being installed.

1.06 SUBSTITUTIONS

A. Substitutions of plant types or change in the size of plant material will only be permitted upon submission of documented proof that the particular plant type and size specified is not obtainable.

B. Where B&B or WB&B plants are specified, CG plants of the same species, etc., will not be accepted. Where a B&B or WB&B is not specified on a particular plant material, B&B, WB&B or CG plants may be used provided they meet all specifications.

1.07 GUARANTEE

A. All plant material shall be guaranteed for a minimum of one (1) calendar year from the time of final acceptance.

1.08 REPLACEMENT

A. The guaranteeing of plant material shall be construed to mean the complete and immediate replacement of plant material if it is:

1. Not in a healthy growing condition.

2. There is a question to its survival ability at the end of the guarantee period.

3. It is dead.

1.09 SIZE, QUALITY AND GRADE OF REPLACEMENT

A. Replacement plant material shall be of the same species, quality and grade as that of the plant to be replaced. The size of the replacement shall not necessarily be the same size as the original specified plant at its initial planting but shall closely match specimens of the same species. Replacements shall be guaranteed for a period equal to the originally specified guarantee. This guarantee period shall begin at time of plant replacement.

1.10 GUARANTEE NULL AND VOID

A. The guarantee shall be null and void for plant material which is damaged or dies as a result of "Act of God" limited to hail, freeze, lightening, winds which exceed hurricane force, and lethal yellowing, providing the plant was in a healthy growing condition prior to these "Acts of God".

PART 2 - MATERIALS

2.01 PLANT MATERIAL

A. Florida No. 1: Except where another grade is specifically called for in the Plans, all plant material shall be no less than Florida No. 1 at the time of final inspection immediately prior to the acceptance by the CITY.

B. Habit of Growth: All plant material shall have a habit of growth that is normal for that species and shall be sound, healthy, vigorous and free from insects, plant diseases, injuries, and dead limbs.

C. Branching, Leafing, Measurements and Ball Sizes:

1. Trees and Shrubs: Requirements for the measurement, branching character, ball diameter, depth and other standards shall follow the Code of Standards recommended by the American Association of Nursery Stock, Bulletin Z-60.1-1973 and as revised.

2. Palms: Requirements for the measurement of clear trunk, clear wood and graywood ball diameter and depth shall comply with requirements as set forth by the Florida department of Agriculture's "Grades and Standards for Nursery Plants, Part II for Palms and Trees".

D. Die-Back and Leaf-Drop: Plant material showing signs of die-back or leaf-drop will not be accepted and must be removed from the job immediately if so directed by the ENGINEER. Therefore, any plant material with tendencies toward leaf-drop or dieback must be root pruned early enough to provide a sound network of hair roots prior to relocation to the job site.

E. Mechanical Destruction of Foliage: Mechanical destruction of foliage resulting from root pruning shall not effect more than 10% of the total foliage prior to planting on the job site. Loss of foliage caused by seasonal change will be accepted.

F. Spanish Moss: If Spanish Moss (Tillandsia usneoides) exists on plant material, it shall be completely removed prior to planting on the job site.

G. Palms: Before transporting, see Delivery, Storage and Handling; for requirements related to wrapping of root balls.

1. Remove a minimum of fronds from the crown of the palms to facilitate transporting and handling.

2. Palms with burn marks, nail holes, and frond boots on trunk shall not be accepted.

3. Using untreated burlap strip or untreated cotton twine, tie Sabal Palmetto buds and leave in place until Palmetto is established. Tying shall be as set forth in Florida Department of Agriculture's "Grades and Standards for Nursery Plants". Tying of other palms shall be at the option of the CONTRACTOR.

4. To reduce head volume, Palm fronds may be taper trimmed by not more than one-third (1/3).

5. Palm trees showing cable or chain marks and equipment scars shall be rejected.

H. Chlorosis: The allowable level of Chlorosis in foliage shall be as set forth in the Florida Department of Agriculture's "Grades and Standards for Nursery Plants".

2.02 PLANTING SOILS

A. General Type: All plant material with the exception of Sabal palmetto shall be planted with planting soil mixed with 50% original soil, if the soil is of good quality, as determined by the ENGINEER. The planting soils shall be sandy loam (50% sand, and 50% muck) typical of the locality. The soil must be taken from ground that has never been stripped, with a slight acid reaction (5.5 to 6.5 ph) and without an excess of calcium or carbonate. Soil shall be delivered in a loose friable condition.

B. Special Type: Planting soil for palms shall be a good grade of salt free sand, which is free of all weeds.

2.03 WATER

A. Water shall be potable, from municipal water supplies or other sources, which are approved by a public health department.

2.04 MULCH

A. Mulch shall be Eucalyptus mulch or other approved non-native tree bark mulch. It must be uniformly shredded and be free from pieces of bark larger than 1", foreign matter, weed seeds and any other organic or inorganic material. Submit sample for approval. CONTRACTOR shall apply one application at initial installation and a second application prior to final acceptance.

2.05 FERTILIZER

A. New Plant Material: Trees, palms and shrubs, fertilize with Agriform planting tablets, 20-20-5 formula, 21 gram or approved equal.

B. New Ground Covers: Fertilize with an approved fertilizer of fifty percent (50%) or greater organic 6-6-6 or 8-8-8 with minor elements including, but not limited to, iron zinc and manganese.

C. Composition of Quality: All fertilizer shall be uniform in composition and dry. Granular fertilizer shall be free flowing and delivered in manufacturers standard container with name of material, weight and guaranteed analysis printed on container. Tabletized fertilizer shall be delivered in unopened containers or boxes. All bags, containers or boxes shall be fully labeled with the manufacturer's analysis. Submit labels to ENGINEER for approval prior to placement of fertilizer.

D. All shall comply with the State of Florida fertilizer laws.

2.06 PRUNING PAINT

A. Pruning Paint shall be commercial tree paint, which is waterproof, antiseptic, adhesive, elastic and free of kerosene, water, cresol and any other substances harmful to plant material.

2.07 VEGETATIVE ROOT INHIBITOR

A. A vegetative root inhibitor shall consist of a polypropylene fabric with root control time-release modules of Trifluralin with an effective life of 100 years or approved equal.

B. Vegetative root inhibitor shall Bio-Barrier as manufactured by Reemay, Inc. or approved equal.

PART 3 - EXECUTION

3.01 INSPECTION

A. Utilities: The location and existence of utilities (overhead and underground) shall be thoroughly investigated and verified by the CONTRACTOR before the work begins in the area of said utilities. The CONTRACTOR shall exercise care in digging and work so as not to damage existing utilities in said areas, such as underground pipes, cables, wires, etc. Should such overhead or underground obstructions be encountered which interfere with planting, the ENGINEER shall be consulted immediately in order for a decision to made on the relocations of plant material to clear such obstruction. The CONTRACTOR shall be responsible for the immediate repair of any damage to utilities caused by CONTRACTOR’s work.

3.02 PREPARATION

A. Staking Plant Locations: Plant locations must be staked or marked prior to plant hole excavation or placing on deck, by scaling the plants from existing features found on-site and shown on the plans or by given dimensions if shown.

B. Spacing of Shrubs: Shrub beds located next to another bed, walkway, structure, etc., shall have the plants along the perimeter spaced so that the plants can mature properly without growing into the other bed, walkway, structure, etc.

C. Excavation of Plant Holes: Excavation of plant holes shall be roughly cylindrical in shape with the sides approximately vertical. The ENGINEER reserves the right to adjust the size and shape of the plant hole and the location of the plant in the hole to compensate for unanticipated structures or unanticipated factors. All plant holes shall be sufficiently deep to allow the rootball to set on existing soil and have root collar at grade level. Plants shall be centered in the holes with the tree trunk locations scaled from existing permanent structures as shown on the drawings. Plants shall be set straight or plumb in locations. All plant holes to accommodate plants with ball sizes less than 24" in diameter shall be at least 18" greater than the diameter of the ball. All plants holes to accommodate plants with ball sizes two feet (2') and larger in diameter shall be at least twice the diameter of the ball. The excavated material from the plant holes may not be used to back-fill around the plant material. Such material shall be disposed of either on the project site or off the site as directed by the ENGINEER. Plant holes for shrub material planted in mass shall meet all requirements listed above for plant holes. However, they shall not be individual holes but one continuous hole or excavation. Plant holes for hedge material shall also meet all requirements listed above for plant holes, however, a continuous trench shall be used in lieu of individual holes.

3.03 INSTALLATION

A. Setting of Plants:

1. When lowered into the hole the plant shall rest on the prepared hole bottom such that the roots after settlement are level, or slightly above the level of its previous growth condition and the final level of the ground around the plant shall conform to the surrounding grade. The plants shall be set straight or plumb or normal to the relationship of their growth prior to transplanting. The ENGINEER reserves the right to realign any plant material after it has been set.

2. Palms of the Sabal species may be set deeper than the depth of their original growth condition in order to lessen the necessity for support or bracing. For such deeper planting however, it will be required that the underlying soil be friable and that the clear trunk requirements set forth in the plant list be maintained from the finished grade and NOT from the previous grade of the palm trees before it was transplanted.

3. Plant material of the shrub category and smaller must be handled by the ball only. Plant material too large for hand handling, if moved by winch or crane, must be thoroughly protected from chain, rope or cable marks, girdling, bark slippage, limb breakage and any other damage that might occur by improper handling or negligence.

4. All palm trees handled by the trunks must be wrapped with burlap and wood battens, held in place by banding strips as called for in the details.

B. Backfilling:

1. Use planting soils specified in Article 2.02, Planting Soil. Backfill to the bottom two thirds of the planting hole and firmly tamp and settle by watering as backfilling progresses. After having tamped and settled the bottom two thirds (2/3) of the hole, thoroughly puddle with water and fill remaining one third (1/3) of the hole with planting soil, tamping and watering to eliminate air pockets.

C. Application of Fertilizer:

1. Fertilize New Planting (Trees, Palms and Shrubs) as follows:

a. Specified Container Size	Application Rate
1 gallon container	1 tablet
3 gallon container	2 tablets
5 gallon container	3 tablets
7 gallon container	5 tablets

b. Large tubs or boxes and B&B material shall receive one (1) tablet for each one-half (1/2) inch of trunk diameter (measured three (3) feet from ground). For large shrubs, one (1) tablet for each one (1) foot of height or spread.

D. Mulch: Within 24 hours after planting, planting areas must be mulched as called for in these specifications. The mulch shall be uniformly applied to a depth of two (2) inches over all shrub, tree and groundcover areas and any areas indicated on the plans.

E. Staking and Guying shall be installed within 24 hours; in accordance with details.

F. Initial Watering: Initially, water the plant material to develop uniform coverage and deep-water penetration of at least six inches (6"). Avoid erosion, puddling, and washing soil away from plant roots.

G. Hand Watering: Provide hand watering of plant material as necessary subject to weather conditions, to maintain healthy growing conditions until final acceptance. This shall be in addition to water received from irrigation system, if any.

H. Pruning:

1. The amount of general pruning shall be limited to the minimum necessary to remove dead or injured twigs and branches and to compensate for the loss of roots as a result of transplanting operations. Pruning shall be done in such a manner as not to change the natural habit of shape of a plant, and in accordance with National Arborist Association standards for pruning.

2. All broken or damaged roots shall be cut off smoothly. The tops of all trees shall be pruned in a manner complying with standard horticultural practices. All cut surfaces of one-half inch (1/2") or more in diameter above ground level shall be treated with approved commercial tree paint.

I. Weeding: In the event that weeds or undesirable vegetation becomes prevalent to such an extent that they threaten plant material, they shall be removed as directed by the ENGINEER. If necessary, the plant material and/or planting soil shall be replaced as needed to eliminate the weeds at the expense of the CONTRACTOR.

3.04 CLEANING AND PROTECTION

A. Disposal of Trash: All debris and other objectionable material created through planting operations and landscape construction shall be removed completely on a daily basis from the job or as directed by the ENGINEER. Excess soil shall be disposed of as directed by the ENGINEER.

B. Responsibility for Protection and Restoration of Property: The CONTRACTOR shall be responsible for all damage to property whether it is accidental or necessary for the completion of the contract.

C. Protection Against Mechanical Damage: The CONTRACTOR's responsibility for protection against mechanical damage shall include providing protection from vehicles and providing warning signs and barricades as might be necessary and CONTRACTOR shall repair, restore and replace any planting areas which become damaged as a result of any negligence of the CONTRACTOR or CONTRACTOR's employees in complying with these requirements. Coordination shall be with the CITY and the ENGINEER.

D. Responsibility Prior to Final Acceptance:

1. Maintenance shall begin immediately after each plant is planted and continue until final acceptance.

2. Plants shall be watered by hose, soaking thoroughly each day for the first two weeks (14 calendar days) and every other day for the following two week period. Soaking then shall continue on a twice weekly basis for another period of three (3) weeks for material over five feet (5') height, amounting to a total of 28 days after installation of planting under five feet (5') and a total of 45 days for plants over five feet (5'). All watering is required without regard to an irrigation system.

3. Plant maintenance shall include watering, pruning, weeding, cultivating, mulching, tightening and repairing of guys, stakes, braces, etc., replacement of sick or dead plants, resetting plants to proper grades or upright position and maintenance of the watering saucer, and all other care needed for proper growth of the plants. Plant material rejected during the course of the construction shall be removed within five (5) working days and replaced before the inspection for completion will be scheduled.

4. During the maintenance period and up to the issuance of Certificate of Final Acceptance, the CONTRACTOR shall do all seasonal spraying and/or dusting of all planting. The materials and methods shall be in accordance with the highest standard nursery practices and as recommended by the CITY, or Horticultural Engineer and approved by the ENGINEER, prior to implementation.

5. Planting areas and plants shall be protected against trespassing and damage. If any plants become damaged or injured they shall be treated or replaced, as directed and in compliance with this specification. No work shall be done within or over planting areas or adjacent to plants without proper safeguards and protection.

3.05 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on actual quantities installed as more specifically discussed and described in SECTION 01025 of MEASUREMENT AND PAYMENT.

END OF SECTION 02900

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. The work included in this section consists of furnishing all labor, supplies, equipment and materials necessary to complete the installation of sod and associated materials herein after listed and as shown on the plans.

1.03 RELATED WORK

A. Section 02200 - Earthwork.

B. Section 02210 - Site Grading.

C. Section 02284 - Top Soil.

D. Section 02900 - Landscape Work.

1.04 QUALITY ASSURANCE

A. Sodding work shall be performed by a firm specializing in sodding.

B. Source Quality Control: Ship sod with certificates of inspection as required by governing authorities.

Do not make substitutions. If specified sod is not obtainable, submit proof of non-availability to ENGINEER, together with proposal for use of equivalent material.

C. Analysis and Standards: Package standard products with manufacturer have certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

1.05 SUBMITTALS

A. Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.

B. Plant and Material Certifications:

1. Certificate of inspection as required by governmental authorities.
2. Manufacturer's or vendor's certified analysis for soil amendments or fertilizer materials.

1.06 DELIVERY, STORAGE AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

B. Sod: Time delivery so that sod will be placed within 24 hours after stripping. Protect sod against drying.

C. Transporting:

1. Sod transported to the project in open vehicles shall be covered with tarpaulin or other suitable covers securely fastened to the body of the vehicle to prevent injury to the sod material. Closed vehicles shall be adequately ventilated to prevent overheating of the sod. Evidence of inadequate protection against drying out in transit shall be cause for rejection.

2. Sod shall be kept moist, fresh and protected at all times. Such protection shall encompass the entire period during which the sod is in transit, being handled, or in temporary storage.

3. Upon arrival at the temporary storage location or the site of work, sod shall be inspected for proper shipping procedures. Should the roots be dried out, the ENGINEER will reject the sod. When sod has been rejected, the CONTRACTOR shall remove it at once from the area of the work and replace it.

4. Unless otherwise authorized by the ENGINEER, the CONTRACTOR shall notify the ENGINEER at least 48 hours in advance of the anticipated delivery date of sod material. A legible copy of the invoice, showing species and variety of sod included for each shipment shall be submitted to the ENGINEER. Certificate of Inspection must accompany each sod shipment.

1.07 JOB CONDITIONS

A. Begin installation of sod after preceding related work is accepted.

B. Environmental Requirements:

1. Install sod during months acceptable to the ENGINEER.
2. Do not install sod on saturated soil.

C. Protection: Erect signs and barriers to control vehicular traffic.

D. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until parties concerned mutually agree upon removal.

1.08 SEQUENCING AND SCHEDULING

A. Correlate planting with specified maintenance periods to provide maintenance from date of substantial completion.

B. Coordination with sodding: Plant trees, palms and shrubs after final grades are established and prior to planting of sod, unless otherwise acceptable to ENGINEER. If planting of trees, palms and shrubs occurs after sod work, protect sod areas and promptly repair damage to lawns resulting from planting operations.

1.09 SPECIAL PROJECT WARRANTY

A. Warranty sod through specified lawn maintenance period, and until final acceptance.

PART 2 - PRODUCTS

2.01 PLANTING SOIL

A. Provide new planting soil that is fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps, stones larger than 1 inch in any dimension, and other extraneous or toxic matter harmful to plant growth.

B. Obtain planting soil from local sources or from areas having similar soil characteristics to that found at project site.

C. Refer to Section 162 of the "FDOT Standard Specifications for Road and Bridge Construction" dated 1991 for Topsoil Specifications.

2.02 COMMERCIAL FERTILIZER

A. For sod, provide fertilizer with percentage of nitrogen required to provide not less than 1 pound of actual nitrogen per 1,000 sq. ft. of lawn area and not less than 4 percent phosphoric acid and 2 percent potassium. Provide nitrogen in a form that will be available to sod during initial period of growth; at least 50 percent of nitrogen to be organic form.

2.03 SOD

A. Provide strongly rooted sod, not less than 2 years old, free of weeds and undesirable native grasses, and machine cut to pad thickness of 1-1/2 inch (plus or minus 1/4 inch), excluding top growth and thatch. Provide only sod capable of vigorous growth and development when planted (viable, not dormant).

B. Provide sod uniform pad sizes with maximum 5 percent deviation in either length or width. Broken pads with uneven ends will not be acceptable. Sod pads incapable of supporting their own weight when suspended vertically with a firm grasp on upper 10 percent of pad will be rejected.

C. Provide sod composed of the following:

1. Bahia sod
2. St. Augustine

D. Sod shall be nursery grown on cultivated mineral agricultural soils. Sod shall have been mowed regularly and carefully maintained from planting to harvest.

E. American Sod Producers Association (ASPA) Grade: Nursery Grown or Approved. Field grown sod is not acceptable.

F. Furnished in pads:

1. Size:

a. Length: 24 inches plus or minus 5%.
b. Width: 18 inches plus or minus 5%
c. Thickness: 1-1/2 inches excluding top growth and thatch.

2. Not stretched, broken or torn.

G. Uniformly mowed height when harvested: 2 inches.

H. Thatch: Maximum 1/2 inch uncompressed.

I. Inspected and found free of disease, nematodes, pests, and pest larvae, by entomologist of State Department of Agriculture.

J. Weeds:

1. Free of Bermuda grass, nut grass or other objectionable weeds.

K. Uniform in color, leaf texture, and density.

2.04 WATER

A. Water shall be potable, from municipal water supplies or other sources which are approved by a public health department.

2.05 FERTILIZER

A. FS O-F-241c (1), Grade A or B.

B. The chemical designation shall be 1-8-8, with at least 50 percent of the nitrogen from a non-water-soluble organic source.

2.06 HERBICIDES

A. As recommended by the State Department of Agriculture.

2.07 STAKES

A. Softwood, 3/4-inch diameter, 8-inch length.

PART 3 - EXECUTION

3.01 PREPARATION OF GROUND SURFACE

A. Before mixing, clean planting soil of roots, plants, sods, stones, clay lumps, and other extraneous material harmful or toxic to plant growth.

B. Mix specified fertilizers with planting soil as necessary at rates specified. Delay mixing fertilizer if planting will not allow placing of planting soil within a few days.

C. For sod, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.

3.02 PREPARATION OF PLANTING BEDS

A. Loosen subgrade of lawn areas to a minimum depth of 4 inches. Remove stones measuring over 1 1/2 inches in any dimension. Remove sticks, stones, rubbish, and other extraneous matter. Limit preparation to areas, which will be planted promptly after preparation.

B. Spread planting soil to minimum depth of 2" or as required meeting lines, grades, and elevations shown, after light rolling and natural settlement. Add specified fertilizer and mix thoroughly into upper 4 inches of topsoil.

C. Place approximately 1/2 of total amount of topsoil required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil. Add specified soil amendments and mix thoroughly into upper 4 inches.

D. Where sod is to be planted in areas that have not been altered or disturbed by excavating, grading, or stripping operations, prepare soil for lawn planting as follows: Till to a depth of not less than 6 inches. Apply fertilizers as specified. Remove high areas and fill in depressions. Till soil to a homogenous mixture of fine texture, free of lumps, clods, stones, roots and other extraneous matter.

E. Prior to preparation of unchanged areas, remove existing grass, vegetation and turf. Dispose of such material outside of CITY'S property. Do not turn existing vegetation over into soil being prepared for lawns.

F. Allow for sod thickness in areas to be sodded.

G. Apply specified commercial fertilizer at rates specified and thoroughly mix into upper 2 inches of topsoil. Delay application of fertilizer if lawn planting will not follow within a few days.

H. Fine grade sod areas to smooth, even surface with loose, uniformly fine texture. Roll, rake, and drag lawn areas, remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas, which can be planted immediately after grading.

I. Moisten prepared sod areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting lawns. Do not create a muddy soil condition.

J. Restore sod areas to specified condition, if eroded or otherwise disturbed, after fine grading and prior to planting.

3.03 SODDING NEW LAWNS

A. Lay sod within 24 hours from time of stripping.

B. Lay sod to form solid mass with tightly fitted joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass.

C. Anchor sod on slopes with wood pegs to prevent slippage.

D. Water sod thoroughly with a fine spray immediately after planting.

3.04 MAINTENANCE

A. Begin maintenance immediately after planting.

B. Maintain lawns for not less than 30 days after substantial completion, and longer as required to establish an acceptable lawn.

C. Maintain sod by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

D. Mowing:

1. Whenever grass reaches a height of 3 inches, it shall be cut back to 2" with all clippings removed.

2. After two mowings, CONTRACTOR shall topdress the sod with an application of fertilizer at the rate of 1 pound of actual nitrogen per 1,000 square feet.

3.05 CLEANUP AND PROTECTION

A. During sodding work, keep pavements clean and work area in an orderly condition.

B. Protect sodding work and materials from damage due to landscape operations, operations by other CONTRACTORs and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged sod work as directed.

3.06 INSPECTION AND ACCEPTANCE

A. Sod areas will be accepted when in compliance with all the following conditions:

1. The roots are thoroughly attached to the soil.

2. Absence of visible joints.
3. All areas show a uniform stand of specified grass in healthy condition.
4. At least 60 days have elapsed since the completion of the work in this section.

B. When inspected sod work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by ENGINEER and found to be acceptable. Remove rejected plants and materials promptly from project site.

C. Procedure:

1. The CONTRACTOR shall submit a request for acceptance in writing to the ENGINEER. Request must be received not less than 10 days before the anticipated date for final inspection.

2. Upon completion of all repairs and/or renewals required by ENGINEER at the inspection, the ENGINEER will verify the completeness of the work and then notify the CITY in writing that the work is accepted.

3. Upon completeness, the CITY will assume maintenance of all sod areas.

3.07 MEASUREMENT AND PAYMENT

A. Measurement and payment will be based on actual quantities installed as more specifically discussed and described in SECTION 01025 of MEASUREMENT AND PAYMENT.

END OF SECTION 02910

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the concrete work, as indicated on the drawings, as specified herein or both, except as for items specifically indicated as "NIC ITEMS".

B. Including but not necessarily limited to the following:

1. Form work, shoring, bracing and anchorage.

2. Concrete reinforcement and accessories.

3. Cast-in-place concrete.

4. Plugging abandoned pipelines and/or structures in place.

1.03 RELATED WORK

A. Section 02510 - Concrete sidewalk

B. Section 02513 - Asphaltic Concrete Paving - General

C. Section 02515 - Portland Cement Concrete Paving.

D. Section 03300 - Cast-in-Place Concrete.

E. All applicable sections of Division 1, 2, 3 and 4.

1.04 QUALITY ASSURANCE

A. All work shall be in accordance with ACI 301, latest edition, a copy of which shall be maintained on site.

B. Requirements of Regulatory Agencies: perform work in accordance with local building and other applicable codes.

C. Installation: Performed only by skilled workmen with satisfactory record of performance on completed projects of comparable size and quality.

D. Inspection and Testing:

1. Test Cylinders - As per ASTM C-39.

a. Minimum of three (3) concrete test cylinder shall be taken for every 75 or less cubic yards of concrete placed each day.

b. Minimum of one (1) slump test shall be taken during any cold weather concreting, and be cured on job site under same conditions as the concrete it represents.

2. Slump Test - As per ASTM C-143.

a. Minimum of one (1) slump test shall be taken for each set of test cylinders taken.

1.05 SUBMITTALS

A. Test Reports: Reports of concrete compression, yield, air content and slump tests.

B. Certificates:

1. Manufacturer's certification that materials meet specification requirements.

2. Material content per cubic yards of each class of concrete furnished.

a. Dry weights of cement.
b. Saturated surface-dried weights of fine and course aggregate.
c. Quantities, type and name of all mixtures.
d. Weight of water.

3. Ready-mix delivery tickets as per ASTM C-94.

C. Shop Drawings:

1. Show sizes and dimensions for fabrication and placing of reinforcing steel and bar supports.

2. Indicate reinforcement sizes, spaces, locations and quantities or reinforcing steel, and wire fabric, bending and cutting schedules, splicing and supporting and spacing devices.

3. Indicate formwork dimensioning, materials, arrangement of joints and ties.

4. Shop drawings shall be prepared under seal of a Professional Structural Engineer, registered in the State of Florida.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size and length.

B. Handle and store materials to prevent contamination.

1.07 JOB CONDITIONS

A. Allowable concrete temperatures:

1. Hot weather: Maximum 90 degrees F as per ASTM C-94.

B. Do not place concrete during rain, unless protection is provided.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Materials shall conform to ACI 301, latest edition.

B. Plywood forms: Douglas Fir Species, solid one side, form grade, sound undamaged sheets.

C. Lumber: Southern Pine Species, No. 2 Grade, with grade stamp clearly visible.

D. Form Ties: Removable, snap-off metal, of fixed and adjustable length, cone ends.

E. Tubular Column Type: Round, spirally wound laminated fiber material, clearly visible.

2.02 REINFORCING STEEL

A. Reinforcing steel shall conform to ASTM A615, 60 ksi yield grade billet steel reformed bars; uncoated finish.

B. Welded steel wire fabric shall conform to ANSI/ASTM A185, plain type; coiled rolls, uncoated finish.

2.03 CONCRETE MATERIALS

A. Cement: shall conform to ASTM C150, normal Type II Portland, gray color.

B. Fine and coarse aggregate shall conform to ASTM C33.

C. Water: clean and not detrimental to concrete.

2.04 ADMIXTURES

A. Air Entraining: ASTM C-260

B. Chemical: Type (as required) ASTM C-494.

C. Fly Ash and Pozzolans: ASTM C-618

D. Color - Conditioned Concrete: ASTM C-494 and ASTM C-979

2.05 ACCESSORIES

A. Non-shrink grout: pre-mixed compound with non-metallic aggregate, cement, water reducing and plasticing agents; capable of minimum compressive strength of 3500 psi.

B. Construction joints: locate and install construction joints, which are not shown on drawings, so as not to impair strength and appearance of the structure, as acceptable to the ENGINEER. Place construction joints perpendicular to the main reinforcement, continue reinforcement across construction joints.

C. Expansion joints: shall be a minimum of 3/4-inch thick asphalt impregnated fiberboard as per ASTM D-1751.

D. Form release agent shall be a colorless material, which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete.

E. Water shall be clear and potable.

2.06 CURING MATERIALS

A. Water shall be clean and potable.

B. Absorptive mat shall be burlap fabric of 9 oz./sq. yd. clean, roll goods complying with AASHTO M182, Class 3.

C. Membrane curing compound shall conform to ASTM C309.

D. Clear Sealer: "Clear Bond" as manufactured by Guardian Chemical Co., Dayton Day-Chem Cure-W (J-9-A) or approved equal.

E. Color curing compound shall be liquid membrane-forming conforming to ASTM C 309 two-component Lithochrome Colorwax by L.M. Scofield Company, or approved equal, color to match admixture for color-conditioned concrete.

2.07 CONCRETE MIX

A. Mix concrete in accordance with ASTM C94.

B. Concrete:

1. Compressive strength (28 days): 3000 psi.

2. Slump: 4(±) 1 inch.

C. Concrete / Flowable fill for grouting and plugging:

1. Compressive strength (28 days) 2000 psi.

2. Slump: as required to grout and plug.

PART 3 - EXECUTION

3.01 FORMWORK ERECTION

A. Verify lines, levels, and measurement before proceeding with formwork.

B. Hand trimed sides and bottom of earth forms; remove loose dirt.

C. Align form joints.

D. Do not apply form release agent where concrete surfaces receive special finishes or applied coatings, which may be affected by agent.

E. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors and other inserts.

3.02 REINFORCING

A. Place, support and secure reinforcement against displacement.

3.03 PLACING CONCRETE

A. Color Conditioned concrete, when batching, shall not be less than one-third of the capacity of the mixing drum (a minimum of four yards for a ten yard mixer) and will be in full cubic yard increments.

B. Notify ENGINEER minimum 24-hours prior to commencement of concreting operations.

C. Scratch, float, trowel, broom or belt finish surfaces, as scheduled or indicated on the Drawings.

D. Place 2000 psi concrete for pugging and grouting pipelines and structures in-place as required after proper connection to new service and function of system is complete.

3.04 TOLERANCES

A. Provide Class B tolerance to floor slabs according to ACI 301. Pitch to drains 1/4 inch per foot.

3.05 FINISHES FOR EXPOSED SURFACES

A. Provide exposed surfaces with finishes as called for on the Drawings.

3.06 CONCRETE CURING

A. Curing for standard grey work after finishing, cure concrete by keeping moist for one (1) week after placement. Floors and vertical surfaces may be sprayed with an approved curing compound to retard evaporation of water, if spraying is not objectionable because of future finishing requirements. Begin curing operations as soon as concrete has attained its initial set. Keep exposed concrete surface moist for at least one (1) week.

B. Apply a liquid membrane-forming compound, conforming with ASTM C 309, color to match that of the color condition concrete. Apply on flat work immediately after the finishing operation pursuant to the manufacturers recommendations.

3.07 MEASUREMENT AND PAYMENT

A. No separate measurement and payment is provided for work covered by this Section. All costs in connection with concrete work shall be included in the bid price of any item in the bid schedule for which concrete products, materials, or appurtenances are required.

END OF SECTION 03010

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Formwork for Cast-In-Place Concrete, with shoring, bracing, and anchorage.

B. Openings for other affected work.

C. Form accessories.

D. Stripping forms.

1.03 RELATED WORK

A. Section 03010 - Concrete.

B. Section 03200 - Concrete Reinforcement.

C. Section 03300 - Cast-In-Place Concrete.

1.04 SYSTEM DESCRIPTION

A. Design, engineer and construct formwork, shoring and bracing to meet design code requirements, so that resultant concrete conforms to required shapes, lines, and dimensions.

1.05 QUALITY ASSURANCE

A. Construct and erect concrete formwork in accordance with ACI 301 and 347.

1.06 SUBMITTALS

A. Indicate pertinent dimensions, materials, and arrangement of joints and ties.

B. Prepare shop drawings under seal of Professional Structural Engineer registered in the State of Florida.

C. Manufacturers certification that materials meet specification requirements.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle materials in accordance with manufacturers recommendations.

B. Deliver form materials in manufacturer's packaging with installation instructions.

C. Store off ground in ventilated and protected area to prevent deterioration from moisture or damage.

D. Remove packaging from void forms.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Plywood: Douglas Fir Species; medium density overlaid one side grade; sound, undamaged sheets with straight edges.

B. Lumber: Southern Pine Species; No. 2 grade; with grade stamp clearly visible.

C. Tubular Column: Round, of spirally wound laminated fiber type; surface treated with release agent; of size required.

2.02 FORMWORK ACCESSORIES

A. Form Ties: Snap-off metal of adjustable length; cone type; 1 1/2 inch break back dimension; free of defects that will leave holes no larger than 1-1/4 inches diameter in concrete surface.

B. Form Release Agent: Colorless material which will not stain concrete, absorb moisture, or impair natural bonding in color characteristics of coating intended for use on concrete.

C. Fillets for Chamfered Corners: Wood strips or rigid PVC plastic in maximum possible lengths.

D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required; or strength and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify lines, levels, and measurements before proceeding with formwork.

3.02 PREPARATION

A. Hand-trim sides and bottoms of earth forms; remove loose dirt prior to placing concrete.

B. Minimize form joints. Symmetrically align joints and make weathertight to prevent leakage of mortar.

C. Arrange and assemble formwork to permit dismantling, stripping, so that concrete is not damaged during its removal.

D. Arrange forms to allow stripping without removal of principal shores, where required to remain in place.

3.03 ERECTION

A. Provide bracing to ensure stability of formwork. Strengthen formwork liable to be overstressed by construction loads.

B. Camber slabs and beams to achieve ACI 301 tolerances.

C. Provide temporary ports in formwork to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close ports with tight fitting panels, flush with inside face of forms, neatly lifted so that joints will be apparent in exposed concrete surfaces.

D. Provide expansion strips on external corners of beams and columns, where exposed.

E. Install void forms. Protect from moisture before concrete placement. Protect from crushing during concrete placement.

F. Construct formwork to maintain tolerances in accordance with ACI 301.

3.04 APPLICATION OF FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel, anchoring devices, and embedded items.

B. Do not apply form release agent where concrete surfaces are scheduled to receive special finishes or applied coverings, which may be affected by agent. Soak contact surfaces of untreated forms with clean water. Keep surfaces wet prior to placing concrete.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for work embedded in or passing through concrete.

B. Coordinate work of other sections in forming and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

C. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.

3.06 FORM REMOVAL

A. Notify ENGINEER prior to removing formwork.

B. Do not remove forms and shoring until concrete has sufficient strength to support its own weight, and construction and design loads which may be imposed upon it. Remove load-supporting forms when concrete has attained 75 percent of required 28-day compressive strength, provided construction is reshored.

C. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F for 24-

hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

D. Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28-days. Determine potential compressive strength of inplace concrete by testing field-cured specimens representative of concrete location of members.

E. Reshore structural members due to design requirements or construction conditions to permit successive construction.

F. Remove formwork progressively so no unbalanced loads are imposed on structure.

G. Do not damage concrete surfaces during form removal.

H. Store reusable forms for exposed architectural concrete to prevent damage to contact surfaces.

I. Remove formwork in same sequence as concrete placement to achieve similar concrete surface coloration.

3.07 CLEANING

A. Clean forms to remove foreign matter as erection proceeds.

B. Ensure that water and debris drain to exterior through clean-out ports.

3.08 MEASUREMENT AND PAYMENT

A. No separate measurement and payment is provided for work covered by this Section. All costs in connection with concrete formwork shall be included in the bid price of any item in the bid schedule for which concrete formwork is required.

END OF SECTION 03100

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Reinforcing steel bars, welded steel wire fabric, fabricated steel bar or rod mats for cast-in-place concrete.

B. Support chairs, bolsters, bar supports, spaces, for supporting reinforcement.

1.03 RELATED WORK

A. Section 03010 - Concrete.

B. Section 03100 - Concrete Formwork.

C. Section 03300 - Cast-In-Place Concrete.

1.04 QUALITY ASSURANCE

A. Perform concrete reinforcement work in accordance with CRSI Manual and Standard Practice, and Documents 63 and 65.

B. Conform to ACI 301.

1.05 SUBMITTALS

A. Indicate sizes, spacings, locations and quantities of reinforcing steel, bending and cutting schedules, splicing, stirrup spacing, supporting and spacing devices.

B. Prepare shop drawings under seal of Professional Structural ENGINEER registered in the State of Florida.

C. Submit mill test certificates and supplied concrete reinforcing, indicating physical and chemical analysis.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Reinforcing Steel: ASTM A615, 60-ksi-yield grade billet-steel, deformed bars, uncoated finish.

B. Welded Steel Wire Fabric: ANSI/ASTM A185 plain type; in coiled rolls; uncoated finish.

C. Stirrup Steel: ANSI/ASTM A82.

2.02 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gauge annealed type.
B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete, including load bearing pad on bottom to prevent vapor barrier puncture.

C. Chairs, Bolsters, Bar Supports, Spacers Adjacent to Architectural Concrete Surfaces: Plastic coated or stainless steel type; sized and shaped as required.

2.03 FABRICATION

A. Fabricate in accordance with ACI 315, providing concrete cover specified in Section 03300.

B. Locate reinforcing splices not indicated on Drawings at points of minimum stress. Indicate location of splices on shop drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Before placing concrete, clean reinforcement of foreign particles or coatings.

B. Place, support, and secure reinforcement against displacement. Do not deviate from alignment or measurement.

C. Do not dispose or damage vapor barrier required by Section 03300.

3.08 MEASUREMENT AND PAYMENT

A. No separate measurement and payment is provided for work covered by this Section. All costs in connection with concrete reinforcement work shall be included in the bid price of any item in the bid schedule for which concrete reinforcement is required.

END OF SECTION 03200

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Provide all labor, materials, necessary equipment and services to complete the Cast-In-Place Concrete Work, as indicated on the drawings, as specified herein or both except as for items specifically indicated as "NIC ITEMS".

B. Including but not necessarily limited to the following:

1. Cast-In-Place concrete walls, footings, foundation walls, paving, walks, slabs, formwork, reinforcing and all other components as indicated on the Drawings.

1.03 RELATED WORK

A. Section 03010 - Concrete.

B. Section 03100 - Concrete Form work.

C. Section 03200 - Concrete Reinforcement.

D. Section 03370 - Concrete Curing.

E. Section 02510 - Concrete Sidewalk

1.04 QUALITY ASSURANCE

A. Applicator Qualifications: Minimum of five years experience on 5 comparable concrete projects.

B. Requirements of Regulatory Agencies: Perform work in accordance with local building codes.

C. Allowable Tolerances: Flat work true to plane 1/8 inch in 10 feet.

D. Slump tests as per ASTM C-143, and test cylinders as per ASTM C-39.

1.05 TESTS

A. Submit proposed mix design of each class of concrete to appointed firm for review prior to commencement of work.

B. Testing firm will take cylinders and perform slump and air entrainment tests in accordance with ACI 301.

C. Tests of cement and aggregates will be performed to ensure conformance with requirements stated herein.

D. Three (3) concrete test cylinders will be taken for every 75 cu. yds. or less of each class of concrete placed each day.

E. One (1) slump test will be taken for each set of test cylinders taken.

F. All testing shall be at the expense of the CONTRACTOR.

1.06 SUBMITTALS

A. Provide product data for specified products.

B. Test Reports: Reports of concrete compression, yield, air content, and slump tests.

C. Certificates:

1. Manufacturer's certification that materials meet specification requirements.

2. Material content per cubic yard of each class of concrete furnished.

   a. Dry weights of cement.
   b. Saturated surface-dried weights of fine and coarse aggregate.
   c. Quantities, type and name of admixtures.
   d. Weight of water.

3. Ready-mix delivery tickets, ASTM C-94.

D. Shop Drawings:

1. Show sizes and dimensions for fabrication and placing of reinforcing steel and bar supports.

2. Indicate bar schedules, stirrup spacing, and diagrams of bend bars.

3. Detail items of form systems affecting appearance of architectural concrete surfaces such as joints, tie holes, liners, patterns and textures. Show items in relation to entire form system.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size and length.

B. Handle and store materials to prevent contamination.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Allowable concrete temperatures:
- Hot Weather: Maximum 90□ as per after C-94.

B. Do not place concrete during rain, unless protection is provided.

PART 2 - PRODUCTS

2.01 MATERIALS & MANUFACTURERS

A. Concrete Ready-Mix concrete ASTM C-94.

1. Cement:

a. ASTM C 150, Type II

2. Admixtures:

a. Air entraining: ASTM C-260
b. Chemical: Type (as required) ASTM C-494.
c. Fly ash and pozzolans: ASTM C-618
d. Vapor Barrier: 6-mil thick film of type recommended for below grade application.

3. Coarse aggregate: Not less than 50% clean, hard, crushed stone conforming to requirements of Table 2, size number 467 ASTM C-33.

4. Slump 4 in. maximum; plus tolerance 0, minus tolerance 1 in.

5. Air content: 5% + 1%.

6. Mix proportioning:

a. In accordance with ASTM C-94.
b. 28 day compressive strength of moist cured laboratory samples 3,000 PSI.
c. Use set retarding admixtures during hot weather only when approved by ENGINEER.
d. Minimum cement contents 5 sacks/cubic yards.
e. Add air-entraining agent to concrete work exposed to exterior.

7. Curing Material: Liquid membrane, ASTM C-309, Type 1.

8. Mixes:

a. ASTM C-94.
b. Mix concrete only in quantities for immediate use.
c. Do not retemper or use set concrete.

B. Bars.

1. Deformed billet steel: ASTM A 615, Grade 60.

C. Wire Fabric:

1. Welded Wire Fabric Steel: ASTM A 185

D. Tie Wire: FS QQ-W-461-G, annealed steel, black 16 ga. minimum.

E. Bar supports: Conform to "Bar Support Specification," CRSI Manual of Standard Practice.

F. Forms:

1. Conform with ACI 347, Chapter 3, Material and Form Work.

2. Lumber:

a. Softwood framing lumber: Kiln dried, PS-20.
b. Boards less than 1 1/2 in. thick and 2 in. wide, used for basic forms and form liners: Kiln dried.
c. Grade marked by grading rules agency approved by American Lumber Standards Committee.
d. Light framing or studs for board or plywood forms, 2 in. to 4 in. width and thickness Construction Standard grade.
e. Boards for basic forms Construction Standard grade.
f. Board surface: Smooth.

3. Plywood:

a. Exterior type softwood plywood, PS 1-66.
b. Each panel stamped or branded indicating veneer grades, species, type and identification.
c. Wood faced plywood for architectural concrete surfaces.
(1). Panel veneer grades: B - C.
(2). Mill-oiled sides and mill-sealed edges of panels.

4. Ties:

a. Materials: Stainless Steel.
b. Type: Snap Ties.
c. Depth of breakback: 1 in.
d. Maximum diameter 1/4 in.

5. Form coatings:

a. Non-staining type.
b. Agent: Pine oil derivative.

G. Water: Clean and potable.

PART 3 - EXECUTION

3.01 FORMWORK

A. Conform to ACI 347, Chapter 2, Construction; and Article 4.2, architectural Concrete.

B. Framing, Bracing and Plywood Form Liners: APA Form V 345-72.

C. Provide temporary openings in framework for concrete placement.

D. Fill voids of plywood joints with sealant and tool smooth.

E. CONTRACTOR is responsible for the design, construction, removal and complete safety of formwork and shoring.

F. Form construction shall be provided to shape, lines dimensions of members shown; substantial, tight enough to prevent leakage, and properly braced or tied to maintain position and size, form sides and bottoms of members unless specifically excepted.

3.02 REINFORCING

A. Fabrication shall be provided to latest ACI Manual of Practice ACI-315.

B. Reinforcing free from excessive rust, scale or coating reducing bond. Bars bent cold in fabrication plant. Chairs, support bars, and other accessories furnished to carry and provide coverage as required by ACI Manual.

C. Unless otherwise indicated the minimum coverage is 3 in. for footings (slabs to have 3/4 in. minimum). Call any "crowding" of reinforcement to ENGINEERs attention during placing.

D. Splices shall be Mesh 6 in. lap, bars 30 diameter minimum.

E. Conduit or pipes embedded in concrete must have specific approval and be located to avoid cracking or reduction in strength. Provide extra strong pipe sleeves where pipes are allowed to pierce concrete beams or walls.

F. Placement:

1. Bar supports: CRSI 65.

2. Reinforcing bars: CRSI 63.

G. Steel Adjustment:

1. Move within allowable tolerances to avoid interference with other reinforcing steel, conduits, expansion joints, or embedded items.

2. Do not move bars beyond allowable tolerances without concurrence of ENGINEER.

3. Do not heat, bend or cut bars without concurrence of ENGINEER.

H. Splices:

1. Lap splices: Tie securely with wire to prevent displacement of splices during placement of concrete.

2. Splice devices: Install in accordance with manufacturer's written instructions.

3. Welding: Perform in accordance with AWS Standards.

4. Do not splice bars except at locations shown on drawings without concurrence of ENGINEER.

I. Wire Fabric:

1. Install in longest practicable length.

2. Lap adjoining pieces one full mesh minimum, and lay splices with 16-gage wire.

3. Offset end laps in adjacent widths to prevent continuous laps.

J. Cleaning: Remove dirt, grease, oil, loose mill scale, excessive rust, and foreign matter that will reduce bond with concrete.

K. Protection During Concreting: Keep reinforcing steel in proper position during concrete placement.

3.03 JOINTS

A. Construction pours shall be continuous pours except where joints are indicated. No additional joints except by special acceptance in writing by the ENGINEER. Allow no construction or interrupted pour joints in any exposed surface, unless treated as part of design.

1. Where indicated and as detailed, provide saw cut type construction joints of sizes as called for on the drawings.

B. Expansion joints shall be constructed as shown on drawings.

1. Expansion material shall be 1/2" continuous full depth strips set 1/2" below finish surface with 1/2" x 1/2" joint sealant filler above.

3.04 BUILT-IN ANCHORING DEVICES, FIXTURES, PIPE SLEEVES AND OTHER INSERTS

A. Build-in and coordinate as required and called for on the drawings all items to be constructed into concrete such as anchoring devices, fixtures, piping, sleeves and other inserts and items as required for a complete installation.

3.05 INSPECTION

A. Assure that excavation and formwork are completed, with smooth rubbed finish, and that excess water is removed.

B. Check that reinforcement is secured in place.

C. Verify that expansion joint material, anchors, and other embedded items are secured in position.

D. Verify anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, held securely, and will not cause hardship in placing concrete.

3.06 CONCRETE QUALITY

A. Design of mix shall be a laboratory designed mix to satisfy the following requirements and shall be approved by the ENGINEER.

1. Ready mixed concrete as per ASTM C-94 with 28 day strength 3,000 PSI minimum, for all standard grey concrete work.

2. Proportion the concrete to work readily into forms and around reinforcement, without excessive manipulation, segregation or water gain. Approved additives may be used to achieve the above results.

3. Slump shall be maximum 3 in. for footings, and for all other concrete shall be 3 in. to 5 in.

4. Submit for approval representative test results by independent laboratory to substantiate proposed mix design.

3.07 PREPARATION FOR POURS

A. Notify the CITY'S Representative, ENGINEER and other inspectors at least 36 hours prior to inspection.

B. Equipment forms, and reinforcing shall be clean and wet down, reinforcing firmly secured in place, runways set up and not resting on or displaying reinforcing.

C. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent. Apply bonding agent in accordance with manufacturer's instruction.

D. At locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels, and pack solid with non-shrink grout.

3.08 PLACING

A. Mixing and conveying shall be as per ASTM C-94 and as follows:

1. Maximum elapsed time from addition of water to placing in forms -60 minutes, (total mixing time).

2. Concrete handled and placed by methods, which keep concrete plastic, prevent separation of materials, and do not displace reinforcement.

B. Deposit as close as possible to final position to avoid segregation of materials. Restrict drop to 3 foot maximum (less for exposed concrete), using tremie if necessary.

