

ENGINEERING MANUAL

I. Engineering Requirements

As set forth in various sections of the City ordinances, Developers of property within the City of East Bethel are required to submit certain plans and specifications for review and approval by the City. These include such items as grading plans, drainage plans, topographic surveys, plats, street and utility plans and specifications. These plans and specifications shall be prepared by competent professionals.

The professional services required of the Developer may include one or more of the following professionals: architect, land surveyor, planner, soils and civil engineer and testing service. The engineering services include not only preparation of plans and specifications, but field staking in order to assure the City that the completed project is in conformance with the approved plans and specifications. The City will provide inspection of the installation of the facilities at the Developer's expense.

Within the development contract, the Developer can either construct and finance the improvements, or request that they be installed under a public improvement project and assessed against the property benefitting. Approval of the choice is a City Council matter.

If the Developer chooses to install required public improvements within the development, the following procedures shall be followed:

1. The Developer shall submit plans, specifications and copies of all design calculations to the City for review and approval. These plans are to be prepared by a licensed professional civil engineer and shall be in accordance with City standards as outlined herein. The City comprehensive sanitary sewer, water, storm drainage and thoroughfare plans shall be adhered to in design considerations. All sanitary sewer and watermain testing shall be completed and copies of service ties submitted to the City prior to issuance of any service connection permits.
2. The Developer shall submit erosion and sediment control plans to the City for review and approval. No work is to begin until all erosion and sediment control methods are in place and approved by the City.
3. The Developer shall furnish a separate Development Plan showing housepad with elevations on front & back of pad and garage floor slab, lot corners, drainage arrows, and street grade in front of driveway.

4. The Developer will be responsible for not only plans and specifications preparation, but also for providing staking. Resident inspection of said improvements to assure compliance with the approved plans shall be completed by the City.
5. Copies of all bids, change orders, etc. relating to the improvements shall be forwarded to the City Engineer.
6. The Developer shall furnish to the City the list of selected contractors and subcontractors being considered for retention by the Developer for any of the public improvements work in the development. The City has the right to reject any contractor or subcontractor deemed unacceptable to the City.
7. Any changes to the approved plans and specifications shall be approved by the City Engineer in writing before work is started. If the change affects the project letter of credit by increasing the cost, the letter of credit shall be increased before the work can begin.
8. The Developer will hold a preconstruction meeting at the City Hall prior to start of any work on the development. The City staff and City Engineer along with the contractor and subcontractors, Developer's engineer, utility companies and other interested parties must be invited to the meeting. The Developer will be responsible for drafting pre-construction meeting minutes. The said minutes shall be submitted to the City Engineer for review, and then distributed by the Developer to all parties whom were in attendance at the meeting.
9. The Developer shall retain an independent testing service to perform the required tests of materials. Copies of tests will be directed to the City Engineer. The cost of this service will be the responsibility of the Developer.

The City shall be notified 24 hours in advance of all scheduled tests so its representatives can be present at the time tests are made. The required tests include sanitary sewer, watermain, storm sewer, street subgrade, base course, wear course, and curb and gutter.

10. Upon completion of all the work required, the City Engineer or his/her designated representative, a representative of the contractor and a representative of the Developer will make the required final inspections of all work. This includes a final inspection of all site grading and approval by the City Engineer before any building permits will be issued. Before the final payment is made to the contractor by the Developer, the City Engineer shall be satisfied that all work is satisfactorily completed in accordance with the approved plans and specifications, and the Developer's engineer shall submit a written statement attesting to same.

Acceptance of the completed work shall be made by motion of the City Council upon the recommendation of the City Engineer.

11. An as-built survey signed by a Professional Land Surveyor for each individual lot will be required to verify lot corner elevations, swales, emergency overflow elevations, and house low floor and lowest opening elevations. Said survey shall be submitted to the City Building Department for review and approved by the City Engineer prior to the Certificate of Occupancy being issued.
12. Warranty Period – If within the time prescribed by law, by the contract documents and/or the Developer’s Agreement any of the work is found to be unacceptable, the Developer shall correct it promptly unless the City Council has previously accepted the work. The Developer shall give prompt notice after discovery of any unacceptable conditions to the contractor responsible for the project work.

