MUNICIPAL STANDARDS

310 Greenwood Street

Grand Ledge, MI 48837

Ph: (517) 627-2149

cityofgrandledge.com

Contents

Chapter 1, In General

Introduction

These standards provide the infrastructure requirements and specifications for development in the City of Grand Ledge.

Definitions

AASHTO	American Association of State Highway and Transportation Officials
CCDC	The Clinton County Drain Commissioner.
CCRC	The Clinton County Road Commission.
City	The City of Grand Ledge.
City Engineer	The individual(s) or firm named by the City to review and/or inspect a particular development.
City Management	The City Manager or their assigns.
Contractor	The construction company engaged by the developer to make improvements for a development.
Design Engineer	The individual(s) or firm engaged by the developer for a particular development.
Developer	The entity proposing to develop a project in the City.
ECDC	The Eaton County Drain Commissioner.
ECRC	The Eaton County Road Commission.
EGLE	The State of Michigan Department of Environment, Great Lakes, and Energy.
MDOT	The State of Michigan Department of Transportation.
Standards	The Municipal Standards contained herein.
Subdivision Ordinance	City Code Chapter 36 – Subdivisions
Zoning Ordinance	City Code Chapter 46 – Zoning

Regulatory Agencies, Policies, and Codes

Americans with Disabilities Act (ADA) requirements according to the Federal Justice Department, published on ADA.gov.

AASHTO A Policy on Geometric Design of Highways and Roads.

City Code library.municode.com/mi/grand_ledge/codes/code_of_ordinances

EGLE *Instructions and Explanation for Permit Application for Water Supply Systems*, April 2020.

EGLE MiEnviro Portal www.mi.gov/mienviroportal

2015 International Fire Code (IFC), Appendix C - *Hydrant Distribution*

Michigan Manual of Uniform Traffic Control Devices (MMUTCD)

Miss Dig Underground Facility Damage Prevention and Safety Act

Michigan Natural Resources and Environmental Protection Act – 1994 PA 451

Michigan Safe Drinking Water Act 399 of 1976

Phase II Clean Water Act

Recommended Standards for Wastewater Facilities by the Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (10 State Standards) latest edition.

Recommended Standards for Water Works by the Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (10 State Standards) latest edition.

Suggested Practice for Water Works Design, Construction and Operation for Type I Public Water Supplies by Michigan Department of Environmental Quality Water Bureau (now EGLE) February, 2008.

Chapter 2, Administrative Procedures

Site Plan Review Required

Site plans are reviewed to ensure that proposed construction projects comply with the Zoning Ordinance (building setbacks, parking lot dimensions, required landscaping, etc.) and all other applicable ordinances and construction design standards. In most cases, site plan review is only required for projects that increase the amount of impervious surface on a particular site and for new buildings and building additions, regardless of whether they will increase the imperviousness of the site. Renovations and modifications to an existing building do not require site plan review but do require review and approval of building and architectural plans by the Building Department. Building Department plan review is a separate and distinct process from site plan review and is conducted to ensure that new construction and modifications to existing buildings will comply with the provisions of the Michigan Building Code.

The level of detail that must be provided on a site plan and the approval process varies depending on the use of a site and whether the proposed changes will result in an expansion of a use or an increase in impervious surface:

***** *Zoning Administrator Review* – Review and approval of a basic plot plan is required by the Zoning Administrator prior to issuance of a building permit for:

- New single or two-family residential dwellings and accessory structures or additions thereto.
- Building additions and accessory structures on all parcels of land which do not result in the expansion of a use and do not increase the amount of impervious surface on a site.
- A change of use to an existing building in any zoning district, other than the Central Business District, to determine if there is adequate parking on the site to fulfill the Zoning Ordinance requirement for the proposed use.

* *Administrative Site Plan Review* – Review and approval of a site plan that complies with the requirements of the Zoning Ordinance is required for the reconstruction of a parking lot, the construction of a new parking lot, and for a building addition or accessory structure that does not result in an expansion of a use. Site plans for these types of projects are reviewed and approved by the Zoning Administrator, City Engineer, Department of Public Services, and Fire Department.

* *Planning Commission Site Plan Review* – Review and approval of a site plan that meets the requirements of the Zoning Ordinance is required by the Planning Commission for all new development and site changes not listed in the preceding paragraphs of this document. In some cases, such as new site condominium developments, site plans must also be approved by the City Council, following review and recommendation by the Planning Commission.

The Zoning Administrator has the discretion to require Planning Commission review and approval of a site plan for any project that would otherwise be approved administratively.

Subdivision plats will be processed in accordance with the requirements and procedures set forth in the Subdivision Ordinance.

The Zoning and Site Plan Approval Process:

- Verify that the proposed development is permitted in the existing zoning district or if a rezoning, Special Use Permit, or variance will be necessary.

- In most cases, if a proposed development is going to require rezoning, a Special Use Permit, or variance, do not submit the site plan or plat until the necessary approval has been granted.

- Once proper zoning is confirmed and/or any Special Use Permit or variance has been approved, submit a Preliminary Plat in accordance with the procedures outlined in Subdivision Ordinance, or a site plan in accordance with the Zoning Ordinance.

- When the site plan is submitted, the Zoning Administrator will coordinate internal distribution and reviews. The applicant will be responsible for non-City reviews (i.e., MDOT, CCDC or ECDC, Tri County Regional Planning Commission, or CCRC or ECRC…)

- After the reviews are complete and any necessary revisions have been made, the Zoning Administrator will place the site plan or plat on the Planning Commissioner meeting agenda for review and approval. Plats and, in some cases, site plans will also require approval by the City Council.

- Once all of the approvals have been granted, the Zoning Administrator will issue a letter of approval to the applicant, referencing the date of the approvals, the date on the site plan, and the name of the design firm/professional.

Basic Plan Requirements

All site plans must be prepared, signed, and sealed by a professional civil engineer licensed in the State of Michigan.

The applicant shall submit one (1) electronic copy of the entire site plan set and all supporting documents in PDF format and twenty (20) hard copies of the entire site plan set printed on 24-inch by 36-inch sheets, containing the information listed in of the Zoning Ordinance, which includes but is not limited to the following:

1. **Cover Sheet** showing the entire development, zoning, development name, developer name and contact information, engineer and contact information, relationship to existing streets, distance to the river, and a location map inset. If the development is to be phased, indicate the individual phases including the location, acreage, and intended future development (i.e., number of residential units), if known.

2. **Existing Conditions Sheet(s)** with a minimum scale of 1-inch equals 100 feet and 1-foot contours, property lines, adjacent conditions within 50 feet, existing utilities and elevations, required setbacks, current ownerships, and relationship to the 100-year flood plain.

3. **Overall Grading Plan** showing existing and proposed grades, drainage patterns, and detention.

4. **Road and Utility Plan and Profiles Sheet(s)** with a minimum scale of 1-inch equals 40 feet horizontal and 1-inch equals 4 feet vertical. Indicate road centerline with stationing. All proposed road, sanitary sewer, watermain, and storm sewer must be shown on a plan and profile sheet.

5. **Detail Sheets** showing proposed road cross-sections, utility details, detention basin detail, sidewalks, curbs, trenches, and traffic control.

6. **Soil Erosion and Sedimentation Control** per CCDC or ECDC requirements.

The plan details required for subdivision plats are listed in the Subdivision Ordinance.

Phased Development Projects

If development is to occur in phases, the following shall apply:

1. The entire development shall be shown on the site plan with the phases clearly delineated.

2. The site plan for the development shall expire two (2) years from date of approval for those phases that are not completed or actively under construction and proceeding meaningfully towards completion. The site plan approval may be extended by the Planning Commission for periods of two (2) additional years until the entire development is complete.

3. The developer shall execute a public infrastructure agreement with the City and provide the financial guarantee to ensure completion of the required infrastructure for the entire development prior to the commencement of any construction.

4. The City may require the installation of temporary infrastructure, including street connections and turn-arounds for emergency vehicle circulation and access. The City may also require the installation of utilities, sidewalks, lighting, and landscaping beyond the limits of the phase to be developed, if determined to be necessary for safety reasons or to mitigate any negative impacts of the proposed development on surrounding properties.

5. All water and sewer fees shall be paid in full for a project that is located on a single parcel of land, prior to issuance of the first building permit for any construction. This shall not apply to single condominium units that are located on separate parcels of land in a site condominium development but shall apply to condominium units that are located on a single parcel of land that may be owned collectively by the owners of the condominium units located thereon.

Public Infrastructure Agreements

Public Infrastructure Agreements will be required for projects impacting roads, sidewalks, pedestrian paths, sanitary sewers, water distribution and stormwater systems, parks, parking lots, or any other City property or infrastructure.

Payment of Fees, Deposits, Bonds, and Escrow Payments

Payment of fees, deposits, bonds, and escrow payments will be required prior to scheduling a preconstruction meeting or commencement of any construction activities. These include but are not limited

to; inspection escrow, permit fees, fees for review of plans or other documents by the City Engineer, and construction completion performance guarantee.

Work in the Right-of-Way

A right-of-way permit is required for any work within a public right-of-way including that which involves utilities, driveways, trees, sidewalks, and earthwork.

Easements

The developer is responsible for obtaining all necessary easements, including, but not necessarily limited to, telecommunication, electric service, and street lighting easements from the servicing entities and shall provide documentation thereof to the City. Easements required for storm drainage, sanitary sewer, water facilities, and street connections, sidewalks, or non-motorized pathways shall be determined by City Management and/or the City Engineer.

The City may require easements to provide for the extension of utility services and street connections onto adjoining parcels of land. The developer shall also provide access easements to parks, open space, and other common areas within a site as necessary.

Special Assessment Districts

Special assessment districts are required for developments that include public street lighting and storm water management, collection, treatment, detention, and disposal. The special assessment procedures can be found in City Code Chapter 32 – Special Assessment Procedure. Special assessment districts must be complete prior to final acceptance of the improvements related thereto.

Chapter 3, Design Standards

The requirements of this Section may be waived or modified if approved by the City Engineer and City Management, upon determining that said waiver or modification 1) will result in an equally effective or improved public infrastructure system, 2) is necessary based upon a unique feature of the site, 3) will preserve or enhance the natural environment, or 4) will improve operation and maintenance functions.

Road Design

Residential rights-of-way must be a minimum of sixty-six (66) feet unless a reduced width is approved by the City Engineer and City Management. Note that the MDOT, and the CCRC or ECRC requirements apply to rights-of-way under their respective jurisdictions.

Road Cross Section requirements are as follows:

- Road section is thirty-one (31) feet from back of curb to back of curb.
- Curb and gutter shall be MDOT F4 concrete.
- Road sub-base is a minimum of eight (8) inches of MDOT Class II granular material compacted to ninety-five percent (95%) maximum density. Sub-grade must be proof rolled prior to sub-base placement, soft sub-grade must be removed and replaced with Class II compacted material.
- Base is a minimum of eight (8) inches of MDOT 22A compacted to ninety-five percent (95%) maximum density.
- Surface is MDOT 13A Hot Mix Asphalt (HMA).
    - Levelling course two and one-half (2½) inches (275 lbs./square yard).
    - Wearing course one and one-half (1½) inches (165 lbs./square yard).
- Concrete material is MDOT P1.
- Detectable warning plates shall be East Jordan Iron Works (EJIW) Duralast Cast Iron with black asphaltic dip.
- Streets shall be designed according to the latest edition of *AASHTO A Policy on Geometric Design of Highways and Roads.*
- Intersections shall be designed to be perpendicular with curb radii a minimum of 25 feet.
- Streets shall be designed with a maximum grade of six percent (6%) and a minimum grade of one-half percent (0.5%). The transverse grade will be two percent (2%) from the centerline crown to the gutter pan.

