CITY OF BELDING
IONIA COUNTY, MICHIGAN

STANDARD CONSTRUCTION REQUIREMENTS

FOR

STREET, STORM SEWER, SIDEWALK, SANITARY SEWER, WATER MAIN, STREET TREE AND STREET LIGHT IMPROVEMENTS, AND DEMOLITION

August 2013
14593

FLEIS & VANDENBRINK
ENGINEERING, INC.
Offices in Grand Rapids, Traverse City and Muskegon
2960 Lucerne Drive SE, Grand Rapids, MI 49546
Phone: 616.977.1000 Fax: 616.977.1005

TABLE OF CONTENTS

CITY OF BELDING
RESOLUTION NO. 2011-08-56

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF BELDING, MICHIGAN AUTHORIZING AMENDMENTS TO THE STANDARD CONSTRUCTION REQUIREMENTS.

At a regular meeting of the City Council of the City of Belding, County of Ionia, Michigan, held in said City on the 2nd day of August, 2011.

PRESENT: Council Members Bunce, Scheid, Belding, Gunderson and Wills.

ABSENT: None.

The following preamble and resolution were offered by Council Member Bunce and seconded by Council Member Belding.

WHEREAS, the Standard Construction Requirements were adopted on November 2, 2004 and became effective on November 16, 2004; and

WHEREAS, staff has determined that certain amendments to the Standard Construction Requirements are desirable and necessary; and

WHEREAS, changes, additions, deletions or modifications to the Standard Construction Requirements are allowable through a resolution by the Belding City Council.

NOW THEREFORE, BE IT RESOLVED by the City Council of the City of Belding, Michigan that the amendments to the Standard Construction Requirements are hereby approved and become effective immediately.

Upon vote for the adoption of said resolution, the vote was:

YEAS: Council Members Bunce, Scheid, Belding, Gunderson and Wills.

NAYS: None.

THIS RESOLUTION WAS THEREUPON DECLARED ADOPTED THIS 2ND DAY OF AUGUST, 2011.

CERTIFICATION

I hereby certify that the foregoing is a true and complete copy of a resolution adopted by the City Council of the City of Belding, County of Ionia, State of Michigan, at a meeting held on August 2, 2011, the original of which is on file in my office and available to the public. Public notice of said meeting was given pursuant to and in compliance with the Open Meetings Act, Act No. 267 of the Public Acts of Michigan of 1976, including in the case of a special or rescheduled meeting, notice by posting at least eighteen (18) hours prior to the time set for said meeting.

Dated: August 2, 2011

Kareen J. Thomas
City Clerk

PURPOSE OF THIS DOCUMENT:

The purpose of this document is to provide Developers, Consulting Engineers and Contractors working in the City of Belding the standard construction requirements required by the City for street, storm sewer, sidewalk, sanitary sewer, water main street tree and street light improvements which, after acceptance by the City, will become public facilities.

THESE STANDARD CONSTRUCTION REQUIREMENTS SHALL BE INCORPORATED BY REFERENCE AS PART OF THE CONTRACT DOCUMENTS FOR THE ACQUISITION AND CONSTRUCTION OF PUBLIC STREET, STORM SEWER, SIDEWALK, SANITARY SEWER, WATER MAIN, STREET TREE AND STREET LIGHT IMPROVEMENTS IN THE CITY OF BELDING. MICHIGAN DEPARTMENT OF TRANSPORTATION (MDOT) SPECIFICATIONS AND STANDARD PLANS REFERENCED THROUGHOUT THE SPECIFICATIONS SHALL BE SUPERSEDED BY THE MOST CURRENT VERSION PUBLISHED BY MDOT.

CITY OF BELDING

ORDINANCE NO. 473

AN ORDINANCE TO ADOPT STANDARD CONSTRUCTION REQUIREMENTS FOR STREET, STORM SEWER, SIDEWALK, SANITARY SEWER, WATER MAIN, STREET TREE AND STREET LIGHT IMPROVEMENTS.

THE CITY OF BELDING ORDAINS:

Section 1. Addition of New Section 14-1.

The Code of Ordinances (the "City Code") of the City of Belding (the "City") is amended by the addition of a new Section 14-1 which shall read in its entirety as follows:

Section 14-1. Standard Construction Requirements.

Construction specifications prepared by the City Engineers and contained within "The City of Belding, Ionia County, Michigan 2004 Standard Construction Requirements for Street, Storm Sewer, Sidewalk, Sanitary Sewer, Water Main, Street Tree, and Street Light Improvements" are hereby adopted. A copy of such Standard Construction Requirements shall be filed in the office of the City Clerk. The City Council may provide by resolution for changes, additions, deletions or modifications to such Standard Construction Requirements and file the same in the office of the City Clerk.

Section 2. Addition of Municipal Civil Infraction Fine Amount.

Section 1-24(h) is amended to add municipal civil infraction fine amounts for violations of the Standard Construction Requirements established by Section 14-1, to read in its entirety as follows:

Section 14-1. Standard Construction Requirements.

Failure to comply with any provision of Section 14-1 (Standard Construction Requirements):	500.00
First repeat offense:	1,000.00
Second (or any subsequent) repeat offense	2,500.00

Section 3. Severability.

Sections of this Ordinance shall be deemed severable and should any section, clause or provision of this Ordinance be declared invalid, the same shall not affect the validity of the ordinance as a whole or any part thereof other than the part declared to be invalid.

Section 4. Effective Date.

This Ordinance shall become effective ten (10) days after publication in a newspaper of general circulation.

FIRST READING: October 19, 2004

SECOND READING: November 2, 2004

EFFECTIVE DATE: November 16, 2004

Moved by Council Member Stout, seconded by Council Member Blunt, that the foregoing Ordinance be adopted.

YEAS: Council Members Geisen, Stout, Wills, Blunt and Husted.

NAYS: None.

ABSENT: None.

ORDINANCE DECLARED ADOPTED.

CERTIFICATION

I hereby certify that the foregoing ordinance was adopted by the City of Belding City Council in a regular session held on November 2, 2004, and that it was published in the Daily News on November 6, 2004.

_____

Kareen Thomas, City Clerk

DIVISION 01

SPECIFICATIONS

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 TEMPORARY UTILITIES:

A. Construction: Provide all arrangements, permits and payments.

1.02 TEMPORARY SANITARY FACILITIES:

A. Provide and maintain all necessary facilities.

1.03 GUARDRAILS AND BARRICADES:

A. Protection of Work and Public:
   1. Provide and maintain all necessary materials, including:
      a. Signal lights from sunset to sunrise.
      b. Warnings lights and all devices in accordance with MDOT Manual of Uniform Traffic Control Devices.
      c. Temporary Fencing.

B. Roadway and Alley Closing:
   1. All closings require approval.
   2. Notify police, fire department and schools.
   3. Provide accessibility to fire hydrants at all times.

C. Traffic Detours:
   1. Detour routes and signage shall be in accordance with the approved plans or as approved by CITY or CITY ENGINEER.
   2. Detour routes shall be adequately signed, barricaded and maintained during construction.
   3. Gravel roads within detour routes shall be maintained by periodic grading and chlorine treatment.

D. Driveway Closing: Eight (8) hour maximum with prior notification to resident. Maintain emergency access to all properties during construction. All driveways shall be accessible at the end of the work day.

1.04 SPECIAL CONTROLS AND MISCELLANEOUS ITEMS:

A. Sidewalks: Accommodate pedestrian traffic.

B. Surface Drainage: Provide protection and maintenance.

C. Signs and other movable surface features:
   1. Witness location prior to removal. Relocate to accessible location and maintain during construction.
   2. After utilities are placed and backfilled, replace in accordance with the Michigan Manual of Uniform Traffic Devices.

D. Mailboxes:
   1. Witness location prior to removal. Relocate to accessible location and maintain temporary postal service during construction. Notify post office of temporary location.
   2. Upon completion of construction, replace in accordance with United States Postal Service regulations.

END OF SECTION

SECTION 01525

CONSTRUCTION AIDS - SHORING

PART 1 - GENERAL

1.01 SUMMARY:

A. Work included: This Section includes the work required for all temporary shoring.

1.02 JOB CONDITIONS:

A. Interrupted Utility Service - Stand-by service: Provide to utility standards prior to shoring installation.

B. Installing and Removing by Jetting is prohibited.

C. Scheduling clean-up: Promptly following utility installation.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General: Used or new, wood or steel.

B. Pipe Laying Box Dimensions: Provide adequate working room and control of trench width to meet utility bedding requirements.

PART 3 - EXECUTION

3.01 PERFORMANCE:

A. Installation and Removal:
   1. General: Protect adjacent property, work and workmen.
   2. Pipe laying box:
      a. Permitted where safety of workmen is sole consideration.
      b. Prevent dislocation of utility and bedding when moving.
   3. Voids left by removal: Fill and compact in accordance with DIVISION 2 - SECTION 02220 - EXCAVATING, BACKFILLING AND COMPACTING.
   4. Shore, sheet pile and brace excavations as required to maintain them secure, remove shoring as the backfilling progresses, but only when banks are safe against cave-ins or collapse. Where shoring or underpinning furnishes permanent or temporary support, extreme care shall be taken to insure that no settlement or collapse will occur. Conform to MIOSHA safety rules and regulations.

B. Temporary Shoring Left in Place: Cut off minimum 2 feet below established surface grade.

END OF SECTION

SECTION 01526

CONSTRUCTION AIDS - DEWATERING

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes the work required for all temporary dewatering.

1.02 JOB CONDITIONS:

A. Private Wells and Property:
   1. CONTRACTOR shall be responsible for all damage and interruption resulting from temporary dewatering operations.
   2. CONTRACTOR shall provide temporary service and limit interruption to 4 hours.

B. Discharge Disposal:
   1. To OWNER's systems: Permission required.
   2. Surface erosion control: Provide.

C. Scheduling clean-up: Promptly following utility installation.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General: Adequate for purposes intended.

PART 3 - EXECUTION

3.01 PERFORMANCE:

A. General: Provide and maintain dry working conditions until utility is completed.

B. Prevent hydraulic stressing of structures as required.

C. Place sufficient observation wells to adequately monitor the water during all dewatering procedures so as not to affect the structural integrity of existing buildings.

D. The Contractor shall be responsible for temporary service of an individual water supply where these supplies are cut off due to lowering of the water table during construction. The Contractor shall not lower the water table unnecessarily.

E. Provide internal dewatering where bulkheads are to be removed.

F. Plug and abandon dewatering wells per requirements of the State of Michigan's Mineral Well Act, Act 315 of P.A. of 1969.

END OF SECTION

SECTION 01527

CONSTRUCTION AIDS - BYPASS PUMPING

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes the work required for the bypassing and pumping of wastewater flow where needed to isolate sections of sewer under construction.

1.02 SUBMITTALS:

A. Operational Data: Approval of the proposed procedure and schedule for bypassing and point of discharge will be required by CITY and CITY ENGINEER.

1.03 JOB CONDITIONS:

A. Flow Restrictions: Total restriction of wastewater flow is prohibited unless approved in writing by the CITY.

B. Bypassing wastewater to ground or surface waters is prohibited.

C. Responsibility: CONTRACTOR is responsible for any damages to private or public property due to sewer backup while controlling or bypassing wastewater flow.

D. Emergency Equipment: Provide backup pumps and equipment in case of failure.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General: Materials and equipment used for bypass pumping shall be adequate for purposes intended.

PART 3 - PRODUCTS

3.01 PERFORMANCE:

A. General: Provide and maintain all bypass pumping equipment and manpower necessary to adequately perform the work.

B. Isolation of Work Area:
   1. Temporarily bypass the wastewater flow from the nearest upstream to the nearest downstream manhole or divert the flow from the nearest upstream manhole to holding tanks.
   2. Dispose of waste from holding tank by pumping to nearest downstream manhole or by hauling from site by a licensed waste hauler.

END OF SECTION

SECTION 01560

TEMPORARY CONTROLS - EROSION

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes the work required to provide and maintain temporary soil erosion and sedimentation control.

1.02 JOB CONDITIONS:

A. Scheduling: Clean-up shall occur within one (1) week after erosion control measures are no longer required.

1.03 SUBMITTALS:

A. Operational Data: Submit a plan for the control of soil erosion and sedimentation to the local agency regulating soil erosion and sedimentation. Upon approval of the plan, a soil erosion permit shall be obtained.

PART 2 - PRODUCTS

2.01 MATERIALS: Materials used for temporary erosion and sedimentation control shall be in accordance with MDOT 208.02 and as approved by the regulating agency.

PART 3 - PRODUCTS

3.01 PERFORMANCE:

A. General: Abide with all applicable rules and regulations as established by the State of Michigan and the local regulating agency in conjunction with Act 451 of 1994, Natural Resources and Environmental Protection Act, Part 91 as amended, Michigan Soil Erosion and Sedimentation Control (formerly PA 347 of 1972, as amended).

B. Sediment Removal:
   1. Take such steps as are necessary to assure the retention and removal of any sediment which enters a drainage system along the construction route before said system discharges into a stream, pond or lake.
   2. If eroded material is allowed to enter a storm sewer system, all catch basins, manholes and pipe shall be cleaned following construction prior to receipt of final payment. Unless CONTRACTOR can document positively to what extent an existing storm sewer system along the construction area was silted in prior to construction, no credit will be given for cleaning the system.
   3. Maintain roadways in a passable condition until paving is completed, including any maintenance and dust control.

C. Soil Erosion and Sedimentation Control Measures: MDOT 208.03D.

1. Provide and maintain the following temporary soil erosion and sedimentation control measures unless otherwise shown on the Drawings or in the permit:
   a. Excavated or borrow material stock-pile.
      (1) Place bales of hay or straw and/or siltation fencing around stockpile in a manner to prevent soil erosion from entering the drainage system or leaving the site.
   b. Trench backfill in place.
      (1) Place bales of hay, straw or silt fence staked in place across trenches, ditches and around inlets to prevent soil erosion from leaving the site or entering the drainage system until:
         (a) Seed and mulch have been placed in non-paved areas.
         (b) Aggregate has been placed in bituminous and gravel areas.
   c. Dewatering discharge.
      (1) Place bales of hay, straw and/or siltation fencing staked in place at point of discharge, adequately anchored.
   d. Grading limits.
      (1) Place silt fence staked in place along down gradient side of all areas disturbed by grading operations.
   e. Catch basins.
      (1) Provide inlet protection around catch basin and below grates. Remove after turf is established
   f. Culvert inlets.
      (1) Place stone check dam and silt fence staked in place upstream of all culvert inlets.
   g. Drain cleanout.
      (1) Excavate sediment basin and place stone check dam at downstream end prior to cleanout operation.
2. Maintain controls during non-working hours and during working hours if weather so requires.
3. Remove silt or solids retention at control structures, manholes, catch basins, storm sewers and culverts following construction.

D. Maintenance of Soil Erosion and Sedimentation Control Measures: MDOT 208.03E.

E. Removal of Soil Erosion and Sedimentation Control Measures: MDOT 208.03F.

3.02 SCHEDULES:

A. MDOT Standard Plan R-96-D (6 sheets)

END OF SECTION

DIVISION 02

SPECIFICATIONS

SECTION 02220

EXCAVATING, BACKFILLING AND COMPACTING

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes the work required for trenching, excavating and backfilling, clearing, special pipe foundations and special work below grade.

1.02 DEFINITIONS:

A. Maximum Density: Maximum dry weight in pounds per cubic foot of a specific material..

B. Optimum Moisture: Percentage of water at maximum density.

C. Rock Excavation: Includes all boulders or rock weighing 400 pounds (approximately one cubic yard) or more and all solid or ledge rock, slate, shale, sandstone and other hard materials that require continuous use of pneumatic tools, heavy rippers or continuous drilling and blasting for removal. Pavements are not included.

D. Suitable Excavated Material: Mineral (inorganic) soil free of cinders, refuse, sod, boulders, rocks, pavement soft or plastic clays, vegetable or other organic material and capable of being compacted as specified. Moisture content has bearing on the suitability of materials to be used.

E. Granular Material: Coarse grained materials having no cohesion, which derives its resistance to displacement from internal stability.

F. Cohesive Material: Fine grained material which derives its resistance to displacement by manual attraction between particles of the mass, involving forces of molecular origin (i.e. Clays are considered cohesive).

G. Grade Terminology: Article 3.10 SCHEDULES.

1.03 REFERENCES:

A. MDOT - Michigan Department of Transportation, *"2003 Standard Specifications for Construction", current edition.*

B. ASTM - American Society of Testing Materials, latest edition.

1.04 JOB CONDITIONS:

A. Obtain and comply with construction permits from agencies having jurisdiction over the work.

B. Scheduling: Clean up promptly following utility installation backfilling.

C. Dust Control: Broom or apply dust palliatives as needed.

D. Length of Open Trench: 50 feet maximum.

E. Driveway Closing: Eight (8) hour maximum with prior notification to resident. Maintain emergency access to all properties during construction.

E. Signs, mailboxes and other movable surface features:
1. Witness location prior to removal. Relocate to accessible location and maintain during construction.
2. Upon completion of construction, replace to original position and condition.
3. Replace regulatory traffic control signs immediately after utilities are placed and backfilled.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Trench Backfill:
1. Granular Material shall be MDOT 902.08, Table 902-3, Class III limited to 1.0 inch maximum size.
2. Select Granular Material shall be MDOT 902.08, Table 902-3, Class II or IIa limited to 1.0 inch maximum size.
3. Concrete shall be Grade S3, 3,000 psi compressive strength, 4 inch maximum slump.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Clearing and Grubbing:
1. Perform clearing, grubbing and tree removal required for proposed construction within limits of right-of-way, easement and/or project site.
2. Dispose of tree, stump and brush material by removing it from the site or as otherwise approved.
3. Save and protect all trees and vegetation unless identified to be removed.
4. Repair or replace trees, shrubs and other vegetation damaged by CONTRACTOR's operation.

B. Removal of Surface Improvements:
1. Remove improved surfaces such as pavement, drives, sidewalk, curb and gutter, lawns, etc. just prior to excavating / trenching operations. Edges of pavements removed shall be sawcut.

C. Conflicting Utilities:
1. Before starting excavation, establish location and extent of existing utilities in work area.
2. Establish potential conflict areas prior to construction.
3. Excavate and expose existing utilities presenting potential conflict to determine their exact location and elevation.
4. Advise ENGINEER of conflicts and obtain instructions on how to proceed.
5. Make adjustments in proposed utility location.
6. Make arrangements with owner of existing utility for relocation, if necessary.
7. Schedule work accordingly.

D. Dewatering:
1. Provide and maintain dewatering equipment as necessary to provide dry trench

sub-grade.
2. Provide temporary water supply to homes interrupted by dewatering operations.

E. Soil Erosion and Sedimentation Control:
1. Obtain permit from Ionia County Drain Commissioner.
2. Provide and maintain soil erosion and sedimentation control measures during construction.

3.02 EXCAVATION:

A. General:
1. Dispose of surplus and unsuitable excavated material.
2. Remove, salvage and stockpile topsoil on-site in area designated by ENGINEER.
3. Unsuitable material encountered in sub-grade or below payment line: Notify ENGINEER and obtain instruction on how to proceed.

B. Trenches:
1. Depth: Provide a uniform and continuous bearing and support for proposed utility on solid and undisturbed or compact granular material.
2. Minimum Width: Allow space for jointing and bedding.
3. Maximum Width: The following limitations shall apply at utility crown:
a. 6 inch through 10 inch diameter: 30 inches.
b. 12 inch through 30 inch diameter: Outside diameter plus 24 inches.
c. 30 inch and over diameter: Outside diameter plus 36 inches.
d. Elliptical: Outside pipe width plus 36 inches.
4. Shoring: Provide sheeting, shoring, bracing, shelving, etc. in order to protect excavations in accordance with current MIOSHA and OSHA regulations.

C. Blasting:
1. Obtain and comply with required permits.
2. Perform only during hours approved.

D. Length of Open Trench shall be 200 feet maximum.

E. Damage to Existing Underground Utilities:
1. Report all damage to ENGINEER and utility owner.
2. Repair to utility owners standard.

3.03 BACKFILLING:

A. Pipe bedding area and special pipe foundation area: Compact granular material to ninety percent (95%) of maximum density according to the Modified Proctor Method or to ninety-five percent (95%) of maximum density using the Michigan Cone Test.

B. Trench Backfill Area:
1. Under permanent pavement, shoulder areas and areas within a one on one slope from the shoulder edge:
a. Compact suitable excavated material or granular material Class II in 9.0 inch layers to ninety-five percent (95%) of maximum density according to the Modified Proctor Method or to ninety-five percent (95%) of maximum density using the Michigan Cone Test.
2. Under nonpermanent pavement: Same as permanent pavement.
3. Under unimproved right-of-way areas: Compact suitable excavated material to eighty-five percent (85%) of maximum density.

4. Under landscaped and unimproved areas: Compact suitable excavated material to eighty percent (80%) of maximum density.
5. Under undercut existing structure: Place concrete.

C. Structures:
1. Density requirements: Same as Trenches.
2. Concrete structure: Place backfill only after seventy-five percent (75%) of concrete design strength has been reached.

3.04 TRENCH UNDERCUTTING AND BACKFILL:

A. Excavation: Perform to ENGINEER instructions.
B. Backfill: Provide to payment line with granular material compacted in compacted in place.

3.05 BORING AND JACKING:

A. Comply with MDOT, Road Commission, and ENGINEER requirements.

3.06 COMPACTION, TESTING AND INSPECTION:

A. Surplus excavated and unsuitable excavated material shall become the property of the CONTRACTOR.

B. Dispose of surplus excavated or unsuitable excavated materials off-site.

C. Performance and test equipment will be provided by approved independent laboratory.

D. Moisture - Density relationships:
1. Cohesive (clays) soils: ASTM D 1557 (Modified Proctor).
2. Granular (sands) soils: Michigan Cone Test.

E. Field Density: Either of following:
1. ASTM D-2167 (Rubber Balloon).
2. ASTM D-2922 (Nuclear).

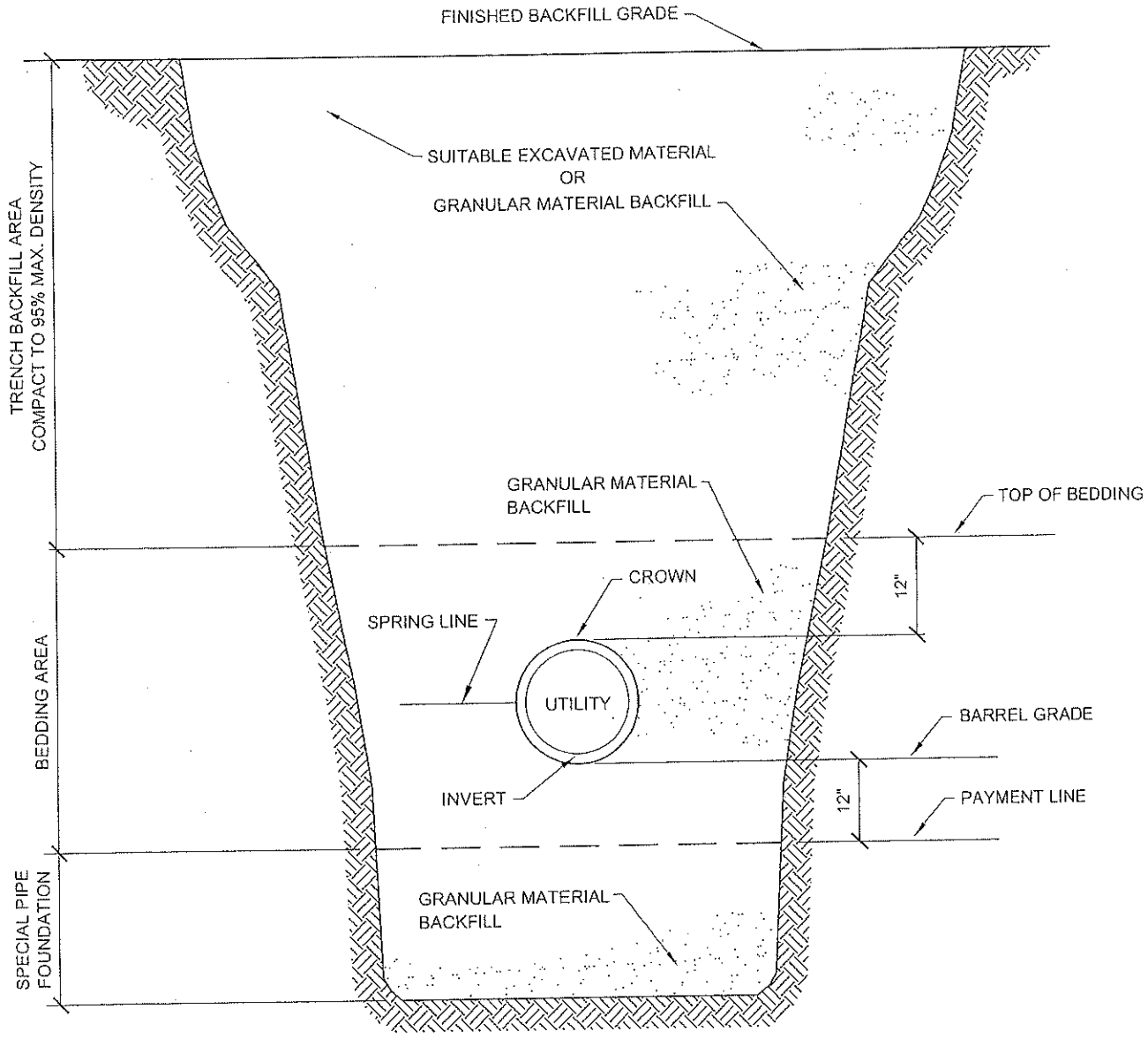
F. Furnish equipment and personnel to provide access to test location and depth. Density tests will be performed at various levels, as determined, during or after backfilling operation.

G. Correct any deficiencies resulting from insufficient or improper compaction. Retesting of density in areas of failed tests shall be performed at the CONTRACTOR's expense.

3.07 SCHEDULES:

A. Excavating and backfilling terminology (included at end of this section)

END OF SECTION



UTILITY EXCAVATING AND BACKFILLING TERMINOLOGY

SECTION 02410

DEMOLITION

PART 1 – GENERAL

1.01 SUMMARY OF WORK:

A. Work includes, but is not necessarily limited to, the demolition of buildings, structures, concrete and masonry foundations, floors and pavements, equipment, piping, and related work associated with removing buildings and structures from a site and restoring the surface.

B. Regulatory Requirements:
   1. Conform to applicable codes for demolition work, safety of structures and dust control.
   2. Obtain Demolition Permit from CITY. Comply with conditions outlined in Demolition Permit issued by CITY and these specifications.
   3. Notify affected utility companies before starting work and comply with their requirements.
   4. Do not close or obstruct egress width to exits.
   5. Do not disable or disrupt building fire, life safety, or municipal fire systems without 7-day prior written notice to the CITY.
   6. Comply with requirements of NFPA 241, "Safeguarding Construction, Alteration, and Demolition Operations".
   7. Conform to procedures applicable when discovering hazardous or contaminated materials.

1.03 SUBMITTALS

A. Submit the following to CITY for review no later than 5 days prior to commencement of demolition work:
   1. A detailed schedule showing the following:
      a. Anticipated demolition start date.
      b. Coordination of shutoff, capping and abandoning of existing utility services as required.
      c. Proposed demolition sequence.
      d. Demolition completion date.
   2. Proposed equipment, methods and operations of demolition and modifications specified herein.
   3. Proposed receiving location(s) of all materials to be hauled off site.
   4. Proposed route(s) to receiving location(s) of all materials to be hauled off site.
   5. Methods and procedures to be utilized to minimize soil erosion for heavy equipment and trucking operations.
   6. All required State and Local permits.

1.03 PROTECTION:

A. Existing Structures:
   1. Maintain free and safe passage to and from buildings.
   2. Prevent movement or settlement of adjacent structures.
   3. Provide and place bracing, shoring and underpinning, and be responsible for safety and support of structures and assume liability for such movement, settlement, damage or injury.
   4. Cease operations and notify ENGINEER immediately if safety of structure appears to be endangered. Take precautions to properly support structure. Do not resume operations until safe conditions are restored.
   5. All active utility mains traversing the project site shall be maintained.
   6. Do not close or obstruct any streets, sidewalks, alleys or passageways unless specifically authorized.

B. Barricades:
   1. Provide, erect and maintain barricades, lighting and guard rails as required by applicable regulatory agencies to protect occupants of building and workers.
   2. Provide temporary fencing. Obtain OWNER's approval prior to removing any existing fencing.

C. Coordination with local authorities:
   1. Cooperate with local authorities and utility companies whose work affects or will be affected by the demolition operations. Ascertain the rules, regulations and requirements of these authorities that affect the demolition process: notify them of conditions affecting their work. Disconnect or arrange for disconnection of utility services if required.
   2. Comply fully with all provisions of the local codes, laws and ordinances applicable to work of this Section.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

3.01 PREPARATION:

A. Permits: Obtain all necessary permits.

B. Safety: Be responsible for all safety requirements.

C. Convenience: Carry out demolition work to cause as little inconvenience to surrounding areas as possible.

D. Remove all asbestos containing materials prior to commencing final demolition activities.

3.02 DEMOLITION:

A. General:
   1. Install all soil erosion and sediment control measures, if any, as required prior to any demolition work.
   2. Remove all mechanical, electrical, piping, and miscellaneous equipment and appurtenances before commencing structure demolition.
   3. It is the CONTRACTOR's responsibility to turn off all applicable utilities prior to demolition.
   4. Repair all demolition performed in excess of that required.
   5. Do not use explosives in the work.
   6. It is the CONTRACTOR's responsibility to maintain all access drives and roads utilized by construction/demolition traffic. This includes, but is not limited to, periodic street sweeping and repairing (patching/reconstructing) access drives and roads damaged by construction traffic.

B. Burning: Do not burn materials on Site.

C. Stockpiling: On site stockpiles of demolished materials shall be removed from the site within 48 hours.

D. Disposal of materials:
   1. Remove contaminated, dangerous and others materials from Site and dispose of in accordance with applicable regulations.
   2. Arrange and pay for all required hauling, storage, collection and disposal. CONTRACTOR is responsible for any waste characterization that may be required by the waste receiver.

E. Pollution Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.
   1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
   2. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing prior to start of work.

F. Structure Demolition: Demolish structures, concrete and masonry foundations, floors and pavements completely and remove from site. Use such methods as required to complete work within limitations of governing regulations and this specification.
   1. Structures may be removed intact only when acceptable and approved by CITY.
   2. Proceed with demolition in systematic manner, from top of structure to ground. Complete demolition work above each level before disturbing supporting members on lower levels.
   3. Demolish concrete and masonry in small sections.
   4. Remove structural framing members and lower to ground by hoists, derricks, or other suitable methods.
   5. Break up and remove concrete slabs-on-grade and asphalt paving.
   6. Locate demolition equipment throughout structure and remove materials so as to not impose excessive loads to supporting walls, floors or framing.

G. Filling Basement: Completely fill below-grade areas and voids resulting from demolition of structures and removal of foundations and pavements with Class II sand, or other approved granular material.
   1. Place fill materials in horizontal layers not exceeding 6 inches in loose depth. Compact each layer at optimum moisture content to 95% of maximum density.
   2. After fill placement and compaction, grade surface to meet adjacent contours and to provide flow to surface drainage.

END OF SECTION

SECTION 02500

PAVING AND SURFACING

PART 1 - GENERAL

1.01 SUMMARY:

A. Work includes construction of new and reconstruction of existing bituminous pavements including associated earthwork, paving and surfacing for roads, driveways, parking lots, curb and gutter, shoulders, and related work.

B. Definitions:
1. Pavement structure: Any combination of subbase, base course and surface course, including shoulders, placed on subgrade.
2. Permanent pavement: All improved pavement surfaces above the quality of treated or untreated gravel.
3. Subgrade: That portion of the earth grade upon which the pavement structure is to be placed.
4. Subbase: The layer of specified material of designed thickness placed on the subgrade as a part of the pavement structure.
5. Base course: The layer of specified or selected material of designed thickness placed on a subbase or a subgrade to support leveling and surface courses.
6. Leveling course: Layer of specified material placed on the base course in preparation for the surface course.
7. Surface course: The top layer of a pavement structure.
8. Bond Coat: Asphalt emulsion used to enhance the adhesion between HMA courses.
9. Maximum Specific Gravity of Asphalt (Gmm): The ratio of the weight in air of a unit volume of an un-compacted asphalt mixture to the weight of an equal volume of gas free distilled water at a given standard temperature.
10. Maximum density (soils): Maximum unit weight of soil material according to Modified Proctor Method ASTM D1557.
11. Density Control Target: Target density of a HMA mixture determined by multiplying the Gmm times the density of water ($62.4 lb/ft^3$).
12. Hot mixed asphalt (HMA): Same as bituminous.

1.02 REFERENCES:

A. MDOT - Michigan Department of Transportation, *"2003 Standard Specifications for Construction"*.

B. ASTM - American Society of Testing Materials, latest edition.

C. MTM – Michigan Test Methods, latest edition.

1.03 SUBMITTALS:

A. Mix Designs:
1. Hot mixed asphalt: Provide job-mix formula (JMF) prepared by independent lab or approved by MDOT for bituminous base, leveling and surface courses to ENGINEER two weeks prior to paving. The job-mix formula shall include, at a minimum, the Gmm, Gmb, Gb, Gse, Gsb and parameters listed in Tables 1 & 2 of this specification.

2. Concrete: Provide concrete mix designs meeting the requirements of MDOT Section 601, prepared by independent lab, in accordance with MDOT Section 605.02 to ENGINEER for approval two weeks prior to paving. Contractor may submit concrete mix designs previously approved by MDOT for Engineer's approval.

B. Certification of quality by producer for the following:
   1. Cement
   2. Aggregates
   3. Asphalt cement
   4. Pavement marking material
   5. Prime coat
   6. Bond coat
   7. Admixtures
   8. Curing compound
   9. Steel reinforcement

C. Concrete Test Specimens: Deliver acceptance cylinders to the place of inspection and testing.

D. Centerline Road Description: Provide to CITY.

1.04 JOB CONDITIONS:

A. Seasonal Limitations::
   1. Removal of permanent pavement: Unless otherwise specified, execute during the period from March 15 to October 15.
   2. Restoration of permanent pavement: Unless otherwise specified, execute during the period from April 15 to November 15.

B. Protect concrete from being damaged by rain. Concrete damaged by rain shall be replaced at no cost to OWNER.

C. Weather Limitations:
   1. Cold Weather Protection: Protect concrete from freezing until the concrete has achieved a compressive strength of at least 1000psi.

D. Clean up promptly following pavement installation.

E. Maintenance of Temporary Surfaces: Maintain temporary surfaces until permanent pavement installation is completed.

F. Driveway Closing: Twenty-four (24) hour maximum.

G. Allow access to the bituminous and concrete plants for verification of mix proportions, aggregate gradations and temperatures.

1.05 DRIVEWAY REQUIREMENTS:

A. Driveway approaches shall be concrete, except as specified in paragraphs B. and C.
   1. See Standard Details.
   2. MDOT Type M openings will be allowed for commercial drive approaches per MDOT Standard Plan R-29-E (see Section 02501).
   3. If sidewalk does not exist, it shall be constructed across the drive width at time of drive improvements in accordance with the City Standard Construction Requirements and the City handout entitled "Requirements for Infrastructure".

4. If the street right-of-way is greater than 66 feet, the length of drive approach shall be 25 feet minimum including the sidewalk.

B. Exception: Resurfacing of existing bituminous drive approaches.
   1. See Standard Detail No. 12.
   2. Existing bituminous drive approaches may be resurfaced if the area of existing pavement milled and/or removed is equal to or less than 50 percent of the existing drive approach area. Otherwise, the existing bituminous drive approach shall be removed and replaced with a concrete drive approach in accordance with the City Standard Details, except as specified in paragraph C.
   3. The existing curb and sidewalk shall not be overlaid with bituminous. The existing drive approach to be resurfaced shall be milled at the existing curb and sidewalk to a minimum depth of the proposed resurfacing thickness and to a minimum width of 2 feet.

C. Exception:
   1. Where concrete curb and gutter or bituminous valley gutter does not exist, and sidewalk does not exist: Bituminous drive approaches will be allowed. The length of drive approach shall be 20 feet minimum. If sidewalk does not exist, construction of sidewalk across the drive width will not be required.
   2. Where concrete curb and gutter does exist or is being constructed as part of driveway improvements: Concrete drive approaches required. The length of drive approach shall be 25 feet minimum including the sidewalk.
   3. Meet requirements of the CITY and the Michigan Department of Transportation (MDOT).

D. Bituminous Driveway Approach thicknesses:
   1. Residential: 3 inches of bituminous (in 2 equal lifts) over 6 inches of aggregate base.
   2. Commercial/Industrial: 4 inches of bituminous (in 2 equal lifts) over 8 inches of aggregate base.

1.06 PERMIT FOR WORK WITHIN STREET RIGHT-OF-WAY (ROW):

A. A permit shall be obtained from the CITY prior to any work being performed within the street right-of-way.
B. Prior to performing any work within the right-of-way of M-44, permits shall be obtained from the CITY and the Michigan Department of Transportation (MDOT).

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Subbase: Granular material Class II, MDOT 902.08, Table 902-3.

B. Aggregate Base Course: For bases to be surfaced with concrete or bituminous mixtures, use Aggregate 22A unless otherwise specified. MDOT 302.02 and 902.06.

C. Aggregate Surface Course:
   1. Use Aggregate 22A when the Aggregate surface course is to receive a bituminous surface at a later date. MDOT 306.02 and 902.06.
   2. Use Aggregate 23A when the Aggregate Surface Course is to be constructed without a bituminous surface. MDOT 306.02 and 902.06.

D. Aggregate Shoulders and Approaches:

1. Use Aggregate 22A for construction of Class I shoulders and approaches. MDOT 307.02 and 902.06.
2. Use Aggregate 23A for construction of Class II shoulders and approaches. MDOT 307.02 and 902.06.
3. Use salvaged aggregate or Aggregate 23A for construction of Class III shoulders and approaches. MDOT 307.02 and 902.06.

E. Hot Mix Asphalt (HMA) Base Course:
1. MDOT 502.03 HMA 13A.
2. MDOT 904.03, Asphalt binder PG 58-28.

F. Hot Mix Asphalt (HMA) Leveling Course:
1. MDOT 502.03, HMA 13A.
2. MDOT 904.03, Asphalt binder PG 58-28.

G. Hot Mix Asphalt (HMA) Top Course:
1. MDOT 502.03, HMA 13A.
2. MDOT 904.03, Asphalt binder PG 58-28.
3. Aggregate Wear Index (AWI) 260.

H. Bond Coat: Asphalt material SS-1h. MDOT 502.03 and 904.03C.

I. Pavement Marking: MDOT 920.01.

J. Concrete: Unless otherwise approved, use concrete Grade P1, 6.0 sack, air entrained, MDOT Section 601.

K. Concrete Curb & Gutter: Unless otherwise approved, use concrete Grade P1 or S2, 6 sack, air entrained, MDOT Section 602 for P1 and MDOT Section 701 for S2.

L. Curing Compound:
1. Provide white membrane curing compound MDOT 903.05, unless otherwise noted.

M. Chemical admixtures: MDOT Section 903.03.
1. Use of Calcium Chloride is not allowed.

N. Steel Reinforcement: MDOT Section 905.

O. Joint Materials: MDOT Section 914.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Removal: Remove all existing pavement structure required, as shown on the drawings. MDOT 204.03.A2.
1. Pavement remnant limit: Remove pavement to edge or joint, where dimension is less than 3 feet.
2. Butt joint: Provide where new pavement meets existing pavement. MDOT 502.03.63.

B. Dispose of all material removed during the construction.

C. Subgrade:
1. Obtain approval prior to placing the subbase or aggregate base course.

2. Construct to the required line, grade and cross section. MDOT 205.03.N.
   a. Tolerance if subbase is required: Trim within ± 0.1 foot of design grade.
   b. Tolerance if subbase is not required: Trim within ± ¾ inch of design grade.
3. Compaction:
   a. Compact to not less than ninety percent (90%) of the maximum density according to the Modified Proctor Method ASTM D1557.
   b. Compact to not less than ninety-five percent (95%) of the maximum density using the Michigan Cone Test.

D. Excavation: Conform to MDOT 205.03.G.

E. Embankment: Conform to MDOT 205.03.H and 205.03.I.

F. Inspection: Obtain approval of ENGINEER subgrade and each layer of pavement structure prior to placing successive layer.

3.02 PERFORMANCE:

A. Subbase:
   1. Thickness: Conform to design cross section.
   2. Construction method:
      a. Place in layers not exceeding 15 inches loose measure.
      b. Spread evenly and compact to not less than ninety-five percent (95%) maximum density according to Michigan Sand Cone Test.
      c. Conform construction to MDOT 301.03.

B. Aggregate Base:
   1. Thickness: Conform to design cross section compacted in place in two (2) equal courses.
   2. Construction Method: MDOT 302.03.A.
   3. Tolerances:
      a. Curbed streets: Shape the aggregate base course to the established grade and cross section, within the tolerance of ¼ inch.
      b. Other: Unless otherwise specified, shape within ½ inch of the established grade and cross section.
      c. Check and correct grades prior to pavement placement if traffic use is allowed.

