American Samoa Power Authority

Water Division

AC REPLACEMENT
TECHNICAL SPECIFICATIONS

SEPTEMBER 2024

GENERAL CONDITION

1. DEFINITIONS

Contract contains legally binding provisions governing the Contractor and the Contractor's work during the construction and warranty period. Certain definitions pertaining to measurements and measurement quantities are set forth in a separate section below. Wherever in the Contact Documents the following terms are used, the intent and meaning shall be interpreted as follows:

2. ABBREVIATIONS

Whenever in these Contract Documents the following abbreviations are used, the intent and meaning shall be interpreted as follows:

"AASHTO" means the American Association of State Highway and Transportation Officials.

"ACI" means the American Concrete Institute.

"AISC" means the American Institute of Steel Construction.

"AISI" means the American Iron and Steel Institute.

"ANSI" means the American National Standards Institute.

"API" means the American Petroleum Institute.

"ASCE" means the American Society of Civil Engineers.

"ASME" means the American Society of Mechanical Engineers.

"ASTM" means the American Society for Testing and Materials.

"AWS" means the American Water Society.

"AWWA" means the American Water Works Association.

"FED. SPEC." means the Federal Specifications.

"IEEE" means the Institute of Electrical and Electronics Engineers.

"NEC" means the National Electrical Code.

"NEMA" means the National Electrical Manufacturers' Association.

"NESC" means the National Electric Safety Code.

"NEPA" National Fire Protection Association.

"OSHA" means the Occupational Safety and Health Act (Federal and State)

"SSPC" means the Steel Structures Painting Council.

"UBC" means the Uniform Building Code.

"UL" means the Underwriters' Laboratories, Inc.

"AS APPROVED," unless otherwise qualified, shall be understood to be followed by the words "by the Engineer and/or the Procurement Manager."

"AS SHOWN," AND "AS INDICATED" shall be understood to be followed by the words "on the technical specifications or drawings."

"BIDDER" means the person or persons, partnership, firm, or corporation that submitted a proposal or bid for the work contemplated under the IFB.

"CONTRACT" means the written agreement governing the performance of the work and the furnishing of labor, materials, incidental services, tools and equipment in the construction of the work. It includes supplemental agreements amending or extending the work contemplated and which may be required to complete the work in a substantial and acceptable manner. Supplemental agreements are written agreements covering alterations, amendments or extensions to the contract and include contract change orders.

"CONTRACT DOCUMENTS" has the same meaning as set forth in Section 4 of the instruction to bidders.

"CONTACTOR" means the person or persons, partnership, firm or corporation who enters into the contract awarded to it by the American Samoa Power Authority pursuant to a solicitation.

"CONTRACTING OFFICER," means the ASPA Procurement Manager.

"DAYS," unless otherwise specifically stated, will be understood to means calendar days.

"ENGINEER" means the ASPA engineer, whose decisions concerning the acceptability of material and work shall be final.

"GOVERNMENT," OR "ASG" means the American Samoa Government.

"NOTICE", or the requirement to notify means a written communication delivered in person or by certified or registered mail to the individual, or to a member of the firm, or to an officer of the corporation for whom it is intended. Certified or registered mail shall be addressed to the last business address known to he/she who gives the notice

"OR EQUAL," shall be understood to indicate that the "equal" product is the same or better than the product named in function, performance, reliability, quality and general configuration. Determination of equality in reference to the project design requirements will be made by the engineer. Such "equal" products shall not be purchased or installed by the Contractor without the engineer's written approval.

"OWNER" means the American Samoa Power Authority.

"PLANS" means the drawings, plans, profiles, cross sections, elevations, details and other supplementary drawings or reproductions thereof, signed by the engineer, which show the location, character, dimensions and details of the work to be performed. Plans may either be bound in the same book as the balance of the contract documents or bound in separate sets and are a part of the contract documents, regardless of the method of binding.

“SPECIFICATIONS” means the terms, provisions and requirements contained herein. Where standard specifications, such as those of ASTM, ASSHTO, etc., have been referred to, the applicable portions of such standard specifications shall become a part of these contract documents.

“SUBSTANTIAL COMPLETION,” means that degree of completion of the project or a defined portion of the project, sufficient to provide ASPA, at its discretion, the full-time use of the project or defined portion of the project for the purposes for which it was intended.

“WORK,” means all material, labor, tools and all appliance, machinery, transportation and appurtenances necessary to perform and complete the contract, and such additional items not specifically indicated or described which can be reasonably inferred as belonging to the item described or indicated as required by good practice to provide a complete and satisfactory system or structure. As used herein, “provide” shall be understood to mean “provide complete in-place”, that is, “furnish and install”.

"WORK SITE," means the location of at which the Contractor, including but not limited to the Contractor's employees, performs the tasks and responsibilities related to the completion of the contract.

3. CONTRACT DOCUMENTS

The contract documents are complementary, and what is called of by one shall be as binding as if called for by all. The intent of the contract documents is to include all work (except specific items to be furnished by the ASPA) necessary for completion of the contract. Materials or work described in words which so applied have a well-known technical and trade meaning shall be held to refer to such recognized standards. Any discrepancies of omissions found in the contract documents shall be reported to the engineer immediately. The engineer will clarify discrepancies or omissions, in writing within a reasonable time.

4. ALTERATION

This contract may be amended at any time during the term hereof, with or without additional consideration, provided, however, no amendments or other variation of this contract shall be valid unless in writing and signed by the Contractor and ASPA. ASPA, without invalidating the contract, may order changed in the work within the general scope of the contract by altering, adding to, or deducting from the work, the contract being adjusted accordingly. All such work shall be executed under the conditions of the original contract, except as specifically adjusted at the time of ordering such change. In giving instructions, the engineer may order minor changes in the work not involving extra cost and not inconsistent with the purposes of the project, but otherwise, except in an emergency endangering life or properly, additions or deductions from the work shall be performed only in pursuance of an approved changed order from ASPA, signed by ASPA’s chief executive officer. If the work is reduced by alterations, such action shall not constitute a claim for damages based on loss anticipated profits.

5. VERBAL STATEMENT AND AGREEMENTS

No oral statements of any person whosoever shall in any manner or degree, modify or otherwise affect the terms of the contract. The Contractor is advised that ASPA assumes no responsibility for any of its officers or agents prior to the execution of this contract, unless such understandings or representations by ASPA are expressly stated in writing in this contract. The Contractor shall thoroughly examine and become familiar with all of the various parts of the contract documents and determine the nature and location of the work, the general and local conditions, all other matters which can in any way affect the work under this contract. Failure to make an examination necessary for this determination shall not release the Contractor from the obligations of this contract. The Contractor warrants that no verbal agreement or conversation with any officer, agent, or employee of ASPA, or with the engineer either before or after the execution of this contract, has affected or modified any of the terms or obligations herein contained.

6. DOCUMENTS TO BE KEPT ON THE JOB SITE

The Contractor shall keep one copy of the contract documents on the job site, in good order, available to the engineer and to his representatives. The Contractor shall maintain on the job site, and make available to the engineer upon request, one current marked up set of the drawings that accurately indicate all approved variations in the completed work. This set of marked up drawings shall be used by the Contractor along with field notes and other appropriate data for the preparation of the final “as built” drawings.

7. OWNERSHIP OF DRAWINGS

All plans, drawings, technical specifications and copies thereof furnished by the engineer are his property. They are not to be used in other work and, with the exception of the signed contract set, are to be returned to him/her on request at the completion of the work. Any reuse of these materials without specific written verification or adaptation by the engineer will be at the risk of the user and without liability or legal expense to the engineer or the project’s design firm.

8. DUTIES OF CONTRACTOR

Within the term provided, and in accordance with the provisions of this Contract, the Contractor shall faithfully and competently be responsible for accomplishing the duties and tasks (the "Work") as set forth in the Contract Documents.

9. SUPERCEDURE

If the contract is preceded by a letter of dispatch of intent, a notice of award, or a notice to proceed, anticipating the execution of the contract, then such aforementioned letter, dispatch, notice, or directive and all rights and obligations of the parties there under are superseded and merged into the contract. All acts of the Contractor and ASPA under said letter, dispatch, notice, or directive shall be deemed to have been under the contract. The American Samoa power authority (“ASPA”) will make no payment under the award until the formal contract has been prepared and executed by ASPA and the Contractor.

10. REPRESENTATIONS

In order to induce ASPA to enter into this contract, Contractor makes the following representation(s): Contractor has familiarized itself with the nature and the extent of the contract documents, work site, locality, and all local conditions and laws and regulations that in any manner may affect cost, progress, performance, or furnishing of the work. Contractor is duly licensed to perform the work as required by local laws and regulations.

11. CONTRACTOR'S LOCAL ADDRESS

The Contractor must provide and maintain a post office address within the territory of American Samoa and file the same with the engineer. Any written notice that is required or desirable shall be served on the Contractor personally, delivered to his representative on the sire, left at the last known place of residence or business of the Contractor, and/or sent through the mails to previously mentioned local post office address. All notices addressed in compliance with the said directions of the Contractor and properly mailed shall become effective when so mailed or at the time of delivery by any of the above methods.

12. CONTRACTOR COMPOSITION

The term "Contractor," whenever used herein, refers to and means the parties or party (individual, co-partnership, corporation or joint-venture) who or which shall have duly entered into a contract with ASPA to perform the work described in the contract documents. If the Contractor hereunder is comprised of more than one legal entity, Contractor expressly agrees that each such entity shall be jointly and severally liable hereunder. Within thirty (30) days after receipt of notice to proceed or award of contract, the Contractor shall provide the engineer with a copy of any supplemental documents, which set forth in detail exactly how the contract will be sponsored, managed and controlled. The Contractor shall also provide, on or before this time, power(s) of attorney or other acceptable documents that attest to the authority and right of designated representatives to commit and sign documents for the Contractor.

13. CONTRACTOR STATUS

It is agreed that the Contractor shall be an independent contractor of ASPA in the performance of this contract. The relationship of the parties hereto shall in no event be deemed or construed to be that of employer and employee of principal and agent, or of any other relationship other than the Contractor as an independent Contractor.

14. ASSIGNMENT

Neither party to the contract shall assign the contract or sublet it as a whole, without the written consent of the other, nor shall the Contractor assign any monies due or to become due to it hereunder without the previous written consent of ASPA.

15. SUBCONTRACTORS

The Contractor agrees that it shall fully indemnify and hold harmless ASPA for the acts and/or omissions of its subcontractors, and of persons either directly or indirectly employed by such subcontractors. Nothing contained in the contract documents shall create any contractual relationship between any subcontractor and ASPA. ASPA shall not be liable to or pay any subcontractor for Contractor's failure to pay said subcontractor.

16. COVENANT AGAINST CONTINGENT FEES

The Contractor warrants that no person or selling agency has been employed or retained to solicit or secure the contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bonafide employees or bonafide established commercial or selling agencies maintained by the Contractor for the purpose of securing business. For breach or violation of this warranty, ASPA shall have the right to annul this contract without liability or, at its discretion, to deduct from the contract price of considerations, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

17. PROHIBITED INTEREST

No official of ASPA who is authorized in such capacity and on behalf of ASPA to negotiate, make, accept, or approve, or to take part in negotiating, making, accepting or approving any architectural, engineering, inspection, construction, or material supply contract or any subcontract in connection with the construction of the project, shall become directly or indirectly integrated personally in this contract or in any part thereof. No officer, employee, architect, attorney, engineer, or inspector of or for ASPA who is authorized in such capacity and on behalf of ASPA to exercise any legislative, executive, supervisory, or other similar functions in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part thereof, any material supply Contractor, subcontract, insurance contract, or any other contract pertaining to the project.

18. KICKBACKS PROHIBITED

ASPA may, by written notice to the Contractor, terminate the contract for cause if ASPA finds that any payment, gratuity (in the form of entertainment, gifts, or otherwise), or offer of employment was made by or on behalf of the Contractor to any ASPA employee, his/her representatives, family members, partners or assigns, any employee of the united states, any employee of the American Samoa government, including members of the FONO of American Samoa; with a view toward securing an agreement or securing favorable treatment with respect to obtaining or performance of this contract in the event that ASPA terminates the contract under this subsection, ASPA shall be entitled to:

Pursue the same remedies against the Contractor which ASPA could pursue in the event of a breach of contract by the Contractor; and

Recover the full amount of such payment gratuity from the person so employed by ASPA.

The rights and remedies of ASPA provided for in this subsection shall not be exclusive and are in addition to any other rights and remedies provided by law or under the Contract Documents.

19. COVENANT AGAINST COLLUSION

The Contractor warrants that neither it nor any of its employees have directly or indirectly entered into any secret or non-secret agreement, participated in any collusion, or otherwise taken any action in restraint of competition in connection with the bid or proposal submitted. For breach or violation of this warranty, ASPA shall have the right to annul this Contract without liability or in its discretion to pursue the same remedies against the Contractor that ASPA could pursue in the event of breach of contract by the Contractor, and as a penalty in addition to any other damages to which it may be entitled by law, to exemplary damages.

20. REPORTS, RECORDS, DATA AND DRAWINGS

The Contractor shall submit to ASPA such schedules of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as ASPA may request concerning work performed or to be performed under the contract. The Contractor shall submit to ASPA an electronic copy of "as built" drawings either in AutoCAD 2010 at the end of the construction period. These drawings shall represent a complete and accurate record of the actual work accomplished and shall be based upon first hand observations by the project superintendent or his designated representative. A detailed survey of all in-place structures shall be conducted and this data incorporated into said drawings. The Contractor shall include the following items in the "as built" drawings:

Project location and site (community and project description and number);

Name of project engineer, inspector and Contractor;

North arrow and scale;

Legend;

Requests for partial payments will not be approved if a set of marked drawings are not kept current, and request for final payment will not be approved until the drawings are delivered to the Engineer.

The Contractor agrees that ASPA, the Comptroller General of the United States, or the Secretary of the Interior, or any of their duly authorized agents or representatives, shall, until the expiration of three years after final payment under the Contract shall have access to and the right to examine any directly pertinent books, document, papers, and records of the Contractor involving transactions related to the Contract.

The Contractor further agrees to include in all its subcontracts hereunder a provision to the effect that the subcontractor agrees that ASPA, the Comptroller General of the United States, or the Secretary of the Interior, or any of their duly authorized agents or representatives, shall, until the expiration of three years after final payment under the subcontract, shall have access to and the right to examine any directly pertinent book, documents, papers and records of such subcontractor, involving transactions related to the Contract.

21. INSURANCE

The Contractor shall obtain the insurance coverage designated herein and pay all costs associated therewith. Such insurance shall be for the coverage, amounts and limits as set forth in subsection below. Before commencing the Work under the Agreement, the Contractor shall furnish ASPA with certificates of insurance showing the type, amount, class of operations covered, effective dates and date of expiration of policies. The Contractor's public/general liability and automobile liability policies shall name ASPA as an additional insured. The Contractor's insurance shall be maintained for the full period of this Agreement.

In the case of a breach of any provision of this section, ASPA, at its option, may take out and maintain, at the expense of the Contractor, such insurance as ASPA may deem proper and may charge the Contractor with such amounts due. Nothing contained in these insurance requirements is to be construed as limiting the extent of the Contractor's responsibility for payments of damages resulting from its operations under this Agreement.

Requirements:

The Contractor shall maintain during the term of this Agreement such insurance as follows:

1. Workmen's Compensation. The Contractor shall maintain such statutory amounts of workmen's compensation insurance as are set forth in the American Samoa Code Annotated and American Samoa Administrative Code.
2. Employer's Liability. The Contractor shall maintain employer's liability insurance in the amount of Five Hundred Thousand Dollars ($500,000.00 USD).
3. Public/General Liability. Public/General liability shall include coverage for wrongful death claims, and shall not exclude coverage for explosion, collapse or underground exposure.
4. Bodily/personal injury. The Contractor shall maintain public/general liability insurance covering third party bodily/personal injury for Five Hundred Thousand Dollars ($500,000.00 USD) per person/per occurrence with an aggregate of One Million Dollars ($1,000,000.00 USD).
5. Property damage. The Contractor shall maintain public/general liability insurance covering property damage for One Hundred Thousand Dollars ($100,000.00 USD) per person/per occurrence with an aggregate of Two Hundred Thousand Dollars ($200,000.00 USD).
6. Automobile Liability
    i. Bodily/personal injury. The Contractor shall maintain automobile liability insurance covering third party bodily/personal injury for Five Hundred Thousand Dollars ($500,000.00 USD). Per person/per occurrence with an aggregate of One Millions Dollars ($1,000,000.00 USD).

ii. Property damage. The Contractor shall maintain automobile liability insurance covering property damage for One Hundred Thousand Dollars ($100,000.00 USD) per persona/per occurrence with an aggregate of Two Hundred Thousand Dollars ($200,000.00 USD).

7. Builder's Risk Insurance. Unless otherwise modified in the Supplementary Conditions, the Contractor shall secure and maintain during the life of the Contract Builders Risk Insurance coverage for 100 percent of the Contract amount. Such insurance shall not exclude coverage for earthquake, landslide, flood, collapse, or loss due to the results of faulty workmanship, and shall provide for losses to be paid to the Contractor and ASPA as their interests may appear.

The above policies shall protect the Contractor from claims for damages for personal injury, including accidental death, as well as from claims for direct property damage, which may arise from negligent operations under this Agreement, whether such operations are by itself or by ASPA employees.

When the construction is to be accomplished within a public or private right-of-way requiring special insurance coverage, the Contractor shall conform to the particular requirements and provide the required insurance. The Contractor shall include in his liability policy all endorsements that the said authority may require for the protection of the authority, its officers, agents and employees. Insurance coverage for special conditions, when required, shall be provided as set forth in the Supplementary Conditions.

22. INDEMNITY

The Contactor shall indemnify, defend and hold harmless ASPA, its directors, officers, employees and agents from and against any and all claims and demand whatsoever, including costs and attorney's fees, resulting from Contractors negligent acts or omissions, or any other tortuous conduct, in connection with performance of this Contract, Contractor shall indemnify, defend and hold harmless ASPA, its directors, officers, employees and agents from and against any and all claims and demands whatsoever, including costs and attorney's fees, under the doctrine of strict liability as it may be applied by a court of competent jurisdiction to Contractor's performance under this Contract.

23. PAYMENT OF TAXES

The Contractor shall pay and shall assume exclusive liability for all taxes levied or assessed on or in connection with its performance of the Contract, whether before or after acceptance of the work, including but not limited to federal payroll taxes or assessments, and Government of American Samoa income and excise taxes. The Contractor may be required to show that all taxes due or accrued to American Samoa have been paid or guaranteed before leaving American Samoa.

24. LAW, PERMITS AND LICENSES

The Contractor shall keep itself fully informed of all local and federal laws and regulations that affect in any manner the work set forth in the Contract Documents. The Contractor shall at all times comply with said laws and regulation, and protect and indemnify ASPA, its directors, officers, agents, representatives, and employees against any claim or liability arising from or based on the violation of any such laws or regulations. All permits licenses and inspection fees necessary for prosecution and completions of the work shall be secured and paid for by the Contractor, unless otherwise specified.

25. SUPERINTENDENT

During the term of the Contract, the Contractor shall keep English speaking, competent supervisory personnel. The Contractor shall designate in writing, before starting work, an authorized representative acceptable to the Engineer who shall have complete authority to represent and act for the Contractor. The residential address and telephone number of the authorized representative shall be made available to the Engineer for emergency communication during off-hours. The Contractor shall give efficient supervision to the work, using his best skill and attention. The Contractor shall be solely responsible for all construction means, methods, techniques and procedures, and for providing adequate safety precautions and coordinating all portions of the work under the Contract.

26. ENGINEER'S FIELD OFFICE

Contractor shall provide, maintain, and subsequently remove as its property a field office as specified below, for the exclusive use of Engineer and its representatives.

Engineer's field office, equipped as specified below, shall be available for Engineer's use prior to the start of work at project site, and shall remain on the site for 30 days after final acceptance of all work. The field office shall be located where directed by the Engineer; leveled, blocked, tied down, and skirted as directed; and, relocated, when necessary, and approved.

Contractor shall maintain field office in good repair and acceptable appearance. Provide daily cleaning service, maintenance, and replenishment, as applicable, of paper towels, paper cups, soap, tissue paper, and bottled water service.

Provide gravel or crushed rock under and around the field office to a minimum distance of 10 feet. Provide sanitary facilities in compliance with local health authorities.

Field office shall be trailer-type mobile structure or approved equal with the following features and equipment, new or like new in appearance and function:

Security guard screens on all windows.

Toilet and washbasin in separate compartments

Insulated double walls, floor, and roof.

Self-contained, window air conditioner.

Fluorescent ceiling lights.

27. ENGINEER’S DIRECTION

The superintendent or other duly authorized representative of the Contractor shall represent the Contractor in all directions given to the Contractor by the Engineer. Directions of major importance will be confirmed in writing. Any direction will be so confirmed, in each case, on written request from the Contractor.

28. EMPLOYEES

The Contractor shall employ American Samoa labor to the fullest extent possible. It shall be responsible for hiring its own labor. It shall be the responsibility of the Contractor to ascertain that any foreign recruitment complies in full with all applicable laws may subject it to termination of the Contract for cause or withholding of amounts payable to the Contractor. The Contractor shall employ only competent, skillful workers to do the work, and whenever any person shall appear to be incompetent or to act in a disorderly or improper manner; such person shall be removed from the work. Such removal shall not be the basis of any claim for compensation of damage against ASPA. In connection with the performance of work under his Contract, the Contractor agrees not to employ any person undergoing sentence of imprisonment at hard labor. Contractor shall, at all times, provide competent, suitable personnel to survey and layout the work and perform construction as required by the Contract. Contractor shall at all times maintaining proper discipline and order at the work site.

29. DISCREPANCY WITH LOCAL OR FEDERAL LAW

If any discrepancy or inconsistency is discovered between any provision of the Contract Documents and any law, ordinance, regulation, order decree of the American Samoa or United States government, the Contractor shall forthwith report the same to the Engineer in writing. The Contractor shall at times observer and comply with all such existing and future laws, ordinances, regulations, orders and decrees, and shall protect and indemnify ASPA, its directors, officers, agents, representatives and employees against any claim or liability arising from or based upon the violation of any such law, ordinance, regulation, order or decree, whether by the Contractor or by its employees. Particular attention is called to prevailing wage and overtime compensation.

30. HOURS OF WORK

The Contractor shall schedule all work to be performed during the period from 6:00 a.m. to 6:00 p.m., Monday through Friday and, if permitted, on Saturday. No work will be permitted on Sunday or holidays without specific approval of ASPA. The Contractor may be permitted to work at night, if it can satisfactorily demonstrate the need, in order to maintain the required progress or protect the work from the elements. If permitted to work at night, the Contractor shall provide sufficient and satisfactory lighting and other facilities therefore. For night work, if any be performed, the Contractor shall receive no extra payment, but compensation shall be considered as having been included in the price stipulated for the work. The Contractor shall, however, be charged for such additional inspection and administrative costs as ASPA may incur.

31. EQUAL OPPORTUNITY

This subsection is applicable unless the Contract is exempt under the rules, regulations, and relevant orders of the Secretary of Labor (41CFR, ch. 60). During the performance of the Contract, the Contractor agrees as follows:

The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and election for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Engineer setting forth the provisions of this subsection.

The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

The Contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice, to be provided by the Engineer, advising the labor union or workers' representative of the Contractor's commitments under this subsection, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The Contractor will comply with all provisions of Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, and of the rules, regulations, and relevant orders of the Secretary of Labor.

The Contractor will furnish all information and reports required by Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

A. In the event of the Contractor's noncompliance with this subsection, or with any of the said rules, regulations, orders, the Contract may be cancelled, terminated, or suspended, in all or in part, and the Contractor may be declared ineligible for further government contracts in accordance with procedures authorized in Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

B. The Contractor will include the provisions of this subsection in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order No. 11246 of September 24, 1965, as amended by Executive Order No. 11375 of October 13, 1967, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the government may direct as a means of enforcing such provisions, including sanctions fort noncompliance.

32. SAFETY REQUIREMENTS

The Contractor shall be solely and completely responsible for safety conditions on the site where work is to be performed, including that safety of all persons and property during the term of the Contract. This requirement shall apply continuously and not be limited to normal working hours. Safety provisions shall conform to United States Department of Labor, Occupational Safety, and Health Act ("OSHA") and other applicable laws. Contractor shall become thoroughly familiar with governing safety provisions and shall comply with the obligations set forth therein. Contractor shall develop and maintain for the duration of the Contract, a safety program that will effectively incorporate and implement required safety provisions. Contractor shall appoint a qualified employee who is authorized to supervise and enforce compliance with the safety program. The Engineer's duty to conduct construction review of the Contractor's performance is not intended to include a review or approval of the adequacy of Contractor's safety supervisor, safety program, or safety measures taken in, on, or near the construction site.

As part of the safety program, Contractor shall maintain at its office or other well-known place at the site of the work, safety equipment applicable to the work as prescribed by the governing safety authorities and articles necessary for giving first-aid to the injured. Contractor shall do all work necessary to protect the general public from hazards, including, but not limited to, surface irregularities and/or unramped grade changes in pedestrian sidewalk or walkway, and trenches or excavations in roadway. Barricades, lanterns, and proper signs shall be furnished in sufficient amount to safeguard the public and the work. Contractor shall construct and maintain satisfactory and substantial temporary chain link fencing, solid fencing, railing, barricades or steel plates, as applicable, at all openings, obstructions, or other hazards in streets, sidewalks, floors, roofs, and walkways. Such barriers shall have adequate warning lights as necessary or required for safety. The Contractor shall comply with Owner's safety rules while on the Owner's property.

If death or serious injuries or damages are caused, the accident shall be reported immediately by telephone or messenger to the Engineer. In addition, Contractor shall promptly report to ASPA in writing all accidents whatsoever arising out of, or in connection with, the performance of the work whether on or adjacent to the site, giving full details and statements of witnesses. If claim is made by anyone against the Contractor or any subcontractor on account of accident, Contractor shall promptly report the claim to ASPA in writing, giving full details of the claim.

The Contractor's tools and equipment used on the work shall be furnished in sufficient quantity and of a capacity and type that will safely perform the work specified, and shall be maintained and used in a manner that will not create a hazard to person or property, or cause a delay in the progress of work.

The Contractor will comply with the rules and regulations of the Territory authorities regarding closing or restricting the use of public streets or highways. No public or private road shall be closed, except by written permission of the proper authority. The Contractor will make every effort to avoid obstruction to traffic and normal commercial pursuits. Where traffic will pass over backfilled trenches before they are paved, the

Contractor will maintain the top of the trench to allow normal vehicular traffic to pass over and provide temporary access driveways when required. Contractor agrees that its cleanup operations shall follow immediately after backfilling. When flagmen and guards are required by regulation or when deemed necessary for safety, the Contractor will furnish them with appropriate apparel and other traffic control devices. Traffic control procedures and devices used on all rights-of-way shall meet the requirements of the applicable current laws and regulations for traffic control. Contractor will notify the fire and police departments before closing any street or portion thereof and notify said departments when the streets are again passable for emergency vehicles. The Contractor shall leave it night emergency telephone number or numbers with the police department, so that contact may be made easily at all times in case of barricade and flare trouble or other emergencies.

The Contractor shall perform all work in a fire safe manner. The Contractor shall furnish and maintain on site adequate firefighting equipment capable of extinguishing incipient fires. The Contractor shall comply with applicable American Samoa and United States fire prevention laws and regulations. Where these regulations do not apply, the Contractor agrees to follow the applicable parts of the National Fire Prevention Standard for Safeguarding Building Construction Operations (NFPS No.241).

33. PROTECTION OF WORK AND/OR PROPERTY

The Contractor shall at all times safely guard ASPA's property from damage or loss. The Contractor shall at all times safely guard and protect from damaging its own work. All loss or damages arising from any unforeseen obstruction or defects which may be encountered in the prosecution of the work, or from the action of the elements, shall be sustained by the Contractor.

34. MATERIALS AND WORKMANSHIP

Unless otherwise specified in the Contract Documents, the Contractor shall provide and pay for all materials, labor, water, tools, equipment, light, power, supplies, transportation and other facilities or incidentals necessary for the furnishing, performance, testing, start-up, execution and completion of the work. Contractor shall additionally furnish all fuel, power, light, telephone, water sanitary facilities, temporary facilities, and any other facilities or incidentals necessary for the furnishing, performance, testing, start-up, execution and completion of the work. Unless otherwise specified in the Contract Documents, all materials shall be new, and both workmanship and materials shall be of good quality. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the applicable supplier or industry standards. The Contractor shall, if required, furnish satisfactory evidence as to the kind and quality of materials. All work shall be done and completed in a thoroughly workmanlike manner notwithstanding any omission from the Technical Specifications or the Drawings, and it shall be the duty of the Contractor to call the Engineer's attention to apparent errors or omissions and request instructions before proceeding with the work. All work performed by the Contractor after it learns or should have learned of an error or omission in the Technical Specifications or Drawings without notifying the Engineer will be at the Contractor's own expense. The Engineer may, by appropriate instructions, correct errors and omissions, and these instructions shall be as binding upon the

Contractor as though contained in the original Technical Specifications or Drawings. All defective work or materials shall be removed from the premises by the Contractor, whether in place or not, and shall be replaced or renewed as the Engineer may direct. All materials and workmanship of whatever description shall be subjected to the inspection of and rejection by, the Engineer if not in conformance with the Technical Specifications. Contractor shall repair or replace, at Contractor's sole expense, every portion of the work that is damaged or destroyed prior to the final completion of the work and caused in whole or in part by the acts or omissions of the Contractor.

35. PNRS CONDITIONS

The Contractor shall inform ASPA upon discovery of any historic artifacts or properties found at the construction site(s). Contractor must ensure that any excess dirt, cinder, spoils, concrete, pavement and/or drilling materials, must be properly disposed of. Any other uses of these materials shall require a separate land use permit. Associated costs shall be borne by the Contractor and shall be incidental to the undertaking of the scope of this project. The Contractor shall make every effort to prevent soil erosion and the escape of debris to the ocean. The Contractor shall not leave the project site in condition that would cause soil erosion in the future. The Contractor shall identify a staging area acceptable to the ASPA and the PNRS. Any other work not within the scope of this project conducted at this site shall require a separate land use permit application.

36. THE ENGINEER

Authority of the Engineer

A. The Engineer shall be ASPA's representative during the construction period. His authority and responsibility shall be limited to the provisions set forth in these Contract Documents. The Engineer shall have the authority to reject work and materials whenever such rejection may be necessary to ensure execution of the Contract in accordance with the intent of the Contract Documents.

B. Duties and Responsibilities of the Engineer

C. The Engineer will make periodic visits to the site of the project to observe the progress and quality of the work and to determine, in general, if the work is proceeding in accordance with the intent of the Contract Documents. He shall not be required to make comprehensive or continuous inspections to check quality or quantity of the work, and he shall not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the work. Visits and observations made by the Engineer shall not relieve the Contractor of his obligation to conduct comprehensive inspections of the work and to furnish materials and perform acceptable work, and to provide adequate safety precautions in conformance with the intent of the Contract.

D. The Engineer will make decisions, in writing, on all claims of ASPA or the Contractor arising from interpretation or execution of the Contract Documents. Such decision shall be necessary before the Contractor can receive additional money under the terms of the Contract. Changes in work ordered by the Engineer will be made in compliance with section entitled "Alterations."

E. One or more inspectors may be assigned to observe the work and to act in matters of construction under this Contract. It is understood that such inspectors shall have the power to issue instructions and make decisions within the limitations of the authority of the Engineer. Such inspection shall not relieve the Contractor of his obligations to conduct comprehensive inspections of the work, and to provide adequate safety precautions in conformance with the intent of the Contract.

37. REJECTED MATERIAL

Any material condemned or rejected by the Engineer or his authorized inspector because of non-conformity with the Contract Documents shall be removed at once from the vicinity of the work by the Contractor at his own expense, and the same shall not be used on the work.

38. UNNOTICED DEFECTS

Any defective work or material that may be discovered by the Engineer before the final acceptance of work, or before final payment has been made, or during the guarantee period, shall be removed and replaced by work and materials which shall conform to the provisions of the Contract Documents. Failure on the part of the Engineer to condemn or reject based on inferior work or materials shall make such deductions in the final payment therefore as may be just and reasonable.

39. RIGHT TO RETAIN IMPERFECT WORK

If any part or portion of the work done or material furnished under this Contract shall prove defective and not in accordance with the Technical Specifications and Drawings, and if the imperfection n the same shall not be of sufficient magnitude or importance as to make the work dangerous or unsuitable, or if the removal of such work will create conditions which are dangerous or undesirable, ASPA shall have the right and authority to retain such work but shall make such deductions in the final payment therefore as may be just and reasonable.

40. SHOP DRAWINGS

After execution of the Contract, the Contractor shall submit, in quadruplicate, to the Engineer for his review, such shop drawings, electrical diagrams, and catalog cuts for fabricated items and manufactured items (including satisfactory identification of items, units and assemblies in relation to the Drawings and Technical Specifications). Unless otherwise approved by the Engineer, shop drawings shall be submitted only by the Contractor, who shall indicate by a signed stamp on the shop drawings, or the other approved means, that the Contractor has checked the shop drawings, and that the work shown is in accordance with Contract requirements and has been checked for dimensions and relationship with work of all other trades involved. The practice of submitting incomplete or unchecked shop drawings for the Engineer too correct for finish will not be acceptable, and shop drawings which, in the opinion of the Engineer, clearly indicate that they have not been checked by the Contractor will be considered as non-complying with the intent of the Contract Documents and will be returned to the Contractor for resubmission in the proper form.

When the shop drawings have been reviewed by the Engineer, two sets of submittals will be returned to the Contractor appropriately stamped. If major changes or corrections are

necessary, the shop drawings may be rejected and one set will be returned to the Contractor with such changes or corrections indicated, and the Contractor shall correct and resubmit the shop drawings in quadruplicate, unless otherwise directed by the Engineer. No changes shall be made by the Contractor to resubmitted shop drawings other than those changes indicated by the Engineer.

The review of such shop drawings and catalog cuts by the Engineer shall not relieve the Contractor from responsibility for correctness of dimensions, fabrication details and space requirements, or for deviations from the Contract Drawings or Specification, unless the Contractor has called attention to such deviations in writing by a letter accompanying the shop drawings and the Engineer approves the change or deviation in writing at the time of submission; nor shall review by the Engineer relieve the Contractor from the responsibility for errors in the shop drawings. When the Contractor does call such deviations to the attention of the Engineer, the Contractor shall state in his letter whether or not such deviations involve any deduction or extra cost adjustment.

41. DETAILED DRAWINGS AND INSTRUCTIONS

The Engineer will furnish, with reasonable promptness, additional instructions by means of Drawings or otherwise, if, in the Engineer's opinion, such are required for the proper execution of the work. All such Drawings and instructions will be consistent with the Contract Documents, truce developments thereof, and reasonably inferable therefrom.

42. WARRANTY OF TITLE

No material, supplies, or equipment for the work shall be purchased subject to any chattel mortgage security agreement or under a conditional sale or other agreement by which an interest therein or any part thereof is retained by the seller or supplier. The Contractor warrants good title to all material, supplies and equipment installed or incorporated in the work and agrees upon completion of all work to deliver the premises together with all improvements and appurtenances constructed or placed thereon by it to ASPA free from any claim, lien, security interest, or charge and further agrees that neither it nor any person, firm, or corporation furnishing any materials or labor for any work covered by the Contract shall have any right to a lien upon the premises or any improvements or appurtenances thereon, provided that this shall not preclude the Contractor from installing metering devices and other equipment of ASPA, the title of which is so commonly retained by ASPA. The provisions of this section shall be inserted by the Contractor into all subcontracts, and notice of its provisions shall be given to all persons furnishing materials for the work when no formal contract is entered into for such materials.

43. SUBSTITUTION OF MATERIALS

Except for ASPA-selected equipment items, and items where no substitution is clearly specified, whenever any material, article, device, product, fixture, form, type of construction, or process is indicated or specified by patent or proprietary name, by name of manufacturer, or by catalog number, such specifications shall be deemed to be used for the purpose of establishing a standard of quality and facilitating the description of the material or process desired. This procedure is not to be construed as eliminating from competition other products of equal or better quality by other manufacturers where fully suitable in design. The Contractor may, in such cases, submit complete data to the

Engineer, within thirty (30) days following the award of the Contract, for consideration of another material, type, or process which shall be substantially equal in every respect to that so indicated or specified. Substitute materials shall not be used unless approved by ASPA in writing. The Engineer will be the sole judge of the substituted article or material.

44. TESTS SAMPLES AND INSPECTIONS

The Contractor shall furnish, without extra charge, the necessary test pieces and samples, including facilities and labor for obtaining the same, as requested by the Engineer. When required, the Contractor shall furnish certificates of tests of materials and equipment made at the point of manufacture by a recognized testing laboratory. The Engineer, and authorized ASPA agents, and their representatives shall at all times be provided safe access to the work wherever it is in preparation or progress, and the Contractor shall provide facilities for such access and for inspection, including maintenance of temporary and permanent access. If the Technical Specifications, the Engineer's instructions, or any laws or regulations require any work to be specially tested or approved, the Contractor shall give timely notice of its readiness for inspection. Inspections to be conducted by the Engineer will be promptly made, and where practicable, at the source of supply. If any work should be covered up without approval or consent of the Engineer, it shall, if required by the Engineer, be uncovered for examination at the Contractor's expense. Re-examination of questioned work may be ordered by the Engineer, and, if so ordered, the work shall be uncovered by the Contractor. If such work is found to be in accordance with the Contract Documents, ASPA will pay the cost of reexamination and replacement. If such work is found to be not in accordance with the Contract Documents, the Contractor shall correct the defective work, and the cost of reexamination and correction of the defective work shall be paid by the Contractor.

45. ROYALTIES AND PATENTS

The Contractor shall pay all royalty and license fees, unless otherwise specifies. The Contractor shall defend all suits or claims for infringement of any patent rights and shall defend, indemnify and hold harmless ASPA from any such suits or claims.

