City of Mt. Pleasant Engineering Design Standards

March 2025

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City of Mt. Pleasant
Engineering Design Standards

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SECTION 1 – INTRODUCTION

Purpose

These standards shall be known as the "City of Mt. Pleasant Engineering Design Standards" and shall hereinafter be referred to as "Engineering Design Standards".

The purpose of the Standards shall be to establish the minimum design and construction standards for the following: grading and surface drainage, parking lots and driveways, bike paths, water supply systems, sanitary sewer system, storm water system, storm water detention/retention basins and other engineering improvements for site plan, subdivision and condominium development plans.

Procedures

Procedures shall be in accordance with the City of Mt. Pleasant's Code of Ordinances and Public Works Standards, as amended, and the State of Michigan Subdivision Control Act of 1967, being Act 288 of P.A. of 1967, as amended.

Certification

All subdivisions, condominiums, site plans, and utility plans submitted to the City of Mt. Pleasant for review shall bear the signature and seal of a licensed professional, according to Public Act 299 of 1980, and currently registered to practice in the State of Michigan, under whose supervision the plans were prepared.

Exception

Exceptions to the se standards may be permitted provided, in the opinion of the Engineer, the substitute design is equal to or better than the requirements established by these standards.

SECTION 2 – DEFINITIONS

The following is a list of words and phrases defined for the purpose of their use in interpretation of the Engineering Design Standards. These definitions shall apply in the interpretation, administration, and enforcement of the Engineering Design Standards. Words and phrases not specifically defined shall rely on their definition in the City of Mt. Pleasant's Code of Ordinances.

"**AASHTO**" shall mean the American Association of State Highway and Transportation Officials policy manual

"Alley" shall mean any dedicated public way affording a secondary means of access to abutting property and not intended for general traffic circulation

"American Water Works Association" or **"AWWA"** shall mean nonprofit scientific and educational society dedicated to the improvement of water quality and supply. AWWA has developed the industry standards that govern the operations of community tap water providers throughout the world.

"American National Standards Institute" or **"ANSI"** shall mean that national standards setting organization

"City" shall mean the City of Mt. Pleasant, Michigan and its officers, employees, and agents, including, but not limited to, the City Commission, City Planning Commission, City staff, City attorney, City engineer, etc.

"Development" or **"Developer's Project"** or **"Project"** shall mean a specifically designated site being developed, or proposed for development, by a developer.

"Ditch" or **"Drainage Swale"** shall mean an open channel used to transport water, groundwater, surface water run-off, or drainage water from any source.

"Drainage Facilities" or **"Drainage Water Facilities"** shall mean any storm sewers, lakes, ponds, streams, rivers, or storm drains, including facilities designated as County Drains, that receive water from lands owned by more than one owner.

"Easement" shall mean a grant by the owner of the use of land by the public, a corporation, or persons, for specific uses and purposes, to be designated as a "public" easement or a "private" easement depending on the nature of the use.

"Engineer" is the City of Mt. Pleasant's Engineer or other City officer, employee or agent acting on behalf of the City in the administration of the City's Engineering Design Standards.

"Engineering Design Standards" are the applicable standard relevant to the planning, design, and construction of infrastructure improvements within the City, as adopted and contained in the City's Engineering Design Standards.

"Foundation Drain Service Pipe" shall mean a conveyance pipe that receives only foundation drain groundwater seepage, exclusive of directly and intentionally introduced surface water runoff.

"Isabella County Drain Commissioner" or **"ICDC"** shall mean that person or agency responsible for drainage improvements under the jurisdiction of the State Drain Act, Public Act 40 of 1956, as amended.

"Isabella County Road Commission" or **"ICRC"** shall mean that agency responsible for the construction, operation, and maintenance of county highways, roads, and streets.

"Land Developer" or **"Developer"** shall mean a person, firm, association, partnership, corporation, or any other legal entity who intends to develop land by making various improvements to the land as described under "Site Improvements".

"Land Development" or **"The Development of Land"** shall mean the reshaping of the land environment to provide for the elements or amenities associated with community living. Items considered as these elements or amenities include any of the items listed under the definition for "Site Improvements".

"Michigan Department of Transportation" or **"MDOT"** shall mean the State agency that operates State roadways and Federal Expressways.

"National Pollution Discharge Elimination System" or **"NPDES"** shall mean that system required by the State of Michigan to regulate treatment and discharge of storm water and/or wastewater to the waters of the State.

"Natural Outlet" shall mean any drainage water outlet, including storm drains and sewers into a watercourse, pond, ditch, lake or other body, surface, or groundwater.

"Open Drain" shall mean a large open channel used to transport storm water, groundwater, and surface water runoff or drainage water from any source.

"Parking Lot Bay" shall mean a portion of the width of a parking lot that includes a set of parking stalls on either side of a driveway provided for access to such parking stalls.

"Person" shall mean any individual, firm, company, association, society, corporation, governmental agency (including school district), or other legal entity.

"Plat" shall mean a map or chart of a subdivision of land as defined in Act 288 of Michigan Public Acts of 1967, as amended.

"Preliminary Subdivision Plan" shall mean a preliminary plat showing the salient features of a proposed subdivision of land submitted to an approving authority for purposes of preliminary consideration, as defined in Act 288 of Michigan Public Acts of 1967, as amended.

"Public Utility Company" or **"Utility Company"** shall mean a legally constituted firm, corporation, or agency, other than the City or a County agency acting under a contract with the City, that operates under a franchise or agreement approve by the City for the purpose of installing and operating public utilities, including, but not limited to, gas piping, electric or telephone wiring (underground or overhead), oil piping, television cable, water supply, transmission mains, sanitary sewer interceptors, and/or drainage facilities.

"Right of Way" or **"ROW"** shall mean land dedicated, reserved, used or to be used for a street, alley, walkway or other public purposes.

"Sight Distance" shall mean the unobstructed straight-line length of view from a driver's eye height to an object height.

"Surface Water Runoff" or **"Storm Water"** shall mean that p art of rainfall or melting snowfall that reaches the storm water drain as runoff from natural land surfaces, building roofs or pavements.

"Underdrain Pipe" shall mean a geotextile-wrapped perforated pipe installed underground for the specific purpose of lowering a high groundwater condition or draining a granular subbase by receiving groundwater seepage and conveying it to a storm water drain. Farm drain tile is not Underdrain Pipe.

"Underwriters Laboratories, Inc." or **"UL"** shall mean product safety testing and certification organization, UL is synonymous with safety.

"User" shall mean the owner or occupant of any premises connected with and/or using any of the facilities operated by the Department.

"Utility Company's Contractor" shall mean a construction contractor engaged by the utility company to install public utilities for the utility company; or, in the case where the utility company has a construction division that installs its own utilities, shall mean the utility company.

"Watercourse" shall mean a natural or artificial open channel for the passage of water either continuously or intermittently.

SECTION 3 – GENERAL REQUIREMENTS & SUBMITTALS

The items found in this section contain the general requirements for the submittal of plans to the City for review, comment, and approval. In addition, specific requirements pertaining to Water Mains, Sanitary Sewers, Storm Drains, Detention, and Paving and Grading follow this Section and apply as stated within their respective context.

Submittal Instructions

1. Complete sets of site plans, including engineering plans, bearing the seal of a registered professional licensed to practice in the State of Michigan, according to the Occupational Code, Public Act 299 of 1980, shall be submitted to the City for review. The number of sets shall be according to the City's zoning ordinance. The City may elect to send the plans to a consulting firm of their choice for review. Each plan sheet shall contain the project name and the project owner's name and address.

