WASTEWATER COLLECTION - CONSTRUCTION SPECIFICATIONS

October 2023 Edition

THE CITY OF ALCOA, TENNESSEE

PUBLIC WORKS & ENGINEERING DEPARTMENT

WATER AND SEWER SERVICES

CITY OF ALCOA

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STATE OF TENNESSEE

9-13-23

WPN 23.0517

APPROVED FOR CONSTRUCTION

THE DOCUMENT BEARING THIS STAMP HAS BEEN RECEIVED AND REVIEWED BY THE

TENNESSEE DEPT. OF ENVIRONMENT & CONSERVATION

DIVISION OF WATER RESOURCES

AND IS HEREBY APPROVED FOR CONSTRUCTION BY THE COMMISSIONER

Adnan Bahou

10/13/2023

THIS APPROVAL SHALL NOT BE CONSTRUED AS CREATING A PRESUMPTION OF CORRECT OPERATION OR AS WARRANTING BY THE COMMISSIONER THAT THE APPROVED FACILITIES WILL REACH THE DESIGNED GOALS.

APPROVAL EXPIRES FIVE YEARS FROM ABOVE DATE

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FOREWORD

These specifications have been compiled to assist in the orderly design and construction of the City of Alcoa's Wastewater Collection System. Combined with the construction specifications for the water, street, and drainage systems, documented procedures have been established that will benefit City of Alcoa staff, City Commission, Regional Planning Commission, and other City committees in the construction, operation, and maintenance of the City's infrastructure system. Just as important, these specifications provide a framework for developers, engineers, and others who are involved with water and sanitary sewer system improvements and the construction of street drainage in private developments.

Any further reference to "the City" shall mean "The City of Alcoa Public Works & Engineering Department".

The development of these specifications was a combined effort. The basis for the wastewater collection system construction standards are the Tennessee Department of Environment and Conservation Regulations and Guidelines. City staff have reviewed and modified the requirements to closely fit the practices desired for the City service area. Key staff members involved in that work were:

- Shane Snoderly, PE, RLS, Public Works & Engineering Director
- David Marcum, PE, Senior Civil Engineer
- Richard "Chipper" Wyatt, Assistant Director of Operations
- Russell Whitehead, Utility Supervisor
- Kenneth Hendrix, Public Works Inspector II
- John Clay Garland, Public Works Inspector I

The assembly of comments and suggestions from each of these individuals resulted in these *Wastewater Collection – Construction Specifications* for the City of Alcoa Public Works & Engineering Department.

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STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF WATER RESOURCES
William R. Snodgrass - Tennessee Tower
312 Rosa L. Parks Avenue, 11th Floor
Nashville, Tennessee 37243October 13, 2023

October 13, 2023

Mr. David Marcum
Senior Civil Engineer
City of Alcoa
e-copy: dmarcum@cityofalcoa-tn.gov
725 Universal St
Alcoa, TN 37701

Subject: **City of Alcoa**
County: Blount
Wastewater Project Number: 23.0517
Project: Alcoa- Construction Specifications - 2023 Edition

Dear Mr. Marcum:

The Tennessee Department of Environment and Conservation, Division of Water Resources, acknowledges the receipt of your engineering documents on September 13, 2023.

A review of these standard sanitary sewer specifications shows that they conform with our guidelines. Therefore, they have been stamped "APPROVED". This approval will remain in effect until October 13, 2028.

To expedite matters, please reference the assigned wastewater project number 23.0517 in any future correspondence. If we may be of any assistance, please feel free to contact Mr. Adnan Bahour, Ph.D. at (615) 532-0638 or by E-mail at *Adnan.Bahour@tn.gov*.

Sincerely,

Angela Jones, P.E.
Manager, Engineering Services Unit

cc: Water-Based Systems File
Mr. Michael J. Atchley, Unit Manager, TDEC Division of Water Resources, Michael.Atchley@tn.gov

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REFERENCE INDEX

The purpose of this Reference Index is to catalog by name and address those agencies, associations and others who are referred to in these Standards by their initials.

AASHTO American Assn. of State Highway and Transportation Officials
444 N. Capitol St., NW
Washington, DC 20001
http://www.transportation.org/

ANSI American National Standards Institute
1819 L Street, NW, Suite 600
Washington, DC 20036
http://www.ansi.org/

ASTM American Society for Testing and Materials
1916 Race Street
Philadelphia, PA 19103
http://www.astm.org/

AWWA American Water Works Assn.
6666 W. Quincy Ave.
Denver, CO 80235
http://www.awwa.org

DIPRA Ductile Iron Pipe Research Association
245 Riverchase Parkway, E., Suite 0
Birmingham, AL 35244-1856
http://dipra.org/

HI Hydraulic Institute
30200 Detroit Road
Cleveland, OH 44145
http://www.pumps.org/

NFPA National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471
http://www.nfpa.org/

NSF National Sanitation Foundation Testing Laboratory, Inc.
University of Michigan
P.O Box 1468
Ann Arbor, MI 48106
http://www.nsf.org/

TDEC-DWR Tennessee Department of Environment and Conservation
Division of Water Resources
312 Rosa Parks Ave.
Tennessee Tower – 2nd Floor
Nashville, TN 37243-1534
http://www.tennessee.gov/environment/water/

UL Underwriters Laboratories, Inc.
333 Pfingsten Road
Northbrook, IL 60062-2096
http://ul.com/

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CONTENTS

SECTION 2: WASTEWATER COLLECTION SYSTEM

2.0 SYSTEM DESIGN

2.0.1 Pre-Design Conference

(a) Prior to the design of a wastewater collection system extension, the design ENGINEER / ENGINEER of Record (here after referred to as "the ENGINEER") should first confer with the City Planner (or the Planner of the appropriate Planning region) in regard to growth potential and density that may be expected in the general area of the extension being planned.

(b) A pre-design conference with the City of Alcoa Public Works & Engineering Department staff shall follow to discuss customer needs, system requirements, and Standards & Specifications, as well as any coordination or other issues related to the mains being extended.

(c) The ENGINEER must be licensed to practice in the State of Tennessee by the Tennessee Department of Commerce and Insurance, Board of Architectural and Engineering Examiners.

(d) **In residential, commercial, and industrial developments, all costs related to engineering design, construction, and materials, including fittings and piping for sanitary sewer service connections, shall be furnished and installed by the developer.**

(See City of Alcoa Municipal Code, Title 18, Section 18-602 "Extension of Sewer Mains".)

2.0.2 Design Basis

(a) Generally, sewers should be designed to carry, when running full, not less than the following daily per capita contributions of wastewater, exclusive of wastewater from industrial plants:

1. Laterals and sub-main sewers: 400% of average design flow.

2. Main, trunk, and outfall sewers: 250% of average design flow.

(b) In general, wastewater collection extensions shall be designed for the estimated ultimate tributary population.

2.0.3 Design Factors

(a) In determining the required capacities of sanitary sewers, the following factors must be considered:

1. Maximum hourly quantity ofwastewater;

2. Additional maximum wastewater from industrial plants; and

3. Ground water infiltration.

(b) Typical design flows for various facilities are tabulated in Appendix A. The flows shown are assumed to include nominal infiltration, but an additional allowance should be made where conditions are unfavorable. However, actual flows shall be used when available.

2.0.4 Plans and Specifications Approval

(a) Construction plans, hydraulic calculations, and construction specifications for a proposed sanitary sewer must be submitted accordingly:

1. Hydraulic calculations must be submitted for all receiving lines as described in Chapter 2, "Collection Systems", of the TDEC Division of Water Resources *Design Criteria for Review of Sewage Works Construction Plans and Documents*.

   (i) Hydraulic calculations shall initially be submitted to the City of Alcoa Public Works & Engineering Department for approval.

   (ii) Following the City's approval, hydraulic calculations shall then be submitted to the Tennessee Department of Environment and Conservation (TDEC), Division of Water Resources for approval.

2. Plans must be submitted to TDEC within thirty (30) days of City of Alcoa approval. Upon State approval:

   (i) A copy of the Tennessee Department of Environment and Conservation – Division of Water Resources (TDEC-DWR) approval letter and two (2) stamped approved sets of drawings must be submitted to the City; and

   (ii) One (1) stamped approved drawing shall be kept on-site with CONTRACTOR.

3. City and State approval shall expire twelve (12) months from the date of the TDEC approval date.

(b) Sheet Layout:

1. Plans shall be clear and legible and shall conform to the requirements of the City of Alcoa Public Works & Engineering Department's Standards.

2. Plans shall be on sheets 24-inches by 36-inches.

3. Each plan sheet shall contain:

   (i) An appropriate Title Block showing the name of the project. The Title Block must be located at the bottom or right hand side of the sheet, readable from the bottom or right hand side.

   (ii) Location,

   (iii) OWNER;

   (iv) ENGINEER;

   (v) Date;

(vi) Scale (in feet) – See Section 2.0.4 (d);

(vii) True North (where applicable);

(viii) Sheet number; and

(ix) Revision data.

4. Each plan sheet shall contain a blank area at least 4-inches by 6-inches near the Title Block for imprinting the official "*Approved for Construction*" stamps of both the Tennessee Department of Environment and Conservation and the City of Alcoa Public Works Department.

(c) Sewer Plans:

1. Plans shall comply with all Rules of the Tennessee Board of Examiners for Land Surveyors Chapter 0820-03 "Standard of Practice" and shall include information as provided in Section 0820-03-.07 (2) "Topographic Surveys".

2. A plot plan of the existing and proposed sewers shall be submitted for projects involving substantial additions to the existing sewer system.

3. For all existing and proposed sewers, the plan shall show:

(i) Location;

(ii) Size; and

(iii) Direction of flow.

4. Hydraulic calculations are required for all lines in the project.

5. All lines receiving discharge from the project shall be shown to be adequate.

6. A vicinity map must accompany all sewer line extensions.

7. For projects involving multiple sewer lines, include a project map showing the overall layout of the entire project.

8. Plan and Profile views are required for all wastewater lines.

(i) Plans and profiles for specific represented sanitary sewer sections should be drawn on the same sheet.

(ii) The profile of the sanitary sewer shall be drawn from left (lowest elevation and station number) to right (highest elevation and station number).

(d) Scaling:

1. Plan and profile drawings should be 1:20 or 1:30 in congested areas, and 1:40 or 1:50 in non-congested areas.

2. The plan view should be drawn to a corresponding horizontal profile scale.

3. The profile area should have a scaling ratio of 10 horizontal to 1 vertical.

   (i) Horizontal scale should not be more than 50 feet-to-the-inch.

   (ii) Vertical scale of profiles shall not be more than 10 feet-to-the-inch.

(e) The following shall be shown and labeled on all sanitary sewer plan and profile views:

1. Location of:

   (i) Streets;

   (ii) Right-of-ways;

   (iii) Bridges;

   (iv) Embankments;

   (v) Water crossings, etc.

2. Grade line of existing and proposed ground surface;

3. Size, material, and type of pipe for both main and service sewer lines;

4. Length between manholes (to $1/100^{th}$ foot);

5. Grade (slope) of sewer between each two adjacent manholes (to $1/100^{th}$ foot);

6. Bottom invert and surface elevation at each manhole (to $1/100^{th}$ foot) on both plan and profile views;

7. Invert elevations of all additional pipes connecting to the manhole (to $1/100^{th}$ foot) on both plan and profile views, with drop structures shown on additional inverts over 2-feet from manhole bottom;

8. Stationing: The sewer line should be stationed at 100-foot intervals, and stationing of all appurtenances shall be shown on the plan and profile.

8. Location (with stationing) and size of existing or proposed service lines and taps (if known);

10. Location (with stationing) and size of all utility lines that cross the sewer line (water, gas, storm water, electric, etc.), with correct separation distance indicated, and any appropriate encasement if required; and

11. Sanitary sewer casing pipes, including material, diameter, length, and beginning and ending stationing.

12. All special features (with stationing) such as inverted siphons, concrete encasements, elevated sewers, etc.

13. Structures both above and below ground which might interfere with the proposed construction, particularly water mains, gas mains, storm drains, etc. (Additionally, indicate overhead and buried electric lines when relevant.)

14. Easements, lot and right-of-way lines, and corners to be in place at the completion of the project.

15. Lot numbers, street names, proposed edge-of-pavement, and property owner information.

16. Permanent Benchmark based on USGS Datum referenced to Tennessee NAD 83 Coordinate System. Additional Benchmarks will be required when the project exceeds 2,000 linear feet (LF) in length.

(f) Design Considerations

1. All manholes shall be numbered on the plans and correspondingly numbered on the profiles. Consult with the City regarding naming/numbering of new manholes.

2. Whenever possible, sewer service lines shall discharge into a manhole.

3. Other utilities shall be drawn on the sheet for clarification or reference and shall be a reduced line weight and/or grey scale color from the design utility.

4. Where there is any question of the sewer being sufficiently deep to serve any residence or other source, the elevation and location of the basement floor or other low point source shall be plotted on the profile of the sewer which is to serve the house or source in question.

(g) As-Built Plans

1. Upon completion of the project and prior to sale(s) of individual service(s) and/or obtaining a Certificate of Occupancy (C.O.), the design ENGINEER shall prepare detailed As-Built Plans to reflect the project as constructed. **The newly constructed sewer will not be accepted by the City, nor will any connections be allowed to the newly constructed sewer, until As-Built plans are provided as required.**

2. The following As-Built Plans shall be submitted to the City:

(i) One set of ENGINEER-stamped plans;

(ii) In digital format: AutoCAD (*dwg* or *dxf* format) and in PDF format, compatible with the City's mapping system;

(iii) Four (4) copies of applicable Operations and Maintenance manuals must be delivered prior to or with the As-Builts (if applicable);

(iv) All applicable easement drawings and documents, recorded at the Blount County Register of Deeds office; and

(v) Cost of Installation broken down into labor, materials, and equipment. (This information is required by the State of Tennessee and must be provided along with As-Built plans.)

3. Hand revised or cloud revision construction sheets will NOT be accepted as As-Built Plans.

2.0.5 Easements

(a) Easements are required when lines are installed within proximity to private property, or within property not considered public domain or right-of-way. When this occurs, designated area is needed to provide access to conduct maintenance on the utility lines. Plans must show a delineation of this access by the use of easements.

1. Easements must be acquired prior to final approval of plans by the City of Alcoa.

2. A letter of intent and agreement to conditions must be provided with the property owner's signature.

(b) Easement widths vary with depth of the utility line due to the necessary working space to avoid structural damage and to safely access and maintain the lines. The following are guides to easement widths:

TABLE 2.0.5-1 GRAVITY SEWER EASEMENTS

Depth of Line	Width	Distance from Centerline
Minimum to 11 Feet	15 Feet	7.5 Feet
11 Feet to 20 Feet	25 Feet	12.5 Feet
Greater than 20 Feet	Special Case Design	Special Case Design

2.0.6 Manhole Protection

Manholes receiving force main discharges or other similar corrosive influent shall receive a corrosion-resistant admixture or internal lining.