46. DEFECTIVE WORK

The Contractor warrants and guarantees to ASPA that all work will be in accordance with the Contract Documents and will not be defective. Contractor hereby agrees to make, at its own expense, all repairs or replacements necessitated by defects in materials or workmanship, supplied under the Contract, which become evident to ASPA within one (1) year after the date of final acceptance of the work or within such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents. If defective work is found, Contractor shall promptly, without cost to ASPA and in accordance with ASPA's written instructions, promptly either correct such defective work, or if it has been rejected by ASPA, remove it from the work site and replace it with non-defective work. The Contractor further assumes responsibility for a similar guarantee for all work and materials provided by the subcontractors or manufacturers of all work and materials provided by the sub-contractors or manufacturers of packaged equipment components. The Contractor also agrees to defend, indemnify and hold harmless ASPA from and against liability of any

kind arising from damage due to said defects. The Contractor shall make all repairs and replacements promptly upon receipt of written order for same from ASPA. If Contractor does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk or loss of damage, ASPA may have the defective work corrected or the rejected work removed and replaced, and all direct, indirect and consequential costs of such removal and replacement (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) will be paid by Contractor.

47. COMMENCEMENT OF THE WORK

Before work shall be started and materials ordered, the Contractor shall meet and consult with the Engineer to discuss the materials, equipment and all arrangements for prosecuting the work. Work shall not commence until the Contractor receives the Notice of Proceed in writing from ASPA.

48. SCHEDULES AND PROGRESS REPORTS

Prior to starting work, the Contractor shall accept ASPA's Milestone Schedule or submit to the Engineer its own progress schedule for acceptance showing approximately the dates on which each part or division of the work is expected to be started and finished, including an estimated timeline for use of the materials. ASPA's Milestone Schedule for purposes of progress payments ("Milestone Payments") to the Contractor shall determine ASPA's payment duties, unless the Engineer determines in writing that the Contractor's progress schedule shall be considered the official Milestone Schedule.

The Contractor shall also forward to the Engineer, at the end of each month, an itemized report of the delivery status of major and critical items of purchased equipment and material, including the status of shop drawings and the status of shop and field fabricated work. These progress reports shall indicate the date of the purchase order, the current percentage of completion, estimated delivery and cause of delay, if any.

The Contractor's progress schedule must conform to the calendar days set forth for the completion of the work and shall be subject to modification by the Engineer. The Engineer shall be advised in advance by the Contractor when construction work is scheduled and the days when no construction work will take place. If the Contractor fails to notify the Engineer in advance of a the day or days when no construction work will be done, the Contractor will be charged the cost of inspection for that day or days and such charges may be deducted from any payment due the Contractor. If the completion of any part of the work or the delivery of materials is behind the approved schedule, the Contractor shall submit in writing a plan acceptable to the Engineer for bringing the work up to schedule.

ASPA shall have the right to withhold Milestone Payments for the work if the Contractor fails to prosecute the work in accordance with the Milestone Schedule. It is expressly understood and agreed that the time of beginning, rate of progress and time of completion of the work are the essence of the Contract. The work shall be prosecuted at such time, and in or on such part or parts of the project as may be required, to complete the project as contemplated in the Contract Documents and the approved Milestone Schedule.

49. NIGHT WORK

The Contractor may be required to prosecute the work at night if, at any time, the Engineer deems it necessary for the progress of the work, or if emergencies arise, and the Contractor shall promptly comply with any such requirements made in writing by the Engineer. The Contractor will also be permitted to work at night if it shall satisfy the Engineer of the need therefore in order to maintain the required progress or protect the work from the elements. If ordered or permitted to work at night, the Contractor shall provide sufficient and satisfactory lighting and other facilities therefore. For night work, if any be performed, the Contractor shall receive no extra payment, but compensation shall be considered as having been included in the price stipulated for the work.

50. ASPA's RIGHT TO PERFORM WORK

If in the opinion of the Engineer the Contractor neglects to prosecute the work in a timely manner or in accordance with the Milestone Schedule, or neglects or refuses at its own cost to perform and/or replace work rejected by the Engineer, then ASPA shall notify the Contractor and its surety of the condition, and after ten (10) days' written notice to the Contractor and the Surety, and without prejudice to any other right or remedy which ASPA may have under the Contract Documents, including the section entitled "ASPA's Right to re-Contractor Work," and take over that portion of the work which has been neglected or improperly executed and make good the deficiencies and deduct its costs thereof from the payments then or thereafter due the Contractor.

51. TERMINATION FOR CONVEINANCE

ASPA may terminate the Contract in whole or, from time to time, in part, if the Chief Executive Officer (the "CEO") determines that a termination is in the best interest of ASPA. In such case, the CEO shall terminate the Contract by delivering to the Contractor a two-week notice of termination specifying the extent of termination and the effective date. Within two weeks of termination, the Contractor shall cease its prosecution of the work, turn over to ASPA all data and other materials acquired for purposes of the Contract, and submit to ASPA a claim for materials acquired for purposes of the Contract, and submit to ASPA a claim for materials and/or labor supplied prior to termination. ASPA shall pay the Contractor an equitable price for materials purchased and labor expended by the Contractor prior to termination, provided that such price not to exceed a fair proportion of the original Contract price.

After receipt of a notice of termination issued pursuant to this section, and except as directed by the CEO, the Contractor shall immediately proceed with the following obligations, regardless of any delay in determining or adjusting any amounts due under this section:

1. Stop the supply and delivery of goods and labor as specified in the notice;
2. Place no further orders for goods, materials, services, labor or facilities, except as necessary to complete any continued portion or portions of the Contract;
3. Terminate all subcontracts to the extent they relate to the supply and delivery of goods terminated;
4. Assign to ASPA, as directed and approved by the CEO, all right, title, and interest of the Contractor under the subcontracts terminated, in which case ASPA shall

have the right to settle or to pay any termination settlement proposal arising out of those terminations;

5. With approval or ratification to the extent required by the CEO, settle all outstanding liabilities and termination settlement proposals arising from the termination of subcontracts; the approval or ratification will be final for purposes of this section;
6. Complete performance of the supply and delivery of goods not terminated;
7. Take any action that may be necessary or that the CEO may direct, for the protection and preservation of the goods related to the Contract that is in the possession of the Contractor and in which ASPA has or may acquire an interest; and
8. Submit a final termination settlement proposal to the CEO in the form and with the certifications prescribed by the CEO. The Contractor shall submit the proposal promptly upon notice of termination, but no more than one (1) month from the effective date of termination, unless extended in writing by the CEO upon written request of the Contractor within this one (1) month period. However, if the CEO determines that the facts justify it, a termination settlement proposal may be received and acted on after one (1) month or any extension. If the Contractor fails to submit the proposal within the time allowed, the CEO may determine, on the basis of information available, the amount, if any, due to the Contractor because of the termination and shall pay the amount determined.

52. TERMINATION FOR CAUSE

ASPA may discharge the Contractor and terminate the Contract at any time when ASPA shall determine that it has sufficient cause arising from (a) Contractor's dereliction or unsatisfactory performance of a duty, (b) Contractor's failure to perform the work in accordance with the provisions of the Contract Documents, (c) misrepresentation by the Contractor, or (d) conviction of the Contractor or any of its directors and/or officers of a felony. If ASPA terminates the Contractor for cause prior to completion of the Contractor's duties, in addition to any other rights or remedies granted ASPA in the Contract Documents and at law, ASPA shall require repayment by the Contractor of all advanced payments or Milestone Payments made and may require delivery of any partially completed work. ASPA shall finish the remaining work to be performed by whatever method ASPA may deem expedient and the Contractor shall not be entitled to receive any further compensation. In the event that the cost, including additional managerial and administrative services, to ASPA to complete the work exceeds the contract price, such excess costs shall be paid by the Contractor.

53. TERMINATION FOR DEFAULT

If the Contractor refuses or fails to perform any provision of the Contract or Contract Documents with such diligence as will ensure its completion within the time specified in the Contract or any extension thereof, otherwise fails to timely satisfy any provision set forth in the Contract Documents, or commits any other substantial breach of the Contract Documents, ASPA may notify the Contractor in writing of the delay or non-performance, and if not cured within ten (10) days or any longer time specified in writing to ASPA, ASPA shall terminate the Contractor's right to proceed under the Contract or such part of

the Contract Documents as to which there has been delay or a failure to properly perform. In the event of termination in whole or in part under this section, ASPA may procure similar supplies, materials and/or services in a manner and upon terms deemed appropriate by ASPA, as further set forth in the section entitled "ASPA's Right to Re-contract Work". Notwithstanding termination of the Contract and subject to any directions from ASPA, the Contractor shall take timely, reasonable, and necessary action to protect and preserve property in the possession of the Contractor in which ASPA has an interest.

Payment for completed work shall be at the sole discretion of ASPA. Payment for the protection and preservation of property shall be in an amount agreed upon by the Contractor and ASPA. ASPA may withhold from amounts due the Contractor such sums as ASPA deems to be necessary to protect ASPA against loss because of outstanding liens or claims of former lien holders and to reimburse ASPA for the excess costs incurred in procuring similar goods, material and/or services. Except with respect to defaults of subcontractors, the Contractor shall not be in default by reason of any failure in performance of the Contract in accordance with its terms if the Contractor has notified ASPA within ten (10) days after the cause of the delay and the failure arises out of causes such as acts of God, acts of the public enemy, acts of ASPA and any other ASPA entity in its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes or other labor disputes, freight embargo, or unusually severe weather. If the failure to perform is caused by the failure of a subcontractor to perform or to make progress, and if such failure arises out of causes similar to those set forth above, the Contractor shall not be deemed to be in default, unless the supplies and/or services to be furnished by the subcontractor were reasonably obtainable from other sources in sufficient time to permit the Contractor to meet the Contract requirements.

If, after notice of termination for default, it is determined for any reason that the Contractor was not in default under the provisions of this section, the rights and obligations of the parties shall, be the same as if the notice of termination had been issued pursuant to the subsection entitled "Termination for Convenience."

The rights and remedies provided in this subsection are in addition to any other rights and remedies provided by law or under the Contract Documents.

54. TERMINATION FOR NATIONAL EMERGENCIES

ASPA shall terminate this Contract or portion thereof by written notice when the Contractor is prevented from proceeding with this Contract as a direct result of an Executive Order of the President or Governor of American Samoa with respect to the prosecution of war or in the interest of national defense. ASPA shall not be liable for any claims for loss of anticipated profits.

55. ASPA'S RIGHT TO RE-CONTRACT WORK

If (a) ASPA determines that the Contractor has abandoned the work, (b) the Contractor is adjudged to be bankrupt, (c) the Contractor makes a general assignment, with ASPA's approval, for the benefit of the Contractor's creditors, (d) a receiver is appointed on account of its insolvency, (e) the Contractor, on more than one working day, refuses or fails to supply enough properly skilled workers or proper materials, (f) the Contractor

fails to make prompt payment to subcontractors for materials or labor, (g) the Contractor disregards the laws or regulations of American Samoa or the United States, or (h) ASPA finds that the Contractor is in material breach of any provision of the Contract Documents or any laws or regulations, then ASPA may, without prejudice to any other right or remedy provided to ASPA under the Contract Documents or at law, and after giving the Contractor and its surety ten (10) days' written notice of its intent to terminate for default, terminate the employment of the Contractor in accordance with this section and the section entitled "Termination for Default" and take possession of the premises and of all materials, tools and appurtenances thereon and finish the work by whatever method ASPA may deem expedient. In such case, the Contractor shall not be entitled to receive any further compensation. In the event that the cost, including additional managerial and administrative services to ASPA to complete the work exceeds the contract price such excess costs shall be paid by the Contractor.

56. SUSPENSION OF THE WORK

ASPA shall have the authority to suspend the work wholly, or in part, for such period or periods as it may deem necessary, due to severe weather or such other conditions as are considered by ASPA to be unfavorable to the prosecution of the work. ASPA shall also have the authority to suspend the work for such time as is necessary due to the failure on the part of the Contractor to carry out orders given by ASPA or any other Contract (collectively all of the above shall constitute a "Foreseeable Suspension").

In the event that the Contractor is ordered by ASPA to suspend the Work for a Foreseeable Suspension, the period of shutdown shall be computed from the effective date of ASPA's order to suspend work to the effective date of ASPA's order to resume the Work. ASPA shall, at its sole discretion, determine whether a contract amendment is appropriate, whose determination will not be unreasonable. In the event that the Contractor is ordered by ASPA to suspend the Work for some unforeseen cause not otherwise provided for in this Agreement and over which the Contractor has no control (an "Unforeseen Suspension"), the period of suspension shall be computed from the effective date of ASPA's order to suspend work to the effective date of ASPA's order to resume the Work (the "Suspension Period"). In the event of an Unforeseen Suspension, ASPA and the Contractor shall execute an appropriate contract amendment extending the term of this Contract to account for the Suspension Period.

No provision of this section shall be construed as entitling the Contractor to compensation for delays due to inclement weather, for suspension made at the request of the Contractor, or for any other delay.

57. EXAMINATION OF EXISTING FACILITIES

After the Contract is executed and before the commencement of work, the Contractor and Engineer shall make a thorough examination of all existing building, structures, and other improvements in the vicinity of the work, as applicable, which might be damaged by construction operations. Periodic examinations of existing buildings, structures, and other improvements in the vicinity of the work shall be made jointly by authorized representatives of the Contractor, Engineer, Owner, and the affected property owners. The scope of the examination shall include cracks in structures, settlement, leakage, and similar conditions. Records in triplicate of all observations shall be prepared by the

Contractor and each copy of every document shall be signed by the authorized representatives of the Owner and Contractor and signed in the manner specified above. One signed copy of every document and photograph will be kept on file in the office of the Engineer. These records and photographs are intended for use as indisputable evidence in ascertaining whether, and to what extent, damage occurred as a result of the Contractor's operatives and are for the protection of the adjacent property owners, the Contractor, and the Owner.

58. DIFFERING SITE CONDITIONS

The Contractor shall promptly, and before such conditions are disturbed, notify the Engineer in writing of: (a) subsurface or latent physical conditions at the site differing materially from those indicated in the contract, or (b) unknown physical conditions at the site of an unusual nature, differing materially from those ordinarily encountered and generally recognized as being work of the character provided for in the Contract. The Engineer shall promptly investigate the conditions, and if he/she finds that such conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the work under the Contract, whether or not changed as a result of such conditions, an equitable adjustment shall be made by ASPA and the Contract shall be modified in writing accordingly. No claim of the Contractor under this clause shall be allowed unless the Contractor has given the notice required above. No claim by the Contractor for an equitable adjustment hereunder shall be allowed if asserted after final payment under this Contract.

59. UNFORESEEN DELAYS

If the Contractor is delayed in the progress of the work by any act or neglect of ASPA, or by strikes, lockouts, fire, unusual weather conditions, or unavoidable casualties, the Contractor shall, within 48 hours of the start of the delay give notice to the Engineer of the cause of the delay and estimate the possible time extension involved. Within seven (7) days after the conclusion of the delay, the Contractor shall give notice to the Engineer of any actual time extension requested as a result of the aforementioned occurrence. No extension of time will be granted to the Contractor for delays occurring to parts of the work that have no measurable impact on the completion of the total work under the Contract, nor will extension of time be granted for delays to parts of work that are not located on the critical path if the Critical Path Method ("CPM") is used for scheduling the work. No extension of time will be considered for weather conditions normal to the area in which the work is being performed. Unusual weather conditions, if determined by the Engineer to be of a severity that would stop all progress of work, may be considered as cause for an extension of Contract completion time.

The Engineer may order the Contractor to suspend the work that may be subject to damage in climatic conditions. When delay is caused by an order to suspend work given on account of climatic conditions which, in the opinion of the Engineer, could have been reasonably foreseen, and for damage that could have been forestalled by diligent and reasonable action on the part of the Contractor, the Contractor will not be entitled to any extension of time on account of such order. The Contractor shall maintain all drainage ways through the work open and clear for drainage and storm water flow. The Contractor's attention is directed to the average annual rainfall in American Samoa which

is approximately 200 inches.

Delays in delivery of equipment or material purchased by the Contractor or his subcontractors (including ASPA selected equipment) shall not be considered as a just cause for delay. The Contractor shall be fully responsible for the timely ordering, scheduling, expediting, delivery and installation of all equipment and materials.

Within a reasonable period after the Contractor submits to the Engineer a written request for an extension of time, the Engineer will present his written opinion to the Contractor as to whether an extension of time is justified, and, if so, his recommendation as to the number of days for time extension. The Engineer will make the final decision on all requests for extension of time.

In no event shall the Contractor be entitled under the Contract to collect or recover any damages, loss or expense incurred by any delay other than as caused by ASPA. If additional costs were incurred by contractor due to delays caused by ASPA, the contract is entitled to a cost claim of no more than the amount of the liquidated damage fee under the "Failure to complete the work in the time agreed upon" clause.

60. FAILURE TO COMPLETE THE WORK IN THE TIME AGREED UPON

It is agreed by the parties to the Contract that time is of the essence, and that in case all the work is not completed before or upon the expiration of the term of the Contract, damages will be sustained by ASPA, and it is therefore agreed that the Contractor will pay to ASPA the amount stipulated in the Contract Documents. A liquidated damage fee of <u>One Thousand Dollars ($1,000.00)</u> per day shall be assessed by ASPA and shall be payable by the Contractor for each day the Contractor fails to successfully complete the Work before or upon the expiration of the term of the Contract. The parties explicitly agree that payment and acceptance of any late penalties shall not constitute accord and satisfaction of the Contractor's failure to complete the Work within the term of this Contract. In addition, ASPA will have the right to charge to the Contractor and to deduct from the final payment for the work the actual cost to ASPA of engineering, inspection, construction, review, and other overhead expenses, which are directly chargeable to the Contract and which accrue during the period of such delay.

In the event that the Contractor fails to complete the work within the term of the Contract, ASPA may then relet the Contract for the unfinished portion of the work, or complete it by Force Account. Such reletting or doing said work by Force Account shall not relieve the original Contractor or its Sureties from liabilities on their bonds, or relieve the Contractor of its responsibilities set forth in the Contract Documents for all portions of this work completed by the Contractor.

61. DISPUTES

Except as otherwise provided in the Contract, any dispute concerning a question of fact arising under the Contract or the Contract Documents which is not disposed of by agreement, shall be decided by the Engineer, who shall reduce his/her decision to writing and mail or otherwise furnish a copy thereof to the Contractor. The decision of the Engineer shall be final and conclusive unless, within thirty (30) days from the date of receipt of such copy, the Contractor mails or otherwise furnishes to the Engineer a written appeal addressed to ASPA's Chief Executive Officer ("CEO"). The decision of the CEO

or his/her duly authorized representative for the determination of such appeals shall be final and conclusive. This provision shall not be pleaded in any suit involving a question of fact arising under the Contract as limiting judicial review of any such decision to cases where fraud by such official or his representative or board is alleged; provided, however, that any such decision shall be final and conclusive, unless the same is fraudulent or capricious or arbitrary or so grossly erroneous as necessarily to imply bad faith or is not supported by substantiating evidence. In connection with any appeal proceeding under this section, the Contractor shall be afforded an opportunity to be heard by the CEP and to offer evidence in support of its appeal. After a final decision by the CEO of a dispute hereunder, and during any further appeals to a court of competent jurisdiction, the Contractor shall proceed diligently with the performance of the Contract and in accordance with the CEO's decision. This section does not preclude considerations of questions of law in connection with decisions provided for above.

62. JURISDICTION

This Contract shall be construed according to the laws of American Samoa. All disputes under this Contract and all judicial proceedings shall be brought in the High Court of American Samoa. The Contactor hereby appoints the Treasurer of the American Samoa Government as agent for service within the jurisdiction, if an agent of the Contractor cannot be found in American Samoa after a reasonable search.

The Treasurer of American Samoa is hereby appointed agent of the Contractor for service of process in all judicial proceedings. At the time of service of papers upon the agent above-referenced, ASPA shall also cause confirming copies to be posted in the U.S. Mail, certified mail, properly stamped and addressed to the Contractor's address of record.

63. OTHER CONTRACTS

ASPA reserves the right to let other Contracts in connection with the work. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work and shall properly connect and coordinate his work with theirs. If any part of the work under the Contract depends on the prior acceptable completion of work by others under separate Contract(s), the Contractor shall inspect and promptly report to the Engineer any defects in such work that would adversely affect the satisfactory completion of the work under the Contract. The Contractor's failure to so inspect and report shall constitute acceptance of the work by others as being suitable for the proper reception and completion of the work under this Contract, excluding, however, those defects in the work by others that occur after the satisfactory completion of the work specified hereunder.

64. USE OF PREMISES

The Contractor shall confine its equipment, the storage of materials, and the operation of its workers to limits shown on the Functional Specifications and/or Drawing, and shall not unreasonably encumber the premises with its materials. The Contractor shall provide, at its own expense, the necessary rights-of-way and access to the work which may be required outside the limits of ASPA's property or acquired right-of-way. The Contractor shall not load or permit any part of a structure to be loaded with a weight that will endanger its safety.

65. ENVIRONMENTAL CONTROLS

The Contractor, in executing the work, shall maintain affected areas within and outside project boundaries free from environmental pollution that would be in violation of applicable laws. The Contractor shall not impair the operation of existing water systems and shall maintain original site drainage whenever possible.

66. WATER POLLUTION CONTROLS

The Contractor, in executing the work, shall comply with all applicable laws prohibiting the pollution of marine waters, lakes, wetlands, streams, or river waters. Prior to commencing excavation and construction, the Contractor shall obtain the Engineer's approval of the Contractor's detailed plans showing procedures intended to handle and dispose of groundwater, and storm water flow, including dewatering pump discharges. Dewatering pump discharges shall be conveyed to an existing storm water outfall. The Contractor shall comply with the procedures outlined in the U.S. Environmental Protection Agency manuals entitled "Guidelines for Erosion and Sedimentation Control Planning and Implementation," "Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity," and "Erosion and Sediment Control-Surface Mining in Eastern United States."

67. WASTE MATERIAL DISPOSAL

The Contractor shall comply with all ASPA and ASEPA pollution control, solid waste and landfill requirements, regulations and laws. The Contractor shall not burn or bury rubbish or waste materials on the premises. The Contractor shall not dispose of volatile wastes such as mineral spirits, oil, chemicals, or paint thinner in storm or sanitary drains. Disposal of wastes into streams or waterways is specifically prohibited. The Contractor shall provide acceptable containers for collection and disposal of waste materials, debris, and rubbish. The Contractor shall, prior to transporting any materials to the premises, submit to and obtain approval by the Engineer of all planned routes of passage. Routes shall be developed to minimize the impact of the additional traffic on the functioning of the transportation in American Samoa.

68. USE OF PREMISES

The Contractor shall at all times, keep the work site free from waste, materials, and rubbish caused by his operations, including all materials, tools, equipment, machinery and surplus. Should it become necessary for ASPA to remove any of the aforementioned materials from its facilities, ASPA may do so and charge all costs incurred thereof to the Contractor. Contractor shall confine construction equipment, the storage of materials and equipment and the operations of workers to the work site, or a safe storage facility not adjacent to the work site. The Contractor shall not unreasonably encumber the work site with materials or equipment. Contractor shall be fully responsible for any damage to the work site or areas contiguous thereto resulting from the performance of the work. During the progress of the work, Contractor shall keep the work site free from accumulations of waste materials, rubbish, and other debris resulting from the work. At the completion of the work, Contractor shall remove all waste materials, rubbish and debris from and about the work site as well as the removal of all tools, construction equipment, machinery, and surplus material, and shall leave the work site clean.

69. SUBSTANTIAL COMPLETION DATE

The Engineer may, at his/her sole discretion, issue a written notice of substantial completion for the purpose of establishing the date that ASPA will assume the responsibility for the cost of operating such equipment. Said notice shall not be considered as final acceptance of any portion of the work or relieve the Contractor from completing the remaining work within the specified time and in full compliance with the Contract Documents.

70. ASPA USE

ASPA shall have the right to take possession of and use any completed or partially completed portions of the work. Such use shall not be considered as final acceptance of any portion of the work, nor shall such use be considered as cause for an extension of the Contract completion time, unless authorized in writing by ASPA.

If, after installation, the operation or use of the materials or equipment to be furnished under this Contract proves to be unsatisfactory to ASPA, ASPA shall have the right to operate and use such materials or equipment until it can, without damage to ASPA, be taken out of service for correction or replacement. Such period of use of the defective materials or equipment pending correction or replacement shall in no way decrease the guarantee period required for the acceptable corrected or replaced items of materials or equipment.

71. PAYMENT

In consideration of the faithful performance of the work prosecuted in accordance with the provisions of these Contract Documents, ASPA promises to pay to the Contractor, the total contract amount. In consideration of the faithful performance of the work prosecuted in accordance with the provisions of these Contract Documents, the American Samoa Power Authority (ASPA) will pay the Contractor in United States dollars for all such work on the basis of percentage of completion for lump sum items and unit price for all other items.

72. GUARANTEE OF STRUCTURES

The Contractor shall guarantee the work done under this Contract against leaks, breaks, malfunctions, or other unsatisfactory conditions due to defective equipment, materials, or workmanship for a period of 1 year from the date of his acceptance of the final payment under the Contract. Any repair work or replacement required, in the opinion of the Engineer, shall be done immediately by the Contractor at his own expense.

Neither the final certificate of payment nor any provision in the Contract nor partial or entire use or occupancy of the premises by ASPA shall constitute an acceptance of work not done in accordance with the Contract nor relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects in the work and pay for any damage to other work resulting there from which shall appear within a period of 1 year from the date of final acceptance of work. ASPA will give notice of observed defects with reasonable promptness.

ASPA may make such repairs, if, within 5 days after mailing of a notice in writing to the

Contractor or to his agent, the Contractor shall neglect to make or undertake with due diligence the aforesaid repairs; provided, however, that if, in the opinion of the Engineer, delay would cause serious loss or damage, repairs may be made without notice being sent to the Contractor, and the Contractor shall pay the cost thereof.

73. CONTRACTORS' AND MANUFACTURERS' COMPLIANCE WITH LOCAL SAFETY, OSHA AND OTHER CODE REQUIREMENTS

The completed work shall include all necessary permanent safety devices, such as machinery guards and similar ordinary safety items required by the federal (OSHA) industrial authorities and applicable local and national codes. Further, any features of the work (including ASPA-select equipment) subject to such safety regulations shall be fabricated, furnished and installed in compliance with these requirements. Contractors and manufacturers of equipment shall be held responsible for compliance with the requirements included herein. Contractors shall notify all equipment suppliers and subcontractors of the provisions of this Article.

In selecting and/or approving equipment for installation in the project, ASPA and Engineer assume no responsibility for injury or claims resulting from failure of the equipment to comply with applicable national and local safety codes or requirements or the safety requirements of a recognized agency, or failure due to faulty design concepts, or defective workmanship and materials.

74. SUBSTITUTION OF MATERIALS

Except for ASPA-selected equipment items, and items where no substitution is clearly specified, whenever any material, article, device, product, fixture, form, type of construction, or process is indicated or specified by patent or proprietary name, by name of manufacturer, or by catalog number, such specifications shall be deemed to be used for the purpose of establishing a standard of quality and facilitating the description of the material or process desired. This procedure is not to be construed as eliminating from competition other products of equal or better quality by other manufacturers where fully suitable in design, and shall be deemed to be followed by the words "or equal". The Contractor may, in such cases, submit complete data to the Engineer, within 35 days following award of Contract, for consideration of another material, type, or process, which shall be substantially equal in every respect to that so indicated or specified. Substitute materials shall not be used unless approved in writing. The Engineer will be the sole judge of the substituted article or material.

75. MATERIALS AND EQUIPMENT OF FOREIGN MANUFACTURE

Foreign-made materials and equipment proposed for use on this Contract shall meet with the full intent and purpose of these Contract Documents; and documentation substantiating compliance with the specified requirements shall be submitted in English to the Engineer for review and approval prior to the Contractor's purchase and delivery to the project site. The ready availability of manufacturer's services and replacement parts for maintenance purposes shall be described and warranted. Bidders shall notify prospective suppliers of foreign-made material of this requirement, and the requirement for correcting defective workmanship and materials for a period of one year following final acceptance of the work under this Contract.

76. CORRECTION OF DEFECTIVE WORK AFTER FINAL ACCEPTANCE

The Contractor hereby agrees to make, at his own expense all repairs or replacements necessitated by defects in materials or workmanship, supplied under terms of this Contract, which become evident within 1 year after the date of final acceptance of the work or within 1 year after the date of substantial completion established by the Engineer for specified items of equipment, or within such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents. The Contractor further assumes responsibility for a similar guarantee for all work and materials provided by subcontractors or manufacturers of all work and materials provided by the subcontractors or manufacturers of packaged equipment components. The Contractor also agrees to hold ASPA harmless from liability of any kind arising from damage due to said defects. The Contractor shall make all repairs and replacements promptly upon receipt of written order for same from ASPA. If

the Contractor fails to make the repairs and replacement promptly, ASPA may do the work, and the Contractor and his Surety shall be liable for the cost thereof.

77. RELEASE OF LIENS AND CLAIMS

Before ASPA pays the Contractor the final payment for the work, the Contractor shall sign and deliver to ASPA a release of liens or claims sworn to under oath and duly notarized. The release shall state that the Contractor has satisfied all claims and indebtedness of every nature in any way connected with the work, including (but not limiting the generality of the foregoing) all payrolls, amounts due to subcontractors, accounts for labor performed and materials furnished, incidental services, liens and judgments. If any lien or claim remains unsatisfied after all payments to the Contractor are made, the Contractor shall refund to ASPA all monies that the latter may be compelled to pay in discharging such a lien or claim, including all costs and attorney's fees. In addition to the above, final payment will not be made until the Contractor has filed with ASPA the following:

a. Consent of the surety for final payment;
b. Satisfactory evidence by affidavit or otherwise that the Contractor's debts resulting from the Contract have been fully paid or satisfactorily received;
c. Tax clearance from the American Samoa Government that all delinquent taxes levied or allowed under Territorial statutes have been paid; and
d. A properly executed non-gratuity affidavit.

78. FINAL PAYMENT

Upon completion of all the work under the Contract, the Contractor shall notify the Engineer, in writing, that it has completed the Contract and requests final payment. If the work has been completed as provided in the Contract Documents, the Engineer will recommend acceptance of the completed work and submit a final estimate for the amount due the Contractor under this Contract. Upon approval of this final estimate by ASPA and compliance with provisions in the section entitled "RELEASE OF LIENS OR CLAIMS," and other sections or provisions of the Contract Documents as may be applicable; ASPA shall pay to the Contractor all monies due it under the provisions of these Contract Documents.

The acceptance by the Contractor of the final payment shall release ASPA, its directors, officers, employees, agents and representative from any and all liability to the Contractor for every act or omission of ASPA relating to or arising out of the Contract or the work performed. No payment, however, final or otherwise, shall operate to release the Contractor or its sureties from obligations under the Contract Documents, the Payment Bond, and any other bonds and/or warranties as provided for in the Contract Documents.

79. NO WAIVER OF RIGHTS

Neither the inspection by the Engineer, nor any order by ASPA for payment of money, nor any payment for, or acceptance of, the whole or any part of the work by the Engineer, nor any extension of time, nor any possession taken by ASPA or its employees, shall operate as a waiver of any provision of the Contract Documents, or any power therein reserved to ASPA, or any right to damages therein provided, nor shall any waiver of any

breach of the Contract Documents be held to be a waiver of any other or subsequent breach.

80. MEASUREMENT DEFINITIONS

This Section includes specifications for measurement as they apply to the Work, and includes provisions applicable to lump sum prices, measurement by volume and unit prices as indicated.

Work to be paid for at a Contract price per unit measurement, as indicated in the Contract Documents, will be measured by the Engineer in accordance with United States Standard Measures.

A. LUMP-SUM MEASUREMENT

Lump-sum measurement will be for the entire item, unit of work, structure, or combination thereof, as specified and as indicated in the Bid Schedule of the Bid Form.

B. MEASUREMENT BY VOLUME

Measurement by volume will be by the cubic dimension indicated in the Schedule. Method of volume measurement will be by the unit volume in place or removed as shown on the Contract Drawings as specified.

When material is to be measured and paid for on a volume basis and it is impractical to determine the volume by the specified method of measurement, or when requested by the Contractor in writing and accepted by the Engineer in writing, the material may be weighed in accordance with the requirements specified for weight measurement. Such weights will be converted to volume measurement for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Engineer and shall be agreed to by the Contractor before such method of measurement of pay quantities will be accepted.

C. LINEAR MEASUREMENT

Linear measurement will be by the linear dimension listed or indicated in the Contract Documents. Unless otherwise indicated, items, components, or work to be measured on a linear basis will be measured at the centerline of the item in place.

81. THIRD PARTY BENEFICIARY

This Contract is not intended to create in the public or any member thereof a third party beneficiary or to authorize anyone not a party to this Contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of this Contract.

82. PROHIBITION AGAINST INTEREST IN THIS CONTRACT

No member of or delegate to the Congress of the United States or FONO of American Samoa shall be admitted to any share or any part of this Contract or to any benefit to arise from the same; provided that the foregoing provision of this contract is made with a corporation for its general benefit. No employee of ASPA who exercises any functions

or responsibilities in connection with the carrying out of the project to which this Contract pertains shall have any private interest, direct or indirect, in this Contract.

83. FORCE MAJEURE

Neither party shall be construed to be in default with respect to any obligation hereunder if performance of such obligation is prevented by uncontrollable forces. The term uncontrollable forces is deemed for the purpose of this Contract to mean any cause beyond the control of the party affected, including, but not limited to, flood, earthquake, severe storm, drought, lightning, fire, war, riot, civil disturbance, labor disturbance, sabotage, or restraint by a court order or other regulatory agency, which by exercise of due diligence and foresight such party could not reasonably have been expected to avoid. Any party rendered unable to fulfill any obligation by reason of uncontrollable forces shall exercise due diligence to remove such inability with all reasonable dispatch. Nothing contained herein shall be construed to obligate a party to settle a strike against its will.

84. NOTICES

All notices and correspondence required to be sent to either party hereunder shall be delivered personally or by certified or registered mail and addressed as follows and deemed effective when so mailed (subject to the right to designate a different address by notice similarly given):

MISCELANEOUS

1. ASSIGNMENT

The Contractor shall neither assign nor subcontract any portion of this Agreement without the express written approval of ASPA.

2. AMENDMENTS

This Contract may be amended at any time during the term hereof, provided, however, that no amendments or other variation of this Contract shall be valid unless in writing and signed by the Contractor and a duly authorized representative of ASPA.

3. RELATIONSHIP OF THE PARTIES

The relationship of the parties hereto shall in no event be deemed or construed to be that of employer and employee or of principal and agent, or of any other relationship other than as an independent Contractor providing the services specified in this Contract.

4. ENTIRE AGREEMENT

This Contract and all documents incorporated herein constitute the entire agreement between the parties and supersede any oral or written understandings or agreements.

5. SEVERABILITY

Each part of this Contract is intended to be severable. In the event that any part of this Contract is found by the High Court of American Samoa to be illegal or unenforceable, such provision or provisions shall be severed or modified to the extent necessary to render it enforceable, and as so severed or modified, this Contract shall continue in full force and effect.

6. SECTION HEADINGS, NUMBERS AND LETTERS

The section headings and section numbers and letters in this Contract are for reference purposes only and shall not affect in any way the meaning or interpretation of this Contract.

7. FURTHER ASSURANCES

In addition to the instruments and documents to be made, executed and delivered pursuant to this Agreement, the parties hereto agree to make, execute and deliver or cause to be made, executed and delivered, to the requesting party such other instruments and to take such other actions as the requesting party may reasonably require to carry out the terms of this Contract and the transactions contemplated hereby.

8. EXECUTION IN COUNTERPARTS

This Contract may be executed in any number of counterparts, each of which shall be deemed an original and all of which together shall constitute one and the same agreement.

9. WAIVER

Any waiver at any time by ASPA of its rights with respect to this Contract, or with respect to any other matter arising in connection with this Contract, shall be deemed a waiver of that specific instance only and shall not be deemed a waiver with respect to any other matter arising thereafter in connection with this Contract.

10. AUTHORITY

Each party represents and warrants that it has the necessary corporate and/or legal authority to enter into this Contract and to perform all of its duties and obligations imposed by this Contract. Each party further represents that the individuals executing this Contract on their respective behalf have been duly authorized to do so and that such execution creates a valid, binding and legally enforceable obligation of each party.

11. CONFLICTS

In the event a court of competent jurisdiction finds that a conflict exists between two or more provisions of the Contract Documents, the provisions of the Contract shall first prevail, followed by the Notice to Bidders, Instruction to Bidders, Technical Specifications, Drawings and then Bid Form, in that order.

12. BONDS AND OTHER PERFORMANCE SECURITY

The Contractor shall provide the following performance bond and labor and material payment bond or other performance security unless otherwise stipulated in the bid documents: Performance Bond at 100% of the total bid amount and Payment Bond at 100% of the total bid amount.

SUPPLEMENTARY CONDITIONS

1. GENERAL FEDERAL DAVIS-BACON WAGES

The following supplements shall modify, delete, and or add to the General Conditions. Where any article, paragraph, or sub paragraph in the General Conditions is supplemented by one of the following paragraphs, the provisions of such article, paragraph, or sub paragraph shall remain in effect and supplemental provisions shall be considered as added thereto. Where any article, paragraph in the General Conditions is amended, voided, or suspended by any of the following paragraphs, the provisions of such article, paragraph or sub paragraph not so amended, voided, or superseded shall remain in effect.

Federal Labor Standards Provisions. For Federally Assisted Construction Contracts. United States Department of Labor. CFR Code of Federal Regulations Pertaining to ESA. (Federal Davis-Bacon Wages). Title 29, Chapter I, Part 5, Subpart A (29 CFR 5.5)

Section Name: Contract provisions and related matters.

(a) The Recipient shall assure that the sub recipient(s) insert in full in any contract in excess of $2,000 which is entered into for the actual construction, alteration or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the applicable FY appropriation requirements, the following clauses:

(1) Minimum Wages.

(i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage

determination for the classification of work actually performed, without regard to skill, except as provided in Sec. 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined

pursuant to paragraphs (a)(1)(ii) (B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding.

The loan or grant recipient shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the (Agency or SRF program) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and Basic Records

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b) (2) (B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the

Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the SRF program if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the SRF program. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the SRF program if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the SRF program, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).