1. Compact by mechanical vibration to thoroughly work around reinforcing and eliminate honeycomb.

C. Place concrete in accordance with ACI 301.

D. Hot Weather Placement: ACI 301.

E. Cold Weather Placement: ACI 301.

F. Ensure reinforcement, inserts, embedded parts and formed joints are not disturbed during concrete placement.

G. Maintain concrete cover around reinforcing as follows:

Item	Coverage
Beams	1 1/2 inch
Supported Slabs	3/4 inch
Column Ties	1 1/2 inch
Walls (exposed to weather or backfill)	2 inch
Footings and Concrete Formed Against Earth	3 inch
Slabs on Fill	2 inch

H. Place concrete continuously between predetermined construction and control joints. Do not break or interrupt successive pours such that cold joints occur.

I. Saw cut control joints at an optimum time after finishing. Use 3/16 inch thick blade, cutting 1/3 depth of slab thickness.

J. Separate exterior slabs on fill from vertical surfaces with joint filler. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface.

K. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify ENGINEER upon discovery.

3.09 CONCRETE CURING

A. Curing for standard grey work after finishing, cure concrete by keeping moist for one (1) week after placement. Floors and vertical surfaces may be sprayed with an approved curing compound to retard evaporation of water, if spraying is not objectionable because of future finishing

requirements. Begin curing operations as soon as concrete has attained its initial set. Keep exposed concrete surface moist for at least one (1) week.

B. Apply a liquid membrane-forming compound, conforming to ASTM C 309, color to match that of the color condition concrete. Apply on flat work immediately after the finishing operation pursuant to the manufacturers recommendations.

3.10 CONCRETE FINISHING

A. Unexposed concrete work shall be patched and repaired immediately after removal of forms.

1. Cut off metal ties a minimum of 1 in. back from surface of concrete.

2. Moderate honeycomb cut out and prepared for patching. Severe honeycomb with exposed steel reinforcing is to be removed or "united" at the discretion of the ENGINEER.

3. Wet areas for patching and pack carefully with rich mortar rubbed to match surface.

B. Provide concrete surfaces to be left exposed, walls, columns, beams, with smooth rubbed finish.

C. Provide Class B tolerances to floor slabs and toppings according to ACI 301.

D. Pitch to drains 1/4 inch per foot.

E. Exposed concrete work shall be patched and repaired as accepted by ENGINEER after consultation. Patching and rubbing will be kept to a minimum if possible, but when necessary will be done with great care to obtain maximum degree of matching in color and texture to adjacent finished concrete surfaces.

F. Monolithic finish using care to obtain a level surface; floors out of level or with variation greater than 1/8 in. in 10 feet shall be corrected.

G. All finishes shall be as called for on the drawings.

3.11 SEPARATE FLOOR TOPPINGS

A. Prior to placing, roughen concrete base course and remove foreign materials. Broom and vacuum clean.

B. Place dividers, edge strips, reinforcing and other items to be cast in.

C. Apply bonding agent on base course in accordance with manufacturer's instructions. Apply sand and cement slurry coat on base course immediately prior to placing toppings.

D. Place concrete floor toppings to required lines and levels.

3.12 PATCHING

A. Notify ENGINEER immediately upon removal of forms.

B. Patch imperfections.

3.13 DEFECTIVE CONCRETE

A. Modify or replace concrete not conforming to required levels and lines, details, and elevations.

B. Repair or replace concrete not properly placed or of the specified type.

3.14 FIELD QUALITY CONCRETE

A. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.15 PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. During curing period, protect concrete from damaging mechanical disturbances, water flow, loading, shocking, and vibration.

3.16 APPLICATION OF BOND COAT FOR CONCRETE LEVELING COAT FOR PAVERS AND TEXTURED SURFACES

A. Provide installation as per manufacturer's standard printed specifications, instructions and recommendations.

3.17 MEASUREMENT AND PAYMENT

A. No separate measurement and payment is provided for work covered by this Section. All cast in place concrete shall be included in the bid price of the relevant item in the bid schedule.

END OF SECTION 03300

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. All applicable provisions of the Bidding and Contract Requirements, and Division 1 - General Requirements shall govern the work under this Section.

1.02 WORK INCLUDED

A. Maintenance of conditions for proper concrete curing.

1.03 RELATED WORK

A. Section 02510 - Concrete Sidewalk

B. Section 03010 - Concrete

C. Section 03300 - Cast-in-Place Concrete

1.04 QUALITY ASSURANCE

A. Conform to requirements of ACI 301.

1.05 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings.

B. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete.

1.06 SUBMITTALS

A. Provide product data for specified products.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperature at 70 degrees F. for three (3) days.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Water: Clean and not detrimental to concrete.

B. Absorptive Mat: Burlap fabric of 9 oz./sq. yd. clean, roll goods.

C. Curing Compound: As per ASTM C309.

PART 3 - EXECUTION

3.01 INSPECTION

A. Verify concrete surfaces are ready for curing.

3.02 CURING COMPOUND

A. Apply curing compound in two (2) coats with second coat at right angles to first.

B. Apply in accordance with manufacturer's instructions.

3.03 SPRAYING

A. Spray water over slab areas; maintain wet for three (3) days.

3.04 ABSORPTIVE MAT

A. Saturate burlap side of burlap fabric mat. Place over slab areas, burlap side down; lap edges and ends 12 inches. Maintain in place for seven (7) days.

3.05 CONCRETE CURING

A. Curing for standard grey work after finishing, cure concrete by keeping moist for one (1) week after placement. Floors and vertical surfaces may be sprayed with an approved curing compound to retard evaporation of water, if spraying is not objectionable because of future finishing requirements. Begin curing operations as soon as concrete has attained its initial set. Keep exposed concrete surface moist for at least one (1) week.

B. Apply a liquid membrane-forming compound, conforming with ASTM C 309, color to match that of the color condition concrete. Apply on flat work immediately after the finishing operation pursuant to the manufacturers recommendations.

C. Cure concrete as scheduled or indicated.

D. Remove absorptive mat after curing.

3.06 MEASUREMENT AND PAYMENT

A. No separate measurement and payment is provided for work covered by this Section. All costs in connection with concrete curing shall be included in the bid price of any item in the bid schedule for which concrete curing is required.

END OF SECTION 03370

Tapping Guide

THOMPSON™
PIPE GROUP
PRESSURE

Thompson Pipe Group-Pressure – Product & Services Guide

Tapping Guide

- General
- Concrete Pressure Pipe
  - Key Features of Thompson Pipe Group Tapping
  - Threaded Service Connections – 1" (25 mm) – 2" (50 mm)
  - Flanged Outlet Connections – 4" (101 mm) and Larger
- Steel Pressure Pipe
- Additional Services

General

Tapping allows expansion and/or service to existing water systems without interruption to the community's water supply. Thompson Pipe Group is equipped to provide economical tapping solutions. All types and sizes of pressure pipe can be tapped using standard tapping equipment and established tapping methods. The Thompson Pipe Group team can also train utility personnel in this procedure.

Note

All operations described in this section should be performed in accordance with U.S. OSHA regulations, state and local codes and recognized safe practices. Thompson Pipe Group personnel are not permitted to enter excavations which do not meet OSHA standards. Confined spaces will not be entered until OSHA permit entry procedures have been completed.

Concrete Pressure Pipe

As a general rule, the maximum size of a tap is 75% of the pipe's internal diameter. In certain circumstances, special exceptions may be made. Size on size taps are not possible. For tapped connections, the pipe design and pipeline pressure must be verified prior to tapping.

Key Features of Thompson Pipe Group Tapping

- Stress is carried by the tapping assembly providing greater strength at the point of tap
- Rubber gasket seal provides a permanent, watertight connection
- Pressure test prior to cutting guarantees a positive seal
- Cement mortar protection of entire tapping assembly assures longevity

Threaded Service Connections: 1" (25 mm) – 2" (50 mm)

- Thompson Pipe Group furnishes:
  - Complete tapping assembly
  - Tapping machine service
  - Experienced technician to mount assembly, mount and operating the tapping machine and supervise application of a protective mortar coating over the entire assembly
- The project owner furnishes:
  - Necessary OSHA safe excavation and barricades
  - Labor to assist in mounting assembly and to apply cement mortar coating
  - Corporation stop
  - Sufficient supply of air to operate tapping machine: 90 cfm@90 psi

Concrete Pressure Pipe (Cont.)

Threaded Service Connections: 1" (25 mm) – 2" (50 mm) (Cont.)

Procedure

1. Remove the cement mortar coating of pipe from an area slightly larger than the base of the tapping assembly gland, exposing the prestressing wire or mild steel rod wrap. Note the gland and pressure activated rubber gasket seated in the groove at its base.

2. Cut and remove wire or rod from opening in mortar coating, exposing the steel cylinder on B-303 and L-301 pipe. On E-301 pipe, remove exterior concrete core to expose steel cylinder.

3. Position tapping assembly saddle over hole in coating, and secure it around the pipe with U-bolts.

4. Insert gland into saddle, connecting it with the four bolts anchored in the saddle.

Concrete Pressure Pipe (Cont.)

Threaded Service Connections: 1" (25 mm) – 2" (50 mm) (Cont.)

Procedure (Cont.)

5. Install corporation stop into gland.

6. Tighten bolts to compress rubber gasket of gland against steel cylinder of pipe for a watertight seal. Check the position of the rubber gasket against the steel cylinder with a feeler gauge.

7. Connect the drilling machine to the corporation stop. A carbide steel-tipped drill is recommended.

8. Open the corporation stop, advance the drill and cut the concrete core. Retract the drill, close the corporation stop and remove the drilling machine.

Concrete Pressure Pipe (Cont.)

Threaded Service Connections: 1" (25 mm) – 2" (50 mm) (Cont.)

■ **Procedure** (Cont.)

9. Fill the space between the pipe and tapping assembly with cement mortar. With the aid of a joint wrapper, apply a protective coating of cement mortar at least 1” (25 mm) thick over all exposed surfaces of tapping assembly, including U-joints.

10. Complete pressure tap with cement mortar protection.

Concrete Pressure Pipe (Cont.)

Flanged Outlet Connections: 4" (101 mm) and larger

- Thompson Pipe Group furnishes:
  - Complete tapping assembly
  - Tapping machine service
  - Experienced technician to mount assembly, operate the tapping machine and supervise application of a protective mortar coating over the entire assembly
- The project owner furnishes:
  - Necessary OSHA safe excavation and barricades
  - Labor to assist in mounting assembly and to apply cement mortar coating
  - Tapping valve and support
  - Adequate hoisting equipment for mounting assembly, valve and tapping machine
  - Sufficient supply of air to operate tapping machine for 4" (101 mm) and larger taps: 125 cfm@125 psi

- **Procedure**

1. Remove cement mortar coating of pipe from an area slightly larger than the base of the tapping assembly gland, exposing the prestressing wire or round bar rod and steel cylinder on L-301 and B-303 pipe. On E-301 pipe, the wire and concrete core are exposed.

2. Position tapping assembly saddle over opening in coating, and securely attach it to the pipe with U-bolts or a clamp style "halfback."

3. Fill the space completely between the pipe and saddle (and between the pipe and "halfback" clamp, if used) by pouring a quick-set Portland cement mortar into the holes provided. Allow mortar to harden before proceeding to the next step.

Concrete Pressure Pipe (Cont.)

Flanged Outlet Connections: 4" (101 mm) and larger (Cont.)

Procedure (Cont.)

4. Cut and remove wire or rod from opening in mortar coating. If tapping E-301 pipe, also remove exterior concrete core to expose the steel cylinder.

5. Connect gland flange to the assembly with stud bolts inserted in the saddle flange. Note the O-ring gasket seated in the groove at the base of the gland.

6. Tighten bolts and compress rubber gasket against the steel cylinder of the pipe for a permanent, watertight seal. Check position of rubber gasket with a feeler gauge.

7. Connect a standard tapping valve to the gland flange with valve studs and/or cap screws. Position a support under the valve.

8. The power-operated tapping machine with carbide, steel-tipped shell cutter is brought into position. The pilot drill in the center penetrates the pipe wall first, stabilizing the shell cutter as it cuts.

Concrete Pressure Pipe (Cont.)

Flanged Outlet Connections: 4" (101 mm) and larger (Cont.)

■ **Procedure** (Cont.)

9. Connect the tapping machine to the valve. Then open the valve and air test the entire assembly to assure absolute watertightness. Advance the shell cutter by hand through the valve opening until contact is made with the steel cylinder of pipe to commence cutting. Finally, withdraw the cutting head by hand past the gate, and then close the valve.

10. Disconnect the tapping machine. Note the steel cylinder coupon and concrete or cement mortar core cut from pipe wall.

11. To complete the tap, with the aid of a joint wrapper, apply a protective coating of cement mortar at least 1" (25 mm) thick over all exposed surfaces of tapping assembly, including U-bolts or clamp. Provide permanent support for tapping valve.

Steel Pressure Pipe

Note

Many of the repair and tapping procedures for steel pressure pipe are the same as for concrete pressure pipe, with a few subtle differences. For more information, please contact Thompson Pipe Group.

Additional Services

Installation

Field service expertise and consultation are available before, during and after the installation process, if needed.

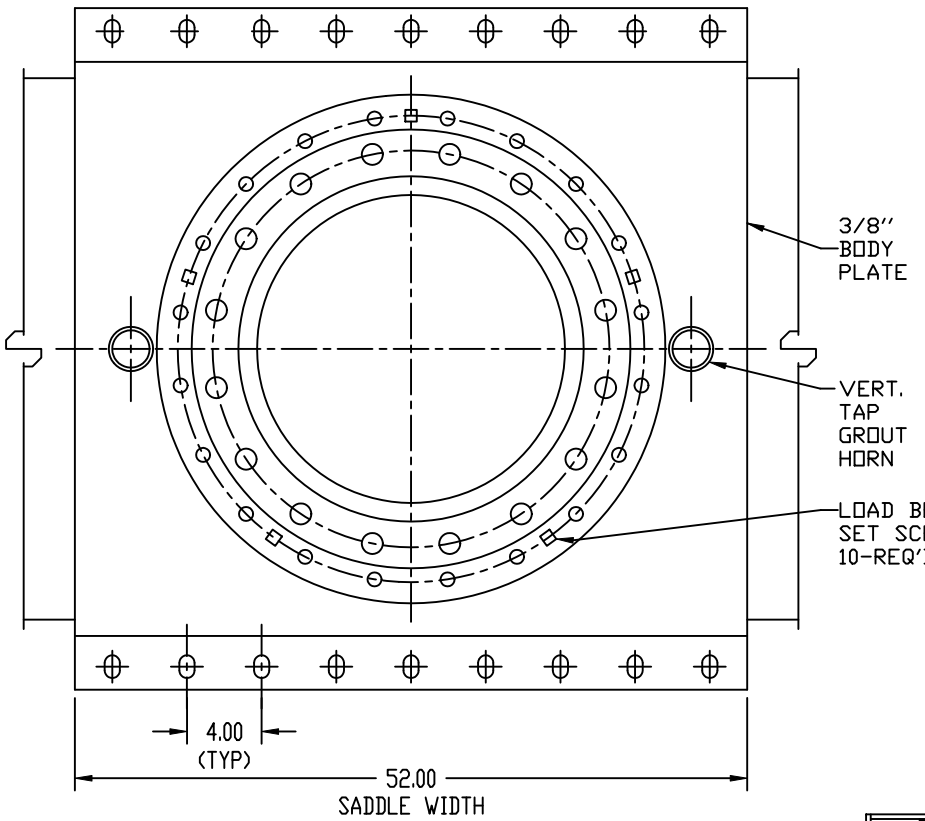
Welding

Thompson Pipe Group welders are available on an hourly basis.

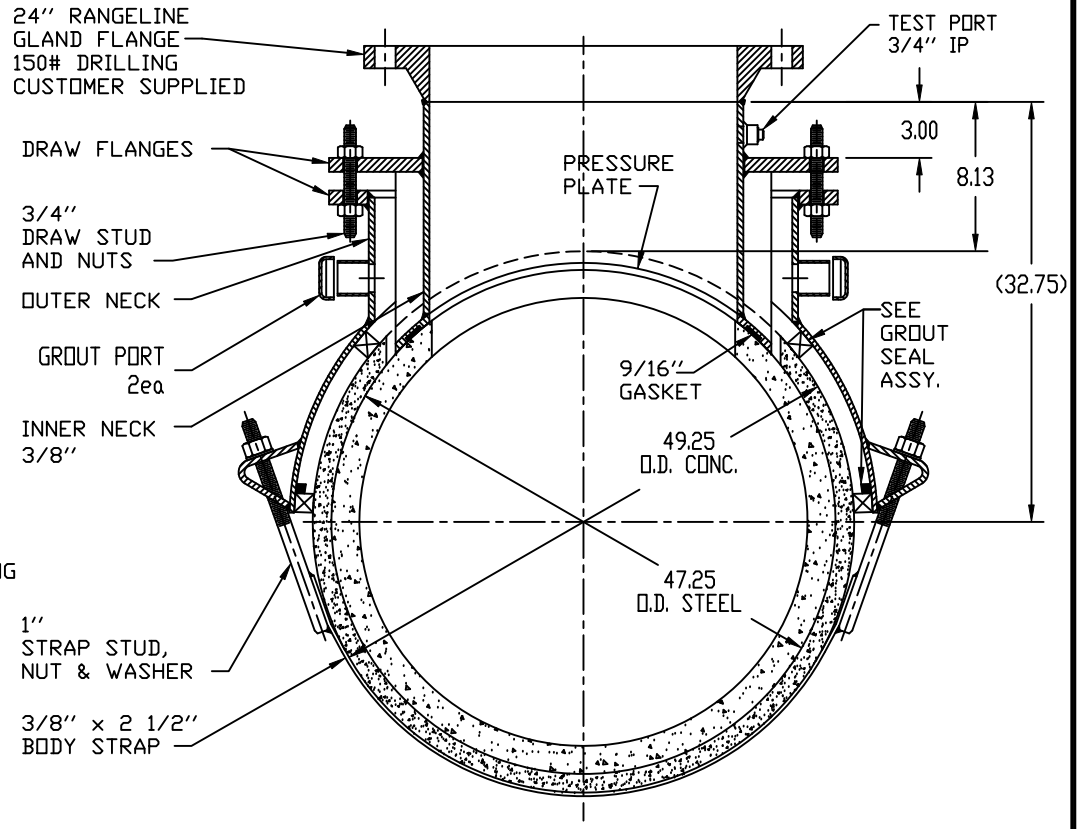
Field Services

Thompson Pipe Group field services are available 24 hours a day for emergency repairs.
In the U.S., call: 972 262 3600 during normal business hours Central Standard Time or 800 445 1534 evenings, weekends and holidays.

TYPICAL PCCP TAPPING SLEEVE ASSEMBLIES



TOP VIEW



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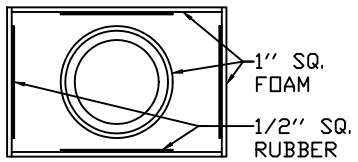


GROUT SEAL ASSEMBLY

NOTES:

1. ALL WELDS PER AWWA STDS.
2. WORKING PRESSURE: 150 psi
3. FINISH: EPOXY COAT
4. 304 SS FASTENERS (STUDS, STRAPS, NUTS & WASHERS)
5. PIPE O.D.'S TO BE VERIFIED.
6. VERIFY ALL DATA
7. FAB. TO LINE STOP ACCURACY

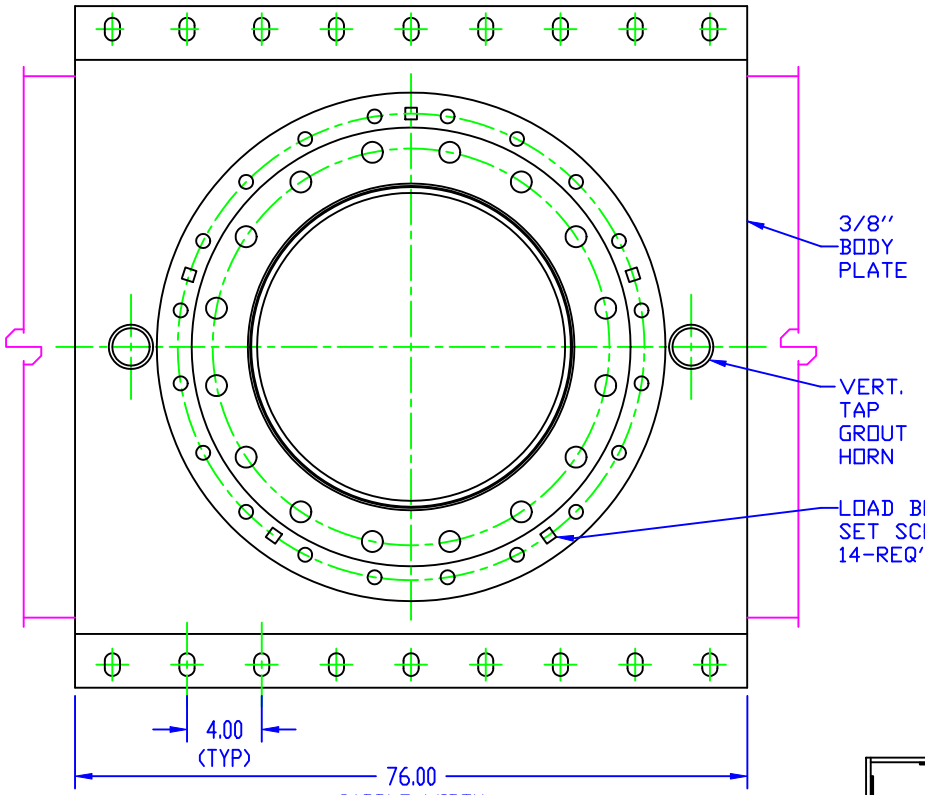
REVISIONS	DATE	S	BY	APVD.

JCM INDUSTRIES, INC. NASH, TX.
P.O. BOX 1220
NASH, TX 75569
www.jcmindustries.com
OFFICE: (903) 832-2581
TOLL FREE: (800) 527-8482
FAX: (800) 874-9524

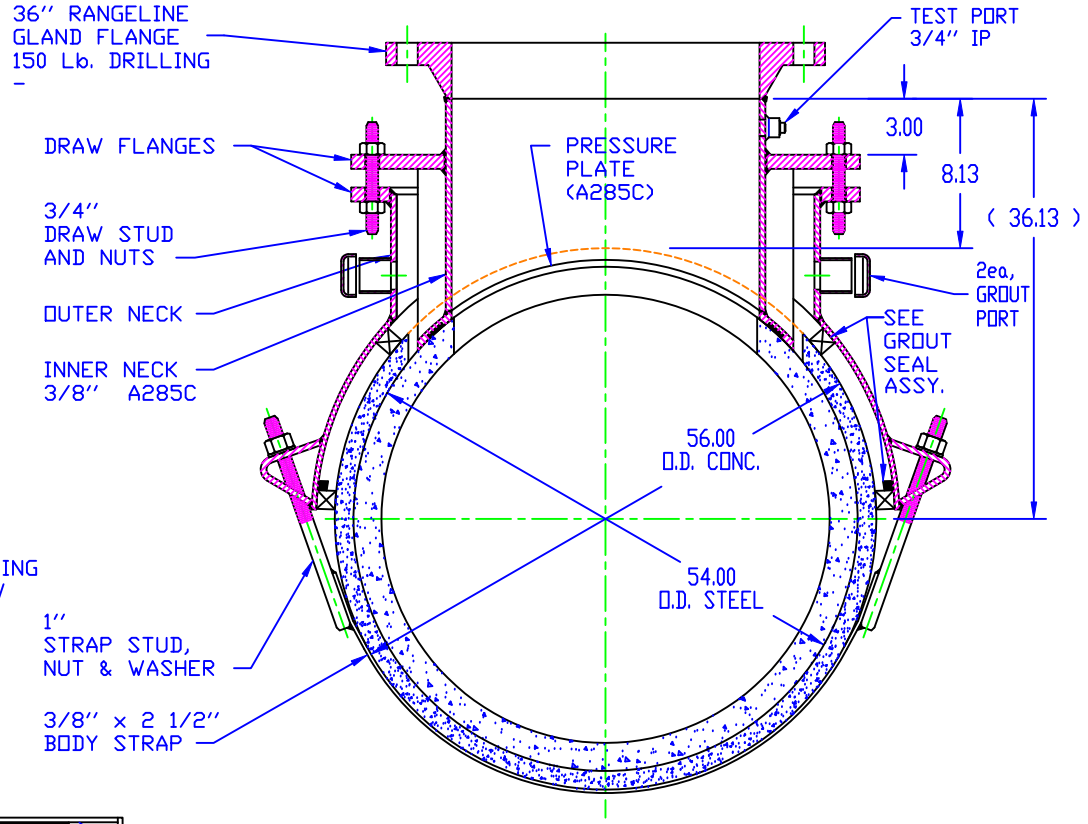
445-42 x 24 T1 (ESS) - (LSA / VT)

TAPPING SLEEVE FOR CONCRETE STEEL CYLINDER PIPE

UNLESS OTHERWISE SPECIFIED TOLERANCES TO BE			DRAWN BY	CHECKED BY	APVD. BY	DWG. NO.	REV.
FRACTIONS	DECIMALS	ANGLES	MWS	-----	-----	GEN-006899	
± 1/8"	.063	2°	DATE 07/26/11	NO. SHEETS 1 of 1	SCALE -----	PART NO. -------	--



TOP VIEW



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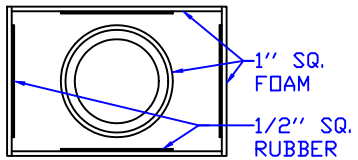

GROUT SEAL ASSEMBLY

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6. VERIFY ALL DATA
7. FAB. TO LINE STOP ACCURACY

REVISIONS	DATE	S	BY	APVD.
⊖ -	-	-	-	

JCM
JCM INDUSTRIES, INC. NASH, TX.
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www.jcmindustries.com
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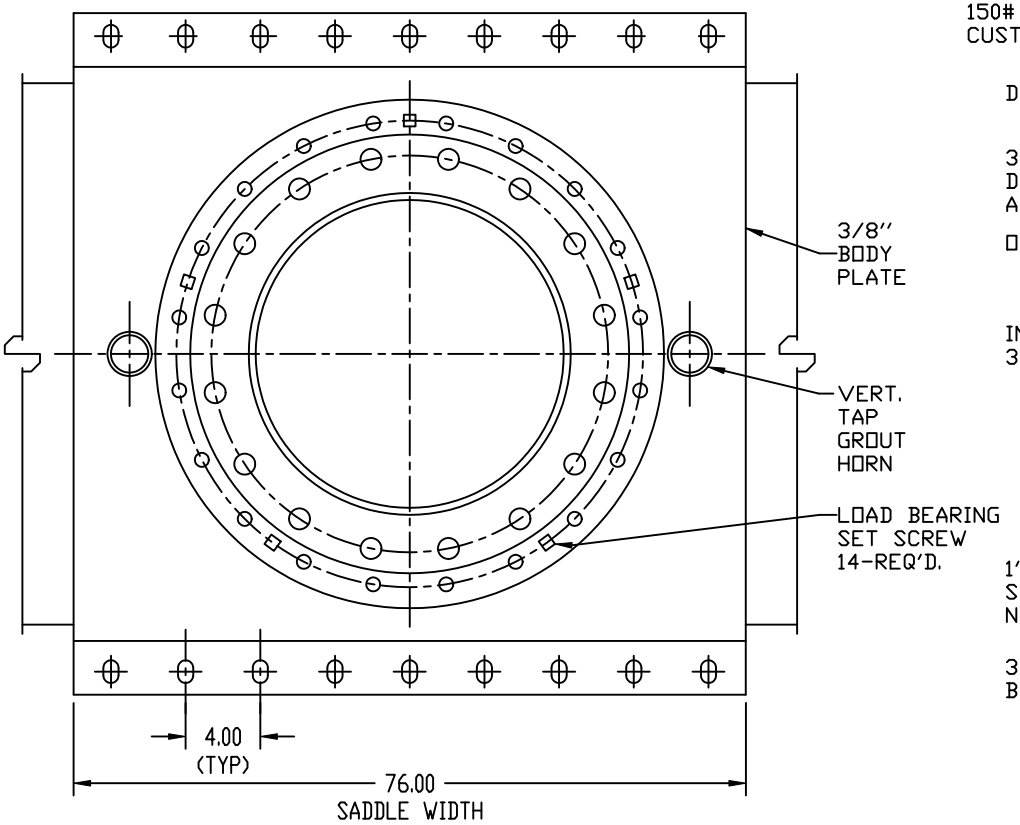
TOLL FREE: (800) 527-8482
FAX: (800) 874-9524

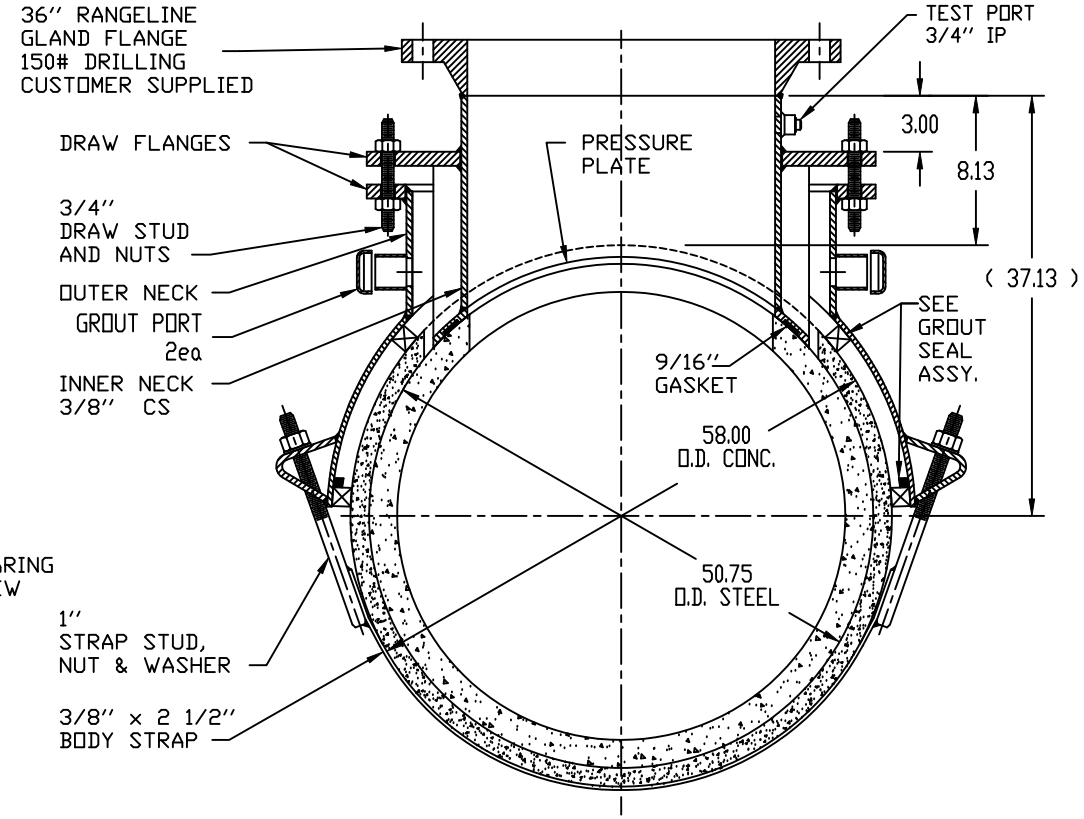
445-48 x 36 T1 ESS - (LSA)/ VT

TAPPING SLEEVE FOR CONCRETE STEEL CYLINDER PIPE

UNLESS OTHERWISE SPECIFIED TOLERANCES TO BE			DRAWN BY	CHECKED BY	APVD. BY	DWG. NO.	REV.
FRACTIONS	DECIMALS	ANGLES	HPT	-----	-----	GEN-006783	
± 1/8"	.063	2°	DATE 06/20/11	NO. SHEETS 1 of 1	SCALE -----	PART NO. -------	--



TOP VIEW



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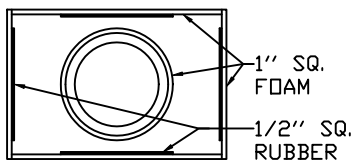

GROUT SEAL ASSEMBLY

NOTES:

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2. WORKING PRESSURE: 150 psi
3. FINISH: EPOXY COAT
4. 304 SS FASTENERS (STUDS, STRAPS, NUTS & WASHERS)
5. PIPE O.D.'S TO BE VERIFIED.
6. VERIFY ALL DATA
7. FAB. TO LINE STOP ACCURACY

REVISIONS	DATE	S	BY	APVD.
⊖ -	-	-	-	

JCM INDUSTRIES, INC. NASH, TX.
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www.jcmindustries.com
OFFICE: (903) 832-2581
TOLL FREE: (800) 527-8482
FAX: (800) 874-9524

445-48 x 36 T1 (ESS) - (LSA / VT)

TAPPING SLEEVE FOR SP 12 CONCRETE PIPE - LINESTOP ACCURACY

UNLESS OTHERWISE SPECIFIED TOLERANCES TO BE			DRAWN BY	CHECKED BY	APVD. BY	DWG. NO.	REV.
FRACTIONS	DECIMALS	ANGLES	MWS	-----	-----	GEN-006900	--
± 1/4"	.125	5°	DATE 07/26/11	NO. SHEETS 1 of 1	SCALE -----	PART NO. -------	

THOMPSON PIPE GROUP

110 Pearl Street
P.O. Box 101
Coldwater, OH 45828
Phone: 419/678-2596
Fax: 419/678-2917

SAMPLE SPECIFICATION FOR TAPPING ASSEMBLIES ON PCCP

A. FLANGED TAPPING SLEEVES FOR PCCP

1. MATERIAL

a. Saddle Plate shall be manufactured from ASTM A283 Grade C Steel or equal.

b. Straps shall be manufactured from ASTM A 276 Type 304 Stainless Steel.

c. Gasket shall have a broad, flat sealing surface and shall be manufactured of a material suitable for the intended conveyed fluid.

d. Flange to be connected to valve shall be manufactured in accordance with AWWA C207 Class D. Flanges larger than 12" diameter shall have an alignment recess suitable for accepting the alignment lip of the tapping valve.

e. Waterway shall be lined with fusion-bonded epoxy to a minimum thickness of l5 mils in accordance with AWWA C2l3.

f. All other steel shall be coated with a fusion-bonded epoxy coating.

g. Bolts, studs and nuts shall be stainless steel 18-8 type 304.

2. FEATURES

a. Sleeve shall be designed for an operating pressure of 150 psi.

b. The sleeve shall have a separate gland, which allows the sleeve to be installed, and the annular space between the pipe and the sleeve to be grouted, prior to cutting the prestressed wires.

c. Foam or rubber grout gaskets and hard rubber spacers shall be used to provide an annular space between the pipe and the sleeve. Grout horns shall be furnished to facilitate grouting of the annular space.

d. The annular space shall be grouted with a suitable Portland Cement grout. The grout shall be allowed to set prior to cutting any prestressing wires. Any accelerant used in the grout shall not be deleterious to prestressing wire.

e. The pressure plate shall be adequately braced to eliminate vibration & flexing of the plate while the tapping machine is operating.

f. The machined gasket groove on the pressure plate must be consistently positioned about throat of tapping gland waterway. However, ID of the gasket groove must be set back a minimum of 1" from the waterway to allow dispersal of forces generated by gasket compression. Gasket grooves machined in a circle and then rolled to an elliptical shape will not be allowed.

g. All waterway welds shall be dye-penetrant inspected or hydrostatically shop tested for water tightness.

h. The gland shall be equipped with load bearing set screws to transfer thrust loads from the branch piping to the sleeve.

i. A three-flange configuration shall be used on all outlets above twelve-inch to allow for valve bypass.

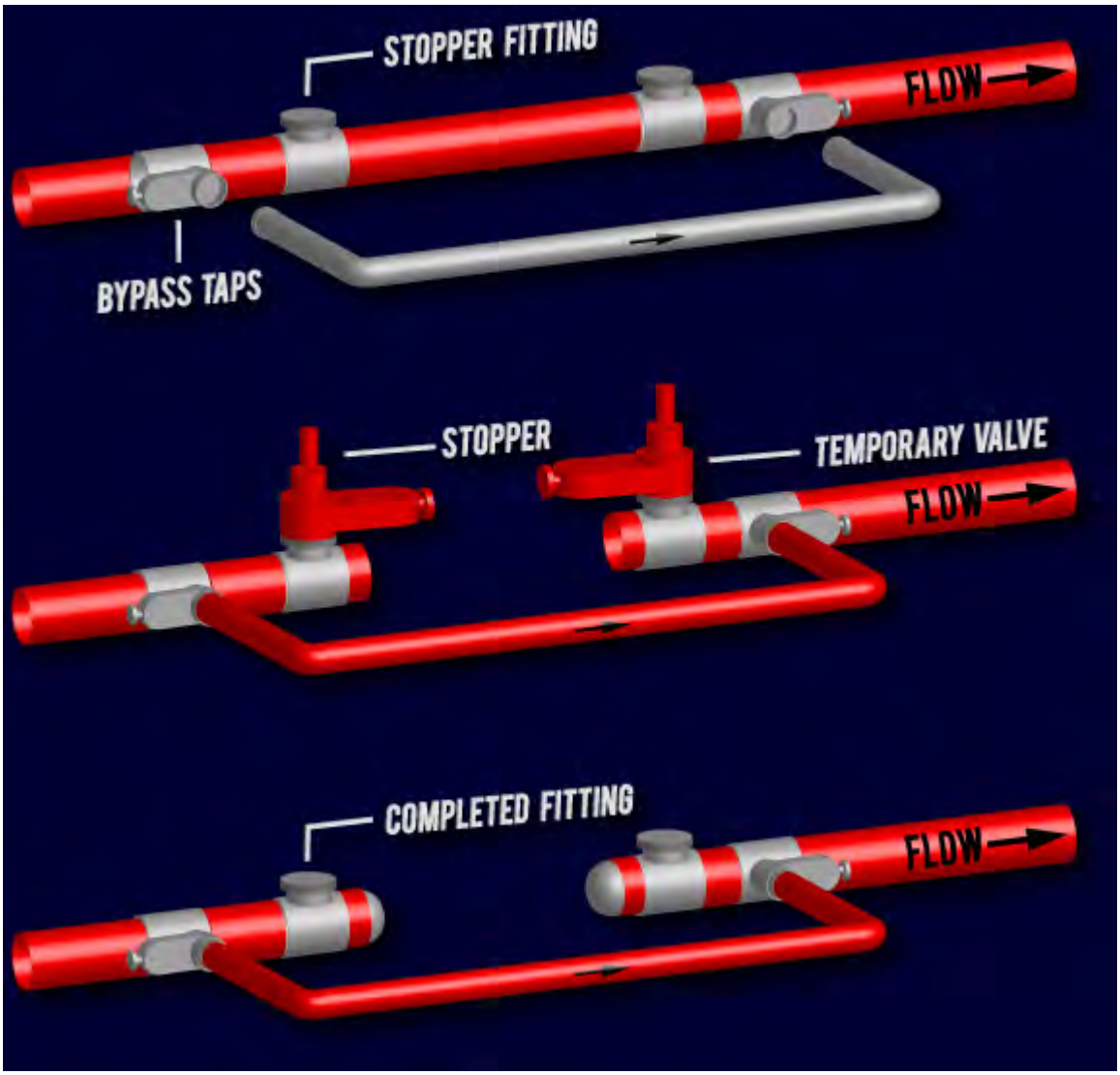
j. Welding the gland to the steel cylinder of the pipe to provide a watertight seal shall not be permitted.

k. The sleeve shall be encased in a minimum of one inch of Portland cement mortar or concrete for corrosion protection after the tap.

l. The sleeve shall be Thompson Pipe Group or approved equal.

RANGELINE TAPPING SERVICES LINE STOP INSTALLATION FOR CONCRETE PIPE

Line Stopping



THOMPSON™
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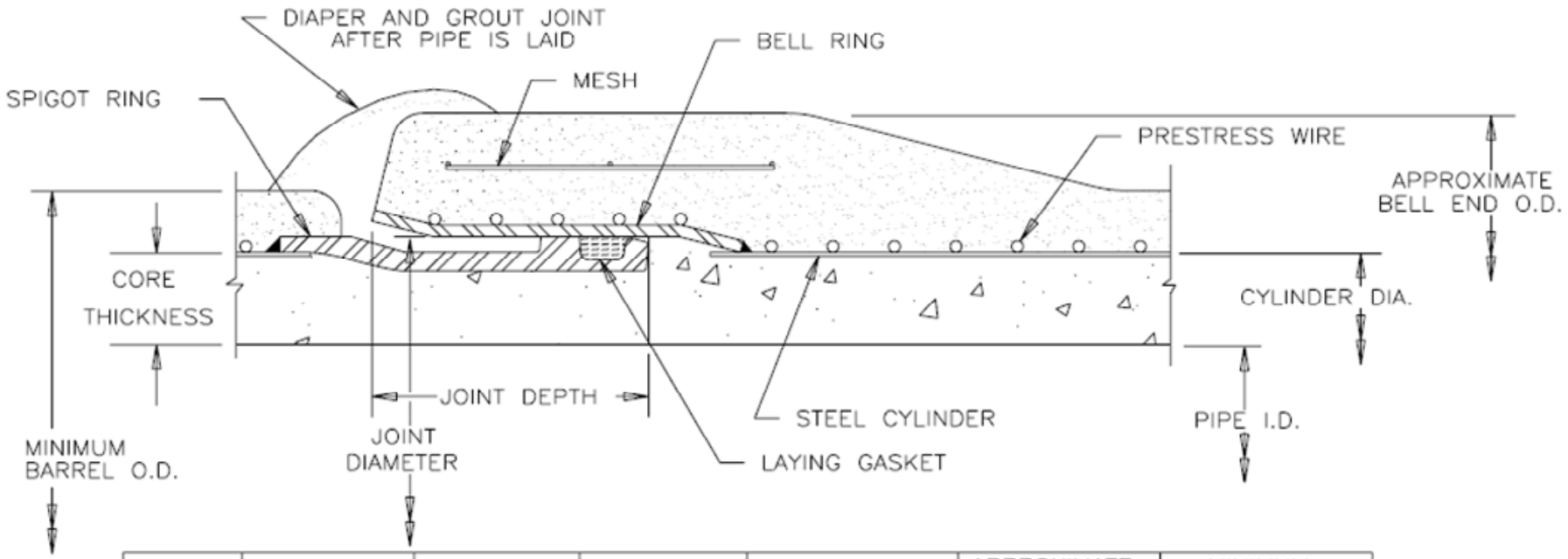
PRESSURE

TYPICAL PCCP PIPE DIMENSIONS



PIPE I.D.	CORE THICKNESS	JOINT DIAMETER	CYLINDER O.D.	APPROXIMATE WEIGHT (#/L.F.)	APPROXIMATE BELL OUTSIDE DIA.	MINIMUM BARREL OUTSIDE DIA.
16	1	18 1/2	18	140	22 1/2	20
18	1 1/8	20 3/4	20 1/4	155	24 3/4	22 1/4
20	1 1/4	23	22 1/2	185	27	24 1/2
24	1 1/2	27 1/2	27	240	31 1/2	29
30	1 7/8	34 1/4	33 3/4	350	38 1/4	35 3/4
36	2 1/4	41	40 1/2	475	45	42 1/2
42	2 5/8	47 1/4	47 1/4	590	51 1/4	49 1/4
48	3	54	54	760	58	56

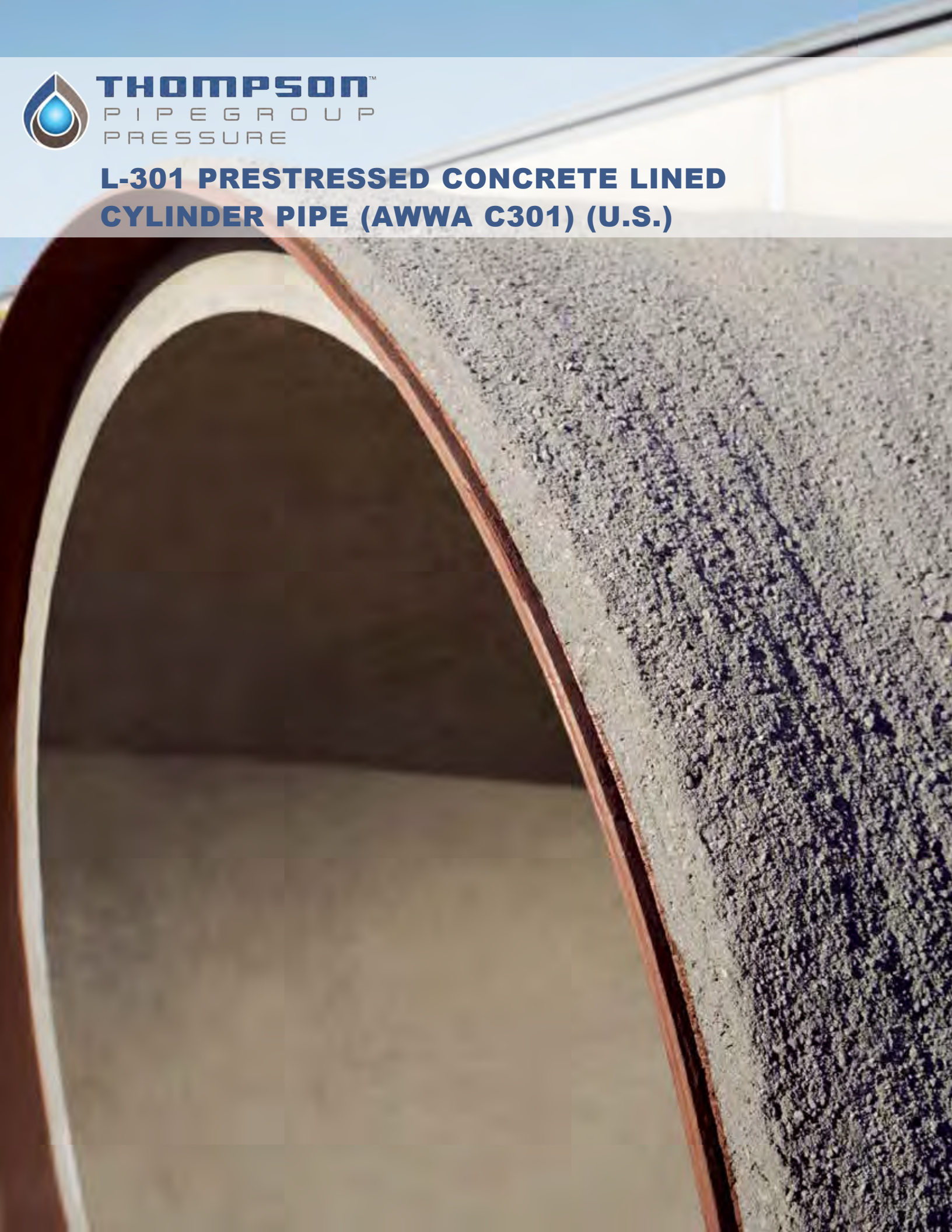
ALL DIMENSIONS IN INCHES EXCEPT AS SHOWN

NOTE: JOINT RINGS SHOWN IN THIS DRAWING ARE JUST FOR ILLUSTRATION PURPOSES AND MAY NOT REFLECT THE ACTUAL JOINT USED ON A PARTICULAR PROJECT. PLEASE REFER TO THE JOINT DETAIL DRAWING FOR JOINTS USED ON A SPECIFIC PROJECT.

THOMPSON PIPE GROUP PRESSURE		**Typical Prestressed Concrete Lined Cylinder Pipe Dimensions 16" - 48"**	**Drawn By: red** **Appr. By:** **Date: 28 Feb 2018**	**Drawing Number** **LCP-DIM** **Rev.**

THOMPSON™
PIPEGROUP
PRESSURE

L-301 PRESTRESSED CONCRETE LINED CYLINDER PIPE (AWWA C301) (U.S.)