(a) The manhole receiving the force main discharge, and the next five (5) manholes downstream in sequence, shall be treated, when practical.

(b) Corrosion-protection admixture, when required during manhole construction, shall be Xypex® or approved equal.

(c) Internal linings, when used, shall be epoxy or polymer based. (See Section 2.3.13)

2.0.7 Grease, Oil, and Sand Traps and Separators

(a) Gravity-type separators, interceptors, or other such devices for the removal of oil, grease, sand, grit, glass, entrails, or other such material likely to create or contribute to a blockage of the wastewater collection system or otherwise interfere with the operation of the wastewater treatment plant are required at:

1. Applicable commercial sources;

2. Where required by the International Plumbing Code adopted by the City, and

amended by the city; or

3. Where required by other ordinance or regulation of the City of Alcoa.

(b) Such devices shall be of a type and capacity approved by the city's ENGINEER and inspector, and shall be located as to be readily and easily accessible for cleaning, pumping, and inspection.

1. During the plans review conducted by the City of Alcoa personnel of proposed commercial and industrial developments, the need for traps or separators will be determined. If a trap or separator is required, detailed plumbing plans shall be submitted to and approved by the public works and engineering department prior to commencement of construction.

2. All grease traps shall meet design criteria noted above and as described within these Specifications. Persons wishing to install precast concrete septic tanks or concrete tanks shall submit to the control authority. A field inspection shall be required to ensure that the installation complies with the approved drawings and that adequate baffling has been installed.

3. Minimum grease trap and separator size shall be 1,000 gallons.

4. The location of the trap or separator should be placed in an area that is clear of the discharge and flow from rainwater down spouts or other stormwater conveyances. Traps or separators shall not be located in flood prone areas.

5. Additional information can be found in the City of Alcoa Municipal Code, Title 18, Chapter 2, Section 217 "Grease, Oil, and Sand Traps and Separators" (Revised under Ordinance No. 13-305).

6. Grease traps shall be sized by the following formula:

Grease trap size (gallons) = F.U. x 0.5 x 5 gpm x 12 minutes where:

- F.U. = fixture units plumbed into grease trap (as listed in International Plumbing Code adopted by the city, and as amended by the City)
- gpm = Gallons per minute
- 0.5 = factor to account for low probability of all fixture units operating simultaneously

2.0.8 Non-City Septic Failure

(a) Properties outside the City of Alcoa may apply for sanitary sewer connections if either of the following conditions are met:

1. The property has an existing septic field that is failing and cannot be repaired;

2. The property is located near an existing City of Alcoa sanitary sewer and can be reached by a gravity-flow lateral or a privately owned Low Pressure System (LPS) pump system; or

(b) For sanitary sewer access to be granted in these cases:

1. It must be determined that either of the conditions of 2.0.8 (a) have been satisfied;

2. Annexation into the City must be initially requested;

   (i) If approved, the property must be annexed for sewer connection to proceed.

   (ii) If denied, connection to the City's sanitary sewer may still be considered. (Annexation denial may occur if the property cannot be annexed by the City of Alcoa because it is not contiguous with the City limits, it lies outside the City's Urban Growth Boundary/territory, or it lies within another municipality's boundaries or Urban Growth Boundary.)

3. For existing septic system failures, a letter from the Blount County Environmental Health Department certifying the failure of the septic field must be provided to the City of Alcoa.

4. Construction and connection costs will be paid by the customer.

2.0.9 Private Sewage Disposal and Holding Tank Waste Disposal

(a) See the City of Alcoa Municipal Code Section 18-205 for additional information regarding private sewage disposal.

(b) Sanitary sewage "Dump Stations" may be approved by the City of Alcoa for commercial developments such as bus lines and truck-stop facilities, camp-sites, or on-site Recreational Vehicle (RV) and boat storage or occupancy.

(c) The "RV/Bus/Camper/Boat Holding Tank Waste Discharge Application" (See Appendix C) must be completed and submitted to the City for consideration of approval. General construction and operation requirements are described within this application. This form includes standard drawings for station layout and signage.

(d) The installation will require two (2) inspections:

1. Initial examination of the connection made to the existing sanitary sewer lateral;

2. Inspection of the completed dump station.

(e) The Station must also apply with the City of Maryville Pre-Treatment Program and be permitted.

(f) Operation of the dump station will require regular completion of the "Recreational Holding Tank Waste Discharge Monthly Report" (See Appendix C)

(g) If the facility ceases operation and the site will no longer require a dump station, the station must be completely removed before service can be terminated.

2.0.10 City of Alcoa Municipal Code

(a) All specific rules, regulations, and requirements for the City of Alcoa's sanitary sewer

operation are required as described and defined in the City's Municipal Code, specifically Title 18: *Water, Sanitary Sewers, and Storm Sewers*. All subsequent Title 18 Addendums apply.

(b) The Code can be found online at:

https://www.mtas.tennessee.edu/system/files/codes/Alcoa-t18.pdf

2.0.11 Standards Flexibility

(a) Interpretations of these Standards and Design Criteria or the determination of any other Public Works & Engineering Department standards and design criteria not covered under these

1. Standards shall be at the discretion of the City of Alcoa Public Works & Engineering Director.

2. The decision of the Director shall be based on past practices, traditional policies, widely accepted professional principles, and practices of the industry.

(b) Right of Appeal: Any disagreement with the interpretations or determinations made by the Public Works & Engineering Director with respect to these Standards or any other standards not covered herein may be appealed to the Alcoa City Manager.

2.0.12 Warranty Inspection

Twelve (12) months following acceptance of the sewer line, a follow-up inspection will be made to determine if any failures/deficiencies have occurred as a direct result of the CONTRACTOR's work and/or materials. Present at this inspection will be a representative(s) of the Alcoa Public Works & Engineering Department and of the developer and/or CONTRACTOR. The developer and/or CONTRACTOR will be responsible for correction of all failures/deficiencies that have occurred during the first year of operation.

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2.1 WASTEWATER COLLECTION LINES DESIGN

2.1.1 Minimum Diameter

(a) Main lines: Not less than 8-inches in diameter.

(b) Service lines: Not less than 6-inches in diameter.

2.1.2 Depth

(a) In general, sewers should be deep enough to drain basements and to prevent freezing. Where practical, a minimum depth of 5-feet should be maintained.

(b) Maximum depth of bury or cover will be determined by pipe material, conditions of bury, and future use subject to manufacturer's limits of bury.

2.1.3 Slope

(a) All sewers shall be so designed and constructed to give mean velocities, when flowing half full, of not less than 2.0 feet-per-second (fps).

(b) All sewers shall be laid with uniform slope between manholes.

(c) The minimum recommended slopes for 8-inch through 12-inch sewer mains are shown below. However, these slopes should be used only when required.

TABLE 2.1.3-1 GRAVITY SEWER SLOPE

Sewer Size (in)	Minimum Slope (feet per 100-foot)	%
8	0.522 / 100 ft.	0.522
10	0.387 / 100 ft.	0.387
12	0.304 / 100 ft.	0.304

(b) Sewers larger than 12-inch diameter shall be designed in compliance with the latest Tennessee Department of Environment and Conservation – Division of Water Resources (TDEC-DWR) standards. (See Chapter 2, "Collection Systems", of the TDEC Division of Water Resources *Design Criteria for Review of Sewage Works Construction Plans and Documents*.)

(c) Where existing sanitary lines installed prior to 1985 and are being replaced as part of a line rehabilitation project, slopes for these lines should meet minimum TDEC-DWR standards.

2.1.4 High Velocity Protection

(a) Ductile iron pipe (DIP) shall be used when slopes are greater than:

TABLE 2.1.4-1 HIGH VELOCITY GRAVITY SEWER SLOPE	
Sewer Size (in)	**%**
8	18
10	13
12	9

(b) Sewers larger than 12-inch diameter shall be designed in compliance with the latest TDEC-DWR standards.

(c) Where velocities of greater than 15 feet-per-second (fps) are expected, provide protective measures against internal erosion or displacement by shock, such as design of drop inlets to replace steep slopes.

2.1.5 Alignment

Sewers shall be designed with straight alignment between manholes.

2.1.6 Increasing Size

(a) When a smaller incoming sewer line joins a larger one at the bottom of a manhole, sufficiently adjust the invert of the smaller incoming sewer to maintain the same energy gradient.

(b) Acceptable methods for securing these results are:

1. Place the 0.8 depth point of both incoming sewer lines at the same elevation;

2. Match the different incoming pipe crowns to prevent backflow into the smaller pipe.

2.1.7 Surface Water Crossings

(a) Surface water crossings, both under and over water, present special problems which shall be discussed with the Alcoa Public Works & Engineering Department, the Tennessee Department of Environment and Conservation – Division of Water Resources (TDEC-DWR), and the U.S. Army Corps of Engineers before plans are prepared.

(b) Should permits be required, the ENGINEER of Record shall apply for the required permits and submit required fees.

2.1.8 Pipe Bedding

(a) All sewers shall be designed to prevent damage from superimposed loads.

(b) Proper allowance for loads on the sewer shall be made because of the width and depth of trench.

(c) As a general rule, DIP or concrete encasement shall be used in vehicular traffic areas where cover is less than 4-feet, or in open areas where cover is less than 2-½-feet.

(d) DIP shall be required when sewer installation occurs in areas of non-virgin soil (*i.e.* areas of "fill").

(e) Piers shall be provided when necessary for support.

(f) For structural reasons, DIP, concrete encasement, or relocation shall be required when culverts or other conduits are laid such that the top of the sewer is less than 18-inches below the bottom of the culvert or other conduit.

2.1.9 Joints and Infiltration

(a) Sewer joints should be designed to minimize infiltration and to prevent the entrance of roots.

(b) Standard laying lengths for Polyvinyl Chloride (PVC) pipe shall not exceed 20-feet,.

2.1.10 Manholes

(a) Manholes shall be installed at:

1. The upper end of each collection sewer line;

2. All changes in grade;

3. All changes in horizontal direction;

4. Points of changes in pipe size;

5. All pipe intersections; and

6. Distances not greater than 400-feet.

(b) Drop Manholes:

1. A drop pipe shall be provided for a sewer entering a manhole at an elevation of 24-inches or more above the manhole invert.

2. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24-inches, the invert should be U-shaped to prevent deposition of solids.

(c) Diameter:

1. The minimum inside diameter of manholes shall be 48-inches.

2. The entrance tube shall be at least 24-inches in diameter (inside).

(d) Other Considerations:

3. Invert Flow Angle: The minimum angle of a pipe invert with flow coming into the

manhole shall be 90-degrees from the outlet pipe invert. When it is impossible to obtain this angle, the inlet pipe must be a drop, splash, or constructed invert above the flow channel installed in a manner that does not inhibit normal flow through the manhole.

4. Manholes are not to be located in low lying areas where storm water runoff or other flows may extend to within 12-inches of the top of the manhole, unless designed and constructed to include watertight frames and covers, and/or other means to prevent the intrusion of surface water.

5. All manholes where the top of casting is lower than the top of a pump station wet well where their flows terminate shall have water-tight lids.

6. Manholes receiving force main discharge shall comply with Section 2.0.6 of these specifications.

(e) Brick Manholes: When rehabilitation design or new development intersects with existing sewer systems, brick manholes are to be replaced with new pre-cast manholes.

(f) Odor control devices may also be required due to detention time or other odor causing materials in the influent flow (*i.e.*. force main discharge). Odor control devices shall be reviewed and approved by the Alcoa Public Works & Engineering Department prior to installation.

2.1.11 Protection of Water Supplies

(a) Water Supply Interconnections: There shall be no physical connection between a potable water supply line and a sewer or appurtenance which would permit the passage of any wastewater or polluted water into the potable water supply.

(b) Horizontal Separation:

1. Sewers should be installed at least 10-feet from any existing or proposed water pipe.

2. Should local conditions prevent a lateral separation of 10-feet, a sewer may be laid closer to the water main if:

(i) It is installed in a separate trench; and

(ii) The elevation of the top of the sewer pipe is at least 18-inches below the bottom of the water pipe.

(c) Vertical Separation:

1. Whenever a sewer must cross under a water main, the sewer shall be installed at such elevation that the top of the sewer is at least 18-inches below the bottom of the water main.

2. When the elevation of the sewer cannot meet the above requirement, the water main shall be:

(i) Relocated to provide the separation; or

(ii) Reconstructed with DIP for a minimum distance of 10-feet on each side of the sewer.

3. At least one (1) full length of water main should be centered over the sewer so that both joints shall be as far from the sewer as possible.

(d) When it is impossible to obtain proper horizontal and vertical separation as stipulated above:

1. Both the water and sewer mains shall be constructed to water line standards; and

2. Both the water and sewer mains shall be pressure-tested to assure watertightness.

2.1.12 Force Mains

(a) Velocity: At design flow, velocity in excess of 2 feet-per-second (fps) shall be maintained.

(b) Air Release Valve:

1. An automatic air release valve shall be placed at high points in the force main to prevent air-locking.

2. Air-Release valves shall be installed in 4-foot diameter pre-cast concrete manholes.

(c) Termination: Force mains shall terminate in the invert of a manhole.

(d) Pipe diameter: Force mains are to be a minimum of 4-inches in diameter. (Exceptions are covered under Section 2.1.14 "Low Pressure Collection Systems".)

(e) A maximum Hazen and Williams "C" factor of 130 shall be used, regardless of the pipe material.

(f) See Section 2.0.6 "Manhole Protection" regarding requirements for downstream manhole Hydrogen Sulfide (H_2S) protection.

(g) Force Main Location:

1. Force mains are to be located within the public right-of-way or easements as conditions warrant.

2. Standard location for the collector mains is along the front lot line.

3. Pipe Detection:

(i) Force mains shall be wrapped with 12-gauge Copperhead SuperFlex™ – 1230 CCS Tracer Wire during construction.

(ii) Wire Placement:

(1) The wire shall be placed loosely along the sides of the pipe and tucked in underneath before backfill begins.

(2) The wire shall not be stretched tightly along the length of the pipe, placing it in tension, and allowing it to be easily broken as backfill is placed in the trench.

2.1.13 Wastewater Lift Stations

(a) Sanitary sewage life (or pump) stations shall be of the pre-engineered submersible package pump type with above-ground pump control housing, such as the Ebara EP-1 or approved equal, as approved by the City of Alcoa. In general, lift stations should be of the submersible or wet well/dry sump packaged configuration. Other designs may be considered for installation.

1. Designs must conform to the requirements of ANSI/HI 1.1 through 9.8.

2. Wet wells should include capacity for submergence, sump, and storage cumulatively.

3. Storage shall be determined from the point of lead pump start.

4. Pipe entries into the wet well shall be in accordance with TDEC and OSHA requirements.

5. Wet wells and/or dry sumps whose depth exceeds 12-feet:

   (i) Must be evaluated for increased foundation size; and

   (ii) A report provided for geotechnical bearing capacity of the soils at the wet well location.

6. Acceptable submersible designs must be of a non-clog design and be able to pass a 3-inch solid.

(b) Site Grade

1. Sites must be evaluated for local storm water runoff, ensuring the runoff is deflected away from the station, and passing runoff is non-erosive.