(B) Each payroll submitted shall be accompanied by a ``Statement of Compliance,'' signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

> (1) That the payroll for the payroll period contains the information required to be provided under Sec. 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under Sec. 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is

correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the ``Statement of Compliance'' required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the loan or grant recipient or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) APPRENTICES AND TRAINEES

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under

the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the

wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act requirements.

The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts

The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the SRF program may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination

Debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon

Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

(b) Contract Work Hours and Safety Standards Act. The Agency Head shall cause or require the contracting officer to insert the following clauses set forth in paragraphs (b)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Sec. 5.5(a) or 4.6 of part 4 of this title. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b) (1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b) (1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b) (1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The government may withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b) (2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b) (1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b) (1) through (4) of this section.

(c) In addition to the clauses contained in paragraph (b), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes

cited in Sec. 5.1, the Agency Head shall cause or require the contracting officer to insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Agency Head shall cause or require the contracting officer to insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the loan or grant recipient and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

Minimum Wage. The minimum wage in American Samoa for the construction industry was set at $4.60 per hour on May 25, 2008, for Federally Assisted Construction Projects. Any changes in minimum wage during the term of this contract must be complied with at no increase in the contract sum. The Act also provides for additional increases in the minimum wage of $0.50 an hour each year on May.

END OF SECTION

SECTION 00100

SUMMARY OF WORK

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

1.1.1 The General Conditions of Construction Contracts and Special Provisions preceding these specifications shall govern this section of the work.

1.2 GENERAL INTENTION

1.2.1 Complete installation of connection to proposed HDPE Waterline Replacement Project - Phase I. Work includes construction and installation of two (2) PRV / PSV.

1.2.2 The Work Includes: All Work as described in the General Intention. This Summary of Work shall become a part of the Contract.

1.2.3 The Contractor will be responsible for reading these specifications and he shall become familiar with the drawings. All items mentioned in the specifications and that appear on the drawings, shall be required to be installed as if specifically mentioned in this section.

1.3 CONTRACT

1.3.1 Contract may be awarded to only one Contractor depending on the outcome of the bid and the Contractor's capability to perform the work and to provide a Performance Bond.

1.4 SEQUENCE

1.4.1 Contractor may use any sequence of operations he chooses compatible with completion dates noted in the Specifications, and other limitations required by the Contract Documents.

1.5 COOPERATION, COORDINATION, SUPERVISION, SCHEDULING

1.5.1 General Contractor is responsible for expediting coordination and scheduling all work, and for proper notifications to Owner’s Representative and/or agencies responsible for code compliance

END OF SECTION

SECTION 00110

APPLICABLE STANDARDS

PART 1-GENERAL

1.1 GENERAL PROVISIONS

1.1.1 The General Conditions of Construction Contracts and Special Provisions preceding these specifications shall govern this section of the work.

1.2 DESCRIPTION

1.2.1 Work Included:

1.2.1.1 Throughout the Contract Documents, reference is made to codes and standards that establish qualities and types of workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics.

1.2.1.2 Where materials or workmanship are required by these Contract Documents to meet or exceed the specifically named code or standard, it is the Contractor's responsibility to provide materials and workmanship that meet or exceed the specifically named code or standard.

1.2.1.3 It is also the Contractor's responsibility, when so required by the Contract Documents or by written request from the ENGINEER, to deliver to the ENGINEER all required proof that the materials or workmanship, or both, meet or exceed the requirements of the specifically named code or standard.

1.2.2 Related Work Described Elsewhere:

1.2.2.1 Specific naming of codes or standards occurs on the Drawings and in other Sections of these Specifications.

1.3 QUALITY ASSURANCE

1.3.1 Familiarity with Pertinent Codes and Standards: In procuring all items used in this Work, it is the Contractor's responsibility to verify the detailed requirements of the specifically named codes and standards and to verify that the items procured for use in this Work meet or exceed the specified requirements.

1.3.2 Rejection of Non-Complying Items: The Engineer reserves the right to reject items incorporated into the Work that fail to meet the specified minimum requirements. The Engineer further reserves the right, and without prejudice to other recourse, the Engineer may take, to accept non-complying items subject to an adjustment in the Contract Amount as approved by the Engineer and the Owner.

END OF SECTION

SECTION 00120

PROJECT MEETINGS

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

1.1.1 The General Conditions of Construction Contracts and Special Provisions preceding these specifications shall govern this section of the work.

1.2 DESCRIPTION

1.2.1 Work Included:

1.2.1.1 To enable orderly review during progress of the Work, and to provide for systematic discussion of problems, the Engineer will conduct project meetings throughout the construction period.

1.2.2 Related Work Described Elsewhere:

1.2.2.1 The Contractor's relations with his subcontractors and materials suppliers, and discussions relative thereto, are the Contractor's responsibility and are not part of project meetings contents.

1.3 QUALITY ASSURANCE

1.3.1 Persons designated by the Contractor to attend and participate in the project meetings shall have all required authority to commit the Contractor to solutions agreed upon in the project meetings.

1.4 SUBMITTALS

1.4.1 Agenda Items: To the maximum extent practicable, advise the Engineer at least 24 hours in advance of project meetings regarding all items to be added to the agenda.

1.4.2 Minutes: The Engineer will compile minutes of each project meeting and will furnish the Contractor.

PART 2- PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 MEETING SCHEDULE

3.1.1 Except as noted below for Preconstruction Meeting contractor will hold project meetings weekly. Coordinate as necessary to establish mutually acceptable schedule for meetings.

3.2 MEETING LOCATION

3.2.1 To the maximum extent practicable, meetings will be held at the job site.

3.3 PRE-CONSTRUCTION MEETING

3.3.1 Schedule the Preconstruction Meeting as soon as possible after the Owner has issued Notice to Proceed. Provide attendance by authorized representatives of the Contractor and all major subcontractors. The Engineer will advise other interested parties and request their attendance.

3.3.2 Minimum Agenda: Distribute data on and discuss:

3.3.2.1 Organizational arrangement of Contractor's forces and personnel and those of subcontractors, materials suppliers and Engineer

3.3.2.2 Channels and procedures for communications

3.3.2.3 Construction Schedule, including sequence of critical work

3.3.2.4 Contract Documents, including distribution of required copies of original Documents and revisions

3.3.2.5 Processing of Shop Drawings and other data submitted to the Engineer for review

3.3.2.6 Processing of field decisions and Change Orders

3.3.2.7 Rules and regulations governing performance of the work

3.3.2.8 Procedures for safety and first aid, security, quality control, housekeeping, and other related matters

3.4 PROJECT MEETINGS

3.4.1 Attendance:

3.4.1.1 To the maximum extent practicable, assign the same person to represent the Contractor at project meetings throughout progress of the work. Subcontractors, materials suppliers, and others may be invited to attend those project meetings in which their aspects of the Work are involved.

3.4.2 Minimum Agenda:

3.4.2.1 Review, revise as necessary and approve minutes of previous meeting.

3.4.2.2 Review progress of the Work since last meeting, including status of submittals for approval.

3.4.2.3 Identify problems that impede planned progress.

3.4.2.4 Develop corrective measures and procedures to regain planned schedule.

3.4.2.5 Complete other current business.

END OF SECTION

SECTION 00130

SUBMITTALS AND SUBSTITUTION

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

1.1.1 The General Conditions of Construction Contracts and Special Provisions preceding these specifications shall govern this section of the work.

1.2 DESCRIPTION

1.2.1 Work Included:

1.2.1.1 Wherever possible throughout the Contract Documents, the minimum, acceptable quality of workmanship and materials has been defined by manufacturer's name and catalog number, reference to recognized industry and government standards, or description of required attributes and performance.

1.2.1.2 To ensure that the specified products are furnished and installed in accordance with design intent, procedures have been established for advance submittal of design data and for their review by the ENGINEER.

1.2.1.3 Make all submittals required by the Contract Documents, revise and resubmit as necessary to establish compliance with the specified requirements.

1.2.2 Related Work Described Elsewhere:

1.2.2.1 Individual requirements for submittals are described in pertinent other Sections of these Specifications.

1.3 QUALITY ASSURANCE

1.3.1 Coordination of Submittals: Prior to each submittal carefully review and coordinate all aspects of each item being submitted and verify that each item and the submittal for it conforms in all respects with the requirements of the Contract Documents. Affixing the Contractor's signature to each submittal certifies that this coordination has been performed.

1.3.2 Certificates of Compliance:

1.3.2.1 Certify that all materials used in the Work comply with all specified provisions thereof. Certification shall not be construed as relieving the Contractor from furnishing satisfactory materials if, after tests are performed on selected samples the material is found not to meet specified requirements.

1.3.2.2 Show on each certification the name and location of the Work, name and address of Contractor, quantity and date or dates of shipment or delivery to which the certificate applies and name of the manufacturing or fabricating company. Certification shall be in the form of letter or company-standard forms containing all required data. An officer of the manufacturing or fabricating company shall sign certificates.

1.3.2.3 In addition to the above information all laboratory test reports submitted with Certificates of Compliance shall show the date or dates of testing, the specified requirements for which testing was performed and results of the test or test

1.4 SUBMITTALS

1.4.1 Submittals Schedule:

1.4.1.1 Within 35 days after award of Contract and before any items are submitted for approval submit to the ENGINEER two copies of the schedule.

1.4.1.2 Certificates of Compliance:

1.4.1.2.1 Upon completion of the Work and as a condition of its acceptance submit to the ENGINEER all Certificates of Compliance.

1.4.1.3 Procedures:

1.4.1.3.1 Make submittals in strict accordance with the provisions of this Section.

PART 2 – PRODUCTS

2.1 SUBMITTAL SCHEDULE

2.1.1 General:

2.1.1.1 Compile a complete and comprehensive schedule of all anticipated submittals during progress of the Work. Include a list of each type of item for which Contractor's drawings, Shop Drawings, Certificates of Compliance, material samples, guarantees or other types of submittals are required. Upon approval by the ENGINEER this schedule will become part of the Contract and the Contractor will be required to adhere to the schedule except when specifically otherwise permitted.

2.1.2 Coordination:

2.1.2.1 Coordinate the schedule with all necessary Subcontractors and materials suppliers to ensure their understanding of the importance of adhering to the approved schedule and their ability to so adhere.

2.1.3 Revisions:

2.1.3.1 Revise and update the schedule on a monthly basis as necessary to reflect conditions and sequences. Promptly submit revised schedules to the ENGINEER for review and comment.

2.2 SHOP DRAWINGS AND COORDINATION DRAWINGS

2.2.1 Shop Drawings:

2.2.2 Scale and Measurement:

2.2.2.1 Make all Shop Drawings accurately to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the Work.

2.1.3 Type of Prints Required:

2.1.3.1 Submit all Shop Drawings in the form of six (6) copies shall be submitted for review, blue line or black line print of each sheet.

2.1.4 Reproduction of Review Shop Drawings:

2.1.4.1 Printing and distribution of review Shop Drawings for the Engineer's use will be by the ENGINEER. All review comments of the ENGINEER will be shown on the sepia transparency when it is returned to the Contractor. The Contractor shall make and distribute all copies required for his purposes.

2.3 MANUFACTURER'S LITERATURE

2.3.1 General:

2.3.1.1 Where contents of submitted literature from manufacturers include data not pertinent to the submittal, clearly indicate which portion of the contents is being submitted for review.

2.3.1.2 Number of Copies Required:

2.3.1.3 Submit six (6) copies of all required shop drawings, product data, etc...

2.4 SAMPLES

2.4.1 Accuracy of Samples:

2.4.1.1Samples shall be of the precise article proposed to be furnished.

2.4.2 Number of Samples Required:

2.4.2.1 Unless otherwise specified submit samples in the quantity that is required to be returned plus two (2) that will be retained by the ENGINEER.

2.4.3 Reuse of Samples:

2.4.3.1 In situations specifically so approved by the ENGINEER, the Engineer's retained sample may be used in the construction as one of the installed items.

2.5 COLORS AND PATTERNS

2.5.1 Unless the precise color and pattern is specifically described in the Contract Documents and whenever a choice of color or pattern is available in a specified product, submit accurate color and pattern charts to the ENGINEER or review and selection.

2.6 SUBSTITUTIONS

2.6.1 Approvals Required:

2.6.1.1 The Contract is based on the standards of quality established in the Contract Documents.

2.6.1.2 All products proposed for use, including those specified by requirement attributes and performance shall require approval by the ENGINEER before being incorporated into the Work.

2.6.1.3 Do not substitute materials, equipment, or methods unless the ENGINEER has specifically approved such substitution for this Work.

2.6.2 "Or Equal":

2.6.2.1 Where the phrase "or equal" or "equal as approved by the ENGINEER" occurs in the Contract Documents. Do not assume that materials, equipment, or methods will be approved or are equal unless the item has been specifically approved for this Work by the ENGINEER. The decision of the Engineer shall be final.

PART 3 – EXECUTION

3.1 IDENTIFICATION OF SUBMITTALS

3.1.1 Consecutively number all submittals. Accompany each submittal with a letter of transmittal containing all pertinent information required for identification and checking of submittals.

3.2 COORDINATION OF SUBMITTALS

3.2.1 General:

3.2.1.1 Prior to submittal for approval, use all means necessary to fully coordinate all materials including, but not necessarily limited to:

3.2.1.2 Determine and verify all interface conditions, catalog numbers and similar data.

3.2.1.3 Coordinate with other trades as required.

3.2.1.4 Clearly indicate all deviations from requirements of the Contract Documents.

3.2.2 Grouping of Submittals:

3.2.2.1 Unless otherwise specified make all submittals in groups containing all associated items to ensure that information is available for checking each item when it is received. Partial submittals may be rejected as not complying with the provisions of the Contract Documents and the Contractor shall be strictly liable for all delays so occasioned.

3.3 TIMING OF SUBMITTALS

3.3.1 General:

3.3.1.1 Make all submittals far enough in advance of scheduled dates for installation to provide all time required for reviews, for securing necessary approvals, for possible revisions and re-submittals, and for placing orders and securing delivery.

3.3.1.2 Engineer's Review Time:

3.3.1.3 In scheduling, allow at least 10 calendar days for review by the ENGINEER following his receipt of the submittal.

3.3.2 Delays:

3.3.2.1 Delays caused by tardiness in receipt of submittals will not be an acceptable basis for extension of the Contract completion date.

3.4 ENGINEER/ENGINEER'S REVIEW

3.4.1 General:

3.4.1.1 Review by the ENGINEER shall not be construed as a complete check, but only that the general method of construction and detailing is satisfactory. Review shall not relieve the Contractor from responsibility for errors that may exist.

3.4.2 Authority to Proceed:

3.4.2.1 The notations "Reviewed, no exceptions noted" or "Reviewed, exceptions noted" authorize the Contractor to proceed with fabrication, purchase, or both, of the items so noted subject to the revisions, if any, required by the Engineer's review comments.

3.4.3 Revisions:

3.4.3.1 Make all revisions required by the ENGINEER. If the Contractor considers any required revision to be a change, he shall so notify the ENGINEER provided for under "Changes" in the General Conditions. Show each drawing revision by number, date, and subject in a revision block on the drawing. Make only those revisions directed or approved by the ENGINEER.

3.4.4 Revisions After Approval:

3.4.4.1 When a submittal has been reviewed by the ENGINEER, re-submittal for substitution of materials or equipment will not be considered unless accompanied by an acceptable explanation as to why the substitution is necessary.

END OF SECTION

SECTION 00140

CONSTRUCTION SCHEDULE

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

1.1.1 The General Conditions of Construction Contracts and Special Provisions preceding these specifications shall govern this section of the work.

1.2 DESCRIPTION

1.2.1 Work Included:

1.2.1.1 To assure adequate planning and execution of the work so that the work is completed within the number of calendar days allowed in the Contract, and to assist the ENGINEER in appraising the reasonableness of the proposed schedule and in evaluating progress of the work, prepare and maintain the schedules as described in this Section.

1.2.2 Definition:

1.2.2.1 "Day" used throughout the Contract, unless otherwise stated, means "calendar day".

1.3 QUALITY ASSURANCE

1.3.1 Qualifications of Scheduling Personnel:

1.3.1.1 Employ a scheduler who is thoroughly trained and experienced in compiling construction schedule data, in analyzing by use of Critical Path Method or PERT, and in preparation and issue of periodic reports as required below.

1.3.1.2 Reference Standards: Perform all data preparation, analysis, charting, and updating in accordance with all recommendations contained in the current edition of "CPM In Construction" manual of Associated General Contractors, or in accordance with other standards approved by the ENGINEER.

1.3.2 Reliance upon approved schedule:

1.3.2.1 The construction schedule as approved by the ENGINEER will be an integral part of the Contract, and will establish interim contract completion dates for the various activities.

1.3.2.2 Should any activity not be completed within 15 days after the stated scheduled date, the ENGINEER should have the right to order the Contractor to expedite completion of the activity by whatever means the ENGINEER deems appropriate and necessary, without additional compensation to the Contractor.

1.3.2.3 Should any activity be 30 or more days behind schedule, the ENGINEER shall have the right to perform the activity or have the activity performed by whatever method the ENGINEER deems appropriate.

1.3.2.4 The Contractor shall reimburse cost incurred by the ENGINEER in connection with expediting construction activity under this Article to the ENGINEER.

1.3.2.5 It is expressly understood and agreed that failure by the ENGINEER to exercise the option to either order the Contractor to expedite an activity or to expedite the activity by other means shall not be considered precedent setting for any other activities.

1.4 SUBMITTALS

1.4.1 General:

1.4.1.1 Comply with the provisions of Section 01300 – SUBMITTALS AND SUBSTITUTIONS.

1.4.2 Preliminary Analysis:

1.4.2.1 Within ten days after receipt of Notice to Proceed, submit one reproducible copy and four prints of a preliminary Construction Schedule, plus four prints of proposed forms for Materials Status Reports, prepared in accordance with Part 3 of this Section.

1.4.3 Periodic Reports:

1.4.3.1 On the first working day of each month, submit four prints of the Construction Schedule updated as described in Part Three of this Section.

1.4.3.2 Accompanying each periodic submittal of Construction Schedule submit four prints of the Materials Status Reports updated as described in Part Three of this Section.

PART 2 – PRODUCTS

2.1 CONSTRUCTION ANALYSIS

2.1.1 Diagram:

2.1.1.1 Graphically show the order and interdependence of all activities necessary to complete the Work, and the sequence in which each activity is to be accomplished, as planned by the Contractor and his project field superintendent in coordination with all Subcontractors whose work is shown on the diagram. Activities shown on the diagram shall include, but are not necessarily limited to:

2.1.1.2 Project mobilization;

2.1.1.3 Submittals and approvals of Shop Drawings and Samples;

2.1.1.4 Procurement of equipment and critical materials;

2.1.1.5 Fabrication of special material and equipment, and their installation and testing;

2.1.1.6 Final cleanup;

2.1.1.7 Final inspection and testing;

2.1.1.7.1 All activities by the ENGINEER that affect progress, required dates for completion, or both, for all and for each part of the work

2.1.2 The detail of information shall be such that duration times of activities shall normally range from one to 15 days. The selection and number of activities shall be subject to the Engineer's approval.

2.1.3 Show on the diagram, as a minimum for each activity, preceding and following event numbers, description of each activity, cost, and activity duration in calendar days. Submit diagram on a sheet 75 cm (30") high by the width required.

2.1.4 Mathematical Analysis:

2.1.4.1 Furnish a mathematical analysis of the diagram by manual or computer aided means, including a tabulation of each activity. Show the following information as a minimum for each activity:

2.1.4.1.1 Preceding and following event number;

2.1.4.1.2 Activity description;

2.1.4.1.3 Estimated duration of activities;

2.1.4.1.4 Earliest start date (by calendar date);

2.1.4.1.5 Latest start date (by calendar date);

2.1.4.1.6 Earliest finish date (by calendar date);

2.1.4.1.7 Latest finish date (by calendar date);

2.1.4.1.8 Slack or float (in calendar days);

2.1.4.1.9 Monetary value of the activity;

2.1.4.2 Percentage of activity completed;

2.1.4.3 Contractor's earnings based on portion of activity completed.

2.1.4.4 The means used in making the mathematical analysis shall be capable of compiling the total value of completed and partially completed activities, and be capable of accepting modifications approved for time and logic adjustment.

2.1.5 Periodic Reports:

2.1.5.1 If computer-aided means are used, list the activities in computer printout sorts as follows:

2.1.5.2 By the preceding event number from lowest to highest, and then in order of the following event number;

2.1.5.3 By the amount of float, then in order of preceding event numbers, and then in order of succeeding event numbers;

2.1.5.4 In order of preceding event numbers, and then in order of succeeding event numbers (show the dollar amount and dollars spent to date for each activity);

2.1.5.5 Other sorts requested by the Engineer, for which the Contractor will be reimbursed in accordance with the General Conditions provisions for "Changes".

2.2 MATERIALS STATUS REPORT

2.2.1 Format:

2.2.1.1 The Contractor's standard materials status report form will be acceptable if, in the Engineer’s judgment, it provides sufficient pertinent data to determine that materials procurement flow is adequate for all needs of the Work.

2.2.2 Content:

2.2.2.1 Show at least the following information:

2.2.2.1.1 Item description, listed in accordance with Specifications Section number in which the item is called for

2.2.2.1.2 Purchase Order number and date of issue

2.2.2.1.3 Vendor name

2.2.2.1.4 Date shipped, and shipping means utilized

2.2.2.1.5 Estimated date of arrival at job site

2.2.2.1.6 Actual date of arrival at job site, and receiving report number

2.2.4 Data Processing:

2.2.4.1 Process the data by manual or computer-aided methods, but to a degree of promptness and accuracy assuring complete display of all pertinent current information at date of each periodic report.

PART 3 – EXECUTION

3.1 PRELIMINARY ANALYSIS

3.1.1 Contents

3.1.1.1 Show all activities of the Contractor under this Work for the period between receipt of Notice to Proceed and submittal of Construction Schedule.

3.1.1.2 Show the Contractor's general approach to remainder of the Work.

3.1.1.3 Show cost of all activities scheduled for performance before submittal and approval of the Construction Schedule.

3.1.2 Submittal

3.1.2.1 Submittal shall be in accordance with submittal requirement.

3.2 CONSTRUCTION SCHEDULE

3.2.1 As soon as practicable after receipt of Notice to Proceed, complete the construction analysis as required. Meet with the ENGINEER, review contents of proposed Construction Schedule, and make all revisions agreed upon.

3.3 MATERIALS STATUS REPORT

3.3.1 As soon as practicable after receipt of Notice to Proceed, meet with the ENGINEER, review contents of proposed Materials Status Reports, and make all revisions to format agreed upon.

3.4 PERIODIC REPORTS

3.4.1 Construction Schedule Contents:

3.4.1.1 Report actual progress by updating the mathematical analysis

3.4.1.2 Note on the summary report, or clearly show on a revised issue of affected portions of the detailed diagram, all revisions causing changes in the detailed program.

3.4.1.3 Revise the summary report as necessary for clarity.

3.4.1.4 Show activities or portions of activities completed during the reporting period, and their actual value.

3.4.1.5 State the percentage of Work actually completed as scheduled as of the report date, and the progress along the critical path in terms of days ahead of or behind the allowable dates.

3.4.1.6 If the Work is behind schedule, also report progress along other paths with negative slack.

3.4.1.7.1 Include a narrative report which shows, but is not necessarily limited to:

3.4.1.7.2 A description of the problem areas, current and anticipated;

3.4.1.7.3 Delaying factors, and their impact;

3.4.1.7.4 An explanation of corrective actions taken or proposed

3.4.1.7.5 Show the date of latest revision. Submit in accordance with the provisions of section 01300-Submittal.

3.4.2 Materials Status Report:

3.4.2.1 On the letter of transmittal, accompanying periodic reports, on an accompanying summary sheet, or by other means acceptable to the ENGINEER, clearly indicate those items the deliveries of which are critically overdue or otherwise hazardous to maintenance of the approved schedule.

3.4.2.2 Submit in accordance with the provisions of section 01300-Submittal

3.5 REVISIONS

3.5.1 Make only those revisions to approved Construction Schedule and approved Materials Status Reports as are approved in advance by the ENGINEER.

END OF SECTION

SECTION 00150

TEMPORARY FACILITIES AND CONTROL

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

1.1.1 The General Conditions of Construction Contracts and Special Provisions preceding these specifications shall govern this section of the work.

1.2 DESCRIPTION

1.2.1 Work Included:

1.2.1.1 Temporary facilities and controls required for this Work include, but are not necessarily limited to:

1.2.1.2 Temporary utilities such as water, electricity and telephone

1.2.1.3 Field offices and sheds

1.2.1.4 Sanitary facilities

1.2.1.5 Enclosures such as tarpaulins, barricades, and canopies

1.2.1.6 Fencing of the construction area

1.2.1.7 Haul roads.

1.2.2 Related Work Described Elsewhere:

1.2.2.1 Except that all equipment furnished by Subcontractors shall comply with all requirements of pertinent safety regulations, the ladders, planks, hoists, and similar items normally furnished by the individual trades in execution of their own portions of the work are not part of this Section.

1.2.2.2 Permanent installation and hook-up of the various utility lines are described in pertinent other Sections of these Specifications.

1.3 PRODUCT HANDLING

1.3.1 Use all means necessary to maintain temporary facilities and controls in proper and safe condition throughout progress of the work.

1.4 JOB CONDITIONS

1.4.1 Make all required connections to existing utility systems with minimum disruption to services in the existing utility systems, when disruption of the existing service is required, do not proceed without the ENGINEER’s approval and, when required, provide alternate temporary service.

PART 2 – PRODUCTS

2.1 UTILITIES

2.1.2 General:

2.1.2.1 All temporary facilities shall be subject to the Engineer’s approval.

2.1.3 Water:

2.1.3.1 Furnish and install all necessary temporary water lines and water supply and, upon completion of the Work, remove all such temporary facilities.

2.1.3.2 The Contractor will furnish all water needed for construction, at no cost to the Owner.

2.1.4 Electricity:

2.1.4.1 Furnish and install all necessary temporary wiring and, upon completion of the work, remove all such temporary facility.

2.1.4.2 Furnish and install area distribution boxes so located that the individual trades may use 30m (100') maximum length extension cords to obtain adequate power and artificial lighting at all points where required for the work, for inspection and for safety.

2.1.5 The Contractor shall make arrangements for and pay for all temporary electrical power required for construction.

2.1.6 Telephone:

2.1.6.1 Make all necessary arrangements and pay all costs for operation and installation of telephone service to the Contractor's office at the site.

2.2 CONTRACTOR’S FACILITIES

2.2.1 Field Office:

2.2.1.1 Provide a field office building and sheds adequate in size and accommodation for all Contractor's Offices, supplies and storage.

2.2.1.2 Within the Contractor's facilities, provide enclosed space adequate for holding weekly project meetings. Furnish with all required tables, chairs, and utilities.

2.2.1.3 The entire facility, including furniture, will remain the property of the Contractor and shall be removed from the site after completion of the work.

2.2.1.4 Sanitary Facilities: Provide temporary sanitary facilities in the quantity required, for use of all personnel. Maintain in a sanitary condition at all times.

2.3 ENCLOSURES

2.3.1 Furnish, install, and maintain for the duration of construction all required scaffolds, tarpaulins, barricades, canopies, warning signs, steps, bridges, platforms, and other temporary construction necessary for proper completion of the work in compliance with all safety and other regulations.

2.4 PROJECT SIGNS

2.4.1 Allow no signs or advertising of any kind on the job site except as specifically approved in advance by the ENGINEER.

2.5 FENCING OF THE CONSTRUCTION AREA

2.5.1 General:

2.5.1.1 Furnish and install temporary fence around construction areas on the site

2.5.2 Construction:

2.5.2.1 The temporary fence shall consist of woven wire mesh not less than 1.82 m (72”) in height, complete with metal posts and all required bracing and with truck and pedestrian gates as required.

PART 3 – EXECUTION

3.1 MAINTENANCE AND REMOVAL

3.1.1 Maintain all temporary facilities and controls as long as needed for the safe and proper completion of the Work. Remove all such temporary facilities and controls as rapidly as progress of the Work will permit, or as directed by the ENGINEER

END OF SECTION

SECTION 00160

SITE CLEANING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

1.1.1 The General Conditions of Construction Contracts and Special Provisions preceding these specifications shall govern this section of the work.

1.2 DESCRIPTION

1.2.1 Work Included:

1.2.1.1 Throughout the construction period, maintain the buildings and site in a standard of cleanliness as described in this Section.

1.2.2 Related Work Described Elsewhere:

1.2.2.1 In addition to standards described in this Section, comply with all requirements for cleaning up as described in various other Sections of these Specifications.

1.2 QUALITY ASSURANCE

1.2.1 Inspection:

1.2.1.1 Conduct daily inspection, and more often if necessary, to verify that requirements of cleanliness are being met.

1.2.2 Codes and Standards:

1.2.2.1 In addition to the standards described in this Section, comply with all pertinent requirements of governmental agencies having jurisdiction.

PART 2 – PRODUCTS

2.1 CLEANING MATERIALS AND EQUIPMENT

2.1.1 Provide all required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

2.2 COMPATIBILITY

2.2.1 Use only the cleaning materials and equipment that are compatible with the surface being cleaned, as recommended by the manufacturer of the material or as approved by the Engineer.

PART 3 – EXECUTION

3.1 PROGRESS CLEANING

3.1.1 General:

3.1.1.1 Retain all stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.

3.1.1.2 Do not allow the accumulation of scrap, debris, waste material, and other items not required for construction of this Work.

3.1.1.3 At least twice each month, and more often if necessary, completely remove all scrap, debris, and waste material from the job site.

3.1.1.4 Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the ecology.

3.1.2 Site:

3.1.2.1 Daily, and more often if necessary, inspect the site and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.

3.1.2.2 Weekly, and more often if necessary, inspect all arrangements of materials stored on the site.

3.1.2.3 Maintain the site in a neat and orderly condition at all times.

3.1.3 Structures:

3.1.3.1 Weekly, and more often if necessary, inspect the structures and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.

3.1.3.2 Weekly, and more often if necessary, sweep all interior spaces clean. "Clean", for the purpose of this sub-program, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and hand-held broom.

3.1.3.3 As required preparatory to installation of succeeding materials, clean the structures or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using all equipment and materials required to achieve the required cleanliness.

3.1.3.4 Following the installation of finish floor materials, clean the finish floor daily (and more often if necessary) at all times while work is being performed in the space in which finish materials have been installed. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from all foreign material that, in the opinion of the ENGINEER may be injurious to the finish floor material.

3.2 FINAL CLEANING

3.2.1 Definition:

3.2.1.1 Except as otherwise specifically provided, "clean" (for the purpose of this Article) shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaning using commercial quality building maintenance equipment and materials.

3.2.2 General:

3.2.2.1 Prior to completion of the Work, remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste. Conduct final progress cleaning as required.

3.2.3 Site:

3.2.3.1 Unless otherwise specifically directed by the ENGINEER, broom clean all paved areas on the site and all public paved areas directly adjacent to the site. Completely remove all resultant debris.

3.2.4 Structures:

3.2.4.1 Exterior: Visually inspect all exterior surfaces and remove all traces of soil, waste material, smudges, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. If necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior of the structure. In the event of stubborn stains not removable with water, the ENGINEER may require light sandblasting or other cleaning at no additional cost to the Owner.

3.2.4.2 Interior: Visually inspect all interior surfaces and remove all traces of soil, waste material, smudges, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. Remove all paint dropping, spots, stains, and dirt from finished surfaces. Use only the specified cleaning materials and equipment.

3.2.5 Timing:

3.2.5.1 Schedule final cleaning as approved by the ENGINEER.

END OF SECTION

SECTION 00170

SITE CLEARING

PART 1 - GENERAL

1.1 SECTION INCLUDES

1.1.1 Remove surface debris and topsoil excavation

1.1.2 Clear site of plant life, trees, shrubs and grass, including the root system of trees and shrubs

1.2 MEASUREMENT AND PAYMENT

1.2.1 Site Clearing:

1.2.2 Basis of Measurement and Payment: Payment for site clearing shall be an incidental cost to the installation of the connections and shall include all work related to clearing site, loading and removing waste materials from site.

1.3 REGULATORY REQUIREMENTS

1.3.1 Conform to applicable American Samoa Code for disposal of debris, burning debris on site and use of herbicides.

1.3.2 Coordinate clearing Work with utility companies and Owner.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PREPARATION

3.1.1 Prepare site as per construction drawings and provide erosion control per PNRS permit requirements.

3.2 PROTECTION

3.2.1 Locate, identify, and protect utilities that remain, from damage.

3.2.2 Protect trees, plant growth, and features designated to remain, as final Landscaping

3.2.3 Protect bench marks and existing structures from damage or displacement.

3.3 CLEARING

3.3.1 Clear areas required for access to site and execution of Work.

3.3.2 Remove trees and shrubs, within marked areas and as indicated.

3.3.3 Remove Stumps and main root system

3.3.4 Clear undergrowth and deadwood, without disturbing subsoil.

3.3.5 Remove debris, rock, and extracted plant life from site.

3.4 TOPSOIL EXCAVATION

3.4.1 Excavate topsoil from areas to be further excavated, or re-graded.

3.4.2 Stockpile in area where directed by engineer and approved by landowner to height not exceeding 8 feet and protect from erosion.

END OF SECTION

SECTION 00180

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

1.1.1 The General Conditions of Construction Contracts and Special Provisions preceding these specifications shall govern this section of the work.

1.2 DESCRIPTION

1.2.1 Work Included: This Section establishes general requirements pertaining to cutting (including excavating), fitting, and patching of the Work required to:

1.2.2 Make the several parts fit properly.

1.2.3 Uncover Work to provide for installation, inspection or both of ill-timed Work.

1.2.4 Remove and replace Work not conforming to requirements of the Contract Documents.

1.2.5 Remove and replace defective work.

1.3 QUALITY ASSURANCE

1.3.1 Perform all cutting and patching in strict accordance with pertinent requirements of these Specifications and, in the event no such requirements are determined, in conformance with the ENGINEER's written direction.

1.4 SUBMITTALS

1.4.1 Request for the Engineer’s Consent:

1.4.2 Prior to cutting which affects structural safety, submit written request to the ENGINEER for permission to proceed with cutting.

1.4.3 Should conditions of the Work, or Schedule, indicate a required change of materials or methods for cutting and patching, so notify the ENGINEER and secure his written permission prior to processing.

PART 2-PRODUCTS

2.1 MATERIALS

2.1.1 For replacement of Work removed, use materials that comply with the pertinent Sections of these Specifications.

2.2 PAYMENT COSTS

2.2.1 The extent of cutting and patching of below slab/grade is shown on the drawings; the cost for such work shall be included in the lump sum price. Contractor performs all other cutting and patching needed to comply with the Contract Documents at no additional cost to the Owner.

PART 3-EXECUTION

3.1 CONDITIONS

3.1.1 Inspection

3.1.1.1 Inspect existing conditions, including elements subject to movement or damage during cutting, excavating, backfilling, and patching.

3.1.1.2 After uncovering the Work, inspect conditions affecting installation of new Work.

3.1.2 Discrepancies:

3.1.2.1 If uncovered conditions are not as anticipated, immediately notify the ENGINEER and secure needed directions.

3.1.2.2 Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 PREPARATION PRIOR TO CUTTING

3.2.1 Provide all required protection including, but not necessarily limited to, shoring, bracing, and support to maintain structural integrity of the Work

3.3 PERFORMANCE

3.3.1 Perform all required excavation and backfilling as required under pertinent Sections of these Specifications. Perform cutting and demolition by methods that will prevent damage to other portions of the Work and will provide proper surfaces to receive installation of repair and new work. Perform fitting and adjustment of products to provide finished installation complying with the specified tolerances and finishes.

END OF SECTION

SECTION 00190

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

1.1.1 Cast-in-place concrete, floors, shear walls, foundation walls, equipment pads and slabs on grade.

1.2 REFERENCES

1.2.1 ACI 301 - Structural Concrete for Buildings.

1.2.2 ACI 302 - Guide for Concrete Floor and Slab Construction.

1.2.3 ACI 304 - Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete.

1.2.4 ACI 305R - Hot Weather Concreting.

1.2.5 ACI 306R - Cold Weather Concreting.

1.2.6 ACI 308 - Standard Practice for Curing Concrete.

1.2.7 ACI 318 - Building Code Requirements for Reinforced Concrete.

1.2.8 ANSI/ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous Type).

1.2.9 ANSI/ASTM D1190 - Concrete Joint Sealer, Hot-Poured Elastic Type.

1.2.10 ANSI/ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

1.2.11 ANSI/ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.2.12 ASTM B221 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.

1.2.13 ASTM C33 - Concrete Aggregates.

1.2.14 ASTM C94 - Ready-Mixed Concrete.

1.2.15 ASTM C150 - Portland Cement.

1.2.16 ASTM C260 - Air Entraining Admixtures for Concrete.

1.2.17 ASTM C330 - Light Weight Aggregates For Structural Concrete.

1.2.18 ASTM C494 - Chemicals Admixtures for Concrete.

1.2.19 ASTM C618 - Fly Ash and Raw or Calcinated Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

1.2.20 ASTM A775 - Reinforcing Steel Bars

1.3 PROJECT RECORD DOCUMENTS

1.3.1 Accurately record actual locations of embedded utilities and components which are concealed from view.

1.4. QUALITY ASSURANCE

1.4.1 Perform Work in accordance with ACI 301.

1.4.2. Maintain one copy of documents on site.

1.4.3 Acquire cement and aggregate from same source for all work.

1.4.4 Conform to ACI 305R when concreting during hot weather.

1.4.5 Conform to ACI 306R when concreting during cold weather.

PART 2 - PRODUCTS

2.1. CONCRETE MATERIALS

2.1.1 Cement: ASTM C150, Portland type.

2.1.2 Water: Clean and not detrimental to concrete.

2.2. ACCESSORIES

2.2.1 Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

2.3. JOINT DEVICES AND FILLER MATERIALS

2.3.1 Joint Filler: ASTM D1751, ASTM D994, asphalt impregnated fiberboard, closed cell polyvinyl chloride, molded vinyl foam or pre-molded sponge rubber.

2.3.2 Construction Joint Devices: Integral galvanized steel or extruded plastic.

2.3.3 Expansion and Contraction Joint Devices: ASTM B221 alloy, extruded aluminum; resilient neoprene filler strip with a Shore A hardness of 35 to permit plus or minus 25 percent joint movement with full recovery.