L-301 PRESTRESSED CONCRETE LINED CYLINDER PIPE (AWWA C301)

Concrete structures are prestressed when predetermined compressive stresses are applied to them to counter expected future tensile stresses as a result of field loads.

In Prestressed Concrete Lined Cylinder Pipe (L-301), prestressing is achieved by helically wrapping, under measured tension and at uniform spacing, a high tensile strength wire around the concrete-lined steel cylinder. This wire wrap places the steel cylinder and concrete core in compression, developing the pipe's ability to withstand specified hydrostatic pressures and external loads with a safety factor comparable to other waterworks piping materials.

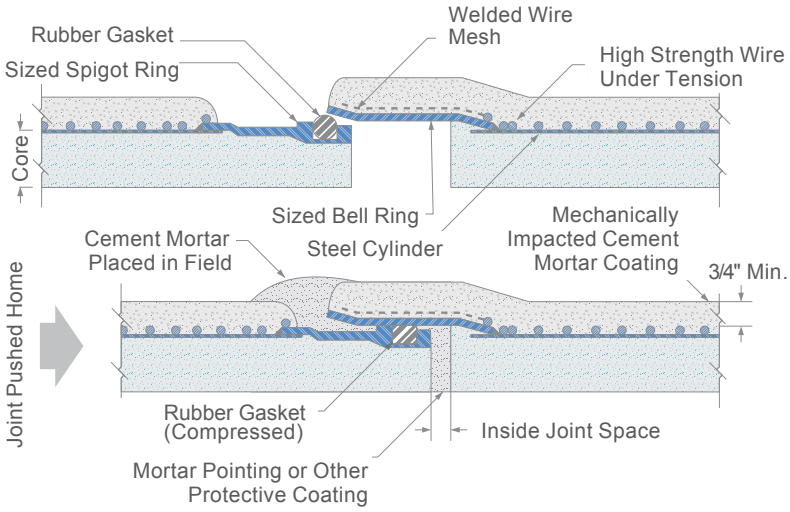
Concrete's high compressive strength and steel's high tensile strength are combined to form an elastic structure. This feature allows the pipe to perform even when design working loads are exceeded.

AWWA C301 Pipe Data Sheet (For lined cylinder pipe made in U.S.)

inside pipe diameter*	core thickness including cylinder	max. outside diameter at bell	weight per lineal foot	standard laying length*
16"	1"	21"	120#	20' - 32'
18"	1 1/8"	23"	150#	20' - 32'
20"	1 1/4"	25 1/2"	175#	20' - 32'
24"	1 1/2"	30 "	230#	20' - 32'
27"	1 11/16"	33 1/2"	285#	20' - 32'
30"	1 7/8"	37"	330#	20' - 32'
33"	2 1/16"	40 1/2"	390#	20' - 32'
36"	2 1/4"	43 1/2"	445#	20' - 24'
39"	2 7/16"	47"	515#	20' - 24'
42"	2 5/8"	50 1/2"	575#	20' - 24'
48"	3"	57 1/2"	725#	16' - 20'

NOTE: * Availability of diameters and laying lengths varies by location. Contact your sales representative for more information.

JOINT CLOSURE: TPG Pressure's circular O-ring gasket provides a highly dependable positive joint seal. Made of high-quality synthetic rubber, extruded to exacting tolerances and measured volumetrically, the gasket fits within an accurately shaped spigot groove.



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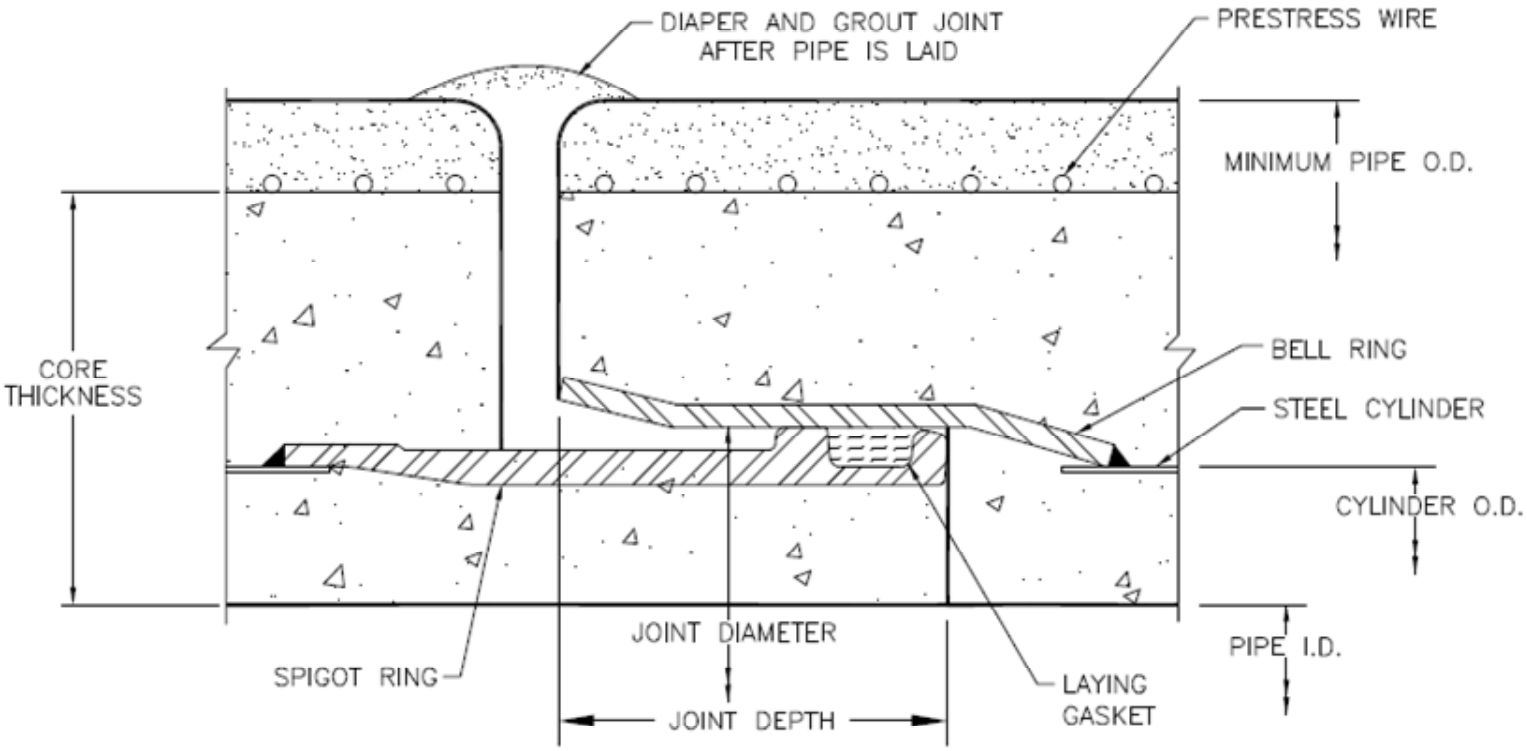


PIPE I.D.	CORE THICKNESS	JOINT DIAMETER	CYLINDER O.D.	APPROXIMATE WEIGHT (#/L.F.)	MINIMUM PIPE O.D.
36	2 1/4	39	38 1/2	450	42 1/2
42	3 1/2	45	44 1/2	725	51
48	4	51 1/4	50 3/4	900	58
54	4	57 3/4	56 7/8	1000	64
60	4 1/2	63 7/8	63	1240	71
66	5	70 1/8	69 1/4	1500	78
72	5 1/2	76 3/8	75 1/2	1780	85
78	6	82 1/2	81 5/8	2060	92
84	6 1/2	88 3/4	87 7/8	2390	99
90	6 1/2	94 7/8	94	2540	105
96	6 1/2	101 1/8	100 1/4	2700	111

ALL DIMENSIONS IN INCHES EXCEPT AS SHOWN

NOTES:

JOINT RINGS SHOWN IN THIS DRAWING ARE JUST FOR ILLUSTRATION PURPOSES AND MAY NOT REFLECT THE ACTUAL JOINT USED ON A PARTICULAR PROJECT. PLEASE REFER TO THE JOINT DETAIL DRAWING FOR JOINTS USED ON A SPECIFIC PROJECT.

49563–A REV.C

THOMPSON PIPE GROUP PRESSURE

Typical Prestressed Concrete Embedded Cylinder Pipe Dimensions 36" - 96"

Drawn By: red
Appr. By:

Date: 28 Feb 2018

Drawing Number

ECP-DIM
Rev.

THOMPSON™
PIPEGROUP
PRESSURE

E-301 PRESTRESSED CONCRETE CYLINDER PIPE (AWWA C301) (U.S.)

E-301 PRESTRESSED CONCRETE CYLINDER PIPE (AWWA C301) (U.S.)

Concrete structures are prestressed when predetermined compressive stresses are applied to them to counter expected future tensile stresses as a result of field loads.

In Prestressed Concrete Embedded Cylinder Pipe (E-301), prestressing is achieved by helically wrapping, under measured tension and at uniform spacing, a high tensile strength wire around the concrete core. This wire wrap places the concrete core and the embedded cylinder in compression, developing the pipe's ability to withstand specified hydrostatic pressures and external loads with a safety factor comparable to other waterworks piping materials.

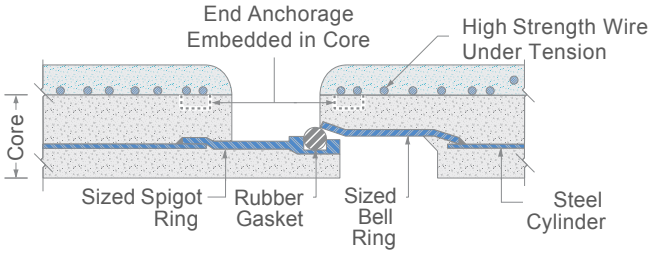
Concrete's high compressive strength and steel's high tensile strength are combined to form an elastic structure. This feature allows the pipe to perform even if the design working loads are exceeded.

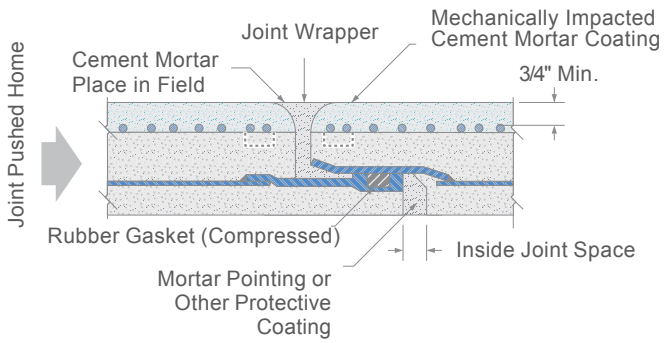
AWWA C301 Pipe Data Sheet (For embedded cylinder pipe made in U.S.)

inside pipe diameter*	max. outside diameter at bell	weight per lineal foot	Standard laying lengths*
54"	64"	1010#	20'
60"	70 1/2"	1240#	20'
66"	78"	1500#	16'/20'
72"	84 1/2"	1780#	20'/24'
78"	90 1/2"	2060#	20'
84"	96 1/2"	2390#	20'
90"	103 1/2"	2540#	20'
96"	111"	2700#	16'/20'
102"	118"	2990#	16'/20'
108"	124"	3150#	16'/20'
114"	131"	3530#	16'/20'
120"	138"	3930#	16'/20'
126"	144"	4450#	12'
132"	151"	4550#	12'
138"	158"	4990#	12'
144"	164"	5350#	12'/16'

NOTE: * Availability of diameters and laying lengths varies by location. Contact your sales representative for more information.

JOINT CLOSURE: TPG Pressure's circular O-ring gasket provides a highly dependable positive joint seal. Made of high-quality synthetic rubber, extruded to exacting tolerances and measured volumetrically, the gasket fits within an accurately shaped spigot groove.





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BELL BOLT
DISASSEMBLY/REASSEMBLY GUIDE

Suggested Procedure for the Disassembly and Re-Assembly Of Bell Bolt Restrained Joints

General

The bell bolt joint was supplied by the Interpace Corporation to serve as a means of restraint for unbalanced thrust conditions as can occur at elbows, tees, wyes, and bulkheads. The joint consists of a specially-shaped steel bell ring that has been drilled and tapped for a series of bolts spaced circumferentially around the joint circumference. During pipe manufacture, the bolts were installed into the tapped holes and set such that the bottom of each bolt is flush with the inside sealing surface of the bell ring. This allowed the steel spigot ring to be pushed home into the bell ring during installation and avoided damage to the rubber o-ring gasket as it was being compressed into the spigot ring groove. After jointing, each bolt was then tightened down such that the head was in contact with the exterior surface of the bell ring. The protrusion of the bolt down behind the spigot gasket groove prevented the spigot ring from being pulled back out under the influence of axial, tensile thrust forces. For details, refer to the attached page taken from the Interpace Corporation Engineering Manual.

Disassembly

Carefully remove the exterior joint grout from around the joint using a small, pneumatic chipping hammer. Take particular care to avoid damage to any nearby prestressing wire. Remove a sufficient amount of joint grout such that all of the bell bolts are exposed around the exterior surface of the bell ring.

Figure 1: Bell bolt bell exposed with several bell bolts removed

Using the appropriately sized wrench, unscrew and remove each bell bolt. Place each bolt in a suitable container since they will be needed for reassembly of the joint. Note that the threading used for the bolts is an interference thread pattern. Each bolt will turn rather hard due to this threading. This type of thread was used to prevent the bolts from loosening during shipment and handling.

With all bolts removed, the spigot ring is now free and called be pulled out of the bell ring.

Figure 2: Bell bolt removed

Reassembly

Carefully clean the exposed portions of the bell ring and spigot ring. Insure that all dirt, surface corrosion, and joint grout are removed. Clean each bell bolt by using a wire brush to insure that the threads are free of dirt and joint grout.

Figure 3: Bell bolt inserted into threaded hole in bell ring

Return the bell bolts to each threaded hole in the bell ring. Turn them down such that the bottom of the each bolt is exactly flush with the inside sealing surface of the bell ring. Use sandpaper or emery cloth on the bell ring sealing surface to remove any sharp edges that might damage the rubber gasket.

Carefully clean the gasket, gasket groove, and bell sealing surface and lubricate with a vegetable lubricant furnished by the pipe manufacturer. Always use a new rubber gasket when reassembling joints. The lubricant must be approved for use in potable water and must be harmless to the rubber gasket. Use only lubricant supplied by the pipe manufacturer. Before placing the o-ring rubber gasket into the spigot ring groove, apply a light coat of the lubricant to the spigot gasket groove. Also apply a light coat of lubricant to the rubber gasket. Do not over-apply the lubricant. Stretch the rubber gasket into the spigot ring groove. Equalize the stretch in the gasket by inserting a smooth steel rod about 3/8" in diameter (a large screwdriver works well) between the gasket and the spigot ring and run it around the joint circumference several times in each direction.

Center the spigot ring in the bell of the mating pipe and push or pull it home with suitable equipment. Insure that the spigot ring remains centered in and square with the bell ring during the jointing operation.

Turn each bell bolt down such that the bolt head is in contact with the exterior surface of the bell ring. Do not over tighten. Remember that the threads are interference fit so they will turn hard.

Figure 4: Bell bolt inserted into bell ring

After final assembly, the exterior joint recess must be filled with Portland cement grout for corrosion protection.

The grout diaper for Prestressed Concrete Cylinder Pipe (PCCP) consists of a Typar synthetic fabric layer (gray in color) and a layer of closed cell foam. These layers are sewn together along with a pair of 5/8" wide steel bands at each edge which are used to secure the diaper to the pipe exterior. A stretching tool (normally part of the Installation Kit) is used to tighten the steel bands. Once the bands are pulled tight, a steel clip is crimped around the band ends to hold them in position. The crimping tool is also part of the Installation Kit. It's important that the diaper be carefully placed against the exterior surface of the pipe to insure that it's flush with no gaps or gathers. The closed cell foam surface is to be placed against the pipe exterior. The diaper must be centered on the joint.

The wet grout will flow down to the bottom of the diaper and begin to bulge it out. It's often helpful to place some bedding material directly under the diaper at the bottom to support the weight of the wet grout. Take care to not push excessive amounts of bedding material under the diaper such that it's pushed up into the joint recess. This will impede the flow of wet grout. For larger diameter pipe, placing the grout in several lifts is helpful. The grout must be allowed to take an initial set before subsequent lifts are added.

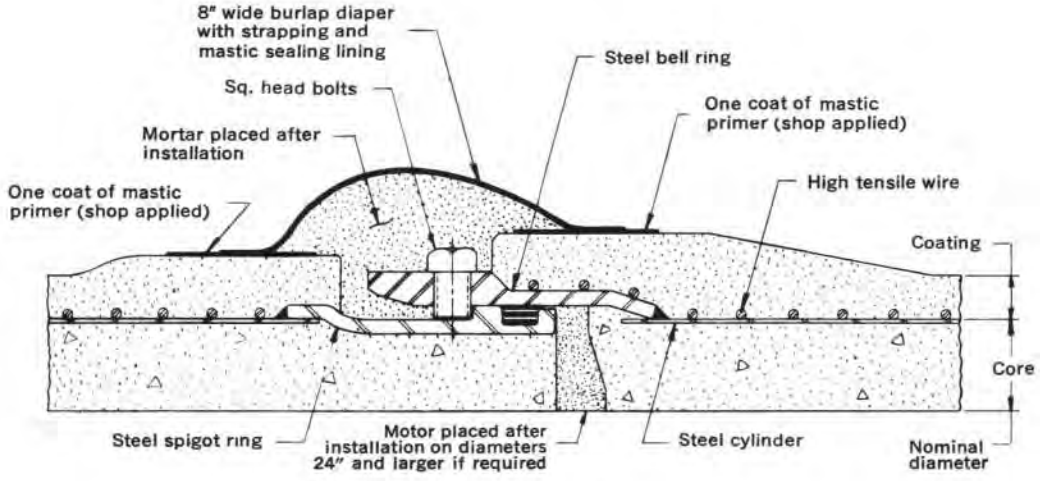
Mix the grout using one part ASTM C150 Type 1 or Type 2 Portland cement to not more than three parts clean sand with sufficient water to achieve a pourable consistency. The grout should look and pour like a thick cream. If it's too thick, it will not flow around the joint; if it's too thin, it may leak out of the diaper. Carefully pour the mixed grout into the gap at the top of the diaper. Most contractors use plastic 5 gallon buckets. A large funnel might be helpful.

As the pouring proceeds, the workers should inspect the diaper around the joint periphery to insure that the grout is flowing all around. Once the diaper is full and wet grout is puddling at the gap at the top, apply a stiffer mix (perhaps the consistency of wet brick mortar) over the joint. Insure that all metal joint components have at least 1" of coverage. Then fold the diaper flap over the gap and allow the grout to cure.

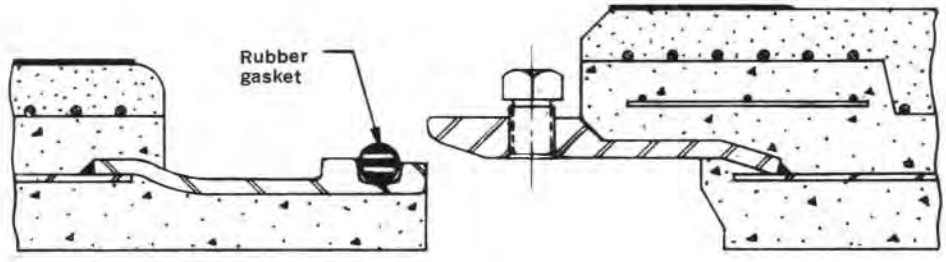
The joint grout's primary function is to provide corrosion protection to the exposed metal components of the joint and, in the case of a restrained joint to provide some structural benefit. We recommend that pipe with restrained joints not be pressurized until the joints have been grouted and the grout allowed to cure. The wet grout flows down and around the restrained joint components and can act as a variable width shim between the clamp and the harness bars and serve to transfer axial thrust forces in compression.

Backfilling operations can begin immediately after the diaper has been filled. When placing backfill around the filled diapers, care must be taken to avoid damage to or displacement of the diapers.

Typical Bell Bolt Joint



JOINT CLOSED
SP-5 PIPE



JOINT OPEN
SP-12 PIPE

OPERATIONS TO BE PERFORMED IN THE FIELD:

1. Inspect bell to insure that inside surface is smooth. Bolts must not be recessed into, or project beyond bell. If bell is not smooth reset bolts .
2. Make joint pushing spigot home until coating mortar is less than ½" from bell.
3. Tighten bolts around the bell until fully engaged.
4. Place mastic diaper (remove paper attached) on pipe and tighten strapping. Grout joint with mortar. Remove paper from separate 18" long mastic patch and place over opening to cover mortar with mastic diaper. (In cold weather, heat mastic to about 60°F for easy placement around joint.)

Lock Joint

FLEXIBLE TIED JOINT - BELL BOLT TYPE

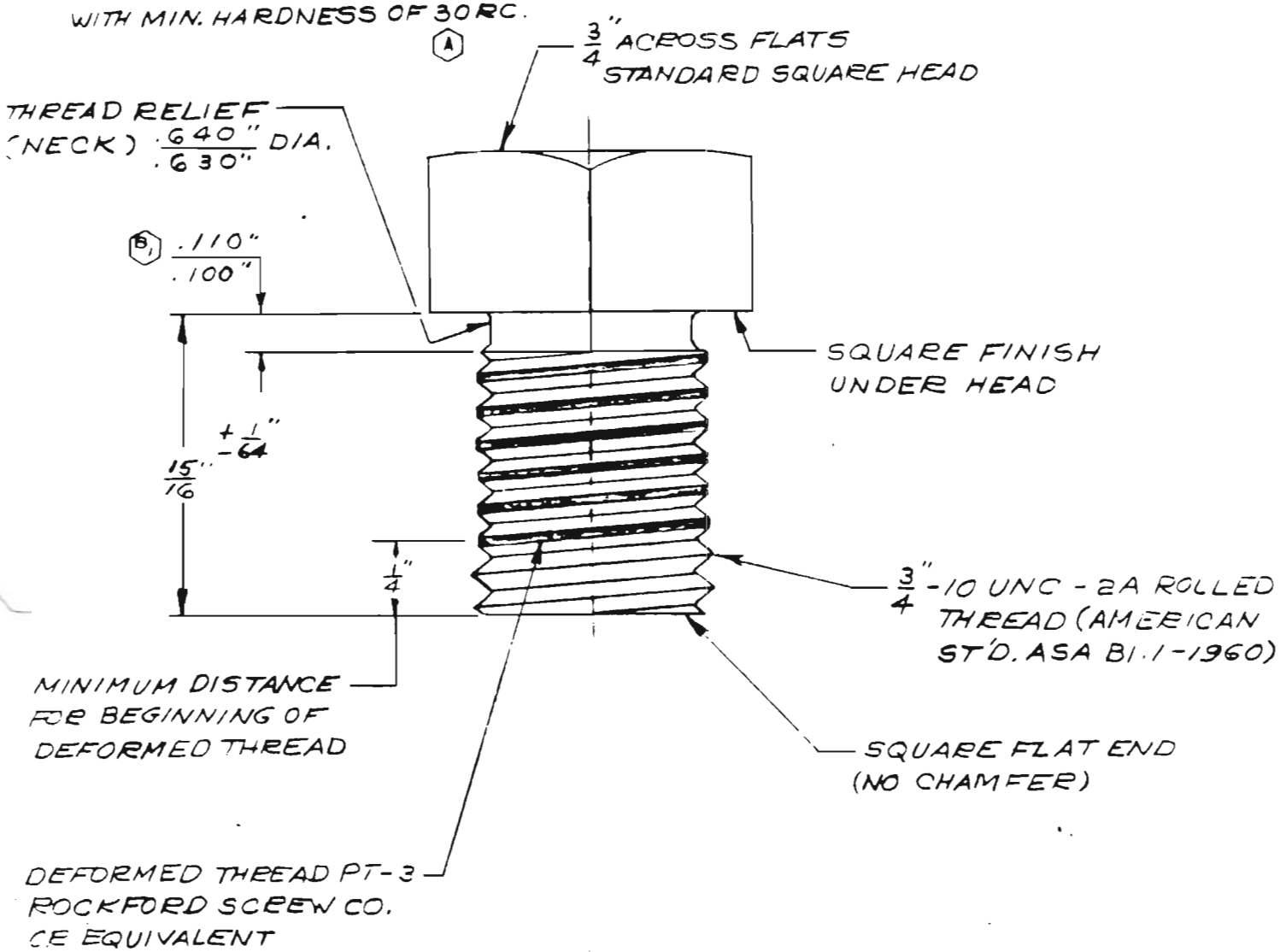
E-4-2253

DR. A.A.	9.7.71	CHC.K.K	9/9/71	APP. NSD	9-9-71	APP.		SCALE: 2/1

MATERIAL:

STEEL WITH MIN. PHYSICAL PROPERTIES AS IN FOLLOWING SPECIFICATIONS FOR BOLTS & STUDS:
SAE J429 a GRADE 5 (OR BETTER)
OR ASTM A449 (OR BETTER)
WITH MIN. HARDNESS OF 30 RC.

JAN 15

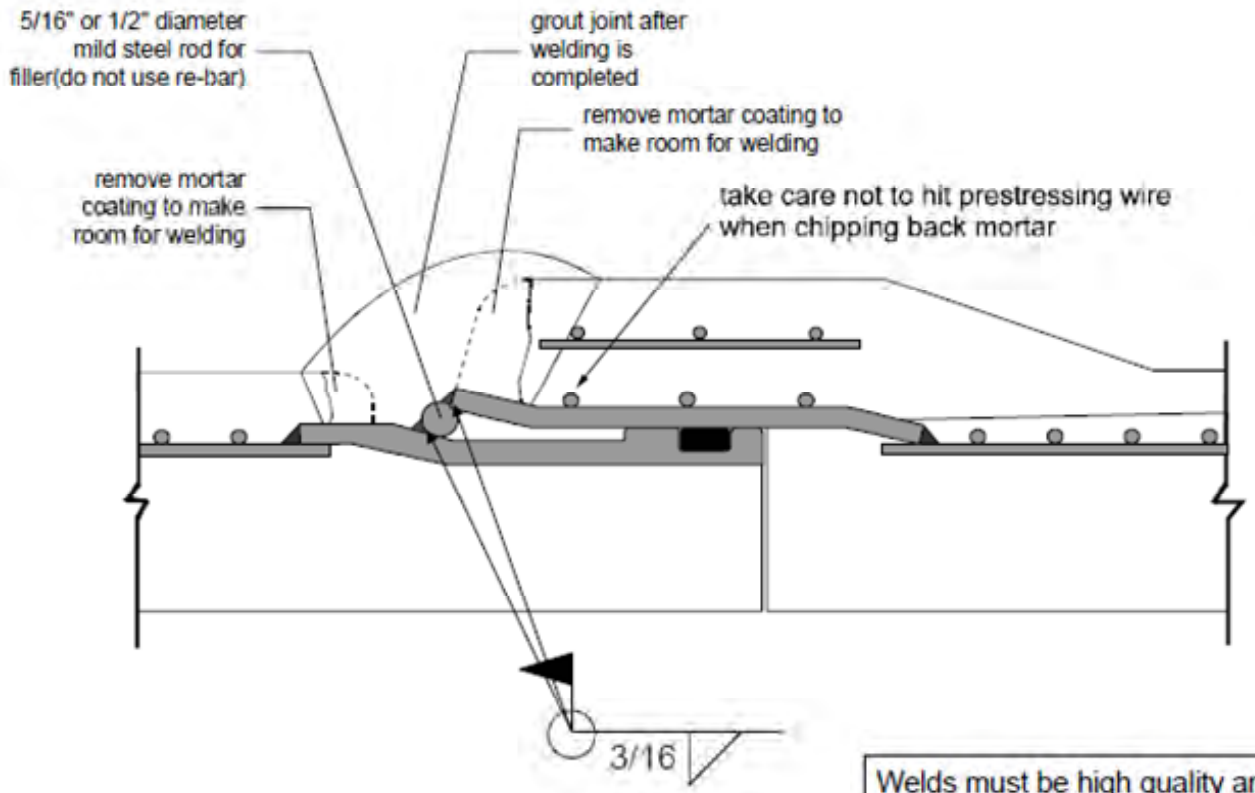


IMPORTANT NOTES:

THREAD RELIEF (NECK) WITH SQUARE FINISH UNDER HEAD, FULLY FORMED THREAD AS SHOWN AND SQUARE FLAT END ARE ABSOLUTELY NECESSARY DESIGN FEATURES OF THE SCREW. NO SCREW SHALL BE ACCEPTED NOT MEETING THESE SPECIFICATIONS.

'AD PLATE TO COMMERCIAL STDS. (MIN. = .00015)

EV.	DESCRIPTION		
	MAT'L. WAS CARBON OR ALLOY STL. H.T. C.K.K. 9.27.71		
	PLASTIC PATCH REPLACED WITH DEFORMED THREAD C.K.K. 9-7-71		
B	B1 WAS 1/8"; B2 - ADDED, ADDED NOTES. C.K.K. 3.13.69	F	ADDED NOTE 2 12.28
A	WAS 40 C.K.K. 10.30.68	E	DEFORMED TH'D ON 360; REMOVE (5)



Welds must be high quality and of sufficient penetration to develop the strength of the steel cylinder.

The weld must be watertight.

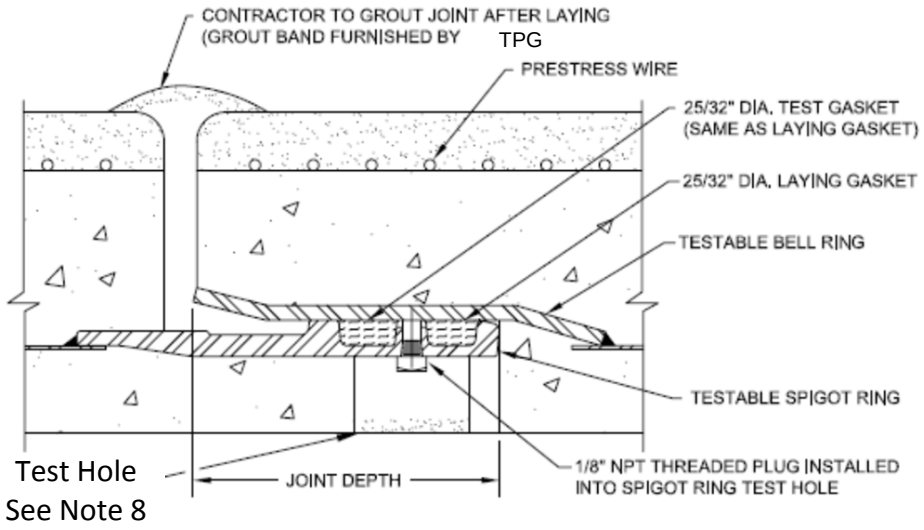
Filler rod must be mild, low-carbon steel such as ASTM A36 or ASTM A283.

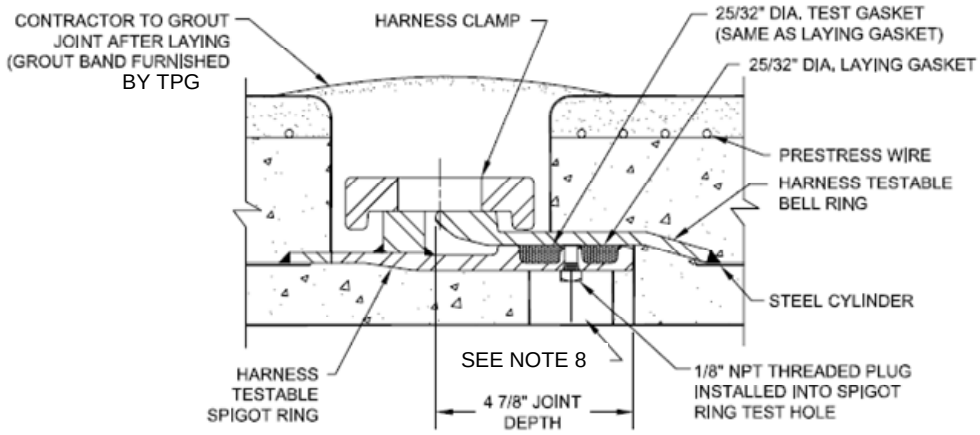
The steel joint rings are fabricated from mild, low carbon steel.

Make the welds in a series of 6" long segments to avoid overheating the rubber gasket.

Use a low hydrogen welding rod such as E6010 or E6011.

THOMPSON PIPE GROUP PRESSURE		**Typical Welded Joint Repair**	**Drawn By: red** **Appr. By:** **Date: 28 Feb 2018**	**Drawing Number** **WELD-REP** **Rev.**





Notes:

1. Prior to assembling the joint, remove and save the 1/8” NPT plug.
2. After insuring that any dirt or other debris has been cleaned from the joint rings, using a gloved hand or stiff brush, apply a thin coat of joint lubricant to bell ring sealing surface and the spigot ring gasket grooves. Do not over-apply the joint lubricant. This application is to be done just before joint assembly.
3. Apply a thin coat of joint lubricant to the rubber o-ring gaskets and then snap them into position in their respective spigot ring grooves. Do not over-apply the joint lubricant. This application is to be done just before joint assembly.
4. Assemble the pipe joint.
5. Install the test gauge assembly into the spigot ring test port. Exercise care to avoid cross-threading.
6. Pressurize the test assembly to 50 psi and hold for 5 minutes. Loss in pressure must not exceed 5 psi for a successful test.
7. After test, release the pressure and remove the test gauge assembly. Replace the 1/8” NPT plug.
8. Test hole in the concrete core is to be filled with Portland cement mortar after a successful test and installation of 1/8” NPT plug.
9. The joint should be air-tested as soon after assembly as practicable.

THOMPSON PIPE GROUP PRESSURE		**Typical ECP Testable Joint (Non-Restrained and Restrained)**	**Drawn By: red** **Appr. By:** **Date: 28 Feb 2018**	**Drawing Number** **Rev.**

PROCEDURE FOR REMOVING
A LENGTH OF CONCRETE PRESSURE PIPE

THOMPSON™
PIPE GROUP
PRESSURE

PROCEDURE FOR REMOVING A LENGTH OF CONCRETE PRESSURE PIPE

INSTALLATION OF VARIOUS MATERIALS SUCH AS SHORTS, TEES, ADAPTERS, AND CLOSURES

Thompson Pipe Group

August 2017

INITIAL EXAMINATION

Refer to Figure 1

1. Excavate all around the pipe length to be removed.

2. On the pipe to be removed, continue the excavation along the sides of the pipe in each direction approximately 2 feet past the next pipe joint.

3. Remove the exterior grout at the pipe joints at each end of the length to be removed and determine what type of joints it has. Refer to the table below:

Joint Type	Description	Comments
Standard push-on joint	This joint should pull apart easily once the bond with the exterior joint grout and any "joint set" have been overcome	Unrestrained Joint
Snap-Ring Restrained	The Snap-Ring insert must be cut and removed by pulling it back thru the "window" in the Snap Ring bell ring or the "nose" (front portion) of the Snap Ring bell ring must be cut off.	These joints are restrained-type that must be released before the joint will separate.
Bell-Bolt Restrained	Remove <u>all</u> bolts completely and proceed with disassembly as with the standard push-on joint. These bolts use an interference-type threading requiring more torque than normal to remove them.	
Harness Clamp Restrained	Unbolt and remove the bolts located at each side (ie. springline) of the pipe joints. This will allow the upper and lower halves of the harness clamp rings around the joint to be removed. Then proceed with disassembly as with the standard push-on joint.	
Turnbuckle Bolted Restrained	Cut the turnbuckle bolts in half with a torch or saw and proceed with disassembly as with the standard push-on joint.	
Field Welded Restrained	Carefully burn through the weld causing as little damage as possible to the joint ring to remain. Proceed with disassembly as with the standard push-on joint.	

BREAKING INTO PIPE

Refer to Figure 2

1. Pick a location on the pipe and scribe a line approximately 2' long at each springline (180º apart ±). Connect the ends of these longitudinal lines with circumferential lines marked across the top of the pipe.

2. Utilizing a standard cut-off saw with a concrete, steel, or combination blade, cut through the mortar coating along the lines described in Step 1 to a depth of 1"-1 ½".

   - ❖ NOTE: Cutting to a depth of 1" – 1 ½" will cut through and relax the prestressing wires and break the bond with the mortar coating. The coating and wires are now loose and can be removed with a large sledge hammer. On Lined Cylinder Pipe (LCP), if the saw cut penetrated 1 ½", the steel cylinder inside will be cut and can be removed with a hammer and/or pry bar. On Embedded Cylinder Pipe (ECP), it will be necessary to cut deeper with the saw to reach and remove the steel cylinder.

3. Once the steel cylinder has been removed, the inner concrete core is exposed. It's a good idea at this point to knock a small hole through the core to determine if the pipe is empty. If not, a pump suction hose can be inserted to facilitate dewatering and eliminate an uncontrolled, flooded excavation.

   If the line is empty or the water is controlled, continue removing the top 180º portion of the core with a sledge hammer or jack hammer.

4. The bottom half (180º portion) can now be removed from the inside-out. You can elect to use a sledge hammer, pneumatic jackhammer, or a saw or any combination to dislodge the inner core and cylinder. Slightly undermining the pipe beneath the work area will facilitate removal of this material.

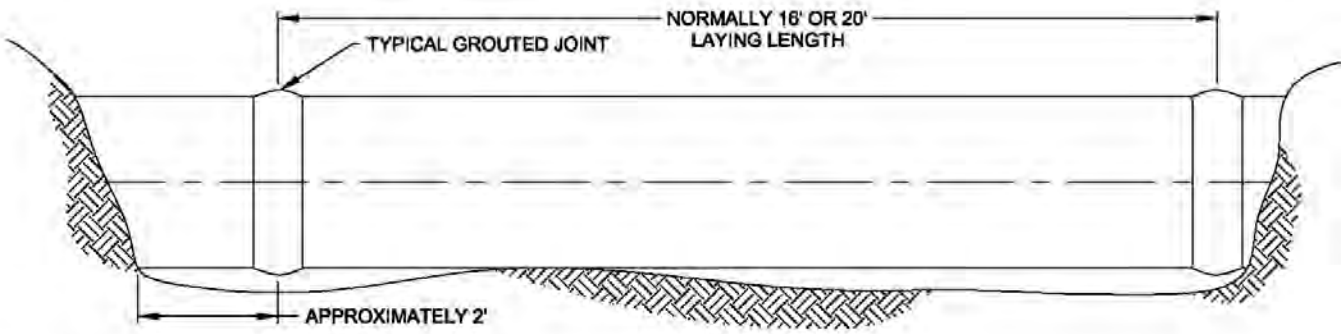


FIGURE 1 INITIAL EXAMINATION

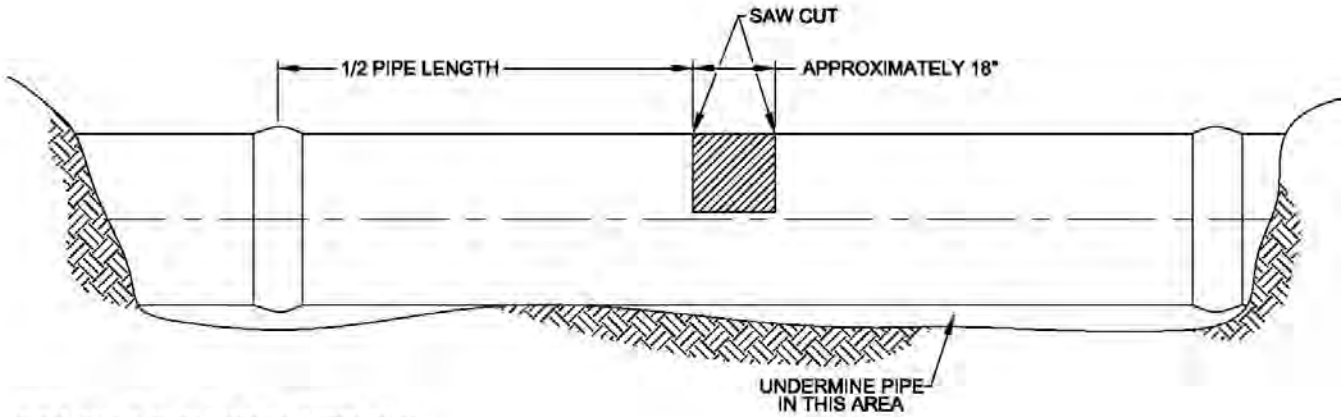


FIGURE 2 BREAKING INTO PIPE

SECTION REMOVAL

Refer to Figure 3

1. Once the center section of pipe has been completely removed, the remaining pipe sections are ready for removal.

2. **Do not** attempt to pull the pipe apart with only an upward lift as this could damage the mating joints to remain and to which the replacement pieces will be connected.

3. Place a choker cable (preferred instead of a link-type chain) near the cut ends of the remaining sections to provide maximum leverage and gently lift upward, then push down, then pull to the right and left. Repeat this "wiggling" action to loosen the joints at each end of the pipe being removed.

Once a separation begins to appear at the joint, the major direction of force when lifting or swinging should be in a direction away from the pipe joint.

PREPARATION OF JOINT ENDS

Refer to Figure 4

After all sections are removed, the excavation and remaining pipe joints should be prepared to accept the new sections.

1. Re-establish proper bedding material to support the new pipe.

2. Leave sufficient room in the bedding under each joint for the tightening of any bolts and for placement of a new grout band. Space will also be required under the closure assembly for the concrete encasement.

3. Remove any remaining or loose joint grout from the inside shoulder of the bell ring and the outside shoulder of the spigot ring. This will eliminate any interference when assembling the new pieces.

4. Clean the steel joint ring surfaces of any old grout material, dirt, or joint lubricant. Use a file, steel brush, wire wheel, or sandpaper to loosen hard material and clean rags to wipe the joint rings. Carefully inspect the joint rings for any damage or corrosion.

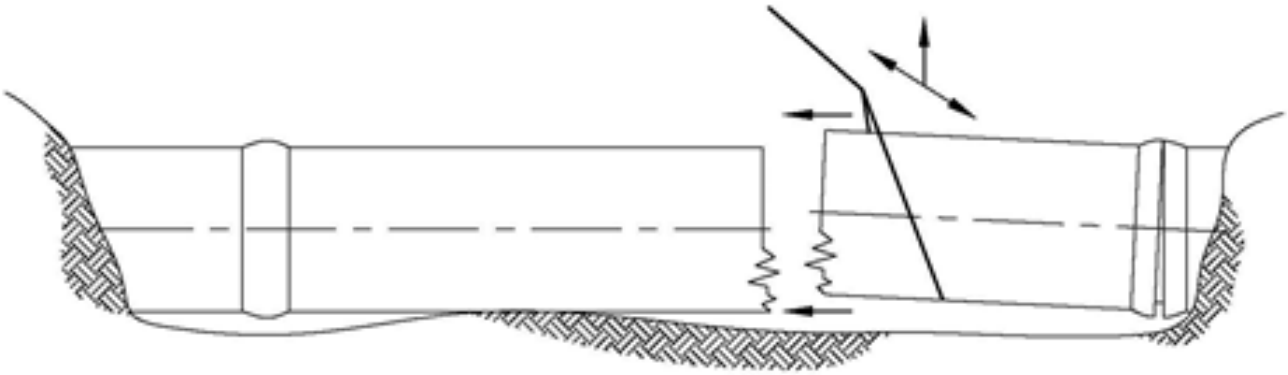


FIGURE 3 SECTION REMOVAL

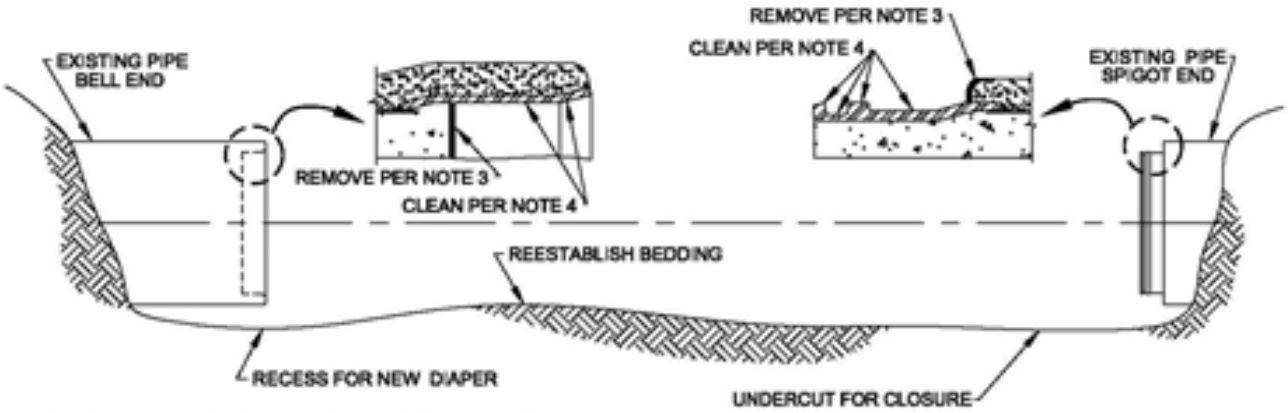


FIGURE 4 PREPARATION OF JOINT ENDS

INSTALLING REPLACEMENT PIECES

Refer to Figures 5, 6, and 7

Replacement pipe may consist of a short prestressed length, a double spigot adapter fitting, and closure assembly (illustrated in Figure 5), or a tee fitting and closure assembly (illustrated in Figure 6), or a valve and closure assembly (illustrated in Figure 7) or a combination of these pieces.

1. Prior to assembly, the flat surfaces of the bell rings and the gasket groove surfaces of the spigot rings as well as the rubber gasket itself, should be coated lightly but thoroughly with joint lubricant to facilitate assembly. Use only joint lubricant supplied by Hanson Pressure Pipe.

2. Use all new rubber o-ring gaskets. Insure that the correct gasket is being used. Gaskets contain markings that identify the pipe diameter and type for which they are designed. Assemble the pipe materials into the existing bells or over the existing spigots. Check gasket position with a feeler gauge.

3. Measure the clear distance between the remaining spigot ends with particular attention paid to the diagonal dimensions in order to assure proper alignment in both the horizontal and vertical planes.

4. Once square alignment is achieved, transfer the clear distance measurement, <u>minus one inch</u>, to the closure cylinder. Check all measurements twice.

5. Cut the closure cylinder, with a cut-off saw, square along the scribed line through the steel cylinder and mortar lining.

6. Lubricate the flat surfaces of the bell closure ring A and push this ring and the follower ring C back far enough onto the closure cylinder to clear the ends of the pipe. Stretch the closure gasket B (larger, unstretched diameter than pipe laying o-ring gaskets) slowly up and over A until it rests between A and C (Also refer to Figure 8 for more detail on the correct position of the closure gasket). The closure is now ready for placement.

    - ❖ Assembly of these pipe joints may be accomplished by:

        1. Pulling joints home with wire rope, come-along type hoist, or deadman anchor.
        2. Pushing joints home utilizing excavation equipment (backhoe bucket) being careful to use a wood timber between bucket and pipe joint surfaces for protection.
        3. Pushing and sliding closure rings utilizing hydraulic jacks.