2. The site within 20-feet of the pump station shall have a finished grade slope of no greater than 2.5%.

(c) Unless specifically exempted, the design and construction of all lift stations shall include:

1. Paved (asphalt or concrete) driveway;

2. Minimum 8-foot high, 9-gauge barbed top chain-link fence enclosing the site;

3. Minimum 12-foot wide gate for access;

4. Permanent potable water supply:

(i) Potable water yard hydrants shall be located 10-feet or greater from the pump station/wet well;

(ii) Separation of potable and sanitary lines shall be maintained as required/practicable.

5. Ultrasonic and bubbler type level sensors are acceptable;

6. Piping shall include bypass piping with header piping outside the pump station wall terminating with male OPW-type quick-connect fittings;

7. An exhaust blower for ventilation must be provided to the pump house or dry sump,

(i) The blower shall turn on at 70°F and off at 55°F.

(ii) The blower shall also be automatically activated when the entry hatch is opened and may be manually operated.

8. Each pump shall have an approved bourdon-type pressure gauge to monitor discharge pressure.

9. All valves must be non-rising stem gate valves.

10. Portable heater and dehumidifier must be supplied with each station.

(d) Electrical equipment:

1. All electrical equipment must conform to the latest AIEE and NEMA standards and must have UL approval.

2. The electrical control unit must be SCADA (Supervisory Control and Data Acquisition) ready and must be integrated with the City of Alcoa's SCADA system.

3. The SCADA system must have – at a minimum:

(i) Signals/displays for wet well level;

(ii) Pump run status;

(iii) High level alarm;

(iv) High sump alarm;

(v) Discharge pressure;

(vi) Power phase fault;

(vii) RTU AC power failure;

(viii) Wet well & pump house/dry sump intrusion alarms.

(ix) Digital display mounted on the front of the control panel to display:

(1) Level settings;

(2) Current level; and

(3) Pump run status.

(e) Plans and specifications must be submitted to the Alcoa Public Works & Engineering Department for approval.

1. Plans and specifications shall include manufacturer's design submittal including:

(i) Pump curves; and

(ii) Proposed station configuration.

2. Prior to final acceptance of the constructed station, the following shall be provided:

(i) Two (2) sets of As-Built drawings

(1) One (1) reproducible hardcopy; and

(2) One (1) electronic copy.

(ii) Four (4) sets of installation and operating and maintenance (O&M) manuals. Two (2) sets of installation and operating manuals on CD (compact disk). MS Word or PDF format may be substituted for two (2) hardcopy sets.

2.1.14 Low Pressure Collection Systems

(a) Low pressure or "grinder"-type sewer pumps and systems may be constructed in connection with the City of Alcoa's sanitary sewer system where gravity sewer is extremely costly, impractical, or inaccessible.

1. **Gravity sewer lines are required when feasible for sanitary sewer collection.** The use of small pump systems shall be reviewed on a case-by-case basis to determine feasibility.

2. Within the City of Alcoa's sanitary sewage system, grinder-type pumps are only allowed when necessary for users to access a gravity line that will not serve the premises by gravity flow, or under certain circumstances when design conditions of new sanitary sewer systems indicate that grinder pumps are preferred. (See Paragraph (e) 4.)

3. Individual customers are required to have their own grinder pumps. Customers are not allowed to share pumps with other customers.

(b) The City has the right of approval or denial regarding low pressure pump connections to the City's sanitary sewer system in terms of use, location, product, and installation, including the following:

1. Establishing and enforcing design and installation standards;

2. Accessing the site and equipment for both inspection and repair;

3. Obtaining remedies for non-compliance;

4. Conducting emergency responses.

(c) All requirements for sewer connections shall satisfy:

1. The City of Alcoa's *Wastewater Collection – Construction Specifications* (latest edition); and

2. The City of Alcoa's Municipal Code: *Title 18: Water, Sanitary Sewers, and Storm Sewers* (latest edition).

(i) All subsequent Title 18 Addendums apply.

(ii) The Code can be found online at:

https://www.mtas.tennessee.edu/system/files/codes/Alcoa-t18.pdf

(d) Low pressure grinder pumps, low pressure tanks, septic tank effluent pumps (STEP), STEP tanks, and septic tank effluent gravity (STEG) tanks are integral to the treatment and conveyance of sewage in an LPS design. When connected to the City of Alcoa's sanitary sewer system, these components, INCLUDING THE GRINDER PUMP, whether as individual units or part of an LPS, SHALL BE OWNED BY THE CUSTOMER.

(e) Low Pressure Systems (LPS): Low pressure pumps may be installed at individual wastewater service locations, or as part of a larger low pressure system.

1. An LPS is defined as an engineered branching network of small grinder pump stations at each wastewater source that pumps into low pressure force mains (with lines ranging in size from 1¼-inch to 6-inch) that combine to a single discharge directly into a gravity collector sewer or a conventional sewage pump station.

2. An LPS is designed around a sole-single pump type. The pumps used in such systems shall be approved by the City of Alcoa.

3. Applicants for LPS pump installations shall provide plans and calculations to justify the need and functionality of the proposed pump unit.

4. In certain cases of new development, individual grinder pumps or LPS's may be recommended or required by the City:

(i) If the design of the proposed gravity sewer system requires construction of a full pump station and high pressure force main; or

(ii) If the proposed gravity sewer is greater than 8-feet deep, making shallower grinder pumps and related low-pressure force mains the preferred option.

(f) LPS Force Mains

1. Multiple low pressure pumps functioning as a system shall be connected to a common force main, with appropriate engineering calculations provided to the City.

2. If an LPS for multiple pumps is approved and constructed for a certain specified address (or addresses), the City will own, maintain, and control the common lines of the force main.

3. When possible, low pressure force mains shall connect to gravity lines or manholes.

   (i) If connections must be made to larger existing high pressure force mains, calculations shall be provided to verify that the design of the smaller low pressure pump and related piping will not be overwhelmed, allowing high-pressure sewage to be conveyed back through the low-pressure system and onto the privately owned location.

   (ii) Costs related to the failure of the low-pressure system to successfully pump into a high-pressure force main will be the responsibility of the private owner.

4. Low pressure force main systems for multiple pump arrangements are to be located within the public right-of-way or easements as conditions warrant to allow access to equipment for repairs and inspections.

   (i) Standard location for the collector mains is along the front lot line.

   (ii) Pumps and tanks shall be located adjacent to the public right-of- way.

(g) Non-City Grinder Pump Connections: Properties outside the City of Alcoa may apply for grinder pump connections to the City's sanitary sewer system.

1. For approved connections, these properties shall meet the processes and conditions defined in "Section 2.0.8 – Non-City Septic Failure" of these Specifications.

2. When approved, properties with existing septic tanks applying for connection to the City's system shall install the pump downstream of the tank, creating a Septic Tank Effluent Pumping (STEP) system. The OWNER shall be responsible for all maintenance related to the tank.

3. Before approval and connection to the City sanitary sewer system, the existing septic tank shall be pressure tested to ensure that no leaks exist. Should the existing tank have leaks, it will be sealed to eliminate the leaks, or replaced with a new septic tank or wet well at the customer's expense.

(h) User Costs:

1. Initial Tap Fee: Calculated by the City and provided before installation.

2. Initial System Purchase Costs: Provided by the City, based on current system prices:

   (i) Pump;

   (ii) Wet well;

   (iii) Electrical control panel;

3. Monthly Service Agreement Fee: This amount will be provided to the customer at the time of service;

4. Monthly Sewer Usage: Billing is based on metered water usage. (NOTE: Electricity to power the grinder pump system shall be purchased by the customer.)

(i) Installation Responsibility:

1. When it has been determined that a grinder pump or LPS will be allowed at a site, the customer will then pay all appropriate fees, including but not limited to the cost of the complete grinder pump unit (pump, wet well, electrical control panel, associated valves, and service lines to the sewer main.)

2. The City will install and be responsible for the pump, wet well, electrical control panel, associated valves, and service lines to the sewer main.

3. The customer shall be responsible for installation of house-side plumbing to the to the we well, and supplying electrical power to the station disconnects, and also including the disconnects.

(j) Maintenance or Replacement of Low Pressure Pumps:

1. Individual customers with grinder pumps or part of an LPS shall pay a monthly service maintenance fee to the City to cover necessary preventive or emergency maintenance, or for complete replacement of pumps as needed.

2. Commercial grinder pump customers (*i.e.* businesses, apartment complexes, duplexes under the control of a landlord, etc.) will NOT pay the monthly service maintenance fee, and shall be responsible for maintenance and repairs of grinder pumps and related appurtenances.

(k) Misuse or Abuse of Pumps

1. The customer fully owns their low pressure system and is ultimately responsible for its proper use.

2. Refer to pump and LPS literature for items that should not be placed into the system.

3. Misuse or abuse of the system will void the service agreement between the City and the customer, and the customer will be charged for the full cost of repairs or replacement at the time of service.

4. Pumps requiring excessive maintenance or replacement may be additionally assessed for non-compliance, or completely disconnected from the City's sanitary sewer system if it is determined that proper care is not being provided for the pumps in terms of what materials may pass through them without causing damage.

    (i) The pump and grinder system will not be reconnected to the City's sanitary sewer system until the pump has been repaired at the customer's expense.

    (ii) Continued misuse or abuse of the pump and grinder system may result in removal from the City's maintenance and repair program, whereupon all future pump repairs and replacements shall be solely the responsibility of the customer.

(l) Installation Requirements:

1. Residential pumps shall be Razor Grinder Pumps, manufactured by Barnes, or approved equal as determined by the City.

    (i) No alternate models that are not approved by the City will be connected to the City's sanitary sewer system.

    (ii) Non-approved models installed and connected prior to that adoption of these requirements will be replaced with approved models as their service life ends.

2. Pipe Detection:

    (i) Low pressure force mains and service mains shall be wrapped with 12-gauge Copperhead SuperFlex™ – 1230 CCS Tracer Wire during construction.

    (ii) Wire Placement:

        (1) The wire shall be placed loosely along the sides of the pipe and tucked in underneath before backfill begins.

        (2) The wire shall not be stretched tightly along the length of the pipe, placing it in tension, and allowing it to be easily broken as backfill is placed in the trench.

3. Valves shall be placed on the upstream side of tees on the main and branching lines. The dead ends of all lines in a pressure system shall have a clean out with threaded connection in a ground level valve box.

4. Service line taps shall be 1¼" minimum.

    (i) Each service line is required to have installed an isolation valve and check valve installed in ground level valve box.

    (ii) All connections to the low pressure main shall enter vertically into the top of the main.

5. Only approved grinder pumps shall be tied to a low pressure sewer system.

   (i) The slurry produced by the grinder pump must pass through a minimum 1¼ -inch service line;

   (ii) A minimum velocity of 2 feet-per-second (fps) shall be designed for all lines;

   (iii) The designed system must utilize pumps that do not allow backflow conditions;

   (iv) The low pressure grinder pump unit(s) shall be watertight, and must be located above the seasonal ground water table.

6. Electrical Service:

   (i) The serviced building/residence/structure shall have a sufficient electrical distribution panel to provide electrical power to operate the low pressure grinder pump unit and controls.

   (ii) Underground circuits must be provided to the pump unit. For residential units, customer shall provide two (2) dedicated circuits from a main or sub-panel. These shall be terminated in individual disconnects on the "line" side of the disconnect.

      (1) One circuit shall be 240V, 30A, as required for pump power.

      (2) One circuit shall be 120V, 15A for supply of power to the alarm.

   (iii) The pump control box shall have an audible and visual alarm mounted to the servicing building and, where practical, visible from the front of the lot.

   (iv) Electrical service shall be paid by the owner/tenant of the serviced unit.

7. Flushing Stations:

   (i) For LPS, flushing stations shall be placed at a maximum of every 400-feet and made up of an isolation valve with a valved flushing connection on either side.

   (ii) Flushing stations shall be built and contained in a single pit.

8. Air-Release Valves: For LPS, air-release valves shall be installed in the low pressure force main at:

   (i) 2,500 linear feet (LF) intervals on long horizontal runs;

   (ii) Each downward leg of 30-feet or more of drop; and

   (iii) Each ascending leg at 2,000-foot intervals, as well as other locations shown on the plans.

2.2 PRODUCTS

2.2.1 General

(a) All materials must be approved by the City per Section 2.3.2 (d) of these construction specifications.

(b) **All materials shall be manufactured and assembled in the U.S.A. (domestic) or under U.S. standards (non-domestic)** as provided by, but not limited to, the agencies listed in the Reference Index of these specifications.

1. Manufacturers of non-domestic materials shall supply documentation and/or certification of quality control procedures and meeting required standards herein.

2. When a manufacturer supplies both domestic and non-domestic manufactured materials, domestic manufactured materials are the required source by the City.

3. Submittals for all materials shall supplied by the material manufacturer and must show or disclose adherence to required standards within these specifications.

   (i) Additionally, manufacturers of materials shall include the name and address of the point of manufacturing.

   (ii) Submittals shall be visibly and specifically marked to indicate model, type, style, size, etc. to be supplied and used in construction.

4. Unless previously approved, all materials used in the construction should be new materials manufactured no earlier than one (1) year prior to the current year.

5. When project material is stored long-term prior to use, it must be done to manufacturer's requirements, in a way to prevent contamination and is subject to rejection due to damage, mishandling and improper storage.

(c Manufacturers may be excluded from use due to non-performance or other material quality issues.

1. The manufacturer shall be notified in writing and a period of performance review shall be conducted by the City.

2. Reinstatement is the burden of the manufacturer who must provide assurances, a quality improvement plan and an extended suitable warranty on all supplied materials in writing.

2.2.2 Pipe – Gravity Flow

(a) Polyvinyl Chloride (PVC) Pipe:

1. Shall be manufactured from virgin, NSF approved resin conforming to the requirements of ASTM Standard D1784.

2. All PVC pipe shall conform to the requirements of either:

(i) ASTM Standard D3034 and have a Standard Dimension Ratio (SDR) of 35; or,

(ii) AWWA Standard C900 DR14.

3. Gaskets used for joining PVC pipe shall conform to ASTM Standard F477.

4. All PVC pipe shall be clearly marked with:

(i) Manufacturer's name;

(ii) Nominal diameter;

(iv) SDR35 (ASTM D3034) or AWWA C900 DR14; and

(v) NSF approved seal.

5. Depth:

(i) Less than 12-feet: Use of ASTM D3034/SDR35 PVC pipe shall be limited to depths less than 12-feet.

(ii) Greater than 12-feet: Where depths to the sewer invert are 12-feet or more, AWWA C900 DR14 PVC pipe or ductile iron pipe (DIP) shall be used.

(b) Ductile Iron Pipe (DIP):

1. Approved Pipe:

(i) As a minimum, DIP shall meet the latest requirements of Class 50 thickness, AWWA Standard C150 and C151.

(ii) As an alternate when market supplies do not meet project schedules, with City of Alcoa approval, Class 350 will be allowed, meeting the requirements of AWWA C150 and C151.