- Dead end streets may not exceed eight hundred (800) feet and must be constructed with a turn-around. A cul-de-sac with a minimum outside curb radius of sixty feet (60) feet and an interior island with rolled curb may be approved based on future development possibilities.

- Street signs must be provided according to the City standard and placed next to any STOP sign. Traffic control signs shall meet the latest version of the MMUTCD. Intersections shall be striped with stop bars and cross walks.

- Street lighting shall be provided. The developer and/or design engineer shall obtain a street lighting plan from the electric utility subject to the approval of the Zoning Administrator and City Engineer.

- All drive approaches between the curb and sidewalk shall be concrete, six (6) inches for residential and eight (8) inches for commercial. The slope shall be not less than one percent (1%) nor more than ten percent (10%).

- Curb cuts may be saw cut with a one-half (½) inch maximum lip.

- Driveways on single family residential parcels of land and driveways used to access a single condominium unit, whether attached or detached, shall not exceed a width of twenty (20) feet within the road right-of-way, measured at the edge of the sidewalk, nearest to the street.

Sidewalks and Non-Motorized Pathways

Sidewalks shall be constructed parallel to and along both sides of all City, county, and state streets and highways except where non-motorized pathways are required along routes designated as such by the City Code or the Master Plan. Sidewalks and non-motorized pathways must be constructed in compliance with the following standards:

- In general, sidewalks shall be a minimum of five (5) feet wide and nonmotorized pathways shall be a minimum of seven (7) feet wide, unless an alternate width is required by City Management. The exact width shall be determined based upon projected volumes of pedestrian traffic or unique features of the physical environment such as uneven topography.

- Non-motorized pathways must comply with AASHTO Guide for the Planning, Design, and Operation of Bicycle Facilities and Design for H20 Loading.

- Sidewalks and non-motorized pathways shall be constructed in accordance with the following standards:

    1. Shall be constructed of concrete that is at least four (4) inches thick, six (6) inches thick at the intersection of all driveways (eight (8) inches at commercial drives), on a four (4) inch sand base which may be increased up to eight (8) inches if deemed necessary by the City Engineer.

    2. Shall be placed one (1) foot from the property lines along all public streets.

    3. Shall comply with the ADA.

4. Longitudinal slopes may not exceed five percent (5%), transverse slopes shall slope to the street with a slope of one percent)1%) to two percent (2%).

5. Cross slopes shall be one-half percent (½%)minimum, two percent (2%) maximum.

6. The nominal grade shall be three percent (3%) above the existing curb, assuming the existing curb height is six (6) inches in height. Where a curb does not exist, or where the existing curb is not six (6) inches in height, the grade must be approved by the City Engineer.

7. Where practical, sidewalks and non-motorized pathways shall be sloped toward the abutting street. In all cases, however, adequate drainage must be provided.

- All ramps shall be installed prior to any building construction. Sidewalk or pathways, as required, shall be installed as buildings are constructed and must be completed before issuance of a permanent certificate of occupancy can be issued for the site upon which the building is located.

- Sidewalk ramps must be constructed to MDOT Standard Detail R-28-J

- Cast iron detection plates are required in accordance with specifications provided by the City Engineer.

- Upon written request by the proprietor, the City Council may waive or modify the installation of sidewalk or non-motorized pathways, after review and recommendation by City Management, where it can be demonstrated that there is a practical difficulty that makes installation unreasonably difficulty or where it would not serve a purpose based upon the motorized and pedestrian transportation system in the area. The City Council may, however, require alternative non-motorized improvements. MDOT, state, and federal law requirements may not be waived.

- See Appendix 1 for Typical Road Cross Section.

- See Appendix 2 for Typical Driveway Detail.

Streetlights

Lighting is required along all streets whether public or private.

A street lighting plan from the servicing utility, including the light fixture details, shall be submitted by the proprietor and shall be subject to the review and approval by the Zoning Administrator and City Engineer.

In the case of a subdivision plat, site condominium development, or other development that involves the installation or modification of public streets, the developer shall petition the City for a street lighting special assessment district which shall be established prior to acceptance of the streets by City.

Underground Wiring

All distribution lines and wiring for telephone/telecommunication service, electric service, and streetlights shall be located entirely underground, and conduits or cables shall be placed within private easements

provided to such service companies by the proprietor or within dedicated rights-of-way. Drainage and underground utility installations which traverse privately-owned property shall be protected by easements.

Telephone and electrical facilities placed in dedicated rights-of-way shall be planned so as not to conflict with other underground utilities and shall be constructed in accordance with standards of construction approved by the State of Michigan Public Service Commission or its successor in function.

The City Council, upon recommendation of City Management, may waive the requirement for underground wiring based upon a determination, due to the size of the area and the existence of above-ground utilities on surrounding properties, that no public purpose would be served by imposing this requirement.

Sanitary Sewer Design

Plans and specifications shall be prepared by a professional engineer licensed in the State of Michigan. Design of sewers must be in accordance with the *Recommended Standards for Wastewater Facilities by the Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers* (10 state standards) latest edition.

Plan and profile(s) sheets must be twenty-four (24) inches by thirty-six (36) inches, scale one (1) inch equals forty (40) feet horizontal, one (1) inch equals four (4) feet vertical. Profiles shall show existing and proposed elevations in USGS Datum, NAVD 88. Plans must show proposed first floor elevations in plain view or table format and verify basement service.

The design engineer must submit a Basis of Design for review and use in obtaining a Part 41 permit. The Basis of Design must include all the information necessary for the City to input into the EGLE MiEnviro web site. In addition, the design engineer must submit a proposed schedule of construction including the relationship to the installation of other utilities, road construction, and phasing.

The following design details must be included in the drawings and/or specifications:

- Trench detail indicating standard slopes, bedding and backfill.
- Sanitary sewer pipe – solid wall PVC, SDR 26 with push on joints.
- Leads – match main line pipe, six (6) inch minimum size.
- Eight (8) inches to ten (10) inch, wyes, twelve (12) inch and larger, tees.
- Manholes – ASTM C478, minimum forty-eight (48) inch diameter, integral base, premium joints, plastic coated steel steps. Spacing not to exceed five hundred (500) feet. Place at all bends and change of grade. Do not place in the wheel travel path of a road.
- Manhole connectors, resilient joint, stainless-steel bands, KOR-N-SEAL or equivalent.
- Castings, EJIW 1040.
- Adjustment, concrete grade rings. Bricks are not allowed. Plaster coat interior.

- Bedding to one (1) foot above pipe, MDOT CL II granular compacted to ninety-five percent (95%) maximum density. Excavate and shape for bells.

- Trench backfill under or within a forty-five (45) degree slope of any surface improvement, MDOT CL II granular compacted to ninety-five percent (95%) maximum density.

- Lead markers, four (4) inches by four (4) inches treated lumber with a minimum ten (10) penny nail for location purposes.

Refer to Appendix 3 for the City standard specifications for sanitary sewer systems.

Water Distribution Design

Plans and specifications shall be prepared by a professional engineer licensed in the State of Michigan. Design of water distribution systems must be according to the *Recommended Standards for Water Works by the Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers* (10 State Standards) latest edition and *Suggested Practice for Water Works Design, Construction and Operation for Type I Public Water Supplies* by Michigan Department of Environmental Quality Water Bureau (now EGLE) February, 2008.

Plan and profile(s) sheets must be twenty-four (24) inch by thirty-six (36) inch, scale one (1) inch equals forty (40) feet horizontal, one (1) inch equals four (4) feet vertical. Profiles shall show existing and proposed elevations in USGS Datum, NAVD 88.

The design engineer must submit a Basis of Design for review and use in obtaining a permit under Act 399.

After the review is complete, submit a completed permit application for the City's signature. For instruction, see EGLE's *Instructions and Explanation for Permit Application for Water Supply Systems*, April 2020. In addition, the design engineer must submit a proposed schedule of construction including the relationship to the installation of other utilities, road construction, and phasing.

The following design details must be included in the drawings and/or specifications:

- Trench detail indicating depth of cover bedding and backfill. Minimum depth of bury is five (5) feet six (6) inches.

- Main-line pipe – Class 52 ductile iron with continuity wedges. The design shall be looped to avoid dead ends except for planned future extensions. Future extensions must include a tee, valve, and hydrant.

- Valve locations, spacing not to exceed five-hundred (500) feet, minimum two (2) for each tee and three (3) for each cross.

- Fire hydrant locations, minimum three (3) feet behind curb, including valve, Storz connection facing the street. Spacing shall follow the *2015 International Fire Code (IFC),* Appendix C - *Hydrant Distribution*, two-thousand (2,000) gallon per minute minimum residential flow requirement or latest

adopted standard. Threads must meet City standard. Weep holes shall be left open, installation shall include geotextile and pea stone surrounding the hydrant.

- Service lead locations.

Materials shall be as follows:

- Pipe: American made, ductile iron, Class 52, cement mortar lined, continuity wedges, and polyethylene encasement.
- Fittings: American made, ductile iron, cement mortar lined, restrained joints at bends. Thrust blocks are not allowed.
- Valves: Resilient wedge, EJIW, non-rising stem, open left.
- Valves Boxes: EJIW 8650 with No.6 Base.
- Service Leads: Type K copper, minimum one (1) inch diameter.
- Corporation Stops: Mueller H-15008 or Ford. Use service clamps for services over one and one-half (1½) inch.
- Curb Stops: Mueller H-15155 or Ford.
- Curb Boxes: Mueller, extension type, Minneapolis pattern.
- Hydrants: EJIW, six (6) inch connection. The hydrant must have a six (6) inch valve on the inlet connection. Three (3) nozzles – two (2) two and one-half (2½) inch NFPA threads and one (1) four (4) inch Stortz style pumper connection. Leave weep holes open.
- The inlet connection must be a restrained joint.

Refer to Appendix 4 for the City standard specifications for water utility systems.

Stormwater Management Design

Stormwater management systems serving sites one (1) acre or more in size must meet the requirements of Phase II of the Clean Water Act. The design shall also comply with the Guidance Manual found at www.epa.gov.

For all sites, the design engineer shall submit a Basis of Design for review indicating flows, pipe sizes and slopes, detention calculations (if required), and stormwater treatment methods. Design must avoid surcharging of pipes in a ten (10) year storm and velocities may not exceed ten (10) feet per second, minimum three (3) feet per second.

For sites over one (1) acre, maintenance agreements and bonds are required per the City Code. For any publicly owned and operated systems, a special assessment district is required.

Plans and specifications shall be prepared by a professional engineer licensed in the State of Michigan.

Plans and specifications shall include plan and profile drawings for all pipes, and plan and cross sections for detention, overall grading, and a planting plan. Plan and profile(s) sheets must be twenty-four (24) inch by thirty-six (36) inch, scale one (1) inch equals forty (40) feet horizontal, one (1) inch equals four (4) feet vertical.