2. A certified boundary summary of the site or a copy of the complete plat shall be submitted along with the engineering construction plans.

3. Plans shall be submitted on 24-inch x 36-inch paper having blue or black lines, and shall be neatly and accurately prepared.

4. All plans shall contain the latest version of the applicable City's Standards for Construction, available here: https://cms2.revize.com/revize/mtpleasant/forms/Streets%20and%20Engineering/Standard%20Construction%20Special%20Provisions%20and%20Details%20-%20Jan%202025.pdf

5. The cover sheet shall include a map showing the location of the proposed project, a symbol legend, and an index.

6. Existing information, topography, utilities, etc., shall be shown in gray or lighter line weight, while proposed improvements shall be shown in dark and heavy black lines. The legend shall clearly refer to all line symbols used.

7. For projects having more than one (1) sheet of plans, a general plan having a scale of one-inch equal to 100-feet (1" =100') shall be provided, with bar scale, showing the overall project and indicating the size and general location of all improvements shown in the detailed plans. Street names, street and easement widths, lot lines, lot dimensions, lot numbers, zoning and ownership shall be

shown on all plans.

8. Utilities shall be located in accordance with the City's Standards. Utilities shall be parallel to lot lines. Generally, utilities shall be constructed in the road right-of-way or in easements adjacent to the road right-of-way.

9. Grading plans are requirement for all developments.

10. Engineering plans having a scale of no greater than one-inch equals 50-feet (1" =50') horizontal and one-inch equals five feet (1" =5') vertical (for profiles) shall be provided with bar scale. Sanitary sewer and water main can be shown on the same sheet. Plan and profile views are required on all gravity sewers. The profile, where possible, shall be shown below the plan view on the same sheet.

11. Storm sewer and pavement shall be shown on the same sheets. Plan and profile views are required for all storm sewers. A plan view with centerline stationing shown is required on all paving plans. Show the top of curb line on profile.

12. All utility crossings must be shown in the plan and profile views. When a water main crosses a sewer, an invert elevation for the water main shall be shown. The minimum vertical clearance between utilities shall be 18-inches.

13. Profiles of sewers shall indicate the size, rim elevations of all structures, the length of pipe between structures, slope of the pipe, numbering of structures, and casting. The profile shall indicate the existing and proposed ground elevations above the route for the sewer. The inverts of all sewers, both existing and proposed, shall be given at manholes. The location of areas requiring compacted sand backfill shall be indicated on the profile.

14. Elevations shall be on United States Geological Survey datum. A minimum of two (2) permanent benchmarks for the work shall be indicated on the plans.

15. Any areas that are considered wetlands, as defined by the Michigan Department of Environment, Great Lakes and Energy (EGLE), shall be indicated on the plans. No improvements will be allowed in wetlands unless the EGLE issues a permit for such improvements.

16. Finished grade shall be indicated at the corners of all buildings and utility structures.

17. Plans for landscaping or tree planting required by the City's zoning ordinance shall conform to the City's standards and be submitted for review and approval prior to final site plan approval.

18. All new grass areas that are required in the public right-of-way and all existing grass areas that are disturbed by construction shall be established or restored in conformance with the City's Standards.

19. Street names shall be approved by the City.

20. The developer's consulting engineer shall forward plans for approval to any public utility (gas, electric, etc.) and any federal, state or county agency whose facilities or right-of-way may be affected by the proposed construction. Permits for such construction, if required, shall be the responsibility of the developer. One (1) copy of any such permit shall be provided to the City prior to construction.

21. For all developments, the developer shall provide the City with one (1) electronic copy, in AutoCAD format on a thumb drive or CD, one (1) electronic copy in Adobe PDF format, and two (2) sets of prints sealed by a registered professional licensed to practice in the State of Michigan according to State of Michigan Occupational Code, Public Act 299 of 1980, of all as-built drawings for sanitary sewers, storm sewers, water mains, detention basins, prior to final approval and acceptance by the City.

22. All materials and workmanship shall conform to the latest edition of the Michigan Department of Transportation's Standard Specifications for Construction, and the City of Mt. Pleasant's Standard Specifications and Details for Construction. In the event of a conflict between standards, the most stringent shall govern, except when the City agrees that a less stringent interpretation is appropriate for the intended use.

SECTION 4 – DRIVEWAYS, SIDEWALKS, BIKE LANES AND BIKE PATHS

Plans and Specifications – Submittal Procedure

Plans and specifications shall be submitted as part of a site development package in accordance with the City of Mt. Pleasant's Development Guide, available at:

https://cms2.revize.com/revize/mtpleasant/economic%20development/MP%20Development%20Guidebook_July%202023.pdf

City Standard Special Provisions and Details

Driveways, sidewalks, bike lanes, and bike paths shall be designed to the 2020 MDOT Standard Specifications and City of Mt. Pleasant Standard Special Provisions and Details, latest edition, available here:

https://cms2.revize.com/revize/mtpleasant/forms/Streets%20and%20Engineering/Standard%20Construction%20Special%20Provisions%20and%20Details%20-%20Jan%202025.pdf

Plans and Specifications – Design Criteria for Driveways

A. Residential
All residential driveways within the road right-of-way shall be concrete with a minimum thickness of six-inches (6") or asphalt with a minimum thickness of three-and-a-half-inches (3.5"). Refer to the City's Zoning Ordinance for width and placement requirements.

B. Commercial
All commercial driveways within the road right-of-way shall be concrete with a minimum thickness of six-inches (6") or asphalt with a minimum thickness of three-and-a-half-inches (3.5"). Refer to the City's Zoning Ordinance for width and placement requirements.

C. Industrial
Heavily traveled industrial drives shall be designed by a qualified professional engineer and approved by the City. Refer to the City's Zoning Ordinance for width and placement requirements.

D. Commercial and industrial approaches shall be MDOT Type "M" openings.

E. Driveways shall be sloped to direct drainage to the street (min. slope = 1%, max slope = 10%).

F. For residential approaches constructed on an existing curbed street, the curb and gutter shall be entirely removed or cut horizontally when approved in advance by the City. When an MDOT Type "M" approach is constructed on any existing curbed street, the curb and gutter must be entirely removed. The extent of the removal shall extend to the nearest joint past the spring line of the new curb.

Plans and Specifications – Design Criteria for Sidewalks

A. Sidewalks shall generally be located six-inches (6") off of the right-of-way line and parallel to such line, and shall be required on both sides of a new street. Continuous sidewalk shall be provided across the parcels frontage in accordance with the City's Zoning Ordinance.

B. Sidewalks shall be a minimum of five-feet (5') wide with control joints one-inch (1") deep at five-foot (5') intervals.

C. Subbase for sidewalks shall be Class II sand four-inches (4") deep.

D. Sidewalks shall generally conform to the grade of the existing topography. Sidewalk transvers slopes shall not exceed one-half-inch (0.5") per foot. Transverse slopes less than one-quarter-inch (0.25") per foot shall not be used unless longitudinal drainage is provided. Longitudinal grades shall not exceed one-inch (1") per foot.

E. Sidewalks shall also meet latest Americans with Disabilities Act (ADA) requirements.

F. Sidewalks shall have smooth transitions and gentle curves. No sharp edges or abrupt changes in alignment are allowed. Sidewalks shall "jog" around natural features (trees, etc.) as determined by the City.

G. Plans for sidewalks shall include proposed grades along the edges of the sidewalk at 50-foot (50') intervals and at grade changes.

H. In general, sidewalks shall be at a higher elevation than the street and slope transversely toward the street at two-percent (2%) minimum.