2. A corrosion-resistant ceramic epoxy lining may be required when DIP is used in close proximity to a lift station discharge or other locations where a corrosive atmosphere is likely. This lining shall be Protecto 401.

(i) The lining shall have a 40-mils dry film thickness within pipe;

(ii) Line interior of bell and exterior of spigot in joint sealing areas with 6 mils to 10 mils of specified lining;

(iii) Lining shall consist of amine cured novolac epoxy containing at least 20 percent by volume quartz pigment;

(iv) Surface Preparation:

(1) SP10 near-white abrasive blast;

(2) Pinhole Detection: 2,500 volts minimum over 100 percent of lined surfaces;

(v) Fittings shall meet the requirements of AWWA Standard C110, with either mechanical joints or slip-on joints with rubber gaskets. Fittings at pipes required to have Protecto 401 coatings will also have this same coating.

3. Pipe sections shall be clearly marked with:

(i) Manufacturer's name;

(ii) D.I. or Ductile Iron;

(iii) Weight; and

(iv) Class or nominal thickness.

4. Ductile iron pipe (DIP) shall be manufactured by:

(i) American;

(ii) U.S. Pipe,

(iii) Griffin;

(iv) McWane pipe; or

(v) Approval equal.

5. Ductile Iron Pipe or AWWA C900 PVC pipe shall be required where depths are 12-feet or more to the sewer invert.

6. Ductile Iron Pipe shall be required where depths are less than 4-feet in roadways.

(c) HDPE

1. HDPE shall conform to requirements of AWWA C906 or ASTM F714.

2. Polyethylene resin shall meet or exceed requirements of ASTM 3350 for PE 4710 material. Pressure rating shall be based on hydrostatic design stress of 800 psi at 73.4° F.

3. Dimensional Ratio (DR):

(i) Pipe Larger than 4-inches: Minimum DR 17 (unless otherwise noted on the design drawings).

(ii) Pipe 4-inches and Smaller: Minimum DR 11 (unless otherwise noted on the design drawings).

4. Outer diameter basis: Ductile Iron Pipe Size (DIPS).

5. Pipe lengths, fittings, flanged connections to be joined by thermal butt-fusion shall be of compatible resin mix for the fusion process.

6. HDPE pipe shall have a co-extruded green cover or extruded green stripes designating use for sanitary sewer.

   (i) Color print lines are not an acceptable method for designation of sewer mains.

   (ii) Pipe with extruded green stripes shall have a minimum of three equally spaced stripes.

   (iii) Pipe shall have a heat indented print line containing the information required in ASTM D 3035.

7. Approved HDPE manufacturers:

   (i) Performance Pipe;

   (ii) Rinker Polypipe;

   (iii) Uponor North America;

   (iv) ARNCO, Elyria, OH.

8. Fittings:

   (i) Sizes 6-inches or smaller: Molded and fabricated from polyethylene

   (ii) Sizes 8-inches and larger: Use thermal butt-fusion.

   (iii) Polyethylene fittings shall have same or higher pressure rating as pipe

   (iv) Butt fusion fittings shall comply with ASTM D3261 requirements.

9. Backup Rings:

   (i) Convoluted for flanged connections:

      (1) ASTM A536, Ductile Iron.

      (2) Complete with one piece, molded polyethylene flange adapters;

      (3) Flanged connections: Same or greater pressure rating as pipe.

   (ii) Ductile Iron: Shop primed with red oxide and shop coated with two part-part epoxy material in accordance with AWWA C550. Dry film thickness shall be 10 mils minimum.

10. Electrofusion joint fittings shall have ISO 9001 and NSF 61 certification.

   (i) Manufacturers:

(1) Central Plastics Company;

(2) Central Electrofusion System; or

(3) IPEX, Inc.;

(4) Friatec.

11. Joint:

(i) Thermal-butt fusion or electrofusion, except where connecting to unions, valves, and equipment with flanged or threaded connections that may require future disassembly or as indicated on the Drawings.

(ii) Mechanical joints shall not be utilized with HDPE pipe.

12. Gaskets: Material, size, and thickness shall be as recommended by pipe or flange manufacturer, and in accordance with PPI Technical Note 38.

13. Bolts, Nuts, Washers: Carbon steel, ASTM A307, Grade A hex head bolt, and ASTM A563, Grade A hex head nuts.

14. Thrust Restraint:

(i) Wall Anchor: Material, internal diameter, shear strength shall be the same as the HDPE pipe. Butt fusion shall be method of joining. Extrusion bead welding is not allowed. Concrete thrust collars around wall anchor shall be in accordance with Project Drawings.

(ii) Products that restrain HDPE pipe with wedges, machined serrations, or clamps are not acceptable.

15. Electrofusion Flex Restraint:

(i) Material: HDPE.

(ii) Design for restraining movement of HDPE pipe.

(iii) Electrofusion shall be method of joining.

(iv) Manufactures:

(1) Central Plastics Company; or

(2) ISCO Industries.

(d) Pipe Fittings:

1. PVC Pipe Fittings:

(i) Fittings shall be manufactured from virgin, NSF approved resin conforming to the requirements of ASTM Standard D1784.

(ii) Fittings should be supplied from the same manufacturer and/or be of the same type as the PVC pipe.

2. Ductile Iron and Cast Iron Fittings:

(i) Ductile iron fittings for use in sewer lines shall be 350 psi pressure rating, cement-mortar lined, mechanical joints, meeting the latest requirements of AWWA Standard C153.

(ii) Cast iron fittings for use in sewer lines shall be 250 psi pressure rating, cement- mortar lined, mechanical joints, meeting the latest requirements of AWWA Standard C110.

(iii) A corrosion-resistant lining may be required when ductile iron and/or cast iron fittings are used in close proximity to a lift station discharge or other locations where a corrosive atmosphere is likely.

(iv) Rubber gasket joints shall meet the latest requirements of AWWA Standard C111.

(v) Ductile iron or cast iron fittings or other fittings approved by the ENGINEER shall be used in conjunction with ductile iron.

2.2.3 Wastewater Lift (Pump)Stations

Sanitary sewage lift (or pump) stations shall be of the pre-engineered submersible package pump type with above-ground pump control housing, such as the Ebara EP-1 or approved equal, as approved by the City of Alcoa. (See Section 2.1.13 Wastewater Lift Stations.)

2.2.4 Force Main

(a) PVC:

1. For PVC force main pipe having a diameter of 8-inches in diameter and less, Pressure Class 235, C900 PVC pipe may be used.

2. The pipe must meet the requirements set forth in ASTM Standards D1784 & D2122 for 4-inch through 8-inch pipe designated DR-18.

3. Install in accordance with AWWA C605, ASTM D2321, and AWWA Manual 23.

4. Joints: In accordance with manufacture's written instructions.

(b) HDPE:

1. Install polyethylene pipe in conformance with AWWA M55, PPI TR-33, ASTM F2620, and pipe manufacturer's recommendations.

2. Allow pipe to sufficiently cool, in accordance with manufacturer recommendations, prior to making any connections to flanges, existing pipeline systems or structures. Coordinate pipe surface temperature as measured with infrared temperature gun with ENGINEER/OWNER prior to making

connections.

3. Joining:

   (i) Preparation:

      (1) Inside and outside of pipe ends shall be cleaned with cotton or non-synthetic cloth to remove dirt, water, grease, and other foreign materials.

      (2) Pipe ends shall be cut square and carefully aligned prior to heating.

   (ii) Assemble and join at the Site using the butt-fusion method to provide a leak proof joint. Threaded or solvent-cement joints and connections are not permitted.

   (iii) All equipment and procedures used in shall be in strict compliance with ASTM F2620 and with the manufacturer's recommendations.

4. Where indicated on the Project Drawings, connect HDPE pipe to auxiliary equipment such as valves, pumps, tanks, and other pipe systems with flanged connections as follows:

   (i) Polyethylene flange adapter, thermally butt-fused to end of pipe. Flange "stub-ends" are not allowed.

   (ii) Bolt and nut of sufficient length to show a minimum of three complete threads when joint is made and tightened to manufacture's standard

   (iii) Follow requirements of PPI Technical Note 38 including mandatory 4-hour bolt re-torquing.

5. Support heavy fittings, manholes, and rigid structures in such a manner that no subsequent relative movement between polyethylene pipe at flanged joint and rigid structures is possible.

6. Minimum long-term bending radius restricted to limits recommended by AWWA M 55, Table 8-2.

   (i) Prior to pipe installation, two trial fusion welds shall be performed, and reviewed and approved by the OWNER.

   (ii) Full penetration welds shall provide homogeneous material across the cross section of weld. Fusion machine employed for trial welds shall be same machine utilized for project installation.

7. The butt-fused joint shall be true alignment and shall have uniform rollback beads resulting from the use of proper temperature and pressure.

   (i) The joint shall be allowed adequate cooling time before removal of pressure.

(ii) Excessive interior bead depth is cause to have the joint cut out and replaced.

8. The fused joint shall be watertight and shall have tensile strength equal to or greater than that of the pipe.

9. All joints shall be subject to acceptance by the OWNER prior to insertion.

10. The CONTRACTOR shall cut out and replace defective joints at no additional cost to the OWNER.

(i) Any section of the pipe with a gash, blister, abrasion, nick, scar, or other deleterious fault greater in depth than ten percent of the wall thickness (ASTM 585), shall not be used and shall be removed from the Site. However, a defective area of the pipe may be cut out and the joint fused in accordance with the procedures stated above.

(ii) Any section of the pipe having other defects such as concentrated ridges, discoloration, excessive spot roughness, pitting, variable wall thickness or any other defect of manufacturing or handling as determined by the OWNER shall be discarded and not used.

(c) Ductile Iron Pipe:

1. If working pressure exceeds 235 psi for any portion of the main, the force main shall be ductile iron meeting the latest requirements of AWWA Standard C-151, minimum. Class 50 thickness, coated with a corrosion resistant interior lining with either mechanical joints or slip-on joints with rubber gaskets.

2. Ductile iron pipe (DIP) shall be manufactured by:

(i) American Cast Iron;

(ii) U. S. Pipe;

(iii) Griffin;

(iv) McWane Pipe; or

(v) Another City of Alcoa-approved equal.

2.2.5 Low Pressure Main

(a) Low pressure force mains tied to low pressure grinder pump stations (1¼ -inch to 3-inch pipes) shall be:

1. Pressure Class 200, SDR 21 PVC pipe, ASTM D1784

2. Schedule 40 PVC, ASTM D1785 and D2665

3. Pressure Class 200, PE 4710, DR 11, PE pipe, ASTM D3350.

(b) Pipe Detection:

(i) Low pressure force mains and service mains shall be wrapped with 12-gauge Copperhead SuperFlex™ – 1230 CCS Tracer Wire during construction.

(ii) Wire Placement:

(1) The wire shall be placed loosely along the sides of the pipe and tucked in underneath before backfill begins.

(2) The wire shall not be stretched tightly along the length of the pipe, placing it in tension, and allowing it to be easily broken as backfill is placed in the trench.

(c) Fittings for force mains shall comply with the specifications of low pressure main pipe, pressure class 200 or greater.

2.2.6 Concrete Materials

Concrete used in conjunction with the installation or repair of sewer lines and appurtenances shall meet the requirements of the *City of Alcoa Street & Drainage Construction Specifications, Latest Edition, Section 03001 Concrete Work*:

(a) Class "A"Concrete:

(b) Minimum compressive strength: 28 days, 4,000 psi.

(c) Cylinder Testing: When needed, a minimum of three (3) cylinders is required.

2.2.7 Manholes

(a) General Requirements

1. Manholes shall be precast reinforced concrete meeting the requirements of ASTM Standard C478.

2. Manhole inside diameter shall be:

(i) 48-inches for 18-inch and lesser diameter pipes; and

(ii) 60-inches for 21-inch to 30-inch diameter pipes.

3. Wall thickness shall be a minimum of 5-inches.

4. The minimum compressive strength of precast manhole risers, bases, cone, or top sections, and grade rings shall be 4,000 psi.

5. The access opening in top sections shall be a minimum diameter of 24-inches.

6. Joints: The reinforced concrete manhole base and riser sections, except grade rings, shall be formed with male and female ends, so that when the manhole base, riser, and top are assembled they will make a continuous and uniform manhole. Joints shall conform to ASTM C443 standards.

7. Lift Holes:

(i) Lift holes (or eyes) may be provided in each section for the purpose of handling.

(ii) Lift holes must not protrude through the concrete walls.

(iii) Lift holes should be installed on the sides on the cone tops.

8. Poured-in-place reinforced concrete manholes, polyethylene manholes, or fiberglass manholes may be used with prior permission of the City.

9. Doghouse-style manholes shall not be used on lines with diameters less than 12"

10. Manhole Corrosion Protection:

(i) Where flows may exist at less than 2 feet-per-second (fps) or where the manhole is located on the discharge of a sanitary force mains, the interior of the manhole shall be coated with Hydrogen Sulfide (H_2S) protection (Xypex or other approved corrosion resistant coating).

(ii) Hydrogen Sulfide (H_2S) protection can be an admixture to the manhole concrete mix during construction or a polymer or epoxy liner installed after the manhole is in place. (See Section 2.3.8. (o) Installing Manholes)

(iii) The manhole receiving the force main discharge, and the next five (5) manholes downstream in sequence, shall be treated, when practical.

(b) Precast reinforced concrete manhole bases:

1. The base riser sections shall be precast with integral floors.

2. Bases for pipes 10-inches diameter or less shall have a minimum outside height of 24-inches.

3. Bases for 12-inch through 18-inch diameter pipe shall have a minimum outside height of 36-inches.

4. Heights of bases for pipes greater than 18-inches in diameter shall be according to the manufacturer's specifications, subject to prior approval of the City.

(c) Precast Reinforced Concrete Tops: Precast tops may be one of the following two types:

1. Eccentric cone

2. Flat slab top

(d) Precast Reinforced Concrete / Manufactured Polymer Grade Rings:

1. Must meet or exceed AASHTO HS-25 loadings & ratings.

2. Grade ring wall thickness shall be a minimum of 5-inches.

3. Grade rings shall not be greater than 9-inches in height.

4. The combined height of stacked grade rings shall be a maximum of 12-inches. Additional height greater than 12-inches require the use of manhole riser section(s).

5. All grade rings must be fastened to the manhole riser and casting and to each other when more than one is used.

6. Manufactured polymer grade rings shall be used on manholes located with in vehicular traffic areas. Approved rings (manufacturers) are Pro-Ring (Cretex), Adjustment Ring (Ladtech), and Elevation Ring (Underground Technologies).

(e) Manhole Steps (Precast and Poured-in-Place Concrete Manholes):

1. Manhole steps shall be fabricated from aluminum alloy 6061-T6 or Copolymer polypropylene aluminum core molded steps.

   (i) Copolymer steps shall be orange in color or other OSHA applicable color code and shall meet or exceed the strength requirements of ASTM C478, Section 16.

   (ii) Manholes steps shall be ML-10-TDS-AR, manufactured by American Step Company, or approved equal.