C. Aggregate Surface:
   1. Thickness: Provide 8 inches compacted in place in two (2) equal courses.
   2. Construction Method: MDOT 306.01 through 306.03.

D. Shoulder (aggregate):
   1. Thickness: Provide 4 inches of compacted aggregate shoulder on an aggregate base, unless otherwise specified.
   2. Construction Method: MDOT 307.01 through 307.03.

E. Shoulder (other than aggregate):
   1. Thickness: Provide 4 inches of compacted soil or topsoil on an aggregate base, unless otherwise noted.

F. Bituminous Base:
   1. Construction Methods: Conform placement of the bituminous base mixture not exceeding lifts of 3 inches in accordance with MDOT 502.03.F through 502.03.K.
   2. Tolerances:

a. Curbed streets: Shape the bituminous base course to the design grade and cross section, within a tolerance of 3/8 inch.
b. Other: Unless otherwise specified, shape within 3/4 inch of the design grade and cross section.

G. Bond Coat:
1. Construction Method: MDOT 502.03.D. Apply between successive paving courses.
2. Application Rate: Provide 0.15 gallon per square yard.

H. Bituminous Leveling and Surface:
1. Cutting: Saw vertically and in straight lines at any angle with pavement centerline.
2. Thickness: Do not place bituminous surface mixture in lifts exceeding 2 inches unless otherwise approved. Provide design thickness.
3. Construction Methods:
a. Paving: Conform method of paving to MDOT 502.03.F through 502.03.K.
b. Prior to placement of bituminous surface, verify crowns and grades of roadway for positive drainage. Any deficiencies in grade or crown shall be corrected prior to placement of surface course.
4. Tolerances: Bituminous surface on streets with new curbs shall have a finish elevation of ¼ inch above curb.
5. Pavement Density: Minimum ninety-six percent (96%) of the density control target.

I. Hot Mixed Asphalt Drive Approach:
1. Preparation: Construct drive approach on prepared subgrade or embankment as required to meet plan grades.
2. Aggregate Base (Residential): Provide 6 inches of Aggregate 22A compacted in place.
3. Aggregate Base (Commercial/Industrial): Provide 8 inches of Aggregate 22A placed and compacted in two lifts.
4. HMA Mixture (Residential): Provide 3 inches of HMA 13A placed and compacted in two lifts of equal thickness.
5. HMA Mixture(Commercial/Industrial): Provide 4 inches of HMA 13A placed and compacted in two lifts of equal thickness.

J. Hot Mixed Asphalt Patching:
1. Preparation: Saw cut vertically in straight lines parallel or perpendicular to pavement centerlines. Minimum dimension of area to be patched shall be 2 feet for placement and compaction of materials.
2. Aggregate Base: Provide a miminum of 6 inches of Aggregate 22A compacted in place.
3. HMA Mixture: Match existing pavement thickness (minimum 3 inches).

K. Concrete Pavement (P1 – 6.0 sack minimum or HE):
1. Cut: Saw vertically at right angles or parallel to pavement centerline.
2. Removal: For streets, driveways and alleys, break out concrete sections after cutting (crane and ball pavement breaker or equivalent is prohibited).
3. Thickness:
a. Residential drive approaches: 6 inches minimum.
b. Commercial or Industrial drive approaches: 8 inches minimum with WW mesh reinforcement.
c. Streets: 8 inches minimum with steel reinforcement.
4. Construction Methods: Unless otherwise specified, conform paving procedures to MDOT 602.03.

L. Concrete Curb and Gutter:

1. Place concrete on moist base.
2. Conform to thickness and shape of OWNER's standard or as indicated in the drawings.
3. Construct curbing mechanically using slip forms or place with fixed forms including face forms.
4. Epoxy coated steel reinforcement:
   a. Place in accordance with OWNER's standard and per the drawings.
   b. Reinforcement shall be spliced by lapping at least 10 inches and securing with two (2) ties per splice.
   c. Lane ties, where required, shall be placed in the correct position and spaced in accordance with the drawings.
5. Concrete shall be consolidated during placement using a spade or vibration.
6. Finishing:
   a. Round all exposed edges to a radius of approximately ¼ inch including transverse joints.
   b. Do not add water to the concrete surface to aid finishing.
   c. Apply broom finish.
7. After removing forms and before applying curing compound, repair all honeycombed areas or voids with Type R-2 mortar. Excessive voids or honeycomb will require removal and replacement as directed by the ENGINEER.
8. Joints:
   a. Contraction joints shall be spaced evenly on 10 foot centers.
   b. Expansion joints shall be full depth and located as follows:
      1) 10 foot each side of curb castings
      2) At the spring points of curb radius
      3) Every 250 feet
9. Curing MDOT Section 602.03.M: Curing compound shall be applied immediately following finishing operations.

M. Joints:
1. Provide construction, expansion and control joints as indicated in the plans and in accordance with MDOT 602.03.
2. Seal joints in accordance with MDOT 602.03.R and 602.03.S.

N. Pavement Markings
1. Construction Method: MDOT 811.03.
2. CONTRACTOR shall layout all proposed markings in accordance with the MMUTCD and MDOT Standards prior to placement for ENGINEER approval.

3.03 STRUCTURE COVER ADJUSTMENT:

A. Construction Method: MDOT 403.03.C.
1. Adjust structure castings to finish grade or to a maximum of ¼ inch below finish grade of all manholes, catch basins and valve boxes.
   a. Set grades of castings and valve boxes from street grades with a tilt of castings where necessary to meet proposed street grades and crown.
   b. All castings, when adjusted to finish grade, shall be backfilled with Grade S2 concrete placed in entire area disturbed for casting adjustment up to bituminous leveling course.
2. Adjust castings to finish grade after the leveling course is complete.
   a. Castings shall be kept below grade or flush with the proposed sand subgrade so as not to conflict with grading operations or conflict with placement of leveling course.
   b. HMA removed from area for casting adjustment shall be saw cut square around the casting.

B. Concrete curb and gutter:
   1. Adjust structure cover to finish grade with top of curb and pavement edge set to the proposed grade.
   2. Tilt casting towards back of curb a maximum of 1 inch and transition gutter line of concrete curb to gutter line of casting.
   3. Set casting in a bed of concrete or mortar prior to pouring curb.
   4. Concrete or mortar bed inside of casting shall be troweled smooth and shall be free of voids.

3.04 PAVEMENT MARKINGS

A. Construction Method: MDOT 811.03

B. Contractor shall layout all proposed markings in accordance with the MMUTCD and MDOT Standards prior to placement for ENGINEER approval.

3.05 TESTING AND INSPECTION:

A. Observation: By the ENGINEER or his designated authorized representative.

B. Aggregates:
   1. Sampling and Analysis: Michigan Testing Methods, Series 100.
   2. Exception: Provide certification of approved stockpiled material.

C. Hot Mixed Asphalt Pavement Density:
   1. Density acceptance of HMA mixtures will be measured with a nuclear density gauge using the Gmm from the approved Job-Mix Formula for the density control target. The required in place density of the HMA mixture shall be 92.0-96.0% of the density control target.
   2. The Contractor is responsible for determining Quality Control Density and establishing a rolling pattern that will achieve the required in place density.

D. Hot Mixed Asphalt Mix Composition:
   1. Sampling:
      a) Acceptance sampling shall include a minimum of two samples per mix type for each day of production with no less than three samples for each mix type per project.
      b) Method of sampling shall be determined by the ENGINEER.
   2. Extraction: ASTM D2172
   3. Sieve Analysis: ASTM C117 and ASTM C136
   4. Tolerance: Acceptance tolerances for HMA parameters are detailed in the following Table.

Table 3: Uniformity Tolerance Limits for HMA Mixtures

PARAMETER	Surface & Leveling Course	Base Course
	Range	Range
Binder Content	± 0.50	± 0.50
% Passing #8 and Larger Sieves	± 8.0	± 9.0
% Passing #30 Sieve	± 6.0	± 9.0
% Passing #200 Sieve	± 2.0	± 3.0
1. The mixture shall be proportioned to test as closely as possible to the Job-Mix-Formula. 2. The crushed particle content of the aggregate shall not be more than 10 percentage points above or below the crush particle content listed in the approved JMF.		

5. Acceptance: If for any one mixture, two consecutive aggregate gradations on one sieve, or binder contents exceed the uniformity tolerance or do not meet the minimum requirements for crushed particle content the mixture will be rejected.

E. Concrete Acceptance Testing:
   1. Temperature, slump and air content: Conduct tests on the first load of concrete placed and at a minimum of once per hour of continuous pour.
      a) The temperature of the concrete shall be between 45°F and 90°F at the time of placement.
      b) Slump of the concrete shall not exceed 3.0 inches or the slump indicated in the approved mix design.
      c) Air content at the time of placement shall be 6.5 $\pm$ 1.5 percent, unless otherwise noted.
   2. Strength: The average compressive strength of two companion cylinders shall be equal to or greater than 3500 psi at 28 days, unless otherwise noted.
      a) Sample for strength at least once every 200 cubic yards.
      b) Concrete strength will be based on compressive strength.
      c) A single strength test consists of two cylinders.
      d) Temperature, slump and air content tests shall be run at the same time as cylinders are cast.
   3. Additional cylinders or beams may be molded and tested at the CONTRACTORS expense for early breaks and determination of concrete strength for opening to traffic or construction equipment.

F. Tolerance: Gutter and top of curb shall be finished within 3/16 inch in 10 feet when checked with a 10 foot straight edge.

3.05 SCHEDULES:

A. See Standard Details.

END OF SECTION

SECTION 02501

CONCRETE SIDEWALK AND SIDEWALK RAMPS

PART 1 - GENERAL

1.01 SUMMARY:

A. Work includes construction of new and removal and replacement of existing sidewalk and sidewalk ramps.

B. Definitions:
   1. Pavement Structure: The combination of the base, subbase and bituminous or concrete surface placed on the subgrade. Pavement includes: gravel, bituminous and concrete surfaced streets and driveways.
   2. Subgrade: The portion of the subgrade on which the concrete sidewalk is to be placed.
   3. Subbase: The layer of specified material of designed thickness placed on the subgrade as a part of the pavement structure.

1.02 REFERENCES:

A. MDOT - Michigan Department of Transportation, *"2003 Standard Specifications for Construction", Current Edition.*

B. ASTM - American Society of Testing Materials, latest edition.

C. ADAAG – Americans with Disabilities Act Accessibility Guidelines.

1.03 SUBMITTALS:

A. Certification of quality by producer for the following:
   1. Cement
   2. Aggregates

B. Concrete Test Specimens: Deliver to the place of inspection and testing.

C. Concrete Mix Design: Provide job-mix formula prepared by independent lab or approved by MDOT two weeks prior to placement.

D. Submittal of as-built plans to the CITY upon completion of project.

1.04 JOB CONDITIONS:

A. General Limitations: Concrete shall not be placed between November 1 and April 1, unless authorized by the CITY. Concrete shall not be placed when the air temperature in the shade is less than 40 degrees Fahrenheit and falling. Concrete shall not be placed if portions of the base, subbase, or subgrade layer are frozen, or if the grade exhibits poor stability from excessive moisture levels. Chemicals shall not be added to reduce the freezing point. Any deviation from the above, when authorized, will require protection from freezing until the concrete has attained a compressive strength of at least 1,000 psi (1,000 psi strength will typically be attained after 2 days of curing). Concrete damaged by frost action shall be removed and replaced.

B. Clean-up promptly following sidewalk installation.

C. Maintenance of Temporary Surfaces: Maintain temporary surfaces until permanent sidewalk installation is completed.

D. Driveway Closing: 24 hour maximum for removal and replacement of concrete plus additional 96 hours (4 days) for curing. Prior to replacement, the removed portion of the driveway shall be brought up to its proposed grade with gravel and/or bituminous.

E. Protect areas under construction with lighted barricades and reflectorized fencing in accordance with applicable MDOT, MIOSHA and ASHA regulations.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Subbase: Granular material MDOT Class II, MDOT 902.

B. Concrete: Limestone aggregate, 5½ sack minimum, 4% to 7% entrained air, five (5) gallons per sack maximum water/cement ratio, 3-inch slump maximum, 3,500 psi minimum compressive strength at 28 days.

C. Concrete Joint Filler: Conform to MDOT 914.03 and 914.04A.

D. Forms: Rigid in accordance with MDOT 803.03B, except at curved sections which shall utilize a bendable material to provide a uniform radius.

E. Gravel Base: MDOT 902.06, 22A Aggregate.

F. Bituminous Patching: Bituminous Mix 13A.

G. Bituminous Bond Coat: MDOT 502.02 and 904.03C.

H. Detectable Warning Surfaces:
1. Cast ductile iron plate with anchor lugs.
2. Slip resistant textured surface.
3. Color and finish: Black asphalt dip.
4. Provide minimum 5 foot width with 2 – 18" plates on outside and 1 – 24" plate on inside.
5. Meet ADAAG.
6. Manufacturer: East Jordan Iron Works or Neenah Foundry Company.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Removal: Remove or sawcut at the existing joint or line marked by OWNER's ENGINEER in area of removal. Remove adjacent pavement structure necessary to place forms.

B. Removal of subgrade material to maintain existing sidewalk elevation and meet specified concrete thickness shall be included in the cost of the sidewalk.

C. Disposal of all removed material shall be performed by the CONTRACTOR. Keep all removed material off private property at all times.

D. For sidewalk crossing bituminous drives: Sawcut existing bituminous and use as forms.

E. For sidewalk crossing concrete drives: Remove or sawcut at the existing joint or line marked by the ENGINEER.

F. Cut and protect tree roots as directed by the ENGINEER.

G. Excavation: Form subgrade by trenching, excavating or filling to the required elevation.

H. Notify ENGINEER if unsuitable material exists below subgrade. Remove unsuitable material as directed by ENGINEER. If unsuitable material is removed, place a minimum 4-inch sand subbase to elevation required for bottom of concrete. In fill areas, the subbase shall be at least 1 foot wider than the sidewalk width.

I. Compact subbase to 95% maximum density.

J. Scheduling: Maximum time between removal and replacement shall be 7 days.

3.02 PERFORMANCE:

A. Sidewalk and Ramp Requirements:
   1. All sidewalks shall be minimum of 5 feet in width, with the grade of ¼ inch per foot from the property towards the street, unless otherwise directed.
   2. All sidewalks shall be a minimum of 4 inches thick except through driveways where they shall be a minimum of 6 inches thick for residential and 8 inches for commercial / industrial, with WW mesh reinforcement. Sidewalks shall continue through commercial driveways.
   3. Sidewalk ramps shall have a uniform grade except as necessary for short grade changes and shall be in conformance with ADAAG and these specifications. Detectable warning surfaces shall be provided.
   4. Sidewalk ramps shall be 8-inch thick with WW mesh reinforcement.
   5. Detectable warning surfaces:
      a. Provide for tactile and visual warning that contrast visually with adjacent walking surfaces, either light-on-dark or dark-on-light.
      b. Provide cast ductile iron detectable warning plates embedded into newly cast concrete. Provide same width as sidewalk, minimum. Install in accordance with manufacturer's recommendations, ADAAG and these specifications. Surface applied products will not be allowed. Do not construct detectable warnings by forming or stamping in newly cast concrete.
      c. Provide detectable warning plates on sidewalk ramps where the sidewalk crosses commercial driveways.

B. Structure Adjustment: Any utility structures in the sidewalk or ramp not conforming to the finished grade shall be adjusted to grade. Conform to MDOT 403.03C.

C. Concrete Mixing and Delivery: Transit mix concrete conforming to MDOT 601.03E.

D. Placing and Finishing Concrete:
   1. Place concrete on a moist base in one (1) lift to the specified depth. The concrete shall be thoroughly spaded along the faces of the forms before finishing operations are started. The concrete shall be struck off to the required grade and cross section.

2. All edges and joints shall be slightly broomed transversely to roughen the surface after the concrete has received a float finish. The sidewalk ramps shall be textured with a coarse broom transversely to the ramp slope.

E. Curing and Protection:
   1. Concrete shall be cured and protected as specified under MDOT 602.03M and 602.03T except that pedestrian traffic may be allowed after 48 hours if authorized.

F. Joints:
   1. Joints shall be constructed to true line with their faces perpendicular to the surface of the sidewalk and shall not vary more than ¼ inch from their designated position. Transverse joints shall be constructed at right angles to centerline of the sidewalk and longitudinal joints shall be constructed parallel to the centerline unless otherwise required. When sidewalk is constructed in partial width, transverse joints shall be placed in line with like joints in the existing sidewalk.
   2. The concrete at the faces of all joints shall be thoroughly spaded or vibrated and compacted to fill all voids and the surface shall be finished smooth and substantially true to grade.
   3. Three-quarter (3/4) inch transverse expansion joints shall be placed in line with all expansion joints in abutting curb, gutter or combination curb and gutter. When sidewalk does not abut such pavement, ½ inch transverse expansion joints shall be placed at intervals not exceeding 50 feet and at all transitions between 4 inch and 6 inch sidewalk. Expansion joint filler shall extend the full depth of the joint with the top slightly below the finished sidewalk surface. The filler shall be supported temporarily until concrete is poured against it.
   4. One-half (½) inch longitudinal expansion joints shall be placed between the sidewalk and the back of abutting parallel curb or gutter, between the sidewalk and buildings, or other rigid structures.
   5. One-half (½) inch expansion joints shall be placed between sidewalk approaches and the back of curb and gutter, or the edge of driveway pavement, including bituminous driveways.
   6. Contraction joints shall be placed at 5 foot intervals. They shall divide sidewalk into areas not more than 36 square feet nor less than 16 square feet. Contraction joints will be produced by slab division forms extending to the full depth of concrete or by cutting joints in the concrete after floating to a depth of not less than ¼ the thickness of the concrete. The cut joints shall not be less than 1/8-inch or more than ¼ inch in width and shall be finished smooth and substantially true to line.

G. Backfilling and bituminous patching:
   1. After concrete has gained sufficient strength (70% of design), all rails, forms, stakes and supports shall be removed in a manner as not to injure finished concrete and all exposed edges of the concrete shall be backfilled, compacted and leveled immediately.
   2. In areas where the sidewalk crosses bituminous drives, sawcut existing bituminous. Bituminous patching shall be placed and compacted.

H. Bituminous Patching:
   1. Place minimum 4 inches of aggregate base 22A and compact to ninety-five percent (95%) of maximum density.
   2. Place minimum 2 inches of Bituminous Mix 13A.

I. Concrete curb and gutter: CITY's or MDOT's Standard.
   1. Match existing curb and gutter.
   2. Construction methods: MDOT 802.03.

3.03 TESTING AND INSPECTION:

A. Observation: By CITY, CITY'S ENGINEER or designated authorized representative.
   1. Inspection of forms is required prior to pouring concrete.

B. Acceptance Testing:
   1. Cement: Certification of quality by producer.
   2. Concrete:
      a. Sample: ASTM C172
      b. Frequency: Once for each 50 cubic yards of each class of concrete placed.
      c. Perform following from sample:
         (1) Mold three 6-inch cylinder compressive strength specimens: ASTM: C31
         (2) Slump test: ASTM C143
         (3) Air test: ASTM C231
         (4) Yield test: ASTM C138
         (5) Strength test: ASTM C139
   3. If initial testing indicates failure or nonconformance to specifications, additional testing shall be paid for by the CONTRACTOR. Replace nonconforming material and retest.

C. Aggregates: Provide certification of approved stockpiled material.

D. Concrete:
   1. Limestone aggregate.
   2. Slump: 3 inches maximum.
   3. Entrained Air: 4 percent to 7 percent.
   4. Strength: 3500 psi, at 28 days.

3.04 TREE ROOT CUTTING:

A. The following information shall be used as a guide when trimming tree roots:
   1. Excavate as shallow as possible in the area adjacent to the tree root.
   2. Make clean cuts with a saw or sharp chisel. Do not bury jagged or torn roots.
   3. Do not allow the exposed root ends to dry out. If exposed for more than a day, they can dry out. Cover all exposed roots with soil at the end of the day.
   4. Avoid cutting roots larger than 3.5 inches.

3.05 TREE ROOT BARRIER:

A. Install tree root barrier along the sidewalk adjacent to trees to reduce future damage by tree roots in areas determined by the TOWNSHIP or TOWNSHIP ENGINEER. Installation shall be in accordance with manufacturer's recommendations.

B. Install in 4-inch wide trench (with roots removed) adjacent to the sidewalk between the sidewalk and tree to a minimum depth of 30 inches. Secure with pins. Backfill carefully to avoid dislodging the barrier, and compact firmly.

C. Manufacturer: Typar Biobarrier or approved equal.

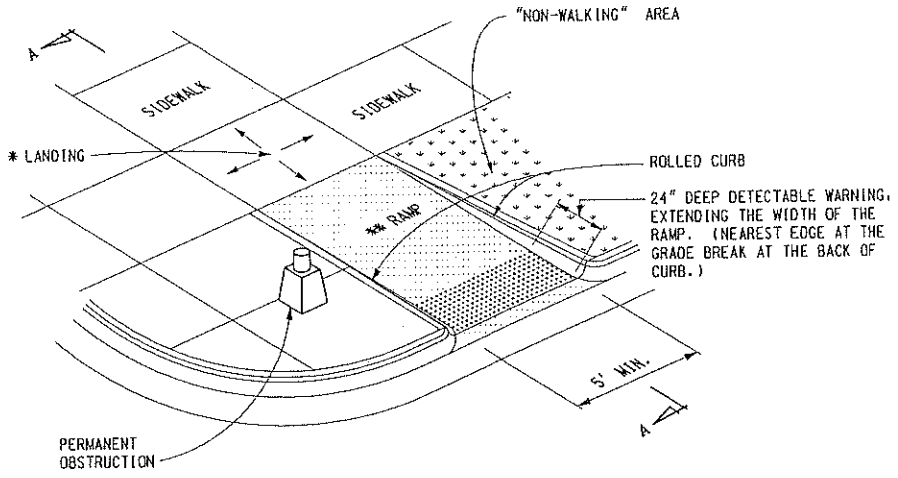
3.06 SCHEDULES:

A. MDOT Standard Plan R-28-F SIDEWALK RAMP AND DETECTABLE WARNING DETAILS (7 sheets).

B. MDOT Standard Plan R-29-E DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK (4 sheets).

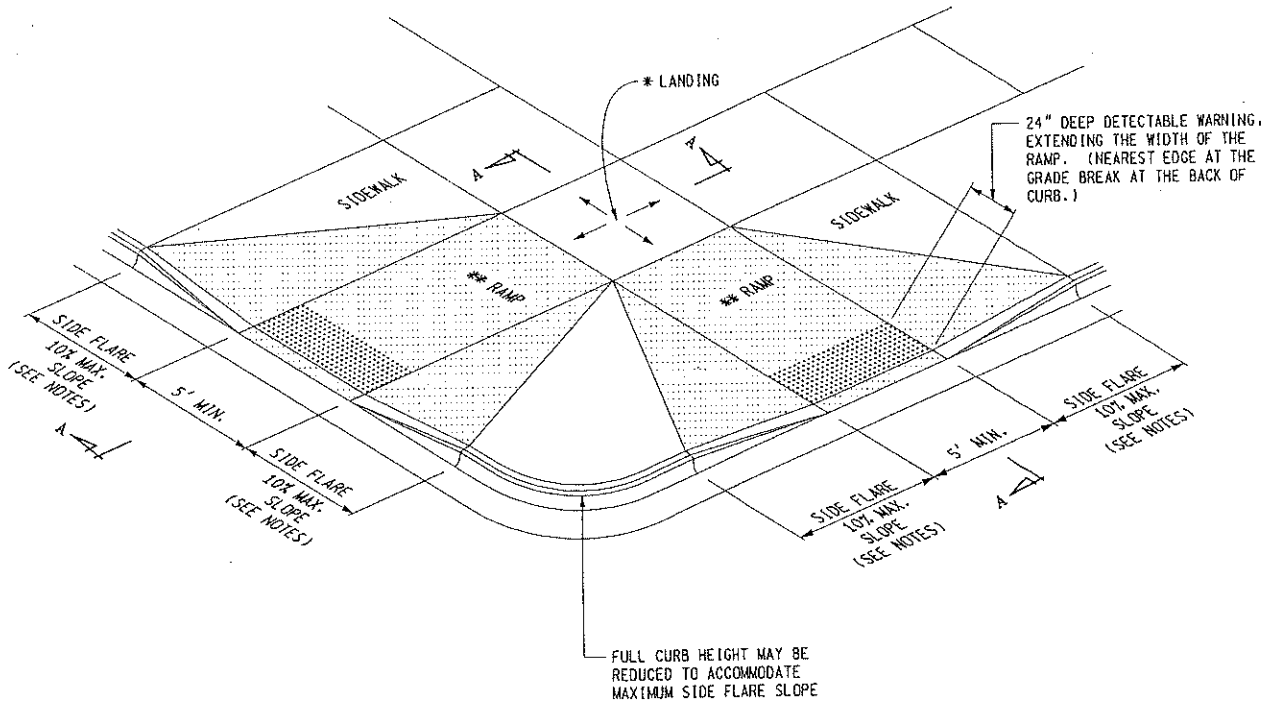
* MAXIMUM LANDING SLOPE IN ANY DIRECTION IS 2.0%. MINIMUM LANDING DIMENSIONS 5' x 5'.

** MAXIMUM CROSS SLOPE ON RAMP IS THE SAME AS THAT FOR SIDEWALK (2.0%). RUNNING SLOPE 5% - 7% (8.3% MAXIMUM) SEE NOTES.



SIDEWALK RAMP TYPE R

(ROLLED SIDES)



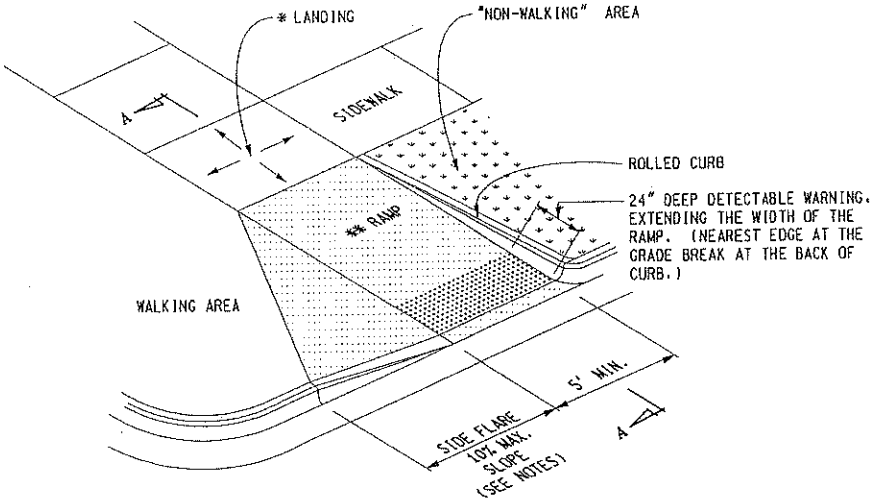
SIDEWALK RAMP TYPE F

(FLARED SIDES, TWO RAMPS SHOWN)

MDOT Michigan Department of Transportation PREPARED BY DESIGN DIVISION DRAWN BY: B.L.T. CHECKED BY: W.K.P.	DEPARTMENT DIRECTOR Kirk T. Steudle APPROVED BY: _____ ENGINEER OF DELIVERY APPROVED BY: _____ ENGINEER OF DEVELOPMENT	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR SIDEWALK RAMP AND DETECTABLE WARNING DETAILS F.H.W.A. APPROVAL | 4-17-2008 PLAN DATE | R-28-F | SHEET 1 OF 7

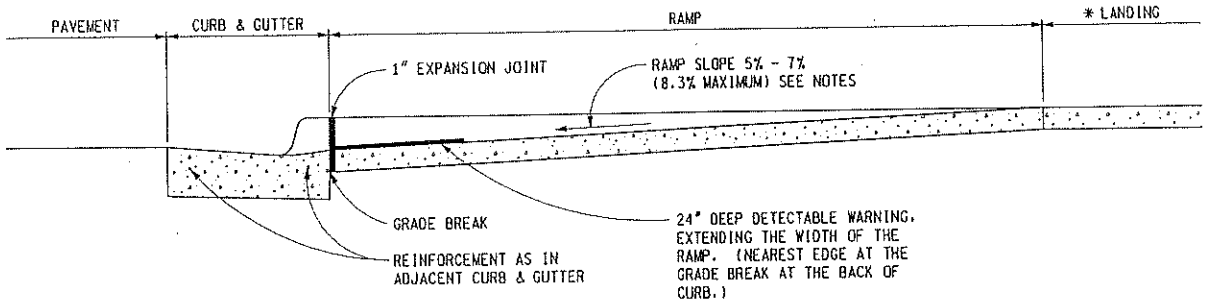
* MAXIMUM LANDING SLOPE IN ANY DIRECTION IS 2.0%. MINIMUM LANDING DIMENSIONS 5' x 5'.

** MAXIMUM CROSS SLOPE ON RAMP IS THE SAME AS THAT FOR SIDEWALK (2.0%). RUNNING SLOPE 5% - 7% (8.3% MAXIMUM) SEE NOTES.

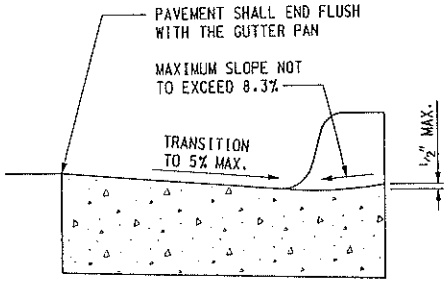


SIDEWALK RAMP TYPE RF

(ROLLED / FLARED SIDES)



SECTION A-A



SECTION THROUGH CURB CUT

(TYPICAL ALL RAMP TYPES)

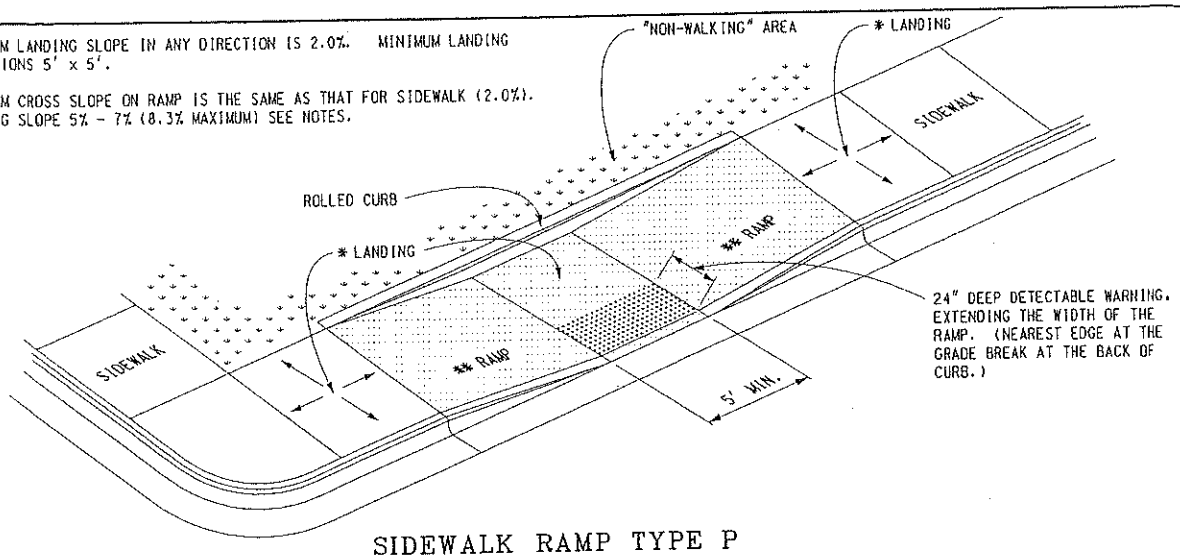
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

F.H.W.A. APPROVAL	4-17-2008 PLAN DATE	R-28-F	SHEET 2 OF 7

* MAXIMUM LANDING SLOPE IN ANY DIRECTION IS 2.0%. MINIMUM LANDING DIMENSIONS 5' x 5'.

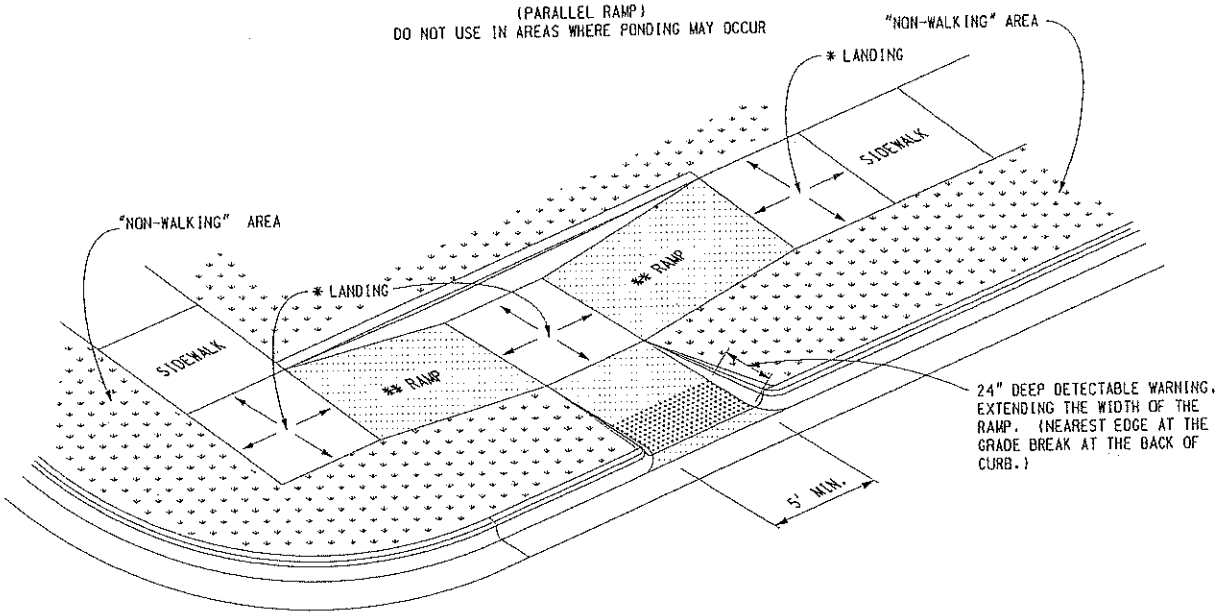
** MAXIMUM CROSS SLOPE ON RAMP IS THE SAME AS THAT FOR SIDEWALK (2.0%). RUNNING SLOPE 5% - 7% (8.3% MAXIMUM) SEE NOTES.



SIDEWALK RAMP TYPE P

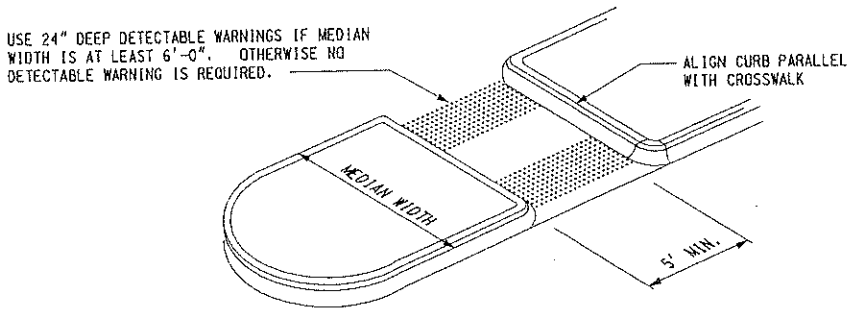
(PARALLEL RAMP)

DO NOT USE IN AREAS WHERE PONDING MAY OCCUR



SIDEWALK RAMP TYPE C

(COMBINATION RAMP)



SIDEWALK RAMP TYPE M

(MEDIAN ISLAND)

MICHIGAN DEPARTMENT OF TRANSPORTATION

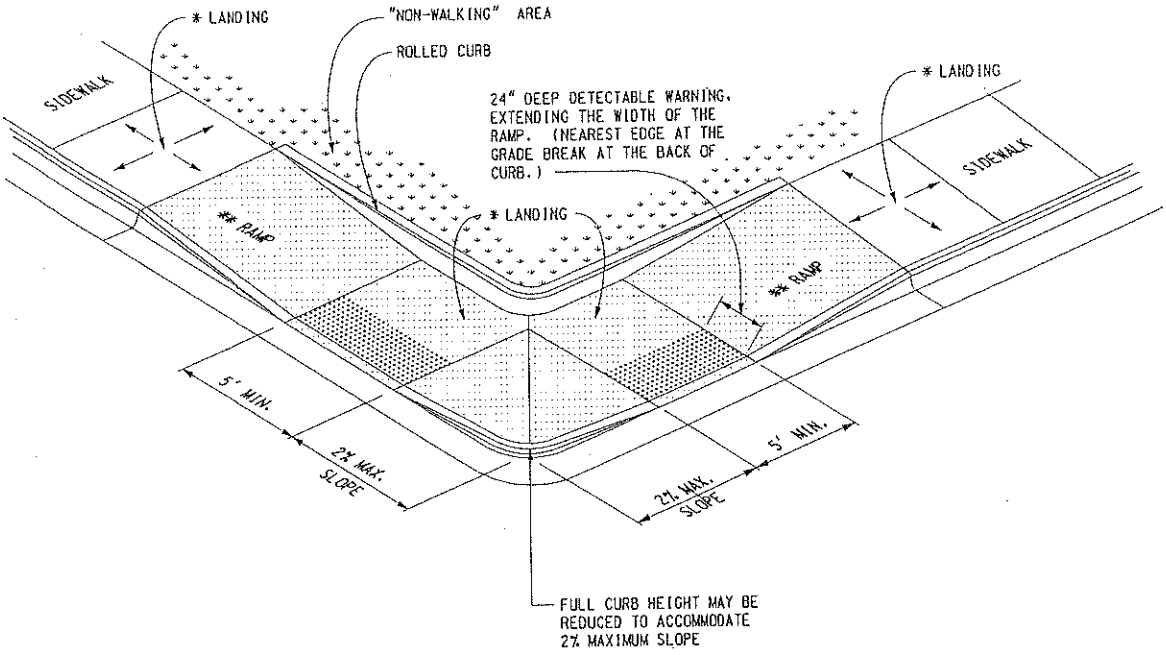
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

F.H.W.A. APPROVAL	4-17-2008 PLAN DATE	R-28-F	SHEET 3 OF 7

* MAXIMUM LANDING SLOPE IN ANY DIRECTION IS 2.0%. MINIMUM LANDING DIMENSIONS 5' x 5'.

