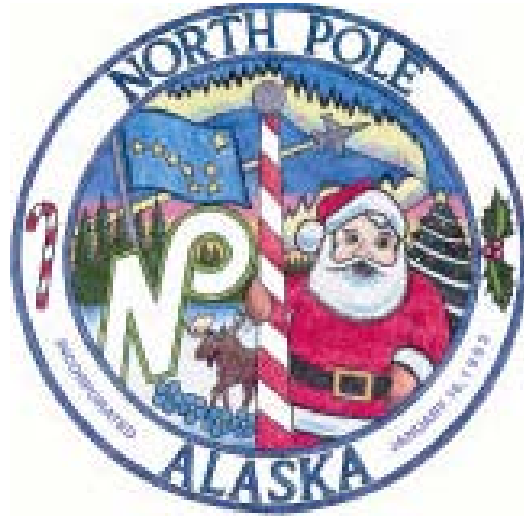


CITY OF NORTH POLE



UTILITY STANDARDS OF CONSTRUCTION

Revised: June 2007



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CITY OF NORTH POLE

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- W1 Water Details
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City of North Pole Utility Standards of Construction

SECTION 1 - WASTEWATER COLLECTION SYSTEM DESIGN GUIDELINES

1.1 - GENERAL

The design of a wastewater collection system within the City of North Pole, hereinafter referred to as the Utility, service areas that connect to the Utility system, shall be submitted to and approved in writing by the ADEC and the Utility prior to construction. The design shall be in accordance with State Regulations (specifically 18 AAC 72), Utility standard details, the current Uniform Plumbing Code, other Utility planning schemes, and the guidelines herein and shall be consistent with the Construction Guidelines for the Utility wastewater collection system. Final design shall be certified by a professional engineer registered in the State of Alaska. It is suggested that a preliminary concept of the wastewater collection system be submitted for review by the Utility prior to the preparation of the required final design report, construction plans, specifications, and submission to the ADEC. The purpose of the preliminary submittal is to present the concept, factual data, (including soil boring) controlling assumptions and considerations used for the functional planning of the proposed system.

The proposed final plat or metes and bounds description of the improvement area or other similar data must be submitted with each wastewater collection design. Permanent easements with fifteen (15) feet minimum on either side of the wastewater collection pipe and appurtenances) are required for wastewater systems constructed on private property for maintenance access. A copy of all recorded easements within the improvement area must be submitted with the plans, if not shown on an approved plat. All pertinent non-objections and/or permits from affected utilities and/or government agencies shall be secured prior to final approval.

Any addition to the Utility wastewater collection system shall be consistent with the Utility's standards of design, quality of materials, and construction. Special emphasis shall be given to reduce future operation and maintenance costs due to conditions peculiar to North Pole.

This document compliments the Design and Construction Guidelines for Water Distribution Systems and both should be used together, as appropriate, to eliminate conflicts.

This document is designed to aid in meeting the requirements of the Utility. It must be emphasized that no single document can possibly present guidelines for all situations that will be encountered. The Utility shall have the ultimate authority to interpret this document and may direct modifications for specific situations. Any regulation or code that conflicts with these standards shall be brought to the attention of the City of North Pole's Director of Public Works.



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1.2 - DESIGN CRITERIA

1.2.1 GENERAL

For the purpose of reviewing plans for a wastewater collection system, the design criteria contained in the Alaska Administrative Code (18 AAC 72) shall be utilized and supplemented by manufacturer's recommendations and provisions contained herein. Fundamentally, sewage must be transported in a sanitary manner to and through the Utility wastewater collection system with an absolute minimum of infiltration of groundwater and in-flow of storm run off. No storm drain or roof drains shall be allowed to connect to the wastewater collection system (18 AAC 72.040).

1.2.2 PARAMETERS

Attention shall be given to design details which will minimize potential freeze up problems within the wastewater collection system. Special consideration should be given to cold temperatures, permafrost, and high water tables; conditions common in North Pole. The reports, plans, and specifications for the wastewater collection system shall be certified by an engineer currently registered in the State of Alaska. Allowances for future extensions will be made in the design of all additions. The Utility's standard castings, pumps, and pipe shall be used in the design and construction of these improvements.

Basic design capacity shall be based on expected peak hourly flow from residents and other structures plus infiltration and inflow. For typical domestic situations, an average per capita production of wastewater in North Pole is seventy (80) gallons per day. Peak hourly flow factors are inversely proportional to total average daily flow within a pipe. The following are values currently accepted by the Utility for residential areas:

PEAKING FACTOR FOR PEAK HOUR FLOW

<u>TOTAL AVERAGE FLOW IN PIPE</u>	<u>PEAKING FACTOR</u>
10 gpm	5.6
100 gpm	3.4
1,000 gpm	2.5

Factors for total average flows other than these can be extrapolated. Industrial and commercial area flows should be determined on an individual basis.

Infiltration and inflow are variable factors but, a minimum of 650 gpd/in-mi shall be assumed in design calculations. A peaking factor of 1.8 should be used with these flows to get GPM. In any case, wastewater gravity mains shall be no less than eight (8) inches diameter, and force mains shall be no less than four (4) inches diameter.



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Slopes of wastewater mains are critical to convey the materials suspended in the wastewater. Slopes shall be uniform between manholes and shall, unless specifically authorized, be such to maintain a minimum velocity of two (2) feet per second when flowing full. Wastewater mains shall be located in, or adjacent to, streets (rather than on rear or side lot lines) to facilitate maintenance.

1.2.3 REPORTS, PLANS, AND SPECIFICATIONS

A design report shall be submitted to the Utility and shall include assumptions used in the design, (including expected occupancy of lots) expected population density and constants used for flow calculations. This report shall prove that existing downstream facilities have sufficient capacity and ability to accept the additional loads from the proposed development. The design report, plans, and specifications will be reviewed and approved by the Alaska Department of Environmental Conservation and the Utility. Final plans shall include both plan and profile details showing the relationship between the proposed wastewater improvement and all other existing or proposed utilities and improvements. The plans shall show the exact location of proposed improvements from designated survey control points and shall specify required elevations including pipe and manhole depth. "As-built" plans shall be submitted on reproducible mylar and AutoCAD. All manholes, flush wells and service connections shall be located in their "as-built" positions.

Elevation datum shall be NAVD '88 and noted on the plans. A note must also be included on the plans specifying that construction will be in accordance with these Standards of Construction. Tolerances for survey control and location of improvements are provided in the Construction Guidelines.

1.2.4 MISCELLANEOUS

Pretreatment may be required for industrial wastes as specified in the Utility's Ordinance, approved by the North Pole City Council. A monitoring station may be required to assure compliance with these regulations.

Flow measurement stations may be required for private systems. Equipment shall be of the same type as already used in the Utility system to facilitate maintenance. Meter accuracy is expected to be the actual flow, plus or minus one (1) percent.

Wastewater collection mains shall typically be constructed on the westerly or northerly side of the road or on the opposite side of the water main. The offset from the water main must meet ADEC requirements, and the offset from the right of way must be adequate to allow access to the sewer main for future repairs or replacement. If adequate separation from the right of way cannot be met, easements will be required.



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Wastewater collection mains beneath State of Alaska highways, other selected streets, or the Alaska Railroad, shall be placed in casings as necessary according to their specific utility permit requirements. Pipe for river or slough crossings, or other adverse conditions, requires a ball joint connection system with minimum deflection of fifteen (15) degrees with full restraints.

1.2.5 INSULATION

To help prevent freezing, all wastewater pipe, fittings, and manholes shall be completely insulated to a thickness as shown on Standard Drawings. Waterproof coating shall be used over the foam insulation where pipes are within one (1) foot of the natural groundwater table to help protect the insulation that will be submerged on an annual basis. Polyethylene encasement shall be used over foam insulation where waterproof coating is not used to protect ductile iron from corrosive soils. All wastewater mains shall be installed with a minimum of five (5) feet of cover.

All wastewater mains to be installed within seven (7) feet of existing storm drains, telephone duct banks, etc will require extra insulation. The thickness of the insulation shall be relative to the separation from storm drains. Typically, one (1) additional inch of insulation shall be provided for each foot of separation less than seven (7) feet. In cases where the storm drain or conduit is installed after the wastewater main, the insulation can be applied to the storm drain or conduit pipe rather than exposing and adding insulation to the wastewater pipe. The thickness and extents of the insulation shall be the same on storm drain or conduit pipe as stated for the wastewater main.

Wastewater mains installed in casings shall have insulation spacers, twenty-four (24) inches long, with an outer diameter of two (2) inches less than the casing inner diameter, with tapered ends, and spaced at ten (10) feet on center. All the insulation, on the pipe to be installed through casings, shall be coated with waterproof surface coating.

1.2.6 MANHOLES

All intersections of gravity flow pipe shall be in manholes which shall be designed to minimize deposition, aid maintenance and inspection, and where possible, maintain hydraulic grade lines. When pipes of different sizes join, this can best be accomplished by matching their 0.8 depth points. The matching of crowns is also an acceptable technique. Where matching is not possible, inflow pipes shall have transitional grading in flow channels to minimize the effects of drops. A drop manhole shall be required for drops greater than those specified on Standard Drawings.



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Normally, the grade of a manhole channel shall be the same as the pipes entering and exiting, and a section of pipe with appropriate cut-out will pass completely through the manhole. Where there is a change of horizontal angle less than forty-five (45) degrees, there will be an incremental increase of slope up to 0.05 feet drop across the manhole. For a change of direction from forty-five (45) degrees to ninety (90) degrees, the drop shall be 0.10 feet. For changes in direction greater than ninety (90) degrees, the drop shall incrementally increase to 0.2 feet across the manhole. No service connections shall be allowed to manholes or interceptors but shall be accomplished with saddles placed on collection mains.

Manhole placement shall typically be within the street intersections. Distances between manholes shall not exceed three hundred (300) feet. The manhole inside diameter shall be a minimum of forty-eight (48) inches. A manhole shall be placed adjacent to lift stations, where necessary, to offset the lift station from underneath the roadway driving surface and to facilitate bypassing operations. All dead end mains shall have an access at the end in the form of a cleanout/flush well. The diameter of the mainline cleanout/flush well shall be the same diameter as the mainline.

1.2.7 LIFT STATIONS

The combination of flat topography, deep frost penetration, high water table, and high construction costs for excavation often makes wastewater lift stations necessary in the Utility wastewater collection system. Since lift stations are expensive to construct and to operate, they shall be utilized only as absolutely necessary, and be consistent with Utility planning.

Wastewater lift stations shall be designed with a steel receiving well and furnished with at least two (2) 3-phase, Flgyt N-series, submersible, non-clog wastewater pumps. The system will be completely automatic and electrical controls and accessories shall be completely compatible with the pumps. Each lift station shall be vented. The lift station site shall be readily accessible but outside of street driving surfaces. Permanent easements shall be obtained for a radius of seventy-five (75) feet out from lift station that would allow excavating to the base of the lift station with safe slopes. Safety shall be a primary concern in designing access within the lift station, and all electrical equipment within the lift station shall be explosion proof or intrinsically safe as specified in Section 2, Wastewater Collection System Construction Guidelines.

Capacity of the lift station shall be based on the peak hourly flow (which is the expected average daily flows multiplied by the wastewater peak flow factor). Duplex pumps shall be provided, each one identical, with each having the capacity to handle peak flows. The controls shall be designed to alternate lead pumps, to maximize time between start-ups of each pump, and to equalize wear. The lag pump shall automatically start when water level rises above the lead pump on level.



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The minimum size of a lift station receiving well shall be six (6) feet in diameter. The depth of the receiving well, which is defined as the distance from the inlet invert to the bottom of the pump, shall be a minimum of five (5) feet and shall be designed to both minimize detention time within the lift station and minimize the running time and start-ups of the pumps.

Included in this document is the Lift Station Details (LS1). This and Section 2, 2.29 Standard Detail for Lift Stations shall be consulted for more design details.

The design report shall include flows, pump curves, anticipated power consumption, operations and maintenance information, recommended spare parts, and other appropriate information.

1.2.8 SEPARATION DISTANCE

Horizontal and vertical separation shall be in accordance with the latest ADEC Regulations 18 AAC 72.020. Water and sewer mains (including manholes) shall be separated by a minimum of ten (10) feet horizontally, and eighteen (18) inches vertically at crossings, measured edge to edge. Where it is not practical to maintain this separation, the ADEC may allow deviation on a case by case basis, if a waiver request is submitted to ADEC and is properly supported by data from the design engineer. Waiver requests must identify the reason for lesser separation and show:

- A. The lines are located in separate trenches and the top of the sewer main, where crossing is at the maximum depth possible below the bottom of the water main until existing appurtenances' elevations or depths of cover requirements prohibit such installation, and;
- B. The sewer line is designed and constructed in a manner equivalent to the requirements for a potable water pipe and is pressure tested to ensure water tightness, or;
- C. The sewer line is enclosed in a water-tight carrier pipe of similar strength, i.e., casing.

At locations where water and sewer mains must **cross**, a waiver is **not** required if:

- Water line is above the sewer line;
- Sewer line is bedded per Type 4 or 5 (AWWA Standard C600-05);
- Water line joints are at least nine (9) feet from the sewer line **and**;
- Water line is at least eighteen (18) inches vertically from the sewer line.



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If the above conditions can not be met for sewer and water crossings, a waiver request (similar to horizontal separation) must be submitted to ADEC.

Any design that fails to meet the ten (10) foot horizontal or eighteen (18) inch vertical separation distance shall require a waiver from ADEC.



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SECTION 2 - WASTEWATER COLLECTION SYSTEM CONSTRUCTION GUIDELINES

2.1 - GENERAL

2.1.1 GUIDELINES

The design of a wastewater collection system which ultimately connects to the Utility collection system shall be submitted to and approved in writing by the Utility prior to construction. The design shall be in accordance with state regulations, the Utility Master Plan or other Utility planning schemes, and all aspects of this document. Final design will be submitted to and approved by the Alaska Department of Environmental Conservation and must be certified by a professional engineer registered in the State of Alaska (18 AAC 72) prior to beginning construction. In addition to basic design, the engineer shall look at such things as flow velocities, quantities in the proposed wastewater system, and any changes in the existing Utility system caused by the proposed addition.

This document is designed to aid in meeting the requirements of the Utility. It must be emphasized that no single document can possibly present guidelines for all situations that will be encountered. The Utility shall have ultimate authority to interpret this document and shall direct modifications for specific situations.

2.1.2 WORK INCLUDED

This section covers the installation of all wastewater pipe and appurtenances for the wastewater collection system.

Materials, operations or methods herein or indicated on the drawings as being required for the project shall be provided by the Developer/Contractor. The Developer/Contractor shall provide all the necessary labor, equipment, material and the incidentals necessary to complete the system as shown on the plans.

2.1.3 CODES AND REGULATIONS

In addition to complying with all pertinent codes and regulations, the Developer/Contractor must comply with all requirements of the most recent Uniform Plumbing Code, as adopted by the Utility, and this standard.

Where provisions of pertinent codes and standards conflict with this document, the more stringent provisions shall apply.



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2.1.4 CONSULTING ENGINEER

The consulting engineer shall be a registered engineer in the State of Alaska retained by the Developer/Contractor to design and coordinate the installation of the wastewater system.

- A. The consulting engineer shall furnish drawings and specifications which, as far as practical, completely represent the requirements of the work to be performed under the contract.
- B. The consulting engineer shall be responsible for the design of any construction changes required during the course of construction.
- C. The consulting engineer shall submit signed drawings and specifications to ADEC along with the associated application for construction approval. After construction is complete, they must submit the application for interim and final approval to operate.
- D. The consulting engineer shall be responsible for submission of stamped as-built drawings to the Utility upon completion of the project. As-built drawings shall show all changes made during construction as well as a minimum of three (3) swing ties to all manholes, cleanouts, and service saddles.
- E. The consulting engineer will provide the Utility with advance notice of the work schedule and report to the Utility as to the progress of the work and manner in which it is being performed.
- F. The consulting engineer is not authorized to revoke, alter, enlarge, relax, or release any requirements of the City and ADEC approved plans and specifications without concurrence, or to approve or accept any portion of the work or to issue instructions contrary to this document.

2.1.5 INSPECTION OF WORK BY UTILITY

- A. The Utility shall perform inspections of the work and material to ensure compliance with the plans, specifications, and these Standards of Construction. Such inspections may extend to any part of the work including the preparation, fabrication, or manufacture of the materials used. The Utility's authorized representative will decide: all questions which may arise as to the quality and acceptability of materials furnished and work performed; all questions as to the degree of completion of the work; all questions which may arise as to interpretation of the plans and specifications, and all questions as to the acceptable fulfillment of the contract on the part of the Developer/Contractor.



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- B. The Utility's authorized representative shall have the authority to reject any work or materials that do not meet Utility standards.
- C. The presence or absence of the Utility's authorized representative does not relieve the Developer/Contractor from his obligation to fully perform all requirements of this document, nor does it give rise to any right of action or suit by the Developer/Contractor, or third persons against the Utility.

2.2 - MATERIALS

2.2.1 GENERAL

All materials shall be new, of current manufacture, and conform to the specifications contained herein. The Developer/Contractor shall submit manufacturer's literature and affidavit of compliance with specified standards of the Utility for review and approval prior to procuring materials.

2.2.2 PIPING

- A. Gravity wastewater mains shall be ductile iron pipe with cement mortar lining in accordance with AWWA C-104
- B. Force mains shall be ductile iron pipe lined with 40 mils ceramic epoxy, Protecto 401 or equal. Ceramic epoxy must meet the following requirements:

Permeability:	0.00 perms per ASTM E 96 (Method A)
Salt Spray:	0 mm per ASTM B117
Cathodic Disbondment:	<0.5 mm per ASTM G95 (1.5 volts at 97 deg F, 30 days)
Immersion Testing	Per ASTM D 714
20% Sulfuric Acid	No effect after two (2) years
140 deg F 25% Sodium Hydroxide	No effect after two (2) years
150 deg F Distilled Water (scribed panel)	No effect after two (2) years
120 deg F Tap Water (scribed panel)	0.0 undercutting after two (2) years with no effect
- C. Pipe used for trenchless rehabilitation of wastewater mains will be approved on a case-by-case basis.
- D. Ductile iron pipe shall conform to AWWA C-151. Ductile iron pipe shall be cement mortar lined and shall be minimum thickness as shown on Standard Drawings.
- E. Insulated wastewater pipe installed in sleeves or near groundwater shall be coated with waterproof surface coating.