The grading plan must include the proposal first floor elevation of each building and the proposed grading at one (1) foot contour elevations within twenty (20) feet of the site, to be certified by a licensed land surveyor upon project completion.

Details must include pipe trench bedding details, sump pump leads, manholes, catch basins, inlet and outlet details, and detention basins.

- Manholes – ASTM C478, minimum forty-eight (48) inch diameter, integral base, premium joints, plastic coated steel steps. Spacing not to exceed five-hundred (500) feet. Place at all bends and change of grade and catch basin connections.

- Connections shall be resilient joint, stainless-steel bands, KOR-N-SEAL or equivalent.

- Sump pump connections shall be six (6) inches in diameter, core and boot, PVC pipe SDR 26. A minimum of two (2) inches in diameter is required.

- Catch basins – ASTM C478, a minimum of forty-eight (48) inches in diameter with a minimum lead size of twelve (12) inches diameter and must be spaced so that storm water flow in the gutter does not exceed three-hundred (300) feet.

- Castings – Manholes EJIW 1040, catch basins, EJIW stamped "Dump no Waste". Use concrete grade rings to adjust castings, bricks are not allowed.

- Storm sewer pipe in road rights-of-way must be MDOT Class IV concrete.

- Grading plans must be designed to meet Phase II of the Clean Water Act and ECDC or CCDC Soil Erosion Control requirements. Slopes must not exceed three and one-half (3½) horizontal to one (1) vertical. Plans must utilize existing grades and protect existing topography whenever possible. Drainage to adjacent properties must be limited to existing flows. Drainage may not be increased or concentrated. Drainage plans must show flow patterns that will need to be maintained after the development is complete.

Lawns

Prior to issuance of a certificate of occupancy, the building site, including the area within the right-of-way, must be seeded to establish a thick, healthy lawn, free of weeds and sufficient to prevent bare spots and to stabilize the soil in accordance with the Soil Erosion Control Program of the County of jurisdiction. No other ground cover beyond standard lawn grass produced by seeding is permitted within the right-of-way, with the exception of the mulch bed surrounding street trees as required by these standards. Sod may be used in lieu of seeding on the site, outside of the public right-of-way.

Street Trees

Planting Design Guidelines

All trees shall be single stem unless otherwise specified in the construction documents and specifications.

- Species Selection

  The planting of monocultures trees should be avoided in order to reduce the chances of mass die-off in the event of disease that affects certain species. No tree shall be planted next to a tree of the same of species and each linear block shall be planted with trees from at least four (4) different genera.

  A list of tree species that are acceptable for planting along City streets is included herein as Appendix 5. Other species may be acceptable but must be approved by the City prior to planting. Trees that do not lose their foliage during the winter months (evergreen trees) are not acceptable street trees as they obstruct vision and restrict sunlight from melting ice on pavement. Factors such as power line location, curb to sidewalk distance, soil conditions, etc. must be considered when selecting species for planting. A tree planting plan must be submitted to the City for review showing spacing, tree species and starting sizes.

- Planting Site Size

  Planting site size and soil conditions as well as aesthetics are factors in tree species selection. It is the intent of this specification to minimize the damage caused by maturing trees to sidewalks and curbing by tree roots. Generally, trees that are shorter at maturity have small trunk and root diameters than trees that are larger at maturity. Trees that typically have surface rooting tendencies like bald cypress and zelkova are not approved street tree species.

Distance from Curb to Walk	Tree Height at Maturity
Less than five (5) feet	None
Five (5) to seven (7) feet	Less than thirty (30) feet
Seven (7) to ten (10) feet	Less than forty-five (45) feet
Over ten (10) feet	Any

- Lines of Sight

  Maintaining adequate lines of sight is important for safe pedestrian and vehicular usage of the right-of-way as well in assisting customers in locating businesses. The following clear zone guidelines should be considered in all tree planting plans.

  Intersections:

  Twenty-five (25) miles per hour – thirty (30) feet from the curb line intersection extended

Thirty-five (35) miles per hour – forty (40) feet from the curb line intersection extended

Forty-five (45) miles per hour or more – forty (40) or more feet from the curb line intersection extended

Other situations and objects where lines of sight should be considered in tree planting are driveways, fire hydrants, traffic signs of various types, and business signs.

- Tree Planting Periods

  There are two (2) tree planting periods per year: April 15 to May 15 and September 1 to December 1. Refer to Appendix 6 for the MiDNR IC4108-1 Tree Maintenance Guidelines.

- Tree Size Class

  As a general rule, street trees shall have a minimum caliper (diameter six (6) inches above root ball) starting size in accordance with the List of Approved Street Trees and Minimum Planting Sizes (found in Appendix 5). Deviations from this size class must be approved by the City in writing prior to tree selection and planting.

- Number of Trees

  A minimum of one (1) street tree per parcel is required. Additional street trees are required as follows:

  1. Corner lots shall have one (1) street tree along each road frontage.

  2. Two (2) street trees are required along road frontages where the lot line is one-hundred fifty (150) feet or more in length.

  3. Trees shall be separated by at least fifty (50) feet but not more than seventy-five (75) feet.

- Individual Tree Selection

  Tree selection shall take place at the tree nursery. The acceptability of trees is the sole discretion of the City. Trees shall conform with all standards for nursery stock as published by the American National Standards Institute (ANSI most current) unless otherwise agreed to by the City in writing. The overall form of the tree shall be typical of the species. The leaf size and color shall be typical of a mature tree of the species. Trees shall be free of insect, disease, and other pests. Tree trunks shall be free of abrasions and/or missing bark. Tree balls shall be solid and symmetrical and be free of dents, and/or loose soil areas.

- Tree Planting Specification

  The tree planting specifications are shown on Standard Tree Planting Detail MiDNR IC4108 (most current). The acceptability of the contractors planting technique rests solely with the City. Any deviation from the tree planting specification must be approved in writing by the City prior to

planting of trees. Trees that are not planted in accordance with the specifications shall be identified by the City and shall be replanted in accordance with the planting specification at the contractor's expense. Native species are encouraged.

- Tree Warranty Period

  The developer will be responsible for ensuring that the street trees are alive and healthy for a period of 2 (two) years from the date of planting. Upon inspection by the City at the end of the two (2) year period, if the trees are found to be dead or in an unhealthy state to the extent that they are likely to die, the developer shall be responsible for replacing the trees during the next planting period as specified in this document, after written notification by the City. The replacement trees are subject to the same requirements, inspections, and replacement time frames as the original trees. If there is a dispute between the City and the developer as to the condition of the trees, the developer shall be responsible for providing documentation from an arborist certifying that the trees are in a healthy state of growth.

  The trees shall be warranted by the contractor for a period of two (2) calendar years from the date of acceptance by the City. The acceptability of the trees is determined solely by the City. If at any time during the warranty period, the City determines the trees to be in unacceptable health the contractor shall replace those trees during the next planting period free of additional charges and the two (2) year warranty period for the replacement trees shall start.

  At the end of the warranty period, the trees shall be inspected by the City for acceptance. The tree leaves should be of a color and size typical of established trees of the species. The twigs of the tree shall show current year's growth to be typical of field grown trees prior to transplanting. The limbs and trunk of the tree shall have undamaged bark and shall be free of boring and/or scale type insects. The twigs, trunk, and branches shall also be free of damaging fungi or other pests. The root system of the tree shall have undamaged bark and shall be free of boring insects and damaging fungi or other pests. Trees that are found to be in unacceptable health/condition shall be replaced by the contractor under the warranty clause.

- Tree Maintenance Checklist

  Attached as Appendix 6 are the MIDNR IC4108-1 Tree Maintenance Guidelines (MINIMUM) including a list of suggested maintenance activities for the contractor which will help ensure the acceptability of trees at the end of the warranty period, along with a Tree Planting Detail.

- Attached as Appendix 5 is the list of City approved street trees.

Chapter 4, Construction

Pre and Post Construction Requirements and Procedures

A pre-construction conference is required prior to the start of any construction. Prior to scheduling the pre-construction conference, the developer or contractor must provide:

1. Executed Public Infrastructure Agreement
2. Easements
3. Copies of approved plan sets
4. Satisfactory Insurance Policy with the City names as "Additional Insured"
5. Maintenance Agreements
6. Special assessment district documentation
7. Construction schedule showing any phases
8. List and schedule of submittals
9. After-hours contact information for contractor and foreman
10. Traffic control and staging plan

The pre-construction conference will include:

1. City representatives
2. City Engineer and/or inspector
3. Developer
4. Developer's design engineer
5. Developer's contractor
6. Invitees may include: MDOT, ECRC or CCRC, ECDC or CCDC, and utilities, as appropriate.

Construction may not begin until this conference has taken place, permits and traffic control systems are in place, and required deposits have been received. Individual utilities may not be installed until all plans and permits have been approved. Allow fourteen (14) days for review.

The contractor must have a foreman or superintendent on site at all times while work is being conducted. This individual must have decision making authority. The contractor must provide an after-hours contact who will answer the phone and respond to emergencies twenty-four (24) hours a day.

The City will provide construction inspection to be reimbursed per the Public Infrastructure Agreement. The contractor must provide access for and follow the direction of this City provided inspector.

The City will arrange for geotechnical testing according to the following schedule:

Material	Test Guide	Frequency
Subgrade	Density	One (1) test per two-hundred fifty (250) feet per width of twenty-seven (27) feet or less
Subbase	Density	One (1) test per two-hundred fifty (250) feet per width of twenty-seven (27) feet or less
Aggregate Base	Density	One (1) test per two-hundred fifty (250) feet per width of twenty-seven (27) feet or less
HMA Mixtures	Density	One (1) test per four-hundred (400) feet per width of twenty-seven (27) feet or less
Trench Backfill	Density	One (1) test per two-hundred (200) cubic yards of material
Concrete Curb & Gutter	Cylinders Air Slump	One (1) set of three (3) cylinders sampled and tested by certified concrete technician for every thirty (30) cubic yards placed, each day
Concrete Sidewalk/ Driveway	Cylinders Air Slump	One (1) set of three (3) cylinders sampled and tested by certified concrete technician for every thirty (30) cubic yards placed, each day

At the City's discretion, the testing frequency may be increased to achieve compliance. The testing will be reimbursed per the Public Infrastructure Agreement.

Sanitary sewers must pass a low-pressure air test, mandrel test, and televising inspections prior to acceptance.

Storm sewers must pass a televising inspection prior to acceptance.

Water mains must be pressure tested, flushed, chlorinated, and pass two (2) consecutive bacteriological tests prior to acceptance.

The final grade, all surface improvements, flow channels, and finishes must be visually inspected (walked) by the City inspector, contractor, and developer prior to acceptance. (This walk must include a "punch list" created and distributed by the contractor.) The contractor must also get a final SESC inspection from the ECDC or CCDC as applicable.

Pre and Post Construction Surveys

Prior to the start of construction, survey stakes must be placed at the corners of the proposed building to be constructed under the approved permit. A survey stake identifying the first finished floor elevations shall also be required.

For single and two-family homes and accessory structures, the City may require a post-construction survey for any new construction, prior to issuance of a certificate of occupancy, if there is reasonable cause to suspect that it may not comply with the approved plan(s).