** MAXIMUM CROSS SLOPE ON RAMP IS THE SAME AS THAT FOR SIDEWALK (2.0%). RUNNING SLOPE 5% - 7% (8.3% MAXIMUM) SEE NOTES.



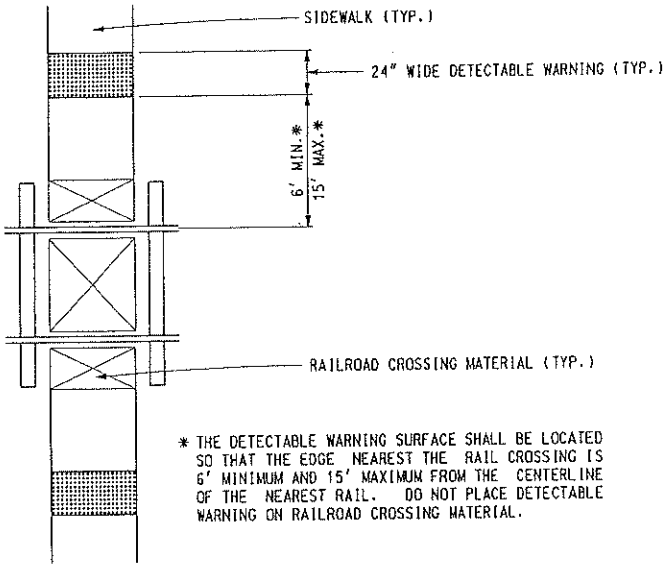
SIDEWALK RAMP TYPE PF

(PARALLEL WITH FLARE)

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

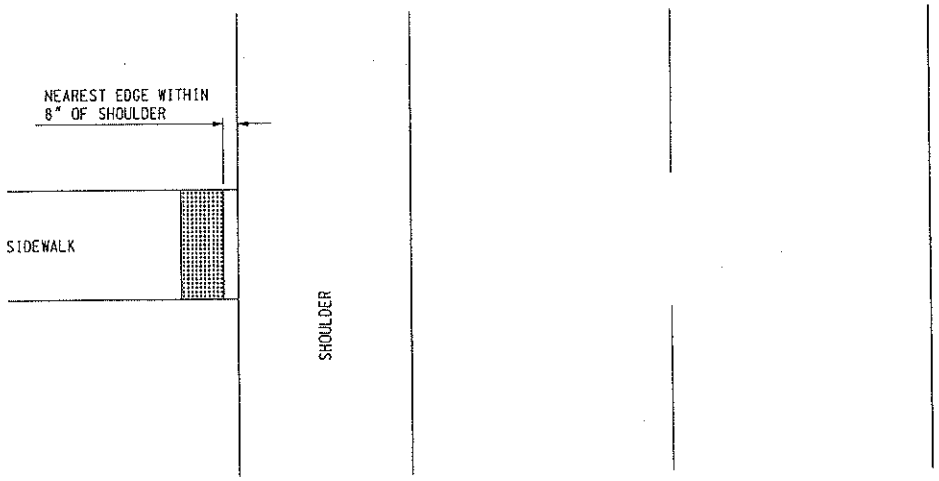
SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

F.H.W.A. APPROVAL	4-17-2008 PLAN DATE	R-28-F	SHEET 4 OF 7



SIDEWALK RAMP TYPE RR

(DETECTABLE WARNING AT RAILROAD CROSSING)



SIDEWALK RAMP TYPE FS

(DETECTABLE WARNING AT FLUSH SHOULDER)

MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

F.H.W.A. APPROVAL	4-17-2008 PLAN DATE	R-28-F	SHEET 5 OF 7

LEGEND

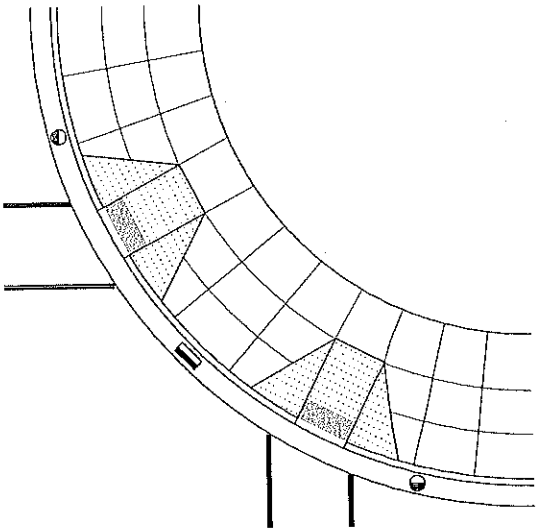
SIDEWALK RAMP

"NON-WALKING" AREA

CROSSWALK MARKING

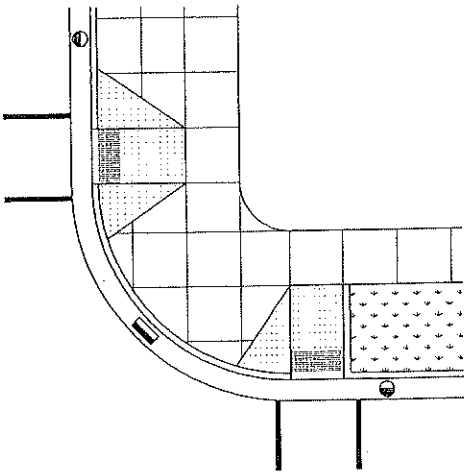
PREFERRED LOCATION OF DRAINAGE INLET (TYP.)

ALTERNATE LOCATION OF DRAINAGE INLET (TYP.)

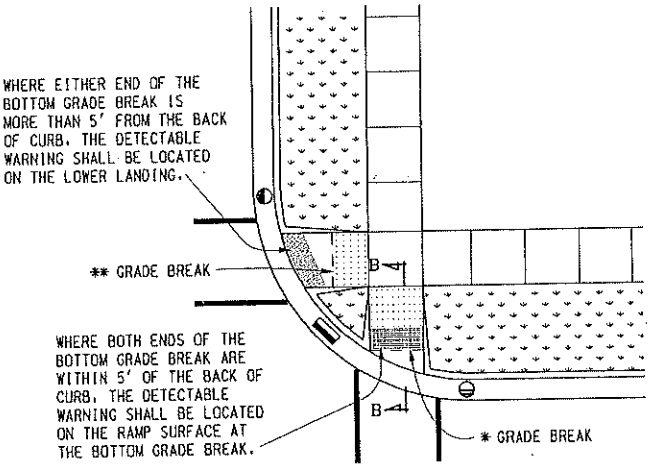


SIDEWALK RAMP PERPENDICULAR TO RADIAL CURB (TYPE F SHOWN)

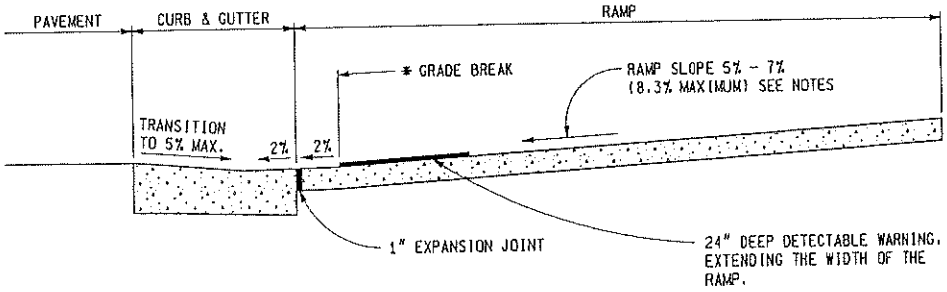
(USE WITH RADIAL CURB WHEN THE CROSSWALK AND SIDEWALK RAMP ARE NOT ALIGNED)



SIDEWALK RAMP PERPENDICULAR TO TANGENT CURB (TYPE F AND TYPE RF SHOWN)



SIDEWALK RAMP LOCATED IN RADIUS (TYPE R SHOWN)



* GRADE BREAKS AT THE TOP AND BOTTOM OF PERPENDICULAR CURB RAMPS SHALL BE PERPENDICULAR TO THE DIRECTION OF RAMP RUN. AT LEAST ONE END OF THE BOTTOM GRADE BREAK SHALL BE AT THE BACK OF CURB.

** GRADE BREAKS AT THE TOP AND BOTTOM OF PERPENDICULAR CURB RAMPS SHALL BE PERPENDICULAR TO THE DIRECTION OF RAMP RUN.

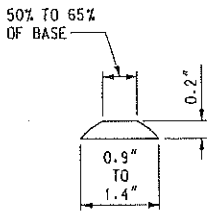
SECTION B-B

SIDEWALK RAMP ORIENTATION

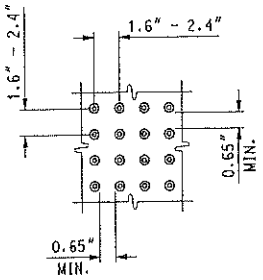
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

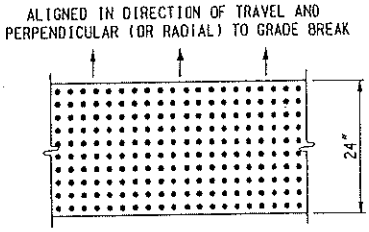
F.H.W.A. APPROVAL	4-17-2008 PLAN DATE	R-28-F	SHEET 6 OF 7



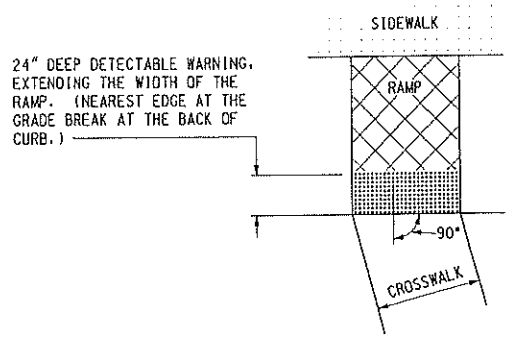
DOME SECTION



DOME SPACING



DOME ALIGNMENT



DETECTABLE WARNING DETAILS

NOTES:

DETAILS SPECIFIED ON THIS PLAN APPLY TO ALL CONSTRUCTION, RECONSTRUCTION, OR ALTERATION OF STREETS, CURBS, OR SIDEWALKS BY ALL PUBLIC AGENCIES AND BY ALL PRIVATE ORGANIZATIONS CONSTRUCTING FACILITIES FOR PUBLIC USE.

SIDEWALK RAMPS ARE TO BE LOCATED AS SPECIFIED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

RAMPS SHALL BE PROVIDED AT ALL CORNERS OF AN INTERSECTION WHERE THERE IS EXISTING OR PROPOSED SIDEWALK AND CURB. RAMPS SHALL ALSO BE PROVIDED AT WALK LOCATIONS IN MID-BLOCK IN THE VICINITIES OF HOSPITALS, MEDICAL CENTERS, AND LARGE ATHLETIC FACILITIES.

SURFACE TEXTURE OF THE RAMP SHALL BE THAT OBTAINED BY A COARSE BROOMING, TRANSVERSE TO THE SLOPE OF RAMP.

SIDEWALK SHALL BE RAMPED WHERE THE DRIVEWAY CURB IS EXTENDED ACROSS THE WALK.

CARE SHALL BE TAKEN TO ASSURE A UNIFORM GRADE ON THE RAMP, FREE OF SAGS AND SHORT GRADE CHANGES. WHERE CONDITIONS PERMIT, IT IS DESIRABLE THAT THE SLOPE OF THE RAMP BE IN ONLY ONE DIRECTION, PARALLEL TO THE DIRECTION OF TRAVEL.

RAMP WIDTH SHALL BE INCREASED, IF NECESSARY, TO ACCOMMODATE SIDEWALK SNOW REMOVAL EQUIPMENT NORMALLY USED BY THE MUNICIPALITY.

THE MAXIMUM RUNNING SLOPE OF 8.3% IS RELATIVE TO A FLAT (0%) REFERENCE. HOWEVER, IT SHALL NOT REQUIRE ANY RAMP OR SINGLE RAMP WITHIN A COMBINATION OF RAMPS TO EXCEED 15 FEET IN LENGTH.

IF POSSIBLE, DRAINAGE STRUCTURES SHOULD NOT BE PLACED IN LINE WITH RAMPS. EXCEPT WHERE EXISTING DRAINAGE STRUCTURES ARE BEING UTILIZED IN THE NEW CONSTRUCTION, LOCATION OF THE RAMP SHOULD TAKE PRECEDENCE OVER LOCATION OF DRAINAGE STRUCTURE.

THE SLOPE OF THE GUTTER PAN SHALL BE TRANSITIONED TO A MAXIMUM OF 5% IN THE AREA OF THE CURB CUT OF THE SIDEWALK RAMP. MAINTAIN THE NORMAL GUTTER PAN SLOPE ACROSS THE DRAINAGE STRUCTURE INLETS.

THE TOP OF THE JOINT FILLER FOR ALL RAMP TYPES SHALL BE FLUSH WITH THE ADJACENT CONCRETE.

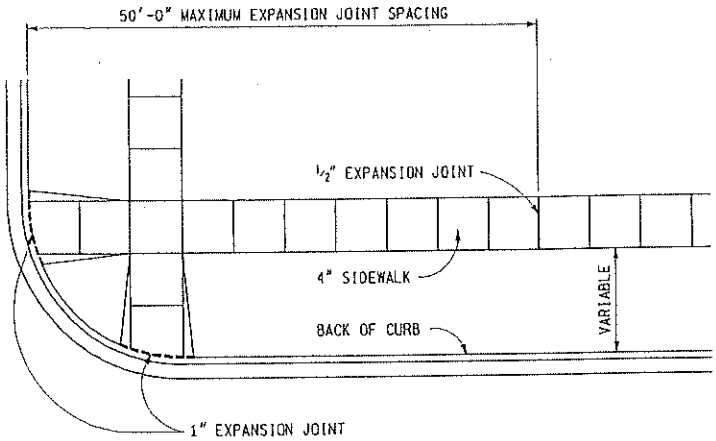
CROSSWALK AND STOP LINE MARKINGS, IF USED, SHALL BE SO LOCATED AS TO STOP TRAFFIC SHORT OF RAMP CROSSINGS. SPECIFIC DETAILS FOR MARKING APPLICATIONS ARE GIVEN IN THE "MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES".

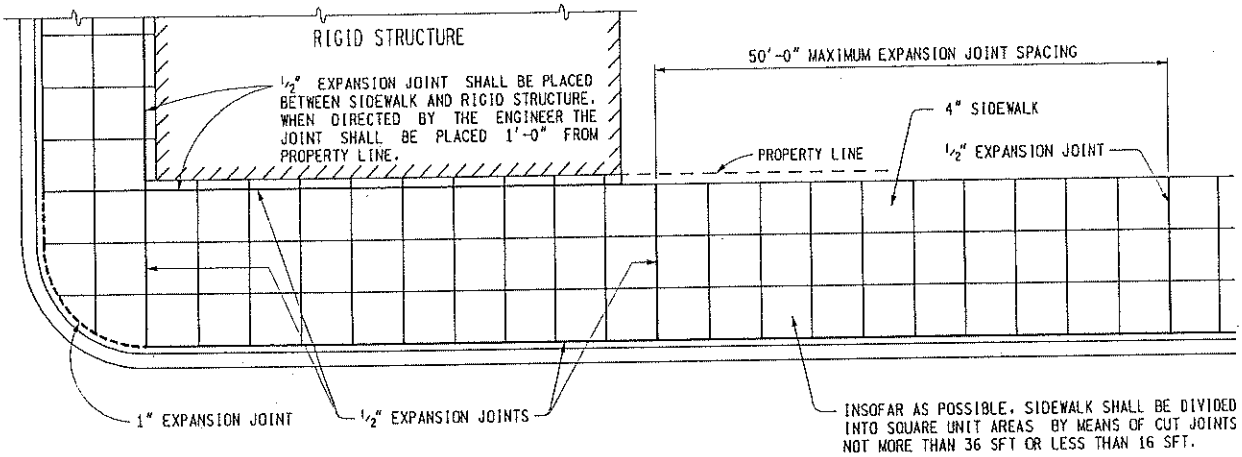
FLARED SIDES WITH A SLOPE OF 10% MAXIMUM, MEASURED ALONG THE CURB LINE, SHALL BE PROVIDED WHERE A CIRCULATION PATH CROSSES THE SIDEWALK RAMP. FLARED SIDES ARE NOT REQUIRED WHERE THE EDGES OF A SIDEWALK RAMP ARE PROTECTED BY LANDSCAPING OR OTHER BARRIERS TO TRAVEL BY WHEELCHAIR USERS OR PEDESTRIANS ACROSS THE EDGE OF THE SIDEWALK RAMP.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

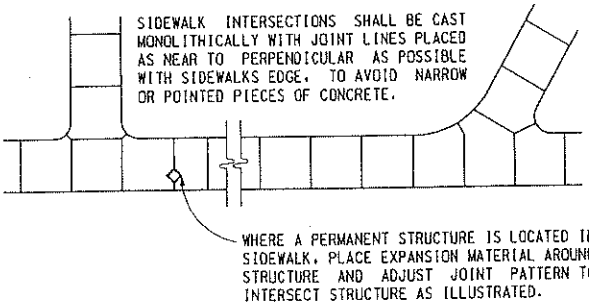
SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

F.H.W.A. APPROVAL	4-17-2008 PLAN DATE	R-28-F	SHEET 7 OF 7

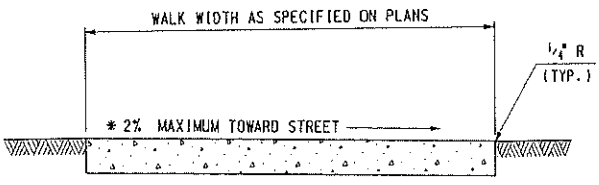




LOCATION OF JOINTS IN CONCRETE SIDEWALK



TYPICAL SIDEWALK JOINT LAYOUTS

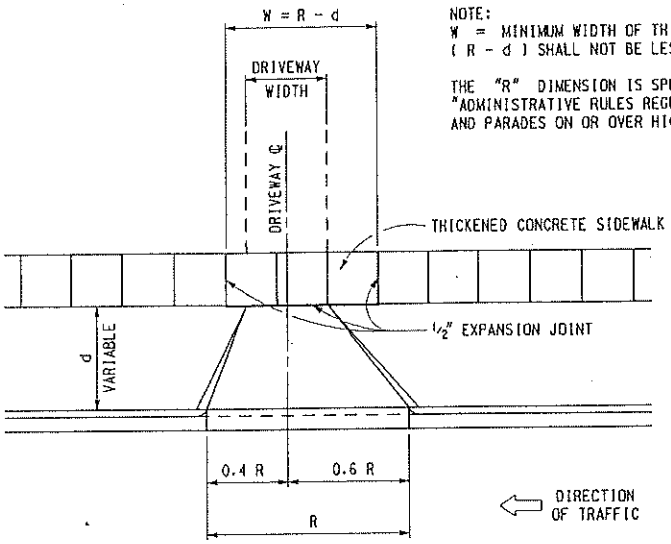


* SEE NOTES

4" CONCRETE SIDEWALK

MDOT Michigan Department of Transportation PREPARED BY DESIGN DIVISION DRAWN BY: B.L.T. CHECKED BY: W.K.P.	DEPARTMENT DIRECTOR Kirk T. Steudle APPROVED BY: John C. Friend ENGINEER OF DELIVERY APPROVED BY: [signature] ENGINEER OF DEVELOPMENT	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK 4-26-2007 F.H.W.A. APPROVAL | 2-28-2007 PLAN DATE | R-29-E | SHEET 1 OF 4

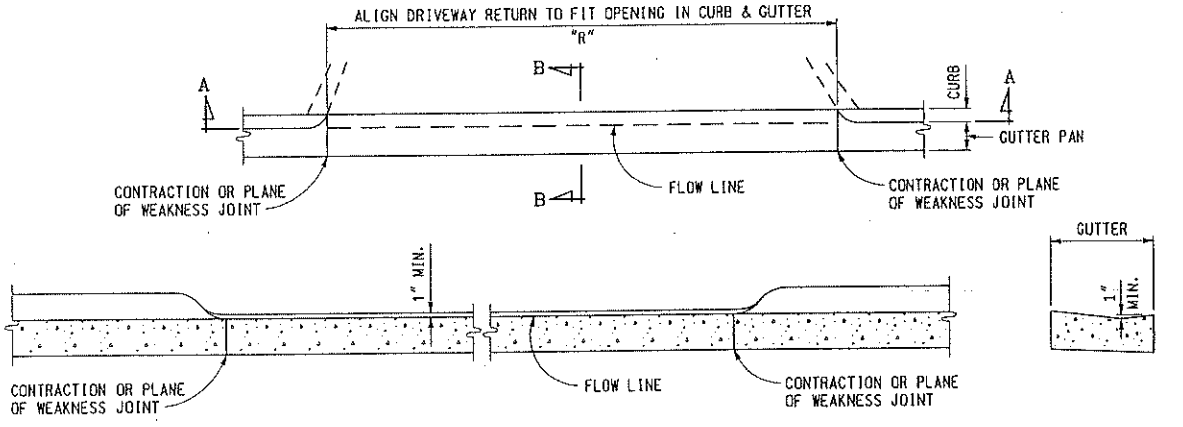
NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL SIGNED COPY APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE MICHIGAN DEPARTMENT OF TRANSPORTATION.



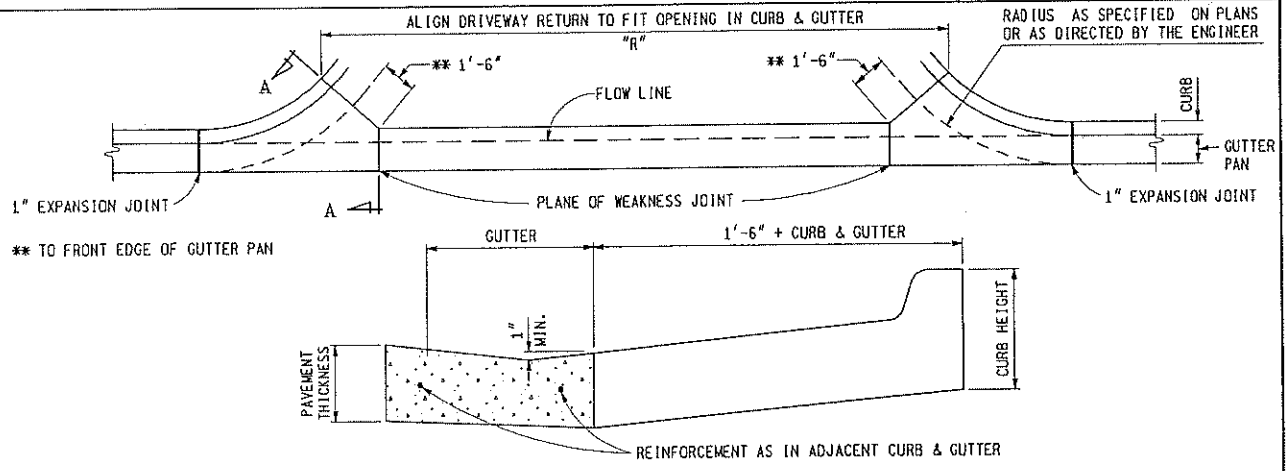
NOTE:
W = MINIMUM WIDTH OF THICKENED CONCRETE SIDEWALK.
(R - d) SHALL NOT BE LESS THAN DRIVEWAY WIDTH.

THE "R" DIMENSION IS SPECIFIED IN THE PUBLICATION "ADMINISTRATIVE RULES REGULATING DRIVEWAYS, BANNERS AND PARADES ON OR OVER HIGHWAYS".

CONCRETE DRIVEWAY OPENING LAYOUT



CONCRETE DRIVEWAY OPENING, DETAIL L



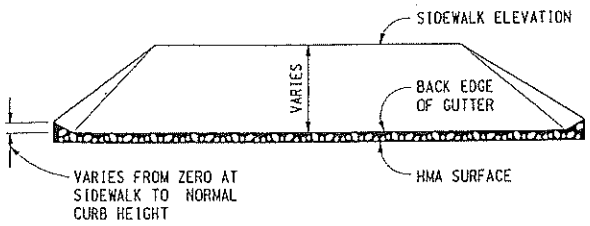
CONCRETE DRIVEWAY OPENING, DETAIL M

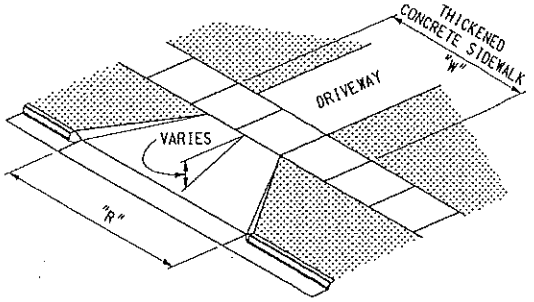
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK

4-26-2007 F.H.W.A. APPROVAL	2-28-2007 PLAN DATE	R-29-E	SHEET 2 OF 4

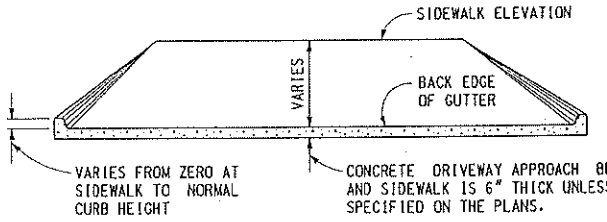
NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL SIGNED COPY APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE MICHIGAN DEPARTMENT OF TRANSPORTATION.

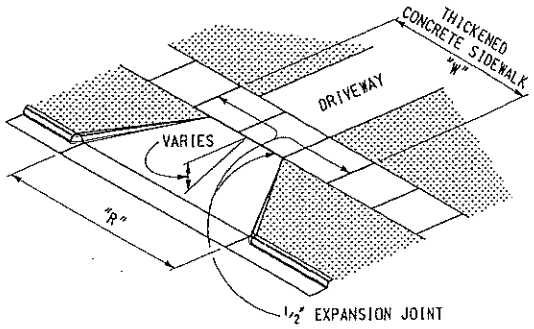




HMA DRIVEWAY APPROACH

(TO BE USED WITH DETAIL L)





NOTES:

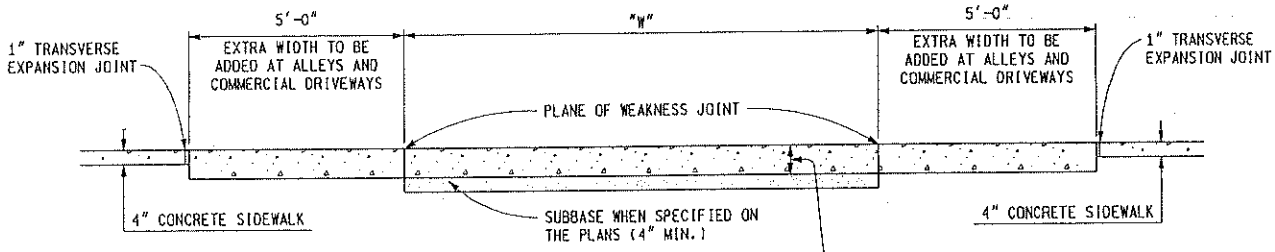
MONOLITHIC CURB IS INCLUDED IN THE CONCRETE DRIVEWAY APPROACH QUANTITY.

REINFORCEMENT IS NOT REQUIRED UNLESS SPECIFIED ON THE PLANS. WHEN REINFORCEMENT IS SPECIFIED, SEE CHART ON THIS SHEET.

WHEN AREA BETWEEN CURB & GUTTER AND SIDEWALK IS MORE THAN 300 SFT, PLACE A CONTRACTION JOINT IN LINE WITH CENTERLINE OF DRIVEWAY AND PERPENDICULAR TO ROADWAY.

CONCRETE DRIVEWAY APPROACH

(TO BE USED WITH DETAIL L OR M)



WHEN CONCRETE DRIVEWAY APPROACH IS SPECIFIED, THE THICKENED CONCRETE SIDEWALK THICKNESS IS EQUAL TO THE THICKNESS OF THE CONCRETE DRIVEWAY APPROACH. WHEN HMA DRIVEWAY APPROACH IS SPECIFIED, THE THICKENED CONCRETE SIDEWALK THICKNESS IS 6" MIN.

THICKENED CONCRETE SIDEWALK

REINFORCEMENT FOR CONCRETE DRIVEWAYS		
CONCRETE DRIVEWAY THICKNESS	WIRE SIZE (6" x 6" MESH)	AVERAGE WEIGHT (LBS/SFT)
LESS THAN 8"	W1.4	21
	W2.9	42
8" OR GREATER	USE WIRE FABRIC REINFORCEMENT SPECIFIED ON STANDARD PLAN R-45-SERIES	

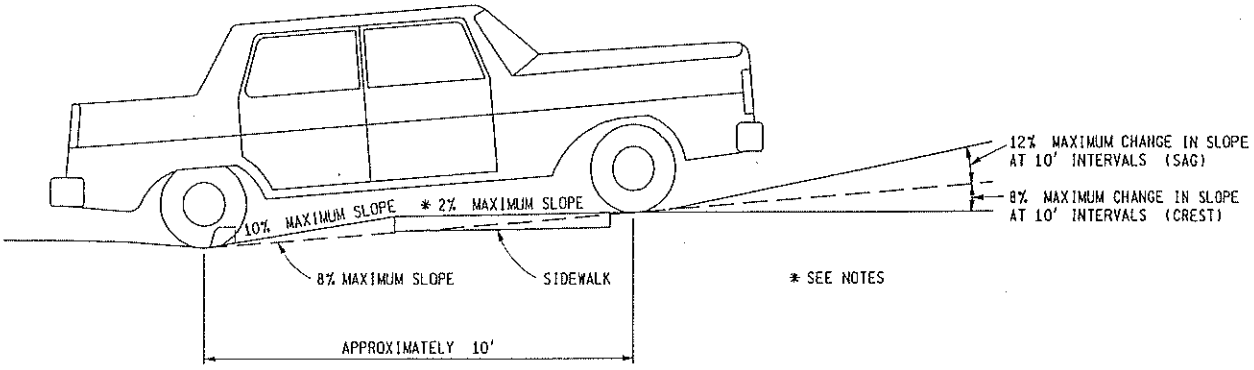
MICHIGAN DEPARTMENT OF TRANSPORTATION

BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

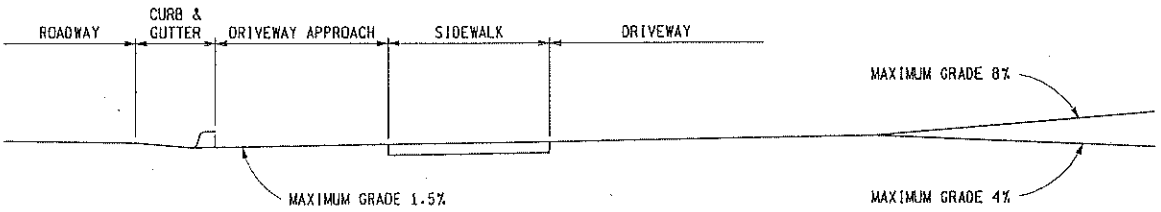
DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK

4-26-2007 F.H.W.A. APPROVAL	2-28-2007 PLAN DATE	R-29-E	SHEET 3 OF 4

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL SIGNED COPY APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE MICHIGAN DEPARTMENT OF TRANSPORTATION.



LOW VOLUME COMMERCIAL OR RESIDENTIAL DRIVEWAY SLOPES



COMMERCIAL DRIVEWAY PROFILE FOR MAJOR TRAFFIC GENERATORS

NOTES:

FOR DRIVEWAY DESIGN REFER ALSO TO "ADMINISTRATIVE RULES REGULATING DRIVEWAYS, BANNERS, AND PARADES ON OR OVER HIGHWAYS" AND GEOMETRIC DESIGN G-680-SERIES, COMMERCIAL DRIVEWAYS.

FOR CURB AND GUTTER DETAILS, SEE STANDARD PLAN R-30-SERIES.

TRANSVERSE SIDEWALK SLOPES ARE TYPICALLY 1.5% OR 2% MAXIMUM. IN ORDER TO MEET SITE CONDITIONS, IF THE TRANSVERSE SLOPE IS REQUIRED TO BE LESS THAN 1.5%, LONGITUDINAL DRAINAGE MUST BE PROVIDED.

WHEN SETTING GRADES FOR COMMERCIAL DRIVES, THE TYPES OF VEHICLES USING THE DRIVE SHOULD BE CONSIDERED.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK

4-26-2007 F.H.W.A. APPROVAL	2-28-2007 PLAN DATE	R-29-E	SHEET 4 OF 4

NOTE: THIS PLAN IS NOT A LEGAL ENGINEERING DOCUMENT BUT AN ELECTRONIC DUPLICATE. THE ORIGINAL SIGNED COPY APPROVED FOR PUBLICATION, IS KEPT ON FILE AT THE MICHIGAN DEPARTMENT OF TRANSPORTATION.

SECTION 02660

WATERMAINS

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes the work required for water mains, structures and appurtenant work.

1.02 REFERENCES:

A. AWWA - American Waterworks Association, latest edition.

B. ANSI - American National Standards Institute, latest edition.

C. ASTM - American Society Testing Materials, latest edition.

1.03 SUBMITTALS:

A. Submit the following for review by ENGINEER:
   1. Product Data on Valves, Hydrant and service fittings.
   2. Details for each connection to existing water main.
   3. Proposed equipment and method for flushing, pressure testing, leakage testing and chlorination.

B. Report witness measurements on valves, fittings and curb boxes.
   1. Provide measurements from three permanent fixtures such as building corners, power poles and trees 8 inch diameter and larger.

C. Provide certifications on pipe and fittings indicating conformance to specifications **PRIOR** to installation.

1.04 JOB CONDITIONS:

A. Interrupting Water Service:
   1. Scheduling: Obtain CITY's approval prior to interruption of service.
   2. Provide notice of twenty-four (24) hours to affected occupants and twenty-four (24) hours to Fire Department of time and duration.
   3. Provide stand-by service as required; outage not to exceed four (4) hours.
   4. Existing valve operation shall be by CITY's employees only.
   5. Prevent contamination of existing water mains.

B. Install service lines after pressure and bacteriological testing is accepted.

C. Clean up promptly following pipe installation within maximum of 600 feet behind pipe laying operation.

D. Salvage all existing valve boxes, curb boxes and hydrants removed and deliver to the CITY's yard. Hydrants shall be removed carefully without causing damage to the hydrant and fittings.

PART 2 - PRODUCTS

2.01 GENERAL:

A. Cement Lining: ANSI A21.4 standard thickness for ductile iron pipe and fittings.

B. Hydrant Leads: Ductile iron pipe with mechanical joints.

C. All materials used in the water distribution system (pipe, fittings, joints, valves) shall meet ANSI/NSF Certification 61 or 14.

2.02 PIPE:

A. Ductile Iron: ANSI A21.50 and ANSI A21.51; Class 53.

B. Service Tubing:
   1. Copper: ASTM B88, Type K annealed and soft temper.

2.03 JOINTS:

A. Ductile Iron Pipe and Fittings:
   1. Mechanical: ANSI A21.11.
   2. Push-on: ANSI A21.11.
   3. Electrical Continuity: Required. Provide bronze wedges (3 per joint), conductive gaskets or thermite welded sockets and cables.

B. Service Tubing and Fittings:
   1. Copper: Flared.

2.04 FITTINGS:

A. Ductile Iron: ANSI A21.10, or ANSI A21.53, Class 54, 250 psi working pressure through 12 inches and 150 psi above. Mechanical joint solid sleeves, Clow Corporation #F1012 or equal.

2.05 VALVES (OPEN LEFT):

A. Gate: AWWA C509 Resilient seated, epoxy coated surfaces, rubber encapsulated gate, bronze non-rising stem with double o-ring seal. Provide full diameter unobstructed flow. End connections shall match pipe.
   1. Manufacturer(s): U.S. Pipe, Metroseal 250, American Darling, or equal.

B. Boxes: Three (3) section cast iron with lid marked WATER:
   1. Upper section: Screw on adjoining center section and full diameter throughout.
   2. Center section: Minimum 5 inch inside diameter.
   3. Base section: Fit over valve bonnet and shaped round for valves through 10 inch and oval for 12 inch and over.

2.06 HYDRANTS (OPEN LEFT):

A. AWWA C502, mechanical joint with drain outlet and plug. Drain outlet shall be plugged in areas of high groundwater, in poor draining soils, or in contaminated soils.

B. Residential: 5 inch size with 6 inch inlet connection, 2 - 2½ inch hose nozzles and 1 – 4 1/2 inch pumper nozzle.

C. Commercial / Industrial: 5 inch size, no hose nozzles and 2 – 4 ½ inch pumper connections.

D. Provide National Standard Fire Hose Thread and pentagon operating nut.

E. Manufacturer: East Jordan Iron Works, Watermaster 5BR (see 3.06 SCHEDULES).

F. Color: Red. Paint hydrant with a zinc chromate primer and finish coat of Rust-Oleum #944 chrome red above grade after installation and after turning / height adjustment and with two coats of asphalt varnish below grade. Painting shall be in strict accordance with ANSI/AWWA C502.

G. Barrel length shall be properly sized so the centerline of the pumper nozzle is 24" to 30" above grade at a 6' depth of cover over the pipe.

2.08 SERVICE FITTINGS:

A. Corporation Stops:
1. Copper tubing: Mueller Co. #H15000 or Hays Mfg. Co. #5200.

B. Curb Stops: Ford, McDonald or Mueller to match CITY standard.

C. Curb Boxes: Minneapolis pattern.

2.09 MISCELLANEOUS:

A. Service Clamps: Cast iron double strap, brass or bronze with stainless steel parts, AWWA C800 threads.

B. Tie Rods and Clamps: Clow Corp. or Traverse City Iron Works.

C. Plastic Seamless Encasement Tubing:
1. Material: ASTM D-1248 Polyethylene, Type I, Class C, 8 mils thick. AWWA C105.
2. Closing Tape: 2 inch wide Poly Ken #900 0r Scotchwrap #50.

D. Mechanical Joint Restraint: Megalug by EBAA Iron Sales, Inc., or approved equal.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Alignment and Grade:
1. Deviations: Notify ENGINEER and obtain instructions to proceed where there is a grade discrepancy or an obstruction not shown on plans.
a. Verify location and depth of existing utilities in advance of construction and provide adjustments in alignment and grade of watermain at no additional cost.
2. Depth of pipe: Minimum cover over pipe shall be 6 feet below existing or finished grade (whichever is lower) unless otherwise indicated on plans. Depth of services shall be 7 feet under pavement
4. High points in pipeline: Locate at services and hydrants.

B. Bedding:
1. Method: Article 3.05 SCHEDULES.
2. Provide bedding area backfill in accordance with SECTION 02220 EXCAVATING, BACKFILLING AND COMPACTING.

3. Provide continuous bearing supporting entire length of pipe barrel evenly.

C. Cleaning Pipe and Fittings:
   1. General: Provide interior free of foreign material and joint surfaces free of lumps and blisters.

3.02 INSTALLATION:

A. Laying Pipe:
   1. Prevent entrance of foreign material and plug watertight when left unattended.
   2. Provide pipe length and bedding as a unit in a frost free, dry trench.
   3. Special supports and saddles: Article 3.05 SCHEDULES.
   4. Provide minimum vertical and horizontal separation between water main and sanitary sewer, storm sewer or force main of 18 inches and 10 feet, respectively.
   5. ENGINEER's approval required for pipe lengths less than 6 feet.
   6. Joint deflection shall not exceed the following values or as recommended by pipe manufacturer.

Maximum Joint Deflection

Nominal Pipe Size (inches)	Push-On Joint		Mechanical Joint	
	Deflection Angle (Deg-Min)	Maximum Offset (inches)*	Deflection Angle (Deg-Min)	Maximum Offset (inches)*
4	3° - 30'	14	6° - 15'	23
6	3° - 30'	14	5° - 20'	20
8	3° - 30'	14	4° - 00'	15
12	3° - 30'	14	4° - 00'	15
16	2° - 15'	8 ¼	2° - 40'	10
24	2° - 15'	8 ¼	1° - 45'	7

*Offsets are based upon 18-foot lengths of pipe

B. Cutting Pipe:
   1. Ductile iron: Power saw.

C. Jointing:
   1. Mechanical:
      a. Lubricate as recommended by manufacturer.
      b. Tighten bolts evenly to 75 to 90 foot-pounds.
   2. Push-on:
      a. Lubricate as recommended by manufacturer.
      b. Shape beveling as recommended by manufacturer.

D. Setting Valves, Fittings and Fire Hydrants:
   1. General: Article 3.05 SCHEDULES.
   2. Valves: Set plumb.
   3. Valve boxes:
      a. Base section: Center and plumb over operating nut and 2 inches above bonnet joint.
      b. Upper section: Set cover flush with finished grade.
      c. Witnesses: Provide 3 measurements to permanent surface features.
   4. Hydrants:
      a. Connection: With ductile iron pipe and auxiliary valve.

b. Positioning: Plumb with pumper nozzle facing curb and nozzle centerline 27 inches minimum and 33 inches maximum above finished grade.
   1) CITY reserves the right to require a specific nozzle orientation for all hydrants.
c. Provide necessary length of 6 inch pipe for hydrant leads.
d. Provide 1 cubic yard of minimum 1-inch stone around drain outlet if unplugged.

5. Tie valves to tees and crosses and tie hydrants to valves using Megalug retainer glands or approved equal. Also provide concrete reaction backing as specified.

F. Connections:
1. Existing water mains:
   a. Provide temporary support during cut-in.
   b. Disinfect by swabbing pipe, valves and fittings with four percent (4%) chlorine solution.
   c. Pressure off: Install mechanical joint solid sleeve.
   d. Pressure on: Install tapping sleeve, valve and box.
2. Service lines:
   a. Align at right angles to street or easement line.
   b. Minimum depth shall be same as pipe, except depth shall be 7 feet under pavement.
   c. Install after acceptable pressure test and chlorination of water main.
   d. Curb boxes: Set plumb and provide 3 measurements to surface features.
   e. Tapping shall be at 45° above center and shall provide horizontal loop at corporation stop.
   f. Minimum size of service line shall be 1-inch unless otherwise directed by CITY.
   f. Maximum tap sizes shall be as follows:

Type of Pipe	Pipe Size									
	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
	Maximum Direct Tap Size									
Ductile:	½"	¾"	1"	1¼"	1½"	2"	2"	2"	2"	2"
	Maximum Tap Size with Double Strap Saddle									
All Pipe:	1"	1½"	2"	2"	2"	2"'	2"	2"	2"	2"

G. Reaction Backing:
1. Placement: Article 3.05 SCHEDULES.
   a. Place concrete manhole block next to pipe and concrete reaction backing behind. Mega lugs and fitting bolts shall not be covered with concrete.
2. Bearing area: Provide the following square feet of concrete against trench wall in sand:

Pipe Size	Tees Plugs	Hydrants 90° Els	Wyes 45° Els	22½° Els	11¼° Els
4"	2	1	1	1	1
6"	3	3	2	1	1
8"	4	6	3	2	1
10"	7	9	5	3	2
12"	9	11	6	3	2
14"	11	15	8	5	3
16"	13	20	10	6	3
18"	16	25	12	7	4
20"	20	28	14	8	4
24"	28	40	20	11	6

3. Other Soil Conditions:
   (a) Cement sand or hardpan - Multiply above by 0.5
   (b) Gravel - Multiply above by 0.7
   (c) Hard dry clay - Multiply above by 0.7
   (d) Soft clay - Multiply above by 2.0
   (e) Muck - secure all fittings with Megalug retainer glands or tie rod clamps and concrete reaction backing the same as listed for sand conditions. Install as required by SECTION 02220 EXCAVATING, BACKFILLING AND COMPACTING.