I. Where sidewalks meet driveways, they shall run continuously through the drives. The slop of the drives shall be designed to meet the sidewalk.

J. At street intersections, sidewalk ramps shall be used to meet the existing street grade. If existing curb is involved, the curb shall be removed and the sidewalk ramped to meet the pavement. No horizontal curb cuts shall be used unless approved in advance by the City. Refer the City's Standard Details and Specifications for detectable warning plates. Curb ramps shall meet ADA standards.

K. Integrated curb and sidewalk shall not be used, except as approved by the City.

L. Sidewalks shall have the following thicknesses:

Thru Drives*	6"
Sidewalk Ramps	6"
All Others**	4"

*Plus one (1) flag each side of driveway

** In any emergency access areas, sidewalk must be 6" or as required

M. Shoulders shall be graded gently away from the sidewalk and be seeded and mulched or sodded.

Sharrows

A. Sharrows may be used as approved by the City, provided the following criteria are met.
   1. AADT is less than 2,500
   2. Speed limit is 25 MPH
   3. The street is designated as a major street

B. Symbols shall be marked at each block corner or a distance of no more than 800-feet, provided there are no intersecting streets.

C. Adequate signage shall be used in conjunction with the sharrow symbols.

D. Sharrow symbols shall be placed in the center of the drive lane.

Bike Lanes

A. Bike lanes shall be a minimum of five-feet (5') wide.

B. Symbols shall be marked at each block corner or a distance of no more than 800-feet (800'), provided there are no intersecting streets.

C. Adequate signage shall be used in conjunction with the bike lane symbols.

D. At posted speeds above 25 MPH, more separation may be required between then bike lane and the travel lane, as determined by the City.

Bike Paths

A. Bike paths may be used in areas where the AADT and/or design speed is such that in-road treatments, such as bike lanes or sharrows, are infeasible as determined by the City.

B. Typical construction shall be 275#/Syd of 13A asphalt over six-inches (6") of MDOT 22A, compacted to 98% of Michigan cone.

C. Minimum width shall be 10-feet (10'), unless approved in writing by the City.

D. Path shall be graded to drain over the curb.

E. ADA plates shall be required at the road intersections. Ramps shall be a minimum six-inches (6") of concrete a minimum of five-feet (5') from the back of the curb, and the full width of the path. Cast iron ADA plates or approved equivalent are required.

SECTION 5 – PARKING LOTS

Plans and Specifications

A. Submittal Procedure

Plans and specifications shall be submitted as part of a site development package in accordance with "General Requirements and Submittals".

B. Design Criteria

1. Parking lot cross sections shall be approved by the City's Engineering Department. Cross section shall be designed to accommodate volume and traffic types for the anticipated parking lot use.

2. Concrete curb shall be placed on drive entrances for the paved parking area. Concrete curbing shall be required in all locations where it needs to protect landscaping areas or sidewalk. Concrete curb shall be MDOT F4, unless approved otherwise. Bituminous curbing will not be permitted. Thickened edge sidewalks are acceptable when the pavement is sloped away from the sidewalk.

3. When sidewalks are provided adjacent to the parking are curbs where car overhangs occur, such walks shall be a minimum width of 7-feet (7'), as measured from the face of the curb.

4. Parking bays shall be 64-feet (64') wide (20-foot stalls and 24-foot aisle, plus 20-foot stall). However, for a single bay, a car overhang of two-feet can be assumed and the width between face of curbs may be reduced to 60-feet (60'). Moreover, on the curb side of a multiple bay parking area, the two-foot (2') overhang may be assumed for the purposes of reducing the pavement width of the outside bay to 62-feet (62'). Where the parking area is adjacent to the project boundary line, the face of curb shall be located at least two-feet (2') from such boundary line and must meet the City's current Zoning Ordinance.

5. Individual parking spaces shall be marked by painted-on yellow stripes a minimum of four-inches (4") wide. The stripe shall extend from the front of the parking stall space to the end of the space.

6. Barrier-free parking spaces shall be striped in blue and signed meeting the latest Americans with Disabilities Act requirements.

C. Parking Lot Lighting

1. All parking lots shall be illuminated. Lighting intensities shall average one (1) foot candle measured at the surface for parking areas. Service drives shall have a lower intensity, averaging 0.5 foot candles. All outdoor lighting shall be shielded to reduce glare and arranged to reflect light away from all residential districts, adjacent residences, and public rights-of-way. At the property line, 0.1 foot candles shall be the maximum amount of light.

2. A photometric plan (lighting grid) may be required to determine the appropriateness of the proposed lighting layout and intensity.

3. Light poles shall have a maximum height as required by the Zoning Ordinance, unless approved by the City.

4. All fixtures shall be high pressure sodium lamps, metal halide, or as required by the Zoning Ordinance. Photocells or other approved equipment is required for all fixtures.

5. All wiring shall be UL listed for wet locations. No wiring shall be exposed.

SECTION 6 – ROADS AND PAVING

Plans and Specifications

A. Submittal Procedure

Plans and specifications shall be submitted as part of a site development package in accordance with the City of Mt. Pleasant's Development Guide, available here:

https://cms2.revize.com/revize/mtpleasant/economic%20development/MP%20Development%20Guidebook_July%202023.pdf

B. General Content

1. All plans are to identify clearly public/private dedication.

2. Provide continuous stationing

3. Centerline curve data (radius, deflection angle, degree of curvature and total arc length) for all roads shall be indicated on the plans. All horizontal curves shall be consecutively numbered and indicated in the plan view.

4. Finish grade of all structures shall be indicated in the plan view.

5. Show a detail of all intersections and cul-de-sacs. The detail shall show layout and detailed grades. Maximum scale of the detail shall be one-inch (1") equals 30-feet (1"=30').

6. A profile view shall be provided for all roads, public and private, and include the following:

    a. Elevations at top of curb and at centerline
    b. Existing ground elevations at the center of the right-of-way and at other locations, as required for review. Elevations shall be based on NAVD 88.
    c. Station and elevations of all high points, low points, grade breaks, curb returns and necessary information at vertical curves.
    d. Top of curb and elevations at each station. Grade in vertical curves must be indicated at 25-foot (25') intervals.

City Standard Special Provisions and Details

Roads shall be designed to the 2020 MDOT Standard Specifications and City of Mt. Pleasant Standard Special Provisions and Details, latest edition, available here:

https://cms2.revize.com/revize/mtpleasant/forms/Streets%20and%20Engineering/Standard%20Construction%20Special%20Provisions%20and%20Details%20-%20Jan%202025.pdf

Design Specifications

A. Private roads are to be designed to Public Road Standards.

B. Lane widths for new construction and reconstruction, which includes reconstruction of the curb and gutter, shall be 10-feet (10').

Exceptions:
11-foot (11') minimum lane widths may be required:

1. On Major Streets with State and/or other grant funding by the funding agency
2. For streets with high truck and/or bus volumes. This determination will be made by the City's Engineering Department.

C. The intersection of roads shall be as close to 90° as possible with a variation of no more than 10°.

D. Cul-de-sacs shall be avoided, unless space restraints require such usage, and such streets shall not exceed 600-feet (600') in length. A reduced pavement section may be submitted for review for a temporary cul-de-sac. "T" and "L" type turnarounds shall not be permitted.

E. Soil borings, a minimum of five-feet (5') below existing grade, shall be taken by an independent testing laboratory or qualified professional at intervals not to exceed 500-feet (500') when required. Additional borings may be required where the USDA Soil Survey or onsite inspection indicates unstable soil may be present.