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2.2.3 PIPE JOINTS

- A. Joints for ductile iron pipe shall be rubber gasketed push-on joint (U.S. Pipe Tyton or equal) or mechanical joint conforming to AWWA C-111.
- B. At stream crossings, pipe joints must be restrained with mechanical joint fittings along with gripper glands and field lok gaskets. Restrained joint pipe and fittings shall be designed for a maximum working pressure of 250 psi.

2.2.4 PIPE FITTINGS

Fittings for ductile iron pipe shall be mechanical joint and shall conform to AWWA C-110. The fittings shall have a minimum rating of 150 psi working pressure but be capable of withstanding three times the rated water working pressure as per AWWA C-110. Fittings shall be ductile iron. Interior of fittings for gravity mains shall be cement mortar lined per AWWA C-104. Fittings for force main pipe shall be lined with ceramic epoxy as described in 2.2.2.B. Fittings with joint restraint shall be ductile iron and shall conform to ANSI A 21.10.

2.2.5 INSULATION

Urethane spray foam insulation shall be rigid closed cell, two component urethane foam with the following properties:

K Factor:	0.15 (Btu - in/FT ² - Hr - °F) per ASTM C 518
Compressive Strength:	45 psi per ASTM D 1621
Nominal Density:	3.0 pcf per ASTM D 1622
Tensile Strength:	70 psi per ASTM D 1623
Shear Strength:	45 psi per ASTM C 273
Water Absorption:	0.017 gm/cc per ASTM D 2842
Water Vapor Permeability:	1.9 perm per ASTM C 355
Closed Cell Content (min):	90% per ASTM D 1940

Insulation material shall be Resin Technology 2035. Applicator shall demonstrate prior experience of at least two (2) years, and the Utility shall be the sole judge of the qualifications of system, application method, and applicator.

2.2.6 POLYETHYLENE ENCASEMENT

Polyethylene encasement shall conform to ANSI/AWWA C105/A21.5 "Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids." Provide 8-mil polyethylene film tube or sheet.



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2.2.7 WATERPROOF SURFACE COATINGS

Coating shall be a two-component, one hundred (100) percent solids, sprayable polyurea coating with the following properties:

Hardness:	90±5 (ASTM D-2240 Shore A)
Hardness:	50±5 (ASTM D-2240 Shore D)
Freeze/Thaw:	No disbonding or distortion (ASTM D-2126, 5 cycles)
Tensile Strength:	2500 psi (ASTM D-412, ASTM D-638)
Elongation:	265% (ASTM D-412, ASTM D-638)
Permeability (MVT@30 mils):	0.024 perm (ASTM E-96, Procedure B)
Weathering:	3,000 hrs without threatening signs of deterioration (ASTM G-26, ASTM G-53)
Tear Resistance:	430±50 pli (ASTM D-624)

Coating shall be polyurea elastomer, "Permax 700-HP" by Resin Technologies; "Polyshield SS-100" by Specialty Products, Inc.; or approved equivalent. Applicator shall demonstrate prior experience of at least two (2) years, and the Utility shall be the sole judge of the qualifications of system, application method, and applicator.

2.2.8 MANHOLES

- A. The manholes shall be completely watertight. Materials used in construction shall conform to the requirements of ASTM Specification Designation C-478 and approved details.
- B. Manhole bases and cones shall be formed of 3000 psi concrete. They shall have wire mesh and rebar as shown on the standard details.
- C. Each precast concrete manhole section shall be set and sealed by use of a gasket type seal such as Ram-Nec or equal.
- D. Manhole covers and rings shall be fabricated from cast iron per ASTM A-48, Class 35B.

The traffic cover shall have a diameter of twenty-four and three quarter (24¾) inches with a clear inside diameter of twenty-three (23) inches. Overall depth shall be ten (10) inches with a seven (7) inch height from the flange.

The word "SEWER" shall be cast into the manhole cover. Manhole cover shall be solid except for a maximum of two lifting holes and a maximum of one side pick slot. Manhole rings and covers shall be machine ground on seating surfaces so as to assure a non-rocking fit in any position and interchangeability.



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Manhole rings and covers shall be East Jordan Iron Works IFCO 741 or Olympic Foundry Inc. MH26A or equal. The Utility reserves the right to determine the suitability of the manhole covers and rings based upon its proposed location and projected traffic patterns.

2.2.9 CLEANOUTS

Force main and gravity cleanouts shall be as shown on the standard detail drawings.

Flushwell cleanouts shall be constructed with a forty-five (45) degree elbow, ductile iron pipe to surface. An acceptable product for 8-inch cleanout is East Jordan Iron Works IFCO 221 cleanout cover assembly.

2.2.10 LIFT STATIONS

2.2.10.1 Wet Well

- A. Fabrication: The wet well shall be constructed of structural steel plate, with all seams welded in accordance with standard AWS practices, with proper fillet section and continuity to assure a sound, watertight structure. The barrel shall be rolled into the diameter shown on the plans. A steel channel hatch frame shall be welded to the top as shown on the plans. The frame opening size and location shall be coordinated with the pump manufacturer. Penetration sleeves shall be provided as shown on the plans for all pipes, conduits, and vents. A piping and slide rail brace shall be provided as shown on the Standard Drawings. Six (6) hold down clips, two (2) lifting lugs and one (1) grounding lug shall be welded to the barrel as shown on the Standard Drawings. At the Contractor's option, the wet well may be attached to the wet well base, insulated and coated, prior to lowering into position.
- B. Ballast: The concrete bottom for the lift station was designed to provide a minimum factor of safety of two against uplift when the lift station is completely backfilled and the exterior water level is at the top of the lift station. The Contractor is responsible for providing additional ballast, if installation conditions warrant, during installation to prevent uplift.
- C. Protective Coating: All mill scale, rust, weld flux or other foreign matter shall be removed from all steel surfaces by sandblasting to SSPC-SP-10 specifications for near white blast cleaning. Surface irregularities shall be removed by grinding and filling. All surfaces shall be coated with 16 mils (dry) of Coal Tar Epoxy per the coating manufacturer's recommendation. Carboline Bitumastic 300 M or Sherwin- Williams Hi-Mil Sher-Tar Epoxy are acceptable products.



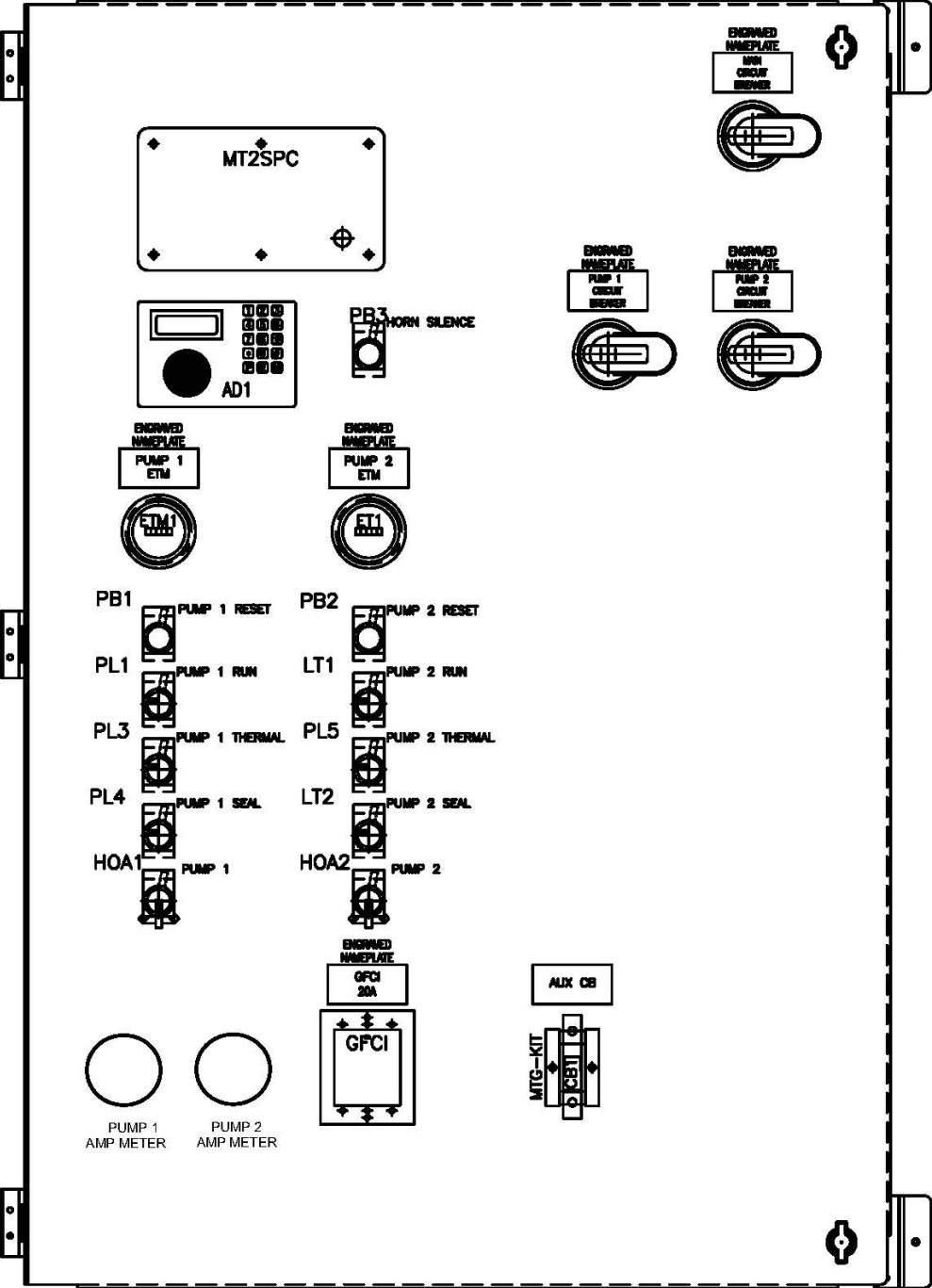
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- D. Cathodic Protection: Protection shall be provided by two (2) 17-lb. magnesium anode packs with #8 stranded, insulated, copper leads for connection to the lifting lugs.

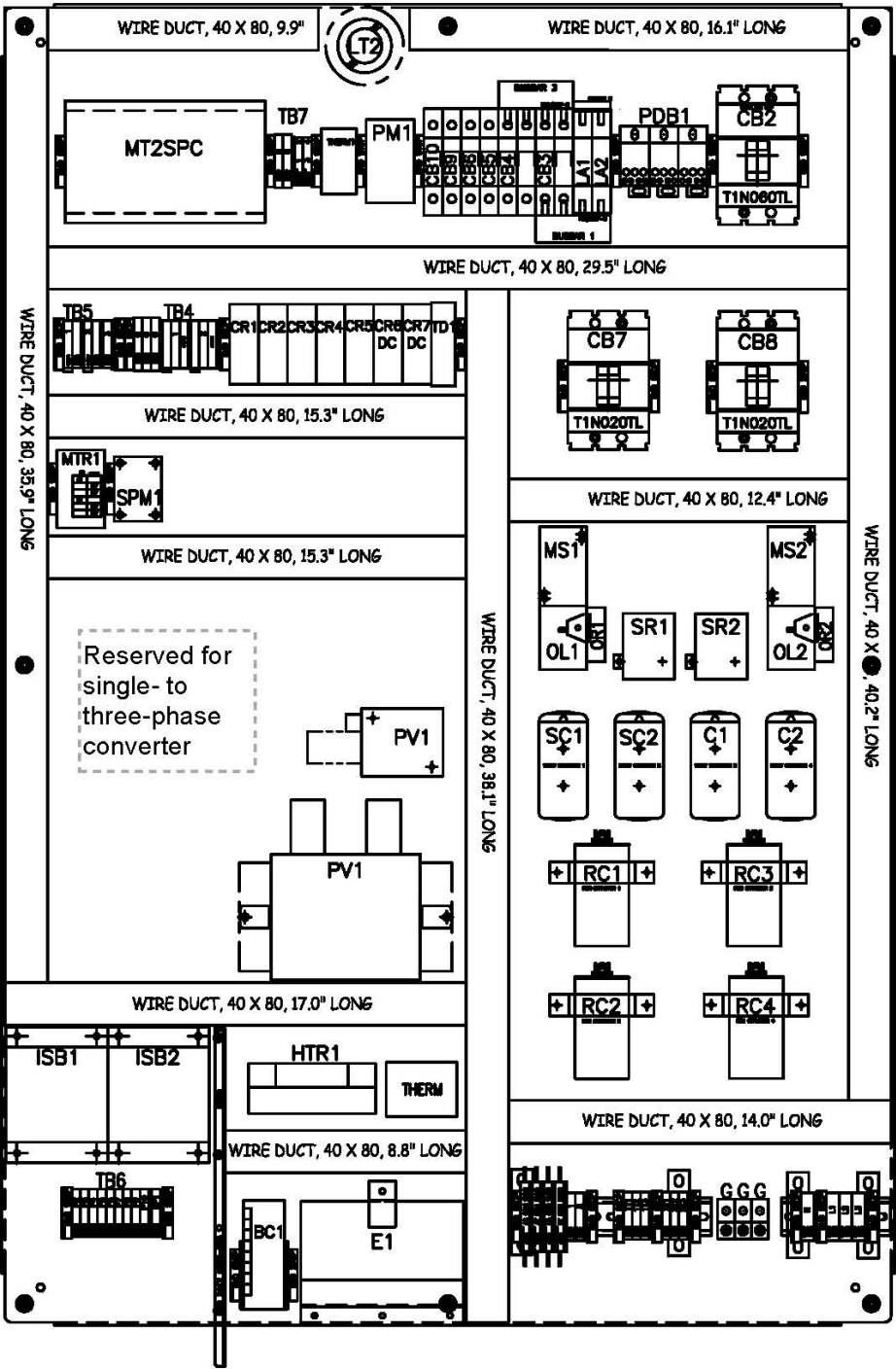
2.2.10.2 Control Panel

The Control Panel: An automatic pump control center shall be mounted in a NEMA 4, insulated, dead front, outdoor enclosure for operation at the required voltage.

- A. Manufacturer: The control panel shall be manufactured by Flygt and organized as shown on the diagram.
- B. Control System: Include a 120V maximum control circuit transformer with disconnect and overload protection, with an automatic electrical alternator provided for these duplex stations. Control wiring entering wet well shall utilize intrinsically safe power sources and barrier relays with energy level incapable of igniting combustible gases within the wet well.



FRONT VIEW
SWIN PANEL 33"x49"



FRONT VIEW
SUBPANEL 33"x49"

NOTE: Panel size may be modified if a phase converter is not needed or as required to fit components.



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- C. Three-Phase Power Monitor: Provide a monitor for protection of the motors in case of low voltage, single phasing, or phase reversal. Upon any fault detection the control shall shut the pumps off.
- D. Motor/Control Coordination: Prefabricate panel to match motor and control characteristics.
- E. Meters/Lights: Provide with elapsed time meters, running lights and seal failure warning lights for each pump. Warning lights mounted in the pump control panel shall also be provided to indicate if any of the sewage pump motors have tripped from overload conditions. The panel shall include a momentary contact test switch for testing the lights.
- F. Wet Well Level Alarm: An "ALARM" sensor located in the wet well shall be incorporated into the control panel which will energize an alarm light and bell. This shall have the capability of being activated by both the sensor probe and a sensor float. Power for running these alarm lights shall be provided by the control panel. The panel shall include a momentary contact test switch for testing the alarm light, and an alarm silencing switch.
- G. Heating/Ventilation:
 - 1. Provide a thermostatically controlled heater with a circulating fan to maintain the panel interior ambient temperature between 40°F and 100°F for an exterior temperature range of -60°F to 100°F. The heating/ ventilation shall have a separate overcurrent protective device. Hoffman DAH4001B or approved equal.
 - 2. Provide a 6-inch thermostatically controlled vent fan. Provide a stainless steel intake louver with filter near the bottom of the cabinet and a stainless steel outlet louver near the top. The louvers shall have 8- by 8-inch external shielding covers. The thermostat shall cause the fan to operate on temperature rise. Hoffman A-TEMNO thermostat, Hoffman A-6AXFN fan, Hoffman A-VK66SS6 louvers, Hoffman A-FLT66 filter, or approved equal.
 - 3. The Heating/Ventilation equipment shall have a separate overcurrent protective device.
- H. Receptacle Outlet: Provide a 125-volt, single-phase, 20-ampere-rated receptacle outlet. The receptacle shall be connected to the line side of the equipment disconnecting means. The receptacle shall have a separate overcurrent protective device. The receptacle outlet shall be provided with ground-fault circuit interrupter (GFCI) protection for personnel.



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- I. Hand-Off-Auto Switch: Each sewage pump shall have an individual oil-tight hand-off-auto switch mounted on the control panel which allows the following pump operational modes:
 - 1. Hand Mode: Each pump is individually energized to operate independent of the liquid level in the wet well.
 - 2. Off Mode: Each pump is de-energized until another operation mode is selected.
 - 3. Auto Mode: Each pump is controlled by the liquid level controls which energize the pumps according to wet well liquid level.
- J. Sequence of Operations: At the "lead pump on" liquid level, the controls shall energize one of the pumps identified as the lead pump for that cycle. As the liquid level falls to the "pump off" level, the lead pump shall be de-energized by the pump controls. As the level again rises to the "pump on" level the control panel shall energize the other pump not used in the first pumping cycle so as to alternate the operation of the pumps on successive pump cycles. If the lead pump is not able to lower the wet well's liquid level and the level rises to the "lag pump on" level, the second pump (identified as the lag pump for the pump cycle) shall be energized by the pump controls and run with the lead pump until the liquid level drops to the "pump off" level at which point both pumps are de-energized.
- K. Automatic Restart after Power Outage: The control circuitry shall provide for automatic restart of the lead pump upon restoration of electrical power after an outage. Start of the lag pump shall be delayed for 5 minutes to avoid flooding of the downstream sewers and electrical overloads.
- L. Provide a rust protection capsule inside the cabinet. Zerust VCC-1-1 or approved equal.
- M. Electrical wiring and components must be in compliance with all applicable codes. Wiring must be capable of flexing at temperatures of -60 deg F.
- N. Spare Parts: The following spare parts shall be provided for each control panel:
 - 1. One fuse of each type and ampacity used.
 - 2. One spare contactor.
 - 3. Two spare bulbs for the indicator lights.
 - 4. One control transformer.
- O. Control Panel Backboard: Provide 1-5/8- by 1-5/8-inch 12-gauge galvanized unistrut support channels to mount the 1-inch plywood backboard to the 4-inch galvanized steel pipe for the lift station control panel. The plywood shall be pressure treated, APA rated C-C plugged, Group 2 exterior. Apply two coats of industrial gray enamel paint to plywood before mounting.