For all other construction, a post-construction survey prepared by a licensed land surveyor or civil engineer shall be submitted to the City within thirty (30) calendar days from the date of project completion and prior to issuance of a final certificate of occupancy:

Post construction surveys shall include the following information:

1. First floor finished elevations.

2. Finished grades at all building corners and at all corners of the property.

3. Topographic contours on and within twenty (20) feet of the site at two (2) foot intervals, referenced to a USGS or NGVD benchmark.

If it is determined that the finished elevations of the building or the grading of the site is not consistent with the approved grading and drainage plans, all drainage control systems deemed necessary by the City Engineer shall be installed to ensure that run-off from the site does not negatively impact adjoining parcels or infrastructure facilities. A final certificate of occupancy shall not be issued until the site has been inspected and found to be acceptable by the City Engineer.

Record drawings must be provided in AutoCAD and PDF format and include any changes from the design drawings, surveyed pipe inverts, surveyed water, sanitary and storm lead locations, and elevations.

See Appendix 7 for Digital Submission Requirements.

APPENDICES

Appendix 1 – Typical Road Cross Section

Appendix 2 – Typical Driveway Detail

Appendix 3 – Sanitary Sewer System Specifications

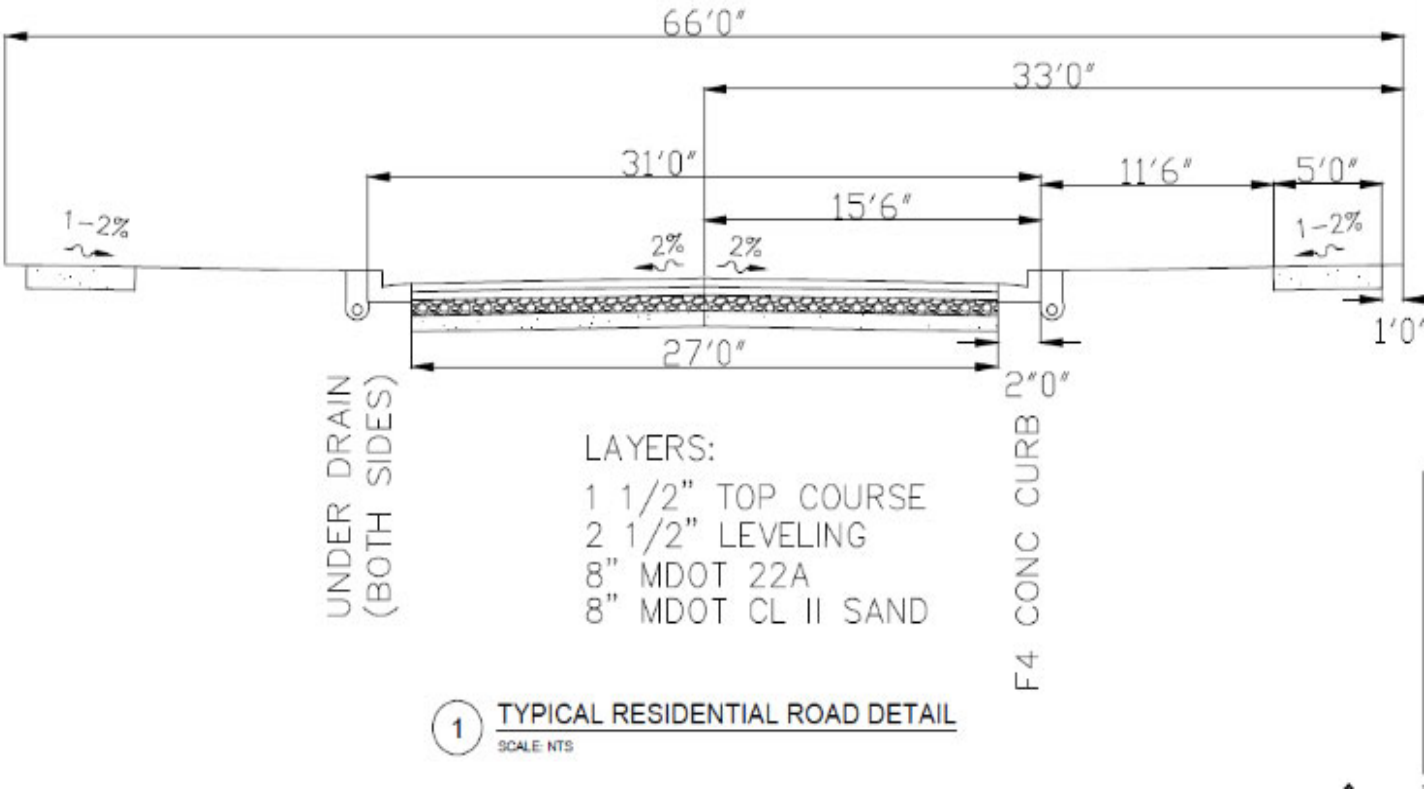
Appendix 4 – Water Utility System Specifications

Appendix 5 – List of Approved Street Trees

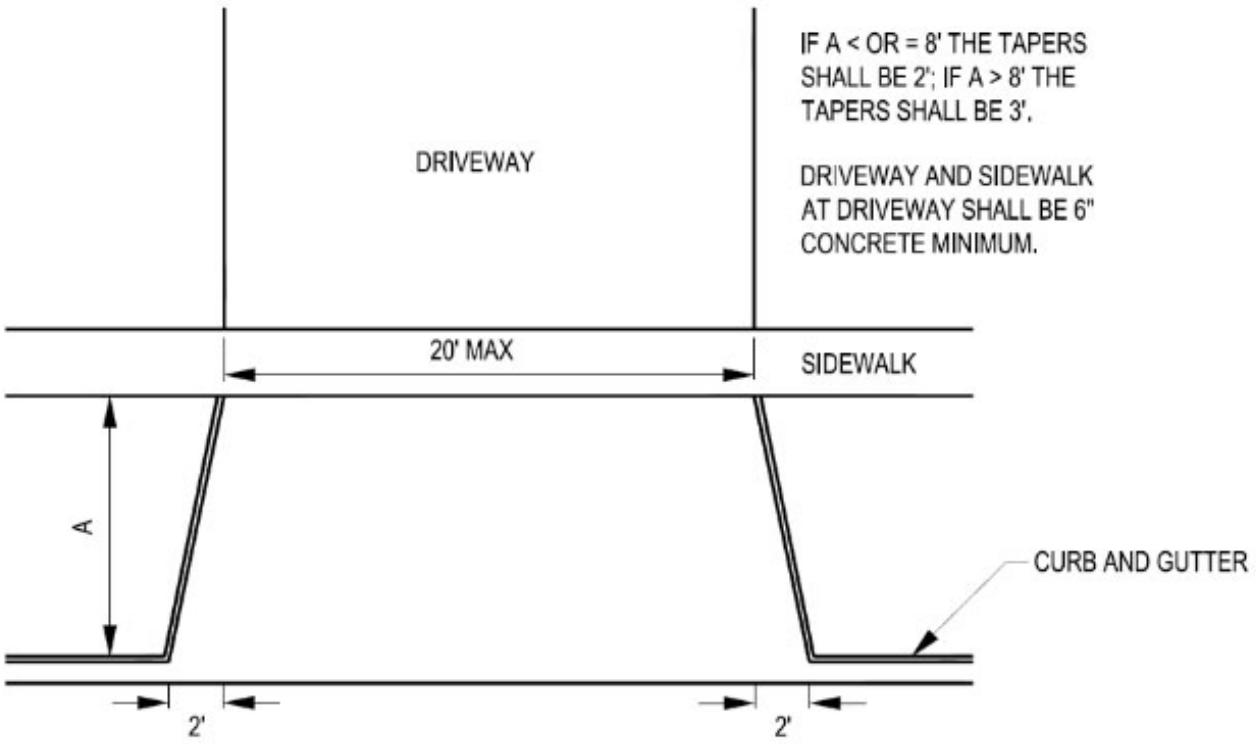
Appendix 6 – Michigan Department of Natural Resources IC4108-1 Tree Maintenance Guidelines & Tree Planting Detail

Appendix 7 – Digital Submission Requirements

Appendix 1 – Typical Road Detail



Appendix 2 – Typical Driveway Detail



TYPICAL CURB BREAKS

NO SCALE

Appendix 3 – Sanitary Sewer System Specifications

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the furnishing and installation of a sanitary sewer system.

B. Related Sections include the following:

1. Division 2 Section "Excavating, Backfilling and Compacting for Utilities."

1.3 REFERENCES

A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:

1. ASTM Standard Specifications:
   a. A48 – Gray Iron Castings.
   b. A536 – Ductile Iron Castings.
   c. A746 – Ductile Iron Gravity Sewer Pipe.
   d. C14 – Concrete Sewer, Storm Drain, and Culvert Pipe.
   e. C76 – Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
   f. C443 – Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
   g. C478 – Precast Concrete Manhole Sections.
   h. C923 – Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.
   i. D1785 – Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
   j. D2239 – Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
   k. D2241 – Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series).
   l. D3034 – Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
   m. D3035 – Polyethylene (PE) Pl Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.
   n. D3212 – Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
   o. D4396 – Rigid Poly (Vinyl Chloride) (PVC) and Related Plastic Compounds for Non-pressure Piping Products.
   p. F679 – Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
   q. F794 – Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
   r. F949 – Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings.
2. ASTM Standards:
   a. C497 – Method of Testing Concrete Pipe, Sections, or Tile.
   b. C822 – Definitions of Terms Relating to Concrete Pipe and Related Products.
   c. C924 – Practice for Testing Concrete Sewer Lines by Low-Pressure Air Test Method.
   d. C969 – Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Pipe Sewer Lines.
   e. C1103 – Practice for Joint Acceptance Testing of Installed Precast Pipe Sewer Lines.
   f. D2321 – Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.

g. D3839 – Practice for Underground Installation of Flexible Reinforced Thermosetting Resin Pipe and Reinforced Plastic Mortar Pipe.
h. F402 – Practice for Safe Handling of Solvent Cements and Primers Used for Joining Thermoplastic Pipe and Fittings.
i. F1417 – Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.

3. ANSI/AWWA:
   a. A21.4 – Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water.
   b. C111/A21.11 – Rubber Gasket Joints for Ductile Iron Pressure Pipe Fittings.
4. NASSCO – National Association of Sewer Service Companies: Recommended Specification for Sewer Collection System Rehabilitation.
5. MDOT:
   a. 2013 Standard Specifications for Construction.
   b. Standard Plans

1.4 SUBMITTALS

A. Product Data:
   1. Pipe Materials.
   2. Manholes.
   3. Mandrel
B. Certificates: Submit Manufacturers' sworn statements that the pipe materials furnished comply with this Specification.

1.5 Quality Assurance

A. Fabrication and Installation Personnel Qualifications:
   1. Trained and experienced in the fabrication and installation of the materials and equipment.
   2. Knowledge of the design and the reviewed submittals.

