

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to work of this section.
- B. Alaska Department of Transportation and Public Facilities (ADOT&PF) Standard Specifications for Highway Construction, 2015 Edition, to the extent referenced.
- C. Related Sections:
 - 1. Section 01 57 20 – Erosion, Sediment, and Pollution Control.
 - 2. Section 31 22 13 - Rough Grading.
 - 3. Section 31 23 16 - Excavation.
 - 4. Section 31 23 17 – Trenching.
 - 5. Section 31 23 23 - Fill.
 - 6. Section 32 11 23 – Aggregate Surface Course.

1.2 SUMMARY

- A. Section Description:
 - 1. Soil Materials for site work. Aggregate surface course material is in Section 32 11 23 AGGREGATE SURFACE COURSE.
 - 2. The Owner provides ADOT&PF driveway application permit plan review and approval.
 - 3. The traffic control plan (TCP) submitted to ADOT&PF for the driveway permit application is schematic in nature. The CONTRACTOR shall provide a TCP signed in accordance with the latest edition of the Manual on Uniform Traffic Control Devices (MUCTD), submitted to and approved by ADOT&PF, at least 10 days prior to beginning any driveway construction.
- B. Contractor-provided independent test laboratory/Testing Agency for all soil gradation test requirements. Testing services shall include all equipment, labor, materials, and testing plan.
- C. See Specification Section 01 57 20 EROSION, SEDIMENT, AND POLLUTION CONTROL, Paragraph Submittals, for the SWPPP associated with CONTRACTOR site work.

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO T96 - Test for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- B. ASTM International:
 - 1. ASTM C117 - Materials Finer than 75-Micrometer (No. 200) Sieve in Mineral Aggregates by Washing.
 - 2. ASTM C136 - Sieve Analysis of Fine and Coarse Aggregates.
 - 3. ASTM D75 - Sampling Aggregates.
 - 4. ASTM D422 - Particle-Size Analysis of Soils.

5. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

C. Alaska Test Method (ATM):

1. ATM 207 – Moisture Density Relations of Soil.
2. ATM 204 – Determining Liquid Limit of Soils.
3. ATM 205 – Determining Plastic Limit and Plasticity Index of Soils.
4. ATM 212 – Determining the Standard Density of Coarse Granular Materials Using the Vibratory Compactor.
5. ATM 304 – Sieve Analysis of Fine and Coarse Aggregates.
6. ATM 313 – Degradation Value of Aggregate.

1.4 SUBMITTALS

- A. See Division 01 General Requirements for submittal procedure.
- B. Laboratory Tests: For all soil used as fill and backfill.
 1. ATM 304 soil gradations and, ATM 207 and ATM 212 optimum moisture-maximum density curve for each Soil Material used.
- C. Material Source: Submit name of imported materials source.
- D. Manufacturer's Certificate: Certify products meet or exceed requirements.

1.5 QUALITY ASSURANCE

- A. Furnish each soil material from single source throughout the Work. If the source changes, then provide a new set of material submittals per Article SUBMITTALS.

1.6 DEFINITIONS

- A. Excavation consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.
- B. Non-Frost-Susceptible (NFS) soils are inorganic soils containing 5 percent or less by weight grains finer than Sieve No 200.
 1. Test Method: ASTM C117, C136, D75, and D422.
- C. Fill is material placed above the existing surface.
- D. Backfill is material placed in an excavation.
- E. Bedding is material in which buried pipes, cables, and utility appurtenances are set.
- F. Unsuitable soil is in-place soil or other material that can be identified as having insufficient strength characteristics or unsuitable to carry intended loads without excessive consolidation or loss of stability. Materials which do not comply with the requirements for soil materials are unsuitable. Materials classified in ASTM D2487 as PT, OH, or OL are unsuitable. Unsuitable materials also include refuse or uncompacted backfills from previous construction.

- G. Compaction is by tamping soil with a hand tool or machine to achieve a specific in-place density.
- H. Unstable subgrade includes pockets of soft, yielding soil identified during subgrade compaction and soil identified by subgrade inspection.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Soil Materials - Soil material used for fill and backfill shall be free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, and deleterious or objectionable materials and shall not contain unsuitable material and frozen material. Unless specified otherwise, the maximum particle diameter shall be one-half the lift thickness at the intended location. Soil materials include Structural, Subbase, Granular, General Fill, and Bedding.
- B. Subbase - Subbase soil material shall be NFS gravel, as produced from approved sources. It shall consist of crushed or naturally occurring granular material, which provides a uniform mixture complying with the requirements of these specifications, as to gradation, soil constants, and capability of being compacted into a dense and stable structure. The material shall be free of vegetable matter, trash, snow and ice, lumps, or excessive amounts of silt, clay and other objectionable foreign substances and may be pit-run material that meets the requirements specified in the following tables.

Table 1: Subbase Material Gradation Determined by ATM 304

<u>Sieve Size</u>	<u>% Passing by Weight</u>
2 inch	100
3/4 inch	40 - 80
No. 4	15-60
No. 200	*5.0 max.

(*Based on that portion passing the 3-inch screen.)

Table 2 : Subbase Material Properties

<u>Property</u>	<u>Test Method</u>	<u>Requirement</u>
L.A. Wear %	AASHTO T 96	50, max.
Liquid Limit	ATM 204	25, max.
Plasticity Index	ATM 205	6, max.
Degradation Value	ATM 313	40, min.

- C. Structural Fill - Structural fill shall meet the same soil material gradation requirements as Subbase.
- D. General Fill – Approved in writing, based on visual and soil texture field inspection by the Owner’s Representative, soil with the characteristics required to compact to the soil density

specified for the intended location. General Fill cannot be substituted for locations where Subbase, Structural, or Bedding is shown in the drawings.

- E. Granular - Granular material shall be hard, durable particles or fragments of stone or gravel with the following gradation ranges.

Table 3: Granular Material Gradation Determined by ATM 304

<u>U.S. Std. Sieve</u>	<u>Cumulative % Passing by Weight</u>
2"	100
1"	0-100
1/2-inch	0-100
3/8-inch	0-30
No. 200	0-1

- F. Bedding Material: Bedding material shall be gravel or sand and shall not have mechanically fractured material. Pipe bedding shall meet the following gradation. The Contractor shall provide non-frost-susceptible bedding for direct bury cable in accordance with cable manufacturer requirements.

Table 4 : Bedding Material Gradation Determined by ATM 304

<u>U.S. Std. Sieve</u>	<u>Cumulative % Passing by Weight</u>
3/4-inch	100
No. 40	Less than 40
No. 200	0-3

2.2 SOURCE QUALITY CONTROL

- A. When tests indicate materials do not meet specified requirements, change material and retest.
- B. Furnish materials of each type from same source throughout the Work. If the source changes, then provide a new set of material submittals per Article SUBMITTALS.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Excavated material shall be used to the maximum extent possible for Soil Material.
- B. Stockpile excavated material potentially meeting requirements for Soil Material separate from unsuitable soil. Before using excavated soil for fill and backfill, it shall be tested to confirm that it meets requirements set forth in Part 2 PRODUCTS.

3.2 STOCKPILING

- A. Stockpile materials on site at locations coordinated and approved by the OWNER's Representative.

- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Prevent intermixing of soil types or contamination.
- E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.

3.3 STOCKPILE CLEANUP

- A. Grade stockpile to prevent free standing surface water. Leave area in clean and neat condition.

END OF SECTION

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PART 1 - GENERAL

1.1 SUMMARY

- A. Section Description:
 - 1. Clearing trees.
 - 2. Grubbing associated with driveway construction earthwork.

1.2 SUBMITTALS

- A. See Division 01 General Requirements for submittal procedure.
- B. Disposal sites for clearing and grubbing debris.
- C. See Specification Section 01 57 20 EROSION, SEDIMENT, AND POLLUTION CONTROL, Paragraph Submittals, for the SWPPP associated with CONTRACTOR site work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing plant life designated to remain is tagged or identified.
- B. Identify staging areas for placing removed materials not immediately removed from the site.

3.2 PREPARATION

- A. Underground Utility Locates: Request underground utilities to be located and marked within and surrounding clearing and grubbing areas.
 - 1. Call Alaska Dig Line at (907) 278-3121 for private utility line information not less than one (1) week before performing Work.

3.3 PROTECTION

- A. Locate, identify, and protect utilities indicated to remain, from damage.
- B. Protect trees, plant growth, and features designated to remain by erecting barriers or by such other means as the circumstances require.
- C. Protect bench marks, survey control points, and existing structures from damage or displacement.

3.4 BURNING

- A. The use of burning at the project site for the disposal of refuse and debris will not be permitted.

3.5 USE OF EXPLOSIVES

- A. Use of explosives will not be permitted.

3.6 CLEARING AREAS

- A. Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including down timber, snags, brush, and rubbish occurring in the areas to be cleared.
- B. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface.
- C. Trees and stumps shall be removed from areas designated for clearing and grubbing. This work shall include the felling of such trees. The removal of their stumps and roots shall occur only in grubbing area. Trees shall be disposed of as specified in paragraph MATERIALS DISPOSAL

3.7 GRUBBING AREAS

- A. Grubbing shall consist of the removal and disposal of stumps, roots and matted roots to the top of gravel subgrade.
- B. Material to be grubbed, together with logs and other organic or in-organic debris shall be removed to the top of gravel subgrade as needed to construct the driveway.

3.8 UTILITY AND SURFACE FEATURE REMOVAL

- A. Remove abandoned utilities. Indicated removal termination point for underground utilities on Record Documents.
- B. Continuously clean-up and remove waste materials from site. Do not allow materials to accumulate on site.
- C. Do not burn or bury materials on site.

3.9 MATERIALS DISPOSAL

- A. All material generated during site clearing and grubbing operations shall be disposed of at a Contractor provided disposal site. Chipping is at the discretion of the Contractor. Debris shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Federal, State, and Local regulations regarding hauling and disposal shall apply.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Description:

1. Excavation, filling, and back filling for rough grading to top of subbase.
2. Soil compaction density and testing interval requirements.
3. CONTRACTOR provided independent test laboratory/Testing Agency for all soil compaction and soil gradation test requirements. Testing services shall include all equipment, labor, materials, and testing plan.

B. Related Specification Sections:

1. Section 31 00 00 - Earthwork.
2. Section 31 23 16 - Excavation.
3. Section 31 23 23 – Fill.

1.2 REFERENCES

A. Alaska Test Methods (ATM):

1. ATM 207 – Moisture Density Relations of Soils.

B. ASTM International:

1. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. See Division 01 General Requirements for submittal procedure.

B. Pre-Construction Submittal:

1. Field In-Place Density Testing Plan. Provide this submittal under Section 31 23 23, FILL.

C. Laboratory Tests: Soil Material gradations and moisture-density curve are submitted under Section 31 00 00 EARTHWORK.

D. Field In-Place Density Testing Results and location of all testing sites.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Soil Materials: As specified in and submittals under Section 31 00 00 EARTHWORK.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Project Management and Coordination: Verification of existing conditions before starting work.
- B. Verify survey bench mark and intended elevations for the Work are as indicated on Drawings.

3.2 PREPARATION

- A. Underground Utility Locates: Request underground utilities to be located and marked within and surrounding construction areas.
 - 1. Call Alaska Dig Line at (907) 278-3121 for private utility line information not less than one (1) week before performing Work.
- B. Identify required lines, levels, contours, monuments, and datum.
- C. Notify and coordinate with utility companies to remove and relocate utilities.
- D. Protect utilities indicated to remain from damage.
- E. Protect plant life, pavements, roadway surfaces, and other site features remaining as portion of final landscaping.
- F. Protect bench marks, survey control point, existing structures and paving from excavating equipment and vehicular traffic.

3.3 CONSTRUCTION DURING FREEZING CONDITIONS

- A. See Specification Section 31 23 23 FILL, Construction During Freezing Conditions.