F. The applicant shall remove all unsuitable soil, including muck, peat, and marl, as well as brush, trees, tree stumps, and similar materials from the full width of the roadway. These areas shall then be backfilled with MDOT Class II Granular Material to provide a stable subgrade for the roadway construction.

G. Street cross-sections shall include curb and gutter, and shall meet or exceed the minimum pavement thicknesses shown in the cross sections. Subsurface soil conditions shall govern exact thickness. Pavement cross-sections may have either an aggregate base or full depth asphalt. No concrete cross-sections will be allowed. All cross-sections shall be subject to the approval by the City. Phased development shall use the same cross-section throughout the entire project.

H. Unless otherwise approved by the City, minimum curb and gutter radii at intersections shall be as follows:

Minimum Radius (back of curb)

1. Major Streets 25-feet (25')
2. Local Streets 20-feet (20')
3. Entrances (residential, commercial, or industrial) shall be designed to accommodate the larger vehicles anticipated to use the site and stay within their lane.

I. Maximum allowable pavement grade shall be five percent (5%) and the minimum allowable(s) shall be as follows:

1. Concrete gutter grades – 0.40%
2. Concrete gutter return at intersections = 0.40%
3. Pavement surface grade to gutter line – 1.50%
4. Typical cross-slop = 2.00%

J. At the intersection of two (2) roadways, the maximum grade shall be three percent (3%) for a distance of 100-feet (100') from the point of intersection.

K. All streets shall be designed for a minimum design speed of 30 mph (posted speed 25 mph). Design criteria (AASHTO and Design Speed) shall be noted on the plans.

L. The minimum sight distance for all roads shall be 300-feet (300') for streets with design speeds of 30 mph. High design speeds shall be designed according to AASHTO, latest edition.

M. Whenever a change in the vertical centerline grade of one percent (1%) or more occurs, provide a vertical curve. The minimum length of vertical curve shall be 100-feet (100'), and shall be rounded to the nearest 50-feet (50') thereafter. For a 30 mph design speed, the minimum crest "K" value shall be 30 and the minimum sag "K" value shall be 40. Higher design speeds shall be designed according to AASHTO, latest edition.

N. Left turn lanes may be considered on streets where traffic volumes are high enough or safety considerations are sufficient to warrant them. Such usage shall be determined on a case by case basis by the road authority having jurisdiction.

O. All curbing shall be concrete meeting MDOT standard details and City Special Provisions, unless otherwise approved by the City. The curb detail shall be MDOT Type F-4.

P. All curbing shall drain to catch basins in the curb. Catch basins shall be spaces as specified in the Storm Drainage System section.

Q. Continuous edge drain may be required, as directed. Edge drain shall be a minimum of four-inch (4") diameter pipe wrapped with a geotextile fabric (sock) and backfilled with a granular material or cleaned crushed stone. Edge drain shall be connected to a catch basin.

R. The City may require street lighting at street intersections or other locations to serve purposes of safety and/or security. When required, the intensity and type of illumination, location and types of poles, bases, etc., shall be coordinated with the existing and future street lighting within the area.

S. The owner/developer shall provide and properly maintain, until accepted by the City, all traffic and pavement markings, which the City may determine as necessary for the proper operations of the roadway/driveway/curb cut. Only those traffic signs and pavement markings specified by the City (or jurisdictional authority) may be used within the road right-of-way. All signs and pavement markings shall conform to the current Michigan Manual of Uniform Traffic Control Devices (MMUTCD). The developer shall be responsible for constructing all required signs and pavement markings.

T. Pavement Marking

1. Stop Bars
   a. Reference MDOT standard detail PAVE-945-D, available here: https://mdotjboss.state.mi.us/TSSD/getCategoryDocuments.htm?categoryPrjNumbers=1403856,1403857,1403858,2677852,2668204,1403859,2677853,1403860,2668206&category=Pavement%20Markings
   b. Stop bars on city streets shall be 24-inches (24″) in width
   c. Stop bars shall be placed near stop signs wherever a Major Street intersects another Major Street.
   d. Stop bars shall be placed near stop signs wherever any street intersects Pickard Street, M-20, or Broomfield Road.
   e. Stop bars shall be placed near stop signs at any intersection that has marked crosswalks.

2. Crosswalks
   a. Reference MDOT standard detail PAVE-945-D, available here: https://mdotjboss.state.mi.us/TSSD/getCategoryDocuments.htm?categoryPrjNumbers=1403856,1403857,1403858,2677852,2668204,1403859,2677853,1403860,2668206&category=Pavement%20Markings
   b. Crosswalks should be marked at intersections of Major Streets.
   c. Standard crosswalks shall be marked with 6-inch (6″) edge lines.

3. Piano Bar or Special Emphasis Crosswalks
   a. Piano bar or special emphasis crosswalks shall be placed at certain intersections on Major Street crossings near schools or at particularly congested intersections in the central business district.
   b. They shall be 12-inch (12″) bars six-feet (6′) wide or wider, 3-feet (3′) on center. No edge stripe is necessary.

4. On-Street Parking
   a. On-street parallel parking shall be a minimum of eight-feet (8′) in width from the face of the curb and a minimum of 23-feet (23′) in length.
   b. On-street angled parking shall be a minimum of nine-feet (9′) in width and 18-feet (18′) in length from the face of the curb.

5. Bicycles
    a. Shared Lanes
        I. Reference MDOT standard detail PAVE-961-C available here: https://mdotjboss.state.mi.us/TSSD/getCategoryDocuments.htm?categoryPrjNumbers=1403856,1403857,1403858,2677852,2668204,1403859,2677853,1403860,2668206&category=Pavement%20Markings
        II. Where used, shared lane marking should be placed at the beginning of every block or every 250-feet (250') as appropriate.

    b. Dedicated Lanes
        I. Reference MUTCD Section 9 available here: https://mutcd.fhwa.dot.gov/pdfs/11th_Edition/part9.pdf
        II. The "Helmeted Bicyclist Symbol", including optional arrow as shown in the MUTCD, will be used when designating dedicated bicycle lanes.

SECTION 7 – GRADING

Requirements for Master Grading Plans

A Master Grading Plan is required for all developments. Master Grading Plans shall meet the requirements of the City's Storm Water Management Ordinance. Master Grading Plans shall accompany the set of engineering construction plans and shall include the following:

A. Benchmark locations, descriptions, and elevations (USGS) to be used for the development.

B. The minimum scale for grading plans is one-inch (1") equals 50-feet (1" =50').

C. The grades of existing adjacent houses, buildings, drainage structures, and streets shall be shown. One-foot (1') existing contours shall be shown for the site and 50-feet (50') feet past the property line(s). The drainage pattern of all adjacent land shall be indicated. All off site drainage flowing onto the site shall be clearly labeled and identified.

D. Match existing grade at the property boundaries.

    1. Grading plans shall correspond with proposed landscape and soil erosion requirements. Any revisions in the grading plan may require Planning Department approval if it directly or indirectly affects the approved landscape.

    2. The grading plan shall be designed to ensure that if a failure occurs in the storm system, water will drain without flooding structures.

E. Show proposed building finish floor grade to hundredths of a foot. For residential developments, place house grades within the plan view of the typical house to be built in this development.

F. The finished grade shall be compatible with the grades of surrounding buildings and yards.

G. For non-residential developments, show the proposed sidewalk grades at lot lines, center of driveway crossings and at fifty-foot (50') intervals to hundredths of a foot.