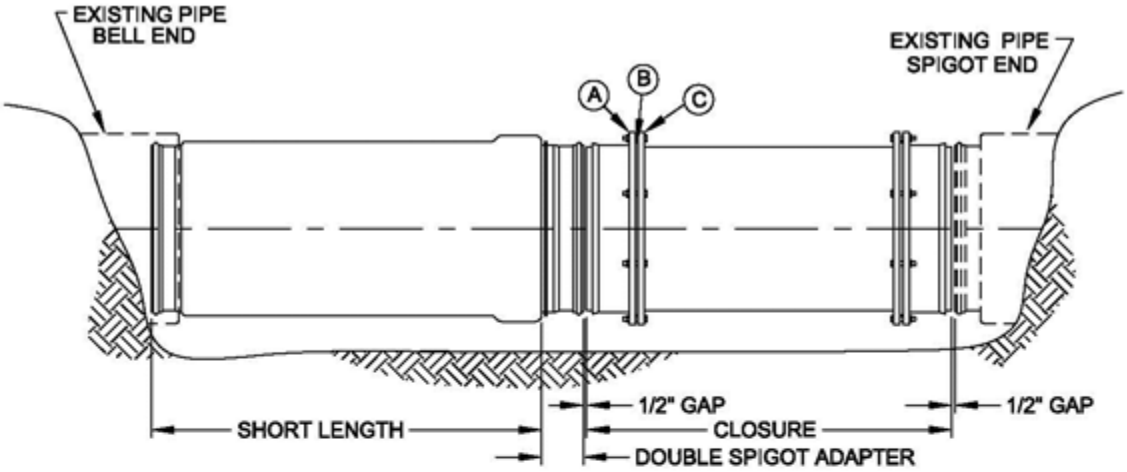


FIGURE 5 INSTALLING REPLACEMENT PIECES
SHORT PIPE AND CLOSURE

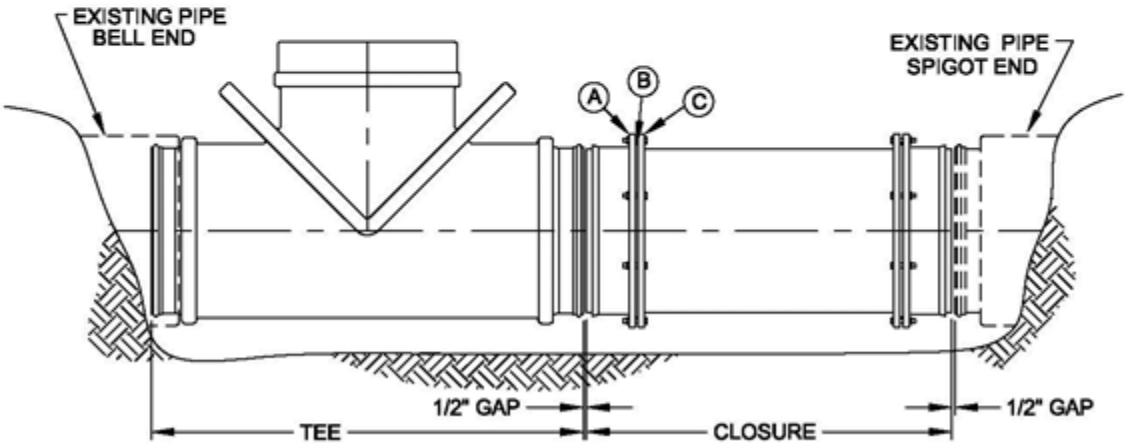


FIGURE 6 INSTALLING REPLACEMENT PIECES
TEE AND CLOSURE

CLOSURE PLACEMENT

Refer to Figure 8

1. Lower the closure cylinder assembly into the clear opening between the spigot rings. Note that a double spigot adapter may be required since a closure must be used with a spigot joint at each end.

2. Push or pull the bell closure ring A as close to the spigot as possible and then pull or push the bell closure ring home until movement bottoms out against internal stops. Check gasket position with feeler gauge.

    A. Pull together with come-alongs attached to the bolt holes in the bell closure ring and to a dead man cable or wire rope cable around the short or existing pipe.

    Or

    B. Push bell closure ring over spigot utilizing a Porta-Power-type hydraulic jack against braces welded to the closure cylinder.

3. Roll the closure gasket B into position behind bell closure ring A.

4. Pull sliding follower ring C up against the closure gasket and install the closure bolts and nuts.

5. Repeat steps 2, 3, and 4, on the joint at the other end of the closure cylinder.

6. Draw follower ring C tight against closure gasket B until approximately ¼" ± gap exists between A and C.

7. Important:

    If the assembly will remain open to inspect for leaks while the line is pressurized, bracing must be placed between the follower rings C at each end to prevent A, B, and C, at each end, from moving under pressure and opening the joint between the bell closure ring A and the spigot of the adjoining pipe. It is usually beneficial to not encase the closure assembly in concrete until the line has been filled and pressurized in order to check for leaks. If the closure gasket is found to be leaking, simply tighten the closure nuts and bolts.

    Upon completion, the entire closure assembly must be encased in Portland cement concrete to prevent corrosion. Ready-mix concrete can be used. Call for minimum 3000 psi concrete and insure that all exposed steel surfaces get at least 3" of coverage. Sandbags or plywood, in conjunction with the trench walls, can be used to create a crude form for the concrete.

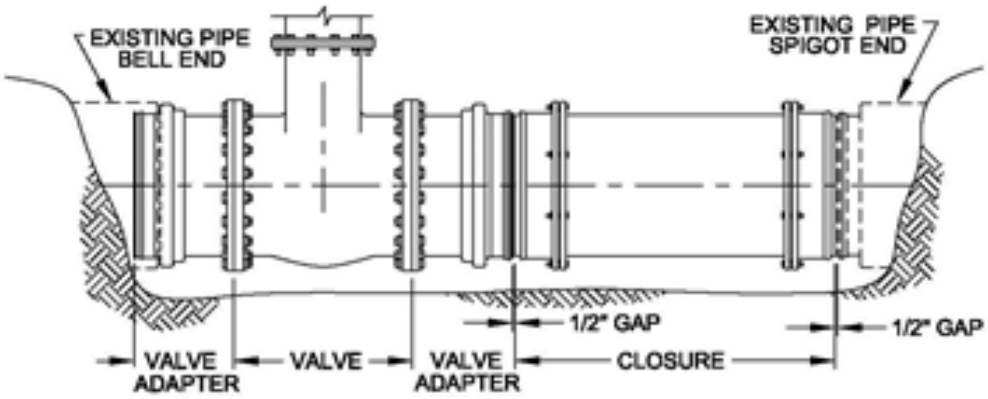


FIGURE 7 INSTALLING REPLACEMENT PIECES
VALVE AND CLOSURE

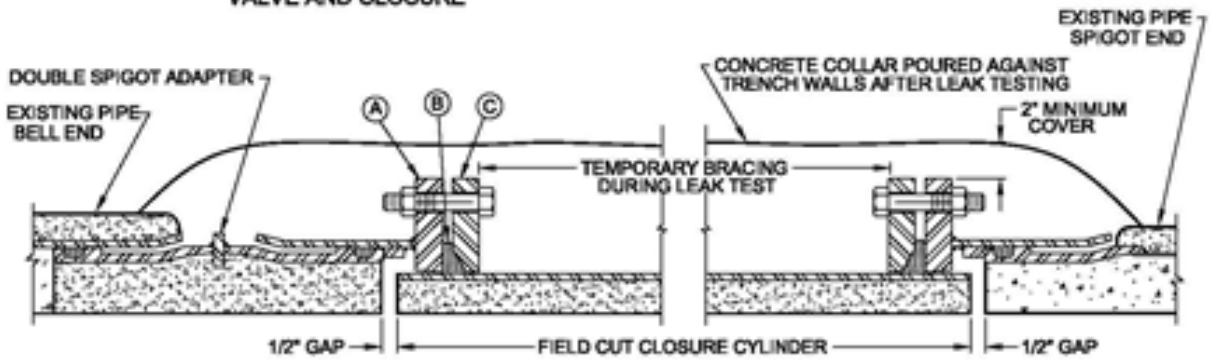


FIGURE 8 CLOSURE PLACEMENT

REPAIR GUIDE

THOMPSON PIPE GROUP PRESSURE

Repair Guide

THOMPSON™
PIPEGROUP
PRESSURE

Thompson Pipe Group-Pressure – Product & Services Guide

Repair Guide

- Introduction
- Emergency Phone Numbers
- Emergency Repair Questionnaire
- Making a Durable Repair
- Types of Concrete Pressure Pipe
  - B-303
  - L-301 and E-301
  - V-300, C-302, V-302 and NC-301
- Welded Steel Pressure Pipe
  - S-200
- Repair Procedures
  - Quick Reference
  - Mortar or Concrete
  - Heat & Reshape or Weld On New Joint Ring
  - Exterior Joint Weld
  - Interior Joint Weld
  - Welded Repair
  - Weld-On Repair Saddle
  - Gasket Repair Saddle
  - Dry Tap
  - Damaged Pipe Removal for Closure Placement
  - B-303 Cut Pipe Closure
  - Reinforcing Clamp

Introduction

Pressure pipe, when properly designed, manufactured and installed, will provide safe, reliable and continuous service under normal and transient conditions. Unfortunately, due to accidents or other unforeseen circumstances, it is sometimes necessary to repair or replace a pipe in the line.

Though durable, this pipe is not designed to withstand impact from a backhoe, jackhammer or an auger. This Repair Guide will provide a course of action to follow should such an event occur.

Thompson Pipe Group stocks repair and replacement clamps, saddles, pipe sections, closures and other materials at most of our manufacturing facilities. The fittings department can quickly fabricate non-stock repair materials from its steel plate inventory.

This Guide describes the most common repair procedures; however, not all repairs are covered. Thompson Pipe Group's field representatives have extensive knowledge in repair procedures and can usually offer a practical solution to most situations. They are available for assistance in an emergency 24 hours a day. See contact information on the following page.

For the best feedback in an emergency, make a record of the types and sizes of pipe in the system. It may also be helpful to provide a sketch showing the location, size and type of pressure pipe. Use the Emergency Repair Questionnaire on page three.

Emergency Phone Numbers

Thompson Pipe Group field services are available 24 hours a day for emergency repairs.
In the U.S., call: 972 262 3600 during normal business hours Central Standard Time or 800 445 1534 evenings, weekends and holidays. In Canada, call: 888 497 7371.

Note

All operations described in this Guide should be performed in accordance with Occupational Safety and Health Act (OSHA) regulations, provincial, state and local codes and recognized safe practices. Material handling equipment shown or described in this Guide should have sizes and capacities determined by a qualified person.

Emergency Repair Questionnaire

If an emergency repair is needed, please try to answer these questions before calling Thompson Pipe Group.

1. If Thompson Pipe Group furnished the pipe, do you know: Job number? _____
   Installation date? _____
2. What is the size and type of the damaged pipe?
   Inside diameter _____
   - ☐ Bar-Wrapped Cylinder Concrete Pipe (B-303)
   - ☐ Prestressed Concrete Lined Cylinder Pipe (L-301)
   - ☐ Prestressed Concrete Embedded Cylinder Pipe (E-301)
   - ☐ Reinforced Cylinder Pipe (V-300)
   - ☐ Reinforced Noncylinder Pipe (C-302, V-302 or DRG)
   - ☐ Prestressed Noncylinder Pipe (NC-301)
   - ☐ Steel Pipe (S-200)
3. If the type of damaged pipe is unknown, what is the outside measured circumference? _____
4. Does the damaged pipe have an outlet?
   Outlet size _____
   Outlet joint type:
   - ☐ CPP bell or spigot joint
   - ☐ Flange joint
   - ☐ MJ Bell
   - ☐ Plain end
   - ☐ Other
5. Is the damaged pipe a fitting?
   - ☐ Tee/Wye
   - ☐ Bend (angle of deflection)
   - ☐ Reducer
   - ☐ Adapter (type of joints)
   - ☐ Other _____
6. Is the damaged pipe a special piece?
   - ☐ Bevel
   - ☐ Restrained joint
   - ☐ Pipe is double coated, painted, bonded, etc.
7. What is the laying length of the damaged pipe? _____

Emergency Repair Questionnaire (Cont.)

8. What is the operating pressure of the line?

   PSI _____

   Feet of Head _____

9. What is the line's purpose? _____

10. Type of coating (if steel pipe) _____

11. What are the dimensions of the damaged area? _____

12. Do you have clear directions to the site of the damage or to a delivery point? _____

13. Do you have the name and phone number of the key person to contact? _____

    If yes, please provide: _____

14. Do you need Thompson Pipe Group personnel to assist in the repair? _____

Making a Durable Repair

Completed repairs on concrete and steel pressure pipe should provide both the strength to contain the pipeline pressure and protection from corrosion.

Pressure containment strength is generally established by assuring adequate gasket compression, by welding, by installing additional circumferential reinforcement on existing pipe or by pipe replacement.

Corrosion protection of the repair is generally provided by coating all exposed steel with a 1" (25 mm) minimum thickness of Portland cement mortar.

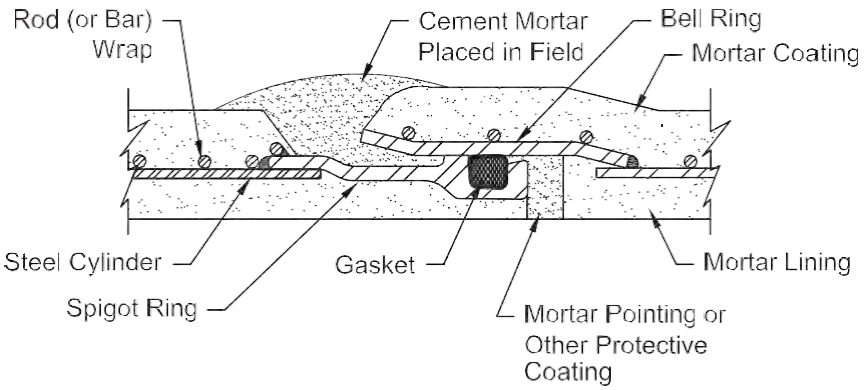
If the pipeline being repaired is bonded for monitoring or cathodic protection, the repair steel should also be electrically connected to the pipeline steel.

The proper procedure to repair leaks in damaged pressure pipe depends on the pipe type. The type of pipe determines whether the pipe has a cylinder, the location of the cylinder in the pipe wall and whether the pipe is prestressed.

Types of Concrete Pressure Pipe

B-303

The most common type of concrete pressure pipe manufactured by Thompson Pipe Group is Bar-Wrapped Cylinder Concrete Pipe (B-303). Prior to 1970, this pipe was known as American concrete cylinder pipe or P-381. From 1970 to 1995, it was marketed as Pretensioned Concrete Cylinder Pipe (P-303). This pipe is manufactured in diameters ranging from 10" (250 mm) to 64" (1600 mm). The bell, spigot, cylinder and spiral reinforcing rod on this pipe are all made of mild steel and can be welded. However, the cylinder for B-303 and other types of concrete pressure pipe can be as thin as 16 gauge (0.0598"/1.5 mm), so only welders experienced in making watertight welds on thin steel should attempt welding repairs on concrete pipe cylinders.



Note

The bell, spigot, cylinder and spiral reinforcing rod on B-303 pipe are all made of mild steel and can be welded.

Caution

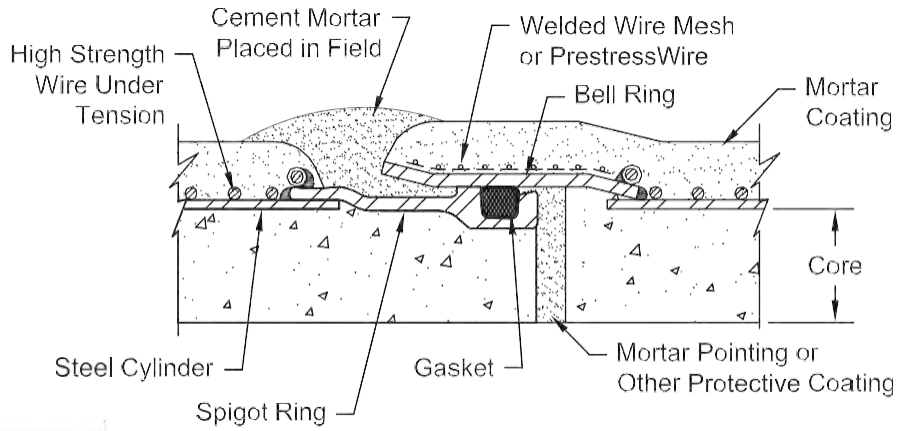
If the cylinder is 14 gauge (0.0747"/1.9 mm) or thinner, only a welder with experience on concrete pressure pipe should attempt the repair.

Types of Concrete Pressure Pipe (Cont.)

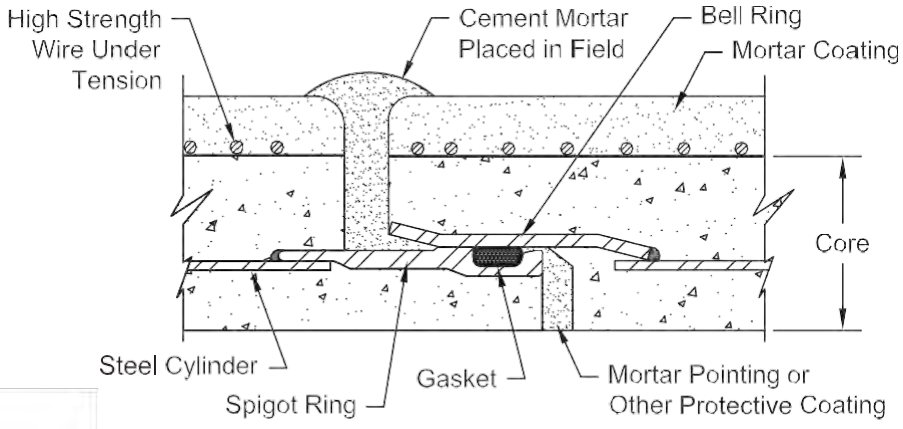
L-301 and E-301

Thompson Pipe Group currently manufactures two other types of concrete pressure pipe: Prestressed Concrete Lined Cylinder Pipe (L-301) and Prestressed Concrete Embedded Cylinder Pipe (E-301). L-301 pipe has been manufactured in 16" (400 mm) through 60" (1500 mm) diameters and E-301 pipe has been manufactured in 24" (600 mm) through 144" (3600 mm) diameters. The bell, spigot and cylinder of these pipe are made of mild steel and the cylinder is usually 16 gauge (0.0598"/1.5 mm) material. The spiral prestressing wire is very high strength steel and cannot be welded. For this reason, repair procedures for these types of pipe usually use circumferential clamps or similar materials which do not require structural support from the prestressing wire.

L-301



E-301



Note

The bell, spigot and cylinder of L-301 and E-301 pipe are made of mild steel and the cylinder is usually 16 gauge (0.0598"/1.5 mm) material.

Repair procedures for L-301 and E-301 pipe use circumferential mild steel clamps or similar materials which do not require structural support from the prestressing wire.

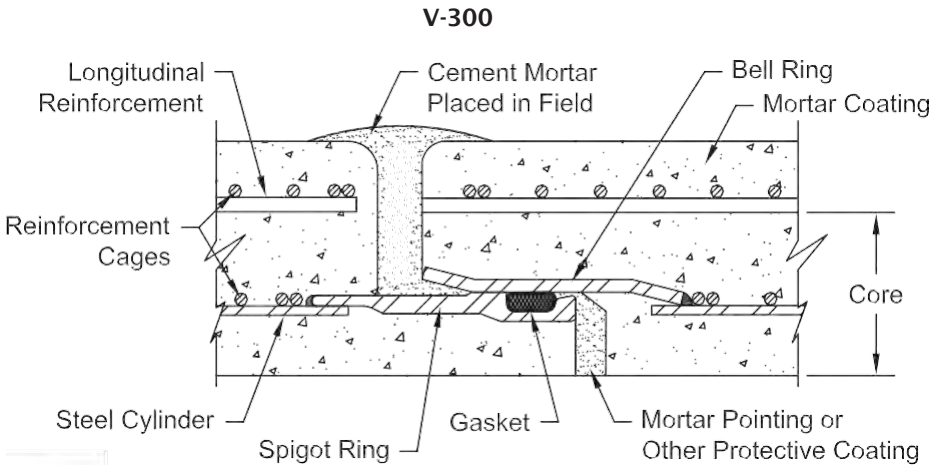
Types of Concrete Pressure Pipe (Cont.)

V-300, C-302, V-302 and NC-301

There are several other types of concrete pressure pipe which are no longer manufactured by Thompson Pipe Group. These include reinforced vibrated concrete cylinder pipe (V-300), reinforced centrifugal concrete pipe (C-302), reinforced vibrated concrete pipe (V-302) and prestressed noncylinder pipe (NC-301).

Reinforced vibrated concrete cylinder pipe (V-300), also called Lock Joint Cylinder Pipe, was marketed in diameters from 24" through 120". The V-300 pipe bell, spigot, cylinder and reinforcement are made of mild steel. The pipe cylinder is embedded several inches under the outer pipe wall surface.

Non-cylinder C-302, V-302 and NC-301 depend on the pipe wall concrete to contain the pipeline pressure. In these pipes, there is no steel cylinder against which a seal may be achieved. C-302 pipe has steel bells and concrete spigots. V-302 pipe has steel bells and steel spigots. NC-301 pipe has steel spigots and either a steel or concrete bell.



Note

The bell, spigot, cylinder and reinforcing rod on V-300 pipe are all made of mild steel and can be welded.

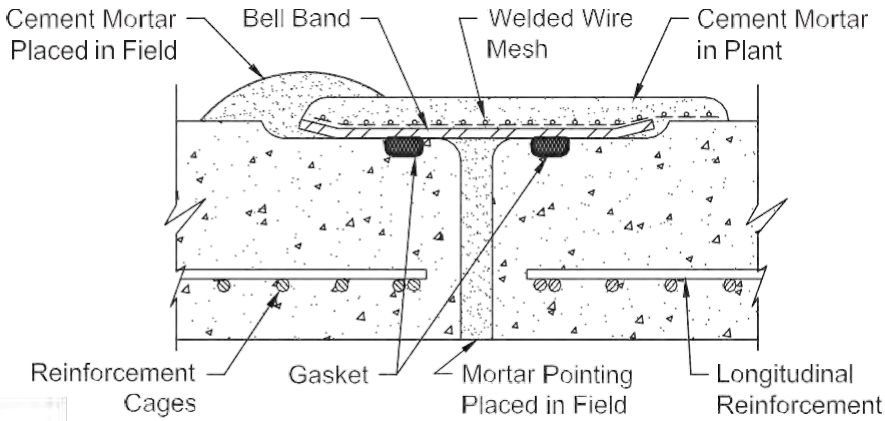
Caution

If the cylinder is 14 gauge (0.0747") or thinner, only a welder with experience on concrete pressure pipe should attempt the repair.

Types of Concrete Pressure Pipe (Cont.)

V-300, C-302, V-302 and NC-301 (Cont.)

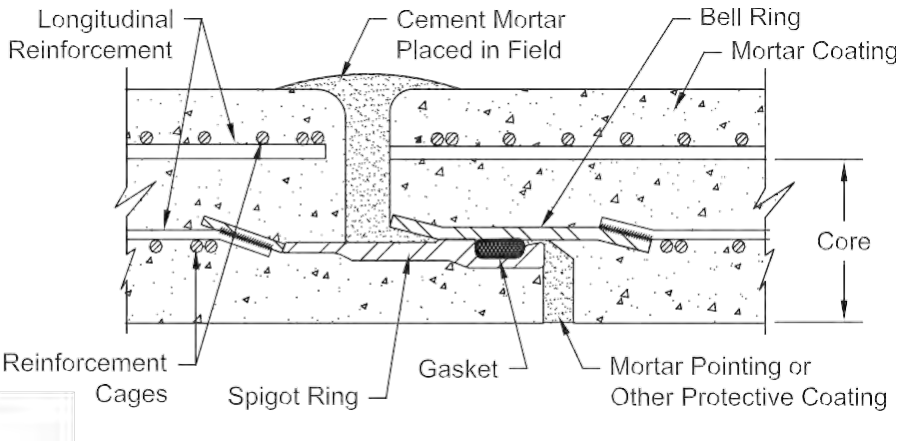
C-302



Note

C-302 and V-302 are non-cylinder pipe with smooth exterior surfaces. Holes in these pipe walls can often be sealed by compressing a gasket against the outside of the pipe.

V-302



Note

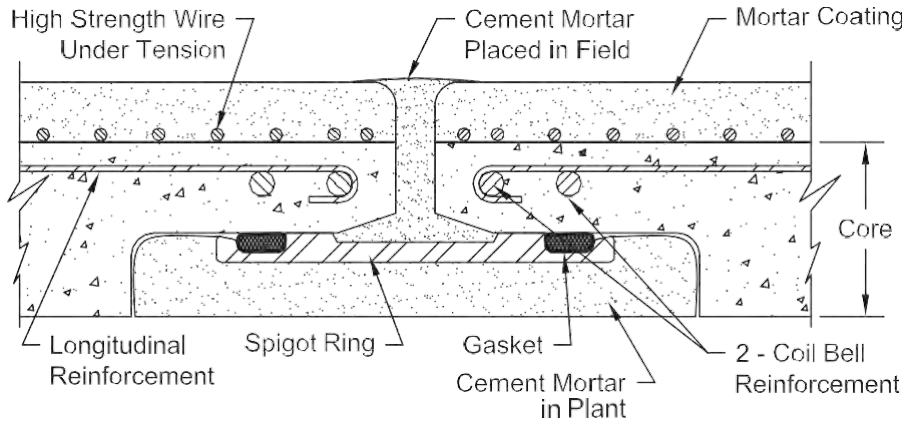
V-302 and some NC-301 pipe have steel bells and spigots which can be welded to seal joint leaks.

Types of Concrete Pressure Pipe (Cont.)

V-300, C-302, V-302 and NC-301 (Cont.)

C-302 pipe was marketed in diameters from 12" through 84". V-302 pipe was marketed in sizes from 36" through 120". NC-301 pipe was made in 72", 78", 96", 108" and 120" diameters.

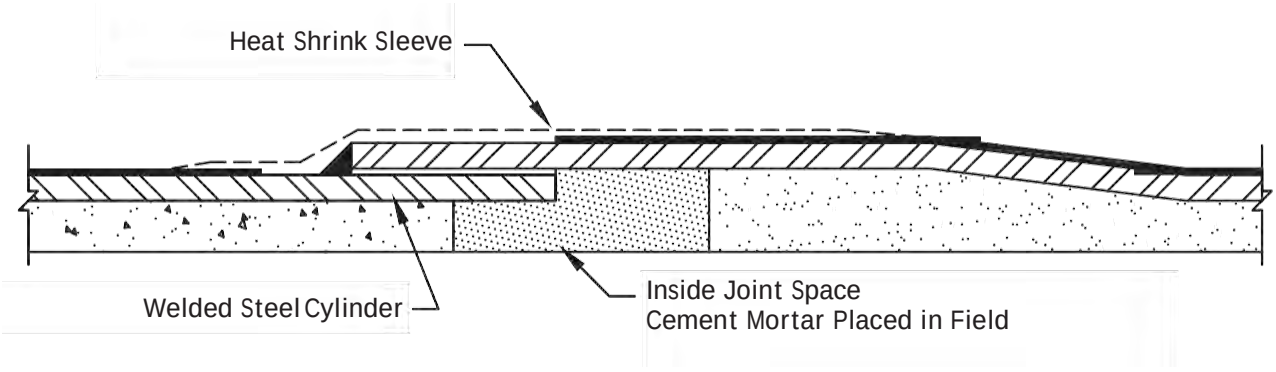
NC-301: 72", 78" & 96"

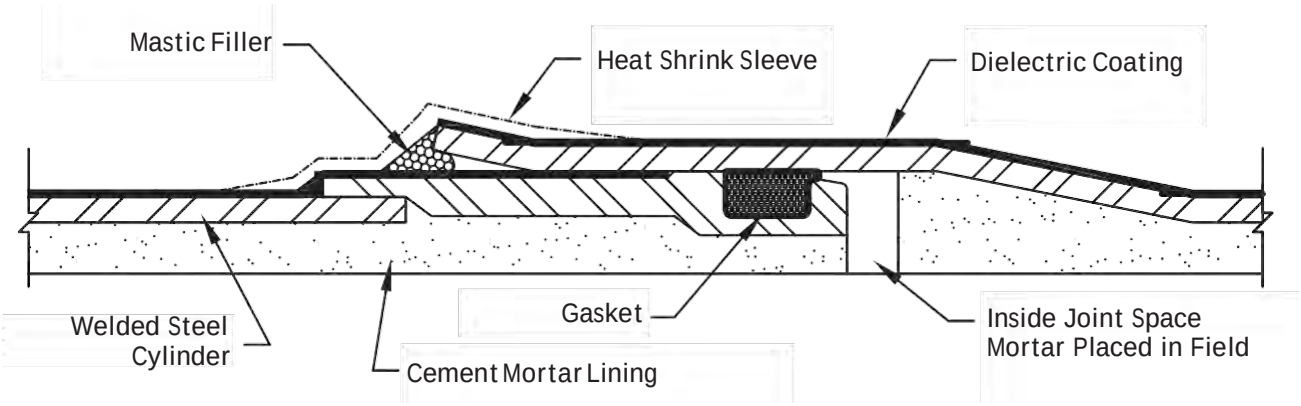


Welded Steel Pressure Pipe

S-200

Thompson Pipe Group's welded steel pressure pipe combines the high strength and flexibility for above-ground and in-plant applications requiring lightweight and longer lengths of pipe. Steel has the ability to withstand high working pressures and can handle surge pressures that may occur due to unplanned operating circumstances. Since it is easy to fabricate, it can be engineered and manufactured into various pipe sizes, shapes and configurations for economical transportation over longer distances.





Repair Procedures

Quick Reference

Typical repair procedures for various types of pipe and conditions are listed here. Some repairs can be made with the pipeline pressurized, provided there is no leak with sufficient water volume or pressure to endanger repair personnel.

Other repairs can be made with the pipeline full but depressurized in order to reduce leakage to a level which will not interfere with the installation of the repair. Where pipe sections must be replaced, the line must be drained.

Any steel used in repairs on electrically bonded pipelines must be made electrically continuous with the pipeline steel and all repair and pipe steel must be properly protected with Portland cement mortar.

Problem	Repair	Page
Repair of Mortar or Concrete B-303		15
■ Joint repairs during new pipe installation		
– Bent joint ring	Heat & reshape or weld on new joint ring	16
– Insufficient joint overlap		
■ All diameters	Exterior joint weld	17
■ Larger (>30") diameters	Interior joint weld	18
■ Joint repairs on existing pipe		
– Pipe under low or no pressure		
■ All diameters – slight or no seeping	Exterior joint weld	17
■ Larger (>30") diameters (requires draining & access to interior)	Interior joint weld	18
– Pipe under operating pressure	Weld-on repair saddle	20-25
■ Pipe barrel repairs		
– Pipe not under pressure		
■ Steel damaged but lining intact	Welded repair	19
■ Steel and lining damaged	Dry tap	29
– Pipe under pressure	Weld-on repair saddle	20-25
■ Pipe replacement: Cut pipe closure		31-32

Repair Procedures (Cont.)

Quick Reference (Cont.)

Problem	Repair	Page
L-301		
■ Joint repairs during new pipe installation		
– Bent joint ring	Heat & reshape or weld on new joint ring	16
– Insufficient joint overlap		
■ All diameters	Exterior joint weld	17
■ Larger (>30"/762 mm) diameters	Interior joint weld	18
■ Joint repairs on existing pipe		
– Pipe under low or no pressure		
■ All diameters – slight or no seeping	Exterior joint weld	17
■ Larger (>30"/762 mm) diameters (requires draining and access to interior)	Interior joint weld	18
– Pipe under pressure	Weld-on repair saddle	20-25
■ Pipe barrel repairs		
– Pipe not under pressure; wire damaged but cylinder intact	Reinforcing clamp	33
– Pipe under pressure	Weld-on repair saddle	20-25
E-301		
■ Joint repairs during new pipe installation		
– Bent joint ring	Heat & reshape or weld on new joint ring	16
– Insufficient joint overlap	Interior joint weld	18
■ Joint repairs on existing pipe	Interior joint weld	18
■ Pipe barrel repairs		
– Pipe not under pressure; wire damaged but cylinder intact	Reinforcing clamp	33

Repair Procedures (Cont.)

Quick Reference (Cont.)

Problem	Repair	Page
V-300		
■ Joint repairs on existing pipe		
– Pipe not under pressure	Exterior joint weld or interior joint weld	17 18
– Pipe under pressure	Weld-on repair saddle	20-25
■ Pipe barrel repairs		
– Pipe not under pressure; steel damaged but lining intact	Welded repair	19
– Pipe under pressure	Weld-on repair saddle	20-25
C-302 and V-302		
■ Joint repairs on existing pipe		
– V-302 pipe not under pressure	Interior joint weld	18
– Pipe under pressure or not	Gasket repair saddle	26-28
■ Pipe barrel repairs		
– Pipe under pressure	Gasket repair saddle	26-28
NC-301		
■ Joint repairs on existing pipe with steel joint rings		
– Pipe not under pressure	Interior joint weld	18

Note

Many of the repair and tapping procedures for steel pressure pipe are the same as for concrete pressure pipe, with a few subtle differences. For more information, please contact Thompson Pipe Group.

Repair Procedures (Cont.)

Mortar or Concrete

Repair of Unlaid Pipe or Interior Repairs on Installed Pipe

1. Chip back to sound lining or coating. The borders of the sound material around the repair area should be slightly undercut to key the repair mortar in place. Care must be taken during chipping to avoid nicking any steel, especially any cylinder or prestressing wires.

2. Clean and wet the surface of the repair area. Apply a thick cement slurry to the area to be patched.

3. Ram and compact a stiff mortar into the repair area. The mortar shall be worked under the borders of the surrounding mortar or concrete and under or around any exposed reinforcement or prestressing wire. Wire mesh may be useful for supporting the mortar over large repair areas. The surface of the repair mortar shall be shaped to the pipe contour in a manner assuring there is at least ¾" (19 mm) coverage over any pipe steel.

4. The repair mortar can be one part cement to three parts sand mixed with as little water as possible so the mortar will be very stiff but workable. Repairs made with such mortar should be protected while being cured for 24 hours using intermittent water spray, wet covering, plastic sheet or a curing compound.

   Alternatively, the repair mortar can be a high pH, low chloride, quick set mortar so the repair will harden quickly and require no special curing procedures.

Exterior Repairs on Installed Pipe

Exterior mortar or concrete repairs on installed pipe can be made as outlined above. Alternatively, after the exterior damaged mortar or concrete has been removed and the area of damage cleaned, the pipe exterior can be encased with mortar or concrete. This can be accomplished either by placing a joint wrapper to straddle the repair area and filling the wrapper with mortar, or by backfilling the trench pipe zone in the repair area with concrete or mortar.

All mortar repairs should be protected from freezing until they have cured.

Repair Procedures (Cont.)

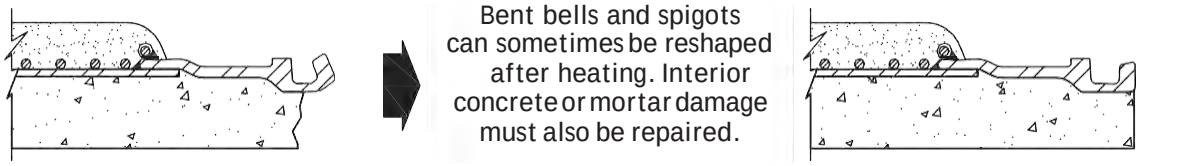
Heat & Reshape or Weld On New Joint Ring

B-303, L-301 and E-301 Repair Procedure

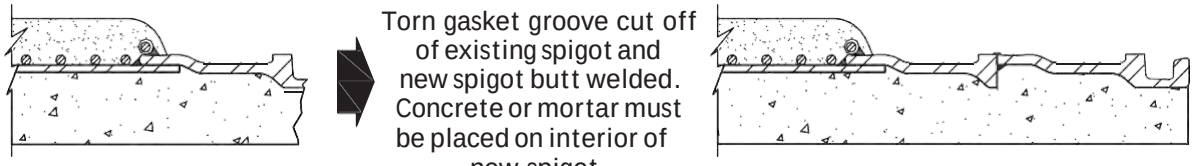
1. Joint rings which are misshaped due to being bumped during or after delivery can sometimes be heated and hammered back to essentially their original configuration. Such a repair must only be made: (a) with the approval of the owner's inspector or representative; and (b) under the supervision of a Thompson Pipe Group field representative.

2. After the bell or spigot is repaired, all broken mortar or concrete around the repair must be removed and replaced.

3. If the joint ring cannot be repaired, a new ring can be provided by Thompson Pipe Group to be butt welded to the damaged one.



Bent bells and spigots can sometimes be reshaped after heating. Interior concrete or mortar damage must also be repaired.



Torn gasket groove cut off of existing spigot and new spigot butt welded. Concrete or mortar must be placed on interior of new spigot.

Repair Procedures (Cont.)

Exterior Joint Weld

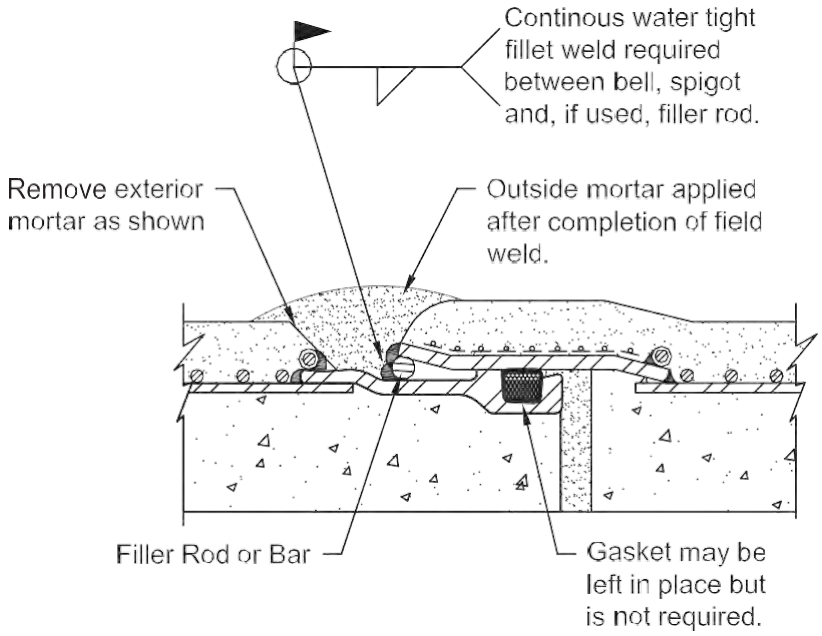
B-303, L-301 and V-300 Repair Procedure

1. Remove sufficient exterior mortar or, for V-300 pipe, exterior concrete to provide access for complete circumferential weld. Use caution to avoid breaking the prestressing wire on L-301 pipe or the rod reinforcement on B-303 or V-300 pipe.

2. Reduce the gap between materials to be welded. This may require the use of a filler rod or bar, or heating and flattening the bell flare, or similar preparation, depending upon the extent of joint overlap.

3. Place a continuous, watertight weld around the entire circumference of the joint.

4. Repair exterior mortar or concrete.



Note

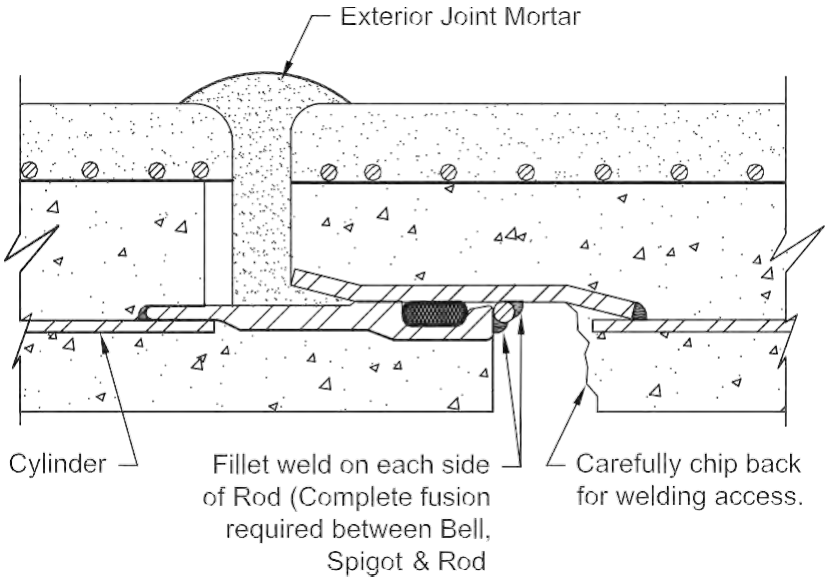
The weld must be continuous and watertight, so the gasket is not needed. The joint configuration and need for filler material will vary depending on joint overlap.

Repair Procedures (Cont.)

Interior Joint Weld

B-303, L-301, E-301, V-302, V-300 and some NC-301 Repair Procedure

1. The line must be dewatered and access to the interior provided. If no entrance is available, a saddle type manhole can be installed.
2. For repairs required during installation due to insufficient joint overlap, the gasket may be left off the spigot since the weld will be continuous and watertight.
3. To repair joints where the gasket has already been installed, place a 3/8" (9 mm) mild steel rod around the joint and weld solid as shown in the detail below.
4. When the weld is completed, clean the interior joint recess and repair the interior concrete and mortar.
5. Examine the adjacent interior joints to assure they do not need to be welded or re-mortared. Where re-mortaring is required, the exterior should be examined and re-mortared if necessary.



Note

The weld must be continuous and watertight.

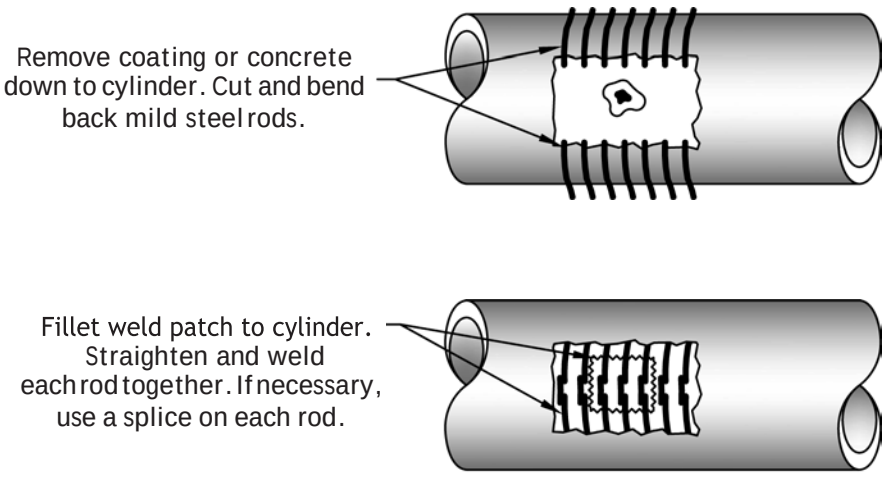
Repair Procedures (Cont.)

Welded Repair

B-303 and V-300 Repair Procedure

1. Remove the mortar coating or concrete down to the cylinder within a few inches around the damaged area. Cut and bend back reinforcing rods.
2. Center a steel patch over the hole in the cylinder and weld it in place with a watertight fillet weld around the perimeter of the patch (see Caution). Straighten and weld the cut reinforcing rods back together. If necessary, use a splice on each wrap.
3. Cover all exposed steel with a 1" (25 mm) minimum thickness cement mortar.

B-303



Caution

This repair requires welding to a pipe cylinder which may be as thin as 16 gauge (0.0598"/1.5 mm). Only welders experienced in making watertight welds on thin steel should attempt this procedure.

Repair Procedures (Cont.)

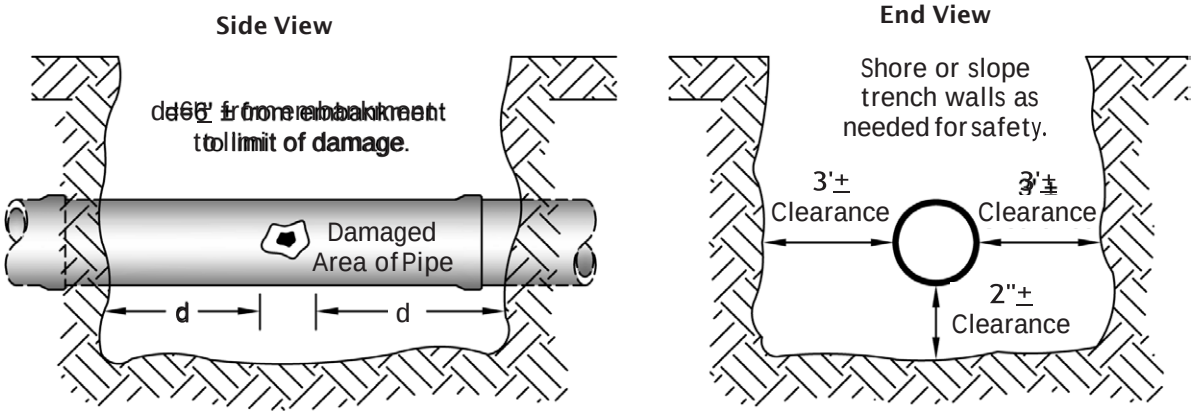
Weld-On Repair Saddle

B-303, L-301 and V-300 Repair Procedure

Although the standard repair saddle width is 24" (609 mm) wide, longer repair saddles may be quickly fabricated if needed.

1. Excavate necessary clearance around the damaged area of pipe for installation of repair saddle. Recommended clearances are shown in sketch.

2. Remove a 5" (127 mm) wide area of mortar coating or exterior concrete around the entire circumference of the pipe cylinder on each side of the damaged area. The standard repair saddle is 24" (609 mm) wide, thus the centerlines of the chipped areas should be approximately 24" (609 mm) apart. Please note it is neither necessary nor desirable to remove all the mortar coating or exterior concrete surrounding the damaged area of the pipe.



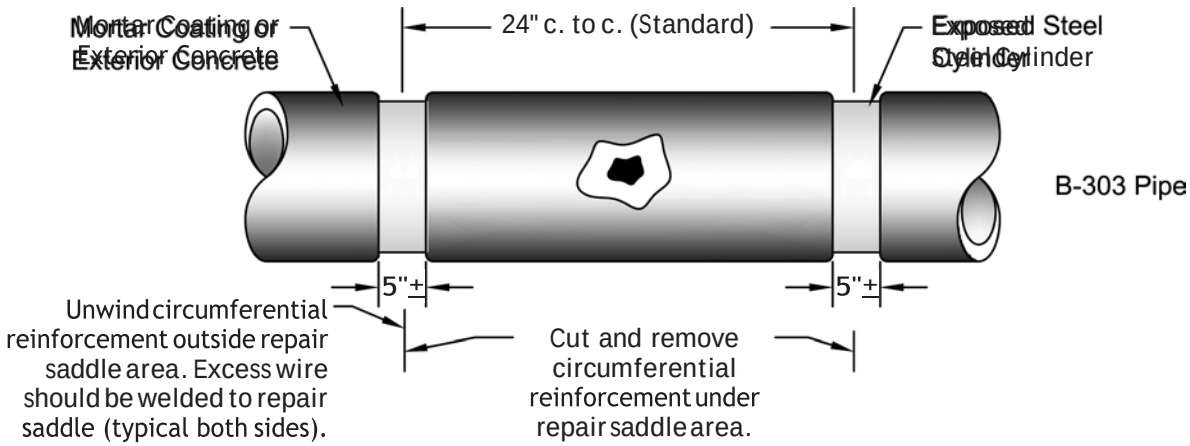
Repair Procedures (Cont.)

Weld-On Repair Saddle (Cont.)