Unless otherwise noted in the contract documents, the following requirements shall apply:

- a. The contractor shall guarantee all work relating to street construction including concrete curb and gutter, utilities, appurtenances, material and equipment furnished by him/her for a period of two years from the date of written acceptance by the City Council of the work or project.
 - b. The Developer shall provide letter of credit(s) as defined in the Developers Agreement. The amount of the letter of credit(s) will be determined by the City Engineer and the City Attorney.
13. After all public improvements have been completed, properly inspected as specified above, and after an acceptable maintenance guarantee has been provided the public improvements will be scheduled for acceptance by the City Council subject to the following:
 - a. The Developer or the Developer’s engineer must submit written certification to the City Engineer stating that all public improvements have been completed in accordance with the approved plans and specifications.
 - b. The Developer’s engineer shall provide the City with a complete set of computer disks compatible with City Engineering software and 2 sets of full size blue line “as-builts” for the City records as outlined in this manual. These as-builts shall be submitted within 90 days after the City has approved the final plat.

II. Erosion Control Policy

1. Required Erosion Control Plan. Prior to commencing any earth disturbing activity in a subdivision, the Developer shall prepare and submit to the City Engineer a Stormwater Pollution Prevention Plan (SWPPP).
2. The SWPPP shall conform to the MnPCA's "Application for General Storm-water Permit for Construction Activity (MN R100001) and as specified herein:
 - a. The plan shall be suited to the topography and soils so as to create the least erosion potential.
 - b. The land shall be developed in increments of workable size on which adequate controls of erosion and siltation can be provided and maintained during the construction period. Grading operations and other land disturbing operations shall be staged so that the area being developed is not exposed for long periods of time without stabilization.
 - c. Temporary vegetation and/or mulching shall be used to protect the areas exposed during the development. No area shall be left denuded for a period longer than five (5) days after initial site grading and other land disturbing operations on slopes of 3:1 and greater. These areas shall be mulched and stabilized with an erosion control netting acceptable to the City Engineer.
 - d. Permanent vegetation and structures shall be installed within 30 days after completion of initial grading. If grading is not completed until after the planting season has expired, temporary erosion control measures, including dormant seeding and mulching, shall be implemented.
 - e. Sediment basins (debris basins, desilting basins, or silt traps) shall be installed and maintained to remove sediment from runoff waters from the land undergoing development. Storm sewer inlets shall be provided with debris guards and microsilts basins to trap sediment and avoid possible damage from blockage. The silt shall be removed when necessary. If sediment/siltation measures taken are not adequate and result in downstream sediment, the Developer shall be responsible for cleaning out or dredging downstream storm sewers and ponds as necessary.
 - f. Before grading is commenced, all control measures as shown on the approved plan shall be installed.

- g. Immediately after curb and gutter has been placed, cured, and backfilled, approved erosion control measures shall be installed directly behind the curb.
- h. Erosion control practices shall comply with the Minnesota Pollution Control Agency Best Management Practices.
- i. The Developer shall be responsible for cleaning and maintenance of the storm sewer system (including ponds, pipes, catch basins, culverts, and swales) within the subdivision and the adjacent off-site storm sewer system that receives storm water from the subdivision. The Developer shall follow all instructions it receives from the City concerning the cleaning and maintenance of the storm sewer system. The Developer's obligations under this paragraph shall end as defined in the Developers Agreement.
- j. The Developer shall be responsible for cleaning all streets in the subdivision and adjacent to the subdivision from sediment and debris from the subdivision for a period of two (2) year beginning when the streets have been completed and accepted by the City.

3. Financial Guarantee

- a. A portion of the Developer's letter of credit required by the Developer's agreement shall include a guarantee of compliance with erosion control measures, and shall be furnished upon approval of the Developer's Agreement before work is commenced. The financial guarantee shall remain in place until all the Developer's obligations under the erosion control plan have been satisfied.
- b. If the City draws upon the financial guarantee, the Developer shall within ten (10) days of the draw, deposit with the City additional security in the same amount that the City has drawn. No further inspections will be conducted, no new building permits will be issued, and all work must stop within the development until the cash deposit for erosion control is restored to the predraw balance.