H. All existing and proposed earth grades are to be in hundredths of a foot.

I. Refer to the City's Storm Water Ordinance for rear yard drainage requirements.

J. Show existing and proposed ground grades at lot corners around the perimeter boundaries.

K. Show the proposed side yard swale elevation between all buildings.

L. The general direction of flow of all yard drainage and all swales must be indicated with arrows.

M. Additional grades shall be shown under special conditions as required.

N. The lot number or address shall be shown for each lot.

O. Any required storm sewer easements shall be a minimum of 20-feet (20') wide. All drainage easements for swales shall be a minimum of 10-feet (10') wide. Easements for drainage ditches shall include the ditch plus a minimum of 10-feet (10') beyond the top of banks on each side. The City shall require additional easement width when sewer size or depth and soils or other conditions warrant a wider easement. Easements are required for all public storm drains and private drains serving more than one (1) parcel.

P. No berms shall be placed over any underground public water main, sanitary sewer, storm drain, or within the designated easements for such facilities.

Q. Drainage water, sump pump water, and/or ground water shall not be discharged to the sanitary sewer system.

R. It shall be unlawful for any person to interfere with, modify, or obstruct the flow of drainage water across any property in any manner different from the approved plan.

Retaining Walls

A. Retaining walls should be used when adequate grading cannot be accomplished.

B. Retaining walls exceeding 42-inches (42") in height should include protective fencing on top or as required by State and County codes.

C. Retaining walls exceeding thirty-six (36) inches in height shall be designed by a licensed Professional Engineer. Design calculations shall be submitted with the construction plans.

SECTION 8 – SOIL EROSION AND SEDIMENTATION CONTROL

Submittal Procedure

Soil erosion and sedimentation plans shall be incorporated into any plans submitted. An Isabella County Soil Erosion Control Permit is required on projects not administered by the City of Mt. Pleasant.

Plan Requirements

The soil erosion and sedimentation control plans shall contain the following data and other information as required by the County or other agencies on sheets 24-inch (24") by 36-inch (36"), using the USGS Vertical Datum.

A. Public and private roads in the area, and all adjacent properties, and the extent of site grading, to at least 50-feet (50') beyond site boundaries.

B. Topographic plan at a legible scale, no smaller than 1"=50' to 50' beyond site boundaries showing:

    1. Existing ground elevations with either two-foot (2') contour intervals or spot elevations on a 50-foot (50') grid

    2. Existing structures and significant features, including trees six-inches (6") in diameter or larger, existing ground cover, extend and condition

    3. Existing drainage and soil information

C. Site grading and development plans as required under other sections of the City of Mt. Pleasant's Engineering Design Standards for all proposed utilities on the site.

D. The Soil Erosion and Sedimentation Control Plan shall include the following:

    1. Description and location of the limits for all proposed earth changes

    2. Description and location of all soil erosion measures

3. The timing and sequence of all proposed earth changes

4. Information as to how excavated material will be handled and stored to prevent erosion

5. Information on trench backfill restoration, including schedule of placement

6. Information concerning the existing drainage system, including a provision for maintenance.

E. Notes

The following notes shall appear on the plans:

1. The Contractor shall make daily inspections for effectiveness of erosion and sedimentation control measures and make any necessary repairs immediately.

2. Any sedimentation from work on this site shall be contained on the site, and not allowed to collect on any off-site areas or in waterways.

3. The Contractor shall apply temporary erosion and sedimentation control measures when required and as directed on these plans. The Contractor shall remove temporary measures as soon as the permanent stabilization of slopes, ditches, and other earth changes have been completed. This would include temporary sedimentation ponds.

Principles of Erosion and Sedimentation Control

A. Plan the development to fit the topography, soils, waterways, and natural vegetation at a site with the least necessary earth disturbance or change.

B. Expose the smallest practical area of land for the shortest practical time through staging the work and early application of temporary or permanent erosion control measures.

C. Apply soil erosion control measures as a first line of defense against on-site damage to prevent sediment production. These measures include special

grading methods, run-off control measures, temporary and permanent vegetation.

D. Apply sedimentation control measures as a perimeter protection to prevent off-site damage. These measures include diversion ditches, sediment traps, vegetative filters, and sediment basins.

E. Apply follow-up and periodic maintenance for continued effectiveness of control measures.

Engineering Design Standards

A. Riprap is required at all locations where storm water velocities may be erosive to soils. Riprap shall be placed at all storm water inlets, outlets, and basin outlets. Riprap shall be a nominal four-inch (4") to six-inch (6") minimum diameter and be clean of any foreign material.

B. Newly constructed storm water facilities shall be constructed to control flow velocities to limit erosion.

C. Based on the nature of the development, the plans shall contain a time schedule for the installation of permanent soil erosion control measures.

D. If specific details are required for soil erosion control measures, they shall be shown on the plans.

E. Soil erosion controls shall be used to prevent silt from entering public roadways and storm sewers at all times.

F. All disturbed areas shall receive four-inches (4") of topsoil, seed and mulch.

G. Crush aggregate mud mats 100-feet long by 26-feet (100' x 26') wide, at a minimum, shall be used at the entrance of construction sites.

H. On larger projects or when phasing is involved, the developer may be required to provide alternate construction drives to the site to avoid damage to newly constructed streets.

SECTION 9 – STORM WATER DETENTION AND RETENTION FACILITIES

Plans and Specifications Submittal Procedure

All plans, specifications, and calculations for detention basins and storm water storage shall be submitted in accordance with the City of Mt. Pleasant's Storm Water Management Ordinance.

Design Criteria

Refer to the City's Storm Water Management Ordinance for design criteria.

Maintenance Agreement

An agreement for the operation and/or maintenance of the detention basin system must be executed by the developer and submitted to and accepted by the City. This agreement, as to both form and content, shall be subject to the approval of the City's legal counsel.

Acceptance of Utilities

1. Preliminary Acceptance
   A. Prior to acceptance, all detention areas cleaned in accordance with City standards
   B. The developer shall submit record drawings, which must include rim elevations, inverts, pipe size, and slopes.

2. Final Acceptance

   Approved record drawings shall be submitted to the City in Adobe PDF format prior to final acceptance of the sewer. The City will review the record drawings to determine if the sewer is acceptable. IF the City determines the sewer has deficiencies, they shall be corrected prior to acceptance by the City.

SECTION 10 – STORM WATER DRAINAGE SYSTEMS

Plans and Specifications – Submittal Procedure

The plans and specifications shall be submitted in accordance with the Requirements and Submittals.

Plans and Specifications – General Design Considerations

A. Storm sewer systems for roadways and individual parcels less than 30 acres, not including off-site drainage areas, shall be designed for a 10-year storm by means of the rational method formula: Q=CIA; where Q is the peak rate of runoff in cubic feet per second, A is the area in acres, C is the co-efficient of runoff for the drainage area, and I is the average rainfall intensity in inches per hour for a certain time of concentration. The rainfall intensity shall be determined by the formula: I=175/(T+25); where T is the time of concentration equal to the time required for a drop of water to run from the remote point of the watershed to the point for which runoff is being estimated. In most instances, an initial T equal to 20 minutes for residential areas can be used. Use T equal to 15 minutes in other land use areas.

   Larger drainage areas shall be designed by a method approved by the City. The calculations submitted shall indicate the following information for each pipe: Drainage District Number, Structure Number of Receiving and Collecting Structures, Area, "C" Factor, Intensity, "Q", Length, Size and Slope of Pipe Run, Velocity, Pipe Capacity, Rim Elevation and Elevation of the Hydraulic Gradient.