3.4 EXCAVATION

- A. CONTRACTOR shall perform all excavation of every description and of whatever substances encountered to the depth indicated on the drawing or otherwise specified.
- B. See Specification Section 31 23 16 EXCAVATION for stockpiling and Specification Section 31 00 00 EARTHWORK for testing of excavated soil considered for reuse. Gradation testing of excavated soil shall be completed before it is used for project fill and backfill.
- C. Remove excess excavated soil not intended for reuse, from site.

3.5 SUBGRADE PREPARATION

- A. See Specification Section 31 23 23 FILL, Subgrade Preparation.

3.6 BACKFILLING

- A. See Specification Section 31 23 23 FILL, Backfilling.

3.7 TOLERANCES

- A. Top Surface of Rough Grading: Plus or minus 0.08 foot from required elevation.

3.8 FIELD QUALITY CONTROL

- A. Definition: Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ATM 207.
- B. Field in-place density shall be determined in accordance with ASTM D6938. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job, on each different type of material encountered, at intervals as directed by the Project Engineer. Copies of calibration curves, results of calibration tests, and field and laboratory density tests shall be furnished to the Project Engineer and CONTRACTOR. When tests indicate Work does not meet specified requirements, remove soil lift, replace and retest.
- C. The following table describes minimum soil compaction density and field testing requirements.

Material/Location	Test Method	Number of Tests	*Minimum Compaction Density, ATM 207
General Fill	ASTM D6938	Minimum of 2 tests per lift or 1 test per 8,000 sq. ft., whichever is greater.	90%
Subbase	ASTM D6938	Minimum of 4 tests per lift or 1 test per 4,000 sq. ft., whichever is greater.	95%
*Minimum soil compaction density unless noted otherwise on the Drawings.			

END OF SECTION

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PART 1 - GENERAL

1.1 SUMMARY

- A. Section Description:
 - 1. Excavation for new structures, utilities, storm water basin, and traffic areas.
- B. Related Specification Sections:
 - 1. Section 31 00 00 - Earthwork
 - 2. Section 31 22 13 – Rough Grading.
 - 3. Section 31 23 17 – Trenching.
 - 4. Section 31 23 23 – Fill.

1.2 SUBMITTALS

- A. Sheeting and Shoring: As it occurs during the course of CONTRACTOR's work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

- A. Underground Utility Locates: Request underground utilities to be located and marked within and surrounding construction areas.
 - 1. Call Alaska Dig Line at (907) 278-3121 for private utility line information not less than one (1) week before performing Work.
- B. Identify required lines, levels, contours, and datum.
- C. Notify and coordinate with utility companies to remove and relocate utilities.
- D. Protect and support utilities indicated to remain from damage. Any outage shall be coordinated with and approved by the Project Engineer.
- E. Protect bench marks, survey control points, existing structures, pavements, roadway embankments from excavating equipment and vehicular traffic damage.

3.2 EXCAVATION

- A. Excavations shall be reasonably smooth and uniform to the lines, grades and cross sections shown in the Drawings or as directed by the Owner's Representative. Excavations shall be conducted to ensure that material outside of excavation limits remains undisturbed.

- B. Perform compaction in accordance with Specification Section 31 22 13 ROUGH GRADING.
- C. Slope banks as required to meet Occupational Safety and Health Administration (OSHA) requirements.
- D. Do not interfere with 45-degree bearing splay of foundations.
- E. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- F. Trim excavation. Remove loose matter.
- G. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yards measured by volume.
- H. Notify Owner's Representative of unexpected subsurface conditions.
- I. Correct areas over excavated with subbase fill. See Specification Section 31 00 00 EARTHWORK for soil gradation requirements.
- J. Remove excess and unsuitable material from site.

3.3 EXCAVATED SOIL REUSE

- A. Excavated material shall be used to the maximum extent possible for project fill and backfill. Before use, excavated soil shall be tested to confirm that it meets gradation requirements set forth in Specification Section 31 00 00, EARTHWORK, Part 2 PRODUCTS.

3.4 STOCKPILING

- A. Stockpile materials on site at locations coordinated and approved by the Owner's Representative.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Prevent intermixing of soil types.
- E. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
- F. Grade stockpiles to prevent standing surface water.
- G. Leave soil stockpile area in a clean and neat condition.

3.5 SHEETING AND SHORING

- A. The Contractor shall sheet, shore, and brace excavations as required to prevent danger to persons, structures and adjacent properties and to prevent caving, erosion, and loss of surrounding soil.

- B. Sheeting and shoring designed to be left in place as part of the completed Work, shall be cut off minimum 36 inches below finished grade.
- C. If sheeting and shoring is used it shall be designed by a registered professional engineer and submitted to the OWNER for approval.

3.6 DEWATERING

- A. Prevent surface water from flowing into excavations and from flooding project site and surrounding area.
- B. Do not allow water to accumulate in excavations. Provide and maintain pumps, sumps, suction, and discharge lines, and other dewatering system components necessary to convey water away from excavations.
- C. Establish and maintain temporary drainage ditches, and other diversions outside excavation limits, to convey rainwater, and water removed from excavations, to collecting or runoff areas. Do not use trench excavations as temporary drainage ditches.
- D. Dewatering activity shall be in accordance with State of Alaska, Alaska Pollution Discharge Elimination System (APDES), General Permit for Excavation Dewatering, Permit Number AKG002000. This permit expires midnight, July 31, 2019.

3.7 FIELD QUALITY CONTROL

- A. See Specification Section 31 22 13 ROUGH GRADING for soil compaction testing requirements. See Specification Section 31 00 00 EARTHWORK for soil gradation requirements.
- B. Request visual inspection of subgrade bearing surfaces by Project Engineer before installing subsequent work.

3.8 PROTECTION

- A. Prevent displacement or loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- C. Protect and support structures, utilities and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

END OF SECTION

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PART 1 - GENERAL

1.1 SUMMARY

- A. Section Description:
 - 1. Utility trench backfilling and compaction.
 - 2. Section 31 23 17, TRENCHING, does not include surface restoration or utility pipe, conduit, and cables.
- B. Contractor-provided independent test laboratory/Testing Agency for all soil compaction and soil gradation test requirements. Testing services shall include all equipment, labor, materials, and testing plan.
- C. Related Sections:
 - 1. Section 31 00 00 – Earthwork.
 - 2. Section 31 22 13 - Rough Grading.
 - 3. Section 31 23 16 – Excavation.
 - 4. Section 31 23 23 – Fill.

1.2 REFERENCES

- A. Alaska Test Methods (ATM):
 - 1. ATM 207 – Moisture Density Relations of Soils.
- B. ASTM International:
 - 1. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 DEFINITIONS

- A. Utility: Any buried pipe, duct, conduit, or cable.

1.4 SUBMITTALS

- A. See Division 01 General Requirements for submittal procedure.
- B. Pre- Construction Submittal:
 - 1. Field In-Place Density Testing Plan. Provide this submittal under Section 31 23 23, FILL.
 - 2. Traffic Control Plan for Utility Installation Work.
 - a. Includes a plan approved by Alaska Department of Transportation & Public Facilities (ADOT&PF) for work in the Airport Road Right of Way.
- C. Laboratory Tests: Soil Material gradations and moisture-density curve are submitted under Specification Section 31 00 00 EARTHWORK.

- D. Field In-Place Density Testing Results and location of all testing sites.

1.5 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.6 COORDINATION

- A. Verify Work associated with lower elevation utilities is complete before placing higher elevation utilities.

PART 2 - PRODUCTS

2.1 FILL MATERIALS

- A. Soil Materials: As specified in Specification Section 31 00 00, EARTHWORK.
- B. Granular Soil Material: As specified in Specification Section 31 00 00, EARTHWORK.
- C. Bedding Material: As specified in Specification Section 31 00 00, EARTHWORK.

PART 3 - EXECUTION

3.1 LINES AND GRADES

- A. Lay pipes to lines and grades indicated on Drawings.
 - 1. The OWNER's Representative reserves right to make changes in lines, grades, and depths of utilities when changes are required for Project conditions.
- B. Maintain grade and alignment of pipe, cable, or conduit as shown on the Drawings or determined through coordination with the utility owner.

3.2 PREPARATION

- A. Call Local Utility Line Information service not less than three (3) working days before performing Work.
 - 1. Request underground utilities to be located and marked within and surrounding construction areas.
- B. Identify required lines, levels, contours, and datum locations.
- C. Protect plant life, and other site features remaining as portion of final surfacing.

- D. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- E. Maintain and protect above and below grade utilities indicated to remain.
- F. Establish temporary traffic control and detours when trenching is performed in public right-of-way. Relocate controls and reroute traffic as required during progress of Work. The Contractor shall provide a traffic control plan for approval prior to beginning Work.

3.3 CONSTRUCTION DURING FREEZING CONDITIONS

- A. See Specification Section 31 23 23 FILL, Construction During Freezing Conditions.

3.4 TRENCHING

- A. The Contractor shall perform all excavation of every description and of whatever substances encountered to the depths indicated on the Project drawing or as coordinated with the utility owner.
- B. Remove lumped soil, boulders, and rock up of 1/3 cubic yard, measured by volume.
- C. Perform excavation within 24 inches of existing utility service in accordance with utility owner requirements.
- D. Do not advance open trench more than 200 feet ahead of installed pipe, cable, or conduit.
- E. Cut trenches to width and depths indicated on Drawings. Remove water or materials that interfere with Work in accordance with the CONTRACTOR's Storm Water Pollution Prevention Plan (SWPPP).
- F. Provide uniform and continuous bearing and support for bedding material, pipe, cable, and conduit.
- G. Do not interfere with 45 degree bearing splay of foundations.
- H. Trench excavation shall conform to all Federal, State, and Local workplace safety regulations.
- I. When subsurface materials at bottom of trench are loose or soft, immediately contact the OWNER's Representative. Coordinate with the Representative to determine extents of additional trench excavation.
- J. Cut soft areas of subgrade not capable of compaction in place. Backfill with structural soil and compact to density equal to or greater than requirements for subsequent fill material. Where subgrade is saturated use a granular fill. Coordinate fill selection with the Project Engineer. See Section 31 00 00 EARTHWORK for soil gradation requirements.
- K. Trim excavation. Hand trim for bell and spigot pipe joints. Remove loose soil.

- L. Correct areas over excavated areas with compacted backfill.

3.5 SHEETING AND SHORING

- A. The CONTRACTOR shall sheet, shore, and brace excavations as required and as described in Section 31 23 16 EXCAVATION.
- B. Sheeting and shoring designed to be left in place as part of the completed Work, shall be cut off minimum 36 inches below finished grade.

3.6 BACKFILLING

- A. Backfill trenches to contours and elevations with unfrozen fill materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- C. Place fill material in continuous layers and compact to densities found in Article FIELD QUALITY CONTROL. Place soil material in continuous layers as follows:
 - 1. Soil Materials: Maximum loose lift thickness of 8 inches and 6 inches when hand operated mechanical compactors are used.
 - 2. Upon approval by the OWNER's Representative, loose lift thickness for soil may be increased up to 12 inches where heavy vibratory equipment is used if the Contractor can demonstrate with field tests that compaction is achieved.
 - 3. Aggregate Surface Course: Maximum 6-inch loose lift thickness.
- D. Employ backfill placement and compaction method that does not disturb or damage foundation perimeter drainage, and utilities in trench.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. Do not leave more than 50 feet of trench open at end of working day.
- G. Protect open trench to prevent danger to the public and Fire Station Operations.

3.7 TOLERANCES

- A. Top surface of rough grading shall be within 0.08 feet of required elevation.

3.8 FIELD QUALITY CONTROL

- A. Definition: Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ATM 207.

- B. Field in-place density shall be determined in accordance with ASTM D6938. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job, on each different type of material encountered, at intervals as directed by the OWNER's Representative. Copies of calibration curves, results of calibration tests, and field and laboratory density tests shall be furnished to the OWNER's Representative and Contractor. When tests indicate Work does not meet specified requirements, remove soil lift, replace and retest.
- C. The following table describes minimum soil compaction density and field testing requirements.