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Fasteners in contact with the plywood shall be rated for use with pressure-treated wood.

- P. Control and Monitoring: Control panel shall be equipped with a configurable duplex pump controller with a SCADA Remote Telemetry Unit with the capability to communicate via a RS232 port, Flygt MultiTrove MT2SPC or approved equal. The controller shall be equipped with the following minimum I/O:
 - 1. 24 configurable digital inputs.
 - 2. Six configurable digital outputs.
 - 3. One analog output.
 - 4. Two analog inputs.
- Q. Amp Meters: The control panel shall be equipped with analog type amp meters that display the amperage drawn by the pumps while they are operating.
- R. Sensitive Controls Protection: Provide lightning arrestors and surge arrestors to protect equipment in control panel.
- S. Phase Converters: Provide where three phase power is not available. The converter shall allow a single phase input voltage to serve three-phase pumps. Converter shall meet the following requirements:
 - 1. Provide 150 percent starting torque minimum
 - 2. Not affected by cycling rate
 - 3. Configured to comply with specific pump models
 - 4. UL-Listed
 - 5. Three-year warranty

2.2.10.3 Level Regulators

Provide both a probe regulator and a float sensor.

- A. The Level Regulators shall be Flygt MultiTrove, Stick level sensors. Sensors shall be Avesta 254 SMO High Grade Stainless Steel Alloy. Probe Casting shall be uPVC Premium Quality Extruded Tube. Cable shall be PVC/PVC Multi-Core.
- B. The Alarm Sensor Float shall be Anchor Scientific Mini Float SM30N0 (normally open with 30-foot cable), or approved equal. Float shall be suitable for intrinsically safe circuits.



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2.2.10.4 Valves

Valves shall conform to the following:

- A. Gate Valves: Gate valves 3 inches and larger for wastewater shall be resilient seated gate valves conforming to ANSI/AWWA C509. Valves to be operated by a cast iron handwheel mounted on a rising stem rotated counter-clockwise to open. The direction of opening shall be indicated on the handwheel. Valve ends to be flanged conforming to ANSI B16.1, Class 125.
- B. Ball Check Valves:
 - 1. Ball check valves shall be non-clog, fully automatic, maintenance-free, and specifically suited for operation in sewage and storm water where solids, fibers, grit, or highly viscous materials are encountered.
 - 2. Ball check valves will have one moving part, the ball, which automatically rolls out of the path of flow, thus providing an unobstructed and "full flow" equal to nominal size. Upon discontinuation of flow, the ball automatically rolls back to the closed position, thus providing a positive seal against back pressure or backflow.
 - 3. The ball shall have an exterior coating of vulcanized nitrile rubber resistant to grease, petroleum products, animal and vegetable fats, dilute concentrations of acids and alkalies, tearing, and abrasion. The body and cover shall be nodular cast iron type GGG 40/ASTM 65-45-12/SAE 4512. Ball check valves are designed to be maintenance-free and suited for installation in the vertical position. The valve shall be so constructed that by unbolting and lifting off the cover, the ball may be removed and replaced without removing the valve from the line.
 - 4. Ball check valves shall have a sinking ball.
 - 5. Valve shall be rated for 175 psi working pressure for cold water service, and 350 psi hydrostatic test limit pressure. Valve shall have no more than 0.6 feet of headloss at design flow. Valve shall have flanged ends per ANSI B16.1 Class 125. Markings shall include manufacturer, valve size, working pressure, and direction of flow all cast into the body of the valve.

2.2.10.5 Pumps, 3-phase

- A. The pumps shall be submersible type with a minimum 4-inch discharge capable of handling raw, unscreened sewage. They shall each be capable of 15 starts per hour and be capable of running dry without damage. All parts which will come in contact with the sewage will be of gray cast iron, ASTM A 48, Class 35B. All exposed bolts and nuts will be of stainless steel construction. All metal surfaces coming into contact with the pumpage, other



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than stainless steel or brass, shall be protected by a factory-applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

- B. The pumps shall be mounted on a slide rail system with breakaway connection to the discharge piping. The design shall be such that the pump unit will be automatically and firmly connected to the discharge piping when lowered into place on the matching discharge connection permanently installed in the wet well. The pump shall be easily removable for inspection or service, requiring no bolts, or fastenings to be disconnected. Pump removal shall not require personnel to enter the wet well. Each pump shall be fitted with a stainless steel chain of adequate strength and length to permit raising and lowering the pump for inspection and removal. The working load of the lifting system shall be 50 percent greater than the pump unit weight. The pump, with its appurtenances and cables, shall be capable of continuous submergence under water without loss of watertight integrity.
- C. Specific Pump Requirements:
 - 1. Open Impellers with Cutting Edge: The impeller shall be of gray cast iron, ASTM A48 Class 35B, dynamically balanced, semi-open, multi-vane, back-swept, non-clog design. The impeller vane leading edges shall be mechanically self-cleaned upon each rotation as they pass across a spiral groove located on the volute suction which shall keep them clear of debris, maintaining an unobstructed leading edge. The impeller vanes shall have screw-shaped leading edges that are hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge, and other matter found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of sludge and rag-laden wastewater. Impellers shall be locked to the shaft, held by an impeller bolt, and treated with a corrosion inhibitor.
 - 2. Explosion Proof Motors: All pumps shall be explosion proof and equipped with thermal sensors embedded in the stator windings.
 - 3. Cables: Power cables shall be UL-approved for an explosive environment. They shall be intrinsically safe, made of a water resistant material, non-susceptible to the sewage acids, and flexible enough to move with the pumps when they are raised. Cables shall run continuously from the pumps into the surface-mounted NEMA 3R Wet Well junction box.
 - 4. Controls supplied and installed with these pumps shall include circuits for motor pilot thermal sensors and intrinsically-safe control components for liquid level sensors.
 - 5. Performance: The pump shall be capable of delivering the current flow at the Total Dynamic Head shown. Pump manufacturer to be Flygt, Hydromatic, PACO, or approved equal.



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6. Spare Parts: Parts shall be packed in a watertight steel box labeled as to pump manufacturer, size, model and date of issue. The following spare parts shall be supplied for each pump (including spare):
 - a. One complete set gaskets.
 - b. One complete set seals.
 - c. One wear ring.
 - d. One complete set bearings.
 7. Pump Warranty: The pumps will be warranted for a period of five years from Owner acceptance. A copy of the proposed warranty shall be furnished in writing by the Contractor at time of shop drawing submittal and shall certify that the pumps are free of defects in design, material or workmanship. A factory approved service representative, having a permanent place of business in Alaska shall be available to effect pump repairs.
- D. Spare Pump: One new, spare pump shall be provided, for each lift station, complete with motor, pump sealing flange, slide rail guides, power cable and signal cable. This unit shall be complete so that it can be installed with no salvage of components from the existing pump it would replace.

2.2.10.6 Access Hatch:

- A. The access frame and hatch shall be a standard product manufactured for lift stations, meeting the following requirements:
1. Single door cover with insulation fastened mechanically to the underside of the cover.
 2. Channel style frame construction.
 3. All aluminum construction.
 4. Stainless steel hardware, with a minimum of three (2) hinges per door.
 5. Load rating of 300 lbs. per square foot.
 6. Flush drop handle.
 7. Automatic hold-open arm.
 8. Recessed, tamper-resistant padlock assembly.
 9. Stainless steel horizontal compression spring used as lift assist, located so as not to interfere with opening of safety grate.
 10. 10-year warranty.
 11. Provide grate(s) covering the opening, providing fall-through protection per OSHA 1910.23, and control confined-space entry per OSHA 1910.146.
 12. Doors cannot close unless the fall-through protection has been put back in place.
 13. Grate must allow visual inspections and limited maintenance and float adjustment while safety grate is in place.
 14. Open grates must create a physical barrier around the pit.



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15. Color of grates shall be safety orange.
16. Grates shall provide pump platform for minor maintenance.

2.2.10.7 Miscellaneous Materials

- A. Miscellaneous Metals: Bolts, nuts, washers and anchors necessary for the installation of equipment shall be stainless steel. All supports necessary for the installation of equipment shall be galvanized steel in conformance with ASTM A153.
- B. Modular Seal: Link Seal Model S-316 or approved equal. The modular seal shall have an operational temperature range of minus 40 to plus 250 deg F.
 1. Seal Element: The seal element shall be EPDM rubber.
 2. Bolts & Nuts: The bolts and nuts shall be ANSI type 316 Stainless Steel having an average tensile strength of 85,000 psi.
- C. Vent Pipe: High Density Polyethylene, 4-inch diameter, SDR 17. Buried pipe shall be insulated with minimum 2-inches polyurethane.

2.3 - EXECUTION

2.3.1 HANDLING

- A. Use all means necessary to protect materials before, during, and after installation.
- B. In the event of damage, immediately make all repairs and replacements necessary to keep materials in a "like new" condition. These repairs or replacements must be approved by the Utility and made at no cost to the Utility.
- C. All material shall be handled and installed in accordance with manufacturer's recommended handling and installation instructions.
- D. If, in the judgment of the Utility, materials and/or installed work are not being protected or handled as noted in these specifications, or in accordance with manufacturer's handling/installation recommendations, they shall be rejected and removed from the job site and shall not be used on any other work, either present or future for the Utility.

2.3.2 LAYING PIPE

- A. The pipe and fittings shall be inspected for defects before installation.



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- B. All pipe shall be laid and maintained to the required lines and grades with fittings, manholes, cleanouts and appurtenances at the required locations as shown on the design plans.
- C. Wastewater mains shall be laid so as to have a minimum of five (5) feet of backfill over the top of the pipe.
- D. Pipe interiors shall be thoroughly cleaned of all foreign matter before being lowered into the trench. At all times when work is not in progress, all open ends of pipe and fittings shall be securely closed so that no water, earth, rodents, or other substances may enter. Each length of pipe shall be examined during assembly in the trench for debris. Any debris found will be removed immediately.
- E. Trenches shall be kept sufficiently dry so that no pipe will be laid in water. Water shall be kept out of the portions of the trench in which uninsulated joints are located while the joints are insulated and otherwise readied for backfill.
- F. Cutting of pipe for closure or other reasons shall be done by methods which will not damage the pipe and which will ensure tight joints.
- G. Pipe shall be inspected for defects before lowering into the trench. All defective, damaged, or unsound pipe shall be replaced and removed from the site. Any section of pipe that is already laid out and found to be damaged or defective shall be replaced with new pipe at no cost to the Utility.
- H. Pipe bedding shall be as noted in Section 7 Trenching, Backfilling, and Compaction. Bedding shall be placed so as to ensure that the pipe is given a uniform bearing for its full length.
- I. Deflections from a straight line or grade shall not exceed the limits recommended by the manufacturer, minus 2-degrees. If the specified or desired alignment requires deflections in excess of such limits, the Developer/Contractor shall either provide special bends or a sufficient number of shorter lengths of pipe to provide angular deflection within such limits.
- J. Standard lengths of pipe shall be used except where short lengths are required for fittings, or wherever pipe passes through a rigid structure.
- K. Pipe ends for future connections shall be plugged or capped as shown on the design plans.



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- L. Final accuracy of all gravity main installations shall be within 0.01 feet vertically and 0.50 feet horizontally of the exact location taken from the project design plans. In addition, no single section of pipe shall vary by more than ten (10) percent from the grade shown on the project design plans. In no case will a reverse or flat grade be allowed. Pipe which exceeds the above limits of variation shall be adjusted immediately and no further pipe shall be laid until so authorized by the Utility. All costs incurred for adjusting grades of lines shall be the responsibility of the Developer/Contractor.
- M. Lubrication for push-on joints of ductile iron pipe shall be water soluble as recommended by the manufacturer.
- N. Any pipe or structure having its alignment or grade changed by floating in a flooded trench shall be re-laid.

2.3.3 MANHOLES AND CLEANOUTS

- A. Generally, the manhole rings and covers shall be brought to the grades shown on the design plans. The minimum and maximum number of grade rings is shown on the Standard Drawings. However, the Developer/Contractor shall coordinate final grade with the engineer to ensure final grade "fits" as found conditions.
- B. All portions of precast manholes must be approved by the Utility prior to installation. This approval does not relieve the Developer/Contractor of the responsibility for protection of manholes against damage during handling and installation.
- C. Manholes and cleanouts shall be installed at the locations shown on the design plans such that primary leads enter radially at the invert elevations specified. The base section shall be set plumb on the prepared surface.
- D. Where indicated on design plans, a stub shall be provided for future connections to the manhole. The end of the stub shall be stopped with a push-on cap or other device designed by pipe manufacturer to prevent substances and water from entering the pipe.

2.3.4 INSULATION

- A. The Developer/Contractor shall furnish labor, materials, equipment, and services necessary for, and incidental to, field application of sprayed urethane foam insulation.
- B. Wastewater mains and manholes shall have a minimum thickness as shown on Standard Drawings on all outside surfaces unless it can be demonstrated to the satisfaction of the Utility that the main will not freeze.



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- C. Manholes shall receive polyethylene sheeting over the insulation to protect from frost jacking. The number of wraps is shown on Standard Drawings.
- D. Foam shall be applied to wastewater main pipe above ground in a local yard. Pipe may not be sprayed in the ditch except under special circumstances, which must be approved by the Utility.
- E. Pre-insulated pipe that has damaged insulation due to transportation shall be reinsulated to the satisfaction of the Utility. Backfill shall not take place until all insulation has been inspected.
- F. Backfill shall be placed so that pipe insulation will not be damaged.

2.3.5 CONNECTIONS TO EXISTING SYSTEM

- A. Connections to existing Utility wastewater mains shall be made by a licensed and bonded Contractor.
- B. Materials for these connections shall be furnished by the Developer/Contractor.
- C. The Developer/Contractor shall give the Utility at least forty-eight (48) hours advance notice prior to making a connection.
- D. The Utility reserves the right to schedule shutdowns to minimize possible conflicts.

2.3.6 PRESSURE AND LEAKAGE TESTING

The Developer/Contractor shall test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects in the following manner:

- A. Do not enclose, cover, or put into service before inspection and approval.
- B. Test completed piping systems according to requirements of authorities having jurisdiction.
- C. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
- D. Submit separate report for each test.



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- E. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
 - 1. Allowable leakage is maximum of 50 gal./inch of nominal pipe size per mile of pipe, during 24-hour period.
 - 2. Close openings in system and fill with water.
 - 3. Purge air and refill with water.
 - 4. Disconnect water supply.
 - 5. Test and inspect joints for leaks.
 - 6. Option: Test ductile-iron piping according to AWWA C600, "Hydrostatic Testing" Section. Use test pressure of at least 10 psig (69 kPa).
- F. Force mains shall be hydrostatically tested at one hundred (100) psi for a period of two (2) hours. The maximum allowable leakage is no more than 0.59 gallons per hour per one thousand (1,000) feet of pipe for four (4) inch pipe and 0.89 gallons per hour for a six (6) inch pipe. Any pipe that has leakage greater than the allowed rates shall be repaired by the Developer/Contractor.
- G. Manholes: Perform hydraulic test according to ASTM C 969. Leaks and loss in test pressure constitute defects that must be repaired and retested.
- H. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

2.3.7 TEST FOR DAMAGED OR DEFECTIVE PIPE

After the pipe has been installed and tested, the Contractor must arrange for the pipe to be inspected with a video camera system of a type and size approved by the Utility. One approved contractor is College Utilities Corporation. All video work shall be done in the presence of the consulting engineer and shall constitute tests for alignment, grade, damage, defective pipe, or other type of faulty installation. If this inspection indicates any faulty installation of pipe, the Developer/Contractor shall repair or replace the pipe as directed by the Utility.



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SECTION 3 - WATER DISTRIBUTION SYSTEM DESIGN GUIDELINES

3.1 - GENERAL

The design of a water distribution system addition within the City of North Pole service areas that connects to the Utility system shall be submitted to and approved in writing by the ADEC and the Utility prior to construction. The design shall be in accordance with State regulations, the Water Master Plan or other Utility planning schemes, and shall be consistent with the construction guidelines of the Utility water distribution system. Final design will be submitted to and approved by the Alaska Department of Environmental Conservation and thus must be certified by a professional engineer registered in the State of Alaska (18 AAC 80). It is suggested that a preliminary concept, layout of the water mains, soils investigation report, etc., be submitted for review by the Utility prior to the preparation of the required final design report, plans and specifications. The purpose of the preliminary submittal is to present the concept, factual data and controlling assumptions and considerations used for the functional planning of the proposed site. A final design report, plans, and specifications shall be submitted to, and approved by the ADEC and the Utility. The design report shall primarily focus on flow velocities and fire flows in the proposed water system and any changes in the existing water system caused by the addition.

The proposed final plat or metes and bounds description of the improvement area or other similar data must be submitted with each water system design. Permanent easements with ten (10) feet minimum on either side of the pipe are required for water distribution systems constructed on private property for maintenance access. A copy of all recorded easements within the improvement area must be submitted with the design plans, if not shown on an approved plat. All pertinent non-objections and/or permits from affected utilities and/or government agencies shall be secured prior to final approval.

Any addition to the Utility water distribution system shall be consistent with Utility standards of design, quality of materials and construction. Special emphasis shall be given to reduce future operation and maintenance costs due to conditions peculiar to North Pole.

This document compliments the Design and Construction Guidelines for Wastewater Collection Systems and both should be used together to diminish conflicts.

This document is designed to aid in meeting the requirements of the Utility. It must be emphasized that no single document can possibly present guidelines for all situations that will be encountered. The Utility shall have the ultimate authority to interpret this document and may direct modifications for specific situations.