4. Street Sweeping. The Developer shall provide street sweeping within the plat before the final acceptance is approved. If the construction operation within or out of the plat causes debris on the existing streets, the City Engineer may require street sweeping done by the Developer.

5. Enforcement.

- a. The City may issue a stop work order halting all development work and building construction for noncompliance with the erosion control plan.
- b. The City may draw down the posted financial guarantee and perform any work necessary to achieve compliance with the erosion control plan. The City will endeavor to give the Developer advance notice of such action.

III. City Standard Plans

In order for the City to have standardized construction and as-built plans, the guidelines listed below shall be followed:

General Requirements:

1. The Developers must consider the requirements for plans found in the subdivision ordinance and street construction standards attached herein.
2. Incorporated in the set of plans shall be a sheet indicating the entire project, with corresponding sheet numbers on each separate sheet and index.
3. All sheets shall be 22" x 34".
4. Scale Horizontal Scale 1" = 50'
Vertical Scale 1" = 5'
(unless otherwise approved by the City engineer)
5. General Details
 - a. North arrow
 - b. Scale with bargraph
 - c. Date of preparation
 - d. Proposed name of the subdivision in which the roadway and utilities are to be constructed.
 - e. Proposed name of all streets
 - f. Name of the plan preparer, Engineer, Surveyor and Owner
 - g. Seal or signature of the preparer and Licensed Engineer
 - h. Street, sanitary sewer, watermain and storm sewer plan and profile shall be drawn at a scale of 1" = 50' horizontal and 1" = 5' vertical.
 - i. Street cross-sections shall be drawn at a scale of 1" = 10' horizontal and 1" = 5' vertical.

- j. Location map which shows all existing streets within 2500 feet of the proposed plat.
6. All utilities shall be shown in the following approximate locations:
 - a. Sanitary Sewer - on centerline of street right-of-way
 - b. Watermain - ten feet north and east of centerline
 - c. Storm Sewer - ten feet south and west of centerline
 7. All detail drawings shall be on a separate sheet and referenced to the proper sheet.
 8. The profile shall be directly below the plan with the stationing aligned as closely as practical. Stationing shall be shown on the plan view as well as the profile.
 9. All parcels shall be properly labeled with lot and block numbers and plat name, or P.I.D. in unplatted areas. Developed parcels shall have their address shown on the plan. Bearings and distances for all existing roadway centerlines and right-of-ways described above shall be shown.
 10. All match line breaks shall be clean with reference points clearly marked. All plans which are broken by a matchline shall be on the same or consecutive sheets.
 11. Existing utilities shall be shown in both plan and profile, stationed and labeled as existing.
 12. Approximate locations of gas, electric, telephone and cable lines shall be shown.
 13. Right of way and pavement or curb and gutter alignment data shall be shown. Right of way shall be rounded at intersections to allow for utility installation.
 14. Bench marks shall be placed on all sheets.

Specific Requirements:

1. Stationing of sanitary sewer wyes shall be indicated "S" in front of the stationing.
2. All sanitary sewer services shall be drawn on the plan to the constructed length and the length noted. If other than open cut trench methods are employed, the method needs to be indicated on the plans.

3. If the sanitary sewer wye only is constructed, it shall be noted as "Wye Only" after stationing.
4. The invert elevation of all sanitary sewer services shall be shown on the plans. If risers are installed, the height of each shall be indicated on the plans and also drawn on the profile, along with the height of each riser.
5. All manholes shall be numbered on both plan and profile.
6. All hydrants, gate valves and tees shall be stationed on the bottom of the profile.
7. All water corporation stops shall be indicated by a "W" in front of its stationing.
8. All water services shall be drawn to constructed length and the length noted if other than 10 feet in back of the property line. If other than open cut service installation methods are employed, the method needs to be indicated on the plans.
9. The size and type of materials of all sanitary sewer and water services shall be noted on the plans.
10. On combination sewer and water projects, services may be placed in the same trench with sanitary sewer services three feet downstream from water services. Locations will be noted on the plans with an "S & W" in front of the stationing.
11. All sewer and watermain shall be shown in the profile with the appropriate information such as size, material, grades, invert elevations, etc.
12. Appendix C provides specific information for standard specifications for street construction.