Material	Test Method	Number of Tests	Minimum Compaction Density, ATM 207
General Fill	ASTM D6938	Minimum of 2 tests per lift or 1 test per 3,000 sq. ft., whichever is greater.	95%
Structural Fill and Subbase	ASTM D6938	Minimum of 2 per lift, 1 for each additional 1,500 sf	95%
Traffic and ROW Area Utility Trench Backfill	ASTM D6938	Minimum 2 test per lift per 300 feet of trench or minimum of 2 tests, whichever is greater	95%

3.9 PROTECTION OF FINISHED WORK

- A. Reshape and re-compact fills subjected to vehicular traffic during construction.

END OF SECTION

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PART 1 - GENERAL

1.1 SUMMARY

- A. Section Description:
 - 1. Backfilling at foundations.
 - 2. Fill under concrete slabs and pavements.
 - 3. Fill for all site earthwork.
- B. Contractor-provided independent test laboratory/Testing Agency for all soil compaction and soil gradation test requirements. Testing services shall include all equipment, labor, materials, and testing plan.
- C. Related Sections:
 - 1. Section 31 00 00 – Earthwork.
 - 2. Section 31 22 13 – Rough Grading.
 - 3. Section 31 23 16 – Excavation.

1.2 REFERENCES

- A. Alaska Test Method (ATM):
 - 1. ATM 207 - Moisture Density Relations of Soil.
- B. ASTM International:
 - 1. ASTM C578 – Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 - 2. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

- A. See Division 01 General Requirements for submittal procedure.
- B. Pre-Construction Submittal:
 - 1. Field In-Place Density Testing Plan. Include soil testing forms for documenting test results, time, and location of test.
- C. Products:
 - 1. Board Insulation.
- D. Laboratory Tests: Soil Material gradations and moisture-density curve are submitted under Specification Section 31 00 00 EARTHWORK. Aggregate Surface Course gradations and moisture-density curve are submitted under Specification Section 32 11 23 AGGREGATE SURFACE COURSE.
- E. Field In-Place Density Testing Results and location of all testing sites.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Soil Materials: As specified in Section 31 00 00, EARTHWORK.
- B. Aggregate Surface Course: As specified in Section 32 11 23 AGGREGATE SURFACE COURSE.
- C. Board Insulation: Board insulation for earthwork shall be extruded ASTM C578, Type VII, 60 psi ASTM D1621 compressive strength. Expanded polystyrene, ASTM C578, Type XV, 60 psi ASTM D1621 compressive strength, may be used in place of extruded polystyrene if the insulation thickness shown in the plans is increased by at least 15% and rounded up to the nearest 1 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify foundation formwork has been removed and concrete finishing completed.
- B. Verify structural ability foundation to support loads imposed by fill.

3.2 SUBGRADE PREPARATION

- A. Compact subgrade for subsequent backfill materials.
 - 1. Contractor shall compact the subgrade systematically and uniformly until a suitable base is achieved to allow placement and compaction of subsequent layers of fill material.
 - 2. Proof-roll the subgrade with a minimum of four passes of a self-propelled vibratory compactor.
 - 3. Add suitable soil material to form a relatively level surface and continue compaction until the subgrade is a suitable base for the placement and compaction of the first lift of fill, as determined by the OWNER's Representative.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with structural fill and compact to density equal to or greater than requirements for subsequent fill material. Where subgrade is saturated use a granular fill. Coordinate fill selection with the OWNER's Representative. See Section 31 00 00 EARTHWORK for soil gradation requirements.

3.3 CONSTRUCTION DURING FREEZING CONDITIONS

- A. Frost Action Damage Protection: The Contractor shall take adequate precautions to protect foundations and concrete structure from damage due to frost action during freezing conditions.
 - 1. Backfilling: Exterior foundation footings and walls for slab-on-grade structures shall be backfilled to finish grade prior to ambient air temperature falling below 32 deg F.
 - 2. Heating: When ambient air temperatures fall below 32 deg F concrete structure shall be enclosed and heated such that the minimum interior air temperature at all locations is at

least 40 deg F. When exterior foundation footings or walls are not backfilled, areas within 5 feet of the footings or walls shall also be enclosed and heated to 40 deg F minimum.

3. Alternatives: The Contractor may request in writing an alternative method for freeze protection by submitting a Heating and Monitoring Plan in writing to the OWNER's Representative for approval.

B. Earthwork Fill and Backfill:

1. Fill and backfill shall not be placed over snow accumulation or frozen subgrade.
2. Subgrade active layer shall have thawed at least 12 inches.
3. Fill and backfill for all earthwork shall contain absolutely no snow or ice.
4. At time of installation, temperature of soil for all earthwork fill and backfill shall be above freezing.
5. If previously placed fill freezes, either excavate and waste frozen material or allow it to thaw and recompact prior to placement of additional fill.

3.4 BACKFILLING

- A. Backfill areas to contours and elevations with unfrozen materials.

- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

- C. Place material in continuous layers as follows:

1. Structural and Subbase soils: Maximum loose lift thickness of 8 inches and 6 inches when hand operated mechanical compactors are used.
2. Upon approval by the OWNER's Representative, loose lift thickness for only subbase soil may be increased up to 12 inches where heavy vibratory equipment is used if the Contractor can demonstrate with field tests that compaction is achieved.
3. Aggregate Surface Course: Maximum 6-inch loose lift thickness.

- D. Employ placement method that does not disturb or damage other work.

- E. Maintain optimum moisture content of backfill materials to attain required compaction density.

1. If silty soils are too wet to compact without pumping occurring in the subgrade or soil lift, allow these soils to dry out naturally, till, or otherwise accelerate the natural drying of the wet soils by mechanical means.

- F. Backfill against supported foundation walls. Do not backfill against unsupported foundation walls.

1. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

- G. Make gradual grade changes. Blend slope into level areas.

- H. If site features and utilities that are to be retained and protected are damaged by excavation or backfilling, repair or replace said items with new materials.

3.5 TOLERANCES

- A. Top surface of rough grading fill shall be within 0.08 feet of required elevation.

- B. Soil surface under footings areas shall be within 0.05 feet of required elevation.

3.6 FIELD QUALITY CONTROL

- A. Definition: Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ATM 207.
- B. Field in-place density shall be determined in accordance with ASTM D6938. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job, on each different type of material encountered, at intervals as directed by the OWNER's Representative. Copies of calibration curves, results of calibration tests, and field and laboratory density tests shall be furnished to the OWNER's Representative and Contractor. When tests indicate Work does not meet specified requirements, remove soil lift, replace and retest.
- C. The following table describes minimum soil compaction density and field testing requirements.

Material	Test Method	Number of Tests	*Minimum Compaction Density, ATM 207
General Fill	ASTM D6938	Minimum of 2 tests per lift or 1 test per 8,000 sq. ft., whichever is greater.	90% - Outside Vehicle Traffic Area 95% - Traffic Area
Structural Fill and Subbase	ASTM D6938	Minimum of 2 per lift, 1 for each additional 1,500 sf	95%
Traffic and ROW Area Utility Trench Backfill	ASTM D6938	Minimum 2 test per lift per 300 feet of trench or minimum of 2 tests, whichever is greater.	95%
*Minimum soil compaction density unless noted otherwise on the Drawings.			

3.7 PROTECTION OF FINISHED WORK

- A. Reshape and re-compact fills subjected to vehicular traffic or other activity that deforms the fill surface.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to work of this section.

1.2 SUMMARY

- A. Section Description.
 - 1. A gabion consists of a rectangular basket made of galvanized, hexagonal woven steel wire mesh. Also referred to as gabion basket having sides, a bottom and lid.
 - 2. Rock for filling gabion boxes.

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO T96 - Test for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- B. American Society of Testing and Materials (ASTM) International:
 - 1. ASTM A975 – Double Twisted Hexagonal Mesh Gabions and Revet Mattresses.
 - 2. ASTM A641 – Zinc Coated (Galvanized) Carbon Steel Wire.

1.4 SUBMITTALS

- A. See Division 01 General Requirements for submittal procedure.
- B. Product Data: Submit data for all products in Part 2 PRODUCTS used for Project Work.
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Furnish gabion and rock material from single sources throughout the Work.

PART 2 - PRODUCTS

2.1 GABION

- A. Gabion shall be manufactured with non-raveling wire mesh made by twisting continuous pairs of galvanized steel wires through three half turns (commonly referred to as double twisted) to form a hexagonal shaped opening. Gabion sizes, wire diameters, mesh opening sizes, and tolerances shall

comply with ASTM A975. The Contractor shall select the Style Number based on the environmental conditions occurring where gabions are installed.

- B. Gabion wire mesh, 11 gauge minimum, except the selvedge may be heavier. Meet or exceed ASTM A641 medium hardness and tensile strength; Class 3 coating. Use mesh with 4-inch opening in the longest dimension.
- C. Gabion dimensions are shown on the Drawings.

2.2 TIE AND CONNECTING WIRE

- A. Conform to the same specifications as wire used for the gabion wire mesh except that it may not be more than 2 gauges smaller.

2.3 ROCK FILL

- A. Provide rock fill uniformly graded from 4 to 12 inches in the least dimension and having no more than 60% wear per AASHTO T96.
- B. Rock gradation shall allow for the placement of at least three or more layers of rock within each gabion compartment. In all cases undersized rock shall be placed within the interior of the gabion compartment. There shall be a maximum limit of 5% undersized or 5% oversized rock in any gabion compartment.

PART 3 - EXECUTION

3.1 ASSEMBLY

- A. Install the gabions to the lines and elevations shown on the Drawings.
- B. Assemble gabion baskets per the manufacturer's recommended procedures. Align each row or tier of gabion baskets before filling the baskets. Install tie wires in both directions horizontally so that layers between ties are not more than 14 inches thick. Space tie wires not more than 14 inches apart horizontally within any gabion basket cell. Loop tie wires around at least 3 meshes of the gabion basket and tie or twist securely.
- C. Fill each gabion basket with rock so the lid, when secure, will bear on the gabion rock fill. Securely fasten gabion baskets to all adjacent baskets, using sufficient wire to provide the same strength as the body of the mesh.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Description:
 - 1. Riprap placed loose.
 - 2. Separation Geotextile.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO T96 - Test for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - 2. AASHTO M288 – Geosynthetic Specification for Highway Applications
- B. American Society of Testing and Materials (ASTM) International:
 - 1. ASTM D4632 – Grab Breaking Load and Elongation of Geotextiles.
 - 2. ASTM D4491 – Water Permeability of Geotextiles by Permittivity.
 - 3. ASTM D4751 – Determining Apparent Opening Size of a Geotextile.

1.3 SUBMITTALS

- A. See Division 01 General Requirements for submittal procedure.
- B. Product Data: Submit data for all products in Part 2 PRODUCTS used for Project Work.
- C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

- A. Furnish each aggregate material from single source throughout the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Riprap:
 - 1. Riprap shall consist of hard, angular stone and have no more than 50% wear at 500 revolutions as determined by AASHTO T96. Use stones with breadth and thickness at least 1/4 of its length. Do not use rounded boulders or cobbles for the retention basin overflow channel.

2. Provide the following gradation for the riprap class specified on the Drawings.

Table 1: Riprap Gradation

<u>Riprap Class</u>	<u>Gradation</u>
Class I	0 to 50% weighing up to 25 pounds 0-10% weighing more than 50 pounds

- B. Separation Geotextile Fabric: Geotextile shall be a woven synthetic fiber meeting the requirements of Class 1, AASHTO M288:
 1. Maximum elongation of 15% as determined by ASTM D4632.
 2. Minimum permittivity of the fabric shall be 0.05 per second as determined by ASTM D4491.
 3. Reinforcing geotextile shall have an apparent opening size (AOS) equal to No. 40 U.S. Standard Sieve as determined by ASTM D4751.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of existing conditions before starting work.