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3.2 - DESIGN CRITERIA

3.2.1 GENERAL

For the purpose of reviewing plans for a water distribution system, the design criteria contained in the Alaska Administrative Code (18 AAC 80), the latest adopted edition of the Uniform Fire Code and the Standards of ANSI, AWWA, ASTM, and ASME shall be utilized and supplemented by manufacturer's recommendations and provisions included herein.

It is important that the quality of water within the system be maintained. In addition, the design must consider cold temperatures, permafrost, and other factors which contribute to freeze up problems. In addition, other maintenance and operations concerns and anticipated conflicts with other utilities must be satisfied and resolved.

3.2.2 PARAMETERS

Design shall facilitate required testing and must include cleanliness, quality, disinfection, and pressure.

Service connection design and construction requirements shall follow the Utility's Hookup Standards book available at City Hall.

The Utility water distribution system is designed to minimize the risk of freezing. Water lines are insulated with urethane foam and are circulated by pump stations to prevent freezing. The distribution network is laid out in hydraulically balanced loops, and there are no dead ends in the system. Research has shown that a velocity of approximately 1.75 feet per second is required in the mains to circulate the customer's service line and keep them from freezing. New additions to the system must be designed for this minimum flow velocity and must not interfere with the balance of the existing distribution system. Additionally, new additions must supply sufficient flow to provide for both consumption and fire protection.

Basic design capacity shall provide for peak demand or fire protection requirement, whichever is larger. Design water consumption for the Utility shall be ninety (90) gallons per capita per day. Peak hourly demand for residential areas shall generally be at least four and one-half ($4\frac{1}{2}$) times the yearly average daily water demand. Capacity for commercial and industrial use will usually be based on the fire protection requirement. Actual fire protection requirements are based on ISO requirements and will be determined in conjunction with ISO to optimize the insurance rating for the entire service territory.

Normal operating pressure of the North Pole water system is 100 psi and the nominal maximum system design pressure is 200 psi.



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The connection of a fire booster pump to the utility water system is prohibited without advance written approval from the Utility.

These guidelines shall also apply to water transmission lines except that system velocities may be reduced and service connections may be restricted.

3.2.3 REPORTS, PLANS, AND SPECIFICATIONS

The design report will include assumptions used in the design including expected occupancy of lots, expected population density, expected water consumption per capita, expected fire protection requirements, constants used for flow calculations, pump sizing calculations and initial set points for pump station controls. The design report, plans and specifications must be reviewed and approved by the Alaska Department of Environmental Conservation, the Utility and the appropriate Fire Department. "As-built" plans shall be submitted on reproducible Mylar and AutoCAD.

The City will perform the flow analysis and shall be reimbursed by the Developer/Contractor for this work. This analysis will include size of pipe, flow direction, calculated velocities, pressure losses, fire flow availability, peak demand requirements and temperature drop in the new water distribution system as well as detailing exactly how the existing system will be affected by the addition/changes.

Final plans will include both plan and profile details showing the relationship between the proposed water improvement and all other existing or proposed utilities and improvements. The plans shall show exact location of proposed improvements from designated survey control points and shall specify required elevations including pipe depth and fire hydrant top flange height. "As-built" plans must be certified by a Professional Engineer registered in the State of Alaska. All valves, hydrants, and service connections shall be located in their "as-built" positions. A minimum of three (3) swing ties shall be recorded to each valve and service connection. "As-built" plans must be submitted on reproducible Mylar and AutoCAD.

Elevation datum shall be NAVD '88 and noted on the design plans. A note shall be included on the plans specifying that construction will be in accordance with these construction guidelines. Tolerances for survey control and location of improvements are provided in Section 5.23, Construction Surveying.

Operation and maintenance (O&M) information shall detail the specific operational parameters and new components added to the existing water system. O&M manuals will include computer flow analysis, schematized flow pattern and a detailed narrative of the new system's operation, changes in the old system, and the method of operations set-up. Performance curves, equipment, "as-built" data sheets, test data, flow diagrams, "as-built" shop drawings, and narrative description on O&M



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procedures shall be included. Spare parts information shall include parts lists accompanied with drawings, which identify parts by number.

3.2.4 MATERIALS AND OTHER SPECIFICS

All pipe and material shall meet the requirements of the National Sanitation Foundation (NSF) 61. Water mains shall be constructed of ductile iron pipe (DIP) of minimum Class shown on Standard Drawings. Water mains shall be fully restrained. Mains shall not be less than six (6) inches in diameter, except for service connections.

All water mains (including fittings) shall be completely insulated with foam to a thickness shown on Standard Drawings.

All water piping requires extra insulation where it is installed within seven (7) feet of existing storm drains, telephone duct banks, etc. The thickness of the insulation shall be relative to the separation. Typically, one (1) additional inch of insulation shall be provided for each foot of separation less than seven (7) feet. In cases where the storm drain or other conduit is installed after the water main, the insulation can be applied to the storm drain or conduit pipe rather than exposing and adding insulation to the water pipe. The thickness and extents of the insulation shall be the same on storm drain or conduit pipe as stated for the water main.

Water mains installed in casings shall have insulation spacers, twenty-four (24) inches long, with an outer diameter of two (2) inches less than the casing inner diameter, with tapered ends, and spaced at ten (10) feet on center. All the insulation, on the pipe to be installed through casings, shall be coated with waterproof surface coating.

Main line valving shall be provided at a maximum distance of every one thousand (1,000) feet and shall be adjacent to fire hydrants, where possible, to facilitate access to the valve. Resilient seat gate valves shall be used. Valves shall not be used for flow control.

Water mains beneath State of Alaska highways, other selected streets or the Alaska Railroad, shall be placed in casing as necessary according to their specific utility permit requirement. Pipe for river or slough crossing or other adverse conditions require a ball joint connection system with minimum deflection of fifteen (15) degrees with full restraints.

Fire hydrants are typically required at every intersection and in typical residential areas at spacings of less than five hundred (500) feet. ISO requirements for hydrants per area with district definition and the hose laying method shall be utilized to obtain zero deficiencies for ISO Class 3 for hydrant layout and spacing.



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The water main typically will be located at an offset eight (8) feet from the center line of the road on the easterly or southerly side or on the opposite side of the sewer main. Valve boxes shall not be located in ditches or low spots in streets, thus minimizing drainage into them and avoiding disruption or maintenance problems. Fire hydrants typically will be located seven and one-half (7.5) feet behind the top back of the curb.

Soil borings shall be required as necessary to specify the bedding material and determine the water table. Pipe bedding shall be detailed on the design plans. Backfill shall be a minimum of five (5) feet over the pipes. Dewatering shall be required as necessary to allow installation without necessary interference from groundwater.

Pump stations, if required, shall be duplex electric motor driven pump assemblies. Pump stations shall be equipped with temperature and pressure measuring devices and flow meters. Flow control, bypass, pressure control, make-up heat and pump control devices will be provided as necessary. Heating and plumbing system must provide enough redundancy so that one component can be out of commission for maintenance while the other components provide full load. For example, if two boilers are provided, each must be capable of handling the full heat capacity. Upon completion, Developer/Contractor shall provide operator training, operation and maintenance manuals, and complete documentation of all products installed and spare parts provided.

3.2.5 SEPARATION DISTANCE

Horizontal and vertical separation shall be in accordance with the latest ADEC Regulations 18 AAC 80.020. Water and sewer mains (including manholes) shall be separated by a minimum of ten (10) feet horizontally, and by eighteen (18) inches vertically at crossings, measured edge to edge. A water line shall not be installed directly above or below a septic tank or leach field (at any vertical distance) or within ten (10) feet horizontally. Where it is not practical to maintain this separation, the ADEC may allow deviation on a case by case basis, if a waiver request is submitted to ADEC and is properly supported by data from the design engineer. Waiver requests must identify the reason for lesser separation and show:

- A. The lines are located in separate trenches and the top of the sewer main, where crossing, is at the maximum depth possible below the bottom of the water main until existing appurtenances elevations or depths of cover requirements prohibit such installation, and;
- B. The sewer line is designed and constructed in a manner equivalent to the requirements for a potable water pipe and is pressure tested to ensure water tightness or:



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- C. The sewer line is enclosed in a water-tight carrier pipe of similar strength, i.e. casing.

At locations where water and sewer mains must **cross**, a waiver is **not** required if:

- Water line is above the sewer line;
- Sewer line is bedded per Type 4 or 5 (AWWA Standard C600-05);
- Water line joints are at least nine (9) feet from the sewer line **and**;
- Water line is at least eighteen (18) inches vertically from the sewer line.

If the above conditions can not be met for sewer and water crossings; a waiver request (similar to horizontal separation) must be submitted to ADEC.

Any design that fails to meet the ten (10) foot horizontal or eighteen (18) inch vertical separation distance shall require a waiver from ADEC.



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SECTION 4 - WATER DISTRIBUTION SYSTEM CONSTRUCTION

4.1 - GENERAL

4.1.1 WORK INCLUDED

This section covers the installation of all water pipe, fittings, and appurtenances for the water distribution system.

Materials, operations or methods herein or indicated on the drawings as being required for the project, shall be provided by the Developer/Contractor. The Developer/ Contractor shall provide all the necessary labor, equipment, material, and the incidentals necessary to complete the system as shown on the design plans.

4.1.2 CODES AND REGULATIONS

- A. In addition to complying with all pertinent codes and regulations, the Developer/Contractor must comply with all pertinent requirements contained in the most recent Uniform Plumbing Code as adopted by the Utility, the most recent standards of the AWWA as specified, ADEC Regulations, and the most recent standards of the Utility.
- B. Where provisions of pertinent codes and standards conflict with this document, the more stringent provision shall apply.

4.1.3 CONSULTING ENGINEER

The consulting engineer shall be a registered engineer in the State of Alaska retained by the Developer/Contractor to design and coordinate the installation of the water distribution system.

- A. The consulting engineer shall furnish drawings and specifications which, as far as practical, completely represent the requirements of the work to be performed under the contract.
- B. The consulting engineer shall be responsible for the design of any construction changes required during the course of construction.
- C. The consulting engineer shall submit signed drawings and specifications to ADEC along with the associated application for construction approval. After construction is complete they must submit the application for interim and final approval to operate.



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- D. The consulting engineer shall be responsible for submission of stamped as-built drawings to the Utility upon completion of the project. As-built drawings shall show all changes made during construction as well as a minimum of three (3) swing ties to all valves and service connections.
- E. The consulting engineer will provide the Utility with advance notice of the work schedule and report to the Utility as to the progress of the work and manner in which it is being performed.
- F. The consulting engineer is not authorized to revoke, alter, enlarge, relax, or release any requirements of the City and ADEC approved plans and specifications without concurrence, or to approve or accept any portion of the work or to issue instructions contrary to this document.

4.1.4 INSPECTION OF WORK BY THE UTILITY

The Utility shall perform inspections of the work and material to ensure compliance with the plans, specifications, and these Standards of Construction. Such inspections may extend to any part of the work including the preparation, fabrication, or manufacture of the materials used.

- A. The Utility's authorized representative will decide: all questions which may arise as to the quality and acceptability of materials furnished and work performed; all questions as to the degree of completion of the work; all questions which may arise as to interpretation of the design plans and specifications, and all questions as to the acceptable fulfillment of the contract on the part of the Developer/Contractor.
- B. The Utility's authorized representative shall have the authority to reject any work or materials that do not meet Utility standards.
- C. The presence or absence of the Utility's authorized representative does not relieve the Developer/Contractor from his obligation to fully perform all requirements of this document, nor does it give rise to any right of action or suit by the Developer/Contractor, or third persons against the Utility.

4.2 - MATERIALS

4.2.1 GENERAL

All materials shall be new, of current manufacture and conform to the specifications contained herein. Submit manufacturer's literature and affidavit of compliance with specified standards of the Utility for review and approval prior to procuring materials. All material shall meet the requirements of the National Sanitation Foundation (NSF) 61.



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4.2.2 PIPING

- A. Water mains shall be ductile iron pipe, thickness class as shown on Standard Drawings, push on joint, cement lined. Pipe shall conform to AWWA C151. Cement lining shall conform to AWWA C104.

4.2.3 PIPE JOINTS

- A. Joints for ductile iron pipe and fittings shall be furnished with Field Lok® gasketed push-on joint (US Pipe Tyton or equal) or mechanical joint, both conforming to AWWA C111.
- B. All fittings shall have restrained joints. Restrained joint pipe and fittings pressure rating shall 350 psi.

4.2.4 PIPE FITTINGS

- A. Fittings for ductile iron pipe shall be mechanical joint and shall conform to AWWA C110 for 12-inch mains, or C153 for others. The fittings shall have a minimum pressure rating of 350 psi. Only ductile iron fittings are acceptable. Interior of fittings shall be epoxy lined per AWWA C116.

4.2.5 GATE VALVES

Gate valves shall conform to AWWA C-509 Resilient Seat Gate Valves. They shall be epoxy coated and lined in accordance with AWWA C 550. Valves shall be non-rising stem with o-ring seals. Valves shall have high strength cast iron bodies and be designed to withstand working pressures of 200 psi or more. Valves shall open by turning the operating stem in a counter-clockwise direction. Valves shall come equipped with name or symbol, the size of the valve, the year of manufacture and the working water pressure cast on the body of the valve. Valves shall be furnished with ends as specified on the Standard Drawings. Gate valves shall be equipped with a two (2) inch square operating nut.

4.2.6 FIRE HYDRANT ASSEMBLY

- A. Fire hydrants shall be Mueller Super Centurion 250. Each hydrant shall be equipped with two (2) two and a half (2-1/2) inch nozzles and one (1) four and a half (4-1/2) inch pumper nozzle. Nozzle threads shall be National Standard Fire Hose thread.
- B. Fire hydrant assemblies shall include fire hydrant, six (6) inch flange by mechanical joint gate valve, US Pipe "swivel" hydrant tee, and valve box.



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- C. Fire hydrants shall be painted with two (2) coats of alkyd-gloss enamel paint after installation. Color shall be white.
- D. Gate valves shall conform with paragraph 4.2.5 of this section.
- E. Tee fittings shall conform to paragraph 4.2.4 of this section and shall be US Pipe Trim-Tyte ductile iron mechanical joint valve and hydrant tee, or equal.
- F. Valve box shall conform to paragraph 4.2.7 of this section.
- G. Insulation shall conform to paragraph 4.2.8 of this section.
- H. Bollards shall be schedule 40 steel, filled with concrete. They shall be installed at designated hydrants vulnerable to traffic damage. Bollards shall be installed per Standard Drawing W1. Bollards are to be painted white with two (2) coats of alkyd-gloss enamel paint with 3-inch red stripes at 45 degree angle spaced at 6 inches on center.

4.2.7 VALVE BOXES

All buried gate valves shall be furnished with cast iron valve boxes. Valve boxes shall be two (2) piece extension type with a cast iron cover. Valve boxes shall have walls not less than three sixteenth (3/16) inch thick and an internal diameter of not less than five (5) inches. Valve box covers shall have the word "water" cast into them.

Valve boxes shall be slip type with lower flanged top section and a deep well bottom section. Cast iron valve boxes shall be East Jordan Iron Works IFCO 2060 top and IFCO 2056 bottom. Valve box top sections shall be installed five (5) inches above the last extension piece to allow room for a plastic dust or grit cup installed by the Utility. Screw type valve boxes are specifically prohibited.

Valve boxes shall be installed in a manner that will minimize the amount of run off water that will enter the valve box, and provisions shall be made so that water will drain out of the valve box. Valve boxes outside of roadway or sidewalks shall stick up approximately two to three (2-3) inches above ground level for ease in locating.



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4.2.8 INSULATION

Urethane spray foam insulation shall be rigid closed cell, two component urethane foam with the following properties:

K Factor:	0.15 (Btu - in/FT ² - Hr - °F) per ASTM C 518
Compressive Strength:	45 psi per ASTM D 1621
Nominal Density:	3.0 pcf per ASTM D 1622
Tensile Strength:	70 psi per ASTM D 1623
Shear Strength:	45 psi per ASTM C 273
Water Absorption:	0.017 gm/cc per ASTM D 2842
Water Vapor Permeability:	1.9 perm per ASTM C 355
Closed Cell Content (min)	90% per ASTM D 1940

Insulation material shall be Resin Technology 2035. Applicator shall demonstrate prior experience of at least two (2) years, and the Utility shall be the sole judge of the qualifications of application method and applicator.

4.2.9 POLYETHYLENE ENCASEMENT

Polyethylene encasement shall conform to ANSI/AWWA C105/A21.5 "Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids." Provide 8-mil polyethylene film tube or sheet.

4.2.10 WATERPROOF SURFACE COATING

Coating shall be a two-component, one hundred (100) percent solids, sprayable polyurea coating with the following properties:

Hardness:	90±5 (ASTM D-2240 Shore A)
Hardness:	50±5 (ASTM D-2240 Shore D)
Freeze/Thaw:	No disbonding or distortion (ASTM D-2126, 5 cycles)
Tensile Strength:	2500 psi (ASTM D-412, ASTM D-638)
Elongation:	265% (ASTM D-412, ASTM D-638)
Permeability (MVT@30 mils)	0.024 perm (ASTM E-96, Procedure B)
Weathering	3,000 hrs without threatening signs of deterioration (ASTM G-26, ASTM G-53)
Tear Resistance	430±50 pli (ASTM D-624)

Coating shall be polyurea elastomer, "Permax 700-HP" by Resin Technologies; "Polyshield SS-100" by Specialty Products, Inc.; or approved equivalent. Applicator shall demonstrate prior experience of at least two (2) years, and the Utility shall be the sole judge of the qualifications of system, application method, and applicator.



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4.2.11 COMMERCIAL FACILITY CIRCULATION PUMPS

In the event that a customer owned circulation pump is to be the sole source of circulation for a Utility water main; the specifications, pump curves, etc., for this pump must be approved by the Utility prior to purchase of said pump. A typical installation of this type would be a commercial facility that is supplied with an eight (8) inch main and a four (4) inch return. At some point near the building, these mains become the hookup and property of the commercial facility which also owns the circulation pump. As the Utility mains are dead ended and can only be circulated by the customer's pump, it is necessary that the Utility approve the design and capacity of the pump.