H. Polyethylene Encasement:
   1. In corrosive soils: install over ductile iron pipe and tape seams in accordance with AWWA C105.

I. Repair sewer laterals disturbed during construction with PVC schedule 40 pipe and FERNCO fittings. Include information on repaired sewer laterals on the as-built drawings.

3.03 FIELD QUALITY CONTROL:

A. Testing and Inspection:
   1. General:
      a. Observation: By CITY OR ENGINEER.
      b. Completion: Before connecting to existing line.
      c. Notification: Pretest and arrange with CITY OR ENGINEER for observation of test.
      d. Equipment and assistance: Provide.
      e. Required water: By CITY where available from municipal system.
      f. Connection to existing water main: After passing pressure and leakage tests.

   2. Electrical continuity: Test ductile iron pipe for continuity and repair breaks.
   3. Pressure/Leakage Test:
      a. Conditions: Air or air-water methods of applying pressure prohibited.
      b. Sequence: Prior to Flushing and Chlorination.
      c. Procedure: Fill system slowly, expel air through corporation stop at high points and apply pressure.
      d. Pressure: Maintain at a minimum of 1.5 times the stated working pressure (psi) at the lowest elevation of the test section
      e. Duration: Two (2) hours.
      f. Make-up water: From measurable source.
      g. Leakage: Quantity of water supplied to maintain test pressure.
      h. Allowable: Less than:

$$L = \frac{S \times D \times \text{square root of } P}{148{,}000}$$

where,
L = leakage (gallons per hour).
S = length of pipe (feet).
D = nominal pipe diameter (inches).
P = average test pressure (pounds per square inch gauge).

      i. Correction: Repair defects and repeat test until acceptable.
      j. Maximum length of pipe to be tested shall be 1,000 feet.

   4. Testing valves only: Maintain pressure on main and check all valves as follows:
      a. Vent extreme ends of main and briefly check each valve progressively back towards test point.

b. Allowable pressure drop shall be less than 10 psi in five (5) minutes with test pump off.
c. Correction: Repair defects and repeat test until acceptable.

3.04 FLUSHING:

A. Flushing: Shall be performed in accordance with ANSI/AWWA C651
1. Observation: By CITY OR ENGINEER.
2. Sequence: Following pressure testing and prior to chlorination.
3. Maximum intervals: 1,000 feet.
4. Required water: By CITY where and when available from municipal system. Maintain 20 psi residual pressure in existing water system.
5. Minimum velocity: 2½ feet per second at pipe wall. See table below for size and number of Taps required to achieve minimum velocity:

Required flow and openings to flush pipelines

Pipe Diameter *inches*	Flow Required to Produce 2.5 ft/s Velocity in Main *gpm*	Size of Tap 1"	Size of Tap 1½"	Size of Tap 2"	Number of 2 ½-in. Hydrant Outlet
		Number of Taps on Pipe			
4	100	1	-	-	1
6	200	-	1	-	1
8	400	-	2	1	1
10	600	-	3	2	1
12	900	-	-	2	2
16	1600	-	-	4	2

3.05 DISINFECTION:
A. Chlorination: Shall be performed in accordance with ANSI/AWWA C651
1. Observation: By CITY OR ENGINEER.
2. Required water: By CITY where available from municipal system.
3. Chlorine gas: Not permitted on job-site.
4. Sequence: Following pressure tests and flushing and prior to connection to existing water main.
5. Retention time: Chlorinated water of at least 25 mg/l initial shall remain in the pipe for at least 24 hours. At the end of the 24-hour period the chlorine residual shall be at least 10mg/l or rechlorination must take place.
6. Procedure: Operate all valves during disinfection.
7. Bacteriological Testing:
a. Two consecutive safe bacteriological samples shall be taken 24 hours apart before placing the water main into service. Samples shall be collected for every 1,000 feet of new main, plus samples from each branch and the end of the line. If excessive quantities of debris or trench water has entered the main, samples shall then be taken at approximately 200-foot intervals.
b. Sampling: By CONTRACTOR. The sample bottle will be supplied by CITY. CONTRACTOR shall draw the sample and submit it to the CITY
8. Correction: Rechlorinate sections not meeting MDEQ bacteriological requirements.
a. Retesting shall be paid by CONTRACTOR.

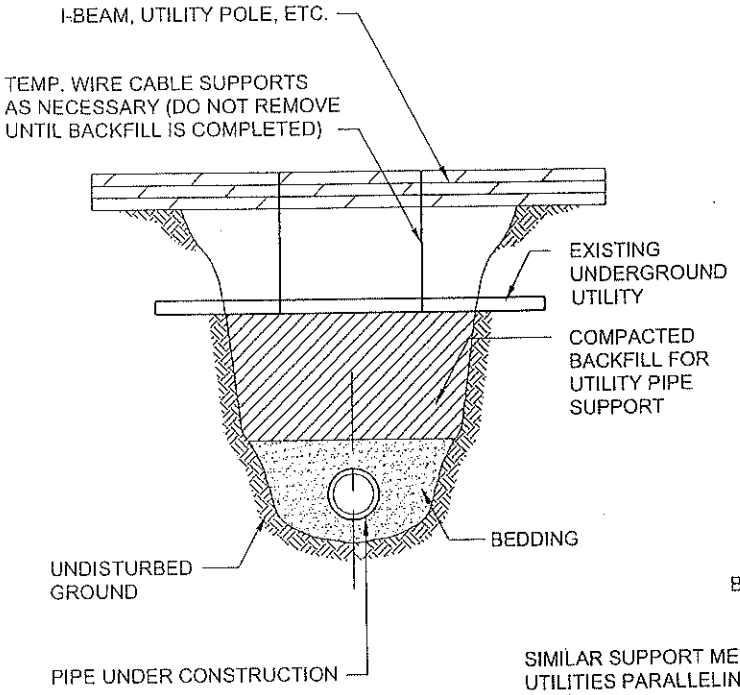
3.06 SCHEDULES:

A. Standard Details:
1. Special supports for underground utilities.

2. Pipe saddles.
3. Methods of bedding pipe.
4. Location of reaction backing.
5. Water main offset / relocation detail.
6. Hydrant assembly.
7. Copper service lead connection / sample point.

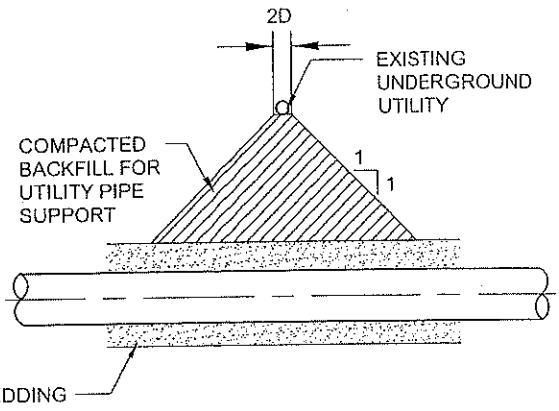
B. Fire Hydrant Specifications (see attached).

END OF SECTION



SECTION

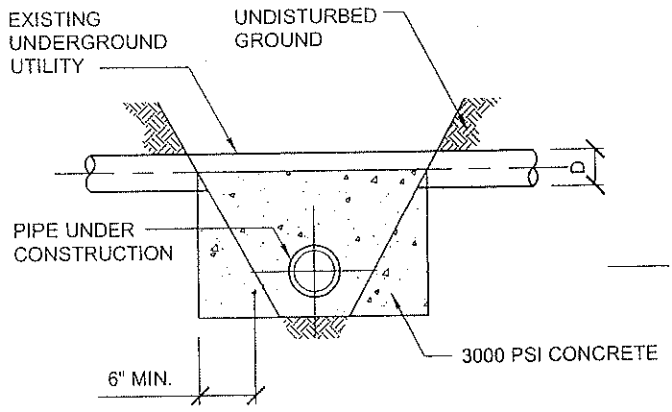
NOTE: MAINTAIN EXISTING COATING ON UTILITY

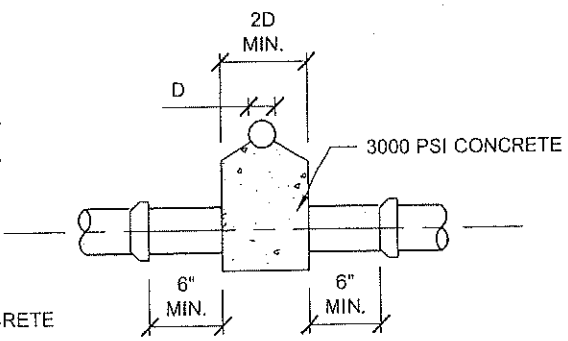


SIMILAR SUPPORT METHODS APPLY TO UTILITIES PARALLELING AND ABOVE THE PIPE UNDER CONSTRUCTION

ELEVATION

SPECIAL SUPPORTS FOR UNDERGROUND UTILITIES





NOTE:

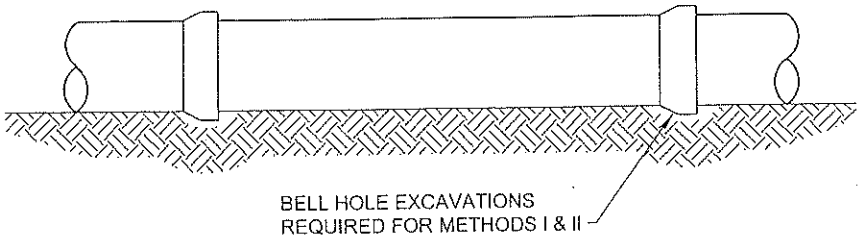
1. PIPE SADDLE IS NOT REQUIRED FOR PLASTIC, STEEL, LEAD OR COPPER PIPE 2" OR SMALLER.

SECTION

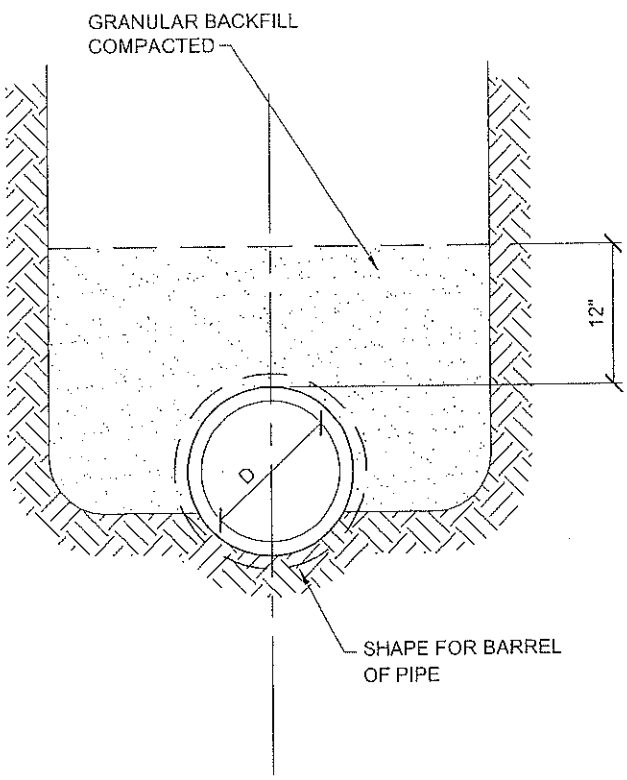
ELEVATION

PIPE SADDLES

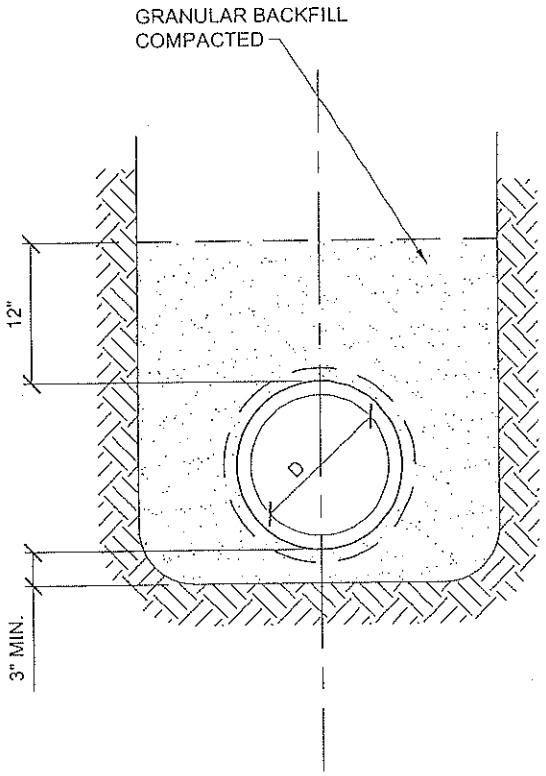
02660_SADDLE
8/02



EXCAVATION FOR BELLS



METHOD I

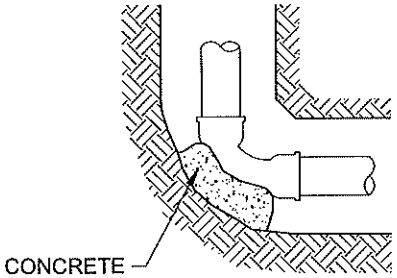


METHOD II

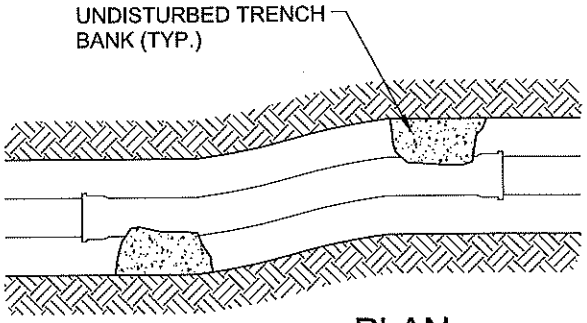
NOTES:

1. METHOD I: IN AREAS OF UNCONSOLIDATED SOILS (SAND, GRAVEL, ETC.)
2. METHOD II: IN AREAS OF CONSOLIDATED SOILS (CLAY, HARDPAN, ROCK, ETC.)

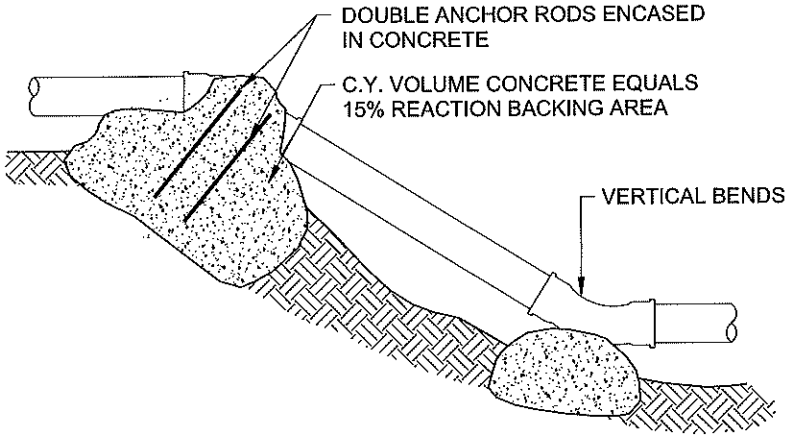
METHODS OF BEDDING PIPE



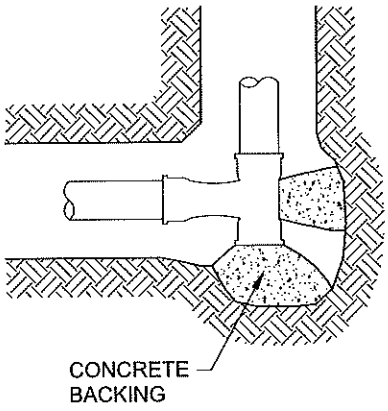
PLAN



PLAN



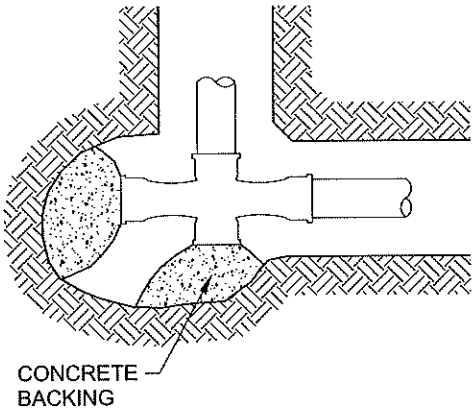
PROFILE



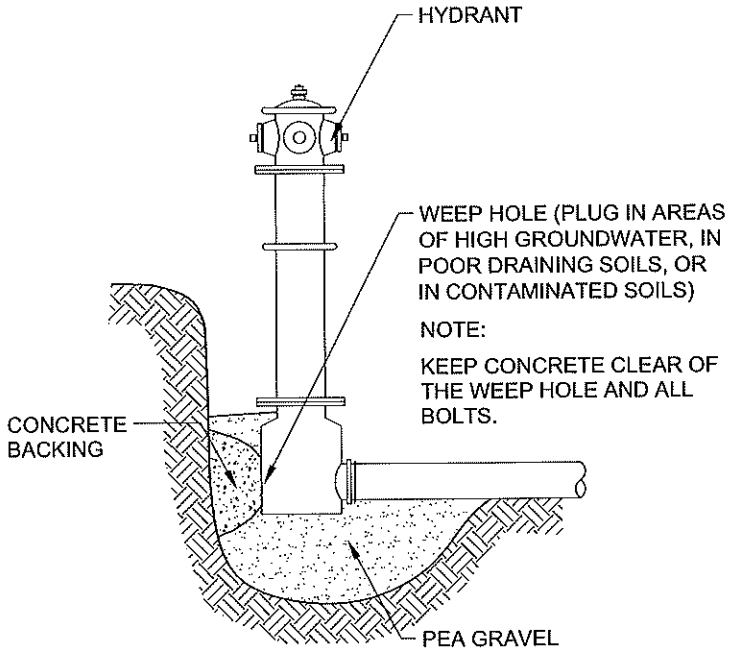
PLAN

ANCHOR ROD SIZE

PIPE SIZE	ROD SIZE
4" THRU 6"	#4
8" THRU 10"	#6
12" THRU 18"	#8
20" THRU 24"	#10

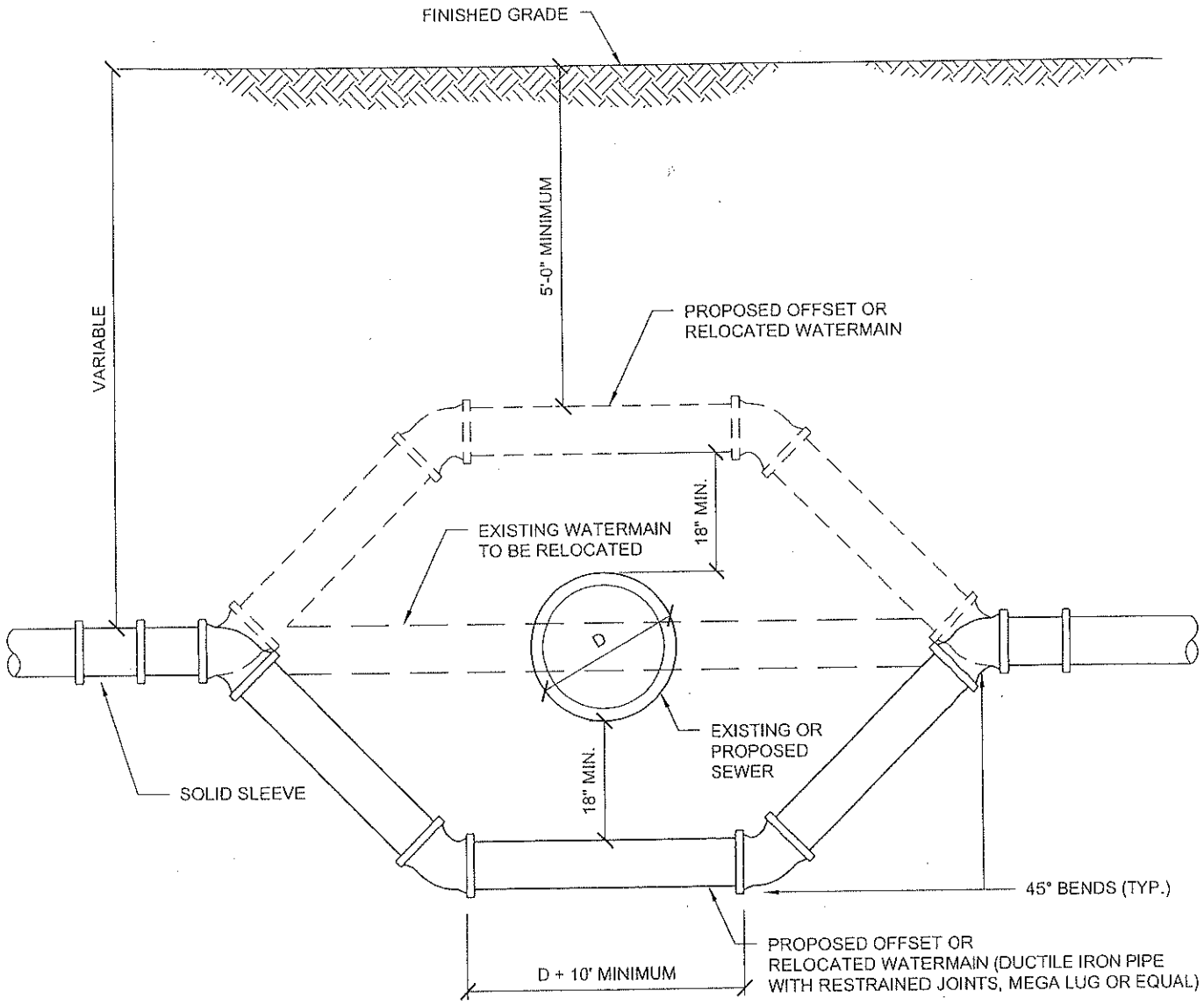


PLAN



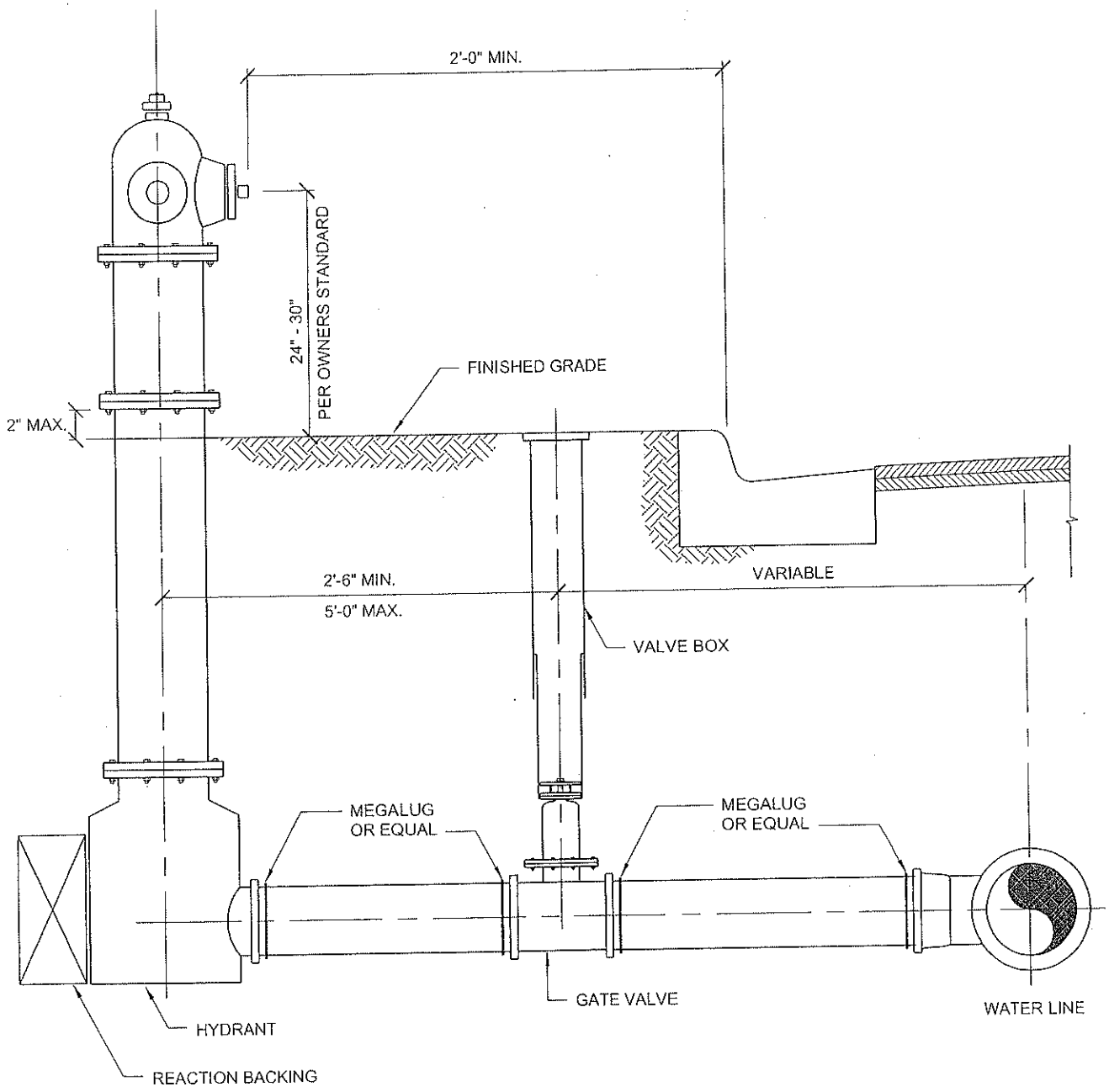
PROFILE

LOCATION OF REACTION BACKING

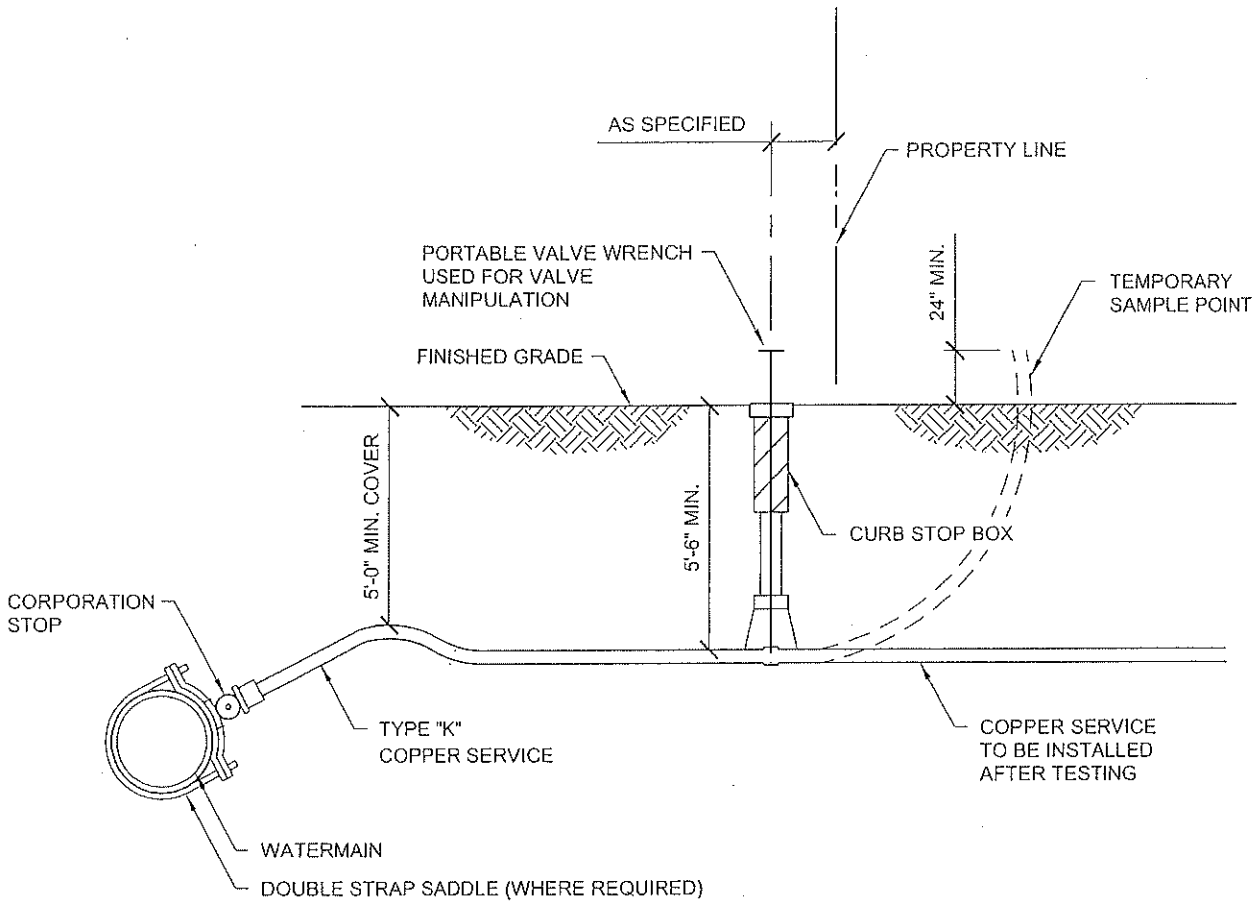


NOTE: WHEN THE MINIMUM CLEARANCE AND COVER CAN BE OBTAINED, THE WATERMAIN IS TO BE RELOCATED ABOVE THE SEWER.

WATERMAIN OFFSET / RELOCATION DETAIL



HYDRANT ASSEMBLY



NOTES:

1. SAMPLE POINT TO BE USED FOR FUTURE SERVICE LEAD.
2. NO TAP SHALL BE MADE CLOSER THAN 18" TO ANY COUPLING OR JOINT IN THE PIPE.

COPPER SERVICE LEAD CONNECTION/SAMPLE POINT

CITY OF BELDING
Fire Hydrant Specifications

Features:

Manufacturer - East Jordan Iron Works, Inc.
Model - WaterMaster 5-BR Fire Hydrant
AWWA standard C502 for dry barrel fire hydrants
UL Listed / UL Labeled
Pressure rating - 150 psi working pressure / 300 psi test pressure
Capacity - full 5 1/4" valve opening
Swivel flange
Permanent lubrication - stem permanently lubricated with food grade grease
Anti-friction washers
Double "O" ring seals
Compression type valve
Thrust pad
Removable brass seat
Paint color - red

Ordering Information:

Residential

5BR Hydrant furnished as traffic model
Nozzle combinations - (2) 2 1/2" hose nozzles, (1) 4 1/2" pumper nozzle
Pentagon operating nut (1 ½" from point to opposite flat)
6" inlet connection
Open left (counter-clockwise)
6' bury depth
2 1/2" nozzles - 2 1/2" NST, 4 1/2" nozzle - 4 1/2" NST
Drain outlet to be plugged in areas of high groundwater, in poor draining soils, and in contaminated soils

Industrial/Commercial

5BR Hydrant furnished as traffic model
Nozzle combinations - (2) 4 1/2" pumper nozzles
Pentagon operating nut
6" inlet connection
Open left (counter-clockwise)
6' bury depth
4 1/2" nozzles - 4 1/2" NST
Drain outlet to be plugged in areas of high groundwater, in poor draining soils, and in contaminated soils

East Jordan Iron Works, Inc.
5075 Clyde Park SW
Grand Rapids, MI 49509
(616) 538-2040

SECTION 02720

STORM SEWERS

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes work required for storm sewer pipe, culverts, structures, drain excavation/cleanout and related work.

1.02 REFERENCES:

A. MDOT - Michigan Department of Transportation, *"Standard Specifications for Construction", Current Edition.*

B. ASTM - American Society Testing Materials, latest edition.

1.03 SUBMITTALS:

A. Submit the following for review by CITY or CITY's ENGINEER **PRIOR** to instatllation:
   1. Pipe certification.
   2. Shop Drawings on radius pipe.

B. Notify CITY on presence of wastewater.

C. Line and grade control method other than Laser Beam shall be approved by CITY or CITY's ENGINEER.

D. Report witness measurements and "as-built" elevation on end of footing drains.
   1. Provide measurements from three permanent fixtures such as building corners, power poles and trees 8-inch diameter and larger.

1.04 JOB CONDITIONS:

A. Maintain existing storm sewer operational.

B. Install service lines, catch basins and inlet leads as pipe laying progresses and within maximum of 600 feet of mainline sewer installation.

C. Clean up promptly following pipe installation and within maximum of 400 feet behind pipe laying operation. Cleanup shall include backfill and rough grading.

PART 2 - PRODUCTS

2.01 PIPE:

A. Concrete Pipe: Reinforced concrete ASTM C-76, Class V.

B. Corrugated Steel: MDOT 909.05.

C. Polyethylene (PE):
   1. ADS N-12 corrugated exterior, smooth interior: ASTM F-405
   2. Hi-Q.

D. Footing Drains: MDOT 909.07.
   1. Fittings: Connect to edge drain or directly to catch basin. Connections to the mainline storm sewer will not be allowed.

2.02 PREMIUM JOINTS:

A. Concrete: ASTM C443, modified to include "O" rings on grooved pipe ends.

B. Corrugated Metal:
   1. Coupling bands: Same as standard joints.
   2. Waterproofing materials: $^{3}/_{8}$ inch Neoprene, solid.
   3. Neoprene width: 7 inch for 12 inch bands and 12 inch for 24 inch bands.

C. Plastic: Rubber O-Rings.

2.03 MANHOLES, CATCH BASINS AND INLETS:

A. Precast Units: ASTM C478 and ASTM C76 Class III.
   1. Joints: Cement mortar, preformed bituminous rope or "O" ring gaskets.
   2. Pipe openings: Pipe diameter plus 6 inches, maximum.

B. Concrete: 3500 psi 28 day, 4 inch maximum slump.

C. Concrete Radial Units: ASTM C139.

D. Grade Rings: ASTM C478.

E. Manhole Steps shall be one of the following:
   1. Cast iron: 10 inch deep by 10 inch wide, 5 inch tread depth, 1 inch by 1 inch tread section, with 2 inch rail height.
   2. Plastic: Reinforced with $^{3}/_{8}$ inch steel rod and dimensioned as cast iron.

F. Manhole Castings: East Jordan 1045Z1 B cover, Neenah R-1642 vented cover.

G. Catch Basin and Inlet Castings: MDOT C, E OR K as follows:
   1. Concrete rolled curb and gutter: Cover C.
   2. Bituminous valley gutter: Cover C.
   3. Ditch centerline: Cover E.
   4. Concrete standard curb and gutter: Cover K. Cover KK where called for on plans. Cover KK shall be East Jordan Iron Works #7030 T1 or T3, Neenah Grate r-3246 or equal.

2.04 RIP RAP:

A. Rip Rap: MDOT 916.01.

B. Geotextile Fabric: Mirafi 600X.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Alignment and Grade:
   1. Deviations: Notify OWNER's ENGINEER and obtain instructions to proceed where there is a grade discrepancy or an obstruction not shown on the drawings.
   2. Expose existing utilities at crossings of proposed storm sewer in advance of laying pipe to verify existing depth. Advise OWNER's ENGINEER of conflicts in grade and provide adjustments in grade of storm sewer.

B. Laser Beam Control:
   1. Check grade at set-up point, 25 foot, 50 foot, 100 foot and 200 foot points thereafter to the next set-up point.
   2. Projector advancement: **RESET AT EACH MANHOLE**.

C. Bedding:
   1. Provide minimum 3 inches granular material bedding in areas of consolidated soils (i.e. clay, hardpan, bedrock, etc.).
   2. Provide bedding area backfill in accordance with SECTION 02220 EXCAVATING, BACKFILLING AND COMPACTING.
   3. Provide continuous bearing by supporting entire length of pipe barrel evenly. Excavate for bells of pipe joints.

3.02 INSTALLATION:

A. Laying pipe:
   1. Direction shall be upstream with spigot or tongue end downstream and bell end upstream.
   2. Joints shall be smooth and clean.
   3. Place pipe length and bedding as a unit in a frost free, dry trench.
   4. Special supports and saddles: Article 3.05 SCHEDULES.
   5. Footing drains and underdrains shall have 4'-0" minimum cover.

B. Jointing:
   1. Premium:
      a. Solvents, adhesives and lubricants shall be furnished by Manufacturer.
      b. Seating: Fully.
      c. Gasket position: Check.

C. Manhole, Catch Basins and Inlets:
   1. General: Article 3.05 SCHEDULES.
   2. Base bedding: Provide 4 inch pea stone with full and even bearing in impervious or wet conditions. Otherwise provide on undisturbed frost-free dry subgrade.
   3. Precast: Fill joint space completely and trowel.

4. Block: Set in full bed of mortar with key slots filled, joints maximum ½ inch at inside face and wipe joints. Plaster coat complete interior of structure with ½ inch coat of cement mortar.
5. Provide manhole casting grade setting as follows:
   a. Existing pavement: Finished grade.
   b. Gravel or lawn grade: Finished grade.
   c. Unpaved areas: Finished grade.
6. Provide catch basin casting grade setting as follows:
   a. Gutter grade: ½ inch below.
   b. Unpaved areas: 6 inches below finished grade.
7. Provide geotextile fabric below catch basin grate temporarily to prohibit sediment entering the storm sewer. Remove when appropriate.

D. Connections:
   1. Existing storm sewer:
      a. Structures: Relay and repoint loose blocks and bricks.
   2. Future Storm Sewer:
      a. Plug: Pipe 4 inch through 21 inch with standard disc.
      b. Bulkhead: Pipe 24 inch and larger with brick and mortar, ½ inch plaster outside.
         (1) 24 inch - 36 inch: 4 inch thick.
         (2) 42 inch - 60 inch: 8 inch thick.
         (3) 60 inch and larger: 12 inch thick.

E. Drain Excavation/Cleanout:
   1. Section: 4 foot flat bottom with 1 on 2 maximum side slopes.
   2. Remove trees and brush as required, unless otherwise indicated.
   3. Excess excavated material:
      a. Drain excavation of 2 feet or less: Spread, level and grade to drain along top of banks.
      b. Drain excavation in excess of 2 feet: Remove from site and place in an upland disposal site.

3.03 TESTING AND INSPECTION:

A. General:
   1. Observation: By CITY or CITY's ENGINEER.
   2. Completion: Before connecting to active system.
   4. Notification: Clean and arrange for inspection.

B. Line and Grade: Allowable drift between structures from proposed alignment will be as follows:
   1. Line:
      a. Through 36 inch: 0.40 foot.
      b. Over 36 inch: 0.80 foot.
   2. Grade:
      a. Through 36 inch: 0.05 foot.
      b. Over 36 inch: 0.10 foot.

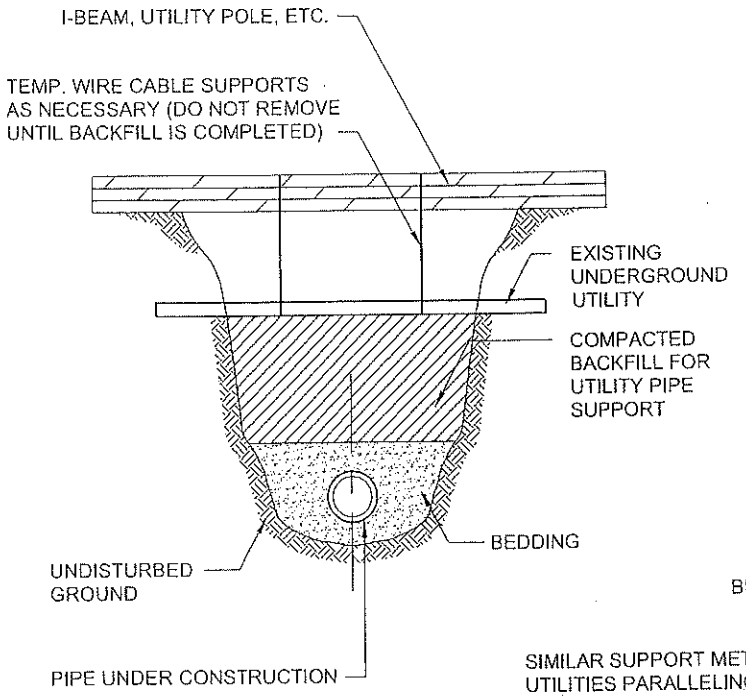
3.04 ADJUST AND CLEAN:

A. General:
   1. Keep pipe and structures clean as work progresses.

3.05 SCHEDULES:

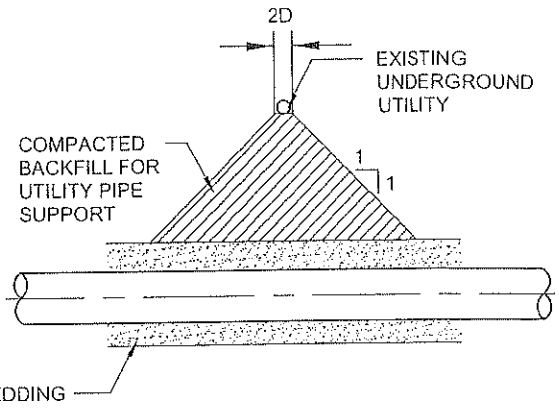
A. Standard Details:
   1. Special supports for underground utilities / pipe saddles.
   2. Methods of bedding pipe.
   3. Standard storm manhole.
   4. Standard storm tee manhole.
   5. Standard catch basin.
   6. Standard inlets.
   7. Special curb / yard inlet.