3.2 PLACEMENT

- A. Install separation geotextile on the subgrade where the Drawings require. Do not drop stone on the geotextile during riprap placement.
- B. Excavate subgrade to the depths shown on the Drawings. Place stones to thickness, height and length shown on the plans in a well-graded mass with a minimum of voids. Fill in unacceptable voids with smaller stones. Place riprap to its full course thickness in one operation. Do not place in layers or use methods likely to cause segregation. Manipulate the rock sufficiently to secure a reasonably regular surface and stability.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Description:
 - 1. Aggregate Surface Course (ASC) product description and installation.
- B. Contractor-provided independent test laboratory/Testing Agency for all soil gradation and compaction testing requirements. Testing services shall include all equipment, labor, materials, and testing plan.
- C. Related Sections:
 - 1. Section 31 22 13 - Rough Grading.
 - 2. Section 31 23 23 - Fill.

1.2 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO T96 - Test for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - 2. AASHTO T104 – Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.
- B. American Society of Testing and Materials (ASTM) International:
 - 1. ASTM D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- C. Specific technical portions of State of Alaska Department of Transportation and Public Facilities (ADOT&PF), Standard Specifications for Highway Construction, 2015 Edition, as referenced in this Section.
- D. Alaska Test Method (ATM):
 - 1. ATM 205 – Determining the Plastic Limit and Plasticity Index of Soils.
 - 2. ATM 207 – Moisture Density Relations of Soil.
 - 3. ATM 304 – Sieve Analysis of Fine and Coarse Aggregates.
 - 4. ATM 305 – Determining the Percentage of Fracture in Coarse Aggregate.
 - 5. ATM 313 - Degradation Value of Aggregate.

1.3 SUBMITTALS

- A. See Division 01 General Requirements for submittal procedure.
- B. Pre-Construction Submittal:
 - 1. Field In-Place Density Testing Plan. Provide this submittal under Specification Section 31 23 23 FILL.

- C. Laboratory Tests: Material properties, ATM 304 soil gradation, and ATM 207 optimum moisture-maximum density curve for each Soil Material.
- D. Material Source: Submit name of imported materials source.
- E. Manufacturer’s Certificate: Certify products meet or exceed requirements.
- F. Field In-Place Density Testing Results and locations of all testing sites.

1.4 QUALITY ASSURANCE

- A. Furnish aggregate surface course material from single source throughout the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aggregate Surface Course: Aggregate Surface Course (ASC) shall meet the requirements of Alaska Department of Transportation and Public Facilities (ADOT&PF) Standard Specifications for Highway Construction, 2015 Edition, Table 703-2, D-1 Base Course. The following is ADOT&PF D-1 soil gradation and material properties.

Table 1: ASC Gradation Determined by ATM 304

<u>U.S. Std. Sieve</u>	<u>Cumulative % Passing by Weight</u>
1-inch	100
3/4-inch	70-100
3/8-inch	50-80
No. 4	35-65
No. 8	20-50
No. 50	6-30
No. 200	0-6

Table 2 : ASC Material Properties

<u>Property</u>	<u>Test Method</u>	<u>Requirement</u>
L.A. Wear %	AASHTO T96	50, max.
Degradation Value	ATM 313	45, min.
Fracture, %	ATM 305	70, min., 1 Face
Plastic Index	ATM 205	6, max.
Sodium Sulfate Loss, %	AASHTO T104	9, max. (5 cycles)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify compacted substrate is dry and ready to support paving and imposed loads.
 - 1. Proof-roll substrate with heavy vibratory roller compactor in minimum two perpendicular passes to identify soft spots.
 - 2. Remove soft substrate and replace with compacted fill as specified in Section 31 23 23 FILL.
- B. Verify substrate has been inspected, gradients and elevations are correct.

3.2 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place fill on soft, muddy, or frozen surfaces.

3.3 CONSTRUCTION DURING FREEZING CONDITIONS

- A. See Specification Section 31 23 23 FILL paragraph CONSTRUCTION DURING FREEZING CONDITIONS.

3.4 SOIL PLACEMENT

- A. Place soil in continuous layers as follows:
 - 1. Aggregate Surface Course: Maximum 6-inch loose lift thickness.

3.5 TOLERANCES

- A. Top surface of the Aggregate Surface Course shall be within 0.05 feet of required elevation.

3.6 FIELD QUALITY CONTROL

- A. Definition: Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ATM 207.
- B. Field in-place density shall be determined in accordance with ASTM D6938. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job, on each different type of material encountered, at intervals as directed by the OWNER's Representative. Copies of calibration curves, results of calibration tests, and field and laboratory density tests shall be furnished to the OWNER's Representative and Contractor. When tests indicate Work does not meet specified requirements, remove soil lift, replace and retest.

C. The following table describes minimum soil compaction density and field testing requirements.

Material/Location	Test Method	Number of Tests	Minimum Compaction Density, ATM 207
Aggregate Surface Course	ASTM D6938	Minimum of 2 per lift, 1 for each additional 1,500 sq. ft.	98%

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Description:

1. Concrete for:
 - a. Canopy Driveway.
 - b. Landings and Sidewalk.
 - c. Curb.
 - d. Airport Road Pavement Replacement and Clinic Driveway Landing.

1.2 REFERENCE STANDARDS

- A. Specific technical portions of State of Alaska Department of Transportation and Public Facilities (ADOT&PF), Standard Specifications for Highway Construction, 2015 Edition, as referenced herein.
- B. American Association of State Highway and Transportation Officials (AASHTO):
 1. AASHTO M148 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete (Same as ASTM C309).
 2. AASHTO M171 - Standard Specification for Sheet Materials for Curing Concrete (Same as ASTM C171).
 3. AASHTO M182 - Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats.
- C. American Concrete Institute (ACI):
 1. ACI 301 - Specifications for Structural Concrete.
- D. American Society for Testing and Materials (ASTM) International:
 1. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 2. ASTM A775 - Standard Specification for Epoxy Coated Steel Reinforcing Bars.
 3. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 4. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 5. ASTM C42 - Standard Specification for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 6. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
 7. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
 8. ASTM C150 - Standard Specification for Portland Cement.
 9. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
 10. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.

11. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
12. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
13. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
14. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
15. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

1.3 SUBMITTALS

- A. See Division 01 General Requirements for submittal procedure.
- B. Pre-Construction Submittal:
 1. Concrete Protection Plan for Cast in Place Concrete for ambient conditions as described in Article AMBIENT CONDITIONS and PROTECTION.
 2. Traffic Control Plan for Airport Road and Clinic Driveway Landing Concrete Placement.
 - a. Airport Road Concrete Pavement Placement may be included with Specification Section 31 23 17 TRENCHING traffic control plan.
 - b. See Article PROTECTION for protecting fresh concrete from traffic.
- C. Advance Notice to OWNER's Representative at least 24-hours prior to placing concrete.
- D. Product Data:
 1. Concrete Mix.
 2. Reinforcement.
 3. Joint Compound.
- E. Concrete Testing:
 1. Slump.
 2. Air Content.
 3. Concrete Temperature.
 4. Compressive Strength.

1.4 AMBIENT CONDITIONS

- A. Cold Weather Concrete - The Contractor shall submit a written cold weather concreting plan for approval to the OWNER's Representative when air temperatures are expected to fall below 35 deg F during the cure period.
 1. When preparing a cold weather concreting plan, follow the technical requirements found in ADOT&PF Section 501 STRUCTURAL CONCRETE, 501-3.05 Cold Weather Concrete.
- B. The Contractor shall provide a written plan for wet weather concrete protection procedures prior to concrete placement.

- C. Placement of concrete shall be prohibited at an ambient air temperature of less than 40 deg F or where the foundation material is frozen, except in special situations where authorized by the OWNER's Representative in writing.
 - 1. Salt, chemicals, or other materials shall not be mixed with the concrete to prevent freezing.
 - 2. Placement of concrete is prohibited whenever there is standing water on the soil surface or in the formwork, the subgrade is soft and yielding because of saturation.
 - 3. Approved admixture shall be used in accordance with the manufacturer's recommendations.

PART 2 - PRODUCTS

2.1 CONCRETE MIX AND MATERIALS

- A. Clinic curb, sidewalk, canopy and driveway landing concrete pavement use ADOT&PF Class A concrete mix as described in ADOT&PF Section 501 STRUCTURAL CONCRETE, Table 501-1 Class of Concrete.
- B. For Airport Road pavement use ADOT&PF Class A concrete mix.
- C. Cement: ASTM C150, Type I – Normal; use one brand of cement throughout Project work.
- D. A central mixing plant shall be used for production of the concrete mix unless otherwise noted. The plant shall provide concrete mix product in compliance with ADOT&PF Section 501 STRUCTURAL CONCRETE, 501-3.04 Mixing, 2. Central Plant Mixing.

2.2 FORM MATERIALS

- A. Form Materials:
 - 1. Form Materials: Conform to ACI 301.
 - 2. Wood or steel form material, profiled to suit conditions.
 - 3. Joint Filler: Premolded joint filler shall conform to the requirements of ASTM D1751; Asphalt impregnated fiberboard.
 - 4. Joint Compound:
 - a. Polyurethane: A one part, polyurethane, self-leveling, joint sealant meeting ASTM C920, Grade P, Type S, Class 25. Color to match concrete.

2.3 REINFORCEMENT

- A. Reinforcement Materials:
 - 1. Deformed Reinforcing: ASTM A615, 60 ksi yield grade, deformed billet steel bars with ASTM A775 epoxy coating.
 - 2. Tie Wire: Minimum 16 gage annealed type.
- B. Aggregates: As required in ADOT&PF Section 501 STRUCTURAL CONCRETE, Table 501-1, Class of Concrete.

- C. Water: Potable, ASTM C94.
- D. Admixtures:
 - 1. Provide concrete admixtures that contain no more than 0.1 percent chloride ions.
 - 2. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.
 - 3. Water-Reducing Admixture: ASTM C494, Type A.
 - 4. High-Range Water-Reducing Admixture: ASTM C494, Type F or Type G.
 - 5. Water-Reducing and Accelerating Admixture: ASTM C494, Type E.
 - 6. Water-Reducing and Retarding Admixture: ASTM C494, Type D.

2.4 FABRICATION

- A. Fabricate reinforcing in accordance with Concrete Reinforcing Steel Institute (CRSI) Manual of Practice.

2.5 ACCESSORIES

- A. Curing Materials:
 - 1. Burlap cloth made from jute or kenaf meeting the requirements of AASHTO M182.
 - 2. Sheet materials for curing concrete meeting the requirements of AASHTO M171.
 - 3. Liquid membrane forming compounds for curing concrete meeting the requirements of AASHTO M148, Type 1, except do not use compounds containing linseed oil.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify compacted soil surface is dry and ready to support paving and imposed loads and required compaction densities have been achieved.
- B. Verify gradients and elevations of soil bearing surface are correct.

3.2 PREPARATION

- A. Moisten substrate to minimize absorption of water from fresh concrete.
- B. Notify OWNER's Representative minimum 24 hours prior to commencement of concreting operations.