2.4. CONCRETE MIX

2.4.1 Mix and deliver concrete in accordance with ASTM C94 and ACI 304.

2.4.2 Use accelerating admixtures only when approved by Engineer.

2.4.3 Use set retarding admixtures during hot weather only when approved by Engineer.

2.4.4. Add air entraining agent to normal weight concrete mix for work exposed to exterior.

2.4.5 Provide Engineer with tickets indicating mix times, delivery and additives to the mix.

PART **3** - EXECUTION

3.1 EXAMINATION

3.1.1 Verify site conditions and verify requirements for concrete cover over reinforcement.

3.1.2 Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.2 PREPARATION

3.2.1 Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.

3.2.2 In locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

3.3 PLACING CONCRETE

3.3.1 Place concrete in accordance with ACI 304, ACI 301 and/or ACI 318.

3.3.2 Notify Engineer minimum 24 hours prior to commencement of operations.

3.3.3 Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints are not disturbed during concrete placement.

3.3.4 Install vapor barrier under interior slabs on grade. Lap joints minimum 6 inches and seal watertight by sealant applied between overlapping edges and ends or taping edges and ends.

3.3.5 Install joint devices in accordance with manufacturer's instructions.

3.3.6 Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

3.3.7 Place concrete continuously between predetermined expansion, control, and construction joints.

3.3.8 Do not interrupt successive placement; do not permit cold joints to occur.

3.3.9 Screed floors and slabs on grade level, maintaining surface flatness of maximum 1/4 inch in 10 ft.

3.4 SEPARATE FLOOR TOPPINGS

3.4.1 Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.

3.4.2 Place required dividers, edge strips, reinforcing and other items to be cast in.

3.4.3 Apply bonding agent to substrate in accordance with manufacturer's instructions.

3.4.4 Place concrete floor toppings to required lines and levels.

3.5 CONCRETE FINISHING

3.5.1 Finish concrete floor surfaces in accordance with ACI 301.

3.5.2 In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drain at 1/8 inch per foot nominal or as indicated on drawings.

3.6 CURING AND PROTECTION

3.6.1 Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

3.6.2 Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

3.6.3 Cure floor surfaces in accordance with ACI 308.

3.7 FIELD QUALITY CONTROL

3.7.1 Field inspection and testing will be performed. Provide free access to Work and cooperate with appointed firm.

3.7.2 Submit proposed mix design of each class of concrete to Owners Engineer for review prior to commencement of Work.

3.7.3 Tests of cement and aggregates may be performed to ensure conformance with specified requirements.

3.8 PATCHING

3.8.1 Allow Engineer to inspect concrete surfaces immediately upon removal of forms.

3.8.2 Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Engineer upon discovery.

3.8.3 Patch imperfections as directed and in accordance with ACI 301.

3.9 DEFECTIVE CONCRETE

3.9.1 Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

3.9.2 Repair or replacement of defective concrete will be determined by the Engineer and will be on the contractor's expense.

3.9.3 Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

3.10 SCHEDULE - CONCRETE TYPES AND FINISHES

3.10.1 Foundation Walls: 4,000 psi 28 day concrete, form finish with honeycomb filled surface.

3.10.2 Roof: 2500 psi 28 day concrete, form finish with honeycomb filled surface.

END OF SECTION

SECTION 00200

CONCRETE FORMWORK

PART 1 GENERAL

1.1 GENERAL PROVISIONS

1.1.1 The General Conditions of Construction Contracts and Special Provisions preceding these specifications shall govern this section of the work.

1.2 DESCRIPTION

1.2.1 Work Included:

1.2.1.1 Provide formwork in accordance with the provisions of this Section for all cast-in-place concrete shown on the Drawings or required by other Sections of these Specifications.

1.2.2 Related Work Described Elsewhere:

1.2.2.1 Excavating for footings is described in Section 02220 – EXCAVATING, FILLING, AND GRADING.

1.3 QUALITY ASSURANCE

1.3.1 Design of Formwork:

1.3.1.1 Design of formwork is the Contractor's responsibility.

1.3.2 Standards:

1.3.3 Comply with pertinent provisions of the ACI 347 as listed in Section 01085 – APPLICABLE STANDARDS.

1.4 SUBMITTALS

1.4.1 General:

1.4.1.1 Comply with pertinent provisions of Section 01300 – SUBMITTALS AND SUBSTITUTIONS.

1.4.2 Manufacturer's Data:

1.4.2.1 Within 30 calendar days after award of the Contract, submit manufacturers' data and installation instructions for proprietary materials including form coatings, ties and accessories, and manufactured form systems if used.

PART 2 PRODUCTS

2.1 FORM MATERIALS

2.1.1 Forms:

2.1.1.1 Construct formwork for exposed (painted or unpainted) concrete surfaces with smooth faced undamaged plywood or other panel type materials acceptable to the Engineer, to provide continuous, straight, smooth as-cast surfaces. Furnish in largest practicable sizes to minimize number of joints.

2.1.1.2 Construct formwork for concrete concealed from view or covered with cement plaster with rough sawn boards of sound grade, as approved by the Engineer, to provide a mechanical bond for subsequent application of plaster.

2.1.1.3 Provide form material with sufficient thickness to withstand pressure of newly placed concrete without excessive and objectionable bow or deflection.

2.1.2 Form Ties:

2.1.2.1 Provide factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete surfaces upon removal.

2.1.2.2 Provide ties so that portion remaining within concrete after removal of exterior parts is at least 3.8 cm (1-1/2") from the outer concrete surface. Provide form ties that will not leave a hole larger than 2.5 cm (1") diameter in the concrete surface.

2.1.3 Form Coatings:

2.1.3.1 Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds.

2.2 DESIGN OF FORMWORK

2.2.1 General:

2.2.1.1 Design, erect, support, brace, and maintain formwork so that it will safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure.

2.2.1.2 Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength for that purpose.

2.2.1.3 Construct formwork so that concrete members and structure are of correct size, shape, alignment, elevation and position.

2.2.1.4 Support form facing materials by structural members spaced sufficiently close to prevent objectionable deflection.

2.2.1.5 Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities, and within-allowable tolerances.

2.2.1.6 Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.

2.2.2 Earth Forms:

2.2.2.1 Side forms of footings may be omitted and concrete placed directly against excavation only when requested by the Contractor and accepted by the Engineer. When omission of forms is accepted, provide minimum additional concrete 2.5 cm (1") on each side of the minimum design profiles and dimensions shown.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

3.1.1 Examine the substrate and conditions under which work of the Section is to be performed, and correct unsatisfactory conditions that would prevent proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 FORM CONSTRUCTION

3.2.1 General:

3.2.1.1 Construct forms complying with ACI 347, to the exact sizes, shapes, lines, and dimensions shown and as required to obtain accurate alignment, location, grades, level, and plumb work in finish structures.

3.2.1.2 Provide for openings, offsets, linkage, keyways, recesses, moldings, reglets, chamfers, blocking, screeds, bullheads, anchorages, inserts, and other features required. Use selected materials to obtain required finishes.

3.2.1.3 Forms for openings and construction that accommodates installation by other trades whose materials and products must be fabricated before the opportunity exists to verify the measurements of adjacent construction which affects such installations, shall be accurately sized and located as dimensioned on the Drawings. In the event that deviation from the Drawing dimensions results in problems in the field, the Contractor shall be responsible for resolution of the conditions as approved by the Project Engineer without additional expense to the Owner.

3.2.2 Fabrication:

3.2.2.1 Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where the slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses and the like to prevent swelling and assure ease of removal.

3.2.2.2 Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement and for placement of concrete. Brace temporary closures and set tightly to temporary openings on forms in as inconspicuous locations as possible, consistent with design requirements. Form intersecting planes to provide true, clean out corners.

3.2.3 Forms for Exposed Concrete:

3.2.3.1 Drill forms to suit ties used and to prevent leakage of concrete mortar around tie holes. Do not splinter forms by driving ties through improperly prepared intersections.

3.2.3.2 Provide sharp, clean corners at intersecting planes without visible edges or offsets. Back joints with extra studs or girts to maintain true, square intersections.

3.2.3.3 Use extra studs, walers, and bracing to prevent objectionable bowing of forms between studs and to avoid bowed appearance in concrete. Do not use narrow strips of form material that will produce bow.

3.2.3.4 Assemble forms so they may be readily removed without damage to exposed concrete surfaces.

3.2.3.5 Corner Treatment: Unless shown otherwise, form chamfers with 2 cm x 2 cm (3/4" x 3/4") strips, accurately formed and surfaced to produce uniformly straight lines and tight edge joints on exposed concrete. Extend terminal edges to required limit and miter chamfer strips at changes in direction.

3.2.4 Control Joints: Locate as indicated.

3.2.4.1 Provision for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Verify size and location of openings, recesses and chases with the trade requiring such items. Accurately place and securely support items to be built into forms.

3.2.4.2 Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before concrete is placed. Re-tighten forms immediately after concrete placement as required to eliminate mortar leaks.

3.3 FORM COATINGS

3.3.1 Coat form contact surfaces with form-coating compound before reinforcement is placed. Do not allow excess form coating material to accumulate in the forms or to be exposed to surfaces that will be bonded to fresh concrete. Apply in compliance with manufacturer's instruction.

3.4 INSTALLATION OF EMBEDDED ITEMS

3.4.1 General:

3.4.1.1 Set and build into the work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of the items to be attached thereto.

3.4.2 Edge Forms and Screed Strips for Slabs:

3.4.2.1 Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in the finished slab surface. Provide and secure units to support types of screeds required.

3.5 REMOVAL OF FORMS

3.5.1 General:

3.5.1.1 Formwork not supporting concrete, such as sides of beams, walls, columns, and similar parts of the Work, may be removed after cumulatively curing at not less than 10 degree C (50 degrees F) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operation, and provided that curing and protection operations are maintained.

3.5.2 Form Facing Material:

3.5.2.1 Form facing material may be removed four days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

3.6 RE-USE OF FORMS

3.6.1 Clean and repair surfaces of forms to be re-used in the Work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to concrete contact surfaces as specified for new formwork. When forms are reused for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets.

END OF SECTION

SECTION 00210

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 GENERAL PROVISIONS

1.1.1 The General Conditions of Construction Contracts and Special Provisions preceding these specifications shall govern this section of the work.

1.2 DESCRIPTION

1.2.1 Work Included:

1.2.1.1 Provide complete, in place, all steel required for reinforcement of cast-in-place concrete as shown on the Drawings.

1.2.2 Related Work Described Elsewhere:

1.2.2.1 Steel reinforcement is also required under Section 03310 – STRUCTURAL CONCRETE.

1.3 QUALITY ASSURANCE

1.3.1 Comply with pertinent provisions of following standards as listed in Section 01085, except as herein modified.

1.3.2 CRSI "Manual of Standard Practice"

1.3.3 ACI 318

1.4 SUBMITTALS

1.4.1 General:

1.4.1.1 Comply with pertinent provisions of Section 01300 – SUBMITTALS AND SUBSTITUTIONS.

1.4.2 Shop Drawings:

1.4.2.1 Within 20 calendar days after award of the Contract, submit complete Shop Drawings of all material proposed to be furnished and installed under this Section. Show:

1.4.2.2 Bar schedules, stirrup spacing, diagrams of bent bars, and arrangement and assemblies.

1.4.2.3 Make Shop Drawings in accordance with ACI 315.

1.4.3 Mill Certificates:

1.4.3.1 Accompanying the Shop Drawings, submit steel producer's certificates of mill analysis, tensile, and bend tests for reinforcing steel.

1.5 PRODUCT HANDLING

1.5.1 Delivery:

1.5.1.1 Deliver reinforcement to the job site bundled, tagged, and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.

1.5.2 Storage:

1.5.2.1 Store reinforcement at the job site in a manner to prevent damage and accumulation of dirt and excessive rust.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Reinforcing Bars:

2.1.1.1 Comply with ASTM A 615, Grade 60 for all sizes Galvanized.

2.1.2 Steel Wire:

2.1.2.1 Comply with ASTM A 82.

2.1.3 Welded Wire Fabric:

2.1.3.1 Comply with ASTM A 185.

2.1.4 Supports for Reinforcement:

2.1.4.1 Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place:

2.1.4.2 Use wire bar type supports complying with CRSI recommendations, unless otherwise indicated. Do not use wood, brick, and other unacceptable materials.

2.1.4.3 For slabs on grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

2.1.4.4 For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with hot-dip galvanized or plastic protected legs.

2.2 FABRICATION

2.2.1 General:

2.2.1.1 Fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI Manual. In case of fabricating errors, do not re-bend or straighten reinforcement in a manner that will injure or weaken the material.

2.2.2 Unacceptable Materials:

2.2.2.1 Reinforcement with any of the following defects will not be permitted in the Work:

2.2.2.1.1 Bar lengths, depths and bends exceeding specified fabrication tolerances.

2.2.2.1.2 Bends or kinks not indicated on Drawings or final Shop Drawings.

2.2.2.1.3 Bars with reduced cross-section due to excessive rusting or other causes

PART 3 EXECUTION

3.1 INSPECTION

3.1.1 Examine the substrate, formwork and the conditions under which concrete reinforcement is to be placed, and correct conditions that would prevent proper and timely completion of the work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

3.2.1 General:

3.2.1.1 Comply with the specified standards for details and methods of reinforcement, placement and support, and as herein specified.

3.2.1.2 Clean reinforcement to remove loose rust and mill scale, earth, and other materials that reduce or destroy bond with concrete.

3.2.1.3 Position, support and secure reinforcement against displacement by formwork, construction or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers as required.

3.2.1.4 Place reinforcement to obtain the minimum coverage for concrete protection. Arrange, space and securely tie bars and bar supports together with 16-gage wire to hold reinforcement accurately in position during concrete placement operations. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.

3.2.1.5 Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh.

3.2.1.6 Provide sufficient numbers of supports and of strength sufficient to carry reinforcement. Do not place reinforcing bars more than 5 cm (2") beyond the last leg of any continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

3.2.2 Splices:

3.2.2.1 Provide standard reinforcement splices by lapping ends, placing bars in contact, and tightly tying wire.

END OF SECTION

SECTION 00220

FUSIBLE POLYVINYL CHLORIDE (PVC) WATER PIPE

PART 1 - GENERAL

1.1 SCOPE OF WORK

1.1.1 This section specifies fusible polyvinyl chloride (PVC) pipe, including standards for dimensionality, testing, quality, acceptable fusion practice, safe handling and storage.

1.2 PIPE DESCRIPTION

1.2.1 Pipe supplier shall furnish fusible PVC pipe as manufactured by Underground Solutions, Inc. or approved equal conforming to all standards and procedures, and meeting all testing and material properties as described in this specification.

PART 2 - QUALITY ASSURANCE

2.1 REFERENCES

2.1.1 ANSI/AWWA C110/A21.10 American National Standard for Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids.

2.1.2 ANSI/AWWA C111/A21.11 American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

2.1.3 AWWA C605 Standard for Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water

2.1.4 AWWA C651 Standard for Disinfecting Water Mains

2.1.5 AWWA C900 Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 12 in. (100mm Through 300mm), for Water Distribution.

2.1.6 AWWA C905 Standard for Polyvinyl Chloride (PVC Pressure Pipe and Fabricated Fittings, 14 in. through 48 in. (350mm Through 1200mm), for Water Distribution and Transmission.

2.1.7 AWWA M23 AWWA Manual of Supply Practices PVC Pipe- Design and Installation, Second Edition

2.1.8 ASTM C923 Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals

2.1.9 ASTM D1784 Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds

2.1.10 ASTM D1785 Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120

2.1.11 ASTM D2152 Test Method for Degree of Fusion of Extruded Poly vinyl Chloride (PVC) Pipe and Molded Fittings by Acetone Immersion

2.1.12 ASTM D2241 Polyvinyl Chloride (PVC) Plastic Pipe (SDR-PR)

2.1.13 ASTM D2665 Polyvinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings

2.1.14 ASTM D3034 Standard Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings

2.1.15 ASTM F477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe

2.1.16 ASTM F679 Standard Specification for Polyvinyl Chloride (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings

2.1.17 ASTM F1057 Standard Practice for Estimating the Quality of Extruded Polyvinyl Chloride (PVC) Pipe by the Heat Reversion Technique

2.1.18 ASTM F1417 Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air

2.1.19 UNI-B-6 Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe

2.1.20 UNI-PUB-08 Tapping Guide for PVC Pressure Pipe

2.1.21 NSF-14 Plastics Piping System Components and Related Materials

2.1.22 NSF-61 Drinking Water System Components--Health Effects

2.1.23 PPI TR-2 PVC Range Composition Listing of Qualified Ingredients

2.2 MANUFACTURER REQUIREMENTS

2.2.1 All piping shall be made from PVC compound conforming to cell classification 12454 per ASTM D1784.

2.2.2 Fusible PVC pipe shall be tested at the extrusion facility for properties required to meet all applicable parameters as outlined in AWWA C900, AWWA C905, and applicable sections of ASTM D2241. Testing priority shall be in conformance with AWWA C900 and AWWA C905

2.2.3 Recommended Manufacturer: Underground Solutions Inc

2.3 FUSION TECHNICIAN REQUIREMENTS

2.3.1 Fusion Technician shall be fully qualified by the pipe manufacturer to install fusible PVC pipe of the type(s) and size(s) being used. Qualification shall be current as of the actual date of fusion performance on the project.

2.3.2 Recommended Technician shall be certified by Underground Solutions Inc.

2.3.3 Fusion certified technician must conduct training and certify Water Division local crew.

2.4 WARRANTY

2.4.1 A one-year warranty for the pipe shall be included from the Contractor, and shall cover the cost of replacement pipe and freight to project site, should the pipe have any defects in material or workmanship.

2.4.2 In addition to the standard pipe warranty, the fusing contractor shall provide in writing a warranty for a period of one year for all the fusion joints, including formation, installation, and pressure testing.

2.4.3 Unless otherwise specified, the warranty periods shall begin after the Certificate of Acceptance is issued for the contract.

2.5 PRE-CONSTRUCTION SUBMITTALS

2.5.1 The following product data is required from the pipe supplier and/or fusion provider:

2.5.1.1 Name of pipe manufacturer

2.5.1.2 Pipe diameter

2.5.1.3 Dimension Ratio (DR 14 or as per plans)

2.5.1.4 Pressure Class per applicable standards

2.5.1.5 Color

2.5.1.6 Confirmation/ Recommended minimum bending radius

2.5.1.7 Confirmation/ Recommended maximum safe pull force

2.5.1.8 Fusion technician qualification indicating conformance with this specification

2.6 POST CONSTRUCTION SUBMITTALS

2.6.1 The following as-recorded data is required from the contractor and/or fusion provider to the owner or pipe supplier upon request:

2.6.1.1 Approved data logger device reports

2.6.1.2 Fusion joint documentation containing the following information

2.6.1.2.1 Pipe diameter and thickness

2.6.1.2.2 Machine diameter

2.6.1.2.3 Fusion technician identification

2.6.1.2.4 Job identification

2.6.1.2.5 Fusion joint number

2.6.1.2.6 Fusion, heating, and drag pressure settings

2.6.1.2.7 Heat plate temperature

2.6.1.2.8 Time stamp

2.6.1.2.9 Heating and cool down time of fusion

2.6.1.2.10 Ambient temperature

PART 3 - PRODUCTS

3.1 Fusible PVC Pressure Pipe for Potable Water

3.1.1 Fusible PVC pipe shall conform to AWWA C900, AWWA C905, ASTM D2241 or ASTM D1785 for standard dimensions, as applicable. Testing shall be in accordance with the referenced AWWA standards for all pipe types.

3.1.2 Pipe shall be manufactured with 100% virgin resin. Pipe shall also have 0% recycled plastics content, and shall not consist of any rework compound, even that obtained from the manufacturer's own production using the same formulation.

3.1.3 Fusible PVC pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.

3.1.4 Fusible PVC pipe shall be manufactured in a standard 40' nominal length, or custom lengths as specified in the plans.

3.1.5 Fusible PVC pipe shall be blue in color for potable water use.

3.1.6 Pipe shall be marked as follows;

3.1.6.1 Nominal pipe size

3.1.6.2 PVC

3.1.6.3 Dimension Ratio (DR), Standard Dimension Ratio (SDR), or Schedule

3.1.6.4 AWWA pressure class, or standard pressure rating for non-AWWA pipe, as applicable

3.1.6.5 AWWA standard designation number, or pipe type for non-AWWA pipe, as applicable

3.1.6.6 NSF-61 mark verifying suitability for potable water service

3.1.6.7 Extrusion production-record code

3.1.6.8 Trademark or trade name

3.1.6.9 Cell Classification 12454 and/or PVC material code 1120 may also be included

3.1.6.10 Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.:

3.2 FUSION JOINTS

3.2.1 Unless otherwise specified, fusible PVC pipe lengths shall be assembled in the field with butt-fused joints. The Contractor shall follow the pipe supplier's written guidelines for this procedure. All fusion joints shall be completed as described in this specification.

3.3 CONNECTION AND FITTINGS

3.3.1 In Connection: Connections shall be defined in conjunction with the coupling of project piping, as well as the tie-ins to other piping systems.

3.3.2 Ductile Iron Mechanical and Flanged Fittings: Acceptable fittings for use with fusible PVC pipe shall include standard ductile iron fittings conforming to AWWA/ANSI C110/A21.10, or AWWA/ANSI C153/A21.53 and AWWA/ANSI C111/A21.11.

3.3.2.1 Connections to fusible PVC pipe may be made using a restrained or non-restrained retainer gland product for PVC pipe, as well as for MJ or flanged fittings.

3.3.2.2 Bends, tees and other ductile iron fittings shall be restrained with the use of thrust blocking or other means as indicated in the construction documents.

3.3.2.3 Ductile iron fittings and glands must be installed per the manufacturer's guidelines.

3.3.3 Sleeve-Type Couplings

3.3.3.1 Sleeve-type mechanical couplings shall be manufactured for use with Fusible PVC pressure pipe, and may be restrained or unrestrained as necessary.

3.3.3.2 Sleeve-type couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself.

3.3.33 Sleeve-type couplings shall be Romac Macro HP “or” approved equal

3.3.4 Expansion and Flexible Couplings

3.3.4.1 Expansion-type mechanical couplings shall be manufactured or use with Fusible PVC pipe, and may be restrained or unrestrained as necessary.

3.3.4.2 Expansion-type mechanical couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself.

3.3.5 Connection Hardware

3.3.5.1 Bolts, nuts, and washers for buried service shall be made of Stainless Steel 316 metal, regardless of any other protective coating protection on it.

3.4 MAXIMUM ALLOWABLE PULL-IN FORCE

3.4.1 Adhere to the following data regarding maximum allowable pull-in force for fusible PVC pipe used for trenchless application. The confirmation of proposed radius of each bore has to be part of the required submittal prior to construction.

Pipe Diameter (in)	Dimension Ratio (DR)	Max. Working Pressure (psi)	DIPS Series			
			Pipe O.D. (in)	Min. Wall (in)	Pipe I.D. (in)	Max. Pull-in Force (lbs)
4	14	305	4.80	0.34	4.07	13,400
6	14	305	6.90	0.49	5.85	27,700
8	14	305	9.05	0.65	7.68	47,700
10	14	305	11.10	0.79	9.42	71,800
12	14	305	13.20	0.94	11.20	101,600

3.5 MINIMUM BENDING RADIUS

3.5.1 Adhere to the following data regarding radius of curvature for fusible PVC pipe used for trenchless application. The confirmation of proposed radius of each bore has to be part of the required submittal prior to construction. In any case, the deflection radius must not exceed 75% of the maximum allowable curvature allowed for standard C-900 PVC pipe.

Pipe Diameter (in)	DIPS Series	
	Critical Bucking Pressure (Ibs)	Minimum Allowable Bending (ft)

4	426	100
6	426	144
8	425	189
10	426	231
12	426	275

PART 4 - EXECUTION

4.1 Delivery and Off-Loading

4.1.1 All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the owner or engineer.

4.1.2 All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the owner or engineer.

4.1.3 Each pipe shipment should be inspected prior to unloading to see if the load has shifted or otherwise been damaged. Notify owner or engineer immediately if more than immaterial damage is found. Each pipe shipment should be checked for quantity and proper pipe size, color, and type.

4.1.4 Pipe should be loaded, off-loaded, and otherwise handled in accordance with AWWA M23, and all of the pipe supplier's guidelines shall be followed

4.1.5 Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.

4.1.6 During removal and handling, be sure that the pipe does not strike anything. Significant impact could cause damage, particularly during cold weather.

4.1.7 If appropriate unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to insure that pipe is not dropped or damaged. Pipe should be carefully lowered, not dropped, from trucks.

4.2 Handling and Storage

4.2.1 Any length of pipe showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the owner or engineer.

4.2.2 Any length of pipe showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the owner or engineer.

4.2.3 Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by the owner or engineer.

4.2.4 Pipe lengths should be stored and placed on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. Caution should be exercised to avoid compression, damage, or deformation to the ends of the pipe. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter.

4.2.4 Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way.

4.2.5 If pipe is to be stored for periods of 1 year or longer, the pipe should be shaded or otherwise shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. Pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excess heat accumulation.

4.3 FUSION PROCESS

4.3.1 General

4.3.1.1 Fusible PVC pipe will be handled in a safe and non-destructive manner before, during, and after the fusion process and in accordance with this specification and pipe supplier's guidelines.

4.3.1.2 Fusible polyvinylchloride pipe will be fused by qualified fusion technicians, as documented by the pipe supplier.

4.3.1.3 Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine.

4.3.1.4 Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process. Fusion machines must incorporate the following elements:

4.3.1.4.1 Heat Plate - Heat plates shall be in good condition with no deep gouges or scratches. Plates shall be clean and free of any debris or contamination. Heater controls shall function properly; cord and plug shall be in good condition. The appropriately sized heat plate shall be capable of maintaining a uniform and consistent heat profile and temperature for the size of pipe being fused, per the pipe supplier's guidelines.

4.3.1.4.2 Carriage – Carriage shall travel smoothly with no binding at less than 50 psi. Jaws shall be in good condition with proper inserts for the pipe size being fused. Insert pins shall be installed with no interference to carriage travel.

4.3.1.4.3 General Machine - Overview of machine body shall yield no obvious defects, missing parts, or potential safety issues during fusion.

4.3.1.4.4 Data Logging Device – An approved data logging device with the current version of the pipe supplier's recommended and compatible software shall be used. Data logging device operations and maintenance manual shall be with the unit at all times. If fusing for extended periods of time, an independent 110V power source shall be available to extend battery life.

4.3.1.5 Other equipment specifically required for the fusion process shall include the following:

4.3.1.5.1 Pipe rollers shall be used for support of pipe to either side of the machine

4.3.1.5.2 A weather protection canopy that allows full machine motion of the heat plate, fusion assembly and carriage shall be provided for fusion in inclement, extreme temperatures, and /or windy weather, per the pipe supplier's recommendations.

4.3.1.5.3 An infrared (IR) pyrometer for checking pipe and heat plate temperatures.

4.3.1.5.4 Fusion machine operations and maintenance manual shall be kept with the fusion machine at all times.

4.3.1.5.5 Facing blades specifically designed for cutting fusible polyvinylchloride pipe shall be used.

4.3.2 Joint Recording

4.3.2.1 Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine. The fusion data logging and joint report shall be generated by software developed specifically for the butt-fusion of fusible polyvinyl chloride pipe. The software shall register and/or record the parameters required by the pipe supplier and these specifications. Data not logged by the data logger shall be logged manually and be included in the Fusion Technician's joint report.

4.4 GENERAL INSTALLATION

4.4.1 Installation guidelines from the pipe supplier shall be followed for all installations.

4.4.2 The fusible PVC pipe will be installed in a manner so as not to exceed the recommended bending radius.

4.4.3 Where fusible PVC pipe is installed by pulling in tension, the recommended Safe Pulling Force established by the pipe supplier shall not be exceeded.

4.5 PREPARATION PRIOR TO MAKING INTER-CONNECTIONS

4.5.1 Approximate locations for existing piping systems are shown in the construction documents. Prior to making connections into existing piping systems, the contractor shall:

4.5.1.1 Field verify location, size, piping material, and piping system of the existing pipe.

4.5.1.2 Obtain all required fittings, which may include saddles, sleeve type couplings, flanges, tees, or others as shown in the construction documents.

4.5.1.3 Have installed all temporary pumps and/or pipes in accordance with established connection plans.

4.5.1.4 Unless otherwise approved, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.

4.6 PIPE SYSTEM CONNECTION

4.6.1 Pipe connections shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines and as indicated in the construction documents. Pipe connections to structures shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines.

4.7 TAPPING FOR POTABLE AND NON-POTABLE WATER APPLICATIONS

4.7.1 Tapping shall be performed using standard tapping saddles designed for use on PVC piping in accordance with AWWA C605. Tapping shall be performed only with use of tap saddles or sleeves. NO DIRECT TAPPING WILL BE PERMITTED. Tapping shall be performed in accordance with the applicable sections for saddle tapping as per "Uni-Pub-8: Tapping Guide for PVC Pressure Pipe by Uni-Bell PVC Pipe Association".

4.7.2 All connections requiring a larger diameter than that recommended by the pipe supplier, shall be made with a pipe connection as specified and indicated on the drawings.

4.7.3 Equipment used for tapping shall be made specifically for tapping PVC pipe:

4.7.3.1 Tapping bits shall be slotted "shell" style cutters, specifically made for PVC pipe. 'Hole saws' made for cutting wood, steel, ductile iron, or other materials are strictly prohibited.

4.7.3.2 Taps may be performed while the pipeline is filled with water and under pressure ('wet' tap,) or when the pipeline is not filled with water and not under pressure ('dry' tap).

4.8 TESTING

4.8.1 Testing shall comply with all applicable jurisdictional building codes, statutes, standards, regulations, and laws.

4.8.2 Hydrostatic Testing and Leakage Testing for Pressure Piping

All hydrostatic and leakage testing shall be in accordance to ASPA's Pressure and Leakage Tests in accordance to AWWA standards. (Refer to section 14000 of this Specifications).

4.9 METHOD OF MEASUREMENT AND PAYMENT

4.9.1 Method of Measurement and Payment for the work included in this section will be in accordance with the payment schedule in the Bid Proposal.

5.0 BUTT FUSION MACHINE

5.1 DESCRIPTION

5.1.1 This specification includes but is not limited to Butt-Fusion Machine to fuse Fusible PVC® pipes together both for pipe connections and fittings.

5.2 REFERENCES

5.2.1 PI Manual for Fusion Equipment Product Standard & Specifications.

5.3 GENERAL

5.3.1 USE

5.3.1.1 Butt Fusion Machine is one of the equipment/methods to join or fuse Fusible PVC pipes for use as water, wastewater and reclaimed water pressure pipe where compatible with the specific conditions of the project. The use of Butt Fusion Machine other than this method may be required by ASPA if it is determined that Butt Fusion Method is unsuitable for the particular application. Any Fusion Machine to be used in the laying of water main piping shall be approved by ASPA prior to purchase.

5.3.2 DOCUMENTATION

5.3.2.1 Documentation from the Fusion Machine Manufacturer showing product standards and specifications should be submitted and approved by ASPA

5.3.3 MANUFACTURER

5.3.3.1 The Butt Fusion Machine including its accessories shall be from a single manufacturer, who is fully experienced, reputable and qualified in the manufacture of Butt Fusion Machine to be used on the project. Qualified manufacturers shall be: McELROY Manufacturing, Inc., or equal as approved by ASPA Engineer.

5.3.4 COMPATIBILITY

5.3.4.1 Contractor/Vendor/Supplier is responsible for compatibility of the Machine to join accredited suppliers of Fusible PVC® Pipes.

5.3.5 WARRANTY

5.3.5.1 The Contractor shall provide a warranty, (NOT LIMITED WARRANTY) against JOIN defects of Fusible PVC for a period of **FIVE (5)** years after the final acceptance of the Project by the OWNER. The CONTRACTOR shall replace

at no expense to the OWNER any JOIN defects within the warranty period.

5.3.6 TECHNOLOGY

5.3.6.1 Butt Fusion Machine Technician / Operators shall be certified Fusion Machine Operators.

5.3.6.2 Certifications shall be provided readily when ASPA requires.

5.3.7 ACCESSORIES

5.3.7.1 All ACCESSORIES shall be compatible to the required sizing of Fusible PVC® pipes and fittings to be installed.

5.3.7.2 FUSION MACHINE shall have **Gas Driven Generator Set** to power the machine, standard insert sets, and data loggers due to proximity of Project's site locations.

END OF SECTION

SECTION 00225

MOLECULARLY ORIENTED POLYVINYL CHLORIDE (PVC-O) PIPE

PART 1 - GENERAL

1.1 SCOPE OF WORK

1.1.1 This section specifies molecularly oriented polyvinyl chloride (PVCO) pressure pipe, including standards for dimensionality, testing, quality, practice, safe handling and storage.

1.2 PIPE DESCRIPTION

1.2.1 Pipe supplier shall furnish PVCO pipe as manufactured by IPEX Inc. - BIONAX® PVCO conforming to all standards and procedures, and meeting all testing and material properties as described in this specification.

PART 2 - QUALITY ASSURANCE

2.1 REFERENCES

2.1.1	AWWA C909-09	Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe 4" through 24" (100 mm through 600 mm) for Water, Wasterwater and Reclaimed Water Services .
2.1.2	ASTM F1483	Standard Specification for Oriented Poly (Vinyl Chloride) (PVCO) Pressure Pipe.
2.1.3	ASTM D1784	Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
2.1.4	ASTM D3139	Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.
2.1.5	ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipes.
2.1.6	NSF-14	Plastics Piping System Components and Related Materials

2.1.7 NSF-61 Drinking Water System Components--Health Effects

2.2 MANUFACTURER REQUIREMENTS

2.2.1 All piping shall be made from PVC compound conforming to cell classification 12454 per ASTM D1784.

2.2.3 Recommended Manufacturer: IPEX Inc. - BIONAX® PVCO, or approved equal.

2.4 WARRANTY

2.4.1 A one-year warranty for the pipe shall be included from the Contractor, and shall cover the cost of replacement pipe and freight to project site, should the pipe have any defects in material or workmanship.

2.4.3 Unless otherwise specified, the warranty periods shall begin after the Certificate of Acceptance is issued for the contract.

2.5 PRE-CONSTRUCTION SUBMITTALS

2.5.1 The following product data is required from the pipe supplier and/or fusion provider:

2.5.1.1 Name of pipe manufacturer

2.5.1.2 Pipe diameter

2.5.1.3 Dimension Ratio (DR 14 or as per plans)

2.5.1.4 Pressure Class per applicable standards

2.5.1.5 Color

2.5.1.6 Confirmation/ Recommended minimum bending radius and 20 feet length pull offset distance.

2.5.1.7 Confirmation/ Recommended maximum safe pull force

2.5.1.8 Fusion technician qualification indicating conformance with this specification

PART 3 – PRODUCTS

3.1 Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe

3.1.1 Manufacturers: IPEX Inc. - BIONAX® PVCO, or approved equal.

3.1.2 PVC Pipe: AWWA C900, elastomeric-gasket couplings, Class 100, 150, or 200 as shown on the drawings or bid schedule.

3.1.2.1 Mechanical Fittings: AWWA C111, rubber-gasket joints, Ductile-Iron Joints: ASTM D3139 compression gasket ring.

3.1.2.2 Trace Wire: Magnetic detectable conductor, plastic covering, imprinted with "Water Line" in large letters.

3.1.3 Ductile Iron Pipe: AWWA C151, pressure class 350, centrifugally cast in metal molds or sand-lined molds, or C104, cement-mortar lining, as shown on the drawings or bid schedule.

2.1.4.1 Fittings: Ductile iron, standard thickness.

2.1.4.2 Joints: AWWA C111, rubber-gasket joints with rods.

2.1.4.3 Jackets: AWWA C105 polyethylene encasement, double layer, half lapped, ½-inch polyethylene tape.

3.1.5 Joint Thrust Restraint

3.1.5.1 Concrete Thrust Blocks:

3.1.5.1.1 One part Portland cement, 2 ½ part of fine aggregate, 3 ½ parts coarse aggregate and just enough water for a workable consistency.

3.1.5.1.2 #4 Epoxy coated rebars.

3.1.5.2 Spatial Anchoring Retainer Glands for Mechanical Joints:

3.1.5.2.1 For C909 PVCO: Equal to

2.1.5.2.1.1 EBAA Series 19MJOO

2.1.5.2.1.2 Romac Industries: ROMA GRIP for PVC (C909) Accessory Pack.

3.1.5.3 Bell Restraint Harness Series 1600 for C900 PVCO Pipe:

3.1.5.3.1 Manufactured by: EBAA Iron Inc., or approved equal

3.1.5.3.2 The restraint shall be manufactured of Ductile Iron conforming to ASTM A536.

3.1.5.3.3 The Restraints shall be coated with MEGA-BOND (visit www.ebaa.com).

3.1.5.3.4 A split ring shall be used behind the pipe bell and a split serrated ring shall be used to grip the pipe.

3.1.5.3.5 Hardwares: Sufficient number of bolts shall be used to connect the bell ring and the gripping ring. The combination shall have a minimum pressure ratings as shown on the table below:

		A	B	C	D	
Nominal Pipe Size	Series Number	Pipe O.D.	Maximum Bell O.D. Cleared	Max. Restraint O.D. (Casing Clearance)	Overall Length	Thrust Bolt (Number - Size)
4	1604	4.80	6.75	9.25	13	2 - ¾ x 13
6	1606	6.90	8.75	11.25	18	2 - ¾ x 18
8	1608	9.05	12.25	14.75	18	2 - ¾ x 18
10	1610	11.10	14.20	16.85	22	4 - ¾ x 22
12	1612	13.20	16.90	19.45	22	4 - ¾ x 22
NOTE: Dimensions are in inches and are subject to change without notice.						

3.1.5.3.6 Installation Instruction:

3.1.5.3.6.1 Assemble the push-on joints as per the pipe manufacturer's instructions.

3.1.5.3.6.2 Install both halves of the non- serrated bell ring around the pipe behind the bell. Install the side bolts and tighten each to 60 ft-lbs (110 ft-lbs on 8, 10 and 12 inches diameters).

3.1.5.3.6.3 Slide the bell ring toward the bell so it fits snugly behind the bell.

3.1.5.3.6.4 Remove the side bolts from the serrated restraint ring. Use the tie bolts to determine the proper location of the restraint ring on the spigot Allow enough room on the tie bolt to fully engage the buts.