END OF SECTION



SECTION

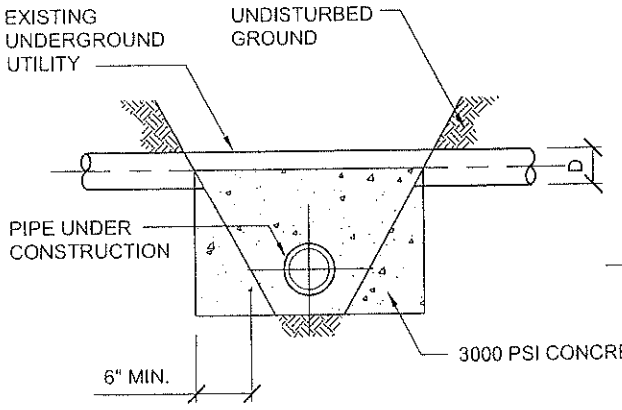
NOTE: MAINTAIN EXISTING COATING ON UTILITY

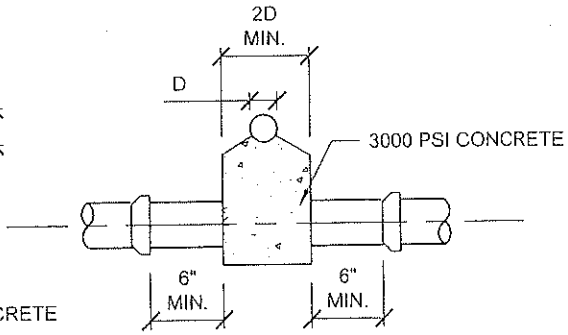


ELEVATION

SIMILAR SUPPORT METHODS APPLY TO UTILITIES PARALLELING AND ABOVE THE PIPE UNDER CONSTRUCTION

SPECIAL SUPPORTS FOR UNDERGROUND UTILITIES





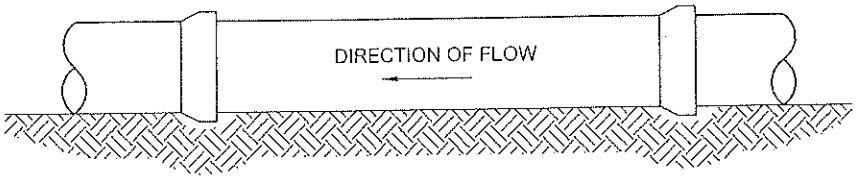
NOTE:

1. PIPE SADDLE IS NOT REQUIRED FOR PLASTIC, STEEL, LEAD OR COPPER PIPE 2" OR SMALLER.

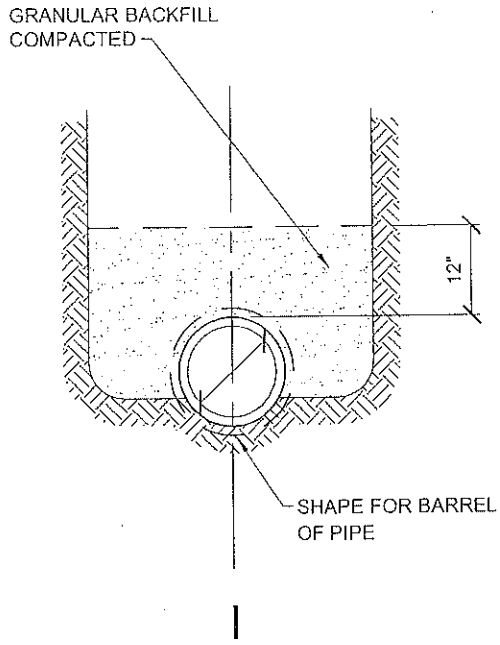
SECTION

ELEVATION

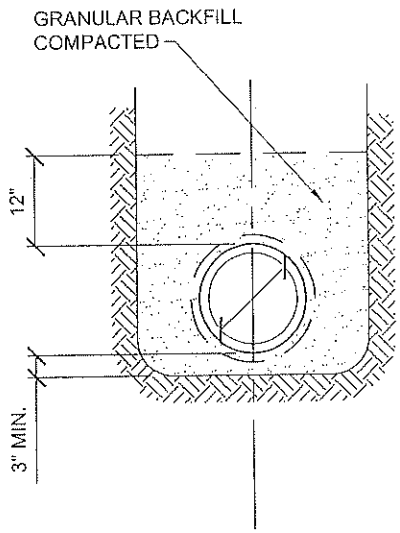
PIPE SADDLES



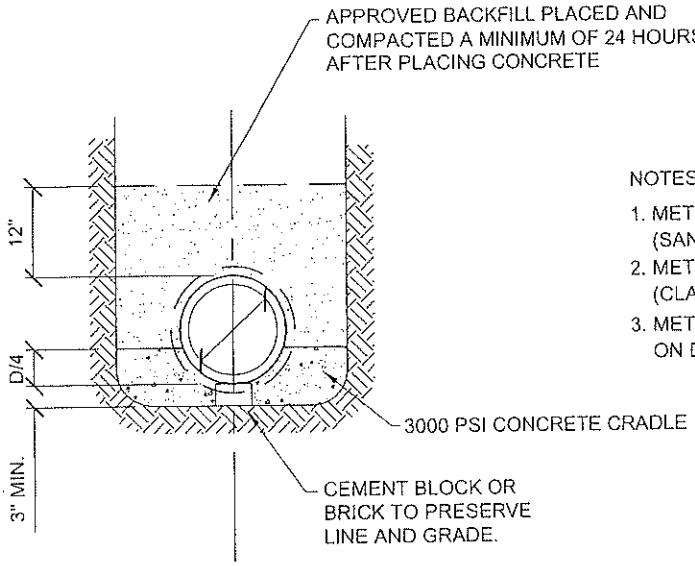
EXCAVATION FOR BELLS



I



II



III

NOTES:

1. METHOD I: IN AREAS OF UNCONSOLIDATED SOILS (SAND, GRAVEL, ETC.)
2. METHOD II: IN AREAS OF CONSOLIDATED SOILS (CLAY, HARDPAN, ROCK, ETC.)
3. METHOD III: IN AREAS INDICATED ON DRAWINGS

METHODS OF BEDDING PIPE

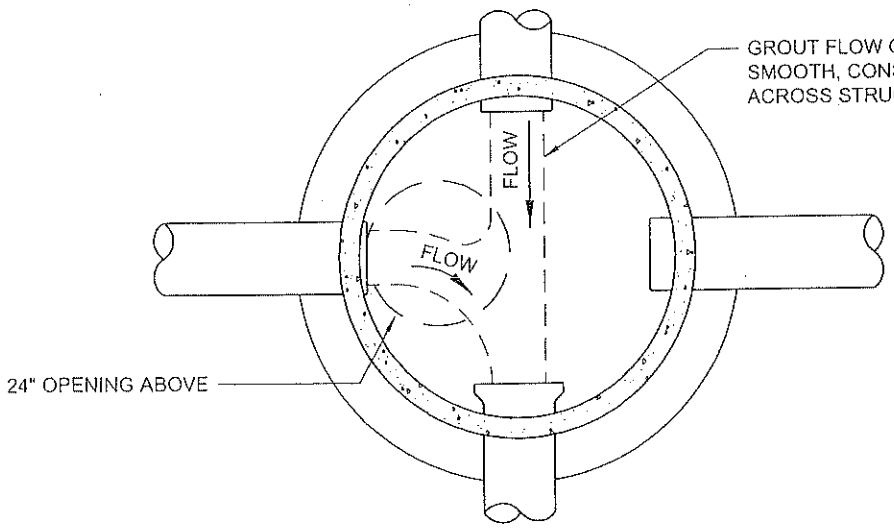
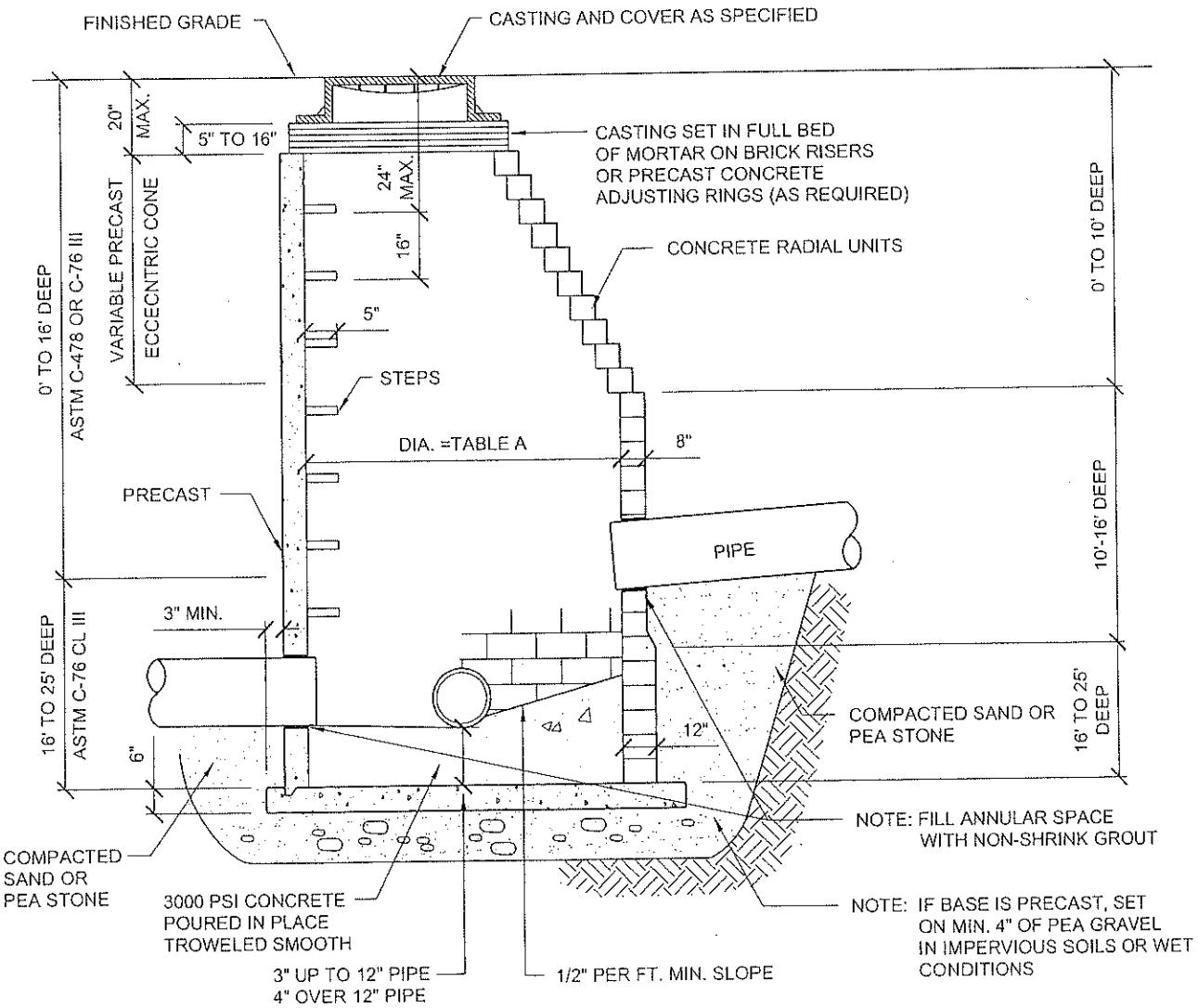


TABLE A

PIPE SIZE	DIAMETER
8" TO 24"	4'-0"
27" TO 33"	5'-0"
36" TO 42"	6'-0"

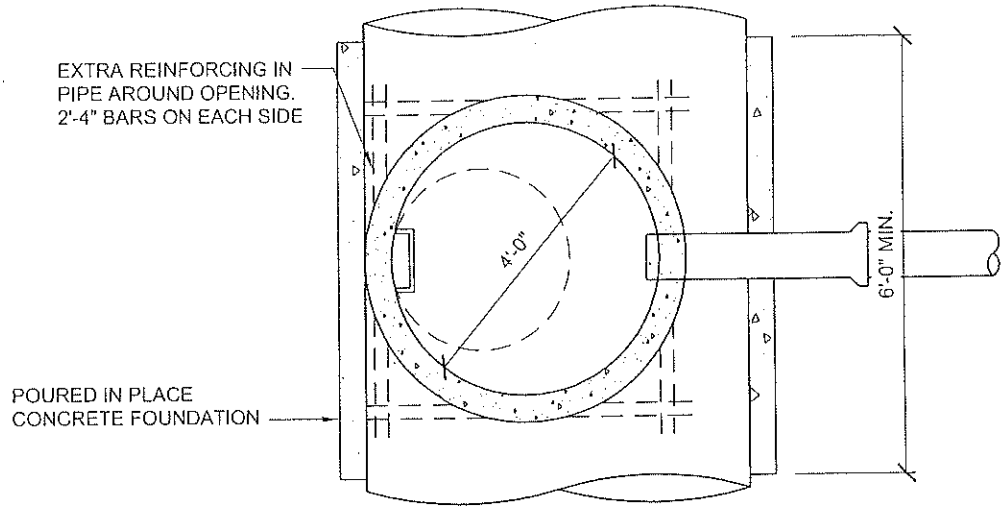
PLAN



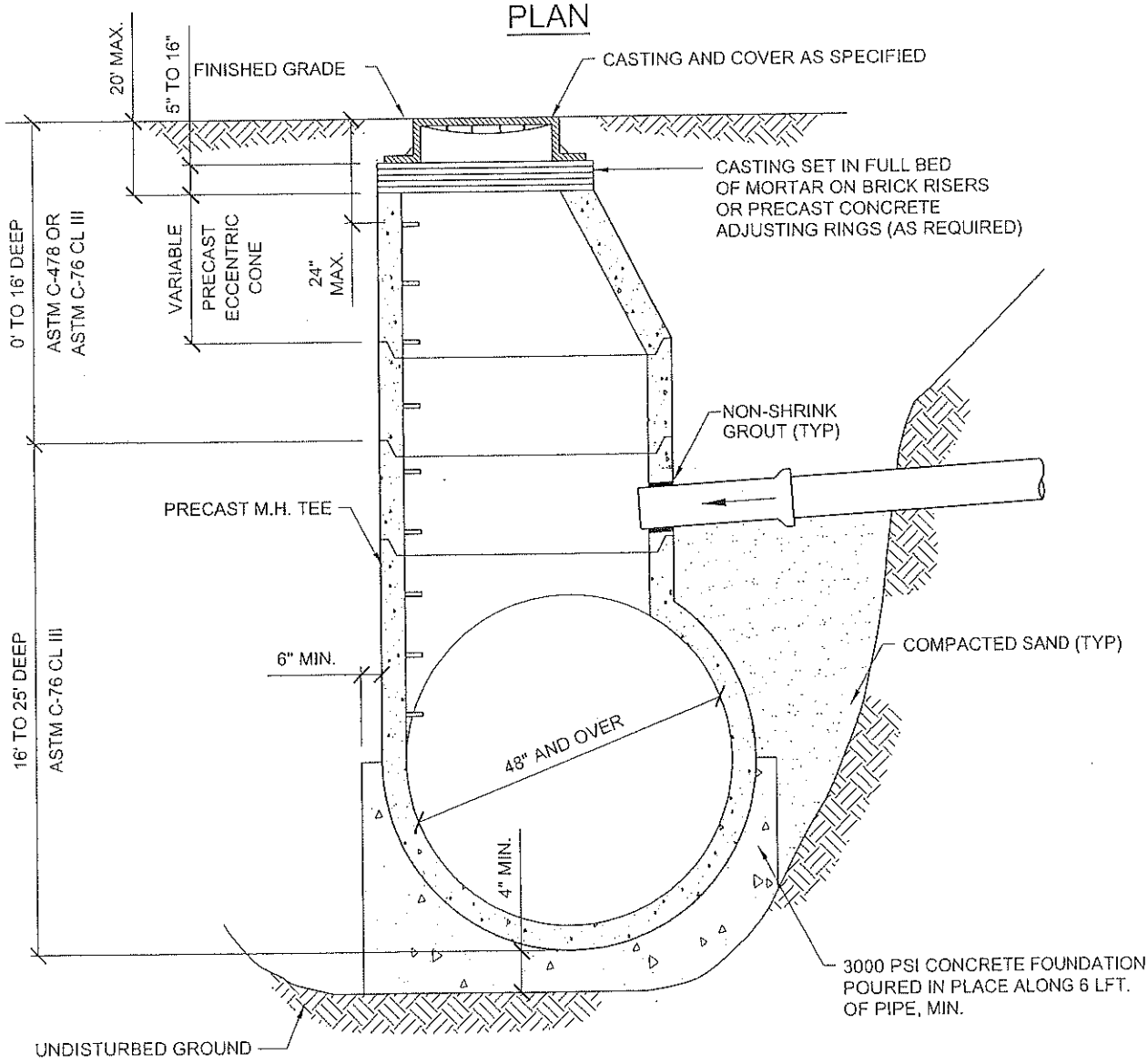
SECTION

STANDARD STORM MANHOLE

02720_MH
8/02



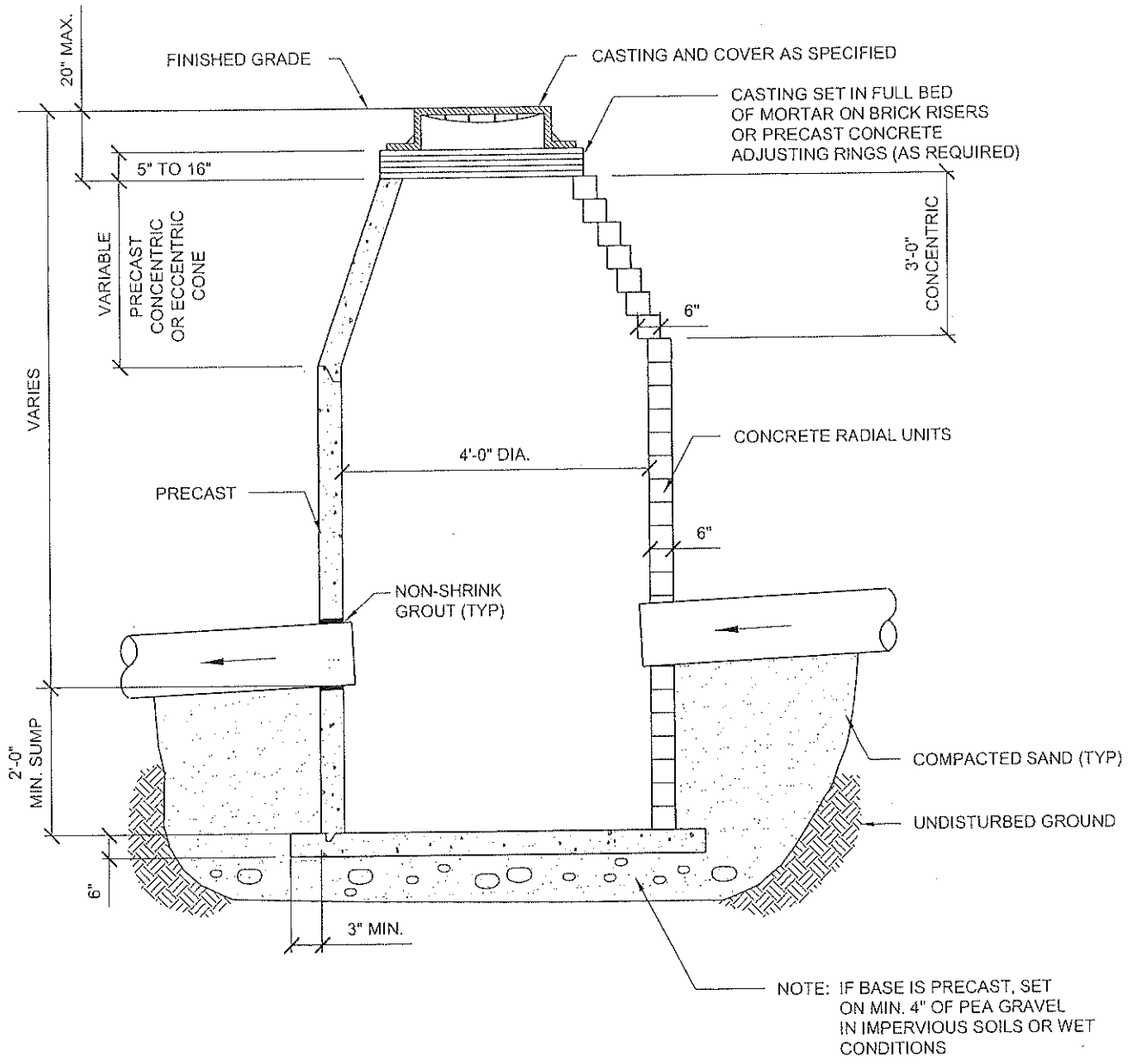
PLAN



SECTION

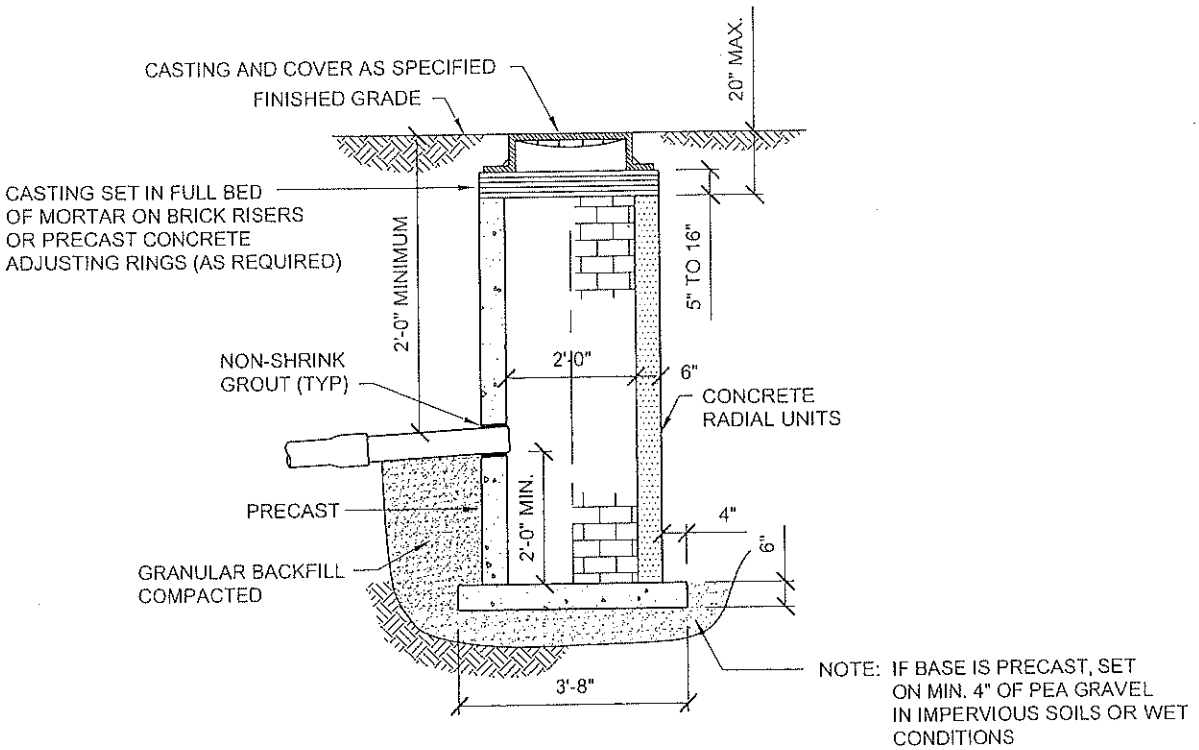
STANDARD STORM TEE MANHOLE

02720_TEEMAN
8/02

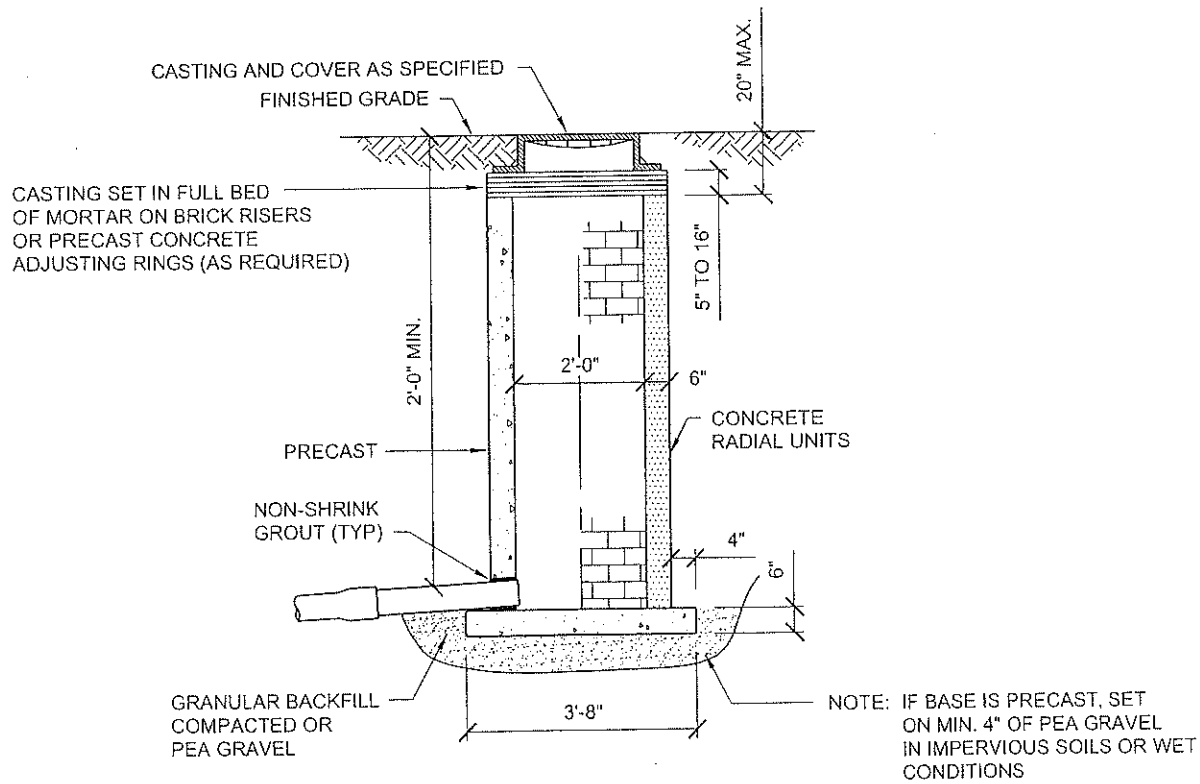


STANDARD CATCH BASIN

02720_CB
8/02

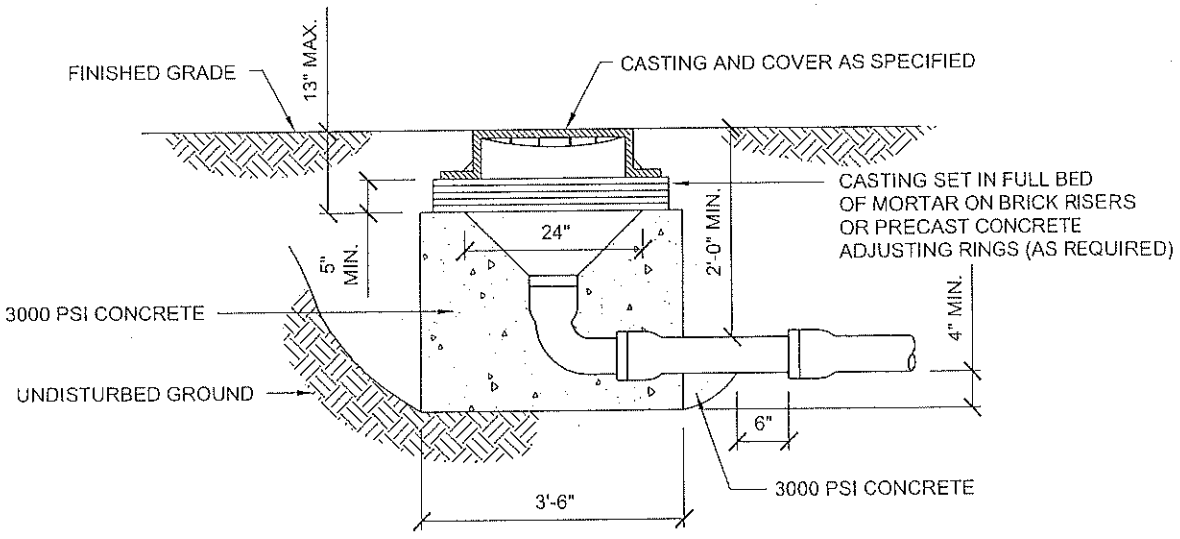


2' DIA. INLET WITH SUMP



2' DIA. INLET

STANDARD INLETS



SPECIAL CURB / YARD INLET

SECTION 02730

SANITARY SEWERS

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes work required for sanitary sewer pipe, structures and appurtenant work.

1.02 REFERENCES:

A. ASTM - American Society Testing Materials, latest edition

B. NCPI - National Clay Pipe Institute.

1.03 SUBMITTALS:

A. Submit the following for review by ENGINEER:
   1. Test Specimens in accordance with the following:
      a. Precast Manholes: Certification of quality by producer.
      b. Pipe: Gravity: Laboratory test one-half percent (½%) of total item with minimum one piece each size, material and class.
   2. Proposed equipment and method for leakage testing
   3. Shop drawings on radius pipe and manhole tees.
   4. Manufacturer's air on vacuum test results on concrete pipe.

B. Report witness measurements and "as-built" elevation on end of service lines.
   1. Provide measurements from three permanent fixtures such as building corners, power poles, manholes and trees 8-inch diameter and larger.

C. Report presence of underground utilities and drains.

D. Line and grade control method other than Laser Beam shall be approved by ENGINEER.

1.04 JOB CONDITIONS:

A. Maintain existing sanitary sewer system operational.

B. Do not bypass wastewater to ground or surface waters.

C. Install service lines as pipe laying progresses and within maximum of 600 feet of mainline sewer installation.

D. Clean up promptly following pipe installation and within maximum of 400 feet behind pipe laying operation. Cleanup includes backfill and rough grading.

PART 2 - PRODUCTS

2.01 PIPE:

A. Sanitary sewer pipe shall be plastic (PVC), ASTM D3034-SDR35 up to 11 feet deep. Sewer pipe less than 6 feet deep and over 11 feet deep shall be plastic (ABS) Truss Pipe, ASTM D2680.
   1. Sewer pipe less than 6 feet deep will only be allowed if approved by CITY and CITY ENGINEER.

B. Service Pipe: Provide minimum 6 inch, same classification as mainline pipe.

C. Plastic Pipe: Provide seating marks where couplings are used for jointing.
   1. Joints: Provide rubber "O" ring.

D. Joint Repair or Connecting to Existing Sewer Pipe of Different Material:
   1. Provide Fernco adapter coupling and stainless steel bands if required.

E. Provide Joint Materials as Indicated for the following Pipes:
   1. Plastic (PVC): ASTM D3034.
   2. Plastic (ABS): ASTM D2680.

2.02 MANHOLES:

A. Manholes shall be precast units or cast-in-place concrete.

B. Precast Units: ASTM C76 Class III or ASTM C478 with circular reinforcement, modified for "O" ring gaskets.
   1. Pipe Openings: Provide flexible, watertight rubber boot using mechanically compressed flexible joint re-seal, link-seal, Pressure Wedge, Kor-N-Seal or equal. Conform to ASTM C923.

C. Concrete: 3500 psi 28 day, 4 inch maximum slump.

D. Concrete Brick: ASTM C55, Grade N-1.

E. Grade Rings: ASTM C478 with "O" ring gaskets.

F. Mortar: ASTM C270: 1 part Portland cement, 1 part lime and 3 parts sand by volume.

G. Manhole Steps:
   1. Plastic with $^{3}/_{8}$-inch steel rod reinforcement conforming to ASTM D2146, Type II.
   2. Dimensions: 10-inch deep by 10 inch wide, 5-inch tread depth.
   3. Comply with applicable Occupational Safety and Health Administration Standards (OSHA).

H. Standard Manhole Castings: East Jordan 1045Z1 A cover or Neenah R-1642 - two hole cover.

I. Bolt-down Manhole Cover: East Jordan 1045Z1 with watertight assembly.

I. Bituminous Waterproofing: ASTM D449.

J. Cement Waterproofing: Masonry filler.

2.03 FLOWABLE FILL:

A. Flowable fill shall be low strength, lean mix, flowable mortar meeting the specifications in Article 3.05 SCHEDULES.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Alignment and Grade:
   1. Deviations: Notify ENGINEER and obtain instructions to proceed where there is a grade discrepancy or an obstruction not shown on the plans.
   2. Laser Beam Control: Provide.
   3. Check grade: At set-up point, 25 foot, 50 foot, 100 foot and 200 foot points thereafter to the next set-up point.
   4. Projector advancement: Reset at each manhole.
   5. Minimum cover over pipe: 5 feet, unless otherwise approved by CITY and CITY ENGINEER..

B. Bedding:
   1. Method: Article 3.05 SCHEDULES.
   2. Provide bedding area backfill in accordance with MDOT Standard Plan No. IV-83H.
   3. Provide continuous bearing by supporting entire length of pipe barrel evenly.

3.02 INSTALLATION:

A. Laying pipe:
   1. Direction shall be upstream with spigot or tongue end downstream and bell end upstream.
   2. Joints shall be smooth and clean.
   3. Place pipe length and bedding as a unit in a frost free, dry trench.
   4. Special supports and saddles: Article 3.05 SCHEDULES.

B. Jointing:
   1. Provide solvents, adhesives and lubricants as furnished by Manufacturer.
   2. Gasket position: Confirm that the gasket is in place and that the joint is properly made.

C. Manholes:
   1. General: Article 3.05 SCHEDULES:
   2. Base bedding: Provide 4 inch pea stone with full and even bearing in impervious soils or wet conditions. Otherwise provide on undisturbed, frost-free, dry subgrade.
   3. Fill joint space completely and trowel between sections of precast units.
   4. Provide casting grade setting as follows:
      a. Existing pavement: Finished grade.
      b. Gravel or lawn grade: Finished grade.
      c. Unpaved areas: Finished grade.
   5. Provide waterproofing on ASTM C478 units and cast-in-place manholes using one of the following methods:

a. Bituminous: Apply 1 gallon per 100 sq.ft. to outside free of holidays and open pin holes
b. Cement: Apply masonry filler to outside by brushing on two (2) coats, each minimum of 2 lbs. per sq. yd.

6. Flow channels:
   a. Construct with concrete up to spring line of pipe and slope towards center of manhole. Trowel smooth.
6. Casting adjustment: concrete ring between leveling and top course of bituminous.
7. Drop connection required for drop of 2 feet or more: ARTICLE 3.05 SCHEDULES.

D. Abandoning and filling existing sanitary sewer:
   1. Plug both ends of the sewer pipe to be abandoned and fill the existing pipe completely with flowable fill.

E. Connections:
   1. Expose existing sanitary sewer and structures to which the new work is to be connected to confirm condition, location and elevation.
   2. Connect to existing sanitary manhole by coring precast structures or jack hammering opening adequate to insert pipe and secure circumference of pipe with non-shrink cement mortar.
      a. Relay and repoint loose blocks and bricks on existing block and brick structures. Rechannel flowlines and benches with concrete.
   3. Future Sanitary Sewer: Provide the following:
      b. Plug: Pipe 4 inch through 21 inch with standard disc.
      c. Bulkhead: Pipe 24 inch and larger with brick and mortar and ½ inch plaster coat outside.
         (1) 24 inch - 36 inch: 4 inch thick.
         (2) 42 inch - 60 inch: 8 inch thick.

F. Service Lines:
   1. Align at right angles to street or easement line.
   2. Grade: Provide at uniform rate from connection or main riser to the property or easement line, minimum $^{1}/_{8}$ inch per foot.
   3. Provide minimum depth at street right-of-way line, property line or easement line as follows:
      a. Standard house with basement: 13 feet below first floor elevation or 4 feet below basement elevation, whichever is deeper.
      b. Tri-level house: 4 feet below basement floor elevation.
      c. House with walkout basement: 5 feet below basement floor elevation.
      d. Commercial and industrial buildings, schools, churches: As determined by ENGINEER.
      e. The above depths govern, except that the minimum depth at the right-of-way line or property line shall be 10 feet below street or easement centerline grade unless otherwise permitted. Property line riser excluded from this requirement.
   4. Connection fitting:
      a. Locate as shown on Plans or as directed by ENGINEER in field.
      b. 45° or 60° Wyes: Provide on all pipe except concrete pipe.
      c. Tees: Allowed only on reinforced concrete pipe.
   5. Main riser will be allowed where cover exceeds 13 feet at mainline.
   6. Plugging: Provide standard plugs or caps securely blocked.
   7. Markers: Place a wood marker (2" x 2" minimum) at end of lateral with sufficient length to extend from invert of lateral to ground surface. Install a steel rerod 36 inches in length immediately next to the wood marker with the top of the rerod 2" below grade. Cover 2' x 2' wood marker and steel rerod with 6' long 4" PVC pipe buried 3' feet.

8. Witnesses: Report the following:
   a. Wyes and Tee: Measurements to nearest downstream manhole.
   b. Markers: Three (3) measurements to permanent surface features.
9. Property line Riser: Required on all laterals. Article 3.05 SCHEDULES.

G. By-pass Pumping: Provide by-pass pumping of wastewater flow as required during construction or replacement of sanitary sewer.

H. Pipe insulation: Where noted on plans, place 2-inch thick Styrofoam insulation board 4 feet wide over pipe at top of bedding.

3.03 TESTING AND INSPECTION:

A. General:
   1. Observation: By CITY OR CITY ENGINEER.
   2. Testing: Perform upon completion and before connecting to active system.
   3. Leakage tests: Provide promptly following installation of sewer pipe including services, and keep within maximum 1200 feet behind pipe laying operation.
   4. Notification: Clean, pretest and arrange for final inspection and test.
   5. Provide necessary equipment, manpower and assistance.

B. Line and Grade: Allowable drift between structures from proposed alignment will be as follows:
   1. Line:
      a. Through 36 inch: 0.20 foot.
      b. Over 36 inch: 0.40 foot.
   2. Grade:
      a. Through 36 inch: 0.02 foot.
      b. Over 36 inch: 0.05 foot.

C. Plastic pipe deformation:
   1. Pipe deflection will be limited to five percent (5%) of diameter.
   2. Pull GO, NO-GO type gauge through pipe by hand. Article 3.05 SCHEDULES.
   3. CONTRACTOR shall provide proof ring for GO, NO-GO gauge from the manufacturer.
   4. Schedule: Conduct after final backfill has been in place a minimum of thirty (30) days, and after shutdown of dewatering operation.
   5. Correction: Repair defects and retest until acceptable.

D. Video Televising:
   1. CONTRACTOR to complete video televising of completed sewers.
   2. CONTRACTOR to provide 1 original and 1 copy (VCR format) of video taping of sewers.

E. Leakage Testing:

   1. CONTRACTOR to perform exfiltration (water or air) test unless ground water is present, in which case CONTRACTOR may opt to perform infiltration test.
   2. Acceptable leakage will be as follows:
      a. Water: Less than 200 gallons per inch of pipe diameter per mile of pipe per twenty-four (24) hours.
      b. Air: Holding time not less than that listed in table. Article 3.05 SCHEDULE.
   3. Correction: Repair defects and repeat test until acceptable.
      a. Method of repairing defects shall be approved by ENGINEER.

F. Infiltration Test (water):
   1. Conditions: Minimum groundwater depth 2 feet above high point of system under test.
   2. Procedure:
      a. Install and maintain "V" notch weir at low end of system under test.
      b. Leakage: Quantity of water measured by "V" notch weir.

G. Exfiltration Test (water):
   1. Conditions: Determine groundwater elevation.
   2. Procedure:
      a. Fill system minimum 2 feet above high point of system or 2 feet above groundwater, whichever is higher.
      b. Leakage: Quantity of water required to maintain constant level.

H. Exfiltration (air): Perform in accordance with NCPI Publication, *"Low Pressure Air Test for Sanitary sewers"*, and in accordance with ASTM F 1417, *"Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air"*.
   1. Condition: Determine groundwater elevation.
   2. Procedure:
      a. All pressure readings are above the average groundwater head.

3.04 ADJUST AND CLEAN:

A. General:
   1. Keep pipe and structures clean as work progresses.

3.05 SCHEDULES:

A. Exfiltration Air Test Table.

B. Standard Details:
   1. Special supports for underground utilities / pipe saddles.
   2. Methods of bedding pipe.
   3. Standard sanitary manhole.
   4. Plastic pipe manhole junction.
   5. GO, NO-GO gauge for plastic pipe.
   6. Standard riser details.
   7. Watertight manhole cover.

