

INVITATION TO BID
CITY OF NAPLES
PURCHASING DIVISION
CITY HALL, 735 8TH STREET SOUTH
NAPLES, FL 34102
PH: 239-213-7100 FX: 239-213-7105

NOTIFICATION DATE:	TITLE	NUMBER:	OPENING DATE & TIME:
07/29/12	PURCHASE OF UNDERGROUND PIPE MATERIAL FOR ASR WELL AND PUMP SYSTEM	058-12	8/8/12 2:00 PM
PRE-BID DATE, TIME AND LOCATION:			

MAILING ADDRESS:	
CITY-STATE-ZIP:	
PH:	EMAIL:
FX:	WEB ADDRESS:

I certify that this bid is made without prior understanding, agreement, or connection with any corporation, firm, or person submitting a bid for the same materials, supplies, or equipment and is in all respects fair and without collusion or fraud. I agree to abide by all conditions of this bid and certify that I am authorized to sign this bid for the bidder. In submitting a bid to the City of Naples the bidder offers and agrees that if the bid is accepted, the bidder will convey, sell, assign or transfer to the City of Naples all rights, title, and interest in and to all causes of action it may now or hereafter acquire under the Anti-trust laws of the United States and the State of FL for price fixing relating to the particular commodities or services purchased or acquired by the City of Naples. At the City's discretion, such assignment shall be made and become effective at the time the City tenders final payment to the bidder.

AUTHORIZED SIGNATURE	DATE	PRINTED NAME/TITLE
<small>Please initial by all that apply I acknowledge receipt of the following addendum</small>		
____Addendum #1	____Addendum #2	____Addendum #3
____Addendum #4		

PLEASE NOTE THE FOLLOWING:

- > **This page must be completed and returned with your bid.**
- > **Bids must be submitted in a sealed envelope, marked with bid number & closing date.**
- > **Bids received after the above closing date and time will not be accepted.**
- > **If you do not have an email address and you want a copy of the Bid Tab, please enclose a stamped, self-addressed envelope with your bid.**

GENERAL CONDITIONS

TO INSURE ACCEPTANCE OF THE BID, PLEASE FOLLOW THESE INSTRUCTIONS. ANY AND ALL SPECIAL CONDITIONS, ATTACHED HERETO, HAVE PRECEDENCE.

- 1. SEALED BID:** All bids must be submitted in a sealed envelope. The face of the envelope shall contain the bid name and bid number. Bids not submitted on attached bid form shall be rejected. All bids are subject to the conditions specified herein. Those which do not comply with these conditions are subject to rejection.
- 2. EXECUTION OF BID:** Bid must contain a manual signature of authorized representative in the proposal section. Bid must be typed or printed in ink. Use of erasable ink is not permitted. All corrections made by bidder to his bid must be initialed.
- 3. NO BID:** If not submitting a bid, respond by returning the Statement of No Bid and explain the reason in the spaces provided. Failure to respond 3 times in succession without justification shall be cause for removal of the supplier's name from the bid mailing list. NOTE: To qualify as a respondent, bidder must submit a "NO BID," and it must be received no later than the stated bid opening date and hour.
- 4. BID OPENING:** Shall be public, on the date and at the time specified on the bid form. It is the bidder's responsibility to assure that his bid is delivered at the proper time and place of the bid opening. Bids which for any reason are not so delivered will not be considered. Offers by telegram; telephone; or fax are not acceptable. Bid files may be examined during normal working hours.
- 5. WITHDRAWAL OF BIDS:** Withdrawal of a bid within sixty (60) days after the opening of bids is subject to suspension or debarment in accordance with Section 2-668 of the City Code for up to three years.
- 6. PRICES, TERMS and PAYMENT:** Firm Prices include all packing, handling, shipping charges and delivery to the destination shown herein. Bidder is encouraged to offer cash discount for prompt invoice payment. Terms of less than 20 days will not be considered.

 - A. TAXES:** The City of Naples does not pay Federal Excise and Sales taxes on direct purchases of tangible personal property. See exemption number on face of purchase order. This exemption does not apply to purchases of tangible personal property made by contractors who use the tangible personal property in the performance of contracts for the improvement of City-owned real property.
 - B. MISTAKES:** Bidders are expected to examine the specifications, delivery schedule, bid prices, extensions, and all instructions pertaining to supplies and services. Failure to do so will be at bidder's risk. In case of mistake in extension, the unit price will govern.
 - C. CONDITION AND PACKAGING:** It is understood and agreed that any item offered or shipped as a result of this bid shall be a new, current standard production model available at the time of this bid. All containers shall be suitable for storage or shipment, and all prices shall include standard commercial packaging.
 - D. SAFETY STANDARDS:** Unless otherwise stipulated in the bid, all manufactured items and fabricated assemblies shall comply with applicable requirements of Occupational Safety and Health Act and any standards there under.
 - E. UNDERWRITERS' LABORATORIES:** Unless otherwise stipulated in the bid, all manufactured items and fabricated assemblies shall carry U.L. approval and re-examination listing where such has been established.
 - F. PAYMENT:** Payment will be made by the buyer after the items awarded to a vendor have been received, inspected, and found to comply with award specifications, free of damage or defect and properly invoiced. All invoices shall bear the purchase order number. Payment for partial shipments shall not be made unless specified in the bid. Failure to follow these instructions may result in delay in processing invoices for payment. In addition, the purchase order number must appear on bills of lading, packages, cases, delivery lists and correspondence.

7. **DELIVERY:** Unless actual date of delivery is specified (or if specified delivery cannot be met), show number of days required to make delivery after receipt of purchase order in space provided. Delivery time may become a basis for making an award (see Special Conditions). Delivery shall be within the normal working hours of the user, Monday through Friday, unless otherwise specified.

8. **MANUFACTURERS' NAMES AND APPROVED EQUIVALENTS:** Any manufacturers' names, trade names, brand names, information and/or catalog numbers listed in a specification are for information and not intended to limit competition. The bidder may offer any brand for which he is an authorized representative, which meets or exceeds the specification for any item(s). If bids are based on equivalent products, indicate on the bid form the manufacturer's name and number. Bidder shall submit with his proposal, cuts, sketches, and descriptive literature, and/or complete specifications. Reference to literature submitted with a previous bid will not satisfy this provision. The bidder shall also explain in detail the reason(s) why the proposed equivalent will meet the specifications and not be considered an exception thereto. Bids which do not comply with these requirements are subject to rejection. Bids lacking any written indication of intent to quote an alternate brand will be received and considered in complete compliance with the specifications as listed on the bid form.

9. **INTERPRETATIONS:** Any questions concerning conditions and specifications shall be directed in writing to this office for receipt no later than ten (10) days prior to the bid opening. Inquiries must reference the date of bid opening and bid number. Failure to comply with this condition will result in bidder waiving his right to dispute the bid.

10. **CONFLICT OF INTEREST:** All bid awards are subject to Section 2-973 Conflict of Interest, City of Naples Code of Ordinances, which states: *"No public officer or employee shall have or hold any employment or contractual relationship with any business entity or any agency which is subject to the regulation of or is doing business with the city; nor shall an officer or employee have or hold any employment or contractual relationship that will create a continuing or frequently recurring conflict between his private interests and the performance of his public duties or that would impede the full and faithful discharge of his public duties. Any member of the city council or any city officer or employee who willfully violates this section shall be guilty of malfeasance in office or position and shall forfeit his office or position. Violation of this section with the knowledge, express or implied, of the person or corporation contracting with or making a sale to the city shall render the contract or sale voidable by the city manager or the city council."*

11. **AWARDS:** As the best interest of the City may require, the right is reserved to make award(s) by individual item, group of items, all or none, or a combination thereof; to reject any and all bids or waive any minor irregularity or technicality in bids received.

12. **ADDITIONAL QUANTITIES:** For a period not exceeding ninety (90) days from the date of acceptance of this offer by the buyer, the right is reserved to acquire additional quantities up to but not exceeding those shown on bid at the prices bid in this invitation. If additional quantities are not acceptable, the bid sheets must be noted "BID IS FOR SPECIFIED QUANTITY ONLY." (THIS PARAGRAPH DOES NOT APPLY FOR A TERM CONTRACT.)

13. **SERVICE AND WARRANTY:** Unless otherwise specified, the bidder shall define any warranty service and replacements that will be provided during and subsequent to this contract. Bidders must explain on an attached sheet to what extent warranty and service facilities are provided.

14. **SAMPLES:** Samples of items, when called for, must be furnished free of expense, on or before bid opening time and date, and if not destroyed may, upon request, be returned at the bidder's expense. Each individual sample must be labeled with bidder's name, manufacturer's brand name and number, bid number and item reference. Request for return of samples shall be accompanied by instructions which include shipping authorization and name of carrier and must be received with your bid. If instructions are not received within this time, the commodities shall be disposed of by the City of Naples.

15. **BID PROTEST:** The city has formal bid protest procedures that are available on request.

16. INSPECTION, ACCEPTANCE AND TITLE: Inspection and acceptance will be at destination unless otherwise provided. Title and risk of loss or damage to all items shall be the responsibility of the contract supplier until accepted by the ordering agency, unless loss or damage results from negligence by the ordering

17. DISPUTES: In case of any doubt or difference of opinion as to the items to be furnished hereunder, the decision of the buyer shall be final and binding on both parties.

18. GOVERNMENTAL RESTRICTIONS: In the event any governmental restrictions may be imposed which would necessitate alteration of the material, quality, workmanship or performance of the items offered on this proposal prior to their delivery, it shall be the responsibility of the successful bidder to notify the buyer at once, indicating in his letter the specific regulation which required an alteration. The City reserves the right to accept any such alteration, including any price adjustments occasioned thereby, or to cancel the contract at no expense to the City.

19. LEGAL REQUIREMENTS: Applicable provision of all Federal, State, county and local laws, and of all ordinances, rules, and regulations shall govern development submittal and evaluation of all bids received in response hereto and shall govern any and all claims and disputes which may arise between person(s) submitting a bid response hereto and the City of Naples by and through its officers, employees and authorized representatives, or any other person, natural or otherwise; and lack of knowledge by any bidder shall not constitute a cognizable defense against the legal effect thereof.

20. PATENTS AND ROYALTIES: The bidder, without exception, shall indemnify and save harmless the City of Naples and its employees from liability of any nature or kind, including cost and expenses for or on account of any copyrighted, patented, or unpatented invention, process, or article manufactured or used in the performance of the contract, including its use by the City of Naples. If the bidder uses any design, device, or materials covered by letters, patent or copyright, it is mutually agreed and understood without exception that the bid prices shall include all royalties or cost arising from the use of such design, device, or materials in any way involved in the work.

21. ADVERTISING: In submitting a bid, bidder agrees not to use the results there from as a part of any commercial advertising.

22. ASSIGNMENT: Any Purchase Order issued pursuant to this bid invitation and the monies which may become due hereunder are not assignable except with the prior written approval of the buyer.

23. LIABILITY: The supplier shall hold and save the City of Naples, its officers, agents, and employees harmless from liability of any kind in the performance of this contract.

24. PUBLIC ENTITY CRIMES: A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a 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 Section 287.017, for CATEGORY TWO for a period of 36 months from the date of being placed on the convicted vendor list.

25. DISCRIMINATION: An entity or affiliate who has been placed on the discriminatory vendor list may not submit a bid on a contract to provide goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not award or perform work as a contractor, supplier, subcontractor, or consultant under contract with any public entity, and may not transact business with any public entity.

26. **COUNTY TAXES:** No proposal shall be accepted from and no contract will be awarded to any person, firm or corporation that is in arrears to the government of Collier County, Florida.

27. **OFFER EXTENDED TO OTHER GOVERNMENTAL ENTITIES:** The City of Naples encourages and agrees to the successful bidder/proposer extending the pricing, terms and conditions of this solicitation or resultant contract to other governmental entities at the discretion of the successful bidder/proposer.

IF THIS BID IS FOR A TERM CONTRACT, THE FOLLOWING CONDITIONS SHALL ALSO APPLY

28. **ELIGIBLE USERS:** All departments of the City of Naples are eligible to use this term contract. Such purchases shall be exempt from the competitive bid requirements otherwise applying to their purchases.

29. **PRICE ADJUSTMENTS:** Any price decrease effectuated during the contract period by reason of market change shall be passed on to City of Naples. Price increases are not acceptable.

30. **CANCELLATION:** All contract obligations shall prevail for at least one hundred eighty (180) days after effective date of contract. After that period, for the protection of both parties, this contract may be cancelled in whole or in part by either party by giving thirty (30) days prior written notice to the other party.

31. **RENEWAL:** The City of Naples reserves the option to renew the period of this contract, or any portion thereof for up to two (2) additional periods. Renewal of the contract period shall be by mutual agreement in writing.

32. **ABNORMAL QUANTITIES:** While it is not anticipated, should any unusual or abnormal requirements arise, the City reserves the right to solicit separate bids thereon.

33. **FISCAL NON-FUNDING CLAUSE:** In the event sufficient funds are not budgeted for a new fiscal period, the City shall notify the contractor of such occurrence and the contract shall terminate on the last day of the current fiscal year without penalty or expense to the City.

IF THIS BID IS FOR PERFORMING A SERVICE, THE FOLLOWING CONDITIONS SHALL ALSO APPLY

34. **ALTERNATIVE BIDS:** Bidders offering service delivery methods other than those permitted by the scope of work may submit a separate envelope clearly marked "ALTERNATIVE BID". Alternative bids will be deemed non-responsive and will not be considered for award. All such responses will, however, be examined prior to award. Such examination may result in cancellation of all bids received to permit rewriting the scope of work to include the alternative method, or the alternative method may be considered for future requirements of the City of Naples.

35. **ANTITRUST:** By entering into a contract, the contractor conveys, sells, assigns and transfers to the City of Naples all rights, titles and interest it may now have or hereafter acquire under the antitrust laws of the United States and the State of Florida that relate to the particular goods or services purchased or acquired by the City of Naples under said contract.

36. **BIDDER INVESTIGATIONS:** Before submitting a bid, each bidder shall make all investigations and examinations necessary to ascertain all site conditions and requirements affecting the full performance of the contract and to verify any representations made by the City of Naples upon which the bidder will rely. If the bidder receives an award as a result of its bid submission, failure to have made such investigations and examinations will in no way relieve the bidder from its obligation to comply in every detail with all provisions and requirements of the contract documents, nor will a plea of ignorance of such conditions and requirements be accepted as a basis for any claim whatsoever by the contractor for additional compensation.

37. CERTIFICATES AND LICENSES: The Contractor, at time of proposal, shall possess the correct occupational licenses, all professional licenses or other authorizations necessary to carry out and perform the work required by the City of Naples and Collier County for this project pursuant to all applicable Federal, State and Local Laws, Statutes, Ordinances, and rules and regulations of any kind.

38. CHANGE IN SCOPE OF WORK: The City of Naples may order changes in the work consisting of additions, deletions or other revisions within the general scope of the contract. No claims may be made by the contractor that the scope of the project or of the contractor's services has been changed, requiring changes to the amount of compensation to the contractor or other adjustments to the contract unless such changes or adjustments have been made by written amendment to the contract signed by the City of Naples and the contractor. If the contractor believes that any particular work is not within the scope of the project, is a material change, or will otherwise require more compensation to the contractor, the contractor must immediately notify the City in writing of this belief. If the City believes that the particular work is within the scope of the contract as written, the contractor will be ordered to and shall continue with the work as changed and at the cost stated for the work within the scope.

39. CONTRACTOR PERSONNEL: The City of Naples shall, throughout the life of the contract, have the right of reasonable rejection and approval of staff or subcontractors assigned to the work by the contractor. If the City reasonably rejects staff or subcontractors, the contractor must provide replacement staff or subcontractors satisfactory to the City in a timely manner and at no additional cost to the City. The day-to-day supervision and control of the contractor's employees and sub-contractors is the responsibility solely of the contractor.

40. COST REIMBURSEMENT: The contractor agrees that all incidental costs, including allowances for profit and tools of the trade, must be included in the bid proposal rates. If an arrangement is made between the contractor and the City to reimburse the contractor for the cost of materials provided in the performance of the work, the contractor shall be reimbursed in the following manner: The City shall reimburse the contractor on completion and acceptance of each assigned job, only for those materials actually used in the performance of the work that is supported by invoices issued by the suppliers of the contractor describing the quantity and cost of the materials purchased. No surcharge shall be added to the supplier's invoices or included in the contractor's invoice submitted to the City that would increase the dollar amount indicated on the supplier's invoice for the materials purchased for the assigned job.

41. EXCEPTIONS: Bidders taking exception to any part or section of the solicitation shall indicate such exceptions on the bid form. Failure to indicate any exception will be interpreted as the bidder's intent to comply fully with the requirements as written. Conditional or qualified bids, unless specifically allowed, shall be subject to rejection in whole or in part.

42. FAILURE TO DELIVER: In the event of the contractor to fail to deliver services in accordance with the contract terms and conditions, the City, after due oral or written notice, may procure the services from other sources and hold the contractor responsible for any resulting purchase and administrative costs. This remedy shall be in addition to any other remedies that the City may have.

43. FAILURE TO ENFORCE: Failure by the City at any time to enforce the provisions of the contract shall not be construed as a waiver of any such provisions. Such failure to enforce shall not affect the validity of the contract or any part thereof or the right of the City to enforce any provision at any time in accordance with its terms.

44. FORCE MAJEURE: The contractor shall not be held responsible for failure to perform the duties and responsibilities imposed by the contract due to legal strikes, fires, riots, rebellions and acts of God beyond the control of the contractor, unless otherwise specified in the contract.

45. INDEPENDENT CONTRACTOR: The contractor shall be legally considered an independent contractor and neither the contractor nor its employees shall, under any circumstances, be considered servants or agents of the City of Naples and the City of Naples shall be at no time legally responsible for any negligence or any wrongdoing by the contractor, its servants or agents. The City of Naples shall not withhold

from the contract payments to the contractor any federal income taxes, Social Security tax, or any other amounts for benefits to the contractor. Further, the City shall not provide to the contractor any insurance coverage or other benefits, including Workers' Compensation normally provided by the City for its employees.

46. ORAL STATEMENTS: No oral statement of any person shall modify or otherwise affect the terms, conditions or specifications stated in this contract. All modifications to the contract must be made in writing by the City of Naples.

47. QUALIFICATIONS OF BIDDERS: The bidder may be required, before the award of any contract, to show to the complete satisfaction of the City of Naples that it has the necessary facilities, ability, and financial resources to provide the service specified therein in a satisfactory manner. The bidder may also be required to give a past history and references in order to satisfy the City in regard to the bidder's qualifications. The City may make reasonable investigations deemed necessary and proper to determine the ability of the bidder to perform the work, and the bidder shall furnish to the City all information for this purpose that may be requested. The City reserves the right to reject any bid if the evidence submitted by, or investigation of, the bidder fails to satisfy the City that the bidder is properly qualified to carry out the obligations of the contract and to complete the work described therein. Evaluation of the bidder's qualifications shall include:

- > The ability, capacity, skill and financial resources to perform the work or service.
- > The ability to perform the work service promptly or within the time specified, without delay.
- > The character, integrity, reputation, judgment, experience, and efficiency of the bidder.
- > The quality of performance of previous contracts or services.

48. QUALITY CONTROL: The contractor shall institute and maintain throughout the contract period a properly documented quality control program designed to ensure that the services are provided at all times and in all respects in accordance with the contract. The program shall include providing daily supervision and conducting frequent inspections of the contractor's staff and ensuring that accurate records are maintained describing the disposition of all complaints. The records so created shall be open to inspection by the City.

49. RECOVERY OF MONEY: Whenever, under the contract, any sum of money shall be recoverable from or payable by the contractor to the City, the same amount may be deducted from any sum due to the contractor under the contract or under any other contract between the contractor and the City. The rights of the City are in addition and without prejudice to any other right the City may have to claim the amount of any loss or damage suffered by the City on account of the acts or omissions of the contractor.

50. REQUIREMENTS CONTRACT: During the period of the contract, the contractor shall provide all the services described in the contract. The contractor understands and agrees that this is a requirements contract and that the City shall have no obligation to the contractor if no services are required. Any quantities that are included in the scope of work reflect the current expectations of the City for the period of the contract. The amount is only an estimate and the contractor understands and agrees that the City is under no obligation to the contractor to buy any amount of services as a result of having provided this estimate or of having any typical or measurable requirement in the past. The contractor further understands and agrees that the City may require services in excess of the estimated annual contract amount and that the quantity actually used whether in excess of, or less than, the estimated annual contract amount and that the quantity actually used shall not give rise to any claim for compensation other than the total of the unit prices in the contract for the quantity actually used.

51. TERMINATION FOR CONVENIENCE: The performance of work under the contract may be terminated by the City in whole or in part whenever the City determines that termination is in the City's best interest. Any such termination shall be effected by the delivery to the contractor of a written notice of termination of at least seven (7) days before the date of termination, specifying the extent to which performance of the work under the contract is terminated and the date upon which such termination becomes effective. After receipt of a notice of termination, except as otherwise directed, the contractor shall stop work on the date of the receipt of the notice or other date specified in the notice; place no further orders or

subcontracts for materials, services or facilities except as necessary for completion of such portion of the work not terminated; terminate all vendors and subcontracts; and settle all outstanding liabilities and claims.

52. TERMINATION FOR DEFAULT: The City of Naples reserves the right to terminate the contract if the City determines that the contractor has failed to perform satisfactorily the work required, as determined by the City. In the event the City decides to terminate the contract for failure to perform satisfactorily, the City shall give to the contractor at least seven (7) days written notice before the termination takes effect. The seven-day period will begin upon the mailing of notice by the City. If the contractor fails to cure the default within the seven (7) days specified in the notice and the contract is terminated for failure to perform satisfactorily, the contractor shall be entitled to receive compensation for all reasonable, allocable and allowable contract services satisfactorily performed by the contractor up to the date of termination that were accepted by the City prior to the termination. In the event the City terminates the contract because of the default of the contractor, the contractor shall be liable for all excess costs that the City is required to expend to complete the work under contract.

53. STATE AND FEDERAL EMPLOYMENT LAWS: Contractors providing service to the City are required to comply with all state and federal employment laws. This includes, but is not limited to, laws resulting from the Immigration and Reform and Control Act of 1986, wherein all employers are required to verify the identity and employment eligibility of all employees. The Department of Homeland Security, U.S. Citizenship and Immigration Services require employees and employers to complete Form I-9 and the employer must examine evidence of identity and employment eligibility within three business days of the date employment begins. Non compliant contractors will be subject to contract sanctions, up to and including contract termination.

54. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY, AND VOLUNTARY EXCLUSION: The contractor agrees to comply with Executive Order 12549 “Debarment and Suspension” and 2 CFR 180 “OMB Guidelines to Agencies on Government wide Debarment and Suspension.” These rules require all contractors using federal funds not be debarred or suspended from doing business with the Federal Government. This includes sub-recipients and lower tier participant for covered transactions. Signing and submitting this document certified the organization and its principals are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency, and further have not within the preceding three-year period been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction .

THE CITY OF NAPLES IS AN EQUAL OPPORTUNITY EMPLOYER

GENERAL INSURANCE REQUIREMENTS

The Contractor shall not commence work until he has obtained all the insurance required under this heading, and until such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work until all similar insurance required of the subcontractor has also been obtained and approved by the Owner.

Certificates of insurance must be issued by an authorized representative of the insurance company at the request and direction of the policyholder and must include sufficient information so as to identify the coverage and the contract for Owner's improvements for which they are issued. Certificates of insurance must be issued by a nationally recognized insurance company with a Best's Rating of no less than B+VII, satisfactory to the Owner, and duly licensed to do business in the state of said Contract.

The Contractor shall procure and maintain, during the life of this Contract, Worker's Compensation Insurance for all of his employees to be engaged in work under this Contract, and he shall require any subcontractor similarly to provide Worker's Compensation Insurance for all of the latter's employees to be engaged in such work, unless such employees are covered by the protection afforded by the Contractor's insurance. In case any employees are to be engaged in hazardous work under this Contract, and are not protected under this Worker's Compensation statute, the Contractor shall provide, and shall cause each subcontractor to provide, adequate coverage for the protection of such employees. It is acceptable to use a State-approved Worker's Compensation Self-Insurance fund.

The Contractor shall take out and maintain during the life of this Contract, Public Liability and Property Damage and shall include Contractual Liability, Personal Injury, Libel, Slander, False Arrest, Malicious Prosecution, Wrongful Entry or Eviction, Broad Form Property Damage, Products, Completed Operations and XCU Coverage to be included on an occurrence basis, and to the full extent of the Contract to protect him, the Owner, and any subcontractor performing work covered by this Contract from damages for personal injury, including accidental death, as well as from claims for property damage, which may arise from operations under this contract, whether such operations be by himself or by a subcontractor, or by anyone directly or indirectly employed by either of them. The Contractor shall also maintain automobile liability insurance including "non-owned and hired" coverage. The entire cost of this insurance shall be borne by the Contractor.

The amount of such insurance shall be no less than \$1,000,000 annual aggregate for bodily injury and property damage combined per occurrence.

The City of Naples must be named as Additional Insured on the insurance certificate and the following must also be stated on the certificate. "This coverage is primary to all other coverage the City possesses for this contract only." The City of Naples shall be named as the Certificate Holder. The Certificate Holder shall read as follows:

The City of Naples
735 Eighth Street South
Naples, Florida 34102

No City Division, Department, or individual name should appear on the Certificate.

No other format will be acceptable.

The Certificate must state the proposal number and title.

When using the "Accord" - 25 Certificate of Insurance only the most current version will be accepted.

The City of Naples requires a copy of a cancellation notice in the event the policy is cancelled. The City of Naples shall be expressly endorsed onto the policy as a cancellation notice recipient.

STATEMENT OF NO BID

If you will not be bidding on this product/service, please help us by completing and returning only this page to:

City of Naples, Purchasing Division
City Hall, 735 8th Street South
Naples, FL 34102
Fax 239-213-7105

Bid # _____ and Description: _____

We, the undersigned, decline to proposal on the above project for the following reason(s):

- ___ We are not able to respond to the Invitation to Bid or Request for Proposals by the specified deadline.
- ___ Our Company does not offer this product or service.
- ___ Our current work schedule will not permit us to perform the required services.
- ___ Specifications are incomplete or information is unclear (Please explain below).

___ Other (Please specify below)

Company Name _____ PH _____

Name and Title of individual completing this form:

(Printed Name)

(Title)

(Signature)

(Date)

REFERENCES

THIS SHEET MUST BE COMPLETED AND RETURNED WITH BID

PROVIDE AT LEAST THREE REFERENCES FOR WHOM YOUR COMPANY HAS PROVIDED SAME OR SIMILAR SERVICES WITHIN THE LAST 2 YEARS.

COMPANY NAME: _____

ADDRESS: _____

TELEPHONE: _____

CONTACT PERSON: _____

CONTACT E-MAIL ADDRESS: _____

COMPANY NAME: _____

ADDRESS: _____

TELEPHONE: _____

CONTACT PERSON: _____

CONTACT E-MAIL ADDRESS: _____

COMPANY NAME: _____

ADDRESS: _____

TELEPHONE: _____

CONTACT PERSON: _____

CONTACT E-MAIL ADDRESS: _____

SPECIAL CONDITIONS

A. TERMS OF CONTRACT

This bid will result in a one time purchase.

B. PROHIBITION OF CONTACT

Under no circumstances should any prospective organization or individual, or anyone acting for or on behalf of a prospective organization or individual, seek to influence or gain the support of any member of the City Council, public official or City staff favorable to the interest of any prospective organization or individual.

Likewise, contact with City Council, any public official or city staff against the interests of other prospective organization (s) and or individual(s) is prohibited. Any such activities will result in the exclusion of the prospective organization or individual from consideration by the City.

C. QUESTIONS

Questions regarding this bidder packet must be received in writing in the Purchasing Division, **NO LATER THAN TEN CALENDAR DAYS PRIOR TO THE BID CLOSING DATE TO ENSURE AN ANSWER IS PROVIDED PRIOR TO CLOSING.**

Direct all questions to:

[John Dunnuck, Purchasing Manager](#)

City of Naples, Purchasing Division

735 8th Street South

Naples, Florida 34102

PH: (239) 213-7100 FX: (239) 213-7105

jdunnuck@naplesgov.com

PURCHASE OF UNDERGROUND PIPE MATERIAL FOR ASR WELL AND PUMPS STATION

OVERVIEW: The City of Naples is seeking bids to purchase, fabricate, and deliver piping material for its ASR Well and Pumps System. For convenience, the Bid Schedule is listed on page 14 of the bid document. Interested Bidders shall follow the specifications as outlined in Exhibit A. Requirements listed on page 16 will be due after the award, not as part of the submittal. The City estimates the cost to be in the range of \$25,000-\$40,000 for this project.

Checklist

- COVER SHEET

- BID SCHEDULE

- REFERENCES

BID SCHEDULE

Piping Material - ASR Well Piping and Pump Systems					
Item	Item Description	Quantity	Unit	Unit Price	Total
1	20" diameter ductile iron push on joint pipe (American Fastite or equal) complete with bell end gasket and push on joint restraint harness (Megalug Series 1700 or equal)	450	FT	\$ _____	\$ _____
2	20" diameter x 2' - 0" long flg x mitered plain end ductile iron spool complete with flange gasket and 304 SS nuts and bolts	2	EA	\$ _____	\$ _____
3	20" diameter x 1' - 0" long flg x flg ductile iron spool complete with flange gaskets and 304 SS nuts and bolts	2	EA	\$ _____	\$ _____
4	20" diameter x 2' - 0" long flg x flg ductile iron spool complete with flange gaskets and 304 SS nuts and bolts	2	EA	\$ _____	\$ _____
5	20" diameter x 4' - 0" long flg x plain end ductile iron spool, complete with MJ gaskets, MJ thrust restraint glands (Megalug Series 1100 or equal) and Corten-A high strength, low alloy, corrosion resistant steel tee head bolts and nuts	2	EA	\$ _____	\$ _____
6	20" diameter C153 flanged ductile iron 90 ° bend complete with flange gaskets and 304 SS nuts and bolts	4	EA	\$ _____	\$ _____
7	20" diameter C153 mechanical joint ductile iron 90 ° bend complete with MJ gaskets, MJ thrust restraint glands (Megalug Series 1100 or equal) and Corten-A high strength, low alloy, corrosion resistant steel tee head bolts and nuts	2	EA	\$ _____	\$ _____
8	20" diameter C153 mechanical joint ductile iron 45 ° bend complete with MJ gaskets, MJ thrust restraint glands (Megalug Series 1100 or equal) and Corten-A high strength, low alloy, corrosion resistant steel tee head bolts and nuts	8	EA	\$ _____	\$ _____
9	20" diameter C153 mechanical joint ductile iron Wye bend complete with MJ gaskets, MJ thrust restraint glands (Megalug Series 1100 or equal) and Corten-A high strength, low alloy, corrosion resistant steel tee head bolts and nuts	1	EA	\$ _____	\$ _____
10	20" diameter DeZurik flanged butterfly valve and electric actuator (Rotork) (open/close operation) complete with flange gaskets and 304 SS nuts and bolts	2	EA	\$ _____	\$ _____
11	Hot dip galvanized pipe clamp support for 20" diameter ductile iron pipe per Detail 3 - M02 and Specification Section 15020	2	EA	\$ _____	\$ _____

GRAND TOTAL COST: \$ _____

Schedule Abbreviations:	
flg:	flange
SS:	stainless steel
pe:	plain end
C153:	ANSI/AWWA C153/A21.53 standard

EXHIBIT A

**CITY OF NAPLES
AQUIFER STORAGE AND RECOVERY WELL
PUMP AND PIPING SYSTEM
MATERIAL BID SPECIFICATIONS**

TABLE OF CONTENTS

DIVISION 1 - GENERAL REQUIREMENTS

01300 Submittals

DIVISION 5 – METALS

05010 Metal Materials
05035 Galvanizing
05050 Metal Fastening
05120 Structural Steel
05140 Structural Aluminum

DIVISION 9 – FINISHES

09900 Painting

DIVISION 11 – EQUIPMENT

11000 Equipment General Provisions

DIVISION 15 – MECHANICAL

15000 Basic Mechanical Requirements
15006 Ductile Iron Pipe
15020 Pipe Supports
15095 Valves, General
15100 Valve Operators and Electric Valve Actuators
15101 Butterfly Valves
15114 Miscellaneous Valves

EXHIBIT A

SECTION 01300

SUBMITTALS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

- A. This section specifies the means of all submittals. All submittals, whether their final destination is to the Owner, Engineer, or other representatives of the Owner, shall be directed through the Engineer. A general summary of the types of submittals and the number of copies required is as follows:

<u>Copies to Engineer</u>	<u>Type of Submittal</u>
6	Shop Drawings
4	Certificates of Compliance
2	Preliminary Operation and Maintenance Manuals
4	Final Operation and Maintenance Manuals (Printed Copies)
1	Final Operation and Maintenance Manuals (Electronic Copy)
4	Warranties
2*	Product Samples

* Unless otherwise required in the specific Section where requested.

1.02 SUBMITTAL PROCEDURES

- A. Transmit each submittal with a form acceptable to the Engineer, clearly identifying the project Contractor, the enclosed material and other pertinent information specified in other parts of this section. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- B. Revise and resubmit submittals as required, identify all changes made since previous submittals. Resubmittals shall be noted as such.
- C. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.03 SCHEDULE OF PAYMENT VALUES

- A. The Contractor shall prepare a preliminary Schedule of Values.
- B. The schedule shall be given in sufficient detail for the proper identification of Work accomplished. Each item shall include its proportional share of all costs including the Contractor's overhead, contingencies and profit. The sum of all scheduled items shall equal

EXHIBIT A

the total value of the Contract.

- C. If the Contractor anticipates the need for payment for materials stored on the project site, he shall also submit a list covering the cost of materials, delivered and unloaded with taxes paid.
- D. The Contractor shall expand or modify the above schedule and materials listing as required by the Engineer's initial or subsequent reviews.

