ATTACHMENT H

TABLE OF CONTENTS

GENERAL CONDITIONS

SECTION 02110
SITE CLEARING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Remove surface debris and topsoil excavation.

B. Remove paving, curbs, rock walls and sidewalks.

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

1.2 RELATED SECTIONS

A. Section 02211 - Rough Grading.

B. Section 02229 - Rock Removal.

1.3 UNIT PRICE - MEASUREMENT AND PAYMENT

Site Clearing:

Basis of Measurement and Payment: Payment for site clearing shall be an incidental cost to the installation of the in-line meter and concrete vault and shall include all work related to clearing site, loading and removing waste materials from site, and restoring the site upon completion of project.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable American Samoa Code annotated for disposal of debris, and burning debris on site.

B. Coordinate clearing Work with utility companies and Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

NO PRODUCTS

PART 3 - EXECUTION

3.1 PREPARATION

Verify that existing plant life designated to remain, is tagged or identified.

3.2 PROTECTION

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

B. Protect trees, plant growth, and features designated to remain, as final landscaping.

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

3.3 CLEARING

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

B. Remove paving, curbs, and sidewalks.

C. Remove trees and shrubs, within marked areas and as indicated. Remove stumps and main root system.

D. Clear under growth and deadwood without disturbing subsoil.

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

3.4 TOPSOIL EXCAVATION

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

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

END OF SECTION

SECTION 02211
ROUGH GRADING

PART 1 - GENERAL

1.1 SECTION INCLUDES

Removal of topsoil, removal of subsoil, cutting, grading and rough contouring the site for the work.

1.2 MEASUREMENT AND PAYMENT

Payment for rough grading shall be incidental cost to the installation of water in-line meters, concrete vaults, roads and related facilities and shall include all work related to rough grading, loading and removing waste from the site.

1.3 PROJECT RECORD DOCUMENTS

Accurately record actual locations of utilities remaining, by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 - PRODUCTS

2.1 MATERIALS

Topsoil, Fill, Structural Fill.

PART 3 - EXECUTION

3.1 EXAMINATION

Verify site conditions and verify that survey bench mark and intended elevations for the Work are as indicated.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.
B. Stake and flag locations of known utilities. Notify utility company to remove and/or relocate utilities.
C. Protect above and below grade utilities that remain.
D. Protect plant life, lawns, rock walls and other features remaining as a portion of final landscaping. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

3.3 FILLING

A. Fill areas to contours and elevations in continuous layers and compact. Make grade changes gradual. Blend slope into level areas.
B. Maintain optimum moisture content of fill materials to attain required compaction density.
C. Remove surplus fill materials from site.
D. Ensure drainage away from construction areas, existing structures and environmentally sensitive areas in accordance with engineer's instructions and applicable rules and regulations.

3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed and may include compaction testing.
B. If tests indicate Work does not meet specified requirements, remove work, replace and retest at contractor's expense.

END OF SECTION

SECTION 02223
BACKFILLING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Building perimeter filling and site structure backfilling.

B. Consolidation, compaction and fill for over-excavation.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

Backfilling shall be considered incidental to the work and no additional compensation shall be made.

1.3 REFERENCES

A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-in. Drop.

B. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.

C. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.

D. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.

E. ASTM D2922 - Density of Soil and Aggregate in Place.

F. ASTM D3017 - Moisture Content of Soil and Soil-Aggregate Mixtures.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

A. PIPE BEDDING: All bedding materials shall be black fine sand. All fill material shall be approved by the Engineer prior to its use.

B. ENGINEERED FILL: All fill, unless otherwise noted herein or shown on the

Drawings shall be engineered fill material. The material shall be soil, soil-rock, coral and/or limestone, which is free from organic matter or other deleterious substances. The fill material shall not contain rocks, coral and/or limestone or lumps over 3 inches in greatest dimension, and shall contain no more than 5 percent finer than No. 200 mesh sieve. Additionally, the top two (2) feet of the engineered fill material under the structures and pavements and three (3) feet horizontally beyond shall be non-expansive with plasticity index of not more than ten (10) and a liquid limit not greater than twenty five (25). Onsite excavated sandy and gravel soils meeting these criteria can be reused for fill.

C. IMPORT MATERIAL: If, in the opinion of the Engineer, onsite materials are not suitable for filling, the Contractor shall haul selected filling material from offsite borrow areas at no extra cost to OWNER. The material shall normally be soil or soil rock mixture, which is free from organic matter and other deleterious substances. The fill material shall not contain rocks or lumps over 3 inches in greatest dimensions.

D. TOPSOIL: Topsoil shall be all surface soils containing organic matter stripped from site. Top soil shall consist of a fertile, friable, natural loam, of uniform quality, free from subsoil, hard clods, stiff clay, hard pan, partially disintegrated debris, or any other undesirable material. Topsoil shall not contain obnoxious weeds.

E. DRAIN ROCK: Drain rock shall consist of crushed rock free from vegetable matter and other deleterious substance. The wear when tested under AASHTO T96 shall not be more than 50 at 500 revolutions. The percent composition by weight shall fall within the limits indicated:

Percent Passing By Weight:

Sieve Size	% of Fines Passing
1”	100
3/4”	90-100
1/2”	20-55
3/8”	0-15
No. 4	0-5

PART 3 - EXECUTION

3.1 PREPARATION

Compact backfill to 90% of Maximum Dry Density.

3.2 BACKFILLING

A. Backfill areas to contours and elevations. Systematically backfill to allow maximum time for natural settlement. Do not backfill over wet or spongy sub-grade surfaces.

B. Place and compact materials in continuous layers not exceeding 8 inches loose depth.

C. Employ a placement method that does not disturb or damage other work. Backfill simultaneously on each side of unsupported foundation walls.

D. Slope grade away from building minimum 2.5 inches in 10 ft or a min. of 2% slope unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

E. Remove surplus backfill materials from site. Leave fill material stockpile areas free of organic materials.

3.3 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 02315.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at the contractor's expense.

3.4 PROTECTION OF FINISHED WORK

A. Protect finished Work, reshape and re-compact fills subjected to vehicular traffic.

END OF SECTION

SECTION 02231
AGGREGATE BASE COURSE

PART 1 - GENERAL

1.1 SECTION INCLUDES

Work required under this section consists of furnishing all labor, materials, tools and equipment necessary for the placement of aggregate base course as specified herein, and as indicated on the Drawings.

1.2 REFERENCES

A. AASHTO T180 - Moisture-Density Relations of Soils Using a 10-lb Rammer and an 18-in. Drop.

B. ANSI/ASTM D698 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb Rammer and 12 inch Drop.

C. ANSI/ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 inch Drop.

D. ASTM D2922 - Test Methods for Density of Soil and Aggregate in Place by Nuclear Methods (Shallow Depth).

E. ASTM D3017 - Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

1.3 SUBMITTAL REQUIREMENTS

The Contractor shall submit samples, certificates and guarantees in accordance with applicable provisions contained in the "General Provisions" sections of these Specifications. A list of submittal requirements is included in the Special Provisions.