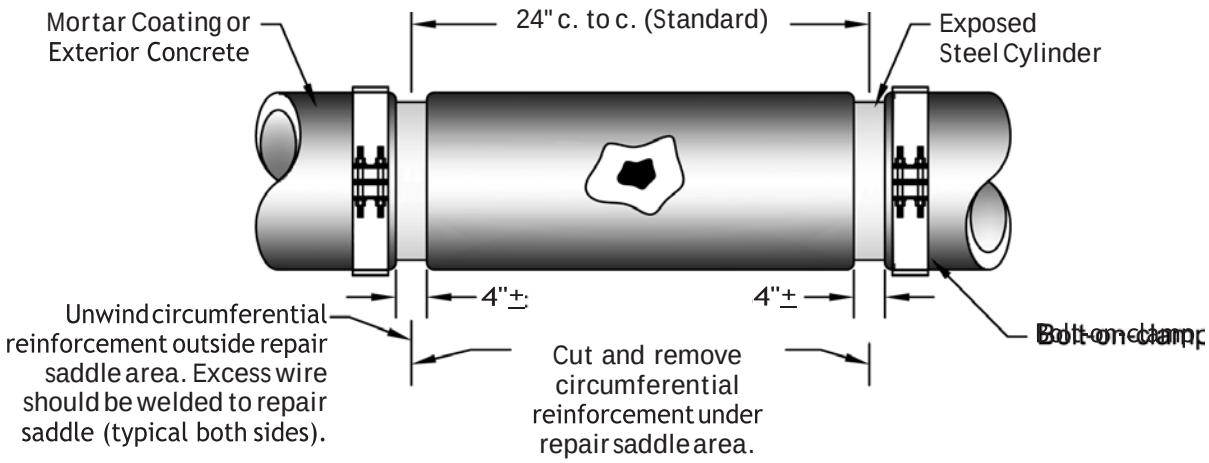
B-303, L-301 and V-300 Repair Procedure (Cont.)

3. Cut and remove circumferential reinforcement in the area of each 5" (127 mm) band which will be under the repair saddle. Unwind the circumferential reinforcement in the area of each band which will be outside the repair saddle. This exposes the bare cylinder for welding.

B-303



L-301



Repair Procedures (Cont.)

Weld-On Repair Saddle (Cont.)

B-303, L-301 and V-300 Repair Procedure (Cont.)

4. Remove the plugs and place the two halves of the repair saddle around the pipe. Tighten the halves together using a set of come-alongs. Weld the two halves of the repair saddle to the pipe and each other using watertight welds (see Caution). One outlet is positioned at the bottom to allow water to escape.

5. Rewind the circumferential reinforcement outside each end of the saddle around the pipe so it is placed in its original location. Weld each free end of the reinforcement to the saddle or, for prestressing wire, place a full circle bolt-on-clamp on either end of the weld-on-clamp and tighten down on the outside of the mortar coating.

6. Install the plugs in the couplings.

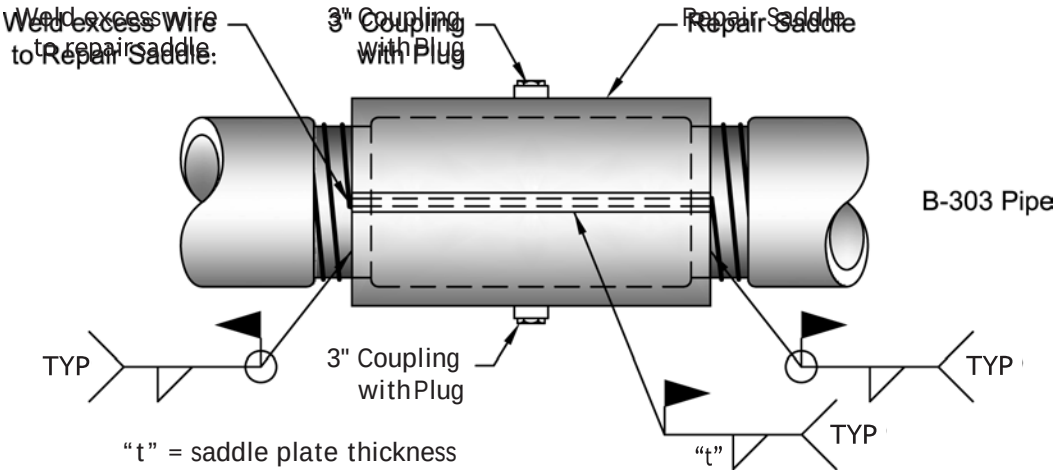
7. Inspect the repair saddle for any leaks and repair as necessary.

8. If possible, drain the recess between the saddle and pipe and refill it with a cement slurry.

9. Reinstall and tighten plugs.

10. Protect all exposed steel with a 1" (25 mm) minimum thickness cement mortar.

B-303

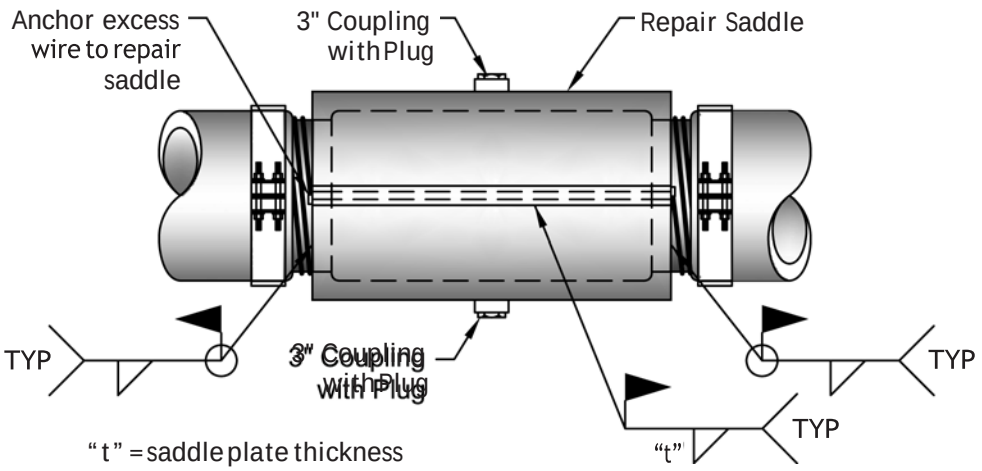


Repair Procedures (Cont.)

Weld-On Repair Saddle (Cont.)

B-303, L-301 and V-300 Repair Procedure (Cont.)

L-301



Caution

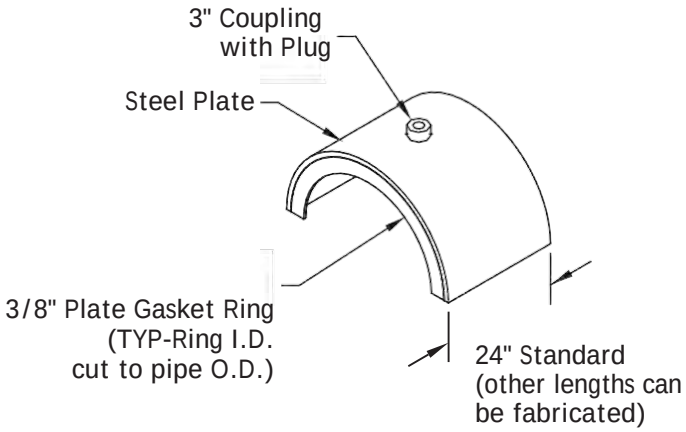
This repair requires welding to a pipe cylinder which may be as thin as 16 gauge (0.0598"/1.5 mm). Only welders experienced in making watertight welds on thin steel should attempt this procedure.

Repair Procedures (Cont.)

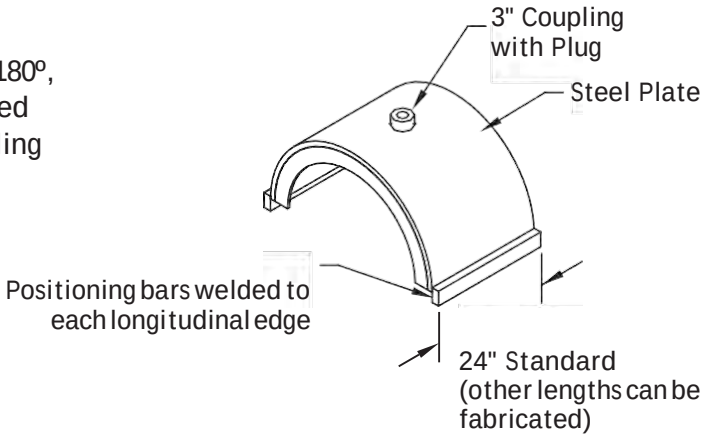
Weld-On Repair Saddle (Cont.)

B-303 and L-301

Top Piece:
steel plate typically 24" long, rounded 180º, with 3" coupling with plug, attached to two 3/8" plate 180º rings.



Bottom piece:
steel plate, typically 24" long, rounded 180º, with full length "t" thickness bars welded to each longitudinal edge, with 3" coupling with plug, attached to two 3/8" plate 180º rings.



Note

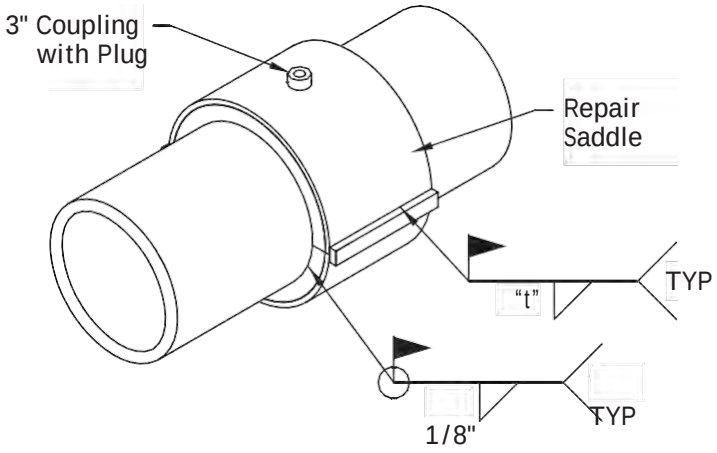
Steel plate thickness "t" (in inches) may be calculated by the formula:

$$\text{"t" Min} = \frac{\text{(I.D. Saddle) (Working Pressure)}}{\text{2 (15,000 psi Steel Stress)}}$$

Repair Procedures (Cont.)

Weld-On Repair Saddle (Cont.)

- **Assembled Repair Saddle**

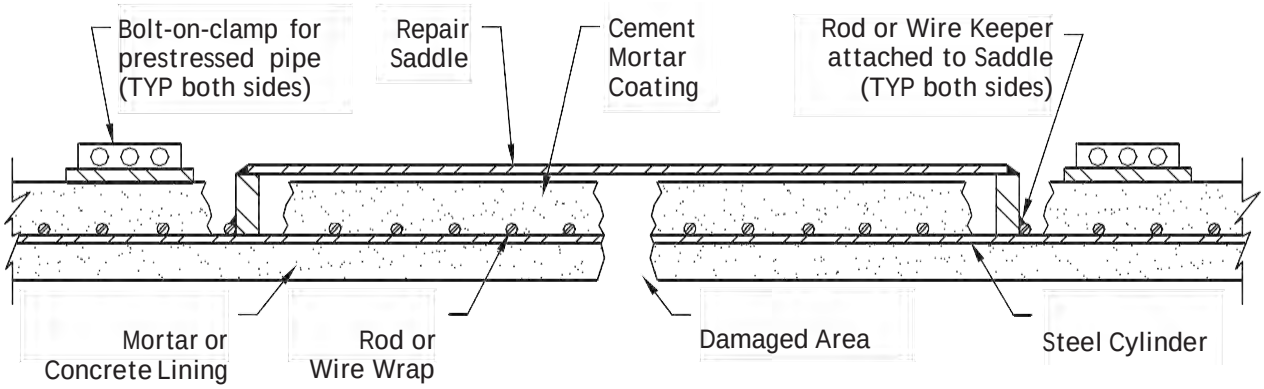


Note

"t" = Saddle plate thickness.

Coating and rod or wire not shown for clarity.

Cross Section View



Repair Procedures (Cont.)

Gasket Repair Saddle

C-302 and V-302 Repair Procedure

1. Excavate necessary clearance around the damaged area of pipe for installation of repair saddle. Recommended clearances are shown in drawing below.

2. The gasket repair saddle is designed to be installed around the outside circumference of C-302 or V-302 pipe, so the outside of these pipes should be scrubbed or brushed clean. It is not necessary to remove any concrete or mortar from C-302 or V-302 pipe for the saddle to be installed.

3. Wrap two – 15/16" rubber gaskets circumferentially around the pipe (one on each side of the damaged area) and splice together using Eastman 910 glue or equal. Lubricate the rubber gaskets.

4. Place two grommet gaskets on each 15/16" gasket so the grommet gaskets will be compressed between the gasket saddle halves. Remove the coupling plugs and place the two halves of the repair saddle over the damaged area of the pipe so the 15/16" gaskets fit in the gasket grooves of the saddle and so the grommet gaskets are between the saddle halves. One coupling is positioned at the bottom to allow water to escape; the other is positioned at the top to allow a quick setting grout to be poured into the recess between the pipe and the saddle. Tighten the two halves together using a set of come-alongs. Weld the two halves of the saddle together.

5. Bend the #12 gauge (0.1046") flaps over the grommet gaskets. Weld the flaps to the saddle gasket rings.

6. Install a plug in the bottom coupling.

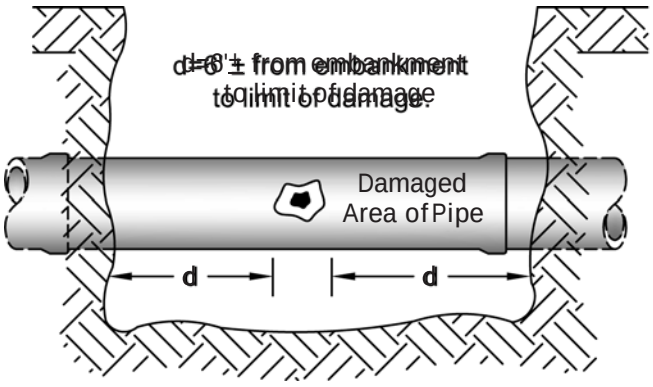
7. Inspect the repair saddle welds for any leaks and repair as necessary.

8. Pour or inject a quick setting grout to completely fill the interior recess of the repair saddle.

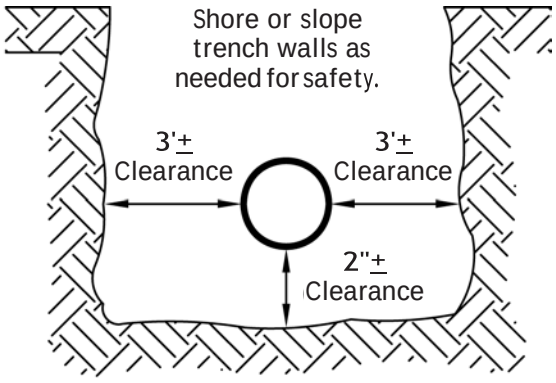
9. Reinstall a plug in the top coupling and tighten.

10. Protect all exposed steel with a 1" minimum thickness cement mortar.

Side View



End View

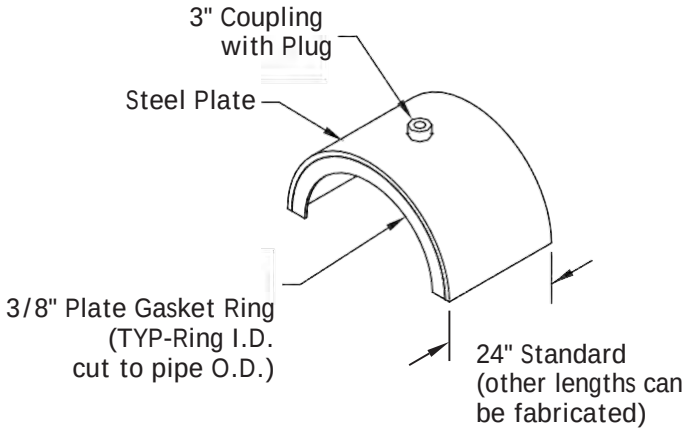


Repair Procedures (Cont.)

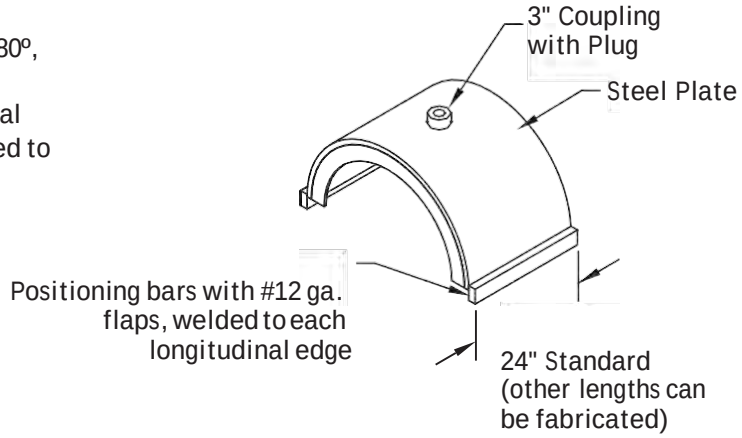
Gasket Repair Saddle (Cont.)

C-302 and V-302

Top Piece:
steel plate typically 24" long, rounded 180º, with 3" coupling with plug, attached to two 3/8" plate 180º gasket groove rings.



Bottom piece:
steel plate, typically 24" long, rounded 180º, with full length "t" thickness bars with #12 ga. flaps welded to each longitudinal edge, with 3" coupling with plug, attached to two 3/8" plate 180º gasket groove rings.



Note

Steel plate thickness "t" (in inches) may be calculated by the formula:

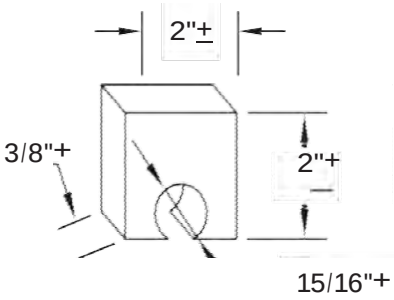
$$\text{"t" Min} = \frac{\text{(I.D. Saddle) (Working Pressure)}}{\text{2 (15,000 psi Steel Stress)}}$$

Coating and rod or wire not shown for clarity.

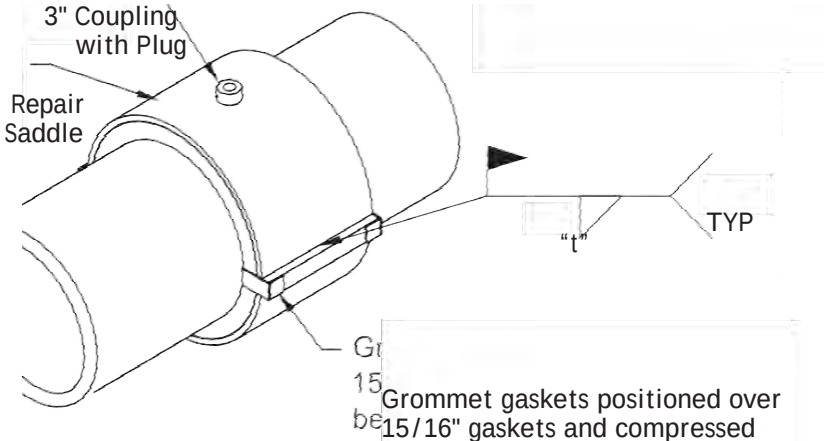
Repair Procedures (Cont.)

Gasket Repair Saddle (Cont.)

Assembled Repair Saddle



Grommet Gasket

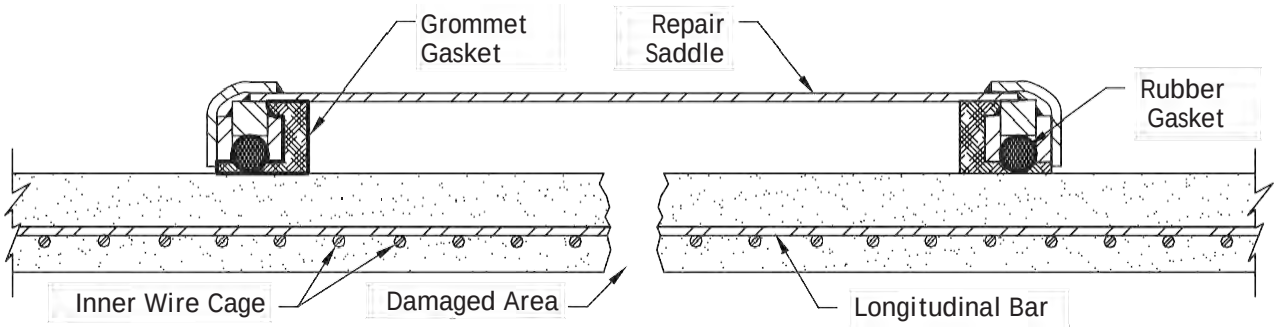


Grommet gaskets positioned over 15/16" gaskets and compressed between saddle halves. #12 ga. flaps bent over grommet gaskets and welded to gasket rings.

Note

"t" = Saddle plate thickness

Cross Section View



Repair Procedures (Cont.)

Dry Tap

B-303 Repair Procedure

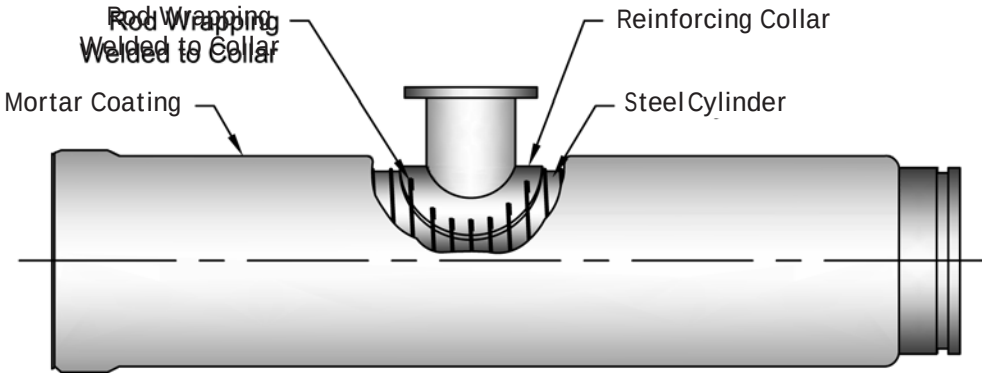
1. Place steel reinforcing collar on pipe centered at the desired location of the outlet and mark an area approximately 2" (50 mm) larger than the area covered by the collar. Remove all coating within this area. Again, place the collar on the pipe at the desired location and mark on the reinforcing rods the outer limits of the collar. Remove the collar and flame cut the rods about 1" (25 mm) inside the area marked. Bend the rods away from the pipe cylinder to permit placing the collar on the cylinder.

2. Place collar on cylinder and weld collar to cylinder around outside of collar using a watertight weld (see Caution). Bend reinforcing rods down against collar and weld rods securely to collar.

3. Position outlet neck in center of outlet opening. Mark opening from inside of outlet. Remove outlet neck and flame cut cylinder as marked. Carefully remove mortar lining from outlet area.

4. Position outlet neck over opening and weld around outside, completely filling space between collar and outlet neck with weld metal, making sure a strong watertight weld is obtained.

5. Close the outlet in a manner that assures watertightness. Cover all exposed steel with a 1" (25 mm) minimum thickness cement mortar.



Caution

This repair requires welding to a pipe cylinder which may be as thin as 16 gauge (0.0598"/1.5 mm). Only welders experienced in making watertight welds on thin steel should attempt this procedure.

Repair Procedures (Cont.)

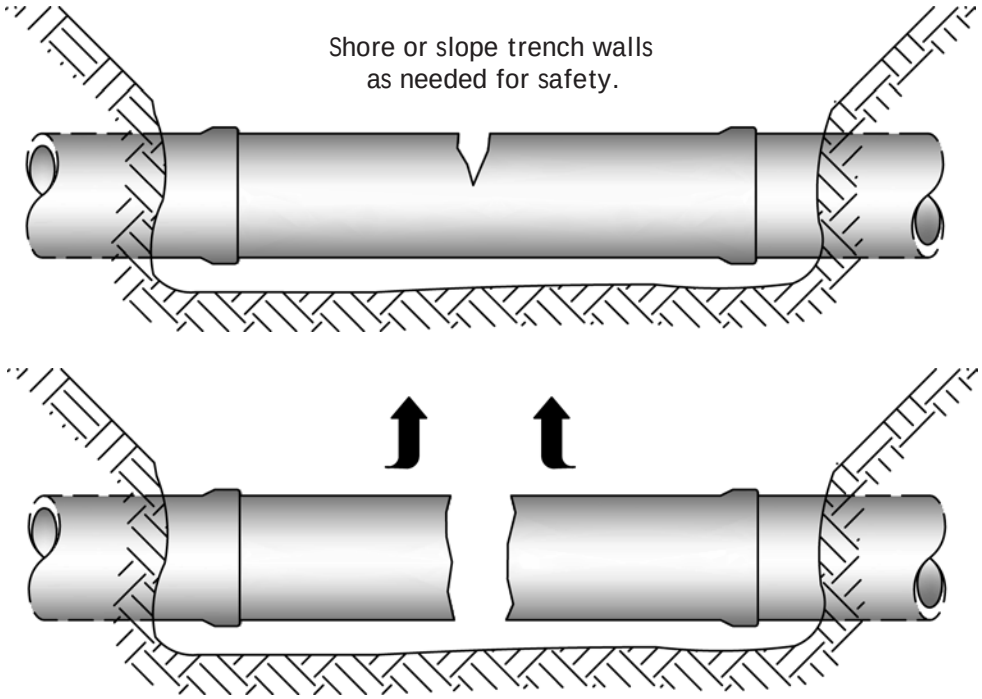
Damaged Pipe Removal for Closure Placement

All Types of Concrete Pressure Pipe Repair Procedure

1. Excavate the area around the damaged section of pipe to adequately expose its entire length.

2. Cut or break out a section approximately 12" (304 mm) long from the damaged pipe. On prestressed or pretensioned pipe this can be accomplished by: (1) chipping a 12" (304 mm) longitudinal by 2" (50 mm) circumferential slot in the coating to expose the wire or rod wrap; (2) cutting the wire or rod with a chisel or torch, (thus safely relieving the wire stress if the pipe is prestressed; (3) forcing a chisel or chipping gun between the wire or rod and the substrate and peeling the wrap and coating off; and (4) cutting the remaining cylinder or core with a torch and/or chipping gun. Alternatively, all types of pipe can be broken with backhoe teeth, a pneumatic spade or with a carbide-tipped circular saw. All steel can be severed with a cutting torch (though workers should avoid hand-cutting stressed, unrestrained prestress wire because of the potential for injury from wire recoil).

3. Carefully work each remnant pipe end up and down until its joint disengages in a manner that does not damage the adjacent pipe joints. Remove the remnants and clean the adjacent bell and spigot in the trench. If necessary, stabilize the subgrade with crushed rock or other suitable material.



Note

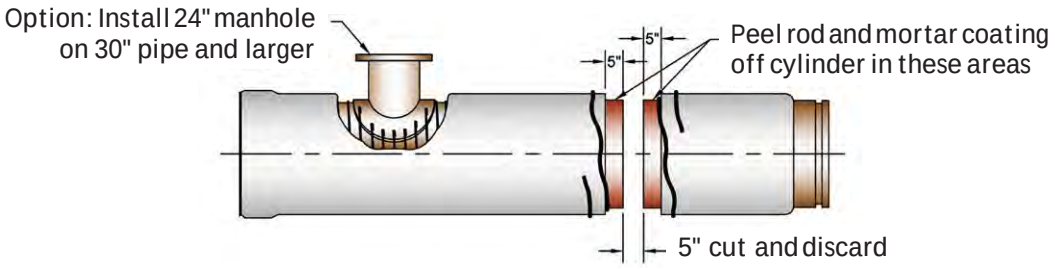
Equipment required: backhoe or drag-line for excavation; backhoe, crane or side-boom tractor for handling pipe; cutting torch; air compressor, water pump hoses, chains, cable slings, lights, ratchet type hoists.

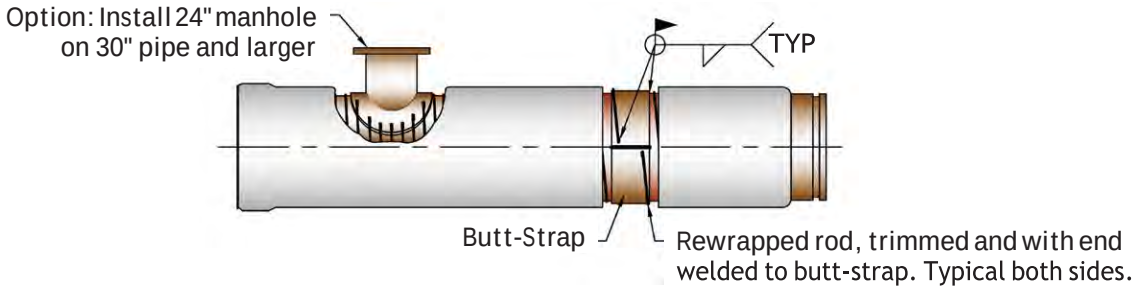
Repair Procedures (Cont.)

B-303 Cut Pipe Closure

Installation Procedure

1. Remove damaged pipe in the manner described on previous page.
2. On the replacement pipe, cut a 5" (127 mm) wide section from the middle of the pipe length using an abrasive circular saw, a chipping gun and cutting torch or similar suitable equipment.
3. Force a chisel or similar instrument carefully between the rod and cylinder and "unpeel" the rod and coating off the cylinder for 5" (127 mm) longitudinally back from each cut end. Do not cut the rod or puncture the cylinder.
4. Using the B-303 Dry Tap procedure described on page 28, install a 24" (609 mm) manhole outlet on pipe 30" (762 mm) or larger to provide access to mortar the butt-strap interior.
5. Position the halves around the cylinder and tighten them in position with a come-along. Place watertight fillet welds between the butt-strap and the cylinder around the circumference of each end of the butt-strap. Place a watertight full penetration butt weld at the longitudinal edges between the butt-strap halves.





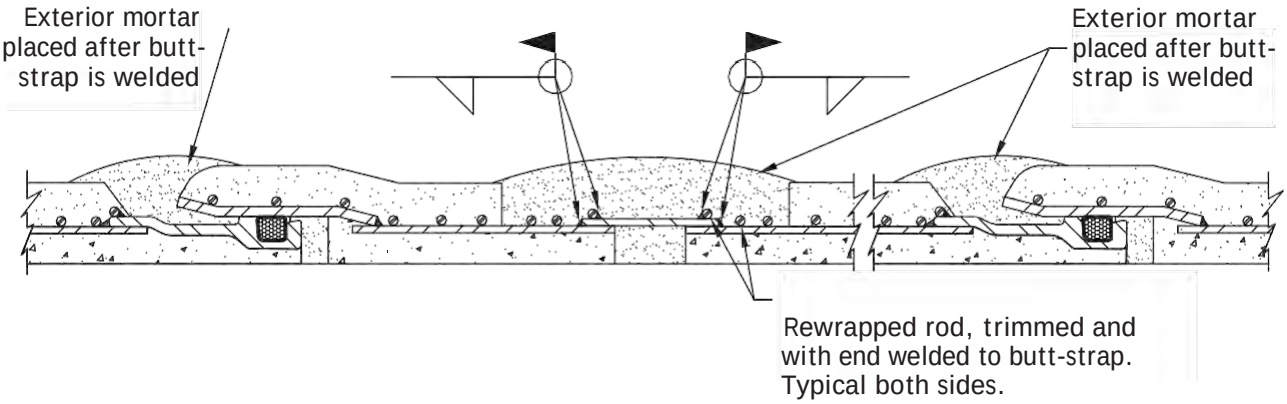
Repair Procedures (Cont.)

B-303 Cut Pipe Closure (Cont.)

Installation Procedure (Cont.)

6. Rewind the rod wrap snugly against the cylinder at the original wrap spacing. Trim the rod after it overlaps the butt-strap and weld the rod end to the butt-strap.

7. Coat all exposed steel with a 1" (25 mm) minimum thickness cement mortar.



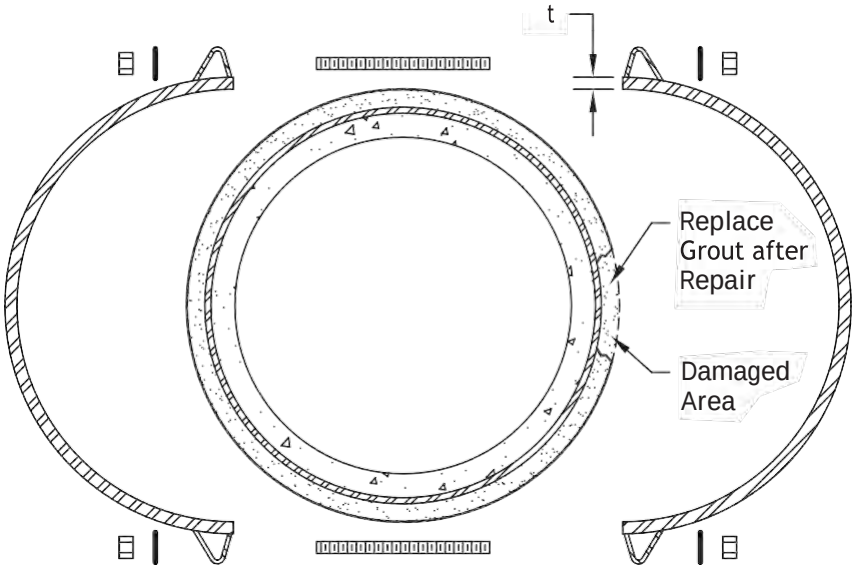
Repair Procedures (Cont.)

Reinforcing Clamp

L-301 and E-301 Repair Procedure

1. Remove loose mortar or concrete around the damaged area outside the cylinder. If the cylinder is visible, visually inspect it to assure the cylinder is watertight and has not been torn, split or punctured. The cylinder must be watertight before proceeding with the repair.
2. Secure clamp to pipe so one clamp half covers the repair area.
3. Coat all exposed steel of clamp and bolts with a 1" (25 mm) minimum thickness cement mortar.

Component Parts – Assembly



Note

Steel plate thickness "t" (in inches) may be calculated by the formula:

$$\text{"t" Min} = \frac{\text{(I.D. Saddle) (Working Pressure)}}{\text{2 (15,000 psi Steel Stress)}}$$

All gasketed joints could be sealed by full circumferential welds if use of gaskets is not feasible.

PRICE BROTHERS EMERGENCY REPAIR MANUAL

Price Brothers Company
Concrete Pressure Pipe
EMERGENCY REPAIR MANUAL

Your basic emergency repair procedure 2

Checklist of critical questions 3

Seven steps to replacing damaged pipe sections 4

Dimensions and weights of concrete pressure pipe 6

Field repair welding details 7

LCP follower ring closure — 16- through 48-inch diameters 8

ECP follower ring closure — 24- through 84-inch diameters 9

ECP field-welded closure — 90- through 144-inch diameters 10

LCP repair saddle installations 11

If you need to call us 12

Your basic emergency repair procedure

Prestressed concrete cylinder pipe (PCCP), manufactured by Price Brothers Company, is conservatively designed to insure safe, reliable, and sustained operation under normal and transient conditions.

Unfortunately, due to accidents, it is sometimes necessary to repair or replace a length of concrete pressure pipe in a line. Whereas we cannot design a pipe to withstand an accidental encounter with a backhoe or jackhammer, we can provide you with a course of action to follow if such an event should occur.

This booklet has been prepared to support your initial response to such an emergency and enable Price Brothers Company to respond quickly to your needs.

All the Price Brothers pressure pipe plants stock replacement pipe sections, closures, and other parts needed for emergency repairs. These repair sections are available in 16- and 20-foot lengths. We also stock repair saddles for 16-inch through 48-inch lined cylinder pipe. Our engineering staff and field service representatives are available to assist you in an emergency. Call Price Brothers' toll-free service telephone number **1-800-445-1534** to get information and help.

Please review this manual and familiarize yourself with the materials and methods used to make a repair, giving special attention to the type and sizes of pipe in your system. You may wish to include in your reference copy of this manual a line drawing showing the location, size, and type of PCCP in your system.

If a leak should occur...

The facing page presents a series of questions. The more questions you can answer, the easier it will be for us to assist you. Questions 1 through 5 cover the most critical information we need in order to send the correct repair materials promptly.

If the extent of the damaged area is less than 10 inches in diameter, a repair saddle may suffice. If the damage exceeds this size, a replacement pipe section is needed.

All pipe stocked by Price Brothers Company for emergency repair use, in diameters from 16 through 96 inches, is designed for an internal operating pressure of 200 psi, although it can be

used for operating pressures up to 250 psi in an emergency. Allowable operating pressure for stock emergency repair materials above 96-inch diameters is shown on Page 10. If your system has higher operating pressures than our repair stock, you may want to consider stocking your own pipe repair material to suit your required pressure.

If the problem turns out to be a leak in a joint due to a looped or cut gasket, and the pipe sections are not damaged, the joint can be sealed by field welding as shown on Page 7.

Please try to answer these key questions before calling Price Brothers

1. What is the size and type of pipe that's been damaged?
   - A. Inside diameter_____
   - B. Lined cylinder pipe_____
   - C. Embedded cylinder pipe_____

2. Is it an outlet pipe? _____
   - Outlet size_____
   - Outlet type:
   - A. Price Brothers joint_____
   - B. Flange joint_____
   - C. MJB_____
   - D. MJS_____
   - E. Other_____

3. Is the damaged pipe a fitting?_____
   - A. Tee/Wye_____
   - B. Elbow (angle of deflection)_____
   - C. Reducer_____
   - D. Adapter (type of joints)_____
   - E. Other _____

4. Do you have clear directions to the site of the damage or to a delivery point?

5. Do you have the name and phone number of the key person Price Brothers is to contact?

6. What is the operating pressure of the line?
   PSI_____ Feet of head _____

7. What is the laying length of the damaged pipe? 20 feet_____ 16 feet_____

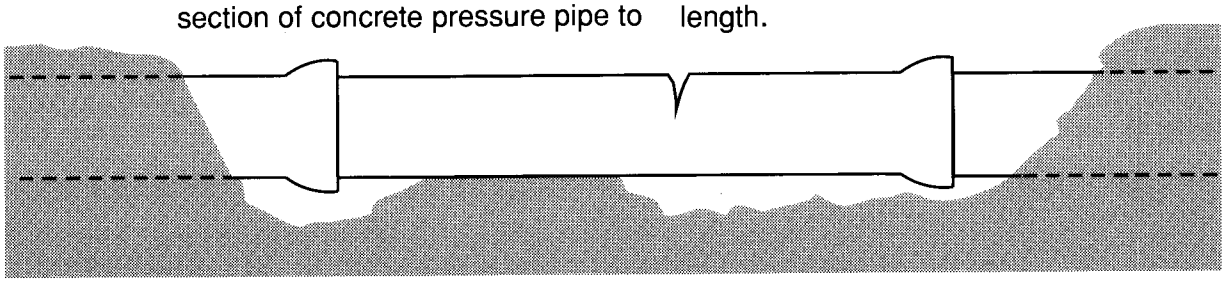
8. Is the extent of damage larger than 10 inches in diameter? Is it near a joint?

9. Is the damaged pipe a special piece?
   - A. Full or half bevel_____
   - B. Restrained joint_____
   - C. Is pipe double coated, painted, bonded, etc.?

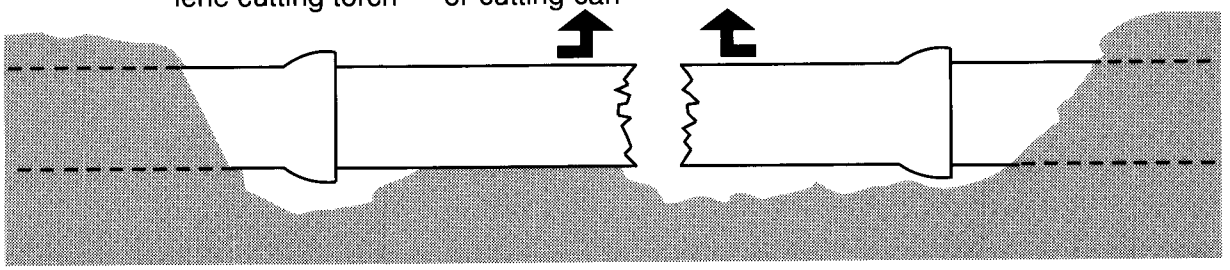
10. Do you need Price Brothers personnel to assist in the repair?

Seven steps to replacing pressure pipe sections

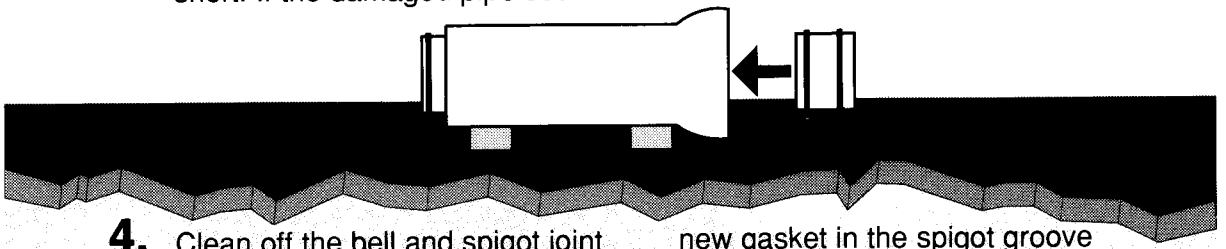
1. Excavate area around the damaged section of concrete pressure pipe to adequately expose its entire length.



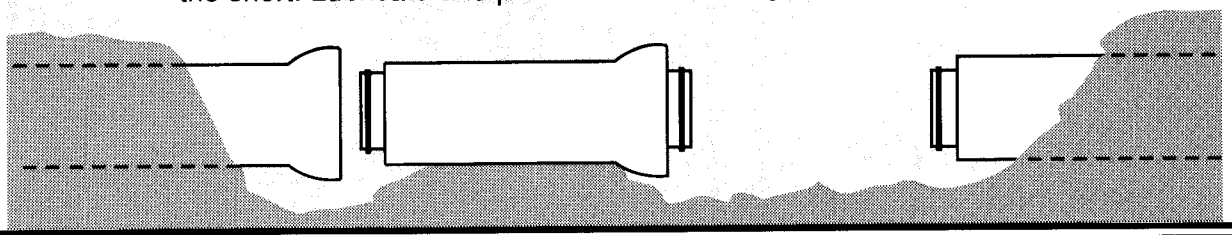
2. Cut or break out a section from the damaged pipe and remove both the bell and spigot ends. The concrete can be broken by the backhoe teeth and the cylinder cut with an acetylene cutting torch — or cutting can be done by using a carbide-tipped circular saw or pneumatic spade. Remove the damaged section carefully to avoid harming the adjoining sections.



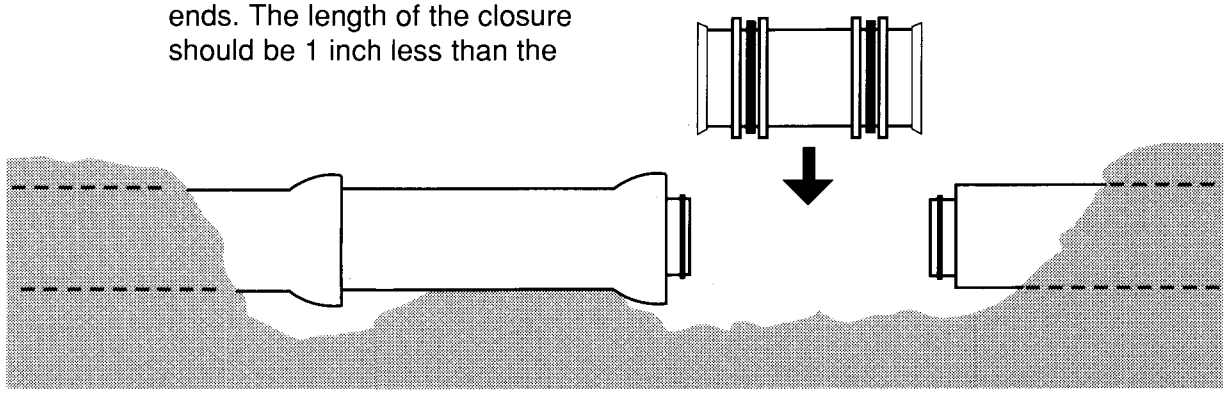
3. Pre-assemble a double-spigot adapter into the bell end of the short. If the damaged pipe section was a bevel, install a full- or half-bevel adapter on the spigot end of the short.



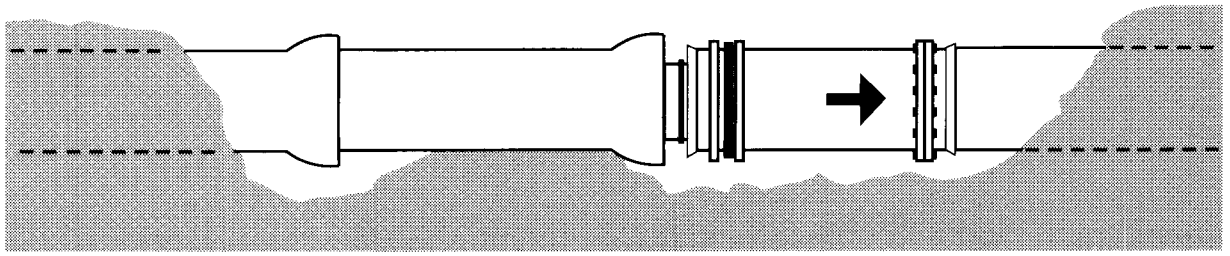
4. Clean off the bell and spigot joint areas of the adjoining pipe sections. Install the double-spigot adapter in the short. Lubricate and place a new gasket in the spigot groove of the short. Lay the short carefully to avoid damage to the existing joint surfaces.



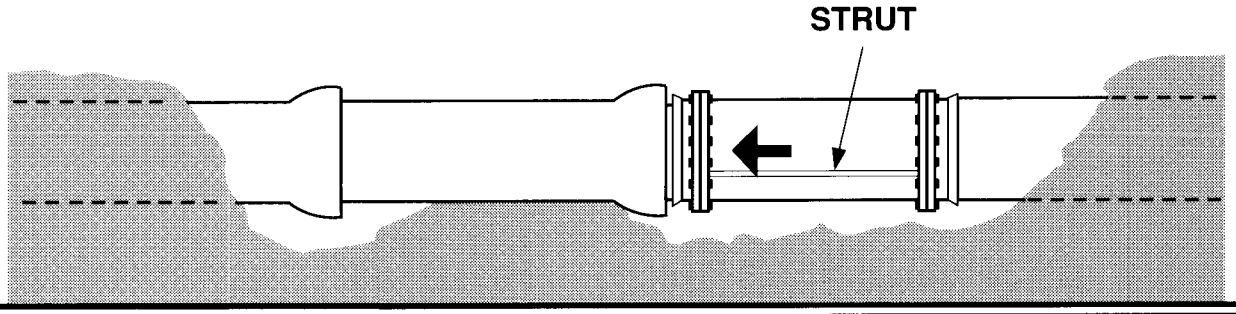
5. Preassemble the follower rings, gaskets, and bell rings on the closure barrel, and measure the clear distance between the spigot ends. The length of the closure should be 1 inch less than the clear distance. Cut the closure, if necessary, using a carbide-blade saw.