1.04 SHOP DRAWINGS

- A. The Contractor shall submit a detailed Schedule of Shop Drawing Submittals at the Pre-Construction Conference, organized by Specification Section Number.
- B. The Contractor shall submit for review shop drawings for concrete reinforcement, structural details, piping layout and appurtenances, wiring, color selection charts, Contractor Furnished Equipment, materials and equipment fabricated especially for this Contract, and materials and equipment for which such Drawings are specified or specifically requested by the Engineer.
- C. Shop drawings shall show the principal dimensions, weight, structural and operating features, space required, clearances, type and/or brand of finish or shop coat, grease fittings, installation/erection drawings, etc., depending on the subject of the Drawings.
- D. When so specified, or if considered by the Engineer to be acceptable, the manufacturer's specifications, catalog data, descriptive matter, illustrations, etc. may be submitted for review in place of shop drawings. In such case, the requirements shall be as specified for shop drawings, insofar as applicable.
- E. The Contractor shall be responsible for the prompt submittal of all shop drawings so that there shall be no delay to the Work due to the absence of such Drawings. The Engineer will review the shop drawings within 21 calendar days of receipt of such Drawings. Reviewed shop drawings will be returned to the Contractor by regular mail, posted no later than 21 days after receipt.
- F. Time delays caused by rejection of submittals are not cause for extra charges to the Owner or time extensions.
- G. Requirements: All shop drawings shall be submitted to the Engineer through the Contractor. The Contractor is responsible for obtaining shop drawings from his subContractors and returning reviewed Drawings to them. All Drawings shall be clearly marked with the name of the project, Owner, Contractor, and building, equipment, or structure to which the drawing applies. Drawings shall be suitably numbered and stamped by the Contractor. Each shipment of Drawings shall be accompanied by a letter of transmittal giving a list of the drawing numbers and the names mentioned above.
- H. Product Data: Where manufacturer's publications in the form of catalogs, brochures, illustrations, or other data sheets are submitted in lieu of prepared shop drawings, such submission shall specifically indicate the particular item offered. Identification of such items and relative pertinent information shall be made with indelible ink. Submissions showing only general information will not be accepted. Non-applicable information shall be crossed out.
- I. Product data shall include materials of construction, dimensions, performance characteristics, capacities, wiring diagrams, piping and controls, etc.

EXHIBIT A

- J. Warranties: When warranties are called for, a sample of the warranty shall be submitted with the shop drawings. The sample warranty shall be the same form that will be used for the actual warranty. Actual warranties shall be originals and notarized.
- K. Work Prior to Review: No material or equipment shall be purchased, fabricated especially for this Contract, or delivered to the project site until the required shop drawings have been submitted, processed and marked either "FURNISH AS SUBMITTED" or "FURNISH AS CORRECTED". All materials and Work involved in the construction shall be as represented by said Drawings.
- L. The Contractor shall not proceed with any portion of the Work (such as the construction of foundations) for which the design and details are dependent upon the design and details of equipment for which submittal review has not been completed.
- M. Contractor's Review: Only submittals which have been checked and corrected should be submitted to the Contractor by its Subcontractors and vendors. Prior to submitting shop drawings to the Engineer, the Contractor shall check thoroughly all such Drawings to satisfy itself that the subject matter thereof conforms to the Drawings and Specifications in all respects. Drawings which are correct shall be marked with the date, checker's name and indications of the Contractor's approval, and then shall be submitted to the Engineer. Other Drawings submitted to the Engineer will be returned to the Contractor unreviewed.
- N. Contractor's Responsibility: The Engineer's review of shop drawings will be general and shall not relieve the Contractor of the responsibility for details of design, dimensions, etc., necessary for proper fitting and construction of the Work required by the Contract and for achieving the specified performance.
- O. Contractor's Modifications: For submissions containing departures from the Contract Documents, the Contractor shall include proper explanation in his letter of transmittal. Should the Contractor submit for review equipment that requires modifications to the structures, piping, layout, etc. detailed on the Drawings, he shall also submit for review details of the proposed modifications. If such equipment and modifications are accepted, the Contractor, at no additional cost to the Owner, shall do all Work necessary to make such modifications.
- P. "Or Equal" Items: Whenever a particular brand or make of material, equipment, or other item is specified, or is indicated on the Drawings, it is for the purpose of establishing a standard of quality, design, and type desired and to supplement the detailed specifications and unless it is followed by the words "NO SUBSTITUTION", or "SUBSTITUTIONS ARE NOT ALLOWED" any other brand or make which is equivalent to that specified or indicated may be offered as an "or equal" item subject to the following provisions:
1. Contractor shall submit for each proposed "or equal" item sufficient details, complete descriptive literature, and performance data together with samples of the materials, where feasible, to enable the Engineer to determine if the proposed "or equal" item is equal, in all respects including, but not limited to, quality, performance, ease of maintenance, availability of spare parts, and experience record.
 2. Contractor shall submit certified tests, where applicable, by an independent laboratory attesting that the proposed "or equal" item is equal.

EXHIBIT A

3. A list of installations where the proposed "or equal" item is equal. Such listing shall cover a minimum of the previous five years and will furnish project names and contact phone numbers.
 4. Where the acceptance of a "or equal" item requires excessive review by the Engineer, revision or redesign of any part of the Work, all such additional review costs, revisions and redesign, and all new Drawings and details required therefore, shall be at the Contractor's expense.
 5. In all cases the Engineer shall be the sole judge as to whether a proposed "or equal" item is to be accepted. The Contractor shall abide by the Engineer's decision when proposed "or equal" items are judged to be unacceptable and shall in such instances furnish the item as specified. No "or equal" items shall be used in the Work without written acceptance of the Engineer.
 6. Acceptance of any proposed "or equal" item shall in no way release the Contractor from any of the provisions of the Contract Documents.
 7. Owner may require, at Contractor's expense, a special performance guarantee or other surety with respect to any substitute.
- Q. Complete Submittals: Each submittal shall be complete in all aspects incorporating all information and data required to evaluate the products' compliance with the Contract Documents. Partial or incomplete submissions shall be returned to the Contractor without review.
- R. Shop Drawing Distribution: The Contractor shall submit a minimum of 8 copies of all shop drawings to the Engineer for review. Where full size drawings are required, the Contractor shall submit one reproducible vellum and two bluelines or blacklines. Shop drawings will be reviewed, stamped and distributed with the appropriate box checked either "FURNISH AS SUBMITTED", "FURNISH AS CORRECTED" or "REVISE AND RESUBMIT". The distribution of processed shop drawings will be as follows:
1. Drawings Marked "FURNISH AS SUBMITTED" or "FURNISH AS CORRECTED"
 - 3 copies returned to the Contractor
 - 1 copies transmitted to the Owner
 - 2 copies remain at the Engineer's office
 - 1 copy remains with the shop drawing reviewer
 - 1 copy for the Engineer's field personnel

EXHIBIT A

2. Drawings Marked "REVISE AND RESUBMIT"

- 2 copies returned to the Contractor
- 2 copies remain at the Engineer's office
- 1 copy remains with the shop drawing reviewer
- 3 copies will be discarded

S. If the Contractor requires additional copies of returned shop drawings, it shall include extra Drawings in its original submittal. The Engineer will process the Drawings and return them to the Contractor.

T. Structural Shop Drawings

1. General: Following are additional requirements for structural shop drawings.

2. Fabricated items: Submit only 1 reproducible vellum and 2 blue/black line prints of all structural shop drawings of fabricated items such as reinforcing, structural steel, aluminum, gratings, floor plates, handrails, stairs, etc. The reproducible copy will be returned to the Contractor for duplication and required further distribution. All proposed changes shall be clearly clouded and flagged for Engineer's review and acceptance.

3. Coordination and Verification: Prior to submission the Contractor shall coordinate the shop drawings with related trades and verify that the required dimensions or information necessary for construction has been made.

4. Facility shop drawings: For each facility reinforcing or structural steel shop drawings such as rebars for footings, base slab, columns, beams, stairs, etc., shall all be submitted at one time.

5. Concrete Products & Accessories: Submittals of all concrete related products and accessories shall be made all at one time, each properly labeled and its use identified by Facility/Structure name.

U. Architectural Shop Drawings: Following additional requirements shall apply. Architectural work requiring design or certification by an Engineer shall accompany signed and sealed design calculations for review. Shop drawings of architectural work related to each other shall be submitted for review all at one time. Combine submittal for items such as the following:

- 1. Doors shop drawings with door hardware shop drawings.
- 2. Roofing shop drawings with flashing, scuppers, etc.
- 3. Louver shop drawings with detailed layout, support framing, flashing and related items.

1.05 WARRANTIES

A. Warranties called for in the Contract Documents shall be originals and submitted to the Owner through the Engineer. When warranties are required they shall be submitted prior to request for payment.

EXHIBIT A

- B. When advance copies of warranties are requested, they shall be submitted with, and considered as shop drawings.

1.06 CERTIFICATES

- A. Four copies of certificates of compliance and test reports shall be submitted for requested items to the Engineer prior to request for payment.

1.07 PRODUCT SAMPLES

- A. Contractor shall furnish for review all product samples as required by the Contract Documents or requested by the Engineer to determine compliance with the specifications.
- B. Samples shall be of sufficient size or quantity to clearly illustrate the quality, type, range of color, finish or texture and shall be properly labeled to show complete project identification, the nature of the material, trade name of manufacturer and location of the Work where the material represented by the sample will be used.
- C. Samples shall be checked by the Contractor for conformance to the Contract Documents before being submitted to the Engineer and shall bear the Contractor's stamp certifying that they have been so checked. Transportation charges on samples submitted to the Engineer shall be prepaid by the Contractor.
- D. Engineer's review will be for compliance with the Contract Documents, and its comments will be transmitted to the Contractor with reasonable promptness.
- E. Acceptable samples will establish the standards by which the completed Work will be judged.

1.08 OPERATION AND MAINTENANCE MANUALS

- A. The Contractor shall submit two (2) complete preliminary Operations and Maintenance (O&M) Manuals for each item of equipment at the same time the initial Shop Drawing for that item is submitted for review. Without inclusion of the preliminary O&M Manuals, the shop drawing submittal will be considered incomplete and will be returned unreviewed.
- B. The Contractor shall furnish and deliver to the Engineer four (4) printed copies and one (1) electronic copy complete and final Operation and Maintenance (O&M) Manuals for the substantial, complete systems including instructions, technical bulletins, and any other printed matter such as diagrams, prints or drawings, containing full information required for the proper operations, maintenance, and repair of all Contractor furnished equipment. The final manuals shall incorporate all Engineer's review comments associated with the preliminary O&M Manual. Also included shall be a spare parts diagram and complete spare parts list. These requirements are a prerequisite to the operation and acceptance of equipment. Each O&M Manual shall be bound together in appropriate three-ring hard cover binders. A detailed table of contents shall be provided for each Manual. Provide an appropriate label on the binder edge. Provide tabs and separate sections for operation, maintenance, spare parts, etc. Front covers and binder edge covers shall reference the facility and project name as directed by the Engineer. Each front and binder edge cover shall include, as a minimum, the Project Name, Date (Month/Year), Equipment Name, and the corresponding Specification Section Number.

EXHIBIT A

- C. Written operations and maintenance instructions are required for all equipment items supplied for this project. The amount of detail shall be commensurate with the complexity of the equipment item. Extensive pictorial cuts of equipment are required for operator reference in servicing.
- D. Information not applicable to the specific piece of equipment installed on this project shall be struck from the Manual by the Contractor. Information provided shall include a source of replacement parts and names of service representatives, including addresses and telephone numbers.
- E. When written instructions include shop drawings and other information previously reviewed by the Engineer, only those editions which were accepted by the Engineer, and which accurately depict the equipment installed, shall be incorporated in the O&M Manual.
- F. Maintenance and Lubrication Schedules: The Contractor shall include in the O&M Manual, for all Contractor furnished mechanical and electrical equipment including switchgear and MCC's, instrumentation, valves, gates, etc., complete maintenance and lubrication schedules. Separate forms will be submitted for each piece of equipment. Sample forms are included at the end of this Section.

PART 2 -- PRODUCTS (Not Used)

PART 3 -- EXECUTION (Not Used)

EQUIPMENT LUBRICATION SCHEDULE

EQUIPMENT NO. _____ DATE _____

LOCATION _____ REV. _____

NAME _____

EQUIPMENT MANUFACTURER _____

ADDRESS _____

PHONE () _____

SERVICE REPRESENTATIVE _____

ADDRESS _____

PHONE () _____

Maintenance Interval

<u>Assembly</u>	<u>Running Time</u>	<u>Calendar</u>	<u>Description/Type/ Special Tools</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

NOTE: Use additional sheets as required

EQUIPMENT MAINTENANCE SCHEDULE

EQUIPMENT NO. _____ DATE _____

LOCATION _____ REV. _____

NAME _____

EQUIPMENT MANUFACTURER _____

ADDRESS _____

PHONE () _____

SERVICE REPRESENTATIVE _____

ADDRESS _____

PHONE () _____

Maintenance Interval

<u>Assembly</u>	<u>Running Time</u>	<u>Calendar</u>	<u>Description/Type/ Special Tools</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

NOTE: Use additional sheets as required

- END OF SECTION -

EXHIBIT A

SECTION 05010

METAL MATERIALS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

- A. Metal materials not otherwise specified shall conform to the requirements of this Section.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Materials for fasteners are included in Section 05050 entitled "Metal Fastening".
- B. Requirements for specific products made from the materials specified herein are included in other sections of the Specifications. See the section for the specific item in question.

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. ASTM A36 Standard Specification for Structural Steel
- B. ASTM A47 Standard Specification for Malleable Iron Castings
- C. ASTM A48 Standard Specification for Gray Iron Castings
- D. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
- E. ASTM A167 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
- F. ASTM A276 Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes
- G. ASTM A307 Standard Specification for Carbon Steel Externally Threaded Standard Fasteners
- H. ASTM A446 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) quality
- I. ASTM A500 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- J. ASTM A501 Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
- K. ASTM A529 Standard Specification for Structural Steel with 42 000 psi (290 Mpa) Minimum Yield Point (1/2 in. (12.7 mm) Maximum Thickness)

EXHIBIT A

- | | | |
|----|---------------------|--|
| L. | ASTM A536 | Standard Specification for Ductile Iron Castings |
| M. | ASTM A570 | Standard Specification for Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality |
| N. | ASTM A572/A572M-94C | Standard Specification for High Strength Low-Alloy Columbium-Vanadium Structural Steel Grade 50 |
| O. | ASTM A666 | Standard Specification for Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar for Structural Applications |
| P. | ASTM B26 | Standard Specification for Aluminum-Alloy Sand Castings |
| Q. | ASTM B85 | Standard Specification for Aluminum-Alloy Die Castings |
| R. | ASTM B108 | Standard Specification for Aluminum-Alloy Permanent Mold Castings |
| S. | ASTM B138 | Standard Specification for Manganese Bronze Rod, Bar, and Shapes |
| T. | ASTM B209 | Standard Specification for Aluminum-Alloy Sheet and Plate |
| U. | ASTM B221 | Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes |
| V. | ASTM B308 | Standard Specification for Aluminum-Alloy Standard Structural Shapes, Rolled or Extruded |
| W. | ASTM B574 | Standard Specification for Nickel-Molybdenum-Chromium Alloy Rod |
| X. | ASTM F468 | Standard Specification for Nonferrous Bolts, Hex Cap Screws, and Studs for General Use |
- 1.04 SUBMITTALS
- A. Material certifications shall be submitted along with any shop drawings for metal products and fabrications required by other sections of the Specifications.
- 1.05 QUALITY ASSURANCE
- A. City may engage the services of a testing agency to test any metal materials for conformance with the material requirements herein. If the material is found to be in conformance with Specifications the cost of testing will be borne by the City. If the material does not conform to the Specifications, the cost of testing shall be paid by the Contractor and all materials not in conformance as determined by the Engineer shall be replaced by the Contractor at no additional cost to the City. In lieu of replacing materials the Contractor may request further testing to determine conformance, but any such testing shall be paid for by the Contractor regardless of outcome of such testing.

EXHIBIT A

PART 2 -- PRODUCTS

2.01 CARBON AND LOW ALLOY STEEL

A. Material types and ASTM designations shall be as listed below:

- | | |
|---|-------------------------------------|
| 1. Structural W Shapes | A 992 (50 ksi) |
| 2. Structural S, M, C, L Shapes | A 36 (36 ksi) |
| 3. Structural HP Shape | A 572, Grade 50 (50 ksi) |
| 4. Structural Tubing | A 500, Grade B or A 501 (42 ksi) |
| 5. Structural Pipe | A 53, Type E or S, Grade B (35 ksi) |
| 6. Plates and Bars | A 36 U.N.O. (36 ksi) |
| 7. Sheet Steel | A 570, Grade C |
| 8. Cold-Formed Structural Studs and Joists
(18-22 gauge) | A 446, Grade C |
| 8. Cold-Formed Structural Studs and Joists
(12-16 gauge) | A 446, Grade D |

2.02 STAINLESS STEEL

A. All stainless steel fabrications shall be Type 316.

B. Material types and ASTM designations are listed below:

- | | |
|----------------------|---------------------------|
| 1. Plates and Sheets | ASTM A167 or A666 Grade A |
| 2. Structural Shapes | ASTM A276 |

2.03 ALUMINUM

A. All aluminum shall be alloy 6061-T6, unless otherwise noted or specified herein.

B. Material types and ASTM designations are listed below:

- | | |
|------------------------------------|------------------------|
| 1. Structural Shapes | ASTM B308 |
| 2. Castings | ASTM B26, B85, or B108 |
| 3. Extruded Bars | ASTM B221 - Alloy 6061 |
| 4. Extruded Rods, Shapes and Tubes | ASTM B221 - Alloy 6063 |

EXHIBIT A

5. Plates ASTM B209 - Alloy 6061

6. Sheets ASTM B221 - Alloy 3003

C. All aluminum structural members shall conform to the requirements of Section 05140 entitled "Structural Aluminum".

D. All aluminum shall be provided with mill finish unless otherwise noted.

E. Where bolted connections are indicated, aluminum shall be fastened with Type 316 stainless steel bolts.

F. Aluminum in contact with dissimilar materials shall be insulated with an approved dielectric.

2.04 CAST IRON

A. Material types and ASTM designations are listed below:

1. Gray ASTM A48 Class 30B

2. Malleable ASTM A47

3. Ductile ASTM A536 Grade 60-40-18

2.05 BRONZE

A. Material types and ASTM designations are listed below:

1. Rods, Bars and Sheets ASTM B138 - Alloy B Soft

2.06 HASTELLOY

A. All Hastelloy shall be Alloy C-276.

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

EXHIBIT A

SECTION 05035

GALVANIZING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

- A. Where galvanizing is called for in the Contract Documents, the galvanizing shall be performed in accordance with the provisions of this Section unless otherwise noted.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Further requirements for galvanizing specific items may be included in other Sections of the Specifications. See section for the specific item in question.

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. Florida Building Code
2. ASTM A123 - Standard Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
3. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
4. ASTM A386 - Standard Specification for Zinc Coating (Hot-Dip) on Assembled Steel Products
5. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
6. ASTM A780 - Standard Practice of Repair of Damaged Hot-Dip Galvanized Coatings

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01300 entitled "Submittals".
 1. Certification that the item(s) are galvanized in accordance with the applicable ASTM standards specified herein. This certification may be included as part of any material certification that may be required by other Sections of the Specifications.

PART 2 -- PRODUCTS

EXHIBIT A

2.01 GALVANIC COATING

- A. Material composition of the galvanic coating shall be in accordance with the applicable ASTM standards specified herein.

PART 3 -- EXECUTION

3.01 FABRICATED PRODUCTS

- A. Products fabricated from rolled, pressed, and forged steel shapes, plates, bars, and strips, 1/8-inch thick and heavier which are to be galvanized shall be galvanized in accordance with ASTM A123. Products shall be fabricated into the largest unit which is practicable to galvanize before the galvanizing is done. Fabrication shall include all operations necessary to complete the unit such as shearing, cutting, punching, forming, drilling, milling, bending, and welding. Components of bolted or riveted assemblies shall be galvanized separately before assembly. When it is necessary to straighten any sections after galvanizing, such work shall be performed without damage to the zinc coating.
- B. Components with partial surface finishes shall be commercial blast cleaned prior to pickling.

3.02 HARDWARE

- A. Iron and steel hardware which is to be galvanized shall be galvanized in accordance with ASTM A153.

3.03 ASSEMBLED PRODUCTS

- A. Assembled steel products which are to be galvanized shall be galvanized in accordance with ASTM A123 or ASTM A386. All edges of tightly contacting surfaces shall be completely sealed by welding before galvanizing.

3.04 SHEETS

- A. Iron or steel sheets which are to be galvanized shall be galvanized in accordance with ASTM A924.

3.05 REPAIR OF GALVANIZING

- A. Galvanized surfaces that are abraded or damaged at any time after the application of zinc coating shall be repaired by thoroughly wire brushing the damaged areas and removing all loose and cracked coating, after which the cleaned areas shall be painted with 2 coats of zinc rich paint meeting the requirements of Federal Specification DOD-P-21035A and shall be thoroughly mixed prior to application. Zinc rich paint shall not be tinted. The total thickness of the 2 coats shall not be less than 6 mils. In lieu of repairing by painting with zinc rich paint, other methods of repairing galvanized surfaces in accordance with ASTM A780 may be used provided the proposed method is acceptable to the Engineer.

- END OF SECTION -

SECTION 05050

METAL FASTENING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

- A. The Contractor shall furnish all materials, labor, and equipment required to provide all metal welds and fasteners not otherwise specified, in accordance with the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 05010 - Metal Materials
- B. Section 05035 - Galvanizing
- C. Section 05120 - Structural Steel

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

- 1. Florida Building Code
- 2. AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts.
- 3. AISC Code of Standard Practice
- 4. AWS D1.1 Structural Welding Code - Steel
- 5. AWS D1.2 Structural Welding Code - Aluminum
- 6. Aluminum Association Specifications for Aluminum Structures
- 7. ASTM A572/A572M-94C Standard Specification for High Strength Low-Alloy Columbium-Vanadium Structural Steel Grade 50
- 8. ASTM A307 Standard Specification for Carbon Steel Externally Threaded Standard Fasteners
- 9. ASTM A325 Standard Specification for High-Strength Bolts for Structural Steel Joints

EXHIBIT A

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| 10. | ASTM A489 | Standard Specification for Eyebolts |
| 11. | ASTM A490 | Standard Specification for Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints |
| 12. | ASTM A563 | Standard Specifications for Carbon and Alloy Steel Nuts |
| 13. | ASTM F593 | Standard Specification for Stainless Steel Bolts; Hex Cap Screws, and Studs |
| 14. | ASTM F594 | Standard Specification for Stainless Steel Nuts |
| 15. | ASTM D1785 | Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe |
| 16. | ASTM F467 | Standard Specification for Nonferrous Nuts for General Use |

1.04 SUBMITTALS

- A. Submit the following items in accordance with Section 01300 entitled "Submittals":
1. Shop Drawings providing the fastener's manufacturer and type and certification of the fastener's material and capacity.
 2. Copy of valid certification for each person who is to perform field welding.
 3. Certified weld inspection reports, when required.
 4. Welding procedures.

1.05 QUALITY ASSURANCE

- A. Fasteners not manufactured in the United States shall be tested and certification provided with respect to specified quality and strength standards. Certifications of origin shall be submitted for all U.S. fasteners supplied on the project.
- B. All steel welding shall be performed by welders certified in accordance with AWS D1.1. All aluminum welding shall be performed by welders certified in accordance with AWS D1.2. Certifications of field welders shall be submitted prior to performing any field welds.
- C. Welds and high strength bolts used in connections of structural steel will be visually inspected in accordance with Article 3.04 of this Section.
- D. The City may engage an independent testing agency to perform testing of welded connections and to prepare test reports in accordance with AWS. Inadequate welds

EXHIBIT A

shall be corrected or redone and retested to the satisfaction of the Engineer and/or an acceptable independent testing laboratory, at no additional cost to the City.

- E. Provide a welding procedure for each type and thickness of weld. For welds that are not prequalified, include a Performance Qualification Report. The welding procedure shall be given to each welder performing the weld. The welding procedure shall follow the format in Annex E of AWS D1.1 with relevant information presented.

PART 2 -- PRODUCTS

2.01 ANCHOR BOLTS

- A. For all conditions throughout this Contract, all anchor bolts shall be Type 316 stainless steel conforming to ASTM F-593.
- B. Nuts shall conform to ASTM F-594, alloy 316.
- C. Equipment manufacturers, fabricators, and suppliers shall design and furnish anchor bolts as required to install the supplied units. The anchor bolt layout shall be coordinated with concrete work as specified herein.
- D. Drilled in type anchor bolts, either adhesive types or mechanical types shall not be used unless approved in writing by the manufacturer/fabricator of equipment or covers, subject to acceptance by the Engineer. All operating pieces of equipment such as pumps, generators, motors etc. shall not be anchored with wedge anchors or other mechanical anchors. Drilled in type anchor bolts shall be Type 316 stainless steel. Drilled in type anchor bolts are specified under Article 2.04 of this Section entitled "Concrete Anchors".

2.02 HIGH STRENGTH BOLTS

- A. High strength bolts and associated nuts and washers shall be in accordance with ASTM A325 or ASTM A490. Bolts, nuts and washers shall meet the requirements of AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts".
- B. Where high strength bolts are used to connect galvanized steel or are otherwise specified to be galvanized, bolts, nuts, and washers shall be hot-dip galvanized in accordance with ASTM A325.

2.03 STAINLESS STEEL BOLTS

- A. Stainless steel bolts shall conform to ASTM F-593. All underwater fasteners shall be Type 316 stainless steel. Unless otherwise specified, fasteners for aluminum and stainless steel members shall be Type 316 stainless steel.
- B. Stainless steel bolts shall have hexagonal heads with a raised letter or symbol on the bolts indicating the manufacturer, and shall be supplied with hexagonal nuts meeting the requirements of ASTM F594. Nuts shall be of the same alloy as the bolts.

EXHIBIT A

2.04 CONCRETE ANCHORS

- A. Where concrete anchors are called for on the Drawings, one of the types listed below shall be used; except, where one of the types listed below is specifically called for on the Drawings, only that type shall be used. Unless otherwise noted, all concrete anchors which are submerged, or which are subject to vibration from equipment such as pumps and generators, shall be adhesive anchors. The determination of anchors equivalent to those listed below shall be on the basis of test data performed by a commercial testing laboratory. There are two types used:
 - 1. Expansion anchors shall be wedge, sleeve, or drop-in mechanical anchors.
 - 2. Adhesive anchors shall be two part injection type.
- B. Expansion anchors shall be Kwik Bolt II by Hilti, Inc., or Trubolt Wedge Anchor by ITW Ramset/Redhead and shall be embedded to the depths shown on the Drawings. If no embedment depth is given, the minimum embedment depth as recommended by the manufacturer shall be used.
- C. Adhesive anchors shall consist of threaded rods or bolts anchored with an epoxy adhesive system conforming to AC308, into hardened concrete or grout-filled masonry. The epoxy adhesive system shall use a two-component adhesive mix and shall be injected with a static mixing nozzle following manufacturer's instructions. The embedment depth of the rod/bolt shall provide a minimum allowable bond strength that is equal to the allowable tensile capacity of the rod/bolt (see Table 1) unless noted otherwise on the Drawings. The adhesive system shall be "PE1000 Epoxy Injection Adhesive Anchoring System" as manufactured by Powers Fasteners, "Epcon G5 System" as manufactured by ITW Ramset/Redhead, or "HIT RE-500 SD Injection Adhesive Anchor System" as manufactured by Hilti, Inc., or equal.
- D. All concrete anchors shall be Type 316 stainless steel.

TABLE 1 Allowable Tensile Capacity (Kips)		
Size	A36 Threaded Rod/Bolt	SST Threaded Rod/Bolt
3/8 inch	2.1	1.9
1/2 inch	3.8	3.5
5/8 inch	5.9	5.6
3/4 inch	8.4	8.2
7/8 inch	11.5	11.4
1 inch	15.0	15.0

EXHIBIT A

2.05 MASONRY ANCHORS

- A. Anchors for fastening to solid or grout-filled masonry shall be adhesive anchors as specified above for concrete anchors.
- B. Anchors for fastening to hollow masonry or brick shall be adhesive anchors consisting of threaded rods or bolts anchored with an adhesive system dispensed into a screen tube inserted into the masonry. The adhesive system shall use a two-component adhesive mix and shall be injected into the screen tube with a static mixing nozzle. The adhesive system shall be "Epcon System" as manufactured by ITW Ramset/Redhead, "HIT HY-20 System" as manufactured by Hilti, Inc, or equal.
- C. All masonry anchors shall be Type 316 stainless steel.

2.06 WELDS

- A. Electrodes for welding structural steel and all ferrous steel shall comply with AWS Code, using E70 series electrodes for shielded metal arc welding (SMAW), or F7 series electrodes for submerged arc welding (SAW).
- B. Electrodes for welding aluminum shall comply with the Aluminum Association Specifications and AWS D1.2.
- C. Electrodes for welding stainless steel and other metals shall comply with AWS code.

2.07 WELDED STUD CONNECTORS

- A. Welded stud connectors shall conform to the requirements of AWS D1.1 Type C.

2.08 EYEBOLTS

- A. Eyebolts shall conform to ASTM A489 unless noted otherwise.

2.09 HASTELLOY FASTENERS

- A. Hastelloy fasteners and nuts shall be constructed of Hastelloy C-276.

2.10 ANTISEIZE LUBRICANT

- A. Antiseize lubricant shall be Graphite 50 Anti-Seize by Loctite Corporation, 1000 Anti-Seize Paste by Dow Corning, 3M Lube and Anti-Seize by 3M, or equal.

PART 3 -- EXECUTION

3.01 MEASUREMENTS

- A. The Contractor shall verify all dimensions and review the Drawings and shall report any discrepancies to the Engineer for clarification prior to starting fabrication.

EXHIBIT A

3.02 BOLT INSTALLATION

A. Anchor Bolts, Concrete Anchors, and Masonry Anchors

1. Anchor bolts shall be installed in accordance with AISC "Code of Standard Practice" by setting in concrete while it is being placed and positioned by means of a rigidly held template.
2. The Contractor shall verify that all concrete and masonry anchors have been installed in accordance with the manufacturer's recommendations and that the capacity of the installed anchor meets or exceeds the specified safe holding capacity.
3. Concrete anchors shall not be used in place of anchor bolts without Engineer's approval.
4. All stainless steel threads shall be coated with antiseize lubricant.

B. High Strength Bolts

1. All bolted connections for structural steel shall use high strength bolts. High strength bolts shall be installed in accordance with AISC "Specification for Structural Joints, using A325 or A490 Bolts." All high strength bolts installed by the "turn-of-nut" method shall have the turned portion marked with reference to the steel being connected after the nut has been made snug and prior to final tightening. These marks will be considered in inspection.
2. All stainless steel bolts shall be coated with antiseize lubricant.

C. Other Bolts

1. All dissimilar metal shall be connected with appropriate fasteners and shall be insulated with a dielectric or approved equal. Unless otherwise specified, where aluminum and steel members are connected together they shall be fastened with Type 316 stainless steel bolts and insulated with micarta, nylon, rubber, or equal.

3.03 WELDING

- A. All welding shall comply with AWS Code for procedures, appearance, quality of welds, qualifications of welders and methods used in correcting welded work.
- B. Welded stud connectors shall be installed in accordance with AWS D1.1.

3.04 INSPECTION

- A. High strength bolting will be visually inspected in accordance with AISC "Specification for Structural Joints Using A325 or A490 Bolts." Rejected bolts shall be either replaced or retightened as required. In cases of disputed bolt installation, the bolts in question shall

EXHIBIT A

be checked by a calibrated wrench certified by an independent testing laboratory. The certification shall be at the Contractor's expense.

- B. Field welds will be visually inspected in accordance with AWS Codes. Inadequate welds shall be corrected or redone as required in accordance with AWS Codes.
- C. Inspection of post installed anchors shall be per requirements of the corresponding ICC ES ER.

- END OF SECTION -

EXHIBIT A

SECTION 05120
STRUCTURAL STEEL

PART 1 -- GENERAL

1.01 THE REQUIREMENT

- A. The Contractor shall furnish all equipment, materials, and services not otherwise specified for the fabrication, delivery, unloading, handling, storing, and erection of all structural steel work as shown on the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 05500 - Metal Fabrications
- B. Section 09900 - Painting

1.03 REFERENCED SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of other requirements of these Specifications, all Work specified herein shall conform to or exceed the requirements of the Florida Building Code, and the applicable requirements of the following documents to the extent that the provisions of such documents are not in conflict with the requirements of this Section:
 - 1. AISC - " Code of Standard Practice for Steel Buildings and Bridges."
 - 2. AISC – "Specification for Structural Steel Buildings."
 - 3. AISC - "Specification for Design Fabrication and Erection of Structural Steel for Buildings", and including the "Commentary of the AISC Specification".
 - 4. AISC - " Specification of Structural Joints Using ASTM A325 or A490 Bolts", as published by the American Institute of Steel Construction.
 - 5. AWS - "Structural Welding Code", AWS Article D1.1 and "Standard Qualification Procedure", as published by American Welding Society.

1.04 SUBMITTALS

- A. In accordance with the procedures and requirements set forth in Section 01300 entitled "Submittals", the Contractor shall submit the following:
 - 1. Certified Mill Test Reports
 - 2. Affidavit of Compliance with grade specified
 - 3. Shop Drawings
 - 4. Certified Weld Inspection Reports
- B. All Shop Drawings shall include the following:

EXHIBIT A

1. Layout drawings indicating all structural shapes, sizes, and dimensions.
2. Beam and column schedules.
3. Detail drawings indicating jointing and anchoring details.
4. All steel work, framing, and details shall conform to Article 1.03 of this Section.

No fabrication shall be started until Shop Drawings have been approved by the Engineer.

- C. Where structural design of the steel is not indicated on the Drawings, the Contractor shall submit design drawings of the steel framing, connections and anchor bolts. Such drawings shall be signed and sealed by a Professional Engineer registered in the State of Florida.

1.05 QUALITY ASSURANCE

- A. Shop inspection may be required by the City at his own expense. The Contractor shall give ample notice to the Engineer prior to the beginning of any fabrication work so that inspection may be provided. The Contractor shall furnish all facilities for the inspection of materials and workmanship in the shop, and the inspectors shall be allowed free access to the necessary parts of the works. Inspectors shall have the authority to reject any materials or Work which does not meet the requirements of these Specifications. Inspection at the shop is intended as a means of facilitating the Work and avoiding errors, but is expressly understood that it will in no way relieve the Contractor from his responsibility for furnishing proper materials or workmanship under this Specification.
- B. The City may engage inspectors to inspect welded connections and to perform tests and prepare test reports.
 1. Ten percent of all butt and bevel welds which extend continuously for 24 inches or less will be completely tested in accordance with AWS D1.1, Part B, Radiographic Testing of Welds, Chapter 6. All butt and bevel welds which extend continuously for more than 24 inches will be spot tested at intervals not exceeding 36 inches.
 2. Welds that are required by the Engineer to be corrected shall be corrected or redone and retested as directed, at the Contractor's expense and to the satisfaction of the Engineer and/or an acceptable independent testing lab.