3.3 INSTALLATION

- A. Forms:
 - 1. Place and secure forms and screeds to correct location, dimension, profile, and gradient.
 - 2. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- B. Reinforcement:
 - 1. Place reinforcing as indicated on Drawings.
 - 2. Interrupt reinforcing at expansion joints by cutting every other rebar.
- C. Transporting Concrete: Transport concrete from the central mixing plant in compliance with ADOT&PF Section 501 STRUCTURAL CONCRETE, 501-3.04 Mixing, 2. Central Plant Mixing.
- D. Placing Concrete:
 - 1. Place concrete in accordance with ADOT&PF Section 501 STRUCTURAL CONCRETE, 501-3.08 Placing Concrete, 1. General.
 - 2. Concrete for Airport Road and Driveway Landing shall be a continuous monolithic pour.
- E. Isolation Joints (IJ):
 - 1. IJ shall be placed along all structures and features that project into, through, or against the concrete.
 - 2. Where concrete pavement meets existing roadway pavement, the concrete shall be field cast against face of roadway pavement and underlying soil. Remove surficial loose soil along the face of the roadway pavement immediately before pouring concrete.
- F. Contraction Joints: Provide 1/4 inch wide weakened-plane transverse contraction joints. Construct contraction joints to a depth of 1 inch prior to the final set of the concrete as follows:
 - 1. Tooled Joints: Form contraction joints in fresh concrete by grooving and finishing each edge of joint with a groover tool.
 - 2. Contraction joints shall be tooled in containment apron at intervals not to exceed 10 foot intervals.
 - 3. No contraction joint in the Airport Road or Driveway Landing reinforced concrete pavement. This concrete is to be a continuous monolithic pour.
- G. Finishing:
 - 1. Airport Road and Driveway Landing Pavements: Provide a finished concrete surface in accordance with ADOT&PF Section 501 STRUCTURAL CONCRETE, 501-3.09 Finishing Concrete Surfaces, 3. Concrete Deck.
 - 2. Clinic Curb, Sidewalk, and Canopy Driveway Pavements: Provide a finished concrete surface in accordance with ADOT&PF Section 501 STRUCTURAL CONCRETE, 501-3.09 Finishing Concrete Surfaces, 4. Curb, Sidewalk, and Concrete Barrier Surfaces.
 - 3. Tooling: Tool edges of slab and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.
 - a. Joint Edge Radius: 1/4 inch.
 - b. Curb Edge Radius: 1/2 inch.

3.4 TOLERANCES

- A. Maximum Variation of Surface Flatness:
1. Airport Road pavement flatness to be tested using a 10-foot-long straight edge. Correct variations for the testing edge and any two contact points of more than 0.01 foot following ADOT&PF Section 501 STRUCTURAL CONCRETE, 501-3.09, 3. Concrete Decks.
 2. 1/8 inch in 10 feet at all other locations.

3.5 FIELD QUALITY CONTROL

- A. Sampling and testing for quality control by the Contractor during placement of concrete shall include the following, as directed by the OWNER's Representative:
1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.
 2. Slump: ASTM C143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
 3. Air Content: ASTM C173, volumetric method for lightweight or normal weight concrete; ASTM C231 pressure method for normal weight concrete; one for each day's pour of each type of air entrained concrete.
 4. Concrete Temperature: Test hourly when air temperature is 40 degrees Fahrenheit and below, and when 80 degrees Fahrenheit and above; and each time a set of compression test specimens is made.
 5. Compression Test Specimen: ASTM C31; one set of 3 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
 6. Compressive Strength Tests: ASTM C39; one set for each day's pour exceeding 5 cubic yards plus additional sets for each 50 cubic yards over and above the first 25 cubic yards of each concrete class placed in any one day; one specimen tested at 7 days, one specimen tested at 28 days, and one specimen retained in reserve for later testing if required.
 7. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.
 8. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
 9. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive by more than 500 psi.
- B. Test results will be reported to OWNER's Representative and CONTRACTOR on same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.
- C. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the

structure, as directed by OWNER's Representative. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Locations of test cores must be approved by the OWNER's Representative. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

- D. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.6 PROTECTION

- A. Wet weather protection is required.
- B. Immediately after placement, protect paving from premature drying, excessive hot or cold temperatures, and mechanical injury.
- C. Do not permit traffic over concrete pavement until at least 7 days after finishing.
- D. Airport Road and Driveway Landing Concrete Pavement – Keep pavement closed to traffic until the concrete has attained at least 80 percent of its compressive strength as described in ADOT&PF Section 501 STRUCTURAL CONCRETE, 501-3.12 Backfilling and Opening to Traffic.

END OF SECTION

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to work of this section.
- B. City and Borough of Juneau (CBJ) Standard Specifications for Civil Engineering Projects and Subdivision Improvements to the extent referenced.

1.2 SUMMARY

- A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing buried water pipe and fittings, connecting to an existing polyvinyl chloride (PVC) City and Borough of Yakutat (CBY) water main, thrust blocks, restrained joints, electrical continuity, disinfection and testing. The CONTRACTOR shall install the water pipe and fittings to the horizontal and vertical alignment shown on the Drawings and shall complete all associated WORK described in this Section.
 - 1. The CONTRACTOR shall obtain the application for water service as described in CBY Code 11.30.030 Application for Service.
- B. The Clinic water service shown in the drawings meets Alaska Department of Environmental (ADEC) definition of a single service line. Single service lines, such as the Clinic water service, are not subject to State of Alaska 18 AAC 80 Drinking Water plan review and approval to construct. There is no water distribution WORK associated with ADEC.

1.3 REFERENCES

- A. American Society of Testing and Material (ASTM) International
 - 1. ASTM A48 – Gray Iron Castings.
 - 2. ASTM A193 – Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service or Other Special Purpose Applications.
 - 3. ASTM A194 – Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
 - 4. ASTM A240 – Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - 5. ASTM C94 – Standard Specification for Ready-Mixed Concrete.
 - 6. ASTM D2000 – Standard Classification System for Rubber Products in Automotive Applications.
 - 7. ASTM D3139 – Joints for Plastic Pressure Pipe Using Flexible Elastomeric Seals.
 - 8. ASTM F477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
 - 9. ASTM F1674 – Joint Restraint Products for Use with PVC Pipe.
- B. American Water Works Association (AWWA):
 - 1. AWWA C104 – Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 - 2. AWWA C105 – Polyethylene Encasement for Ductile-Iron Pipe Systems.

3. AWWA C110 – Ductile-Iron and Gray-Iron Fittings.
4. AWWA C111 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. AWWA C116 – Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings.
6. AWWA C151 – Ductile-Iron Pipe, Centrifugally Cast, for Water.
7. AWWA C153 – Ductile-Iron Compact Fittings for Water Service.
8. AWWA C515 – Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.
9. AWWA C550 – Protective Epoxy Interior Coatings for Valves and Hydrants.
10. AWWA C651 – Standard for Disinfecting Water Mains.
11. AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In., for Water Transmission and Distribution.

C. National Fire Protection Association (NFPA):

1. NFPA 24 – Installation of Private Fire Service Mains and Their Appurtenances.

1.4 SUBMITTALS

A. See Division 01 General Requirements for submittal procedure.

B. Pre-Construction Submittal:

1. Laboratory providing bacteriological testing.
2. Include forms to be used for documenting all water line flushing, pressure testing, and bacteriological sampling. At a minimum the form includes date, time, test personnel, allowable leakage calculation, and location where bacteriological samples are collected.

C. Products:

1. Ductile Iron Water Pipe (DIP), Fittings, Joint Restraints, and Bends.
2. Polyvinyl Chloride (PVC) Pipe, Fittings, Joint Restraints, and Bends.
3. Tracer Wire System.
4. Valves.
5. Valve Boxes.
6. Fire Hydrant.
7. Tapping Sleeve.
8. Underground Marking Tape.

D. Test Reports:

1. Bacteriological Disinfection of Water Service.
2. Hydrostatic Pressure Test and Water Line Flushing.

E. Manufacturer's Certificate: Certify products submitted meet or exceed requirements.

PART 2 - PRODUCTS

2.1 All pipe and fittings, including fire hydrants, shall meet NSF/ANSI 61.

2.2 DUCTILE IRON PIPE

- A. Ductile Iron Pipe (DIP): Ductile iron pipe conforming to the requirements of AWWA C151, with cement mortar lining conforming to the requirements of AWWA C104. Standard Thickness Class 50 pipe shall be used unless otherwise shown on the Drawings. Water pipe shall have an exterior bituminous coating conforming to the requirements of AWWA C110. All water pipe shall be clearly marked with the manufacturer's name, type, class and/or thickness as applicable. Lettering shall be legible and permanent under normal conditions of handling and storage.
1. Provide 8 mil thick polyethylene encasement material for DIP conforming to AWWA C105. Polyethylene encasement is to include a film system incorporating corrosion and microbial control additives as provided by US Pipe or equal.
 2. DIP Joints: Unless otherwise shown on the Drawings, or as specified below, pipe joints shall be push-on rubber gasket type conforming to the requirements of AWWA C111
 3. DIP Restrained Joints: For ductile iron water pipe restrained joints shall be U.S. Pipe TR FLEX, U.S. Pipe field Loc Gasket, EBBA IRON "Mega-lug System", Griffin Snap Lock, Pacific State Lock Mechanical type, or approved equal. Restrained push-on joints for pipe shall be designed for a water working pressure of 250 psi and shall be capable of being deflected a minimum of 3 degrees per joint, for pipe sizes through 18 inches, after assembly.

2.3 DUCTILE IRON PIPE FITTINGS

- A. Fittings for all DIP water pipe and restrained joint water pipe shall be U.S. Pipe TR FLEX, push-on gasket fittings compatible with U.S. Pipe Field Loc Gasket, mechanical joint fittings with EBBA IRON "Mega-lug System", Griffin Snap Lock, Pacific State Lock Mechanical Type, or approved equal.
- B. Ductile iron bends and tees are to have exterior and interior surfaces coated with fusion bonded epoxy in accordance with AWWA C116, minimum Pressure Class 250, and mechanical joint ends. Bends and tees are to be provided by the ductile iron pipe manufacturer and in accordance with AWWA C153.
- C. All valve clusters consisting of a tee and one or more valves, including fire hydrant legs, shall be monolithically restrained with EBBA Iron "Mega-lug System," or approved equal.
- D. Ductile Iron Anchor Coupling / Swivel Coupling meeting requirements of AWWA C153 and Underwriters Laboratories certified product.

2.4 POLYVINYL CHLORIDE (PVC) PIPE

- A. Polyvinyl chloride pipe is to conform to the requirements of AWWA C900 and have a dimensional ratio (DR) of 18. All PVC water line pipe is to be blue in color.
 - 1. PVC pipe to use AWWA C900 gasketed integral bell joint. Maximum angular joint deflection, 1 degree per joint. ASTM F477 gaskets and joints in compliance with ASTM D3139.
 - 2. PVC Stop Coupling / Deflection Couplings conform to the requirements of AWWA C900, DR18. ASTM F477 gaskets and joints in compliance with ASTM D3139.
 - 3. Over Insertion Prevention Device - Piping must be installed with an over insertion prevention device. Device must be compatible with the joint restraint system.
 - 4. Restrained joint system for PVC pipe system is to be Factory Mutual approved or Underwriters Laboratories listed, meet ASTM F1674, and be specifically designed for C900 PVC pipe joints and ductile iron fittings with mechanical joints. Restrained joint system shall not interfere with pipe joints maximum allowable joint deflection.
- B. Bends and tees for PVC pipe shall be AWWA C153 ductile iron having exterior and interior surfaces coated with fusion bonded epoxy in accordance with AWWA C116, minimum Pressure Class 250, and mechanical joint ends.
- C. Trace wire for water lines is to be #10 AWG high strength copper clad steel with a 30-mil HDPE, blue colored, insulation jacket, and have a 600-pound average tensile break load. Grounding rod for tracer wire dead end is to be at least 24 inches in length and copper clad. Grounding clamps are to be EK17 as manufactured by Erico or equal. All wire splice connections to use 3M DBR watertight connectors or equal.

2.5 VALVES

- A. Provide AWWA C515, iron body, fully bronze-mounted, non-rising stem, mechanical joint ends, resilient wedge gate valves. All external and internal valve surfaces shall be painted with an epoxy coating in compliance with AWWA C550.

2.6 VALVE BOXES

- A. Provide adjustable valve box manufactured from ASTM A48, Class 35B, cast iron of a size compatible for the valve on which it is used, minimum cover and wall thickness of 3/16 inch. All surfaces of the valve box case and lid shall have at least an 8-mil but not more than 16-mil coat of coal tar epoxy. Provide a round cover. Cast the word Water into the cover. The minimum diameter of the box shaft is 5 ¼ inches.

2.7 FIRE HYDRANT

- A. Provide fire hydrant meeting the requirements of City and Borough of Juneau (CBJ) Standard Specification Section 02603 FIRE HYDRANTS. The following portions of Section 02603 are adopted:
 - 1. Paragraph 2.1 Fire Hydrants. With the following exceptions.
 - a. Install as a dry barrel fire hydrant.