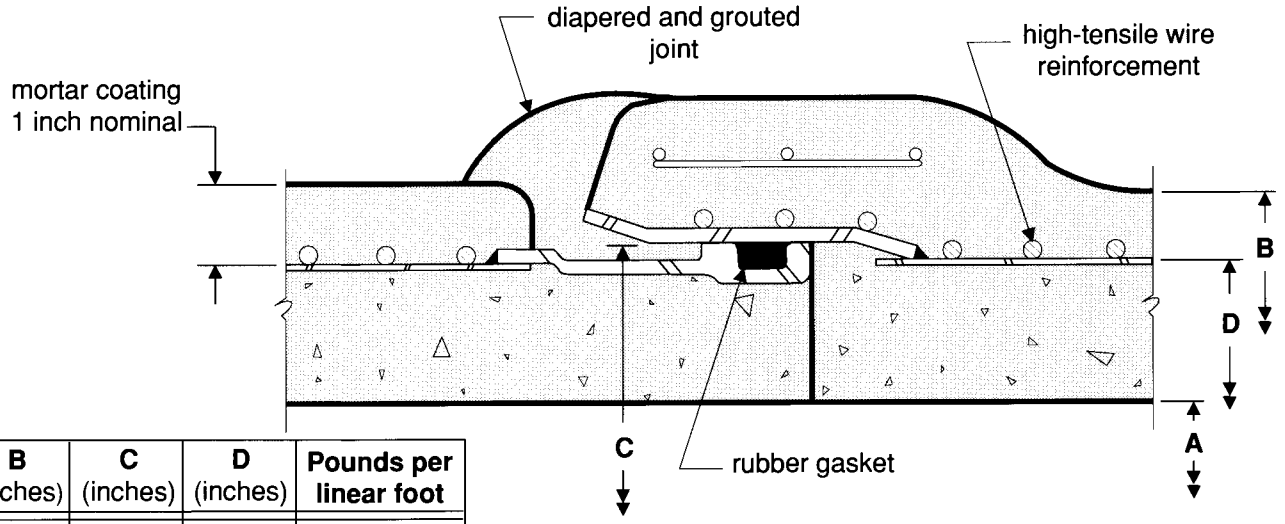
6. Lower the closure carefully and align it with the double-spigot adapter and the spigot of the adjoining pipe section. Install the closure as shown using a come-along to pull the bell rings over the spigots. Roll the 15/16-inch closure gaskets into position and compress them with the follower rings by tightening the bolts. (For a welded closure, see the detail drawing on Page 10.)



7. Place a minimum of two struts between the follower rings. When the struts are in place, turn the water back on and pressurize the line while checking for leaks. Tighten the bolts further, if required. When the line is back in service, encase the closure area in concrete to provide corrosion protection. Then diaper and grout the other joint.

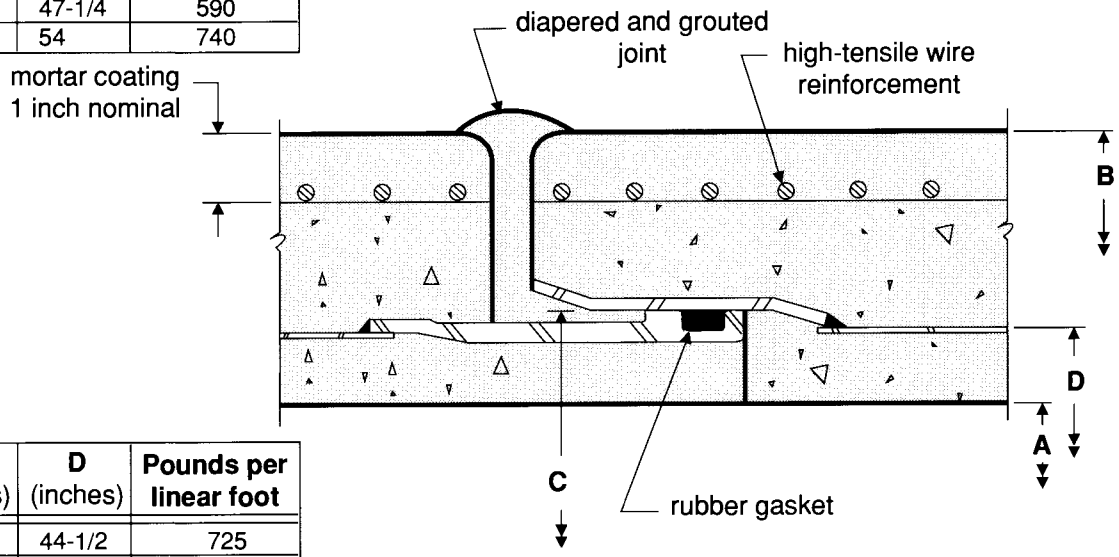


Dimensions and weights of concrete pressure pipe



A (inches)	B (inches)	C (inches)	D (inches)	Pounds per linear foot
16	20	18-1/2	18	135
18	22-1/4	20-3/4	20-1/4	155
20	24-1/2	23	22-1/2	185
24	29	27-1/2	27	245
30	35-3/4	34-1/4	33-3/4	345
36	42-1/2	41	40-1/2	460
42	49-1/4	47-1/4	47-1/4	590
48	56	54	54	740

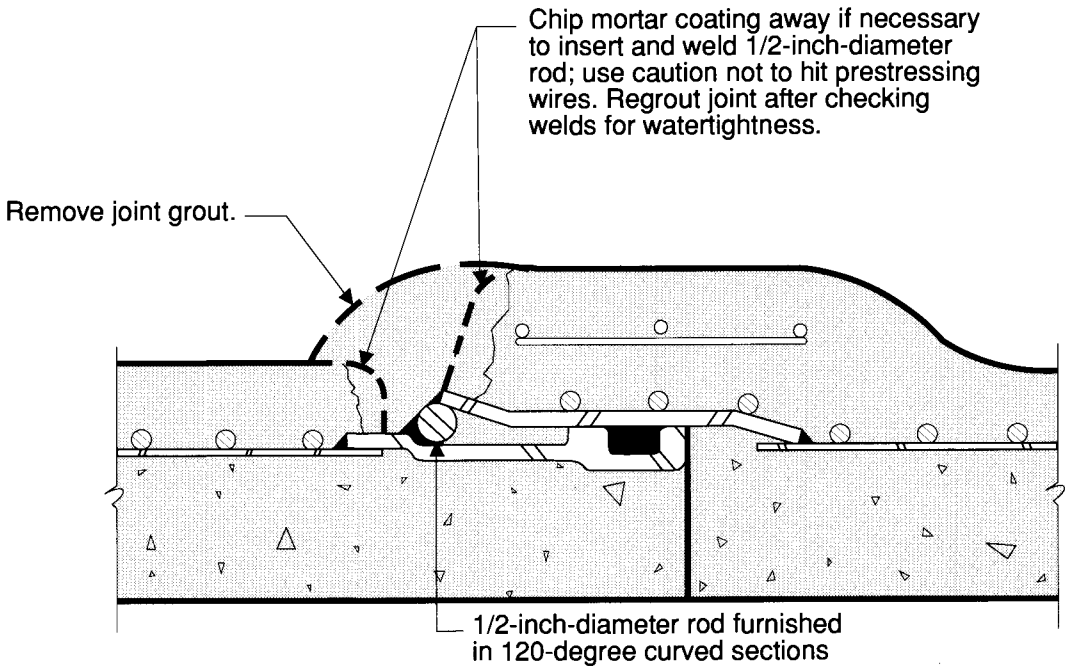
Lined cylinder pipe



A (inches)	B (inches)	C (inches)	D (inches)	Pounds per linear foot
42	51	45	44-1/2	725
48	58	51-1/4	50-3/4	900
54	64	57-3/4	56-7/8	1000
60	70	63-7/8	63	1125
66	78	70-1/8	69-1/4	1500
72	85	76-3/8	75-1/2	1780
78	90	82-1/2	81-5/8	1750
84	99	88-3/4	87-7/8	2390

Embedded cylinder pipe

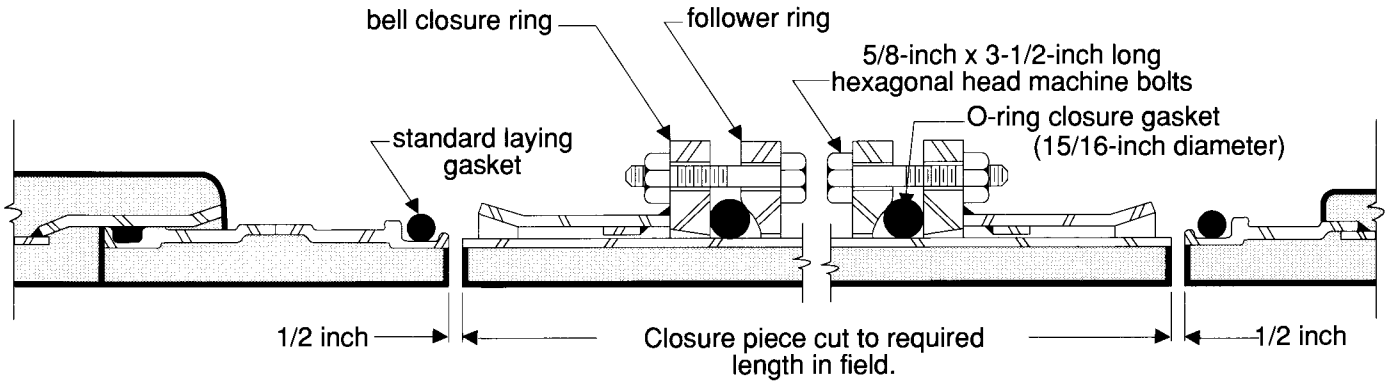
Field repair welding details for lined cylinder pipe



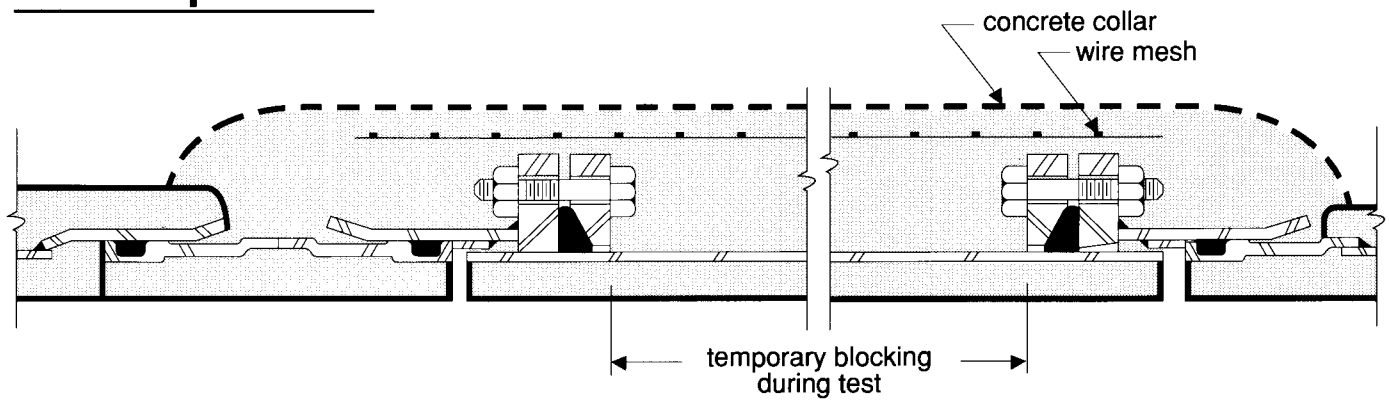
Note:
Watertight 3/16-inch field welds required.

Lined cylinder pipe (LCP) follower ring closure — 16- through 48-inch diameters

Open position



Closed position



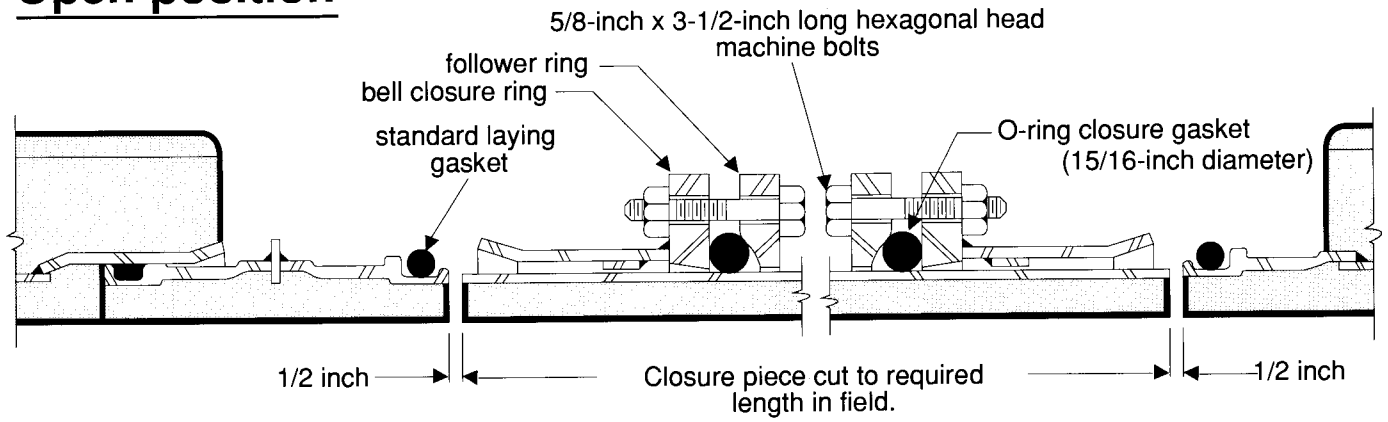
Follower ring closures must be pressure tested before the concrete collar is cast.

During testing, block the follower rings as shown to prevent them from sliding.

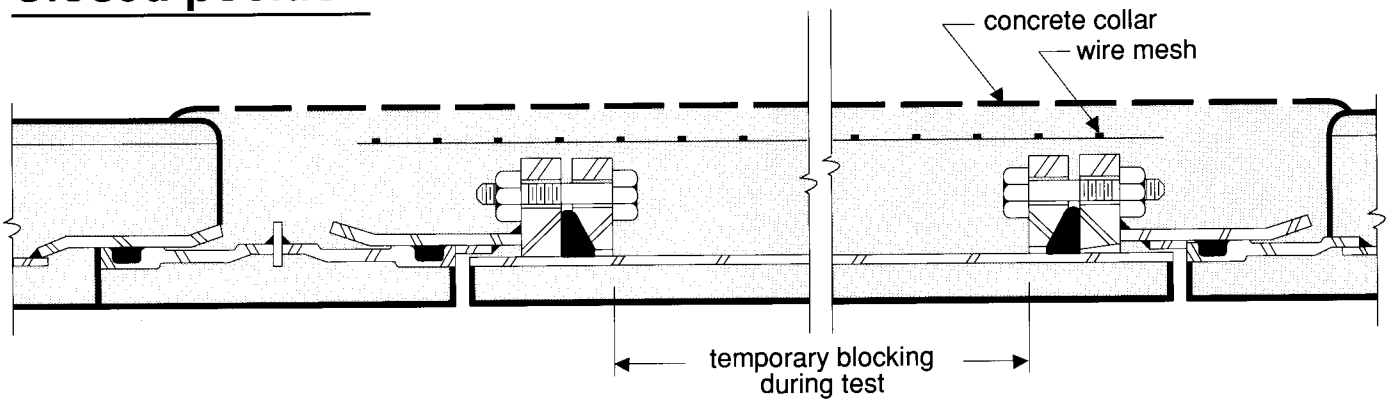
Emergency closures are designed for operating pressures up to 200 psi.

Embedded cylinder pipe (ECP) follower ring closure — 24- through 84-inch diameters

Open position



Closed position

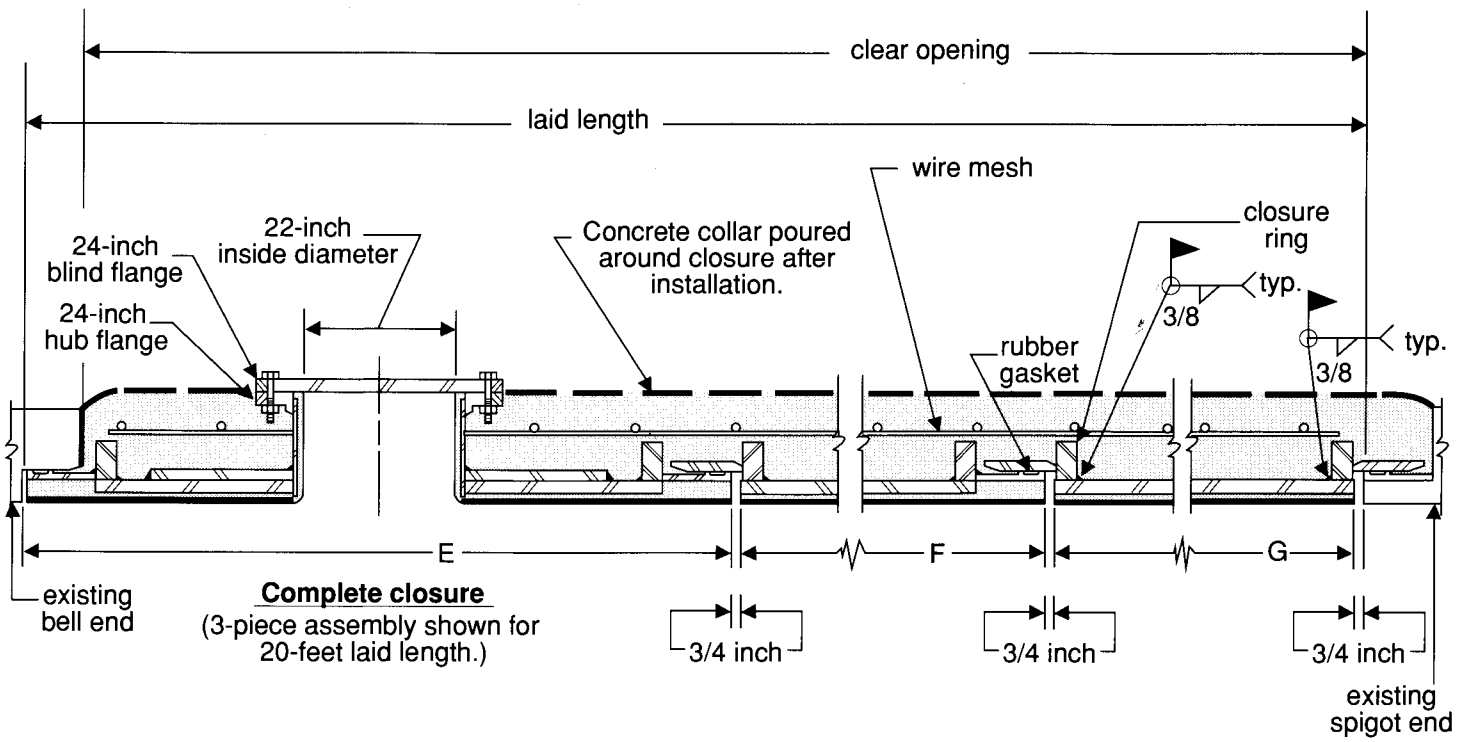


Follower ring closures must be pressure tested before the concrete collar is cast.

During testing, block the follower rings as shown to prevent them from sliding.

Emergency closures are designed for operating pressures up to 200 psi.

ECP field-welded closure — 90- through 144-inch diameters



Pipe inside dimensions (inches)	LAID LENGTH									Operating pressure (psi)
	12 feet nominal length			16 feet nominal length			20 feet nominal length			
	E (feet-inches)	F (feet-inches)	G (feet-inches)	E (feet-inches)	F (feet-inches)	G (feet-inches)	E (feet-inches)	F (feet-inches)	G (feet-inches)	
90				7 - 11		8 - 0	7 - 11	3 - 11-1/4	8 - 0	215
96				7 - 11		8 - 0	7 - 11	3 - 11-1/4	8 - 0	200
102				7 - 11		8 - 0	7 - 11	3 - 11-1/4	8 - 0	190
108				7 - 11-1/8		8 - 0	7 - 11-1/8	3 - 11-1/4	8 - 0	180
114				7 - 11-1/8		8 - 0	7 - 11-1/8	3 - 11-1/4	8 - 0	165
120				7 - 11-1/8		8 - 0	7 - 11-1/8	3 - 11-1/4	8 - 0	160
126	3 - 11-5/8		8 - 0	7 - 11-1/8		8 - 0				150
132	3 - 11-5/8		8 - 0	7 - 11-1/8		8 - 0				145
138	3 - 11-1/8		8 - 0	7 - 11-1/8		8 - 0				140
144	3 - 08-1/8		8 - 0	7 - 11-1/8		8 - 0				135

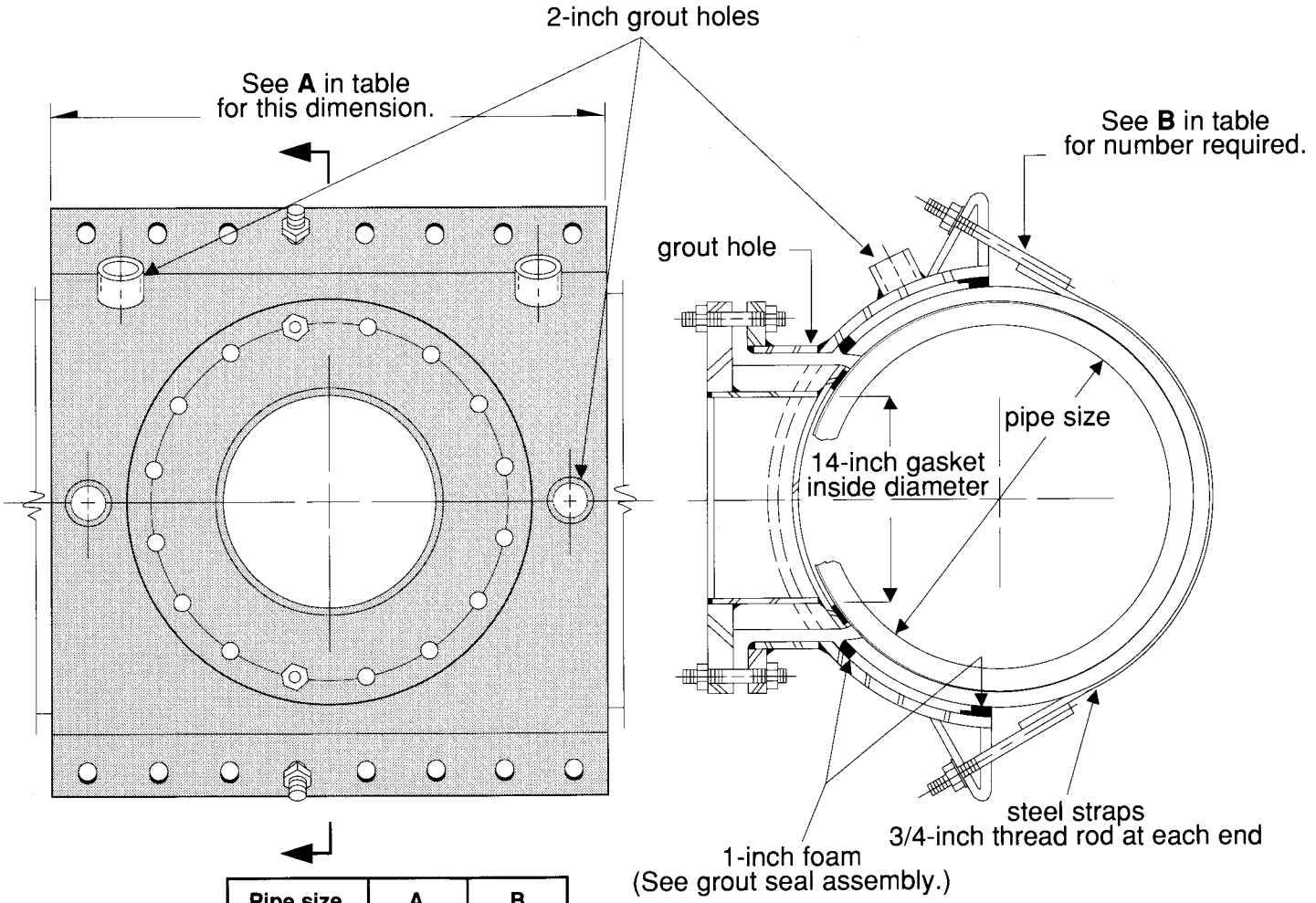
When using this field-welded closure, the welds shown are not designed for use in restrained areas.

These closure rings are designed to be welded to the cylinder around the pipe's full circumference and must be watertight.

When the adjacent pipe class exceeds the allowable pipe class, additional rod reinforcement is required.

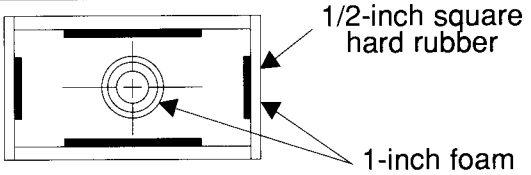
After testing, a concrete collar is poured around the entire closure.

LCP repair saddle installations



Pipe size (inches)	A (inches)	B (quant.)
16	32	8
18	32	8
20	32	8
24	36	9
30	40	10
36	48	12
42	56	14
48	60	15

Grout seal assembly



Once it is installed and tested, but prior to backfilling, the entire repair saddle including straps should be encased in portland cement mortar or concrete to provide a covering at least 1 inch thick over the external steel surfaces.

Four 2-inch-threaded pipe nipples are provided for grouting under the saddle. Use the two nearest the crown of the pipe and plug the other two nipples with 2-inch-threaded caps.

If there's ever an emergency repair needed for your concrete pressure pipe . . .

In the event of any emergency involving a leak in your concrete pressure pipe, you will need to make a prompt and complete repair.

Excavating and examining the pipe will answer immediately many of the critical questions outlined on Page 3. Your engineering drawings and records for the line will also provide important information.

The Price Brothers toll-free service information number will be answered day or night. Soon after you leave your emergency message and telephone number with our operator, a qualified technical representative will respond to learn more about the problem and begin taking appropriate action.

Price Brothers is prepared to send a replacement pipe section and factory trained service personnel to help your crew make a prompt repair.

Additional copies of this Emergency Repair Manual can be obtained from your Price Brothers representative or by writing to Pressure Pipe Division, Price Brothers Company, P.O. Box 825, Dayton, Ohio 45401-0825.

immediately call toll-free 1-800-445-1534

PRICE BROTHERS

PRESSURE PIPE DIVISION

APPENDIX C

Appendix C

PCCP Water Main Repairs

C.1 General

The work shall comply with the "Standards for Construction and Use of Public Rights-Of-Way and Easements", latest edition, as issued by the City of WPB Engineering Services Department. Any conflict or discrepancy between this document and the standards are to be presented to the Owner for clarification.

C.2 Scope

A. Furnish all labor, materials including repair kits, equipment and incidentals required to complete and make ready for operation as specified herein.

B. Refer to the "Standards for Construction and Use of Public Rights-Of-Way and Easements", latest edition, as issued by the City of WPB Engineering Services Department for products not specified in this section.

C. Materials not specified in this Appendix, Project Specifications or in the "Standards for Construction and Use of Public Rights-Of-Way and Easements", latest edition, as issued by the City of WPB Engineering Services Department shall be directed to the Owner for clarification.

D. This section does not include valves for combustible or flammable liquids or gases.

C.3 Submittals

A. Submit to the Owner, with the draft work items and quantities a list of materials to be furnished and the names of the suppliers.

B. Complete shop drawings, product data, and engineering data for all products shall be submitted to the Owner for approval in accordance with the requirements of General Conditions as outlined in the ITB. Clearly indicate make, model, location, type, size and pressure rating, as appropriate.

C. Operating and maintenance data for all valves shall be furnished to the Owner in accordance with the requirements of these Specifications.

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PCCP Water Main Repairs

C.4 Owner Furnished Materials

A. The Contractor shall submit, in conjunction with the construction progress schedule, a schedule of required deliveries for materials furnished by the Owner. The Contractor shall coordinate material shipments with the Owner and the material suppliers.

B. Materials furnished by the Owner will be delivered by truck. Pipe, fittings, valves and other material to be furnished by the Owner shall be delivered to the Owner's storage yard or another site agreed upon by the Contractor and the Owner. This other site, if selected, is to be provided by the Contractor at no additional cost to the Owner.

C. The Contractor shall maintain communication with the material suppliers and the Owner as necessary, to keep informed as to scheduled shipment, and upon notice to the Contractor of the delivery of materials, the Contractor shall proceed without delay to unload such materials.

C.5 Contractor Furnished Materials

A. Upon receipt of materials from the manufacturer, the Contractor shall make an inspection of such materials; check and certify the bill of lading, noting any discrepancies; obtain a proper memorandum signed by the agent of the carrier for any shortage in the shipment, or for any damaged materials received. All bills of lading and any memorandum for shortage or damage of material in the shipment shall be promptly submitted to the Owner. The Contractor shall be responsible for distribution of all materials as required to complete the work. Materials furnished to the Contractor shall be in the custody of the Contractor from the time of receipt by the Contractor of such materials from the carrier until final acceptance of the completed work. The Contractor shall be responsible for any loss or damage to materials furnished by the Owner.

C.6 Transportation and Handling

A. Unloading: Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves and accessories. Make equipment available at all times for use in unloading. Do not drop or dump

materials. Any materials dropped or dumped will be subject to rejection without additional justification. Pipe handled on skids shall not be rolled or skidded against the pipe on the ground.

B. Handling: Handle pipe, fittings, valves and accessories carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift, or front end loader. Do not use material damaged in handling. Slings, hooks or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior coatings or internal lining of the pipe.

C.7 Storage and Protection

A. Store all pipe which cannot be distributed along the route. Make arrangements for the use of suitable storage areas. All materials shall be stored and protected in accordance with the manufacturer's recommendation.

B. Stored materials shall be kept safe from damage. The interior of all pipe, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage.

C. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails or concrete. Pipe in tiers shall be alternated: bell, plain end; bell, plain end. At least two rows of timbers shall be placed between tiers and chocks, affixed to each other in order to prevent movement. The timbers shall be large enough to prevent contact between the pipe in adjacent tiers.

D. Stored mechanical and push on joint gaskets shall be placed in a cool location out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first in, first out basis.

E. Mechanical joint bolts shall be handled and stored in such a manner that will ensure proper use with respect to types and sizes.

Appendix C

PCCP Water Main Repairs

C.8 Quality Assurance

The manufacturer shall provide written certification to the Owner that all products furnished comply with all applicable requirements of these Specifications.

C.9 Valves

A. General

1. Provide valves of same manufacturer throughout where possible.

2. Provide valves with manufacturer's name and pressure rating clearly marked on the outside of the valve body.

3. All exposed bolts, nuts, and washers for buried or submerged valves shall be stainless steel.

B. Shop Painting

1. All exterior ferrous metal surfaces of exposed or submerged valves and appurtenances shall receive a coating of rust-inhibitive primer compatible with the finish paint. The exterior of all buried valves shall have a factory applied, two coat coal tar epoxy coating system. The coal tar epoxy shall be Tnemec Tneme-Tar 46-413, Indurall Ruffstuff 2100 Coal Tar Epoxy or KopCoat Bitumastic No. 300-M. Each coating shall have a dry film thickness of 8-10 mils.

2. All interior ferrous metal surfaces of valves, except for finished or bearing surfaces, and appurtenances shall be provided with two coat, interior epoxy coating conforming to the requirements of AWWA C550 and NSF 61. The coating shall be equal to Tnemec Series 20 Pota Pox, Valspar Series 78 Hi-Build Epoxy, or KopCoat Hi-Gard Epoxy. The coating system shall have a dry film thickness of 4 - 6 mils. WATER SERVICE.

C. Valves (Butterfly and Gate)

1. Valves shall be 90 degree turn, non-lubricated, eccentric type with resilient faced plugs. Design of the valve shall provide that contact between the seat and the plug shall only occur in the final degrees of plug movement. Valves shall be suitable for throttling service and service where valve operation is infrequent.

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PCCP Water Main Repairs

2. Valves shall provide drip tight shut off up to the full pressure rating with pressure in either direction. Pressure ratings shall be established by hydrostatic tests conducted in accordance with ANSI B16.1. Valves shall be rated at a minimum of 150 psi.

3. Valves shall have a port area equal to at least 80 percent of the full pipe area.

4. Bodies shall be cast iron, conforming to ASTM A 126, Class B (carbon steel for 2 inch valves).

5. Valve ends shall be a mechanical joint type, except where flanged or restrained joint ends are required. Mechanical joint valves shall have bell ends conforming to applicable requirements of AWWA C111/ANSI A21.11. Flanged joints shall meet the requirements of ANSI B16.1, Class 125. Flanged valves with flange to MJ adapters shall not be acceptable in lieu of MJ valves.

6. Valve seats shall be a raised, welded in overlay of not less than 90 percent pure nickel, machined to mate with the resilient faced plug. Overlay shall be a minimum of 1/8 inch thick.

7. The plug shall be of semi steel, conforming to ASTM A 126, Class B. The plug facing shall be a synthetic rubber compound of approximately 70 durometer hardness bonded to the plug. Facing material shall be abrasion resistant and suitable for service in sewage and sludge applications.

8. Valves shall be furnished with replaceable, sleeve type bearings in the upper and lower journals. Bearings shall comply with applicable requirements of AWWA C509 or AWWA C504. Bearing materials shall have a proven record of service of not less than five years.

9. The valve body shall be fitted with a bolted bonnet incorporating a stuffing box and pull down packing gland. Packing shall be the split chevron type. Design of exposed valves shall allow visible inspection of the shaft seal, adjustment of the packing, and replacement of the packing, all without disturbing the bonnet or valve operator. The shaft seal shall comply with the requirements of AWWA C504.

10. Actuators
    a. Actuators for buried service and valves 10 inches and larger, shall be equipped with manual operated geared actuators. Geared actuators shall be totally enclosed, oil lubricated, worm and gear type. Shaft seals shall be provided to prevent entry of dirt and water into the actuator. All shaft bearings shall be permanently lubricated bronze bushings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque. Construction of actuator housing shall be semi steel. Gear actuators shall comply with requirements of AWWA C504.

    b. Valves and operators for submerged or buried service shall have seals on all shafts and gaskets on valve operator covers to prevent the entry of water. Operator mounting brackets shall be totally enclosed and shall have gasket seals.

11. Plug valves shall be manufactured by DeZurik, Pratt, or Val-Matic.

D. Valve Operator Accessories
1. Stem Guides (SG): Fully adjustable stem guides with bronze bushings, shall be furnished by the manufacturer of the associated valve and wherever necessary to prevent unsupported stem lengths of 10 feet or more.

2. Extension Stems: Extension stem shall be stainless steel and shall be furnished by the manufacturer of the associated valve to bring the operating nut to within 6-inches of finished grade. Extension stems

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PCCP Water Main Repairs

shall be sized by the valve manufacturer to withstand the maximum valve operator output.

C.9 Reinforcing / Repair Sleeve

A. Reinforcing Clamp shall be sized for the repair for on-call services per Thompson Pipe Group Repair Guide (Appendix B).

B. For emergency repairs, the Contractor shall have available at least one repair sleeves for each pipe size between 20 and 36 inches.

C. Steel plate thickness shall be a minimum of 1/4-inch thick.

D. Reinforcing/repair sleeves shall be manufactured by Thompson Pipe Group or approved equal.

C.10 Reinforcing / Repair Clamp

A. Reinforcing Clamp shall be sized for the repair for on-call services per Thompson Pipe Group Repair Guide (Appendix B).

B. For emergency repairs, the Contractor shall have available at least one repair clamp for each pipe size between 20 and 36 inches.

C. Steel plate thickness shall be a minimum of 1/4-inch thick.

D. Reinforcing/repair clamps shall be manufactured by Thompson Pipe Group or approved equal.

C.10 Pipe

A. Pre-stressed Concrete Cylinder Pipe (PCCP)

1. Pre-stressed concrete cylinder pipe and fittings shall be manufactured in accordance with AWWA C301. Additionally, the pipe and fittings shall be manufactured in accordance with the requirements contained herein.

2. Pipe shall have a welded steel cylinder with steel joint rings welded to its ends.

3. Pipe shall be lined cylinder type. Pipe shall have a minimum core thickness in accordance with AWWA C301. The minimum thickness of mortar coating over the pre-stressing wire shall be 0.75 inch.

D. Ductile Iron Pipe (DIP) Pipe

1. DIP pipe shall be used for replacement of PCCP piping 36 inches or less in diameter.

2. Pipe: Ductile Iron Pipe (DIP) pipe shall be manufactured in accordance with ASTM A 377.

3. Fittings: All fittings shall be ductile iron pipe or factory fabricated to be fusion welded to the pipe. No field fabrication of fittings will be permitted.

4. Joints: Joints for pipe and fittings shall be field welded or flanged.

5. Acceptance: Acceptance will be on the basis of the Owner’s inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.

4. Materials

a. Cement for concrete and mortar shall conform to ASTM C 150, Type II. No admixtures will be allowed without the approval of the Owner. Such approval will only be granted to a written request which provides information on type of admixture and its purpose.

b. Steel for cylinders and fittings shall meet the requirements of AWWA C301.

c. Pre-stressing wire shall meet the requirements of ASTM A 648 and minimum size shall be 6 gauge (0.192 inch).

5. Design

a. Pipe sizes shall be the same as the pipe that will be replaced. Pipe size shall be the actual inside diameter of the pipe.

b. The nominal laying length of standard pipe segments shall be 20 feet. Shorter lengths will be allowed only where necessary to accommodate replacement of damage pipe sections and use of spool pieces.

c. Pipe shall be designed for internal pressure and external loads, both singularly and in combination.

i. Pipe shall be designed for an internal pressure of 65 psi working pressure plus 100 psi surge pressure allowance. No variation in the design internal pressure shall be allowed for varying pipe elevation.

ii. Pipe shall be designed for external loads equal to the sum of the dead load plus live load. The minimum dead load shall be that created by the depth of cover plus four feet, the depth of cover based on difference in elevation of near edge of pavement and top of pipe, or eight feet, whichever is greater. The minimum live load shall be equal to AASHTO HS 20 loading including an appropriate impact factor. A bedding factor of 1.5 and an unlimited trench width shall be utilized in design calculation.

d. No variation in the thickness of the steel cylinder of restrained joint pipe shall be permitted to accommodate the theoretical variation in axial forces.

e. Design calculations shall be in accordance with AWWA C301.

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PCCP Water Main Repairs

6. Joints
   a. Joints shall be sealed with an O Ring rubber gasket. End rings shall be self-centering and so designed that when the joint is completed, the gasket will be enclosed on four sides and watertight under all conditions of service.

   b. Joints exteriors shall be protected with the diaper and grout system per manufacturer's recommendations.

   c. The interior surface of the steel joint rings shall be protected in one of the following ways:
      i. The pipe manufacturer shall paint the surfaces of the joint rings that potentially will be in contact with water with Portland Cement Mortar (ANSI/AWWA C104/A21.4) or Fusion-Bonded Epoxy (ANSI/AWWA C116/A21.16)

      ii. The Contractor shall mortar the interior joint recess using a stiff 1:3 Portland cement/sand mortar.

      iii. The Contractor shall apply a butyl rubber sealant to the spigot end or bell socket prior to joining the pipe such that the sealant squeezes out and fills the interior joint recess.

7. Fittings and specials shall meet the internal and external loading requirements for pipe shown above. Fittings and specials shall be composed of cut and welded steel plate with mortar lining on the interior and exterior surfaces. All surfaces shall be cured in accordance with AWWA C301, Section 3.10. Provide special adapters or transition pieces for connection to pipe of different materials.

8. Factory Testing: One nominal 20-foot length of pipe for every 200 feet of production of completed and cured pipe shall be pressure tested to the specified internal pressure. Pressure shall be maintained for a minimum of 10 seconds. No leakage shall be allowed. A factory testing report shall be provided by the Contractor to the Owner.

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PCCP Water Main Repairs

9. Acceptance
   a. Acceptance will be on the basis of the Owner's inspection.

   b. Acceptance will be on the basis of the pipe manufacturer providing a certificate indicating compliance with AWWA C301.

   c. Acceptance will be on the basis of the pipe manufacturer providing a certificate indicating compliance with these Specifications.

   d. Acceptance will be on the basis of the Owner's review of the pipe manufacturer's shop drawings and assumptions for the detailed pipe design calculations.

10. Detection Tape: Provide detection tape over all DIP water mains.

C.11 Concrete to Ductile Iron Pipe Adapter

A. General:
   1. All products shall meet the requirements of the pre-stressed concrete cylinder pipe and ductile iron pipe specifications of the City of WPB.

   2. Joints for adapters shall be sealed by a rubber gasket so that the joint will remain water tight under all conditions of service.

B. Types:
   1. Concrete (PCCP) Bell x Ductile Iron Pipe (DIP) Mechanical Joint Bell (MJB): This item is an adapter needed to connect concrete pipe (PCCP) force main to Ductile Iron Pipe (DIP) force main. This adapter is a PCCP bell x DIP MJB.

   2. Adapter - Concrete (PCCP) Spigot x Ductile Iron Pipe (DIP) Mechanical Joint Bell (MJB): This item is an adapter needed to connect concrete pipe (PCCP) force main to Ductile Iron Pipe (DIP) force main. This adapter is a PCCP Spigot x DIP MJB.

Appendix C

PCCP Water Main Repairs

C.12 Linestop Sleeves

A. General:

1. Linestop sleeves shall be in accordance with AWWA Manual M-9. They shall also meet AWWA C-301 and C-303 Standards pertaining to design, manufacturing quality tests and welders qualifications. Manufacturers shall have manufactured this type of tapping sleeve for a minimum of ten (10) years.

2. The sleeves shall have a separate gland which permits installation of the sleeve prior to the cutting of the pre-stress wires. The gland shall have a fusion epoxy coated (per AWWA C-213) waterway, and a minimum 7/8” wide hydro-mechanical gasket set in a retaining machined groove of a pressure plate. The gasket groove must be consistently positioned about throat of tapping waterway. Inside diameter of the gasket groove must be set back a minimum of 1” from the waterway to allow dispersal of forces generated by gasket compression. Gasket grooves machined in a circle and formed to an elliptical shape will not be an accepted equal. The pressure plate shall be gusseted to the draw flange to eliminate flexing. The gland shall be equipped with load bearing set screws to protect the cylinder. Sleeves shall be furnished with grouting seals and grout horns to facilitate filling the space between the sleeve and the pipe.

3. Pipe outside diameter shall be verified before ordering sleeves.

B. Materials:

1. BODY: ASTM A285 Grade C, ASTM A-36 Steel.

2. FLANGE: Combination flange with ANSI 150 lb. drilling, supplied by linestop contractor.

3. GASKET: Compounded for use with water, salt solutions, mild acids, bases and sewage.

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4. FASTENERS: Corrosion resistant, Stainless Steel, Type 304 (studs, straps, nuts and washers).

5. FINISH: Epoxy coated (fusion applied per ANSI/AWWA C-213).

C. Approval: Linestop saddles shall be JCM 445 Tapping Sleeve for Concrete Pipe as fabricated by JCM Industries, Inc. for Rangeline, Inc. or an approved equal.

END OF SECTION

APPENDIX D

Appendix D

PCCP Water Main Repair Execution

D.1 General

This Section describes how work is to be completed and the basis that will be used for processing applications for payment. These instructions are to establish expectations for the Contractor to meet. The descriptions are not intended to provide means or methods to the Contractor.

D.2 Emergency Response Procedure

A. The Emergency Response Procedure presents a strategy for the Owner to mobilize labor, materials and equipment to correct a failure condition in the force main which is creating a release of potable water into environment. The Contractor will be contacted by the Owner to determine the following with the Owner:

B. Preliminary Assessment: The following procedure will be for response crews upon arrival at the potential failure location.

1. Determine the location and size of the leak (whether on public or private property, approximate flow rate, etc.)

2. Determine if the leak is causing system pressure loss or affecting a potentially sensitive area (hospital, school, surface water, major roadway, etc.)

3. Determine the type of water main failure (i.e. small hole in pipe versus complete pipeline rupture and/or collapse)

4. Determine if hazardous materials are present (suspicious substances, odors, sheen, foam, etc.).

5. Determine if Traffic Control (MOT) is required to isolate the leak and repair the water main.

6. Assess whether the failure can be responded to by internal staff or if private contractor/neighboring utility or municipal assistance is required to address the situation.

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PCCP Water Main Repair Execution

7. If it is determined that private contractors and/or neighboring utilities will be required to assist in the response and repair effort, the Owner shall contact these entities and ask for assistance.

8. The Owner shall also contact the pipe manufacturer (Forterra) and ask for their assistance in determining the appropriate repair technique based on the failure condition experienced.

D.3 Leak Detection and Isolation

A. The primary goals of the leak detection and isolation procedure is to reduce the volume of treated/revenue water that is transmitted to the failure area and stabilize system pressures in the area surrounding the leak to minimize possible boil water orders and water damage to adjacent property. The following actions endeavor to achieve this goal which can also reduce impacts at the failure area.

B. The Contractor shall determine an appropriate course of action to contain the leak and limit impacts to failure area. The Contractor's plan shall be communicated to the Owner verbally and in writing to ensure coordination with all affected entities.

C. The Contractor shall secure the site to prevent members of the general public from entering the area to avoid stalled or flooded cars adjacent to the leaking pipe. This includes the use of rope, tape, barricades, or other physical barriers. The Contractor shall determine if the police department and a roadway MOT crew are needed to assist with this effort.

D. The Contractor's plan shall contain general guidelines and information regarding the isolation and containment of spill areas. The plan shall be used when determining the appropriate course of action in the field.

1. Depending on the location of the break, the isolation valves that exist on the water main can be manipulated to limit the number of homes and businesses affected by the leak. The Contractor shall coordinate with

the Owner to dispatch a crew to manipulate these valves if determined to be helpful in responding to the pipe break. Any valves that are shut should be marked to denote that they are in the off position.

2. The Contractor shall coordinate with the Owner to contact neighboring utilities to alert them of the situation, allow them to render assistance, and if applicable, alert them that the Owner will require additional potable water flows through the series of interconnects located in various areas of the system.

3. The Contractor shall designate a specific employee for coordination with the Owner, as the Owner monitors various, key points in the distribution system to assess pressure levels.

4. The Contractor shall notify the Owner if the break cannot be managed to maintain system pressures around the pipe break site for repair activities.

5. Once the leak has been contained/isolated and water main flows and pressures are being managed to a level that allows for the containment/isolation system to continue operating successfully, the water main repair technique can be determined and implemented. In determining an appropriate repair method, the use of bypass piping shall be considered as outlined below.

6. The cleanup of areas that have been impacted by excessive water flows that are outside the containment/repair area can commence in accordance with state and local ordinances.

D.4 Pipeline Bypassing And Repair

A. Bypass Piping Procedure: The primary goal of the bypass piping procedure is to allow the water main to be placed back into operation as soon as possible while isolating the repair area so the pipe can be permanently restored. A secondary goal of the bypass piping is to allow water mains

Appendix D

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within the transmission and distribution system to be returned to normal operating status as soon as possible.

1. After reviewing available repair techniques described in Section 1, if it is determined that the repair will require a significant amount of time to perform, or the selected repair cannot be performed without completely stopping flow and draining the water main, a bypass piping assembly should be installed to allow the undamaged segments of water main to be placed back into operation until the permanent repair can be installed.

2. Before any excavation can take place at the site, Sunshine State One Call (*811) is to be contacted to provide an emergency utility locate. This type of failure event can be considered a loss of public service which carries a 2-hour turnaround time for locating.

3. If bypass piping is decided upon, the Contractor shall mobilize to set-up the bypass piping and shall work with material suppliers to obtain additional piping and fittings if required to clear obstacles present in the field.

4. The water main bypass shall then be installed according to the guidelines provided in this document.

5. During the bypass piping installation, the Contractor shall begin the procurement process to obtain the permanent repair materials from the appropriate material suppliers.

6. Once the bypass pipeline is in place, the Contractor shall coordinate with the Owner to the transmission and distribution system back to standard operating procedures.