PART 2 -- PRODUCTS

2.01 MATERIAL INFORMATION

- A. The term "Structural Steel" shall be as defined in the "Codes of Standard Practices for Steel Buildings and Bridges" of the American Institute of Steel Construction (AISC). Included as "Structural Steel" shall be all stiffeners, plates, sag rods and other miscellaneous metal required for a complete installation.

EXHIBIT A

2.02 MATERIALS

A. Structural Steel:

1. Structural steel shall conform to Specification Section 05010 entitled "Metal Materials". Certified mill test reports or certified reports of tests made by the fabricator or a testing laboratory in accordance with ASTM A6 and the governing specification shall constitute evidence of conformity with the above ASTM specification. Additionally, the fabricator shall, if requested, provide an affidavit stating that the structural steel furnished meets the requirements of the grade specified. Unidentified steel, if free from surface imperfections, may be used for parts of minor importance or for unimportant details where the precise physical properties of the steel and its weld-ability would not affect the strength of the structure. All other unidentified steel will be rejected and shall be removed from the site and replaced by the Contractor, all at the expense of the Contractor.
2. Structural steel pipe shall be ASTM A501, or ASTM A53, Type E or S, Grade B.
3. Structural tubing shall be ASTM A501, or A500, Grade B. All members shall be furnished full length without splices unless otherwise noted or accepted by the Engineer.
4. Structural steel shall be cleaned and coated with a shop paint primer; except, that primer shall be omitted for surfaces to be galvanized with no further coating. Surface preparation and primer shall be as specified in Section 09900 entitled "Painting". Shop prime coat shall be applied within eight hours after surface preparation. Shop applied primers shall be as specified in Section 09900 entitled "Painting".

B. Bolts: All fasteners are specified in Section 05050 entitled "Metal Fastening".

C. Rivet Steel: Rivet steel shall conform to the following Specification, Structural Rivet Steel, ASTM A502-1. Certified mill test reports shall constitute sufficient evidence of conformity with the Specifications.

D. Anchor Bolts: Anchor bolts for structural steel shall be of the size and configuration shown on the Drawings and shall conform to Section 05050 entitled "Metal Fastening".

E. Filler Metal for Welding: Welding electrodes for manual shielded metal arc welding shall conform to the Specifications for Mild Steel Covered Arc-Welding Electrodes, AWS A5.1. Bare electrodes and granular flux for the submerged-arc process shall conform to AWS-A5.17 as required for the conditions of actual use.

PART 3 -- EXECUTION

3.01 MEASUREMENT

- A. The Contractor shall verify all dimensions and shall make any field measurements necessary and shall be fully responsible for accuracy and layout of Work. The Contractor shall review the Drawings and any discrepancies shall be reported to the Engineer for clarification prior to starting fabrication.

3.02 FABRICATION

EXHIBIT A

- A. General: Fabrication shall be in accordance with the American Institute for Steel Construction "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings" of the AISC.
- B. Anchor Bolts:
1. All anchor bolts for structural steel erection and other incidental items of the structural steel required to be built into concrete shall be properly set and securely held in position in the forms before the concrete is placed.
 2. Anchor bolts and setting plans for steel columns shall be provided at the site, marked or tagged for ready identification.
 3. Bolts shall be accurately set to template and at elevation to provide suitable projection above concrete and/or grout. Maximum tolerances allowable from indicated locations are: (tolerances may be tighter for manufactured/fabricated elements of work):
 - a. Elevation of concrete before grouting: $\pm 1/4$ inch.
 - b. Elevation of top of anchor bolts: + 1/2 inch to 0 inch under.
 - c. Line of anchor bolt: $\pm 1/8$ inch.
 4. All holes in structural steel members required for anchors, anchor bolts, bolt holes, sag rods for securing wood or other members or for passing of other work noted on the drawings shall be provided by the fabricator and detailed on the Shop Drawings.
 5. Where misalignment between anchor bolts and bolt holes in steel members are encountered, the Engineer shall be immediately notified. The Contractor shall submit a method to remedy the misalignment for review by the Engineer.
- C. Material
1. All materials shall be properly worked and match-marked for field assembly. Where finishing is required, assembly shall be completed including bolting and welding of units before start of finishing operations.

3.03 ERECTION

- A. The erection of all structural steel shall conform to the applicable requirements of the current edition of the "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" of the ASIC. All temporary bracing, guys and bolts as may be necessary to ensure the safety of the structure until the permanent connections have been made shall be provided by the Contractor. High strength steel bolts shall conform to the Specifications of the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation for "Structural Joints using ASTM A325 or A490 Bolts".
- B. Except where otherwise noted on the Drawings or in this Specification, all shop connections shall be welded. All field connections shall be accurately fitted up before being bolted. Drifting shall be only such as will bring the parts into position and shall not be sufficient to enlarge the holes or to distort the metal. All unfair holes shall be drilled or reamed.

EXHIBIT A

C. High Strength Steel Bolts:

1. All bolted connections with high strength bolts shall use Direct Tension Indicator Devised in accordance with Paragraph 8(d)(4) of the "Specification for Structural Joints using ASTM A325 or A490 Bolts", approved by the Research Council on Structural Connections, November 13, 1985. High strength bolts shall be installed in properly aligned holes and tightened to at least the minimum tension specified in the table below. Alternately, calibrated wrench tightened may be used in lieu of Direct Tension Devices provided the requirements of Paragraph 8(d)(2) of the same Specification are met.
2. Fastener tension required for connections subject to direct tension:

Minimum Tension in 1000's of Pounds (kips)

<u>Nominal Bolt Size (Inches)</u>	<u>A325 Bolts</u>	<u>A490 Bolts</u>
1/2	12	15
5/8	19	24
3/4	28	35
7/8	39	49
1	51	64
1-1/8	56	80
1-1/4	71	102
1-3/8	85	121
1-1/2	103	148

Wrenches may be manual torque or power wrenches designed by the manufacturer for use with high strength bolts. If manual torque wrenches are used, their dials shall be calibrated on the job. If power wrenches are used, the manufacturer's recommendations shall be carefully followed and proper working conditions of the machine demonstrated before the work is started.

3. The Engineer may review the procedure for calibration of wrenches and installation of bolts and, in general, shall satisfy himself that all requirements of the Specifications for "Structural Joints using ASTM A325 or A490 Bolts" are met.

D. Cutting and Burning

1. The use of gas cutting torch in the field for correcting fabrication errors will not be permitted on any major member in the structural framing. Its use may be permitted on minor members if the member is not under stress, and then only after the written acceptance of the Engineer has been obtained. No cutting of structural steel

EXHIBIT A

members in the field will be allowed except by the written acceptance by the Engineer.

2. Holes shall be provided per AISC Specifications, or as indicated for securing other Work to structural steel framing and for the passage of other Work through steel framing members. Threaded nuts shall be welded to framing, and other specialty items, as shown, to receive other Work. No torch cut hoes will be permitted.

E. Grouting of Base Plates and Bearing Plates

1. All loose column base plates and billets shall be accurately set to the designated levels on steel wedges or angle screens in preparation for grouting under this Contract. Leveling plates grouted in place shall be installed under all structural steel columns.
2. Prior to the placement of non-shrink epoxy grout beneath base and bearing plates, the bottom surface of the plates shall be cleaned of all foreign materials, and concrete and masonry bearing surface shall also be cleaned of all foreign materials and roughened to improve bonding.
3. Anchor bolts shall be tightened after the supported members have been positioned and plumbed and the non-shrink grout has attained its specified strength.
4. Baseplates shall be grouted with non-shrink epoxy grout to assure full uniform bearing. Grouting shall be done prior to placing loads on the structure.

F. Welding

1. Welding, where required, shall be performed in accordance with the requirements of the AWS - Structural Welding Code. All shop and field welds in structural steel shall be visually inspected by an AWS qualified welding inspector. The Contractor shall furnish a letter of certification for each welded connection stating that these requirements have been met.
2. In assembly and during welding the component parts of built-up work shall be held in place by sufficient clamps, temporary bolts or other adequate means to keep parts in proper position. Where temporary bolts are used, to hold the parts together in steel plates or similar work the temporary bolts shall be removed and the holes shall be filled with welding material where practical. Otherwise, the nuts shall be tightened and the bolt threads outside the unit shall be burned and the bolt opened to prevent the nut from loosening.

G. Misfits at Bolted Connections:

1. Where misfits in erection bolting are encountered, the Engineer shall be immediately notified. The Contractor shall submit a method to remedy the misfit for review by the Engineer. The Engineer will determine whether the remedy is acceptable or if the member must be refabricated.
2. Incorrectly sized or misaligned holes in members shall not be enlarged by burning or by the use of drift pins. The Contractor shall notify the Engineer immediately and shall submit a proposed method of remedy for review by the Engineer.

EXHIBIT A

3.04 FIELD ASSEMBLY

- A. Structural frames shall be set accurately to the lines and elevations indicated. The various members shall be aligned and adjusted to form a part of a complete frame or structure before permanently fastened. Bearing surfaces and other surfaces which will be in permanent contact shall be cleaned before assembly. Necessary adjustments to compensate for discrepancies in elevations and alignments shall be performed.
- B. Individual members of the structure shall be leveled and plumbed within specified AISC tolerances. The Contractor shall provide and install all temporary bracing required until structure is complete.

3.05 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Structural members shall be loaded in such a manner that they may be transported and unloaded without being over-stressed, deformed or otherwise damaged.
- B. Structural steel members and packaged materials shall be protected from corrosion and deterioration. Material shall be stored in a dry area and shall not be placed in direct contact with the ground. Materials shall not be placed on the structure in a manner that might cause distortion or damage to the members or the supporting structures. Repair or replace damaged materials or structures as directed.

3.06 PAINTING

A. General Requirements

- 1. Steel work which will be encased in concrete shall not be painted, and all other steel work that is not to be galvanized shall be given one prime coat and one coat of shop paint before shipment to the field as specified under Section 09900 entitled "Painting". Steel work to be encased in concrete shall have all loose rust and scale removed by wire brushing or other methods as accepted by the Engineer prior to encasement.
- 2. After inspection and acceptance and before leaving the shop, all steel work specified to be painted shall be sand blasted or wheelabrated by the fabricator, of loose mill scale, loose rust, weld slag or flux deposit, dirt and other foreign matter to satisfy the following requirements of the Steel Structures Painting Council: Specification (SSPC), SP-6 NACE 3 for all steel except immersion service; for all steel in immersion service, SSPC-SP-10 NACE2.
- 3. Cleaned metal shall be primed or pretreated within six hours after cleaning to prevent new rust forming.

B. Contact Surfaces: Contact surfaces shall be cleaned and primed in accordance with Item A of this Section but shall not be painted.

C. Finished Surfaces: Machine finished surfaces shall be protected against corrosion by rust-inhibiting coating that can be easily removed prior to erection or which has characteristics that make removal unnecessary prior to erection.

EXHIBIT A

- D. Surfaces Adjacent to Field Welds: Surfaces within 2 inches of an field weld location shall be free of materials that would prevent proper welding or produce objectionable fumes while welding is being done.
- E. Painting Schedule
1. After erection of the structural steel and miscellaneous steel is complete, the Contractor shall touch up all abrasions in the shop coat and shall spot paint all field rivets, field bolts and field welds with the paint and procedure specified in Section 09900 entitled "Painting".
 2. All painting performed at the fabricator's shop shall be subject to inspection by the City or his representative. All parts of the Work shall be made accessible to the City or his representative. The Contractor shall correct such work as found defective under this Section of the Specification.
 3. Field cuts on galvanized steel shall be wire brushed and coated with Carbomastic 15, Carboline Co., or equal, to a thickness of 4 to 6 mils.

- END OF SECTION -

EXHIBIT A

SECTION 05140

STRUCTURAL ALUMINUM

PART 1 -- GENERAL

1.01 THE REQUIREMENT

- A. The Contractor shall furnish all equipment, labor, materials, and services required to provide all structural aluminum work in accordance with the Contract Documents. The term "structural aluminum" shall include items as defined in the Aluminum Association "Specifications for Aluminum Structures".

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 05010 - Metal Materials
- B. Section 05050 - Metal Fastening

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of other requirements of the Specifications, all work specified herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of the Bid.
 - 1. Florida Building Code
 - 2. Aluminum Association "Specifications for Aluminum Structures"
 - 3. AWS D1.2 - "Structural Welding Code".

1.04 SUBMITTALS

- A. Submit the following in accordance with Section 01300 entitled "Submittals".
 - 1. Certified Mill Test Reports
 - 2. Affidavit of Compliance with grade specified
 - 3. Shop Drawings which include the following:
 - a. Layout drawings indicating all structural shapes, sizes, and dimensions.
 - b. Beam and column schedules.
 - c. Detailed drawings indicating jointing, anchoring and connection details.

EXHIBIT A

1.05 QUALITY ASSURANCE

- A. Shop inspection may be required by the City at his own expense. The Contractor shall give ample notice to the Engineer prior to the beginning of any fabrication work so that inspection may be provided. The Contractor shall furnish all facilities for the inspection of materials and workmanship in the shop, and the inspectors shall be allowed free access to the necessary parts of the work. Inspectors shall have the authority to reject any materials or work which do not meet the requirements of these Specifications. Inspection at the shop is intended as a means of facilitating the work and avoiding errors, but is expressly understood that it will in no way relieve the Contractor from his responsibility for furnishing proper materials or workmanship under this Specification.

PART 2 -- PRODUCTS

2.01 MATERIALS

- A. Structural aluminum shall comply with Section 05010 entitled "Metal Materials".
- B. Fasteners for structural aluminum shall be in accordance with Section 05050 entitled "Metal Fastening". Fasteners shall be Type 316 stainless steel.
- C. Electrodes for welding shall be in accordance with Section 05050 entitled "Metal Fastening".

PART 3 -- EXECUTION

3.01 MEASUREMENT

- A. The Contractor shall verify all dimensions and shall make any field measurements necessary and shall be fully responsible for accuracy and layout of work. The Contractor shall review the Drawings and any discrepancies shall be reported to the Engineer for clarification prior to starting fabrication.

3.02 FABRICATION

- A. Fabrication shall be in accordance with the Aluminum Association "Specifications for Aluminum Structures". Fabrication shall begin only after Shop Drawing approval.
- B. Except where otherwise noted on the Drawings or in this Specification, all shop connections shall be welded.
- C. All holes in structural aluminum members required for anchors, anchor bolts, bolt holes, or other members or for attachment of other work shall be provided by the fabricator and detailed on the Shop Drawings.
- D. All materials shall be properly worked and match-marked for field assembly.

EXHIBIT A

3.03 DELIVERY, STORAGE AND HANDLING

- A. Structural members shall be loaded in such a manner that they may be transported and unloaded without being over-stressed, deformed or otherwise damaged.
- B. Structural aluminum members and packaged materials shall be protected from corrosion and deterioration. Material shall be stored in a dry area and shall not be placed in direct contact with the ground. Materials shall not be placed on the structure in a manner that might cause distortion or damage to the members or the supporting structures. The Contractor shall repair or replace damaged materials or structures as directed.

3.04 ERECTION

- A. All temporary bracing, guys and bolts as may be necessary to ensure the safety of the structure until the permanent connections have been made shall be provided by the Contractor.
- B. Structural members shall be set accurately to the lines and elevations indicated. The various members shall be aligned and adjusted to form a part of a complete frame or structure before being permanently fastened. A licensed civil engineer shall survey the structural aluminum during erection and shall provide a final survey indicating elevations and locations of all major members. Necessary adjustments to compensate for discrepancies in elevations and alignments shall be performed.
- C. No cutting of structural aluminum members in the field will be allowed except by the written approval of the Engineer.
- D. Bearing surfaces and other surfaces which will be in permanent contact shall be cleaned before assembly.
- E. Field welding shall not be permitted unless specifically indicated in the Drawings or approved in writing by the Engineer. All field welding shall comply with Section 05050 entitled "Metal Fastening".
- F. All bolted connections shall comply with Section 05050 entitled "Metal Fastening".
- G. All field connections shall be accurately fitted up before being bolted. Drifting shall be only such as will bring the parts into position and shall not be sufficient to enlarge the holes or to distort the metal. All unfair holes shall be drilled or reamed.
- H. Misfits at Bolted Connections
 - 1. Where misfits in erection bolting are encountered, the Engineer shall be immediately notified. The Contractor shall submit a method to remedy the misfit for review by the Engineer. The Engineer will determine whether the remedy is acceptable or if the member must be refabricated.
 - 2. Incorrectly sized or misaligned holes in members shall not be enlarged by burning or by the use of drift pins. The Contractor shall notify the Engineer immediately and shall submit a proposed method of remedy for review by the Engineer.

EXHIBIT A

3. Where misalignment between anchor bolts and bolt holes in aluminum members are encountered, the Engineer shall be immediately notified. The Contractor shall submit a method to remedy the misalignment for review by the Engineer.
 - I. Where finishing is required, assembly shall be completed including bolting and welding of units before start of finishing operations.
 - J. All aluminum surfaces in contact with concrete shall be given a heavy coat of bituminous paint. Aluminum surfaces in contact with other metals shall be properly isolated.
- 3.05 FINISHES
- A. Structural aluminum shall be furnished mill finished unless noted otherwise. Anodized finish shall be furnished where noted on the Drawings.

- END OF SECTION -

SECTION 09900

PAINTING

PART 1 -- GENERAL

1.01 THE REQUIREMENT

- A. The Contractor shall furnish all labor, tools, materials, supervision and equipment necessary to do all the work specified herein and as required for a complete installation.

1.02 GENERAL INFORMATION AND DESCRIPTION

- A. The term "paint," as used herein, includes emulsions, enamels, paints, stains, varnishes, sealers, cement filler, cement-latex filler and other coatings, whether used as prime, intermediate, or finish coats.
- B. All paint for concrete and metal surfaces shall be especially adapted for use around wastewater treatment plants and shall be applied in conformance with the manufacturer's published specifications.
- C. All paint for final coats shall be fume resistant, compounded with pigments suitable for exposure to sewage gases, especially to hydrogen sulfide and to carbon dioxide. Pigments shall be materials which do not tend to darken, discolor, or fade due to the action of sewage gases. If a paint manufacturer proposes use of paint which is not designated "fume resistant" in its literature, it shall furnish full information concerning the pigments used in this paint.
- D. Coatings used in conjunction with potable water supply systems shall have U.S. Environmental Protection Agency (EPA) and FDA approval for use with potable water and shall not impart a taste or odor to the water.
- E. All building, facilities, structures, and appurtenances, as indicated on the Drawings and as specified herein, shall be painted with not less than one shop coat and two field coats, or one prime coat and two finish coats of the appropriate paint. Items to be painted include, but are not limited to exterior and interior concrete, structural steel, miscellaneous metals, steel and aluminum doors and frames, concrete block, ductwork, sluice gates, operators, pipe fittings, valves, mechanical equipment, motors, conduit, and all other work which is obviously required to be painted unless otherwise specified.
- F. Baked-on enamel finishes and items with standard shop finishes such as graphic panels, electrical equipment, toilet partitions, lockers, instrumentation, etc., shall not be field painted unless the finish is damaged during shipment or installation. Aluminum, stainless steel, fiberglass and bronze work shall not be painted unless color coding and marking is required or otherwise specified. A list of surfaces not to be coated is included in Article 1.09 of this Section.
- G. The Contractor shall obtain all permits, licenses and inspections and shall comply with all laws, codes, ordinances, rules and regulations promulgated by authorities having jurisdiction which may bear on the work. This compliance will include Federal Public Law 91-596 more commonly known as the "Occupational Safety and Health Act of 1970".

EXHIBIT A

1.03 MANUFACTURERS

- A. All painting materials shall be as manufactured by Tnemec, Carboline, Ameron, DuPont or Sherwin Williams.

1.04 SUBMITTALS

- A. The Contractor shall submit paint manufacturer's data sheets, application instructions, and samples of each finish and color to the Engineer for review, before any work is started in accordance with Section 01300 entitled, "Submittals."
- B. Submitted samples of each finish and color shall be prepared so that the area of each sample indicates the appearance of the various coats. For example, where a three-coat system is specified, the sample shall be divided into three areas indicating one coat only, two coats and all three coats. The Engineer will provide written authorization constituting a standard, as to color and finish only, for each coating system.
- C. The Contractor shall prepare a complete schedule of surfaces to be coated and shall identify the surface preparation and paint system he proposes to use. The Paint Schedule shall be in conformance with Article 3.03 of this Section. The schedule shall contain the name of the paint manufacturer, and the name, address and telephone number of the manufacturer's representative that will inspect the Work. The schedule shall be submitted to the Engineer for review as soon as possible following the Notice to Proceed so that the schedule may be used to identify colors and to specify shop painting systems on order for fabricated equipment.

1.05 SERVICES OF MANUFACTURER'S REPRESENTATIVE

- A. The Contractor shall purchase paint from an acceptable manufacturer. The manufacturer shall assign a representative to inspect the application of his product both in the shop and field. The Contractor, through the manufacturer's representative, shall submit his report to the Engineer at the completion of his Work identifying the products used and verifying that said products were properly applied and that the paint systems were proper for the exposure and service.
- B. Services shall also include, but not be limited to, inspecting prior coatings of paint, determination of best means of surface preparation, inspection of complete work, and re-inspection of painted work to be performed six months after the job is completed.

1.06 MANUFACTURER'S INSTRUCTIONS

- A. The manufacturer's published instructions for use as a guide in specifying and applying the manufacturer's proposed paint shall be submitted to the Engineer. Paint shall not be delivered to the job before acceptance of the manufacturer's instructions is given by the Engineer.
- B. A manufacturer's paint will not be considered for use unless that manufacturer's published instructions meets the following requirements:
 - 1. The instructions must have been written and published by the manufacturer for the purpose and with the intent of giving complete instruction for the use and application

EXHIBIT A

of the proposed paint in the locality and for the conditions for which the paint is specified or shown to be applied under this Contract.

2. All limitations, precautions, and requirements that may adversely affect the paint; that may cause unsatisfactory results after the painting application; or that may cause the paint not to serve the purpose for which it was intended; that is, to protect the covered material from corrosion, shall be clearly and completely stated in the instructions. These limitations and requirements shall, if they exist, include, but not be limited to the following:
 - a. Methods of application
 - b. Number of coats
 - c. Thickness of each coat
 - d. Total thickness
 - e. Drying time of each coat, including primer
 - f. Primer required to be used
 - g. Primers not permitted
 - h. Use of a primer
 - i. Thinner and use of thinner
 - j. Temperature and relative humidity limitations during application and after application
 - k. Time allowed between coats
 - l. Protection from sun
 - m. Physical properties of paint including solids content and ingredient analysis
 - n. Surface preparation
 - o. Touch up requirements and limitations
- C. Concrete surfaces specified by the paint manufacturer to be acid etched shall be etched in accordance with the manufacturer's instructions. The surface shall then be thoroughly scrubbed with clean water, rinsed, and allowed to dry. The surface shall be tested with a moisture meter to determine when dry before coating.

1.07 QUALITY ASSURANCE

- A. The Contractor shall give the Engineer a minimum of three days advance notice of the start of any field surface preparation work of coating application work.
- B. All such Work shall be performed only in the presence of the Engineer, unless the Engineer has specifically allowed the performance of such Work in his absence.
- C. Review by the Engineer, or the waiver of review of any particular portion of the Work, shall not relieve the Contractor of his responsibility to perform the Work in accordance with these Specifications.
- D. Where special coatings are to be performed by a subcontractor, the Contractor shall provide five references which show that the painting subcontractor has previous successful experience with the specified or comparable coating systems. Include the name, address, and the telephone number for the Owner of each installation for which the painting subcontractor provided the protective coating.

EXHIBIT A

1.08 SAFETY AND HEALTH REQUIREMENTS

- A. In accordance with requirements of OSHA Safety and Health Standards for Construction (29CFR1926) and the applicable requirements of regulatory agencies having jurisdiction, as well as manufacturer's printed instructions, appropriate technical bulletins, manuals, and material safety data sheets, the Contractor shall provide and require use of personnel protective and safety equipment for persons working in or about the project site.
- B. All paints must comply with the requirements of the National Ambient Air Quality Standards.

1.09 SURFACES NOT TO BE COATED

- A. The following items shall not be coated unless otherwise noted:
 - 1. Stainless steel work.
 - 2. Galvanized checkered plate.
 - 3. Aluminum handrails, walkways, windows, louvers, grating and checkered plate.
 - 4. Flexible couplings, lubricated bearing surfaces and insulation.
 - 5. Packing glands and other adjustable parts of mechanical equipment.
 - 6. Finish hardware.
 - 7. Plastic switch plates and receptacle plates.
 - 8. Signs and nameplates.

1.10 ADDITIONAL PAINT

- A. At the end of the project, the Contractor shall turn over to the Owner a gallon can of each type and color of paint, primer, thinner or other coating used in the field painting. If the manufacturer packages the material concerned in gallon cans, then it shall be delivered in unopened labeled cans as it comes from the factory. If the manufacturer does not package the material in gallon cans, and in the case of special colors, the materials shall be delivered in new gallon containers, properly closed with type labels indicating brand, type, color, etc. The manufacturer's literature described the materials and giving directions for their use shall be furnished in three bound copies. A type-written inventory list shall be furnished at the time of delivery.

1.11 SHIPPING, HANDLING AND STORAGE

- A. All painting materials shall be brought to the job site in the original sealed labeled containers of the paint manufacturer and shall be subject to review by the Engineer. Where thinning is necessary, only the product of the manufacturer furnishing the paint shall be used. All such thinning shall be done strictly in accordance with the manufacturer's instructions, and with the full knowledge of the Engineer.
- B. Materials and their storage shall be in full compliance with the requirements of pertinent codes and fire regulations. Receptacles shall be placed outside buildings for paint gates and containers. Paint waste shall not be disposed of in plumbing fixtures, process drains or other plant systems or process units.

PART 2 -- PRODUCTS

EXHIBIT A

2.01 MATERIALS

- A. Table 09900-1 depicts the coatings referenced in Article 3.03 of this Section entitled, "Paint Schedule". Table 09900-1 lists Tnemec products as a reference. Equivalent products by the manufacturers listed in Article 1.03 of this Section may be submitted for review.

TABLE 09900-1
PRODUCT LISTING

<u>Ref. No.</u>	<u>Description</u>	<u>MANUFACTURERS REFERENCE</u> <u>Tnemec</u>
102	Epoxy Polyamide Masonry Filler	54-660 Concrete and Masonry Filler
103	Epoxy Mastic	135 - Color
104	Epoxoline Primer	66 - 1211
105	Hi-Build Epoxoline	66 - Color
106	Vinyl Acrylic	51-792
107	Waterborne Acrylic Epoxy	113-Color
110	Endura Shield III	73 - Color
111	Modified Waterborne Acrylate	157 - Envirocrete (Sand Texture)
114	Waterborne Polyamide Epoxy	151 - Elasto-Grip
115	Aromatic Urethane, Zinc Rich	90-97
116	Water repellent	Chemprobe Deck
117	Modified Amine Epoxy	63-1500
118	Epoxy Modified Concrete	218
119	High Solids Epoxy	104

PART 3 -- EXECUTION

3.01 SURFACE PREPARATION

- A. Surfaces to be painted shall be clean and dry, and free of dust, rust, scale and all foreign matter. No solvent cleaning, power or hand tool cleaning shall be permitted unless acceptable to the Engineer or specified herein.
- B. Except as otherwise provided, all preparation of metal surfaces shall be in accordance with Specifications SP-1 through SP-10 of the Steel Structures Painting Council (SSPC). Where Steel Structures Painting Specifications are referred to in these Contract Documents, the corresponding Pictorial Surfaces Preparation Standard shall be used to define the minimum final surface conditions to be supplied. Grease and oil shall be removed and the surface prepared by hand tool cleaning, power tool cleaning or blast cleaning in accordance with the appropriate Specification SP-1 through SP-10.

EXHIBIT A

- C. Weld flux, weld spatter and excessive rust scale shall be removed by power tool cleaning as per SSPC-SP-3-63.
- D. Threaded portions of valve and gate stems, machined surfaces which are limited for sliding contact, surfaces which are to be assembled against gaskets, surfaces or shafting on which sprockets are to fit, or which are intended to fit into bearings, machined surfaces of bronze trim on slide gates and similar surfaces shall be masked off to protect them from the sandblasting of adjacent surfaces. Cadmium-plated or galvanized items shall not sandblasted unless hereinafter specified, except that cadmium-plated, zinc-plated, or sherardized fasteners used in assembly of equipment to the sandblasted shall be sandblasted in the same manner as the unprotected metal. All installed equipment, mechanical drives, and adjacent painted equipment shall be protected from sandblasting. Protection shall prevent any sand or dust from entering the mechanical drive units or equipment where damage could be caused.
- E. Hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place prior to cleaning and painting, and not intended to be painted, shall be protected or removed during painting operations and repositioned upon completion of painting operations.
- F. Any abraded areas of shop or field applied coating shall be touched up with the same type of shop or field applied coating, even to the extent of applying an entire coating, if necessary. Touch-up coating and surface preparations shall be in addition to and not considered as the first field coat.
- G. Sand from sandblasting shall be thoroughly removed, using a vacuum cleaner if necessary. No surface which has been sandblasted shall be painted until inspected by the Engineer.
- H. Exposed Pipe
 - 1. Bituminous coated pipe shall not be used in exposed locations. Pipe which shall be exposed after project completion shall be primed in accordance with the requirements herein. Any bituminous coated ferrous pipe which is inadvertently installed in exposed locations shall be sandblasted to SSPC-SP-5 White Metal before priming and painting.
 - 2. After installation and prior to finish painting, all exterior, exposed flanged joints shall have the gap between adjoining flanges and gaps between the pipe wall and threaded-on flanges sealed with a single component Thiokol caulking to prevent rust stains.
- I. Ferrous Metal Surfaces
 - 1. All ferrous metal surfaces not required to be galvanized shall be cleaned of all oil grease, dirt, rust and tight and loose mill scale by blasting in accordance with the following: SSPC-SP-5, White Metal Blast Cleaning and comply with the visual standard NACE 1, for submerged metal. SSPC-SP-10 Near White Metal Blast Cleaning, and comply with the visual standard NACE 2 for all other locations. Pickling, complying with SSPC-SP-8, may be substituted for Near White Blast in areas as determined by the Engineer. Priming shall follow sandblasting before any

EXHIBIT A

evidence of corrosion occurs, before nightfall and before any moisture is on the surface.

2. Existing painted ferrous metal surfaces shall be cleaned of all oil, grease and dirt by blasting with a minimum 2,500 psi high pressure blast. All rust shall be removed in accordance with SSPC-SP-3 and spot primed with the applicable primer.
- J. Field surface preparation of small, isolated areas such as field welds, repair of scratches, abrasions or other marks to the shop prime or finish shall be cleaned by power tools in accordance with SSPC-SP-3, or in difficult and otherwise inaccessible areas by hand cleaning in accordance with SSPC-SP-2 and spot primed.
- K. Primed or Coated Surfaces and Non-Ferrous Surfaces
1. All coated surfaces shall be cleaned prior to application of successive coats. All non-ferrous metals not to be coated shall be cleaned. This cleaning shall be done in accordance with SSPC-SP-1, Solvent Cleaning.
- L. Shop Finished Surfaces
1. All shop-coated surfaces shall be protected from damage and corrosion before and after installation by treating damaged areas immediately upon detection. Abraded or corroded spots on shop-coated surfaces shall be prepared in accordance with SSPC-SP-2, Hand Tool Cleaning and then touched up with the same materials as the shop coat.
 2. All shop coated surfaces which are faded, discolored, or which require more than minor touch-up, in the opinion of the Engineer, shall be repainted. Cut edges of galvanized sheets, electrical conduit, and metal pipe sleeves, not to be finish painted, shall be cleaned in accordance with SSPC-SP-1, Solvent Cleaning and primed with zinc dust-zinc oxide metal primer.
- M. Galvanized and Copper Alloy Surfaces
1. All copper, or galvanized metal surfaces shall be brush blasted and given one coat of epoxy primer.
- N. Concrete and Masonry Surfaces
1. Concrete and masonry surfaces to be painted shall be prepared by removing efflorescence, chalk, dust, dirt, grease, oil, form coating, tar and by roughening to remove glaze. All surfaces shall be repaired prior to commencement of the coating operation.
 2. Concrete and masonry surfaces are to be cured for at least 28 days prior to coating them.
- O. New concrete immersion surfaces that are to be coated shall be brush blasted per SSPC-SP7 to produce the necessary "sandpaper texture" surface required for satisfactory adherence of the paint. Areas of concrete, which contain blow holes or voids, shall be filled with the manufacturer's approved filler material.

EXHIBIT A

P. Existing Painted Concrete and Masonry Surfaces

1. Existing painted concrete and masonry surfaces requiring paint as identified herein shall be prepared by applying a minimum 2500 psi high pressure water blast to the existing painted surface to remove all loose paint, chalk, dust, dirt, grease, oil, latents, and other foreign materials. Cracks, chips or voids in the existing concrete shall be repaired in accordance with paint manufacturer recommendations.

Q. PVC Pipe Surfaces

1. All pipe surfaces shall be lightly sanded before painting.

3.02 SHOP PAINTING

- A. All fabricated steel work and equipment shall receive at the factory at least one shop coat of prime paint compatible with the paint system required by these Specifications. The Contractor shall coordinate all shop priming to ensure compatibility with paint system specified. Surface preparation prior to shop painting shall be as specified. Finish coats may be applied in the shop if acceptable to the Engineer. All shop painted items shall be properly packaged and stored until they are incorporated in the Work. Any painted surfaces that are damaged during handling, transporting, storage or installation shall be cleaned, scraped, and patched before field painting begins so that Work shall be equal to the original painting received at the shop. Equipment or steel Work that is to be assembled on the site shall likewise receive a minimum of one shop coat of paint at the factory. Surfaces of exposed members that will be inaccessible after erection shall be prepared and painted before erection.
- B. The Contractor shall specify the shop paints to be applied when ordering equipment in order to assure compatibility of shop paints with field paints. The paints and surface preparation used for shop coating shall be identified on shop drawings submitted to the Engineer for review. Shop paint shop drawings will not be reviewed until the final project paint system has been submitted by the Contractor and reviewed by the Engineer.
- C. Shop finish coats may be the standard finish as ordinarily applied by the manufacturer if it can be demonstrated to the Engineer that the paint system is equal to and compatible with the paint system specified. However, all pumps, motors and other equipment shall receive at least one field applied finish coat after installation.