1.4 MEASUREMENT AND PAYMENT

Payment will be incidental to installation of asphaltic concrete and Portland cement paving under Technical Specification Section 02510 and Section 02520 respectively.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

Base course aggregate materials shall consist of durable and sound crushed stone, free of lumps or balls of clay or other objectionable matter. Crushed stone and gravel shall be free from flat, elongated, soft or disintegrated pieces. Crushed gravel retained on a No. 4 sieve shall have at least 90 percent by weight with at least two fractured faces. Base course materials samples shall have a Bearing Ratio of at least 30 as determined by laboratory test on a 4-day soaked specimen in accordance with ASTM D1883; compact specimen in accordance with ASTM D1557, Method D. Determine grain size in accordance with ASTM C136 and amount of material finer than 200 mesh sieve in accordance with ASTM C117. Aggregate shall have a percentage of wear not exceeding 45 when tested in accordance with ASTM C131, Grading A. Binder material, that portion of material passing the No. 40 sieve, shall be of such composition that the composite material conforms to the requirements specified herein. It shall be of such nature that it can be compacted readily with watering and rolling to a firm, stable base. Aggregate shall conform to the following sizes:

Percentage by Weight Passing
Square Mesh Laboratory Sieves:

Sieves	% Passing
1 ½”	100
1”	60-100
½”	30-65
No. 4	20-50
No. 40	5-25
No. 200	0-10

That portion of the material passing the No. 40 sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than 5 as determined by ASTM D423 and ASTM D424, respectively. Prepare samples in accordance with ASTM D2217, Procedure A.

PART 3 - EXECUTION

3.1 EXAMINATION

Verify substrate has been inspected; gradients and elevations are correct.

3.2 AGGREGATE PLACEMENT

A. Place aggregate in maximum 8 inch loose layers and compact. All base course material shall be placed in layers to the same transverse and longitudinal grades as those of the surface of the finished pavement. Each layer of material shall be brought to the optimum moisture for compaction through wetting or drying as required. The loose thickness of each layer or lift shall be such that the compaction requirements specified in paragraph 2 will be obtained with the rolling equipment used, but in no case shall a layer or lift exceed 6 inches in compacted thickness.

B. Level and contour surfaces to elevations and gradients indicated.

C. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

D. Use mechanical tamping equipment in areas inaccessible to compaction equipment. Each layer or lift of base course material shall be compacted to a density of not less the 95 percent of the maximum density obtained by ASTM Compaction Test D1557 (Method D). The finished surface of the base course shall have no irregularities that exceed 3/8 inch when tested with a 10-foot straight edge in any direction.

3.3 QUALITY ASSURANCE PROVISIONS

Sampling and Testing shall be conducted by an approved testing laboratory at the expense of the Contractor.

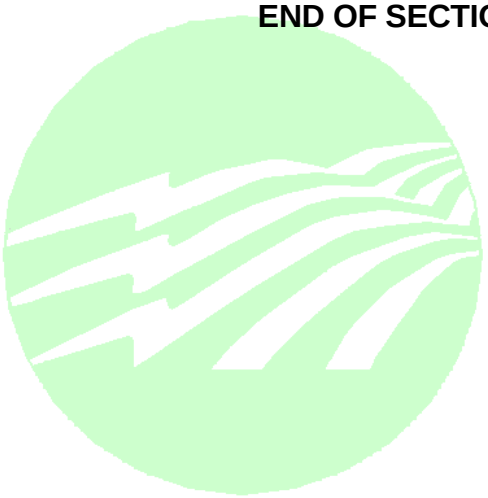
A. Sampling: Suitable samples from the source(s) of selected material shall be submitted not less than 30 days before commencing the construction and additional samples shall be furnished during the construction as required upon request. Method for obtaining material for tests shall conform to ASTM D75. All samples to be tested or examined shall be supplied by the Contractor at his expense. Samples shall be representative of the materials in the deposit or quarry.

B. Laboratory Tests: Submit the following test reports for approval prior to start of construction:

1. Gradation
2. Atterberg Limits
3. Proctor test

C. Density Tests: Field density tests shall be in accordance with ASTM D1556 or ASTM D2922. There shall be at least one field density test for each 100 square yards or every 100 linear feet of each layer of base material. Laboratory density tests will be performed in accordance with ASTM D1557.

END OF SECTION



SECTION 02315
EXCAVATION, TRENCHING AND BACKFILL FOR PIPELINES

PART 1 – GENERAL

1.1 SUMMARY

This section includes excavation, trenching and backfilling 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

A. Measurement

1. Linear feet of pipe installed measured horizontally over the centerline of the pipe.
2. If stationing is established on the job, stationing may be used to determine the payment quantities.

B. Basis for Payment

No separate Payment will be made for this item. Payment will be made on a unit cost basis per linear foot of pipe installed per Technical Provision Section 02667.

1.3 RELATED WORK

A. Section 02316 – Rock Excavation

B. Section 02667 – Water Distribution Mains

C. Section 02520/02522 – Road Restoration

E. Section 02920 – Top soiling, Seeding, Fertilization and Mulching

F. Section 02231 – Aggregate Base Course

1.4 REFERENCES

A. 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].

B. ASTM D1556 – Test Method for Density of Soil in Place by the Sand-Cone Method

C. ASTM D2216 – Test Method for Laboratory Determination of Water Content of Soil, Rock and Soil-Aggregate Mixtures

D. ASTM D2487 – Classification of Soils for Engineering Purposes [Unified Soil Classification System].

E. ASTM D2774 – Standard Recommended Practice for Underground Installation of Thermoplastic Pressure Piping

F. ASTM D2922 – Test Method for Density of Soil and Soil Aggregate and Rock in Place by Nuclear Methods (Shallow Depth)

G. ASTM D3017 – Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

H. OSHA 1926 – Occupational Safety and Health Standards for the Construction Industry

1.5 DEFINITIONS

A. Bedding, Haunching and Initial Backfill zones as defined herein and on the standard thermoplastic pipe trench detailed drawing below.

B. Native, and Import and Selected/Engineered Material Definitions:

1. Native Material: Soils excavated from the trench in the immediate vicinity of current pipe installation activities.
2. Import Material: Soils transported from a soil pit stockpile at a location other than the location where trench excavation is taking place.
3. Selected/Engineered Fill: Soil specified in the plans or specifications or by the Project Engineer to meet permit conditions or selected applications.

C. 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

A. Submit the result of ASTM 698 standard proctors, including proctor curve, for each soil type encountered and used on the job.

B. Submit all field compaction test results in writing within 5 days of being performed.

C. Submit gradation curves for imported fill for project engineer review and approval prior to placement.

1.7 QUALITY ASSURANCE

A. 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 density testing equipment.

B. Locations: Provide compaction test results at locations as designated by the Project Engineer and/or American Samoa Department of Public Works.

1. Frequency:

a. Excavation, Trenching and Backfilling in an Established, Traveled Roadway: once per 100-feet along the pipeline (maximum).
b. Excavation, Trenching and Backfilling outside of an Established, Traveled Roadway: once per 300-feet along the pipeline (maximum).