B. The developer's engineer shall use judgement in arriving at proper imperviousness factors, but in general, the following "C" factors are acceptable minimums. The applicant shall submit calculations to justify the "C" factors used.

1.	Lawn areas	0.2
2.	Pavement and roof areas	0.9
3.	Overall area of single-family subdivision	0.35
4.	Overall area of multiple housing development	0.55
5.	Overall area of commercial development	0.80
6.	Overall area of industrial development	0.80

C. The plans shall include a hydraulic design calculation for each run of pipe and open channel. Flow velocities shall be calculated using Manning's equation.

D. The 10-year storm hydraulic gradient for non-submerged drain systems shall be maintained below the top of the sewer pipe.

E. A drainage area map showing all watershed areas, runoff coefficients, acreage of each area and proposed drainage system, in plan view, shall be included with the plans.

F. All off-site drainage flowing onto the site shall be included in the drainage area map and such flows provided for in the design calculations.

G. Storm water detention or retention is required for all developments in the City.

Plan and Profile – General

Plan portion of sheet shall include, at a minimum:

1. All storm sewers shall be shown in Plan and Profile, with the profile generally shown below the plan view. All structures and end sections shall be sequentially labeled in both plan and profile views.

2. Scale of plan portion of sheet shall be no smaller than 1"=50', with scale of profile portion of sheet, 1"=50" horizontal and 1"=5' vertical.

3. All elevations shall be on USGS datum.

Plan View

Plan portion of sheet shall include, at a minimum:

1. Existing topography and all existing and planned surface and underground improvements in streets and easements in which sewer construction is proposed, and in contiguous areas if pertinent to design and construction.

2. Location and direction of flow of each section of proposed sewer between manholes.

3. Locations of all manholes and other sewer appurtenances and special structures, with proposed rim elevations for all inlets and catch basins.

4. Elevations shall be on USGS datum. There shall be a minimum of two (2) benchmarks and one (1) benchmark at least every 1,200-feet (1,200').

Profile View

1. Profile portion of sheet shall appear below companion plan portion, generally projected vertically and, as a minimum, show the following:

    a. Size, slope, length, type and class of pipe, and controlling invert elevations for each section of proposed sewer between manholes

    b. Limits of special backfill requirements

    c. Profile (over centerline of proposed sewer) of existing and proposed finish ground and pavement surfaces

    d. If the hydraulic grade is provided in the previously mentioned calculations, then it does not have to be shown on the profile.

    e. Location of existing and proposed utilities crossing the line of the sewer or otherwise affecting sewer construction.

    f. Location, by station, of every proposed manhole with manhole number, invert elevations of all inlet and outlet pipes, and top of casting elevation

2. Manholes shall be identified by numbers assigned consecutively and increasing in magnitude in the direction opposite to the direction of flow.

3. All catch basin and inlet leads shall have a minimum slope of one percent (1%).

Location of Sewers

A. Storm sewers shall generally be located on the same side of streets as water mains and generally within the street right-of-way.

B. For subdivisions, storm sewers shall be located in the public road right-of-way or in easements adjacent to the public road right-of-way. Storm sewers shall not be located in rear yards, except to pick up rear yard drainage or in unusual circumstances, or for sump pump discharge lines.

C. The horizontal alignment of sewers, which are not proposed to generally follow street, drive, or parking area pavements, shall parallel property or building lines with clearance distances sufficient to accommodate the full width of any proposed easement.

D. Where possible, provide a minimum of two-and-one-half (2-1/2) feet of cover from the top of finish road or earth grade to the top of any storm sewer.

E. In parking areas, catch basins should be located in the gutter or parking stall areas. Catch basins in the driving areas should be avoided when possible.

Catch Basins and Inlets

In general, catch basins and inlets shall be located:

1. The flows do not exceed the intake capacity of the structure casting
2. At all low points in gutters, swales and ditches, where applicable
3. At the upstream curb return, if more than 200-feet (200') downstream of a high point in the gutter, or as required preventing water from crossing an intersection.
4. Catch basins shall be spaced no more than 350-feet (350') from the crest of the road. Subsequent catch basins shall be spaced a maximum of 400-feet (400') apart.
5. Yard catch basins shall be provided at all low points in drainage swales. Provide intercepting yard catch basins such that not more than 400-feet (400') of swale drainage runs into any one (1) catch basin, other than a low point catch basin, where 600-feet (600') of drainage is allowed.

Manholes

A. Manholes shall be located at:
   1. All changes in alignment
   2. Points where the size of the sewer changes
   3. Points where the grade of the sewer changes
   4. The junction of sewer lines
   5. Street intersections or other points where catch basins or inlets are to be connected

B. Manhole spacing for storm sewers shall be as follows:

Diameter of Sewer	Maximum Manhole Spacing
12″ to 42″	400 feet
48″ to 60″	500 feet
66″ and larger	600 feet

Where future connections to a manhole are anticipated, stubs with water-tight bulkheads shall be provided.

C. Covers for manholes, catch basins and inlets

Description	Grate	EJIM # or Equal
Solid Cover	A	1040
Flat Grate (round)	M1	1040
Low Curb Inlet	M1, Dump No Waste	7066
Flat Grate (Square)	M1, Dump No Waste & Fish Image (5105)	5100
Low Beehive Inlet	Dump No Waste	6517
High Beehive Inlet	Dump No Waste	6508
High Curb Inlet	M1, Dump No Waste	7045

East Jordan Iron Works (EJIW)

Hydraulics

A. Minimum pipe size for sewers, catch basin leads, and inlet leads shall be 12-inch (12″) nominal internal diameter.

B. Minimum design velocity shall be two and one-half feet (2.5′) per second and maximum design velocity shall be 10-feet (10′) per second with pipe flowing full.

C. Design life of enclosed storm sewers and bridges shall be 50-years or more, except for driveway culverts in open ditch areas, which shall have a design life of 20-years or more.

Open Drains

A. Where proposed, open drains shall be designed to convey the upstream design flow. A one-foot (1′) freeboard shall be provided.

B. Side slopes of open drains shall have a maximum slop of one-foot (1′) vertical to six-feet (6′) horizontal, except that a low flow channel (roadside ditches, rear yard swales, etc.) may have side slopes of one-foot (1′) vertical to three-foot (3′) horizontal. Open drain side slopes shall have an established sod surfacing or be seeded, fertilized and mulched as soon as possible after construction.

C. Open drains must have slope protection, i.e. riprap, gabion baskets, etc., at bends, under bridges, and at other critical points required by the City.

D. The City will not accept the work until all turf is established.

E. Hydraulic calculations for open channel flow shall be provided to assure the channel has adequate conveyance. Velocities shall be kept to a minimum, less than four (4) cfs, to prevent sour.

End Section and Bar Screens

An end section with prefabricated bar screen shall be installed on the end of all storm sewers 15-inches (15″) in diameter and larger. Openings of the bar screen shall be no more than six-inches (6″) on centers and shall be designed to be sturdy, permanent, easily maintained, and non-clogging.

Acceptance of Utilities

A. Preliminary Acceptance

1. Prior to acceptance, all sewers shall be flushed and cleaned in accordance with City standards.
2. The developer shall submit record drawings, which must include rim elevations, inverts, pipe size and slopes.

B. Final Acceptance

Approved record drawings, one (1) electronic copy on disk in AutoCAD format, one (1) electronic copy in Adobe PDF format, and two (2) sets of prints, sealed by a registered professional civil engineer licensed to practice in the State of Michigan, according to State of Michigan Occupational Code, Public Act 299 of 1980, shall be submitted to the City prior to final acceptance of the sewer. The City will review the record drawings to determine if the sewer is acceptable. IF the City determines the sewer has deficiencies, they shall be corrected to the City's satisfaction prior to the City accepting the sewer.