3.03 PAINT SCHEDULE

- A. The Contractor shall adhere to this paint schedule, providing those paints named or equal. DFT shall mean the minimum dry film thickness per application measured in mils. Products are referenced by numbers listed in Article 2.01 of this Section entitled "Product Listing." The paint schedule identifies the minimum DFT required per coat. If the Contractor does not achieve the specified DFT range in a single coat, he shall provide additional coats as necessary at no additional cost to the Owner.
- B. Metal Surfaces, Atmospheric (Exterior) Exposure
 1. Metal surfaces exposed to the atmosphere that do not come into contact with wastewater or corrosive atmosphere including the following types of surfaces shall be painted as described below:

EXHIBIT A

- a. Pumps, motors, process equipment, machinery, etc.
- b. Above ground piping, valves and pipe supports.
- c. Miscellaneous steel shapes, angles, etc.
- d. Exposed surfaces of conduit, ductwork, etc.

Ferrous Metal

<u>Application</u>	<u>No.</u>	<u>Description</u>	<u>DFT</u>
First - 1 coat	104	Epoxoline Primer	3.0 - 5.0
Second - 1 coat	105	Hi-Build Epoxoline	2.0 - 3.0
Finish - 1 coat	110	Endura Shield	<u>2.0 - 3.0</u>
		Min. Total	9.0 Mils

Non-Ferrous Metal

<u>Application</u>	<u>No.</u>	<u>Description</u>	<u>DFT</u>
First - 1 coat	105	Hi-Build Epoxoline	2.0 - 3.0
Second - 1 coat	110	Endura Shield	<u>2.0 - 3.0</u>
		Min. Total	5.0 Mils

Galvanized

<u>Application</u>	<u>No.</u>	<u>Description</u>	<u>DFT</u>
First - 1 coat	115	Aromatic Urethane, Zinc-Rich	2.0 - 3.5
First - 1 coat	105	Hi-Build Epoxoline	2.0 - 3.0
Second - 1 coat	110	Endura Shield	<u>2.0 - 3.0</u>
		Min. Total	7.5 Mils

EXHIBIT A

C. Metal Surfaces, Interior Exposure

1. Interior metal surfaces (nonsubmerged) that do not come in contact with wastewater or the corrosive atmosphere including the following types of surfaces shall be painted as follows:

- a. Pumps, motors, process equipment, machinery, etc.
- b. Piping, valves and supports.
- c. Miscellaneous steel shapes, angles, rails, etc.
- d. Exposed surfaces of conduit, ductwork, etc.

<u>Application</u>	<u>No.</u>	<u>Description</u>	<u>DFT</u>
First - 1 coat	104	Epoxoline Primer	3.0 - 5.0
Finish - 1 coat	105	Hi-Build Epoxoline	<u>4.0 - 6.0</u>
		Min. Total	9.0 Mils

D. Ductile Iron Pipe, Exterior or Interior Exposure

1. Ductile iron pipe exterior or interior exposure shall receive the following types of paint:

<u>Application</u>	<u>No.</u>	<u>Description</u>	<u>DFT</u>
First - 1 coat	105	Hi-Build Epoxoline	3.0 - 5.0
Finish - 1 coat	110	Endura Shield	<u>3.0 - 5.0</u>
		Min. Total	8.0 Mils

E. PVC Pipes, Exterior or Interior Exposure

1. PVC pipes, valves, and accessories, shall receive the following types of paint:

<u>Application</u>	<u>No.</u>	<u>Description</u>	<u>DFT</u>
First - 1 coat	105	Hi-Build Epoxoline	2.0 - 3.0
Finish - 1 coat	110	Endura Shield	<u>2.0 - 3.0</u>
		Min. Total	5.0 Mils

F. Exterior of All New Concrete, Stucco and Masonry Surfaces

1. The exterior above grade surfaces of all new structures shall receive the following:

<u>Application</u>	<u>No.</u>	<u>Description</u>	<u>DFT</u>
First - 1 coat	111	Modified Waterborne Acrylate	6.0 - 9.0
Finish - 1 coat	111	Modified Waterborne Acrylate	<u>6.0 - 9.0</u>
		Min. Total	12.0 Mils

EXHIBIT A

G. Exterior of Existing Concrete, Stucco and Masonry Surfaces requiring Touch-Up caused by Contractor's Construction Activities:

1. Exteriors of existing structures shall be painted as identified herein. Paint colors and color scheme shall match existing.

<u>Application</u>	<u>No.</u>	<u>Description</u>	<u>DFT</u>
First - 1 coat	114	Waterborne Polyamide Epoxy	1.0 - 2.5
Brush - 1 coat*	111	Modified Waterborne Acrylate	4.0 - 6.0
Finish - 1 coat	111	Modified Waterborne Acrylate	<u>6.0 - 9.0</u>
		Min. Total	12.0 Mils

* (Apply a brush coat of TNEMEC Series 157 Enviro-Crete into all exposed cracks prior to application of finish coat.)

H. Concrete and Masonry Surfaces, Interior Exposure

1. Interior exposed masonry and concrete surfaces of all new non-water retaining structures shall be painted as described below:

<u>Application</u>	<u>No.</u>	<u>Description</u>	<u>DFT</u>
First - 1 coat	102	Epoxy – Polymaide Masonry Filler	60 - 80 (sq. ft./gal)
Finish - 1 coat	105	Hi-Build Epoxoline	4.0 - 6.0

I. Interior of Existing Painted Concrete and Masonry Surfaces requiring touch-up caused by Contractor's construction activities.

1. Interior exposed masonry and concrete surfaces shall be painted as described below:

<u>Application</u>	<u>No.</u>	<u>Description</u>	<u>DFT</u>
First - 1 coat	103	Epoxy – Mastic	3.0 - 5.0
Finish - 1 coat	105	Hi-Build Epoxoline	<u>4.0 - 6.0</u>
		Min. Total	9.0 Mils

J. Existing Painted Exterior and Interior Pumps, Equipment, Piping, Valves, Fittings and Supports Requiring Touch-Up Caused by Contractor's Construction Activities.

Existing painted exterior and interior piping, pumps, valves, fittings, supports, shall be painted as described below:

<u>Application</u>	<u>No.</u>	<u>Description</u>	<u>DFT</u>
First - 1 coat	103	Epoxy Mastic	3.0 - 5.0
Finish - 1 coat	110	Endura Shield	<u>2.0 - 3.0</u>
		Min. Total	8.0 Mils

EXHIBIT A

3.04 PAINTING

- A. All paint shall be applied by experienced painters with brushes or other applicators acceptable to the Engineer.
- B. Paint shall be applied without runs, sags, thin spots, or unacceptable marks. Paints shall be applied at the rate specified by the manufacturer to achieve the minimum dry mil thickness required. Additional coats of paint shall be applied, if necessary, to obtain thickness specified.
- C. Paint shall be applied with spraying equipment only on those surfaces approved by the Engineer. If the material has thickened or must be diluted for application by spray gun, each coat shall be built up to the same film thickness achieved with undiluted brushed-on material. Where thinning is necessary, only the products of the particular manufacturer furnishing the paint shall be used; and all such thinning shall be done in strict accordance with the manufacturer's instructions, as well as with the full knowledge of the Engineer.
- D. Surfaces not accessible to brushes or rollers may be painted by spray by dauber or sheepskins and paint mitt. If any of these methods is to be used, it shall be done in strict accordance with the manufacturer's instructions, as well as with the full knowledge of the Engineer.
- E. Drying Time
 - 1. A minimum of twenty-four hours drying time shall elapse between application of any two coats of paint on a particular surface unless shorter time periods are a requirement of the manufacturer or specified herein. Longer drying times shall be required for abnormal conditions as defined by the manufacturer.
- F. Weather Restrictions
 - 1. No painting whatsoever shall be accomplished in rainy or excessively damp weather when the relative humidity exceeds 85 percent, or when the general air temperature cannot be maintained at 50 degrees Fahrenheit or above throughout the entire drying period. No paint shall be applied when it is expected that the relative humidity will exceed 85 percent or that the air temperature will drop below 50 degrees Fahrenheit within 18 hours after the application of the paint.
 - 2. Dew or moisture condensation should be anticipated; and if such conditions are prevalent, painting shall be delayed until midmorning to be certain the surfaces are dry. The day's painting shall be completed well in advance of the probable time-of-day when condensation will occur.
- G. Inspection of Surfaces
 - 1. Each and every field coat of priming and finishing paint shall be inspected by the Engineer or his authorized representative before the succeeding coat is applied. The Contractor shall follow a system of tinting successive paint coats so that no two coats for a given surface are exactly the same color. Areas to receive black protective coatings shall in such cases be tick-marked with white or actually gauged as to thickness when finished.

EXHIBIT A

- H. Before application of the prime coat and each succeeding coat, any defects or deficiencies in the prime coat or succeeding coat shall be corrected by the Contractor before application of any subsequent coating.
- I. Samples of surface preparation and of painting systems shall be furnished by the Contractor to be used as a standard throughout the job, unless omitted by the Engineer.
- J. When any appreciable time has elapsed between coatings, previously coated areas shall be carefully inspected by the Engineer, and where, in his opinion, surfaces are damaged or contaminated, they shall be cleaned and recoated at the Contractor's expense. Recoating times of manufacturer's printed instructions shall be adhered to.
- K. Coating thickness shall be determined by the use of a properly calibrated "Nordson-Mikrotest" (or equal) dry mil thickness gauge.
- L. The Contractor shall provide free of charge to the Engineer two new "Nordson-Mikrotest" dry film gauges to be used to inspect coating by Engineer and Contractor. One gauge may be used by Contractor and returned each day to the Engineer. Engineer will return gauges to Contractor at completion of job.
- M. Special Areas
 - 1. All surfaces which are to be installed against concrete, masonry etc., and will not be accessible for field priming and/or painting shall be back primed and painted as specified herein, before erection. Anchor bolts shall be painted before the erection of equipment and then the accessible surfaces repainted when the equipment is painted.
- N. Special attention shall be given to insure that edges, corners, crevices, welds and rivets receive a film thickness equivalent to that of the adjacent painted surfaces.
- O. Safety
 - 1. Respirators shall be worn by persons engaged or assisting in spray painting. The Contractor shall provide ventilating equipment and all necessary safety equipment for the protection of the workmen and the Work.
- P. Quality Workmanship
 - 1. The Contractor shall be responsible for the cleanliness of his painting operations and shall use covers and masking tape to protect the Work whenever such covering is necessary, or if so requested by the Owner. Any unwanted paint shall be carefully removed without damage to any finished paint or surface. If damage does occur, the entire surface, adjacent to and including the damaged area, shall be repainted without visible lapmarks and without additional cost to the Owner.
- Q. Painting found defective shall be scraped or sandblasted off and repainted as the Engineer may direct. Before final acceptance of the Work, damaged surfaces of paint shall be cleaned and repainted as directed by the Engineer.

EXHIBIT A

- R. Any pipe scheduled to be painted and having received a coating of a tar or asphalt compound shall be painted with two coats or "Intertol Tar Stop", "Tnemec Tar Bar" or equal before successive coats are applied in accordance with the paint schedule.

3.05 SCHEDULE OF COLORS

- A. All colors shall be as designated by the Engineer at the shop drawing review. The Contractor shall submit color samples including custom color choices as required to the Engineer as specified in Article 1.04 of this Section. The Contractor shall submit suitable samples of all colors and finishes for the surfaces to be painted, or on portable surfaces when required by the Engineer. The Engineer shall decide upon the choice of colors and other finishes when alternates exist. No variation shall be made in colors without the acceptance from the Owner. Color names and/or numbers shall be identified according to the appropriate color chart issued by the manufacturer of the particular product in question.

3.06 COLOR CODING AND LETTERING OF PIPING

- A. In general, the pumps and equipment shall be painted the same color as the piping system to which it is connected unless otherwise directed by the Engineer. Where colors are not designated for piping and conduit systems they will be selected during the shop drawing review from the paint manufacturer's standard color charts.

B. Lettering of Piping

- 1. The Contractor shall apply identification titles and arrows indicating the direction of flow of liquids to all types and sections of all new and existing plant piping. Titles shall be as directed by the Engineer. Identification titles shall be located midway between color coding bands where possible. Identification lettering and arrows shall be placed as directed by the Engineer, but shall generally be located each fifteen feet in pipe length and shall be properly inclined to the pipe axis to facilitate easy reading. Titles shall also appear directly adjacent to each side of any wall or slab the pipeline passes through.

- C. The titles shall be painted by use of stencils and shall identify the contents by complete names at least once in each area through which it passes and thereafter be abbreviated.

- D. Title color shall be black or white as directed and shall have an overall height in inches in accordance with Table 09900-1. Letter type shall be Helvetica Medium upper case. The manufacturer's instructions shall be followed in respect to storage, surface preparation and application. For piping less than 3/4-inch diameter, the Contractor shall furnish and attach corrosion resistant color tags with the required lettering.

E. Banding

- 1. Where bands are indicated in the Pipe Color Coding Schedule, the pipe is to be painted for its full circumference with a band of the color indicated. The bands shall be six inches wide, neatly made by masking, and spaced eight feet apart. The Contractor may substitute precut prefinished bands on piping subject to acceptance by the Engineer. Where banded pipes are running concurrently in a space, bands shall be located so that on adjacently located pipes, bands will be grouped beside each other.

3.07 OSHA SAFETY COLORS

EXHIBIT A

- A. Items listed in ANSI Z53.1-1971, Section 2.1 shall be painted ANSI Red. In general, these items shall include fire protection equipment and apparatus; wall mounted breathing apparatus, danger signs and locations; and stop bars, buttons or switches. In addition all hose valves and riser pipes, fire protection piping and sprinkler systems, and electrical stop switches shall be painted ANSI Red.
- B. Items listed in ANSI Z53.1-1971, Section 2.3 shall be painted ANSI Yellow. Yellow shall be the basic color for designating caution and for marking physical hazards such as striking against, stumbling, falling, tripping, and "caught in between". In addition, an 8-inch wide strip on the top and bottom tread of stairways shall be coated.

3.08 WORK IN CONFINED SPACES

- A. The Contractor shall provide and maintain safe working conditions for all employees. Fresh air shall be supplied continuously to confined spaces through the combined use of existing openings, forced-draft fans, or by direct air supply to individual workers. Paint fumes shall be exhausted to the outside from the lowest level in the contained space.
- B. Electrical fan motors shall be explosion proof if in contact with fumes. No smoking or open fires will be permitted in, or near, confined spaces where painting is being done.

3.09 CLEANING

- A. The buildings and all other Work area shall be at all times kept free from accumulation of waste material and rubbish caused by the Work. At the completion of the painting, all tools, equipment, scaffolding, surplus materials, and all rubbish around the inside the buildings shall be removed and the Work left broom clean unless otherwise specified.

TABLE 09900-1

HEIGHT OF PIPING LETTERING

<u>Diameter of Pipe or Pipe Covering</u>	<u>Height of Lettering</u>
3/4 to 1-1/4 inches	1/2 inch
1-1/2 to 2 inches	3/4 inch
2-1/2 to 6 inches	1-1/4 inches
8 to 10 inches	2-1/2 inches
Over 10 inches	3-1/2 inches

Notes:

1. Letter type shall be Helvetica Medium upper case. The manufacturer's instructions shall be followed in respect to storage, surface preparation and application.
2. For piping less than 3/4-inch diameter (as identified in Table 09900-2), the Contractor shall furnish and attach corrosion resistant color tags with the required lettering.

- END OF SECTION -

SECTION 11000

EQUIPMENT GENERAL PROVISIONS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

- A. The Contractor shall provide all tools, supplies, materials, equipment, and all labor necessary for the furnishing, construction, installation, testing, and operation of all equipment and appurtenant work, complete and operable, all in accordance with the requirements of the Contract Documents.
- B. The provisions of this Section shall apply to all equipment specified and where referred to, except where otherwise specified or shown.
- C. All equipment of the same type (i.e. Centrifugal Pumps, Rotary Lobe Positive Displacement Blowers, etc.), although for different systems shall be supplied by the same manufacturer.
- D. All equipment shall be of first class workmanship and shall be entirely designed and suitable for the intended services. All equipment shall be manufactured in accordance with applicable industry standards.
- E. All materials used in fabricating the equipment shall be new and undamaged. All materials shall conform to applicable provisions of the AISC Specifications for the design and fabrication of structural steel, AWS Welding Specifications and to pertinent ASIM Standard Specifications.
- F. These Specifications are intended to provide a general description of what is required, but do not cover all details which will vary in accordance with the requirements of the Contractor furnished equipment. They are, however, intended to cover the furnishing, the shop testing, the delivery and complete installation and field testing, of all materials, equipment and appurtenances complete as herein specified, whether or not specifically stated in the Specifications.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 09900 - Painting
- B. Division 15 - Mechanical

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. All codes, as referenced herein, are specified in Section 01090 entitled "Reference Standards."
- B. Commercial Standards
 - 1. All equipment, products, and their installation shall be in accordance with the following standards, as applicable, and as specified in each Section of these specifications:

EXHIBIT A

- a. American Society for Testing and Materials (ASTM).
- b. American Public Health Association (APHA).
- c. American National Standards Institute (ANSI).
- d. American Society of Mechanical Engineers (ASME).
- e. American Water Works Association (AWWA).
- f. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).
- g. American Welding Society (AWS).
- h. National Fire Protection Association (NFPA).
- i. Federal Specifications (PS).
- j. National Electrical Manufacturers Association (NEMA).
- k. Manufacturer's published recommendations and specifications.
- l. General Industry Safety Orders (OSHA).
- m. American Gear Manufacturers Association (AGMA).
- n. American Hot Dip Galvanizers Association (AHDGA).
- o. American Standards Association (ASA).
- p. National Association of Corrosion Engineers (NACE).
- q. Anti-Friction Bearing Manufacturers Association, Inc. (AFMBA).
- r. Underwriters' Laboratories, Inc. (UL).

B. The following standards have been referred to in this Section of the specifications:

- | | | |
|----|-------------------|---|
| 1. | ANSI B16.1 | Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250, and 800. |
| 2. | ANSI B16.5 | Pipe Flanges and Flanged Fittings, Steel, Nickel Alloy, and Other Special Alloys. |
| 3. | ANSI B46.1 | Surface Texture. |
| 4. | ANSI S12.6 | Method for the Measurement of the Real-Ear Attenuation of Hearing Protectors. |
| 5. | ANSI/ASME B1.20.1 | General Purpose Pipe Threads (Inch). |
| 6. | ANSI/ASME B31.1 | Power Piping. |

EXHIBIT A

7. ANSI/AWWA D100 Welded Steel Tanks for Water Storage.
8. AWWA C206 Field Welding of Steel Water Pipe.
9. ASTM A 48 Specification for Gray Iron Castings.
10. ASTM A 108 Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.

1.04 SUBMITTALS

A. Shop Drawings

1. The Contractor shall furnish complete shop drawings for all equipment specified in the various Sections, together with all piping, valves, and controls for review by the Engineer in accordance with Section 01300 entitled "Submittals."

B. Spare Parts

1. The Contractor shall obtain and submit from the manufacturer a list of suggested spare parts for each piece of equipment. After review by the Engineer, Contractor shall furnish such spare parts suitably packaged, identified with the equipment number, and labeled. Contractor shall also furnish the name, address, and telephone number of the nearest distributor for each piece of equipment. All spare parts are intended for use by the Owner, only, after expiration of the guaranty period.
2. The spare parts list shall indicate specific sizes, quantities, and part numbers of the items to be furnished. Terms such as "1 lot of packing material" are not acceptable.

1.05 MANUFACTURERS

- A. All equipment covered by the specifications are intended to be standard equipment and manufactured by reputable manufacturers having experience in the production of such equipment. The equipment furnished shall be designed, constructed and installed in accordance with the best practices and methods and shall operate satisfactorily.

1.06. MANUFACTURER'S EXPERIENCE

- A. Unless otherwise directed by the Engineer, all equipment furnished shall have a record of at least 5 years of successful, troublefree operation in similar applications, from the same manufacturer.

1.07 SERVICES OF MANUFACTURER'S REPRESENTATIVE

- A. The Contractor shall provide the services of a qualified manufacturer's technical representative who shall adequately supervise the installation and testing of all equipment furnished under this Contract and instruct the Contractor's personnel and the Owner's operating personnel in its maintenance and operation as outlined in the General Conditions and Division 1 entitled "General Requirements".

EXHIBIT A

- B. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor.
- C. The manufacturer's representative shall sign in and out at the office of the Resident Project Representative on each day present at the project.

1.08 QUALITY ASSURANCE

A. Inspection, Startup, and Field Adjustment

- 1. All equipment testing and startup shall be in accordance with Section 01660 entitled "Equipment Testing and Plant Startup", and as specified herein.
- 2. The Contractor shall demonstrate that all equipment meets the specified performance requirements. Contractor shall provide the services of an experienced, competent, and authorized service representative of the manufacturer of each item of major equipment who shall visit the site of Work, and as necessary, to perform the following tasks:
 - a. Assist the Contractor in the installation of the equipment.
 - b. To inspect, check, adjust if necessary and approve the equipment installation.
 - c. To start-up and field-test the equipment for proper operation, efficiency, and capacity.
 - d. To perform necessary field adjustments during the test period until the equipment installation and operation are satisfactory to the Engineer.
 - e. To instruct the Owner's personnel in the operation and maintenance of the equipment.
- 3. The costs of all inspection, startup, testing, adjustment, and instruction work performed by said factory-trained representatives shall be borne by the Contractor.
- 4. The time allocated in the equipment Specification Sections for the manufacturer's representative is for the use of the Engineer. Any additional time required by the Contractor must be furnished by the Contractor.

B. Public Inspection

- 1. It shall be the responsibility of the Contractor to inform the local authorities, such as building and plumbing inspectors, fire marshal, OSHA inspectors, and others, to witness all required tests for piping, plumbing, fire protection systems, pressure vessels, safety systems, etc., to obtain all required permits and certificates, and pay all fees.

C. Tolerances

- 1. Tolerances and clearances shall be as shown on the shop drawings and shall be closely adhered to. Machine work shall in all cases be of high-grade workmanship and finish, with due consideration to the special nature or function of the parts.

EXHIBIT A

Members without milled ends and which are to be framed to other steel parts of the structure may have a variation in the detailed length of not greater than 1/16 of an inch for members 30 feet or less in length, and not greater than 1/8 of an inch for members over 30 feet in length.

D. Machine Finish

1. The type of finish shall be the most suitable for the application and shall be shown in micro-inches in accordance with ANSI B46.1. The following finishes shall be used:
 - a. Surface roughness not greater than 63 micro-inches shall be required for all surfaces in sliding contact.
 - b. Surface roughness not greater than 250 micro-inches shall be required for surfaces in contact where a tight joint is not required.
 - c. Rough finish not greater than 500 micro-inches shall be required for other machined surfaces.
 - d. Contact surfaces of shafts and stems which pass through stuffing boxes and contact surfaces of bearings shall be finished to not greater than 32 micro-inches.

1.09 CLEANUP

- A. After completion of the installation and testing, the Contractor shall remove all debris from the site, clean all equipment and controls, and hand over its work in perfect operating condition in accordance with Section 01700 entitled "Project Closeout".

1.10 GUARANTEES, WARRANTIES

- A. After completion, the Contractor shall furnish to the Owner the manufacturer's written guarantees that the equipment will meet all requirements of these specifications. The Contractor shall also furnish the manufacturer's warranties as published in its literature and as specified.
- B. Unless otherwise noted, minimum warranty period is one year from date of Substantial Completion for all equipment items.

1.11 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. The Contractor shall be responsible for the delivery, storage, and handling of products.
- B. Load and unload all equipment and appurtenances by hoists or skidding. Do not drop products. Do not skid or roll products on or against other products. Pad slings and hooks in a manner which prevents damage to products.
- C. Promptly remove damaged products from the job site. Replace damaged products with undamaged products.

1.12 TOOLS, SUPPLIES AND SPARE PARTS

EXHIBIT A

- A. Parts shall be completely identified with a numerical system to facilitate parts inventory control and stocking. Each part shall be identified by a separate number. Parts which are identified for more than one size unit shall have the same number.
- B. All special tools required to disassemble, service and adjust the equipment shall be furnished by the equipment manufacturer. All tools shall be supplied in a suitable tool chest or case complete with lock and duplicate keys.

PART 2 -- PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Noise Level

- 1. When in operation, no single piece of equipment shall exceed the OSHA noise level requirements for a one-hour exposure.

B. Service Factors

- 1. Service factors shall be applied in the selection or design of mechanical power transmission components. Unless otherwise specified, the following load classifications shall apply in determining service factors:

<u>Type of Equipment</u>	<u>Load Classification</u>
Pumps: Centrifugal	Uniform

- C. For service factors of electric motors, see Section 16040 entitled "Electric Motors." Where load classifications are not specified, best modern practice shall be used.

D. Welding

- 1. Unless otherwise specified or shown, all welding shall conform to the following:
 - a. ANSI/AWWA D100.
 - b. AWWA C206.
- 2. All composite fabricated steel assemblies which are to be erected or installed inside a hydraulic structure, including any fixed or movable structural components of mechanical equipment, shall have continuous seal welds to prevent entrance of air or moisture.
- 3. All welding shall be by the metal-arc method or gas-shielded arc method as described in the American Welding Society's "Welding Handbook" as supplemented by other pertinent standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards governing same.
- 4. In assembly and during welding, the component parts shall be adequately clamped, supported, and restrained to minimize distortion and for control of dimensions. Weld

EXHIBIT A

reinforcement shall be as specified by the AWS code. Upon completion of welding, all weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance, with uniform weld contours and dimensions. All sharp corners of material which is to be painted or coated shall be ground to a minimum of 1/32-inch on the flat.

E. Protective Coatings

1. All equipment shall be painted or coated in accordance with Section 09900 entitled "Painting," unless otherwise approved by the Engineer. Non-ferrous metal rotating/lubricated and corrosion-resisting steel surfaces shall be coated with grease or lubricating oil. Coated surfaces shall be protected from abrasion or other damage during handling, testing, storing, assembly, and shipping.
2. Gears, bearing surfaces, and other similar surfaces obviously not to be painted shall be given a heavy shop coat of grease or other suitable rust-resistant coating. This coating shall be maintained as necessary to prevent corrosion during periods of storage and erection and shall be satisfactory to the Engineer up to the time of the final acceptance.

F. Protection of Equipment

1. All equipment shall be boxed, crated, or otherwise protected from damage and moisture during shipment, handling, and storage. All equipment shall be protected from exposure to corrosive fumes and shall be kept thoroughly dry at all times.
2. Equipment having moving parts such as gears, electric motors, etc. and/or instruments, control panels, switchgear shall be stored in a temperature and humidity controlled building until such time as the equipment is to be installed.
3. Equipment with electric motors having space heaters shall have the space heaters energized unless stored in a temperature and humidity controlled building. Space heaters shall be energized at the time of installation and maintained until acceptance of the equipment.
4. For exterior storage of fabricated products, the items shall be placed on sloped supports above ground. Products subject to deterioration shall be covered with impervious sheet covering; ventilation shall be provided to avoid condensation.

EXHIBIT A

G. Identification of Equipment Items

1. Each item of equipment shipped shall have a legible identifying mark corresponding to the equipment number shown or specified for the particular item.

H. Vibration Level

1. All equipment subject to vibration shall be provided with restrained spring-type vibration isolators or pads per manufacturer 's written recommendations.

I. Shop Fabrication

1. Shop fabrication shall be performed in accordance with the Contract Documents and the final reviewed and processed shop drawings.

2.02 EQUIPMENT SUPPORTS AND FOUNDATIONS

A. Equipment Supports

1. All equipment supports, anchors, and restrainers shall be adequately designed for static and dynamic loads.

B. Equipment Foundations

1. Equipment foundations shall be revised to meet manufacturer's written recommendations if necessary. All mechanical equipment, tanks, control cabinets, etc. shall be mounted on minimum 4-inch high concrete bases, as shown on standard structural details, unless otherwise shown or specified. Foundation drawings shall be submitted to the Engineer for review in accordance with the requirements of Section 01300 entitled "Submittals."

2.03 PIPE HANGERS, SUPPORTS, AND GUIDES

- A. All pipe connections to equipment shall be supported, anchored, and guided to avoid stresses and loads on equipment flanges and equipment. Supports and hangers shall be in accordance with the requirements of Section 15020 entitled "Pipe Supports."

2.04 FLANGES AND PIPE THREADS

- A. All flanges on equipment and appurtenances provided under this Section shall conform to ANSI B16.1, Class 125; or B16.5, Class 150, unless otherwise shown. All pipe threads shall be in accordance with ANSI/ASME Bl.20.1, in accordance with requirements of Section entitled "Piping, General."

2.05 COUPLINGS

- A. Flexible couplings shall be provided between the driver and the driven equipment to accommodate angular misalignment, parallel misalignment, end float, and to cushion shock loads. Where required for vertical shafts, 3-piece spacer couplings shall be installed.
- B. The Contractor shall have the equipment manufacturer select or recommend the size and type of coupling required to suit each specific application.

EXHIBIT A

- C. Taperlock bushings may be used to provide for easy installation and removal on shafts of various diameters.
- D. Where universal type couplings are shown, they shall be of the needle bearing type construction, equipped with commercial type grease fittings.
- E. Flexible couplings shall be as manufactured by Woods Corp., or approved equal.

2.06 SHAFTING

- A. All shafting shall be continuous between bearings and shall be sized to transmit the power required. Keyways shall be accurately cut in line. Shafting shall not be turned down at the ends to accommodate bearings or sprockets whose bore is less than the diameter of the shaft. All shafts shall rotate in the end bearings and shall be turned and polished, straight, and true.
- B. Materials
 - 1. Shafting materials shall be appropriate for the type of service and torque transmitted. Environmental elements such as corrosive gases, moisture, and fluids shall be taken into consideration. Materials shall be as shown or specified unless furnished as part of an equipment assembly.
 - a. Low carbon cold-rolled steel shafting shall conform to ASTM A 108, Grade 1018.
 - b. Medium carbon cold-rolled shafting shall conform to ASTM A 108, Grade 1045.
 - c. Corrosion-resistant shafting shall be stainless steel or monel, whichever is most suitable for the intended service.
- C. Differential Settlement
 - 1. Where differential settlement between the driver and the driven equipment may be expected, a shaft of sufficient length with 2 sets of universal type couplings shall be provided.

2.07 BEARINGS

- A. Bearings shall conform to the standards of the Anti-Friction Bearing Manufacturers Association, Inc. (AFBMA).
- B. To assure satisfactory bearing application, fitting practice, mounting, lubrication, sealing, static rating, housing strength, and other important factors shall be considered in bearing selection.
- C. All grease-lubricated type bearings shall be equipped with a hydraulic grease fitting in an accessible location and shall have sufficient grease capacity in the bearing chamber.

EXHIBIT A

- D. All lubricated-for-life bearings shall be factory-lubricated with the manufacturer's recommended grease to insure maximum bearing life and best performance.
- E. Except where otherwise specified or shown, all bearings shall have a minimum B-10 life expectancy of 60,000 hours.
- F. Bearing housings shall be of cast iron or steel and bearing mounting arrangement shall be as specified or shown, or as recommended in the published standards of the manufacturer. Split-type housings may be used to facilitate installation, inspection, and disassembly.
- G. Sleeve-type bearings shall have a Babbitt or bronze liner.

2.08 GEARS AND GEAR DRIVES

- A. Unless otherwise specified, gears shall be of the helical or spiral-bevel type, designed and manufactured in accordance with AGMA Standards, with a minimum service factor of 1.7, a minimum B-10 bearing life of 60,000 hours and a minimum efficiency of 94 percent. Worm gears shall not be used, unless specifically accepted by the Engineer.
- B. All gear speed reducers or increasers shall be of the enclosed type, oil- or grease-lubricated and fully sealed, with a breather to allow air to escape but keep dust and dirt out. The casing shall be of cast iron or heavy-duty steel construction with lifting lugs and an inspection cover for each gear train. An oil level sight glass and an oil flow indicator shall be provided, arranged for easy reading.
- C. Gears and gear drives as part of an equipment assembly shall be shipped fully assembled for field installation.
- D. Material selections shall be left to the discretion of the manufacturer, provided the above AGMA values are met. Input and output shafts shall be adequately designed for the service and load requirements. Gears shall be computer-matched for minimum tolerance variation. The output shaft shall have 2 positive seals to prevent oil leakage.
- E. Oil level and drain location relative to the mounting arrangement shall be easily accessible. Oil coolers or heat exchangers with all required appurtenances shall be furnished when necessary.
- F. Where gear drive input or output shafts have to connect to couplings or sprockets supplied by others, the Contractor shall have the gear drive manufacturer supply matching key taped to the shaft for shipment.

2.09 DRIVE CHAINS

- A. Power drive chains shall be commercial type roller chains and meet ANSI Standards.
- B. A chain take-up or tightener shall be provided in every chain drive arrangement to provide easy adjustment.
- C. A minimum of one connecting or coupler link shall be provided with each length of roller chain.

EXHIBIT A

- D. Chain and attachments shall be of the manufacturer's best standard material and suitable for the process fluid.

2.10 SPROCKETS

- A. Sprockets shall be used in conjunction with all chain drives and chain-type material handling equipment.

- B. Materials

- 1. Unless otherwise specified, materials shall be as follows:

- a. Sprockets with 25 teeth or less, normally used as a driver, shall be made of medium carbon steel in the 0.40 to 0.45 percent carbon range.
 - b. Type A and B sprockets with 26 teeth or more, normally used as driven sprockets, shall be made of minimum 0.20 percent carbon steel.
 - c. Large diameter sprockets with Type C hub shall be made of cast iron conforming to ASTM A 48, Class 30.

- C. All sprockets shall be accurately machined to ANSI Standards. Sprockets shall have deep hardness penetration in tooth sections.

- D. Finish bored sprockets shall be furnished complete with keyseat and set screws.

- E. To facilitate installation and disassembly, sprockets shall be of the split type or shall be furnished with taper-lock bushings as required.

- F. Idler sprockets shall be furnished with brass or Babbitt bushings, complete with oil hole and axial or circumferential grooving. Steel collars with setscrews may be provided in both sides of the hub.

2.11 V-BELT DRIVES

- A. V-belts and sheaves shall be of the best commercial grade and shall conform to ANSI, MPTA, and RMA Standards.

- B. Unless otherwise specified, sheaves shall be machined from the finest quality gray cast iron.

- C. All sheaves shall be statically balanced. In some applications where vibration is a problem, sheaves shall be dynamically balanced. Sheaves operating at belt speeds exceeding 6,500 fpm may be required to be of special materials and construction.

- D. To facilitate installation and disassembly, sheaves shall be furnished complete with taper-lock or QD bushings as required.

- E. Finish bored sheaves shall be furnished complete with keyseat and set screws.

- F. Sliding motor bases shall be provided to adjust the tension of V-belts.

2.12 DRIVE GUARDS

EXHIBIT A

- A. All power transmission, prime movers, machines, and moving machine parts shall be guarded to conform with the OSHA Safety and Health Standards (29 CFR 1910). Where required for lubrication or maintenance, guards shall have hinged access doors.