PART 2 – PRODUCTS

2.1 PIPE MATERIALS

A. Sanitary Sewer Pipe
   1. General: 15-Inch Diameter and Smaller:
      a. One type for entire work.
      b. Except service leads or when a specific type is indicated on the Drawings.
   2. Type:
      a. PVC (Solid Wall) – Pipe Diameter of 15-Inches or Less:
         1) Pipe and Fittings: ASTM D3034 SDR26:
            a) PVC Compound Cell Classification: ASTM D1784, 12454-B or 12454-C.
         2) Joints: ASTM D3212, elastomeric gasket, push-on.
         3) Gaskets: ASTM F477.
B. Sanitary Service Leads (Laterals):
   1. Material: Same as sanitary sewer pipe unless indicated otherwise on the Drawings.
   2. Wyes and Tees:
      a. Sanitary Sewer 8-Inch or 10-Inch Diameter: Wye.
      b. Sanitary Sewer 12-Inch Diameter or Larger: Tee.
   3. Plugs or Stoppers:
      a. Air-tight seal.
      b. Removable without damage to pipe bell.

c. Capable of holding 5 psig.
d. Joints and gaskets to match sanitary sewers.

4. Clean Out Casting:
   a. EJIW; 1750 Type A; or approved equal.
5. Sewer Saddle:
   a. CB by Romac Industries, Inc.; or approved equal.

2.2 MANHOLES

A. Type of Units:
   1. As indicated on the Drawings.
   2. Precast Reinforced Concrete:
      a. Base Section:
         1) ASTM C478.
         2) Base rise section with integral floor unless constructing a manhole over an existing pipe, in which case base may be separate from riser.
      b. Riser and Cone Sections:
         1) ASTM C478.
         2) Watertight Manholes: Provide four 5/8-inch threaded anchor bolts in cone section.
      c. Joints: Premium: ASTM C443, O-ring gasket.
      d. Pipe Connector: ASTM C923.

B. General
   1. Steps:
      a. Polypropylene plastic-coated steel.
      b. M.A. Industries PSI-PF; or equal.
      c. Minimum: 10 inches wide x 5 inches deep.
   2. Manhole Castings:
      a. Manufacturers:
         1) Watertight: EJIW, 1040PT; or equal.
      b. Solid covers, no vent holes.
   3. Connection between Manhole and Sewer:
      a. Resilient Connector: ASTM C923.
      b. Type 304 stainless steel bands in accordance with ASTM A167.
      c. KOR-N-SEAL by NPS; or equal.
   4. Mortar: ASTM C270, Type M.
   5. Brick:
      a. Concrete: ASTM C55, Type I, Grade N.
   6. Grade Rings: ASTM C478.
   7. Concrete: MDOT 601 and 7001, Grade P1 or S2.
   8. Waterproofing:
      a. Cement: Masonry filler.

2.3 MISCELLANEOUS

A. Pipe Deflection Test Gage:
   1. Manufacturer: Cheme Industries, Inc.; or equal.
   2. Mandrel:
      a. 10-Inch for 8-Inch to 15-Inch fin sets.
      b. 24-Inch for 18-Inch to 48-Inch fin sets.
   3. Fin O.D.: Not less than 95% of base inside pipe diameter.

4. Minimum 9 fins.
5. Allowable Maximum Deflection: 5% of diameter.
6. Provide proving rings to verify accuracy of test gage.

PART 3 – EXECUTION

3.1 PREPARATION

A. Alignment and Grade:
   1. If there is a grade discrepancy or an obstruction which is not indicated on the Drawings, notify Engineer, and obtain instructions prior to proceeding.
   2. Where sanitary sewer crosses water main:
      a. Expose water main prior to laying sanitary sewer to verify existing depth.
      b. Maintain minimum clearance of 18 inches unless otherwise indicated on the Drawings.
   3. Control:
      a. Laser Beam:
         1) Check Line and Grade at:
            a) Set-up point, 25 feet, 50 feet, 100 feet and.
            b) 200 feet intervals thereafter.
         2) Reset projector at each manhole with a 500-foot maximum.

3.2 INSTALLATION

A. General:
   1. Install pipe, fittings, and appurtenances in accordance with Manufacturer's recommendations except as herein specified or indicated on the Drawings:
      a. PVC Pipe: ASTM D2321.
   2. Prevent entrance of foreign material.
B. Pipe Laying:
   1. Bearing:
      a. Support entire length of pipe barrel evenly.
      b. Provide bell holes at joints.
   2. Direction: Commence at outlet and proceed upgrade with spigot ends pointing in direction of flow.
   3. Method:
      a. Clean bell, gasket groove and spigot.
      b. Set gasket.
      c. Apply lubricant to spigot.
      d. Center spigot end of pipe to be laid and push home against base of socket.
      e. Center pipe to form a sewer with uniform invert.
   4. Allowable Alignment Deflection:
      a. Horizontal: 0.20 feet.
      b. Vertical: 0.1 feet.
      c. Slope: ± 5% of planned grade.
C. Jointing:
   1. Lubricants and gaskets: To be furnished by pipe Manufacturer.
   2. Gaskets:
      a. Surfaces of Joint: Clean and dry before lubricant is applied.
      b. Take care in laying that the pipe does not shift, and that gasket remains in a home position after assembly.

D. Manholes
   1. Base Section Placement: Full and even bearing.
   2. Precast Units: Mortar joints and lift holes.
   3. Block Units:
      a. Block: Set in full bed of mortar with key slots filled.
      b. Joints: Maximum 1/2-inch wide at inside face and wiped.
   4. Top of Casting Elevation:
      a. Gravel Areas: 3 inches below surface.
      b. Bituminous Base Course: At base course grade.
      c. Final Bituminous Wearing Surface:
         1) At finished grade.
         2) Adjustment of castings from base course grade to finished grade is incidental.
      d. Ditches: 6 inches below ditch bottom or protruding not more than 8 inches above slope; as applicable.
      e. Other Areas: As directed by Engineer or as indicated on Drawings.
   5. Waterproofing: Prevent visible leakage.

E. Service Leads (Sanitary Sewer Laterals):
   1. Locations:
      a. Service lead locations indicated on Drawings are schematic only to represent approximate locations and total number.
      b. Confirm exact service lead location with property owner.
      c. Unless otherwise directed, install service leads at center of vacant lots.
   2. Alignment: Right angles to street centerline, except as indicated otherwise on the Drawings.
   3. Grade: Uniform minimum of 1/8-inch per foot (1%).
   4. Depth:
      a. Elevations at property line indicated on Drawings.
      b. If Drawings are not specific, depth shall be adequate to serve basement of existing building.
      c. At property line of vacant lots, mobile homes or temporary structures, minimum depth shall be maximum depth possible.
      d. Record depth of end lateral below finished grade.
   5. Risers:
      a. In event of high groundwater, risers may be required, decision shall be made by Engineer.
      b. Required if sanitary sewer is more than 12 feet below finished grade.
   6. Plugs: Plug ends airtight with standard disc or cap.
   7. Markers:
      a. Install 4-inch x 4-inch treated wood marking rod at end of each service lead extending vertically from end of lead to within 3 inches of ground surface.
      b. Place 2-inch-long galvanized lag bolt in end of wood rod.
   8. Witness and Measurements:
      a. Wyes and Tees:
         1) Measurement to center of nearest downstream manhole.
         2) Note manhole by number indicated on Drawings.
      b. End of Service Leads: three (3) measurements to permanent surface features, GPS coordinates Horizontal and Vertical.

F. Connections:
   1. To existing structures:

a. Opening: No larger than needed for new pipe.
b. Brick or block structure: Relay and repoint loose blocks and bricks.

2. For future use:
   a. 4-inch through 12-inch Diameter: Plug with standard cap or disc.
   b. 24-inch and larger:
      1) Bulkhead with 8-inch-thick brick and mortar.
      2) ½-inch mortar plaster on outside of bulkhead.

3.3 CLEANING

A. Debris: Remove dirt and debris, including cemented or wedged material, from the inside of sewers and manholes.
B. Final Acceptance: Clean all sewers and manholes before requesting final acceptance.

3.4 TESTING AND INSPECTION

A. Observation: By Engineer.
B. Notification for Testing: Arrange with Engineer following backfill, cleaning and pretesting.
C. Equipment and Manpower: Provide everything required for testing.
D. Alignment and Grade Tests:
   1. Visual:
      a. Each manhole-to-manhole section.
      b. Mirrors or Lights: Adequate to illuminate the Section.
   2. Laser Beam:
      a. Set Laser Beam and Target:
         1) At respective manholes.
         2) Sequentially at ¾-inch Offset From:
            a) Invert.
            b) Crown.
            c) Left ¼ point/
            d) Right ¼ point.
      b. One or More Laser Beam Discontinuous:
         1) Remove and replace section.
         2) Undamaged pipe may be reused.
E. Low Pressure Air Test for Leakage:
   1. Required for all types of pipe:
      a. Concrete Pipe: ASTM C924
      b. Plastic Pipe: ASTM F1417
   2. Test each manhole-to-manhole section following completion of service leads, risers, and other appurtenances.
   3. Pressure: Initially 4.0 psi greater than groundwater back pressure for two (2) minute duration.
   4. Pressure: Drop:
      a. Measure the time interval for pressure drop from 3.5 to 2.5 psi greater than groundwater back pressure. Compare with the minimum test time. Measured time interval must be equal to or greater than the minimum test time.
      b. Minimum Test Time for Various Pipe Sizes:

PIPE DIAMETER (IN.)	MINIMUM TIME (MINS.)	LENGTH FOR MINIMUM TIME (FT.)	TIME FOR LONGER LENGTHS(S)
4	3:46	597	0.380 L
6	5:40	398	0.854 L
8	7:34	298	1.520 L
10	9:26	239	2.374 L
12	11:20	199	3.418 L
15	14:10	159	5.342 L
18	17:00	133	7.692 L
21	19:50	114	10.470 L
24	22:40	99	13.674 L
27	25:30	88	17.306 L
30	28:20	80	21.366 L
33	31:10	72	25.852 L
38	34:00	66	30.768 L

c. If the test section includes more than one pipe size, calculate the test time for each pipe size and add the times together to arrive at the total test time for the section.

5. Repair leaks and repeat test until acceptable results are achieved.

F. Deflection Test for Plastic Pipe:
   1. Go-No Go Gage:
      a. Pull go-no go gage through each section:
         1) At least 30 days after completion of backfill.
         2) Pulled by one person, with no mechanical advantage.
      b. Go-no go gage will not pass:
         1) Remove and replace section.
         2) Undamaged pipe may be reused.
   2. Vibratory Re-rounding Device:
      a. Use not permitted.

G. Internal Television Inspection of Sanitary Sewers:
   1. General:
      a. Provided by Owner.
      b. Inspect all sanitary sewers using a closed-circuit color television camera.
      c. Provide Engineer with digital video and written logs to document the Internal Television Inspection:
         1) Written logs shall note the location of all sewer laterals and pipe deficiencies by distance from the upstream manhole.
         2) The video shall include audio commentary regarding the sewer condition.

d. Engineer will review the video and written logs to verify that the sanitary sewers were constructed in accordance with the Plans and Specifications.
e. The video shall verify that the sanitary sewers are clean and free of sediment and debris to the satisfaction of the Engineer. Sanitary sewers not satisfactorily cleaned shall be promptly cleaned and reinspected by closed-circuit television camera.
f. Television inspection shall be completed, and documentation of television inspection shall be provided to the Engineer. The Engineer shall determine that the sanitary sewers were constructed in accordance with the Plans and Specifications before any payment for completed sections of sanitary sewer will be recommended to Owner.