As-Built Requirements:

1. All as-built plans shall be submitted on computer disks compatible with City Engineering software with unnecessary construction information removed (contours, trees, shrubs, fences, etc.). Two sets of full size as-built plans shall be provided in addition to the disks.
2. As-built plans on all ponding areas are required. Plans shall indicate finished contours at two (2) foot intervals, normal water elevation, high water elevation, and the acre feet of storage for each ponding area along with the final storm sewer plans.

3. All "as-built" plans shall be certified by the design engineer and land surveyor responsible for the field work.
4. All water valves shall be located with at least two permanent field ties, using the following priority:
 - a. Fire hydrants
 - b. Manholes
 - c. Catch basins, if curb and gutter is in
 - d. Buildings or other permanent structures
 - e. Power poles, trees, other semipermanent items
 - f. Stationing from hydrants, manholes, catch basins, if over 100'
 - g. Back of curb only when used with station in (f.) above
5. All services shall be tied with at least two ties, using the following priority:
 - a. The served structure with address noted
 - b. Neighboring structures with address noted
 - c. Fire hydrants
 - d. Manholes, catch basins, if curb and gutter is in
 - e. Other permanent structures (bridges, telephone boxes, electrical boxes, etc.)
 - f. Power poles, trees, and other semipermanent items
 - g. Stationing from hydrant, manhole, catch basins – these may be used with back of curb distance only as last possible means.
6. Show contractor's name on the as-builts.
7. Show where fabric has been placed or correction to pavement section has been made in the streets on the plan portion of the as-builts.
8. Benchmarks shall be referenced on each sheet.
9. All hydrants are to be at required height after lawns, boulevards, etc. are finished (sod, seed, etc.) This will be the Developer's responsibility.

IV. City Standard Materials

In order to standardize certain construction materials and assure quality construction, we have adopted the following:

1. Sanitary Sewer pipe and service line materials:
 - a. Plastic pipe shall be smooth wall polyvinyl chloride (PVC) and shall conform with ASTM D 3034 for the size and strength requirements

shown on the plans. Minimum pipe strength shall be SDR 35. All joints shall be elastomeric gasketed.

- b. Ductile iron sewer pipe shall be Class 50 and shall meet ANSI specifications A-21.51.
- c. All connections between existing and new sanitary sewer or service pipe shall be made with factory manufactured flexible couplings, Fernco or equivalent, specially designed and sized for sanitary sewer connections.
- d. All PVC sanitary sewer service pipe and fittings shall be SDR 26 minimum pipe strength. All service pipe connections shall be solvent welded. Gasketed connections will not be allowed.

2. Storm Sewer and Drainage Pipe

- a. All storm sewer pipe within any street right-of-way shall be reinforced concrete pipe of the class as shown on the plans. Pipe shall meet Mn/DOT 3236 Specification. Pipe joint sealer materials shall be preformed rubber, Type A, in accordance with Mn/DOT Specification Section, 3726.
- b. Storm sewer pipe on private property or on easements not used for vehicle traffic may be corrugated high density polyethylene (HDPE) pipe.
 - 1. Corrugated Polyethylene Pipe: Corrugated polyethylene pipe and fittings shall be manufactured from high density polyethylene (HDPE) virgin compounds. Clean reworked HDPE materials from the manufacturer's own production may be used by the manufacturer of HDPE pipe, provided that the pipe and fittings produced meet all requirements of these Special Provisions and in AASHTO M294 and Design Section 18 of AASHTO Standard Specifications for Highway Bridges. The polyethylene compounds shall conform to the requirements of ASTM D3350 Cell Class 335420C.
 - 2. Wall thickness shall be the thickness of the inner liner measured between corrugation valleys of the outer rib wall. The wall thickness shall equal or exceed the minimum wall thickness values in Table 1. The pipe stiffness shall be determined in accordance with AASHTO M294 at 5 percent deflection. The average pipe stiffness shall equal or exceed the minimum pipe stiffness value for each size of pipe listed in Table 1.