3.1.5.3.6.5 Install both half of the restraint ring at the proper location, tapping each half into place. Make sure that the complete ID is touching the pipe before installing the side bolts evenly to 60 ft-lbs (110 ft-lbs on 8, 10 and 12 inches diameters).

3.1.5.3.6.5 Place nuts on the tie bolts and tighten until they are snug. Allow enough room on the tie bolt to fully engage the nut with several threads showing. Do not tighten these bolts to force the spigot into the bell of the joint.

PART 4 – EXECUTION

4.1 Delivery and Off-Loading

4.1.1 All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the owner or engineer.

4.1.2 All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the owner or engineer.

4.1.3 Each pipe shipment should be inspected prior to unloading to see if the load has shifted or otherwise been damaged. Notify owner or engineer immediately if more than immaterial damage is found. Each pipe shipment should be checked for quantity and proper pipe size, color, and type.

4.1.4 Pipe should be loaded, off-loaded, and otherwise handled in accordance with AWWA M23, and all of the pipe supplier's guidelines shall be followed

4.1.5 Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.

4.1.6 During removal and handling, be sure that the pipe does not strike anything. Significant impact could cause damage, particularly during cold weather.

4.1.7 If appropriate unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to insure that pipe is not dropped or damaged. Pipe should be carefully lowered, not dropped, from trucks.

4.2 Handling and Storage

4.2.1 Any length of pipe showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the owner or engineer.

4.2.2 Any length of pipe showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the owner or engineer.

4.2.3 Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by the owner or engineer.

4.2.4 Pipe lengths should be stored and placed on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. Caution should be exercised to avoid compression, damage, or deformation to the ends of the pipe. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter.

4.2.4 Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way.

4.2.5 If pipe is to be stored for periods of 1 year or longer, the pipe should be shaded or otherwise shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. Pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excess heat accumulation.

4.5 PREPARATION PRIOR TO MAKING INTER-CONNECTIONS

4.5.1 Approximate locations for existing piping systems are shown in the construction documents. Prior to making connections into existing piping systems, the contractor shall:

4.5.1.1 Field verify location, size, piping material, and piping system of the existing pipe.

4.5.1.2 Obtain all required fittings, which may include saddles, sleeve type couplings, flanges, tees, or others as shown in the construction documents.

4.5.1.3 Have installed all temporary pumps and/or pipes in accordance with established connection plans.

4.5.1.4 Unless otherwise approved, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.

4.6 PIPE SYSTEM CONNECTION

4.6.1 Pipe connections shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines and as indicated in the construction documents. Pipe connections to structures shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines.

4.6.1 CURVATURE OF THE PIPELINE:

There are three common methods used to achieve changes in direction with PVC-O Pressure Pipe. They are: using PVC Fittings, deflecting the joint, and bending the pipe barrel.

4.6.1.1 Using PVC Fittings:

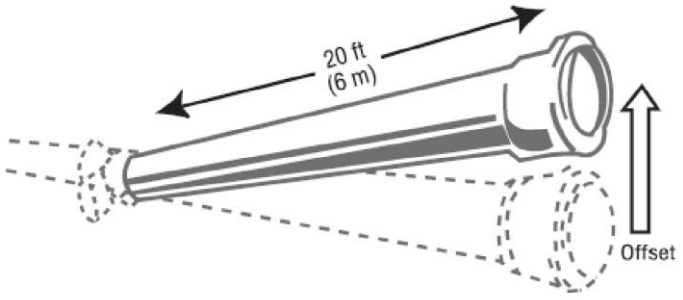
Pipeline Curvatures can be achieved by using PVC Fittings. Standard elbows for molded fittings include 22 1/2, 45 and 90 degrees. The cut lengths and radii are as follows:

Size		Cut Length		Radius	
in	mm	in	mm	ft	m
6	150	36	910	22	6.7
8	200	36	910	21	6.3
10	250	42	1070	26	7.9
12	300	48	1220	30	9.2
14	350	60	1520	40	12.2
16	400	72	1830	48	14.6
18	450	74	1870	49	14.8
20	500	82	2080	54	16.5
24	600	98	2480	67	20.3

4.6.1.2 Deflecting the Joint:

The procedure for offsetting pipe gasketed joint is shown below. **Warning: "DO NOT COMBINE THIS METHOD WITH BENDING THE PIPE BARREL".**

1. Make a concentric assembly, but push the spigot into the bell only to a point about ½ inch (13 mm) short of the reference line (the first reference line if there are two). This incomplete assembly permits more movement of the end of the pipe at the bottom of the bell.
2. Without delay, shift the loose bell end of the assembled length by not more than the following recommended maximum offsets. Use only manual effort.



MAXIMUM RECOMMENDED OFFSETS, TO ACHIEVE MINIMUM CURVE RADUIS BY DEFLECTING A STRAIGHT LENGTH OF PIPE AT THE JOINT.

** *Bell-by-Bell fittings such as tees and couplings offer a*

Pipe Size		Max Offset		Angle at One Bell	Resulting Radius of Curvature Using 20ft (6m) Lengths	
in	mm	in	mm			
4	100	12½	320	3°	382 ft	116 m
6	150	12½	320	3°	382 ft	116 m
8	200	12½	320	3°	382 ft	116 m
10	250	12½	320	3°	382 ft	116 m
12	300	10½	270	2.5°	458 ft	140 m
14 - 24	350 - 600	6¼	160	1.5°	764 ft	233 m
30 - 48	750 - 1200	4	100	1.0°	1146 ft	349 m
At Molded PVC Fittings (all sizes)		4	100	1.0°**	1146 ft	349 m

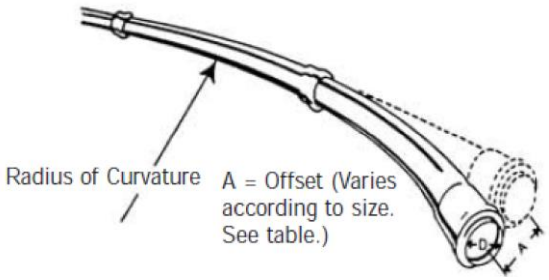
total of 2° deflection per fitting.

4.6.1.3 Bending the Pipe barrel:

Smaller diameters of PVC-O Pressure pipes can be laid to the line of the curved trench by bending the pipe barrel into curved shape. The procedure is as follows:

1. Make a concentric assembly in the usual way. Keep the spigot in straight alignment with the bell.
2. Place compacted backfill around the assembled joint to restrict its movement while the curvature is being made.
3. Place compacted backfill at the inside of the curve, at the midpoint of the pipe length, to form a fulcrum.
4. **Using only manual effort**, move the leading bell of the pipe length to be curved by no more than the offset distance shown in the following table below.
5. **Tapping bent PVCO pipe is permitted BUT it is recommended to tap on straight or not bended pipe.**

NOTE: *Bent Pipes should be clearly marked along their length to avoid the possibility that they will be tapped in the future.*



MAXIMUM RECOMMENDED OFFSETS, TO ACHIEVE MINIMUM RADII OF CURVATURE BY BENDING THE BARREL OF 20 ft (6 m) LENGTHS.

CIOD Pipe – Blue Brute™ & Bionax® C909 Pipe

Pipe Size D		Max Offset		Resulting Angle of Deflection	Resulting Radius of Curvature	
in	mm	in	mm		ft	m
4	100	24	600	5.7°	100	30
6	150	17	430	4.0°	144	44
8	200	13	300	3.0°	188	58
10	250	10	254	2.5°	232	71
12	300	8.7	221	2.1°	275	84

NOTE: Minimum radius is approximately 250 times nominal OD

IPS OD Pipe – Cycle Tough™ F1483 Pipe

Pipe Size D		Max Offset A		Resulting Angle of Deflection	Resulting Radius of Curvature	
in	mm	in	mm		ft	m
4	100	32	813	7.6°	75	23
6	150	22	560	5.2°	111	34
8	200	17	430	4.0°	144	44
10	250	13	330	3.2°	179	55
12	300	11	280	2.7°	213	65

NOTE: Minimum radius is approximately 200 times nominal OD

** SDR and DR both refer to the outside diameter of the pipe divided by pipe thickness:* O.D.

4.7 TAPPING FOR POTABLE AND NON-POTABLE WATER APPLICATIONS

4.7.1 Tapping shall be performed using standard tapping saddles designed for use on PVC piping in accordance with AWWA C605. Tapping shall be performed only with use of tap saddles or sleeves. NO DIRECT TAPPING WILL BE PERMITTED. Tapping shall be performed in accordance with the applicable sections for saddle tapping as per "Uni-Pub-8: Tapping Guide for PVC Pressure Pipe by Uni-Bell PVC Pipe Association".

4.7.2 All connections requiring a larger diameter than that recommended by the pipe supplier, shall be made with a pipe connection as specified and indicated on the drawings.

4.7.3 Equipment used for tapping shall be made specifically for tapping PVC pipe:

4.7.3.1 Tapping bits shall be slotted "shell" style cutters, specifically made for PVC pipe. 'Hole saws' made for cutting wood, steel, ductile iron, or other materials are strictly prohibited.

4.7.3.2 Taps may be performed while the pipeline is filled with water and under pressure ('wet' tap,) or when the pipeline is not filled with water and not under pressure ('dry' tap).

4.8 TESTING

4.8.1 Testing shall comply with all applicable jurisdictional building codes, statutes, standards, regulations, and laws.

4.8.2 Hydrostatic Testing and Leakage Testing for Pressure Piping

All hydrostatic and leakage testing shall be in accordance to ASPA's Pressure and Leakage Tests in accordance to AWWA standards. (Refer to Section 14000 of this Specifications).

4.9 METHOD OF MEASUREMENT AND PAYMENT

4.9.1 Method of Measurement and Payment for the work included in this section will be in accordance with the payment schedule in the Bid Proposal.

END OF SECTION

SECTION 00230

PVC PIPE: SCHEDULE 80 FOR SERVICE CONNECTION

PART 1- PIPE APPLICATION:

1. Corrosion resistant pressure pipe, IPS sizes 1/8" through 24", for use at temperatures up to and including 140°F. Pressure rating (210 psi to 1230 psi) varies with schedule, pipe size, and temperature. Generally resistant to most acids, bases, salts, aliphatic solutions, oxidants, and halogens.
2. Pipe exhibits excellent physical properties and flammability characteristics (independently tested flame and smoke characteristics-ULC).
3. Typical applications include: chemical processing, plating, high purity applications, potable water systems, water and wastewater treatment, irrigation, agricultural, and other industrial applications involving corrosive fluid transfer.
4. This pipe will be used for Potable Water Systems application and must meet all Local and Federal regulations pertaining to potable water applications.

PART-2 SCOPE:

1. This specification outlines minimum manufacturing requirements for Polyvinyl Chloride (PVC) Schedule 80 iron pipe size (IPS) pressure pipe. This pipe is intended for use in applications where the fluid conveyed does not exceed 140°F. This pipe meets and or exceeds the industry standards and requirements as set forth by the American Society for Testing and Materials (ASTM) and the National Sanitation Foundation (NSF International).

PART 3- PVC MATERIALS:

1. The material used in the manufacture of the pipe shall be domestically produced rigid polyvinyl chloride (PVC) compound, Type I Grade I, with a Cell Classification of 12454 as defined in ASTM D1784, trade name designation H707 PVC. This compound shall be gray in color as specified, and shall be approved by NSF International for use with potable water (NSF Std 61).

PART 4 - DIMENSIONS:

1. PVC Schedule 80 pipe shall be manufactured in strict accordance to the requirements of ASTM D1785 for physical dimensions and tolerances. Each production run of pipe manufactured in compliance to this standard, shall also meet or exceed the test requirements for materials, workmanship, burst pressure, flattening, and extrusion quality defined in ASTM D1785. All belled-end pipe shall have tapered sockets to create an interference-type fit, which meet or exceed the dimensional requirements and the minimum socket length for pressure-type sockets as defined in ASTM D2672. All PVC Schedule 80 pipe must also meet the requirements of NSF Standard 14 and CSA Standard B137.3 rigid PVC pipe for pressure applications, and shall bear the mark of these Listing agencies. This pipe shall have a flame spread rating of 0-25 when tested for surface burning characteristics in accordance with CAN/ULC-S102-2-M88 or equivalent.

PART 5- MARKING:

1. Product marking shall meet the requirements of ASTM D1785 and shall include: the manufacturer's name (or the manufacturer's trademark when privately labeled); the nominal pipe size; the material designation code; the pipe schedule and pressure rating in psi for water @ 73°F; the ASTM designation D1785; the independent laboratory's seal of approval for potable water usage; and the date of manufacturing.

END OF SECTION

SECTION 00240

PAINTING AND COATINGS

PART 1 - GENERAL

1.1 SCOPE OF WORK

1.1.1 Work included under this section consists of surface preparation, field paint application, surface protection, clean-up, and/or other appurtenant work on the following surfaces:

1.1.1.1 All exterior and interior surfaces.

1.1.1.2 All exterior and buried ferrous metal surfaces.

1.1.1.3 All exposed pipe, and other mechanical and electrical equipment if any.

1.1.1.4 Touch-up painting of pre-finished mechanical, electrical and specialty equipment.

1.1.1.5 All metal trim, metal doors, frames, flashings, gratings, brackets, bolts, nuts, clamps and hangers.

1.1.1.6 Ducts, piping and electrical conduit in painted rooms, against painted

surfaces, or exposed to the weather.

1.1.2 The Contractor shall furnish all materials, tools, and equipment, and shall do all painting work specified herein, or otherwise specified or indicated on the Drawings.

1.2 QUALITY OF WORK

1.2.1 All finishes shall be applied by skilled workmen in accordance with the best practices and standards of the painting trade. Brushes, rollers, all equipment, and the techniques used in applying finishes shall be of sufficient quality to assure the specified results. Work not conforming to this specification shall be corrected by touching up or refinishing as directed by the Engineer.

1.3 SUBMITTAL REQUIREMENTS

1.3.1 The contractor shall submit shop drawings, manufacturer's literature and color samples in accordance with applicable provisions contained in the "General Provisions" and "Special Provisions" sections of these Specifications. A detailed list of submittal requirements is included in the Special Provisions.

1.4 DELIVERY AND STORAGE

1.4.1 Painting materials shall be delivered to site in manufacturer's original containers with labels intact and seals unbroken. Painting materials and equipment shall be stored and mixed in rooms assigned for that purpose. All necessary precautions shall be taken to prevent fire. Rags or waste soiled with paint shall be removed from premises at end of each day's work, or shall be stored in covered metal containers.

1.5 INTENT

1.5.1 It is the purpose and intent of this Specification to cover the complete paint finishing of all exterior and interior surfaces as scheduled or specified and all surfaces which normally require a paint finish for corrosion resistance, weather protection, finished appearance or utility. Finished surfaces shall be of the type of finish, color sheen, film thickness and quality specified.

1.6 REFERENCE STANDARD OF QUALITY

1.6.1 The painting specification sand paint finish schedule list products by brand name to a standard of quality. Products of other manufacturers may be accepted in place of those specified upon proof of equivalency in accordance with the General Provisions as modified by the Special Provisions and this section.

1.6.2 If the Contractor desires to use other than specified products, he shall submit an itemized list giving the manufacturer's name, and the specific name and number of each product offered as a substitute and such other information as is necessary to enable the Engineer to evaluate substitute products. Approval of substitute of products shall be obtained from the Engineer before any materials are applied. Unspecified materials, such as turpentine and paint thinner shall be pure and of the highest quality of an approved manufacturer and shall bear the manufacturer's label on each container or package. All materials shall be delivered to the job site in the original containers with contents and labels intact.

1.7 PRELIMINARY EXAMINATION

1.7.1 Notify the Engineer in writing of any uncorrected defects in surfaces to be painted. Do not proceed with the finishing of surfaces in question until any discrepancies are corrected. The starting of work on any surface shall imply that the surface has been inspected and approved by the painting Contractor.

1.8 FIELD PRIMING

1.8.1 In general, surfaces of equipment, steel, and cast iron are specified to be shop primed. Any such surfaces which have not been shop primed shall be field primed. Galvanized, aluminum, stainless steel and insulated surfaces shall be field primed.

1.8.2 Surfaces specified to be field painted with clear finish coats need not be primed. Priming will not be required on concrete block and plaster board surfaces specified to be painted with latex paint.

1.9 RIGHT OF REJECTION

1.9.1 No exterior painting or interior finishing shall be done under conditions which jeopardize the appearance or quality of the painting or finishing in any way and the Engineer shall have the right to reject all material or work that is unsatisfactory, and reserve the right at all times to replace either, or both, at the expense of the Contractor.

PART 2 - MATERIALS

2.1 GENERAL

2.1.1 All paint shall be the product of a recognized manufacturer exclusively engaged in the manufacture of painting material. All paints for wood and metal surfaces shall be well-ground and shall not skin, liver, curdle, or body excessively in the containers. It shall be readily stirred with a paddle to a smooth uniform paint.

2.1.2 The paint shall be suitable for brushing at package consistency. It shall brush out evenly and shall not show laps or unevenness of color or texture. When applied to vertical surfaces, it shall not sag.

2.1.3 All exposed surfaces, including sides and edges, shall be painted. Hangers, brackets, fastenings, and other miscellaneous items shall be painted with the same system as the adjacent material. Paint systems shall be in addition to shop primers.

2.1.4 Paint shall be stored inside. No adulterant, unauthorized thinner, or other material not included in the paint formation shall be added to the paint for any purpose.

2.1.5 Paint used in successive field coats shall be produced by the same manufacturer. Paint used in the first field coat over shop painted or previously painted surfaces shall cause no wrinkling, lifting, or other damage to underlying paint. Any paint system shall be the product of a single manufacturer.

2.1.6 All paint used for intermediate and finish coats shall be guaranteed by the paint manufacturer to be lead-free, and fume proof. Where painting materials are referenced to Federal or Military Specifications, the reference shall define general type and quality required but is not intended to limit acceptable materials to an exact formulation.

2.1.7 For each paint, the Contractor shall follow the paint manufacturer's specific application instructions. Upon the Engineer's request, the Contractor shall furnish the following application instructions:

2.1.7.1 Surface preparation recommendations.

2.1.7.2 Type of primer to be used.

2.1.7.3 Maximum dry and wet mil thickness per coat.

2.1.7.4 Minimum and maximum curing times between coats.

2.1.7.5 Thinner to be used with each paint.

2.1.7.6 Ventilation requirements.

2.1.7.7 Atmospheric conditions during which the paint shall not be applied.

2.1.7.8 Allowable methods of application.

2.1.7.9 Maximum allowable moisture content and minimum age of plaster, concrete and wood surfaces at time of paint application.

2.1.7.10 Curing time before submergence in water.

2.1.8 The minimum number of coats and minimum total dry mil thickness of the system for each surface shall be as specified in the paint schedule.

2.2 PAINTING SCHEDULE

2.2.1 A schedule is appended to this section listing the surface preparation, primer, finish and dry mil thickness to be used on each surface to be coated.

2.3 PRIMERS AND PRETREATMENT

2.3.1 P-1 Epoxy Primer - Minimum dry thickness l.5 mils. Koppers 654 "Epoxy Primer", or Tnemec 66-1211 "Hi-Build Expoxoline".

2.3.2 P-2 Rust Inhibitive - Minimum dry thickness 2 mils. Koppers 622 "Rust-Penetrating" or Tnemec 77 "Chem-Prime".

2.3.3 P-3 Galvanized Metal Wash Primer - Minimum dry thickness 0.5 mils (mil-P-153B). Koppers 40 "Passivator or Tnemec 32-1210 "Vinoline".

2.4 INTERMEDIATE AND FINISH PAINTS

2.4.1 F-1 Epoxy Resin - Minimum dry thickness 6 mils. Koppers 200 "HB Epoxy", or Tnemec 66 "Hi-build epoxy.

2.4.2 F-2 Gloss Alkyd Enamel - Minimum dry thickness 1.5 mils (Fed Spec TT-E-489). Koppers "Glamortex 501" enamel or Tnemec "Tnemegloss" enamel.

2.4.3 F-3 Semigloss Alkyd Enamel - Minimum dry thickness 2.1 mils (Fed Spec TT-E-529). Koppers "Glamortex Semi-gloss" or Tnemec 23 "Enderatone".

2.4.4 F-4 coal Tar - Minimum dry thickness 15 mils. Koppers "Bitumastic Super Service Black" or Tnemec 449 "Heavy Duty Black".

2.4.5 F-5 Polyurethane - Minimum dry thickness 2 mils. Tnemec 70 "Endurashield".

2.5 ALUMINUM SURFACES

2.5.1 All aluminum in contact with steel or concrete shall be painted in accordance with the ASCE "Specifications for Structures of Aluminum Alloy 6061-T6, Second Progress Report of the Committee of the Structural Division of Design in Lightweight Structural Alloys".

2.6 SURFACES NOT TO BE PAINTED

2.6.1 Except as otherwise required or directed, the following surfaces are to be left unpainted:

2.6.2 Exposed surfaces of aluminum.

2.6.3 Polished or finished stainless steel. Unfinished stainless steel shall be painted.

2.6.4 Nickel or chromium.

2.6.5 Galvanized surfaces, except piping, conduit, exposed pre-cast concrete wall panel anchors, and ductwork.

2.6.6 Piping concealed in plumbing chases and above suspended ceilings.

2.6.7 Rubber and plastics, including fiberglass reinforced plastics.

PART 3 - PERFORMANCE

3.1 SURFACE PREPARATION

3.1.1 The Contractor shall prepare the surfaces to be coated as specified under the paint schedule. Any surfaces to be coated which are not listed under the paint schedule shall be prepared in accordance with the manufacturer's instructions for the material to be applied.

3.1.2 All grease, oil, dirt, and other contaminants which may affect the bond between the coating and the surface shall be removed by a cleaning agent which will leave the surface clean and dry.

3.1.3 Cleaning and painting operations shall be performed in a manner which will prevent dust or other contaminants from getting on freshly painted surfaces.

3.1.4 Surfaces shall be free of cracks, pits, projections, or other imperfections which would prevent the formation of a smooth, unbroken paint film, except for concrete block construction where a rough surface is an inherent characteristic.

3.1.5 When applying touch-up paint, or repairing previously painted surfaces, the surfaces to be painted shall be cleaned and sanded or wire brushed in such a manner that the edges of adjacent paint are feathered or otherwise smoothed so that they will not be noticeable when painted. All paint made brittle or otherwise damaged by heat or welding shall be completely removed.

3.1.6 Hardware items such as bolts, screws, washers, springs, and grease fittings need not be cleaned prior to painting if there is no evidence of dirt, corrosion, or foreign material.

3.1.7 All galvanized surfaces shall have a metal conditioner applied prior to the first prime coat.

3.1.8 All surfaces to be finished shall be clean and dry before any materials are applied. Use a moisture meter to determine moisture content as follows. The moisture content shall be less than 18 percent for wood; 8 percent for stucco, concrete or plaster.

3.1.8.1 Metal Surfaces

3.1.8.1.1 Where noted, the surface preparation for steel and other metals refer to the specifications for surface preparation by the latest revision of the Steel Structures Painting Council. All metal work shall be cleaned of grease, oil and dirt by solvent cleaning (SSPC-SP-1).

3.1.8.1.2 Method S-1 - Surface shall be wire brushed where required to remove loose rust and dirt, etc. (SSPC-SP2)

3.1.8.2 Galvanized Surfaces

3.1.8.2.1 Method G-1 - All galvanized surfaces shall be prepared for painting in strict conformity with the instructions of the manufacturer of the vinyl wash primer. Any subsequent primer required by the coating manufacturer for the finish coating shall than be applied. Any chemical treatment of galvanized surfaces shall be followed by thorough rinsing with clear water.

3.1.8.3 PVC Pipe

3.1.8.3.1 Method V-l - All wax and oil shall be removed from PVC plastic surfaces by wiping with a solvent of the type used for the specified primer.

3.2 PAINT APPLICATION

3.2.1 Apply all finish evenly, free from sags, runs, crawls, brush marks, skips or other defects. Apply products at the proper consistency and do not thin or otherwise alter them except in accordance with the manufacturer's printed directions. All coats shall be applied in such manner as to produce an even film of uniform thickness completely coating all corners and crevices. All painting shall be done by thoroughly experienced workmen. Care shall be exercised during spraying to hold the nozzle sufficiently close to the surfaces being painted to avoid excessive evaporation of the volatile constituents and loss of material into the air, or the bridging over of crevices and corners. Spray equipment shall be equipped with mechanical agitators, pressure gauges, and pressure regulators. Nozzles shall be of proper size. Floors, roofs, and other adjacent areas and installations shall be satisfactorily protected by drop cloths or other precautionary measures. All over-spray shall be removed by approved methods or the affected surface repainted. Care shall be exercised to avoid lapping of paint on hardware of other unscheduled surfaces.

3.2.2 Each coat of material shall be thoroughly dry before the application of a succeeding coat. In no case shall paint be applied at a rate of coverage per gallon which is greater than the maximum rate recommended by the manufacturer. Paint films showing sags, checks, blisters, teardrops, or rat edges will not be accepted. Paint containing any of these defects shall be entirely removed and the surface repainted.

3.2.3 Sandpaper enamels and varnishes lightly between coats and dust thoroughly before the application of a succeeding coat.

3.2.4 If the finish coat is to be colored, the prime coat and the intermediate coat shall be tinted to have a slight variation in color from each other and from the finish coat.

3.2.5 Finish tops, bottoms, and edges of doors after they are fitted.

3.3 PRIMING

3.3.1 Edges, corners, crevices, welds, and bolts shall be given a brush coat of primer before the specified spot or touch-up painting of metal surfaces. Special attention shall be given to filling all crevices with paint.

3.3.2 Abraded and otherwise damaged portions of shop applied paint shall be repainted. Welded seams and other uncoated surfaces, heads and nuts of field installed bolts, and surfaces where paint has been damaged by heat, shall be given a coat of the specified primer. This patch, spot, or touch-up painting shall be completed, and shall be dry and hard, before additional paint is applied.

3.3.3 Prime and back-prime all wood and millwork.

3.4 LATEX PAINT

3.4.1 Latex paint shall be applied by brushing or rolling; spraying is not permitted. Latex paint shall not be thinned excessively.

3.5 MIXING AND THINNING

3.5.1 Paint shall be thoroughly mixed each time any is withdrawn from the container. Paint containers shall be kept tightly closed except while paint is being withdrawn.

3.5.2 Unless otherwise authorized, all paint shall be factory mixed to proper consistency and viscosity for hot weather application without thinning. Thinning will be permitted only as necessary to obtain a recommended coverage at lower application temperatures. In no case shall the wet film thickness of applied paint be reduced, by addition of paint thinner or otherwise, below that represented by the recommended coverage rate.

3.6 FERROUS METAL FILM THICKNESS

3.6.1 It is intended that the dry film thickness and the continuity of submerged painted ferrous metal surfaces be subject to continual field check by the Engineer. Dry film thickness shall be measured by a General Electric thickness Gauge. Continuity shall be tested by a low voltage-west sponge, transistorized device as manufactured by the K-D Company, Palo Alto, California. Contractor shall perform continuity tests as required by the Engineer.

3.7 ATMOSPHERIC CONDITIONS

3.7.1 Apply all material to dry and properly prepared surfaces when weather conditions are favorable for painting. No materials shall be applied when the temperature of the materials is below 50 degrees F, or when the temperature of the air, surface to be painted or substrate, is below (or likely to fall below) 50 degrees F. Final ruling on the favorability of weather conditions shall be in accordance with the recommendations of the manufacturer and/or the Engineer.

3.8 REPAIRING DAMAGED PAINT ON EQUIPMENT

3.8.1 Painted surfaces on equipment, which have become damaged prior to acceptance by the Government, shall be repainted with the same or equivalent paint used in the original application.

3.9 PROTECTION OF SURFACES

3.9.1 Throughout the work the contractor shall use drop cloths, masking tapes, and other suitable measures to protect all surfaces from accidental spraying, splattering, or spilling of paint. He shall be liable for and shall correct and repair any damaged condition resulting from his operations or from the operations of all those who are responsible to him during the time his work is in progress and until the work is accepted. In case bituminous paints are spilled or dropped on any material except metals, the spots shall, after surface cleaning, be spot painted with aluminum paint prior to applying the specified paint. Any exposed concrete or masonry not specified to be painted which is damaged by paint shall be either removed and rebuilt or, where so authorized by the Government, painted with two coats of masonry paint.

3.10 CLEAN-UP

3.10.1 All cloths and cotton waste which might constitute a fire hazard shall be placed in metal containers or destroyed at the end of each work day. Upon completion of the work all staging, scaffolding and containers shall be removed from the site or destroyed in a manner approved by the Engineer.

END OF SECTION

SECTION 00250

CHAIN LINK FENCING

PART 1 - GENERAL

1.1. Unless stated otherwise, all materials for chain link fencing and gates above and below ground shall be PVC coated galvanized as specified in the current ASTM F 668.

POST

1.2. All posts shall be of sufficient length to provide a 36-inch minimum setting in concrete footings and at a depth as specified on the plans. Posts shall be set at a maximum spacing of 10' o.c. Posts shall be in proper alignment so that there is a minimum of 4” on all sides of the post. No material shall be installed on the post nor shall the post be disturbed in any manner within 7 days after the individual post footing is completed. Should rock be encountered at a depth less than the planned footing depth a hole 2” larger than greatest dimension of the post shall be drilled to a depth of 12”. No extra compensation shall be made for rock excavation.

(1) All posts. PVC coated Galvanized steel, 35 percent minimum carbon content, 60,000 pounds per square inch minimum tensile strength (Schedule 40).

(2) Line Posts. 2-3/8 inch O.D. pipe weighing 3.65 pounds per linear foot or 2 inch x 2-1/4 inch H section weighing 4.10 pounds per linear foot unless otherwise specified on drawings.

(3) End, Corner and Pull Posts. 2-7/8 inch O.D. pipe weighing 5.79 pounds per linear foot unless otherwise specified on drawings.

(4) Gate posts. For single gate or one leaf of double gates: (aa) Up to 6 feet wide. 3 inch O.D. pipe weight 5.79 pounds per linear foot unless otherwise specified on drawings. (ab) 6 feet to 15 feet wide. 4 O.D. pipe weighing 9.11 pound per linear foot.

(5) Post Tops. Tubular post tops designed to prevent moisture from entering posts and to support top rail.

TOP RAILS

1.3. (1) 1-1/2 inch I.D. PVC coated galvanized steel pipe weighing 2.27 pounds per linear foot. (2) Provided with PVC coated galvanized, outside sleeve, self-centering 7- inch long couplings approximately every 20 feet.

HORIZONTAL BRACES

1.4. (1) Braces shall be 1-1/2 inch I.D. PVC coated galvanized steel pipe weighing 2.27 pounds per linear foot with plain ends.

DIAGONAL BRACES

1.5. (1) Diagonal braces shall be 3/8 inch diameter PVC coated galvanized steel rods or as specified on drawing. (2) Diagonal braces shall be provided with heavy galvanized iron turnbuckles to adjust the tension.

FENCE FABRIC

1.6. (1) Wire. 9 gauge PVC coated galvanized steel wire, of medium high carbon quality, minimum tensile strength of 70,000 pounds per square inch, interwoven into 2 inch diamond mesh. (2) Fabric. 72 inches wide, selvage shall be knuckled at bottom and twisted and barbed at top.

BARBED WIRE

1.7. PVC coated barbed wire shall be 10 gauge with 10 gauge barbs. All barbs shall be 4 points and spacing of barbs shall be 4 to 6 inches.

FABRIC CONNECTIONS AND INSTALLATION

1.8. (1) Terminal post shall be fastened by 3/16 inch x 3/4 inch stainless steel stretcher bars with 11 gauge stainless steel or aluminum bands unless otherwise specified on drawings.

1.9. (2) All line posts shall be fastened with 9 gage stainless steel or aluminum wire clips unless otherwise specified on drawings.

1.10. (3) All top rails shall be fastened with a 9 gage stainless steel or aluminum tie wires.

1.11. (4) The bottom edge of the fabric shall be fastened by 1/8 inch PVC coated galvanized tension bars with 11 gage stainless steel or aluminum bands unless otherwise specified on drawings.

1.12. (5) The fence shall generally follow the contour of the ground, with the bottom of the fence no more than 2” from ground surface. At locations of small natural swales and where it is not practical to have the fence conform to the general contour of ground surface, longer post may be used and multiple strands of barbed wire stretched there on to span the opening below fence. Vertical clearance between strands of barbed wire shall be 4” or less.

CONCRETE

1.13. Concrete shall be of a commercial grade with a min 28-day compression strength of 2500psi. All concrete shall be placed against solid, undisturbed or re-compacted fill materials. All aggregates shall comply with latest ACI requirements. Cement shall be Type II Portland. Concrete Mix Design (Proportion) shall be submitted to ASPA for approval prior to any concrete placement.

END OF SECTION

SECTION 00260

EXCAVATION, TRENCHING AND BACKFILL FOR PIPELINES

PART 1 – GENERAL

1.1 SUMMARY

1.1.1 This section includes excavation, trenching and backfill necessary for the construction of the facilities as indicated on the plans including, but not limited to: water mains and service lines, sewer mains and service lines, valves and concrete manholes and related appurtenances.

1.2 MEASUREMENT AND PAYMENT

1.2.1 Measurement

1.2.1.1 Linear feet of pipe installed measured horizontally over the centerline of the pipe.

1.2.1.2 If stationing is established on the job, stationing shall be used to determine the payment quantities.

1.2.2 Basis for Payment

1.2.2.1 Payment shall be full compensation for all temporary controls and facilities; excavation; rock excavation; erosion and sediment control; trenching; pipe; pipe fittings; pipe installation; joint thrust restraints; casing; bedding;, including imported bedding; slurry; compaction; compaction testing; grading; hydrostatic testing; disinfection; site restoration (excluding rock walls, fences, roads and sidewalks; and provision of record drawings (as-builts); and site cleanup.

1.3 REFERENCES

1.3.1 ASTM D698 – Test Methods for Moisture Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb. Rammer and 12-in. Drop [Standard Proctor Test].

1.3.2 ASTM D1556 – Test Method for Density of Soil in Place by the Sand-Cone Method

1.3.3 ASTM D2216 – Test Method for Laboratory Determination of Water Content of Soil, Rock and Soil-Aggregate Mixtures

1.3.4 ASTM D2487 – Classification of Soils for Engineering Purposes [Unified Soil Classification System].

1.3.5 ASTM D2774 – Standard Recommended Practice for Underground Installation of Thermoplastic Pressure Piping

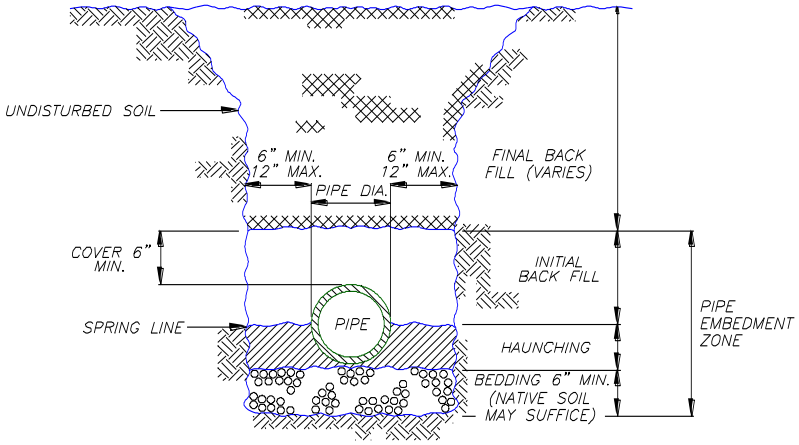
1.3.6 ASTM D2922 – Test Method for Density of Soil and Soil Aggregate and Rock in Place by Nuclear Methods (Shallow Depth)

1.4.7 ASTM D3017 – Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

1.4.8 OSHA 1926 – Occupational Safety and Health Standards for the Construction Industry

1.5 DEFINITIONS

1.5.1 Bedding, Haunching and Initial Backfill zones as defined herein and on the standard thermoplastic pipe trench detailed drawing below.



1.5.2 Native, and Import and Select/Engineered Material Definitions:

1.5.2.1 Native Material: Soils excavated from the trench in the immediate vicinity of current pipe installation activities.

1.5.2.2 Import Material: Soils transported from a soil pit stockpile at a location other than the location where trench excavation is taking place.

1.5.2.3 Select/Engineered Fill: Soil specified in the plans or specifications or by the Project Engineer to meet permit conditions or selected applications.

1.5.3 Soil Materials as summarized in the table below and further defined in ASTM D2487:

USCS Group	Description
GW	Well-Graded Gravel, with less than 5% fines
GP	Poorly-Graded Gravel, with less than 5% fines
SW	Well-Graded Sands, with less than 5% fines
SP	Poorly-Graded Sands, with less than `5% fines
GW-GM or GW-GC	Well-Graded Gravel, with 5-12% fines
GP-GM or GP-GC	Poorly-Graded Gravel, with 5-12% fines
SW-SM or SW-SC	Well Graded Sands with 5-12% fines
SP-SM or SP-SC	Poorly Graded Sands with 5-12% fines

1.6 SUBMITTALS

1.6.1 Submit the result of ASTM 698 standard proctors, including proctor curve, for each soil type encountered and used on the job.

1.6.2 Submit all compaction test results in writing within 5 days of being performed.

1.6.3 Submit gradation curves for imported fill for project engineer review and approval prior to placement.

1.7 QUALITY ASSURANCE

1.7.1 Compaction Testing Qualifications: Tests must be performed by a firm or professional regularly engaged in soil testing for engineering purposes. The individual on site shall be certified to operate nuclear density equipment.

1.7.2 Locations: Provide compaction test results at locations as designated by the Project Engineer and/or American Samoa Department of Public Works.

1.7.2.1 Frequency:

1.7.2.1.1 Excavation, Trenching and Backfilling in an Established, Traveled Roadway: once per 100-feet along the pipeline (minimum).

1.7.2.1.2 Excavation, Trenching and Backfilling outside of an Established, Traveled Roadway: once per 300-feet along the pipeline (minimum).

1.7.2.2 At each location, provide enough tests to demonstrate compliance with the compaction requirements for both the pipe embedment zone and the final backfill zone.