2. Performance Requirements:
   a. Inspection procedures and equipment shall meet the applicable standards as presented in the National Association of Sewer Service Companies (NASSCO) Recommended Specifications for Sewer Collection System Rehabilitation.
   b. Each section of sanitary sewer between manholes shall be television inspected separately utilizing a video camera and related equipment specifically designed for the purpose of internal sewer inspection.
   c. The camera speed shall not exceed 30 feet per minute.
   d. The camera shall be stopped for no less than 10 seconds at the entrance manhole, each service lateral, exit manhole, and at all points where the sewer is damaged or deficient.
   e. Lighting for the camera shall be adequate to allow a clear picture of the entire periphery of the sewer and shall be varied as required to be effective for all pipe diameters inspected.
   f. Cables and equipment used to propel the camera shall not obstruct the camera view or interfere with the documentation of the sewer conditions.
   g. The video recording shall be a continuous recording.
   h. The mobile recording studio shall have adequate space to accommodate up to 3 persons for the purpose of viewing the video monitor while the inspection is in progress.
   i. Whenever possible, the camera shall move in a downstream direction.
   j. The location of the camera in the sewer shall be monitored by an accurate measuring system which records the distance traveled from the upstream manhole on the video.
   k. All video recordings and written logs shall be clearly labeled with the project name, location identification and date of recording.
   l. If sewer has dirt and debris which prohibits video inspection, the sewer shall be cleaned and re-televised at no expense to Owner.

Appendix 4 – Water Utility System Specifications

PART 1 – GENERAL

1.1 SUMMARY

B. This section includes the furnishing and installation of a water distribution system.

1.2 REFERENCES

C. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:

1. ASTM Standard Specifications:
   a. A48 – Grey Iron Castings.
   b. A126 – Grey Iron Castings for Valves, Flanges, and Pipe Fittings.
   c. A167 – Standardized Specification for Stainless and Heat-Resistant Chromium-Nickel Steel Plate, Sheet, and Strip.
   d. A240 – Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.
   e. B62 – Composition Bronze or Ounce Metal Castings.
   f. B88 – Seamless Copper Tube.
   g. C478 – Precast Concrete Manhole Sections.
   h. C923 -Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
   i. D429 – Rubber Property-Adhesion to Rigid Substrates.
   j. D449 – Asphalt Used in Dampproofing and Waterproofing.
   k. D1248 – Polyethylene Plastics Molding and Extrusion Materials.
   l. D1784 – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
   m. D1785 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80 and 120.
   n. D2657 – Standard Practice for Heat Fusion Joining of Polyolefin Pipe.
   o. D3035 – Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter.
   p. D3139 – Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.
   q. F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
   r. F2164 – Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure.
2. ANSI/AWWA:
   a. C104/A21.4 – Cement-Mortar Lining for Ductile Iron Pipe Fittings for Water.
   b. C110/A21.10 – Ductile Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids.
   c. C111/A21.11 – Rubber-Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings.
   d. C150/A21.50 – Thickness Design of Ductile Iron Pipe.
   e. C151/A21.51 – Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.
   f. C153/A21.53 – Ductile Iron Compact Fittings, 3-inch through 24-inch (76 mm through 610 mm), and 54-inch through64-inch (1,400 mm through 1,600 mm) for Water Service.

g. C655 – Field Dechlorination.
h. C301 – Prestressed Concrete Pressure Pipe, Steel-Cylinder Type, For Water and Other Liquids.
i. C304 – Design of Prestressed Concrete Cylinder Pipes.

3. AWWA Standard/Manuals:
   a. C502 – Dry-Barrel Fire Hydrants.
   b. C504 – Rubber-Seated Butterfly Valves.
   c. C506 – Backflow Prevention Devices – Reduced Pressure Principle and Double Check Valve Type.
   d. C511 – Reduced Pressure Principal Backflow Prevention Assembly.
   e. C512 – Standard for Air Release, Air/Vacuum and Combination Air Valves for Waterworks.
   f. C515 – Reduced Wall, Resilient Seated Gate Valves for Water Supply Service.
   g. C550 – Standard for Protective Epoxy Interior Coating for Valves and Hydrants.
   h. C600 – Installation of Ductile Iron Water Mains and Their Appurtenances.
   i. C605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
   j. C651 – Disinfecting Water Mains.
   k. C700 – Cold Water Meters – Displacement Type, Bronze Main Case.
   l. C701 – Cold Water Meters – Turbine Type for Customer Services.
   m. C702 – Cold Water Meters – Compound Type.
   n. C706 – Direct-Reading, Remote-Registration Systems for Cold Water Meters.
   o. C800 – Underground Service Line Valves and Fittings.
   p. C900 – Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch, for Water.
   q. C905 – Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14-inch through 36-inch.
   r. C906 – Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4-inch through 63-inch for Water Distribution.
   s. M23 – PVC Pipe – Design and Installation.
4. DIPRA – Ductile Iron Pipe Research Association.
5. NFPA – National Fire Protection Association.
6. NSF/ANSI:
   a. 372 – Drinking Water System Components – Lead Content.
   b. 14 – Plastic Pipe System Components and Related Materials.
7. National Sanitation Foundation (NSF) Standards:
   a. 14 – Plastic Piping System Components and Related Materials.
   b. 60 – Drinking Water Treatment Chemicals.
   c. 61 – Drink Water System Components.

1.3 SUBMITTALS

D. Action Submittals:
   1. Product Data:
      a. Pipe.
      b. Gaskets.
      c. Hydrants.
      d. Valves.
      e. Thrust control materials.
      f. Corporation stops.

g. Curb box.
h. Curb stops.

2. Tapping Materials and Methods: Required information:
   a. Dimensions.
   b. Details of construction and installation.
   c. Name of Manufacturer.
   d. Model.
3. Procedures: Required information for flushing, pressure testing and chlorinating:
   a. Equipment.
   b. Methods.

E. Informational Submittals: Submit Manufacturer's sworn and notarized statements that the materials furnished comply with this Specification.

1.4 QUALITY ASSURANCE

F. Installation Personnel Qualifications:
   1. Trained and experienced in the installation of the materials.
   2. Knowledgeable of the design and the reviewed Submittals.
G. Water Distribution System: Pressure and leak tests.
H. Water Quality: Bacteriological tests.

1.5 PROJECT CONDITIONS

I. Scheduling of Water Shutoffs:
   1. Approval required from Public Works Superintendent.
   2. Not to exceed four (4) hours.
   3. Standby service may be required by utility agency.
   4. Required Notice:
      a. Fire Department: 48 hours.
      b. Affected Customers: 48 hours.
      c. If local regulations require more notice, the local regulations shall prevail.
   5. Operation of Existing Valves: By Owner's employees only.
J. Contamination of Existing Lines:
   1. Prevent.
   2. Chlorinate and flush contaminated lines.

PART 2 – PRODUCTS

2.1 PIPE AND FITTING MATERIALS

A. Ductile Iron Pipe:
   1. ANSI/AWWA C150/A21.50 and C151/A21.51.
   2. Class: 52
   3. American made.
   4. Cement Mortar Lining:
      a. ANSI/AWWA C104/A21.4.
      b. American made Ductile Iron only.
   5. Meet the requirements of ANSI/NSF Standard 61 and the certification must be stamped on the exterior wall of the pipe.
   6. Joints:
      a. ANSI/AWWA C111/A21.11.
      b. Push-on.

c. Restrained:
1) 6-Inch Through 24-Inch:
a) U.S. Pipe: TR Flex Restrained Joint; Field Lok gasket.
b) American: Flex-Ring Restrained Joint; Fast Grip gasket.
c) Clow: Super-Lock Restrained Joint.
d) Griffin Pipe: Snap-lok Restrained Joint.
e) Mechanical joint restraint with Megalugs by EBAA Iron Sales; or equal.
2) For pipe sizes greater than 24-inch, joints requiring restraint shall be manufactured restrained joint pipe.
d. Lubricant: Provide in accordance with Manufacturer's recommendation.
e. Electrical Continuity:
1) Wedges:
a) Serrated silicon bronze.
b) Two (2) per joint.

B. Fittings:
1. All fittings shall be restrained to pipe.
2. Ductile Iron Fittings:
a. 6-inch Through 24-inch:
1) ANSI/AWWA C153/A21.53, compact fittings.
2) Mechanical joints.
3) 350 psi pressure rating.
4) Lining:
a) Standard thickness, cement mortar lining in accordance with AWWA C104.
b) Fusion bonded epoxy in accordance with AWWA C550, nominal 6-8 Mils.
b. 30-Inch Through 48-Inch:
1) ANSI/AWWA C110/A21.10.
2) Manufactured restrained joint.
3) Ductile Iron glands.
4) 250 psi pressure rating (minimum).
5) Lining:
a) Standard thickness, cement mortar lining in accordance with AWWA C104.
b) Fusion bonded epoxy in accordance with AWWA C550, nominal 6-8 Mils.
c. Joint Restraint for Ductile Iron Fittings to Ductile Iron Pipe:
1) 6-Inch Through 24-Inch Pipe:
a) Mechanical joints with Megalugs by EBAA Iron Sales; or equal.
b) Push-on joint with stainless steel gripper gasket.
c) Restrained joints to match restrained joint pipe.
d. Electrical Continuity:
1) Wedges:
a) Serrated silicon bronze.
b) Two (2) per joint.
e. Polyethylene Encasement: ANSI/AWWA C105/A21.5.

C. Gaskets:
1. ANSI/AWWA C111/A21.11.
2. Styrene Butadiene (SBR)

2.2 MANUFACTURED UNITS

A. Valves:
   1. Manufacturer: EJIW, Mueller.
   2. Resilient-Seated Gate Valve: AWWA C515:
      a. Non-rising stem.
      b. Wrench nut, 2-inch square.
      c. Open left (clockwise).
      d. Mechanical joint ends.
      e. Stem Seal: Buna-N double O-rings.
      f. Body and Bonnet: Ductile Iron
      g. Wedge: ASTM D249 rubber coated cast or ductile iron.
      h. Coating: AEEA C550 fusion-bonded epoxy.
      i. Pressure Rating: 200 psi.
      j. Stem: Manganese bronze.
   3. Valve Boxes:
      a. Manufacturers and Models:
         1) EJIW 8560 with No. 6 base.
      b. 5-1/4-inch shaft.
      c. Three (3) section cast iron.
      d. Cast iron lid marked "WATER"
      e. Adjustable:
         1) By means of threaded top and center sections.
         2) Height: 51 inches to 72 inches.
   4. Post Indicators:
      a. Manufacturers and Models: Waterous A240; or equal.
      b. Cast iron post.
      c. Window with "OPEN" or "CLOSED" indicator.
      d. Cast iron wrench actuator.
      e. Depth of bury: 6 feet.

B. Manholes, Vaults, and Chambers:
   1. General:
      a. Grade Rings: ASTM C478.
      b. Joints:
         1) 1-inch butyl gasket in flexible rope form.
         2) E.Z. Stik, Butyl-Lok; or equal.
      c. Steps:
         1) Manufacturers: MA Industries, PS-1-PF; or equal.
         2) Steel rod, ½-inch, encapsulated in copolymer polypropylene.
      d. Casting:
         1) Manufacturers and Models: Neenah, R-1670; EJIW, 1045.
         2) Solid, gasketed, self-sealing cover.
         3) Imprinted on cover "WATER".
      e. Connection Between Manhole and Sewer:
         1) Resilient Connector: ASTM C923 and ASTM A167.
         2) 304 stainless steel bands.
         3) KOR-N-SEAL by NPS, Inc.; or equal.
   2. Valve Manholes and Air Release Chambers:

a. Precast Sections: ASTM C478.
b. Corporation Stops: Mueller, H-15000.