- b. Delete L., a reference to CBJ valve box. Valve box detail in the Drawings.
- c. Delete M. thaw wire. Leader pipe to the Clinic fire hydrant is PVC.

2.8 TAPPING SLEEVE

- A. For connecting to existing CBY water main provide a tapping sleeve with the following material specifications:
 - 1. ASTM A240, Type 304 stainless steel shell and lugs and washers.
 - 2. ASTM A193, Type 304, stainless steel bolts.
 - 3. ASTM A194, Type 304, hex nuts.
 - 4. ASTM D 2000 gasket compounded for water service.
 - 5. Mechanical joint T-bolts and nuts low alloy steel per AWWA C111.
 - 6. Mechanical Joint Outlet.
- B. Typical tapping sleeve products include ROMAC Industries Style SST and Mueller Model H304.

2.9 UNDERGROUND MARKING TAPE

- A. Underground marking tape shall be 6-inch-wide, 4-mil-thick, polyethylene tape with black lettering with the following wording: "Caution: Waterline Buried Below." Marking tape shall be installed above the water pipe as shown on the Drawings. Color: Blue.

2.10 CONCRETE

- A. Concrete for thrust blocks and valve box slab shall conform to ASTM C94, with at least 5.0 sacks of Type 1 cement per cubic yard of concrete, and obtaining a minimum 28-day compressive strength of 3,000 psi. Bagged concrete mix or redi-mix concrete is acceptable.

PART 3 - EXECUTION

3.1 GENERAL

- A. The CONTRACTOR shall preserve and protect all existing utilities and other facilities including but not limited to: telephone, television, electrical, water and sewer utilities, surface or storm drainage, highway or street signs, mailboxes, and survey monuments. The CONTRACTOR shall immediately repair or replace utilities or other facilities damaged during construction. The CONTRACTOR shall support and protect any underground utility conduits, pipes, or service lines where they cross the trench.
- B. The CONTRACTOR shall give at least 24 hours notice to the CBY Public Works Department prior to:
 - 1. Requiring water or sewer main line locates;
 - 2. Interruption of water service in any area; or
 - 3. Use of water from any fire hydrant.

- C. Any water service disruption shall be restored as soon as possible. The CONTRACTOR shall comply with the current policy for buried utility locates by the CBY Public Works Department. The CONTRACTOR shall notify all local radio stations and any customers who will be affected of a planned water service disruption.

3.2 INSTALLATION

- A. Water pipe shall be installed in accordance with the manufacturer's printed specifications and instructions.
- B. The water pipe shall be handled carefully to prevent damage to the pipe, pipe lining, or coating. Water pipe and fittings shall be loaded and unloaded using hoists and slings to avoid shock or damage, and under no circumstances shall they be dropped, skidded, or rolled. If any part of the coating or lining is damaged, repair thereof shall be made in a manner satisfactory to the OWNER's Representative at the CONTRACTOR's expense.
- C. All water pipe and fittings shall be inspected for defects. Damaged pipe will be rejected and the CONTRACTOR shall immediately place all damaged pipe apart from the undamaged and shall remove the damaged pipe from the site within 24 hours.
- D. Whenever it becomes necessary to cut a length of water pipe, the cut shall be made by abrasive saw or by special pipe cutter.
- E. All pipe ends shall be square with the longitudinal axis of the water pipe and shall be reamed and smoothed to ensure a good connection.
- F. The water pipe shall be laid to the horizontal and vertical alignment shown on the Drawings. A minimum 6 feet of cover shall be maintained from finish grade to top of water pipe, unless otherwise shown on the Drawings. Fittings shall be installed at the location shown on the Drawings.
- G. To prevent dirt and other foreign material from entering the pipe and fittings during handling and installation, the open end of the pipe shall be protected by a water-tight plug at all times except when joining the next section of pipe.
- H. Under no circumstances shall pipe deflections, either horizontal or vertical, exceed the manufacturer's printed recommendations. Where deflections would exceed the manufacturer's recommendations, fittings shall be used.
- I. Vertical deflections to avoid obstructions that exceed allowable water pipe joint deflections shall be accomplished by the use of fittings and either joint restraints or vertical thrust blocking conforming to the Drawings. Additional fittings to those indicated on the Drawings will be required to accomplish these vertical deflections.
- J. Concrete thrust blocks shall be furnished and installed in accordance with the Drawings.
- K. Pressurized water pipe ends shall be plugged and thrust blocks installed. Volume and bearing area of thrust blocks for end plugs shall be equal to applicable standards for bends greater than 45 degrees.

- L. All pipe fittings and pipe joints shall be restrained.

3.3 FLUSHING, TESTING AND DISINFECTION

- A. Prior to acceptance, the CONTRACTOR shall “Open-Bore” flush the water pipe then perform hydrostatic tests, electrical continuity tests, and disinfection and coliform testing. Testing may be done in any sequence. However, in the event the disinfection, coliform and continuity tests have been performed and repairs are made to the water pipe system in order to pass the hydrostatic test, all previous tests and the “Open-Bore” flushing shall be repeated to the satisfaction of the OWNER’s Representative.

3.4 OPEN-BORE FLUSHING

- A. Open bore flushing is required of all installed water pipes to remove any foreign matter in accordance with AWWA C651. The minimum flow rate shall be 2.5 feet per second. The CONTRACTOR shall furnish, install and remove all pumps, fittings and pipes necessary to perform the flushing; shall provide all additional excavation and backfill; and shall dispose of all water and debris flushed from the water pipe. Flushing through fire hydrants, reduced outlets or fittings shall not be permitted unless specifically authorized in writing by the OWNER’s Representative. The CONTRACTOR shall notify the OWNER’s Representative, in writing, 48 hours in advance of any flushing operation. A flushing scheme and schedule shall be submitted by the CONTRACTOR for review and approval by the OWNER’s Representative prior to flushing. The schedule for flushing must be approved by CBY Public Works. The CONTRACTOR shall be responsible for obtaining any permits necessary for flushing operations.
- B. In addition to flushing to remove foreign matter the water lines, including the fire hydrant service pipe, shall be flushed in accordance with NFPA 24. NFPA and AWWA C651 flushing may be done concurrently.

3.5 DUCTILE IRON PIPE HYDROSTATIC TESTING

- A. Hydrostatic testing will be conducted in the presence of the OWNER’s Representative on newly installed water pipes after “Open-Bore” flushing, in accordance with the requirements of AWWA C600 for ductile iron pipe and as stated hereafter. The CONTRACTOR shall furnish all assistance, equipment, labor, materials, and supplies necessary to complete the test to the satisfaction of the OWNER’s Representative. The CONTRACTOR shall suitably valve-off or plug the outlet to existing or previously-tested water pipe prior to performing the required hydrostatic test. Prior to testing, all air shall be expelled from the water pipe. If permanent air vents are not available to accommodate testing, the CONTRACTOR shall install corporation stops and blow-off lines so the air can be expelled as the line is filled with water.
- B. Pressure Testing:
 - 1. The hydrostatic pressure for main line pipe shall be a minimum of 150 psi or 1.5 times the operating pressure of the water pipe (measured at the highest elevation of the newly-installed water pipe), whichever is greater, unless otherwise directed by the OWNER’s Representative. Acceptance pressure testing shall be done with all service lines installed, corporation stops open, and pressure against the closed curb stops. The duration of each

hydrostatic pressure test on main line pipe shall be one hour. Pumping will cease after the required test pressure has been reached. If the pressure remains constant for 1 hour without additional pumping, or pressure drop is less than 5 psi, that section of water pipe is acceptable.

2. The hydrostatic pressure for fire line testing shall be a minimum of 200 psi for 2 hours as defined by NFPA 24. Acceptance pressure testing shall be done with all service lines installed, corporation stops open, and pressure against the closed curb stops. Pumping will cease after the required test pressure has been reached. If the pressure remains constant for 2 hours without additional pumping, or pressure drop is less than 5 psi, that section of water pipe is acceptable.
- C. If the pressure drops 5 psi or more during the initial one-hour hydrostatic pressure test, the CONTRACTOR shall conduct a leakage test. Leakage shall be determined by measuring “make-up” water necessary to restore the specified test pressure. The quantity of water lost from the water pipe shall not exceed the number of gallons per hour as determined by the following formula:
- $$L = \frac{ND(P)^{0.5}}{7400}$$
- L = Allowable leakage in gallons per hour
N = Summation of mechanical and push-on joints in length of water pipe tested
D = Diameter of water pipe in inches
P = Test pressure in pounds per square inch
- D. Should the tested section fail to meet the pressure test as specified, the CONTRACTOR shall locate and repair the defects and then retest the water pipe as specified above. Any specific leakage point detected shall be corrected by the CONTRACTOR to the satisfaction of the OWNER’s Representative regardless of the allowable leakage specified above.
- E. All tests shall be made with the auxiliary gate valves open and pressure against the hydrant. After the hydrostatic test has been successfully completed, each valve shall be tested by closing in turn and relieving the pressure beyond. This test of the valves will be acceptable if there is no immediate loss of pressure on the gauge when the pressure comes against the valve being checked. The CONTRACTOR shall verify that the pressure differential across the valve does not exceed the rated working pressure of the valve.
- F. Sections to be tested shall be limited to 1,500 feet, unless otherwise approved in writing by the OWNER’s Representative.
- G. Defective materials or poor quality of WORK, discovered as a result of the hydrostatic tests, shall be replaced by the CONTRACTOR. Whenever it is necessary to replace defective material or correct the workmanship, the hydrostatic test shall be repeated until a satisfactory test is obtained.
- H. The OWNER’s Representative shall be present for all hydrostatic and leakage tests. The CONTRACTOR shall notify the OWNER’S Representative at least 24 hours prior to any test and shall notify the OWNER’s Representative at least two hours in advance of the scheduled time if the test is to be cancelled or postponed.
- I. After completion of testing, all test and air vent pipe shall be removed and the corporation stop closed at the water pipe, in the presence of the OWNER’s Representative.

3.6 PVC PIPE HYDROSTATIC TESTING

- A. Hydrostatic testing of PVC pipe proceeds in the same manner as for ductile iron pipe with the following procedure modifications.
 - 1. Place sufficient backfill before filling the pipe for hydrostatic testing. Where backfilling immediately is required, test the pipe section prior to permanent surfacing is installed. Where thrust blocks have been installed allow sufficient concrete curing before testing. Pressure and leakage testing can be done concurrently.
 - 2. While the line is under pressure check for leaks in all exposed pipe, fitting, valve, and fire hydrant joints. Repair all defective joints and repeat the test until all visible leaks stop and the allowable leakage requirements are met.
 - 3. Hydrostatic pressure testing is determined by NFPA 24, 200 psi for 2 hours. Under no circumstances shall the test pressure exceed 235 psi for DR 18 pipe.
 - 4. Use the same allowable leakage formula for ductile iron pipe to determine if the hydrostatic test passes.

3.7 TRACER WIRE ELECTRICAL CONTINUITY

- A. The CONTRACTOR shall perform line tracing on trace wire installed. Continuity for the tracing tests will be through wires attached to water line pipe and brought to the surface. Tracing test must not be performed until all excavations have been completed and backfilled.

3.8 DISINFECTION

- A. Disinfection by chlorination of all new water pipe shall be completed and a satisfactory bacteriological report obtained prior to placing the pipe in service and in accordance with AWWA C651. "Open-bore" flushing shall be completed before chlorination is begun.
- B. Chlorine shall be applied by one of the following methods:
 - 1. Liquid chlorine gas-water mixture;
 - 2. Direct chlorine gas feed; or
 - 3. Hypochlorite commercial products such as HTH, Perchlolen, Macho-chlor, or approved equal.
- C. The chlorinating agent shall be applied at the beginning of the section adjacent to the feeder connection, insuring treatment of the entire water pipe. Water shall be fed slowly into the new water pipe with chlorine applied in amounts to produce a dosage of 50 ppm. Application of the chlorine solution shall continue until the required residual of not less than 50 ppm free chlorine is evident at all extremities of the newly constructed line.
- D. The chlorine gas-water mixture shall be applied by means of a solution-feed chlorinating device. Chlorine gas shall be fed directly from a chlorine cylinder equipped with a suitable device for regulating the rate of flow and the effective diffusion of gas within the water pipe. Hypochlorite products shall be placed or injected into the water pipe. During the chlorination process, all intermediate valves and accessories shall be operated. Valves shall be manipulated so that the strong chlorine solution in the water pipe being treated will not flow back into the pipe supplying the water.