C. Specification FF-1 for Flowable Fill.

END OF SECTION

EXFILTRATION AIR TEST

TIME REQUIRED FOR LOSS OF PRESSURE FROM 3.5 PSIG TO 3.0 PSIG FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q = 0.0015 (CU. FT./MIN./SQ.FT. OF INTERNAL SURFACE AREA)

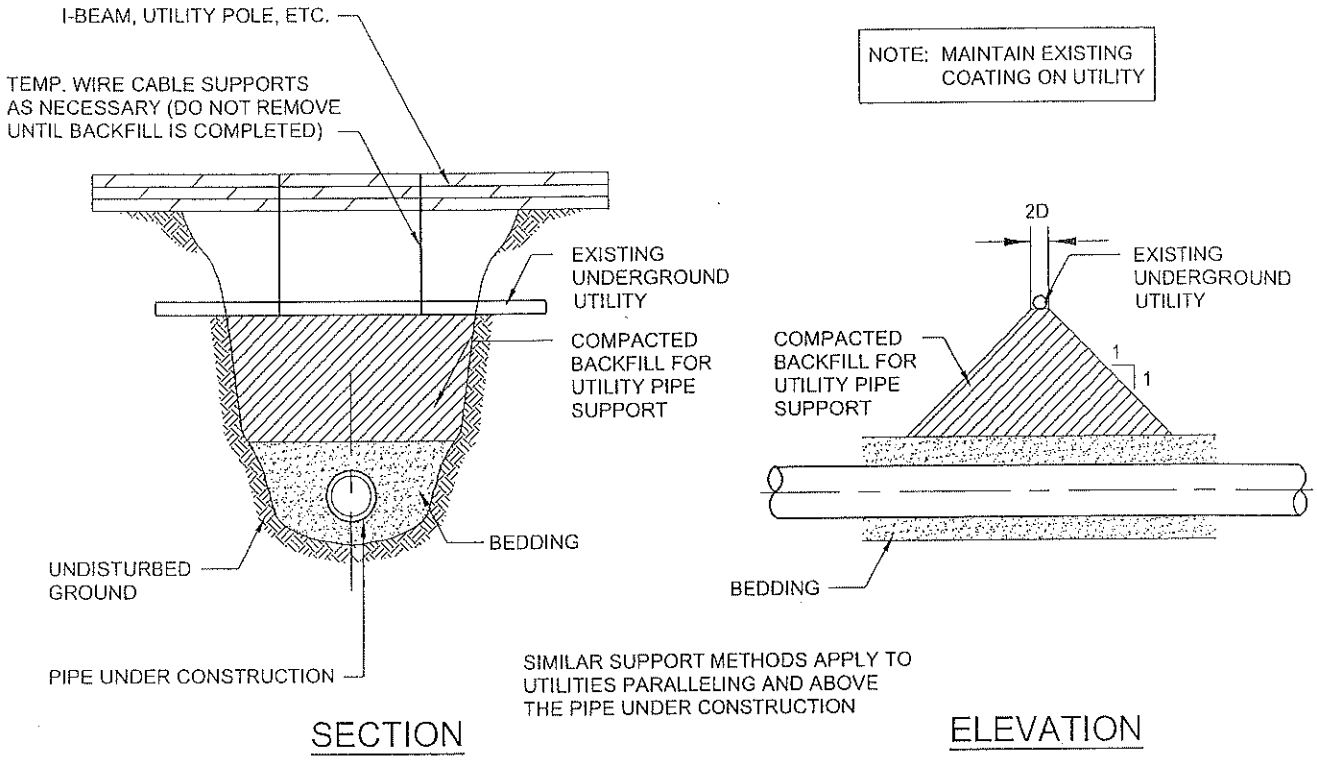
Pipe Diameter (in.)	Minimum time (min; sec.)	Length for Min. Time (ft.)	Time for Longer length (sec.)	Specification Time for Length (L) Shown (min:sec)										
				100ft	150ft	200ft	250ft	300ft	350ft	400ft	450ft	500ft	550ft	600ft
4	1:53	597	.190L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:54
6	2:50	398	.427L	2:5050	2:50	2:50	2:50	2:50	2:50	2:51	3:12	3:34	3:55	4:16
8	3:47	298	.760	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42	6:20	6:58	7:36
10	4:43	239	1.187L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54	9:54	10:53	11:52
12	5:40	199	1.709L	5:40	5:40	5:42	7:08	8:33	9:48	11:24	12:50	14:15	15:40	17:06
15	7:05	159	2.671L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02	22:16	24:29	26:43
18	8:30	133	3.846L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51	32:03	35:16	38:28
21	9:55	114	5.235L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16	43:37	47:59	52:21
24	11:20	99	6.837L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17	56:59	62:41	68:23
27	12:45	88	8.653L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54	72:07	79:20	86:33
30	14:10	80	10.683L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07	89:02	97:56	106:51
33	15:35	72	12.926L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57	107:44	118:31	129:17
36	17:00	66	15.384L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23	128:13	141:02	153:51
39	18:25	61	18.054L	30:57	45:09	60:11	75:14	90:16	105:19	120:22	135:24	160:32	165:31	180:34
42	19:50	57	20.939L	34:54	52:21	69:48	87:15	104:42	122:09	139:36	157:03	174:31	191:58	209:25

Note: When 2 sizes of pipe are involved, the time shall be computed by the ratio of lengths involved.

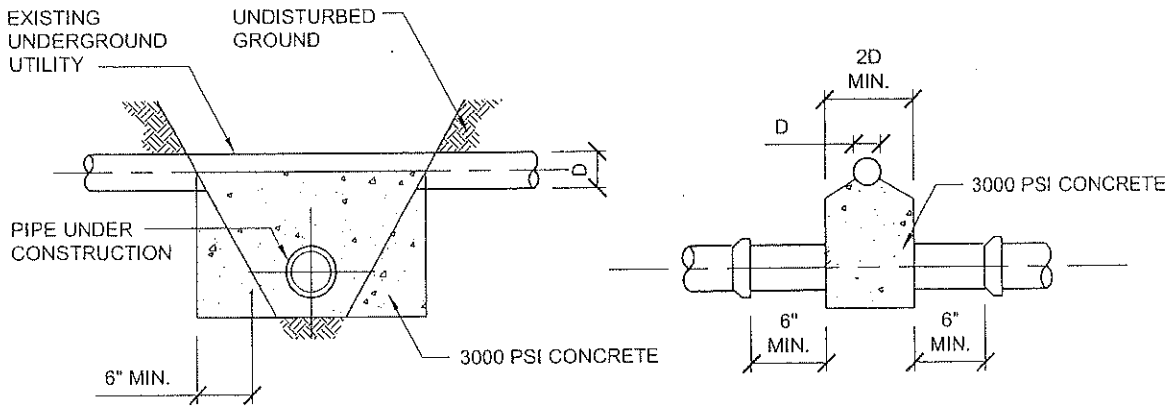
Example: 400 feet of 10 inch pipe and 200 feet of 6 inch pipe

$$\text{Time} = \frac{\text{Length(1)} \times \text{Time(1)} + \text{Length(2)} \times \text{Time(2)}}{\text{Length(1)} + \text{Length(2)}} = \frac{400 \times 7{:}54 + 200 \times 2{:}50}{400 + 200}$$

$$= \frac{400 \times 474 + 200 \times 170}{400 + 200} = 373 \text{ seconds} = 6{:}13 \text{ (min:sec)}$$



SPECIAL SUPPORTS FOR UNDERGROUND UTILITIES



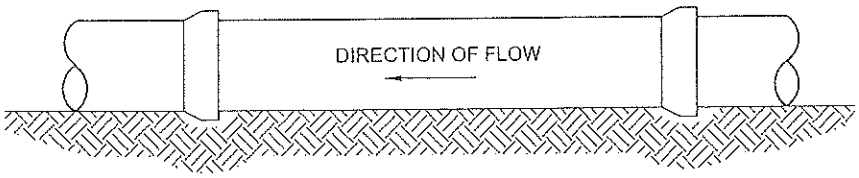
NOTE:

1. PIPE SADDLE IS NOT REQUIRED FOR PLASTIC, STEEL, LEAD OR COPPER PIPE 2" OR SMALLER.

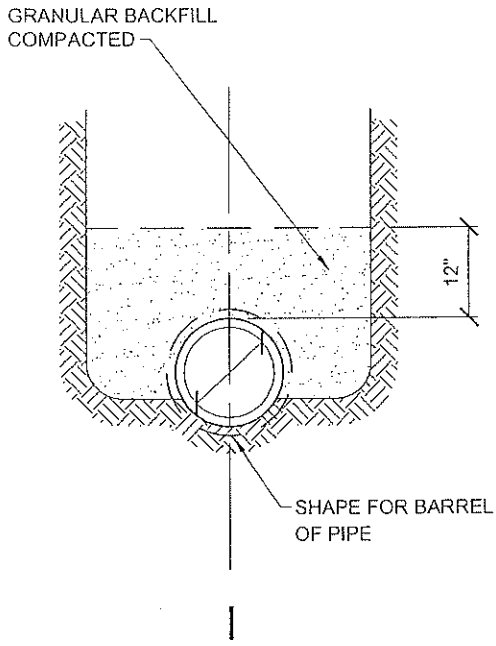
SECTION

ELEVATION

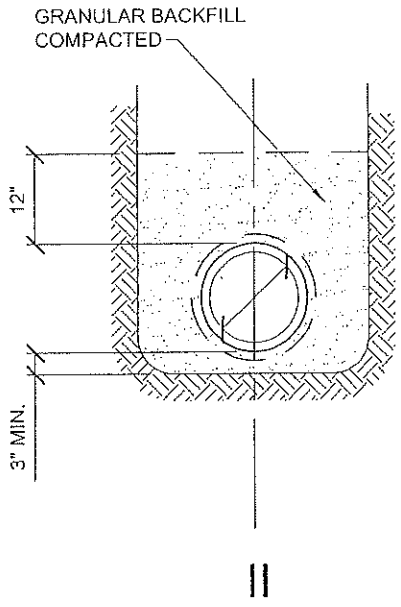
PIPE SADDLES



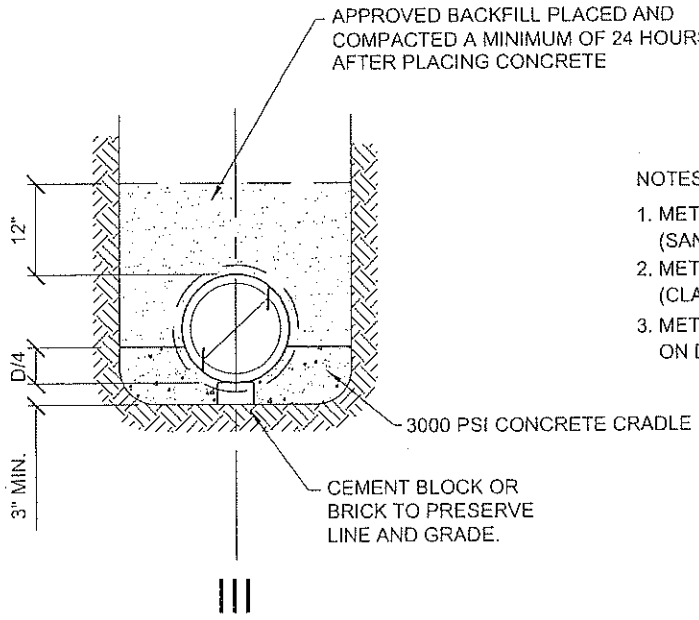
EXCAVATION FOR BELLS



I



II

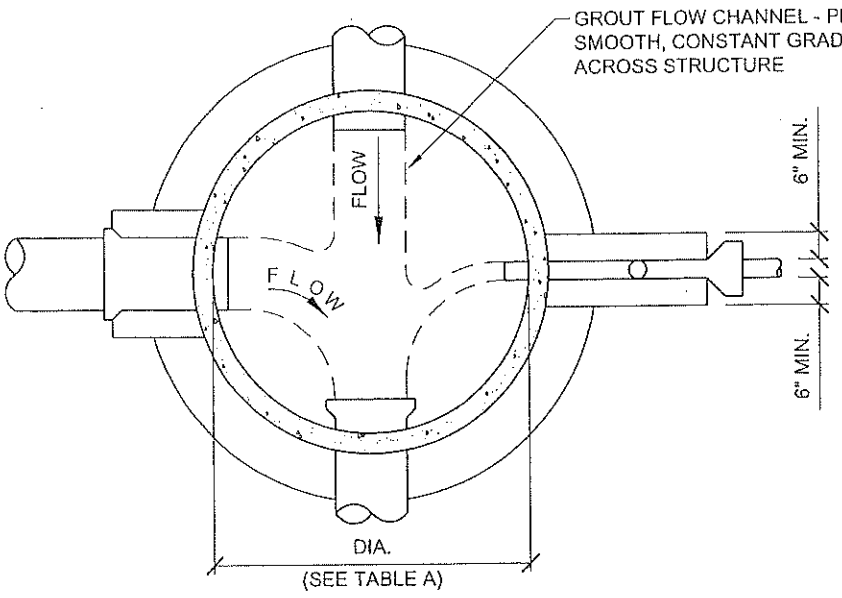


III

NOTES:

1. METHOD I: IN AREAS OF UNCONSOLIDATED SOILS (SAND, GRAVEL, ETC.)
2. METHOD II: IN AREAS OF CONSOLIDATED SOILS (CLAY, HARDPAN, ROCK, ETC.)
3. METHOD III: IN AREAS INDICATED ON DRAWINGS

METHODS OF BEDDING PIPE



PLAN

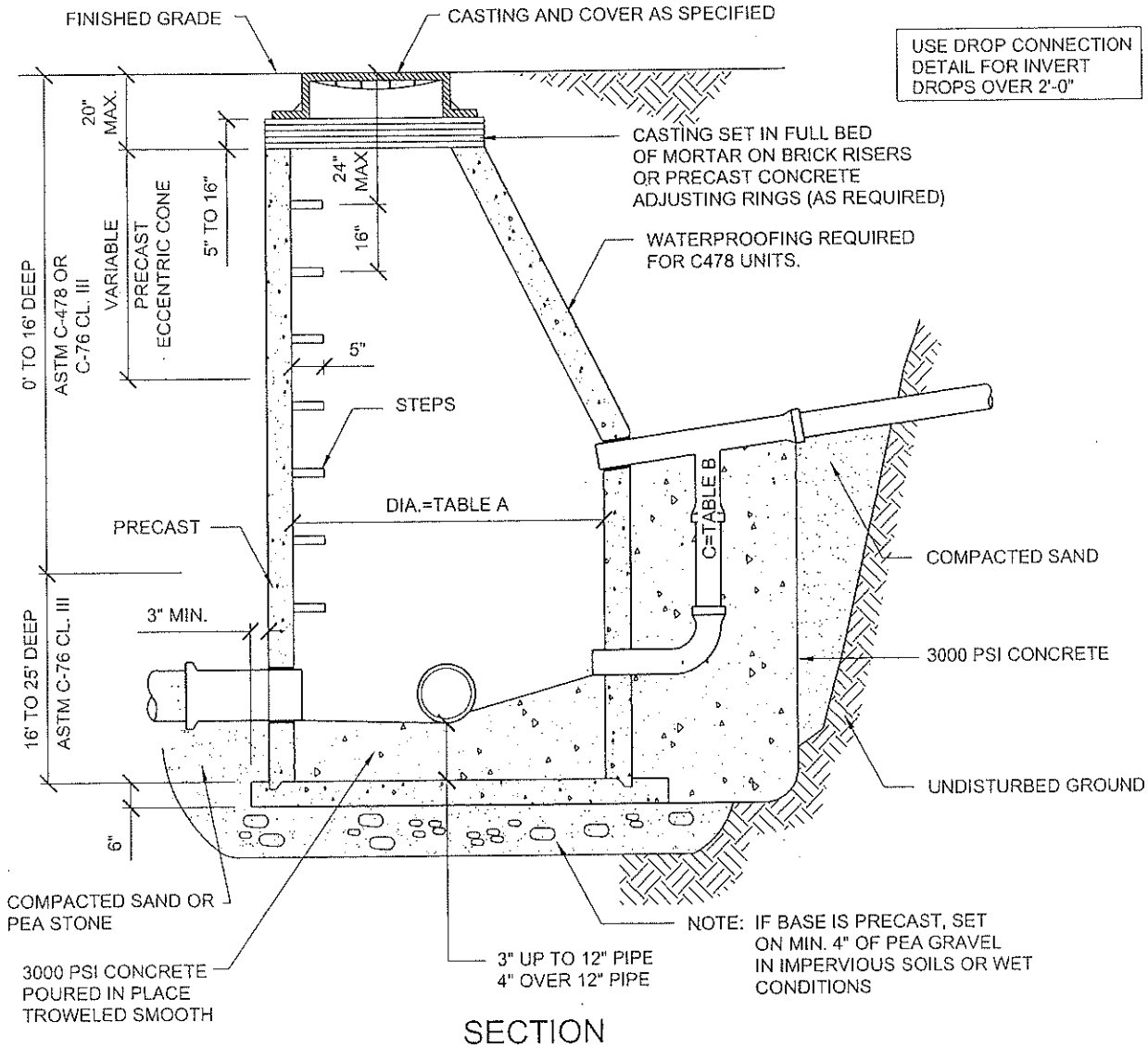
TABLE A

PIPE SIZE	DIA.
8" TO 24"	4'-0"
27" TO 33"	5'-0"
36" TO 42"	6'-0"

TABLE B

PIPE SIZE (INCOMING)	DROP SIZE C
8" THRU 12"	8"
15" THRU 18"	10"
21" THRU 27"	12"
30" THRU 36"	15"

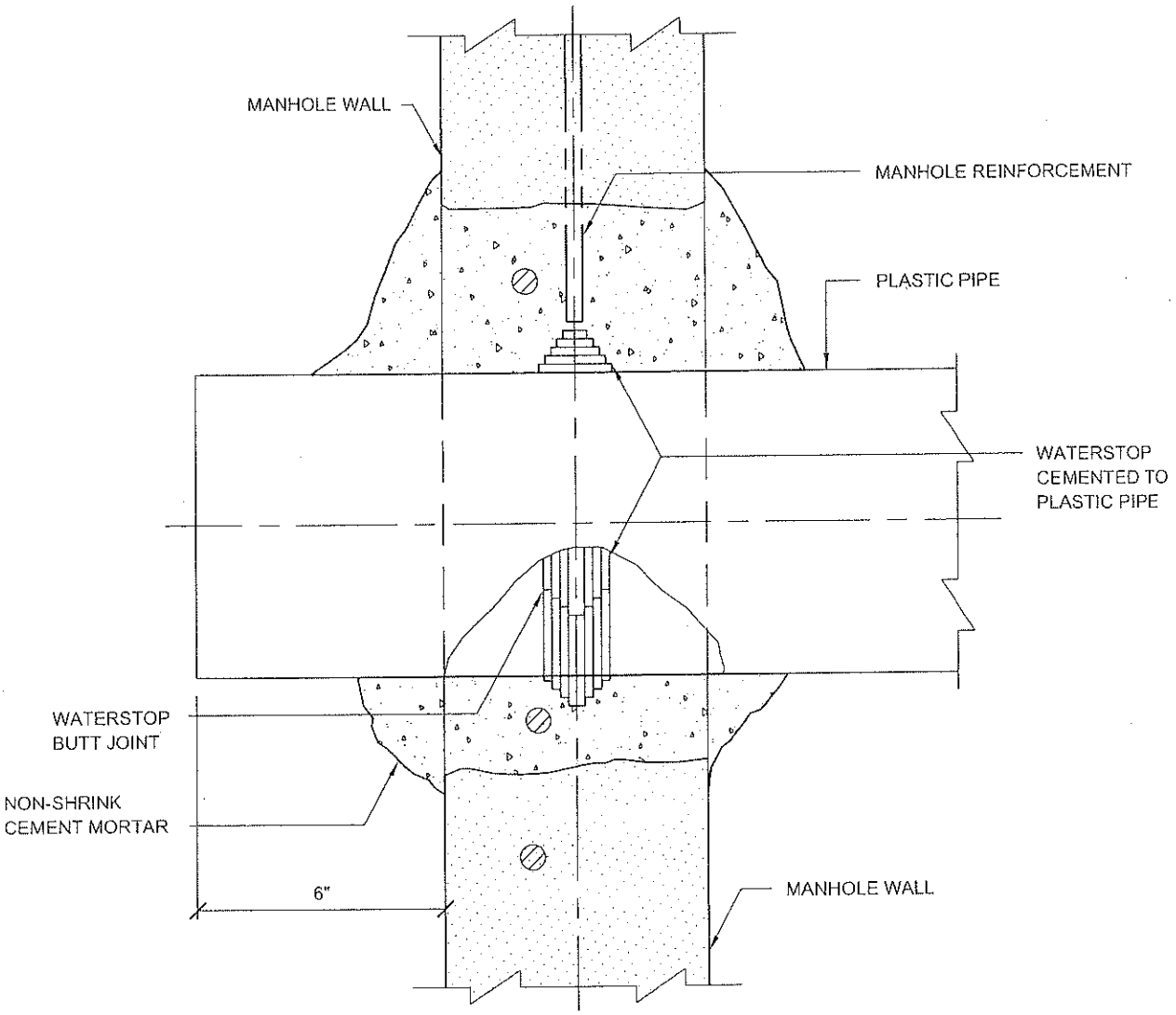
USE DROP CONNECTION DETAIL FOR INVERT DROPS OVER 2'-0"



SECTION

STANDARD SANITARY MANHOLE

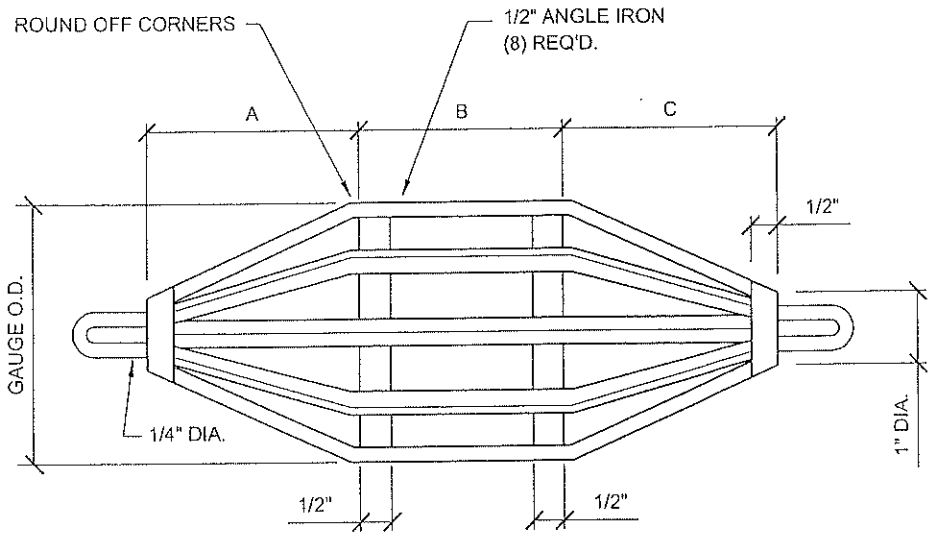
02730_MH
8/02



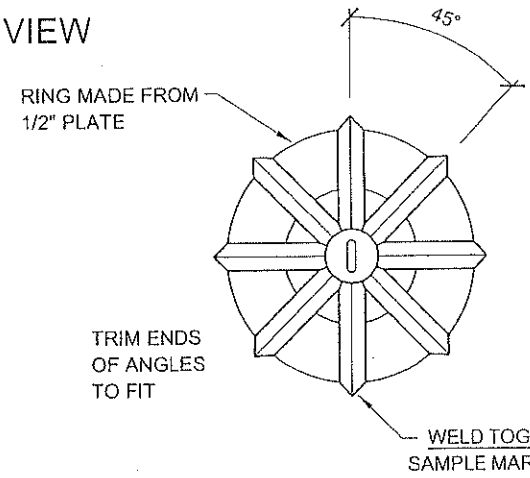
NOTE:

TO BE USED ONLY FOR CONNECTION TO EXISTING MANHOLE WHERE FLEXIBLE RUBBER BOOT CANNOT BE INSTALLED OR AS ALLOWED BY ENGINEER

PLASTIC PIPE MANHOLE JUNCTION



SIDE OR TOP VIEW



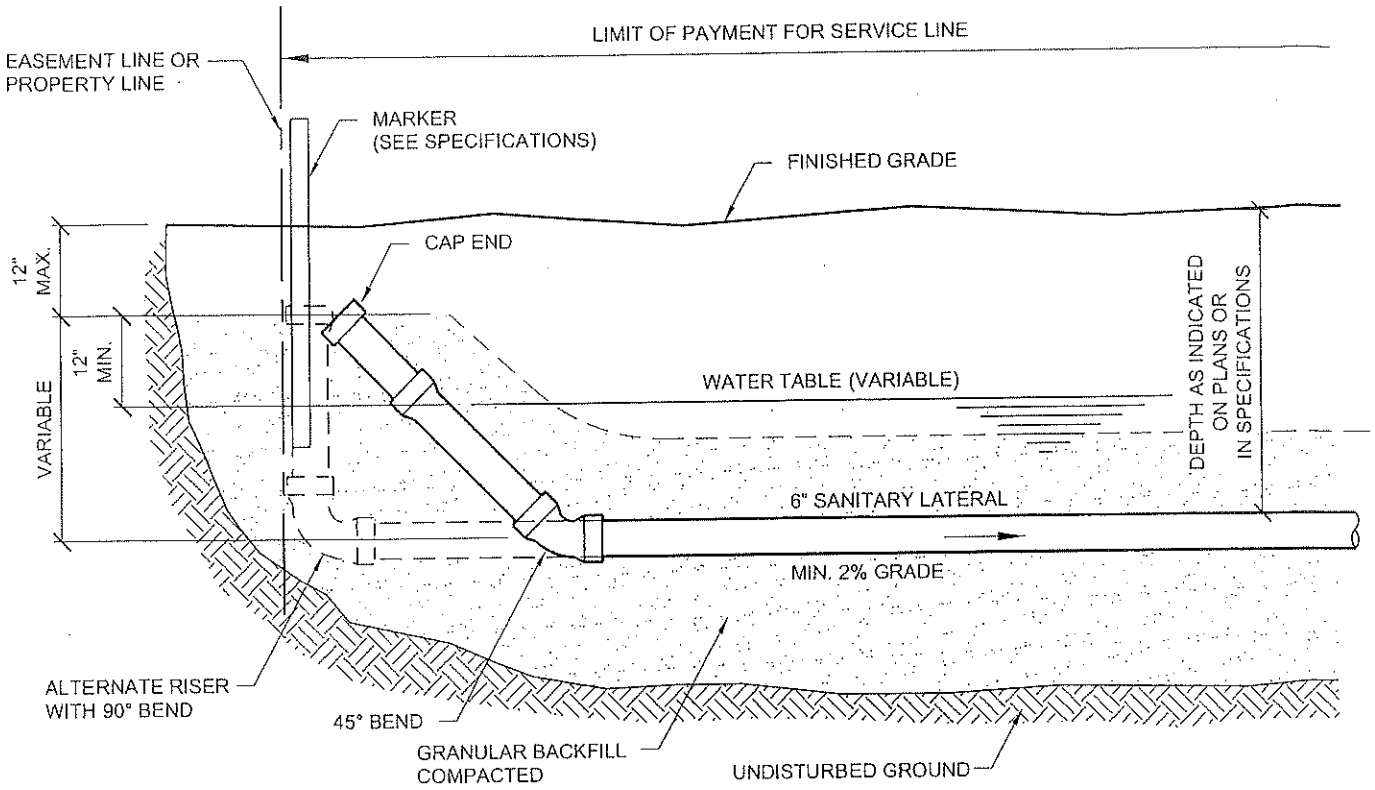
END VIEW

NOTE:
AFTER CONSTRUCTION IS COMPLETED, TRUE THE O.D. DIMENSION FOR THE FULL LENGTH OF "B" TO ≒ ± 0.010" BY TOOL AND LATHE OR GRINDING.

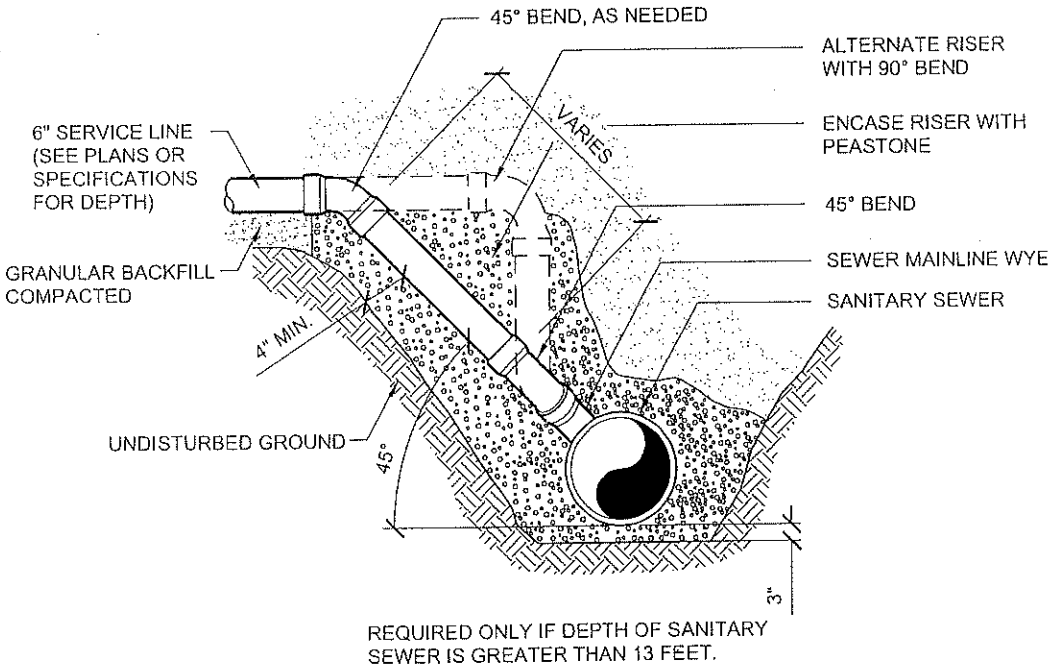
DIMENSION SCHEDULE			
PIPE SIZE	A	B	GAUGE O.D.
6"	4.0"	4"	95% OF MFRS. ACTUAL INSIDE DIAMETER
8"	5.3"	6"	
10"	6.7"	6"	
12"	8.0"	8"	
15"	10.0"	9"	

OTHER SIZES TO BE DETERMINED BY ENGINEER

GO, NO-GO GAUGE FOR PLASTIC PIPE



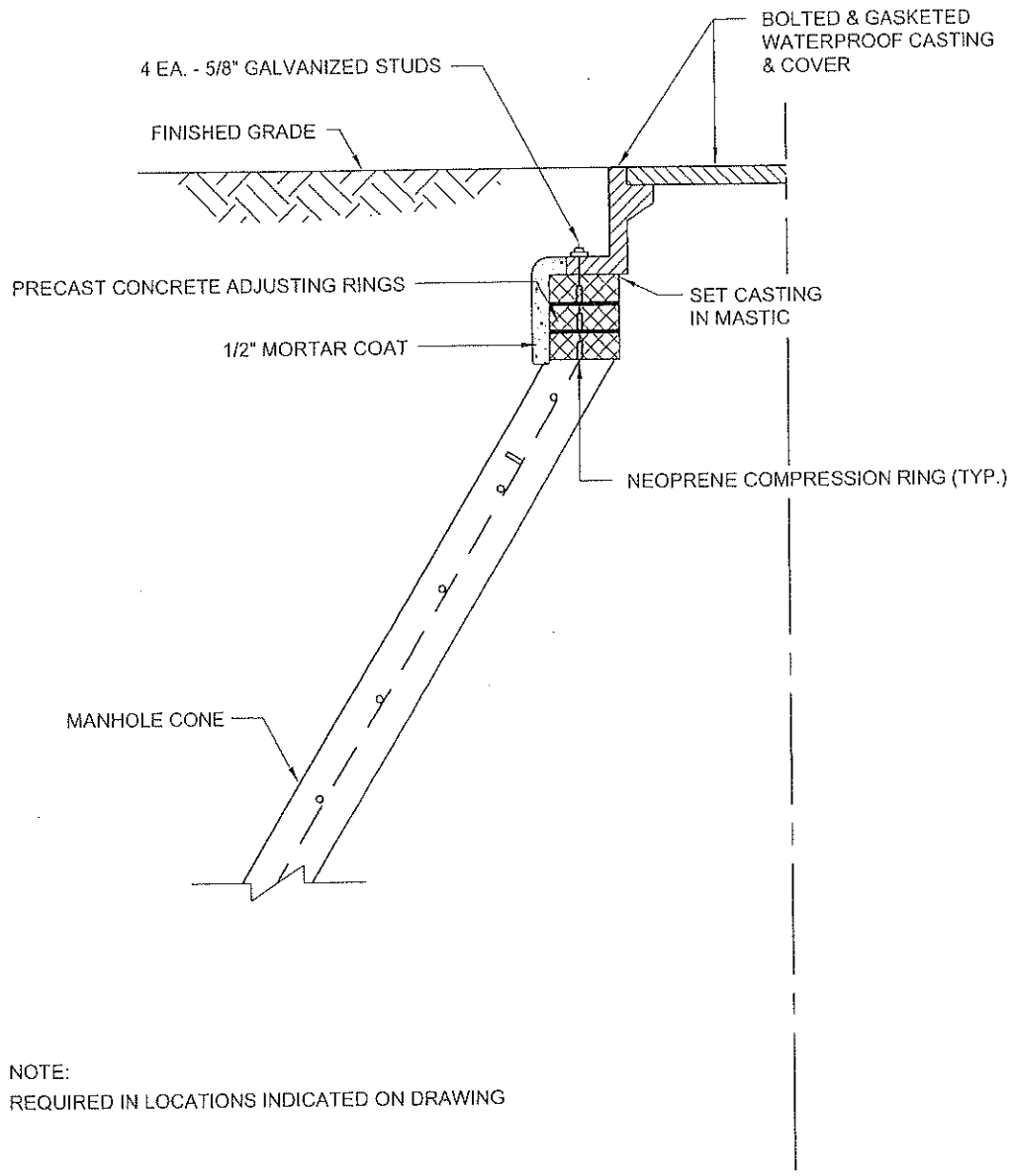
PROPERTY LINE RISER



REQUIRED ONLY IF DEPTH OF SANITARY SEWER IS GREATER THAN 13 FEET.

MAINLINE RISER

STANDARD RISER DETAILS



NOTE:
REQUIRED IN LOCATIONS INDICATED ON DRAWING

WATER TIGHT MANHOLE COVER

SPECIFICATION FF-1
SPECIFICATION FOR FLOWABLE FILL

DESCRIPTION

Flowable Fill (FF) shall consist of a mixture of (a) portland cement, fly ash, and water; (b) portland cement, granular material, fly ash, and water; or (c) fly ash, granular material and water. All Materials will be as specified in the Standard Specifications or as stated. All flowable fill after setting is intended to be removable by conventional mechanical excavation methods.

MATERIALS

		Specific Gravities ***
Portland Cement	8.01 MDOT Std. Spec's.	3.15
Fly ash	ASTM C 618(1)*	2.40
Granular material Class II **	8.02 MDOT Std. Spec's	2.60
Water	8.11 MDOT Std. Spec's	1.00

* Except there is no limit on the loss on ignition.
** Except that 100% shall pass 19mm sieve.
*** Specific gravity values used for mix proportions given. If material used differs from these values appropriate adjustments should be made.

OPTIONAL FLOWABLE FILL (FF) MIXTURES

FF Mix Number One*
Cement Stabilized Fly Ash Mixture (Class F Fly Ash)

Portland Cement		100 lb/ft3
Fly ash	(Class F)	2,000 lb/ft3
Water	Sufficient water to produce the desired flowability (approx. 3 gal/ ft3)	

FF Mix Number Two*
Controlled Density Fill Mixture (Class F Fly Ash)

Portland Cement		50 lb/ft3
Fly ash	(Class F)	500 lb/ft3
Granular material		2,850 lb/ft3
Water	Sufficient water to produce the desired flowability (approx. 1 gal/ft3)	

FF Mix Number Three*
Controlled Density Fill Mixture (Class C Fly Ash)

(due to the variability of type 'C' fly ash there is no suggested mix)

*NOTE: The ready-mixed concrete producer supplying the flowable fill shall have a 28-day test on the mix option to be used for the trench backfill showing that the compressive strength is less than 1034 kPa for the fly ash from the same source that will be used for the trench backfill.

TRANSPORTING AND CONSTRUCTION METHODS

The temperature of the flowable fill mix as manufactured and delivered shall be at least 50° F.

Mixtures shall be transported to the point of placement in a revolving drum mixer or agitator.

During placement operations around manholes and in utility trenches, care shall be used to avoid dislocating any pipes due to fluid pressure from the flowable fill by even placing of the material. Any pipes within the backfill area should be considered for securing to avoid buoyant effect of flowable fill.

When Flowable Fill (FF) is used in pavement cuts the fill shall be placed to the top of pavement. After setting, the flowable fill is to be removed to the bottom of a concrete pavement patch or to the top of bituminous base course.

SECTION 02732

SANITARY FORCEMAINS

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes work required for sanitary forcemains, structures and appurtenant work.

1.02 REFERENCES:

A. ASTM - American Society Testing Materials, latest edition.

B. ANSI - American National Standards Institute, latest edition.

1.03 SUBMITTALS:

A. Submit the following for review by CITY or CITY's ENGINEER **PRIOR** to installation:
   1. Product data on Isolation Valves and Air Release Valves.
   2. Proposed equipment and method for Pressure and Leakage testing

B. Report witness measurements on fittings.
   1. Provide measurements from three permanent fixtures such as building corners, power poles and trees 8-inch diameter and larger.

C. Provide certification on pipe and fittings indicating conformance to specifications **PRIOR** to installation.

D. Submittal of as-built plans to the CITY upon completion of project.

1.04 JOB CONDITIONS:

A. Activating New System: Notify CITY or CITY's ENGINEER after completing tests.

B. Clean up promptly following pipe installation and within maximum of 600 feet behind pipe laying operation. Cleanup includes backfill and rough grading.

PART 2 - PRODUCTS

2.01 GENERAL:

A. Cement Lining: ANSI A21.4 Standard thickness for ductile iron pipe and fittings.

2.02 PIPE:

A. Ductile Iron: ANSI A21.50 and ANSI A21.51; Class 52.

2.03 JOINTS:

A. Ductile Iron Pipe and Fittings:
   1. Mechanical: ANSI A21.11.
   2. Push-on: ANSI A21.11.
   3. Electrical Continuity: Provide bronze wedges (3 per joint), conductive gaskets, or thermite welded sockets and cables.

2.04 FITTINGS:

A. Ductile Iron: ANSI A21.10, ANSI 21.53, Class 54, 250 psi working pressure through 12 inch and 150 psi greater than 12 inch.

2.05 VALVES (Open left):

A. Gate: AWWA C500, double disc, non rising stem, fully bronze mounted and roller and gear operator over 16 inches.

B. Plug: ANSI B16,1, Clow Corporation F-5410, or equal.

C. Air release: APCO 400 or Val-Matic 48 BWA.

D. Boxes: Three (3) section cast iron with lid marked SEWER.
   1. Upper section: Screw on adjoining center section and full diameter throughout.
   2. Center section: Minimum 5 inch inside diameter.
   3. Base section: Fit over valve bonnet and shaped round for valves through 10 inch and oval for 12 inch and over.

2.06 AIR RELEASE VALVE AND CLEANOUT CHAMBERS:

A. Chambers shall be precast or cast-in-place concrete.

B. Precast Units: ASTM C478 and ASTM C76, Class III.
   1. Joints: Cement mortar, preformed bituminous rope or "O"-ring gaskets.
   2. Pipe Opening: Pipe diameter plus 6 inch, maximum.

C. Concrete: 3500 psi 28 day, 4 inch maximum slump.

D. Concrete Brick: ASTM C55, Grade N-1.

E. Grade Rings: ASTM C478.

F. Mortar: ASTM C270, 1 part Portland cement, 1 part lime and 3 parts sand by volume.

G. Chamber Steps:
   1. Plastic with $^{3}/_{8}$ inch steel reinforcement.
   2. Dimensions: 10 inch deep by 10 inch wide, 5 inch tread depth.

H. Chamber Casting: East Jordan 1045Z1 A cover or Neenah R-1642 - two hole cover.

I. Piping: Coal tar epoxy coating required.

2.07 MISCELLANEOUS:

I. Tie Rods and Clamps: Clow Corporation or Traverse City Iron Works.

J. Plastic Seamless Encasement Tubing:
   1. Material: ASTM D1248 Polyethylene, Type I, Class C, 8 mils thick.
   2. Closing tape: 2 inch wide Poly Ken #900 or Scotchwrap #50.