C. Hydrants:
1. Manufacturers and Models: EJIW.
2. AWWA C502.
3. Bury Length: As required to produce standard hydrant assembly detail.
4. Outlet Nozzles:
a. Hose:
1) Number: 2.
2) Diameter: 2-½ inches.
3) Threads: NFPA.
4) Brass.
5) Fastened by mechanical means.
b. Pumper:
1) Number: 1.
2) Diameter: 4 inches.
3) Stortz Connection:
a) Hydrant Pumper Nozzle shall be of one-piece design, compatible with (4" or 5" depending on hydrant) Stortz Hose coupling.
b) Nozzle shall be an integral part of the fire hydrant and must be furnished by the manufacturer or authorized distributor designed by manufacturer.
c) Stortz adaptors will not be accepted.
4) Brass.
5) Fastened by mechanical means.
c. Caps:
1) Cast Iron.
2) Chained to hydrant barrel.
3) Operating nut.
5. Main Valve:
a. 5-1/4 inches in diameter.
b. Main Valve: Rubber.
c. Valve Plates: Bronze
d. Valve Seat: Brass or bronze.
e. Valve Facing: Rubber or leather.
6. Inlet Connection:
a. Side.
b. Diameter: 6 inches.
c. Mechanical joint.
7. Operating stem and mechanism.
a. Open left (counterclockwise).
b. Stem: Steel.
c. Operating Nut: 1-½-inch pentagonal brass or bronze.
d. Stem Coupling: Breakable steel with stainless steel cotter pins.
e. Weathershield: Cast Iron.
f. Protected opening between wrench nut and bonnet with an O-ring.
8. Drain Outlet: Drain to pea stone, wrap with geotextile.

9. O-ring Seals: Buna-N.
10. Bolt, Studs and Nuts: Corrosion-resistant.
11. Color: Vermillion Red.
12. Traffic flange.
13. Grand Ledge Fire Department Requirements.

2.3 WATER SERVICE MATERIALS

A. General:
   1. General: AWWA C800.
   2. Service Clamps:
      a. Bronze, double strap, iron pipe thread, O-ring seal cemented in place.
      b. Manufacturers: Mueller, Ford; or equal.
   3. Corporation Stops:
      a. Bronze, iron pipe thread by compression copper.
      b. Manufacturers: Mueller; H-15008, or Ford.
   4. Curb Stops:
      a. Bronze, compression copper by compression copper.
      b. Minneapolis pattern.
      c. Manufacturers: Mueller H-15155, or Ford.
   5. Curb Boxes:
      a. Minneapolis pattern, extension type.
      b. Manufacturers: Mueller or Ford.

B. Service Lines: Copper: B 88, Type K, soft-temper, or other material pre-approved by the Department of Public Works Superintendent.

C. Water Service Meter Connections (indoors):
   1. Copper: ASTM B88, Type K, L, hard drawn.
   2. Copper Horns: Ford No. 3 or 4, Copper horn; or equal.
   3. Valves:
      a. Inlet Ball Valve:
         1) Ford B11; or equal.
         2) Bronze body, tee head, stern.
         3) O-rings: Buna-N.
         4) Valve Seats: Buna-N
         5) Ball: Fluorocarbon-coated brass.
   4. Couplings and Fittings: Brass 85-5-5-5 (B 62) flared joints.
   5. Meter Box Cover:
      a. Ford Wabash W3, double lid; or equal.
      b. Body, Lid: Cast iron.
      c. Inner Lid: Plastic.
      d. 11-½-inch opening.
      e. 4 inches dead air space between covers.
      f. Top lid lockable with pentagon bolt.

PART 3 – EXECUTION

3.1 LINE AND GRADE

A. Lay pipe to the grades and elevations indicated on the Drawings.

B. Where No Grades are Indicated:

1. Lay pipe with a minimum of 5-½ feet of cover below finish grade.
2. Lay pipe at constant uphill and downhill grades to and from air release valves.
3. Avoid high points except at air release valves.

3.2 INSTALLATION

A. General:
   1. Except as herein provided or indicated on the Drawings, install in accordance with:
      a. Ductile Iron: AWWA C600.
   2. Protect all materials before, during and after installation.
   3. Install pipe, fittings, and appurtenances in accordance with Manufacturer's re3commendations except as indicated herein or on the Drawings.
   4. Prevent entrance of foreign materials.
   5. Restrain pipe, fittings valves and couplings as required.

B. Placement of pipe:
   1. Bearing: Support entire length of pipe barrel evenly with extra excavation at joints.
   2. Bell and Spigot: Clean and lubricate immediately prior to assembly.
   3. Jointing:
      a. Mechanical: Tighten evenly to 75 to 90-foot pounds of torque.
      b. Restrained: Manufacturers recommended method.
   4. Cutting Pipe:
      a. Power saw.
      b. Ductile Iron Pipe: Taper cut end by grinding or filing back at least 1.8-inch on a 30-degree bevel.
   5. Thoroughly clean gasket seating surfaces in the socket and on the plain end of the pipe to remove all coating rust and foreign material before use of conductive gasket.

C. Setting Valves and Valve Boxes:
   1. Set plumb on 4 inches of compacted 3/8-inch (minimum) crushed stone.
   2. Valve Boxes:
      a. Shall not transmit shock to valve.
      b. Plumb over operating nut.
      c. Set cover to finished grade.
      d. Witness.
   3. Pressure Tap Sleeve and Valve:
      a. Set at the direction of tapping Subcontractor.
      b. Set and remove tapping machine.

D. Hydrants: Place "Out of Service" placards or labeled bags on pumper nozzle of all hydrants immediately after installation and on all disconnected existing hydrants. Remove after water main is placed in service.

E. Thrust Control:
   1. Provide at all fittings.
   2. Installation in accordance with:
      a. Submittals reviewed by Engineer.
      b. Manufacturer's instructions.
   3. Restrain all pipe joints within given distance from each fitting (both directions):

TABLE 1					
Length of Restrained Pipe Required.					
Pipe Diameter	22-1/2 Degree Bends and Less	45 Degree Bends	90 Degree Bends, Plugs	Tee Run	Tee Branch
6-inch	5-foot	10-foot	20-foot	10-foot	10-foot
8-inch	5-foot	10-foot	25-foot	10-foot	20-foot
10-inch	5-foot	15-foot	35-foot	10-foot	25-foot
12-inch	10-foot	15-foot	40-foot	10-foot	30-foot
16-inch	10-foot	20-foot	50-foot	10-foot	40-foot

F. Service Leads:
   1. Taps at 45 degrees above center.
   2. Use double strap saddle for all taps on PVC pipe and for services on DIP over 1-½-inch.
   3. Direct tap ductile iron pipe for ½ inch through 1-½-inch services only.
   4. Alignment and Grade:
      a. At right angles with street line.
      b. Minimum depth: 5 ½ feet of cover.

3.3 TESTING AND DISINFECTION

A. Observation: By Engineer.
B. Notification:
   1. Pressure Testing: Arrange with Engineer following successful pretesting.
   2. Bacteriological Testing: Arrange with Engineer following successful pressure test.
C. Equipment and Manpower: Provide everything required for testing, disinfection, and flushing.
D. Water:
   1. To be provided by Owner.
   2. Provide temporary connections from Municipal water system to the water main or for hauling water.
   3. Provide backflow prevention device.
E. Pressure and Leak Tests for DI Pipe:
   1. ANSI/AWWA C600.
   2. Duration: Two (2) hours.
   3. Pressure:
      a. Maintain 150 pounds per square inch at the average elevation in water main segment being tested.
      b. Do not exceed the pipe's rated test pressure.
   4. Water:
      a. To be provided by Owner.
      b. Contractor shall be responsible for providing temporary connections and backflow preventor from municipal water system for hauling water.
   5. Make-Up Water: From measurable source.
   6. Maximum Allowable Leakage:

$$L = \frac{SxDxP^{0.5}}{148{,}000} + 0.0078 \text{ gal/hr/in of diameter for each closed valve tested against}$$

L = Leakage in gallons per hour.

S = Length of pipe tested in feet; maximum value 2,000. When length of pipe tested exceeds 2,000 feet, the allowable leakage will be based on 2,000 feet.

D = Pipe diameter in inches.

P = Test pressure: 150 pounds per square inch.

7. Maximum Length of Pipe to be Tested: 2,000 feet, or nearest two (2) valves if water on opposite side of valve is not in service.
8. Perform test against tapped cap or plug with a standpipe and not against existing valve if water on opposite side of valve is in service.
9. Repair leaks and repeat tests until acceptable results are achieved.
10. Pressure testing against existing valves is not allowed.

F. Disinfection:
   1. In Accordance with AWWA C651:
      a. Sodium hypochlorite.
      b. Continuous-feed method.
      c. Calcium hypochlorite granules not required.
      d. Minimum residual 25 parts per million (ppm) initial concentration.
      e. Minimum residual 10 ppm after 24 hours.

G. Flushing:
   1. Water Main Mainlines: In accordance with AWWA C651.
   2. Water: Owner supplied.
   3. Provide backflow preventor.
   4. Velocity:
      a. Water Main Mainline: Minimum 3 feet per second in accordance with AWWA.
      b. Water Services (Domestic and Fire Protection): Minimum 10 feet per second in accordance with NFPA.
   5. Duration:
      a. Initial: Until entire volume of water in pipeline has been replaced.
      b. Final: Until residual chlorine equals that of adjoining system.
   6. Dispose of chlorine residual in accordance with applicable state and local requirements.
   7. Dispose flushing water to the sanitary sewer. Notify Owner in advance to confirm location and timing of discharge.

H. Bacteriological Testing:
   1. In accordance with AWWA C651 and state regulatory agency requirements.
   2. Two (2) consecutive bacteriologically safe samples must be taken at 24-hour intervals for each section of pipe installed.
   3. Repeat disinfection if bacteriological test fails.
   4. Collect samples from each branch of pipe, and at a maximum spacing of 1,000 feet.
   5. Engineer or Owner: Transport samples to the lab for testing.

6. Cost of initial and repeat bacteriological lab tests are the responsibility of the Contractor.

I. Sequence:
   1. Pressure test.
   2. Flush.
   3. Chlorinate.
   4. Flush.
   5. Wait 24 hours.
   6. Bacteriological sample.
   7. Wait 24 hours.
   8. Bacteriological sample.
   9. Place in Service.

Appendix 5 – List of Approved Street Trees and Minimum Planting Sizes

Max. height less than 25 ft. - Minimum size for planting 1.5" caliper.

Species	Common Name	Considerations
Amelancher sp.	Autumn Brilliance Serviceberry Princess Diana Serviceberry Alleghany Serviceberry	Shade tolerant. White flowers. Slow growth rate.
Pyrus calleryana	Jack Pear	White flowers. Spreads less than 10 feet.
Syringa reticulata	Ivory Silk Japanese Tree Lilac	Disease resistant. 20 feet width. White flowers.

Max. height 25 ft. to 40 ft. - Minimum size for planting 2" caliper.