2. Manhole steps shall be corrosion resistant, free from sharp edges, burrs, or other projections which may be a safety hazard and shall be of sufficient strength to support a live load of 300-pounds imposed at any point.

3. The minimum width of cleats shall be 10-inches.

4. The legs and struts shall be of sufficient length for the cleat to project a minimum clear distance of 4-inches from the wall when the step is securely imbedded in the manhole wall.

5. The top surface of the cleats shall be designed to prevent foot slippage.

6. Steps should be positioned vertically over the manhole pipe outlet and at a maximum spacing of 16-inches.

7. Steps shall be the same size, projection, spacing, and alignment in each manhole.

(f) Section Joints: Base risers, section risers, and tops shall be designed for confined O-ring gasket joints meeting the latest requirements of ASTM Standard C443 or flexible butyl resin sealant meeting the latest requirements of ASTM Standard C990.

(g) Manhole Openings:

1. Openings in the base section wall shall be cored for the required number and size of pipes, and shall be manufactured as to allow up to 20-degrees axial deflection.

2. Pipe openings made in the field in existing manhole walls for PVC pipe installation shall be machine cored. Each core shall have installed a flexible molded neoprene boot meeting requirements of Section 2.2.4 (h) 1. of these Standards.

(h) Pipe Entrance Couplings:

1. A watertight pipe-to-manhole gasket system using a flexible molded neoprene compound boot meeting the latest requirements of ASTM Standard C443 or rubber meeting the latest requirements of ASTM Standard C923 shall be installed for each core opening furnished in base riser sections.

2. Gaskets shall be designed to allow up to 20-degrees axial deflection.

3. Internal expanding bands or power sleeves shall be of a type 304 stainless steel meeting the latest requirements of ASTM Standard C923 and shall be designed to allow contraction around the boot to clamp and seal the boot to the pipe.

4. Other specially designed flexible products may be approved by the Alcoa Public Works & Engineering Department.

(i) Manhole Covers:

1. Manhole cover frames and lids shall be of gray cast iron meeting the latest requirements of ASTM Standard A48, Class 30, (30,000 psi);

2. Painting of the frame and lid is not required.

3. Manhole frames and covers shall be round, with the cover/frame interface machine ground horizontally, and should weigh not less than 375 pounds.

4. Manhole frames shall have:

   (i) Clear openings of 24-inches;

   (ii) Heights of approximately 7-1/2-inches; and

   (iii) Overall base diameters of approximately 35-inches.

5. The manhole frame base shall have four uniformly spaced holes for attachment to the manhole using 5/8-inch diameter bolts or threaded rods.

6. Lid requirements:

   (i) Thickness of 1-½-inches;

   (ii) Diameter of 26-inches;

   (iii) Shall be solid;

   (iv) Shall have either one or two concealed pick holes for lifting purposes.

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7. Top surfaces of lids shall have embossed treads for non-slippage purposes and embossed words “SANITARY SEWER” with letters approximately 2-inches in size.

   (i) Special casting lettering/graphics may be used where developments

provide a uniform code requirement for esthetic purposes.

(ii) When special castings are used, a spare must be provided for every ten (10) castings placed in the collection system.

8. Manhole frames and covers shall be manufactured by:

(i) Neenah R-1642;

(ii) East Jordan Iron Works, No. V-1380;

(iii) John Bouchard & Sons Co., 1152M or 1123 (Watertight); or

(iv) Approved equal.

9. Watertight Manhole Covers:

(i) Watertight manhole frames and covers shall be utilized when the manhole is located in flood prone areas or where storm water drains over a manhole. Where drainage is temporary and shall be removed during restoration and final grading, a manhole cover insert may be used.

(ii) Watertight manhole frames and covers shall be of the outer lid/inner watertight cover configuration. The frame and outer lid shall meet the same material and dimensional requirements of non-watertight covers.

(iii) The steel locking bar for the inner watertight cover shall be equipped with a minimum ¾-inch diameter stainless steel or brass bolt for securing the cover. The bolt shall be equipped with a minimum ½-inch diameter, 4-inch long "tee" handle for installation and removal.

(iv) The inner watertight cover shall be equipped with two (2) cast iron, stainless steel or brass eye-hooks for ease of removal and installation of the cover and a neoprene gasket for a watertight seal between the inner cover and frame.

(v) Watertight manhole frames and covers shall be

(i) Neenah Foundry Company No. R-1755-F1;

(ii) John Bouchard & Sons No. 1123; or

(iii) Approved equal.

(j) Manhole inserts for corrosion resistance shall be made of corrosion resistant polymer, from 3/32 to 6/32 thick and have a pull device attached for removal.

1. Manufacturers are:

(i) Parsons;

(ii) FRW; or

(iii) Approved equal.

(2) Inserts used with lock down lids shall not inhibit the locking function of the lid.

(k) Manhole Drops (Drops of 24" or greater)

1. Inside Drops:

(i) Are preferred over Outside Drops;

(ii) Shall be manufactured and made from impact and chemical resistant polymer materials;

(iii) Shall be attached to the inside walls as required by the manufacturer;

(iv) Must not interfere with ladder ways and use of ladder ways;

(v) Shall be Reliner® (Duran Inc.) or approved equal;

(vi) Must include a removable device to allow full diameter access to the influent line where the drop is mounted;

(vii) Shop drawings for pre-manufactured internal drop assemblies shall be submitted for review and approval by the Alcoa Public Works & Engineering Department.

2. Outside Drops:

(i) Inside drops are preferred over outside drops. When the connection does not allow for preferred drop connections, outside drops are to be either pre-cast and integral, or constructed from C900 PVC or DIP and fittings.

(ii) Outside drop manholes shall be designed by a Structural ENGINEER.

(iii) Integral and precast outside drops shall be monolithically poured with the manhole base and each riser ring used to form the manhole during manufacturing.

(iv) When required by depth equal or greater than 12-feet, the poured slab receiving the manhole base shall be extended to support the outside drop portion of the manhole in the same manner as a standard manhole.

(v) Constructed outside drops are to have restrained joints and a secure cast in place base extending 12-inches above the upper end of the bottom 90-degree bend. That maximum gap between the manhole and outside drop pipe is 12-inches.

(vi) Concrete used in constructing drop pipe assemblies shall meet the conditions under Section 2.2.6 of these Standards

2.2.8 Pipe Detection

Means of detecting PVC and HDPE pipe, as well as related PVC fittings, shall be 12-gauge

Copperhead SuperFlex™ – 1230 CCS Tracer Wire.

2.2.9 Air Release Valves

(a) Air release valves for use on pressure sewage mains shall be of the combination air release/vacuum breaker design.

(b) Internal valve components: To minimize corrosion, these shall be constructed of:

1. Stainless steel;

2. Brass; and/or

3. Bronze.

(c) Each valve shall be designed/sized for its particular application.

(d) Air-Release valves shall be installed in 4-foot diameter pre-cast concrete manholes.

(e) Valves shall be manufactured by:

(i) APCO;

(ii) Crispin;

(iii) Golden-Anderson; or

(iv) Approved equal.

2.2.10 Valves – Pressurized Main (Force Main)

(a) Valves on force main lines 4-inches or greater shall:

1. Be mechanical joint;

2. Be resilient-seat type.

3. Have:

(i) Iron body;

(ii) Non-rising stem;

(iii) Operating nut:

(1) "O"-ring;

(2) Stem seal type;

(3) 2-inch square;

(4) Opens counter- clockwise.

(b) Gate Valves:

1. Shall meet the latest requirements of AWWA Standard C-509 or C-515.

2. Shall have pressure ratings of 200 psig or greater.

3. Shall be manufactured by:

(i) Mueller Company, Model A-2360;

(ii) U.S. Pipe & Foundry Company, Model No. 5460;

(iii) McWane Pipe and Foundry, Model F-6100;

(iv) Clow Company, Model Number 5065;

(v) Waterous Company, Series 500;

(vi) M & H Company, Model 3067-01;

(vii) American Cast Iron Company, American Darling (any model numbers); or

(viii) Approved equal.

(c) Ball Valves

1. Valves on force main lines less than 4-inches shall have fully ported ball valves with a tee handle actuator;

2. Low pressure system service check valves will be 1-1/4" full flow flap type valves;

3. Isolation valves for the check valves will include a full port 2-inch meter stop with locking wing;

4. Ball valves shall be Chemtrol, Hayward, or approved equal.

2.2.11 Clean Outs / Flushing Stations - Low Pressure Sewer Systems

(a) On low pressure sewer systems flushing stations shall be installed at no greater than 1,500 linear foot (LF) intervals, where two (2) mains come together and at terminal ends in accordance with the details shown in the drawings.

(b) Each flushing station shall be constructed in accordance with the details shown on the plans depending on whether it is a mid-line or end of the line station.

(c) Valves will be full port 2-inch meter stops with locking wings

2.2.12 Grinder Pump Units – Low Pressure Sewer Systems

(a) The grinder pumps shall be able to obtain a range of total dynamic head (TDH) from 0- to 130-feet (56 psi) at a discharge of 9 to 14 gallons-per-minute (gpm).

(b) The grinder unit shall macerate all material of normal domestic and commercial sewage, and also a reasonable amount of foreign objects such as paper, wood, plastic, and glass chips to fine particles that pass freely through the pump.

(c) The pump units must be National Sanitary Foundation (NSF) and Underwriters Laboratory (UL) approved.

(d) The wet well shall be made of a heavy-duty, corrosion-resistant polymer material, and have a minimum capacity of 70 gallons.

(e) The pump shall be a contained unit that is easily removed and installed without entering the unit.

(f) The wet well and upper enclosure shall each be watertight.

(g) Low pressure service lines shall be 1¼-inch lines meeting all requirements of this section, unless a larger line is required by design.

(h) Pumps shall be Razor Grinder Pumps manufactured by Barnes, or approved equal as determined by the City. The manufacturer shall supply:

1. One set of special tools required for operation, adjustment; and maintenance of the pumping station;

2. Operations and Maintenance (O&M) manuals. These manuals shall include a detailed parts list with catalog number, and electrical power and control wiring diagram.

2.2.13 Casing and Spacers

(a) Casing pipe must meet all requirements of the Tennessee Department of Transportation (TDOT) and/or American Railway Engineering and Maintenance-of-Way Association (AREMA).

(b) Casing pipe diameter shall be two times (2X) the nominal diameter of the carrier pipe.

(c) Unless specified otherwise, the minimum wall thickness of steel casing pipe shall be as follows:

TABLE 2.2.12-1
CASING PIPE REQUIREMENTS

Casing Diameter (in)	Wall Thickness (in)
4-8	0.25
12-24	0.375
30 and greater	As specified by crossing type

(d) Steel casing pipe shall have minimum yield strength of 35,000 psi.

1. Casing shall meet ASTM A- 36, Grade 2, ASTM A-139-Grade B, or approved equal.

2. Pipe shall be coated and lined in accordance with AWWA C-210 or approved equal.

3. Pipe joints shall be welded in accordance with AWWA C-206.

4. After pipe is welded, coating and lining shall be repaired.

(e) HDPE Casing pipe may be substituted for steel casing and be of HDPE PE4710 SDR 11.

1. HPDE Casing shall meet the requirements ASTM F714-05.

2. HDPE Casing shall be butt fused according to manufacturer's recommendation.

(f) Casings 30-inches and larger shall be installed with neat cement grouting ports and corrosion resistant plugs.

1. Ports shall be place on either side of the casing at an interval not exceeding 5-feet.

2. The minimum neat cement grout strength shall be 500 pounds-per-square-inch (psi).

(g) Casing spacers shall meet strength and durability requirements for insertion of the carrier pipe into a bored casing and the carrier pipe with the intended fluid at full flow. Bands and riser shall be stainless steel or steel with a corrosion resistant coating.

(h) Casing spacers shall be installed per manufacturer's specifications. Spacers used for sanitary sewer shall follow a spacer installation plan specific to the design slope of the pipe.

(i) Casings shall have end seals installed on each end of the casing. End seals shall be specifically manufactured for casing use and shall be pull-on or wrap around type made of rubber with stainless steel banding clamps on the casing and carrier pipe.

2.3 CONSTRUCTION OF WASTEWATER COLLECTION LINES

2.3.1 Licensing

All construction on the City of Alcoa's wastewater collection system that is not performed by the Public Works Department shall be executed by a person, firm, or corporation licensed to engage in contracting as set forth in the Tennessee Contractors Licensing Act of 1976 (TCA 62-601), as may be amended from time to time.

(a) This requirement shall apply to all construction, regardless of the amount of work involved.

(b) These requirements also apply to SUB-CONTRACTORS who may be engaged to conduct any part or all of the line installation work.

2.3.2 Pre-Construction Activities

(a) Prior to commencement of work:

1. The CONTRACTOR or developer may be required to provide a cash deposit, bond, certified check, or other acceptable form of security for the amount of the work to be completed or a portion thereof pursuant to the approved construction plans.

2. The amount of this security shall be determined by and at the discretion of the Director of Public Works.

3. Should the work not be performed in accordance with these Specifications and/or other applicable requirements, the City may execute the security for the purpose of remediation of any deficiencies and/or for the completion of the project.

4. Within sixty (60) days of the completion and acceptance of all provisions of the approved plans, cash deposits or other legal arrangements, or unexpended or unobligated funds thereof, shall be refunded or terminated.

(b) The CONTRACTOR should supply:

1. Two (2) complete sets of construction drawings,

2. Copies of all applicable permits; and

3. All applicable licenses.

(c) The CONTRACTOR should attend a mandatory Pre-Construction meeting with the City of Alcoa Public Works & Engineering staff.

1. Responsible representatives for the CONTRACTOR, SUB-CONTRACTOR (s) & owner/developer must attend.

2. Attendance of the ENGINEER is optional unless required by the utility.

(d) Supply material submittal sheets on all materials to be installed.

1. Submittal sheets must contain manufacturer, required standards to be met, and marks or highlights to indicate model, size, type, and material of material proposed for the project.

2. All submittals must be approved prior to start of construction.

3. All materials shall be manufactured or assembled in the U.S.A. or under U.S. standards as provided by, but not limited to, the agencies listed in the Reference Index of these specifications.

4. Suppliers/manufacturers must show or disclose adherence to the same on their material submittal sheets.

(e) Request a dig/locate request from the Tennessee One Call system seventy-two (72) hours prior to commencement of excavation activities.

2.3.3 Soil Erosion Control

(a) Unless otherwise specified, the CONTRACTOR shall be responsible for erosion control and slope stabilization relative to the construction of sanitary sewerage improvements.

(b) The CONTRACTOR shall be responsible for installation and maintenance of all necessary temporary and permanent control measures.

(c) As a minimum, the CONTRACTOR shall construct and maintain all components shown in the Plans or directed by the ENGINEER during the life of the Contract to control erosion and pollution. Such measures may include, but not be limited to:

1. Berms;

2. Dikes;

3. Dams;

4. Sediment basins;

5. Fiber mats;

6. Netting;

7. Mulches;

8. Grasses;

9. Slope drains;

10. Temporary silt fences; and

11. Other control devices.

(d) All work must be in compliance with applicable federal, state, and local Stormwater Management Rules and Regulations.