3. Connections shall be made with bell and spigot joints. Clamp-on-bands shall not be allowed. Pipe couplers shall be subject to rejection upon failure to conform to any requirements of this specification. HDPE pipe shall be furnished with metal apron end sections.
 - c. Riprap shall be required for all sizes to prevent erosion. Fabric blanket conforming with MnDOT 3733 Type IV shall be required under the rip-rap. Erosion control blanket is required at all inlets per Mn/DOT Standard Plat No. 9102D.
 - d. All flared end sections for pipe culverts 18" and larger shall be fitted with trash guards and all flared end sections on pipe storm sewer systems shall be fitted with trash guards.
3. Metal Sewer Castings
- a. Castings for sanitary sewer manhole shall be Neenah R1733 or approved equal with a concealed pickhole and a neoprene gasket and groove for watertight application. The words "Sanitary Sewer" shall be imprinted on the cover. Waterproof castings where required shall be Neenah R 1751 or approved equal.
 - b. Castings for storm manholes and catchbasin shall be in accordance with the standard plates and schedule of structures. Unless otherwise specified, castings shall be equivalent to Neenah R-1733 for manholes and R-3250-1 with C grates for catch basins.
 - c. Off-street catchbasin manhole and catchbasin inlets shall be constructed per MnDOT Standard Plate 4143E – Stool Grate & Concrete Frame.
4. Manhole and Catchbasin Structure
- a. Manhole and catchbasin structure shall be in accordance with applicable MnDOT standard plates or City standard plates and Mn/DOT Standard Specification Section 2506. All manholes and covers shall be reinforced for traffic loadings.
 - b. Manholes identified on the plans as box structures shall be constructed from precast reinforced concrete box sections conforming to ASTM C-789 placed on end. Wall thickness and reinforcement shall be in accordance with ASTM C-789 Table 1 for box section under earth dead load and HS-20 live load conditions. Base and cover slabs shall have thickness and reinforcement to meet MnDOT HS-20 traffic loadings.

- c. All manhole and catchbasin structures with builds greater than 5.0 feet from casting to invert shall have steps. Maximum distance from top of casting to first step is 2 feet.
5. Chimney Seal or Infi- Shield External Seal or Flex-Seal Utility Seal

Any one of the three following ring seals is allowed. (Contractor choice)

a. CHIMNEY SEAL

- 1. Chimney seals shall consist of a flexible internal rubber sleeve, interlocking extensions and stainless steel expansion bands. (See standard plate No. 308)
- 2. The seal shall remain flexible throughout a 25 year design life, allowing repeated vertical movement of the frame of not less than 2 inches and/or repeated horizontal movement of not less than ½ inch. The sleeve portion of the seal shall be either double or triple pleated with a minimum unexpanded vertical height of either 8 inches or 10 inches respectively. The sleeve and extension shall have a minimum thickness of 3/16 inches and shall be made from a high quality rubber compound conforming to the applicable requirements of ASTM C-923, with a minimum 1500 psi tensile strength, a maximum 18% compression set and a hardness (durometer) of 48₊₅. The bands shall be integrally formed from 16 gauge stainless steel conforming to ASTM A-240, Type 304, with no welded attachments, shall have a minimum adjustment range of 2 diameter inches and a positive locking mechanism. Any screws, bolts or nuts used for this mechanism shall be stainless steel conforming to ASTM F-593 and 594, Type 304.

b. FLEX-SEAL UTILITY SEALANT

- 1. Manhole seal shall be designed to prevent leakage of water into the manhole through the frame joint area and the area above the manhole cone including all extensions to the chimney area. Extensions shall include but is not limited to lifting rings, brick and/or block material that may have been used to achieve grade. The seal shall remain flexible allowing for the repeated vertical or horizontal movements of the frame due to frost lift, ground movement or the thermal movement of pavements. The final liner material shall be made no less than 200 mils. of corrosion resistant aromatic

flexible urethane resin coating to be applied to the inside wall of the entire chimney area as described above. The product shall have a minimum elongation of 800% and a hardness (Durometer) of 75. Final liner shall have a minimum tensile and adhesion strengths of 1150 psi and 175 lb. /in. respectively. The manhole sealing system shall conform to the physical requirements of ASTM D-412, with a minimum of 200 mils. thickness for durability and resistance elongation and tearing. The lining product shall have an aromatic urethane primer resin on the complete surface. The sealing system shall line the interior of the adjustment area from the cone/top of the manhole and onto the inside of the casting. (See standard plate No. 309)