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.

3. If testing reveals inadequate compaction, retest at that location after remedying the non-compliance with the specifications at the contractor's expense.

PART 2 – PRODUCTS

2.1 BEDDING, HAUNCHING AND INITIAL BACKFILL MATERIAL

A. Imported Bedding, Haunching and Initial Backfill Materials: Use one of the following materials.

1. USCS (ASTM D2487) soil types SP, SW (coarse grained soils with less than 5% fines) and GP-GM, GP-GC, SP-SM, SW-SM, SW-SC, with maximum particle sizes limited to 1/2-inch, utilized as stipulated in Part 3 - Execution.

B. Native bedding, native haunching and native initial backfill material:

1. Use in accordance with the restrictions of Part 3 – Execution.
2. Free from particles greater than 1/2-inch in dimension.

2.2 FINAL BACKFILL MATERIAL

A. General:

1. Free from soil chunks larger than 3-inches in greatest dimension.
2. Free from stones or rocks larger than 3-inches in greatest dimension.
3. Free from organic materials.
4. Free of Toxic Waste or Hazardous Chemicals per American Samoa Environmental Protection Agency Requirements. Certify if possible.

B. Imported Final Backfill for Wet Conditions:

1. Types 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. Otherwise meeting the general requirements of Article 2. 2 Paragraph A.

2.3 SLURRY MIX

General:

Conform to the American Samoa Department of Public Works Standard Specification for Construction of Local Streets and Roads as applicable.

PART 3 - EXECUTION

3.1 GENERAL

A. Conform to applicable safety laws, including, but not limited to, OSHA 29 CFR Part 1926.

B. Obtain all permits from the appropriate road agencies for construction within road right of way.

C. Repair damage resulting from settlement, slides, cave-ins, water pressure, and other causes.

D. 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

A. Remove brush, trees and stumps from excavation and site.

B. Strip and stockpile existing topsoil.

C. Maintain surface drainage away from trenching or excavation.

D. If existing soil cannot provide uniform and stable bearing support along the length of the pipe, then over-excavate 6-inches below bottom of pipe.

E. If trench is more than 4’ 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.

F. Contractor will be responsible for disposal of excavated materials during excavation to an AS-EPA/ASPA approved site. Contractor must identify construction disposal sites before construction can begin.

3.3 TRENCHING

A. Total Bottom Width: As indicated on plans.

B. Depth: Provide minimum cover as specified, or depths shown on plans.

C. Top Width: As needed to meet safety requirements, but minimize the width where possible.

D. Trench Walls: Keep trench walls vertical in the pipe embedment zone.

E. Length of Open Trench:

1. Unless authorized by the Project Engineer in writing, the length of trench excavation in advance of pipe being laid shall not exceed 40 feet during active construction.

2. All trenches must be backfilled immediately or before end of each day's work. If any trench is left open overnight, it shall be completely barricaded and fenced.

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 Owner.

3.4 BEDDING

A. General:

1. Where over excavation is necessary, install a minimum of 6-inches of Imported Bedding.

2. Level and form the bottom of the trench to provide uniform bearing support along the length of the pipe.

B. 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	95%
Unimproved Surfaces or Fields	80%

3.5 HAUNCHING AND INITIAL BACKFILL

A. General

1. Provide complete and uniform bearing and support for the pipe, including allowance for bell holes.
2. Work material under the pipe haunches and around the pipe to ensure full pipe support.
3. Place material in lifts no greater than 8-inches thickness in loose measure.
4. Install initial backfill to a depth of 6-inches over the crown of the pipe.

B. Material Usage:

1. Rigid Pipe (Ductile Iron):
   a. Dry Trench and Site Conditions: Use native material free from particles greater than 1-inch in dimension.
   b. Wet Trench Conditions: Imported Material.
2. Plastic Pipe: Imported Material
   a. 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

C. Compaction of Haunching and Initial Backfill:

1. Compact haunching material and initial backfill using walk-behind vibratory plate compactor or manual hand-tamping tools
2. Ensure no contact between compacting equipment and the pipe.
3. Prohibited Compaction Equipment for Haunching and Initial Backfill:

a. hoe-pack
b. hydro-hammer
c. rammer-tamper
d. vibratory rollers

4. Prevent movement of the pipe during placement or compaction of material.
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	95%
Unimproved Surfaces or Fields	80%

3.6 FINAL BACKFILL

A. General:

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 2.2 B.

2. Haul away waste, material not meeting the requirements at contractor's expense.

3. Conform to Section 02231 – Aggregate Base Course: backfill requirements under roadways.

4. Repair any trenches improperly backfilled or where settlement occurs, then refill and compact.

B. Compaction:

1. Install 2-feet of total fill over the pipe crown before subjecting the

trench to hydro-hammers, hoe-packs, or vehicular traffic.

2. Backfill in lifts to meet compaction requirements throughout the full depth of backfilled trench.

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	12-inches	95%
Areas of Recent Fill or Embankment	12-inches	90%
Rights-of-Way	12-inches	90%
Unimproved Surfaces or Fields	24-inches	80%

4. Use smaller lifts if necessary to meet the in-place density requirements.

3.7 REMOVAL OF NUISANCE WATER

A. Control site drainage, springs and runoff, and prevent water from adversely affecting trenching locations.

B. Remove nuisance water entering the trenches. Water that can be removed through the use of sump or trash pumps will not be considered dewatering.

C. 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.

3.8 LOCATE EXISTING UTILITIES

A. Field locate all existing underground utilities.

B. Contact local water and sewer officials, 48-hours in advance of work in areas needing utility location service.

3.9 UTILITY CONFLICTS

A. Protect existing utilities from damage during excavation and backfilling operations.

B. Provide temporary support for existing water, gas, telephone, power, or other utility services that cross the trench until backfilling of trench is complete.

1. Compact backfill to 95% of maximum density under disturbed utilities.
2. Coordinate the repair of existing utilities, regardless of whether they were properly located.

   a. 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.
   b. 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.
   c. Fair compensation will be negotiated for repairs to tribal water and sewer utilities that were improperly located. However, if the Contractor neglects to request a Tribal utility locate in accordance with the Contract requirements, no compensation will be made to the Contractor.

C. Water and sewer parallel and perpendicular crossings:

1. Maintain a 6-foot horizontal separation (O.D. to O.D.) for parallel mains.
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 are met:

   a. Vertical separation is 18 inches (O.D. to O.D.)
   b. Water main is above the sewer main.
   c. Sewer pipe is constructed to withstand 150 psi static pressure without leaking.
3. Maintain a minimum 18-inch vertical separation (O.D. to O.D.) for perpendicularly crossing mains.

   a. Place water pipe over sewer pipe.

4. If it is impossible to meet any of the above separation distances and deviations, and specific provisions are not indicated on the plans,

bring the matter to the attention of the Project Engineer for resolution.

END OF SECTION

SECTION 02520
PORTLAND CEMENT CONCRETE PAVING

PART 1 – GENERAL

1.1 SECTION INCLUDES

Concrete sidewalks, stair steps, integral curbs, gutters, parking areas, and roads.