2.13 INSULATING CONNECTIONS

- A. Insulating bushings, unions, couplings, or flanges, as appropriate, shall be used in accordance with the requirements of the Section 15000 entitled "Piping, General."

2.14 GASKETS AND PACKINGS

- A. Gaskets shall be in accordance with the requirements of Section 15000 entitled "Piping, General."
- B. Packing around valve stems and reciprocating shafts shall be of compressible material, compatible with the fluid being used. Chevron-type "V" packing shall be Garlock No. 432, John Crane "Everseal," or approved equal.
- C. Packing around rotating shafts (other than valve stems) shall be "O"-rings or similar seals, or mechanical seals, as recommended by the manufacturer and accepted by the Engineer.

2.15 NAMEPLATES

- A. Equipment nameplates of stainless steel shall be engraved or stamped and fastened to the equipment in an accessible location with No. 4 or larger oval head stainless steel screws or drive pins. Nameplates shall contain the manufacturer's name, model, serial number, size, characteristics, and appropriate data describing the machine performance ratings.

2.16 SAFETY REQUIREMENTS

- A. Where work areas are located within a flammable or toxic gas environment, suitable gas detection, ventilating, and oxygen deficiency equipment shall be provided. Workers shall be equipped with acceptable breathing apparatus.

2.17 OVERLOAD PROTECTION

- A. Unless otherwise specified in individual equipment Sections, all major equipment drives shall be provided with mechanical or electrical overload protection device as specified in the following paragraphs.
- B. Mechanical System
 - 1. The overload protection shall be a mechanical device to provide for reliable protection in the event of excessive overload. It shall be a ball detent type designed for long-term repeatability and life. It shall be infinitely adjustable by a single adjusting nut. Once set it shall be tamperproof, and incorporate a torque monitoring and control system. It shall activate an alarm set for 85 percent, and a motor cutout switch set for 100 percent of maximum continuous running torque.

EXHIBIT A

2. A visual torque indication shall be provided and oriented so that it may be read from the walkway. The dial shall be calibrated from 0 to 100 percent of maximum continuous running torque. The design of the torque limiter should initiate the mechanical disengagement of the drive upon overload. Each unit shall be suitable for outdoor/corrosive environments with a protective finish, corrosion inhibiting lubricants and a stainless steel cover.

C. Electronic System

1. As an alternative to the mechanical system, the overload protection may be an Electronic Torque Monitoring Control System capable of displaying torque, rpm's, one level of overload and two levels of overload of the drive system. It shall incorporate a time-delay for start-up and a voltage monitoring and compensation circuit for up to +/- 15 percent variation.

- D. The overload device shall have an enclosure suitable for outdoor installation at temperatures of 0-70 degrees C, and relative humidity up to 100%, unless unit is in an air conditioned environment where 95 percent shall be acceptable. A visual torque dial shall be provided and oriented so that it can be easily read from the walkway.

- E. The torque monitoring system shall be calibrated to: alarm and shut down the system in the event the torque drops to 50 percent of normal running; alarm at 85 percent of maximum continuous running torque and shut down the motor at maximum continuous running torque of the equipment. The system shall be calibrated at the factory of the equipment manufacturer and it shall be capable of monitoring twice the maximum continuous running torque of the equipment.

F. Manufacturers, or Approved Equal

1. American Autogard Corporation
2. Ferguson Machine Company.

PART 3 -- EXECUTION

3.01 INSTALLATION

- A. All equipment shall be installed in accordance with acceptable procedures submitted with the shop drawings and as indicated on the Drawings, unless otherwise accepted by the Engineer.

EXHIBIT A

B. Alignment

1. Equipment shall be field tested to verify proper alignment, operation as specified, and freedom from binding, scraping, vibration, shaft runout, or other defects. Drive shafts shall be measured just prior to assembly to ensure correct alignment without forcing. Equipment shall be secure in position and neat in appearance.

C. Lubricants

1. The installation work shall include furnishing the necessary oil and grease for initial operation.

D. Couplings

1. The Contractor shall install the equipment in accordance with the equipment manufacturer's printed recommendations.

E. Insulating Connections

1. All insulating connections shall be installed in accordance with the manufacturer's printed recommendations.

F. Pipe Hangers, Supports and Guides

1. Hangers shall be spaced in accordance with ANSI/ASME B.31.I and with tables in Section 15000 entitled "Piping, General."

3.02 PROTECTIVE COATING

- A. All exposed materials, except corrosion-resistant metals which have not been shop painted shall be field coated as specified in Section 09900 entitled "Painting." Shop painted items which suffered damage to the shop coating shall be touched up as specified in said "Painting" section.

- END OF SECTION -

SECTION 15000

BASIC MECHANICAL REQUIREMENTS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

- A. The Contractor shall furnish and install to the required line and grade, all piping together with all fittings and appurtenances, required for a complete installation. All piping located outside the face of structures or building foundations and all piping embedded in concrete within a structure or foundation shall be considered exterior piping.
- B. The Contractor shall furnish and install fittings, couplings, connections, sleeves, adapters, harness rods and closure pieces as required to connect pipelines of dissimilar materials and/or sizes herein included under this Section and other concurrent Contracts for a complete installation.
- C. The Contractor shall furnish all labor, materials, equipment, tools, and services required for the furnishing, installation and testing of all piping as shown on the Drawings, specified in this Section and required for the Work. Piping shall be furnished and installed of the material, sizes, classes, and at the locations shown on the Drawings and/or designated in this Section. Piping shall include all fittings, adapter pieces, couplings, closure pieces, harnessing rods, hardware, bolts, gaskets, wall sleeves, wall pipes, hangers, supports, and other associated appurtenances for required connections to equipment, valves, or structures for a complete installation.
- D. Piping assemblies under 4-inch size shall be generally supported on walls and ceilings, unless otherwise shown on the Drawings or ordered by the Engineer, being kept clear of openings and positioned above "headroom" space. Where practical, such piping shall be run in neat clusters, plumb and level along walls, and parallel to overhead beams.
- E. The Contractor shall provide taps on piping where required or shown on the Drawings. Where pipe or fitting wall thicknesses are insufficient to provide the required number of threads, a boss or pipe saddle shall be installed.
- F. The work shall include, but not be limited to, the following:
 - 1. Connections to existing pipelines.
 - 2. Test excavations necessary to locate or verify existing pipe and appurtenances.
 - 3. Installation of all new pipe and materials required for a complete installation.
 - 4. Cleaning, testing and disinfecting as required.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Division 1 - General Requirements
- B. Division 2 - Sitework

EXHIBIT A

- C. Division 5 - Metals
- D. Division 9 - Finishes
- E. Division 11 – Equipment
- F. Division 16 - Electrical

1.03 MATERIAL CERTIFICATION AND SHOP DRAWINGS

- A. The Contractor shall furnish to the OWNER (through the Engineer) a Material Certification stating that the pipe materials and specials furnished under this Section conform to all applicable provisions of the corresponding Specifications. Specifically, the Certification shall state compliance with the applicable standards (ASTM, AWWA, etc.) for fabrication and testing.
- B. Shop Drawings for major piping (2-inches in diameter and greater) shall be prepared and submitted in accordance with Section 01300 – Submittals. In addition to the requirements of Section 01300 – Submittals, the Contractor shall submit laying schedules and detailed Drawings in plan and profile for all piping as specified and shown on the Drawings.
- C. Shop Drawings shall include, but not be limited to, complete piping layout, pipe material, sizes, class, locations, necessary dimensions, elevations, supports, hanger details, pipe joints, and the details of fittings including methods of joint restraint. No fabrication or installation shall begin until Shop Drawings are approved by the Engineer.

PART 2 -- PRODUCTS

2.01 GENERAL

- A. All specials and every length of pipe shall be marked with the manufacturer's name or trademark, size, class, and the date of manufacture. Special care in handling shall be exercised during delivery, distribution, and storage of pipe to avoid damage and unnecessary stresses. Damaged pipe will be rejected and shall be replaced at the Contractor's expense. Pipe and specials stored prior to use shall be stored in such a manner as to keep the interior free from dirt and foreign matter.
- B. Testing of pipe before installation shall be as described in the corresponding ASTM or AWWA Specifications and in the applicable standard specifications listed in the following sections. Testing after the pipe is installed shall be as specified in Section 3.09.
- C. Joints in piping shall be of the type as specified in the appropriate Piping System Schedule in Section 15390, Schedules.
- D. ALL BURIED EXTERIOR PIPING SHALL HAVE RESTRAINED JOINTS FOR THRUST PROTECTION UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE DRAWINGS. ALL EXPOSED EXTERIOR PIPING SHALL HAVE FLANGED JOINTS, UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE DRAWINGS.

EXHIBIT A

- E. The Contractor shall verify existing above ground and buried piping tie-in connections before fabricating new piping assemblies. The Contractor shall verify size, type, and location of all existing buried piping and appurtenances by excavating test pits as required of all buried connections and crossings which may affect the Contractor's work prior to ordering pipe and fittings to determine sufficient information for ordering materials. The Contractor shall take whatever measurements that are required to complete the work as shown or specified.
- F. Before setting wall sleeves, pipes, castings and pipes to be cast in place, the Contractor shall check the Drawings and equipment manufacturer's drawings which may have a direct bearing on the pipe locations.
- G. Piping shall be attached to pumps, valves, equipment, etc., in accordance with the respective manufacturers' recommendations. This includes the use of flexible connectors as required.
- H. All changes in directions or elevations shall be made with fittings, unless otherwise shown.

2.02 WALL PIPES

- A. Where wall sleeves or wall pipes occur in walls that are continuously wet on one or both sides, they shall have water stop flanges at the center of the casting or as shown on the Drawings. Ends of wall pipes shall be flange, mechanical joint, plain end, or bell as shown on the Drawings, or as required for connection to the piping. Wall pipes shall be of the same material as the piping that they are connected to. If welded waterstop flanges are employed, welds shall be 360 degree continuous on both sides of flange. Unless otherwise shown on the Drawings, waterstop flanges shall conform to the minimum dimensions shown below:

<u>Pipe Size</u>	<u>Waterstop Flange Diameter</u>	<u>Waterstop Flange Thickness</u>
4" - 12"	OD + 3.10"	0.50"
14" - 24"	OD + 4.15"	0.75"
30" - 36"	OD + 4.50"	1.00"
42" - 48"	OD + 5.00"	1.25"
54"	OD + 5.90"	1.50"

2.03 SLEEVES

- A. Unless shown otherwise, all piping passing through walls and floors shall be installed in sleeves or wall castings accurately located before concrete is poured, or placed in position during construction of masonry walls. Sleeves passing through floors shall extend from the bottom of the floor to a point 3 inches above the finished floor, unless shown otherwise. Water stop flanges are required on all sleeves located in floors or walls which are continually wet or under hydrostatic pressure on one or both sides of the floor or wall.
- B. Sleeves shall be cast iron, black steel pipe, or fabricated steel in accordance with details shown on the Drawings. If not shown on the Drawings, the Contractor shall submit to the Engineer the details of sleeves he proposes to install; and no fabrication or installation thereof shall take place until the Engineer's approval is obtained. Steel sleeves shall be fabricated of structural steel plate in accordance with the standards and procedures of AISC

EXHIBIT A

and AWS. Steel sleeve surfaces shall receive a commercial sandblast cleaning and then be shop painted in accordance with Section 09900 – Painting.

- C. When shown on the Drawings or otherwise required, the annular space between the installed piping and sleeve shall be completely sealed against a maximum hydrostatic pressure of 20 psig. Seals shall be mechanically interlocked, solid rubber links, trade name "Link-Seal", as manufactured by the Thunderline Corp., Wayne, Michigan, or equal. Rubber link, seal-type, size, and installation thereof, shall be in strict accordance with the manufacturer's recommendations. For non-fire rated walls and floors, pressure plate shall be glass reinforced nylon plastic with EPDM rubber seal and 304 stainless steel bolts and nuts. For fire rated walls and floors, two independent seals shall be provided consisting of low carbon steel, zinc galvanized pressure plates, silicon rubber seals and low carbon steel, zinc galvanized bolts and nuts.
- D. Cast iron mechanical joint adapter sleeves shall be Clow # 1429, as manufactured by the Clow Corp., or equal. Mechanical joint adapter sleeves shall be provided with suitable gasket, follower ring, and bolts to affect a proper seal. In general, sleeves installed in walls, floors, or roofs against one side of which will develop a hydrostatic pressure, or through which leakage of liquid will occur, shall be so sealed. If welded waterstop flanges are employed, welds shall be 360 degree continuous on both sides of flange.

2.04 SOLID SLEEVE COUPLINGS

- A. Solid sleeve couplings shall be used to connect buried service piping where shown on the Drawings. Solid sleeves shall be ductile iron, long body and shall conform to the requirements of ANSI A21.10 (AWWA C110). Unless otherwise shown or specified, solid sleeve couplings shall be Style A11760 as manufactured by American Cast Iron Pipe Co., or equal.

2.05 FLEXIBLE COUPLINGS

- A. Flexible couplings shall be as manufactured by the Red Valve Company and shall consist of a molded reinforced fabric of cotton and natural rubber. Galvanized steel retaining rings shall be furnished. End connections shall match ANSI 125 pound flanges with a minimum pressure rating of 140 psi.

2.06 SLEEVE TYPE COUPLINGS

- A. Sleeve type, flexible couplings shall be furnished and installed where shown on the Drawings or otherwise required to resist internal operating pressures. In addition to that specified herein, harnessed, sleeve type flexible couplings shall be provided on all exposed pipe 3 inches and larger in diameter that spans any expansion joint in a building or structure.
- B. Materials shall be of high strength steel and couplings shall be rated for the same pressures as the connecting piping.
- C. Gaskets shall be rubber. Bolts and nuts shall be alloy steel, corrosion-resistant and prime coated.
- D. Couplings shall be shop primed with a premium quality primer compatible with the painting system specified in Section 09900 - Painting. Field painting of wetted area shall be done prior to installation.

EXHIBIT A

E. Harnessing

1. Harness couplings to adjacent flanges as shown, specified or otherwise required to restrain all pressure piping.
2. Dimensions, sizes, spacing and materials for lugs, tie rods, washers, and nuts shall conform to the standards for the pipe size, and design pressure specified.
3. No less than two (2) bolts shall be furnished for each coupling.
4. Tie bolts, nuts and washers shall be ASTM A 193, Grade B7 steel or better and as a minimum shall be hot dip galvanized.
5. Harness rods shall have lengths less than 10 feet between adjacent flanged joints on fittings and as a minimum shall be hot dip galvanized.

- F. Couplings shall be as manufactured by Dresser Industries, Style 38, or equal as required and shown on the Drawings. All couplings shall be provided without interior pipe stop.

2.07 FLANGED ADAPTERS

- A. Flanged adapters shall be furnished as required and as shown on the Drawings.
- B. All flanged adapters, 12 inches in diameter and smaller, except as shown on the Drawings or directed by the Engineer, shall be locking type flanged adapters.
- C. Pressure and service shall be the same as connected piping.
- D. Materials shall be cast iron for pipes up to 12 inch diameter and high strength steel for pipes larger than 12 inch diameter.
- E. Flanged adapters shall be shop primed with a premium quality primer compatible with the paint system specified in Section 09900 – Painting. Field painting of wetted area shall be done prior to installation.
- F. Bolts and nuts shall be alloy steel, corrosion-resistant and prime coated.
- G. Where identified on the Drawings, flanged coupling adapters shall be harnessed by tying the adapter to the nearest pipe joint flange using threaded rods and rod tabs. The threaded rods, rod tabs, nuts, bolts and washers shall be as shown on the Drawings and as a minimum shall be hot dip galvanized.
- H. Flanged adapters shall be as manufactured by Dresser Industries, Style 127 or 128, Smith Blair Corporation, or equal.

2.08 MECHANICAL COUPLINGS (SPLIT TYPE - SHOULDERED END)

- A. Mechanical couplings (split type-shouldered end) shall be furnished as specified or shown on the Drawings.
- B. Materials shall be of malleable iron and couplings shall be rated for the same pressures as the connecting piping.

EXHIBIT A

- C. Gaskets shall be rubber. Bolts and nuts shall be heat treated carbon steel track bolts and shall be plated.
- D. After installation, buried couplings shall receive two heavy coats of an approved coal tar which is compatible with the finish of the coupling. Exposed couplings shall be painted in accordance with Section 09900 - Painting.
- E. Couplings shall be as manufactured by Victaulic Company of America, Style 44, or equal.

2.09 TAPPING SLEEVES AND TAPPING SADDLES

- A. Tapping sleeves shall be similar to Mueller Outlet Seal, American Uniseal or Kennedy Square Seal. All sleeves shall have a minimum working pressure of 150 psi. All sleeves larger than twelve (12) inches shall be ductile iron. All taps shall be machine drilled; no burned taps will be allowed.
- B. Tapping saddles may be used on mains sixteen (16) inches and larger where the required tap size does not exceed one-half the size of the main (i.e. 8-inch tapping saddle for use on a 16-inch main). Tapping saddles shall be manufactured of ductile iron providing a factor of safety of at least 2.5 at a working pressure of 250 psi. Saddles shall be equipped with a standard AWWA C-110-77 flange connection on the branch. Sealing gaskets shall be "O" ring type, high quality molded rubber having an approximate seventy durometer hardness, placed into a groove on the curved surface of the tapping saddles. Straps shall be of alloy steel. The tapping saddle shall be the American tapping saddle, U.S. Pipe tapping saddle, or equal. All taps shall be machine cut, no burned taps will be allowed.

2.10 UNIONS

- A. For ductile iron, carbon steel, and grey cast iron pipes assembled with threaded joints and malleable iron fittings, unions shall conform to ANSI B16.39.
- B. For copper piping, unions shall have ground joints and conform to ANSI B16.18.
- C. For PVC and CPVC piping, unions shall be socket weld type with Viton O-ring.

2.11 THERMOPLASTIC TUBING AND FITTINGS

- A. Thermoplastic tubing shall be manufactured from polyallomor tubing. Tubing shall be protected from ultraviolet radiation degradation with a black coating or integral color conforming to ASTM D-1248, Type 1, Class C, Category 3. Fittings and connectors used with thermoplastic tubing shall be the flareless tube type constructed of brass conforming to SAE CA377, SAE CA360 or equal. Brass sleeves shall be used.
- B. Assembly of the thermoplastic tubing shall consist of pushing the tubing into the fitting and hand tightening the nut with final tightening with a wrench. Care shall be taken not to overtighten the nut. Plastic tube racks and bend holders shall be provided for holding the tubing in position. Needle valves used with thermoplastic tubing shall be the globe type constructed with a brass body, stem and seat and Buna-N "O"-ring seals. Installation shall be in accordance with the manufacturer's recommendations. Thermoplastic tubing, shall be the Impolene (polyallomor) system and needle valves, fittings and connectors shall be the

EXHIBIT A

Poly-Flo with 261 UB Universal Nut and Sleeve system as manufactured by Imperial Eastman, or equal.

PART 3 -- EXECUTION

3.01 INSTALLATION

- A. All piping shall be installed by skilled workmen and in accordance with the best standard practice for piping installation as shown on the Drawings, specified or recommended by the pipe manufacturer. Proper tools and appliances for the safe and convenient handling and installing of the pipe and fittings shall be used. Great care shall be taken to prevent any pipe coating from being damaged on the inside or outside of the pipe and fittings. All pieces shall be carefully examined for defects, and no piece shall be installed which is known to be cracked, damaged, or otherwise defective. If any defective pieces should be discovered after having been installed, it shall be removed and replaced with a sound one in a satisfactory manner by the Contractor and at his own expense. Pipe and fittings shall be thoroughly cleaned before they are installed and shall be kept clean until they are accepted in the complete work. All piping connections to equipment shall be provided with unions or coupling flanges located so that piping may be readily dismantled from the equipment. At certain applications, Dresser, Victaulic, or equal, couplings may also be used. All piping shall be installed in such a manner that it will be free to expand and contract without injury to itself or to structures and equipment to which it is connected. All piping shall be erected to accurate lines and grades with no abrupt changes in line or grade and shall be supported and braced against movement, temporary, or permanent. All exposed piping shall be installed with vertical and horizontal angles properly related to adjoining surfaces or pipes to give the appearance of good workmanship. Unless otherwise shown or approved, provided a minimum headroom clearance under all piping of 7 feet 6 inches.
- B. Unless otherwise shown or specified, all waste and vent piping shall pitch uniformly at a 1/4-inch per foot grade and accessible cleanouts shall be furnished and installed as shown and as required by local building codes. Installed length of waste and vent piping shall be determined from field measurements in lieu of the Drawings.
- C. All excavation shall be made in such a manner and to such widths as will provide ample room for properly installing the pipe and permit thorough compaction of backfill around the pipe. The minimum trench widths shall be in strict accordance with the "Trench Width Excavation Limits" as shown on the Drawings. All excavation and trenching shall be done in strict accordance with these specifications and all applicable parts of the OSHA Regulations, 29CFR 1926, Subpart P.
- D. ALL EXCAVATION REQUIRED BY THIS CONTRACT SHALL BE UNCLASSIFIED. NO ADDITIONAL PAYMENT WILL BE MADE FOR ROCK EXCAVATION REQUIRED FOR THE INSTALLATION OF PIPE OR STRUCTURES SHOWN ON THE DRAWINGS.
- E. Enlargements of the trench shall be made as needed to give ample space for operations at pipe joints. The width of the trench shall be limited to the maximum dimensions shown on the Drawings, except where a wider trench is needed for the installation of and work within sheeting and bracing. Except where otherwise specified, excavation slopes shall be flat enough to avoid slides which will cause disturbance of the subgrade, damage to adjacent areas, or endanger the lives or safety of persons in the vicinity.

EXHIBIT A

- F. Hand excavation shall be employed wherever, in the opinion of the Engineer, it is necessary for the protection of existing utilities, poles, trees, pavements, or obstructions.
- G. No greater length of trench in any location shall be left open, in advance of pipe laying, than shall be authorized or directed by the Engineer and, in general, such length shall be limited to approximately one hundred (100) feet. The Contractor shall excavate the trenches to the full depth, width and grade indicated on the Drawings including the relevant requirements for bedding. The trench bottoms shall then be examined by the Engineer as to the condition and bearing value before any pipe is laid or bedding is placed.
- H. No pressure testing shall be performed until the pipe has been properly backfilled in place. All pipe passing through walls and/or floors shall be provided with wall pipes or sleeves in accordance with the specifications and the details shown on the Drawings. All wall pipes shall be of ductile iron and shall have a water stop located in the center of the wall. Each wall pipe shall be of the same class, thickness, and interior coating as the piping to which it is joined. All buried wall pipes shall have a coal tar outside coating on exposed surfaces.
- I. JOINT DEFLECTION SHALL NOT EXCEED 75 PERCENT OF THE MANUFACTURERS RECOMMENDED DEFLECTION. Excavation and backfilling shall conform to the requirements of Section 02200 - Earthwork, and as specified herein. Maximum trench widths shall conform to the Trench Width Excavation Limits shown on the Drawings. All exposed, submerged, and buried piping shall be adequately supported and braced by means of hangers, concrete piers, pipe supports, or otherwise as may be required by the location.
- J. Following proper preparation of the trench subgrade, pipe and fittings shall be carefully lowered into the trench so as to prevent dirt and other foreign substances from gaining entrance into the pipe and fittings. Proper facilities shall be provided for lowering sections of pipe into trenches. UNDER NO CIRCUMSTANCES SHALL ANY OF THE MATERIALS BE DROPPED OR DUMPED INTO THE TRENCH.
- K. Water shall be kept out of the trench until jointing and backfilling are completed. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no water, earth, or other substance will enter the pipes, fitting, or valves. Pipe ends left for future connections shall be valved, plugged, or capped, and anchored as required.
- L. All piping shall be installed in such a manner that it will be free to expand and/or contract without injury to itself or to structures and equipment to which it is connected. All piping shall be erected to accurate lines and grades with no abrupt changes in line or grade and shall be supported and braced against movement, temporary, or permanent. All exposed piping shall be installed with vertical and horizontal angles properly related to adjoining surfaces or pipes to give the appearance of good workmanship. Pipes crossing within a vertical distance of less than or equal to one (1) foot shall be encased and supported with concrete at the point of crossing to prevent damage to the adjacent pipes as shown on the Drawings.
- M. The full length of each section of pipe shall rest solidly upon the bed of the trench, with recesses excavated to accommodate bells, couplings, joints, and fittings. Before joints are made, each pipe shall be well bedded on a solid foundation; and no pipe shall be brought into position until the preceding length has been thoroughly bedded and secured in place. Pipe that has the grade or joint disturbed after laying shall be taken up and relaid by the Contractor at his own expense. Pipe shall not be laid in water or when trench conditions are unsuitable for work.

EXHIBIT A

- N. Proper and suitable tools and appliances for the safe convenient handling and laying of pipe shall be used and shall in general agree with manufacturer's recommendations.
 - O. AT THE CLOSE OF EACH WORK DAY THE END OF THE PIPELINE SHALL BE TIGHTLY SEALED WITH A CAP OR PLUG SO THAT NO WATER, DIRT, OR OTHER FOREIGN SUBSTANCE MAY ENTER THE PIPELINE AND THIS PLUG SHALL BE KEPT IN PLACE UNTIL PIPE LAYING IS RESUMED.
 - P. During the laying of pipe, each pipe manufacturer shall provide his own supervisor to instruct the Contractor's pipe laying personnel in the correct procedure to be followed.
 - Q. For buried pipe applications, all piping 4-inches and larger in diameter shall be provided with a minimum of two 4-foot lengths of pipe for the first two joints outside of a building or tank wall, or concrete encasement, unless a greater number of joints is shown or called out on the Drawings. The two 4-foot lengths of pipe shall be required in addition to any fittings located within the affected area. Where multiple branch fittings (tees, wyes and crosses) occur, each branch of the fitting shall be provided with one 4-foot length of pipe. In all other instances and for all pipe sizes, only full lengths of pipe (as furnished by the pipe manufacturer) shall be used with the exception of closure pieces at manholes and areas where joint deflection is required.
 - R. For gravity sewer installations, the Contractor shall use a laser device to maintain the trench and pipe alignment. The laser device shall be re-checked for correct elevation and pipe alignment prior to pipe installation if the device is left in the pipe overnight. Corrected invert elevations at each manhole and any adjustments will be coordinated and approved by the Engineer.
 - S. ALL PIPING SHALL HAVE TYPE "A" BEDDING AS SHOWN ON THE DRAWINGS, UNLESS OTHERWISE SPECIFIED HEREIN OR INDICATED ON THE DRAWINGS.
 - T. AT THE CLOSE OF WORK EACH DAY PIPELINE TRENCHES SHALL BE COMPLETELY BACKFILLED. IN PAVED AREAS THE SURFACE MAY BE TEMPORARILY RESTORED WITH BASE IN LIEU OF REPAVING DAILY. IF TEMPORARY BASE ROCK IS INSTALLED, IT SHALL BE INSTALLED TO AN ELEVATION NO MORE THAN 1-INCH BELOW THE EXISTING PAVEMENT. THE TEMPORARY BASE ROCK SHALL BE THE REQUIREMENT FOR ROAD BASE MATERIAL SPECIFIED IN SECTION 02510, ASHPALTIC CONCRETE PAVEMENT. ALL EXCESS BASE ROCK INSTALLED FOR TEMPORARY ACCESS SHALL BE REMOVED PRIOR TO PAVING. UNDER NO CONDITIONS SHALL ANY PIPELINE TRENCH BE LEFT OPEN DURING NON-WORKING HOURS.
- 3.02 REINFORCED CONCRETE PIPE, CONCRETE CULVERT, AND DRAIN PIPE
- A. The laying of reinforced concrete pipe shall conform to the applicable sections of the Concrete Pipe Handbook as published by the American Concrete Pipe Association.
- 3.03 DUCTILE IRON PIPE
- A. Ductile iron pipe (DIP) shall be installed in accordance with the requirements of the Ductile Iron Pipe Handbook published by the Ductile Iron Pipe Research Association, and AWWA C600.

EXHIBIT A

- B. Where it is necessary to cut ductile iron pipe in the field, such cuts shall be made carefully in a neat workmanlike manner using approved methods to produce a clean square cut. The outside of the cut end shall be conditioned for use by filing or grinding a small taper, at an angle of approximately 30 degrees.
- C. UNLESS OTHERWISE APPROVED BY THE ENGINEER, FIELD WELDING OF DUCTILE IRON WILL NOT BE PERMITTED.

3.04 PVC/CPVC AND HDPE PIPE

- A. Polyvinyl chloride (PVC), chlorinated polyvinyl chloride (CPVC) and High Density Polyethylene (HDPE) pipe shall be laid and joints assembled according to the respective manufacturer's recommendation. PVC pipe installation shall comply with applicable sections of the Uni-Bell PVC Pipe Association Recommended Standard Specifications.
- B. Plastic piping shall not be installed when the temperature is less than 60°F except as otherwise recommended by the manufacturer and approved by the Engineer.

3.05 CARBON AND STAINLESS STEEL PIPE

- A. Installation of steel pipe shall be by skilled workmen and shall conform to the applicable sections of AWWA Manual M-11. Joints for steel piping shall be either screwed, welded, or flanged as shown on the Drawings or as specified.
- B. Welding in the field shall be performed only when requested on the shop drawings and permitted by the Engineer for carbon steel pipe. No welding of stainless steel pipe shall be allowed in the field. All field welds shall be radiographically inspected.
- C. Installation of the steel casing pipe shall be by skilled workmen and in accordance with the best standard practice for steel pipe installation. Joints for steel casing pipe shall be butt welded.
 - 1. The boring equipment to be used for installing the jacked casing shall be of such size and capacity to allow the boring to proceed in a safe and expeditious manner. The installation of the casing and boring of the hole shall be done simultaneously to avoid cave-ins or settlement and for safety of traffic above.
 - 2. The Contractor shall check the vertical and horizontal alignment of the casing by survey instrument at least once during each four feet of advance, or as directed by the Engineer. Pits shall be well sheeted and braced as necessary for safe and adequate access for workmen, inspectors and materials and shall be of a size suitable to equipment and material handling requirements.
 - 3. Under no conditions shall jetting or wet boring of encasement under pavement be allowed.
 - 4. After installation of the carrier pipe, each end of the casing pipe shall be made watertight with a brick masonry bulkhead. In addition, a Class B concrete cradle shall be provided from each end of the bulkhead to the first pipe joint outside of the bulkhead.

3.06 COPPER PIPE

EXHIBIT A

- A. Installation of copper pipe shall be by skilled workman in accordance with the manufacturer's recommendations. Use teflon tape at all fittings unless otherwise required for intended service. Install unions at the connections to each piece of equipment to allow removal of equipment without dismantling connecting piping.
- B. Wall sleeves shall be provided for all piping passing through exterior walls and shall be of the same material as the piping to which it is joined. All wall sleeves shall be provided with an acceptable waterstop.
- C. The Contractor shall provide hot and cold water mains with branches and risers complete from point indicated on the Drawings running to all fixtures and other outlets indicated. Mains and branches shall be run generally as shown on the Drawings. The Contractor shall provide all interior water piping, branches, and risers as shown on the Drawing and shall make connections to all plumbing fixtures, hose bibs, wall hydrants, and other points requiring water under this and other Divisions of the Specifications.
- D. All water mains and branches shall be pitched at least one (1) inch in twenty-five (25) feet toward fixtures. The piping installation shall be arranged so that the entire system can be drained through fixture supply connections.
- E. Unions shall be installed at the connections to each piece of equipment to allow for removal of equipment without dismantling connecting piping.
- F. Joints 1-1/4 inches and larger shall be made with silver solder. For joints less than 1-1/4 inches and all valves (regardless of size) use 95/5 solder. Soldered joints shall be prepared with a non-corrosive paste flux in accordance with manufacturer's instructions. All joints shall be thoroughly cleaned with emery cloth and reamed out before assembly. Acid core solder will not be permitted.

3.07 POLYPROPYLENE AND POLYVINYLIDENE FLUORIDE PIPE

- A. The pipe and fittings shall be of the same material for both inner and outer walls of the pipe.
- B. Polypropylene pipe shall be black UV stabilized co-polymer conforming to the requirements of ASTM D-4101. Where used in exterior locations, material shall provide a weathering resistance absent of further coating, covering, or wrapping unless specified herein or shown on the Drawings.
- C. Polyvinylidene fluoride shall comply with ASTM D-3222. The material shall provide translucence, thus enabling a visual inspection of liquid in the annular space between the inner and outer walls.
- D. Where elastomers are selected by the manufacturer, such selection shall be with regard to the application of the chemical solution to be transported.
- E. Pipe and associated fittings shall be rated for not less than 75 psi at 73°F.
- F. Double-walled pipe and fittings shall be molded and used throughout. Molded ribs shall maintain permanent alignment of the inner and outer walls of the pipe and fittings.
- G. Ends of fittings shall be flush, creating a single plane.

EXHIBIT A

- H. Wall thickness of the inner and outer walls of double-walled pipe shall be identical, providing identical pressure ratings.
- I. Where shown on the Drawings, a leak detection system of the manufacturer's design shall be supplied, complete with vent pipes, manual drain outlet, and electric float switch. Switch shall be rated for 0.080 amps at 120 VAC.
- J. Polypropylene and polyvinylidene flouride pipe shall be laid and joints assembled by skilled workers according to the respective manufacturer's recommendations. Joints shall be butt fusion welded.
- K. Plastic piping shall not be installed when the ambient temperature is less than 60°F except as otherwise recommended by the manufacturer and approved by the Engineer.
- L. Wall sleeves shall be provided where piping passes through exterior walls. All sleeves shall be provided with an acceptable waterstop.
- M. Double walled pipe shall be Asahi/American or equal. Pipe shall be furnished complete with flanges or other appurtenant fittings by the same manufacturer and made especially for use with the double walled pipe.