The pump shall be sized to provide a minimum of one-tenth (1/10) foot per second in the largest Utility main circulated and change the water in the main a minimum of once every six (6) hours, (i.e. 4 times per day). In the example given above this would mean one-tenth (1/10) foot per second in the eight (8) inch main which could be up to one thousand five hundred sixty (1,560) feet long, to change each six (6) hours. The pump should pump fifteen (15) gallons per minute. The pump's operating point shall be determined by calculation of head loss of the service loop.

4.2.12 PUMP HOUSE

Building shall be concrete masonry with a metal roof sized to provide adequate space for all mechanical and electrical equipment in accordance with building codes and adequate space for maintenance applications as determined by the Utility.

4.2.12.1 Domestic Water System

A. Pumps:

1. Manufacturer: Paco or equal
2. Furnish and install a double suction horizontal split case centrifugal pump suitable for potable water service.
3. Casing: Casings shall be designed for 150 psi working pressure and shall be hydrostatically tested at 150 percent of the maximum working pressure under which the pump could operate at design speed. Pumps shall have the casing divided on the horizontal centerline. The casing halves shall be accurately machined, bolted and doweled together with a non-asbestos type gasket. Removal of the upper casing half and bearing housings shall permit removal of the complete rotating assembly without disturbing piping connections. Pumps shall be provided with removable bearing housings which will permit inspection and/or replacement of the mechanical seals, shaft sleeves, and bearings without removing the rotating assembly or top casing half. Pumps with 4 inch or larger discharge flanges shall be of the double volute design. Suction and discharge flanges shall be drilled to



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ANSI Standards and be machined flat face. Pumps shall be fitted with lead-free bronze renewable case wear rings indexed with a dowel pin for fixed positioning.

4. Impeller: The lead-free bronze impeller shall be an enclosed Francis vane type, double suction design, hydraulically and dynamically balanced. The impeller is to be securely mounted on the pump shaft, and attached with a steel key. The impeller shall be locked in position by threaded shaft sleeves. The impeller shall be trimmed to meet the specific hydraulic requirements. Impeller trim must be equal to or less than 90 percent of maximum diameter which will fit into the pump casing.
5. Shaft: The pump shaft shall be made of high tensile 300 series stainless steel, precision ground to provide a true running rotating element.
6. Bearings: The pump shaft shall be adequately supported by the pump bearings to limit the shaft deflection to 0.002 inches. Bearings shall be ball type, grease lubricated and locked to the shaft with positive locks of ample size to withstand any axial thrust loads. Each bearing housing shall be bolted to the upper and lower casing halves for a full 360-degree support registered fit to insure positive alignment. Bearing shall provide a minimum life of 10 years when calculated at 50 percent of Best-Efficiency-Point for the scheduled pump.
7. Shaft Seals: The pump manufacturer shall recommend the proper mechanical seal based on the pressure, temperature and liquid outlined on the equipment schedule. Mechanical seals, at a minimum, shall have ceramic stationary seats, carbon rotating seats, and Buna elastomers.
8. Shaft Sleeves: Lead-free bronze shaft sleeves shall be firmly attached to the pump shaft through threading and locking means. Shaft sleeve design shall prevent corrosion and wear to the shaft.
9. Base, Coupling, and Guard: The pumps shall be mounted on a steel base with drip pan and directly connected through a heavy-duty flexible coupling to a horizontal motor as outlined in these specifications. The pump manufacturer shall provide an OSHA coupling guard, which shall be mounted between the pump and motor and attached firmly to the base.
10. Motors: The motor shall be sized to operate continuously without exceeding the horsepower rating regardless of the flow and head throughout the operating range of the "System Curve." Motors shall meet EPAC standards for premium high efficiency as a minimum. Close coupled, base-mounted, end suction, centrifugal pump with all bronze construction suitable for domestic potable water use.



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B. Control of Water Distribution Circulation Pumps:

1. The freshener pump shall be manually controlled (on/off).
2. One of the pair of large circulation pumps shall run continuously. Each pump shall be monitored for proof of flow. If proof of flow is not established, the lead pump shall be shut off, and the lag (stand-by) pump shall be activated.
3. Local control panel shall be provided that includes the water main temperature (as it leaves the building), lead/lag green pilot light for pump status. Panel shall have lead/lag pump selector switches and an alarm for lead pump failure.

4.2.12.2 Heating System

Heating System shall use propylene glycol and double walled heat exchangers with atmospheric vents. Provide a minimum of two (2) boilers, hydronic circulation pumps, and heat exchangers sized so that one component may be out of operation while the others provide the full heating or circulation capacity.

A. Control of Heating System:

1. The boilers shall operate continuously as required to maintain a 180 degree F. glycol heating water supply temperature. The boilers shall activate whenever the outside air temperature is below a set temperature (adjustable). Whenever the outside air temperature is 5 degrees above the set temperature the boilers shall be off.
2. The main hydronic circulation pumps shall activate whenever the outside air temperature is below a set temperature (adjustable). The hydronic circulation pumps shall be off whenever the outside air temperature is 5 degrees above the set temperature. One pump shall be set to run continuously when activated and the other pump(s) shall serve as the auxiliary pump in case the main pump fails.
3. The glycol make-up system shall provide 50/50 glycol solution to the hydronic system as required by the system pressure sensor and make-up control valve. On a sensed pressure the glycol make-up pump shall activate and the system control valve shall open allowing the pump to fill the system as required. When the system pressure reaches the set pressure (adjustable), the glycol make-up pump shall deactivate and the system make-up control valve shall close.
4. The heat exchangers shall modulate as required to maintain a domestic water supply temperature (entire circulated flow) of 42 degrees F. (adjustable). Each heat exchanger shall be manually valved as main and stand-by units.
5. Provide outside air, glycol heating supply temperature indicators on the face of a hydronic system local control panel. Panel shall have green operation indicator pilot lights for the main and stand-by hydronic circulation pumps. Provide alarms for main hydronic pump failure.



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4.2.12.3 Sensors and Alarms:

- A. General: System shall consist of a central panel or module with the necessary electronics to monitor local and remote conditions via sensors, and then to dial out to pre-programmed phone numbers to provide notification of abnormal conditions. Basis of design: Phonetics Sensaphone model 1104.
- B. Central Panel or Module: Factory fabricated console with input keypad, battery backup, RJ-11 telephone jack and cord, 120V plug power connection, tested for compliance with UL 1459. Shall have 4 user-selectable inputs, A/C power loss sensing, battery condition monitor, clock, and shall dial programmed numbers in sequence (on alarm condition) until acknowledged. System shall intelligently detect ringing or busy signal and shall be able to call pagers or beepers. Unit shall have programmable security code access.
- C. Monitoring: Shall monitor local space temperature with adjustable alarm at 50 degrees F, distributed water temperature with adjustable alarm set at 35 degrees F, and pump flow with alarm condition initiated when no flow occurs (adjustable setpoint). All sensors shall be compatible with central module.
 - 1. Indoor Temperature Sensor: 2.8 k ohm thermistor with 20 to 150 degrees F range.
 - 2. Water Temperature Sensor: Immersion thermistor sensor with range 10 to 230 degrees F, with stainless steel well. Basis of design: Kele model ST-W.
 - 3. Flow Sensor: NEMA 3R enclosure, adjustable differential pressure switch, materials compatible with potable water systems. Basis of design: Kele model F61KD.

4.3 - EXECUTION

4.3.1 HANDLING

- A. Use all means necessary to protect materials before, during, and after installation.
- B. In the event of damage, immediately make all repairs and replacements necessary to keep materials in a "like new" condition. These repairs or replacements must be approved by the Utility and made at no cost to the Utility.
- C. All material shall be handled and installed in accordance with manufacturer's recommended handling and installation instructions.



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- D. If, in the judgment of the Utility, materials and/or installed work are not being protected or handled as noted in these specifications, or in accordance with the manufacturer's handling/installation recommendations, they shall be rejected and removed from the job site and shall not be used on any other work, either present or future for the Utility.

4.3.2 LAYING PIPE

- A. The pipe and fittings shall be inspected for defects before installation.
- B. All pipe shall be laid and maintained to the required lines and grades with fittings and appurtenances at the required locations as shown on the design plans.
- C. Water mains shall be laid with a minimum of five (5) feet of backfill over the top of pipe.
- D. Pipe interiors shall be thoroughly cleaned of all foreign matter before being lowered into the trench. At all times when work is not in progress, all open ends of pipe and fittings shall be securely closed so that no water, earth, rodents or other substances may enter. Each length of pipe shall be examined during assembly in the trench for debris. Any debris found will be removed immediately.
- E. Trenches shall be kept sufficiently dry so that no pipe will be laid in water. Water shall be kept out of the portions of the trench in which un-insulated joints are located while the joints are insulated and otherwise readied for backfill.
- F. Ductile Iron piping shall be laid inside polyethylene encasement tubing. The seams between tubing sleeves shall be taped.
- G. Cutting of pipe for closure or other reasons shall be done by methods which will not damage the pipe and which will insure tight joints.
- H. Pipe shall be inspected for defects before lowering into the trench. All defective, damaged or unsound pipes shall be replaced and removed from the site. Any section of pipe already laid but found to be damaged or defective shall be replaced with new pipe, at no cost to the Utility.
- I. Pipe bedding shall be as noted in Section 7 Trenching, Backfill, and Compaction. Bedding shall be placed to ensure that the pipe is given a uniform bearing for its full length.



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- J. Deflections from a straight line or grade shall not exceed the limits recommended by the manufacturer, minus 2-degrees. If the specified or desired alignment requires deflections in excess of such limits, the Developer/Contractor shall either provide special bends or a sufficient number of shorter lengths of pipe to provide angular deflection within such limits.
- K. Standard lengths of pipe shall be used except where short lengths are required for fittings, or wherever pipe passes through a rigid structure.
- L. Pipe ends for future connections shall be valved, plugged or capped and shall be provided with restraints.
- M. Lubrication for push-on of ductile iron pipe shall be water soluble as recommended by the manufacturer.
- N. Any pipe or structure having its alignment or grade changed by floating in a flooded trench shall be re-laid.
- O. To counteract the unbalanced thrust at horizontal and vertical angle points, bends and other special fittings, the Developer/Contractor shall provide Mechanical Joint fittings with Megalugs® and all push-on joints shall have Field Lok® Gaskets.
- P. At tie-in locations to piping that was installed with unrestrained joints, thrust blocks are required. Thrust blocks shall be constructed as shown on Standard Drawings.

4.3.3 FITTING AND VALVE INSTALLATION

- A. Fittings and valves shall be installed at the locations shown on the design plans.
- B. Valve installation shall be in accordance with Standard Drawings.

4.3.4 FIRE HYDRANT INSTALLATION

- A. Fire hydrants shall be installed at the locations shown on the design plans.
- B. Fire hydrant installation shall be in accordance with the Standard Drawings. Fire hydrants shall be inspected, installed, and tested according to the most recent publication of AWWA M-17.

4.3.5 INSULATION

- A. The Developer/Contractor shall furnish labor, materials, equipment and services necessary for, and incidental to, field application of spray urethane foam.



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- B. Water mains and fittings shall have a minimum thickness of urethane foam insulation shown on Standard Drawings.
- C. Insulation shall be applied to water mains above ground in a local yard. Pipe may not be insulated in the ditch except under special circumstances, which must be approved by the Utility.
- D. Hydrants shall be insulated as shown on the standard detail drawings. The drain holes must not be covered.
- E. Buried valves shall be insulated with urethane foam, thickness shown on Standard Drawings, up to the packing gland.
- F. Pre-insulated pipe that has damaged insulation due to transportation shall be reinsulated to the satisfaction of the Utility. Backfill shall not take place until all insulation has been inspected.
- G. Backfill shall be placed so that pipe insulation will not be damaged.

4.3.6 CONNECTIONS TO EXISTING SYSTEM

- A. Connections to existing water mains shall be made by Utility personnel only, at the expense of the Developer/Contractor.
- B. Materials for these connections shall be furnished by the Developer/Contractor.
- C. The Developer/Contractor shall give the Utility at least forty-eight (48) hours advance notice when requesting a connection.
- D. The Utility reserves the right to schedule shutdowns to minimize possible conflicts and inconvenience to its existing customers.

4.3.7 PRESSURE TESTING

The Developer/Contractor shall perform a pressure test on the installed pipeline; in accordance with the latest revision of AWWA 600. All mechanical joints shall be left exposed until completion of the pressure test. All portions of the pipeline shall be adequately restrained or backfilled to counteract thrust forces introduced by the pressure test. All pitorifice assemblies, service tees and hydrants shall be installed prior to the pressure test. All air shall be properly vented from the pipe during charging. Water for pressure testing and flushing will be provided by the Utility. Once the line has been filled and all air removed, the utility main connection shall be isolated from the new section of piping under test. The Contractor shall provide potable make-up water and test pump to pressurize the line to **150 psig**. The make-up water and pump shall be disconnected during the test period. Only approved



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pressure gauges with 5 psi increments shall be used, provided by the Contractor. While under this pressure, all joints shall be visually examined. Any evidence of leakage shall be repaired and the line retested until meeting these requirements.

After there is no evidence of leakage, the pipe section shall be held under pressure for **2 hours**, with an initial pressure of 150 psig. At the end of the 2 hours, the make-up water and pump shall be reconnected and the line re-pressurized to 150 psig. The make-up water shall then be bled off into a graduated container until the pressure equals the pressure indicated at the end of the test.

The allowable leakage shall be determined by the following formula:

$$(1) \quad L = \frac{S D \sqrt{P}}{148,000}$$

L = allowable leakage (make-up water), in gallons per hour

S = length of pipeline tested (feet)

D = nominal diameter of the pipe (inch)

P = average test pressure during the test (psi)

No pipe section will be accepted if the leakage is greater than allowable. Service reconnections and final connections to the existing main shall be visually inspected at main line pressure.

4.3.8 DISINFECTION AND FLUSHING

- A. Mains shall be disinfected in accordance with the latest revisions of AWWA C651. The Developer/Contractor shall furnish all material, labor, equipment, and services required for disinfection of the pipeline. Mains shall be chlorinated using calcium hypochlorite granules or tablets.

The main shall be filled slowly so as not to wash the chlorine to the end of the test section.

The chlorinated water will have a minimum contact time of 24 hours. A minimum chlorine residual of 25 mg/L is required at the end of the 24 hour period. The maximum value shall not be more than 50 mg/L to minimize damage to copper service lines. Mains shall be thoroughly flushed following disinfection.

- B. If initial chlorine concentrations are not uniform, circulate water until uniform.
- C. All new lines shall be full bore flushed. Flushing through hydrants shall not be permitted.



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- D. Disposal of the flushing water shall be the responsibility of the Developer/Contractor. Removal of this water shall not cause damage to property or inhibit the flow of vehicular traffic in or around the work area.
- E. The disinfection shall be supervised by a State certified laboratory. This laboratory shall certify that the initial, residual, and flushed chlorine concentrations meet the standards. A biological purity test shall be taken and a State certified laboratory shall provide a drinking water analysis report for total coliform bacteria for each sample taken. Absolutely no service connections will be made until these test results have met Utility standards and have been approved by the Utility and ADEC has granted Interim Approval to Operate.



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SECTION 5 - CONSTRUCTION SURVEYING

5.1 - GENERAL

5.1.1 SCOPE OF WORK

The Developer/Contractor shall perform all surveying and staking essential for the completion of the project in conformance with the design plans and specifications and shall perform all necessary calculations required to accomplish this work. Monumentation shall be in accordance with State of Alaska Standard Drawings.

5.1.2 QUALITY ASSURANCE

- A. In addition to complying with all pertinent codes and regulations, all staking, surveying computations and calculations shall be accomplished in accordance with standard surveying practices and instructions issued by the Utility.
- B. Where provisions of pertinent codes and standards conflict with this specification, the more stringent provisions shall control.
- C. The Developer/Contractor shall use competent personnel and suitable equipment for the layout work required and shall furnish all stakes, templates, straight edges and other devices necessary for checking and maintaining point, lines and grades.
- D. Upon the Utility's request, the Developer/Contractor shall provide evidence acceptable to the Utility that the individual who is proposed to perform the construction staking has a minimum of three (3) years experience in similar construction staking work in the State of Alaska, is knowledgeable in the operation of required staking instruments and is capable of reading, understanding and accomplishing the construction survey work described herein.
- E. All surveying work requiring the setting/resetting of monuments, property corners and all permanent survey monuments shall be accomplished under the direct supervision of a Registered Land Surveyor, licensed in the State of Alaska.
- F. The contractor shall maintain a red line "mark-up" set of plans which shall be revised by the contractor as the work progresses to reflect current conditions. The revisions are to be indicated in a neat, well organized manner and are to include all changes to the original plan as well as the elevation and plan location of any utilities, structures etc. encountered or installed. Field notes shall be kept in standard bound notebooks in a clear, orderly, and neat



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manner consistent with standard engineering practices. Field books shall be available for inspection by Utility personnel at any time. Copies of all field notes shall become the property of the Utility prior to final acceptance of the project. A minimum of three (3) swing ties shall be recorded to all valve boxes, manholes, flushwells, and service connections.

5.1.3 DISCREPANCIES

In the event that a discrepancy or error is discovered in the Utility Standards or design plans, immediately notify the Utility in writing. Do not proceed with installation in the areas of discrepancy until all such discrepancies have been fully resolved.

5.2 - CONSTRUCTION REQUIREMENTS

5.2.1 GENERAL

- A. The Developer/Contractor shall be responsible for the supervision of the construction surveying personnel. Any errors resulting from the preparations of said personnel shall be corrected at the expense of the Developer/Contractor, at no cost to the Utility.
- B. All lot corners adjacent to, or within the area of the construction project that are destroyed or disturbed by the Developer/Contractor, shall be replaced at the expense of the Developer/Contractor.
- C. If field measurements or construction work is necessary to determine quantities or verify proper installation, that work shall be performed by the Developer/Contractor's survey crew under the supervision of the Utility.
- D. The Developer/Contractor shall be responsible for recording the locations of all installed pipes and appurtenances to the accuracy stated in subsections 5.1.2(A), 5.2.3(A) and 5.2.3(B).

5.2.2 SURVEY CONTROL

All control, alignment, or grades necessary for construction shall be the responsibility of the Developer/Contractor. All alignment and grades shall be set in such a manner that they can be checked by the Utility.