7. The permanent repair operation can then commence as coordinated with the Owner.

Appendix D

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B. Water Main Repair: After the valve closures, line stops, with or without bypass piping has been successfully installed and shown to operate effectively, permanent repairs to the water main can begin.

1. Work on the permanent repair should begin immediately after the main has been isolated or the bypass has been placed into operation. The repair work should continue as quickly as possible to implement the permanent repair so that the area can be restored and the bypass removed.

2. The repair method employed will need to be based on the failure experienced and can be modified as appropriate to meet the needs of the specific failure event and location.

3. Once the repair has been completed, the repair should be tested and observed under system pressure. To perform this test, the bypass piping should slowly be taken offline by opening the line stops and shutting down the bypass.

4. If the repairs show visible leak or fail to maintain system pressure for a minimum of 60 minutes, the bypass should be opened and the line stop reactivated. The repair shall be inspected, corrected, and retested.

5. The repair shall be determined acceptable after the repair has shown no visible leaks, has maintained system pressure for at least 60 minutes. Upon confirmation by the Owner, the bypass piping and line stops can be removed, the taps permanently abandoned and the excavation area backfilled and restored.

D.5 Cleanup Procedures And Disposal

The Contractor shall clean and restore areas that have been impacted by the water main failure after the leak has been isolated and repairs have been made. No readily identified asphalt, rocks, dirt or debris is to remain in impacted areas after cleanup activities.

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PCCP Water Main Repair Execution

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D.6 Product Installation

A. Valves

1. Installation: All valves and appurtenances shall be installed in the locations selected by the Owner, true to alignment and properly supported. Any damage to the above items shall be repaired to the satisfaction of the Engineer before they are installed.

2. Field Painting: All valves shall be finish coated at the factory. No field painting shall be performed except touch-up painting where the coating has been damaged, using manufacturer's approved coating.

3. Inspection and Testing: Following installation, operating tests will be performed to demonstrate to the Engineer that all equipment and accessories will function in a satisfactory manner. The Contractor shall make, at Contractor's own expense, all necessary changes, modifications and/or adjustments required to ensure satisfactory operation.

4. Cleaning: Prior to acceptance of the work of this section, thoroughly clean all installed materials, equipment and related areas.

B. Reinforcing Clamps and Sleeves

1. Installation:

   a. All reinforcing clamps and appurtenances shall be installed in the locations determined by the Owner, and properly supported. Any damage to the above items shall be repaired to the satisfaction of the Owner before they are installed.

   b. Refer to Appendix B for installation procedure.

   c. Backfill and burial of all installed reinforcing clamps shall be after inspection and testing of the product.

2. Inspection and Testing: Following installation, operating tests will be performed to demonstrate to the Owner that the repair is complete and durable to the operating conditions of the force main. The Contractor shall make, at Contractor's own expense, all necessary changes, modifications and/or adjustments required for the repair to pass the operating tests.

C. Pipe

1. Lay all pipe and fittings to accurately conform to the lines and grades of the existing water main.

2. Pipe Installation

a. Proper implements, tools and facilities shall be provided for the safe performance of the work. All pipe, fittings and valves shall be lowered carefully into the trench by means of slings, ropes or other suitable tools or equipment in such a manner as to prevent damage to sewer materials and protective coatings and linings. Under no circumstances shall sewer materials be dropped or dumped into the trench.

b. All pipe, fittings, valves and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the Engineer, who may prescribe corrective repairs or reject the materials.

c. All lumps, blisters and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and free from dirt, sand, grit or any foreign materials before the pipe is laid. No pipe which contains dirt shall be laid.

d. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing or other materials shall be placed in the pipe at any time.

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PCCP Water Main Repair Execution

e. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.

f. It is common practice to lay pipe with the bells facing the direction in which work is progressing; however, it is not mandatory.

g. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade shall not be permitted.

h. Provide detection tape for all pipe. Detection tape shall be buried 4 to 10 inches deep. Should detection tape need to be installed deeper, the Contractor shall provide 3-inch wide tape. In no case shall detection tape be buried greater than 20 inches from the finish grade surface.

3. Alignment and Gradient
   a. Lay pipe straight in alignment and gradient or follow true curves, as nearly as practicable. Do not deflect any joint more than the maximum deflection recommended by the manufacturer.

   b. Maintain a transit, level and accessories on the job to lay out angles and ensure that deflection allowances are not exceeded.

   c. Prior to backfilling the trench, the Contractor shall survey the elevation of the water main top of pipe barrel at minimum 100-foot intervals, at all bends, at all air valves, and at all plug valves. The location description and elevation of each point surveyed shall be recorded.

4. Expediting of Work: Excavate, lay the pipe, and backfill as closely together as possible. Do not leave unjointed pipe in the trench overnight. Backfill and compact the trench as soon as possible after

laying and jointing is completed. Cover the exposed end of the installed pipe each day at the close of work and at all other times when work is not in progress. If necessary to backfill over the end of an uncompleted pipe or accessory, close the end with a suitable plug, either push on, mechanical joint, restrained joint or as approved by the Engineer.

5. Joint Assembly
   a. Mechanical, flange and restrained type joints shall be assembled in accordance with the manufacturer's recommendations.

   b. Each restrained joint shall be inspected by the Contractor to ensure that it has been “homed” 100 percent.

   c. The Contractor shall internally inspect each pipe joint to insure ensure proper assembly for pipe 24 inches in diameter and larger after the pipe has been brought to final alignment.

END OF SECTION

APPENDIX E

401 Clematis Street
West Palm Beach, FL 33401
Phone: 561-822-1200
Fax: 561-494-1116

APPROVED MATERIALS LIST (AML)

REVISED: April 27th, 2018

PLEASE REFER TO THE GENERAL NOTES AND SUBMITTAL GUIDELINES SECTION STARTING ON PAGE 6 PRIOR TO FILLING OUT ANY OF THE SUBMITTAL SHEETS.

OFFICIAL USE ONLY - THIS SECTION

Contractor: _____ Engineer: _____

Project Name: _____ Project No.: _____

APPROVED: _____ _____
SIGNATURE DATE

APPROVED AS NOTED: _____ _____
SIGNATURE DATE

NOT APPROVED: _____ _____
SIGNATURE DATE

OFFICIAL USE ONLY - THIS SECTION

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INSTRUCTIONS AND GENERAL NOTES:

Sections 1 through 4 are listed materials for specific uses in City-owned and maintained water and wastewater systems. Sections 5 through 8 are listed material for specific use in the construction and maintenance of infrastructure to be owned and maintained by the City. Materials are listed by type of material, group, short specification listed with each approved item, approved manufacturer, and manufacturer's part number.

When applicable, standard detail sheet number(s) will be identified on the Approved materials List (AML) page for the purpose of cross referencing the material to the drawing.

SUBMITTAL GUIDELINES:

1. Submit two (2) complete original AML packages with a transmittal letter. One (1) original to be retained in the project file and one (1) original provided to staff for use.
   A. Submit with the original AML package any additional copies, as needed, to be approved and returned for the Engineer/Contractor/Supplier' use.
   B. Submit with the original AML package a Concurrency form executed by the Engineer and Contractor.
   C. Submittals shall be complete AML packages. Complete AML's by indicating the following:
      i. Check each type of material item to be used.
      ii. Check each corresponding manufacturer and model number to be used.
      iii. Initial any written changes or corrections to an AML.
   D. Any proposed non-standard material submittals shall include two (2) original copies for City retention and a Shop Drawing material Approval for each separate material item. Submit with the original AML package any additional shop drawing copies, as needed, to be approved and returned for the Engineer/Contractor/Supplier's use.

2. The City of West Palm Beach approves materials to be utilized in the water distribution system within the rights of ways, easements and on private property up to the downstream side of the backflow preventers in the following Municipalities in our utility service coverage area:

   A. City of West Palm Beach
   B. Town of Palm Beach
   C. Town of South Palm Beach
   D. Parts of Palm Beach County (Served by City of West Palm Beach)

   The City of West Palm Beach approves materials to be utilized in the sanitary collection system, wastewater lift stations, force mains, and services within the rights of ways and easements of:

   A. City of West Palm Beach

3. Material cut sheets from a supply house catalog will not be considered a suitable shop drawing submittal.

4. Foreign and domestic materials manufacturers shall meet the same criteria for quality and craftsmanship.

5. All materials, fittings, pipe and equipment shall be new, unused, and warranted for a minimum period of one (1) year after acceptance.

6. The City of West Palm Beach undertakes a continual effort to maintain an AML that reflects the latest technological advances and industry capabilities. The AML is updated as often as it is practical.

7. The AML does not supersede the policies and procedures of the City of West Palm Beach Purchasing Department. Any direct and specifically identifiable conflicts between the AML and City technical specifications shall be arbitrated by the Department Director responsible for the related material (e.g. any conflict with water distribution pipe would be decided by the Director of Public Utilities).

8. The most current edition of the AML is maintained on the City of West Palm Beach Engineering Services web page and is available via email or paper copy, upon request. AML's associated with City capital construction projects will utilize the edition stipulated by the contract execution date, all other shall utilize the latest edition at the time of initial submission.

9. City may implement new and additional materials and/or manufacturers to a project-specific AML or in general. Project-specific material shall be added to a shop drawing amendment with Engineer of Record (EOR)'s approval. In general material may added to the next edition of the AML with City's approval.

10. By signing the Concurrency form, the Engineer and Contractor agree to adhere to the material specifications of the AML. It shall be acknowledged that the City has right to reject construction materials not in accordance with the AML.

11. All material parts utilized in the City's water distribution system, except hydrants, shall meet the provisions of Chapter 62-555.335, Florida Administrative Code.

- End of Section -

ENGINEERING SERVICES DEPARTMENT
P.O. Box 3366,
West Palm Beach, FL 33402
TEL (561) 494-1040
FAX (561) 494-1116

CERTIFICATION AND CONCURRENCY FORM

Project Name: _____

Concurrence of Contractor: _____ _____
Signature Date

_____
Firm

Concurrence from the
Engineer of Record (EOR): _____ _____
Signature Date

_____
Firm

The execution of this document acknowledges that I (We), the above signed, have reviewed this Approved Materials List (AML) in its entirety, initialed all error corrections to the AML, and concur that the materials listed are acceptable and appropriate for the project noted above. As the engineer-of-record and/or contractor, I (We), the above signed, shall provide written notification to the City for any material listed in the AML to which I object being utilized for the project noted above.

Individual material shop drawings will be required for all non-standard items. Materials not listed in the AML, or AML listed material that defers in specification, shall be considered non-standard material.

PRESSURE PIPE STANDARDS ARE TO BE USED FOR:

1. Potable water distribution system, water distribution transmission mains, large meter services and private fire lines. Distribution System Utility Service Area includes:
    A. City of West Palm Beach
    B. Town of Palm Beach
    C. Town of South Palm Beach.

2. Sanitary Collection Force Mains. Sanitary Collection System Utility Service Area includes:
    A. City of West Palm Beach.

Submittal: FIRE HYDRANTS

FIRE HYDRANTS APPROVED FOR USE:

Hydrants shall conform to requirements of AWWA Standard C502-94 for Dry Barrel Hydrants or the latest revision, as to the design, component materials, construction and manufacture except as modified or noted in the City technical specifications (a copy of those specifications can be supplied on request). Approved hydrants will be used in the construction of systems to be owned and operated by the City of West Palm Beach Public Utilities Department. Approved hydrants shall be used in the construction of private systems within the corporate boundaries of the City of West Palm Beach.

☐ Clow Medallion	☐ American B-84-B	☐ Mueller Super Centurion 250	☐ Kennedy Guardian

HYDRANT COATINGS:

When constructed to the City of West Palm Beach technical specifications, hydrants shall have a shop coat of silver paint applied at the manufacturer. Contractors shall paint the hydrant bonnets with the following coating after installation and prior to acceptance. Contractors shall clean, prep, and paint all damaged factory paint.

Paint for Fire Hydrant Bonnet (REQUIRED)

☐ HENTZEN COATING, INC.: Alert Series Light Reflective Coating

Paint for the Barrel Section and Nozzle Caps (TOUCH-UP PAINT)

☐ SHERWIN-WILLIAMS: Silver-Brite Aluminum paint. Sale identification No. B59S11

MISCELLANEOUS COLORS:

Hydrants installed outside the City of West Palm Beach corporate boundaries, may be painted alternate colors. A letterhead correspondence from the Fire Chief or Fire Marshal of the corresponding service area (Town of Palm Beach, Town of South Palm Beach, and Unincorporated Palm Beach County), may request permission to paint the barrel section any alternate color. An original copy of the request shall accompany the AML submittal. The reflective bonnet paint color cannot be changed.

☐ Proposed Color: _____

Manufacturer: _____

Paint Color No.: _____

AUTOMATIC FLUSHING DEVICE:

☐ Kupferle Foundry Co., 9800-WC Eclipse

☐ Kupferle Foundry Co., 9400-WC Eclipse

Submittal: DUCTILE IRON PIPE

Pipe shall comply with ANSI/AWWA Standard or latest revision. 3", 10", 14" and 16" pipe are considered "odd" sizes and can only be used to tie into existing lines. The minimum standards for 3 to 12" pressure pipe Class 52. The minimum standard for 14" to 64" pressure pipe is Class 51. The minimum standard for all F.J. (Flanged) pipes, for any usage, shall be Class 53. The minimum standard for all size diameter sanitary collection system gravity mains shall be Class 50 or Pressure Class 350.

MANUFACTURER:

☐ American ☐ U.S. Pipe ☐ McWane

CLASS:

☐ Class 52, sizes to be used on water mains: _____
☐ Class 51, sizes to be used on water mains: _____
☐ Class 52, sizes to be used on force mains: _____
☐ Class 51, sizes to be used on force mains: _____
☐ Class 50, sizes to be used on gravity mains: _____
☐ Pressure Class 350, sizes to be used on gravity mains: _____
☐ Class 53, sizes to be used for FJ pipe: _____

BELL TYPE:

☐ FLANGE JOINTS:
Flanges shall be ANSI Standard Class 125, plain faced and drilled, in accordance with ANSI B16.1. Flanges shall be solid with a uniform thickness as shown on Table 15.3 and Figure 15.1 of the ANSI/AWWA C115/A21.15 standard or latest revision. Submit a letterhead correspondence from the manufacturer/vendor certifying that the flanged pipe complies with ANSI/AWWA Flange standard, the ANSI/AWWA pipe standard and the ANSI/AWWA lining standard (if for water) or the lining for gravity or force mains.

☐ MECHANICAL JOINT:
All mechanical joints shall conform to ANSI/AWWA C111/A21.11 standard or latest revision.

☐ SLIP OR PUSH-ON JOINTS:
All push-on type joints shall conform to ANSI/AWWA C111/A21.11 standard or latest revision. The gasket material shall be SBR type or equal.

☐ RESTRAINED JOINT:
All restrained joints shall conform to the latest edition of ANSI/AWWA C151 standard.

Submittal: DUCTILE IRON LININGS AND COATINGS

DISTRIBUTION SYSTEM WATER MAINS:

INTERIOR:

☐ Cement mortar lining required, per ANSI/AWWA C104/A21.4 standard or the latest revision.

EXTERIOR:

☐ In ground placement, bituminous asphalt coating required, per ANSI/AWWA C104/A21.4 standard or latest revision.

☐ Fusion-Bonded Epoxy Coating, per ANSI/AWWA C116/A.21.16

ENCASEMENT:

☐ Polyethylene Encasement, per ANSI/AWWA C105/A21.5 standard or latest revision. Encasement shall be 4 mil CL/HDPE.

☐ American Ductile Iron Pipe Company

☐ U. S. Pipe Company

SANITARY SEWER COLLECTION GRAVITY MAINS, FORCE MAINS, AND LATERALS (DIP):

NOTE: When DIP is used in wetwells and air release valve vault applications, the interior coating shall be applied to the inside and outside of the pipe.

INTERIOR:

☐ PERMITE
Permox PCS-9043, Glass Flake Epoxy

☐ VULCAN PAINTERS, INC.
Protecto 401, Ceramic Epoxy Lining.

EXTERIOR:

☐ In ground placement, bituminous asphalt coating required, per ANSI/AWWA C104/A21.4 standard or latest revision.

ENCASEMENT:

☐ Polyethylene Encasement, per ANSI/AWWA C105/A21.5 Standard or latest revision. for in-ground placement. Encasement shall be a minimum of 4 mils thick, CL/HDPE.

☐ American Ductile Iron Pipe Company

☐ U. S. Pipe Company

COATING CERTIFICATIONS:

Certification letter must state the pipe and or fitting manufacturer to be used, the applicable ANSI/AWWA standard, the coating to be used and the thickness of the coating.

☐ Shop for pipe (attach certification letter after this page)

☐ Shop for fittings (attach certification letter after this page)

Submittal: DUCTILE IRON FITTINGS

DUCTILE IRON FITTINGS:

Cast ductile iron fittings 3” through 24” shall be pressure rated at 350 psi minimum. Flange -joint fittings shall be rated at 250 psi minimum. All 30” and 36” fittings shall be pressure rated to 250 psi minimum. All fittings shall conform to the latest edition of either ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53, and C111/A21.11 standards.

☐ TYLER/UNION ☐ SIGMA PRODUCTS

☐ GRIFFIN PIPE PRODUCTS ☐ STAR PIPE PRODUCTS

List sizes to be used: _____

RESTRAINED JOINT TYPE (by pipe manufacturer):

☐ American Cast Iron Pipe, 4" - 12" Field Lock Gaskets
☐ American Cast Iron Pipe, Fast-Grip gaskets 4 thru 16"
☐ American Cast Iron Pipe, Lok-Ring 42" - 64"
☐ American Cast Iron Pipe, Flex Ring 4" - 36"
☐ American Cast Iron Pipe, 14" - 36"; 4"-16" Fast-Grip gaskets
☐ US PIPE/Griffin Pipe Products, Snap-Lok 6”-48”
☐ U.S. Pipe, T.R. Flex 4" - 64"
☐ U. S. Pipe, Field LOK Gaskets 4" -24".

MECHANICAL JOINT RESTRAINT:

Mechanical type joint shall be furnished with high strength corten T-head bolts and hex nuts with composition, dimensions, and threading in accordance with C-111 Standard. For all joint restraint products, apply corrosion resistant coating Mega-bond (or approved equal). Polyester based powder electro-statically applied in two coats and heat cured after each coating for cast body. Xylan Fluoropolymer coating will be used for wedge assemblies. Applicable for all restraint devices through 24”. Clow Field Lok Gaskets will use a normal cast or ductile iron mechanical joint gland or the Clow Field Lok gland.

DIP:

☐ EBAA IRON
Megalug
Series 1100

☐ STAR PIPE
Stargrip
Series 3000

☐ FORD
Uniflange
Series 1300, 1390, 1400, & 1450

☐ SIGMA PRODUCTS
Series SLD

☐ CLOW
MJ Field Lok Gasket
Series DI, 4 to 24” only

NOTE: All restrained joint systems shall be pressure rated to the same as Ductile Iron pipe and fittings. All components of the restrained system shall meet or exceed the requirements of the latest edition of ANSI/AWWA C-111/A21.21.11 standard. Restraints shall provide a non-point loading type of restraint contact on the pipe with sufficient positive gripping action to secure the gland to the pipe and be designed so that the restraint action is increased as a result of increases in the line pressure.

Submittal: DUCTILE IRON FITTINGS (CONTINUED)

FLANGED JOINT RESTRAINT:

Flange Bolts and nuts shall be carbon steel, hex head, ASTM A183, with a Zinc electroplated finish. The flange type gasket material shall be 1/8-inch thick rubber type conforming to ANSI B16.21 and AWWA C-207, unless otherwise specified. For all joint restraint products, apply corrosion resistant coating Mega-bond (or approved equal). Polyester based powder electro-statically applied in two coats and heat cured after each coating for cast body. Xylan Fluoropolymer coating will be used for wedge assemblies. Applicable for all restraint devices through 24".

☐ EBAA IRON
Megalug
Series 2100

APPROVED JOINT RESTRAINT FITTINGS:

☐ UNION FOUNDRY
Swivel joint fittings

APPROVED JOINT RESTRAINT FOR PVC:

In some cases there are existing PVC mains that need to be cut or tied into and restrained back due to the addition of elbows, tees and valves. This section covers the types and approved joint restraint allowed. For all joint restraint products, apply corrosion resistant coating Mega-bond (or approved equal). Polyester based powder electro-statically applied in two coats and heat cured after each coating for cast body. Xylan fluoropolymer coating will be used for wedge assemblies. Applicable for all restraint devices through 24".

BELL RESTRAINTS:

☐ EBAA IRON
Series 1600 (4 thru 12")
Series 2800 (14 thru 36")

TIE RODS AND ACCESSORIES:

☐ SIGMA PRODUCTS:
Duc Lugs (bent eye bolts not allowed):
Socket Clamps (with cast iron washers)
All thread rod, zinc plated (¾" only)

Submittal: PVC FOR FORCE MAIN

Polyvinyl Chloride (PVC):
PVC pressure pipe (4-inch through 12-inch) shall conform to the applicable requirements of ANSI/AWWA C900 and subject to additional requirements specified herein. PVC pressure pipe (14-inch through 36-inch) shall conform to the applicable requirements of ANSI/AWWA C905 and subject to additional requirements specified herein. Pipe shall be colored green for force main application.

MANUFACTURER:

- ☐ JM Manufacturing Company*
- ☐ CertainTeed*
- ☐ IPEX, Inc.
- ☐ Sanderson Pipe
- ☐ Diamond Plastic Corporation*
- ☐ North American Pipe Corporation
- ☐ National Pipe and Plastic

NOTE: *No Pipe deflection at joint allowed

LOCATING / TRACER WIRE:

Trace wire system must be installed as a continuous single wire. No looping or coiling of wire is allowed. Trace wire must be properly grounded at all dead ends/stubs. All trace wire termination points shall utilize a trace wire access box.

Locating wire shall be 14 AWG single strand, soft drawn copper wire; 4/64 – inch polyvinyl chloride insulation, color coated per APWA standard for the specific utility being marked. Locating wire shall be spliced before and after all valve boxes and when connecting at Tee's. All splices should be covered with electrical tape. When splicing wire at Tee's, keep clear of fittings.

All main line trace/locating wires must be interconnected in intersections, at tees, and crosses. At tees, the three wires shall be joined using a single 3-way lockable connector. At Crosses, the four wires shall be joined using a 4-way connector.

All new trace wire installations shall be located using typical low frequency (512 Hz) line tracing equipment, witnessed by City, prior to acceptance.

☐ Manufacturer/Model Num.: _____

Submittal: PVC FOR FORCE MAIN (CONTINUED)

DIP FITTINGS FOR PVC:

Fittings in the pipe shall be ductile iron fittings. All fittings shall conform to the latest edition of either ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53, and C111/A21.11 standards.

- ☐ TYLER/UNION
- ☐ GRIFFIN PIPE PRODUCTS
- ☐ SIGMA PRODUCTS
- ☐ UNION FOUNDRY COMPANY
- ☐ STAR PIPE PRODUCTS

List sizes to be used: _____

JOINTS:

All joints for the buried PVC shall be either an integral bell manufactured on the pipe or a separate coupling both employing a rubber ring joint. Deflection at all joints should not exceed 1.5 degrees or one half the maximum deflection recommended by the manufacturer.

RESTRAINED JOINT TYPE (by pipe manufacturer):

- ☐ Certain Teed Certalok
- ☐ JM Eagle Lok

MECHANICAL JOINT RESTRAINT:

Mechanical joint restraint shall be incorporated in the design of the follower gland. Glands shall be manufactured of ductile-iron conforming to ASTM A536-80. The restrained glands shall have a pressure rating equal to that of the PVC pipe which it is used. All mechanical joints shall conform to ANSI/AWWA C111/A21.11 and ANSI/AWWA C1530/A21.53 latest revision.

PVC / C900/C905 PVC:

- ☐ EBAA IRON Series 2000
- ☐ SIGMA PRODUCTS Series SLC
- ☐ STAR PIPE Series 4000
- ☐ CLOW MJ Field Lok Gasket and or Gland Series PV, 4 to 12” only

NOTE: All restrained joint systems shall be pressure rated to the same as Ductile Iron pipe and fittings. All components of the restrained system shall meet or exceed the requirements of the latest edition of ANSI/AWWA C-111/A21.21.11 standard. Restraints shall provide a non-point loading type of restraint contact on the pipe with sufficient positive gripping action to secure the gland to the pipe and be designed so that the restraint action is increased as a result of increases in the line pressure.

Submittal: VALVES

RESILIENT WEDGE GATE VALVES (RWGV):

Distribution Water Mains and Sanitary Sewer Collection Force Mains.

Valves shall conform to the latest edition of ANSI/AWWA C509-87 standard, non-rising stems (NRS) with 2" square operating nuts. Minimum valve size shall be 4". Valves smaller than 4" see curb stop material section. UL/FM required on shut-off RSGV for Double Detector check valves application only. See backflow prevention.

- ☐ AMERICAN 2500 Series
- ☐ CLOW F-6100 Series
- ☐ KENNEDY Ken-Seal 2370 (Super Seal)
- ☐ MUELLER A-2360
- ☐ WATEROUS Series 500
- ☐ M & H Style 3067 or Style 3068

RESILIENT SEAT BUTTERFLY VALVES:

For use on 14" and larger water mains only.

2" square operating nuts. Valves shall conform to the latest edition of AWWA 504 standard.

- ☐ CLOW 5300 Series H Series 450 & 4500
- ☐ Dresser 14501
- ☐ DEZURIK BAW
- ☐ KENNEDY
- ☐ MUELLER Lineseal III
- ☐ PRATT Groundhog

PLUG VALVES (To be used on force mains only):

Valves shall conform to the latest edition of AWWA C517 standard.

- ☐ PRATT
  Model Num.: _____
- ☐ Milliken Valve
  Model Num.: _____
- ☐ DEZURIK
  Model Num.: _____

JOINT TYPES (For all Valve Types):

- ☐ MJ
- ☐ SJ
- ☐ FJ
- ☐ TF / MJ (Tapping Flange to Mechanical Joint)

Submittal: VALVE BOXES

NOTE: The valve box, valve lid and valve extension shall be utilized for each valve. The UVI tags will be used where the debris cap cannot be used.

VALVE BOXES:

Heavy duty, Cast Iron ASTM-A48 Class 30, 2 piece, 5-1/4" opening, flanged base, 18 to 24" adjustable, screw type, valve box, with Locking lid (in paved areas), embossed with "WATER" on the lid for water mains and services.

☐	Tyler/Union 461-S	☐	SIGNA 461-S Part # VB261X/60WT (SIGMA and Tyler are interchangeable)	☐	Bingham & Taylor Non-Flip Option

VALVE BOX LIDS: (Box Lid Shall Match Box Manufacturer)

Non-Locking Lid: Cast Iron ASTM-A48, Class 30. Class 30, embossed with "SEWER" on the lid for force mains, embossed with "WATER" on the lid for water mains and meter service connections.

☐ Tyler/Union ☐ SIGMA ☐ Bingham & Taylor

Locking Lid (For All Paved Areas): Cast Iron ASTM-A48, Class 30, embossed with "SEWER" on the lid for force mains. To be used on Tyler model 461S, 5-1/4", screw type box.

☐ Tyler/Union ☐ SIGMA ☐ Bingham & Taylor

Locking Lid (For All Paved Areas): Cast Iron ASTM-A48 Class 30, embossed with "WATER" on the lid for water mains and services.

☐ Tyler/Union ☐ SIGMA ☐ Bingham & Taylor

VALVE STEM EXTENSION:

Utilized on all in-ground valves 36" or more below finished grade. Used in place of the American Trench Adapter (valve box). Valve extension must be secured to the valve stem, not set over the operating key.

☐ MUELLER ☐ PROSELECT

UNDERGROUND VALVE IDENTIFICATION (UVI) TAGS:

To be used when the Tyler style valve box with the Debris Cap are not used, such as with the AMERICAN valve trench adapter. 3" x 1/4", Brass, with 1-1/2" theft proof "J" rod anchor. **Stamped**, ¼" to 3/8" capital lettering. Each valve will have the following minimum information on the tag, words in parentheses are examples of wording to use, City code (WPB), valve size (6"), type of valve (RV, BV, PV), type of use (WM, FM, RW), and operation instructions (R-21) right 21 turns to open, plus valve number, if applicable. In paved and unpaved areas, the UVI will be placed in the concrete collar around valve boxes.

☐ WAGCO MARKER

Submittal: PERMANENT BLOW-OFFS

CORPORATIONS FOR BLOW-OFFS:

Corporations to be screwed into a cast iron plug or cap shall meet these specifications: 2" Male Iron Pipe Thread (for tap side) by 2" Female or Male Iron Pipe Thread for tie-in to blow-off.
(NOTE: It is recommended to utilize a male thread to eliminate the need for a brass nipple between the corporation and the permanent blow-off).

☐	FORD FB1700-7, or 3149B, or FB500-7	☐	MUELLER B-20046, or H-15015, or H-9969	☐	AY MCDONALD 3131B

BRASS NIPPLES:

All brass shall be of non-lead brass (maximum lead content of 0.10% by weight).

☐ Connections from corporation to blow-off must be 2" iron pipe thread by 6" long brass nipples.

BLOW-OFFS: Prefabricated

☐ Model VB2000B, the Hydrant Plus for meter box installation, as manufactured by Water Plus Corporation. Due to dead-end streets where water mains cannot be looped, the following automatic flush type blow-offs are to be used at all dead-ends:

☐ Hydro-Guard Standard Unit or:

☐ Hydro-Guard Vacuum Breaker DDU (Direct Discharge Unit).

Submittal: TAPPING SLEEVES & SADDLES

TAPPING SLEEVES:

DUCTILE IRON:
Allowed for 4" and larger size taps. May be used on DIP, CIP, ACP and PVC.
Ductile iron with mechanical joints.

☐	AMERICAN 2800 1004	☐	CLOW F-5200 Series	☐	MUELLER H-615 or H-616	☐	U.S. PIPE Type 9

List sizes to be used: _____

STAINLESS STEEL TAPPING SLEEVE:

NOTE: The following materials shall be used when an existing PVC or Transite water or force main is encountered and a sample point, air release or test tap needs to be installed.

Allowed only when tapped line is more than twice as large as tapping diameter (i.e., 12 x 4 is allowable, a 12 x 6 is not allowed). For use on Water Distribution System and/or Force Main System, all 304 stainless steel (SS) with 304 SS hardware required for water or force main taps. May be used on DIP, CIP, AC, or PVC.

☐	JCM J432 J462	☐	MUELLER H-304	☐	SMITH BLAIR 662, 663, 664, or 665
☐	ROMAC SST SST III	☐	FORD FAST FTSS		

List sizes to be used: _____

Submittal: TAPPING SLEEVES & SADDLES (CONTINUED)

SERVICE SADDLES:

All brass shall be of no-lead brass (maximum lead content of 0.10% by weight).

All straps shall be either double stainless steel or single wide stainless steel strap with two bolts on each side of the strap. Usage, size and tapping thread for the corporation to be attached to the saddle shall be as follows:

A. Water Services: Only 1" and 1-1/2"x 2" AWWA tapping thread are allowed.
B. Sample Point/Vent pipe (temporary): 1" AWWA tapping thread
C. Terminal Blow-offs: 2" Iron pipe tapping thread
D. Air Releases: 1-1/2"x 2" AWWA tapping thread

List the following with each saddle to be used:

A. Size of pipe to be tapped _____
B. Type of pipe to be tapped _____
C. Size of tap to be made _____
D. Usage (See A through D above).

☐ FORD
202BS Double Band Brass Saddles

Submittal: CASING MATERIAL

CASING SPACERS:

Install casing spacers 4 feet on both sides of each carrier pipe joints. All bolts, nuts, and washers to be attach to spacer sections shall be cadmium plated or stainless steel. All casing spacers larger than 36" shall be factory designed, taking into consideration the weight of the carrier pipe filled with water. Wooden skids are not acceptable as an alternative.

24" OR LARGER 24" CARRIER PIPE:

- ☐ Pipeline Seal and Insulators, Inc
  - A8G-2
  - C8G-2
  - A12G-2
  - C12G-2
- ☐ APS - Advance Products Systems
- ☐ Cascade CCS

24" OR SMALLER CARRIER PIPE:

- ☐ Pipeline Seal and Insulators, Inc.
  - Ranger Model

END SEALS:

Casing ends shall be completely closed at both openings of all Jack and bore crossings. These seals shall be no less than 1/8" thick and made of specially compounded synthetic rubber.

- ☐ Model "C" as manufactured by PSI
- ☐ Model "W" as manufactured by PSI
- ☐ LINK-SEAL, Stainless steel 316 bolts, washers and nuts.
- ☐ Cascade CCES

Submittal: AIR RELEASES

GENERAL:
ARV's should be painted blue (potable water) green (force main) for ease of identification. For force mains, the air release will be placed on the upstream side of a vertical offset. The same practice will be applicable for distribution system main, where the direction of normal flow can be determined. ARV's must be supplied with all back-flush valves, which must use stainless steel nipples and ball valves.

AIR RELEASE VALVE:

ARV's should be painted blue (potable water) green (force main) for ease of identification.

Water:

- ☐ GA Industries 920 (Short)
- ☐ Val-Matic 45 Series (Long)

Sewer:

- ☐ GA Industries 929 (Short)
- ☐ A.R.I. USA Inc. D-025 (Short)

SIZE:

- ☐ 1" Thread
- ☐ 2" Thread
- ☐ 4" Flanged (For special uses to be called out on the plans)

CORPORATIONS FOR AIR RELEASES:

The 1" or 2" corporation shall be used in conjunction with a brass saddle. AWWA tapping thread by male or female iron pipe thread, otherwise a nipple (SS) will be required between the corporation and the ball valve increasing the height of the top of the air release).

THREAD TYPE:

☐ Female ☐ Male

☐ FORD ☐ MUELLER ☐ AY MCDONALD

Submittal: AIR RELEASES (CONTINUED)

AIR RELEASE MANHOLE RING AND COVER:
Heavy duty, traffic rated, large manhole rings with double covers. The cover must have the offset inner access lid. Ordering information must include: "WEST PALM BEACH" embossed in the lid. If it is a privately owned sewer system, then omit "WEST PALM BEACH". If the air release is on a force main, then it should come with “SANITARY” embossed on the lid. If the air release is on a water main, then it should come with “WATER” embossed on the lid. Manhole lid style “D” must be used in sidewalk areas (non-skid, pedestrian traffic design). Manhole lid style "D" must be used in traffic areas and grass medians.

☐ USF 690-AH-M. 10" high casting with a base of 62", large lid is 50-7/8" wide. 105 lbs. Access lid weight, 760 lbs. Main lid weight, 700 lbs. Ring weight.

BALL VALVES:

☐ NIBCO
☐ Approved Equal:
Manufacturer: _____
Model Number: _____

NIPPLES:

☐ 2" NPT stainless steel. 3” or 4" in length.
☐ 1" NPT stainless steel. 3” or 4" in length.

SADDLE CLAMP:

☐ SS Saddle
List sizes to be used: _____

Submittal: AIR RELEASES (CONTINUED)

WATER AND FORCE MAIN AIR RELEASE MANHOLES COATINGS AND LININGS:
To be applied per manufacturers specifications and by a certified applicator (supply letter of certification).

FORCE MAIN ARV MANHOLES:

INTERIORS:
SPRAY OR BUSH APPLIED (by certified applicator)
☐ MADEWELL: Mainstay ML72 Sprayable micro silica cement mortar base, with DS-5 epoxy lining coat.
☐ LAFARGE ALUMINATES: SewperCoat PG (new and rehabbed manholes)
☐ FLOWRITE FIBERGLASS LINING SYSTEMS (for rehabilitation of manholes)
☐ SPECTRAGUARD by SPECTRUM COATING, INC. (new and rehabbed manholes)

FACTORY APPLIED (joints sealed in the field by a certified applicator)
☐ U. S. PRECAST/AGRU: Studded polypropylene welded liner fabric. Must be applied by a certified pre-caster.
☐ U. S. PRECAST/AGRU: Studded HDPE welded liner fabric. Must be applied by a certified pre-caster.
☐ T-LOCK: Polyethylene or polybutylene welded fabric. Must be applied by a certified pre-caster.

EXTERIOR:
☐ KOPPERS: 300M
☐ Sherwin – Williams (Previously MAB): Ply-Tile Epoxy Tar Coating for exterior coating of manholes.

WATER MAIN ARV MANHOLES:

INTERIOR AND EXTERIOR:
☐ KOPPERS: 300M
☐ Sherwin – Williams (Previously MAB): Ply-Tile Epoxy Tar Coating for exterior coating of manholes.

Submittal: DUCTILE IRON PIPE AND STEEL PIPE PAINTING AND FINISHING

Exposed Ductile Iron Pipe shall be painted as specified in the applicable material list.

NEW AERIAL CROSSINGS

☐ TNEMEC (Minimum 7.5 mils)
Prime Coat: 90-97 Tneme-Zinc (2.5-3.5 DFT-Mils)
Intermediate: 1095 EnduraShield (3.5-5.0 DFT-Mils)
2nd Coat: 701 Hydroflon (2.0-3.0 DFT-Mils)

NOTE: Substitute series 700 for a gloss finish

Color Identification

☐ Water: 11SF / True Blue (Safety)
☐ Force Main: 09SF / Spearmint Green (Safety)
☐ Reclaimed Water: _____
☐ Sanitary: _____

EXISTING AERIAL CROSSINGS

☐ TNEMEC (Minimum 9.5 mils)
Prime Coat: 1 Ominithane (2.5-3.5 DFT-Mils)
Intermediate: 27WB Typoxy (5.0-7.0 DFT-Mils)
2nd Coat: 701 Hydroflon (2.0-3.0 DFT-Mils)

NOTE: Substitute series 700 for a gloss finish

Color Identification

☐ Water: 11SF / True Blue (Safety)
☐ Force Main: 09SF / Spearmint Green (Safety)
☐ Reclaimed Water: _____
☐ Sanitary: _____

NOTE: The contractor shall provide at the end of the project at least one (1) gallon of each generic topcoat.

- End of Section -

WATER SERVICES STANDARDS ARE TO BE USED FOR:

1. Potable water distribution services and private fire lines. Distribution System Utility Service includes:

    A. City of West Palm Beach
    B. Town of Palm Beach
    C. Town of South Palm Beach.

2. If DIP pipe and or fittings are required, review and use the appropriate pages in Section One “Pressure Pipe” submittal package for materials.

3. All brass fittings shall be of no-lead brass (maximum lead content of 0.10% by weight). NOTE: Some manufacturers in this list may not be able to produce compliant lead content material and subsequently are restricted.

Submittal: TAPPING SADDLES

NOTE: The following materials are to be used when an existing PVC or Transite water main are encountered and a service, sample point, air release or test tap needs to be installed.

SERVICE SADDLES:

All brass shall be of non-lead brass (maximum lead content of 0.10% by weight). All straps shall be either double strap brass with two bolts on each side of the strap. Usage, size and tapping thread for the corporation to be attached to the saddle shall be as follows:

A. Water Services: Only 1" and 2" AWWA tapping thread are allowed.
B. Sample Point/Vent pipe (temporary): 1" AWWA tapping thread
C. Terminal Blow-offs: 2" Iron pipe tapping thread
D. Air Releases: 1-1/2"x 2" AWWA tapping thread

List the following with each saddle to be used:

A. Size(s) of pipe to be tapped: _____
B. Type(s) of pipe to be tapped: _____
C. Size(s) of tap to be made: _____
D. Usage (See A through D above): _____

☐ FORD
202BS Double Band Brass Saddles

Submittal: 5/8", 3/4", and 1" WATER METER

NOTE: Brass fittings listed in these specifications must meet 85-5-5-5 ASTM B62 Cast Brass Specs. Use NPT by copper tubing compression fittings, such as; Pack Joint, 110,Mac-Pak or "T" compression. If polyethylene pipe is used, then stainless steel stiffeners are required in conjunction with fittings.

METER BOXES:

All box lids will have a non-skid surface, the metal hinged meter readers lid will be self-closing. All boxes and lids will be H-20 traffic rated. All boxes will come with mouse holes and be of the flared design.

		CDR/HUBBELL
Box:	☐	11"X18"X12"
Lid:	☐	11"X18"X1-3/4"

PIPE:

Service line pipe shall be continuous length with no joints or fittings allowed in the service, except at the corporation and angle stop.

1" CTS polyethylene service tubing (Manufactured by Endot Industries)
1" Copper tubing, ASTM B88, and WWT-799, type "K", soft or hard drawn, rolls or 20' straight lengths.
(Copper tubing use requires the approval of the City of West Palm Beach)

☐ Endotrace, CTS, polyethylene, with attached tracing wire
☐ Mueller Industries, Inc.
☐ Cerro Flow Products LLC

ANGLE VALVES (Plug or Ball):

1" compression by 1" meter coupling, locking style, quarter turn.

	FORD		AY MCDONALD
☐	BA43-444W-NL	☐	74602B-22

METER BUSHING:

1" meter size (male IPT) reducer to 3/4" meter size (female IPT) to be used on 1" angle valves to set 5/8 x 3/4 and 3/4" meters.

	FORD
☐	A34-NL
☐	A24-NL

METER COUPLING (Consumer Side): 3/4" or 1"

	FORD		AY MCDONALD
☐	3/4" PART #C38-23-2-5-NL	☐	3/4" PART #74620 (3/4"X3/4"X2.50)
☐	1" PART# C38-44-2-625-NL	☐	1" PART #74620 (1"X1"X2.63")

CORPORATIONS:

1" AWWA tapping thread by 1" compression coupling

	FORD		AY MCDONALD
☐	FB1000-4	☐	4701-22, 4701T, 4701B-22 or 4701BT

Submittal: 5/8”, 3/4”, and 1” WATER METER (CONTINUED)

Residential Dual Check Valves (Angled):
All brass shall be of non-lead brass (maximum lead content of 0.10% by weight) and ASSE Approved.

- ☐ Ford 3/4” PART #HHCA31-323-NL
- ☐ Ford 1” PART #HHCA31-444-NL

Residential Dual Check Valves (Straight):
All brass shall be of non-lead brass (maximum lead content of 0.10% by weight) and ASSE Approved.

- ☐ Ford 3/4” PART #HHS31-323-NL
- ☐ Ford 1” PART #HHC31-444-NL

Submittal: 1-1/2” and 2" WATER METER

NOTE: Brass fittings listed in these specifications must meet 85-5-5-5 ASTM B62 Cast Brass Specs. Use NPT by copper tubing compression fittings, such as; Pack Joint, 110,Mac-Pak or “T” compression. If polyethylene pipe is used, then stainless steel stiffeners are required in conjunction with fittings.

METER BOXES:

All box lids will have a non-skid surface, the metal hinged meter readers lid will be self-closing. All boxes and lids will be H-20 traffic rated. All boxes will come with mouse holes and be of the flared design.

		CDR/HUBBELL
Box:	☐	17”X30”X12”
Lid:	☐	17”X30”X2”

PIPE:

Service line pipe shall be continuous length with no joints or fittings allowed in the service, except at the corporation and angle stop. Locating wire shall be 14 AWG single strand, soft drawn copper wire; 4/64 – inch polyvinyl chloride insulation. Locating wire shall be spliced before and after all valve boxes and when connecting at Tee’s. All splices should be covered with electrical tape. When splicing wire at Tee’s, keep clear of fittings.

2" CTS polyethylene service tubing (Manufactured by Endot Industries)
2" Copper tubing, ASTM B88, and WWT-799, type "K", soft or hard drawn, rolls or 20' straight lengths.
(Copper tubing use requires the approval of the City of West Palm Beach)

☐ Endotrace, CTS, polyethylene, with attached tracing wire
☐ Mueller Industries, Inc.
☐ Cerro Flow Products LLC

ANGLE VALVES (plug or ball style):

2" compression by 1 - ½ & 2" meter flange coupling, locking style, quarter turn to open.

	FORD		AY MCDONALD
☐	BF43-777W-NL	☐	4602B-22

METER FLANGE (Consumer Side):

Two sizes of couplings are listed. The first size is to come out of the back of a 1-1/2" meter, and the other is to come out the back of a 2" meter. Two types of couplings are specified. The first is a meter flange to compression coupling iron pipe size, the second is meter flange to compression coupling copper tubing size.

		FORD
☐	1-1/2" x IP Size	CF35-66-NL
☐	1-1/2" x CT Size	CF34-66-NL
☐	2" x IP Size	CF35-77-NL
☐	2" x CT Size	CF34-77-NL

Submittal: 1-1/2” and 2" WATER METER (CONTINUED)

CORPORATIONS:

2"AWWA tapping thread by 2" compression coupling.

FORD	AY MCDONALD
☐ FB1000-7NL	☐ 3128B

Must use:

2" female by compression fitting and

FORD	AY MCDONALD
☐ FC1477NL	☐ 4754-22

2” x 2”Brass Bushing

FORD	AY MCDONALD
☐ C18-67	☐ 3126-626

Submittal: DUAL WATER SERVICE

NOTE: The following material is required for all dual services. The City of West Palm Beach specifies two sizes for its dual water services, 1" copper tubing for short services, and 2" for longer services. Dual services cannot have more than 2 - 3/4" meters on the one 1" service. Brass fittings listed in these specifications must meet 85-5-5-5 ASTM B62 Cast Brass Specs. Use NPT by copper tubing compression fittings, such as; Pack Joint, 110, Mac-Pak or "T" compression. If polyethylene pipe is used, then stainless steel stiffeners are required in conjunction with fittings.

METER BOXES:

All box lids will have a non-skid surface, the metal hinged meter reader's lid will be self-closing. All boxes and lids will be H-20 traffic rated. All boxes will come with mouse holes and be of the flared design.

		CDR/HUBBELL
Box:	☐	15"X17"X12"
Lid:	☐	15"X17"X1-1/2"

PIPE:

Service line pipe shall be continuous length with no joints or fittings allowed in the service, except at the corporation and angle stop.

1" CTS polyethylene service tubing (Manufactured by Endot Industries)
1" Copper tubing, ASTM B88, and WWT-799, type "K", soft or hard drawn, rolls or 20' straight lengths.
(Copper tubing use requires the approval of the City of West Palm Beach)

☐ Endotrace, CTS, polyethylene, with attached tracing wire
☐ Mueller Industries, Inc.
☐ Cerro Flow Products LLC

ANGLE VALVES (Plug or Ball):

1" female by 1" meter coupling, locking style, quarter turn (for dual services only).

☐ FORD, FBA13444WNL (Ford "U" branch comes with angle valves)
☐ AY MCDONALD, # 4604, or 4644B, to be used with the "U" branches listed below

"U" BRANCHES:

2" female iron pipe thread by 2 - 1" male iron pipe threads by 7.5" separation between angle valves.

☐ FORD, # UV43-62W (1-1/2" by 3/4" for the long side)
☐ FORD, # UV43-42W (1" by 3/4" for the short side)
☐ AY MCDONALD, _____
Need to supply angle valves with "U" branch (see above)
2" compression by 1-1/2" male iron pipe thread

METER COUPLING (Consumer Side):3/4" or 1"

	FORD		AY MCDONALD
☐	3/4" PART #C38-23-2-5-NL	☐	3/4" PART #74620 (3/4"X3/4"X2.50")
☐	1" PART #C38-44-2-625-NL	☐	1" PART #74620 (1"X1"X2.63")

Submittal: DUAL WATER SERVICE (CONTINUED)

CORPORATIONS:

2"AWWA tapping thread by 2" compression coupling.