1.2 MEASUREMENT AND PAYMENT

A. Measurement: Volume of concrete shall not be measured separately but included in the measurements for vault and in-line meter construction and installation.

B. Basis for Payment Includes: removal and disposal of existing pavement; preparation of base; installation of rebars, dowels; pouring of concrete, curing and testing.

1.3 REFERENCES

A. ACI 301 - Specifications for Structural Concrete for Buildings.

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

C. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.

D. ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

E. ASTM A615 - Deformed and Plain Billet-Steel for Concrete Reinforcement.

F. ASTM C33 - Concrete Aggregates.

G. ASTM C94 - Ready Mix Concrete.

H. ASTM C150 - Portland Cement

I. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

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

1.4 PERFORMANCE REQUIREMENTS

Paving: Designed for parking light duty commercial vehicles, residential streets, main street arteries and movement of trucks up to 30,000 lbs.

1.5 SUBMITTALS FOR REVIEW

Product Data: Provide data on joint filler, admixtures and curing compounds.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with standards of the American Samoa Public Works Department.

B. Obtain cementitious materials from same source throughout.

1.7 REGULATORY REQUIREMENTS

Conform to applicable standards for paving work on public property.

1.8 ENVIRONMENTAL REQUIREMENTS

Do not place concrete when base has standing water.

PART 2 – PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel and Wire Fabric: ASTM A615, yield grade; deformed billet steel bars; unfinished, galvanized or epoxy coated finish.

B. Welded Steel Wire Fabric: Plain type, ASTM A185 or Deformed type, A497; in flat sheets or coiled rolls; unfinished or galvanized.

2.2 CONCRETE MATERIALS

A. Concrete Materials: ASTM C150, Normal - Type II, Portland type, grey, buff or white in color.

B. Fine and Coarse Mix Aggregates: ASTM C33.

C. Water: Not detrimental to concrete.

2.3 CONCRETE MIX - BY PERFORMANCE CRITERIA

A. Mix and deliver concrete in accordance with ASTM C94.

B. Select proportions for normal weight concrete in accordance with ACI 301 .

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

2.4 SOURCE QUALITY CONTROL AND TESTS

A. Submit proposed mix design to Engineer prior to work.

B. Tests on cement and aggregates will be performed to ensure conformance with specified requirements.

C. Test samples in accordance with ACI 301.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify base conditions and verify compacted sub-grade, granular base and/or stabilized soil is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.2 PREPARATION

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of manholes, catch basins and frames with oil to prevent bond with concrete pavement.

C. Notify Engineer minimum 24 hours prior to commencement of concreting operations.

3.3 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

3.4 REINFORCEMENT

Place reinforcement as indicated.

3.5 PLACING CONCRETE

A. Place concrete in accordance with ACI 301.

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

3.6 FINISHING

Finish as indicated on Plans.

3.7 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit vehicular traffic over pavement until 75 percent design strength of concrete has been achieved.

3.8 SCHEDULES

A. Concrete Sidewalks and Median Barrier: 3,000 psi 28 day concrete, 4 inches thick, buff color Portland cement, exposed aggregate finish.

B. Parking Area Pavement: 4,000 psi 28 day concrete, 5 inches thick, 6 x 6 inch mesh reinforcement, wood float finish.

END OF SECTION

SECTION 02522
ASPHALTIC CONCRETE PAVING

PART 1 – GENERAL

1.1 SECTION INCLUDES

Work required under this section consists of furnishing all labor, materials, tools, and equipment necessary for paving work as specified herein, and as indicated on the Drawings.

1.2 MEASUREMENT AND PAYMENT:

A. Measurement: By linear foot of pipe installed beneath pavement.

B. Basis for Payment Includes: saw cutting of existing pavement; removal and disposal of existing pavement; preparation of base; tack coating surfaces; asphalt placement, compacting; rolling; and compaction testing.

1.3 REFERENCES

A. MS-2 - Mix Design Methods for Asphalt Concrete - The Asphalt Institute.

B. MS-3 - Asphalt Plant Manual - The Asphalt Institute.

C. MS-8 - Asphalt Paving Manual - The Asphalt Institute.

D. MS-19 - Basic Asphalt Emulsion Manual, The Asphalt Institute.

E. ASTM D946 - Penetration-Graded Asphalt Cement for Use in Pavement Construction.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with AI Manual MS-8 standard.

B. Mixing Plant: Conform to AI Manual MS-3 standard.

C. Obtain materials from same source throughout.

1.5 SUBMITTAL REQUIREMENTS

The Contractor shall submit samples, certificates, and guarantees in accordance with applicable provisions contained in the "General Provisions" sections of these Specifications. A list of submittal requirements is included in Special Provisions.

1.6 ENVIRONMENTAL REQUIREMENTS

Do not place asphalt when base surface is wet and/or muddy.

1.7 LINES AND GRADES

The Contractor shall furnish and place all lines and grades, stakes, and templates necessary for making and maintaining points, line and elevations.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Asphalt Cement: ASTM D946.

B. Aggregate for Binder Course Mix and Wearing Course Mix

C. Fine Aggregate: sand.

2.2 ACCESSORIES

A. Primer: Homogeneous, medium curing, liquid asphalt.

B. Tack Coat: Homogeneous, medium curing, liquid asphalt.

C. Seal Coat: AI MS-19, slurry type.

2.3 ASPHALT PAVING MIX

A. Use dry material to avoid foaming. Mix uniformly.

B. Binder Course: 4.5 to 6 percent of asphalt cement by weight in mixture in accordance with AI MS-2 standards.

C. Wearing Course: 5 to 7 percent of asphalt cement by weight in mixture in accordance with AI MS-2 standards.

D. Asphalt: The bituminous material shall be paving asphalt with a 60-70 penetration for locally refined product and shall meet the requirements under AASHO Designation M20 for the specified grade. The heptane-xylene equivalent shall be not more that 35% when tested in accordance with ASSHO Designation T102. Asphalt mix shall conform to the Standard Specifications for Road and Bridge Construction of the State of Hawaii.

E. Aggregate for Asphaltic Concrete: Mineral aggregate shall be obtained by crushing and screening hard, durable bluish-gray lava rock of uniform quality. The aggregate shall be free from decomposed materials, vegetable matter, and other deleterious substances. Elongated or flat pieces, where either the ratio of the length to width or of the width to the thickness is greater than three, shall not exceed 25% by weight of the total aggregate in any batch.

Aggregate gradations shall be as shown on the table below.

Sieve Size	Percent Passing By Weight
1/2”	100
3/8”	80-100
No. 4	55-70
No. 8	35-50
No. 30	17-25
No. 100	8-15
N0. 200	4-10
Asphalt Binder (%)	5.5-7.5

The combined grading within the specified limits for the various mixes as shown above shall be of such uniformity that the material passing the indicated sieves during any day's run will not exceed the following variations:

Sieve Size	% Permissible Variation
Larger then No. 4	7%
No. 4	6%
No. 8 and No. 30	4%
No. 100	3%
No. 200	2%
Asphalt Binder	0.3%

A nominal quantity of blending sand and mineral filler will be permitted with the Engineer's approval for the purpose of obtaining the required graduation

of the mineral aggregate. The quantity of blending sand and mineral filler used shall not exceed 5% of the total weight of the aggregate.