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5.2.3 FINAL ACCURACY

- A. A water system shall be installed within six (6) inches horizontally and six (6) inches vertically to the exact location taken from the design plans. However, the minimum of five (5) feet of cover shall always apply.
- B. Sanitary wastewater collection systems shall be installed within six (6) inches horizontally and one-hundredths (1/100) of a foot vertically of the exact location taken from the design plans. In addition, any section of pipe shall not vary by more than ten (10) percent of the gradient shown on the design plans.



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SECTION 6 - TRAFFIC CONTROL

6.1 - GENERAL

The Developer/Contractor shall perform actions necessary to protect and maintain traffic during the life of the contract, including the furnishing of such personnel, equipment and devices as may be required to insure the safety of the traveling public. The street excavation permit will include signing requirements, which shall be followed by the Developer/Contractor.

6.1.1 PUBLIC NOTIFICATION

In the event that the planned construction will effect the public, the Developer/Contractor shall post a notice to the public in a local daily newspaper advising the public of the project boundaries including a scale map showing the project area and suggested detour routes, the project time limits, the general contractor's name, and the need to be alert for construction signs and traffic control. The notice, dimensioned 3- by 5-inch minimum, shall appear once fourteen (14) days prior to the start of work and continuously for seven (7) days beginning five (5) days before the start of work.

6.1.2 TRAFFIC CONTROL SIGNAGE

All traffic control devices used by the Developer/Contractor shall be placed and maintained in accordance with the requirements as specified in the Manual on Uniform Traffic Control Devices with Alaska Supplement. No construction operation will be allowed to commence until the Developer/Contractor has obtained the proper signs and placed them as required by MUTCD. Hastily made hand painted signs and barricades will not be permitted.

6.1.3 ACCESS

The Developer/Contractor will be required to: maintain pedestrian access to all residences and businesses in the construction zone; maintain vehicle access for emergency vehicles, fire trucks, ambulances and police vehicles; provide barricades and flagging personnel as necessary while working all areas and in particular busy intersections on the project. Ditch openings which isolate businesses and other areas as specified by the engineer shall be provided with an approved bridge system capable of withstanding traffic loads to those areas. No road or business driveway may be closed without the approval of the engineer unless the Developer/Contractor has received written authorization from the owner affected.



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6.1.4 OPEN WORK

At no time will the Developer/Contractor have more than one thousand (1,000) feet of trench open, nor more than two (2) existing intersections closed to vehicular traffic. Pedestrian access crossings suitably equipped with handrails shall be provided. The cost of such crossings, if required, shall be the responsibility of the Developer/Contractor.

6.1.5 BARRICADE WARNING LIGHTS

Barricade warning lights shall be provided and maintained at all barricades and at all other points where directed by the engineer and shall be kept continuously functioning from one (1) hour before sunset until one (1) hour after sunrise.

6.1.6 AGENCY NOTIFICATION

The Developer/Contractor is required to notify the following agencies at least twenty-four (24) hours prior to starting any work which might inconvenience or endanger vehicular traffic. Information on project area, duration and detour routes should be provided.

City of North Pole Fire Department	488-2232
City of North Pole Police Department	488-6902
City of North Pole Public Works	488-2281
Alaska State Troopers	451-5100
FNSB - Transit	459-1002
FNSB - School Bus	452-2000 x351 or 352
(If during school year)	

6.1.7 PERMITS

The Owner/Developer or his Developer/Contractor shall be responsible for obtaining all necessary federal, state, borough or city permits. The permit(s) shall describe all work to take place on Federal, State, Borough, or City owned lands, right-of-way(s), or accesses to include tie-in(s) to existing utilities.



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SECTION 7 - TRENCHING, BACKFILLING AND COMPACTION

7.1 - GENERAL

7.1.1 WORK INCLUDED

The work covered by this section includes providing all labor, equipment, supplies, and materials required for excavation, backfill, and compaction for pipelines and related utility structures.

7.1.2 DEFINITIONS

Backfill	Material placed in an excavated area.
Bedding	Material in which utility pipelines or utility related structures are placed.
Classified Backfill	Material other than native material to be used for backfilling trenches or bedding.
Compaction	Tamping soils by hand or machine to achieve a specific in-place density.
Disposal Site	Specific site where construction wastes are deposited.
Drainage Rock	Course or washed granular material supporting structures.
Engineer	Utility engineer or authorized representative responsible for engineering supervision of the construction and contract.
Excavation	The removal of material from an area to provide a suitable base for improvement and/or to reach a specified grade or depth of bury. The improvement may be the replacement of unsuitable material with other material, the removal of existing utility pipelines and related structures, the installation of new utility pipelines or related structures, or other work shown on the design plans.
Embankment	Material placed above the original ground line.
Spoil	Material that has been removed from an excavation.
Over Excavation	Excavation beyond the depth required for setting a utility pipeline or related utility structure in the natural soil.



City of North Pole Utility Standards of Construction

Spring Line	Horizontal line coincidental with the centerline of a buried pipeline.
Pipe Zone	Interval of backfill around a buried pipe extending from the bottom of the pipe to a level of one (1) foot over the top of the pipe.
Structures	Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground.
Subgrade	The uppermost surface of an excavation of the top surface of a fill or backfill immediately below subbase, drainage rock, or topsoil materials.
Trench	Any excavation for a pipeline, pipeline appurtenance, or related utility structure.
Unsuitable Material	Material which in the opinion of the Engineer is inadequate for use in the proposed project.
Utilities	On-site underground pipes, conduits, ducts, and cables.

7.1.3 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

Before any excavation is started, the Developer/Contractor shall contact all other utility companies to determine the exact locations of underground utilities in the field. The Developer/Contractor shall be responsible for any and all costs incurred in protecting existing utilities during construction.

7.2 - MATERIALS

7.2.1 CLASSIFIED BACKFILL (SELECT GRAVEL)

Classified backfill material shall be well-graded, select, alluvial gravel and shall consist of hard, durable particles or fragments of granular aggregates naturally blended with fine sand, clay, silt or other similar binding or filler material from approved sources. The material shall be free of organic matter, lumps or excessive amounts of clay or silt and objectionable or foreign substances. It shall have a plasticity index not greater than six (6) as determined as AASHTO T-90. Select gravel shall meet the following gradation requirements as determined by Alaska T-7.



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GRADING REQUIREMENTS FOR SELECT GRAVEL

Percent Passing by Weight	
<u>Sieve Designation</u>	<u>Grading (% Passing)</u>
3 inch	100
2 inch	85-100
No. 4	30-70
No. 60	35 Max.
No. 200	5 Max.

7.2.2 BACKFILL MATERIAL

Backfill material shall be thawed material obtained during excavation, which is free from organic or frozen material, stumps, roots, trash, high water content, and any other material that in the opinion of the Engineer is unsuitable. Material deemed unsuitable for backfilling shall be removed from the site and replaced with suitable material.

7.2.3 PIPE BEDDING

Bedding material shall be river run, screened, and well-graded, free of organic material or debris.

<u>Sieve Designation</u>	<u>Percent Passing by Weight Grading</u>
½ inch	100
No. 40	Less than 40
No. 200	Less than 5

Or bedding material could consist of uniformly graded pea gravel with a minimum size of 1/4-inch and maximum size of 1/2-inch if wet conditions are encountered. If pea gravel is used for bedding silt zones shall be installed at every valve and every hydrant for 10 feet each side to prevent trench drainage.

7.2.4 FILTER FABRIC

Meet AASHTO M 288 for separation (Class 3). Fabric must be nonwoven and meet the following requirements: AMOCO 4547 or equal,

Grab Tensile Strength:	Minimum 112 pounds as determined by ASTM D 4632.
Puncture Strength:	Minimum 40 pounds as determined by ASTM D 4833.
Elongation:	Minimum 50 percent as determined by ASTM D 4632.



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7.2.5 DRAINAGE ROCK

Washed, uniformly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a four (4) inch sieve and not more than five (5) percent passing a one (1) inch sieve.

7.2.6 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
 - 1. Tape Colors: Provide tape colors for utilities as follows:
 - Blue: potable water
 - Green: sewers and drain lines
 - Yellow: gas, oil, or steam
 - Red: electric power lines, cables, conduit and lighting cables
 - Orange: communications lines, alarm or signal lines, cables or conduit
- B. Electronic Marker shall contain a passive-tuned antenna, molded inside a plastic disk. Shell of marker must be impervious to minerals, chemicals and temperature extremes. 3M Scotchmark 1403-XR, Electronic Ball Marker for water utilities and 1404-XR for wastewater utilities, or equal, compatible with utilities 3M marker locator.

7.3 - EXCAVATION

7.3.1 GENERAL

Trench and structure excavation shall be by open cut unless otherwise noted on the design plans.

The Developer/Contractor shall perform all excavation of the depth and alignment shown on the design plans unless otherwise directed by the consulting engineer in writing. Materials to be used for backfilling shall be piled a sufficient distance from the excavation to avoid overloading that could cause slides or cave-ins.

The Developer/Contractor shall be responsible for preventing standing water in any excavation prior to placement of compacted backfill. Any grading necessary to prevent surface water from draining into excavation shall be done. Any water standing in open excavation shall be promptly removed. Any pipe or structure having its alignment or grade changed by floating in a flooded trench shall be re-laid.



City of North Pole Utility Standards of Construction

Equipment with tracks that is used on pavement shall be equipped with suitable pads to prevent damage to pavement. The Developer/Contractor shall be responsible for any damage to pavement.

Disposal of surplus or unsuitable material: Excavated material not required for fill or backfill and/or unsuitable excavated material shall be removed to a disposal site by the Developer/Contractor.

Excavation in Roadways and Paved Areas:

Pavement, sidewalk, curb and gutter, driveway, bike paths, etc. shall be cut vertically along the lines forming the trench in such a manner as not to damage the adjoining pavement. Pavement cuts shall be twelve (12) inches wider than the trench on each side. Pavement shall be cut just prior to the commencement of paving operations.

Concrete pavement, sidewalk, curb and gutter, or driveway to be removed shall be sawed or cut by equipment approved by the Engineer, along straight lines designated by the Engineer, or shall be broken back to the nearest construction joint or sawed crack.

7.3.2 TRENCH EXCAVATION

- A. Trench Depth: The depth of the trench excavation shall be such that the pipe can be laid on bedding in the bottom of the trench at the invert grade or pipe bury shown on the design plans. The bedding shall be finish graded by hand to provide a uniform bearing for the pipe on undisturbed earth between joints.
- B. If the trench is overexcavated, bedding material shall be used to bring up to grade.
- C. Frozen Material: Where frozen material is encountered during trench excavation, the Developer/Contractor shall excavate the trench to approximately six (6) inches below required trench grade and replace the excavated frozen material with thawed material from the trench excavation, or from other sources, as bedding for the pipe.
- D. Over-Excavation: When, in the opinion of the Engineer, material is encountered at the bottom of the trench, which is unsuitable for pipe bearing, the Developer/Contractor shall over-excavate at least one and one-half (1½) feet and replace the unsuitable material with bedding material. If any ice lenses are present, they must be completely excavated and removed to the satisfaction of the Engineer.



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- E. Trench Configuration: Trench width shall be adequate for proper laying and joining of the pipe and for compaction of backfill around the pipe, but not so wide that excess loads on the pipe will result.
- F. Trench walls shall be vertical to the top of bedding to prevent sloughing of trench walls, the trench walls shall be sloped so as to meet Alaska Department of Labor Safety Codes, OSHA, and other applicable codes.
- G. Bracing and Sheeting: Where required to protect adjacent structures or property and safeguard employees, the trench shall be properly sheeted and braced as prescribed in the construction safety code of the Alaska Department of Labor, OSHA, and other applicable codes. The Developer/Contractor shall be responsible for all costs incurred for any shoring or bracing needed to protect employees and/or adjacent structures, property, and utilities.
- H. Open Trenches: The Developer/Contractor shall have on hand all material and equipment for the completion of work prior to commencing any excavation. Unless specified in writing by the Engineer, the Developer/Contractor shall not expose more than one thousand (1,000) linear feet of open trench at any one time. In trenches adjacent to and in traveled streets, the Developer/Contractor shall not expose any more trench than can be properly backfilled by 6:00 PM of the day that the trench is excavated, unless a written variance is obtained from the City. In no case shall trenches for driveway or street crossings be left open past 5:00 PM on the day they were excavated.
- I. Mailboxes and Street Signs: During trenching operations, temporary relocation of mailboxes and street signs is required. They shall be set firmly at locations approved by the Engineer. After completion of the trenching operation, the mailboxes and street signs shall be reset in their original location and condition.
- J. Damage or Disruption to Property: At his expense, the Developer/Contractor shall replace all fences, mailboxes, animal pens, and other private or public improvements, which are damaged or disturbed as a result of his activity. Where gardens, lawns, or landscaping are encountered along the route of the excavation, the existing topsoil shall be removed and stockpiled for replacement in original condition after the trench is backfilled.



City of North Pole Utility Standards of Construction

7.3.3 BACKFILLING AND COMPACTION

- A. Bedding beneath Pipe: Utility pipelines and related structures shall be bedded as indicated on Standard Drawings. Pipe bedding shall be shaped to fit the lower third of the pipe. Whenever the trench bottom does not afford a sufficiently solid and stable base to support the pipe or appurtenances, the Developer/Contractor shall over-excavate to a depth of at least one and one-half (1½) feet and backfill with bedding material to the specified grade. The Engineer may require a layer of filter fabric to be placed between the subgrade and the bedding material. The bedding shall support the full length of the pipe. Compaction of the subgrade may be required.
- B. Bedding around Pipe: Backfill to the spring line shall be placed by hand in maximum layers of three (3) inches and thoroughly compacted by tamping. Special care shall be taken to assure complete compaction under that portion of the pipe between the spring line and the bottom of the pipe. Backfill material shall be placed in the trench for its full width on each side uniformly.

Material shall have sufficient moisture to permit thorough compaction under and on both sides of the pipe to provide full support free from voids.

From the spring line of the pipe to a depth of one (1) foot above the top of the pipe, the backfill shall be placed in eight (8) inch maximum layers and compacted by tamping.

Compaction of bedding from the bottom of the trench to one (1) foot over the pipe shall be not less than ninety-two (92) percent of the maximum density as determined by ASTM D1557.

All backfilling shall be done progressively. As soon as sections of pipe are laid to proper grade and line, backfilling may proceed.

- C. Backfill Above Pipe: Backfill in this zone may be placed by any method approved by the Utility, providing such method shall not impose excessive concentrated or unbalanced loads which will transmit shock or impact to the buried pipe. All trenches shall be backfilled in uniform layers not exceeding six (6) inches loose depth and compacted to obtain ninety-two (92) percent of maximum density. Under traveled ways, and within street right-of-ways, material shall be compacted to ninety-five (95) percent of ASTM D1557 density. Water settling will not be allowed.

No rocks or stones exceeding six (6) inches in the largest dimension shall be placed within one (1) foot of the top of the trench.



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After backfilling and prior to performing surface restoration, the Developer/Contractor shall grade all trenches and maintain them during the period of construction to provide safe travel by the public, free of settlement, mud holes, ruts, and high centers.

- D. Backfill or Trenches Across or Along Borough, City, or State Roadways: Backfill of a trench in borough, city or state right-of-way must comply fully with the conditions of the permit(s) issued by the appropriate agency.
- E. Compaction testing: Field density tests of compacted backfill may be run at all stages of backfill. These tests will be performed by the Engineer at the expense of the Developer/Contractor to insure that the specified density is being obtained.

The test area shall not exceed one thousand (1,000) feet of trench. Test areas that are not acceptable shall be brought in compliance by additional compaction or removing and reworking the backfill at the Developer/Contractor's expense.

7.3.4 DEWATERING

- A. General: The Developer/Contractor may devise his own method of dewatering excavations. Whatever method is chosen must be approved by the Engineer in writing prior to implementation. The dewatering operation must be conducted so as to dispose of water in the excavation without damage to property, inconvenience to property owners, inconvenience to the public, or impairment of traffic.
- B. Disposal of Water: The disposal of water removed from excavations shall be done in accordance with state regulations, including those of the Department of Environmental Conservation and the Department of Fish and Game. The Developer/Contractor shall be responsible for applying for and securing whatever permits are required for his proposed plan and for complying with the conditions of those permits.
- C. Liability for Damage: The Developer/Contractor shall assume liability for flooding or related water damage to private or public property as a result of dewatering.



City of North Pole Utility Standards of Construction

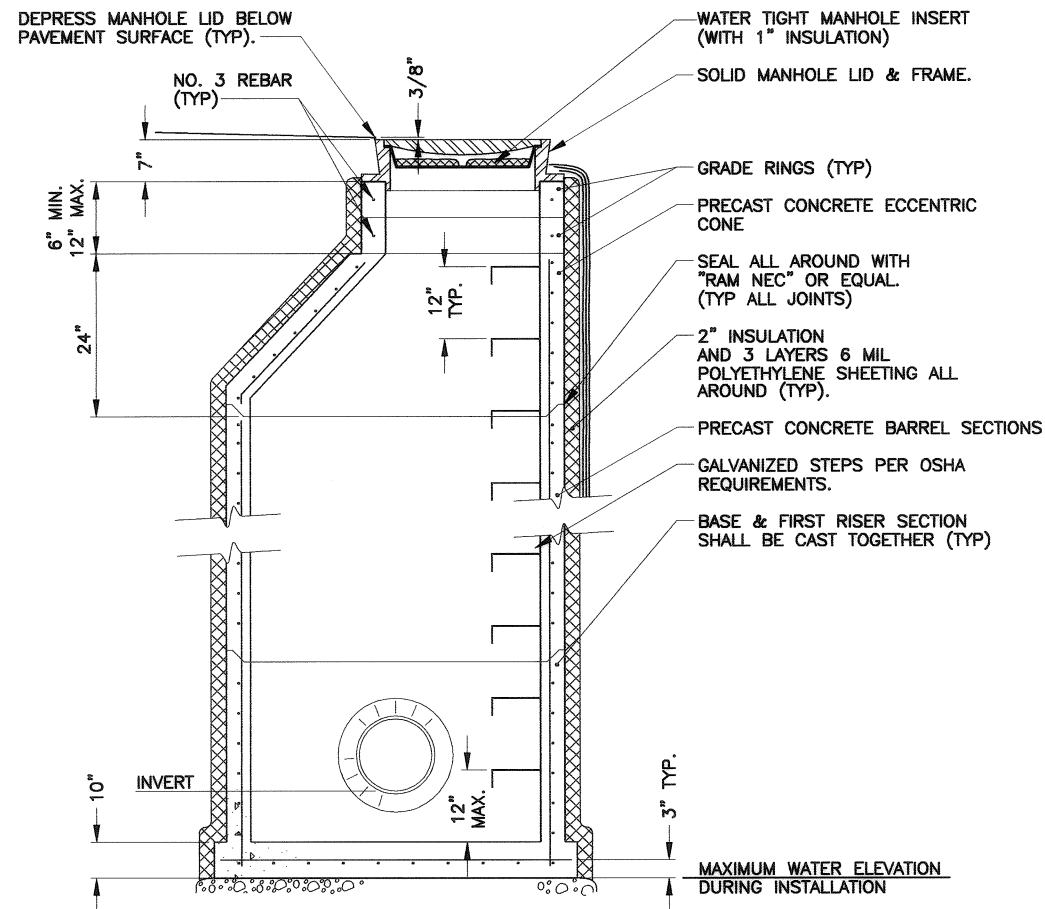
- D. Coordination with Utilities: In the event the Developer/Contractor uses a system of well points, he shall, prior to work, coordinate with local utilities to field determine the location of all buried utilities which could be damaged by driving or otherwise setting well points. The Developer/Contractor shall assume liability for damage to any buried utility, which occurs as a result of his work.
- E. Developer/Contractor shall provide water if a private well is affected by dewatering, and rehabilitate well/pump as required, if well does not deliver similar amount of water after construction as it did before.