2. All loose and protruding mortar and brick that would interfere with the seal's performance shall be removed. Any lips for gravel pan supports shall be cut off flush with casting. All excessive voids shall be sealed. Patching cement, shall conform to the manufactures requirements. Any patching cement work will require the contractor to contact the sealant manufacture to determine in writing the proper time required for the cement to completely cure prior to installing this item. Preparation of surface shall include water blasting machine that delivers the water with a sandblaster attachment in a steady stream at a minimum of 3500 psi. Surface preparation shall also include wire brushing of surface to ensure a clean surface as required by manufacture. Active leaks (infiltration) should be corrected by a method approved by the City Engineer prior to installing an Internal Manhole Seal. After water sandblasting, pressure wash the entire area to remove any loose sand that may have been deposited. The substrate surface must be free of sand, loose debris, latencies, dust, oil, grease or chemical contamination. A blower may be required to completely dry the substrate surface or as recommended by manufacture. Ensure casting and structure surfaces are clean and dry where the primer is intended to adhere. Flex-Seal Utility Sealant or approved equal may require the proper mixing of agents, as recommended by the manufacture's instructions. After allowing for proper drying of primer to occur, sealant may be applied by brush as evenly as possible over the entire chimney area, that includes the frame joint area and the area above the manhole cone including all extensions to the chimney area. The contractor is to furnish the City Engineer two (2) mirrors with extension handles that can be used to inspect sealant application to areas underneath

frame without entry of manhole. These items will become the property of the owner upon completion and at no additional cost of this item. Cost for these items shall be included in the bid items for internal manhole sealing work.

3. The manufacture must in writing certify that each of the contractor's representatives are approved to install item. The proof or certification of training shall be included in the bid items for internal manhole seals.

c. INFI-SHIELD

1. The casting shall be sealed to the structure with an external sealing system. The seal shall be continuous bands, made of high quality EPDM (Ethylene Propylene Diene Monomer) rubber with a minimum thickness of 60 mils. Each unit shall have a 2" wide mastic strip on the top and bottom of the band. The mastic shall be non-hardening butyl rubber sealant, with a minimum thickness of 3/16", and shall seal to the cone/top of the manhole section and over the flange of the casting. (See standard plate No. 310)
2. The external sealing system shall be installed according to the manufacturers recommendations. The external seal shall extend onto the casting and the cone section a minimum of 2".

6. Watermain and Appurtenances

Materials shall conform to the Standard Specifications and to the following:

- a. Watermain shall be polyvinyl chloride (PVC) pressure pipe. PVC watermain shall conform to AWWA C 900 for pipe sizes 4" to 12" and AWWA C 905 for pipe sizes 14" to 24". All pipe shall have a minimum dimension ratio (DR) of 18 corresponding to a working pressure of 150 psi for PVC type 1120 pipe.

The bell of the joint shall consist of an integral wall section with a factory installed, solid cross section elastometric ring, which meets the requirements of ASTM F 477. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C 900 for sizes 4" to 12" and AWWA C 905 for sizes 14" to 24". The pipe shall be manufactured to ductile iron outside dimensions in accordance with AWWA C 900.

Restraints for C 900 and C 905 PVC pipe shall be Ebba Iron Series 2001PV, Uniflange Series 1300C, and 1390C or approved equal. Fittings for the PVC watermain shall be ductile iron.

Trace wire shall be laid with all PVC watermain and shall be #8 copper insulated and rated for underground service. The trace wire shall be connected to all metal fittings, valves, and fire hydrants.

Granular bedding material shall be furnished and installed with the PVC watermain and associated services, as necessary.

- b. Bends shall be 45 degrees or less. Any deflection greater than 45 degrees shall be made with multiple bend sections.
- c. Valves 12" and larger shall be butterfly valves, AWWA C504, Mueller Line Seal or approved equal. Valves smaller than 12" in size shall be resilient wedge valves, Mueller A 2360 Series, American-Darling Series 2500 or approved equal conforming to AWWA C509 standards. All valves shall be installed on-line with accompanying valve boxes. All valves shall close in a clockwise direction. All valves shall be epoxy coated as per AWWA C550.