Blending sand shall be natural sand that is hard-grain of the windblown or water-worn type and shall be clean, free from loam, clay, organic matter, or other deleterious substances. Mineral filler shall consist of thoroughly dry limestone dust or bluish-gray lava rock dust and shall be free of lumps or loosely bonded aggregations.

2.4 SOURCE QUALITY CONTROL

Submit proposed mix design for review prior to commencement of work and test samples in accordance with AI MS-2.

PART 3 - EXECUTION

3.1 EXAMINATION

Verify base conditions. Verify that compacted sub-grade, granular base, stabilized soil is dry and ready to support paving and imposed loads. Verify gradients and elevations of base are correct.

3.2 SUBBASE

Section 02231 - Aggregate Base Course forms the base construction for work of this Section.

3.3 PREPARATION - PRIMER

A. Apply primer in accordance with manufacturer's instructions and AI MS-2 standard.

B. Apply primer to contact surfaces of curbs, gutters and use clean sand to blot excess primer.

3.4 PREPARATION - TACK COAT

A. Apply tack coat in accordance with manufacturer's instructions and AI MS-19 standards.

B. Apply tack coat on asphalt or concrete surfaces over sub-grade surface at uniform rate of 1/3 gal/sq yd and apply tack coat to contact surfaces of

curbs and gutters.

3.5 PLACING ASPHALT PAVEMENT - SINGLE COURSE

A. Place asphalt within 24 hours of applying primer or tack coat.

B. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

C. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.6 PLACING ASPHALT PAVEMENT - DOUBLE COURSE

A. Place asphalt binder course within 24 hours of applying primer or tack coat.

B. Place wearing course within two hours of placing and compacting binder course.

C. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

D. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks.

E. Apply seal coat to surface course in accordance with AI MS-19 standards.

3.7 BITUMINOUS TACK COAT AND PRIME COAT

A. General Requirements: The work includes the application of a bituminous tack coat on existing pavement, as indicated. The tack coat shall be applied only when the surface to be treated is dry or contains moisture not in excess of that which will permit uniform distribution and the desired adhesion.

Prime coat shall consist of liquid asphalt of low viscosity that will penetrate the prepared surface with asphalt so as to plug voids, top coat and bond dust and loose material particles and thus harden or toughen the surface, and to assist in waterproofing the base.

B. Materials: Bituminous material for the tack coat shall be emulsified asphalt conforming to ASTM D977, Designation SS-1. Prime coat shall be Grade MC 70 conforming to AASHO M82.

3.8 BITUMINOUS TACK COAT

A. Preparation of Surface: Immediately before applying a tack coat, all loose material, dirt, clay, or other objectionable material shall be removed from the surface to be coated with a power broom or blower supplemented with hand brooms. After the cleaning operation and prior to the application of the tack coat, an inspection of the area to be coated will be made to determine its fitness to receive the bituminous material.

B. Application of Tack Coat: Tack coat shall be spread at the approximate rate of between 0.05-0.10 gallon per square yard of surface covered. The material shall be heated and applied at a temperature between 75^{o} to 130^{o}F.

Tack coat shall be placed only so far in advance of the surface course placements as is necessary for it to cure to the proper condition for the placement of such course. The Contractor shall be responsible for the protection of the tack coat. Edges of existing pavement against which asphalt concrete course is to be placed shall be given a tack coat.

3.9 PRIME COAT

A. Preparation of Surface: Immediately before applying the prime coat, the surface to be treated shall be swept clean of all loose material, dirt, excess dust, or other objectionable material. No application will be permitted when the surface is appreciably damp or when weather conditions are unsuitable. The liquid asphalt shall be uniformly distributed over the surface by means of sprayer type distributor, pressure operated.

Hand sprayers shall be used to apply the liquid asphalt around castings, areas inaccessible to distributor bars, and whenever cover is insufficient. Road improvements shall be protected from splashing of asphalt. Surface splashed with asphalt shall be immediately cleaned off.

B. Application of Prime Coat: The prime coat shall be spread at the approximate total rate 0.25 gallon per square yard of surface covered. Any excess application of prime coat shall be removed immediately. Traffic shall be kept off the prime coat until it has penetrated the surfaces. The material shall be heated and applied at temperatures between 105^{o}F and 175^{o}F.

3.10 ASPHALTIC CONCRETE

A. Mixing: Asphalt cement shall be heated in a kettle of approved type and maintained at a temperature between 275^{o} to 325^{o}F. The heat must be so applied that there can be no burning of any portion of the asphalt concrete nor shall live steam be injected into the asphalt. The mineral aggregate shall be heated to a temperature between 275^{o} to 325^{o}F.

After heating to the required temperature, the required amount of asphalt cement shall be added to the heated aggregate in a mixer in first class condition. The minimum mixing period shall be 30 seconds and as much longer as may be necessary to produce a thoroughly blended mixture in which all the particles are coated uniformly. Any mixture which shows an excess or deficiency of asphalt, or any uneven distribution of cement due to insufficient mixing, shall be wasted.

B. Preparing of Surface: All surfaces on or against which asphalt concrete wearing surface course is to be placed shall first be given a prime or tack coating as specified, except clean surfaces of any course of asphaltic materials laid within the preceding 24 hours. The Contractor shall prepare the existing surface by power brooming to remove all loose particles, dust, sand, and other foreign materials.

C. Spreading and Finishing: If ordered by the Engineer, on existing base, surface, or pavement that has been prepared as specified herein above, a leveling course mixture shall be spread to level irregularities, dips, depressions, sags, and to provide a smooth base of uniform grade and cross section. The leveling course shall not be placed more that one day in advance of placing the surface course. No additional compensation will be allowed for furnishing, placing, and compacting the leveling course.

At locations where the width of asphalt concrete mixture to be spread is too narrow to permit the use of a self-propelled mechanical spreading and mixing machine, the mix shall be hand spread. The mix shall be dumped from the trucks onto dump boards from which the material shall be shoveled onto the road and raked smooth to grade and contour. The mixture shall be finally shaped and smoothed by means of a wooden float 8 feet long. High spots and irregularities that are transverse to the path of traffic shall be cut down and the material redistributed over the area.

The surface course may also be spread with a mechanical, self-propelled spreading and finishing machine equipped with a hopper or mixture compartment to receive the mixture from the haul trucks and a screen or cutoff device that oscillates in a horizontal motion or vibrates vertically when striking off the course or lift under construction. The screen shall be capable

of adjusting to the required crown and elevation and shall be capable of distributing the full width of a traffic lane. Spreading of the mixture form hauling trucks will not be permitted.