- E. The following table is to be used as a guide for chlorinating pipes by the calcium hypochlorite and water mixture method. The given dosage per 100 feet results in a chlorine solution of 40 to 50 ppm. This dosage takes into account that CONTRACTOR's most frequently use granular HTH, which is 65% pure. If another chlorinating agent is used, the dosage must be adjusted.

PIPE DIAMETER	DOSAGE PER 100 FEET
6 inches	1.35 oz.

- F. A residual of not less than 50 ppm free chlorine shall be produced in all parts of the water pipe. After 24 hours detention there shall be a minimum free chlorine residual of 25 ppm in all parts of the water pipe. This residual shall then be neutralized in the pipe by injecting an approved reducing agent such as sulfur dioxide, sodium bisulfate, sodium sulfite or sodium thiosulfate.
- G. After the water pipe system has been thoroughly flushed, samples will be taken at representative locations in the system by the CONTRACTOR, placed in sterile bottles provided by the testing laboratory, and submitted to an approved laboratory for bacteriological examination. The presence of bacteria in any sample shall be verified with a second sample at the same location. If verified, the pipe disinfection procedure shall be repeated and additional samples taken for bacteriological examination. Pipe disinfection shall be repeated, at the CONTRACTOR's expense, until satisfactory results are obtained.
- H. The water shall be flushed from the water pipe at its extremities, including all curb stops, until the replacement water chlorine residuals are equal to those of the permanent source of supply. The de-chlorinated water and water used for flushing shall be disposed of in a manner approved by the OWNER'S Representative and in conformance with current requirements of the Alaska Department of Fish and Game and the Alaska Department of Environmental Conservation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to work of this section.
- B. City and Borough of Juneau (CBJ) Standard Specifications for Civil Engineering Projects and Subdivision Improvements and CBJ Engineering Standard Details to the extent referenced.

1.2 SUMMARY

- A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing buried sewer pipe and fittings, connecting to an existing City and Borough of Yakutat (CBY) sewer main, and testing. The CONTRACTOR shall install the sewer pipe to the horizontal and vertical alignment shown on the Drawings and shall complete all associated WORK described in this Section.
 - 1. The CONTRACTOR shall obtain the CBY permit as described by CBY Code 11.32.060 Application for Sewage Service.
- B. This WORK includes furnishings and installing connecting bands, branch connections, elbows or other fittings, and all appurtenances required to complete the sanitary sewer and connect to existing sanitary sewer pipe and/or structures.
- C. The vertical and horizontal location of the Clinic sewer service shown on the Drawings is based on topographic field survey and record drawings. At least 21 calendar days before scheduled excavation activity to install the sewer service, the CONTRACTOR shall field confirm the CBY sewer main alignment and depth between manholes MH7-1 and MH6-6 shown on Drawing C2.2. Provide results of these field measurements to the OWNER's Representative within 24 hours of measurement.
- D. The Clinic sewer service meets Alaska Department of Environmental (ADEC) definition of a private sewer line because it serves a single institution. Private sewer lines, such as the Clinic sewer service, are not subject to State of Alaska 18 AAC 72 Wastewater Disposal plan review and approval to construct and operate. There is no sewer system WORK associated with ADEC.

1.3 REFERENCES

- A. ASTM International:
 - 1. ASTM A48 – Gray Iron Castings.
 - 2. ASTM A74 – Cast Iron Soil Pipe and Fittings.
 - 3. ASTM A240 – Chromium and Chromium-Nickle Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - 4. ASTM A536 – Ductile Iron Castings.
 - 5. ASTM C94 –Ready-Mixed Concrete.
 - 6. ASTM C564 – Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

7. ASTM C923 – Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.
8. ASTM D2000 – Standard Classification System for Rubber Products in Automotive Applications.
9. ASTM D3034 – Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
10. ASTM D3212 – Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

1.4 SUBMITTALS

- A. See Division 01 General Requirements for submittal procedure.
- B. Pre-Construction Submittal:
 1. Pipe Testing Method: Provide the leakage test selected; either low-pressure air or hydrostatic exfiltration. Include form to be used for documenting pipe testing. At a minimum the form includes date, time, test personnel, pressure reading, and allowable leakage calculation.
- C. Products:
 1. Polyvinyl Chloride (PVC) Pipe.
 2. Pipe Connection at Manholes.
 3. Sewer Service Saddle.
 4. Sewer Cleanout.
 5. Underground Marking Tape.
- D. Test Reports: Completed pipe testing forms.
- E. Manufacturer's Certificate: Certify products submitted meet or exceed requirements.

PART 2 - PRODUCTS

2.1 POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE

- A. PVC Gravity Sewer Pipe: Pipe shall have a standard dimension ratio (SDR) of 35, and conform to ASTM D3034. Before any PVC pipe is used on this Project, the CONTRACTOR shall supply certifications, signed by an authorized agent of the seller or manufacturer, stating that the material has been sampled, tested, and inspected in accordance with ASTM D3034.
 1. PVC Pipe Joint: The pipe shall have integral wall bell and spigot joints conforming to ASTM D3212. The bell shall consist of an integral wall section with a solid cross-section elastomeric ring, factory assembled, securely locked in place to prevent displacement.
- B. Pipe Connections at Manholes: Provide ASTM C923 waterstops at pipe penetrations. For waterstop cast with a concrete structure use A-Lok Quick Lok Connector or equal. For water stop installed at core drilled penetrations use A-Lok G3 Boot, Kor-n-Seal, or equal.
- C. Sewer Service Saddle: Connect the sewer service to the sewer main using an epoxy coated ROMAC Style CB or equal sewer saddle. ASTM A536 ductile iron saddle, ASTM A240 Type

304 stainless steel adjustable strap, Type 304 stainless steel nuts, bolts, and washers, and ASTM D2000 gasket compounded for sewer service.

1. Bend and joint restraint shall meet the product requirements of Specification Section 33 11 00 WATER DISTRIBUTION SYSTEM, paragraph DUCTILE IRON PIPE and DUCTILE IRON PIPE FITTINGS.

2.2 SEWER CLEANOUT

- A. Sewer cleanout pipe and fittings are to be cast iron hub and spigot service weight conforming to the requirements of ASTM A74 with ASTM C564 gaskets.
- B. Cleanout case and cover, ASTM A48, Class 30 cast iron, H-20 traffic rating, with Sewer CO lettering cast in the cover. Olympic Foundry Part No. M1007 or equal.
- C. Cleanout plug is to be an end of pipe design that will not fall into the pipe. Cherne Industries Part Number 270261 or equal.
- D. Transition coupling to PVC pipe is to be ROMAC Style 501, Ford Meter Box Company Transition Coupling Style FC2A or equal.

2.3 CONCRETE

- A. Concrete for manhole channel construction shall conform to ASTM C94, with at least 5.0 sacks of Type 1 cement per cubic yard of concrete, slump range of 2 to 4 inches, 4 to 7 percent entrained air, and obtaining a minimum 28-day compressive strength of 3,000 psi. Bagged concrete mix is acceptable.

2.4 UNDERGROUND MARKING TAPE

- A. Underground marking tape shall be at least four (4) inches wide, four mil thick, polyethylene tape, with a metallic backing capable of being traced with locators. The tape shall have black letters with the following wording: "Caution: Sewer Line Buried Below." The marking tape shall be installed above the sewer pipe as shown on the Drawings. Color: Green.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. Excavation, bedding, and backfill shall conform to the requirements of Section 31 23 17 TRENCHING. Underground marking tape shall be installed as shown on the Drawings.
- B. Sheeting and bracing used for trenches shall be removed to the elevation of the pipe, but no sheeting will be allowed to be pulled, removed, or disturbed below the pipe. Sheeting and bracing shall meet OSHA requirements.

- C. Before lowering into the trench, the pipe shall be inspected for defects. All cracked, chipped, or broken pipe shall be discarded. The ends and interior of the pipe shall be clean. Belled ends shall be laid upgrade. Handling of the pipe shall be accomplished in a manner that will not damage the pipe. The joint shall be made in the manner recommended by the manufacturer. Care shall be taken not to buckle or disturb previously laid pipe.
- D. Pipe shall be laid accurately to the staked line and grade as indicated on the Drawings.
- E. Pipe shall be cleaned of all foreign matter, and water shall be kept out of trenches until joints have been completed. When WORK is not in progress, open ends of pipe and fittings shall be securely closed to keep foreign matter and animals from entering.
- F. Each joint shall be inspected to ensure that it is properly made before backfilling is done. Care shall be taken to prevent any dirt or foreign matter from entering the open end of the pipe. Where it is necessary to cut pipe, such cuts shall be neatly made in an approved manner. The laid pipe shall be true to line and grade and, when completed, the sewer shall have a smooth and uniform invert. No section of gravity sewer, including service connections, shall have an adverse grade which would pond water in the invert of the sewer.
- G. Sewer manhole channels must be smooth and semicircular in shape providing a flow path from manhole inlet to outlet. Changes to direction in flow are made by forming a continuous radius that is sized to allow access for closed circuit camera and sewer cleaning tools. Manhole benches at the top of flow channels are to be smooth and slope towards channels at a slope of 1:12.
 - 1. Channels may be formed during the manhole casting process or field cast.
 - 2. Where manholes are not being used to change alignment or grade the CONTRACTOR may lay a full stick of pipe through and centered on the manhole, place concrete around the pipe and then cut out the top portion of the pipe after the surrounding channel concrete has set.
- H. Connections to existing sewer mains and manholes shall be made in such a manner so as to not damage the existing facility. Such connections shall be made so that no projections or rough surfaces occur within the pipe.

3.2 TESTING

- A. Prior to testing, the sewer shall be complete, trenches shall be fully backfilled and compacted to finish grade, or, if the sewer is under pavement, finish pavement subgrade. The CONTRACTOR shall provide notes detailing results of the pipe testing.
- B. All sections of pipe shall be tested for leakage using the Exfiltration Test as specified hereafter. Where leakage is in excess of the specified rate, the sewer shall be repaired by the CONTRACTOR as required to comply with the leakage test requirements. The OWNER's Representative may require the CONTRACTOR to repair obvious leaks even though the total length of the test section falls within the maximum allowable leakage for the test used.
 - 1. The CONTRACTOR may choose to test using low-pressure air as described in CBJ Standard Specifications Section 02401 SANITARY SEWER PIPE.
- C. Defective pipe joints shall be repaired in a manner that the repaired pipe joint will have some flexibility and the effectiveness of the repair will not be affected by differential movement of

the adjoining pipes. A "CSSI" or DFW/HPI non-shear coupling, as per CBJ Standard Detail 218 - Coupling for Dissimilar Sanitary Sewer Pipes, or approved equal, will be acceptable in making such repairs.

- D. Check each run of pipeline for gross alignment deficiencies by holding a light in a manhole or accessible end of pipe; there shall be a practically full circle of light through the pipeline when viewed from the adjoining end of line.
- E. *The OWNER's Representative will make one complete TV inspection after all sewers have passed the specified watertightness test. All defects regarding sewer alignment and grade, damaged pipe, and visible leaks observed during this inspection, shall be corrected by the CONTRACTOR. The CONTRACTOR shall de-water the sewers as required for the performance of the TV inspection work by the OWNER's Representative. The CONTRACTOR shall be responsible for all costs associated with any TV inspection required following the initial TV inspection, if any defects were observed during this or any subsequent TV inspections.*

3.3 EXFILTRATION TEST (USING WATER)

- A. Where groundwater is below the pipe to be tested, a minimum of head of eight feet of water above the crown at the upper end of the test section shall be maintained for a period of four hours, during which time it will be presumed that full absorption of the pipe body has taken place, and thereafter for a further period of one hour for the actual test of leakage. During this one hour period, the measured loss shall not exceed the rate given below:

Type of Pipe	Allowable Exfiltration Rate
PVC	$E = 0.0004 DL$

E = Allowable leakage in gallons per hour
D = Nominal inside diameter of pipe in inches
L = Length of pipe being tested in feet

- B. Where groundwater is above any pipe to be tested, the minimum head of the test will be raised to provide an elevation head of eight feet above the groundwater.
- C. The maximum length of sewer in any test section shall be 500 feet.