1.7.2.3 If testing reveals inadequate compaction, retest at that location after remedying the non-compliance with the specifications.

PART 2 – PRODUCTS

2.1 BEDDING, HAUNCHING AND INITIAL BACKFILL MATERIAL

2.1.1 Imported Bedding, Haunching and Initial Backfill Materials: Use one of the following materials.

2.1.1.1 Black sand or 1/4" minus crushed rock.

2.1.2 Native bedding, native haunching and native initial backfill material:

2.1.1.2 Use in accordance with the restrictions of Part 3 – Execution.

2.1.1.3 Free from particles greater than 1-inch in dimension.

2.2 FINAL BACKFILL MATERIAL

2.2.1 General:

2.2.1.1 Free from soil chunks larger than 4-inches in dimension.

2.2.1.2 Free from stones or rocks larger than 4-inches in dimension.

2.2.1.3 Free from organic materials.

2.2.1.4 Free from frost chunks.

2.2.1.5 Free of Toxic Waste or Hazardous Chemicals per American Samoa Environmental Protection Agency Requirements. Certified if possible.

2.2.2 Imported Final Backfill for Wet Conditions:

2.2.2.1 Types GW, GP, SW, SP (coarse grained soils with less than 5% fines) or GW-GC/GM, GP-GC/GM, SW-SC/SM, SP-SC/SM (coarse grained soils with 5-12% fines).

2.2.2.2 Otherwise meeting the general requirements of Article 2.02 Paragraph A.

2.3 SLURRY MIX

2.3.1 General: Conform to American Samoa Department of Public Works Standard Specification for Construction of Local Streets and Roads as applicable.

PART 3 – EXECUTION

3.1 GENERAL

3.1.1 Conform to applicable safety laws, including, but not limited to, OSHA 29 CFR Part 1926.

3.1.2 Obtain all permits from the appropriate road agencies for construction within road right of way.

3.1.3 Repair damage resulting from settlement, slides, cave-ins, water pressure, and other causes.

3.1.4 Provide traffic control and other temporary provisions in accordance with American Samoa Department of Public Works, Department of Public Safety, and PNRS Encroachment Permit Conditions.

3.2 EXCAVATION

3.2.1 Remove brush, trees and stumps from excavation and site.

3.2.2 Strip and stockpile existing topsoil.

3.2.3 Maintain surface drainage away from trenching or excavation.

3.2.4 If existing soil cannot provide uniform and stable bearing support along the length of the pipe, or if the existing soil contains stones greater than 1-inch in dimension, then over-excavate 6-inches below bottom of pipe.

3.2.5 If trench is more than 5’ in depth, the contractor must conform to OSHA guidelines on Trench Safety and Shoring. In addition the contractor must conform to all other State and County requirements for Trench Safety and Shoring.

3.2.6 Contractor will be responsible for disposal of excavated materials during excavation. Contractor must identify, with approval from the Project Engineer or the American Samoa Environmental Protection Agency, the construction disposal site before construction can begin.

3.3 TRENCHING

3.3.1 Total Bottom Width: As indicated on plans.

3.3.2 Depth: Provide minimum cover as specified, or depths shown on plans.

3.3.3 Top Width: As needed to meet safety requirements, but minimize the width where possible.

3.3.4 Trench Walls: Keep trench walls vertical in the pipe embedment zone.

3.3.5 Length of Open Trench:

3.3.5.1 Unless authorized by the Project Engineer in writing, the length of trench excavation in advance of pipe being laid shall not exceed 200-feet during active construction.

3.3.5.2 All trenches must be backfilled during non-work hours, or alternately, up to 20-feet of trench can be left open during non-work hours if the trench is completely barricaded and fenced.

3.3.5.3 If open trenches in excess of this specification result in the wetting of moisture-sensitive stockpiled materials, such that the moisture content makes it impossible to meet compaction requirements, the contractor shall provide imported material that complies with these specifications and haul away the wet materials at no expense to the project or the Owner.

3.4 BEDDING

3.4.1 General:

3.4.1.1 Where over excavation is necessary, install a minimum of 6-inches of imported bedding.

3.4.1.2 Level and form the bottom of the trench to provide uniform bearing support along the length of the pipe.

3.4.2 Compaction of Imported Bedding: Meet the following density requirements based on standard proctor (ASTM D698):

Location	Percent of Max. Dry Density Required
Areas of Recent Fill or Embankment	95%
Areas Traveled By Vehicular Traffic, Rights-of-Way	90%
Unimproved Surfaces or Fields	80%

3.5 HAUNCHING AND INITIAL BACKFILL

3.5.1General

3.5.1.1 Provide complete and uniform bearing and support for the pipe, including allowance for bell holes.

3.5.1.2 Work material under the pipe haunches and around the pipe to ensure full pipe support.

3.5.1.3 Place material in lifts no greater than 6-inches thickness in loose measure.

3.5.1.4 Install initial backfill to a depth of 6-inches over the crown of the pipe.

3.5.2 Material Usage:

3.5.2.1 Rigid Pipe (Ductile Iron):

3.5.2.2 Dry Trench and Site Conditions: Use native material free from particles greater than 1-inch in dimension.

3.5.2.3 Wet Trench Conditions: Imported Material.

3.5.2.4 Plastic Pipe: Imported Material

3.5.2.4.1 If deemed necessary by the Project Engineer, and as required by road owner use imported material for PVC and Polyethylene pipe in accordance with ASTM D 2774 and/or road owner requirements.

Pipe Diameter	Maximum Particle Size
4 inch and under	½ inch
6-8 inch	¾ inch
10-16 inch	1 inch
16 inch and larger	1-1/2 inch

3.5.3 Compaction of Haunching and Initial Backfill:

3.5.3.1 Compact haunching material and initial backfill using walk-behind vibratory plate compactor or manual hand-tamping tools

3.5.3.2 Ensure no contact between compacting equipment and the pipe.

3.5.3.3 Prohibited Compaction Equipment for Haunching and Initial Backfill:

3.5.3.3.1. hoe-pack

3.5.3.3.2 hydro-hammer

3.5.3.3.3 rammer-tamper

3.5.3.3.4 vibratory rollers

3.5.3.4 Prevent movement of the pipe during placement or compaction of material.

3.5.3.5 Meet the following density requirements based on standard proctor (ASTM D698):

Location	Percent of Max. Dry Density Required
Areas of Recent Fill or Embankment	95%
Areas Traveled By Vehicular Traffic, Rights-of-Way	90%
Unimproved Surfaces or Fields	80%

3.6 FINAL BACKFILL

3.6.1 General:

3.6.1.1 If moisture content of the native soil results in the inability to meet compaction requirements (due to fines), use imported material that meets Article 2.02 B.

3.6.1.2 Waste or haul away material not meeting the requirements at contractor's expense.

3.6.1.3 Conform to Section 02705 – Road Restoration for backfill requirements under roadways.

3.6.1.4 Repair any trenches improperly backfilled or where settlement occurs, then refill and compact.

3.7 Compaction:

3.7.1 Install 2-feet of total fill over the pipe crown before subjecting the trench to hydro-hammers, hoe-packs, or vehicular traffic.

3.7.2 Backfill in lifts to meet compaction requirements throughout the full depth of backfilled trench.

3.7.3 Compact to the following requirements (Densities as a percent of Standard Proctor):

Location	Maximum Lift	Percent of Max. Dry Density Required
Under Roadways or Surfaces Traveled by Vehicular Traffic	8-inches	95%
Areas of Recent Fill or Embankment	8-inches	90%
Rights-of-Way	12-inches	90%
Unimproved Surfaces or Fields	24-inches	80%

3.7.3.4 Use smaller lifts if necessary to meet the in-place density requirements.

3.8 REMOVAL OF NUISANCE WATER

3.8.1 Control site drainage, springs and runoff, and prevent water from adversely affecting trenching locations.

3.8.2 Remove nuisance water entering the trenches. Water that can be removed through the use of sump or trash pumps will not be considered dewatering.

3.8.3 Keep trenches free from standing water until the facilities are in place, the end plugged against the entrance of water, and backfill has been placed and compacted.

3.9 LOCATE EXISTING UTILITIES

3.9.1 Field locate all existing underground utilities. Contractor is responsible for field locating all utilities onsite and should not rely on as-built drawings.

3.9.2 Contact ASPA Water Division, Power Division, and Wastewater Division 48-hours in advance of work in areas needing utility location service. Call 684-699-1234.

3.10 UTILITY CONFLICTS

3.10.1 Protect existing utilities from damage during excavation and backfilling operations.

3.10.2 Provide temporary support for existing water, gas, telephone, power, or other utility services that cross the trench until backfilling of trench is complete.

3.10.2.1 Compact backfill to 95% of maximum density under disturbed utilities.

3.10.2.2 Coordinate the repair of existing utilities, regardless of whether they were properly located.

3.10.2.3 Damage to existing utilities properly located through "Utility Locate" programs will be the responsibility of the Contractor to repair, at no cost to the American Samoa Power Authority.

3.10.2.4 Damage to existing utilities improperly located by "Utility Locate" programs shall be at the expense of the "Utility Locate" service or the owner of the damaged utilities.

3.10.2.5 Fair compensation will be negotiated for repairs to Village water and sewer utilities that were improperly located. However, if the Contractor neglects to request a Village utility locate in accordance with the Contract requirements, no compensation will be made to the Contractor.

3.10.3 Water and sewer parallel and perpendicular crossings:

3.10.3.1 Maintain a 10-foot horizontal separation (O.D. to O.D.) for parallel mains.

3.10.3.2 Upon approval by the Engineer, water and sewer mains may be installed in parallel as close as 5-feet, provided all of the following conditions:

3.10.3.2.1 Vertical separation is 24 inches (O.D. to O.D.)

3.10.3.2.2 Water main is above the sewer main.

3.10.3.2.3 Sewer pipe is constructed to withstand 150 psi static pressure without leaking.

3.10.3.2.4 Maintain a minimum 24-inch vertical separation (O.D. to O.D.) for perpendicularly crossing mains.

3.10.3.2.5 Place water pipe over sewer pipe.

3.10.3.2.6 Lay pipe with joints equidistant from the point of crossing.

3.10.4 If it is impossible to meet any of the above separation distances and deviations, and specific provisions are not indicated on the plans, encasement of waterline and sewerline is required. The minimum encasement length is 10 feet for each pipe. This matter must be brought to the attention of the Project Engineer for approval.

3.10.5 The contractor is responsible for relocating all existing utilities if realignment of the new waterline away from utility is not possible. Contractor must use all means to work around existing utilities and only relocate existing utilities if it is the only feasible option.

END OF SECTION

SECTION 00270

WATER DISTRIBUTION MAINS

PART 1 – GENERAL

1.1 SECTION INCLUDES

1.1.1 This section includes water pipe, gate valves, hydrants, preparation, bedding, installation, and disinfection.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

1.2.1 PVC Water Main: Paid by the linear foot, measured to the nearest foot. Includes trench excavation, placement of bedding material (quantity of imported bedding material required, if any, will be paid separately under its own Line Item), hand trimming, pipe, fittings, thrust blocks, water main metallic tracer tape, marker posts, hydrostatic testing, disinfection, backfilling, as-builts, site cleanup, bacteriological sampling and testing, and all appurtenances not otherwise specified in the bid schedule.

1.2.2 Ductile Iron Water Main: Paid by the linear foot, measured to the nearest foot. Includes trench excavation, placement of imported bedding material (quantity of imported bedding material required, if any, will be paid separately under its own Line Item), hand trimming, pipe, fittings, thrust blocks, jacket, water main metallic tracer tape, marker posts, hydrostatic testing, disinfection, backfilling, as-builts, site cleanup, bacteriological sampling and testing, copper wire conductor on top of pipe, and all appurtenances not otherwise specified in bid schedule.

1.2.3 Fire Hydrant Assembly: Paid by the unit, measured to the whole unit. Includes excavation, angle fire hydrant valve, gate valve and box, hydrant wrench, gate valve key, thrust blocks, connection to water main, gravel, concrete, backfilling, protection post, as-builts, site cleanup, and other appurtenances necessary to make a workable installation.

1.2.4 Flush Hydrant Assembly: Paid by the unit, measured to the whole unit. Includes excavation, angle flush hydrant valve, galvanized pipe, gate valve and box, hydrant wrench, gate valve key, thrust blocks, connection to water main, gravel, concrete, backfilling, protection posts, as-builts, site cleanup, and other appurtenances necessary to make a workable installation.

1.2.5 Gate Valve and Box: Paid by the unit, measured to the whole unit. Includes excavation, gate valve, gate valve key, box, thrust blocks, protection posts, backfilling, as-builts, site cleanup, and other appurtenances as necessary.

1.2.6 Pressure Reducing Valve (PRV): Paid by the unit, measured to the whole unit. Includes excavation, pipe, vault, two gate valves (one upstream, one downstream from PRV), gate valve key, boxes, thrust blocks, fittings, protection posts, backfilling, as-builts, site cleanup, and other appurtenances as necessary.

1.2.7 Air Release Combination Valve: Paid by the unit, measured to the whole unit. Includes excavation, pipe, vault, air release combination valve, fittings, marker posts, double strap saddle, corporation stop, and connection to the water main, backfilling, as-builts, site cleanup, and other appurtenances as necessary.

1.2.8 Connection to Existing Water Main: Paid by the unit, measured to the whole unit. For the purposes of this contract, a water main is defined as larger than 2 inches in diameter. Includes excavation, removal and disposal of existing water main and fittings, locating existing valves, draining existing water mains, coordinating shut-down with local utility authority, fittings, disinfection, backfilling, as-builts, site cleanup and other appurtenances as necessary.

1.2.9 Steel Pipe Encasement: Paid by the linear foot, measured to the nearest foot. Includes trench excavation, placement of imported bedding material (quantity of imported bedding material required, if any, will be paid separately under its own Line Item), hand trimming, encasement pipe, fittings, thrust blocks, marker posts, backfilling, as-builts, site cleanup, and all appurtenances not otherwise specified in bid schedule.

1.3 REFERENCES

1.3.1 ANSI/AWWA C104/A21.4 – Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water

1.3.2 AWWA C105 – Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.

1.3.3 ANSI/AWWA C110/A21.10 – Ductile Iron and Gray Iron Fittings, 3 Inch Through 48 Inch, for Water and Other Liquids

1.3.4 ANSI/AWWA C111/A21.11 – Rubber-Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings

1.3.5 ANSI/AWWA C150/A21.50 – Thickness Design of Ductile Iron Pipe

1.3.6 ANSI/AWWA C151/A21.51 – Ductile Iron Pipe, Centrifugally Cast, for Water or Other Liquids

1.3.7 ANSI/AWWA C153/A21.53 – Ductile Iron Compact Fittings, 3 Inch through 16 Inch, for Water and Other Liquids

1.3.8 ANSI/AWWA C502 – Dry Barrel Fire Hydrants

1.3.9 AWWA C503 – Wet-Barrel Fire Hydrants

1.3.10 AWWA C504 – Rubber-Sealed Butterfly Valves

1.3.11 ANSI/AWWA C509 – Resilient Seat Gate Valves for Water and Sewerage Systems

1.3.12 ANSI/AWWA C515 – Reduced Wall, Resilient Seated Gate Valve for Water Supply Service

1.3.13 ANSI/AWWA C600 – Installation of Ductile Iron Water Mains and Their Appurtenances

1.3.15 ANSI/AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water

1.3.16 ANSI/AWWA C651– Disinfecting Water Mains

1.3.17 ANSI/AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inch through 12 Inch, for Water Distribution

1.3.18 AWWA C901 – Polyethylene (PE) Pressure Pipe, Tubing, and Fittings, ¾ inch through 3 inch, for Water.

1.3.19 ASTM D 1785 – Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

1.3.20 ASTM D 2241 – Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).

1.3.21 ASTM D 2466 – Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

1.3.22 ASTM D 2855 – Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

1.3.23 ASTM D 2239 – Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.

1.3.24 ASTM D 3139 – Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

1.3.25 ASTM F 477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

1.3.26 Standard Methods for Examination of Water and Wastewater

1.3.27 NSF 60 - Drinking Water Treatment Chemicals

1.3.28 NSF 61 - Drinking Water System Components

1.4 SUBMITTALS

1.4.1 Water Main and Fittings

1.4.2 Special Anchoring Retainer Glands

1.4.3 Gate Valves and Boxes

1.4.4 Fire Hydrants and Flush Hydrants

1.4.5 Warning Tape

1.4.6 Tracing wire, Box and Splice Materials

1.4.7 Method of Disinfection

1.4.8 Water Testing Lab

1.4.9 Method of Connection to Existing Distribution System

1.4.10 Method of Pressure Testing

1.4.11 Pressure Test Certification Forms

1.5 DEFINITIONS

1.5.1 Fully Restrained: Pipe installed with or including:

1.5.1.1 Certalok C900 joined pipe (or equal)

1.5.1.2 Pipe with Flanged connections

1.5.1.3 Pipe with mechanical joints

1.6 QUALITY ASSURANCE

16.1 Water testing shall be done by the AS-EPA certified laboratory.

1.6.2 Pipe: Perform work in accordance with manufacturer's recommended procedures.

1.6.3 Valves: Mark manufacturer's name and pressure rating on valve body.

1.6.4 Pressure testing shall be done in accordance with the Project Engineer's requirements in Section 3.11.

1.7 DELIVERY, STORAGE, AND HANDLING

1.7.1 Deliver, store, and protect products to site.

1.7.2 Deliver and store valves in shipping containers with labeling in place.

1.8 ACCEPTANCE

1.8.1 Work covered by this section will not be accepted until the backfilling and testing connected with the work has been completed satisfactorily.

1.8.2 Any section of water main that is found defective in material, alignment, or joints before acceptance shall be corrected to the satisfaction of the Project Engineer.

PART 2 – PRODUCTS

2.1 WATER PIPE (SEE SECTION 00220, SECTION 00230)

2.1.1 Fittings: AWWA C111, rubber-gasket joints, Ductile-Iron Joints: ASTM D3139 compression gasket ring.

2.1.2 Trace Wire: Magnetic detectable conductor, plastic covering, imprinted with "Water Line" in large letters.

2.1.3 Fittings: ASTM D2466, PVC.

2.1.4 Joints: ASTM D2855, solvent weld. PVC

2.1.5 Trace Wire: Magnetic detectable conductor, plastic covering, imprinted with "Water Line" in large letters.

2.1.6 Ductile Iron Pipe: AWWA C151, pressure class 350, centrifugally cast in metal molds or sand-lined molds, or C104, cement-mortar lining, as shown on the drawings or bid schedule.

2.1.7 Fittings: Ductile iron, standard thickness.

2.1.8 Joints: AWWA C111, rubber-gasket joints with rods.

2.1.9 Jackets: AWWA C105 polyethylene encasement, double layer, half lapped, ½-inch polyethylene tape.

2.2 Joint Thrust Restraint

2.2.1 Concrete Thrust Blocks:

2.2.1.1 One part Portland cement, 2 ½ part of fine aggregate, 3 ½ parts coarse aggregate and just enough water for a workable consistency.

2.2.1.2 #4 rebar non-coated

2.1.2 Spatial Anchoring Retainer Glands for Mechanical Joints:

2.1.2.1 PVC: Equal to

2.1.2.1.1 EBAA Iron Series 1600.

2.1.2.1.2 FORD Meter Series 1390 Uni-Flange Restraint.

2.3 GATE VALVES

2.3.1 Manufacturers: American Darling, Mueller, Clow, or Waterous, or equal.

2.3.2 Meet or exceed either AWWA C509 or C515, resilient seated gate valves 2 inch through 12 inch NPS, ductile iron body, trim, non-rising stem with square nut, single wedge, mechanical joint, flanged, or slip-on ends as specified in drawings, control rod, and extension box.

2.3.3 Furnish one valve key per contract or delivery order as applicable.

2.4 AIR RELEASE VALVES

2.4.1 AWWA C504, rubber seated, iron body, bronze disc, resilient replaceable seat, water or lug ends, ten position lever handle.

2.4.2 Valve Type: Float operated, with operating pressures up to 150 psi, equal to CRISPIN Air & Vacuum Release Valve AL Series.

2.4.3 Valve Box: Concrete water meter box equal to Christy B-9 or San Diego.

2.5 COMBINATION AIR/VACUUM RELIEF VALVE

2.5.1 Air/Vacuum valves shall be fully automatic float operated valves designed to exhaust large quantities of air during the filling of a piping system and close upon liquid entry. The valve shall re-open during draining or if a negative pressure occurs.

2.5.2 Valves shall be manufactured and tested in accordance with American Water Works Association (AWWA) Standard C512.

2.5.3 Valves used in potable water service shall be certified to NSF/ANSI 61 Drinking Water System Components - Health Effects.

2.5.4 Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited, certifying body.

2.5.5 Valve sizes 3 in. (76 mm) and smaller shall have full size NPT inlets and outlets equal to the nominal valve size. The body inlet connection shall be hexagonal for a wrench connection.

2.5.6 Valve sizes 4 in. (100 mm) and larger shall have bolted flange inlets with threaded or plain outlets and protective hoods to prevent debris from entering the valve. Flanges shall be in accordance with ANSI B16.1 for Class 125 or Class 250 iron flanges and ANSI B16.5 for Class 150 or Class 300 steel flanges.

2.5.7 The valve shall have two additional NPT connections for the addition of Air Release Valves, gauges, testing, and draining.

2.5.8 The valve body shall provide a through flow area equal to the nominal valve size. A bolted cover with alloy screws and flat gasket shall be provided to allow for maintenance and repair.

2.5.9 Floats shall be unconditionally guaranteed against failure including pressure surges. The float shall have a hexagonal guide shaft supported in the body by circular bushings to prevent binding from debris. The float shall be protected against direct water impact by an internal baffle.

2.5.10 The resilient seat shall provide drop tight shut off to the full valve pressure rating. The seat shall be a minimum of .5 in. (12 mm) thick on 2 in. (50 mm) and larger valves and secured in such a manner as to prevent distortion. Valves with working pressures above 400 psig (2760 kPa) shall have metal seats with synthetic seals.

2.5.11 On valve sizes 4 in. (100 mm) and larger, the cover shall be fitted to the valve body by means of a machined register to maintain concentricity between the top and bottom guide bushings at all times. The float shall be double guided with a guide shaft extending through the float to prevent any contact with the body. A resilient bumper shall be provided to cushion the float during sudden opening conditions.

2.5.12 The valve body, cover, and baffle shall be constructed of ASTM A536 Grade 65-45-12 ductile iron.

2.5.13 The float, guide shafts, and bushings shall be constructed of Type 316 stainless steel. Non-metallic guides and bushings are not acceptable. Resilient seats shall be Buna-N. Class 300 steel valves shall have a 316 stainless steel Seat with Buna-N seal to provide an initial contact to Buna-N with final metal to metal contact to prevent over compression of the resilient seal.

2.5.14 An optional Regulated Exhaust Device shall be provided when specified to reduce pressure surges due to column separation or rapid changes in velocity and pressure in the pipeline. The Regulated Exhaust Device shall be mounted on the inlet of the Air/Vacuum Valve, allow free air flow in and out of the valve, close upon rapid air exhaust, and control the air exhaust rate to reduce pressure surges. The device shall have a flanged globe-style body with a center guided disc and seat assembly. The disc shall have threaded holes to provide adjustment of the air exhaust rate through the valve. The holes shall provide for a flow area of 5% of the nominal valve size. The material of the body shall be consistent with the Air/Vacuum Valve. The seat and disc shall be bronze.

2.5.15 A stainless steel screened outlet shall be provided for outdoor installations.

2.5.16 Valve interiors and exteriors shall be coated with an NSF/ANSI 61 certified fusion bonded epoxy in accordance with AWWA C550 when specified.

2.5.17 Low Durometer seat shall be furnished for low pressure application.

2.5.18 All Air (Release, Vacuum, etc) Valves installed in vaults or flood prone locations shall include an inflow preventer to prevent the introduction of contaminated water through the air valve outlet. The inflow preventer shall allow the admittance and exhausting of air while preventing contaminated water from entering during normal operating conditions. The inflow preventer shall be flow tested by an independent third party to certify performance. The third party shall be an approved testing lab of the American Society of Sanitary Engineers.

2.5.19 The manufacturer shall demonstrate a minimum of five (5) years experience in the manufacture of air valves. When requested, the manufacturer shall provide test certificates, dimensional drawings, parts list drawings, and operation and maintenance manuals.

2.5.20 The exterior of the valve shall be coated with a universal alkyd primer.

2.5.21 Air/Vacuum Valves shall be CRISPIN Air & Vacuum Release Valve AL Series or A.R.I. D-040 series Combination Air Valve or approved equal.

2.5.22 Air/Vacuum Valves shall include the following accessories: screen, traffic rated enclosure.

2.6 GATE VALVE BOX

2.6.1 Manufacturer: Tyler Pipe or approved equal.

2.6.2 Two piece slip style valve box

2.6.3 ¼-inch nominal diameter

2.6.4 Length: Sufficient for depth of bury indicated on plans

2.6.5 Cover: Locking with pentagon nut and clearly marked as “water”

2.6.6 Acceptable Products: Equal to the following

2.5.6.1 Tyler Pipe 6855 valve box and lid

2.5.6.2 Rich 920 or 925 valve box and lid

2.6.7 Cast iron and of the sliding type, sized for use with the appropriate valve. Box shall extend from the body of the valve to the finished grade.

2.7 FIRE HYDRANT

2.7.1 Conform to AWWA C503 wet-barrel, as specified in drawings.

2.7.1.1 Bury length is to the nearest 6-inches from the bottom of the connecting pipe to the ground line of the hydrant.

2.7.1.2 Use two hose (2½ inch) and one pumper outlet (4 1/2 inch) nozzles with threads conforming to National Fire Protection Association (NFPA) 1963 for National Standard Fire Hose Coupling Screw Threads

2.7.1.3 The size of the hydrant is designated by the nominal diameter of the main valve opening. In no case shall the diameter of the main valve opening be less than 4 inches.

2.7.1.4 Inlet connection is 6 inch flanged or hub connection.

2.7.1.5 The direction of rotation of the operating nut to open the hydrant is left (counterclockwise).

2.7.1.6 Paint the exterior of the hydrant traffic or safety red.

2.7.1.7 The outlet nozzle cap and chain is bronze.

2.7.1.8 Equipped with break off Flange and check valve (Model/LBI 400A)

2.7.2 Furnish two hydrant wrenches per contract or delivery order as applicable.

2.7.3 Furnish two traffic safety flange repair kits including all couplings, flanges, gaskets and connections necessary to replace a broken safety flange.

2.8 FLUSH HYDRANT

2.8.1 Manufacturer: James Jones Company, Model J342, J344HP, or equal.

2.8.2 Conform to AWWA C503, wet-barrel.

2.8.2.1 Hydrant of bronze material.

2.8.2.2 Inlet connection is 2 inch or 4 inch flanged or hub connection.

2.8.2.3 Use one hose (2 1/2 inch) nozzle with threads conforming to National Fire Protection Association (NFPA) 1963 for National Standard Fire Hose Coupling Screw Threads.

2.8.2.4 Bury length is to the nearest 6 inches from the bottom of the connecting pipe to the ground line of the hydrant.

2.8.2.5 The direction of the rotation of the operating nut to open the hydrant is left (counterclockwise).

2.8.2.6 Paint the exterior of the hydrant traffic or safety red.

2.8.2.7 The outlet nozzle cap and chain is bronze.

2.8.3 Furnish two hydrant wrenches per job-site.

2.8.4 Galvanized Pipe Schedule 40 ASTM A120, Scotch Rap 50 per drawing.

2.8.5 Use Teflon compound on all joints.

2.9 BLOW-OFF HYDRANT

2.9.1 Manufacturer:

2.9.1.1 Kupferle foundry Company or equal

2.9.1.2 Substitutions will be permitted

2.9.2 Sizes: 4-8 inches

2.10 WARNING TAPE

2.10.1 Supply detectable warning tape that is a minimum of 6 inches wide for maximum 24" depth, blue or striped blue, and have a printing that warns of a water line below.

2.11 PIPELINE MARKER POSTS

2.11.1 Posts: Equal to Carsonite composite utility marker CUM-375, blue color.

2.12 PRESSURE REDUCING VALVE

2.12.1 Manufacturer:

2.12.1.1 Cla-val.

2.12.1.2 Substitutions: Will be permitted.

2.12.2 Size: 2-12 inch diameter.

2.12.3 Valve Box: Concrete water meter box equal to Christy B-9 or San Diego 37b.

2.13 AIR RELEASE VALVE ASSEMBLIES

2.13.1 Valve Material: Ductile Iron (ASTM A126 Class B)

2.13.2 Valve Type: Float operated, equal to CRISPIN Air & Vacuum Release Valve AL Series.

2.13.3 Valve Box: Concrete water meter box equal to Christy B-9 or San Diego 37b.

2.14 COMBINATION AIR VALVE

2.14.1 Air/Vacuum Valves shall be CRISPIN Air & Vacuum Release Valve AL Series or approved equal. The air/vacuum valve shall include a screen and traffic rated enclosure.

2.15 STEEL PIPE ENCASEMENT

2.15.1 ASTM A53, schedule 40 black steel pipe.

2.16 TRACER WIRE AND BOX

2.16.1 Wire: Provide #10 AWG jacketed solid copper wire, type THHN/THWN.

2.16.2 Box: Provide 4 inch Schedule 40 PVC pipe and a 4-inch PVC threaded watertight plug as a box for terminations or junctions of tracer wire.

2.16.3 Splice Kit: Use underground waterproof splice materials.

2.17 ACCESSORIES

2.17.1 Thrust Blocks: Refer to Section 00190 (Cast-In-Place Concrete).

2.17.2 Marker Post

2.17.1.1 Manufacturers: Carsonite, Greenline

2.17.1.2 Flexible fiberglass, dual-sided.

2.17.1.3 Blue decal label on both sides as specified in drawing.

2.17.3 Protection Post

2.17.3.1 Black iron, 3 inch diameter, 6 feet long, buried 3 feet.

2.17.3.2 Cover each post at the top with 2 coats of yellow reflectorized paint or tape for a band 3 inches wide.

2.17.3.3 Metallic Tracer Tape, magnetic detectable conductor, copper tracer wire, plastic covering, imprinted with "Water Line" in large letters.

PART 3 – EXECUTION

3.1 EXAMINATION

3.1.1 Verify existing water main size and location.

3.2 DELIVERY, STORAGE AND HANDLING

3.2.1 Ensure that pipe is free from defects and damage at time of delivery and prior to installation in the trench.

3.2.2 Remove all defective pipes from the site within 24-hours of discovery.

3.2.3 Handle pipe with padding between metal machinery and pipe.

3.2.4 Keep dirt and foreign matter away from the pipe interiors and sealing surfaces.

3.2.5 Lower pipe carefully into the trench without dropping, rolling or dumping.

3.3 PREPARATION

3.3.1 Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.

3.3.2 Remove scale and dirt on inside and outside before assembly.

3.3.3 Prepare pipe connections to equipment with flanges or unions.

3.4 BEDDING

3.4.1 Excavate pipe trench in accordance with Section 00250 (Excavating, Trenching and Backfilling). Hand trim excavation for accurate placement of pipe to elevations indicated.

3.4.2 Backfill around sides and to top of pipe with bedding material and tamp in place.

3.4.3 Maintain optimum moisture content of bedding material to attain required compaction density.

3.5 INSTALLATION - WATER MAIN

3.5.1 Maintain separation distances of water main from sewer pipe as per American Samoa Environmental Protection Agency specifications.

3.5.2 Route pipe in straight line.

3.5.3 Install pipe to allow for expansion and contraction without stressing pipe or joints.

3.5.4 Install water mains and appurtenances in the locations and of the sizes and materials shown on the drawings and bid schedule.

3.5.5 Ensure that ends of pipe in the trench are plugged during all work interruptions and all other times necessary to prevent soil, rodents and trench water from entering the pipeline or contaminating the joints.

3.5.6 Promptly remove all debris that enters the pipeline and swab the area with a 1% hypochlorite solution.

3.5.7 Install pipe with a minimum cover depth of 36-inches measured from finished grade to top of pipe.

3.5.8 Install thrust restraint on all fittings and appurtenances. Contractor's option of the following unless specifically noted on the plans:

3.5.8.1 Concrete Thrust Blocks:

3.5.8.1.1 Pour thrust blocks against the fitting and undisturbed earth.

3.5.8.1.2 Place concrete thrust blocks so that the pipe and joints will be accessible for repair.

3.5.8.1.3 Install rebar around the fitting and embed rebar in concrete thrust block as shown on detail drawings.

3.5.8.1.4 Use full 20-foot sections of pipe out of fittings or valves, otherwise use restrained joints within 20-feet of fitting or valve.

3.5.8.2 Special Anchoring Retainer Glands:

3.5.8.2.1 Install in accordance with manufacturer's recommendations.

3.5.8.2.2 Project Engineer may specify that an additional; restraint be used for pipe sections near critical fittings.

3.5.8.3 Joint Restraint Rodding ("shackle rods")

3.5.8.3.1 Rod from hydrant tees to ears on the hydrant base elbow.

3.5.8.3.2 Rod from fitting to fitting.

3.5.8.3.3 Install tie bolts to connect tie rods, if required.

3.5.8.3.4 Install duc lugs where required to increase the width of the rodding.

3.5.8.3.5 Paint rods and hardware with two coats of bituminous coating.

3.5.9 Install fully restrained push-on joints where specifically noted on the plans or if the mains are explicitly called out as "fully restrained" in the bid schedule.

3.5.10 Horizontal Pipe Deflection:

3.5.10.1 PVC:

3.5.10.1.1. AWWA C900 Water Main may be deflected in accordance with AWWA C605, for sizes 4-inch through 10-inch.

Normal Size	Minimum Bending Radius	Offset per 20’ Length
4 in.	100 ft.	23 in.
6 in.	144 ft.	16 in.
8 in.	189 ft.	12 in.
10 in.	231 ft.	10 in.

3.5.10.1.2. Deflection will not be permitted at the joint and must be via a continuous arc of constant radius.

3.5.10.2 Ductile Iron

3.5.10.2.1. Ductile iron push-on joints mains may be deflected in accordance with the manufacturer’s recommendations and AWWA C600.

3.5.10.2.2 Deflection will occur at the push-on joint.

Normal Size	Max Deflection	Offset per 20’ Length
3 in. through 12 in.	5˚	21 in.
14 in. and larger	3˚	12 in.

3.5.11 Install access fittings per Section Disinfection of Water Main System.

3.5.12 Form and place concrete for thrust restraints at each elbow or direction change of pipe main.

3.5.13 Install Metallic Tracer Tape buried continuously at 12 inches below finish grade.

3.5.14 Backfill per Section Excavating, Trenching and Backfilling.

3.5.15 Install marker post at all bends, gate valves…etc. as shown on details.

3.5.16 Provide accurate As-built Drawings and Reference Points to accurate locations with a minimum of 2 points for minor and 3 points for major appurtenances.

3.6 VALVE, VALVE BOX AND MARKER INSTALLATION

3.6.1 Install valves at location indicated on the plans.

3.6.2 Support gate valves on a pre-cast block during assembly, and thrust block and rebar or fully restrain the valve.

3.6.3 Set valves on solid bearing.

3.6.4 Install thrust blocking and rebar as shown in the drawings.

3.6.5 Center and plumb valve box over valve. Set box cover as specified in drawings.

3.6.6 Set valve Marker Post Installation:

3.6.1 Flush with finish grade elevation.

3.6.2 Flush with the surfaced street.

3.6.3 2-inches below the level of an unimproved street.

3.6.7 Valve Marker Post Installation:

3.6.7.1 Set post with 18-inches of post above grade with "V" pointing toward gate valve.

3.6.7.2 Paint the marker post "safety blue".

3.6.7.3 Stencil the size of the valve and the distance to the valve on the post with 2-inch tall black lettering.

3.6.7.4 Install every 300 feet or as directed by the Engineer.

3.6.8 Install concrete collar around gate valve lid.

3.7 FIRE HYDRANT INSTALLATION

3.7.1 Set hydrants plumb. Locate pumper nozzle perpendicular to and facing roadway.

3.7.2 Set hydrants to grade with nozzles at least 20 inches above ground.

3.7.3 Connect auxiliary gate valve to tee and hydrant to gate valve using a 3-foot section of 6-inch water main pipe on each unless otherwise indicated on the plans.

3.7.4 Fully restrain joints between tee and auxiliary gate valve, and between auxiliary gate valve and hydrant.

3.7.5 Set hydrant on precast concrete block.

3.7.6 Set hydrant with the traffic flange at an elevation of 3 to 6 inches above finished grade.

3.7.7 Place gravel, a minimum of 18 cubic feet per hydrant, from 18 inches below to 6 inches above the weep hole opening.

3.7.8 Paint hydrants in accordance with local code, or as specified by the engineer.

3.8 FLUSH HYDRANT INSTALLATION

3.8.1 Set hydrants on solid bearing.

3.8.2 Install hydrants plumb with the pumper nozzle as indicated in the plans. Where grade is established, set the hydrant to an elevation with the nozzles approximately 3 feet above the ground or sidewalk level. Where grades are not established, set the hydrant to the elevation established by the Project Engineer.

3.8.3 Provide each hydrant with protection posts as specified in drawings.

3.9 WARNING TAPE INSTALATION

3.9.1 Install warning tape (6" wide) in water main trench 2 feet max below finish grade, centered over the pipeline.

3.10 PIPELINE MARKER POST INSTALLATION

3.10.1 If the pipeline is not in a roadway or sidewalk and is in an unimproved area, install Carsonite marker posts at 500-foot intervals along the pipeline, centered over the pipe.

3.10.2 If the pipeline is under a traveled roadway, install the marker posts offset from the pipe at a consistent distance.

3.10.3 Allow 36-inches of the post to be exposed above grade.

3.10.4 Stencil the water main information, including offset distance, diameter of pipe, and pipe material neatly on the post.

3.11 PRESSURE AND LEAKAGE TESTING

3.11.1 Whenever practical, before backfill is placed or joint covered, test pipe for leaks.

3.11.2 Furnish necessary material, equipment, labor for testing including, but not limited to: water, pump, water storage vessel, piping, two water pressure gauges, valve hydrant, graduated container and corporation stops.