SECTION 11 – SANITARY SEWER SYSTEM

Plans and Specifications

A. Submittal Procedure

Plans and specifications shall be submitted as part of a site development package in accordance with the City of Mt. Pleasant's Development Guide.

https://cms2.revize.com/revize/mtpleasant/economic%20development/MP%20Development%20Guidebook_July%202023.pdf

B. The applicant may proceed with sanitary sewer permitting once the City has conducted an initial review of the entire construction plan submittal and all revisions pertaining to the sanitary sewer have been completed.

Plans and Specifications – General Design Considerations

A. All sanitary sewer designs shall be developed conforming to the current edition of "Recommended Standards for Waste Water Facilities," published by Health Education Services Division of Health Research, Inc., also known as the "Ten State Standards."

B. Prior to starting any sanitary sewer design, the applicant is encouraged to make use of maps and information available at the City offices. It shall be the responsibility of the applicant to field check and verify utility locations provided by the City.

C. The developer shall research to determine if the sewer has adequate capacity to handle the anticipated volumes. Such research shall be provided to the City for review and may be required for the permit from the Michigan Department of Environment, Great Lakes and Energy (EGLE).

D. In addition to those items required in the General Requirements and Submittals, the cover sheet shall show the following:

1. Overall layout of the sewer system with manhole numbers and direction of flow arrows shall be shown. Existing and proposed sewer shall be shown with different symbols and line types.

2. A flow calculation for the service area and any future service area that may be ultimately served by the proposed sewers shall be submitted.

E. The developer shall obtain a permit from the MI-EGLE for private sanitary sewer main as required by the EGLE.

F. If the developer determines that it is not possible to service their development with a gravity flow sewer, then the developer shall discuss the alternatives with the City.

G. Lift stations, grinder pumps, and low pressure sewers will require specific approval from the City. Design of such will be required to provide for future growth in the design parameters.

H. Soil borings shall be taken by an independent laboratory or qualified professional a minimum of two-feet (2') below design grade at intervals not to exceed 500-feet (500'), when required. Additional borings may be required where the USDA Soil Survey or onsite inspection indicates unstable soil may be present.

Plan and Profile Sheets

A. The plan portion of the sheet shall include, at a minimum, the following:

1. Existing topography and all existing or planned surface or underground improvements in streets or easements in which sewer construction is proposed or in contiguous areas, if pertinent to design and construction.

2. Location, length, size and direction of flow of each section of the proposed sewer between manholes. Private sanitary sewer mains should be designated as such.

3. Locations of all manholes and other sewer appurtenances and special structures.

4. Building sewers or wye branches are to be constructed or installed concurrently with sewer construction with locations at easement and/or property lines.

B. The profile portion of the sheet shall appear below the plan portion, generally projected vertically, and shall show, at minimum, the following:

1. Size, slope, type, class of pipe, class of bedding material, and controlling invert elevations for each section of proposed sewer between manholes

2. Limits of special backfill requirements

3. Location of existing or proposed utilities crossing the line of the sewer or otherwise affecting sewer construction

4. Location by station of every proposed manhole with manhole number, invert elevation of the inlet or outlet pipe, rim elevation and manhole size

5. Length of run between manholes

6. Location by station of all building sewers or wye branches to be constructed or installed concurrently with the proposed sewer construction

7. Existing and proposed ground elevation above the route of the sewer

8. Invert elevation at property line for building sewers to be included with sewer construction

9. Manholes shall be identified by numbers assigned consecutively and increasing in direction opposite to direction of flow in each sewer

10. All elevations shall be NAVD 88

11. There shall be a minimum of two (2) benchmarks with one (1) benchmark at least every 1,200-feet (1,200').

Location of Sanitary Sewers

A. Generally, sanitary sewers shall be installed in a public street right-of-way or in easements exclusively reserved for such use.

B. Sewers shall be constructed outside of paved parking areas, streets, and drives whenever possible

C. Sewers shall be installed parallel to the property or building lines

D. Sanitary sewers shall maintain 10-feet (10') of horizontal separation from all parallel utilities

E. Sanitary sewer crossings of other utilities shall have a minimum vertical clearance of 18-inches (18"), with the sanitary sewer placed below the other utility

Drop Connection

A. External drop connections are required at manholes where the invert of the outlet pipe is 24-inches (24") or more below the invert of the inlet pipe

B. Internal drop connections are not allowed, unless specifically approved by the City

Directional Boring or Bore and Jack

Where conditions require directional boring or bore and jack, consult the City for specific requirements. Where sanitary sewers or sanitary sewer leads cross improved roads of any type, the pipe shall be installed by directional boring or bore and jack (placed in steel casing pipe), unless otherwise approved by the City. All boring work shall be in accordance with the current MDOT standards and as approved by the City.

Extensions and Future Connections

Where the sanitary sewer must be extended from off-site, sanitary sewer leads extending two-feet (2') beyond the property line of all adjacent property of both sides of the right-of-way, the entire length of the off-site sanitary sewer installation shall be provided.

Manhole Locations

A. Manholes shall be constructed at every change in sewer grade, alignment and pipe size and at the end of each sewer line. Maximum distance between manholes shall not exceed 400-feet (400').

B. Where future connections to a manhole are anticipated, stubs with watertight bulkheads shall be provided.

Hydraulic Calculations

A. Calculations shall be provided

B. Minimum and Maximum Velocities
Minimum design velocities for gravity and low pressure sanitary sewers shall be two (2) feet per second and a maximum design velocity shall be 10-feet per second with pipe flowing full.

Allowances for Changes in Pipe Size

A. Maximum flow velocity for full pipe flow shall be maintained by continuity of the 0.80 diameter depth above invert for pipe size increases and also with intersecting sewer grade raised to compensate for head loss due to direction change.

B. Provide a drop of 0.10-feet (0.10') in the downstream sewer invert for all manholes to compensate for velocity head loss of the incoming flow.

Sewer Capacity Design

A. Tributary Area

Sanitary sewers shall be designed to serve all tributary areas, with due consideration given to topography, established zoning and the adopted Master Land Use Plan.

B. Population

1. For design purposes, population shall be based on a minimum of 3.5 persons per detached single-family home site (or equivalent single family unit), and 2.5 persons for each multiple-family dwelling unit.
2. Submissions for review shall include a tabulation of occupancy (usage) types and the conversation of these into terms of equivalent single-family units. The areas of the site, in acres, may be used to calculate dwelling units based on density allowed in the Zoning Ordinance.

C. Sewage Quantities for Pipe Design

For all service areas, sewer design flows shall be in accordance with the "Ten State Standards."

Acceptance of Utilities

Approved record drawings, one (1) electronic copy on disc in AutoCAD format, one (1) electronic copy in Adobe PDF format, and two (2) sets of prints sealed by a registered professional civil engineer licensed to practice in the State of Michigan, according to Michigan Occupational Code, Public Act 299 of 1980, shall be submitted to the City prior to final acceptance of the sanitary sewer. The City will review the record drawings and video tapes to determine if the sewer is acceptable. If the City determines the sewer has deficiencies, they shall be corrected to the City's satisfaction prior to the City accepting the sewer.