FORD		AY MCDONALD	
☐	FB1000-7NL	☐	3128B

Must use:

2" female by compression fitting and 2” x 2”Brass Bushing

FORD		AY MCDONALD		FORD		AY MCDONALD	
☐	FC1477NL	☐	4754-22	☐	C18-67	☐	3126-626

Submittal: EXTENDED & MULTIPLE WATER SERVICE

The City of West Palm Beach specifies a 2" water service for multiple. A multiple service line is any service with more than two (2) single services or combination of two (2) services that include a 1" or larger meter. Two-inch (2") water service is required for any single service in excess of 50'. The next two pages will pertain only to the additional materials needed beyond those specified under the submittals for 1", 2" or Dual Services. Select the required materials from those lists and the additional materials listed in these submittals.

All 2" water service lines shall be extended from a minimum of pipe size of 4". Review and select material listed in the "Pressure Pipe Submittal Package" for the material needed.

The Engineer of Record (EOR) shall be responsible to calculate and properly size the service piping to meet hydraulic flow demand from the main through the meter(s), backflow preventer(s) and to the residence or business.

CURB STOPS:

2" compression by 2" female IPT. To be placed on the end of an extended service.

☐ FORD B41-777 ☐ AY MCDONALD 6106-22

VALVE BOXES:

Heavy duty, Cast Iron ASTM-A48 Class 30, 2 piece, 5-1/4" opening, flanged base, 18" to 24" adjustable, screw type, valve box, with locking lid (for all paved areas), embossed with "WATER" on the lid for water mains and services

Tyler/Union SIGMA Bingham & Taylor

☐ 461-S ☐ 461-S Part # VB261X/60WT ☐ Non–Flip Option

(SIGMA and Tyler are interchangeable) Model:_____

VALVE BOX LIDS: (Box Lid shall match Box Manufacturer)

Non-Locking Lid:

Cast Iron ASTM-A48, Class 30, embossed with "SEWER" on the lid for force mains, embossed with "WATER" on the lid for water mains and services.

☐ Tyler/Union ☐ SIGMA ☐ Bingham & Taylor

Locking lid (For all paved areas):

Cast Iron ASTM-A48, Class 30, embossed with "SEWER" on the lid for force mains. To be used on Tyler model 461S, 5-1/4", screw type box.

☐ Tyler/Union ☐ SIGMA ☐ Bingham & Taylor

Locking lid (in paved areas):

Cast Iron ASTM-A48 Class 30, embossed with "WATER" on the lid for water mains and services.

☐ Tyler/Union ☐ SIGMA ☐ Bingham & Taylor

VALVE EXTENSION STEMS:

Utilized on all in-ground valves 36" or more below finished grade. Used in place of the American Trench Adapter (valve box). Valve extension must be secured to the valve stem, not set over the operating key.

☐ Mueller ☐ Proselect

Submittal: EXTENDED & MULTIPLE WATER SERVICE (CONTINUED)

UNDERGROUND VALVE IDENTIFICATION (UVI) TAGS:

To be used when the Tyler-style valve box with the Debris Cap is used, such as with the American Trench Adapter. Dimensions: 3" x 1/4", Brass, with 2-1/2" theft proof "J" rod anchor. Stamped: ¼" to 3/8" Capital lettering. Each valve will have the following minimum information on the tag, words in parentheses are examples of wording to use: City code (WPB), valve size (6"), type of valve (RV, BV, PV), type of use (WM, FM), and operation instructions (R-21) right 21 turns to open, plus valve number, if applicable. In paved and unpaved areas, the UVI will be placed in the concrete collar around valve boxes.

☐ WAGCO MARKER

BRASS BUSHING:

All brass shall be of non-lead brass (maximum lead content of 0.10% by weight).

2" male IPT by 1" female IPT solid brass bushing. To be placed on the end of the curb stop for an extended 1" or Dual service. Use 2 bushings in the tee listed below for two one inch or dual services. See the 2 by 1" - "Y" fitting which can be used in lieu of the 2" tee, brass bushing and compression fittings.

☐ LEE BRASS ☐ MERIT BRASS

BRASS TEE:

All brass shall be of non-lead brass (maximum lead content of 0.10% by weight).

2" male IPT. To be placed on the end of the extended service for a multiple service connection. See the 2 by 1" - "Y" fitting to be used in lieu of the tee, brass bushing and compression fittings.

☐ LEE BRASS ☐ MERIT BRASS

BRASS FITTINGS:

All brass shall be of non-lead brass (maximum lead content of 0.10% by weight).

1" compression by 1" female IPT to be placed in the bushings on the run of the tee for multiple services. See the 2 by 1" - "Y" fitting to be used in lieu of the tee, brass bushing and compression fittings.

☐ FORD ☐ MUELLER ☐ AY MCDONALD

2" male IPT by 2" Female IPT

☐ FORD ☐ MUELLER ☐ AY MCDONALD

BRASS NIPPLE:

All brass shall be of non-lead brass (maximum lead content of 0.10% by weight).

2" threaded by 6" long solid brass nipple. To be placed between the curb stop and tee for multiple services.

☐ LEE BRASS ☐ FORD

BRASS "Y"BRANCH:

All brass shall be of non-lead brass (maximum lead content of 0.10% by weight).

2" by 1" compression double ended "Y" branch fitting. Placed on end of curb stop to multiple services. Use in lieu of the tee, brass bushing and compression fittings.

☐ FORD ☐ MUELLER

Submittal: MISCELLANEOUS PARTS

On occasion, a variety of parts are required to install service lines and thee parts are not listed in the AML. Parts to be utilized in the construction on water distribution mains and service lines, which are not contained in the AML, shall be submitted as a shop drawing for approval.

All brass shall be of non-lead brass (maximum lead content of 0.10% by weight).

Submittal: 3" OR LARGER WATER SERVICE

GENERAL REQUIREMENTS:

1. See the standard detail sheet WS-6 and WS-6.1 for the location of the material for a large meter installation. Review Section One “Pressure Pipe” for the approved material requirements for water mains and make your selections from that list and submit those applicable sheets. Remember each meter installation will have its own character and may call for additional material.

2. Backflow preventers are required behind the meter so the pipe is not required to be offset back down to the proper laying depth until after the backflow preventer installation.

3. The material list pertains to a meter that will be set on a new or existing stub. Materials for each individual service will call for additional materials, refer to the plan design. The itemized list of material used for the water service will not include the following; tapping valve and sleeve, material for the backflow preventer riser after the meter installation, and material to go from a larger direct tap for fire flow to tee off to the water service.

4. Location and piping for the meter may be rotated to fit the available parkway, sidewalk and/or easement space.

5. A single tapping valve and sleeve may be made on a City water main for both the private fire line and metered service. A tee can be installed in the line after the tapping valve and sleeve for the metered service. If this is the way it is to be installed, then separate valves will need to be installed after the tee to operate the fire line and metered line separately. The tapping valve and sleeve will need to be sized for the larger of the two services (6” private fire line and 4” water service would call for a 6” minimum tap).

6. The following is an itemization of minimum amount and type of materials specifically detailed for a three inch meter. For a 4”, 6 or 8” meter, delete item “E” and change all other items to the meter size. For a more thorough list of the specifications for the material, refer to Section One “PRESSURE PIPE”.

7. The contractor may choose to use F.J. instead of M.J. Fittings on the meter assembly, but not in the roadway. The tapping valve, and first elbow (item “G”) in the service line must be M.J.

Submittal: 3” OR LARGER WATER SERVICE (CONTINUED)

VALVE BOXES:

Two (2) required on the valves listed above.

Heavy duty, Cast Iron ASTM-A48 Class 30, 2 piece, 5-1/4" opening, flanged base, 18” to 24" adjustable, screw type, valve box, with locking lid (for all paved areas), embossed with “WATER” on the lid for water mains and services

☐ Tyler/Union 461-S ☐ Russell/Russco 461-S Part # VB261X/60WT (Russco and Tyler are interchangeable) ☐ Bingham & Taylor Non-Flip Option Model Num.:_____

VALVE BOX LIDS: (Box Lid shall match Box Manufacturer)

Two (2) required on the valves listed above.

Non-Locking Lid:

Cast Iron ASTM-A48, Class 30, embossed with “SEWER” on the lid for force mains, embossed with “WATER” on the lid for water mains and services.

☐ Tyler/Union ☐ SIGMA ☐ Bingham & Taylor

Locking lid (For all paved areas):

Cast Iron ASTM-A48, Class 30, embossed with “SEWER” on the lid for force mains. To be used on Tyler model 461S, 5-1/4", screw type box.

☐ Tyler/Union ☐ SIGMA ☐ Bingham & Taylor

Locking lid (in paved areas):

Cast Iron ASTM-A48 Class 30, embossed with “WATER” on the lid for water mains and services.

☐ Tyler/Union ☐ SIGMA ☐ Bingham & Taylor

VALVE EXTENSION STEMS:

Utilized on all in-ground valves 36” or more below finished grade. Used in place of the American Trench Adapter (valve box). Valve extension must be secured to the valve stem, not set over the operating key.

☐ Mueller ☐ Proselect

UNDERGROUND VALVE IDENTIFICATION (UVI) TAGS:

To be used when the Tyler-style valve box with the Debris Cap is used, such as with the American Trench Adapter. Dimensions: 3" x 1/4", Brass, with 1-1/2" theft proof “J” rod anchor. Stamped: ¼” to 3/8" Capital lettering. Each valve will have the following minimum information on the tag, words in parentheses are examples of wording to use: City code (WPB), valve size (6"), type of valve (RV, BV, PV), type of use (WM, FM), and operation instructions (R-21) right 21 turns to open, plus valve number, if applicable. In paved and unpaved areas, the UVI will be placed in the concrete collar around valve boxes.

☐ WAGCO MARKER

Submittal: 3" OR LARGER WATER SERVICE (CONTINUED)

ITEM "A", VALVES:

2 required, 4", Resilient Wedge, M. J., 2" square operating nut. To be installed in line with the meter, on each side and as close as the pipe and fittings will allow. If one will fit in the meter box, usually the one after the meter then delete one each of the valve boxes and debris caps.

ITEM "B", FLANGE ADAPTERS: (2 required)

3", Megalug series 2100 flange to P.E. pipe (restrained). One on each side of the meter/strainer/test port.

ITEM "C", METER: (1 required)

Meter to be paid by Contractor and supplied by City of West Palm Beach
"C-1" a length of pipe 5 times the diameter of the pipe before the strainer/meter and
"C-2" a length of pipe 3 times the diameter of the pipe after the meter.

ITEM "D", STRAINER :(1 required)

As manufactured by Badger Meter, flanged, NSF 61 Envirobrass II housing, stainless steel strainer with twice the flow capacity as the meter, stainless steel bolts and nuts. Does not take the place of the straight pipe (C-1). Not required when the meter comes supplied with a built in strainer (Fire Flow Meter).

ITEM "E", REDUCERS: (2 required)

4 by 3", P. E. on the 4" end is allowed to save on the amount of Megalugs and pipe to be used. The reducers cannot be used in lieu of the straight pipe listed under item "C".

ITEM "F", METER VAULTS: (1 to 2 required)

Vaults for 3 and 4" compound meters will be 48" wide and 48" long and 18" deep. All lids will have the metal, hinged, meter readers lid within the heavy duty, hot dipped galvanized, steel, traffic rated lid (2-piece). 4" Fire flow and larger meters will call for a minimum of a 48" wide and 72" vault with a three piece lid. The hinged meter reader's lid will be centered over the meter dial. All boxes and lids will be H-20 traffic rated. Due to the size of the services the bypass (see item "H") may need to be installed in a separate 48 by 48" vault.

All lids will have a blank mushroom screwed into the hole drilled for the touch read module. Use TR/PL Housing Item No. 45 with Sensor Button (blank) Item No. 53907152-39004.

☐ US Precast ☐ Brooks

ITEM "G", MECHANICAL OFFSET:

The service at the meter is to be offset higher than the depth of the road crossing. To bring up the service to the proper grade (14" of cover) use one group of the following:

1. M.J., 18" Offset, (2) M.J. 45 degree bends, cement mortar lined,
2. M.J. 90 degree bends, Backflow preventer(s) are required behind the meter so the pipe is not required to be offset back down to the proper laying depth until after the backflow preventer installation.

Submittal: 3” OR LARGER WATER SERVICE (CONTINUED)

ITEM “H”, BY-PASS:

Bypass piping around meter to allow meter to be tested, repaired or replaced. Bypass piping to be same size as metered service piping (4, 6, or 8").
(2) 4", Resilient Wedge Gate Valves, F.J., with wheel handles
(2) 4", Megalug series 2100, flange to P.E. pipe (restrained). One on each side of the two valves.
(2) 4", M. J., tees, cement mortar lined. One on the outside of each of Item # A.
(1) 4" x 2”, F.J. By threaded tee or 4 x 4 tee with a tapped plate, to be installed between the F.J. valves, with the 2" threaded “branch” looking straight up.

with,

(1) 2 x 6" brass nipple threaded into the tee to,
(1) 2" locking style curb cock,
(2) 4" M. J. 90 degree bends,

ITEM “I”, TEST PORT:

Flanged tee is to be bolted to the back of the meter and may be used as part of “C-2".
(1) 3" Flanged tee with 2" threaded branch.
(1) 2" by 3" brass nipple.
(1) 2" Stainless steel ball valve or curb stop with handle.

ITEM “J”, MISCELLANEOUS ITEMS:

(16) 4" Megalug series 1100 restrainer glands for M. J. fittings (minimum).
(2) 3" Megalug series 1100 restrainer glands for M. J. fittings (minimum).
3", DIP, Class 52, cement mortar lined.
List Manufacturer:_____
4", DIP, Class 52, cement mortar lined.
List Manufacturer:_____
3", DIP, Class 53, FJ, cement mortar lined.
List Pipe Manufacturer and Company installing the flanges (attach certification letter from shop):
_____
4", DIP, Class 53, FJ, cement mortar lined.
List Pipe Manufacturer and Company installing the flanges (attach Certification letter from shop):
_____
(2) 4” Megalug series 2100 may be used in lieu of the flanged pipe.

Submittal: PRIVATE FIRE LINES

GENERAL REQUIREMENTS:

1. Review Section One “Pressure Pipe” for the approved material requirements for water mains. Private Fire Line (PFL) installation will have its own challenge and may require additional material.

2. Backflow preventers are required at the property line.

3. The material list pertains to a new tap for a private fire line (PFL). Information and materials for each individual case will call for additional materials, refer to the plan design for this material. The itemized list of material used for the private fire line will not include the material for the backflow preventer riser after the property line.

4. A single tapping valve and sleeve may be made on a City water main for both the PFL and the metered service. A tee can be installed in the line after the tapping valve and sleeve for the metered service. If this is the way it is installed, then separate valves will need to be installed after the tee to operate the fire line and metered line separately. The tapping valve and sleeve will need to be sized for the larger of the two services (6" private fire line 4" water service would call for a 6" minimum tap). This material is listed separately under “DUAL SERVICE MATERIAL”

5. There is no standard detail sheet for a Private Fire Line. A breakdown of the minimum required material for a private fire line installation are listed below. Remember each PFL installation will have its own character and may call for additional material.

6. The following is an itemization of minimum amount and type of materials specified for a 4” fire line. For a 6”, 8” or 10" PFL revise all items to the corresponding meter size. For a 3" PFL, add the items under “D”. See a 2” water service and an extended water service for the materials used for a 2" PFL.

Submittal: PRIVATE FIRE LINES (CONTINUED)

VALVES:

Two (2) required, 4", Resilient Wedge, M. J., 2" square operating nut. To be installed in line with the meter, on each side and as close as the pipe and fittings will allow. If one will fit in the meter box, usually the one after the meter then delete one each of the valve boxes and debris caps.

VALVE BOXES:

Two (2) required on the valves listed above. Heavy duty, Cast Iron ASTM-A48 Class 30, 2 piece, 5-1/4" opening, flanged base, 18" to 24" adjustable, screw type, valve box, with locking lid (for all paved areas), embossed with "WATER" on the lid for water mains and services

☐ Tyler/Union 461-S	☐ SIGMA 461-S Part # VB261X/60WT (SIGMA and Tyler are interchangeable)	☐ Bingham & Taylor Non-Flip Option Model_____

VALVE BOX LIDS: (Box Lid shall match Box Manufacturer)

Two (2) required on the valves listed above.

Non-Locking Lid:

Cast Iron ASTM-A48, Class 30, embossed with "SEWER" on the lid for force mains, embossed with "WATER" on the lid for water mains and services.

☐ Tyler/Union ☐ SIGMA ☐ Bingham & Taylor

Locking lid (For all paved areas):

Cast Iron ASTM-A48, Class 30, embossed with "SEWER" on the lid for force mains. To be used on Tyler model 461S, 5-1/4", screw type box.

☐ Tyler/Union ☐ SIGMA ☐ Bingham & Taylor

Locking lid (in paved areas):

Cast Iron ASTM-A48 Class 30, embossed with "WATER" on the lid for water mains and services.

☐ Tyler/Union ☐ SIGMA ☐ Bingham & Taylor

Submittal: PRIVATE FIRE LINES (CONTINUED)

DEBRIS CAP:

2-required in the valve boxes listed above. All Debris Caps within the system shall have color coded operating handles to the following standard; "Yellow" for curb stops and valves on water services.

VALVE EXTENSION STEMS:

Utilized on all in-ground valves 36" or more below finished grade. Used in place of the American Trench Adapter (valve box). Valve extension must be secured to the valve stem, not set over the operating key.

☐ Mueller ☐ Proselect

UNDERGROUND VALVE IDENTIFICATION (UVI) TAGS:

To be used when the Tyler-style valve box with the Debris Cap is used, such as with the American Trench Adapter. Dimensions: 3" x 1/4", Brass, with 2-1/2" theft proof "J" rod anchor. Stamped: ¼" to 3/8" Capital lettering. Each valve will have the following minimum information on the tag, words in parentheses are examples of wording to use: City code (WPB), valve size (6"), type of valve (RV, BV, PV), type of use (WM, FM), and operation instructions (R-21) right 21 turns to open, plus valve number, if applicable. In paved and unpaved areas, the UVI will be placed in the concrete collar around valve boxes.

☐ WAGCO MARKER

TAPPING SLEEVE:

One (1) required, size of the main to be tapped by 4"

MISCELLANEOUS ITEMS:

One (1) 4" Megalug series 1100 restrainer glands for M.J.fittings.

REDUCER:

For a 3" PFL, One (1) 4" X 3", M.J. Reducer, to be installed in the City Right of Way, just before the property line.

(1) Additional 4" Megalug series 1100 restrainer glands for M. J. fittings.

(1) 3" Megalug series 1100 restrainer glands for M. J. fittings.

Submittal: PRIVATE FIRE LINES (CONTINUED)

VALVES:

Two (2) eequired,
(1) M.J., R.W. Valve, on the building side of the tee to isolate the PFL (sized to fit the run).
(1) M.J., R.W. Valve, on the branch of the tee to isolate the water service (sized to fit the branch).

VALVE BOXES:

Two (2) required on the valves listed above.
Heavy duty, Cast Iron ASTM-A48 Class 30, 2 piece, 5-1/4" opening, flanged base, 18" to 24" adjustable, screw type, valve box, with locking lid (for all paved areas), embossed with "WATER" on the lid for water mains and services

☐ Tyler/Union 461-S ☐ SIGMA 461-S Part # VB261X/60WT (SIGMA and Tyler are interchangeable)

VALVE BOX LIDS: (Box Lid shall match Box Manufacturer)
Two (2) required on the valves listed above.

Non-Locking Lid:
Cast Iron ASTM-A48, Class 30, embossed with "SEWER" on the lid for force mains, embossed with "WATER" on the lid for water mains and services.

☐ Tyler/Union ☐ SIGMA

Locking lid (For all paved areas):
Cast Iron ASTM-A48, Class 30, embossed with "SEWER" on the lid for force mains. To be used on Tyler model 461S, 5-1/4", screw type box.

☐ Tyler/Union ☐ SIGMA

Locking lid (in paved areas):
Cast Iron ASTM-A48 Class 30, embossed with "WATER" on the lid for water mains and services.

☐ Tyler/Union ☐ SIGMA

DEBRIS CAP:

Two (2) required in the valve boxes listed above.
All Debris Caps within the system shall have color coded operating handles for each type service. "Yellow" for curb stops and valves on water services.

VALVE EXTENSION STEMS:

Utilized on all in-ground valves 36" or more below finished grade. Used in place of the American Trench Adapter (valve box). Valve extension must be secured to the valve stem, not set over the operating key.

☐ Mueller ☐ Proselect

UNDERGROUND VALVE IDENTIFICATION (UVI) TAGS:

To be used when the Tyler-style valve box with the Debris Cap is used, such as with the American Trench Adapter. Dimensions: 3" x 1/4", Brass, with 2-1/2" theft proof "J" rod anchor. Stamped: ¼" to 3/8" Capital lettering. Each valve will have the following minimum information on the tag, words in parentheses are examples of wording to use: City code (WPB), valve size (6"), type of valve (RV, BV, PV), type of use (WM, FM), and operation instructions (R-21) right 21 turns to open, plus valve number, if applicable. In paved and unpaved areas, the UVI will be placed in the concrete collar around valve boxes.

☐ WAGCO MARKER

Submittal: PRIVATE FIRE LINES (CONTINUED)

TEE:

M.J, Run of the tee sized to fit the PFL, branch sized by the service size required (4", 6" or 8").

MISCELLANEOUS ITEMS:

Minimum of 7 Megalug series 1100 restrainer glands for M. J. fittings to be used on the tee and valves.

PIPE:

Service line pipe shall be continuous length with no joints or fittings allowed the service, except at the corporation and angle stop.

1" CTS polyethylene water service tubing. (Manufactured by Endot Industries).

1" Copper tubing, ASTM B88, and WWT-799, type "K", soft or hard drawn, rolls or 20' straight lengths.

(Copper tubing use requires the approval of the City of West Palm Beach).

- ☐ Endotrace, CTS, polyethylene, with attached tracing wire
- ☐ Mueller Industries, Inc.
- ☐ Cerro Flow Products LLC

FITTINGS:

- ☐ Brass, 90 degree elbows, compression to female IPT.
  To screw into the ball valves on the backflow preventer.
- ☐ Brass, 90 degree elbows, compression on both ends.
  Located at the bottom of the backflow preventer.
- ☐ Brass or copper, 90 degree elbows, solder to female IPT.
  To screw into the ball valves on the backflow preventer.
  Size: _____
- ☐ Brass or copper, 90 degree elbows, solder joint on both ends.
  Located at the bottom of the backflow preventer.

ACCEPTABLE JOINTS:

- ☐ Solder Joints, per Plumbing and Health Department regulations (lead free).
- ☐ Use NPT by copper tubing compression fittings, such as:
  Pack Joint, 110 Mac-Pak or "T" Compression

Submittal: BACKFLOW PREVENTER(S)

NOTE: It is recommended that you review the City's Manual on Cross Connection Control. All backflow prevention assemblies used on City properties such as buildings, irrigation systems, lift stations, water re-pump stations, water treatment facilities and wastewater treatment facilities must comply with the latest list of Approved Backflow Prevention Assemblies from the University of South California's Foundation.

List the backflow prevention assemblies to be used; include type, manufacturer, model number, model name (if applicable) size and what type of system it will protect.
The following are the minimum standards to be met:

1. All assemblies must appear on the latest approval list from the University of South California's Foundation for Cross Connection Control
2. Only assemblies on that list that are currently being manufactured will be allowed.

	BACKFLOW PREVENTER TYPE	TYPE OF SYSTEM TO BE PROTECTED	MAKER	MODEL NUMBER	SIZE	ORIENTATION
EXAMPLE	RP	Domestic	Watts	709DC-A	3"	

Submittal: BACKFLOW PREVENTER(S) (CONTINUED)

GENERAL REQUIREMENTS:
The following lists of material are for:

1. 3” or larger, single, approved Double Check Detector Assembly (DCDA) or a 3” or larger, single, approved Reduced Pressure Principle Assembly (RPPA).

2. Additional material will be required for a parallel 3” or larger RPA with the first assembly.

3. ¾” to 2”, single, approved Reduced Pressure Principle Assembly (RPPA).

4. Additional material for a ¾” to 2” parallel RPPA with the first assembly.

5. Additional material for a ¾” RPPA for a City owned lift station.

6. Dual, parallel installations of RPPA’s are not required, but it is strongly suggested for restaurants and businesses that cannot afford to have their water turned off during regular working hours.

7. Backflow prevention assemblies and piping are required behind the meter on private property. The Public Utilities Department shall approve the material used through the backflow prevention assembly installation.

8. Location and piping for the backflow prevention assemblies may be rotated to fit the available property lay-out space with no increase in materials or distance from the property line.

9. Landscaping is a requirement for the installation of backflow preventers. Since backflow preventers must be installed at the property line, hedges must be planted around the assemblies to hide them. The hedges are also suggested as a security measure, this may avoid the backflow prevention assemblies not to be tampered by vandals.

10. See the standard detail sheet for the minimum design standards required for backflow installations. Remember the standard detail sheet is the standard, each backflow installation will have its own character and may call for additional material.

11. Some backflow prevention assemblies come built with elbows into the body and others are built with the purpose of being installed in the vertical position. By using these assemblies you can reduce the amount of fittings used. Call your supplier or our backflow techs for a list of this type of approved assemblies.

12. The Fire Department of the local Municipality that the DCDA is installed may have their own requirements. Check with the local official on these items. One item is the installation of tamper switches on the OS & Y valves to insure against them being operated.

13. The following is an itemization of minimum amount and type of materials specifically detailed for a 3” DCDA or RPPA. For a 4", 6” or 8" backflow preventer, change all items to the size required.

14. All backflow preventers used must be new, on the latest USC, FCCC approved list and be a device that is currently manufactured.

Submittal: BACKFLOW PREVENTER(S) (CONTINUED)

3" OR LARGER, SINGLE DCDA OR RPPA INSTALLATION:

FITTINGS:

(4) 3", 90 degree elbows are required. Most installers use two F.J. elbows at the top where they are attached to the flanged valves on the assembly and two MJ elbows on the bottom. All flanged elbows are allowed, but it is suggested that mechanical joint elbows be used underground.

FLANGE ADAPTERS:

(2) 3", Megalug series 2100 flange to P.E. pipe (restrained). If flanged pipe is not used or flanged joint (F.J.) by plain end (P.E.) Pipe is used then flange joint to plain end adapters will be required.

MISCELLANEOUS ITEMS:

(4) 3" Megalug series 1100 restrainer glands for M. J. fittings (minimum).
3", DIP, Class 52, cement mortar lined. List Manufacturer:
3", DIP, Class 53, FJ, cement mortar lined. Supply Company installing the flanges on the pipe.
NOTE: If pipe flanged on both ends is used it must be manufactured to fit the correct height requirement for the backflow preventers, or the assembly will not be approved.
Supports under each device.
Electrical conduit, wiring and two tamper switches. May be required to be installed on the O. S. & Y. Valves on DCDA only. Check with local Fire Department and Building Official.

FIRE DEPARTMENT CONNECTIONS (FDC): (Not a Public Utilities Requirement or review item)

To reduce the amount of pipe and fittings many contractors are placing the siamese connections on the back of the DCDA. It must be understood in West Palm Beach it is required that the FDC must not be more than 150' (hose length) from the closest City fire hydrant. To install the FDC on the backflow preventer do not place a flanged 90 degree bend on the back of the DCDA, but instead place the following (WITH PERMISSION AND MATERIAL REVIEW FROM THE BUILDING DEPARTMENT AND THE FIRE DEPARTMENT):
3" F. J. Tee, one end of run coming off of the DCDA, the branch going down and;
3" flanged 90 degree bend, on the other end of the run and then;
3" wafer check valve, then;
3" flange tapped for 3" IPT, then;
3" steel nipple (IPT), and a
3" FDC (Siamese).
Check with your local Fire, Mechanical, Plumbing plan reviewers and construction inspectors for the requirements of the local municipality you are working in.

3" OR LARGER, PARALLEL RPA INSTALLATION
3", F. J., Tee, run and branch same size to fit the riser pipe.
(2) or (4), 3", DIP, length to fit, Class 53, F.J., cement mortar lined spool pieces. None may be required if there is enough space between the tee and 90 degree bends to separate the backflow preventers. Supply certification letter from the Company installing the flanges.

¾" to 2", SINGLE RPA INSTALLATION
The brass fittings listed in these specifications must meet 85-5-5-5 ASTM B62 Cast Brass Specs. If solder joint fittings are used they must meet the brass spec unless they are pressed cooper fittings. All brass shall be of non-lead brass (maximum lead content of 0.10% by weight).

- End of Section -

GRAVITY SEWERS STANDARDS ARE TO BE USED FOR:

1. The City of West Palm Beach approves materials to be utilized in the sanitary collection system, wastewater lift stations, force mains, and services within the rights-of-ways and easements of:

    A. City of West Palm Beach

2. If DIP pipe and or fittings are required, review and use the appropriate pages in Section One “Pressure Pipe” submittal package for materials.

Submittal: SANITARY GRAVITY SEWER

These submittals shall cover non-pressurized sanitary gravity sewer pipe for the City of West Palm Beach.

GRAVITY SANITARY SEWER PIPE:

PVC sewer pipe shall conform to the requirements of ASTM D-3034 standard with minimum wall thickness of SDR 26.

☐ J-M ☐ Napco ☐ Diamond Plastic Corporation

☐ CertainTeed

PVC sewer pipe required when a gravity main or gravity lateral intersect with a DIP water main pipe, shall be C-900, Class 150, DR 18, PVC water main pipe or (if not available Class 350, ductile iron, epoxy lined, pipe. Review Section 1, Pressure Pipe).

☐ J-M ☐ Napco ☐ Diamond Plastic Corporation

☐ CertainTeed

GRAVITY SEWER FITTINGS:

PVC sewer fittings shall conform to the requirements of ASTM D-3034 standard with minimum wall thickness of SDR 26. Fittings 8-inch and smaller shall be molded in one piece with gasket joints that are of a molded “locked-in” design to prevent loss during transport or “fish mouthing” during pipe insertion. The minimum socket depths shall comply with ASTM D-3034. Fittings 10-inch and larger shall be molded or fabricated with manufacturers standard pipe bells and gaskets. Gaskets shall have minimum cross sectional area of 0.20 square inch and conform to ASTM F0477 standard. All fittings shall be supplied by one manufacturer. Fitting types that are not approved are any “Tee”, “Tee Wye” or “Cross” type fittings. Flows into a run from a branch must be at a minimum of a 30 degree angle. The smallest allowed main size is 8" the smallest allowed lateral size (owned by the City) is 6".

☐ IPEX ☐ PLASTIC TRENDS
☐ Multi Fitting ☐ HARRINGTON CORP.

CLEAN - OUTS:

PVC clean-outs shall have a handhold ring and cover for protection placed over it.

☐ U. S. F Model 7610
☐ SIGMA Model VB2610 (65lbs) set

TAPS INTO EXISTING PIPE:

Tie-in to an existing main that has been Insituformed or lined by another method.

☐ Inserta Tee

INSIDE DROP BOAL:

☐ Manufacturer: _____

Model Num.: _____

Submittal: SANITARY GRAVITY SEWER (CONTINUED)

MANHOLE RING AND COVERS:

Manhole lid style “D” must be used in sidewalk and pedestrian crossing areas (non-skid, pedestrian traffic design). Ordering information must include: with “WEST PALM BEACH” and “SANITARY” embossed in the lid. If it is a privately owned sewer system then “SANITARY” only is embossed in the lid.

☐ USF: 420 ring and cover with an O-ring seal built into the lid (420-ORS).
Style: _____

MANHOLE LID AND RING SEAL:

Manhole lids that do not have O-ring seals are required to be retrofitted with seals. Between the lid and casting.

☐ CRETEX

JOINT SEALANT FOR MANHOLES, AIR RELEASE MANHOLES, AND WETWELLS

☐ K.T. SNYDER COMPANY, INC.: RAM-NEK, plastic gasket joint material.
MADEWELL: 806 Flexible Joint Sealant.

PVC MANHOLE TO PIPE ADAPTERS:

Used to seal the pipe to the manhole. All adapters will be made to fit PVC, SDR-26 pipe. Adapters for use with all new construction. PVC adapters shall have double gasketed bell, with sand coating cast into the outside to allow for adherence to the concrete seal.

☐ HARCO - The Harrington Corp., P.O. Box 10335, Lynchburg, VA 24306
☐ Approved Equal: Manufacturer - _____

OTHER MANHOLE TO PIPE ADAPTERS:

Used to seal the pipe to the manhole. All adapters will be made to fit PVC, SDR-26 pipe. Adapters for use with all new construction. Adapters shall have stainless steel ring seals to seal the adapter to the pipe and to the manhole if they are not poured in place.

☐ Press Seal Gasket Corporation - Press-Boot
☐ U.S. Precast Manhole w/HDPE liner cast-in boot to sleeve connection
☐ U.S. Precast HDPE liner system "Turn Back" joint installed after cast

MANHOLE PRECAST ADJUSTING:

Brick is allowed to be used to raise to grade manholes or air release manholes.

Concrete reinforced 12" wide, 2" high with OD of 36" precast concrete rings are required.

☐ TRI-COUNTY CONCRETE PRODUCTS

Submittal: SANITARY GRAVITY SEWER (CONTINUED)

COUPLINGS FOR USE ON EXISTING FACILITIES (VCP, ETC):

Must have the stiffening collars (shear rings) or they cannot be used.

☐ FERNCO, RC Series
MISSON COUPLING

COUPLINGS FOR USE TO CHANGE PIPE TYPE:

Required when installing DIP in a PVC run of main or a lateral that is too close to another utility.

☐ HARRINGTON
8", PVC, C900 (DIP) x SDR 26 Bell to Bell Adapters.

MANHOLE COATINGS AND LININGS:

To be applied per manufacturers specifications and by a certified applicator (Supply letter of certification).

INTERIORS:

SPRAY OR BUSH APPLIED (by certified applicator)

☐ MADEWELL: Mainstay ML72 sprayable micro silica cement mortar base, with DS-5 epoxy lining coat.
☐ LAFARGE ALUMINATES: SewperCoat PG (new and rehabbed manholes)
☐ FLOWRITE FIBERGLASS LINING SYSTEMS (for rehabilitation of manholes)
☐ SPECTRAGUARD by SPECTRUM (new and rehabbed manholes)
☐ SPECTRASHEILD by Concrete Conservation, Inc.

FACTORY APPLIED (joints sealed in the field by a certified applicator)

☐ U. S. PRECAST/AGRU: Studded polypropylene welded liner fabric. Must be applied by a certified pre-caster.
☐ U. S. PRECAST/AGRU: Studded HDPE welded liner fabric. Must be applied by a certified pre-caster.
☐ T-LOCK: Polyethylene or polybutylene welded fabric. Must be applied by a certified pre-caster.

EXTERIOR:

☐ KOPPERS: 300M
☐ MAB: Ply-Tile Epoxy Tar Coating for exterior coating of manholes.

MANHOLE AND LIFT STATION WETWELL SEALANT:

On Rehabilitation projects It is required that all joints in manholes and lift station wetwells be sealed on the outside with an 8" wide band of Wrapid Seal on flat surfaces and a 12" wide band on angled surfaces at all riser rings and manhole castings. Must be used in conjunction with the joint sealant.

☐ CANUSA
Wrapid Seal

- End of Section -

LIFT STATION STANDARDS ARE TO BE USED FOR:

1. The City of West Palm Beach approves materials to be utilized in the sanitary collection system, wastewater lift stations, force mains, and services within the rights-of-ways and easements of:

    A. City of West Palm Beach

2. If DIP pipe and or fittings are required, review and use the appropriate pages in Section One “Pressure Pipe” submittal package for materials

3. When addressing backflow prevention in lift station water service application, refer to appropriate pages in Section 2 “Backflow Preventers” submittal package.

Submittal: LIFT STATION

PUMP:

The pump manufacturer or builder shall supply a minimum five (5) year warrant on the equipment starting with the date of final acceptance by the City. The pump manufacturer shall supply three (3) sets of operation and maintenance manuals for the equipment.

☐ FLYGHT (3085, 3102, 3127, 3153, 3171, 3202 or 3301)

MODEL S/N: _____

MOTOR: _____

IMPELLER: _____

PUMP RATE: _____

PUMPS TO OPERATE AT _____ GPM, TDH (TOTAL DYNAMIC HEAD) = _____ FT.

HORSEPOWER: _____

OUTLET: _____

MANHOLE AND LIFT STATION WETWELL SEALANT:

On Rehabilitation projects, It is required that all joints in manholes and lift station wetwells be sealed on the outside with an 8" wide band of Wrapid Seal on flat surfaces and a 12" wide band on angled surfaces at all riser rings and manhole castings. Must be used in conjunction with the joint sealant.

☐ CANUSA
Wrapid Seal

WET WELL COATING

To be applied per manufactures specifications and by a certified applicator. The applicator shall supply the letter of certification.

☐ SEWPERCOAT
Applicator: _____

☐ SPECTRASHIELD
Applicator: _____

☐ Approved Equal
Manufacturer/Model Num.:_____
Applicator: _____
Reference: _____

ACCESS DOOR

☐ BILCO TYPE J-AL ALUM. Leaf Access Door with 316 SS Hardware
☐ Approved Equal
Manufacturer/Model Num.:_____
Reference: _____

FALL PROTECTION

☐ HALLIDAY X RETRO-GRATE
☐ Approved Equal
Manufacturer/Model: _____
Reference: _____

Submittal: **LIFT STATION (CONTINUED)**

CHECK VALVE (AWWA C508)

☐ APCO Series 6000

☐ Kennedy Model: _____

☐ Mueller Model: _____

PRESSURE TRANSDUCER

Contractor shall supply calibration certificate for all installments.

☐ TE Connectivity
MEAS KPSI 750

PRESSURE GAUGE AND DIAPHRAGM SEALS

Contractor shall use Glycerin fill for all Pressure Gauges.

☐ ASHCROFT
Model: _____

☐ WIKA
Model: _____

PRESSURE TRANSMITTER

Contractor shall supply calibration certificate for all instrumentation.

☐ ROSEMOUNT, EMERSON
Model Num.3051

Submittal: LIFT STATION PANEL

RTU PANEL

All Applicable electrical codes (latest edition) must be adhered to including WPB, NEC, and FP&L company requirements.

- ☐ CC CONTROLS
  5760 Corporate Way, WPB FL 33407

- ☐ DCR ENGINEERING SERVICE INC.
  502 County Rd. 640, Mulberry FL 33860

- ☐ REVERE INC.
  3810 Drain Field Rd, Lakeland FL 33811

CONTROL PANEL

Refer to Submersible Lift Station - Bill of Material standard detail.

NOTE: All electrical components and systems shall be UL listed, and shall be assembled in a UL listed/approved facility.

LANDSCAPE - HEDGE

Refer to City's landscaping code (Chapter 94 of the Code of Ordinances, Article XIV)

- ☐ Silver Buttonwood
- ☐ Coco Plum
- ☐ Jamaica Caper

- End of Section -

STORM SEWERS STANDARDS ARE TO BE USED FOR:

1. The City of West Palm Beach approves materials to be utilized in the storm water system, and services within the rights-of-ways and easements of:

    A. City of West Palm Beach

Submittal: STORMWATER MANAGEMENT STRUCTURES

MANHOLE RING AND COVER STANDARD:

Ordering information must include: with “WEST PALM BEACH” and “STORM WATER” embossed in the lid. If it is a privately owned sewer system then “STORM WATER” only is embossed in the lid.

- ☐ USF: 240 ring and cover with an O-ring seal built into the lid (240-ORS).
- ☐ Lid style “D” for walkways and sidewalk areas

CURB INLET TOP, FRAME, AND GRATE:

Combination Inlet Frame, Grate, and Curb Box

- ☐ Neenah
  R-3067 Grate Type R

- ☐ USF Curb & Gutter Unlet Frame, Hood and Grate Series
  5130-6431 Heavy Duty Flow Area (190)

Enviro Notice Plates

- ☐ Neenah
  R-3000-B Surface Mount
- ☐ Neenah
  R-3000-D Surface Mount

CATCH BASINS:

Combination Frame and Grate

- ☐ USF Frame and Grate
  4138-6218 Heavy Duty Flow Area (380)

EXFILTRATION TRENCH:

FILTER FABRIC

Non-woven and woven geotextile fabric, needle punched fibers, 100% polypropylene.

- ☐ Advanced Drainage Systems, Inc. (ADS)
- ☐ Amoco Fabrics and Fiber Company

Approved Use:

Weights	Storm Pipe Joints	Exfiltration Trench
2.3 oz.	Y	N
3.5 oz.	Y	N
4 oz.	Y	Y
6 oz.	Y	Y

- End of Section -

HARDSCAPE/FIXTURE STANDARDS ARE TO BE USED FOR:

1. The City of West Palm Beach approves materials to be used within the rights-of-ways and easements of:

    A. City of West Palm Beach

Submittal: HARDSCAPE

PEDESTRIAN SURACES:

- ☐ Detectable Warning Products (Comply with Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Section 527)
  - ☐ Yellow (preferred)
  - ☐ Black
  - ☐ Forest Green
  - ☐ Other: _____ (Specify Color)

- End of Section -

STREET/PUBLIC LIGHTING STANDARDS ARE TO BE USED FOR:

1. The City of West Palm Beach approves materials to be used within the rights-of-ways and easements of:

    A. City of West Palm Beach

Submittal: This section is under development

This section is under development

- End of Section -

LANDSCAPE STANDARDS ARE TO BE USED FOR:

1. The City of West Palm Beach Engineering Department / Parks and Recreations Department approves materials to be used within the rights-of-ways, easements and public property of:

    A. City of West Palm Beach

Submittal: This section is under development

This section is under development

- End of Section -

IRRIGATION STANDARDS ARE TO BE USED FOR:

1. The City of West Palm Beach Parks and Recreations Department approves materials to be used in the irrigation systems and services within the rights-of-ways and easements of:

    A. City of West Palm Beach

Submittal: IRRIGATION SYSTEM COMPONENTS

CONTROLLERS:

The City of West Palm Beach utilizes two (2) types of irrigation controllers. Both types are manufacturer specific units. Exceptions will not be permitted.

Type I: Electrical Irrigation Controller (Utilized when electric service is available or may be installed)

- ☐ Toro Sentinel (Poured Concrete Slab) (Type I)
- ☐ SSA-K-12-PSI-6-N-S4-DR
- ☐ SSA-K-24-PSI-6-N-S4-DR
- ☐ SSA-K-36-PSI-6-N-S4-DR
- ☐ SSA-K-48-PSI-6-N-S4-DR

Type II: Solar Irrigation Controller (Utilized on small irrigation systems where electric service is not available)

- ☐ Leit Solar 4000 Series (Includes 2 Leit Operations Keys and Interface Kit) (Type II)

COMMUNICATIONS:

The Toro Sentinel controller is utilized by the City as a comprehensive irrigation management system. The City utilizes telemetry communications in conjunction with the Toro Sentinel controller. The following items must be included with a Toro Sentinel System:

- ☐ Antenna (AA101K) Unity Gain Kit (One Per Controller) Kenwood UHF Handheld Radio (TK3170K4)(Programmed to City Frequency), Kenwood Battery LITH ION (KNB35L),
- ☐ Kenwood Antenna UHF 3160/3180 (KRA27M), Kenwood Rapid Charge 110V (KSC25), With Marine-Grade Weather-Proof Clear Plastic UHF Radio Sealed Bag

HARDWARE:

- ☐ BPDI Kaddy Shack Controller Protection Enclosure (KS-2) Forest Green w/Concrete Slab BPDI Guard
- ☐ Shack Backflow Enclosure (GS-4) Forest Green w/Concrete Slab

VALVE BOX:

- ☐ Ametek 6" Round Plastic Valve Box w/Latching Lid
- ☐ Ametek 10" Round Plastic Valve Box w/Latching Lid
- ☐ Ametek 12" X 16” Rectangular Plastic Valve Box w/Latching Lid

PIPE (PVC):

- ☐ 6” Mainline Class 200 PVC “O” Ring w/Ductile Iron Fittings
- ☐ 4” Mainline Class 200 PVC “O” Ring w/Ductile Iron Fittings
- ☐ 3” Mainline Class 200 PVC “O” Ring w/Ductile Iron Fittings
- ☐ 2 1⁄2” Schedule 80 Lateral Supply Line to Zones
- ☐ 2” Schedule 80 Lateral Supply Line to Zones
- ☐ 1 1⁄2” Schedule 80 Lateral Supply Line to Zones
- ☐ 1 1/4” Schedule 40 Lateral Supply Line to Zones
- ☐ 1” Schedule 40 Lateral Supply Line to Zones
- ☐ 3/4” Schedule 40 Lateral Supply Line to Zones
- ☐ 1/2” Schedule 40 Lateral Supply Line to Zones
- ☐ Funny Pipe, Super Blue Flex, EHD 1295-010-D, 100’ Coil

Submittal: IRRIGATION SYSTEM COMPONENTS (CONTINUED)

PIPE (DIRECTIONAL DRILL CONDUIT):

- ☐ 4” Directional Bore, Schedule 80 PVC
- ☐ 4” Directional Bore, HDPE, ASTM F 2160
- ☐ 4” Directional Bore, HDPE, UL 651B (Electrical Wiring)
- ☐ 6” Directional Bore, Schedule 80 PVC
- ☐ 6” Directional Bore, HDPE, ASTM F 2160
- ☐ 6” Directional Bore, HDPE, UL 651B (Electrical Wiring)
- ☐ 8” Directional Bore, Schedule 80 PVC
- ☐ 8” Directional Bore, HDPE, ASTM F 2160
- ☐ 8” Directional Bore, HDPE, UL 651B (Electrical Wiring)
- ☐ 12” Directional Bore, Schedule 80 PVC
- ☐ 12” Directional Bore, HDPE, ASTM F 2160
- ☐ 12” Directional Bore, HDPE, UL 651B (Electrical Wiring)

FITTINGS (PVC):

- ☐ 1⁄2” – 1 1⁄4” Fittings and Adapters, Schedule 40
- ☐ 1 1⁄2’ – 2 1⁄2” Fittings and Adapters, Schedule 80
- ☐ Shrub Adapter, Irritrol HS 100

VALVES:

- ☐ 1 1⁄2” Nibco, Class 125 Bronze Gate Valve (T113 – 1 1⁄2”)
- ☐ 2” Nibco, Class 125 Bronze Gate Valve (T113 – 2”)
- ☐ 3” Nibco, Class 125 Bronze Gate Valve (T113 – 3”)
- ☐ 3⁄4” Zone Valve: Irritrol 700 PRS Series with CDR Box
- ☐ 1” Zone Valve: Irritrol 700 PRS Series with CDR Box
- ☐ 1 1/2” Zone Valve: Irritrol 700 PRS Series with CDR Box
- ☐ 2” Zone Valve: Irritrol 700 PRS Series with CDR Box
- ☐ 2” Air Relief Valve

HEADS / BUBBLERS:

- ☐ Toro 4” Pop-Up Spray #570 Z-4P-PRX Series
- ☐ Toro 6” Pop-Up Spray #570 Z-6P-PRX Series
- ☐ Toro 12” Pop-Up Spray #570 Z-12P-PRX Series
- ☐ Hunter PGP Series, Pop-up Rotar
- ☐ Irritrol # 533 Flood Bubblers

BACKFLOW:

- ☐ 1” Febco 825Y
- ☐ 1 1/4” Febco 825Y
- ☐ 1 1/2” Febco 825Y
- ☐ 2” Febco 825Y
- ☐ Approved Equal

SENSORS:

- ☐ 1 1⁄2” Data Industries IR Series (IR220P) Flow Sensor
- ☐ 2” Data Industries IR Series (IR220P) Flow Sensor
- ☐ 3” Data Industries IR Series (IR220P) Flow Sensor

- End of Section –

RECLAIMED WATER SYSTEM STANDARDS ARE TO BE USED FOR:

1. Reclaimed water distribution system. Distribution System Utility Service Area includes:

    A. City of West Palm Beach

Submittal: This section is under development

This section is under development

- End of Section -

Jacobs Engineering Group Inc.

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