3.11.2.1 Water pressure gauges shall be liquid filled with 5 psi or less increments.

3.11.2.2 Pump shall be of a design that limits introduction of air. Defective equipment shall be replaced.

3.11.3 Test mains and have equipment fully prepared prior to calling the Project Engineer or his representative on site to witness the passing of a test. Notify Project Engineer 48 hours prior to pressure testing of any section.

3.11.4 Test Duration: 2 hours minimum

3.11.5 Maximum length of test section: 1,000-feet. Longer length may be tested, but the allowable leakage shall be limited to the 1,000-foot length.

3.11.6 Maximum allowable pressure differential: A pressure differential no greater than 25 psi above the test pressure will be allowed due to elevation changes unless approved by the Engineer.

3.11.7 Testing Procedure:

3.11.7.1 Fill test section with potable water at a velocity below 1ft/s.

3.11.7.2 Expel all air from the test section.

3.11.7.3 Install corporation stops at high points if necessary to facilitate removal, and cap off after successful completion of the test

3.11.7.4 Verify that all fire hydrant lead valves and main valves within the test section are open.

3.11.7.5 Pressurized the main to 150 psi or to the pressure class or rating of the pipe as measured at the lowest elevation along the test section, whichever is less.

3.11.7.6 If pressure drops more than 5 psi during the test, immediately re-pressurize the line to the original test pressure and continue test, and record amount of water required to re-pressurize the line. Two water pressure gauges are required to verify pressurization.

3.11.7.7 At the end of the test, re-pressurize the line to the original test pressure, and record amount of water required to re-pressurize the line.

3.11.7.8 Method of Water Measurement: Supply a means of accurate water measurement that is compatible with the pressurizing equipment (e.g. pump and hoses), such as a water meter or a water container with graduations.

3.11.7.9 Add total amount of water required to re-pressurize the line during and at the end of the test and compare with the allowable leakage as calculated below.

3.11.8 Allowable Leakage Determination

3.11.8.1 L= (N*D*P½)/7400

3.11.8.2 Allowable Leakage (gph)

3.11.8.3 N = Total Length Tested Divided by the Standard Pipe Length

3.11.8.4 D = Nominal Diameter of Pipe (inches)

3.11.8.5 P = Test Pressure (psi)

Example Allowable Leakage Chart Using Formula Above

PVC and DI Pipe with 20-foot sections

Allowable Leakage/ 1000 feet (gph)				
Pipe Diameter, D	P = 100 psi	P = 150 psi	P = 200 psi	P = 250 psi
4 inch	0.27	0.33	0.38	0.43
6 inch	0.41	0.50	0.57	0.64
8 inch	0.54	0.66	0.76	0.85
10 inch	0.68	0.83	0.96	1.07
12 inch	0.81	0.99	1.15	1.28

3.11.9 Repair, at no cost to owner, any section of the line that fails this test.

3.11.20 Repair any visible leakage, regardless of the result of the leakage test.

3.11.21 Retest all repaired sections of line, at no cost to the owner, until pressure test is successfully completed.

3.11.22 Complete pressure test certification forms and submit to Project Engineer within five (5) days of pressure test.

3.12 FLUSHING WATER MAINS

3.12.1 Flush with potable water to provide 3 volumetric exchanges in the pipeline at a minimum velocity of 3 feet per second.

3.12.2 "Pig" line after flushing if sediment or debris is still visible in the discharge.

3.13 DISINFECTION OF WATER MAINS

3.13.1 Disinfect in accordance with one of the methods outlined in Section 5 of AWWA C651

3.13.1.1 Continuous Feed Method:

3.13.1.1.1. Feed a chlorine solution into water entering the main such that the water will have a 25-mg/L free chlorine concentration.

3.13.1.1.2. Continue feeding until the entire pipeline to be disinfected is filled with the chlorinated water.

3.13.1.1..3 At the end of 24-hours, there must be at least 10-mg/L free chlorine residual as evidenced by residual tests taken at approximately 1200 feet intervals along the main.

3.13.1.2 Slug Method:

3.12.1.2.1. Feed a chlorine solution into water entering the main such that the water will have a 100-mg/L free chlorine concentration.

3.12.1.2.2. Apply the solution continuously and sufficiently to ensure that a column of water with 100mg/L free chlorine residual is formed in the pipe.

3.12.1.2.3 Ensure that all parts of the main and its appurtenances are exposed to the column for at least 3-hours.

3.12.1.2.4 Check the residual of the column at 1200 feet intervals along the main. If it drops below 50mg/L, inject additional chlorine solution into the entire column such that its residual is raised to 100 mg/L.

3.13.2 For test methods 2 and 3 in Article 3.12 Paragraph A, ensure that the chlorine solution is introduced within 10-feet of the end of the section being disinfected and for all cases is being withdrawn or wasted from the most extreme point relative to the point of water introduction. If branches exist, ensure that the chlorinated solution reaches all portions of the branches.

3.13.3 After disinfection, flush chlorinated water from the pipe in an environmentally safe manner. In no case shall direct disposal to a surface water be permitted.

3.13.3.1 Check the chlorine residual at time of disposal.

3.13.3.2 If disposal is to the ground surface or ditch, neutralize the chlorine residual if the free residual is above 1 mg/L.

3.13.3.3 Use the following neutralization chemical schedule:

3.13.3.3.1 Sulfur dioxide at 0.8 lb/100,000 gals/mg/L of free chlorine

3.13.3.3.2 Sodium Bisulfite at 1.2 lb/100,000 gals/mg/L of free chlorine

3.13.3.3.3 Sodium Sulfite at 1.4 lb/100,000 gals/mg/L of free chlorine

3.13.3.3.4 Sodium Thiosulfate at 1.2 lb/100,000 gals/mg/L of free chlorine

3.13.3.4 Continue flushing until the residual reaches distribution system levels.

3.13.4 After disinfecting and flushing but before the water main is placed in service, collect and test water samples for bacteriological quality.

3.13.4.1 Sample in accordance with the Standard Methods for Examination of Water and Wastewater.

3.13.4.2 Take two consecutive batches of tests, 24 hours apart.

3.13.4.3 Collect samples from each pipe end and at approximately 1200 feet intervals along each main.

3.13.4.4 Deliver samples to AS-EPA's testing lab and provide Project Engineer with results within 24 hours of laboratory results.

3.13.5 Regardless of the chosen testing method, if initial disinfection fails to produce satisfactory bacteriological results, re-chlorinate the mains and branch lines, flush and take new samples until satisfactory results are obtained.

3.13.5.1 Do not place main in service until the Project Engineer has received safe bacteriological results.

3.14 TRACING WIRE INSTALLATION

3.14.1 Install with all PVC, Ductile Iron, and HDPE Pipe.

3.14.2 Provide a minimum of three attachments to the pipe per pipe length with duct tape or install in the initial backfill layer 6-inches above and along the pipe centerline.

3.14.3 Avoid underground splices, but where necessary, make splices with an underground, waterproof splice kit.

3.14.4 Provide riser boxes at maximum intervals of 1000 feet or at fire hydrant locations.

3.14.4.1 Install an independent tracing wire line between each tracing wire box in each direction of pipe.

3.14.4.2 Bring tracing wire a minimum of 18 inches above ground surface directly behind each hydrant using box construction specified.

3.14.4.3 Install box to elevation that will not interfere with operation and maintenance of the hydrant.

3.15 CONNECTION TO EXISTING WATER MAINS

3.15.1 Make the necessary arrangements with ASPA a minimum of three (3) working days prior to any connections to any water mains.

3.15.2 Do not start work until all the materials, equipment, and labor have been assembled on the site. When work is started on a connection, proceed continuously without interruption, and as rapidly as possible until completed.

3.15.3 If the connection to the existing system involves turning off the water, notify affected customers 24 hours in advance. No shutoff of mains will be permitted overnight, over weekends, or on Federal and holidays. Water shut-off is limited to 4 hours maximum.

3.15.4 Make connections to existing water mains in a neat, workmanlike manner to suit actual conditions encountered at the existing main. Adhere to manufacturer's recommendation to avoid damage to pipe coating when wet or dry tapping. Leave a smooth end at right angles to the axis of the pipe.

3.15.5 Prevent the existing main from being contaminated when making the connection. Take all action necessary to prevent trench water, mud or other contaminants from entering the connection line or main at any time.

3.15.6 Spray or swab all connection components with a 1% hypochlorite solution prior to installation.

3.15.7 Visually inspect any joint not pressure tested for leakage.

3.15.7.1 Test under system pressure prior to backfilling.

3.15.7.2 Test in the presence of the ASPA representative.

3.15.7.3 Repair and retest any joint with leakage until no leakage is visible at no cost to the owner.

END OF SECTION

SECTION 00280

VALVES, FITTINGS AND APPURTENANCES

PART 1 - GENERAL

1.1 SCOPE OF WORK

1.1.1 Work required under this section consists of furnishing and installing valves, gates and appurtenances of the following types:

1.1.1.1 Gate valves
1.1.1.2 Check valves
1.1.1.3 Altitude valves
1.1.1.4 Pressure reducing valves
1.1.1.5 Air release and vacuum valves
1.1.1.6 Hose valves
1.1.1.7 Service saddles
1.1.1.8 Corporation stops
1.1.1.9 Curb stops
1.1.1.10 Valve boxes
1.1.1.11 Pressure gauges
1.1.1.12 Water meters
1.1.1.13 Fire hydrants
1.1.1.14 Pipe Hangers and Saddles

1.2 SUBMITTAL REQUIREMENTS

1.2.1 The Contractor shall submit shop drawings, manufacturer's literature, samples, certificates and guarantees.

1.3 OPERATING AND MAINTENANCE INSTRUCTIONS

1.3.1 The Contractor shall furnish operating and maintenance instructions and parts lists.

PART 2- MATERIALS

2.1 GENERAL

2.1.1 All valves smaller than 2" in diameter shall be provided with screwed ends. All valves 2" and larger in diameter shall have flanged or bell ends unless otherwise indicated on the Drawings or in these Specifications. Flanges shall be dimensioned, faced and drilled in accordance with ANSI B16.1 for class 125 unless stated otherwise on the Drawings or the Specifications. All necessary caulking materials, gaskets, bolts, and nuts shall be provided.

2.1.2 Valves shall be carefully installed in their respective positions, accessible for operation and repair, and free from all distortion and strain, with joints made as specified, and shall be left in satisfactory operating condition. The valves or gates shall be connected to floor stands where required. All stem guides shall be accurately aligned.

2.1.3 All valves, fittings, hydraulic and electric operators, and all other materials shall be protected from damage and corrosion before installation and until completion of work. After installation, all valves except bronze valves and those underground shall be painted in accordance with the painting requirements and color code for the pipelines of which they are a part. Bright or rubbing surfaces shall not, however, be painted, but shall be protected with an approved lubricant.

2.1.4 Valves and gates shall be supplied with suitable operating keys, levers, extension rods, floor boxes, hand wheels or chain operators as indicated on the Drawings or in these Specifications.

2.2 GATE VALVES

2.2.1 All double disc gate valves shall have their stems in a vertical position or be designed for proper operation in the positions shown on the Drawings and shall have the same clear internal diameter as the pipe on which they are placed.

2.2.2 All gate valves 2-1/2 inches in diameter and smaller shall be all brass or bronze, except the hand-wheel, which shall be of die cast aluminum. Valves shall be of the double disc type with rising stems and shall be rated for 200 psi non-shock cold water. Valves shall be Kennedy 251, Stockham Figure B106, or approved equal. Gate valves 3 inches in diameter or larger shall be iron-body, resilient seated, non-rising stem type and shall conform to AWWA C509. Valves shall have mechanical joint ends and gaskets conforming to AWWA C111 or flanged joint ends. Buried valves shall have a 2-inch operating unit and OPEN LEFT. An operating hand-wheel shall be provided with each flanged gate valve installed above ground. A permanently attached extension rod with operating nut shall be installed on all valves deeper than 4 feet below finished grade to ring the nut to within 1 foot of the surface. Valves shall be Dresser, Mueller, Clow or equivalent. All cast iron body gate valves shall be asphalt coated to prevent corrosion. All ductile iron body gate valves shall be fully epoxy coated both on the interior as well as the exterior for maximum corrosion protection.

2.3 CHECK VALVES

2.3.1 Check valves shall be wafer style, spring loaded, and center stem guided type for bolting between adjacent flat face flanges. Bodies shall be semi-steel, plugs and seats shall be bronze, and springs shall be stainless steel. Flow area through the body shall be equal or more than the cross-section of the equivalent pipe size. Check valves shall be APCO Series 3000 or equal.

2.4 ALTITUDE VALVES

2.4.1 Altitude valves shall be of the hydraulically operated, pilot controlled, single seated, diaphragm type, globe valves (with resilient disc) and shall control the high water level in tanks and reservoirs without the need for floats or other devices. It shall be a non-throttling type valve and remain fully open until the “shut-off” point in the tank or reservoir is reached. The valve shall be designed as a two-way or one-way as shown in the drawings.

2.4.2 General Valve Description. The main valve shall be a single diaphragm actuated, globe pattern. The valve shall consist of three major components: the body, with seat installed; the cover with bearings installed and the diaphragm assembly. The valve shall contain a resilient, synthetic rubber disc, having a rectangular cross-section contained on three and one-half sides by a disc retainer and forming a tight seal against a single removable seat insert. No O-ring type discs, circular, square or quad type shall be permitted as the seating surface. The disc guide shall be of the contoured

type to permit smooth transition of flow and shall hold the disc firmly in place. The disc retainer shall be of a sturdy one-piece design capable of withstanding opening and closing shocks. It must have a straight edge sides and a radius at the top edge to prevent excessive diaphragm wear as the diaphragm flexes across this surface.

The diaphragm assemble containing a non-magnetic 303 stainless steel stem shall be fully guided at both ends by a bearing in the valve cover and an integral bearing in the valve seat. The seat shall be solid, one-piece design and shall have a minimum of a five–degree taper on the seating surface for a positive, drip-tight shut off. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from the line pressure.

2.4.3 Pilot Valve Description. The altitude valve pilot control shall be of a diaphragm-actuated, three-way type that operates on the differential force between the height of the water in the tank or reservoir and an adjustable spring-load. The spring-load shall be an arrangement of smaller springs on a plate within the control. At least five different adjustment ranges shall be available with this configuration. When actuated the pilot control shall vent the cover of the main valve to atmosphere through the internal working of the pilot control to open the valve wide. When the desired level in the tank or reservoir is reached, the static height of the tank shall head through a sensing line connected directly to the tank or reservoir. When the control shifts at high water level supply pressure shall be directed into the valve cover through the internal workings of the pilot control to close the valve. The pilot control senses the tank or reservoir head by means of a sensing line connected between the pilot control and the tank or reservoir. A full range of spring settings shall be available in ranges of up to 200 feet.

2.4.4 Type of End Connections. All altitude valves shall have 250# flanged ends in accordance with ANSI B16.1 Standard.

2.4.5 Material. Cast iron used to manufacture the valve body and cover shall meet or exceed the requirements of ASTM A-536 and ANSI B16.42. The bronze used in the manufacture of the valve seat shall meet or exceed the requirements of ASTM B62 and ANSI B16.24. The stainless steel used to manufacture the valve steam shall be type 304 meeting or exceeding the requirements of ANSI B16.5. The disc shall be made of Buna-N™ rubber. Exterior and interior coating shall be FDA approved epoxy applied in accordance with AWWA C550-90.

2.4.6 Manufacturer. The valve shall be manufactured by Cla-Val Co. or approved equal.

2.5 PRESSURE REDUCING VALVES

2.5.1 Pressure reducing valves shall be hydraulically operated, pilot-controlled, diaphragm type. Valves shall be modulating, hydrostatic pressure pilot controlled, and globe pattern as indicated on the Drawings. Pressure reducers shall be Clayton 90G-01AB, Class 250 or equal.

2.6 AIR RELIEF VALVES

2.6.1 Air relief valves for water distribution service shall be ball-and-cup type and shall be of the size and pressure rating indicated on the Drawings. Air relief valves shall be capable of positive action in releasing air entrained in water under pressure. The valve body and cover shall be plastic. Non-plastic alternatives need to be ductile iron, trim shall be bronze and float shall be stainless steel. Ductile iron parts shall be coated to retard corrosion.

2.6.2 Plastic Air relief valves for water service shall be A.R.I. D-040 or D-041 depending on pressure requirements. Non-plastic Air relief valves shall be Crispin by Multiplex Mfg. Co. or equivalent. Air valves for vertical turbine pumps shall include a double-acting throttling device to restrict the rate of outflow and to allow full capacity inflow on pump stoppage. The rate of outflow shall be field adjustable. Air valves for vertical turbine pumps shall be Crispin by Multiplex Mfg. Co. or equal.

2.6.3 Air relief valves shall include the following accessories: screen, traffic rated enclosure.

2.7 HOSE VALVES

2.7.1 Hose valves 3/4-inch in size shall be rough brass or bronze with composition disc and hand-wheel. Valves shall be Crane No. 58, Kennedy or other equivalent.

2.7.2 Hose valves one (1) inch in size and larger shall be wedge disc, 200 psi cold water class with full diameter seat openings. Valves shall be Crane No. 451, Lunkenheimer or other equivalent. Free-standing yard type hose valves shall be 1-inch size, 40-inch high non-freeze post hydrants; J.R. Smith No. 5913, Murdock M-100, Zurn or other equivalent.

2.8 SERVICE SADDLES

2.8.1 On pipe with nominal pipe size 6-inches and smaller, service saddles shall be ductile iron, double strap construction. Saddles shall be Rockwell Type 311, Mueller or other equivalent for Mueller thread.

2.8.2 On pipe with nominal pipe size 8-inches and larger, service saddles shall be ductile iron, double strap construction. Saddles shall be Rockwell Type 313, Mueller, Dresser or other equivalent.

2.9 CORPORATION STOPS

2.9.1 Corporation stops shall be compatible with the type and class of service piping and service saddle used for the connection. For plastic service piping, a stainless steel insert shall be provided with each corporation stop. Corporation stops shall be Mueller, Hayes, Crane or equivalent product with "Mueller Threads".

2.10 CURB STOPS

2.10.1 Curb stops and meter stops shall be compatible with the type and class of service piping used. Curb stops shall be Mueller H-10201 or H-15207, Hayes or other equivalent.

2.11 VALVE BOXES

2.11.1 Valve boxes shall be furnished and installed on all buried valves in the locations shown on the Drawings. Valve boxes shall be concrete traffic-type boxes with cast iron lid on ring seat. The cover shall be marked "WATER". Concrete extension pieces shall be provided with each box as required. Cast iron or PVC pipe extensions may be used for deep bury conditions for valve boxes. Gate Valve boxes shall be 12 inches long. Diameter shall be 10-3/8" minimum with 9" throat diameter. Valve boxes shall be Christ, Model GS, Brook Model 3RT, or equivalent.

2.12 PRESSURE GAUGES

2.12.1 All pressure gauges shall be 3-1/2" minimum dial with black enamel finish with chrome-plated ring. Accuracy shall be 1/2 of 1 percent of scale range. Range shall be 0-100 psi. The movement shall be constructed of stainless steel and Monel, rustproof and corrosion resistant and equipped with recalibration mechanism. Mounting shall be as indicated on the Drawings. Gauges shall be furnished with suitable mounting brackets when flush or wall mounted. All gauge mounting locations shall have 1/4", female connection, tee handle shut-off cocks installed between gauge and gauge tap. Gauges shall be Marsh Type 10-ounce "Mastergauge," Marshalltown Figure 23, Ashcroft Duraguage 1279, or equal.

2.13 WATER METERS

2.13.1 Water meters for measuring pump flow shall be of the size shown on the Drawings. They shall be bronze bodied with thermoplastic straightening vanes, flow tube, and rotor, with graphite radial bearing, stainless steel trim, sealed register, tungsten carbide thrust bearings, and have a ceramic magnet drive. Registration shall be in 1,000s gallons. Sweep hand shall revolve once per 1,000 gallons. Meters shall be Sensus T2/C2 or approved equal and conform to AWWA C701.

2.13.2 PROPELLER TYPE FLOW METER

The flow meters shall be propeller turbine type furnished with fabricated carbon steel body, injection molded thermoplastic propeller and 12 to 15 mil NSF approved fusion bonded epoxy faced and drilled Class 150 ANSI or JIS flanged ends and shall be designed for 150 psi working pressure. Flow meter size shall be of the same size as indicated in the drawings. The meter body shall have the same nominal inside diameter throughout its length and shall be furnished with non-toxic liners. The meter accuracy shall register within plus or minus 2% of actual flow at normal flows and plus or minus 2% of low flow and shall have 6 digits totalizer.

2.13.3 Water meters for residential use shall be Sensus iPerl or approved equal.

2.14 FIRE HYDRANTS

2.14.1 Wet Barrel Hydrants: Hydrants shall be wet barrel, Clow "Ranger" Model 960 or equal and comply with AWWA C503. Hydrants shall have two 2-1/2 inch hose connections and one 4-1/2 inch pumper connection. The end of the 6-inch bury elbow either mechanical joint or flanged as shown on the Drawings. Bury section lengths shall be as shown on the Drawings.

2.14.2 Exterior parts of the hydrant shall be covered with two coats of red paint matching existing hydrants. All hydrant parts shall be distinctly marked with its name, part number, length, size, and marker's name. The markings shall be on cloth tags securely fastened to the parts with wire or shall be painted on the parts by such other means as will ensure positive identification of the parts on delivery.

2.14.3 Hydrant Guard Post: Four-inch diameter steel pipe shall be used to fabricate hydrant guards. Refer to Standard Drawings for construction details. Hydrant guards shall be painted with one coat of suitable primer and two (2) coats of optic red enamel paint. Place the hydrant guard posts so the hydrant is located in the center of the guard.

2.14.4 Remove Existing Hydrants: Hydrants that are to be taken out of service as a result of new construction shall be pressure washed inside and out and delivered to the ASPA storage yard.

2.15 PIPE HANGERS AND SADDLES

2.15.1 Pipe hangers shall be designed to be compatible with the pipe material it supports. Appropriate materials and protective coatings shall be used to prevent failure environmental and galvanized corrosion. Hangers shall be Grinnell Figure 590 or equal, and they shall be suspended by 3/8-inch threaded rod from ceiling flanges, Grinnell Fig. 128 R or equal.

2.15.2 Pipe saddle supports shall be designed to be compatible with the pipe material it supports. They shall be adjustable with saddle, locknut nipple, and reducer to fit 3-inch pipe stanchion and allow vertical adjustment of approximately 4-1/2 inches. The stanchion shall be fitted with a companion flange for bolting to concrete piers. Pipe saddle supports shall be Grinnell Figure 264 or equal.

2.16 METER BOXES

2.16.1 Meter boxes shall be constructed of Cast Iron to meet ASTM A48, class 25. Boxes shall be as manufactured by Ford Meter Box Company, or approved equal. Cover shall be non-hinged type capable of locking.

2.16.2 All fittings for installation of the meter shall be provided and installed at the box. Meters shall be provided and installed by the owner. Specific meters to be provided shall be selected following start of construction, but before meter boxes are to be installed.

PART 3 – PERFORMANCE

3.1 INSTALLATION OF VALVES, GATES, AND METERS

3.1.1 Valves, gates, and meters shall be carefully installed in their respective positions, free from all distortion and strain, with joints made as specified, and shall be left in satisfactory operating condition. Valves and gates shall be connected to floor stands where required. All stem guides shall be accurately aligned. Before installation, all valves and appurtenances shall be thoroughly cleaned of all foreign material, and shall be inspected for proper operation, both opening and closing and to verify that the valves seat properly. Valves shall be installed so that the stems are vertical, unless otherwise approved by the Engineer. All valves shall be tested in place so far as practicable under the conditions specified and any defects revealed in valves or connections tested shall be corrected. Valves, gates, and meters shall be protected both before and after erection, from rust or other damage. After installation, all items except bronze valves and those underground shall be painted in accordance with the painting requirements and color code of the pipe lines of which they are a part. Bright or rubbing surfaces shall not be painted, but shall be protected with a suitable lubricant.

3.2 INSTALLATION OF VALVE BOXES

3.2.1 Valve boxes shall be centered and set plumb over the wrench nuts of the valves and shall not transmit shock or stress to the valves. Valve box

covers shall be set flush with the surface of the finished pavement or such other level as may be approved by the Engineer. For valves not located in pavement, a steel marker post 3'-0" above grade and painted yellow shall be furnished and installed at the property line opposite the valve. Backfill shall be placed around the valve boxes and thoroughly compacted to a density equal to that of the undisturbed ground and in such a manner that will not damage or displace the valve box from proper alignment or grade. Misaligned valve boxes shall be excavated, plumbed, and backfilled at the Contractor's expense.

3.3 INSTALLATION OF TAPPING SLEEVES AND SERVICE SADDLES

3.3.1 Service saddles shall be installed in accordance with the manufacturer's recommendations and shall be of the proper type for the pipe material.

3.4 INSTALLATION OF PRESSURE GAUGES

3.4.1 Pressure gauges shall be installed in the vertical position unless otherwise indicated on the Drawings. Gauges shall be installed with suitable mounting brackets when flush or wall mounted. All gauge mounting locations shall have 1/4", female connection, tee handle shut-off cocks installed between gauge and gauge tap. All installed gauges shall be tested for proper operation and protected from corrosion and damage prior to and after installation until placed in operation.

3.5 INSTALLATION OF FIRE HYDRANTS

3.5.1 Hydrants and Appurtenances: Hydrants shall be installed at the locations shown on drawings and in accordance with the drawing details. Hydrants shall be installed with the barrel vertical. After the hydrant has been checked for alignment and grade, the barrel shall be wedged tightly against the side of the trench to prevent any lateral movement. The wedges may be removed after the concrete anchor block, poured at the bottom elbow, has set. The concrete anchor block shall be poured to at least 12 inches above the invert of the bottom elbow and shall not be disturbed for a minimum of three days or as directed by the Engineer.

3.5.2 Prior to final inspection, fire hydrants and parts above the finish ground surface shall be cleaned of all oil, grease, dirt, or other foreign material and given one coat of red lead and two coats of finish paint as specified in Section 10. Only standard tools shall be used in operating fire hydrants.

3.5.3 Hydrant Guard Posts: Hydrants guard posts shall be fabricated from steel pipe and the assembly shall be welded in a neat and workmanlike manner and shall be cleaned, primed and painted. Drawings of the hydrant guard posts are provided in the drawings.

END OF SECTION

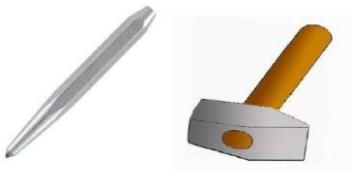
SECTION 00285

DRILLING/CUTTING SMALL AND LARGE OPENINGS OF GLASS LINED STEEL PANELS OF BOLTED STEEL TANK **

PART 1 - GENERAL

1.1 SMALL OPENINGS (e.g. for bolt holes):

1.1.1 Engraving cautiously the center-points of the holes by using e.g. a center punch;

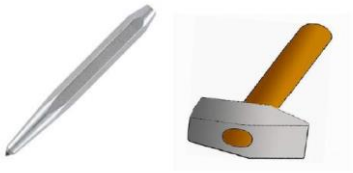


1.1.2 Using a metal drill in the diameter size you need to drill a hole in the panel.

1.2 LARGE OPENINGS:

1.2.1 Mark with a touch-up stick your cutting line;

1.2.2 Engraving cautious a point along the cutting line by using e.g. a center punch;



1.2.3 Using a metal drill in the diameter size you need to drill a hole in the panel.

1.2.4 Using a Jigsaw with a saw-blade for steel and cut the opening along the cutting line.

Note:

****** - provided by United Industries Group, Inc. (UIG)

SECTION 00290

HYDROSTATIC AND LEAKAGE TESTING

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Test all piping, valves, and appurtenances installed under this Contract. Testing shall be performed concurrent with installation. Do not install more than 1,000 feet of pipe without being tested, unless approved by ASPA.

1.02 SUBMITTALS

A. Prepare and submit schedules and procedures to ASPA for testing of all parts of the water main installed in accordance with The Bid Documents and Specifications of the Project. Submit the schedule at least seven days prior to any testing.

PART 2 – PRODUCT

2.01 MATERIALS

A. Furnish the pump, pipe connections, and all necessary apparatus for the pressure and leakage tests including gauges and metering devices. ASPA reserves the option to furnish the gauges and metering devices for the tests. Excavate, backfill, and furnish all necessary assistance for conducting the tests.

PART 3 – EXECUTION

3.01 GENERAL

A. Leakage Tests must be in accordance with ASTM C969 and C1244. Leakage test are required for all gravity lines. Perform hydrostatic pressure tests in accordance with AWWA C600, Section 5.2 - Hydrostatic Testing after the pipe or section of pipe has been laid, thrust blocking cured (min. 5 days), and the trench is completely or partially backfilled. Where practical, testing shall be performed fully isolated from the active distribution system.

B. Contractor may, at his option, completely backfill the trench or partially backfill the trench over the center portion of each pipe section to be tested. However, ASPA may direct the Contractor to completely backfill the trench if local traffic or safety conditions require.

C. For system operating pressures of 200 psi or less, perform the hydrostatic test at a pressure of no less than 100 psi above the normal operating pressure without exceeding the rating of the pipe and appurtenances. For system operating pressures in excess of 200 psi, perform the hydrostatic test at a pressure that is

1.5 times the normal operating pressure, but no more than the design rating of the pipe and appurtenances.

D. Valves shall not be operated in either direction at a differential pressure exceeding the rated valve working pressure. A test pressure greater than the rated valve working pressure can result in trapped test pressure between the gates of a double-disc gate valve. For tests exceeding the rated valve working pressure, the test setup should include a provision, independent of the valve, to reduce the line pressure to the rated valve working pressure on completion of the test. The valve can then be opened enough to equalize the trapped pressure with the line pressure, or the valve can be fully opened if desired.

E. The test pressure shall not exceed the rated working pressure or differential pressure of the valves when the pressure boundary of the test section includes closed, resilient-seated gate valves or butterfly valves.

F. Contractor shall attach a tapping sleeve and valve assembly to the main, and pressure test the assembly prior to making the tap. The required test pressure shall be determined in the same manner as for pipe. The test is acceptable if there is no pressure drop in 15 minutes at test pressure.

3.02 FILLING & TESTING

A. Slowly fill each segregated section of pipeline with water ensuring that all air is expelled. Extreme care must be taken to ensure that all air is expelled during the filling of pipe. The line shall stand full of water for at least twenty-four hours prior to testing to allow all air to escape. If necessary, tap the main at points of highest elevation to expel air as the pipe is filled. Remove the corporation stops and plug the taps after successfully filling the pipeline and expelling all air as approved by ASPA.

B. Apply the specified test pressure, measured at the point of lowest elevation, using a suitable pump connected to the pipe in a manner satisfactory to the ASPA Project Manager. If the elevation of the high point of the pipeline being tested is such that the pressure during testing will be below 85% of the required test pressure, ASPA will require a separate test to be performed on this section of pipeline. In lieu of a separate test, the test pressure measured at the lowest elevation may be increased, within the pressure rating of the pipeline material, such that the resulting pressure at the highest point exceeds 85% of the required test pressure. The test will be conducted for at least two (2) hours at the required test pressure ± 5 psi.

C. Conduct a leakage test concurrently with the pressure test. Leakage is defined as the volume of water that must be supplied into the newly laid pipeline to maintain pressure within ± 5 psi of the test pressure after it is filled and purged of air. Measure the volume of water using a calibrated container or meter.

D. No pipeline installation will be accepted by ASPA if the leakage is greater than that shown in the following table or the design pipe leakage allowance:

Allowable Leakage/ 1000 feet (gph)				
Pipe Diameter, D	P = 100 psi	P = 150 psi	P = 200 psi	P = 250 psi
4 inch	0.27	0.33	0.38	0.43
6 inch	0.41	0.50	0.57	0.64
8 inch	0.54	0.66	0.76	0.85
10 inch	0.68	0.83	0.96	1.07
12 inch	0.81	0.99	1.15	1.28

The table has been generated from the formula:

$$L = \frac{S * D\sqrt{P}}{148{,}000}$$

Where:

L is the allowable leakage in gallons per hour,
S is the length of pipe in feet,
D is the nominal pipe diameter in inches, and
P is the average test pressure in psig.

E. Should any test disclose damaged or defective materials or leakage greater than that permitted, the Contractor shall, at the Contractor's expense, locate and repair and/or replace the damaged or defective materials. Materials used for repair must be approved by ASPA and meet the relevant specifications. Repeat the tests until the leakage is within the permitted allowance and is satisfactory to ASPA.

END OF SECTION

SECTION 00300

AS-BUILTS

PART 1 - GENERAL

1.1 Work required under this section consists of surveying and preparing as-built drawings in AutoCAD to be approved by ASPA.

1.2 Prior to completion of the final inspection, the Contractor shall provide to ASPA an electronic file and certified copies of as-built surveys with all required revisions included as the final as-built survey.

1.3 All changes requested by ASPA must be made to the electronic file, as well as the printed, signed and sealed copies. Neglecting to provide the required information will delay the final inspection.

1.4. All measurements are to be made by the Surveyor or Engineer who will be certifying the project as constructed.

1.5 The Contractor is responsible for coordinating with the Surveyor or Engineer during construction and shall provide access to all utilities prior to being buried; allowing accurate horizontal and vertical measurements to be acquired by the Surveyor or Engineer. In the event of any discrepancies identified by ASPA and at no cost to ASPA, the Contractor shall verify the location and measurements of any buried utilities.

1.6 Any and all utility information must be collected, regardless of "typical" alignments (including existing obstructing, conflicting, or crossing utility infrastructure). Refer to the information provided in the contract documents (construction plans, specifications, etc.).

1.7 The Surveyor or Engineer must provide ASPA with a certificate of its professional liability coverage.

PART 2 - CONFIGURATION STANDARDS

2.1 All electronic as-built utility information in the as-built survey must reference the State Plane Coordinate System 1962, D_1983_HARN_UTM_Zone_2SNAD (horizontal) and NAVD88 or ASVD02 (vertical); the units must be in feet, and be properly projected into its correct spatial location prior to submitting to ASPA. ASPA will not re-project or manipulate as-built surveys in an attempt to correct improperly spatially referenced as-built surveys. It's the certifying Surveyor or Engineer's responsibility to ensure all submitted information adheres to the specifications.

2.2 All new and existing utilities (water, sewer, reclaimed, electrical, communications, etc…) and drainage located within project site impacted by construction shall be located relative to property lines and/or right-of-way lines, using the specifications identified in this document.

2.3 Blocks inserted into a drawing shall be on the correct layer, identifying those features (including service type).

2.4 All text (DTEXT and MTEXT) must be masked; CUT/BROKEN LINES BEHIND TEXT WILL NOT BE ACCEPTED. Detail(s) also must be masked. The dimensions will be created with masked text using a standard dimension style(s)

2.5 All dimensioning, text and multileader lines must be drawn using ASPA's provided template (each template has been preconfigured).

2.5.1 Set the 'Dimension Association' to 2 (exploded dimensions will not be accepted).

2.5.2 Use Arial font in template and name them as follows: ASPA Annotative Text, ASPA Standard Dimension and ASPA Annotative Leader.

2.6 All corresponding line types must be used.

2.7 Text identifying information about features shall be properly aligned. Text shall be visible on the drawing using the template font style provided and with the base set to the upper left-hand corner of the text which is clear of the linear or block features. For legibility, it may require that the label be moved and accompanied by a leader arrow. The labels shall be placed onto a separate layer and not to be placed on the feature layer itself. Labels must be properly rotated for easy legibility (horizontal alignment).

2.8 Features shall be placed on their appropriate layers and assigned colors by layer for consistency. Features shown in the AutoCAD files shall be in model space and be contained in the AutoCAD files as opposed to being linked through externally referenced files (binded layers MUST reflect the correct layers).

2.9 The AutoCAD file shall be reviewed for duplicate objects.

2.10 Polylines shall be continuous from structure to structure. End points of polylines must be snapped to the end points of connecting polylines, with a structure node being snapped to the end point.

2.11 The following list of section should be referenced when creating AutoCAD as-built surveys.

2.11.1 Clean all unnecessary layers and blocks before submitting final as- built plans to ASPA

2.11.2 Use only ASPA approved layers

2.11.3 Properly place features on the correct AutoCAD layers

2.11.4 Do not break lines or trim behind text boxes; utilize the text masking feature (also applies to detail blow ups)

2.11.5 Use reasonably scaled templates and blocks for all drawings

2.11.6 Add continuations / match lines on all related as-builts

2.11.7 Do not explode blocks, even if object is owned by others

2.11.8 Snap all designated blocks at the base point of the object i) Properly connect all lines, blocks, etc.

2.11.9 Create detail blow-ups to show information in close proximity (to maintain legibility)

2.12 Layer naming conventions shall follow the NCS (National CAD Standards) guidelines. For more information on NCS, visit their website at nationalcadstandard.org.

2.13 Each feature (e.g., hydrant, valves, mains, etc.) shall have IDs assigned by the Surveyor or Engineer completing the as-builts, which reference a worksheet table. The worksheet table will contain an inventory of items installed. The entire table must be complete and refer to a corresponding feature on the as-builts.

PART 3 - COSTS

3.1 The as-built surveys shall be prepared at the Contractor's expense.

3.2 The applicant's Contractor shall be responsible for paying in advance to ASPA, the cost for reviewing the final as-built surveys for each extension of the ASPA's utility system. The cost is based on the ASPA's initial estimate of the time needed to review the final as-built surveys.

3.3 Extra time required to review the as-built surveys, due to failure of meeting the as-built specifications or for other inadequate or inaccurate information required of Contractor's Surveyor or Contractor to complete ASPA's as-built drawings or by any combination of such factors shall be charged to and paid by the Contractor as an additional cost of completing ASPA's final CAD as-built plans, based on a rate of $50.00 per hour, plus plotting cost for any extra proof sets.

PART 4 - SUBMISSION OF AS-BUILTS

4.1 As-built surveys shall be submitted using ASPA's AutoCAD template settings; with the Contractor, Surveyor or Engineer's title block. Sheets shall be no larger than 24"x36" and accompanied by all necessary electronic files delivered on CD/DVD or by e-mail.