If a paving machine is used, it shall be operated in such a manner as to distribute the mixture to proper cross section, width, and thickness without segregation or aggregates. If the paving machine leaves ridges, indentations, or other marks in the surface that cannot be eliminated by rolling or prevented by adjustment in operation, its use shall be discontinued and another paving method, acceptable to the Engineer, shall be used by the Contractor.

The maximum depth of asphalt concrete which may be spread and rolled in any one course or lift shall not exceed a compacted thickness of 2 inches. For resurfacing work, the maximum in any one lift shall be 1-1/2 inches, and for driveway construction, the maximum compacted thickness shall be 1-1/4 inches.

If more than one course is to be constructed in any area, not more than 24 hours shall elapse between the spreading and finishing of any two successive courses in that area. New wearing surface mixture shall be spread during unsuitable weather or when the base is wet.

At locations where the width of the asphalt concrete to be placed is too narrow to use rolling equipment, compaction shall be by pneumatic tampers or by other methods that will produce the same degree of compaction as pneumatic tampers. The asphalt concrete shall be thoroughly compacted to the required lines, grades, and cross sections.

Where the width of the asphalt concrete to be placed permits, compaction shall be by self-propelled rollers. The minimum rolling equipment shall be one 2 axle tandem roller weighing at least 8 tons. Compaction shall consist of at least 3 complete coverage with the tandem roller.

D. Smoothness: The finished surface of the pavement shall be true to grade and cross section, free from depression and grainy spots, and shall show a uniform texture.

The top of valve box covers shall be level with the constructed pavement or adjoining surfaces, as applicable. Shoulder areas shall be graded smooth and side ditches reshaped to their previous condition.

E. Sampling and Testing: All sampling and testing shall be conducted by an

approved testing laboratory at the expense of the Contractor.

All material samples shall be supplied by the Contractor at his expense. All materials and material sources shall be approved prior to the use of materials in the work. Sampling of plant mixtures shall be in accordance with ASTM D979. Testing of aggregates shall be made on each sample without delay. Gradation tests shall be made on each sample in accordance with ASTM C136.

The aggregate shall be tested for wear (Los Angeles Test) in accordance with ASTM C131. One test shall be performed initially prior to incorporation into the work and whenever the source is changed. A stripping test in accordance with AASHTO T182 shall be performed initially on all aggregate prior to incorporation into the work and whenever the source is changed. Thickness of the surface course shall be determined on cores taken for the density tests. The compacted surface of the surface course shall be straight-edge tested as the work progresses. The straight-edge shall be applied parallel with and at right angles to the centerline after final rolling. Variations in the wearing course shall not vary more than plus or minus 1/8 inch in ten feet. Any portion of the pavement showing irregularities greater than that specified shall be corrected as directed by the Engineer.

3.11 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation from True Elevation: Within 1/2 inch.

3.12 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed.

B. Take samples and perform tests in accordance with AI MS-2.

3.13 PROTECTION

Immediately after placement, protect pavement from mechanical injury for 4 days.

3.14 SCHEDULES

A. Pavement at Truck Ramp and Garbage Area: Single course of 3-1/2 inch compacted thickness, sand seal coat.

B. Pavement at Parking Areas: Two courses; binder course of 2-1/2 inch compacted thickness and wearing course of 1 inch compacted thickness, fog seal coat.

C. Pavement at Bus Loading Area: Thickness and compaction of sub-base to support vehicles up to 30,000 lbs.

END OF SECTION

SECTION 02667
IN-LINE METERS AND VAULTS INSTALLATION

PART 1 – GENERAL

1.1 SECTION INCLUDES

This section includes water pipe, gate valves, ARVs, in-line meters, concrete, CMUs, preparation, bedding, installation, testing, disinfection and connection to main.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. PVC Water Main: There shall be no separate payment for the installation of PVC pipelines. It shall be included in the measurement for the in-line meter.

B. Ductile Iron Water Main: There shall be no separate payment for the installation of DI pipes. It shall be included in the measurement for the in-line meter.

C. Air Release Combination Valve: There shall be no separate payment for the installation of the ARV. It shall be included in the measurement for the in-line meter.

D. Connection to Existing Water Main: There shall be no separate payment for this item. It shall be included in the measurement for the in-line meter.

E. In line meter: Paid by unit, measured to the whole unit. Includes excavation, rock excavation, disposal of unsuitable materials and debris, erosion control, installation of pipes, meter, gate valves, as-built and all other fittings as specified on drawings.

F. CMU Vaults: Paid by unit, measured to the whole unit. Includes excavation, rock excavation, disposal of unsuitable materials and debris, erosion control, installation/laying CMUs, concreting, as-built and all other appurtenances necessary to comply with SOW as specified and as shown on drawings.

1.3 RELATED SECTIONS

A. Section 02110 - Site Clearing

B. Section 02315 - Excavating, Trenching and Backfilling

C. Section 02316 - Rock Removal

D. Section 03300 - Cast-in-Place Concrete

1.4 REFERENCES

A. ANSI/AWWA C104/A21.4 – Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water

B. AWWA C105 – Polyethylene Encasement for Ductile-Iron Piping for Water and Other Liquids.

C. ANSI/AWWA C110/A21.10 – Ductile Iron and Gray Iron Fittings, 3 Inch Through 48 Inch, for Water and Other Liquids

D. ANSI/AWWA C111/A21.11 – Rubber-Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings

E. ANSI/AWWA C150/A21.50 – Thickness Design of Ductile Iron Pipe

F. ANSI/AWWA C151/A21.51 – Ductile Iron Pipe, Centrifugally Cast, for Water or Other Liquids

G. ANSI/AWWA C153/A21.53 – Ductile Iron Compact Fittings, 3 Inch Through 16 Inch, for Water and Other Liquids

H. ANSI/AWWA C502 – Dry Barrel Fire Hydrants

I. AWWA C503 – Wet-Barrel Fire Hydrants

J. AWWA C504 – Rubber-Sealed Butterfly Valves

K. ANSI/AWWA C509 – Resilient Seat Gate Valves for Water and Sewerage Systems

L. ANSI/AWWA C515 – Reduced Wall, Resilient Seated Gate Valve for Water Supply Service

M. ANSI/AWWA C600 – Installation of Ductile Iron Water Mains and Their Appurtenances

N. ANSI/AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water

O. ANSI/AWWA C651– Disinfecting Water Mains

P. ANSI/AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inch Through 12 Inch, for Water Distribution

Q. AWWA C901 – Polyethylene (PE) Pressure Pipe, Tubing, and Fittings, ¾ inch through 3 inch, for Water.

R. ASTM D 1785 – Poly (VinylChloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

S. ASTM D 2241 – Poly (VinylChloride) (PVC) Plastic Pipe (SDR-PR).

T. ASTM D 2466 – Poly (VinylChloride) (PVC) Plastic Pipe Fittings, Schedule 40.

U. ASTM D 2855 – Making Solvent-Cememted Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

V. ASTM D 2239 – Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.

W. ASTM D 3139 – Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

X. ASTM F 477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

Y. Standard Methods for Examination of Water and Wastewater

Z. NSF 60 - Drinking Water Treatment Chemicals

AA. NSF 61 - Drinking Water System Components

1.5 SUBMITTALS

A. Method of Disinfection
B. Water Testing Lab
C. Method of Connection to Existing Distribution System

D. Method of Pressure Testing
E. Pressure Test Certification Forms

1.6 DEFINITIONS

A. Fully Restrained: Pipe installed with or including:

1. Certalok C900 joined pipe (or equal)
2. Pipe with Flanged connections
3. Pipe with mechanical joints

1.7 QUALITY ASSURANCE

A. Water testing shall be done by a State certified laboratory.

B. Pipe: Perform work in accordance with manufacturer's recommended procedures.

C. Pressure testing shall be done in accordance with the Project Engineer's requirements in Section 3.11.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and protect products to site.