3.08 JOINTS IN PIPING

- A. Restrained joints shall be provided on all pipe joints as specified herein and shown on the Drawings. Restrained joints shall be made up similar to that for push-on joints.
- B. Push-on joints include a single rubber gasket which fits into the bell end of the pipe. The gasket shall be wiped clean, flexed and then placed in the socket. Any bulges in the gasket which might interfere with the entry of the plain end of the pipe shall be removed. A thin film of lubricant shall be applied to the gasket surface which will come into contact with the spigot end of the pipe. The lubricant shall be furnished by the pipe manufacturer. The plain end of the pipe, which is tapered for ease of assembly, shall be wiped clean and a thick film of lubricant applied to the outside. The pipe shall be aligned and carefully entered into the socket until it just makes contact with the gasket. The joint assembly shall be completed by entering the pipe past the gasket until it makes contact with the bottom of the socket. The pipe shall be pulled "home" with an approved jack assembly as recommended by the pipe manufacturer. If assembly is not accomplished by reasonable force, the plain end shall be removed and the condition corrected.
- C. Flanged joints shall be brought to exact alignment and all gaskets and bolts or studs inserted in their proper places. Bolts or studs shall be uniformly tightened around the joints. Where stud bolts are used, the bolts shall be uniformly centered in the connections and equal pressure applied to each nut on the stud. Pipes in all lines subject to temperature changes shall be cut short and cold sprung into place to compensate for expansion when hot.
- D. Mechanical joints shall be made up with gaskets, glands and bolts. When a joint is to be made up, the bell or socket and plain end shall be cleaned and washed with a solution of mild soap in water; the gland and gasket shall be slid onto the plain end and the end then entered into the socket until it is fully "home" on the centering ring. The gasket shall then be painted with soapy water and slid into position, followed by the gland. All bolts shall be inserted and made up hand tight and then tightened alternately to bring the gland into position evenly. Excessive tightening of the bolts shall be avoided. All nuts shall be pulled

EXHIBIT A

up using a torque wrench which will not permit unequal stresses in the bolts. Torque shall not exceed the recommendations of the manufacturer of the pipe and bolts for the various sizes. Care shall be taken to assure that the pipe remains fully "home" while the joint is being made. Joints shall conform to the applicable AWWA Specifications.

- E. Threaded and/or screwed joints shall have long tapered full depth threads to be made with the appropriate paste or jointing compound, depending on the type of fluid to be processed through the pipe. All pipe up to, and including 1-1/2-inches, shall be reamed to remove burr and stood on end and well pounded to remove scale and dirt. Wrenches on valves and fittings shall be applied directly over the joint being tightened. Not more than three pipe threads shall be exposed at each connection. Pipe, in all lines subject to temperature changes shall be cut short and cold sprung into place to compensate for expansion when hot. Joints in all piping used for chlorine gas lines shall be made up with a glycerine and litharge cement. Joints in plastic piping (PVC/CPVC) shall be laid and joints made with compounds recommended by the manufacturer. Installation shall conform to the requirements of ASTM D2774 and ASTM D2855. Unions required adjacent to valves and equipment.
- F. Soldered joints shall have the burrs removed and both the outside of pipe and the inside of fittings shall be thoroughly cleaned by proper tools recommended for that purpose. Flux shall be applied to both pipe and inside of fittings and the pipe placed into fittings and rotated to insure equal distribution of flux. Joints shall be heated and solder applied until it shows uniformly around the end of joints between fitting and pipe. All joints shall be allowed to self-cool to prevent the chilling of solder. Combination flux and solder paste manufactured by a reputable manufacturer is acceptable. Unions required adjacent to valves and equipment.
- G. Welded joints shall be made by competent operators in a first class workmanlike manner, in complete accordance with ANSI B31.1 and AWWA C206. Welding electrodes shall conform to ASTM A233, and welding rod shall conform to ASTM A251. Only skilled welders capable of meeting the qualification tests for the type of welding which they are performing shall be employed. Tests, if so required, shall be made at the expense of the Contractor, if so ordered by the Engineer. Unions shall be required adjacent to valves and equipment.
- H. Copper joints shall be thoroughly cleaned and the end of pipes uniformly flared by a suitable tool to the bevels of the fittings used. Wrenches shall be applied to the bodies of fittings where the joint is being made and in no case to a joint previously made. Dimensions of tubing and copper piping shall be in complete accordance with the fittings used. No flare joints shall be made on piping not suited for flare joints. Installations for propane gas shall be in accordance with NFPA 54 and/or 58.
- I. Solvent or adhesive welded joints in plastic piping shall be accomplished in strict accordance with the pipe manufacturer's recommendations, including necessary field cuttings, sanding of pipe ends, joint support during setting period, etc. Care shall be taken that no droppings or deposits of adhesive or material remain inside the assembled piping. Solvent or adhesive material shall be compatible with the pipe itself, being a product approved by the pipe manufacturer. Unions are required adjacent to valves and equipment. Sleeve-type expansion joints shall be supplied in exposed piping to permit 1-inch minimum of expansion per 100 feet of pipe length.
- J. Dielectric unions shall be installed wherever dissimilar metals are connected except for bronze or brass valves in ferrous piping. Unions shall be provided downstream of each valve

EXHIBIT A

with screwed connections. The Contractor shall provide screwed or flanged unions at each piece of equipment, where shown, and where necessary to install or dismantle piping.

- K. Eccentric reducers shall be installed where air or water pockets would otherwise occur in mains because of a reduction in pipe size.
- L. Joints in polypropylene and polyvinylidene fluoride pipe shall be butt fusion weld. All butt welding shall follow the requirements of ASTM D-2657 and the manufacturer's recommendations.

3.09 FLUSHING AND TESTING

- A. All piping shall be properly flushed and tested unless specifically exempted elsewhere in the Specifications or otherwise approved by the Engineer. Air and gas pipelines shall be flushed and tested with compressed air. Gravity sewer piping shall be flushed and tested as specified in Section 02604 - Utility Structures. All other liquid conveying pipelines shall be flushed and tested with water. The Contractor shall furnish and install all means and apparatus necessary for getting the air or water into the pipeline for flushing and testing including pumps, compressors, gauges, and meters, any necessary plugs and caps, and any required blow-off piping and fittings, etc., complete with any necessary reaction blocking to prevent pipe movement during the flushing and testing. All pipelines shall be flushed and tested in such lengths or sections as agreed upon among the Owner, Engineer, and Contractor. Test pressures shall be as specified in Section 15390 – Schedules, and shall be measured at the lowest point of the pipe segment being tested. The Contractor shall give the Owner and Engineer reasonable notice of the time when he intends to test portions of the pipelines. The Engineer reserves the right, within reason, to request flushing and testing of any section or portion of a pipeline.
- B. The Contractor shall provide water for all flushing and testing of liquid conveying pipelines. Raw water or non-potable water may be used for flushing and testing liquid pipelines not connected to the potable water system. Only potable water shall be used for flushing and testing the potable water system.
- C. Air and gas piping shall be completely and thoroughly cleaned of all foreign matter, scale, and dirt prior to start-up of the air or gas system.
- D. At the conclusion of the installation work, the Contractor shall thoroughly clean all new liquid conveying pipe by flushing with water or other means to remove all dirt, stones, pieces of wood, etc., which may have entered the pipe during the construction period. If after this cleaning any obstructions remain, they shall be corrected by the Contractor, at his own expense, to the satisfaction of the Engineer. Liquid conveying pipelines shall be flushed at the rate of at least 2.5 feet per second for a duration suitable to the Engineer or shall be flushed by other methods approved by the Engineer.
- E. Compressed/service air and gas piping shall be flushed by removing end caps from the distribution lines and operating one (1) compressor, in accordance with the manufacturer's instructions.
- F. After flushing, all air piping shall be pressure and leak tested prior to coating and wrapping of welded joints. Immediately upon successful completion of the pressure and leak test, welded joints shall be thoroughly cleaned of all foreign matter, scale, rust, and discoloration and coated in accordance with the Specifications.

EXHIBIT A

- G. All process air piping shall be leak tested by applying a soap solution to each joint. Leak tests shall be conducted with one (1) blower in service at normal operating pressure.
- H. During testing the piping shall show no leakage. Any leaks or defective piping disclosed by the leakage test shall be repaired or replaced by the Contractor, at his own expense, and the test repeated until all such piping shows tight.
- I. All buried process air piping shall be pressurized to 25 psig and tested for leaks by applying a soap solution to each joint. The air supply shall be stopped and the pipe pressure monitored. System pressure shall not fall by more than 0.5% of the 25 psig test pressure over a one-hour test period. Should the system fail to hold the required pressure for one hour, the cause shall be determined and corrected and the test repeated until a successful test of the entire system is obtained.
- J. Field leakage tests shall be performed for all submerged process air piping. The procedure shall consist of operating the system under clear nonpotable water for visual identification of all leaks. All field leakage tests shall be witnessed by the Engineer. All submerged piping shall be installed free of any leaks.
- K. After flushing, all liquid conveying pipelines shall be hydrostatically tested at the test pressure specified in the appropriate Piping System Schedule in Section 15390 – Schedules. The procedure used for the hydrostatic test shall be in accordance with the requirements of AWWA C600. Each pipeline shall be filled with water for a period of no less than 24 hours and then subjected to the specified test pressure for 2 hours. During this test, exposed piping shall show no leakage. Allowable leakage in buried piping shall be in accordance with AWWA C600.
- L. Any leaks or defective pipe disclosed by the hydrostatic test shall be repaired or replaced by the Contractor, at his own expense, and the test repeated until all such piping shows tight.
- M. After flushing, all gas piping shall be leak tested in accordance with all local codes and regulations and in conformance with the recommendations or requirements of any National Institute or Association for the specific service application.

3.10 DISINFECTION

- A. All pipe and fitting connected to and forming a part of a potable water supply shall be disinfected in accordance with the procedures described in AWWA C 651.
- B. Disinfection shall be accomplished after the pipe has been flushed, if applicable, and passed the hydrostatic test. Such piping shall be filled with 50 parts per million (PPM) of chlorine and held in contact for not less than 24 hours. Final tests after 24 hours contact time shall show a minimum residual chlorine content of 10 ppm in all parts of the system. Disinfection shall be repeated as often as necessary, and as directed by the Engineer and/or the Owner until the minimum residual chlorine content of 10 ppm has been reached. The Contractor shall obtain certificates of satisfactory bacteriological tests and furnish them to the Owner before the request is made for acceptance of the work. The Contractor shall furnish and install, at his own expense, all means and apparatus necessary for performing the disinfection. The chlorine solution shall be thoroughly flushed out prior to placing the new sections of pipe in service. The Contractor is cautioned that the spent chlorine solution must be disposed of in such a way as not to be detrimental to animal, plant, or fish life. Chlorine

EXHIBIT A

residual tests will be made after flushing to assure that residual is not in excess of 1 ppm at any point in system.

3.11 PAINTING AND COLOR CODING SYSTEM

- A. All exposed piping specified shall be color coded in accordance with the Owner's standard color designation system for pipe recognition and in accordance with Section 15030 – Piping and Equipment Identification Systems. In the absence of a standard color designation system, the Engineer will establish a standard color designation for each piping service category from color charts submitted by the Contractor in compliance with Section 09900 – Painting.
- B. All piping specified in this Section shall be painted in accordance with Section 09900 – Painting, except as follows:
 - 1. Copper pipe
 - 2. Stainless steel pipe. Flanges and supports or hangers shall be painted.

- END OF SECTION -

EXHIBIT A

SECTION 15006

DUCTILE IRON PIPE

PART 1 -- GENERAL

1.01 WORK INCLUDED

- A. The Contractor shall furnish and install ductile iron pipe and all appurtenant Work, complete in place, all in accordance with the requirements of the Contract Documents.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 09900 - Painting
- C. Section 15000 - Basic Mechanical Requirements

1.03 REFERENCED SPECIFICATIONS, CODES, AND STANDARDS

- A. Commercial Standards:

ANSI/AWWA C104/A21.4	Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water
ANSI/AWWA C110/A21.10	Ductile-iron and Gray-Iron Fittings 3-in. Through 48-in. for Water and Other Liquids
ANSI/AWWA C111/A21.11	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
ANSI/AWWA C150/A21.50	Thickness design of ductile iron pipe
ANSI/AWWA C151/A21.51	Ductile-iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
ANSI/AWWA C600	Installation of Ductile-Iron Water Mains and Appurtenances

1.04 SUBMITTALS

- A. Shop Drawings: The Contractor shall submit Shop Drawings of pipe and fittings in accordance with the requirements set forth in the Sections entitled – “Piping General Provisions” and “Submittals”. Provide signed certification statement indicating that the interior lining of the pipes and valves meets the requirements of NSF-61.

EXHIBIT A

PART 2 -- PRODUCTS

2.01 GENERAL

A. Pipe shall be centrifugally cast in metal molds or sand lined molds in accordance with ANSI A21.51 (AWWA C151) of grade 60-42-10 ductile iron. The above standard covers ductile iron pipe with nominal pipe sizes from three inches up to and including sixty-four inches in diameter. Working pressure shall be 150 psi.

B. Wall Thickness

1. The following design parameters shall be provided for all buried push-on, mechanical, and restrained joint ductile iron pipe. Wall thickness shall conform to the following classes of AWWA C150, as specified in Table 14 and Table 15, for the following sizes. Flanged pipe shall not be less than Class 53 as identified in Table 15 of AWWA C150.

<u>Buried Pipe</u>	
<u>Size</u>	<u>Class</u>
4" – 12"	52
14" - 54"	51
60" - 64"	Pressure Class 150

2. Where groove type couplings are used, the wall thickness shall be increased by one Class.

C. Joints

1. Ductile iron pipe above grade shall be flanged. All ductile iron pipe below grade shall have thrust restrained joints.
2. Mechanical and push-on type joints shall be in accordance with ANSI A21.11 (AWWA C111).
3. Flanges for flanged pipe shall be in accordance with ANSI A21.15 (AWWA C115), shall be ductile iron, shall be rated at 250 psi maximum working pressure, and shall be similar to flange Class 125 per ANSI B16.1. Where shown on the drawings, pipe and fittings shall be furnished with flanges similar to flange Class 250 per ANSI B16.1. Fittings shall be provided with flanges having a bolt circle and bolt pattern the same as the adjacent pipe and/or mechanical devices. Joint materials shall be ANSI sized and approved and shall consist of 304 SS bolts and nuts and full faced 1/8" thick neoprene gaskets.
4. No raised face flanges shall be used. The raised faces shall be milled flat.
5. Flange gaskets shall be full face neoprene rubber.

D. Restrained Push-on Joints (Single Gasket)

EXHIBIT A

1. Restrained joints in pipe and fittings shall be of the single gasket push-on type, and shall conform to all applicable provisions of ANSI/AWWA Standard C111/A21.11, except that gaskets for pipe and fittings shall be neoprene, and the following requirements:
 - a. Thickness of the pipe barrel remaining at grooves cut, if required in the design of restrained end joints, shall not be less than the nominal wall thickness of equal sized non restrained pipe as specified in Item 2.01B.
 - b. Restrained joints using field welding, set screws, or gaskets with expanding metal inserts will not be acceptable.
 - c. The restraining components, when not cast integrally with the pipe and fittings, shall be ductile iron or a high strength non-corrosive alloy steel.
 - d. Tee head bolts and hexagonal nuts for all restrained joints in pipe and fittings shall be of high strength cast iron with composition, dimensions and threading as specified in ANSI/AWWA Standard C111/A21.11, except that the length of the bolts shall meet the requirements for the restrained joint design.
 - e. The proper number of gaskets, bolts, nuts and all necessary joint material, plus one extra gasket for every 10 joints or fraction thereof, shall be furnished with each order. The gaskets and joint accessories shall be shipped in suitable protection containers.
 - f. Each thrust-restraint joint and the pipe and fitting of which it is a part, shall be designed to withstand the axial thrust from an internal pipeline pressure of at least 150 psi at bulkhead conditions without reduction because of its position neither in the pipeline nor for support from external thrust blocks.
 - g. Restrained push-on joint pipe and fittings shall be capable of being deflected after assembly. During deflection, all components in the restrained system shall be in contact to provide an equal force on all contact areas.
 - h. When restrained spigot ends are ordered the corresponding bell ends of the pipe to be restrained.
2. Restrained push-on joints for ductile iron pipe and fittings shall be TR-FLEX (4-inch through 36-inch) and HP-Lok (42-inch through 64-inch) and as manufactured by U.S. Pipe and Foundry, Flex-Ring (4-inch to 36-inch) and Lok-Ring (42-inch to 64-inch) by the American Ductile Iron Pipe Co., or equal. The restraining components, when not cast integrally with the pipe and fittings, shall be ductile iron or a high strength noncorrosive alloy steel. For cut grooved retainers, the thickness of barrel left after grooving shall not be less than the nominal wall thickness of equal sized nonrestrained pipe as specified herein above for the centrifugally cast ductile iron pipe.
3. Restrained Mechanical Joint: Mechanical joints shall be restrained with Megalug Series 1100 as manufactured by Ebaa Iron, Inc., or equal. Tee head bolts and hexagonal nuts for all restrained joints in pipe and fittings shall be of high strength cast iron with composition, dimensions and threading as specified in ANSI/AWWA Standard C111/A21.1 1, except that the length of the bolts shall meet the requirements for the restrained joint design.

EXHIBIT A

E. Fittings

1. Shall be manufactured in accordance with ANSI A21.10 (AWWA C110) for nominal pipe sizes three inches to sixty-four inches, and shall be either flanged, mechanical joint or restrained joint. Any other fittings, not included in ANSI A21.10 (AWWA C110) shall conform in design and performance to the requirements of this Standard.
2. Shall have a rated pressure equal to or greater than the specified working pressure for nominal pipe sizes of three inches to sixty-four inches (350 psi fittings available through and including twenty-four inches, only).
3. Blind, filler, companion and reducing flanges shall conform to ANSI B16.1.

F. Pipe Coating: All ductile iron pipe, fittings and specials shall be supplied with the same coating material throughout the project. Coating shall be provided in the interior and exterior of the pipe as described hereinafter.

1. Shop Coat (for below ground service): The standard asphaltic coating shall be applied prior to shipment to the exterior wall of buried pipe and fittings in accordance with ANSI A21.51 (AWWA C151).
2. Field Coat (for above ground service or within buried vaults): Final coating shall be applied in field in accordance with Section 09900 – Painting.
3. Interior Lining: All pipe and fittings shall be cement mortar lined to twice the standard thickness in accordance with ANSI A21.4 (AWWA C104). A seal coat of asphaltic material shall be applied to the mortar lining. The seal coat material shall be in accordance with ANSI A21.4 (AWWA C104).

PART 3 -- EXECUTION

3.01 INSTALLATION

- A. Unless otherwise directed, ductile iron pipe shall be laid with the bell ends facing upstream in the normal direction of flow and in the direction of laying.
- B. Restrained joints shall be made in accordance with the manufacturer's standards except as otherwise specified herein. Joints between restrained mechanical joint pipe and/or fittings shall be made in accordance with ANSI/AWWA Standard C600, except that deflection at joints shall not exceed 75 percent of the manufacturer's recommended allowable deflection, or 75 percent of the allowable deflection specified in ANSI/AWWA C600, whichever is the lesser amount.
- C. Before laying restrained joint and restrained mechanical joint pipe and fittings, all lumps, blisters and excess bituminous coating shall be removed from the bell and spigot ends. The outside of each spigot and the inside of each bell shall be wire brushed, and wiped clean and dry. The entire gasket groove area shall be free of bumps or any foreign matter which might displace the gasket. The cleaned spigot and gasket shall not be allowed to touch the trench walls or trench bottom at any time. Vegetable soap lubricant shall be applied in accordance with the pipe manufacturer's recommendations, to aid in making the joint. The workmen shall exercise caution to prevent damage to the gasket or the adherence of grease or particles of sand or dirt. Deflections shall only be made after the joint has been assembled.

EXHIBIT A

- D. Prior to making up flanged joints in ductile iron pipe and fittings, the back of each flange under the bolt heads and the face of each flange shall have all lumps, blisters and excess bituminous coating removed and shall be wire brushed and wiped clean and dry. Flange faces shall be kept clean and dry when making up the joint, and the workmen shall exercise caution to prevent damage to the gasket or the adherence of grease or particles of sand or dirt. Bolts and nuts shall be tightened by opposites in order to keep flange faces square with each other, and to insure that bolt stresses are evenly distributed.
- E. Bolts and nuts in restrained joint, restrained mechanical joint and flanged joints shall be tightened in accordance with the recommendations of the pipe manufacturer for a leak-free joint. The mechanics shall exercise caution to prevent overstress. Torque wrenches shall be used until, in the opinion of the Engineer, the mechanics have become accustomed to the proper amount of pressure to apply on standard wrenches.
- F. Cutting of the ductile iron pipe for inserting valves, fittings, etc., shall be done by the Contractor in a neat and workmanlike manner without damage to the pipe, the lining, or the coating. Pipe 16 inches and larger in diameter shall be cut with a mechanical pipe saw. After cutting the pipe, the plain end shall be beveled with a heavy file or grinder to remove all sharp edges.
- G. Areas of loose or damaged lining associated with field cutting shall be repaired or replaced as recommended by the pipe manufacturer and required by the Engineer. Repair methods shall be as recommended by the manufacturer and shall be submitted to the Engineer for review.
- H. Any work within the pipe shall be performed with care to prevent damage to the lining. No cable, lifting arms or other devices shall be inserted into the pipe. All lifting, pulling or pushing mechanisms shall be applied to the exterior of the pipe barrel.
- I. Homing the pipe shall be accomplished by the use of a hydraulic or mechanical pulling device, unless otherwise accepted by the Engineer. No pipe shall be driven or struck in order to seat it home.
- J. Cleaning: Cleaning methods shall be acceptable to the Engineer, and must be sufficient to remove silt, rocks, or other debris which may have entered the pipeline during its installation and shall also follow the requirements of Section 15995, "Pipeline Testing and Disinfection".

- END OF SECTION -

SECTION 15020

PIPE SUPPORTS

PART 1 -- GENERAL

1.01 THE REQUIREMENT

- A. Reference Section 05050, Metal Fastening.
- B. Reference Section 15000, Basic Mechanical Requirements.

PART 2 -- PRODUCTS

2.01 HANGERS AND SUPPORTS

- A. All piping shall be adequately supported and braced by means of adequate hangers, concrete piers, pipe supports, brackets, or otherwise as may be required by the location. Generally, concrete supports shall be used where pipe centerline is less than 3 feet above floor, and hangers above 6 feet unless specified or shown otherwise. Supports shall be not more than 10 feet on center for steel and cast iron, 5 feet on center for plastic unless otherwise shown on the Drawings or required by the specific manufacturer. All necessary inserts or appurtenances shall be furnished and installed in the concrete or structures for adequately securing hangers and supports to the structure.
- B. Hangers and supports shall conform to the following requirements:
 - 1. All hangers and supports shall be capable of adjustment after installation. Types of hangers and supports shall be kept to a minimum.
 - 2. Hanger rods shall be straight and vertical. Chain, wire, strap, or perforated bar hangers shall not be used. Hangers shall not be suspended from other piping.
 - 3. Vertical piping shall be supported at each floor and between floors by stays or braces to prevent rattling and vibration.
 - 4. Supports and hangers for plastic piping shall include wide saddles or bands as recommended by the manufacturer and approved by the Engineer to distribute load and thus avoid localized deformation of the pipe.
 - 5. Hanger and supports shall prevent contact between dissimilar metals by use of copper plated, rubber, vinyl coated or stainless steel hangers.
 - 6. Copper piping shall be supported by plastic coated or copper plated steel hangers and supports.
 - 7. Plastic piping shall be supported by plastic coated steel hangers and supports.
 - 8. Hangers and supports shall provide for thermal expansion throughout the full operating temperature range.

EXHIBIT A

9. Expansion type anchors used for pipe hangers and supports shall be Type 304 stainless steel.
- C. All metallic hangers and supports shall be standard make by Anvil International, Inc., "Witch" by Carpenter & Paterson, Ltd., B-Line Systems, Inc., or equal; and data on the types and sizes to be used shall be furnished to the Engineer for approval. Metallic support system brackets, rods, support clips, clevis hangers, hardware, etc. materials of construction shall be hot dipped galvanized steel.
- D. Non-metallic support system shall be a heavy duty channel framing system. Channel frames shall be manufactured by the pultrusion process using corrosion grade polyester or vinylester resins. All fiberglass construction shall include suitable ultraviolet inhibitors for UV exposure and shall have a flame spread rating of 25 or less per ASTM E84. Piping accessories, pipe clamps, clevis hangers, support posts, support racks, fasteners, etc., shall be constructed of vinylester or polyurethane resin. Non-metallic support systems shall be standard make Aickinstrut by Aickinstrut, Inc., Unistrut Fiberglass by Unistrut, Inc., Enduro Fiberglass Systems, or equal. The Contractor shall submit data on the types and sizes of approval. Unless otherwise shown or specified the Contractor shall provide support spacings in the conformance with the pipe and support system manufacturer's requirements.

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -

SECTION 15095

VALVES, GENERAL

PART 1 -- GENERAL

1.01 THE REQUIREMENT

- A. The Contractor shall furnish and install, complete with all assemblies and accessories, all valves shown on the Drawings and specified herein including all fittings, appurtenances and transition pieces required for a complete and operable installation.
- B. All valves shall be constructed of first quality materials which have strength, wearing, and corrosion resistance characteristics entirely suitable for the types of service for which the individual valves are designated. Except where noted otherwise, valves designated for water service shall conform to pertinent sections of the latest revision of AWWA C500 Specifications. Cast iron valve bodies and parts shall meet the requirements of the latest revision of ASTM Designation A-126, "Standard Specifications for Gray Iron Castings for Valves, Flanges, and Pipe Fittings, Class B."
- C. All valve body castings shall be clean, sound, and without defects of any kind. No plugging, welding, or repairing of defects will be allowed.
- D. Valves shall have flanged ends for exposed service and mechanical joint ends for buried service, unless otherwise shown on the Drawings or specified herein. Flanged ends shall be flat-faced, 125 lb. American Standard unless otherwise shown or specified in accordance with ANSI B16.1. All bolt heads and nuts shall be hexagonal of American Standard size. The Contractor shall be responsible for coordinating connecting piping. Valves with screwed ends shall be made tight with Teflon tape. Unions are required at all screwed joint valves.

1.02 SUBMITTALS

- A. The Contractor shall furnish to the Owner, through the Engineer, a Performance Affidavit where required in individual valve specifications, utilizing the format specified in Section 11000, Equipment General Provisions. Performance tests shall be conducted in accordance with the latest revision of AWWA C500 and affidavits shall conform to the requirements of the Specifications
- B. Shop Drawings conforming to the requirements of Section 01300, Submittals, are required for all valves, and accessories. Submittals shall include all layout dimensions, size and materials of construction for all components, information on support and anchoring where necessary, pneumatic and hydraulic characteristics and complete descriptive information to demonstrate full compliance with the Documents. Shop Drawings for electrically operated/controlled valves shall include all details, notes, and diagrams which clearly identify required coordination with the electrical power supply and remote status and alarm indicating devices. Electrical control schematic diagrams shall be submitted with the Shop Drawings for all electrical controls. Diagrams shall be drawn using a ladder-type format in accordance with JIC standards.
- C. Operation and maintenance manuals and installation instructions shall be submitted for all valves and accessories in accordance with the Specifications. The manufacturer(s) shall delete all information which does not apply to the equipment being furnished.

EXHIBIT A

1.03 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor shall provide the services of a qualified representative of the manufacturer(s) of the equipment named below to check out and certify the installation(s), to supervise the initial operation, and to instruct the Owner's operating personnel in proper operation and maintenance procedures in accordance with the following schedule:

Item	Valve/Operator Type	Minimum On-Site Time Requirements
1.	Automatic Control Check Valve	One (1) 8-hour day
2.	Surge Anticipators	One (1) 8-hour day
3.	Motor Operated Modulating Valves	One (1) 8-hour day
4.	Motor Operated Open-Close Valves (required only if manufacturer is other than for Item 3 above)	One (1) 8-hour day
5.	Pneumatic Hydraulic Cylinder Operated Valves	One (1) 8-hour day

- B. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor. The manufacturer's representative shall sign in and out at the office of the Engineer's Resident Project Representative on each day he is at the project.
- C. A written report covering the representative's findings and installation approval shall be mailed directly to the Engineer covering all inspection and outlining in detail any deficiencies notes.
- D. The times specified are exclusive of travel time to and from the facility and shall not be construed as to relieve the manufacturer of any additional visits to provide sufficient service to place the equipment in satisfactory operation.

PART 2 -- PRODUCTS

2.01 CORPORATION STOPS

- A. Corporation stops shall be of bronze with tapered male iron pipe threads on inlets and outlets. Terminal outlets shall have screwed bronze hex head dust plugs or caps. Unions shall be used on all corporation stop outlets with connecting piping. Corporation stops shall have a minimum working pressure rating of 250 psi and shall be as manufactured by Mueller Co., Hays Mfg. Div. of Zurn Industries, or equal.

EXHIBIT A

2.02 FLOOR BOXES

- A. Floor boxes shall be provided for all nut operated or floor accessed valves. Floor boxes shall be of the adjustable, sliding type, cast iron, suitable to withstand heavy traffic, as manufactured by James B. Clow & Sons, Kennedy Valve Mfg. Co., or equal. The covers shall be marked with appropriate designations of piping contents (i.e.: water, sewer) and bases shall be the round type. All nut operated valves in this Section shall be clearly identified by stainless steel or laminated plastic identification tags. The tags shall be permanently affixed to the inside of the floor boxes, under grating, etc. and shall bear the embossed letters which clearly identify each valve by its appropriate designation.
- B. Two (2) valve operating wrenches shall be supplied in 4 foot lengths with tee handles for each size nut supplied. Valve wrenches shall be Model No. F-2520 as manufactured by James B. Clow & Sons, Kennedy Valve Mfg. Co., Figure No. 122, or equal.

2.03 VALVE BOXES

- A. The Contractor shall furnish and install valve boxes as shown on the Drawings and specified herein.
- B. All valve boxes shall be placed so as not to transmit shock or stress to the valve and shall be centered and plumb over the operating nut of the valve. The ground in the trench upon which the valve boxes rest shall be thoroughly compacted to prevent settlement. The boxes shall be fitted together securely and set so that the cover is flush with the finished grade of the adjacent surface. A concrete pad as detailed on the Drawings shall be provided around the valve box, sloped outwards.
- C. All valve boxes shall be 2-piece cast iron, sliding type, 5-1/4" shaft, with heavy duty traffic weight collar and the lid marked with the appropriate carrier product (i.e.: WATER). Boxes shall be as manufactured by James B. Clow & Sons, Kennedy Valve Mfg. Co., Charlotte Pipe and Foundry Company, or equal.

PART 3 -- EXECUTION

3.01 INSTALLATION

- A. Except where noted otherwise herein, all valves shall be installing and tested in accordance with the latest revision of AWWA C500. Before installation, all valves shall be lubricated, manually opened and closed to check their operation and the interior of the valves shall be thoroughly cleaned. Valves shall be placed in the positions shown on the Drawings. Joints shall be made as directed under the Piping Specifications. The valves shall be so located that they are easily accessible for operating purposes, and shall bear no stresses due to loads from the adjacent pipe. The Contractor shall be responsible for coordinating connecting piping.
- B. All valves shall be tested at the operating pressures at which the particular line will be used. Any leakage or "sweating" of joints shall be stopped, and all joints shall be tight. All motor operated and cylinder operated valves shall be tested for control operation as directed by the Engineer.

EXHIBIT A

- C. Provide valves in quantity, size, and type with all required accessories as shown on the Drawings.
- D. Install all valves and appurtenances in accordance with manufacturer's instructions. Install suitable corporation stops at all points shown or required where air binding of pipe lines might occur. Install all valves so that operating handwheels or wrenches may be conveniently turned from operating floor but without interfering with access, and as approved by Engineer. Unless otherwise approved, install all valves plumb and level. Valves shall be installed free from distortion and strain caused by misaligned piping, equipment or other causes.
- E. Valve boxes shall be set plumb, and centered with the bodies directly over the valves so that traffic loads are not transmitted to the valve. Earth fill shall be carefully tamped around each valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face, if less than 4 feet.

3.02 SHOP AND FIELD TESTING

- A. Shop and field testing of valves shall be as follows:
 - 1. Certified factory testing shall be provided for all components of the valve and operator system. Valves and operators shall be shop tested in accordance with the requirements in the latest revision of AWWA C500, including performance tests, leakage test, hydrostatic tests, and proof-of-design tests. The manufacturer through the Contractor shall submit certified copies of the reports covering the test for acceptance by the Engineer.
 - 2. Shop testing shall be provided for the operators consisting of a complete functional check of each unit. Any deficiencies found in shop testing shall be corrected prior to shipment. The system supplier through the Contractor shall submit written certification that shop tests for the electrical/pneumatic system and all controls were successfully conducted and that these components provide the functions specified and required for proper operation of the valve operator system.
 - 3. The Contractor shall conduct field tests to check and adjust system components, and to test and adjust operation of the overall system. Preliminary field tests shall be conducted prior to start-up with final field tests conducted during start-up. The factory service representative shall assist the Contractor during all field testing and prepare a written report describing test methods, and changes made during the testing, and summarizing test results. The service representative shall certify proper operation of the valve operator system upon successful completion of the final acceptance field testing.
 - 4. Preliminary and final field tests shall be conducted at a time approved by the Engineer. The Engineer shall witness all field testing.
 - 5. All costs in connection with field testing of equipment such as energy, light, lubricants, water, instruments, labor, equipment, temporary facilities for test purposes, etc. shall be borne by the Contractor. The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

EXHIBIT A

6. Preliminary field tests shall be conducted prior to start-up and shall include a functional check of the entire valve operator system and all system components. Preliminary field tests shall demonstrate that the valve operator system performs according to specifications and that all equipment, valves, controls, alarms, interlocks, etc., function properly. The preliminary field test report must be approved by the Engineer prior to conducting final field acceptance tests. Based on results of preliminary field tests, the Contractor shall make any adjustments required to settings, etc., to achieve the required valve closing time and operation specified or otherwise directed by the Engineer.
7. Final field acceptance tests shall be conducted simultaneously with the start-up and field testing of the pumps, air compressors, process air blowers, etc. Field tests shall be conducted for the full range of operating modes and conditions specified and as directed by the Engineer. Each of the valves shall be tested at minimum, maximum, and normal head/flow conditions, and under all specified conditions of opening and closing. Performance of pneumatic valves and compressed air system under normal operating conditions and during simulated power failures shall be checked.
8. Field testing shall include optimization of opening and closing times of the valves. The Contractor shall provide the means for accurate measurement of pipeline pressures as directed by the Engineer. Valve opening and closing times shall be adjusted based on process requirements to optimize operation of the valves. Final valve opening and closing times as determined by field tests shall be approved by the Engineer prior to final acceptance of the system.

- END OF SECTION -

SECTION 15100

VALVE OPERATORS AND ELECTRIC VALVE ACTUATORS

PART 1 - GENERAL

1.01 THE REQUIREMENT

- A. Equipment shall be provided in accordance with the requirements of Section 11000 – Equipment General Provisions and Section 15000 – Basic Mechanical Requirements.
- B. Valve operators and electric valve actuators shall be designed to unseat, open or close, and seat the valve under the most adverse operating condition to which the valves will be subjected.
- C. Operator mounting arrangements shall be as indicated on the Drawings or as directed by the manufacturer and/or Engineer. There shall be no mounting restrictions on the electric valve actuator.
- D. The valve operators and electric actuators shall be the full and undivided responsibility of the valve manufacturer in order to ensure complete coordination of the components and to provide unit responsibility.