Valve boxes shall be three piece adjustable screw type boxes, nominal 60" to 90" extension, with a 5 ¼" shaft diameter. Valve boxes shall be provided with extension suitable for the design location and a minimum 6-inch available adjustment after final setting. The word "Water" shall be imprinted on each lid.

All valves shall be fitted with extension rods to within one foot of the finished ground surface.

- d. Hydrants shall be Waterous Pacer WB 67 with a 5 ¼ inch seat diameter. Hydrants shall have a traffic flange with 22" break off section. A spring mounted locator rod shall be attached to each hydrant.
- e. All water service will be minimum 1-inch. All copper service pipe shall be Type K.
- f. The component parts of a tap service installation shall include a corporation stop coupling complete with watermain tap and saddle; a curb stop coupling complete with curb box; and copper service piping extending from the corporation stop to the curb stop coupling. Corporation stops for 1" through 2" services shall be Mueller 300 Ball Type or Ford FB Series Ballcorp. All services shall

be wet tapped. Service saddles shall be all Type 304 stainless steel Smith-Blair 372 TaperSeal service saddles, or approved equal. Curb stops for 1" through 2" service shall be Ford Ball Valve B22 Series or Mueller Oriseal and shall be a Minneapolis pattern valve with thread top. Curb box shall be Minneapolis base, sized to fit the curb stop. Boxes shall have a one and one-quarter (1 ¼) inch upper section and shall be furnished with a stationary rod 66" in length. Boxes shall have a minimum twelve-inch (12") adjustment to eight feet (8') when fully extended. All curb boxes located beneath driveways, shall have Ford Series A lid covers placed over the riser. (See Standard Plate 207)

- g. Water services 2-inches and larger shall be constructed with pipe, fittings, valves and boxes as specified for PVC pipe installation.
- h. Water meter shall be obtained from the City with payment of established fee, and installed in accordance with directions.

7. Street Material

All materials shall be in conformance with Minnesota Department of Transportation Standard Specifications for Construction, 2000 edition and all subsequent revisions (MnDOT) or as modified herein in Appendix C.

V. Testing Requirements

Materials shall be sampled and tested in accordance to the MnDOT schedule of material control, except for as modified below. Utility systems shall be tested in accordance with the standard specifications for watermain, service lines, sanitary sewer and storm sewer as published by the City Engineer Association of Minnesota. The City Engineer shall be notified 24 hours in advance of the specific test.

1. Pipe Trench Compaction:

- a. Standard Proctor Density (ASTM D-698-78): Proctor samples will be obtained within the utility trenches for each type of soil encountered in construction.
- b. Density Test Nuclear (ASTM D-2922): 1 test per lift of backfill, 1 test every 500 feet of pipe installed, minimum 1 test daily when backfilling.
- c. Sand-Cone Method (ASTM D-1556): The City Engineer may at his or her discretion, order density tests by the sand cone method.

2. Embankment Compaction:

- a. Standard Proctor Density (ASTM D-698-78): 1 test per source of material.
- b. Density Test Nuclear (ASTM D-2922): 1 test per lift of embankment, 1 test every 500 feet of roadway fill, 1 test daily when constructing embankment.
- c. Density Test Sand-Cone Method (ASTM D-1556): The City Engineer may, at his or her discretion, order density tests by the sand cone method.

3. Select Granular Borrow

- a. Standard Proctor Density (ASTM D-698-78): 1 test per source of material.
- b. Gradation Test: 1 test per source of material.
- c. Density Test Nuclear (ASTM D-2922): 1 test per lift of embankment, 1 test every 500 feet of roadway fill, 1 test daily when constructing embankment.
- d. Density Test Sand-Cone method (ASTM D-1556): The City Engineer may, at his or her discretion, order density tests by the sand cone method.

4. Concrete Tests

- a. General: When molding cylinders for strength tests, three cylinders are to be made according to ASTM C-31.
- b. Compressive Strength (ASTM C-39): 1 set of 3 for every 1000 l.f. of curb and gutter constructed or 1 set of 3 for every 100 cubic yards of concrete placed or a minimum 1 set of 3 daily when pouring concrete.
- c. Percent Air Test (ASTM C-231): 1 test for every 1000 l.f. of curb and gutter constructed or 1 test for every 100 cubic yards of concrete placed or a minimum 1 test daily when pouring concrete.
- d. Slump Test (ASTM C-143): 1 test for every 1000 l.f. of curb and gutter constructed or 1 test for every 100 cubic yards of concrete placed or a minimum 1 test daily when pouring concrete.