(e) Materials

1. Erosion and Sediment Control are measures and materials required during the construction of sanitary sewerage improvements are 'Management Practices' as provided in *The State of Tennessee Erosion and Sediment Control Handbook*.

2. Use and application of these Management Practices are subject to approval and inspection by the City of Alcoa. Failure of one practice to perform adequately to satisfy applicable regulations and permits may warrant the use of greater practices until discharge limits are achieved.

(f) Construction Requirements

1. Unless otherwise specified, the CONTRACTOR shall be responsible for acquisition of all Federal, State, and local erosion control, water pollution, and other such permits applicable to construction of the sanitary sewerage improvements.

2. The City may limit the area of erodible soil exposed by clearing and grubbing operations, excavation, and other operations and may direct the CONTRACTOR to provide immediate permanent or temporary pollution control measures. The CONTRACTOR shall be cognizant of and strive to protect from pollution adjacent watercourses (streams, creeks, etc.), and impoundments (e.g., lakes, ponds). Cut and fill slopes and other excavated areas shall be seeded and mulched as work progresses.

3. The CONTRACTOR shall incorporate all erosion control features into the project at the earliest practicable time.

4. The area of erodible soil exposed at one time should not exceed 43,560 ft^2 (1 acre) without approval of the ENGINEER. The area of excavation operations in progress shall be limited to the CONTRACTOR's ability to finish grade, stabilize, and/or construct other such permanent pollution control measures. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be constructed.

5. In the event of conflict between these requirements and pollution control laws, rules or regulations, or other Federal, State or Local agencies, the more restrictive laws, rules or regulations shall apply.

2.3.4 Preparation

(a) Precautions and Permit to Excavate:

1. Abide by each utility company's requirements when repairing, replacing or disturbing existing facilities.

2. Prior to trench excavation being performed within any public right-of-way, including public alleys, a permit shall be obtained from the governing authority to perform such excavation. As a minimum, the trench backfill and street repair shall be made in accordance with the City of Alcoa Public Works & Engineering Department's Street &.Drainage – Construction Specifications.

(b) Prior to laying pipe, prepare suitable bedding in accordance with Section 2.1.8 of these Standards.

(c) Before placing pipe in trench, field inspect for cracks or other defects. Remove defective pipe from construction site.

(d) Swab the interior of the pipe to remove all undesirable material.

(e) Prepare the bell end and remove undesirable material from the gasket and gasket recess.

(f) Trench excavation:

1. Perform in such a manner as to form a suitable trench in which to place the pipe and so as to cause the least inconvenience to the public.

2. To permit the proper installation of the pipe, allowing room for assembling joints and tamping backfill, the trench width at the crown of the pipe should be 2-feet, plus the nominal diameter of the pipe. Unless approved by the ENGINEER, no trench less than 24-inches wide will be allowed.

3. Cut pavements along neat, straight lines with either a pavement breaker or pavement saw.

4. Trench depth shall be sufficient to provide a minimum cover in accordance with Section 2.1.2 of these Standards.

5. Align trench as shown on the plans and in accordance with Section 2.1.5 of these Standards.

6. Shape the bottom of the trench to provide uniform bearing of the pipe on undisturbed earth throughout its entire length. Dig bell holes to aid in securing uniform support of the pipe.

7. When unstable soil is encountered at the trench bottom, remove it to a depth required to assure support of the pipeline and backfill to the proper grade with AASHTO M-43, Size 3 or 4 coarse aggregate (stone).

8. Remove rock encountered in the trench excavation to a depth of 6-inches (for 24-inch pipe or less) and 9-inches (for 30-inch pipe or greater) below the bottom of the pipe barrel, backfill with suitable earth, and compact to uniformly support the pipe.

9. When ashes, cinders, refuse, organic materials or other unsuitable material is encountered during excavation; this material must be removed to a depth of 6-inch es below any point of the bottom of the pipe and replaced with clean, stable backfill material. Should the potential exist for the pipe to come into contact of corrosive materials the pipe is to be encased with polyethylene.

2.3.5 Installing Gravity Sanitary Sewers

(a) Maintaining accurate field notes of the installation of the waterline and all appurtenances is required of the CONTRACTOR to ensure accurate As-Builts are produced for final acceptance of the work.

(b) Lay pipe true to the lines and grades from the grade and alignment stakes, or equally usable references.

1. While using laser alignment equipment, provide two (2) offset hubs and one (1) grade hub at each manhole set at minimum of fifteen 15-feet or greater from the manhole centerline. Guard stakes should be provided with each.

2. Lasers shall be retested at intervals of no greater than three (3) years.

(i) A copy of retesting certification shall be kept with the instrument or tagged by the recertification provider.

(iii) When a laser is found to be in error of the minimum design grade on a project or greater, it may no longer be used until repaired and recertified by a certified tester.

(c) Installation of Polyvinyl Chloride (PVC) pipe must be constructed as specified in ASTM-D2321 and manufacturer's requirements.

(d) Carefully inspect all pipe and each fitting prior to its placement in the trench, and reject any defective pipe or fitting from the job site.

(e) Lay pipe progressively upgrade, with bell upstream in such a manner as to form close, concentric joints with smooth bottomed inverts. Joining of all pipes shall be in accordance with manufacturer's specifications.

(f) The first joint out of pipe out of a manhole shall be a full length pipe joint.

(g) Bedding: Each pipe section in accordance with the following requirements and those specified in Section 2.1.8 of these standards.

1. Backfill material from 1-foot above the pipe should not exceed 6-inches in diameter at its greatest dimension. Special care shall be used in placing bedding in the haunching region.

2. Ductile Iron Pipe and AWWA C900 PVC Pipe: Each sewer pipe section shall be laid on a 6-inch bed of Size No. 7 or Size No. 67 crushed stone and shall be backfilled to the spring-line of the pipe using Size No. 7 or Size No. 67 compacted crushed stone. (Size No. 57 may be substituted if 67 is not available.)

3. SDR 35/ASTM 3034 PVC Pipe: Each sewer pipe section shall be completely encapsulated with 6-inches of bedding material on the top, both sides, and the bottom of the pipe.

(f) Check Dams

1. Check dams shall be installed in the bedding and backfill of all new or replaced sewer lines to limit the French Drain effect of gravel bedding.

2. Major rehabilitation projects shall also include check dams in the design.

3. Dams shall consist of compacted clay bedding and backfill at least 3-feet thick to

the top of the trench and cut into the walls of the trench 2-feet. Alternatively, concrete may be used, keyed into the trench walls.

4. Dams shall be placed no more than 500-feet apart. The preferred location is upstream of each manhole.

5. All stream crossings shall include check dams on both sides of the crossing

(g) Cover: Unless otherwise specified, provide all gravity sewer lines with a minimum of 4-feet of cover in roadways and 2½-feet of cover in non-traffic areas, unless DIP or concrete encasement is used.

(h) DIP shall be required when sewer installation occurs in areas of non-virgin soil (*i.e.* areas of "fill"). Piers shall be provided for when necessary for support. An impermeable barrier of compacted clay or concrete encasement shall be used at the transition from fill to virgin soil to prevent piping of water through the crushed stone bedding.

(i) For structural reasons, DIP, concrete encasement, or relocation shall be required when culverts or other conduits are laid such that the top of the sewer is less than 18-inches below the bottom of the culvert or conduit.

(j) Do not allow walking on completed pipelines until backfill has been placed to a depth of at least 6-inches above the crown of the pipe.

(k) Keep the pipe free of all unneeded material; upon completion of a section between any two manholes, it shall be possible to view a complete circle of light when looking through the pipe.

(l) When laying pipe ceases for work breaks, the end of a work day, etc., close the open ends of the pipe with a suitable plug for preventing the entrance of foreign materials.

(m) Couplings and adapters used for joining dissimilar gravity pipe materials or for repairing and rejoining sections of gravity sewer shall be of neoprene construction with stainless steel clamps.

(n) All connections, tapping, and other modifications to the existing Public Sanitary Sewer System shall conducted by the City of Alcoa or, when approved, by a CONTRACTOR in the presence of authorized City of Alcoa personnel.

(o) When open cutting of pavement is allowed:

1. Flowable fill shall be placed on top of the pipe to the top of the trench in all City Street.

2. The CONTRACTOR shall use street plates to allow temporary opening of the road to traffic during curing of the flowable back-fill.

2.3.6 Installing Force Main

(a) Unless otherwise indicated by the Drawings, all force mains shall have a minimum of 36-inches of cover.

1. The pipe shall slope continuously between high and low points to eliminate the

formation of air pockets.

2. Unnecessary bends shall be avoided.

3. OWNER shall approve any exceptions.

(b) Thrust restraint shall be installed in accordance with AWWA, DIPRA, and manufacturers specifications.

(c) Air release valves shall be:

1. Located at all high points on the pipeline as shown on the Drawings or as directed by OWNER.

2. Installed in 4-foot diameter pre-cast concrete manholes.

(d) Pipe Detection:

1. Force mains shall be wrapped with 12-gauge Copperhead SuperFlex™ – 1230 CCS Tracer Wire during construction.

2. Wire Placement:

(i) The wire shall be placed loosely along the sides of the pipe and tucked in underneath before backfill begins.

(ii) The wire shall not be stretched tightly along the length of the pipe, placing it in tension, and allowing it to be easily broken as backfill is placed in the trench.

3. The ends of the wire shall terminate in a valve box or other acceptable location – having an excess length of at least 2-feet beyond the valve box opening or other access point – whereby detection equipment may be attached.

4. After wire is placed and trench is backfilled, wire shall be tested to make sure the circuit has remained complete and unbroken.

2.3.7 Installing / Repairing Sanitary Sewer Lines in Street, Highway, and Railroad Rights-of-Way

(a) Permits as may be required for crossing streets, highways, and railroads and performing other work within their rights-of-way shall be obtained from the appropriate authorities.

(b) As a minimum, boring and jacking methods shall be in accordance with Section 02305 of the current *City of Alcoa Street and Drainage Construction Specifications*.

(c) When working within or in close proximity to the right-of-way of any street or highway the CONTRACTOR shall install and maintain traffic control devices in accordance with the standards of the *Manual of Uniform Traffic Control Devices*.

2.3.8 Initial Proof Testing of Sanitary Sewers

It is the intent to specify a "test as you go" procedure in order to establish confidence in the installation and avoid the unnecessary delay of final acceptance.

(a) Initial proof testing will be required when the total footage of a contracted project is greater than 4,000 LF and when 50% of the project footage has been installed, or in the event the run between manholes is greater than 12-feet in depth.

(b) Acceptance does not initiate a reduction in retainage for that section of completed work.

2.3.9 Final Testing – Sanitary Sewer

(a) Before the sewer line is accepted and before any houses are connected, a final testing procedure is to be followed. Testing must be coordinated with and conducted in the presence of authorized City of Alcoa personnel.

(b) Perform a visual inspection. A TV-inspection of the line may be required. All visible leaks shall berepaired.

(c) If there is evidence of infiltration, make measurement with suitable pipe weirs or other instrumentation.

1. If the flow through the lowermost manhole of a continuous section of sewer pipe does not exceed twenty-five (25) gallons-per-day-per-inch of pipe diameter per mile of pipeline and the groundwater level is representative of the highest annual level, the entire continuous section shall be approved for leakage.

2. The leakage test will be conducted with all lines connected, including service lines.

3. If the apparent infiltration rate exceeds twenty-five (25) gallons-per-day-per-inch of pipe diameter per mile, then take additional weir measurements to isolate those sections leaking.

4. Any single reach of pipeline which exhibits an apparent infiltration rate in excess of twenty-five (25) gallons-per-day-per-inch of pipe diameter per mile will not be accepted and all leaks will be located and corrected.

(d) A low-pressure air test shall be made. Low-pressure air testing of all pipes shall be as specified in ASTM C924 for DIP and ASTM F1417 for PVC pipe.

(e) The pressure drop shall be calculated as the number of seconds for the air pressure to drop from a stabilized pressure of 3½ psig to 2½ psig.

1. Minimum Test Time:

TABLE 2.3.8-1
Minimum Pipe Test Time

Nominal Pipe Diameter (in)	Time: (Min:Sec)/100 ft		Nominal Pipe Diameter (in)	Time: (Min:Sec)/100 ft
6	5.40		21	19.50
8	7.33		24	22.40
10	9.27		27	25.30
12	11.20		30	28.20
15	14.10		33	31.10
18	17.00		30	See 2.3.8 (a) 2

2. Sewers larger than 36-inch diameter shall be air tested at each joint. A visual inspection of the line shall be performed immediately after the air test. The minimum time allowable for the pressure to drop from 3½ psig to 2½ psig during a joint test, regardless of pipe size, shall be 10 seconds.

3. Identify and repair / replace any section of line that fails the low-pressure air test.

(i) Mandrel Testing:

1. When PVC pipe is used, pulling an approved "go/no-go" deflection mandrel of 95/100 pipe diameter through all reaches of gravity sewer may be required.

2. No sections will be accepted that exhibit a deflection of more than five (5%) percent.

3. Final mandrel testing shall not occur less than thirty (30) days after installation.

(i) Force Main Testing: Force mains shall be tested under pressure: The line shall be filled with water to 150 psig for two (2) hours. The force main will pass if the pressure drops no more than 5 psig over two (2) hours.

2.3.10 Installing Manholes

(a) Manholes shall be furnished as provided under Section 2.2.7 of these Standards.

(b) Depth of manholes shall be the vertical distance from the lowest invert in the manhole to the top of the manhole cover frame.

(c) Backfill manholes with the same material used for pipelines.

(d) Prepare manhole subgrade on undisturbed earth.

1. Remove all loose earth prior to placing crushed stone base or concrete slab.

2. Fill all disturbed areas below subgrade level with compacted bedding stone.

(e) Manhole Depth

1. Manholes having a depth of <u>less than 12-feet:</u>

(i) The manhole shall be set on a compacted Size No. 7 or 67 (or 57) crushed limestone base.

(ii) The base shall be minimum 6-inches thickness.

(iii) The crushed limestone base shall be placed on dry, consolidated and, when possible, undisturbed soil.

2. Manholes having a depth of <u>12-feet or more:</u>

(i) The manhole shall be set on a thick reinforced concrete slab.

(ii) The concrete slab shall have a 6-inch minimum diameter, 1-foot greater

than the outside diameter of the manhole base section.

(iii) The concrete slab shall be poured on a minimum 3-inch thick compacted crushed stone bedding.

(iv) Concrete shall meet the conditions of Section 2.2.6 of these Standards.

(f) If earth beneath the manhole has been disturbed, it shall be compacted using an approved mechanical compaction device or under cut to suitable material and back filled with clean stone as provided in Section 2.3.9 (e).

(g) Manholes shall be set plumb.

(h) Manhole inverts shall be accurately shaped, using concrete, to a smooth surface texture.

(i) Invert flow channels shall be shaped having the same radii as those of the pipes for which the channels are being provided.