1.9 ACCEPTANCE

A. Work covered by this section will not be accepted until the backfilling and testing has been completed satisfactorily.

B. 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 at contractor's expense.

PART 2 – PRODUCTS

2.1 WATER PIPE

A. Joint Thrust Restraint

1. Concrete Thrust Blocks:

a. One part Portland cement, 2 ½ part of fine aggregate, 3 ½ parts coarse aggregate and just enough water for a workable consistency.
b. #4 deformed rebars.

2. Spatial Anchoring Retainer Glands for Mechanical Joints:

a. PVC: Equal to

i) EBAA Iron Series 2000PV
ii) Romac Industries Grip Ring

2.2 ACCESSORIES

A. Thrust Blocks: Refer to Section 03300 (Cast-In-Place Concrete).

B. Marker Post

1. Manufacturers: Carsonite, Greenline
2. Flexible fiberglass, dual-sided.
3. Blue decal label on both sides as specified in drawing.

C. Protection Post

1. Black iron, 3 inch diameter, 6 feet long, buried 3 feet.
2. Cover each post at the top with 2 coats of yellow reflectorized paint or tape for a band 3 inches wide.
3. Metallic Tracer Tape, magnetic detectable conductor, plastic covering, imprinted with "Water Line" in large letters, copper tracer wire.

PART 3 – EXECUTION

3.1 EXAMINATION

Verify existing water main size and location.

3.2 DELIVERY, STORAGE AND HANDLING

A. Ensure that pipe is free from defects and damage at time of delivery and prior to installation in the trench.

B. Remove all defective pipes from the site within 24-hours of discovery.

C. Handle pipe with padding between metal machinery and pipe.

D. Keep dirt and foreign matter away from the pipe interiors and sealing surfaces.

E. Lower pipe carefully into the trench without dropping, rolling or dumping.

3.3 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, and remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

3.4 BEDDING

A. Excavate pipe trench in accordance with Section 02315 (Excavating, Trenching and Backfilling). Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Backfill around sides and to top of pipe with bedding material and tamp in place.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.5 INSTALLATION - WATER MAIN

A. Maintain separation distances of water main from sewer pipe as per American Samoa Environmental Protection Agency specifications.

B. Route pipe in straight line.

C. Install pipe to allow for expansion and contraction without stressing pipe

or joints.

D. Install water mains and appurtenances in the locations and of the sizes and materials shown on the drawings and bid schedule.

E. 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.

F. Promptly remove all debris that enters the pipeline and swab the area with a 1% hypochlorite solution.

G. Install pipe with a minimum cover depth of 36-inches measured from finished grade to top of pipe.

H. Install thrust restraint on all fittings and appurtenances. Contractor's option of the following unless specifically noted on the plans:

1. Concrete Thrust Blocks:
   a. Pour thrust blocks against the fitting and undisturbed earth.
   b. Place concrete thrust blocks so that the pipe and joints will be accessible for repair.
   c. Install rebar around the fitting and embed rebar in concrete thrust block as shown on detail drawings.
   d. Use full 20-foot sections of pipe out of fittings or valves, otherwise use restrained joints within 20-feet of fitting or valve.

2. Special Anchoring Retainer Glands:
   a. Install in accordance with manufacturer's recommendations.
   b. Project Engineer may specify that an additional; restraint be used for pipe sections near critical fittings.

3. Joint Restraint Rodding ("shackle rods")
   a. Rod from hydrant tees to ears on the hydrant base elbow.
   b. Rod from fitting to fitting.
   c. Install tie bolts to connect tie rods, if required.
   d. install duc lugs where required to increase the with of the rodding.
   e. Paint rods and hardware with two coats of bituminous coating.

I. 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.

J. Horizontal Pipe Deflection:

1. PVC:
   a. 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
6 in.	144 ft.	16 in.
16 in.	231 ft.	10 in.

   b. Deflection will not be permitted at the joint and must be via a continuous arc of constant radius.

2. Ductile Iron
   a. Ductile iron push-on joints mains may be deflected in accordance with the manufacturer's recommendations and AWWA C600.
   b. 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.

K. Install access fittings per Section 02675 (Disinfection of Water Main System).

L. Form and place concrete for thrust restraints at each elbow or direction change of pipe main.

M. Install Metallic Tracer Tape buried continuously at 12 inches below finish grade.

N. Backfill per Section 02315 (Excavating, Trenching and Backfilling).

O. Install marker post and all bends, gate valves…etc as shown on the detail.

P. 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 IN-LINE METERS, STRAINERS, VALVE, VALVE BOX AND MARKER INSTALLATION

A. Install meters, strainers, and valves at location indicated on the plans and as per manufacturers installation requirements.

B. Set valves on solid bearing.

C. Install thrust blocking and rebar as shown in the drawings.

D. Center and plumb valve box over valve. Set box cover as specified in drawings.

E. Valve Marker Post Installation:
   1. Set post with 18-inches of post above grade with “V” pointing toward gate valve.
   2. Paint the marker post “safety blue”.
   3. Stencil the size of the valve and the distance to the valve on the post with 2-inch tall black lettering.
   4. Install every 300 feet or as directed by the Engineer.

F. Install concrete collar around gate valve lid.

3.7 WARNING TAPE INSTALATION

Install warning tape in water main trench 1-foot below finish grade, centered over the pipeline.

3.8 PIPELINE MARKER POST INSTALLATION

A. 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.

B. If the pipeline is under a traveled roadway, install the marker posts offset from the pipe at a consistent distance.

C. Allow 36-inches of the post to be exposed above grade.

D. Stencil the water main information, including offset distance, diameter of pipe, and pipe material neatly on the post.

3.9 PRESSURE AND LEAKAGE TESTING

A. Whenever practical, before backfill is placed or joint covered, test pipe for leaks.

B. 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.

1. Water pressure gauges shall be liquid filled with 5 psi or less increments.
2. Pump shall be of a design that limits introduction of air. Defective equipment shall be replaced.

C. 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.

D. Test Duration: 2 hours minimum

E. Maximum length of test section: 1,000-feet.

F. 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.

G. Testing Procedure:

1. Fill test section with potable water at a velocity below 1ft/s.
2. Expel all air from the test section.
3. Install corporation stops at high points if necessary to facilitate removal, and cap off after successful completion of the test
4. Verify that all fire hydrant lead valves and main valves within the test section are open.
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.
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.