END OF SECTION

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to work of this section.
- B. Related Sections:
 - 1. Section 33 31 00 – Sanitary Sewer Pipe.

1.2 SUMMARY

- A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing sanitary sewer manholes complete, in place as shown in the Drawings.
- B. Specification for sewer cleanouts is in Specification Section 33 31 00 SANITARY SEWER PIPE.

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO M45 – Standard Specification for Aggregate for Masonry Mortar.
- B. ASTM International:
 - 1. ASTM A48 – Gray Iron Castings.
 - 2. ASTM C150 – Portland Cement.
 - 3. ASTM C478 – Circular Precast Reinforced Manhole Sections.
 - 4. ASTM C1107 – Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
 - 5. ASTM D4101 – Standard Classification System and Basis for Specification for Polypropylene Injection and Extrusion Materials.

1.4 SUBMITTALS

- A. See Division 01 General Requirements for submittal procedure.
- B. Products:
 - 1. Precast Manhole.
 - 2. Frames, Covers, and Steps.
 - 3. Non-shrink Grout.
 - 4. Mortar.
 - 5. Manhole Waterproofing System.
- C. Manufacturer's Certificate: Certify products submitted meet or exceed requirements.

PART 2 - PRODUCTS

2.1 MANHOLES

- A. All manholes shall consist of precast concrete sections, including integral base section, riser sections, cones, grade rings, and flat slab tops and shall conform to ASTM C478 and the dimensions shown on the Drawings. All precast sections shall have joints sealed with “RAM-NEK” or “RUB-R-NEK” gasketing material, or approved equal, installed as specified by the manufacturer. Cones shall be eccentric. Pipe penetration gaskets may be cast into all precast manholes or field installed. Pipe connection at manholes are described in Specification Section 33 31 00 SANITARY SEWER PIPE.

2.2 FRAMES, COVERS AND STEPS

- A. All manhole covers shall have the word “SEWER” cast into the top in letters approximately three inches high.
- B. Manhole steps shall be constructed of polypropylene conforming to ASTM D4101, and shall meet current state and federal safety standards.
- C. Manhole frames and covers shall be ductile iron, conforming to ASTM A48, Class 30. The cover shall be designed for the appropriate classification of traffic and shall have the word “SEWER” cast into the top with prominent letters. Bearing surfaces between the frame and cover shall be machined to smooth, plane surfaces. Frames and covers shall be Inland Foundry No. 743, or approved equal.

2.3 MISCELLANEOUS

- A. Non-Shrink Grout - Provide grout meeting ASTM C1107. SikaGrout 212 and Target® Machine Base Grout are typical products.
- B. Mortar is to be composed of one (1) part cement and three (3) parts sand. Sand per AASHTO Specification M45 and cement to ASTM C150 Type II or III. The water to cement ratio is not to exceed 0.53 by weight.
- C. Channel Concrete – See the concrete product in Specification Section Specification Section 33 31 00 SANITARY SEWER PIPE.
- D. Manhole Waterproofing System - Manhole exterior joint waterproofing shall be a MiraDRI system as manufactured by Carlisle CCW, including Carlisle – CWW-715 Damp Concrete Contact Adhesive, CWW 704 primer, CCW MiraDRI 861 Membrane, and CCW 704 mastic, or approved equal that includes a membrane and adhesive system for positive water exclusion. The membrane shall extend at least 18” each side of manhole joints, except this width may be reduced to 9” each side of manhole joints if the joint is less than four feet below finished grade and the joint is above the maximum water table.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. All lifting holes shall be plugged with non-shrink grout and sealed with a MiraDRI System patch, or approved equal, to a minimum of six inches from the edges of the opening, as required to prevent leakage.
- B. After completion of the manhole, all plugs shall be completely removed from the sewers and all loose material shall be removed from the manhole.
- C. No service other than the Clinic shall be connected to the sewer manholes or sewer pipe.
- D. No stub outs for future connections shall be installed on the Clinic manholes.
- E. The joint exterior waterproofing system shall be installed as recommended by the system manufacturer and as described in this Section.
- F. All manholes will be visually inspected by the OWNER's Representative; there shall be no evidence of leakage of water into any manhole from outside sources or any imperfections which may allow such leakage.
- G. One of the two of the Project manholes, as selected by the OWNER's Representative, shall be tested for water-tightness by the CONTRACTOR. The test shall be made, with all connecting pipes plugged, by filling the manhole with clean water to within two inches of the bottom of the cast iron frame. The leakage rate shall not exceed three gallons per day per foot of depth, or fifty gallons per day, whichever is less, over a test period of not less than two hours when the water table is not an adverse factor
- H. The CONTRACTOR shall repair all imperfections and leaks disclosed by either visual inspection or testing. The method of repair shall be subject to the OWNER's Representative approval.
- I. Manhole riser rings shall be sealed to the top of manhole cone or flattop and to each other with one run of "RAM-NEK" or "RUB-R-NEK" around the inside edge and one run around the outside edge of the riser ring. The units shall be heated and compressed to at least 50% of original thickness of the "RAM-NEK" or "RUB-R-NEK." No grout shall be used to seal the riser rings.

END OF SECTION

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to work of this section.
- B. Alaska Department of Transportation and Public Facilities (ADOT&PF) Standard Specifications for Highway Construction, 2015 Edition, to the extent referenced and Standard Details.
- C. Related Sections:
 - 1. Section 33 31 00 – Sanitary Sewer Pipe.
 - 2. Section 33 39 13 – Sanitary Sewer Manhole.

1.2 SUMMARY

- A. The WORK under this Section includes providing all labor, materials, tools and equipment necessary for furnishing and installing storm drain pipe and manholes, culverts, and trench drain in accordance with these Specifications and lines and grades shown on the Drawings.

1.3 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - 1. AASHTO M294 – Specification for Corrugated Polyethylene Pipe, 300 to 1500 mm (12 to 60 in.) Diameter.
- B. ASTM International:
 - 1. ASTM A48 – Specification for Gray Iron Castings.
 - 2. ASTM A536 – Specification for Ductile Iron Castings.
 - 3. ASTM D1248 – Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.
 - 4. ASTM D3350 – Specification for Polyethylene Plastics Pipe and Fittings Materials.

1.4 SUBMITTALS

- A. See Division 01 General Requirements for submittal procedure.
- B. Products:
 - 1. Manholes.
 - 2. Frames, Covers, and Steps.
 - 3. Miscellaneous.
 - a. Non-Shrink Grout.
 - b. Mortar.
 - 4. Corrugated Polyethylene Pipe.

5. Driveway Culvert.
6. Flared End Sections.
7. Trench Drain Grate and Frame.

PART 2 - PRODUCTS

2.1 MANHOLES

- A. Manhole, Frames, Covers, Steps, and Miscellaneous shall meet the requirements of Specification Section 33 39 13 SANITARY SEWER MANHOLES with the following exceptions.
 1. Delete Manhole Waterproofing System.
 2. Delete Pipe Connections at Manholes.
 3. Cover shall have "STORM" cast into the top.
 4. The manhole is not tested for water tightness.
- B. Pipe Connection at Manholes – At the pipe connections completely fill the annular opening around the pipe with non-shrink grout.

2.2 CORRUGATED POLYETHYLENE PIPE

- A. Corrugated polyethylene pipe (CPP) shall be high density corrugated polyethylene, smooth interior pipe, and shall be manufactured in conformity with the latest AASHTO M 294, Type S specification, and shall meet the requirements of ASTM D3350 Cell Classification 324420C, or ASTM D1248, Class C, Category 4, Grade P33.
- B. Pipe shall be joined with "Hancor, Inc. Hi-Q Sure-Lok" (bell-and-spigot) joint, or approved equal, meeting the requirements of AASHTO M294. The bell shall be an integral part of the pipe and provide a minimum pull-apart strength of 400 pounds.
- C. The bell-and-spigot joint shall incorporate a gasket making it silt-tight. Gaskets shall be installed in the bell, or on the pipe, by the pipe manufacturer.
- D. Fittings shall conform to AASHTO M294. Fabricated fittings shall be welded on the interior and exterior at all junctions. All fittings shall connect to the pipe with a bell and spigot joint.
- E. All cut corrugations on CPP pipe shall be cleared of all water and completely grouted to prevent the accumulation of water. Use non-shrink grout found in Specification Section 33 39 13 SANITARY SEWER MANHOLE.
- F. Storm Drain Outfall - Provide a flared end section meeting the requirements of ADOT&PF Specification Section 707, METAL PIPE and ADOT&PF Standard Detail C-06.10, Culvert End Sections.

2.3 TRENCH DRAIN

1. Drain Grate and Frame – Americans with Disabilities Act (ADA) compliant, AASHTO H-20 traffic rated, grate and frame. ASTM A48, Class 35, gray iron frame and ASTM A536 ductile iron or ASTM A48, Class 35, grate. Manufactured with grates that bolt to the frame. Hex head, stainless steel type 304 bolts. Typical product is East Jordan Iron Works V-7380 Trench Grate and Frame.
2. Concrete – Provide the concrete in Specification Section 32 13 13 CONCRETE SIDEWALK, CURB AND PAVEMENT.
3. Rebar – Provide deformed reinforcing bars as described in Specification Section 32 13 13 CONCRETE SIDEWALK, CURB AND PAVEMENT. Epoxy coated reinforcing bars is not required.

2.4 CULVERT

- A. Provide zinc coated, corrugated metal pipe meeting the requirements of ADOT&PF Specification Section 707, METAL PIPE.
- B. Provide a flared end section meeting the requirements of ADOT&PF Specification Section 707, METAL PIPE and ADOT&PF Standard Detail C-06.10, Culvert End Sections.

2.5 UNDERGROUND MARKING TAPE

- A. Underground Marking Tape shall be at least 4-inches wide, 4-mil thick, polyethylene tape with a metallic backing capable of being traced with locators. The tape shall have black letters with the following wording: “Caution: Storm Sewer Line Buried Below”, or similar. The marking tape shall be installed above storm drain pipe, not driveway culvert, as shown on the Drawings. Color: Yellow.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. Excavation, Bedding, and Backfill shall conform to the requirements of Specification Section 31 23 17 TRENCHING. All pipe shall have a minimum cover of 12 inches, unless otherwise shown on the Drawings or directed by the OWNER’s Representative.
- B. The pipe laying shall begin at the downstream end of the pipe. The lower segment of the pipe shall be in contact with the shaped bedding throughout its full length. Bell or groove ends of rigid pipe and outside circumferential laps of flexible pipe shall be placed facing upstream.
- C. Joints shall be made with rubber gaskets.
- D. Flexible conduits shall be firmly joined by approved coupling bands.

- E. Conduit shall be inspected before any backfill is placed. Any pipe found to be substantially out of alignment, unduly settled, or damaged shall be taken up and relaid or replaced.
- F. Installation of all pipes shall conform to the manufacturer's recommended procedures. These Specifications and the Drawings shall take precedence over the manufacturer's recommendations in the event of conflict, if more restrictive.
- G. Pipe culvert shall be installed as shown on the Drawings, unless otherwise directed by the Owner. All bends, couplings and other fittings necessary to connect to existing pipes or flows shall be approved by the Owner.
- H. All cut corrugations on CPP pipe shall be cleared of all water and completely grouted to prevent the accumulation of water.

END OF SECTION