SANITARY SEWER SYSTEM STANDARD DRAWINGS

SS1 - Wastewater Details

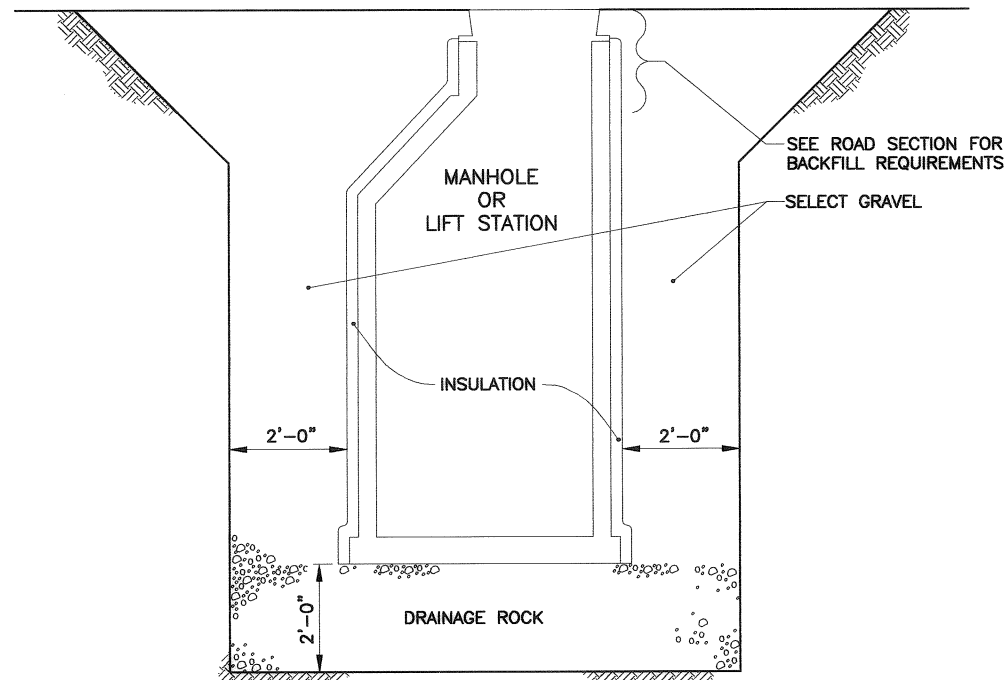
SS2 - Wastewater Details

LS1 - Lift Station Details



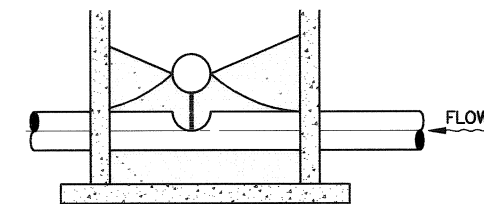
A 48" AND 72" TYPE I MANHOLE SECTION

SS1 NOT TO SCALE



B MINIMUM EXCAVATION LIMITS SECTION

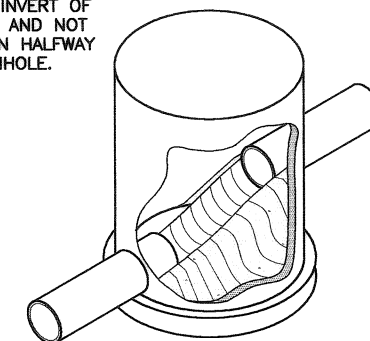
SS1 NOT TO SCALE



MAXIMUM VERTICAL DROP FOR BEAVER SLIDE (MEASURED CROWN TO CROWN):

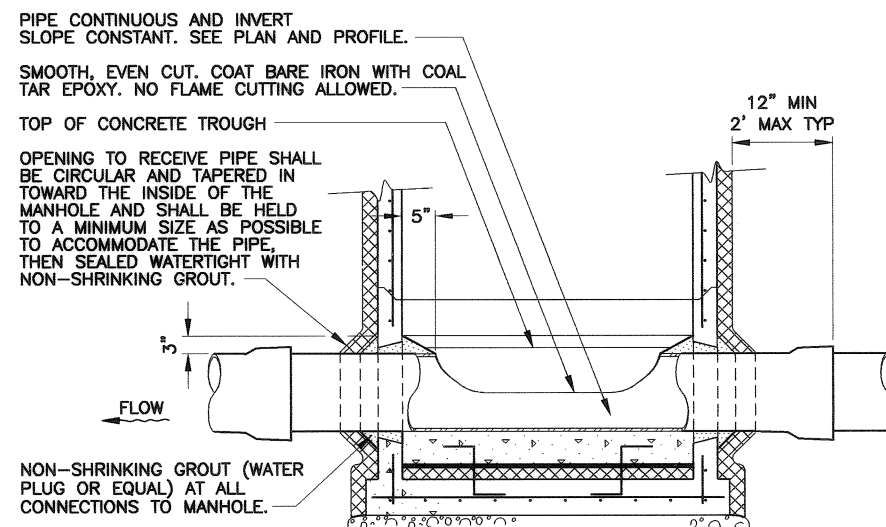
32" FOR 12" PIPE
30" FOR 10" PIPE
28" FOR 8" PIPE

WHEN INSTALLING A BEAVER SLIDE WHERE THE FLOW IS STRAIGHT THROUGH THE MANHOLE, THE BEAVER SLIDE IS TO MATCH THE INVERT OF THE EXISTING LINE AND NOT EXTEND MORE THAN HALFWAY THROUGH THE MANHOLE.



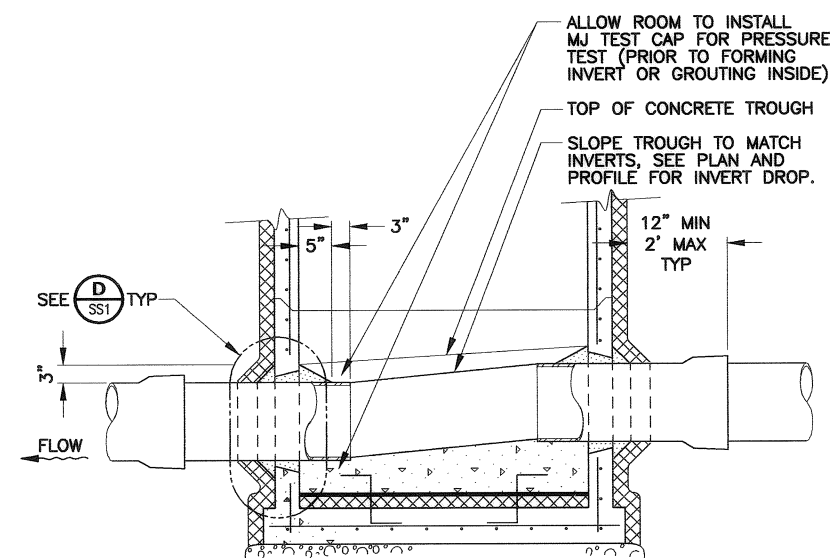
C BEAVER SLIDE SECTION

SS1 NOT TO SCALE



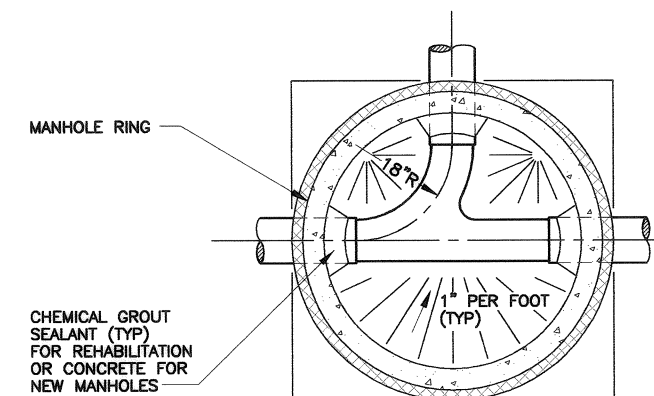
D TYPICAL THROUGH SECTION

SS1 NOT TO SCALE



E TYPICAL THROUGH SECTION WITH DROP

SS1 NOT TO SCALE



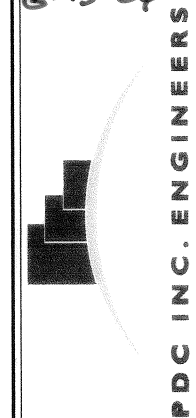
F SANITARY SEWER MANHOLE PLAN

SS1 NOT TO SCALE

CONSULTANT :



6-15-07



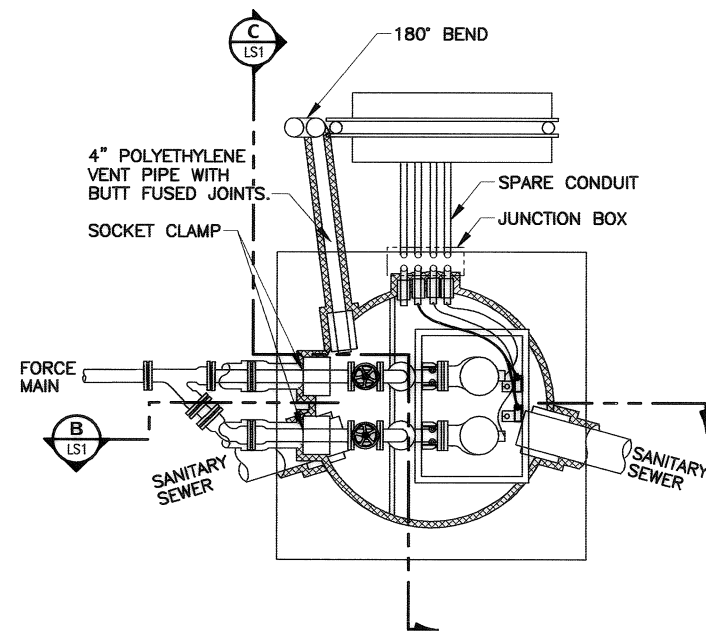
PROJECT :
CITY OF NORTH POLE
STANDARDS OF CONSTRUCTION
NORTH POLE, ALASKA

SHEET TITLE :
WASTEWATER DETAILS

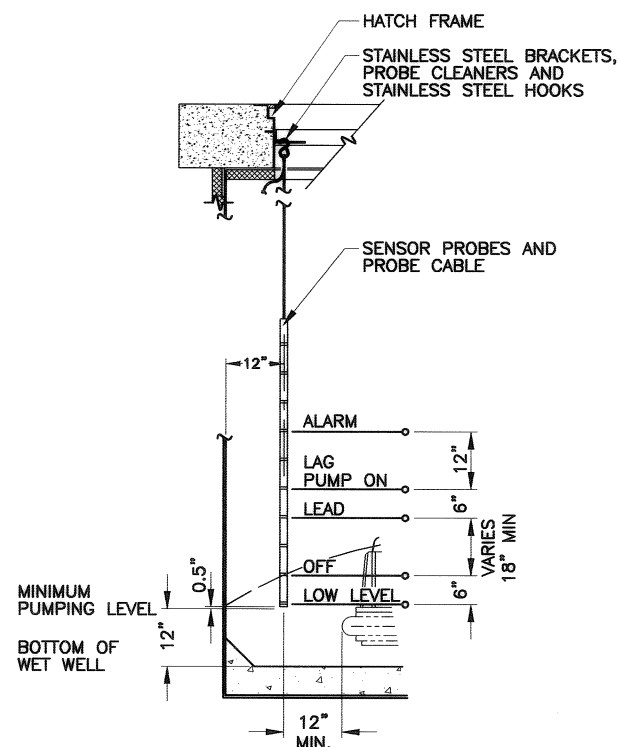
DESIGN KAD
DRAWN GDS
CHECKED KLH
DATE JUNE 2007
PROJECT No.
F06068
SHEET NUMBER
SS1
OF SHEETS