PART 3 - EXECUTION

3.01 PREPARATION:

K. Alignment and Grade:
   1. Deviations: Notify OWNER's ENGINEER and obtain instructions to proceed where there is a grade discrepancy or an obstruction not shown on the plans.
      a. Verify location and depth of existing utilities in advance of construction and provide adjustments in alignment and grade of force main.
      b. Depth of pipe: Minimum cover over pipe below finished grade shall be 5 feet.
   2. High points in pipe line: Locate at air release valves.
   3. Install pipe to elevations and grades when indicated on drawings.

L. Bedding:
   1. Method: Article 3.04 SCHEDULES.
   2. Provide bedding area backfill in accordance with MDOT Standard Plan No. IV-83H.
   3. Provide continuous bearing by supporting entire length of pipe barrel evenly.

M. Cleaning Pipe and Fittings:
   1. General: Provide interior free of foreign material and joint surfaces free of lumps and blisters.

3.02 INSTALLATION:

N. Laying pipe:
   1. Place pipe length and bedding as a unit in a frost free, dry trench.
   2. Special supports and saddles: Article 3.04 SCHEDULES.
   3. Joint deflection shall be as recommended by pipe manufacturer.

O. Cutting Pipe:
   1. Ductile iron: Power saw.

P. Jointing:
   1. Mechanical:
      a. Lubricate with vegetable soap.
      b. Tighten bolts evenly to 75 to 90 foot pounds.
   2. Push-on:
      a. Lubricate as recommended by manufacturer.
      b. Shape beveling as recommended by manufacturer.

Q. Setting Valves and Fittings:
   1. General: Article 3.04 SCHEDULES.
   2. Valves: Plumb.
   3. Valve boxes:
      a. Base section: Center and plumb over operating nut and 2 inches above bonnet joint.
      b. Upper section: Set cover flush with finished grade.

c. Witnesses: Provide three (3) measurements to permanent surface features.

R. Cleanout and Air Release Valve Chambers:
1. General: Article 3.04 SCHEDULES:
2. Base Bedding: Provide 4 inch pea stone with full and even bearing in impervious soils or wet conditions. Otherwise provide on undisturbed, frost-free, dry subgrade.
3. Precast: Fill joint space completely and trowel.
4. Provide casting setting as follows:
   a. Existing pavement : Finished grade.
   b. Gravel grade: Finished grade.
   c. Unpaved areas: Finished grade.

S. Reaction Backing:
1. Placement: Article 3.04 SCHEDULES.
2. Bearing area: Provide the following square feet of concrete against trench wall in sand:

Pipe Size	Tees Plugs	90° Els	45° Els	22½° Els	11¼° Els
4"	1	2	1	1	1
6"	3	3	2	1	1
8"	4	6	3	2	1
10"	7	9	5	3	2
12"	9	11	6	3	2
14"	11	15	8	5	3
16"	13	20	10	6	3

3. Other Soil Conditions:
   a. Cemented sand or hardpan — Multiply above by 0.5
   b. Gravel — Multiply above by 0.7
   c. Hard dry clay — Multiply above by 0.7
   d. Soft clay — Multiply above by 2.0
   e. Muck - Secure all fittings with tie rod clamps with concrete backing the same as listed for sand conditions installed as required by SECTION 02220 EXCAVATING, BACKFILLING AND COMPACTING.

G. Polyethylene Encasement:
1. In corrosive soils: Install over ductile iron pipe and tape seams in accordance with AWWA C-105.

H. Mechanical Joint Restraint: Megalug by EBAA Iron Sales, Inc., or approved equal.

3.03 TESTING AND INSPECTION:

A. General:
1. Observation: By CITY or CITY's ENGINEER.
2. Completion: Before connection to lift station.
3. Notification: Pretest and arrange for inspection and test.
4. Equipment and assistance: Provide.
5. Required water: By CITY where available from municipal system.

Electrical Continuity: Test ductile iron pipe for continuity and repair breaks.

Pressure:
1. Conditions: Air or air-water methods of applying pressure prohibited.

2. Range: 100 to 110 psi at lowest elevation.
3. Duration: 1 hour and until completion of inspection.
4. Procedure: Fill system slowly, expel air through air release valve connection at high points and apply pressure. Install air release valve after test.
5. Inspection: Examine line and appurtenances for leaks and movement.
6. Corrections: Repair defects, visible leaks and repeat test until acceptable.

Leakage :

1. Condition: Following pressure test.
2. Average pressure: Within pressure test range.
3. Duration: two (2) hours.
4. Filling: As in pressure test.
5. Supplying make-up water: Measurable source.
6. Leakage: Quantity of water supplied to maintain test pressure.
7. Allowable: Less than:

$$L = \frac{ND \times \text{Square root of } P}{3700}$$, where

L = leakage (gallons per hour)
N = number of joints
D = nominal pipe diameter (inches)
P = average test pressure (pounds per square inch gauge)

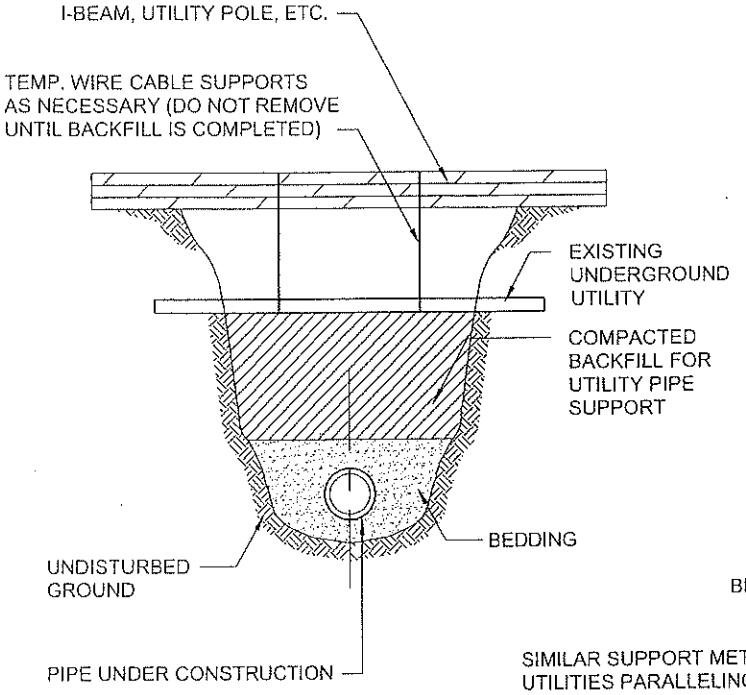
Note: Formula equals 0.8 gallon per hour per mile per inch diameter at 100 psi for 18 foot lengths.

8. Correction: Repair defects and repeat test until acceptable.

3.04 SCHEDULES:

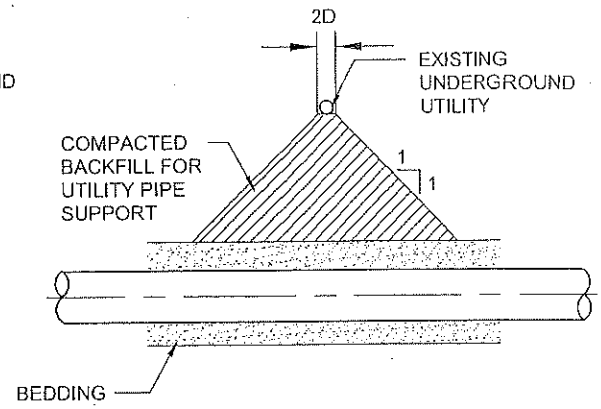
A. Standard Details:
1. Special supports for underground utilities / pipe saddles.
2. Methods of bedding pipe.
3. Location of reaction backing.
4. Standard air release valve chamber.
5. Force main cleanout detail.
6. Drop connection detail for 4 inch or larger forcemain.
7. Drop connection detail for ¼ inch to 3 inch forcemain.

END OF SECTION



SECTION

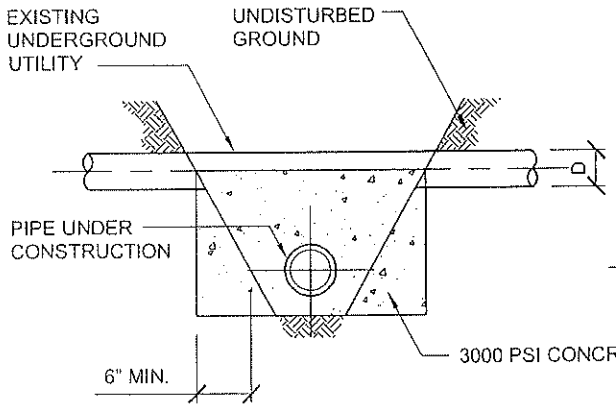
NOTE: MAINTAIN EXISTING COATING ON UTILITY

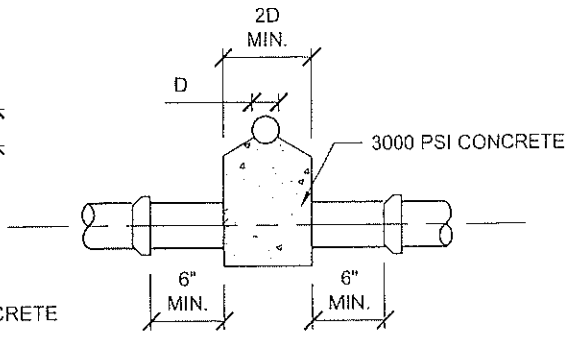


SIMILAR SUPPORT METHODS APPLY TO UTILITIES PARALLELING AND ABOVE THE PIPE UNDER CONSTRUCTION

ELEVATION

SPECIAL SUPPORTS FOR UNDERGROUND UTILITIES





NOTE:

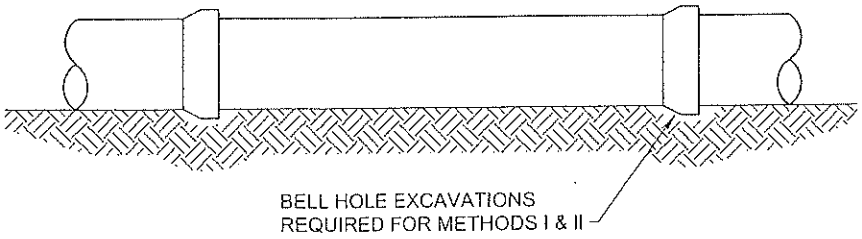
1. PIPE SADDLE IS NOT REQUIRED FOR PLASTIC, STEEL, LEAD OR COPPER PIPE 2" OR SMALLER.

SECTION

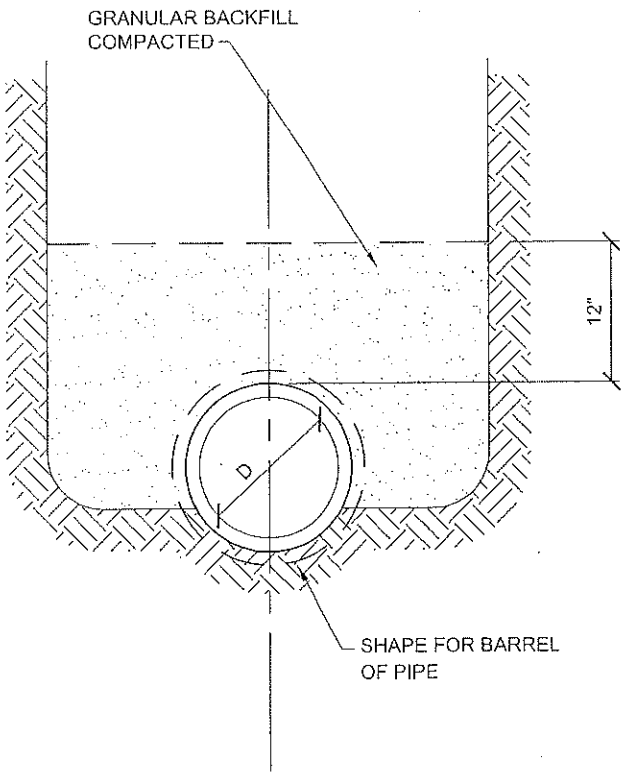
ELEVATION

PIPE SADDLES

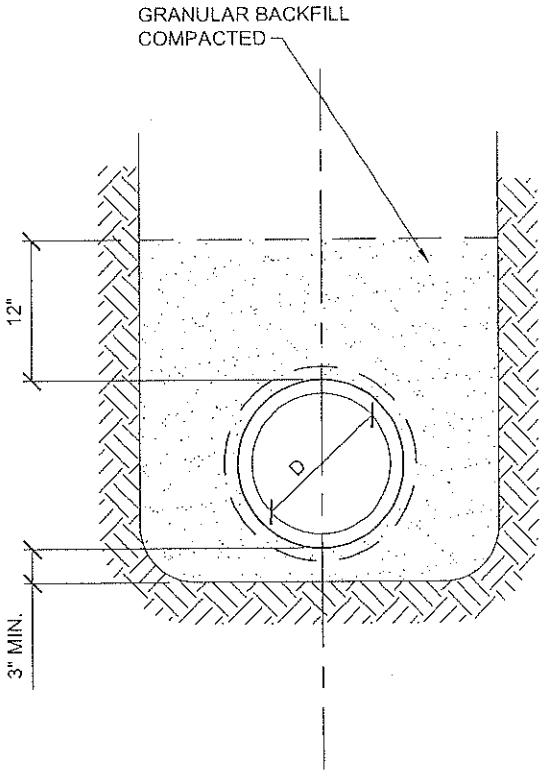
02732_SADDLE
8/02



EXCAVATION FOR BELLS



METHOD I

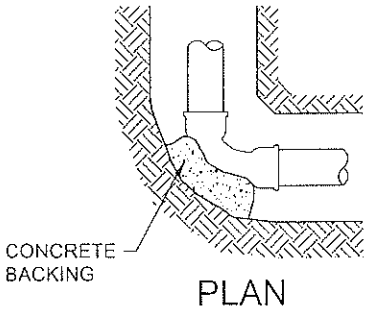


METHOD II

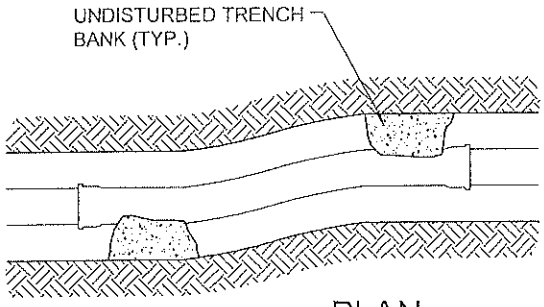
NOTES:

1. METHOD I: IN AREAS OF UNCONSOLIDATED SOILS (SAND, GRAVEL, ETC.)
2. METHOD II: IN AREAS OF CONSOLIDATED SOILS (CLAY, HARDPAN, ROCK, ETC.)

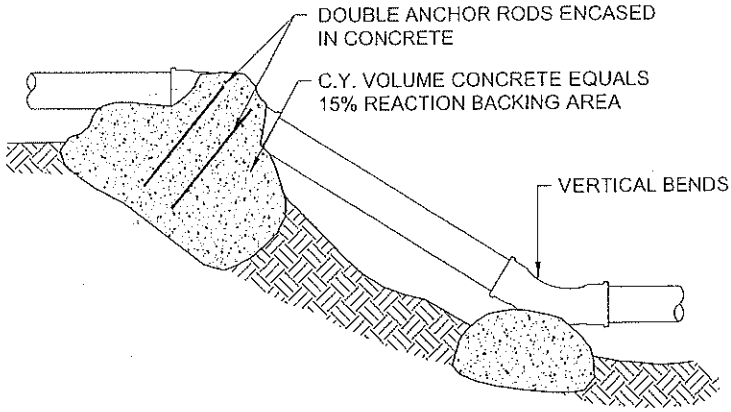
METHODS OF BEDDING PIPE



PLAN



PLAN

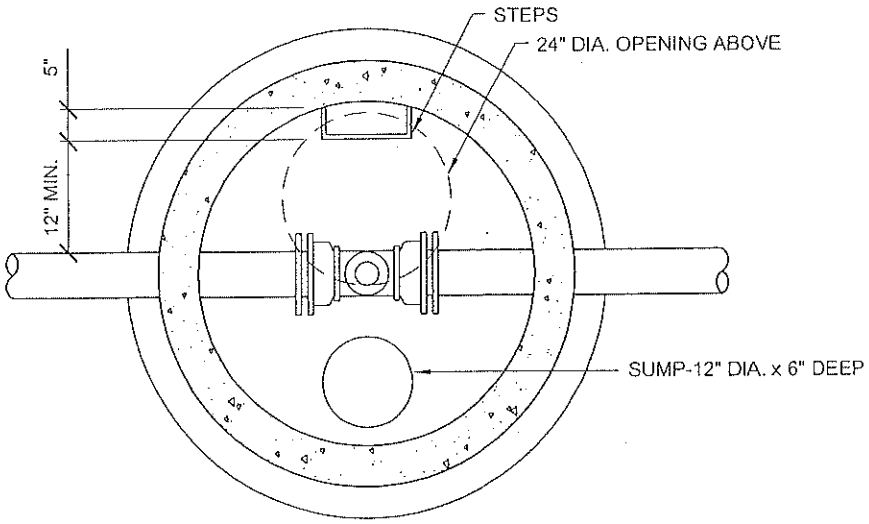


PROFILE

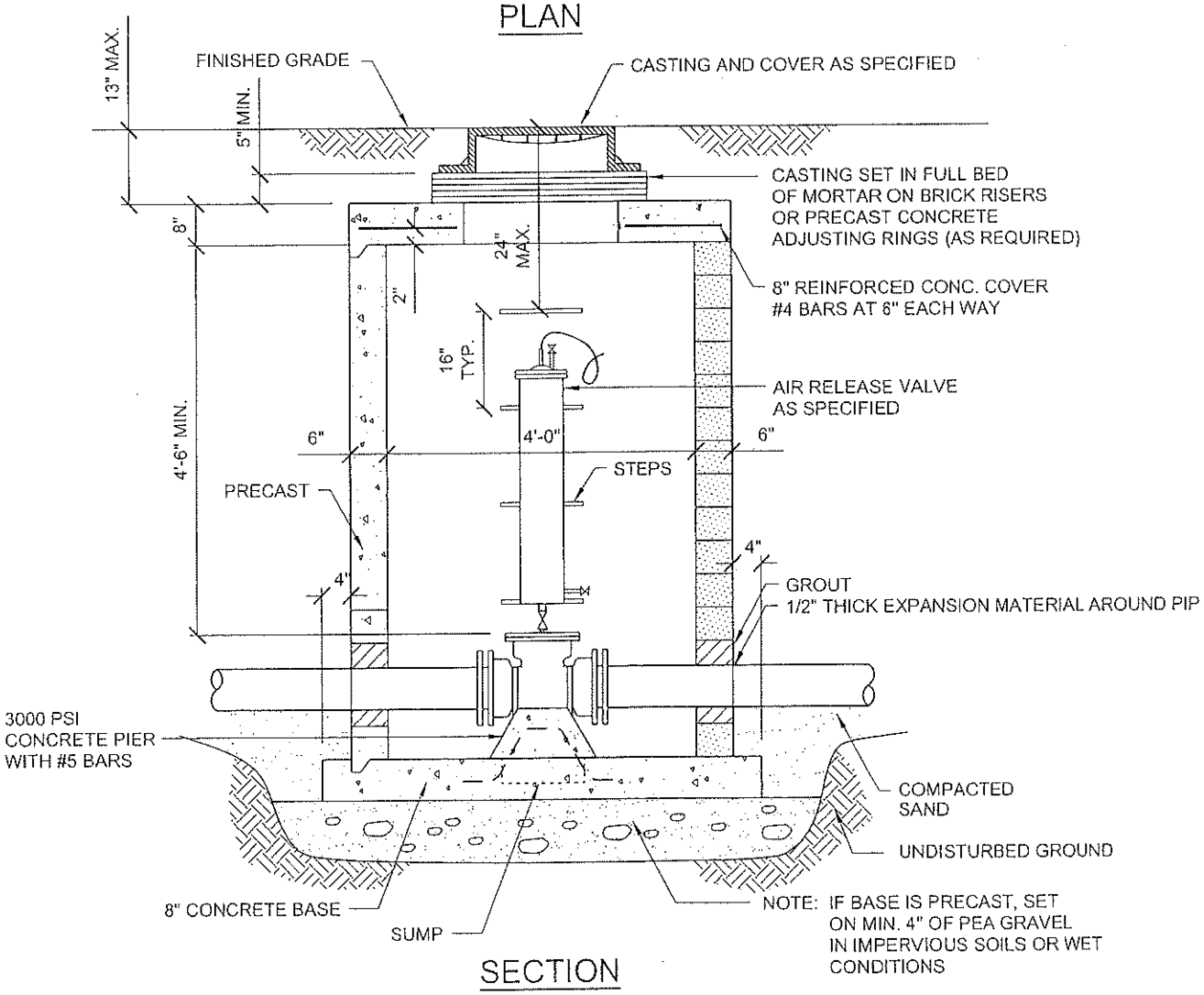
ANCHOR ROD SIZE

PIPE SIZE	ROD SIZE
4" THRU 6"	#4
8" THRU 10"	#6
12" THRU 18"	#8
20" THRU 24"	#10

LOCATION OF REACTION BACKING



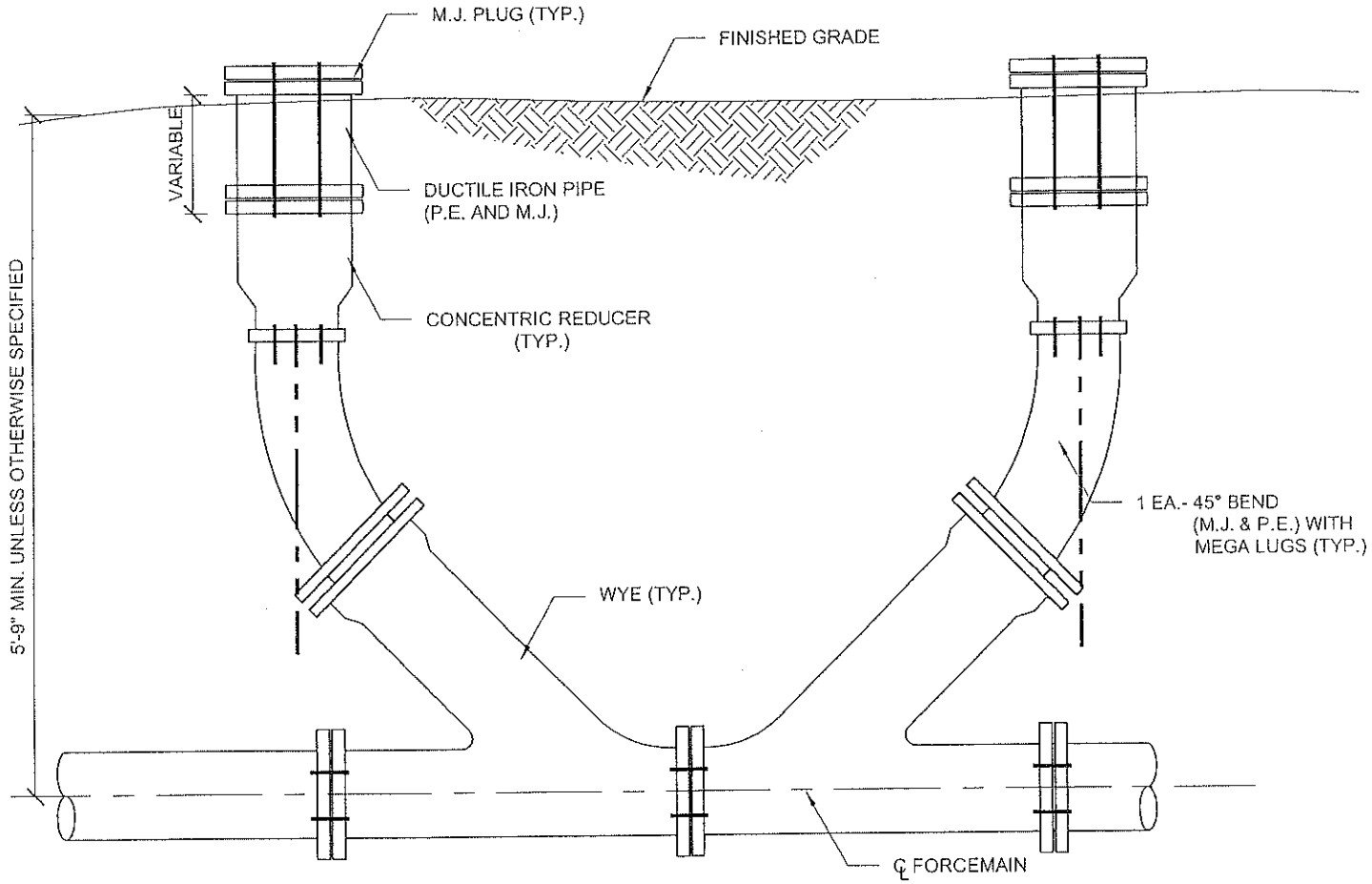
PLAN



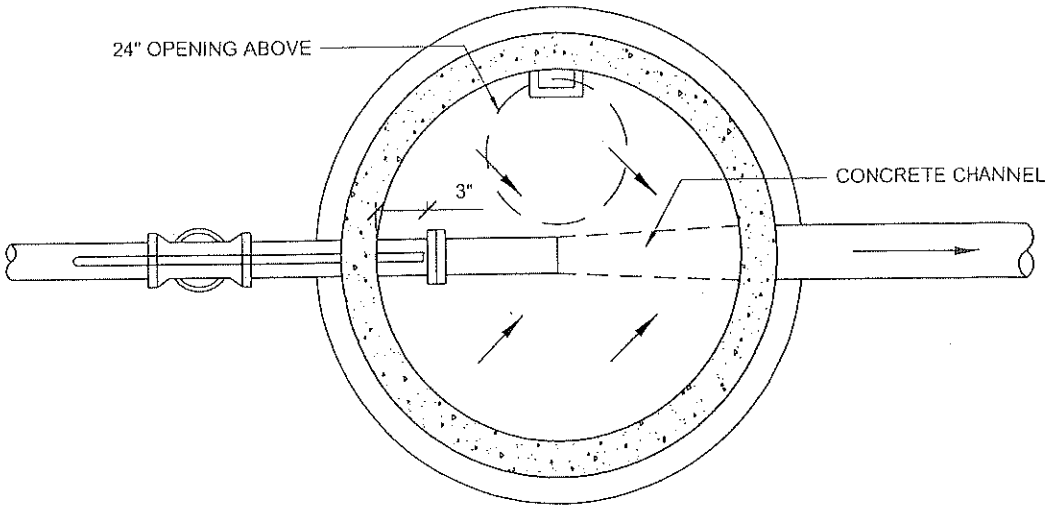
SECTION

STANDARD AIR RELEASE VALVE CHAMBER

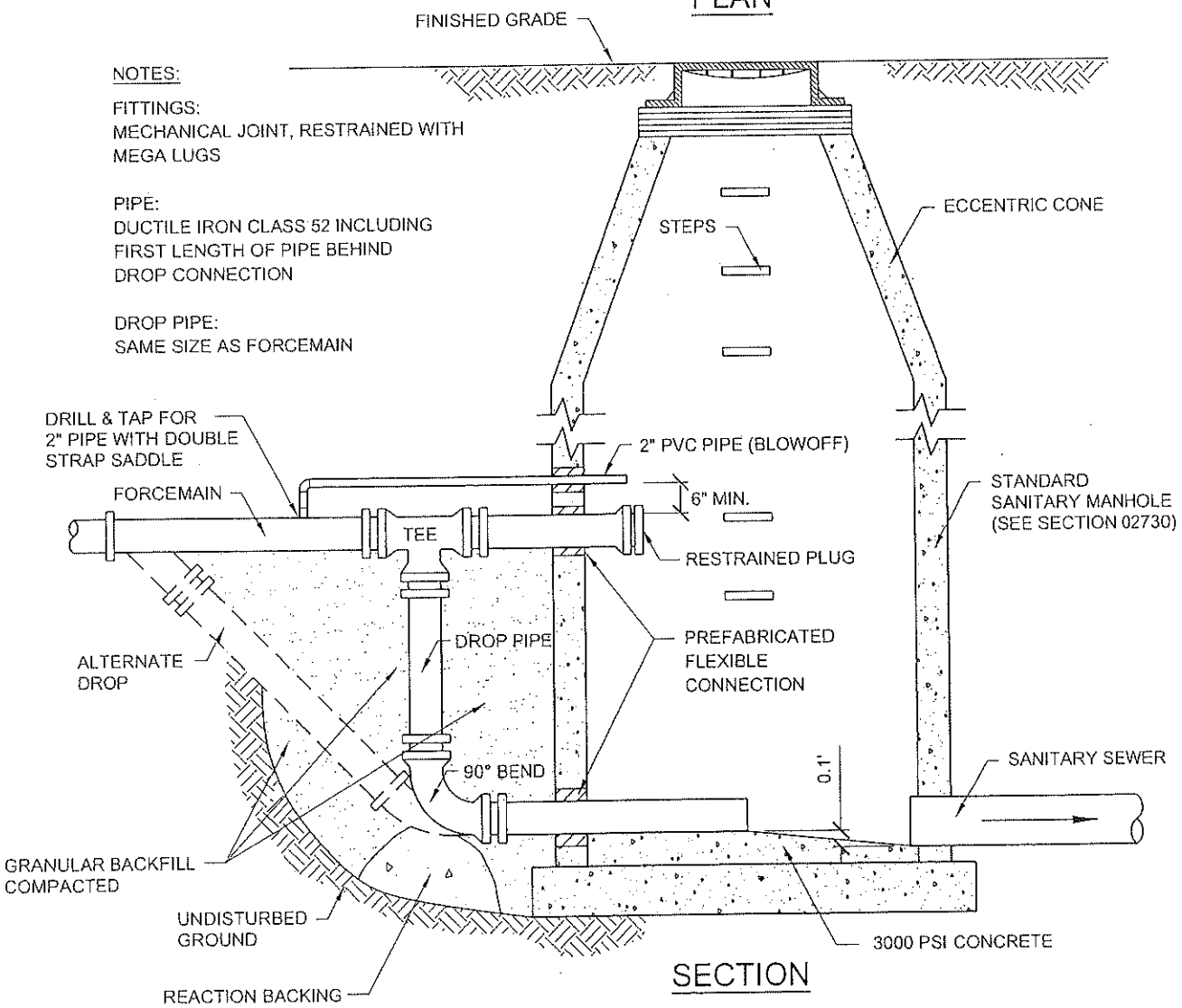
02732_AR
8/02



FORCEMAIN CLEANOUT DETAIL



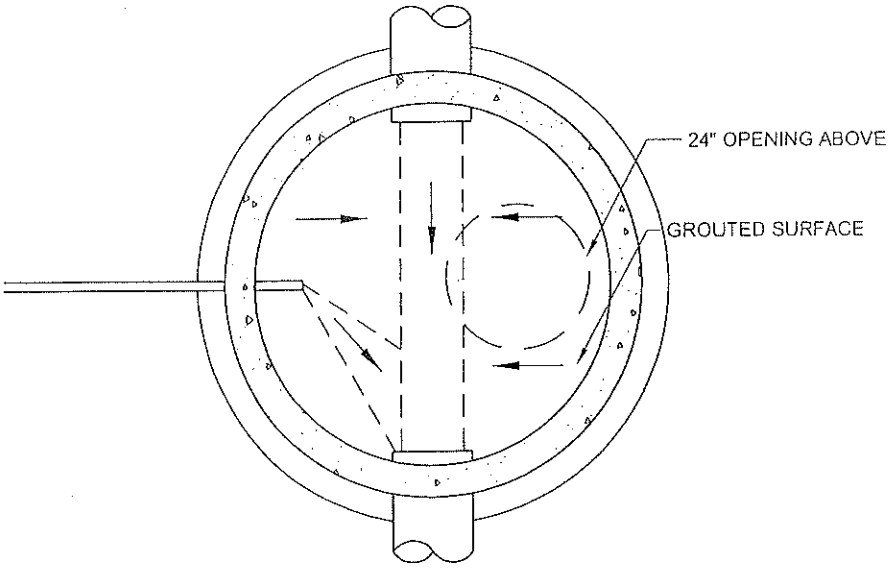
PLAN



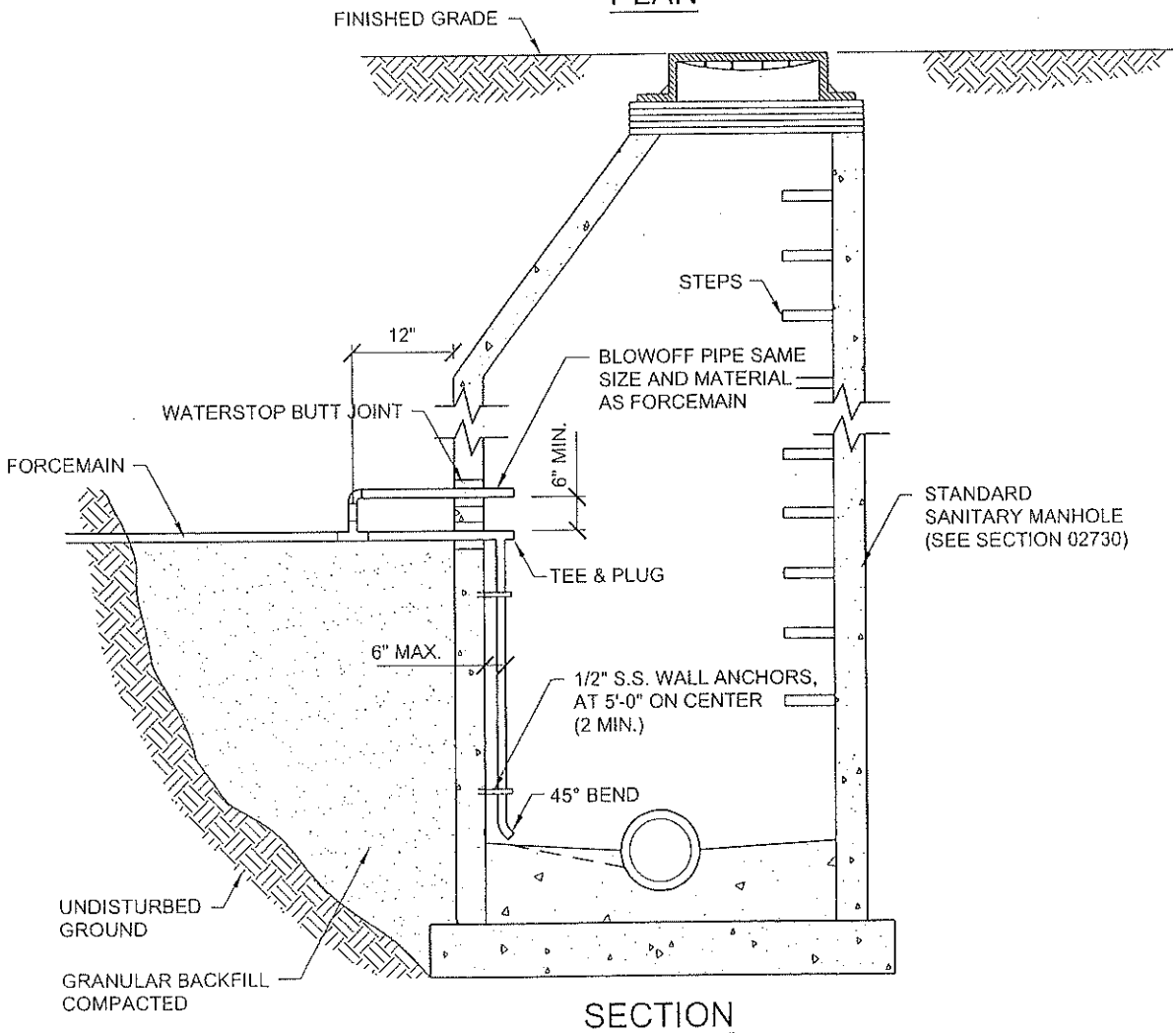
SECTION

DROP CONNECTION DETAIL FOR 4" OR LARGER FORCEMAIN

02732_DROP1
8/02



PLAN



SECTION

DROP CONNECTION DETAIL FOR 1-1/4" TO 3" FORCEMAIN

02732_DROP2
8/02

SECTION 02800

SURFACE PROTECTION AND RESTORATION

PART 1 - GENERAL

1.01 SUMMARY:

A. This Section includes the work required for protection and restoration of surface features such as site improvements and all trees, shrubs, lawns and other landscape features.

B. Definition of Site Improvements: Fences, retaining walls, parking appurtenances, playing fields and equipment, sheds, mail boxes, lawn sprinkling systems, landscaping, yard lights and yard accessories.

1.02 REFERENCES:

A. MDOT - Michigan Department of Transportation, *"2003 Standard Specifications for Construction", Current Edition.*

1.03 JOB REQUIREMENTS:

A. Lawn Areas Disturbed by Construction Operation shall be as follows:
   1. Restoration: Fine grade to 4 inches below finish elevations. Remove all stones and debris greater than 1/2-inch diameter. Place 4 inches of new topsoil, seed, fertilizer and mulch blanket pegged in place.

B. Scheduling:
   1. Restoration of lawns and other surface features: Promptly following curb and gutter, site improvements and paving.
   2. Restoration of site improvements: Promptly following utility installation.
   3. Clean up: Promptly following restoration.

C. Seasonal Limitations: MDOT 816.03.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Trees, shrubs and Plants: CITY standard.

B. Topsoil: MDOT 917.

C. Chemical Fertilizer: Grade 12:12:12.

D. Grass Seed: MDOT 917.12.
   1. Lawns: Mixture THM.
   2. Other areas: Mixture THV.

E. Sod: MDOT 917.13.

F. Mulch Blanket: Excelsior or straw mulch blanket, MDOT 917.15.

G. Site Improvements: Provide materials equal to or better than those that existed prior to start of construction whether shown or not shown on the drawings.

PART 3 - EXECUTION

3.01 PREPARATION:

A. Inspection: Approval required.

3.02 TREES AND SHRUBS:

A. Protection: All items not indicated for removal.

B. Damaged branches: Trim and seal within fifteen (15) days.

C. Replacement: MDOT 815. Place mulching around tree with diameter one foot greater than ball diameter.

3.03 TOPSOIL:

A. Place new topsoil in preparation of seeding or sodding. Remove all stones and debris larger than 1-inch diameter.

B. Construction methods: MDOT 816.03.

3.04 SEEDING:

A. Construction methods: MDOT 816.03 except with the following rates:

1. Topsoil: 4 inches of new topsoil.
2. Fertilizer: 5 pounds per 1,000 square feet.
3. Sowing: 5 pounds per 1,000 square feet.
4. Mulch: 150 pounds per 1,000 square feet.

3.05 SODDING:

A. Construction Methods: MDOT 816.03 with 4 inch topsoil.

3.06 SITE IMPROVEMENTS:

A. Protection: All items not indicated for removal.

B. Restoration: Approval required.

3.07 SURFACE RESTORATION:

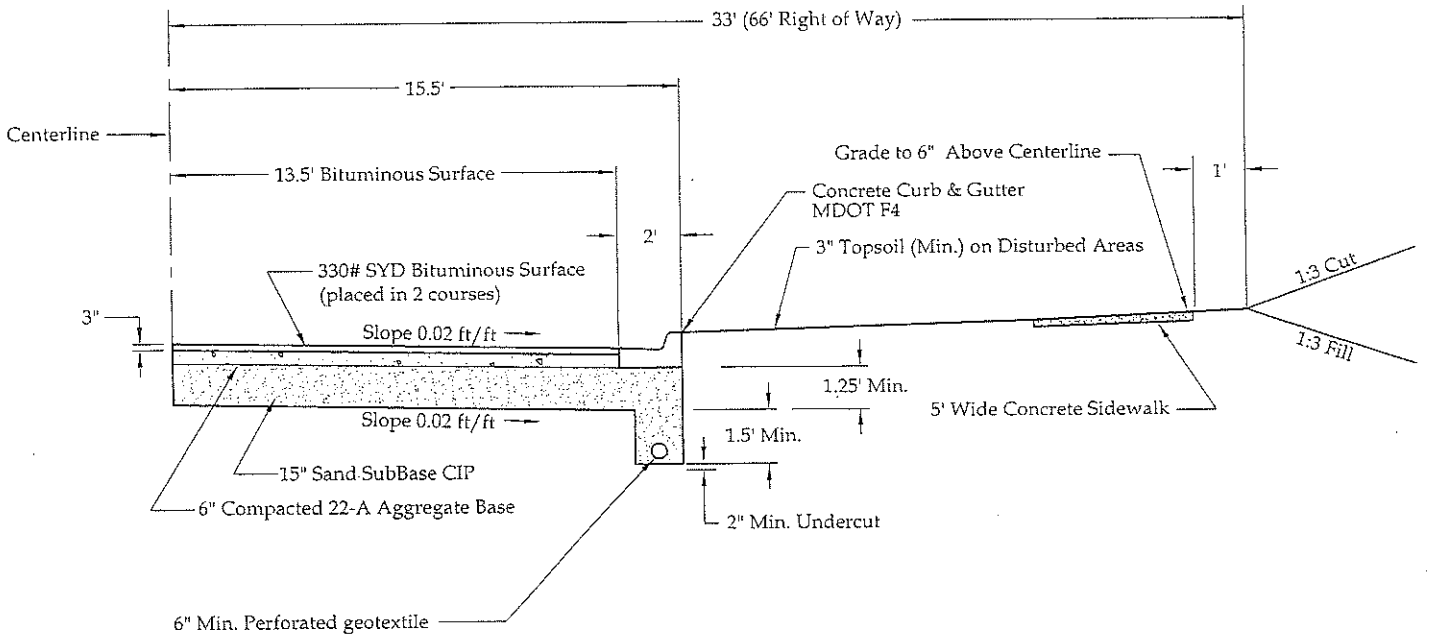
A. Seed: Backfill with site soil, place new topsoil, fine grade, remove stones larger than 1 inch, clay lumps, wood, debris and other extraneous materials, provide hydraulic seeding.