Species	Common Name	Considerations
Acer platanoides columnar	East Street Maple	Upright form, does not spread.
Carpinus betulus 'Fastigata'	European Hornbeam	Upright form, does not spread.
Gledistia 'Impcole'	Imperial Honeylocust	Must be thornless variety.
Pyrus calleryana	Redspire Cleveland Select	Redspire produces round, red fruit.

Max. height over 40 ft. - Minimum size for planting 2.5" caliper.

Species	Common Name	Considerations
Acer freemanii 'Jeffersred'	Autumn Blaze Maple	Seedless
Acer rubrum	Red Sunset Maple Sun Valley Maple	Not seedless Seedless
Acer platanoides	Crimson King Norway Maple	Dark red foliage. Should be planted on sunny sites. Produces winged fruit.
Ginkgo biloba	Ginkgo	Fruitless varieties only
Quercus robur	English Oak	
Tilia corata	Greenspire Linden	

Appendix 6 – List of Approved Street Trees And Minimum Planting Sizes

TREE MAINTENANCE GUIDELINES (MINIMUM)

This information is provide by Authority of the Michigan Department of Natural Resources

To ensure success from your tree planting, the tree must be properly cared for after the initial planting. A properly maintained tree grows well, has less problems and provides many benefits to people and our environment. By following the three (3) year maintenance guidelines, trees receive the care they need to become established. After the first three (3) years, trees should be routinely inspected for problems and watered during dry spells.

Your tree should be planted according to the specifications in these planting guides...

- American National Standards Institute (ANSI)
- Tree City USA Bulletin No. 19 – How to Select and Plant a Tree
- Department of Natural Resources (DNR) Tree Planting Guide (IC4108)

The year after the tree is planted, these specifications should be followed...

- **Water** – Check soil moisture a few inches below the surface in the root ball.
- **Mulch** – Layer three (3) to four (4) inches above the ground around the tree but not touching the tree trunk. The area should be four (4) times the area of the root ball. Do not use treated or dyed mulch.
- **Prune** – only if necessary. Follow specifications in the How to Prune Trees Bulletin (NA-FR-01-95) and/or Tree City USA Bulletin No. 1 – How to Prune Young Shade Trees.
- **Stake** – only if necessary. Follow the specifications on the Tree Planting Guide (IC4108).
- **Check** – for mower/weed whip damage, vandal damage and animal damage.
- **Check** – for any insect or disease problems on the tree and surrounding trees. Contact a forester or arborist if a problem exists.
- **Do not** – fertilize. Fertilizer applied to newly transplanted trees can excessively dry roots (burning).
- **Remove** – all tags and twine from the tree to prevent girdling

The second year after the tree is planted...

- **Water** – Trees should be checked and watered. Monitor and water trees from spring to fall.
- **Mulch** – The area surrounding the tree must be re-mulched every spring to achieve the 3-4 inches depth.
- **Remove** any stakes and ties.
- **Prune** – only if necessary. Follow specifications in the How to Prune Trees Bulletin (NA-FR-01-95).
- **Check** – for any insect or disease problems on the new trees and surrounding trees. Contact a forester or arborist if a problem exists.

The third year after the tree is planted...

- **Water** – Root systems are still being established and soil moisture needs to be checked on a regular basis from early spring to fall.
- **Re-mulch** – trees in the spring.
- **Prune** – if necessary. Remember to prune before the growing season starts.
- **Check** – for any type of damage and make corrections.
- Trees may be **fertilize**d in the spring if a need exists. Consult a forester or arborist before fertilizing.

Research has shown it takes approximately three (3) years for a transplanted tree to become well established on a new site. Maintaining a vigorous, healthy tree requires commitment well after the initial planting. The tree should have a healthy living environment and a structurally good form. Good form is obtained from quality planting stock, and importantly, from proper pruning. Your tree should be mulched, watered, free of insect and disease problems, and should be protected from animal damage and lawn care equipment injury.

Tree Planting and Care Tips

Michigan Department of Natural Resources

Planting

- The best seasons to plant a tree are spring and fall.
- Call 811 before digging to have utility lines located and marked. Avoid planting under power lines.
- Dig a saucer-shaped hole as deep as the tree's root ball and three times as wide.
- Break up the sides of the hole so the roots can grow through.
- Set the root ball in the center of the hole, root flare level with the top of the hole or slightly above.
- Cut away any burlap/wrapping. Remove non-biodegradable materials like plastic pots or ties.
- Gently fill the hole with soil and use water to settle it and remove air pockets.
- Add a 3-4" layer of mulch, leaving a 6" bare circle around the trunk to prevent trunk decay.

Care and maintenance

Pruning

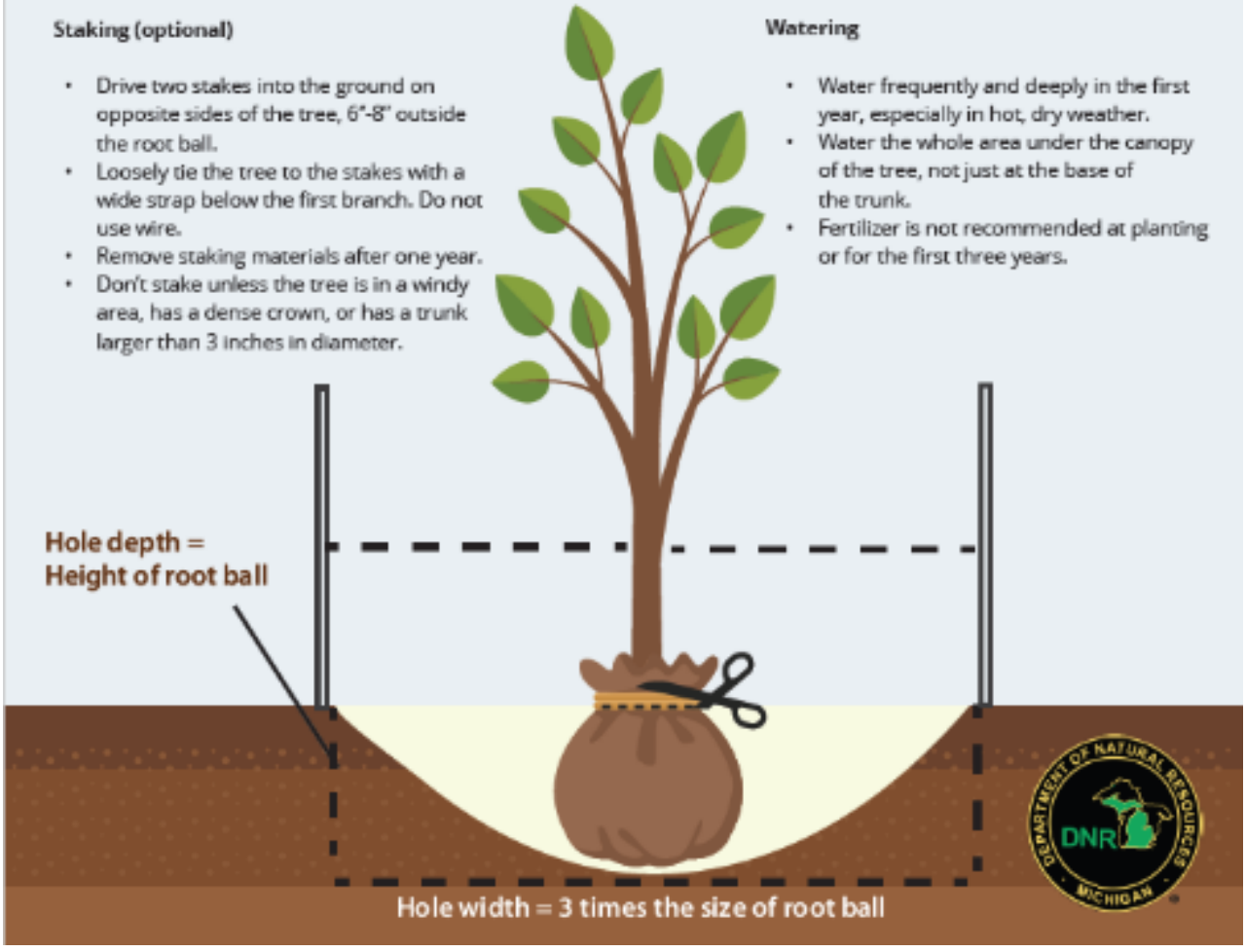
- Prune away any dead or broken branches with clean, sharp pruning shears.
- Do not prune healthy branch tips or the tallest, center part of the tree.
- Clip any small twigs, called suckers, growing from the base of the tree.

Staking (optional)

- Drive two stakes into the ground on opposite sides of the tree, 6"-8" outside the root ball.
- Loosely tie the tree to the stakes with a wide strap below the first branch. Do not use wire.
- Remove staking materials after one year.
- Don't stake unless the tree is in a windy area, has a dense crown, or has a trunk larger than 3 inches in diameter.

Watering

- Water frequently and deeply in the first year, especially in hot, dry weather.
- Water the whole area under the canopy of the tree, not just at the base of the trunk.
- Fertilizer is not recommended at planting or for the first three years.



Appendix 7 – Digital Data Submission Standards

SCOPE

These standards establish the minimum requirements for the submission of digital construction record drawings to the City. Design review drawings may be submitted in Adobe image file, PDF format.

OBJECTIVE

The City maintains digital mapping in a Geographic Information System (GIS) using ESRI ArcGIS software. In an effort to incorporate record drawings into the existing City mapping system, the following criteria are required for the submission of digital data.

COORDINATE SYSTEM

The City mapping system is in the Michigan State Plane Coordinate System - South Zone, North American Datum 1983, International Feet. The vertical datum is North American Vertical Datum 1988. This is the preferred system in which to provide digital drawings. If it is not possible to meet this standard, all plats and site plans must reference at least two section corners to allow for geo-referencing transformation of the data. Digital data must be mapped to scale.

DATA FORMAT

In addition to submittal materials otherwise stated in the Municipal Standards, digital mapping files must be delivered on a portable drive (i.e. flash drive, thumb drive) in all of the following formats:

1. AutoCAD drawing file (DWG) for complete project drawings. (AutoCAD is not required for design review documents).

2. Individual .DWG files representing utilities. ESRI ArcView shape files may be submitted in lieu of DWG.

3. Individual .DWG files representing parcels and street right-of-way. ESRI ArcView shape files May 16, 2023 be submitted in lieu of .DWG.

4. Adobe® image file (PDF) of complete project drawings for both design review and final construction records.

DATA LAYERING

A complete list of drawing layer name descriptions must be delivered with the digital files. The metadata may be provided as an ASCII text file (.TXT), a Microsoft Word document (DOC), or in World Wide Web Consortium (XML) documents. Individual layers must be provided for the following features included in the drawings:

1. Site boundary

2. Parcel lot lines

3. Section corners - note if the point is surveyed or collected with Global Positioning System (GPS)
4. Parcel dimensions
5. Attached condominium footprints
6. Apartment, commercial, and industrial building footprints
7. Road right-of-way
8. Road names
9. Utility pipes - individual layer for each utility type (water main, sanitary sewer, storm sewer, etc.) and diameter
10. Utility labels - individual layer for each utility size and material
11. Utility structures - individual layer for each utility type and structure type including invert elevations.
12. Detention ponds
13. Individual water, sanitary and storm leads. Include invert elevations for sanitary and storm leads.
14. Water valves and fire hydrants.