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.
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.
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.

H. Allowable Leakage Determination

$$L = (N*D*P^{1/2})/7400$$

L = Allowable Leakage (gph)
N = Total Length Tested Divided by the Standard Pipe Length
D = Nominal Diameter of Pipe (inches)
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

I. Repair, at no cost to owner, any section of the line that fails this test.

J. Repair any visible leakage, regardless of the result of the leakage test.

K. Retest all repaired sections of line, at no cost to the owner, until pressure test is successfully completed.

L. Complete pressure test certification forms and submit to Project Engineer within five (5) days of pressure test.

3.11 FLUSHING WATER MAINS

A. Flush with potable water to provide 3 volumetric exchanges in the pipeline at a minimum velocity of 3 feet per second.

B. “Pig” line after flushing if sediment or debris is still visible in the discharge.

3.12 DISINFECTION OF WATER MAINS

A. Disinfect in accordance with one of the methods outlined in Section 5 of AWWA C651

1. Continuous Feed Method:
   a. Feed a chlorine solution into water entering the main such that the water will have a 25-mg/L free chlorine concentration.
   b. Continue feeding until the entire pipeline to be disinfected is filled with the chlorinated water.
   c. 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.

2. Slug Method:
   a. Feed a chlorine solution into water entering the main such that the water will have a 100-mg/L free chlorine concentration.
   b. Apply the solution continuously and sufficiently to ensure that a column of water with 100mg/L free chlorine residual is formed in the pipe.
   c. Ensure that all parts of the main and its appurtenances are exposed to the column for at least 3-hours.
   d. 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.

B. 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.

C. 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.

1. Check the chlorine residual at time of disposal.
2. If disposal is to the ground surface or ditch, neutralize the chlorine residual if the free residual is above 1 mg/L.
3. Use the following neutralization chemical schedule:
   a. Sulfur dioxide at 0.8 lb/100,000 gals/mg/L of free chlorine
   b. Sodium Bisulfite at 1.2 lb/100,000 gals/mg/L of free chlorine
   c. Sodium Sulfite at 1.4 lb/100,000 gals/mg/L of free chlorine
   d. Sodium Thiosulfate at 1.2 lb/100,000 gals/mg/L of free chlorine
4. Continue flushing until the residual reaches distribution system levels.

D. After disinfecting and flushing but before the water main is placed in service, collect and test water samples for bacteriological quality.

1. Sample in accordance with the Standard Methods for Examination of Water and Wastewater.
2. Take two consecutive batches of tests, 24 hours apart.
3. Collect samples from each pipe end and at approximately 1200 feet intervals along each main.
4. Deliver samples to a state certified testing lab and provide Project Engineer with results within 24 hours of laboratory results.

E. 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.

F. Do not place main in service until the Project Engineer has received safe bacteriological results.

3.13 TRACING WIRE INSTALLATION

A. Install with all PVC, Ductile Iron, and HDPE Pipe.

B. 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.

C. Avoid underground splices, but where necessary, make splices with an underground, waterproof splice kit.

D. Provide riser boxes at maximum intervals of 1000 feet or at fire hydrant locations.

1. Install an independent tracing wire line between each tracing wire box in each direction of pipe.
2. Bring tracing wire a minimum of 18 inches above ground surface directly behind each hydrant using box construction specified.
3. Install box to elevation that will not interfere with operation and maintenance of the hydrant.

3.14 CONNECTION TO EXISTING WATER MAINS

A. Make the necessary arrangements with ASPA a minimum of three (3) working days prior to any connections to any water mains.

B. 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.

C. 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.

D. 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.

E. 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.

F. Spray or swab all connection components with a 1% hypochlorite solution prior to installation.

G. Visually inspect any joint not pressure tested for leakage.

1. Test under system pressure prior to backfilling.
2. Test in the presence of the ASPA representative.
3. Repair and retest any joint with leakage until no leakage is visible at no cost to the owner.

3.15 CMU VAULTS

A. Construct all vaults to levels and dimensions as specified and as shown on the drawings.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 SECTION INCLUDES

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

1.2 MEASUREMENT AND PAYMENTS

A. There shall be no separate payment for this item. It shall be included in the measurement for the installation of the in-line meters and CMU vaults.

1.3 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.

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

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

D. ACI 305R - Hot Weather Concreting.

E. ACI 306R - Cold Weather Concreting.

F. ACI 308 - Standard Practice for Curing Concrete.

G. ACI 318 - Building Code Requirements for Reinforced Concrete.

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

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

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

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

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

M. ASTM C33 - Concrete Aggregates.

N. ASTM C94 - Ready-Mixed Concrete.

O. ASTM C150 - Portland Cement.

P. ASTM C330 - Light Weight Aggregates For Structural Concrete.

Q. ASTM C494 - Chemicals Admixtures for Concrete.

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

1.4. PROJECT RECORD DOCUMENTS

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

1.5. QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Maintain one copy of documents on site.

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

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

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

PART 2 – PRODUCTS

2.1. CONCRETE MATERIALS

A. Cement: ASTM C150, Portland type II.

B. Water: Clean and not detrimental to concrete.

2.2. ACCESSORIES

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 4,000 psi in 28 days.

Concrete Masonry Units: All Workmanship and materials shall be in accordance with the latest edition of Uniform Building code and ACI 117-06. CMUs shall have a min compressive strength at 28 days of 1500 psi. Mortar shall have a min compressive strength of 1500 psi. All CMU shall be 6" to match the existing materials and shall be filled with 2000 psi grout. All units shall be sound and free of cracks or other defects that interfere with the proper placement of the unit or significantly impair the strength or permanence of the construction. CMU shall be constructed in running patterns throughout and shall be wetted during placement. The initial bed joint shall not be less than 1/4" in thickness or more than 1" thick, subsequent joint shall not be less than 1/4" or more than 1/2" in thickness.

2.3 CONCRETE MIX

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

B. Use accelerating admixtures only when approved by Engineer.

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

PART 3 – EXECUTION

3.1 EXAMINATION

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

B. 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

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

B. 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

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

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

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

D. 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.

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

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

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

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

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

3.4 CONCRETE FINISHING

A. Finish concrete surfaces in accordance with ACI 301.

3.5 CURING AND PROTECTION

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

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

C. Cure all surfaces in accordance with ACI 308.

3.6 FIELD QUALITY CONTROL

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

B. Submit proposed mix design of each class of concrete to Owner for review prior to commencement of Work.

C. Tests of cement, aggregates and concrete may be performed to ensure conformance with specified requirements.

3.7 PATCHING

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

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

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

3.8 DEFECTIVE CONCRETE

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

B. Repair or replacement of defective concrete will be determined by the Engineer.

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

3.9 SCHEDULE - CONCRETE TYPES AND FINISHES

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

3.10 REBAR

A. All reinforcement shall be deformed bars. Sizes are as specified on drawings.

B. Rebar spacing shall be as specified on drawings.

END OF SECTION