(j) The depth of the channels shall be a minimum of ½ the diameter of the pipes being accommodated.

(k) From the edge of the shaped flow channels to the manhole walls, inverts shall be sloped upward at a minimum of 1 to 6.

(l) The design drop across the manhole shall be 0.1-foot.

(m) Inlets and outlets of each manhole shall be finished smooth and flush with the sides of the manhole wall so as not to obstruct the flow of wastewater through the manhole.

(n) Manholes designed with inlets for future use shall be plugged with a 12- to 18-inches stub-out of pipe with a cap affixed to the outside end of the stub-out.

(o) When completed, the manhole shall be free from channel obstruction and leakage.

(p) Seal joints between manhole sections with rubber O-ring gaskets or flexible butyl resin sealant. Manufacturer's recommendations for placing gaskets or sealant shall be followed.

(q) All lift eyes or holes provided in precast manhole sections shall be filled with concrete or cement mortar. Any manhole component having a lift eye or hole that fully penetrates shall be rejected for use on a sanitary sewer project.

(r) Manhole cover frames shall be attached to the manhole barrel or grade rings by means of four (4) 5/8-inch anchor bolts or threaded rods and shall be set on a controlled expansion waterstop sealant.

(s) Grade Rings

1. Precast concrete grade rings shall be set using a controlled expansion waterstop sealant.

2. Joints of precast concrete grade rings and manhole frames shall be made so as to prevent leakage.

(t) Manholes receiving force main discharges or other similar corrosive influent shall receive a corrosion-resistant admixture or internal lining.

1. The manhole receiving the force main discharge, and the next five (5) manholes downstream in sequence, shall be treated, when practical.

2. Admixture, when required during manhole construction, shall be Xypex® or approved equal

3. Internal linings, when used, shall be epoxy or polymer based:

2.3.10 Vacuum Testing

(a) Vacuum testing shall be conducted on each manhole.

(b) The test shall be performed such that the integrity of each component (*i.e.* pipe connections, seal(s) between manhole sections, seal between manhole and cover frame) is verified.

(c) Testing will be in accordance with ASTM C1244.

(d) Prior to testing, all pipe inlets and outlets shall be plugged and braced.

(d) A vacuum of 10-inches of Mercury shall be drawn and the vacuum pump shut off.

(e) With no additional vacuum added by the pump, the manhole assembly will be accepted if the time measured for the vacuum to drop to 9-inches does not exceed the given value from the table below.

(f) If the given time is exceeded, repairs shall be made or manhole parts replaced until the test time is met.

TABLE 2.3.10-1
Manhold Vacuum Test - Minimum Times (Seconds)

		Manhole Depth (ft)											
		0-8	**10**	**12**	**14**	**16**	**18**	**20**	**22**	**24**	**26**	**28**	**30**
Manhole Diameter (in)	**48**	20	25	30	35	40	45	50	55	59	64	69	74
	60	26	33	39	46	52	59	65	72	78	85	91	98
	72	33	41	49	57	67	73	81	89	97	105	113	121

Ref. ASTM C1244

2.3.11 Sewer Service Assemblies

(a) The standard collector tap shall consist of a tee connected with a minimum full length pipe section 6-inch diameter branch.

1. The tap will consist of fittings made of the same material as that of the line (*i.e.* cast iron or ductile iron fittings on a DIP or AWWA C900 PVC line) except that PVC fittings may be used on vitrified clay lines.

2. DIP and either ductile iron fittings or cast iron fittings or concrete encasement shall be used:

   (i) In roadways where cover is less than 4-feet;

   (ii) In open areas where cover is less than 2½-feet; and

   (iii) Where velocities greater than 15 feet-per-second (fps) are attained.

(b) Risers

1. Risers having 45-degree angles or less measured from the horizontal may be used:

   (i) when the depth of the sewer collector is greater than 8-feet; or

   (ii) when their use will facilitate connection of individual services.

2. All risers having angles of 30-degrees or greater measured from the horizontal shall be placed in a bedding of compacted Size No. 7 or 67 crushed stone having:

   (i) A minimum width of three (3) times the pipe diameter;

   (ii) A minimum thickness under the pipe equal to the pipe diameter; and

   (iii) An overall thickness of twice the pipe diameter.

3. A minimum of 6-inches of bedding stone shall be placed above the top of all PVC risers.

(c) Tee branches and joints used on the collector lines that are not to be used immediately shall be plugged with air-tight plugs or caps of the same material.

(d) Installation of Service Pipe and Fittings in Developments

1. Service pipe and fittings:

   (i) Shall be supplied by the developer and installed from the collector lines to the street right-of-way lines or edges of easements provided.

   (ii) Service pipe and fittings shall meet the conditions under Section 2.2 of these Standards.

2. Ends of service pipes shall be plugged and covered the same as collectors.

3. The minimum grade on service pipes shall be one percent (1%) or 1/8 inch-per-foot.

4. Ends of service pipes shall be field located.

5. Install a length of minimum ½-inch diameter iron bar at the service pipe ends, having a 1-foot hook at the base, placed within 1.5-feet of the end of the assembly, and buried no more than 6-inches from finished grade.

(e) For As-built drawings, record:

1. Distances measured along the collector lines from the nearest downstream manhole to points at right angles to such service pipe ends;

2. Perpendicular distances measured between the collector lines and the service pipe ends; and

3. Depth of service pipe end from the ground surface.

2.3.12 Low Pressure Sanitary Sewer Placement and Testing

(a) Work conducted under this section consists of furnishing all labor, materials, equipment and services for the construction of a complete and working Low Pressure Sanitary Sewer (LPSS) system.

(b) A complete LPSS includes all:

1. Piping;

2. Fittings;

3. Pumping units; and

4. Controls.

(b) Pipe is to be installed in a manner to eliminate the possibility of dirt, gravel, or other foreign materials from entering the installed pipe.

1. At the end of each work period where the pipe is left exposed or buried, a temporary plug must be installed during idle periods.

2. When open cutting of pavement is allowed, the CONTRACTOR shall use street plates to allow temporary opening of the road to traffic during curing of the flowable back-fill.

(c) Material shall be stored in a manner to eliminate debris from entering the pipe and fittings.

(d) All grinder pumps and control equipment shall be stored inside a secure weather resistant building, trailer, or storage system.

(d) Backfill

1. Where stone backfill is required, the stone shall be placed 6-inches above the pipe.

2. Where earth back fill is allowed, back fill material shall be free of any materials which may cause damage to the pipe and shall be compacted to 90% Standard Density Proctor as provided by ASTM D698.

(e) Cover – Low Pressure Sanitary Sewers shall have:

1. Non-traffic areas – 3-feet (Minimum); and

2. Roadways: 4-feet (Minimum)

(f) Lubricant furnished for lubricating joints:

1. Shall be non-toxic;

2. Must not support bacteria growth; and

3. Shall not cause deterioration of the pipe or gaskets.

(g) Testing

1. Prior to testing, the low pressure lines shall be filled and held at working pressure for two (2) days.

2. Low pressure lines from 1-inch through 8-inches shall be pressure tested to 150 psig.

3. The test shall be conducted for a minimum of two (2) hours.

4. The line shall be gauged at the low point of each section of pipe, but at no time shall it be gauged at greater than 1,500-feet sections.

5. All pipe, fittings, and other materials found defective during the test shall be removed and replaced with non-defective material.

6. Testing shall include service lines to the grinder pump.

2.3.13 Manhole Rehabilitation Linings and Coatings

(a) Epoxy Resin-Based Linings and Coatings

1. Epoxy resin-based liners shall:

(i) Be one-hundred percent (100%) solids by volume;

(ii) Be volatile organic compound free; and

(iii) Conform to the minimum physical properties listed in the following table:

TABLE 2.3.13-1
Minimum Physical Properties - Epoxy-Based Linings

Compressive Strength	ASTM D-695	10,500 psi
Tensile Strength	ASTM D-638	7,000 psi
Flexural Strength	ASTM D-790	12,000 psi
Flexural Modulus (Initial)	ASTM D-790	730,000 psi
Density		87 $\pm$ pcf
Bond		Exceed tensile strength of substrate

2. The structures lined with epoxy resin-based liners shall be corrosion resistant to:

(i) Hydrogen Sulfide (H_2S)

(ii) Twenty percent (20%) Sulfuric Acid (H_2SO_4)

(iii) Seventeen percent (17%) Nitric Acid (HNO_3)

(iv) Five percent (5%) Sodium Hydroxide (NaOH)

(v) All common ingredients normally associated with sanitary sewer environments

3. The finished liner shall have long-term flexural modulus of elasticity (50-year) value of 500,000 pounds-per-square-inch (psi), and shall be certified by independent third-party testing.

(b) Polymer-Based Linings and Coatings

1. The lining system to be utilized for manhole structures shall be a multi-component stress skin panel liner system as described below:

2. A Modified Polymer layer is applied to a prepared manhole as a moisture barrier followed by the application of a Polyurethane/Polymeric blend foam as a surface and then finally a Modified Polymer layer as a final corrosion barrier.

3. The Modified Polymer shall be sprayable, solvent-free, two-component polymeric, moisture/chemical barrier specifically developed for the corrosive wastewater environment.

4. The Polyurethane Rigid Structure Foam shall be low viscosity two component foam containing flame retardants.

TABLE 2.3.13-2
Polymer Rigid Structure Foam Properties

Density, nominal, core	ASTM D-1622	4-10 pcf @ 74 degrees F
Compression Strength	ASTM D-1621	90-150 psi @ 74 degrees F
Closed Cell Content		Over 95% @ 74 degrees F
Shear Strength	ASTM C-273	225-250 psi @ 74 degrees F

5. The structures lined with polymer-based liners shall be corrosion resistant to:

(i) Hydrogen Sulfide (H_2S)

(ii) Twenty percent (20%) Sulfuric Acid (H_2SO_4)

(iii) Seventeen percent (17%) Nitric Acid (HNO_3)

(iv) Five percent (5%) Sodium Hydroxide (NaOH)

(v) All common ingredients normally associated with sanitary sewer environments

(vi) Total thickness of multi-component stress panel liner shall be a minimum

of five-hundred (500) mils.

6. Liner Delivery and Storage

   (i) Care shall be taken in shipping, handling, and storage to avoid damaging the lining materials.

   (ii) Any lining product damaged in shipment, showing deterioration, or which has been exposed to any other adverse storage condition that may have caused damage, even though no such damage is evident, shall be marked as rejected and removed at once form the job site.

   (iii) While stored, the lining products shall be adequately packaged, protected and stored in accordance with the manufacturer's recommendations.

7. Polymer-based liners shall be:

   (i) Be one-hundred percent (100%) solids by volume;

   (ii) Be volatile organic compound (VOC) free; and

   (iii) Be designed to operate at ambient temperatures up to one-hundred-forty degrees Fahrenheit (140° F) with excellent abrasion resistance;

   (iv) Conform to the minimum physical properties listed in the following table:

TABLE 2.3.13-3
Minimum Physical Properties - Polymer-Based Linings

Tensile Strength	ASTM D-412	3,600 psi
Elongation %	ASTM D-412	300
Tear Strength	ASTM D-2240	500 PLI
Shore D Hardness	ASTM D-1737	90
100% Modulus	ASTM D-1737	2,400 psi

8. Acceptable products shall be as follows:

   (i) Spraywall or Sprayshield;

   (ii) Dinjer SG Mastic;

   (iii) Spectrashield Liner Systems; or

   (iv) OBIC

9. Grout: AV-202 multi-grout as a single component, moisture activated MDI/TDI blended polyurethane injection resin as manufactured by Avanti or approved equal.

APPENDICES

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APPENDIX A

TAKEN FROM TENNESSEE DEPARTMENT OF ENVIRONMENT & CONSERVATION – DIVISION OF WATER RESOURCES DESIGN CRITERIA – CHAPTER 2

Design Basis for Wastewater Flow and Loadings

Appendix 2-A Typical Wastewater Flow Rates from Commercial and Industrial Sources

(Source: Crites and Tchobanoglous, 1998)

APPENDIX 2-A

DESIGN BASIS FOR WASTEWATER FLOW AND LOADING

Typical Wastewater Flow Rates from Commercial and Industrial Sources

(Source: Crites and Tchobanoglous, 1998)

FACILITY	UNIT	Flow, gallons/unit/day	
		Range	*Typical*
Airport	Passenger	2-4	3
Apartment House	Person	40-80	50
Apartment, resort	Person	50-70	60
Assembly Hall	Seat	2-4	3
Automobile Service Station	Vehicle Served	8-15	12
	Employee	9-15	13
Bar	Customer	1-5	3
	Employee	10-16	13
Boarding House	Person	25-60	40
Bowling Alley	Alley	150-250	200
Camps:			
Pioneer Type	Person	15-30	25
Children's with central toilet/bath	Person	35-50	45
Day, with meals	Person	10-20	15
Day, without meals	Person	10-15	13
Luxury, private bath	Person	75-100	90
Trailer Camp	Person	75-125	125
Campground-developed	Person	20-40	30
Cocktail Lounge	Seat	12-25	20
Coffee Shop	Customer	4-8	6
	Employee	8-12	10
Country Club	Guests on-site	60-130	100
	Employee	10-15	13
Department Store	Toilet Room	400-600	500
	Employee	8-15	10
Dining Hall	Meal Served	4-10	7
Dormitory/bunkhouse	Person	20-50	40
Fairground	Visitor	1-2	2
Hospital, Medical	Bed	125-240	165
	Employee	5-15	10
Hospital, Mental	Bed	75-140	100
	Employee	5-15	10
Hotel	Guest	40-60	50
	Employee	8-13	10
Industrial Building (sanitary waste only)	Employee	7-16	13

Laundry (self-service)	Machine	450-650	550
	Wash	45-55	50
Office	Employee	7-16	13
Picnic Park, flush toilets	Visitor	1-2	2
Prison	Inmate	80-150	120
	Employee	5-15	10
Public Lavatory	User	3-6	5
Rest Home	Resident	50-120	90
	Employee	5-15	10
Restaurant (with toilet)	Meal	2-4	3
Conventional	Customer	8-10	9
Short Order	Customer	3-8	6
Bar/ cocktail lounge	Customer	2-4	3
School, day only			
With cafeteria, gym, showers	Student	15-30	25
With cafeteria only	Student	10-20	15
Without cafeteria, gym or showers	Student	5-17	11
School boarding	Student	50-100	75
Shopping Center	Employee	7-13	10
	Parking Space	1-3	2
Store, resort	Customer	1-4	3
	Employee	8-12	10
Swimming Pool	Customer	5-12	10
	Employee	8-12	10
Theater	Seat	2-4	3
Visitor Center	Visitor	4-8	5

The flow for a residential house is typically 300 gallons/unit/day.