4.1.1 Scale shall range between 1"=10' to 1" = 60', unless approved by ASPA.

4.1.2 Each sheet must be labeled "AS-BUILT" in one-inch high bold letters in the bottom right hand corner and include the following items:

4.1.2.1 Station numbers and with offsets

4.1.2.2 Dimension measurements

4.1.2.3 Lot numbers

4.1.2.4 Street names

4.1.2.5 Scale

4.1.2.6 Location, elevation and datum of the benchmark used

4.1.2.7 Easements as shown on approved plans

4.1.2.8 Certification block (see 3 below)

4.2 Once ASPA has completed its proposed final review of the CAD as-built plans for such extension, a proof set of the proposed plans will be provided to the Contractor for proof reading and verification of the accuracy of ASPA's proposed final CAD as-built drawings, based on the information provided to ASPA by the Contractor or Surveyor.

When ASPA's proposed final CAD as-built drawing have been verified as accurate by the Contractor and ASPA, then a final set of "official" as-built drawing will be plotted by the Contractor for the signature of the Surveyor and/or contractors Engineer.

4.3 Each as-built survey sheet is required to have a certification block and bear the name, address, phone number and signature of the Contractor, and Surveyor or Engineer. The Surveyor will certify the horizontal and vertical dimensions and elevations of the project's as-built conditions. The Contractors Engineer shall certify the project has been constructed in substantial conformance with the permitted construction plans and specifications and certify that the materials and quantities used were accurate and are in accordance with ASPA's approved plans and specifications. The signature(s) certify the as-built survey and information provided is accurate.

4.4 Submit a signed sealed written report in a format acceptable to ASPA by the Surveyor or Engineer which identifies each pipe and appurtenances and outline the attributes of each material.

PART 5 - ASSET TABLE WORKSHEET

5.1 The following list of information shall be collected and turned in as an electronic Microsoft Excel file on CD/DVD, or sent by e-mail.

Fire Hydrants	**Service Saddles**	**Valves**
Plan Sheet Number Easting (X)	Feature ID Plan Sheet Number	Feature ID Plan Sheet Number
Northing (Y) Model Number Manufacturer Direction to Open	Easting (X) Northing (Y) Saddle Type Direction to Open	Easting (X) Northing (Y) Valve Type Direction to Open
Fire Hydrant Size Year of Installation Date of Installation Main Size @ F.H. Connection	Saddle Size Year of Installation Type of Joint Fitting Main Type	Valve Size Year of Installation Type of Joint Fitting Main Type
	Model Number Manufacturer	Model Number Manufacturer

Fittings	**Locate Wire**	**ARV**
Feature ID	Feature ID	Feature ID
Plan Sheet Number	Plan Sheet Number	Plan Sheet Number
Easting (X)	Easting (X)	Easting (X)
Northing (Y)	Northing (Y)	Northing (Y)
Main Type	Main Type	Main Type
Fitting Type		Fitting Type
Fitting Size		Fitting Size
Material Type		Material Type
Year of Installation		Year of Installation
Type of Joint Fitting		Type of ARV

5.2 Layer Name Format

5.2.1 Discipline Designator Values:

Discipline identifier (value), which is added to the layer name

(e.g., CU- WATR-DOMC-PIPE-XXXX XXXX XXXX XXXX XX-ST) the value must be four characters in length (see table below).

Designator	Description
C	Civil
CU	Civil Utilities
V	Survey / Mapping
VU	Survey / Mapping Utilities

5.2.2 Layer

AutoCAD drawing layer name, which follow the National CAD Standards

(e.g., CU-WATR-DOMC-PIPE-XXXX XXXX XXXX XXXX XX-ST) the value must be four characters in length (see table below).

Name	Color	Linetype	Description
C-ANNO-MATL	White	PHANTOM 2	Match line annotation
C-ANNO-NOTE	Yellow	Continuous	Note annotation
C-ANNO-TTLB	White	Continuous	Title block annotation
C-BLDG-ANNO	White	Continuous	Building annotation
C-BLDG-STRC	15	Continuous	Building structure
C-ESMT-ANNO	White	Continuous	Easement annotation
C-ESMT-LINE	White	HIDDEN	Easement line
C-POND-ANNO	15	Continuous	Pond annotation
C-POND-LINE	15	HIDDEN	Pond line
C-PROP-ANNO	White	Continuous	Property annotation
C-PROP-LINE	53	DASHDOT 2	Property line
C-ROAD-CNTR	10	CENTER2	Roadway center line
C-ROAD-CURB	251	Continuous	Roadway curb / edge
C-ROAD-RWAY	White	PHANTOM 2	Roadway right-of-way
C-ROAD-SWLK	251	Continuous	Roadway sidewalk
C-STRM-ANNO	15	Continuous	Storm annotation
C-STRM-LINE	15	Continuous	Storm line
CU-ELEC-ANNO	Yellow	Continuous	Electrical annotation
CU-ELEC-JUNC	14	Continuous	Electrical junction
CU-ELEC-LINE	14	HIDDEN	Electrical line

CU-SSWR-FORC-ANNO	41	Continuous	Sewer forced annotation
CU-SSWR-FORC-DETL	41	Continuous	Sewer forced detail
CU-SSWR-FORC-INFS	30	Continuous	Sewer forced infrastructure
CU-SSWR-FORC-PIPE-XXXX XXXX XXXX XXXX XX-ST	30	Continuous	Sewer forced pipe
CU-SSWR-FORC-SRVC	34	Continuous	Sewer forced service
CU-SSWR-GRAV-ANNO	81	Continuous	Sewer gravity annotation
CU-SSWR-GRAV-DETL	81	Continuous	Sewer gravity detail
CU-SSWR-GRAV-INFS	GREEN	Continuous	Sewer gravity infrastructure
CU-SSWR-GRAV-PIPE-XXXX XXXX XXXX XXXX XX-ST	GREEN	Continuous	Sewer gravity pipe
CU-SSWR-GRAV-SRVC	106	Continuous	Sewer gravity service
CU-SSWR-STRC-LIFT	Yellow	Continuous	Sewer Lift Station structure
CU-WATR-DOMC-ANNO	143	Continuous	Water domestic annotation
CU-WATR-DOMC-DETL	143	Continuous	Water domestic detail
CU-WATR-DOMC-INFS	Cyan	Continuous	Water domestic infrastructure
CU-WATR-DOMC-PIPE-XXXX XXXX XXXX XXXX XX-ST	Cyan	Continuous	Water domestic pipe
CU-WATR-DOMC-SRVC	154	Continuous	Water domestic service

CU-WATR-RECL-ANNO	191	Continuous	Water reclaimed annotation
CU-WATR-RECL-DETL	191	Continuous	Water reclaimed detail
CU-WATR-RECL-INFS	190	Continuous	Water reclaimed infrastructure
CU-WATR-RECL-PIPE-XXXX XXXX XXXX XXXX XX-ST	190	Continuous	Water reclaimed pipe
CU-WATR-RECL-SRVC	185	Continuous	Water reclaimed service

**Layers not included in list shall be added following the NCS guidelines. ASPA shall be provided a list of any new layers added.*

5.2.3 Size Values:

Size identifier (value), which is added to the layer name (e.g., CU-WATR-DOMC-PIPE-XXXX XXXX XXXX XXXX XX-ST) the value must be four characters in length (see table below).

Size*	Description	Size*	Description
0.25	1/4"	6.00	6"
0.50	1/2"	8.00	8"
0.75	3/4"	10.0	10"
1.25	1-1/4"	12.0	12"
1.50	1-1/2"	14.0	14"
1.75	1-3/4"	16.0	16"
2.00	2"	18.0	18"
2.25	2-1/4"	20.0	20"
2.50	2-1/2"	24.0	24"
3.00	3"	30.0	30"
4.00	4"	36.0	36"

**Values not included in list shall be added and abbreviated with four (4) characters. ASPA shall be provided a list of any new values added.*

5.2.4 Material Values:

Material identifier (value), which is added to the layer name (e.g., CU-WATR-DOMC-PIPE-XXXX XXXX XXXX XXXX XX-ST) the value must be four characters in length (see table below).

Identifier*	Description
CIRN	Cast Iron
DIRN	Ductile Iron
FPVC	Fusible Polyvinyl Chloride
HDPE	High-Density Polyethylene
PVC~	Polyvinyl Chloride
SSTL	Stainless Steel
STEL	Steel

**Values not included in list shall be added and abbreviated with four (4) characters. ASPA shall be provided a list of any new values added.*

5.2.5 Class Values:

Class identifier (value), which is added to the layer name (e.g., CU-WATR-DOMC-PIPE-XXXX XXXX XXXX XXXX XX-ST) the value must be four characters in length (see table below).

Designator*	Description
0000	Not Applicable
0051	Class 51
0150	Class 150
0300	Class 300
0900	Class 900
0905	Class 905

**Values not included in list shall be added and abbreviated with four (4) characters. ASPA shall be provided a list of any new values added.*

5.2.6 Rating Values:

Rating identifier (value), which is added to the layer name (e.g., CU-WATR-DOMC-PIPE-XXXX XXXX XXXX XXXX XX-ST) the value must be four characters in length (see table below).

Identifier*	Description
0000	Not Applicable
DR09	Dimension Ratio (DR) is 9
DR11	Dimension Ratio (DR) is 11
DR18	Dimension Ratio (DR) is 18
DR21	Dimension Ratio (DR) is 21
DR25	Dimension Ratio (DR) is 25
DR26	Dimension Ratio (DR) is 26
DR35	Dimension Ratio (DR) is 35
SC40	Schedule 40
SC80	Schedule 80

**Values not included in list shall be added and abbreviated with four (4) characters. ASPA shall be provided a list of any new values added.*

5.2.7 Construction Values:

Construction identifier (value), which is added to the layer name (e.g., CU-WATR-DOMC-PIPE-XXXX XXXX XXXX XXXX XX-ST) the value must be four characters in length (see table below).

Identifier*	Description
DD	Directional Drill
JB	Jack and Bore
OC	Open-cut
PB	Pipe Burst
PP	Pipe Push

**Values not included in list shall be added and abbreviated with two (2) characters. ASPA shall be provided a list of any new values added*

5.2.8 Status Field Codes:

Status identifier (code), which is added to the end of the layer name (e.g., CU-WATR-DOMC-PIPE-XXXX XXXX XXXX XXXX XX-ST)

Code	Description
A	Abandoned D Existing to demolish
E	Existing to remain
F	Future work
M	Items to be moved
N	New work
O	Owned by others

Examples:

Layer Name

CU-SSWR-GRAV-PIPE-4.00 PVC~ 0000 DR26 OC

CU-SSWR-FORC-PIPE-4.00 PVC~ 0900 DR18 OC

CU-SSWR-FORC-PIPE-8.00 DIRN 0051 DR18 OC

CU-WATR-DOMC-PIPE-2.00 PVC~ 0000 SC80 OC

CU-WATR-DOMC-PIPE-36.0 PVC~ 0900 DR21 OC

CU-WATR-RECL-PIPE-4.00 PVC~ 0900 DR21 OC

5.2.9 Acronyms List

The following lists of acronyms are referenced throughout this as- built specification.

Acronym	Description
CAD	Computer Aided Drafting; refers to AutoCAD drawings
ASPA	American Samoa Power Authority
QA/QC	Quality Assurance / Quality Control
Engineer	US Licensed Engineer
Surveyor	US Licensed Surveyor
Contractor	American Samoa Licensed Contractor

END OF SECTION

SECTION 00400

MATERIALS AND EQUIPMENT SPECIFICATION for ELECTRO-MECHANICAL REQUIREMENTS

PART 1 - SUBMERSIBLE PUMP

1.3 OPERATING REQUIREMENTS

The pumps shall meet the following operating requirements: The submersible pump shall be Franklin or ASPA approved equal.

Item	DESCRIPTION	Well # 15
1	Number of Units	2
2	Capacity/Design Flow, GPM	250
3	Total Dynamic Head, feet	270
4	Minimum pump efficiency @ Design Head, %	75
7	RPM	3450
8	Maximum diameter of pump bowl including cable guard, inches	6
9	Submersible Grundfos/Franklin Pump Model or approved equal, 6”Ø	230S250-7
10	Submersible Motor Horsepower Rating, HP / DIA.	25 / 6”
11	Submersible Motor Voltage Rating, Volts	460
12	Phase / Hertz	Three (3) / 60
13	Variable Frequency Drive (VFD) Motor Control Rating, HP	30
14	Voltage Rating, Volts	460
15	Phase / Hertz	Three(3) / 60

1.4 PUMP CONSTRUCTION

Pump Element - The submersible impellers shall be of the semi-open or enclosed type, constructed of 304 stainless steel fully welded impellers and diffusers with split cone taper lock collets and diffusers to resist corrosion, PTFE floating wear ring, ceramic bearing journal and Nitrile rubber fluted bearing. Maximum operating temperature - 140 °F / 60 °C. The pump shaft shall be of type 431 stainless steel. Franklin or ASPA approved equal.

PART 2 - UPVC COLUMN / DROP PIPES SPECIFICATION

2.1 SCOPE

The Polyvinyl Chloride (PVC) drop pipe for potable water submersible pumps shall be **PVC1120, SCH80, CODE H, Johnson Screens® ASTM-D1785, NSF61** threaded mechanical jointing system, corrosion free and inert to chemicals. The drop pipe to be supplied shall be 4"Ø X 20 feet in nominal pipe size.

2.2 REFERENCE DOCUMENTS

- **ASTM D1784** - Standard Specification for Rigid PVC Compounds and Chlorinated PVC Compounds.
- **ASTM D 1785** – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80 and 120.
- **ASTM D28**37 – Standard Test Method for Obtaining Hydrostatic design Basis for Thermoplastic Pipe materials.
- NSF International: **NSF 61** – Drinking Water system Components – Health Effects

2.3 REQUIREMENTS

2.3.1 **Materials**: Pipe and couplings shall be made from unplastisized PVC compounds having a minimum cell classification of 12454, as defined in ASTM D1784. The compound shall qualify for a Hydrostatic Design Basis (HDB) of 4,000 PSI for water @ 73.4^{o}F, in accordance with the requirements of ASTM D2837.

2.3.2 **Materials**: Pipe and couplings shall be made from unplastisized PVC compounds having a minimum cell classification of 12454, as defined in ASTM D1784. The

compound shall qualify for a Hydrostatic Design Basis (HDB) of 4,000 PSI for water @ 73.4ºF, in accordance with the requirements of ASTM D2837.

2.3.3 **Approvals**: PVC drop pipe shall be certified NSF 61 standard for potable drinking water.

2.3.4 **Physical Requirements**: Standard pipe laying length of 20 or 10 feet long heavy duty threaded joints.

2.3.5 **Performance**: All pipe supplied shall meet the performance requirements of ASTM D1785 for schedule 80 pipe.

2.3.6 **Joints**: Pipe shall be joined using a threaded Female X Female precision-machined NPT thread to provide continuous restraint with evenly distributed loading. The joining system shall incorporate elastomeric sealing gaskets which are designed to provide a watertight seal.

2.3.7 **Adapters**: Drop pipe shall be joined to pumps, check valves, pitt less adapters as provided by the same manufacturer.

2.3.8 **Markings**: Drop pipe shall be legibly and permanently marked in ink with the following information:

- Manufacturer and Trade Name
- Nominal Size and Schedule Rating
- Manufacturing Date Code
- NSF 61

The PVC column/riser pipes shall be schedule 80 pipes for potable water (NSF Standard 61). Each column/riser pipes shall be furnished in 3.0 meters (10 ft) or 6.0 meters (20 ft) maximum length whichever available and shall be connected with heavy duty stainless steel threaded couplings.

PART 3 - SUBMERSIBLE PUMP CHECK VALVE

The 4”Ø submersible pump check valve Series 80 DI/SS VFD shall be constructed with ductile iron body, unleaded body NSF certified 372, corrosion resistant internal components, stainless steel valve guide, ductile iron follower, Buna nitrile

FDA approved elastomer disc and 316 stainless steel spring. The pump check valve shall be a threaded type connection manufactured by Flomatic Valves or ASPA approved equal.

PART 4 - SUBMERSIBLE MOTOR 6-INCH & 8-INCH WATER WELL

4.1 GENERAL

4.1.1 Submersible motors shall be of a heavy duty design stainless steel construction with no ferrous metals in design. The submersible motors must conform to the latest applicable NEMA MG1, Motors & Generators for physical dimensions, ANSI/NFPA 70, USA National Electric Code, ANSI/UL 778 Motor Operated. Water Pumps and ANSI/NSF 61 Drinking Water Systems Components standards.

4.1.2 Submersible motors shall be of a heavy duty design stainless steel construction with no ferrous metals in design. The submersible motors must conform to the latest applicable NEMA MG1, Motors & Generators for physical dimensions, ANSI/NFPA 70, USA National Electric Code, ANSI/UL 778 Motor Operated Water Pumps and ANSI/NSF 61 Drinking Water Systems Components standards.

4.2 MOTOR LOAD DESIGN POINT

4.2.1 Service Factor Selection: The pump HP requirement must not exceed the motor Service Factor output rating when running at a minimum of 3450 RPM and 60Hz.

4.3 NAMEPLATE MINIMUM INFORMATIONS

4.3.1 Manufacturer's name, model number and origin of manufacture must be indicated on the nameplate.

4.3.2 Motor full load rating must be indicated on the nameplate.

4.3.3 Motor full load RPM must be ≥3450 RPM at 60Hz for 6-inch motors and this must be indicated on the nameplate.

4.3.4 Motor Service Factor must be indicated on the nameplate.

4.3.5 Motor maximum Service Factor amps must be indicated on the nameplate.

4.3.6 A maximum ambient of ≥30˚C with a minimum cooling flow requirement of 0.5 ft/sec (16 cm/sec) is required and this must be indicated on the nameplate.

4.3.7 The stator must be designed for a UL thermal insulation of Class F or higher and this must be indicated on the nameplate.

4.3.8 The nameplate must be permanently placed on the motor.

4.4 PHYSICAL CONSTRUCTION

4.4.1 The motor must be capable of operating at ±10% of the nameplate voltage rating.

4.4.2 The motors must have a hermetically sealed stator area with solid resin encapsulation of the winding and winding area.

4.4.3 The motor shaft shall be splined per NEMA for mating with the motor/pump coupling.

4.4.4 The motor must be of a double flange design on all motors ≥47kg (100 lbs).

4.4.5 The motor must have a lead connection that will allow it to be easily replaced in the field.

4.4.6 The internal motor cooling and lubricating solution (fill solution) shall be factory installed and designed to remain in the motor for the life of the motor.

4.4.7 The internal fill solution shall require no service after shipment from the motor manufacturer's factory prior to installation.

4.4.8 There must be a spring assisted rubber diaphragm pressure compensation system that is suitable for ≥ 500 PSI.

4.4.9 The internal of the motor shall be sealed from the exterior environment with a positive sealing one-way check valve and a rotating mechanical shaft seal. All other opening shall be positively sealed with a compressed rubber or threaded mechanical seal.

4.4.10 The internal fill solution shall be a water and/or FDA approved propylene glycol based solution – NO OIL BASED FILL SOLUTIONS ARE ACCEPTABLE.

4.4.11 The thrust bearings shall be Kingsbury type with a carbon thrust disk and stainless steel leveling pads.

4.4.12 The radial bearings shall be carbon sleeves with steel shaft journals.

4.4.13 The shaft seal shall be a mechanical rotating seal with silicon carbide seal faces.

4.4.14 The motor must have an internal heat sensor in direct contact with the winding that can communicate an over heat motor condition with above ground equipment through the power cables. The heat sensor shall not require any additional wiring from the motor to the control panel to communicate the overheat condition.

4.4.15 The motor must have been energized and run tested by the manufacturer prior to shipment for verification that the motor meets both the requirements of the bid and the information the manufacturer or its representative provided to the bidder and system designers.

4.4.16 Submergence test must be conducted by the manufacturer prior to shipment to confirm the motor and its lead are suitable for underwater installation. This submergence test must be conducted at ≥500 PSI.

4.5 MOTOR EFFICIENCY

4.5.1 6-inch motors must have a Full Load efficiency of:

4.5.1.1 Eleven (11)– 45 kW (15-60 Hp) 3-Phase of 81% minimum.

PART 5 - MJK ELECTRO-MAGNETIC (MAG) METER

5.1 GENERAL

5.1.1 SYSTEM DESCRIPTION

Sensors, signal processors, displays, hardware and wiring to produce flow indication, flow totals, data logging, flow trend lines, SCADA system communications, control I/O and alarm data along with transmitting a linear signal proportional to the current flow rate in the closed pipe location indicated in the plans.

The electromagnetic flow measurement system shall consist of a Flow Sensor which uses Faradays law of electromagnetic induction along with a microprocessor based Flow Converter and Display.

The flow meter shall have built in self-diagnostics, technician service functions and be suitable for use with the manufacturer's system certifying kit to confirm meter's sensor functions, accuracy of electronics including a calibration check of electronics at a zero flow and a mid-range flow rates, and for confirming all components meet factory specifications for accuracy and feature operation.

5.2 FLOW SENSOR

5.2.1 CONSTRUCTION

The sensor shall be produced from 304 stainless steel pipe, coils, 316L stainless steel electrodes and a hard rubber liner, soft rubber liner, or PTFE liner as required for compatibility with the media. The sensor shall have a 304 stainless steel outer jacket, carbon steel ANSI 150 psi ANSI Class D or ANSI Class E flanges. Carbon steel flanges shall be protected with two part epoxy coating for corrosion resistance.

5.2.2 INSTALLATION

A minimum of 3 pipe diameters up stream and 2 pipe diameters down stream of straight smooth pipe are recommended. (Consult Factory for any variations.)

5.2.2.1 Flow Sensor Operating Temperature shall be: Media Temperature -25ºC to 110ºC (-13ºF to +230ºF), Ambient Temperature -30ºC to 80ºC (-22ºF to + 176ºF).

5.2.2.2 Flow Sensor Sizing shall conform to the manufacturer's sizing recommendations for the expected flow rates per the table below:

Flow Sensor Sizing

Min and max flow:

Size:	Qmin: 0.6 fts [gpm]	Qmax: 30 fts [gpm]	Size:	Qmin: 0.6 fts [gpm]	Qmax: 30 fts [gpm]	Size:	Qmin: 0.6 fts [gpm]	Qmax: 30 fts [gpm]
			¾"	0.995	49.76	2½"	10.52	523.9
			1"	1.550	77.82	3"	15.93	796.9
			1½"	2.549	127.4	4"	24.87	1246
½"	0.091	4.45	1½"	3.984	199.7	5"	38.92	1946
½"	0.559	28.0	2"	6.226	310.7	6"	55.91	2800

Min and max flow:

Size:	Qmin: 0.6 fts [gpm]	Qmax: 30 fts [gpm]	Size:	Qmin: 0.6 fts [gpm]	Qmax: 30 fts [gpm]	Size:	Qmin: 0.6 fts [gpm]	Qmax: 30 fts [gpm]
8"	99.50	4979	18"	506.3	25210	36"	2017	100800
10"	155.4	7780	20"	620.8	31120	40"	2497	124500
12"	224.1	11205	24"	999.1	44910	48"	3584	179300
14"	305.1	15258	28"	1220	74920	20mA output is factory preset to Qmax		
16"	398.5	19919	32"	1594	79820			

5.2.2.3 Flow Sensor shall be capable of being installed for permanent burial or submergence up to 30 ft. (IP 68/NEMA 6P) using manufacturer's submergence and waterproofing kits. Flow sensor shall be capable of temporary (30 minutes) submergence up to 3 ft. (IP 67) without a submergence kit.

5.2.2.4 Flow Sensor shall be full bore internal diameter throughout to reduce liner erosion and reduce turbulence at high flow ranges.

5.2.2.5 Flow Sensor shall be factory calibrated and wet tested to deliver ±0.25% reading accuracy for sizes from ¼ inch up to 12 inch diameters, and ±0.5% reading accuracy up from 14 inch to 20 inch diameters, ±1% reading accuracy from 24 inch to 40 inch

diameters,±2% reading accuracy in sizes above 40 inches diameter. Accuracies will be NIST Traceable.

5.2.2.6 Flow Sensor shall be delivered with a calibration certificate for verification of performance.

5.2.2.7 The Flow Sensor shall have calibration and flow set up data marked on the sensor.

5.2.2.8 No tools or instruments shall be required to enter or confirm calibration data during set-up.

5.2.2.9 The Flow Sensor shall have no electronic components except the electrodes and coils.

5.2.2.10 Flow Sensor shall be capable of operating in 100% humidity on a permanent basis with manufacturer's recommended gel potting.

5.2.2.11 Flow sensor shall be capable of being mounted in at angles up to 45º from vertical around the centre axis of a horizontal pipe.

5.2.2.12 Flow Sensor shall be capable of being installed in any direction without regard to flow direction.

5.2.2.13 The Flow Sensors 316L electrodes shall be lobed so as to create a scouring effect with flow through the tube.

5.2.2.14 The Flow Sensor shall also include a grounding electrode to eliminate the need for grounding rings in wastewater applications (except when using non-conducting pipe).

5.3 FLOW CONVERTER

5.3.1 INSTALLATION

A minimum of 3 pipe diameters up stream and 2 pipe diameters down stream of straight smooth pipe are recommended. (Consult Factory for any variations.)

5.3.1.1 Flow Sensor Operating Temperature shall be: Media Temperature -25ºC to 110ºC (-13ºF to +230ºF), Ambient Temperature -30ºC to 80ºC (-22ºF to + 176ºF).

5.3.1.2 Flow Converter shall have an enclosure rating of IP 67 (NEMA 6).

5.3.1.3 Flow Converter shall have a measurement accuracy of ±0.1%.

5.3.1.4 Flow Converter shall energize and detect signals generated at the flow Sensor electrodes and self-adjust frequency and amplitude to maximize accuracy across a wide range of flow velocities.

5.3.1.5 Flow Converter shall include program for periodic self-cleaning off the Flow Sensor electrodes using cyclic reverse polarization systems to prevent material attachment and to detach plated materials.

5.3.1.6 Flow Converter shall be capable of measuring fluid velocities in low 0 to 0.2m/S (0.6ft/sec.) and up to a maximum velocity up to 10m/s (30ft/sec).

5.3.1.7 Maximum accuracies shall be achieved from 2% of the flow sensors maximum flow rate up through the sensors maximum flow rate.

5.3.1.8 Flow Converter shall be a flow rate transmitter with a fully scaleable 4-20mA output proportional to all or part of the full-scale flow rate and capable of transmitting with a maximum line load of 800 Ω.

5.3.1.9 The Flow Converter shall be capable of transmitting a 4-20mA output proportional to the flow in either direction, or 4-20 mA proportional to flow in both directions, selectable after installation.

5.3.1.10 Flow Converter shall have one voltage free electromechanical relay rated for a maximum of 50VDC at 1 Amp one voltage free relay rated for 50VAC/VDC 120mA max. Both relays are programmable for totalizer counter output, batch counters, high/low flow alarm, system error, empty pipe alarm, and flow direction indication.

5.3.1.11 The Flow Converter shall accept one external digital input rated at a maximum of 30VDC with a signal less than 5VDC registered as = 0 and a signal greater than 10 VDC as registered as = 1, minimum pulse length 100ms. Digital input can be used for reset of batch counters, start and stop batches or alarm acknowledgement.

5.3.1.12 The Flow Converter shall be capable of reading flow in both directions and have three re-settable totalizers and three non-resettable totalizers capable of totalizing the total flow or net flow in both directions.

5.3.1.13 The Flow Converter shall have two batch counters utilizing dynamic adaptive batch counting to minimize under shooting and over shooting of batch volume by self-adjusting the batch cycle based on actual batch size measurement results.

5.3.1.14 Flow Converter shall have a MODBUS RTU-mode for control and communication using either the MJK MagFlux Display unit or for communication with a PLC. The manufacturer shall supply a document with the list of program registers upon request.

5.3.1.15 Flow Converter shall use an RS 485 communication interface capable of transmitting up to 3000 ft. the controls and data in the MODBUS RTU mode to a PLC or MJK Display Unit.

5.3.1.16 Flow Converter shall be capable of operating without a display, with a remote display, with an integral display or as a member of a group of two to four converters working from a single display.

5.3.1.17 Flow converter shall be capable of being operated remote to the Flow Sensor.

5.3.1.18 Converter shall have CE conformance for radio signal input and output immunity.

5.3.1.19 Flow converter shall have user adjustable low flow cut off for automatic zeroing of flow rate, totalizing and mA output. No external switching shall be required to achieve zero flow.

5.3.1.20 Flow Converter dimensions with cover or display unit attached shall not exceed 6.4” W x 5.9”H x 3.5”D.

5.3.1.21 Flow Converter and must be capable of interchanging with any other flow sensor from the same manufacturer, without the use of electronic memory media exchange.

5.3.1.22 Flow Converter must be capable of being remote mounted up to 150 ft from the flow sensor and require only one set of communication cabling to the sensor for operation.

5.3.2 DISPLAY UNIT

5.3.2.1 Display Unit shall be a white dot matrix 64 x128 pixel graphic backlit display.

5.3.2.2 Display Unit shall allow up to four lines of customizable text with automatic font scaling allowing maximum size up to ½ an inch for the primary measurement parameter.

5.3.2.3 Display Unit shall indicate flow, flow direction, volume, totalizers, configuration, and set-up operations in plain English text.

5.3.2.4 The Display Unit shall display a graphical trend line of the flow history which can be expanded to show greater detail down to 5 minutes increments of flow rates.

5.3.2.5 The Display Unit shall collect 160,000 flow data points with date and time at user specified time intervals, and data log daily flow totals.

5.3.2.6 The Display Unit shall communicate with the Flow Converter using a MODBUS RTU mode using RS485 communications on standard twisted wires for distances up to 3000 ft.

5.3.2.7 The Display Unit shall be capable of controlling, configuring, and data logging for up to four Flow Converters and flow sensors at the same time with simultaneous displays of measurements.

5.3.2.8 The Display unit shall also have options for Modbus or Profibus data transmission in addition to the Converter communications modes.

5.3.2.9 The Display Unit shall hold all settings in a flash memory in the event of a power outage. Battery back-up is not acceptable.

5.3.2.10 The Display Unit shall have a USB port for connection or options for Blue Tooth communication to a personal computer for downloading data in CSV file types suitable for use with commonly available

spreadsheet and data management software. The USB port shall also be capable of letting the operator store all flow meter settings as a file on a PC, configure the flow meter converter from a PC, upload software updates, and upload standard configurations.

5.3.2.11 The Display Unit shall be able to be remote mounted up to 3000 feet from Flow Converters.

5.3.2.12 The Display Unit shall have four keypad buttons for configuration and operation by the user and for use as a digital input for control.

5.3.2.13 The Display unit shall be capable of showing 'pop-up' alarm messages which shall persist as long as the alarm condition exists and will disappear 5 minutes after alarm stops.

5.3.3 MATERIALS

5.3.3.1 All instruments and sensors shall be supplied by one manufacturer to ensure consistent fit and system-wide functioning.

5.3.3.2 Provide:

5.3.3.2.1 Flow Sensor compatible with flow rate and media.

5.3.3.2.2 Flow Converter capable of converting conductive liquid velocity signal into flow rate and transmitting proportional signal, totalizing signal and relay signals.

5.3.3.2.3 Display Unit capable of displaying all measurements and set-up functions, and capable of providing data logging functions and program uploads.

5.3.3.2.4 Provide MJK MagFlux Electromagnetic Flow Meter System and recommended spare parts.

5.3.3.2.5 Calibration shall be by registering the Flow Sensor's serial number to the Flow Converter by keying it into the Display Unit. Use of memory chips or other electronic media for this purpose is not allowed.

5.3.3.2.6 System shall start-up and accurately measure immediately after Flow Sensor registration.

5.3.3.2.7 Operator shall use the integral keypad on the Display unit to program relays for error alarms, limit alarms, totalizer output, batch control output, digital inputs and all operating parameters and variables.

5.3.3.2.8 Operator shall use an alarm re-set to manually cancel alarm messages.

5.3.3.2.9 The flow meter shall have built in self-diagnostics, technician service functions and be suitable for use with a

system certifying kit to confirm meter’s sensor functions and accuracy of electronics including a calibration check of electronics at a zero flow and a mid-range flow rate for

confirming all components meet factory specifications for accuracy and feature operation.

5.3.4 WARRANTY

5.3.4.1 The Vendor or manufacturer of the electro - magnetic mag meter shall guarantee for one year of operation that the equipment shall be free from defects in design, materials and workmanship.

5.3.4.2 The Vendor shall, at no cost to the owner, repair or replace any component that is proven to have failed during the warranty period due to a manufacturing defect.

5.4 AIR RELEASE VALVE ASSEMBLY

The thermoplastic air release valve (ARV) shall be furnished with a poppet seals. The ARV valve shall also be EPDM/Viton Elastomer with a pressure rating of 150 PSI. Maximum air flow of 8SCFM and a liquid flow of 60 GPM. Operating pressure shall be at maximum of 20 PSI. The valve shall be of Plast-O-Matic Model ARV075PT-PV or ASPA approved equal.

5.5 PRESSURE GAUGES

All pressure gauges shall be 2-1/2’ minimum dial with black enamel finish with chrome plated ring. Accuracy shall be ½ of 1% of scale range. Range shall be 0-100 PSI. The movement shall be constructed of stainless steel, rust proof and corrosion resistant and equipped with recalibration mechanism. Gauges mounting locations shall have female connection, tee handle shut-off cocks installed between gauge and gauge tap. Pressure gauges shall be Ashcroft or ASPA approved equal.

5.6 BUTTERFLY VALVES

Butterfly valves shall be cast iron body, lug style, wafer type. The valve shall be equipped with Operating Hand Wheel (OHW). Valves shall be DeZurik model KGC-ES or ASPA approved equal.

5.7 SINGLE ARC RUBBER EXPANSION JOINT

The rubber expansion joint shall be with full face flanges and retaining rings drilled to 150# ANSI or JIS standards. Materials of construction shall be of precision molded, neoprene type or other elastomer tube and cover, suitable for water system, and multiple plies of polyester or nylon cord. The arc is necessary to achieve proper movements.

5.8 DUCTILE IRON FLANGED FITTINGS (TEES, ELBOWS, REDUCERS)

Flanged Fittings shall be manufactured of Ductile Iron in accordance with all applicable terms and provisions of standards ANSI/AWWA C110/A21.10. Flanged surfaced shall be faced and drilled in accordance with ANSI Class 125 B16.1. All Ductile Iron Flanged Fittings shall be rated for water pressure of 150 PSI. Fittings are Cement-Lined and seal coated in accordance with ANSI/AWWA C140/A21.4. All coated fittings shall meet the requirements of NSF-61. Interiors shall be lined and seal coated in accordance with ANSI/AWWA C104/A21.04, "Cement-mortar lining for Ductile Iron Pipe and Fittings for water" unless otherwise specified.

5.9 GLOBE TYPE SILENTCHECK VALVE

The Check Valve shall be globe style, silent type flanged with integral spring to close the valve to eliminate water hammer. The valve seat and disk shall be made of 316 stainless steel, 316SS body with maximum pressure rating of 200 psi. Valves shall be of Cla-Val, Flomatic or ASPA approved equal.

5.10 SUBMERSIBLE PUMP CABLE

Submersible pump cable shall be flat type 4-wire flexible K strand with 90°C Dry, 90°C Wet. Ethylene Propylene Rubber (EPR) insulation and Chlorinated Polyethylene Rubber (CPR) outer jacket. Voltages shall be rated at 600 volts. Submersible cables shall be
if Hydroflex or Paige Electric or approved equal and shall be MSHA and RoHS approved.

5.11 VARIABFREQUENCY DRIVE (VFD) MOTOR CONTROL

VARIABLE FREQUENCY DRIVE (VFD)		
The **Dnfoss/Allen Bradley** or approved equal Variable Frequency Drive (VFD) shall be **IP66 / enclosed type NEMA 4X with integral fused disconnect.** The Drive shall meet the following requirement listed below:		
Main Supply:		
	Single (1) Phase Input and Three (3) Phase Output Power Supply:	
	Supply Voltage:	180 - 300 Volts, ± 10%
	Supply Frequency:	60 hzAC
	Displacement Power factor (cos Ø) near unity:	(> 0.98)
	Switching on Input Supply, L1, L2, L3:	1 - 2 times/min
Output Data (U, V, W)		
	Output Voltage:	0 - 100% of Supply
	Switching on Output:	Unlimited
	Ramp Times:	1 - 3600 seconds
	Closed Loop:	0 - 132 Hz
Digital Inputs		
	Programmable Digital Inputs:	6*
	Logic:	PNP or NPN
	Voltage Level:	0 - 24 VDC
	* Two of the inputs can be used as digital outputs	
Analogue Reference Inputs		
	Analogue Inputs:	2
	Modes:	Voltage or Current
	Voltage Level:	-10 to + 10 V (scalable)
	Current Level:	0/4 to 20 mA (scalable)
Pulse Inputs		
	Programmable Pulse Input:	2

	Voltage level:	0 - 24 VDC (PNP positive logic)
	Pulse Input Accuracy:	(0.1 - 110 kHz)
	* Two of thedigital inputs can be used for pulse inputs	
Analogue Output		
	Programmable analogue outputs:	1
	Current range @ analogue output:	0/4 - 20 mA
Relay Outputs		
	Programmable relay outputs:	(240 VAC, 2A)
Field Bus Communication		
	ModBus, RTU, ModBus TCP, BacNet, DeviceNet, ProfiBus, CanOpen, Ethernet and Profinet, **SCADA** connection	
Temperature		
	Ambient Temperature:	up to 55ºC
BUILT - IN PROTECTION		
	System Overload	
	Motor Failures	
	Motor & Drive overloading	
	Voltage Disturbances	
	Power Surges	
	Loss of Phase	
	Phase to Phase and Phase to Ground Short Circuit	
	Ground Fault	
	Switching on Input/Output	
	Electrical disturbances	
	Over Voltage	
	Over Current	
	Under Voltage	

	External Fault	
	Over Temperature	
Compact Pressure Transducer		
	Type:	Danfoss MBS3000
	Accuracy, max.:	1.00%
	Accuracy, typical	0.5%
	Output signal type:	4 - 20 mA, 2 - wire transmitter
	Operating temp.:	- 40 to 185 ºF
	Process Connection:	1/4" NPT, Male
	Pressure Range:	0 – 16 Bar
	Pressure unit reference:	Gauge (relative)
	Response time, max. (ms)	4 ms
	Pressure connection standard:	ANSI/ASME B1.20.1