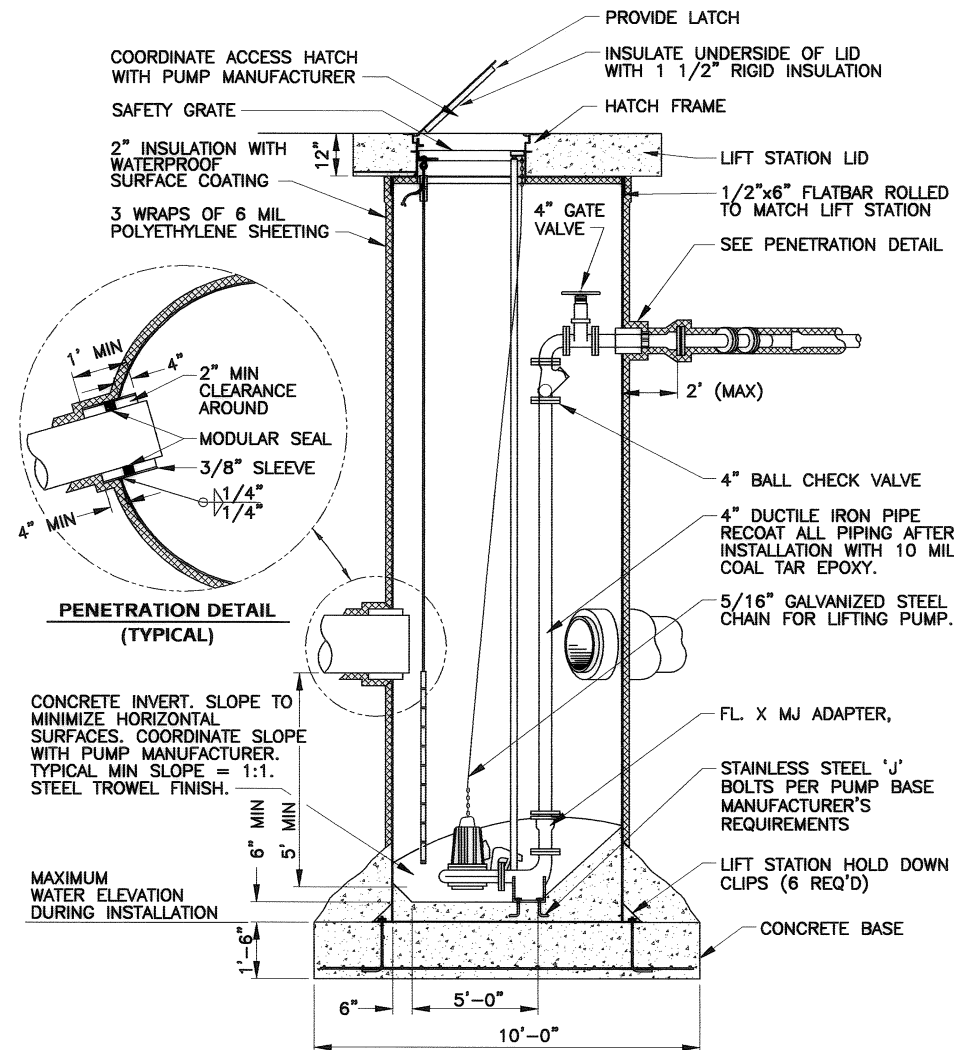
352
OF SHEETS



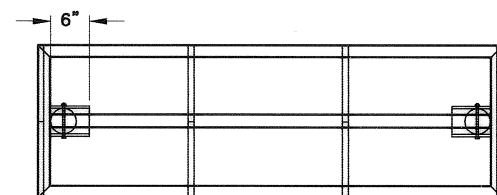
A LIFT STATION PLAN
LS1 NOT TO SCALE



D LIQUID LEVEL PROBE DETAIL
LS1 NOT TO SCALE



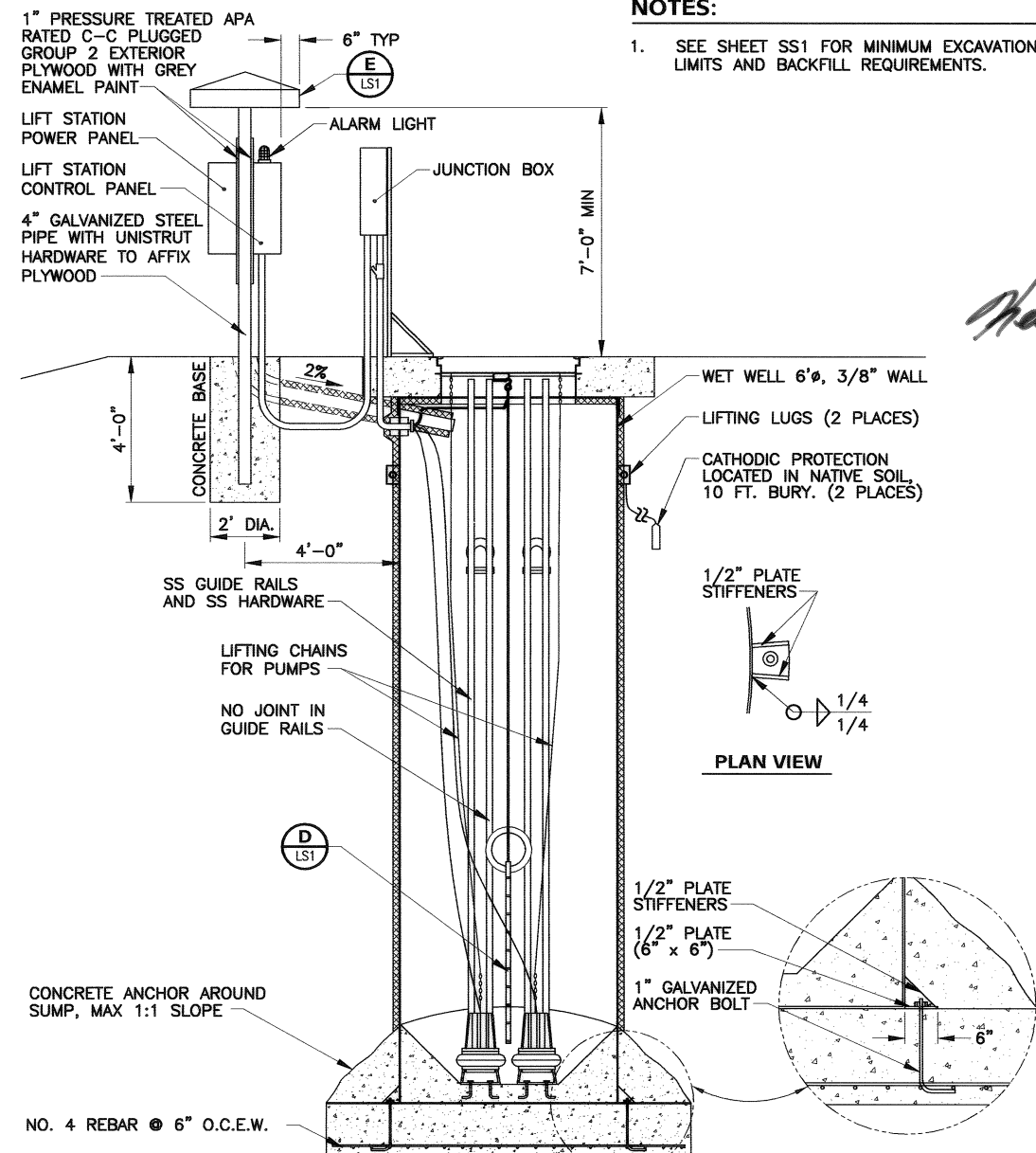
B LIFT STATION SECTION
LS1 NOT TO SCALE



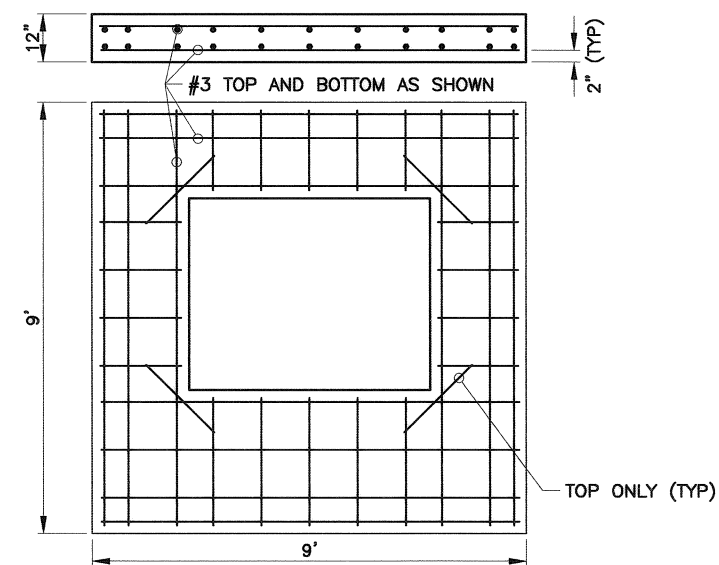
E ROOF SECTION AND PLAN
LS1 NOT TO SCALE

ROOF NOTES:

1. WELDED STEEL TUBING.
2. FRAME SHALL BE SAND-BLASTED, PRIMED, AND RECEIVE TWO COATS DARK GRAY ENAMEL.
3. AFFIX STAINLESS STEEL SHEET METAL ROOF WITH SILICONE SEALANT.



C LIFT STATION SECTION
LS1 NOT TO SCALE



F LIFT STATION LID PLAN AND SECTION
LS1 NOT TO SCALE

NOTES:

1. SEE SHEET SS1 FOR MINIMUM EXCAVATION LIMITS AND BACKFILL REQUIREMENTS.

CONSULTANT:



PDC INC. ENGINEERS
1028 Aurora Drive, Fairbanks, Alaska 99709-5529
6-15-07

PROJECT:
**CITY OF NORTH POLE
STANDARDS OF CONSTRUCTION**
NORTH POLE, ALASKA

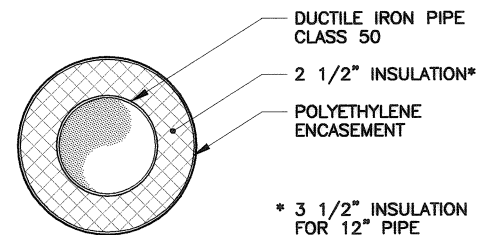
SHEET TITLE:
LIFT STATION DETAILS

DESIGN KAP
DRAWN GDS
CHECKED KLH
DATE JUNE 2007
PROJECT No.
F06068
SHEET NUMBER
LS1
OF SHEETS

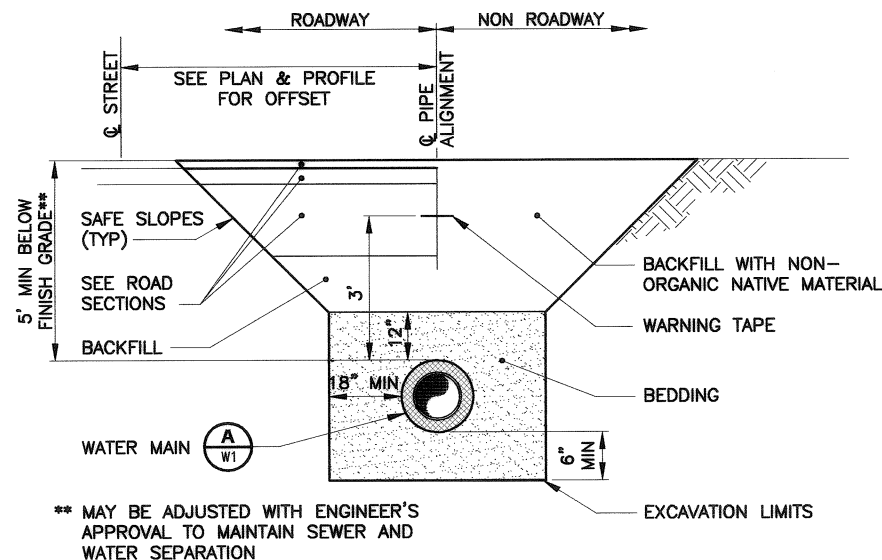
WATER SYSTEM STANDARD DRAWINGS

W1 - Water Details

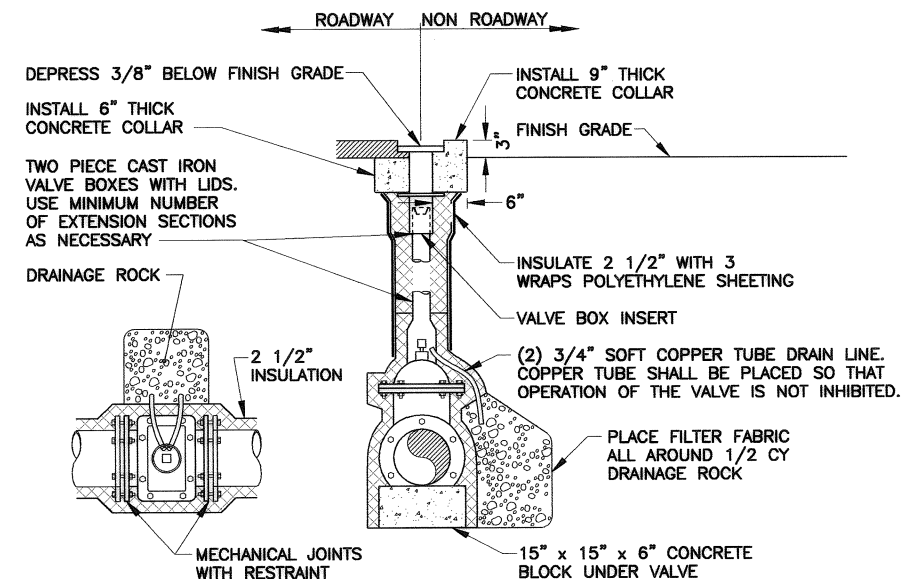
W2 - Thrust Block Details



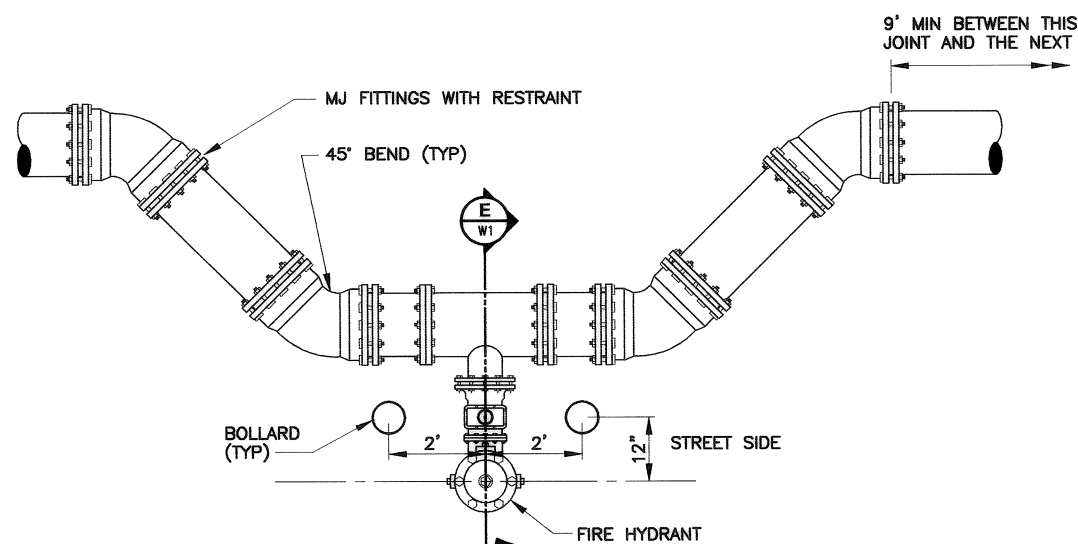
A WATER MAIN PIPE DETAIL
W1 NOT TO SCALE



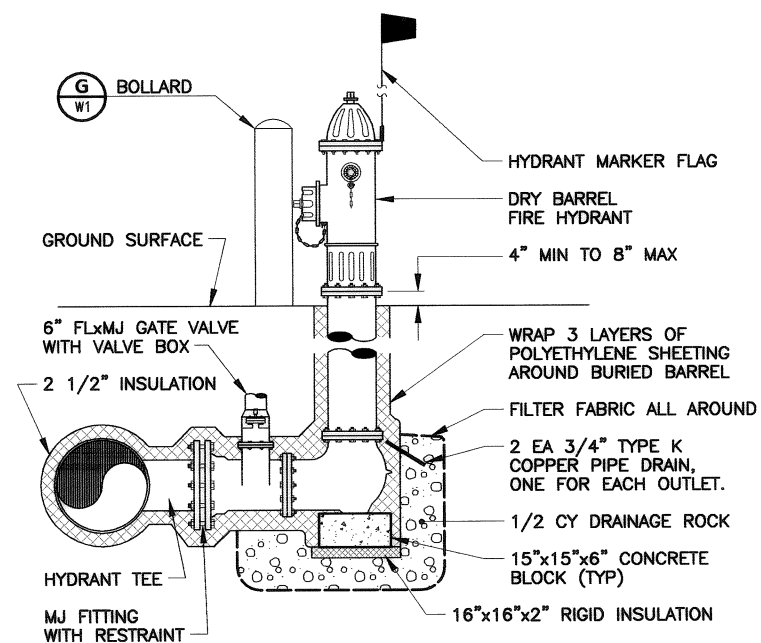
B TYPICAL TRENCH SECTION
W1 NOT TO SCALE



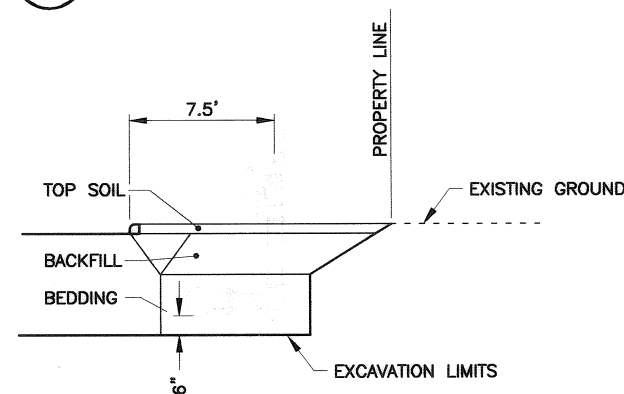
C GATE VALVE DETAIL
W1 NOT TO SCALE



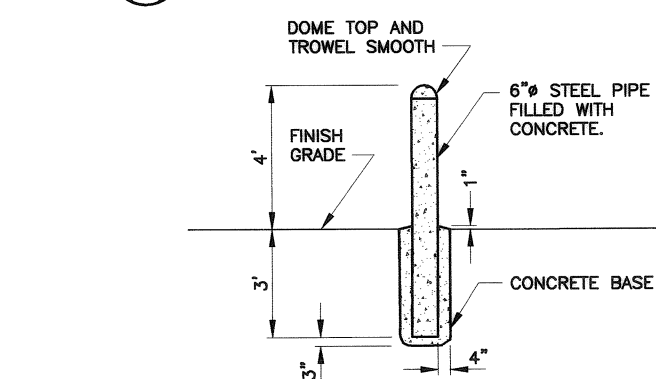
D FIRE HYDRANT PLAN
W1 NOT TO SCALE



E FIRE HYDRANT SECTION
W1 NOT TO SCALE

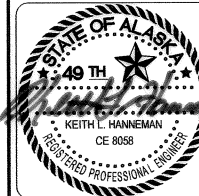


F FIRE HYDRANT SECTION
W1 NOT TO SCALE



G BOLLARD DETAIL
W1 NOT TO SCALE

CONSULTANT :



6-15-07

PDC INC. ENGINEERS
1028 Aurora Drive, Fairbanks, Alaska 99709-5529

PROJECT :

**CITY OF NORTH POLE
STANDARDS OF CONSTRUCTION**

NORTH POLE, ALASKA

SHEET TITLE :

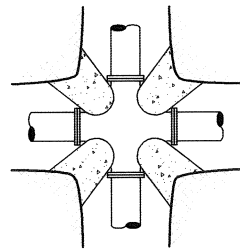
WATER DETAILS

DESIGN KAD
DRAWN GDS
CHECKED KLH
DATE JUNE 2007

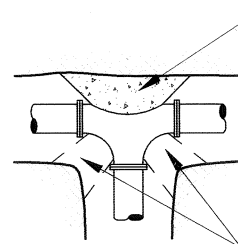
PROJECT No.
F06068

SHEET NUMBER
W1

OF SHEETS



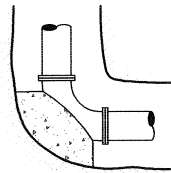
CROSS



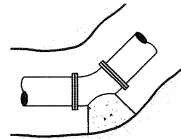
TEE

CONCRETE (TYP)

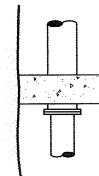
ADDITIONAL BLOCKING
AS DIRECTED



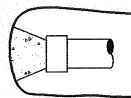
90° BEND



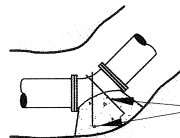
45° BEND



REDUCER



END CAP



VERTICAL BEND

#4 STEEL REINFORCING
BARS COATED WITH
BITUMASTIC

PIPE Ø	HORIZONTAL TO END MINIMUM BEARING AREA, SF						VERTICAL BEND MIN VOL, CY		
	DEAD END TEE	90°	45°	22 1/2°	END CAP	CROSS EACH WAY	90°	45°	22 1/2°
6"	5	7	4	2	5	2	2.6	1.4	0.7
8"	8.5	12	6.5	3.5	8.5	3	4.5	2.4	1.2
10"	13	18	10	5	13	5	6.8	3.7	1.9
12"	18	26	14	7	18	7	9.6	5.2	2.6

THRUST BLOCK NOTES:

1. BASED ON PRESSURE OF 200 psi, MIN COVER OF 3' AND SOIL BEARING OF 1500 psf.
2. FOR SOIL BEARING
 - = 3000 psf, USE 0.5 AREA SHOWN
 - = 1000 psf, USE 1.5 AREA SHOWN
 - = 500 psf, USE 3.0 AREA SHOWN
3. ALL ANCHORS AND THRUST BLOCKS SHALL BE PLACED AGAINST UNDISTURBED SOIL OR COMPACTED BEDDING.
4. THRUST BLOCKS ON CROSSES SHALL BE USED WHENEVER PIPE DIAMETERS DIFFER OR WHEN ONE OR MORE OPENINGS ARE PLUGGED.
5. FORM THRUST BLOCKS SO THAT BOLTS ARE NOT COVERED WITH CONCRETE AND ARE READILY ACCESSIBLE.
6. ALL THRUST BLOCKS SHALL CONSIST OF A MINIMUM OF 0.5 CY CONCRETE.
7. WRAP PIPE AND JOINTS WITH 6 mil POLYETHYLENE SHEETING.



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PDC INC. ENGINEERS
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CITY OF NORTH POLE STANDARDS OF CONSTRUCTION THRUST BLOCK DETAILS

NORTH POLE, ALASKA

DESIGN: KAB
DRAWN: GDS
CHECK: KLH
JUNE 2007

PROJ. No.
F06068

W2