Hydraulic Design Criteria

PROJECT				AREA SERVED	TOTAL AREA SERVED	AVE SEWAGE FLOW	MAX SEWAGE FLOW	PIPE DIAMETER	INVERT ELEVATIONS		SEWER GRADE	SEWER FLOW	VELOCITY FLOWING FULL	CAPACITY FLOWING FULL
STREET	FROM MH	TO MH	LENGTH	ACRES	ACRES	CFS	CFS	IN	UPPER MH	LOWER MH	%	FT	FPS	CFS

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APPENDIX B

CITY OF ALCOA
WATER & WASTEWATER
CONSTRUCTION SPECIFICATIONS
LIST OF CITIED STANDARDS

AASHTO *American Association of State Highway and Transportation Officials*

M 198 Same As ASTM C990

M-43 Sizes of Aggregate (*Stone*) for Road and Bridge Construction

ANSI *American National Standards Institute*

B2.1 Pipe Threading (except Dryseal)

A21.11 Same as AWWA C111

ASTM *American Society for Testing and Materials*

A47 Standard Specification for Ferritic Malleable Iron Castings A48Standard Specification for Gray Iron Castings

A139 Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)

A193 Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications

A307 Standard Specification for carbon Steel bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength

A536 Standard Specification for Ductile Iron Castings

B88 Standard Specification for Seamless Copper Water Tube C150Standard Specification for Portland Cement

C443 Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets

C478 Standard Specification for Circular Precast Reinforced Concrete Manhole Sections C828 Standard Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines

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

C990 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

C1244 Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test prior to Backfill

D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

D1784 Standard specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds

D1785 Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120

D2122 Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

D2241 Standard Specification for Polyvinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)

D2321 Standard Specification for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

D2665 Standard Specification for Polyvinyl Chloride (PVC) Plastic Drain, Waste and Vent Pipe and Fittings
D3034 Standard Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings
D3350 Standard Specifications for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter
F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe F1417 Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air

AWWA *American Water Works Association*
C-104 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
C-110 Ductile-Iron and Gray-Iron Fittings
C-111 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings C-150 Thickness Design of Ductile-Iron Pipe
C-151 Ductile-IronPipe, Centrifugally Cast C-153 Ductile-Iron Compact Fittings
C-502 Dry-Barrel Fire Hydrants
C-504 Rubber-Seated Butterfly Valves, 3 In. (75 mm) through 72 In. (1,800 mm) C-509 Resilient-Seated Gate Valves for Water Supply Service
C-512 Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service C-515 Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service
C-600 Installation of Ductile Iron Water Mains and Their Appurtenances C-651 Disinfecting Water Mains
C-700 Cold-Water Meters--Displacement Type, Bronze Main Case C-702 Cold-Water Meters - Compound Type
C-707 Encoder-Type Remote-Registration Systems for Cold Water Meters C-800 Underground Service Line Valves and Fittings
C-900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. Through 12 in.
C-904 Cross-Linked Polyethylene (PEX) Pressure Pipe
C-906 Polyethylene (PE) Pressure Pipe and Fittings, 4in through 63 for Water Distribution and Transmission.

DIPRA *Ductile Iron Pipe Research Association*
"Thrust Restraint Design for Ductile iron Pipe".

HI *Hydraulic Institute*
ANSI-HI Pump Standards

NFPA *National Fire Protection Association*
13 Standard for the Installation of Sprinkler Systems
1963 Standard for Fire Hose Connections

NSF *National Sanitation Foundation Testing Laboratory, Inc.*
61 Drinking Water System Components

TDEC *Tennessee Department of Environment and Conservation*
Chapter 0400-45-01 *Public Water Systems - Community Public Water Systems Design Criteria*
Chapter 0400-40-01 thru 0400-40-02 *Water Pollution Control Design Criteria for Conveyance and Treatment of Wastewater Tennessee Erosion and*

Rules of the Tennessee Board of Examiners for Land Surveyors
Chapter 0820-03 “Standard of Practice”

UL *Underwriters Laboratories, Inc.*
50 Standard for Enclosures for Electrical Equipment
50E Enclosures for Electrical Equipment, Environmental Considerations

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APPENDIX C
Dump Station Application

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CITY OF ALCOA

PUBLIC WORKS AND ENGINEERING DEPARTMENT
Landfill Services Sanitation Services Street & Stormwater Services
Support Services Water & Wastewater Services Water Quality Services

725 Universal Street, Alcoa, Tennessee 37701 (865) 380-4800 FAX (865) 380-4803

RV/BUS/CAMPER/BOAT HOLDING TANK WASTE DISCHARGE APPLICATION

DATE: _____

Facility Name _____ Phone (____) _____

Location Address: _____

Mailing Address: _____

City/State/Zip Code: _____

Contact Person: _____

24-Hour Emergency Phone: (____) _____

Email Address: _____

Sanitary Waste Collection Station (Dump Station) to be available to: (*Mark all that apply*)

___ On-Site RV/Bus/Boat Storage Customers ONLY
____Extended Stay/Camping Facility Customers ONLY
___ Public Access RV/Boat Drive-In Service ONLY*
___ Both On-Site RV/Boat Storage Customers and Public Access RV/Boat drive-in Service*

** Public Access Drive-In and Extended Stay Facilities require additional pre-treatment equipment – See Construction Requirements.*

Hours of Operation: _____

Days of the Week (*Circle all that apply*): Mo Tu We Th Fr Sa Su

Number of RV/Bus/Boat Units Utilizing Dump Station: _____

CITY OF ALCOA USE: _____

DATE RECEIVED: _____

APPROVED / DISAPPROVED_____ DATE: _____

Location of Holding Tank Waste Discharge Station on Property (Draw here or indicate attached):

Attach Manufacturer's Submittals/Drawings/Photo to back of application.

Will the discharge station have a water-cleaning yard hydrant: [ ] Yes [ ] No

General Discharge Station Requirements:

1. A sign must be placed facing the discharge line and stating:
   "PRIVATE DUMP STATION – EPA APPROVED CHEMICALS ONLY"
2. Only one (1) waste line discharge connection is permitted.

Outdoor Discharge Station Construction Requirements:

1. Must have a raised concrete pad (3-inch minimum above surrounding area) for waste discharge connection if curb is not installed.
2. The pad cannot be greater than 3-feet-by-3-feet inside the pad curb, with or without curb installed when not covered by an awning type/covered structure.
3. Rainwater run-off must not enter the waste discharge connection other than from the 3-foot-by- 3-foot pad itself.
4. Waste discharge connection must be self-closing.
5. Waste discharge connection must be protected from being damaged with bollards, etc.

*Special Discharge Station (Dump Station) Construction Requirements for Public Access Commercial Waste Collection Stations and Extended Stay Facilities:

In addition to the construction requirements listed above, the following conditions must be met.

1. Waste discharge must be collected in a holding tank which is equipped with aeration and odor control systems.
2. Holding tank discharge must have a sample collection port and monitoring recorder.

3. Station must apply with the *City of Maryville Pre-Treatment Program* and be permitted.
4. In addition to these basic requirements, dump stations with a designed capacity of one-hundred (100) or more Recreational Vehicles (RV) per day or ten-thousand gallons (10,000 gal) of waste received per day shall submit an engineered design plan addressing items listed for Public Access Waste Collection Stations. Commercial Stations must also provide electronic records of monthly transactions, all waste discharged into a Commercial Station must have an electronic recorded transaction.

Discharge Station (Dump Station) Operating Requirement:

1. Discharge stations must comply with City of Alcoa *Water, Sanitary Sewer, and Storm Sewer Ordinance*, and are subject to any regulatory change.
2. Discharge Stations may receive sanitary waste and chemicals from sanitary holding tanks of recreation vehicles, travel/camping trailers, and boats only.
3. RV tanks may be flushed with water only. Hose bib must have an operating anti-siphon valve.
4. Commercial waste haulers may not discharge at station.
5. Hoses must be flushed out with potable water only prior to disconnecting from the RV waste discharge connection.
6. Maximum discharge rate is one-hundred gallons-per-minute (100 gpm) for ten (10) minutes during each use.
7. Station and storage sites must be available for inspection by the Public Works Department.
8. Number of storage site spaces shall be reviewed annually. Billing will be adjusted to reflect number of site spaces used for RV storage.

Permit Transfer

Wastewater Discharge Permits are issued to specific Users for a specific operation. A Wastewater Discharge Permit shall not be reassigned, transferred, or sold to a new OWNER, new User, different premises, or a new or change of operation without the approval of the Public Works & Engineering Department. Any succeeding OWNER or User shall also comply with the terms and conditions of the existing permit.

Fees & Rates

Private Sanitary Waste Dump Stations at RV Storage Facilities:

1. Private Sanitary Waste Dump Stations tied to existing private sanitary laterals billed from an existing water meter shall be billed as metered usage at the City of Alcoa's published commercial monthly rate plus a unit rate of one-hundred gallons (100 gal) times the unit storage per month. (Unit storage being the total number of RV, bus, camper trailer, and boat storage spaces.)
   Example: *10 storage units x 100 gallons = 1,000 gallons*
2. Private Sanitary Waste Dump stations that require a new water service and sanitary connection shall pay connection fees based on current City of Alcoa rates.
3. Private Sanitary Waste Dump Stations at camping or extended stay facilities shall pay for connection fees and be billed at current City of Alcoa rates as applied to Public/Commercial dump stations.
4. Rate changes as approved by the City of Alcoa Commission shall apply as promulgated.

Public/Commercial Sanitary Waste Dump Stations:

1. Public/Commercial Sanitary Dump Stations tied to existing private sanitary laterals billed from an existing water meter shall be billed at the City of Alcoa published commercial monthly rate plus a per unit rate of the amount dumped times ten times (10X) at the published City of Alcoa rate per one-thousand gallons (1,000 gal) discharged.
2. Public/Commercial Dump Stations that require a new water service and sanitary connection shall pay connection fees based on current City of Alcoa rates.

The terms and conditions of the permit may be subject to modification of the Public Works & Engineering Department during the term of the permit as limitations or requirements as identified in the City Ordinance are modified or other just cause exists. The User shall be informed of any proposed changes in their permit at by public announcement of a proposed change and by letter at least thirty (30) days prior to the effective date of any change. Any changes or new conditions in the permit shall include a reasonable time schedule for compliance.

I agree to the terms and conditions as listed above within this document, and certify the information provided is accurate and complete to the best of my knowledge.

Company: _____

Signature: _____ **Date:** _____

Title: _____

Return completed application to the City of Alcoa Public Works & Engineering Department.

A copy of this application with approval status shall be returned to the applicant within four (4) working days of receipt.

City of Alcoa - Water Distribution & Waste Water Collection System
RECREATIONAL HOLDING TANK WASTE DISCHARGE MONTHLY REPORT

CITY OF ALCOA

PERMIT HOLDER: _____

ADDRESS: _____ **PAGE** ___ **of** ___

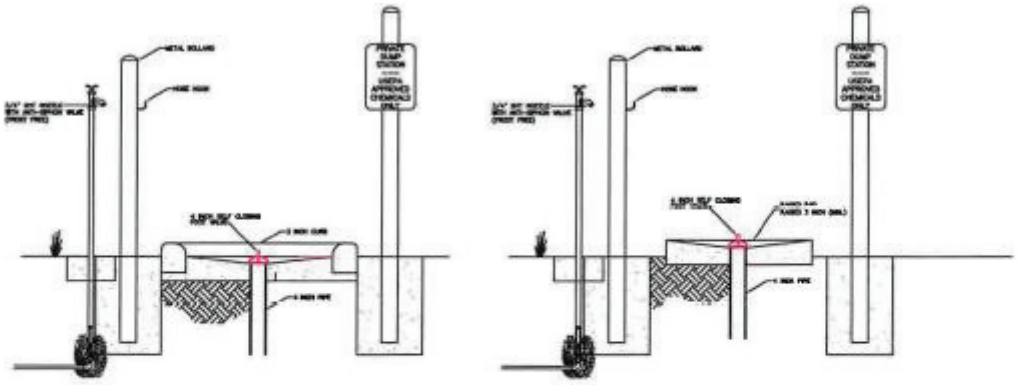
DATE	TIME	VEHICLE TYPE/MAKE	LICENSE / HULL NUMBER	SIZE OF TANK	NAME OF ATTENDANT

I certify the information above is accurate and complete and that all discharges to the sanitary sewer system have been fully disclosed.

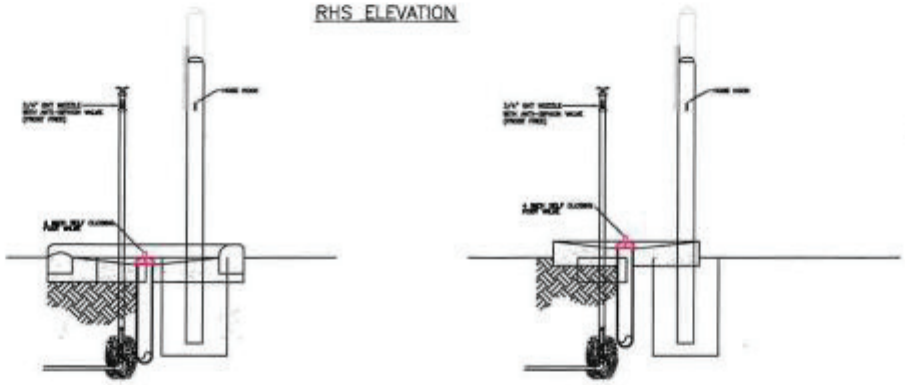
Authorized Signature: _____ Date: _____

NOTE: At the end of each month, mail certified copy to the City of Alcoa, Public Works & Engineering Dept., 223 Associates Blvd, Alcoa, TN 37701

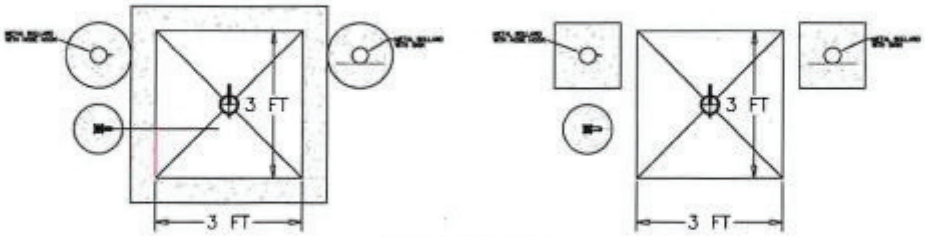
FRONT ELEVATION



RHS ELEVATION



PLAN VIEW



PRIVATE USE ONLY
NO AWNING, COVER OR ROOF

CITY OF ALCOA

CITY OF ALCOA, TENNESSEE
PUBLIC WORKS AND ENGINEERING DEPARTMENT
RV–TRAILER–BOAT DUMP STATION – DETAIL
DATE: 22APR2013 DRWN BY: tsd


PRIVATE DUMP STATION
NOT FOR DIRECT SALES
USEPA APPROVED CHEMICALS ONLY
18"
12"
CITY OF ALCOA
CITY OF ALCOA, TENNESSEE
PUBLIC WORKS AND ENGINEERING DEPARTMENT
RV–TRAILER–BOAT DUMP STATION – SIGN REQUIREMENTS
DATE: 08AUG2019
DRWN BY: tsd

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