1.02 SUBMITTALS

- A. The following items shall be submitted with the Shop Drawings in accordance with, or in addition to the submittal requirements specified in Section 01300 - Submittals; and Section 11000 - Equipment General Provisions:
 - 1. Certification that the force required to operate all valves is as specified herein.

1.03 WARRANTY AND GUARANTEE

- A. Warranty and Guarantee shall be as specified in Section 11000 - Equipment General Provisions.

PART 2 -- PRODUCTS

2.01 GENERAL

- A. Manual operators shall be provided on all valves which do not receive electric actuators. Manual operator type shall be as specified herein and as shown on the Drawings.
- B. Quarter turn valves 8” and greater in size shall have geared operators. Gate valves 14” and greater in size shall have geared operators.
- C. Operators/actuators shall be furnished with conservatively sized extension bonnets, extension stems, or torque tubes, and all required appurtenances required for a complete installation. Operators furnished with extension bonnets shall include stainless steel extension stems, or stainless steel torque tubes.

EXHIBIT A

2.02 MANUAL OPERATORS

- A. Unless otherwise specified or shown on the Drawings, manual operator type shall be as follows:
 - 1. Buried valves shall be equipped with nut operators, extended stems, and valve boxes.
 - 2. Exposed valves up to 6-inch shall be lever operated (except gate valves).
 - 3. Exposed valves 8-inches and larger shall be handwheel operated.
 - 4. Exposed gate valves shall be handwheel operated.
 - 5. Valves with centerline of operator located more than 6-feet above the floor or platform from which it is to be operated shall have a chainwheel operator unless otherwise indicated on the Drawings.
- B. Manual operators shall be rigidly attached to the valve body unless otherwise specified or shown on the Drawings.
- C. All operators shall turn counter-clockwise to open and shall have the open direction clearly and permanently marked.
- D. Valve operators shall be designed so that the force required to operate the handwheel, lever, or chain (including breakaway torque requirements) does not exceed 80 pounds applied at the extremity of handwheel or chainwheel operator. Design pressures for sizing of valve operators shall 150 psi.
- E. Handwheels for valves operators shall not be less than 12 inches in diameter. The maximum diameter of any handwheel shall not exceed 24 inches.
- F. Nut operators shall have standard 2-inch square AWWA operating nuts designed in accordance with AWWA C504-94.
- G. Geared manual operators shall be of the worm gear, traveling nut or scotch yolk type except manual operators for butterfly valves 18-inch in diameter or larger which shall be worm gear, unless otherwise indicated in the individual valve specification. Gear operators shall be of the worm gear or bevel gear type. Gear box designs incorporating end of travel stops in the housing shall be equipped with AWWA input stops. Each gearbox shall require a minimum of 10 turns for 90 degree rotation or full valve stem travel and shall be equipped with a mechanical valve position indicator.
- H. Manual operators on below grade (and vault installed) valves shall be permanently lubricated and watertight under an external water pressure of 10 psi.

2.03 ELECTRIC VALVE ACTUATORS

- A. Electric actuators shall be open/close service for MOV 110, MOV 130, and MOV 140. Electric actuators shall be modulating service for MOV 120.

EXHIBIT A

1. The open/close (non-modulating) valve actuators shall be IQ series as manufactured by Rotork or equivalent models as manufactured by AUMA or Limitorque.
2. The modulating valve actuators shall be Type IQM as manufactured by Rotork or equivalent models as manufactured by AUMA or Limitorque.

B. Performance Requirements

1. The actuators shall be designed for indoor and outdoor service and shall be capable of mounting in any position.
2. Torque capacity of the actuators shall be sufficient to operate the valves with the maximum pressure differential of 100 psi plus a safety factor of 1.5. Actuators in modulating service shall be selected such that the required maximum valve torque is no more than 60% of the electric actuator's maximum rated torque.
3. Operating time for full limits of travel shall be not more than 2 seconds per inch diameter of the valve, +/- 50 percent through 20 inches; +/- 30 percent for valves 24 inches and larger. Operating time for full limits of travel shall not be less than 60 seconds for all modulating valves.
4. Actuators shall be capable of operating in ambient temperatures ranging from -22 degrees F to +158 degrees F.
5. For open/close (non-modulating) actuators, the gearing, motor and solid-state reversing starter shall be capable of up to 60 starts per hour without overheating.
6. For modulating actuators, the gearing, motor and contactor shall be capable of up to 1200 starts per hour without overheating.
7. It shall be possible to carry out the setting of the torque, turns and configuration of the indication contacts without the necessity to remove any electrical compartment covers. A setting tool shall be included for non-intrusive set-up, calibration, and interrogation of the actuator.

- C. The actuators shall include one integral housing, individual compartments for the motor, gearing, wiring terminals and control circuits. The terminal compartments shall be separated from the inner electrical components of the actuator by means of a watertight seal. The inner seal shall protect the motor and all other internal electrical elements of the actuator from entrance of moisture and dust when the terminal cover is removed. Seals shall be provided on the hand wheel and output shafts for weatherproof protection. All external fasteners shall be stainless steel. Compartments shall be provided with moisture and dust-proof rigid cast covers meeting NEMA 6 enclosure requirements, certified to submergence in 20 ft of water for 72 hours. Actuators located in classified areas shall be suitable for the Class, Division and Group environment in which they are located.

- D. All gearing shall be hardened alloy steel or bronze and shall be rated at twice the output torque of the operator and shall be designed to withstand the stall torque of the motor without failure. Output drive gearing shall consist of a worm shaft and worm gear pinion operating in an oil bath. The worm gear pinion shall be alloy bronze. Worm gear drive

EXHIBIT A

shall be self-locking to prevent creeping of the valve disc in an intermediate position. Heavy-duty grease shall protect gearing and sealed ball bearings of the main shaft for five years without changing. For quarter turn applications, overtravel of the operator shall be prevented by internal mechanical stops cast into the actuator.

- E. A mechanical indicator on the gear box and digital position indicator shall be furnished to continuously indicate the position of the valve at and between the fully open and fully closed positions. The mechanical indicator shall be driven by gearing driven off of the main worm gear pinion and shall operate when the actuator is in either the electrical mode or manual mode. The digital indicator shall display valve position, with or without its power supply.
- F. A handwheel shall be permanently attached for manual operation. A gear assembly shall be provided between the handwheel and the worm shaft if required to reduce the force necessary to operate the handwheel to less than 80 pounds. A positive declutch mechanism shall engage the handwheel when required. When the actuator is set in the declutched position for handwheel operation, it shall return automatically to electric operation when the actuator motor is energized. The handwheel shall not rotate during electric operation nor shall a ceased motor prevent handwheel operation. The declutch mechanism shall be padlockable.
- G. The drive motor shall be specifically designed for actuator service and shall be characterized by high starting torque and low inertia. AC motors shall be 460 volts, three phase, 60 Hz AC reversible squirrel cage induction type motors and shall be specifically designed for modulating service where indicated in the Valve Schedule in Section 15390. Motors shall be totally enclosed, non-ventilated, with NEMA Class F insulation minimum (Class H for modulating actuators) and a maximum continuous temperature rating of 120 degree C (rise plus ambient). A 120 VAC space heater shall not be required in the motor compartment. The electric motor shall have a time rating of at least 15 minutes at 104°F (40°C) or twice the valve stroking time, whichever is longer, at an average load of at least 33% of maximum valve torque. Motor bearings shall be permanently lubricated by food oil grade lubrication. The actuator shall include a device to ensure that the motor runs with the correct rotation for the required direction of valve travel with either phase sequence of the three-phase power supply connected to the actuator. The motor controller shall include single phase protection (e.g. Rotork's Synchrophase). A suitable thermal protection device shall also be incorporated in the motor or motor starter circuits, connected to a tripping device. Fast acting fuses shall be provided to protect solid state components. The motor shall be capable of starting against the rated load in either the open or close direction when voltage to the motor terminals is plus or minus ten (10) percent of nameplate rating.
 - 1. Open/Close actuators shall be furnished with electro-mechanical reversing starters.
 - 2. Modulating actuators shall be furnished with solid state reversing starters utilizing thyristors.
- H. All wiring shall be brought to the separately sealed terminal compartment without external piping or conduit box. A separately sealed terminal compartment shall be used for the prevention of damage resulting from condensation entering through the electrical conduits. The following items shall be located in the control circuit compartment.

EXHIBIT A

1. A microprocessor shall be provided to de-energize the motor control circuit in the event of a stall when attempting to unseat a jammed valve and when torque is exceeded during valve travel. Each actuator shall have open direction torque sensing and a close direction torque sensing. The torque protection shall be able to be set in torque units from 40% to 100% of rated actuator torque. Torque protection shall be calibrated prior to the actuator's assembly to the valve.
 2. Travel limit sensing shall be provided to de-energize the motor control circuit when the actuator reaches the limits of travel in the open and close directions. The position encoder shall be "in step" with the actuator output drive at all times in either the electrical or manual mode of operation with or without power. A minimum of four (4) contacts, two (2) normally open and two (2) normally closed, shall be supplied at each end of valve travel. When specified, four (4) additional contacts can be provided to report end of travel or any desired position between ends of travel. All contacts shall be programmable to give indication other than position such as over-torque condition or motor thermostat trip if desired.
- I. Modulating actuators shall have a position feedback circuit. The feedback position signal shall be a 4-20 mA signal corresponding to valve position. Modulating valve actuators shall be designed to respond to either a 4-20mADC analog signal or a digital pulse signal as specified herein or as required to coordinate with the requirements of Division 17.
1. Modulating valve actuators designed to respond to a 4-20mADC signal shall be provided with a valve positioner which shall position the valve proportional to an externally generated 4-20mADC signal. The valve positioning control circuitry shall position the valve by comparing the command signal with the present valve position as indicated by the feedback potentiometer. The positioner shall be field adjustable to fail to the "open," "closed," or "last" position upon loss of 4-20 mADC command signal.
 2. Modulating valve actuators designed to respond to "pulse" open/close signals shall operate the valve during the time the open or close pulse signal is high. Modulating actuators designed to respond to "pulse" open/close signals shall have the latching circuitry described above for open/close actuators disabled. Fused safety switches furnished and installed by the Electrical Contractor shall provide short-circuit and overload protection for the power supply to the actuators.
- J. The electrical terminals shall be housed in a double sealed terminal compartment isolated from the rest of the actuator components. The actuators shall be designed to operate from a single 480VAC, 3-phase source. A minimum quantity of two – 3/4-inch NPT conduit entries shall be furnished.
- K. Actuators shall contain wiring and terminals for the following control functions. All dry contacts shall be rated for 5A at 120VAC.
1. Open, Close, and Stop commands from external dry contacts (utilizing internal 24VDC 120VAC power supply) and/or from an external signal of 20V to 120V. The inputs for the open, close, stop signals shall be field selectable to be respond to either maintained or momentary remote signals. In momentary mode, the actuator shall have internal latching circuitry that causes the operator to drive the valve to its limit of travel upon receipt of the momentary contact signal unless a stop signal is received.

EXHIBIT A

2. Emergency override input from a normally closed or normally open contact. The actuator shall either open or close (field selectable) upon receiving the emergency override input.
3. Remote Local-Off-Remote selector switch, Open/Close pushbuttons, and Open/Closed pilot lights for a remote manual control station (see below). The remote Local-Off-Remote selector switch and Open/Close pushbuttons shall be a dry contact input to the actuator control circuitry. The Open/Closed pilot lights shall be powered from the valve actuator control power.
4. Four (4) unpowered contacts shall be provided which can be selected to indicate valve "Opened" and "Closed" position, "Remote" status of the actuator, and "Fail" status of the actuator. The fail status contacts shall activate upon motor overtemperature, phase-loss and actuator overtorque (minimum).
5. Terminals for 4-20mADC position command and 4-20mADC position feedback as described above for modulating actuators.

L. Local Controls

1. Actuators shall be furnished with a Local-Off-Remote selector switch; Open-Close selector switch for local control; a red lamp indicating closed and a green lamp indicating open. L-O-R selector switch shall be padlockable in any of the three positions. Rubber booted pushbuttons shall not be used.
 - a. When the LOR is in the "Local" position, open/close control shall be by the open and close selector switch on the actuator. Moving the LOR to the "Off" position shall stop the actuator travel.
 - b. When the LOR is in the "Off" position, the actuator shall not operate.
 - c. When the LOR is in the "Remote" position, the actuator shall be controlled by remote inputs from the PLC or from the remote manual control station.
2. The local controls shall be arranged so that the direction of travel can be reversed without the necessity of stopping the actuator.

M. Actuator I/O Signals: The following analog and discrete I/O shall be made available in the actuator to display the actuator status and alarms as the following:

1. Valve position (0-100%)
2. Valve position command (0-100%)
3. OPEN Command
4. CLOSE Command
5. Actuator pulse (Allows valve time of travel to be increased/reduced)
6. REMOTE selected (Indicates L-O-R switch is in the REMOTE position)

EXHIBIT A

7. OPEN position indication (Valve is in open position)
8. CLOSE position indication
9. FAIL alarm

PART 3 -- EXECUTION

3.01 MANUFACTURER' S FIELD SERVICES

- A. The services of a qualified manufacturer's technical representative shall be provided in accordance with Section 11000 - Equipment General Provisions and shall include the following site visits for electric actuators:

Service	Number of Trips	Number of Days/Trip
Installation and Testing	2	2
Startup and Training	4	4

3.02 INSTALLATION

- A. All valve actuators shall be installed in accordance with the manufacturer's published recommendations and the applicable specification sections for valves, and motor controls.
- B. Valve actuators shall be factory coated in accordance with the manufacturer' s standard paint system.

3.03 SHOP TESTING

- A. Shop testing shall be in accordance with Section 11000 - Equipment General Provisions and with the following additional requirements:
1. Conduct a complete functional check of each unit. The actuator manufacturer shall correct any deficiencies found in shop testing prior to shipment.
 2. Submit written certification that:
 - a. Shop tests for the electrical system and all controls were successfully conducted;
 - b. Electrical system and all controls provide the functions specified and required for proper operation of the valve operator system.
 3. Each actuator shall be performance tested and individual test certificates shall be supplied free of charge. The test equipment shall simulate each typical valve load and the following parameters should be recorded:
 - a. Current at maximum torque setting
 - b. Torque at maximum torque setting

EXHIBIT A

- c. Flash Test Voltage
- d. Actuator Output Speed or Operating Time
- e. In addition, the test certificate should record details of specification, such as gear ratios for both manual and automatic drive, closing direction, and wiring diagram code number.
- f. Verification of actuator torque rating with valve.

3.04 FIELD TESTS

A. Field testing shall be in accordance with Section 11000 - Equipment General Provisions and with the following additional requirements:

- 1. Valve actuators shall be field-tested together with the associated valves.
- 2. Test all valves at the operating pressures at which the particular line will be used.
- 3. Test all valves for control operation as directed.
- 4. Field testing shall include optimization of opening and closing times of the valves. Valve opening and closing times shall be adjusted based on process requirements to optimize operation of the valves. Final valve opening and closing times as determined by field tests shall be approved by the Engineer prior to final acceptance of the system.

B. Preliminary Field Tests

- 1. General: Preliminary field tests shall be conducted prior to start-up and shall include a functional check of the entire valve operator system and all system components.
- 2. Scope: Preliminary field tests shall demonstrate that the valve operator system performs according to specifications and that all equipment, valves, controls, alarms, interlocks, etc., function properly.
- 3. Based on results of preliminary field tests, the Contractor shall make any adjustments required to settings, etc., to achieve the required valve closing time and operation, as specified or otherwise directed.

C. Final Field Tests

- 1. Final field tests shall be conducted in accordance with the latest revision of AWWA C500.
- 2. Final field tests shall be conducted simultaneously with the start-up and field testing of the pumps.
- 3. Final field tests shall be conducted for the full range of operating modes and conditions specified and as directed by the Engineer. Each of the valves shall be tested at minimum, maximum, and normal head/flow conditions, and under all

EXHIBIT A

specified conditions of opening and closing.

4. Certification of Equipment Compliance: After the final field tests are completed and passed, submit affidavit according to Section 11000 - Equipment General Provisions.

- END OF SECTION -

EXHIBIT A

SECTION 15101

BUTTERFLY VALVES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

- A. Reference Section 15000 - Basic Mechanical Requirements, and Section 15095 – Valves, General.

PART 2 -- PRODUCTS

2.01 BUTTERFLY VALVES

- A. Butterfly valves (water service) shall be of the rubber-seated, tight-closing type conforming to the latest revision of AWWA C504 Specifications. The manufacturer shall have a minimum of 5 years experience in manufacturing butterfly valves of the sizes required in accordance with AWWA C504 Specifications. All butterfly valves shall be the product of one manufacturer. Butterfly valves shall be as manufactured by DeZurik, Mueller Co., Pratt or equal. Each valve shall be performance and leak tested as specified in AWWA C504 revised as follows: In addition to the testing requirements of AWWA C504, each butterfly valve shall be thoroughly cleaned and opened and closed at least three (3) times prior to testing. Certified copies of the test results shall be submitted to the Engineer for approval prior to shipment of the valve.
- B. Butterfly valves shall be Class 150B, unless otherwise indicated in the valve schedules, and of the short body design.
- C. Valve bodies shall be epoxy coated cast iron conforming to ASTM A-126, Grade B, ASTM A-48, Class 40 or Ductile Iron ASTM A536, Grade 65-45-12. Where required to meet design operating conditions, valve bodies shall be manufactured of higher strength materials. Valve bodies shall have integral hubs for housing shaft bearings and seals.
- D. Butterfly valves shall be of the concentric or eccentric shaft types. Valve discs shall be constructed of epoxy coated ductile iron, ASTM A536, Grade 65-45-12. Disks shall be of the "offset" design to provide a full 360 degree seating surface with no external ribs transverse to flow, and shall comply with the latest revision of AWWA C504 Specifications. The valve manufacturer shall furnish Shop Drawings which include end clearance dimensions when the disc is in the full open position.
- E. The resilient valve seat shall be synthetic rubber designed to seat against a pressure differential of 150 psi on either side of the valve, unless otherwise indicated. The resilient seat shall be mechanically attached to the valve disc or valve body. Any required seat attachment hardware shall be stainless steel. The resilient seat shall be capable of being adjusted or replaced in the field without moving the valve disc along the shaft axis, or removing the valve from the line. The mating seat surface shall be stainless steel or monel. The seats shall be factory tested as per AWWA C504 at a test pressure of 150 psig, unless otherwise indicated, and post adjusted for differential pressures indicated herein.

EXHIBIT A

- F. Valve shafts shall be one-piece or two-piece units of stainless steel construction suitably sized to transmit the torques required to operate the valves under the conditions listed in the valve schedule with appropriate safety factor. Shafts shall be securely attached to valve disc by means of conservatively sized corrosion-resistant taper pins, threaded at one end and secured with lockwashers and nuts (i.e.: mechanically attached). Provide O-ring seal on taper pin if required to prevent leakage. Shaft key shall be constructed of corrosion-resistant material.
- G. Shaft bearings shall be contained in the integral hubs of the valve body and shall be the permanently self-lubricated, corrosion resistant, sleeve type of teflon or heavy-duty bronze. The valve assembly shall be furnished with a factory set two-way thrust bearing designed to center the valve disc in the valve seat at all times. End cover bolts shall be of stainless steel construction.
- H. The shaft seal shall be either the bronze cartridge type with at least two O-rings, monolithic V-Type, or pull down packing type. If monolithic V-Type or pull down packings are utilized, it shall be self-adjusting, self-compensating type. Packing shall be as manufactured by Chevron, or equal. Butterfly valves with pull down packings shall be designed with an extension bonnet so that repacking can be done without removal of the actuator. For buried valves with pull down packing the packing gland cover assembly shall be heavy duty, soil and water resistant. Stuffing boxes for pull down packing shall have a depth sufficient to accept at least four rings of self-compensating type packing specifically selected for the operating pressures to be encountered. Stuffing box bolts, studs and nuts shall be stainless steel.
- I. The "O" ring type shaft seal shall be contained in a removable bronze cartridge. The bronze cartridge shall be manufactured from ASTM B505 copper alloy UNS #C93200 and shall meet the requirements of AWWA C504 for bronze, Grade E. The "O" ring material shall be nitrile, BUNA-N rubber, as intended for use with potable water or wastewater and per ASTM D-2000 with a hardness of 70 Shore A Durometer.
- J. Manual operators for butterfly valves 18-inches in diameter or larger shall be the worm gear type conforming to AWWA C504. Manual operators for butterfly valves mounted above 6 feet from the operating floor shall be equipped with worm gear chainwheel actuators. Operators shall be equipped with adjustable AWWA limit stops, shall be sized according to Table IV for Class 150B, and shall require a minimum of 15 turns for 90 degrees or full stem valve travel. The capacity of the manual operator shall be adequate to drive the valve under the differential pressure of 150 psi and maximum anticipated flow, unless otherwise indicated in the appropriate valve schedule.
- K. The manufacturer shall certify that the butterfly valves are capable of operating in continuous duty service under these pressures and flow conditions.
- L. Each valve shall be hydrostatically tested and tested for bubble tightness after the operator has been mounted and adjusted. Copies of the hydrostatic and leakage test certification and certification of conformance shall be submitted to the Engineer prior to shipment.
- M. All internal and external ferrous components and surfaces of the valves, with the exception of stainless steel and finished or bearing surfaces, shall be shop painted with two coats (10 mils min. dry film thickness) of the manufacturer's premium epoxy for corrosion resistance. Damaged surfaces shall be repaired in accordance with the manufacturer's recommendations.

EXHIBIT A

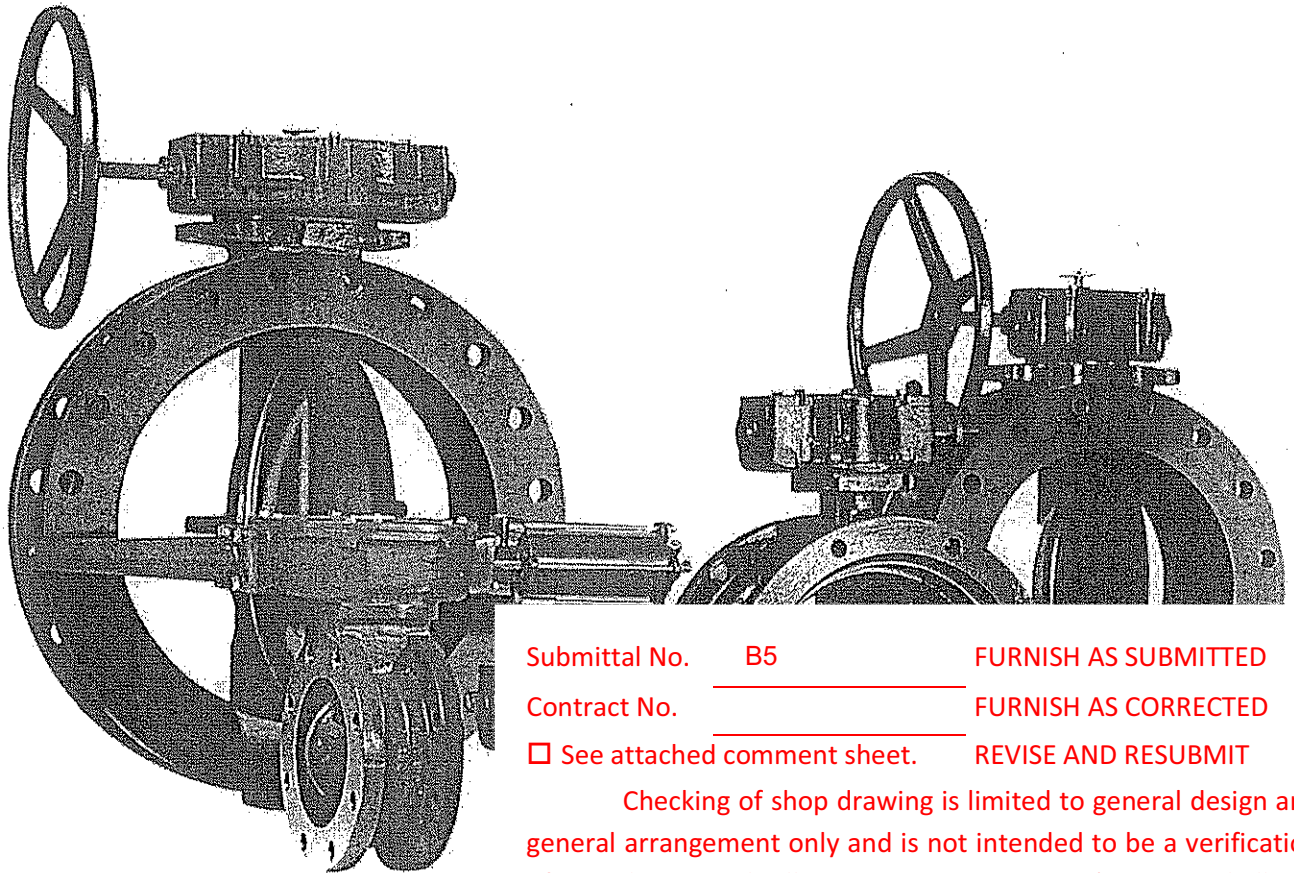
PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -



AWWA BUTTERFLY VALVES TECHNICAL SPECIFICATIONS



Submittal No. B5 FURNISH AS SUBMITTED
 Contract No. FURNISH AS CORRECTED
 See attached comment sheet. REVISE AND RESUBMIT

Checking of shop drawing is limited to general design and general arrangement only and is not intended to be a verification of compliance with all requirements. Engineer's review shall not relieve the Contractor from the responsibility of details of design, correct dimensions for proper fitting, the satisfactory and safe performance of the work, coordination with others' performance, or any other requirements of the Contract.

HAZEN AND SAWYER, P.C.

BY: John Koroshec and Tony Cattaneo
 DATE: May 31, 2011

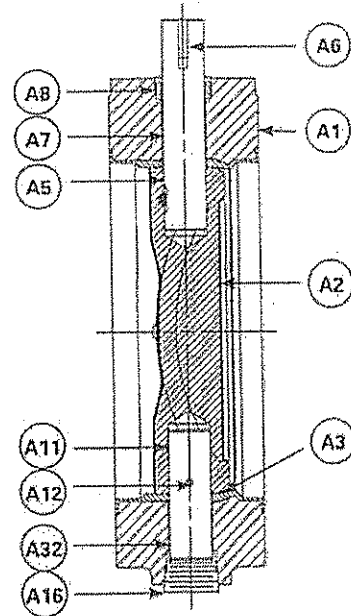
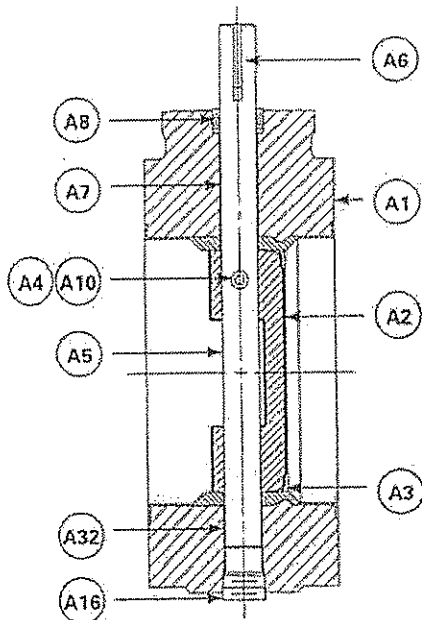
PI # B5

(MOV 130)
(Open/Close operation)

Materials of Construction

3-16" (80-400mm)

18 & 20" (450 & 500mm)



3-20" (80-500mm) Valve Sizes

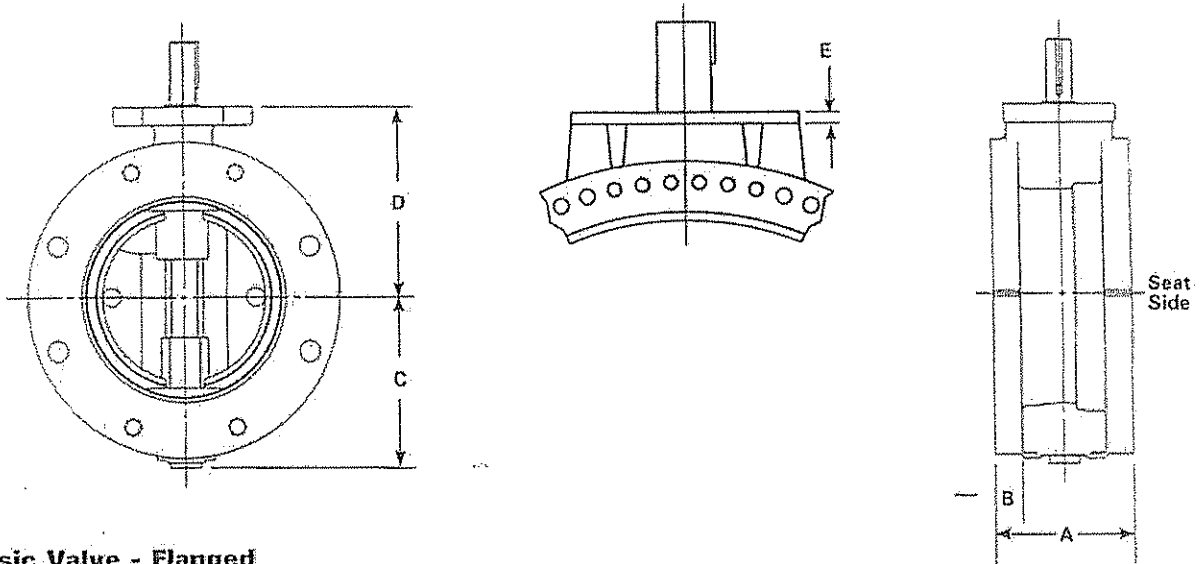
Item	Description	Material
A1	Body NBR or EPDM seat is permanently bonded to the body	Cast Iron ASTM A126 Class B Ductile Iron ASTM A536 Grade 65-45-12
A2	Disc:	Cast Iron ASTM A48 Class 40C Ductile Iron ASTM A536 Grade 65-45-12 316 Stainless Steel, ASTM A276, Type CF8M
A3	Disc Seating Edge	316 Stainless Steel, ASTM A276, Type 316
A4	Tangential Pin 14-20" (350-500mm)	316 Stainless Steel, ASTM A276, Type 316 (250B) 17-4 PH Stainless Steel, H1100
A5	Shaft 3-16" (80-400mm) Upper Shaft 18-20" (450-500mm)	304 Stainless Steel, ASTM A276, Type 304 316 Stainless Steel, ASTM A276, Type 316 17-4 PH Stainless Steel, ASTM A564, Type 630 Condition 1150
A6	Key	Steel AISI 1018
A7	Upper Journal Bearing	Nylon and Molybdenum Disulphide Composition (NBR Seat) PTFE (EPDM Seat) (250B) Teflon/Dacron Fabric Liner, Fiberglass back-up shell
A8	Packing	Acrylonitrile Butadiene (NBR Seat) Ethylene Propylene Diene Terpolymer (EPDM Seat)
A10	Torque Screw 3-12" (80-300mm)	304 Stainless Steel, ASTM A276, Type 304 (250B) 17-4 PH Stainless Steel, Condition 1100
A10	Set Screw 14-20" (350-500mm)	18-8 Stainless Steel
A11	Lower Shaft 18-20" (450-500mm)	304 Stainless Steel, ASTM A276, Type 304 316 Stainless Steel, ASTM A276, Type 316 17-4 PH Stainless Steel, ASTM A564, Type 630 Condition 1150
A12	Set Screw 18-20" (450-500mm)	18-8 Stainless Steel
A16	Plug 3-20" (80-500mm)	3-8" (80-200mm) Carbon Steel, SAE J403, Grade 1008/1010 10-20" (250-500mm) Malleable Iron, ASTM A47-52 Grade 35018 (250B, 3-6" (80-150mm)) Carbon Steel, SAE J403, Grade 1008/1010 (250B, 8-20" (200-500mm)) Malleable Iron, ASTM A47-52 Grade 35018
A32	Lower Journal Bearing	Nylon and Molybdenum Disulphide Composition (NBR Seat) PTFE (EPDM Seat) (250B) Teflon/Dacron Fabric Liner, Fiberglass back-up shell

Provide epoxy coated disc per Specification Section 15101-2.01.D

Provide PTFE per Specification Section 15101-2.01.G

EXHIBIT A

Dimensions



Basic Valve - Flanged

Valve Size	A		B		C		D		E
	25A, 75B & 150B*	250B	25A, 75B & 150B*	250B	25A, 75B & 150B*	250B	25A, 75B & 150B*	250B	250B Only
3" 80mm	5.00 127	5.00 127	.81 21	1.19 30	4.00 102	4.12** 105	4.81 122	4.81 122	-
4" 100mm	5.00 127	5.00 127	1.00 25	1.31 33	4.75 121	5.00** 127	5.56 141	5.56 141	-
6" 150mm	5.00 127	5.00 127	1.06 27	1.50 38	6.03 153	6.25** 159	7.00 178	7.00 178	-
8" 200mm	5.00 152	6.00 152	1.19 30	1.69 43	7.16 182	7.50** 191	8.31 211	8.31 211	-
10" 250mm	8.00 203	8.00 203	1.25 32	1.92 50	8.38 213	8.75** 222	9.50 241	9.50 241	-
12" 300mm	8.00 203	8.00 203	1.31 33	2.03 53	9.66 245	10.25** 260	11.00 279	11.00 279	-
14" 350mm	8.00 203	8.00 203	1.47 37	2.25 57	10.91 277	11.50** 292	11.50 292	11.50 292	-
16" 400mm	8.00 203	8.00 203	1.53 39	2.38 60	12.08 306	12.75** 324	12.75 324	12.75 324	-
18" 450mm	8.00 203	8.00 203	1.66 42	2.50 64	14.03 356	14.50 368	13.50 343	14.00 356	-
20" 500mm	8.00 203	8.00 203	1.78 45	2.63 67	15.02 382	17.50 445	15.25 387	15.25 387	-
24" 600mm	8.00 203	12.00 305	1.92 50	2.91 74	19.00 483	20.19 513	18.41 469	19.50 495	-
30" 750mm	12.00 305	12.00 305	2.25 57	3.13 80	23.00 584	23.75 603	22.62 575	21.75 552	1.25 32
36" 900mm	12.00 305	15.00 381	2.50 64	3.50 89	27.38 696	27.88 695	25.62 651	25.62 651	1.25 32
42" 1100mm	12.00 305	15.00 381	2.75 70	3.81 97	30.91 785	30.91 785	30.42 773	30.42 773	1.25 32
48" 1200mm	15.00 381	15.00 381	2.88 73	4.13 105	35.38 899	35.38 899	33.00 838	33.00 838	1.25 32

Inches
Millimeter

Contact Sartell Valves, Inc. for dimensions on valve sizes 54" (1400mm) and larger.
*Available in AWWA Class 250B when ordered with 17-4 Shaft and 250 psi bearings.
**Flange length exceeds thrust bearing cover in these valve sizes.