5. Televising

The Developer shall televise all sewer pipe, pipe joints, and service connections. One copy of the televising report and tape shall be submitted to the City for review.

VI. Construction Requirements

1. Sanitary Sewer, Watermain, and Storm Sewer

a. Applicable Specifications

Work shall conform to the Standard Utility Specifications as published by the City Engineers Association of Minnesota, 1999.

2. Storm Sewer

Pipe sewers shall be installed in accordance with CEAM 2621 and MnDOT 2501 and 2503, except as modified by these specifications.

3. Casting Adjustments

All utility castings shall be adjusted as follows:

a. Sewer Manhole:

All sanitary and storm sewer manhole castings shall be in place during the laying of the wear course. The castings shall be adjusted before the mat is laid and shall be not less than one-eighth inch (1/8") nor more than three-eighths inch (3/8") below finished grade.

b. Storm Sewer:

Storm sewer inlet castings shall be adjusted to be 0.1 feet below finished gutter line.

c. Water Valve Boxes:

All water valve boxes shall be adjusted prior to wear course paving and shall be not less than one-eighth (1/8") nor more than three-eighths inch (3/8") below finished grade. Only screw-type adjustments are allowed.

d. Grouting Adjusting Rings:

Whenever adjustment rings are provided, the contractor shall grout rings, place the castings and remove all excess grout on the inside and outside of the manhole by wiping smooth with a gloved hand or similar instrument.

4. Streets

The street shall be constructed in accordance with typical sections shown on City Standard Plates and as specified in Appendix C. The final wear course shall not be constructed until at least one construction season after the base construction is completed.

VII. Storm Water Treatment Basins

1. Storm water conveyance, storage and treatment basins shall be designed in accordance with the City of East Bethel's policy on stormwater drainage in Appendix B. Typical basin construction and outlet structures are shown on the City Standard Plates in Appendix A.

VIII. Miscellaneous

1. Proper notification of improvements shall be given by the Developer or his/her engineer to the responsible governmental agencies, watershed districts, etc. affected by said construction. All necessary permits shall be obtained prior to commencing any work. All special requirements of the responsible agencies shall be complied with.
2. The Developer's contractor shall furnish, erect and maintain signs and barricades as provided in MnDOT 1710 "Barricades and Signs" under the General Conditions to protect the public. The City Engineer shall be notified 24 hours prior to the proposed partial blockage or closure of any street or public right-of-way. No street or public right-of-way shall be closed without the proper approval of the City Engineer.
3. It is the responsibility of the Developer's contractor to protect and leave undisturbed those markers or monuments set for the subdivision of land.
4. The Developer and/or his/her contractor shall immediately repair or replace at his/her own expense any defective workmanship or material of which he/she is notified during the construction period, or within the warranty period, regardless of the approval and acceptance of the work.

5. A plan for the routing of construction traffic shall be submitted to the City Engineer for his/her approval. City streets that are utilized for access or egress to the construction site shall be kept free of dirt and other debris resulting from said construction. Adequate control of dust shall be maintained by the Developer or contractor.
6. The City will require the contractor or Developer to submit a list of materials and respective suppliers as well as all tests of materials.
7. If any material or labor supplied by the contractor or Developer is rejected by the City Engineer or his/her designated representative as defective or unsuitable, then such rejected material shall be promptly removed, disposed of off the job site, and replaced with approved material.
8. All street right-of-ways shall be cleared and grubbed to full width except as specifically directed.
9. The standard ten (10) foot utility and drainage easement adjacent to the street right-of-way shall be cleared and grubbed for the placement of utilities except as specifically directed.
10. Work shall not commence before 7:00 a.m. nor extend beyond 7:00 p.m. Monday through Friday. On Saturdays, the hours will be from 8:00 a.m. to 6:00 p.m. No work is to be done on Sundays. Hours and days of work may be modified based on need.