SECTION 12 - WATER DISTRIBUTION SYSTEM

Plans and Specifications -Submittal Procedure

1. Plans and specifications shall be submitted as part of a site development package in accordance with the City of Mt. Pleasant Development Guide. https://cms2.revize.com/revize/mtpleasant/economic%20development/MP%20Development%20Guidebook_July%202023.pdf

2. The Applicant may proceed with water main permitting once the City has conducted an initial review of the entire construction plan submittal and all revisions pertaining to the water main have been completed.

Plans and Specifications - General Design Considerations

A. All water systems shall be designed conforming to the current edition of the "Recommended Standards for Water Works", published by Health Education Services Division of Health Research Inc., also known as the "Ten State Standards".

B. Plans shall consist of plan and profile views of the complete project.

C. Prior to starting any water main design, the applicant is encouraged to make use of maps and information available at the City of Mt. Pleasant DPW office. It shall be the responsibility of the applicant to field check and verify utility locations provided by the City.

D. The plans shall contain a total quantity listing of the proposed water main improvements, indicating the lengths of pipe, type of pipe and their respective sizes.

E. Provide continuous stationing. Identify all existing and proposed tees, valves, bends, hydrants, etc.

F. Soil borings, two-feet (2') below design grade of the pipe (minimum), shall be taken by an independent testing laboratory or qualified professional at intervals not to exceed 500-feet (500'), when required. Additional borings may be required where the USDA Soil Survey or onsite inspection indicates unstable soil may be present.

G. Benchmarks and Elevations

1. Elevations shall be on NAVD 88. There shall be a minimum of two (2) benchmarks with one (1) benchmark at least every 1,200-feet (1,200').

2. Proposed finish grade elevations at hydrants and gate valves or wells shall be shown on the plans.

H. Soil Conditions

Water main design, relative to pipe bedding and location, shall reflect the proper selection of materials and construction method compatible with the field conditions. Areas that show unsatisfactory ground material for pipe bearing or possible chemical deterioration due to soils shall be avoided or the pipe shall be suitably installed on adequately designed bedding and/or enclosed in protective wrap or coating.

I. Location and Layout

1. The distribution system in all developments requiring more than 600-feet (600') of water main shall have a minimum of two (2) connections to a source of supply and shall be a "looped" system, whenever possible, where the system will become a public main. Private water mains shall not be looped back to public water mains.

2. Generally, water mains shall be installed in a public street right of way or in easements exclusively reserved for such use.

3. Water main shall be installed parallel to the property lines or building lines, with clearance distances to allow for a 20-foot (20') width dedication of easement centered on the water main. Water mains shall be kept on one side of the street for the entire length of the street, unless otherwise approved by the City.

4. Water main shall be constructed outside of paved parking areas, streets and drives, unless approved by the City.

5. In new developments, water mains shall be installed from boundary to boundary in abutting roads, interior streets, and at other locations, as may be deemed necessary by the City for future extensions.

6. When connecting to an existing water main, a cut in tee with gate valve or a tapping sleeve and valve will be required. A full body sleeve is required for all taps made to ductile iron, cast iron, or PVC water main, or as directed by the City. Same size tapping sleeves will be allowed.

7. The plans shall indicate the proposed finish grades of all hydrants, valve boxes, and gate wells.

8. All water mains shall be located so as to provide a minimum of 10-feet (10') horizontal clearance between the nearest edge of the water main and the nearest edge of any sanitary or storm sewer.

9. Where conditions require tunneling, directional boring or bore & jack, consult the City for specific requirements. These conditions may include road crossings or conflicts with trees, shrubs, structures or other utilities. Where water mains or water leads cross improved roads of any type, the pipe shall be installed by directional boring or bore and jack (placed in a steel casing pipe), or as approved by the City. All boring work shall be in accordance with the current MDOT standards and as approved by the City.

J. Easements

1. Easements for possible extensions shall be extended to the property line at locations designated by the City. All easements shall be a minimum of 20-feet (20') wide and shall be dedicated to the City.

2. The easement descriptions shall include the hydrant leads and shall extend a minimum of 10-feet (10') beyond the hydrant on any lead. The easement documents shall contain a provision prohibiting the construction of or locating of any above ground structures within the limits of such easements.

K. Pipe Sizes

1. Six-inch (6") diameter water mains are the minimum size to be installed in single-family residential areas.

2. 12-inch (12") water mains are considered to be the minimum size in commercial, office, industrial and multiple family residential areas, except

in a looped system of 1,500-feet (1,500′) or less where eight-inch (8″) mains may be permitted, if approved by the City.

3. Water main shall be sized to provide the volumes required by the proposed developments. Design shall include ample research to verify that the required volumes and pressures are available.

4. Water mains shall be designed to provide adequate volumes for the fire fighting purposes. Insurance Services Office (ISO) Standards shall be used, as a minimum guideline, to provide 1,000 gallons per minute (GPM) for emergency use.

5. All single hydrant leads longer than 75-feet (75′) must be a minimum of eight-inches (8″) in diameter.

H. Pipe Materials

Refer to the City of Mt. Pleasant Special Provision for Water System Materials and Construction for pipe materials.

I. Valves –Location

1. A valve shall be provided at every connection to existing mains, unless otherwise approved by the City.

2. In general, valves on cross connecting mains shall be arranged so that no single line failure will require more than eight hundred (800) feet of main to be out of service. Also, sufficient valves shall be placed such that not more than 24 homes, 30 multiple family units, or two (2) hydrants shall be out of service within such section of water main, which can be isolated. On transmission mains, valves shall be spaced not more than one-quarter (1/4) mile apart. Valves shall be so arranged that any section can be isolated by closing not more than four (4) valves.

3. A valve shall be provided on every dead-end line where required for future extension, at a location approved by the City. All dead-end mains must have valves at the tee.

4. Valves and valve boxes shall be as specified within the city standards.

J. Fire Hydrants

1. Hydrant locations shall be approved by the City and shall be spaced as required by the Fire Code.

2. A hydrant shall be installed at the end of every dead-end main.

3. The location of hydrants with respect to the right of way line shall be indicated on the plans. Hydrant shall be plumb and set to grade prior to final acceptance.

4. Refer to the City of Mt. Pleasant Special Provision for Water System Materials and Construction for hydrant and valve types.

K. Pipe Restraints

Refer to the City of Mt. Pleasant Special Provision for Water System Materials and Construction for pipe restraints.

L. Services

1. Service lines are to be shown to all buildings.

2. Refer to the City of Mt. Pleasant Special Provision for Water System Materials and Construction for service materials.

3. A curb stop for each service line shall be provided and located at the right of way. Curb stops in drives and sidewalk shall be sleeved.

4. The internal diameter shall be shown for each service and the minimum size shall be one (1) inch in diameter.

M. Fire Protection Lines

1. Fire protection lines, where applicable, are to be shown to all buildings.

2. A valve and a back flow device for each fire protection line shall be provided by developer.

3. The domestic supply lead shall be a separate lead not attached to the fire protection line.

N. Acceptance of Utilities

1. Preliminary Acceptance

    a. Refer to the City of Mt. Pleasant Special Provision for Water System Materials and Construction for preliminary acceptance.

    b. The Developer shall submit record drawings, which must include pipe size and tie downs to all water main appurtenances.

2. Final Acceptance

    a. Approved record drawings, one (1) electronic Copy on disk in AutoCAD format, one (1) electronic copy in Acrobat PDF format, and two (2) sets of prints sealed by a Registered Professional Civil Engineer licensed to practice in the State of Michigan according to State of Michigan Occupational Code, Public Act 299 of 1980, shall be submitted to the City prior to final acceptance of the water mains. If the City determines the water main has deficiencies, they shall be corrected to the City's satisfaction prior to the City accepting the water main.