Note: All dimensions are subject to change without notice. Request certified drawings for use in preparing piping layouts.

Cv/Kv Values

Class 150B

Valve Size	100% Cv/Kv	
	Flat Cv/Kv	Dome Cv/Kv
2" / 50mm	362 / 313	359 / 308
4" / 100mm	658 / 569	656 / 559
6" / 150mm	1,382 / 1,194	1,369 / 1,176
8" / 200mm	2,440 / 2,111	2,290 / 2,067
10" / 250mm	3,910 / 3,382	3,840 / 3,322
12" / 300mm	5,730 / 4,960	5,630 / 4,870
14" / 350mm	7,890 / 6,782	7,700 / 6,661
16" / 400mm	10,200 / 8,823	9,980 / 8,633
18" / 450mm	12,600 / 10,899	12,400 / 10,726
20" / 500mm	15,900 / 13,667	15,500 / 13,408
24" / 600mm	22,960 / 19,809	22,500 / 19,463

Class 25A, 75B, 150B

Valve Size	100% Cv/Kv	
	Flat Cv/Kv	Dome Cv/Kv
30" / 750mm	35,500 / 31,573	35,000 / 31,054
36" / 900mm	53,200 / 46,018	52,300 / 45,240
42" / 1100mm	73,100 / 63,282	71,800 / 62,107
48" / 1200mm	109,000 / 94,285	107,000 / 89,099
54" / 1400mm	140,000 / 121,100	137,000 / 118,315
60" / 1500mm	173,000 / 149,645	169,000 / 146,995
66" / 1700mm	210,000 / 181,650	205,000 / 177,270
72" / 1800mm	250,000 / 216,250	245,000 / 204,140

% Open vs. % Cv/Kv 3-42" (80-1100mm)

% Open	Flat % Cv/Kv	Dome % Cv/Kv
10	3	3
15	4	4
20	6	5
25	8	7
30	10	9
35	12	11
40	15	14
45	19	18
50	23	22
55	28	27
60	35	34
65	42	41
70	49	48
75	55	54
80	61	60
85	69	67
90	79	77
95	91	89
100	100	100

48-72" (1200-1800mm)

% Open	Flat % Cv/Kv	Dome % Cv/Kv
10	1	2
15	2	2
20	4	3
25	5	4
30	6	6
35	7	8
40	8	10
45	13	14
50	15	18
55	18	22
60	23	27
65	26	33
70	35	41
75	44	49
80	55	59
85	67	71
90	79	84
95	96	96
100	100	100

Contact Sartell Valves, Inc. for Cv/Kv Values on 78-120" (2000-3000mm) valves and for Class 250B.

Applicable Standards

DeZURIK Water Controls AWWA valves are in conformance with the industry standards listed below.

Valves conform to AWWA Standard ANSI/AWWA C-504, Rubber-Seated Butterfly Valves.

Dimensions and drilling of flanged end connections conform to Class 125 sections of ASME/ANSI B16.1, Cast Iron Pipe Flanges and Flanged Fittings.

Mechanical-Joint bell dimensions conform to ANSI/AWWA C111/A21.11, Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.

Bonding of 3" (80mm) through 20" (600mm) seat conforms to ASTM D429, Standard Test Methods for Rubber Property — Adhesion to Rigid Substrates.

Ozone resistance of seat material conforms to ASTM D1149, Standard Test Method for Rubber Deterioration — Surface Ozone Cracking in a Chamber.

Seat material volume increase is less than 2% after immersion in distilled water for 70 hours, when tested in accordance with ASTM D471, Standard Test Method for Rubber Property — Effect of Liquids.

Materials conform to standards as listed in the Materials of Construction.



675 Mile Crossing Blvd.
Rochester, NY 14624
phone: (585) 328-1650
fax: (585) 328-5846

Project Name: City of Naples ASR Wells A & B

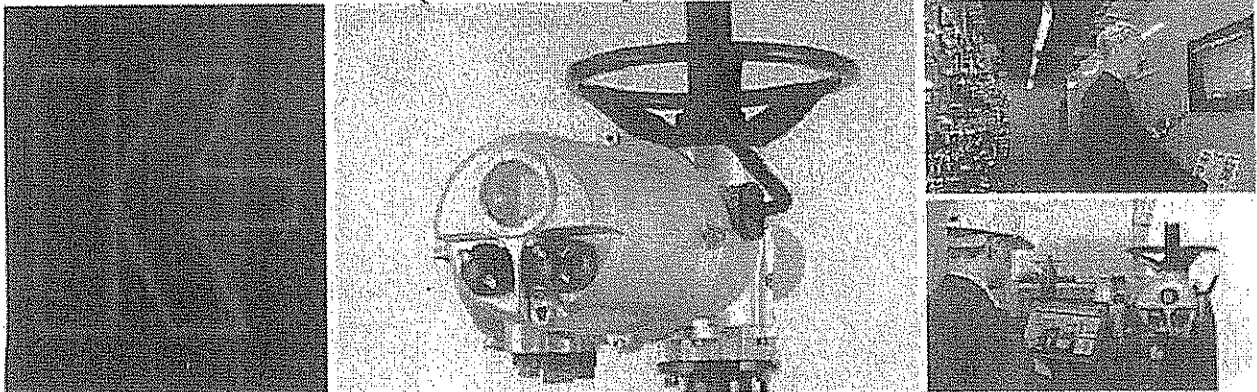
Contract Number: T.B.A.

Contract Section: Div. 15

Date: 4/7/2011

Rotork Customer: FLUID CONTROL SPECIALTIES

The Rotork IQ range



a new generation of intelligent, non-intrusive 3-phase electric valve actuators

Purchase Order No.: T.B.A.

Rotork Job No.: T.B.A.

Consulting Engineer:

Contractor:



675 Mile Crossing Blvd. 14624
Rochester, NY
phone: (585) 328-1550
fax: (585) 328-5848

Rotork Scope Document

T.B.A.

Date: 4/7/2011

LINE ITEM	UNIT QTY.	CUSTOMER PART No.	ACTUATOR MODEL No.	SERVICE	WIRING DIAGRAM	TAG(S)
1	1	16" AWWA-BFV	IQT500FA10	Isolating	6000-000	

rotorik



Electric Motor Actuator Data Sheet

T.B.A.

Line: 1

Date:	4/7/2011
Contract Eng.:	
Project:	City of Naples ASR
Consultant:	
MOV Tag No.'s:	
Shop Drawing:	See attached

CUSTOMER DATA

Name:	FLUID CONTROL SPECIALTIES
P.O. No.:	T.B.A.
P.O. Item:	1
Cust. Part Number:	16" AWWA BFV

VALVE DATA

Make:	DeZURIK
Size:	16"
Type:	AWWA BFV
Class:	150B

ACTUATOR DATA

Model No.:	IQT500
Base:	FA10
Actuator Weight:	49 lbs
Enclosure:	NEMA 4/6
Rated Torque:	369 lbft
Wiring Diagram:	6000-000
Operating Time:	15-60 seconds

Handwheel:	Standard Handwheel
Paint Spec.:	Polyester Powder Coating
Conduit 1:	ASA 0.75"
Conduit 2:	ASA 0.75"
Conduit 3:	None
Conduit 4:	None
Lubrication:	STD
Operating Temp.:	-30 +70 C

MOTOR DATA

Rated Load Amps:	0.9 A
Nominal Load Amps:	0.9 A
Nom. Motor HP:	0.44
Supply V/Ph/Hz:	480V / 3Ph / 60Hz

Insulation Class/Duty:	F / 15 min.
Service Factor:	1
Type:	Totally Enclosed Non-Ventilated

ROTORK IQT500 DETAILS

- *Double sealed watertight enclosure to IEC529, IP68 (BS EN 60529), NEMA 4 & 6
- *Terminal box with three threaded cable entries
- *Integral controls
- *Non-intrusive commissioning and control configuration using the supplied infra-red IQ setting tool
- *Integral illuminated, digital valve position indicator showing 1% increments in valve position with closed and open valve limit symbols
- *Three LEDs for local indication, red-open, yellow-intermediate, green-closed
- *Datalogger which logs operational data and valve/actuator torque profiles
- *Operating time (15 – 60 Seconds, field adjustable)

WIRING DIAGRAM

Wiring diagram 6000-000 is described in publication E120E and includes

- *Control circuit transformer / integral reversing contactors
- *Integral local control and local/remote selectors
- *Four user configurable indication contacts
- *Monitor relay with changeover contact
- *Automatic phase rotation correction
- *Continuous local indication in 1% increments by LCD display

LOCAL INDICATION

A back-lit liquid crystal display gives digital indication from fully open to fully closed in 1% increments. Three LEDs colored red, green and yellow for indication of open, closed and intermediate positions respectively are also provided. The display includes four icons for rapid diagnosis of valve alarm, actuator alarm, control system alarm and actuator battery status. With the supplied IQ setting tool, actuator torque plus position can be displayed allowing the valve torque against position to be monitored in real time. Help screen diagnosis is available for monitoring valve, actuator and control system status. The local display can be rotated to suit actuator orientation. LED colors can be reversed. Please specify with order.

LOCAL CONTROLS

Non-intrusive selectors are provided on the actuator electrical control cover, one for Local/Stop/Remote selection, pad-lockable in each position, and the other for Open/Close control. Controls may be rotated to suit actuator orientation. Local control may be selected to operate using the supplied IQ setting tool. The setting tool incorporates dedicated open, stop and close buttons and will operate over a nominal distance of 0.75 meters from the display window.

ENCLOSURE

Enclosure is watertight to NEMA 4, 4X and 6, IEC 60529 (1989-11) IP68- submersion 7 meters/72

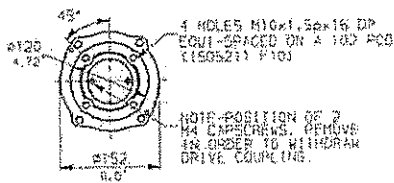
POWER SUPPLY

480/3/60

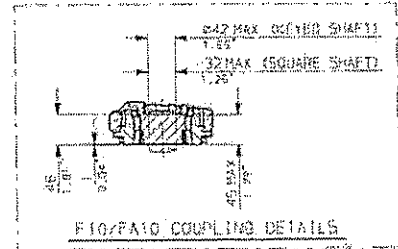
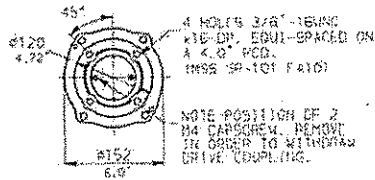
IQT125, 250 & 500 BASES

F10 / FA10 BASES

F10 BASE DETAILS

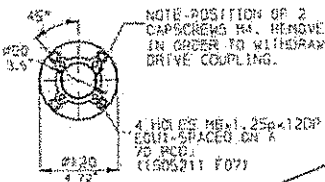


FA10 BASE DETAILS

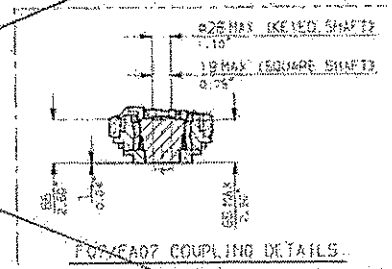
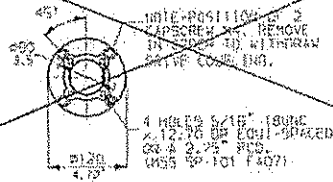


F07 / FA07 BASES

F07 BASE DETAILS

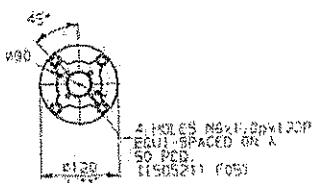


FA07 BASE DETAILS

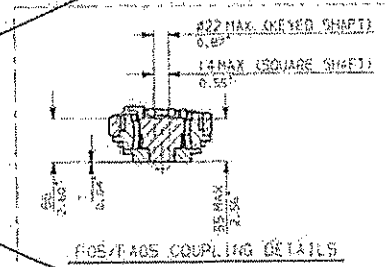
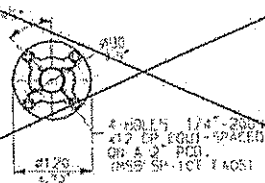


F05 / FA05 BASES

F05 BASE DETAILS



FA05 BASE DETAILS

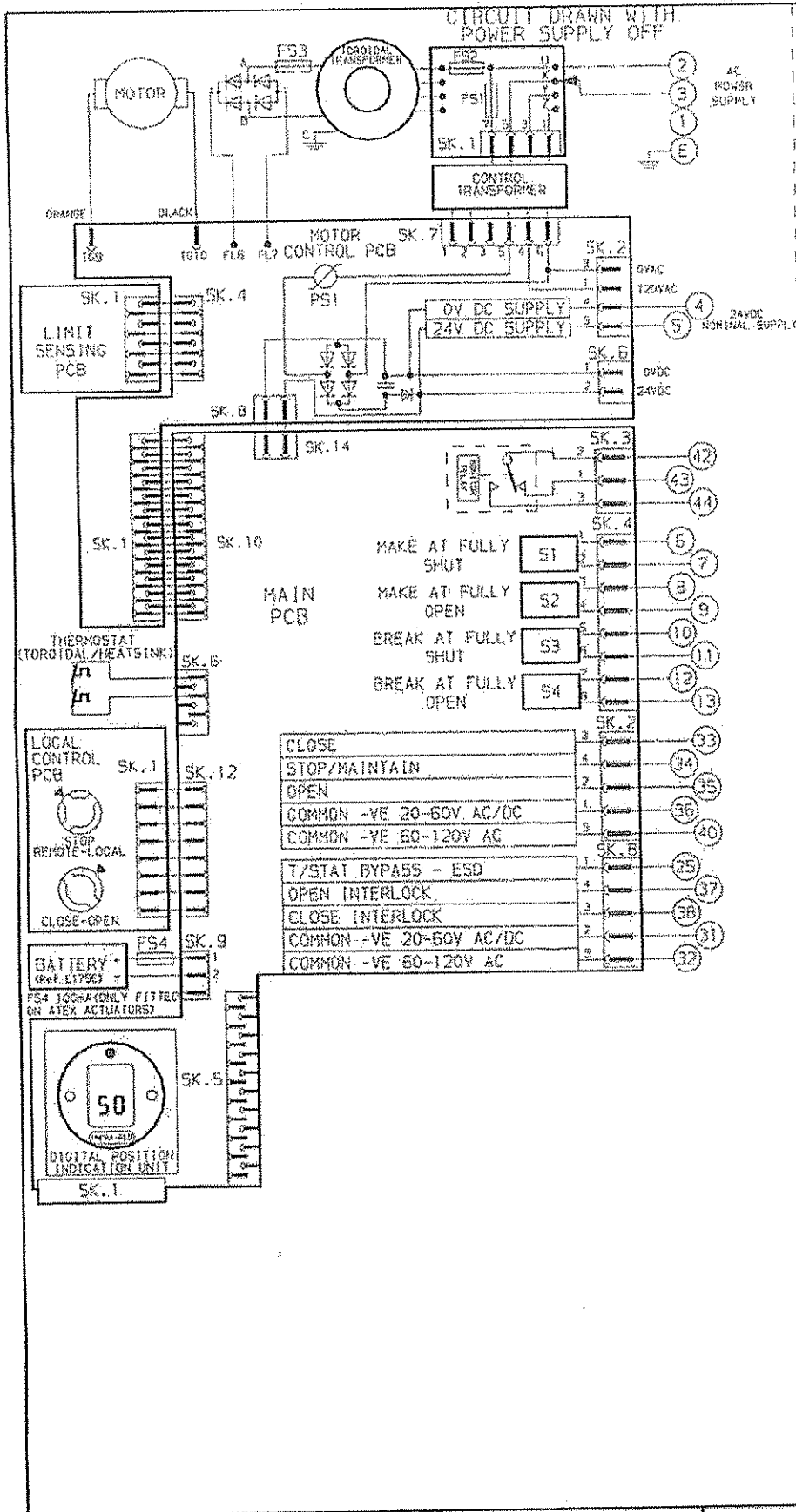


rotork

IQT125, 250, 500 BASES

Date 200803 Scale 1:10

EXHIBIT A



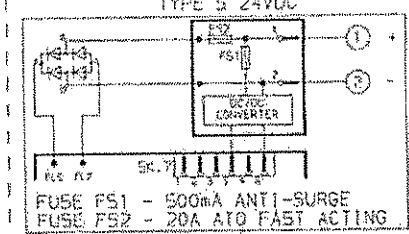
FOR TYPICAL REMOTE CONTROL DETAILS SEE DOCUMENT RWS300

TRANSFORMER TAPPING OPTIONS

TYPE 1		TYPE 2	
TAP	RANGE	TAP	RANGE
X	100 80-120	X	200 160-240
Y	110 88-132	Y	230 184-276
Z	120 96-144	Z	270 216-324
FS1-250mA A/S FS2-5A A/S		FS1-150mA A/S FS2-1.5A A/S	

TYPE 3		TYPE 4	
TAP	RANGE	TAP	RANGE
X	380 304-456	X	480 384-576
Y	400 320-480	Y	575 460-690
Z	415 332-498	Z	690 552-828
FS1-100mA A/S FS2-1.5A A/S		FS1-50mA A/S FS2-1.6A A/S	

TRANSFORMER TYPES 1, 2, 3 & 4 - FUSE FS3 - 20A ATO FAST ACTING



ALL TRANSFORMER TYPES - FS1 SELF RESETTING FUSE

NOTE

REFER TO PUBLICATION E175E FOR APPROVED FUSES FS1, FS2 AND FS3.
MAX EXTERNAL LOAD ON TERMINALS 4 & 5 TO BE 5W.

CONTROL SIGNAL THRESHOLD VOLTAGES TO BE MINIMUM 'ON' 20V AC/DC
MAXIMUM 'OFF' = 3V
MINIMUM CONTROL SIGNAL DURATION TO BE 300MS.

CURRENT DRAWN FROM EACH REMOTE CONTROL SIGNAL IS 5mA ON 24V DC OR 12mA ON 120V AC
WIRES ARE IDENTIFIED AT EACH END BY TERMINAL No. OR TAG No.

INDICATION CONTACTS S1-S4 ARE SHOWN IN THEIR DEFAULT CONFIGURATION. CONTACTS MAY BE CONFIGURED FOR ANY OF THE FUNCTIONS DESCRIBED IN E175E

No 02	DATE 080903	REVISION DETAILS NTR CONNECTION NOTE REMOVED P.J.W CHECKED F.H	www.rotork.com		CONFIG BY PJW	IQT BASIC	
			ROTOROK CONTROLS LTD BATH, BA1 3JQ ENGLAND Tel: 01225-733200	ROTOROK CONTROLS INC ROCHESTER NY 14624, USA Tel: 989-328-1550	DATE 160703 CHECKED TH BASE WD 6000-000 JOB No - M.I.No -		
						CIRCUIT DIAGRAM No -REV 6000-000-02 B1 C1 B2 C2	

rotork technical report

Number: TR1403
Revision: 0

Page 1 of 8
Date: 11.02.04

Title: IQT 500 Actuator Life Test.

Circulation Copy:

RIMS System

Synopsis Only:

Revision 0

Prepared	Checked	Approved
B Clothier	G Beeho	A.Landa

Revision 1

Prepared	Checked	Approved
----------	---------	----------

Revision Notes:

SYNOPSIS

This Actuator life test was carried out as part of the IQT Project test programme:

The unit under test was built to Production specification and was assembled using stock production components:

The Actuator successfully completed the Rotork life test and is suitable for production.

CONTENTS

1. Object
 2. Introduction
 3. Equipment Under Test
 4. Test Equipment
 5. Procedure
 6. Test Results
 7. Conclusion
- Appendix 1 - Photographs

rotork technical report

Number: TR1403

Page 3 of 8

Revision: 0

Date: 11.02.04

1. OBJECT

To confirm that all mechanical parts are capable of completing a Life Test and thus in turn confirm that this size of IQT is suitable for production.

2. INTRODUCTION

In the Development phase of the IQT actuator, all life tests were conducted using prototype components. As part of the test programme it had to be established that the production actuators and their components would complete a standard Rotork type and life test

3. UNIT UNDER TEST

Actuator Type:	IQT500	Actuator Operation Time:	15secs
Power Supply:	415/3/50Hz	Rated Torque:	500 N.M
Wiring diagram:	6000-000		

4. TEST EQUIPMENT

Test rig Q6
Torque Transducer T48
Transducer Indicator: - Tinsley S/No 7247

5. PROCEDURE

The actuator was assembled then calibrated on test rig T48.

The actuator was then set to run the Life test with the following parameters;

Open and Close torque trip against the gearcase stops at 100% rated torque

Load throughout travel, 75% of rated torque

Operating duty cycle 50%.

Life Target 25000 cycles (1 cycle being Open to Close to Open or vice versa)

The Hand drive engagement and disengagement was checked at various times.

6. TEST RESULTS

Calibration details: Clk offset 188
A/clk offset 182
Clk Scaling 103
A/Clk Scaling 96
Input Range 0

Actual set torque Open 550 Nm Close 555 Nm

The actuator completed the required 25000 cycles with no problems arising.

rotork technical report

Number: TR1403

Page 4 of 8

Revision: 0

Date: 11.02.04

Torque values at the end of Life Test:

Open 511 Nm, 550 Nm, 600 Nm. Average torque 550 Nm

Closed 511 Nm, 561 Nm, 537 Nm Average torque 536 Nm

Hand engagement/disengagement was checked numerous times during the test and worked satisfactorily every time.

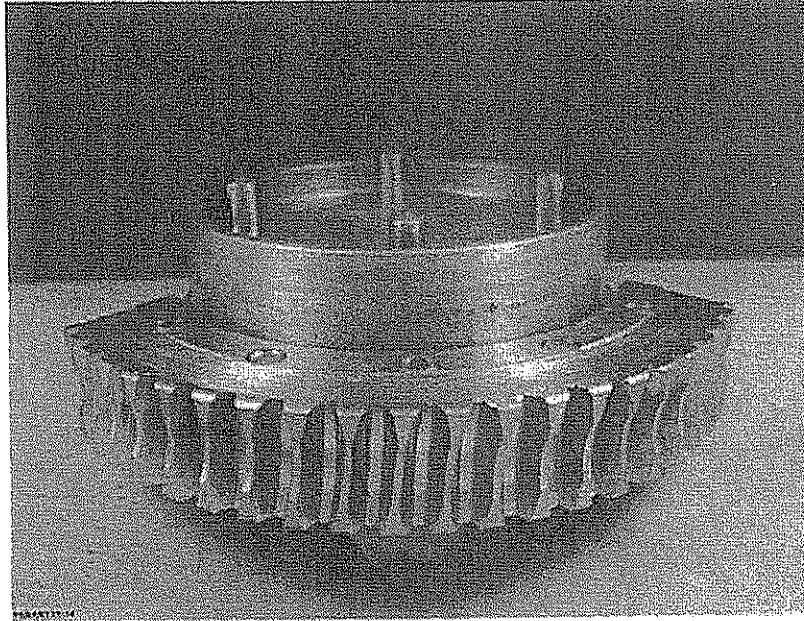
The actuator was dismantled visually inspected and parts photographed.

The actuator components were still in very good condition.

7. CONCLUSION

The Actuator successfully completed the Rotork life test and is suitable for production.

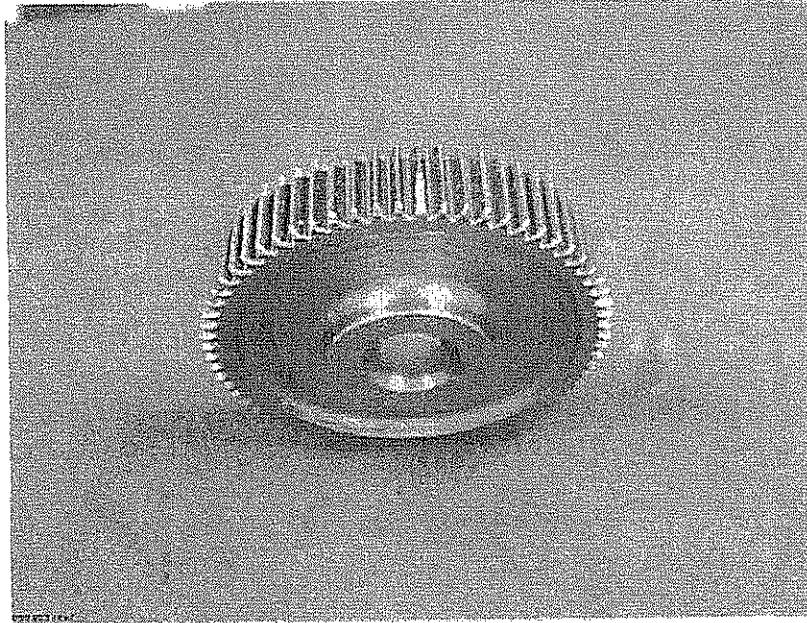
APPENDIX 1
Photographs



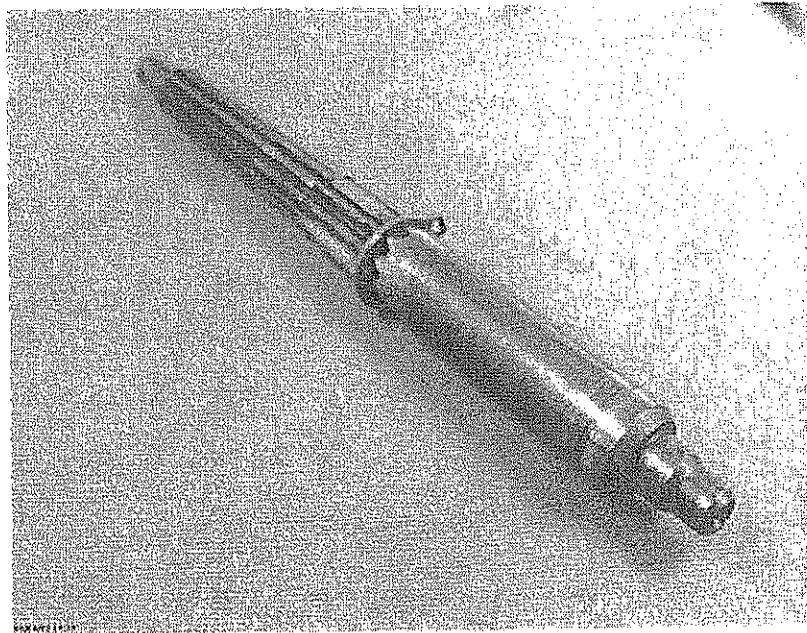
CENTRE COLUMN WORM SEGMENT



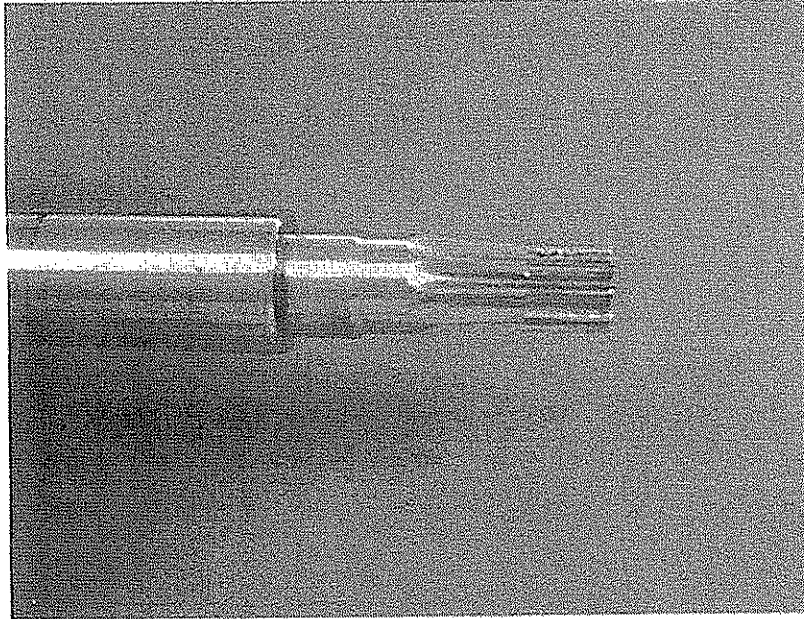
WORMSHAFT



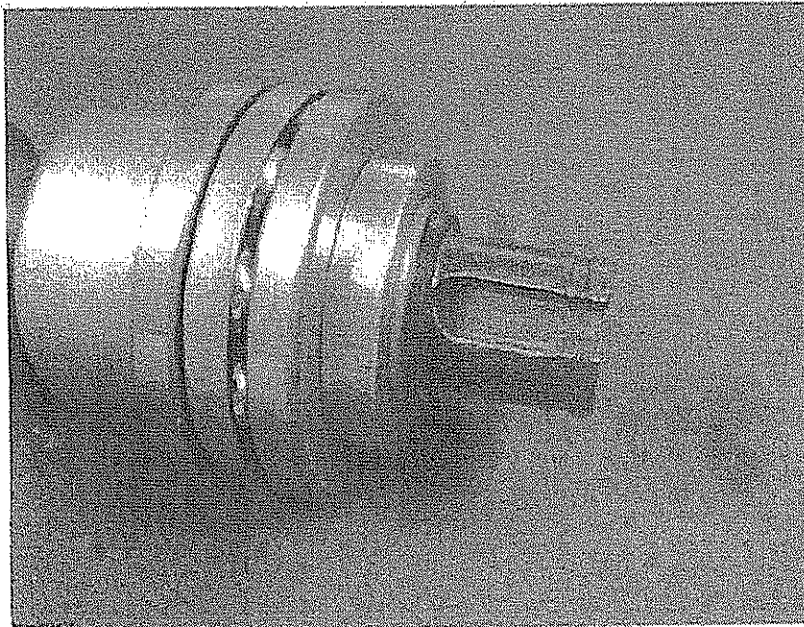
SPURGEAR



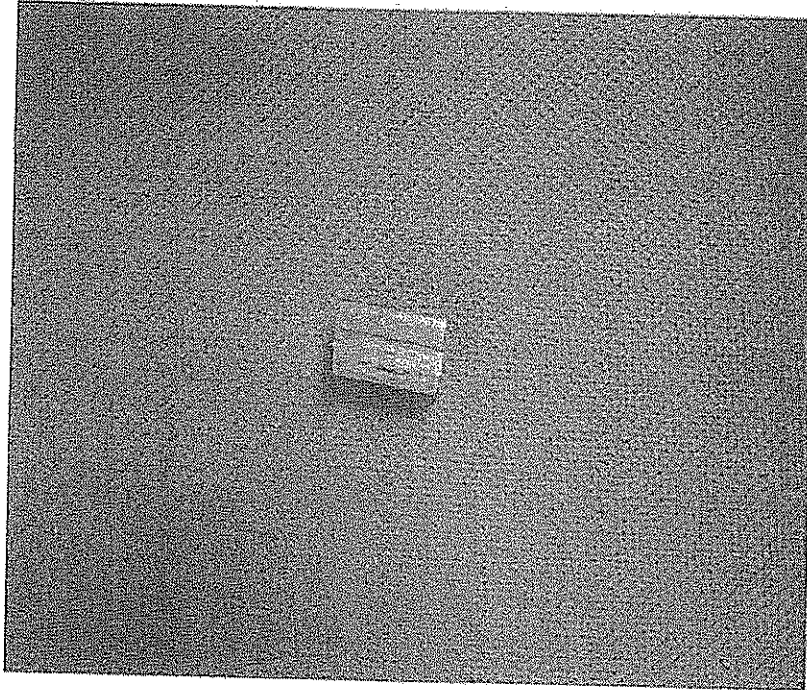
RESOLVER SHAFT



MOTORSHAFT



WORMSHAFT(SPUR GEAR DRIVE.KEYWAY).



SPURGEAR KEY

SECTION 15114

MISCELLANEOUS VALVES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

- A. Reference Section 15000 - Basic Mechanical Requirements, and Section 15095 – Valves, General.
- B. Valves intended for chemical service shall be constructed of materials suitable for the intended service.

PART 2 -- PRODUCTS

2.01 PRESSURE SUSTAINING VALVE

- A. The pressure sustaining valve shall modulate to maintain upstream pressure to a pre-set, constant pressure, regardless of fluctuations in the downstream pressure. The pressure sustaining valve shall maintain close pressure limits without causing surges and shall provide pump control for slow opening and closing and shall also serve as a check valve. The valve shall be hydraulically operated. Pneumatic operation will not be acceptable. The main valve assembly and pilot control system shall be completely assembled and tested, including, but not limited to, a pressure test and a full function operational test, at the factory.
- B. The valve body shall be high strength ductile iron in accordance with A536 and shall be internally and externally coated with fusion bonded epoxy. Valve flanges shall be ANSI 150 Class pressure rated flanges. The main valve trim shall be Series 300 Stainless Steel and the diaphragm shall be Buna-N.
- C. The valve pilot control system shall be a direct-acting, adjustable, spring loaded, diaphragm valve. All pilot control valves and appurtenances shall be made from non-corrosive metal and shall be replaceable without taking the valve out of service. The valve pilot system shall be provided with isolation valves to isolate the pilot system from line pressure to facilitate pilot control maintenance.
- D. The valve shall be designed to operate under the following conditions:

Service	ASR Stored Reuse Water
Location	ASR No. 1 Recovery Pump
Duty	Intermittent
Maximum Inlet Pressure (psig)	90
Minimum Inlet Pressure (psig)	50
Maximum Outlet Pressure (psig)	10
Minimum Outlet Pressure (psig)	1

EXHIBIT A

Minimum Flow (gpm)	350
Maximum Flow (gpm)	1,400
Valve Size (inches)	6
Pipeline Size (inches)	6
Pilot System Adjustment Range (psi)	20 - 200
Valve Ends	Flanged
Cv Range	18.5 to 136

- E. The valve manufacturer shall be responsible for mitigating cavitation of the valve over the entire range of operating conditions. The main valve shall include anti-cavitation trim. The anti-cavitation trim shall include a stationary radial slotted seat and a radial slotted disc guide in 316SS.
- F. The valve shall be fully adjustable via manual operation.
- G. The pressure sustaining valve shall be Cla Val Model 50G-01BDSVYKCKO or equivalent model by Bermad, or equal.

PART 3 -- EXECUTION

(NOT USED)

- END OF SECTION -