B. Sod: Grade backfill to smooth subgrade, place and fine grade new topsoil, place Class A sod, fertilizer, water and roll into new topsoil.

END OF SECTION

STANDARD DETAILS

RESIDENTIAL
TYPICAL HALF-SECTION WITH CONCRETE CURB
NEW CONSTRUCTION

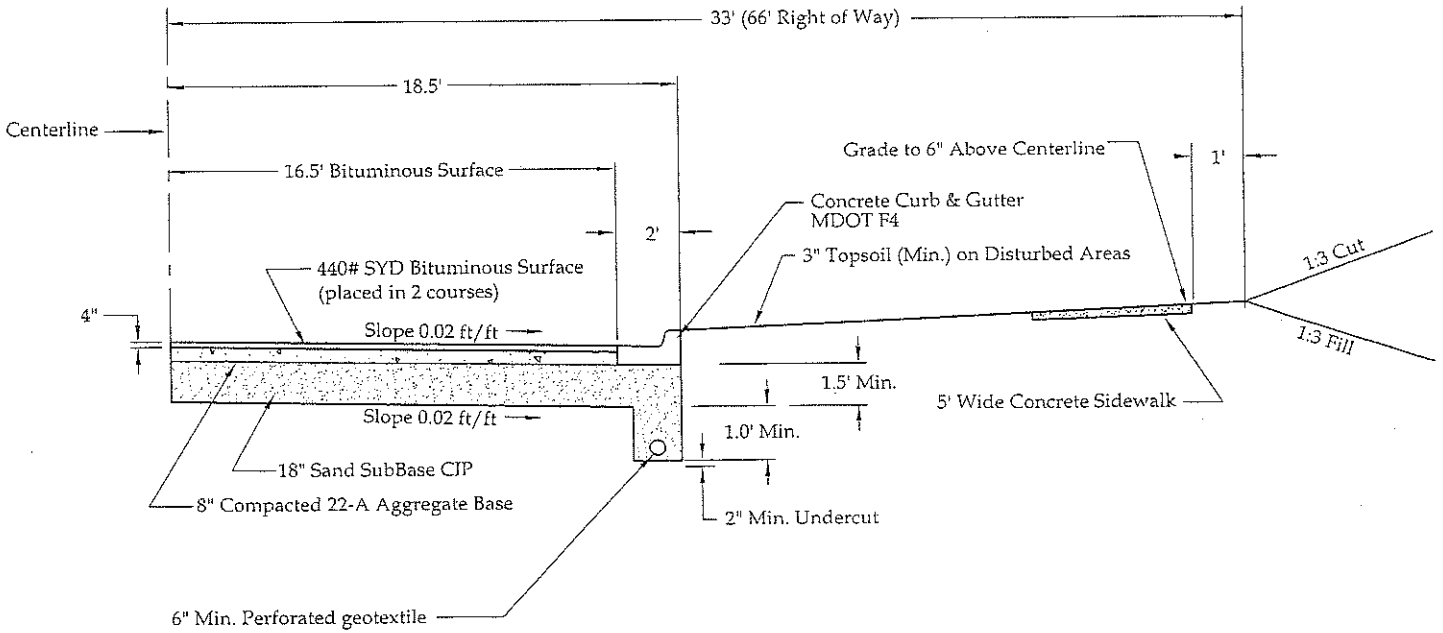


Notes: 1. Minimum grade shall be 0.4 %.
2. Underdrains shall be connected to downstream catch basins.

NOTE:
SEE SECTION 02500
FOR CONSTRUCTION
SPECIFICATIONS

CITY OF BELDING	DETAIL NO. 1	REV NO.	DR BY: ALC CH BY: SVB	SCALE: NONE DATE: 08-16-04	RESIDENTIAL TYPICAL HALF-SECTION WITH CONCRETE CURB

INDUSTRIAL & COMMERCIAL
TYPICAL HALF-SECTION
NEW CONSTRUCTION

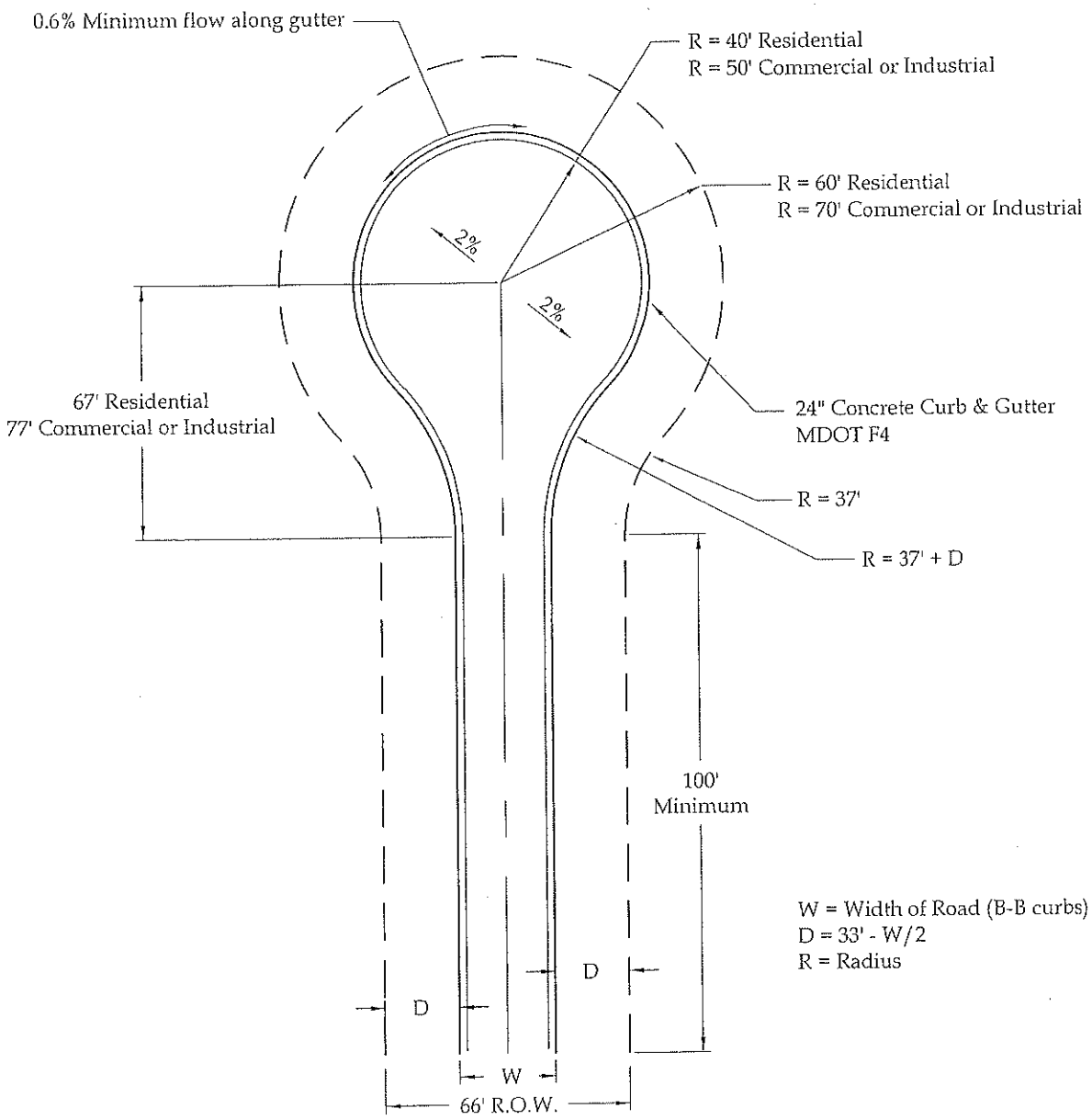


Notes: 1. Minimum grade shall be 0.4 %.
2. Underdrains shall be connected to downstream catch basins.

NOTE:
SEE SECTION 02500
FOR CONSTRUCTION
SPECIFICATIONS

CITY OF BELDING	DETAIL NO. 2	REV NO.	DR BY: ALC CH BY: SVB	SCALE: NONE DATE: 08-16-04	INDUSTRIAL & COMMERCIAL TYPICAL HALF-SECTION

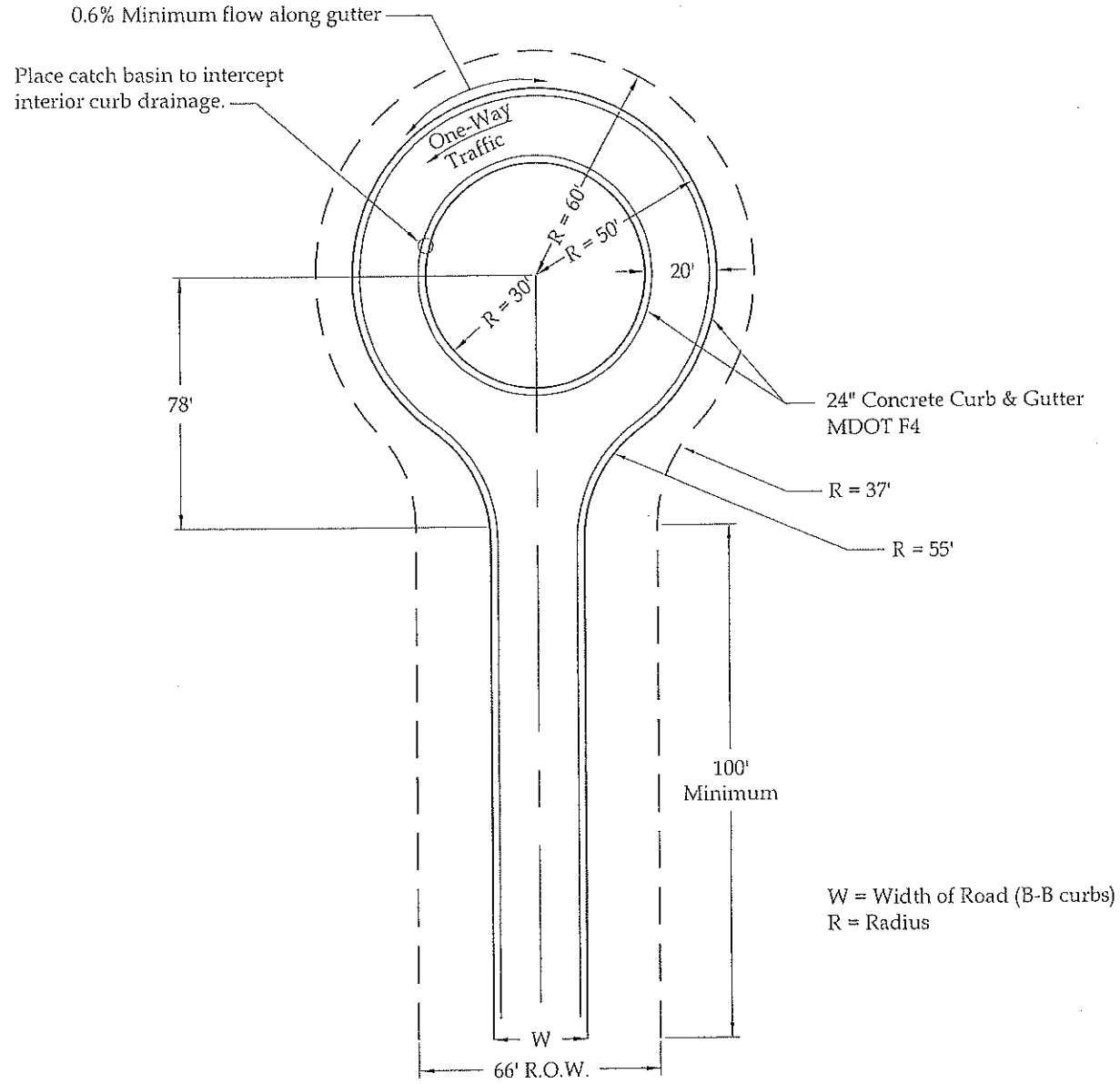
TYPICAL TURNAROUND



The maximum turnaround length shall be 800' and the minimum turnaround length shall be 200'. Both measured from the pavement edge of the intersection street to the back of curb at the end of the turnaround.

CITY OF BELDING	DETAIL NO. 3	REV NO.	DR BY: ALC CH BY: SVB	SCALE: NONE DATE: 08-16-04	TYPICAL TURNAROUND

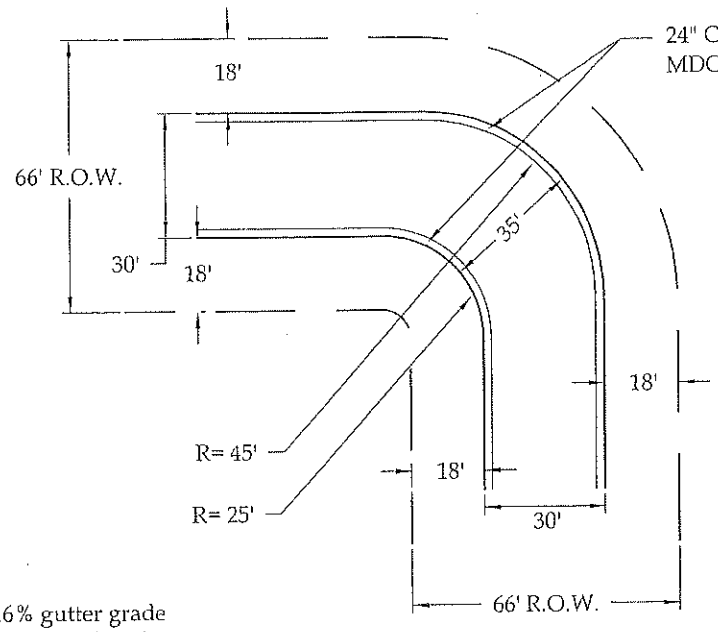
OPTIONAL RESIDENTIAL TURNAROUND



The maximum turnaround length shall be 800' and the minimum turnaround length shall be 200'. Both measured from the pavement edge of the intersection street to the back of curb at the end of the turnaround.

CITY OF BELDING	DETAIL NO. 4	REV NO.	DR BY: ALC CH BY: SVB	SCALE: NONE DATE: 08-16-04	OPTIONAL RESIDENTIAL TURNAROUND

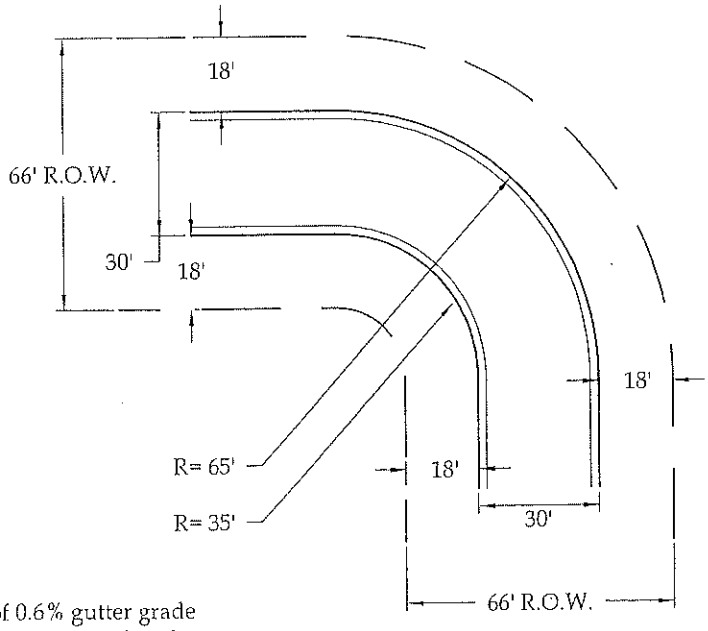
TYPICAL 90° CORNER



R= Radius

Note: A minimum of 0.6% gutter grade shall be maintained through radii.

OPTION 1



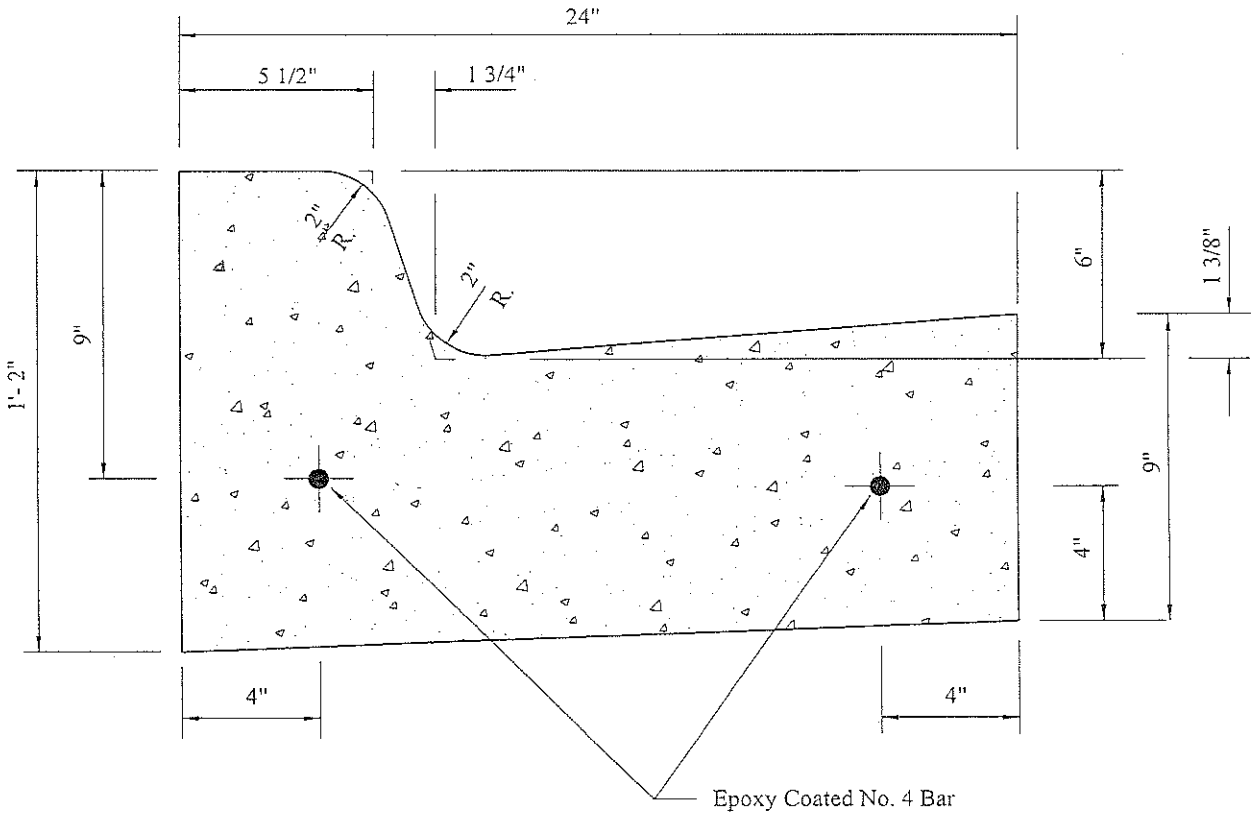
R= Radius

Note: A minimum of 0.6% gutter grade shall be maintained through radii.

OPTION 2

CITY OF BELDING	DETAIL NO. 5	REV NO.	DR BY: ALC CH BY: SVB	SCALE: NONE DATE: 08-16-04	TYPICAL 90° CORNER

24" CONCRETE CURB & GUTTER DETAIL

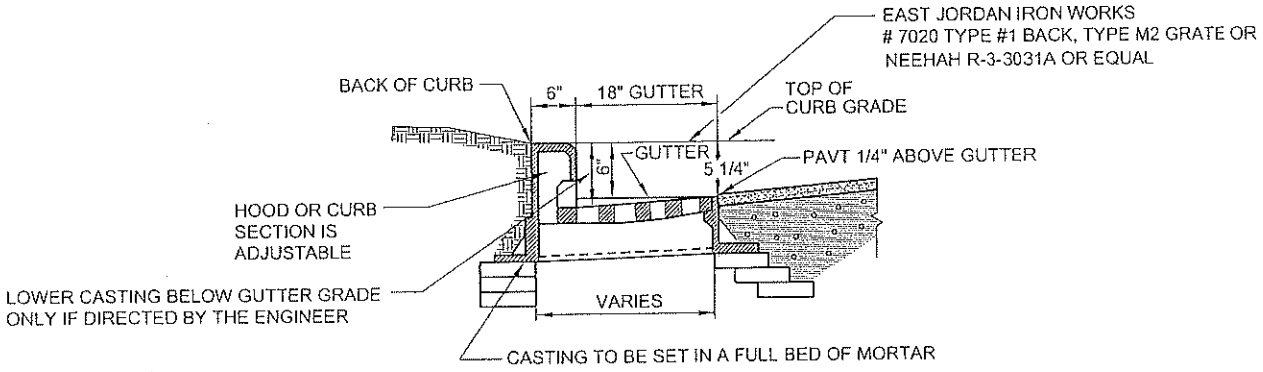


NOTE:
SEE SECTION 02500
FOR CONSTRUCTION
SPECIFICATIONS

R = Radius

Notes: 1. Contraction Joints shall be placed every 10 ft.
2. Expansion Joints shall be placed at 350 ft. Min. and at all radius points.
3. Concrete shall conform to M.D.O.T. Spec. 802.

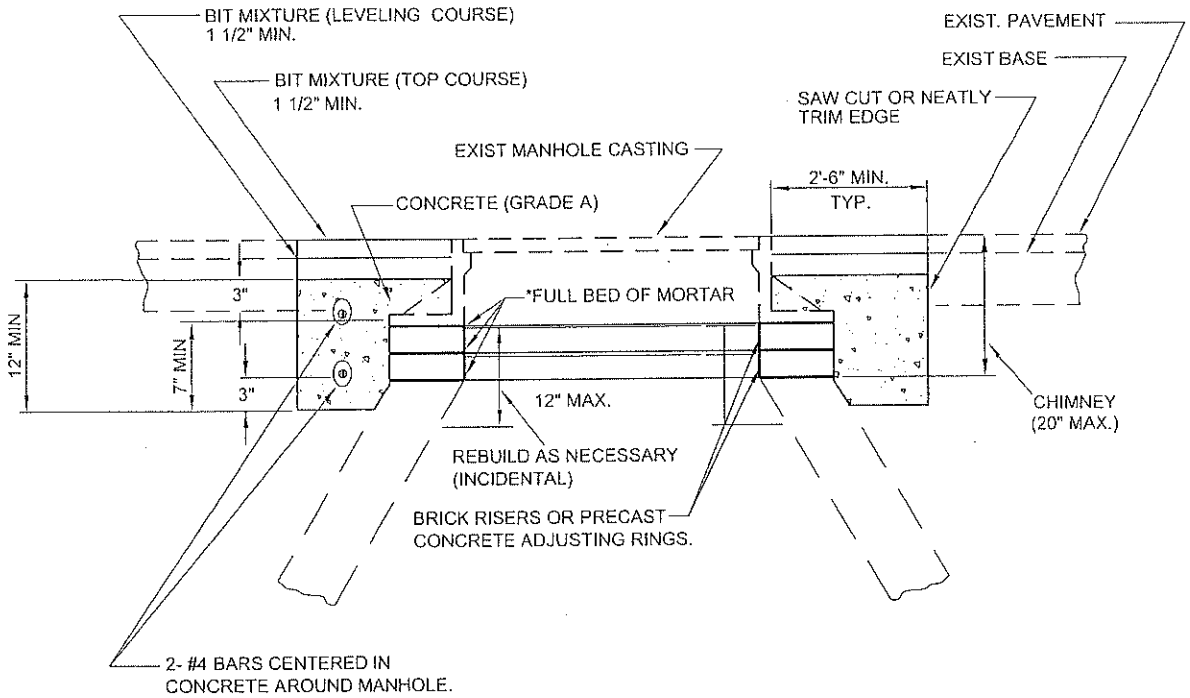
CITY OF BELDING	DETAIL NO. 6	REV NO.	DR BY: ALC CH BY: SVB	SCALE: NONE DATE: 08-16-04	24" CONCRETE CURB & GUTTER DETAIL



CATCH BASIN CASTING SET IN PLACE IN 6" HIGH CURB AND GUTTER

NOTE:
SEE SECTIONS 02500 & 02720
FOR CONSTRUCTION
SPECIFICATIONS

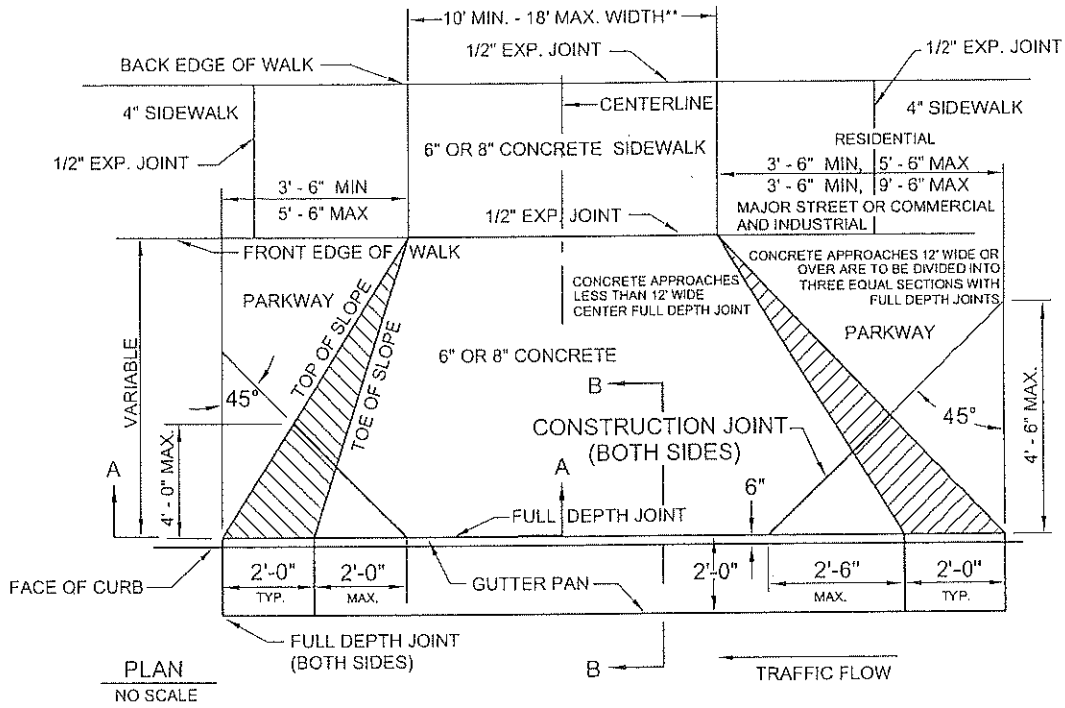
CITY OF BELDING	DETAIL NO. 7	REV NO.	DR BY: ALC CH BY: SVB	SCALE: NONE DATE: 07-14-04	CATCH BASIN DETAIL



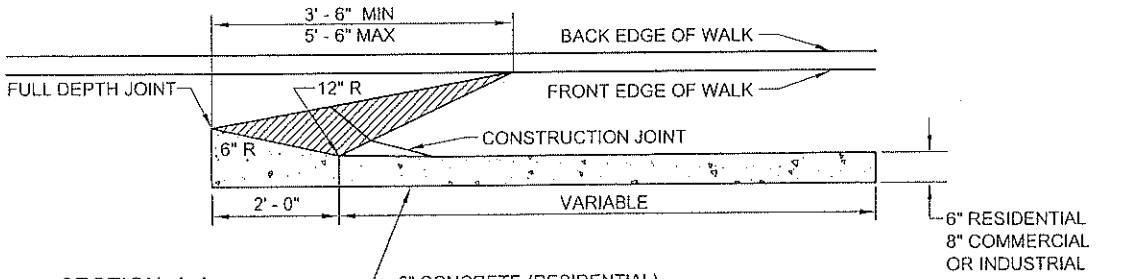
* CONTRACTOR TO USE HIGH EARLY STRENGTH MORTAR WHEN REQUIRED BY CONSTRUCTION SCHEDULE.

NOTE:
SEE SECTIONS 02500 & 02720 OR 02730 FOR CONSTRUCTION SPECIFICATIONS

CITY OF BELDING	DETAIL NO. 8	REV NO.	DR BY: ALC CH BY: SVB	SCALE: NONE DATE: 07-14-04	ADJUSTMENT OF MANHOLE CASTING

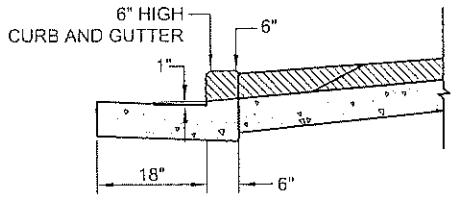


PLAN
NO SCALE



SECTION A-A
NO SCALE

** NOTE:
ANY DRIVEWAY OVER 18 FT. WIDE REQUIRES WRITTEN APPROVAL OF THE CITY.

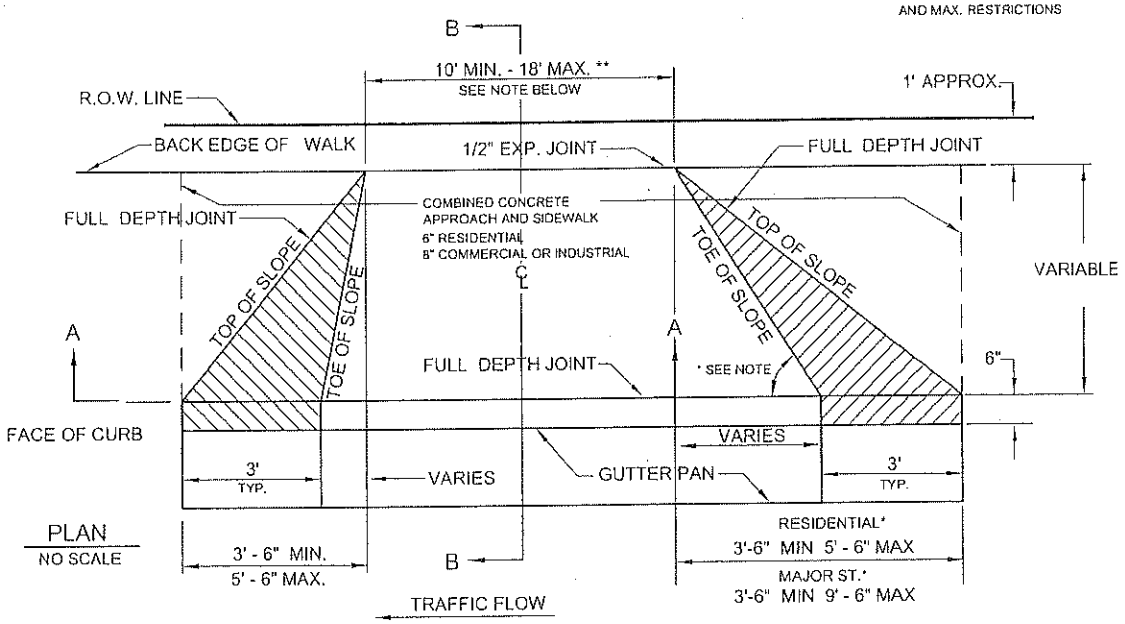


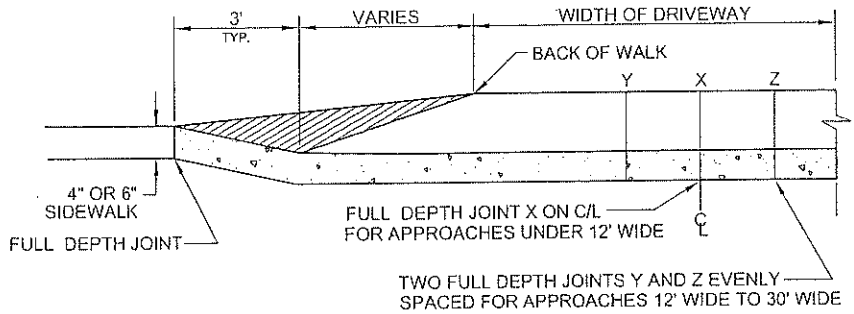
SECTION B-B
NO SCALE

NOTE:
SEE SECTION 02500 FOR CONSTRUCTION SPECIFICATIONS

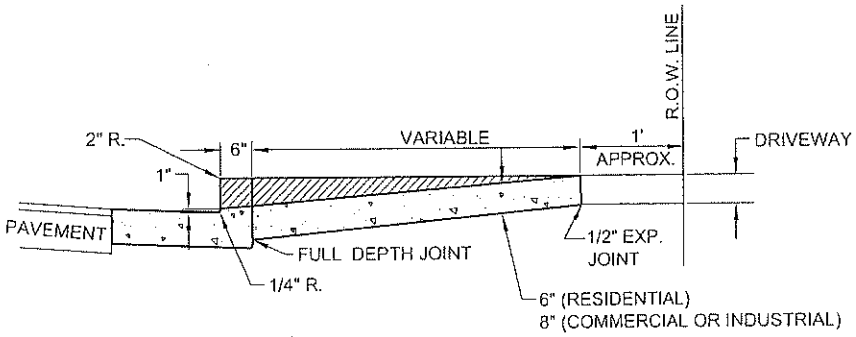
CITY OF BELDING	DETAIL NO. 9	REV NO.	DR BY: ALC CH BY: SVB	SCALE: NONE DATE: 07-14-04	CONCRETE DRIVEWAY APPROACH DETAILS WITH 6" HIGH CURB

*NOTE:
ANGLE IS SUBJECT TO THE MIN. AND MAX. RESTRICTIONS





SECTION A-A
NO SCALE

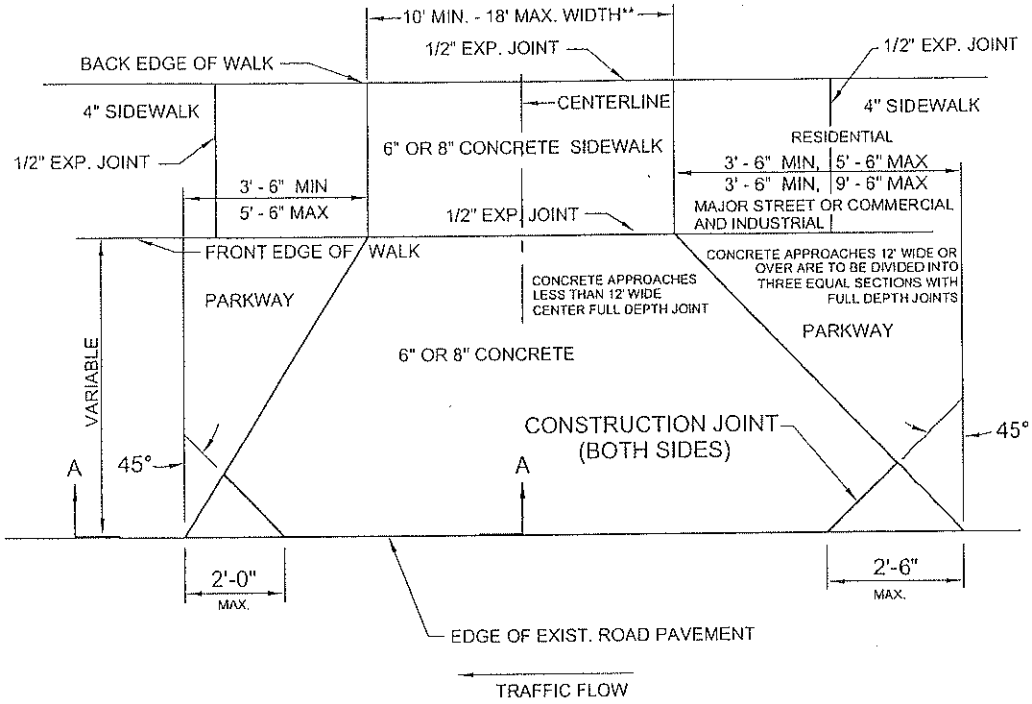


SECTION B-B
NO SCALE

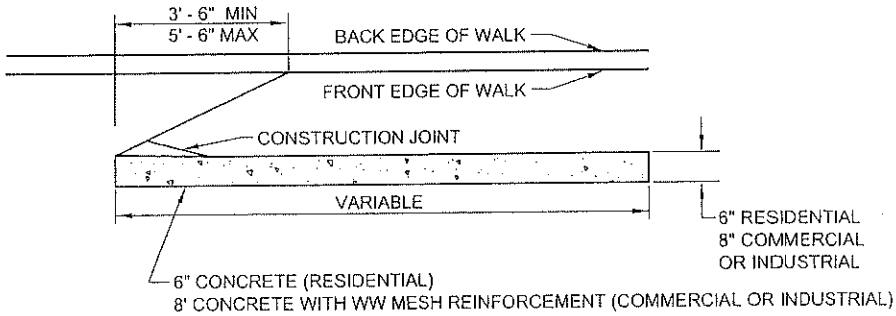
** NOTE:
ANY DRIVEWAY OVER 18 FT. WIDE REQUIRES WRITTEN APPROVAL OF THE CITY.

NOTE:
SEE SECTION 02500 FOR CONSTRUCTION SPECIFICATIONS

CITY OF BELDING	DETAIL NO. 10	REV NO.	DR BY: ALC CH BY: SVB	SCALE: NONE DATE: 07-14-04	COMBINED CONCRETE DRIVEWAY APPROACH AND SIDEWALK WITH 6" HIGH CURB



PLAN
NO SCALE



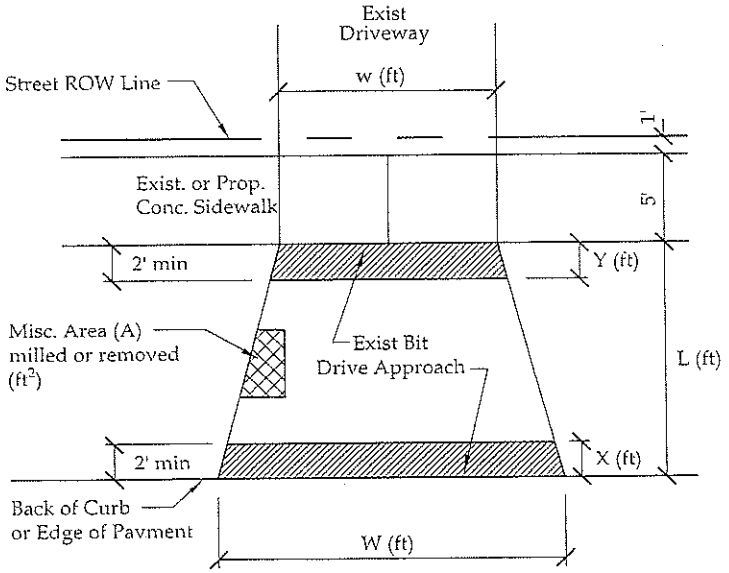
** NOTE:
ANY DRIVEWAY OVER 18 FT. WIDE REQUIRES WRITTEN APPROVAL OF THE CITY.

SECTION A-A
NO SCALE

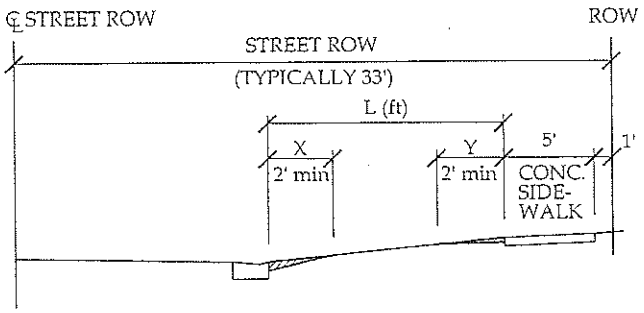
NOTE:
SEE SECTION 02500 FOR CONSTRUCTION SPECIFICATIONS

CITY OF BELDING	DETAIL NO. 11	REV NO.	DR BY: KJV CH BY: SVB	SCALE: NONE DATE: 10-28-05	CONCRETE DRIVEWAY APPROACH WITHOUT CONCRETE CURB

RESURFACING OF EXISTING BITUMINOUS DRIVE APPROACHES



PLAN



SECTION

LEGEND

cold milling bituminous surface to a depth of proposed resurfacing thickness

Area milled and/or removed must be equal to or less than 50 % of the existing drive approach area

$$w\,Y + WX + A \overset{\text{must be}}{\leq} \left(\frac{w + W}{2}\right) 0.5L$$

otherwise, existing bituminous drive approach must be removed and replaced with concrete drive approach per City Standard Detail No. 9.

Neither existing concrete sidewalk nor curb and gutter shall be overlaid with bituminous.

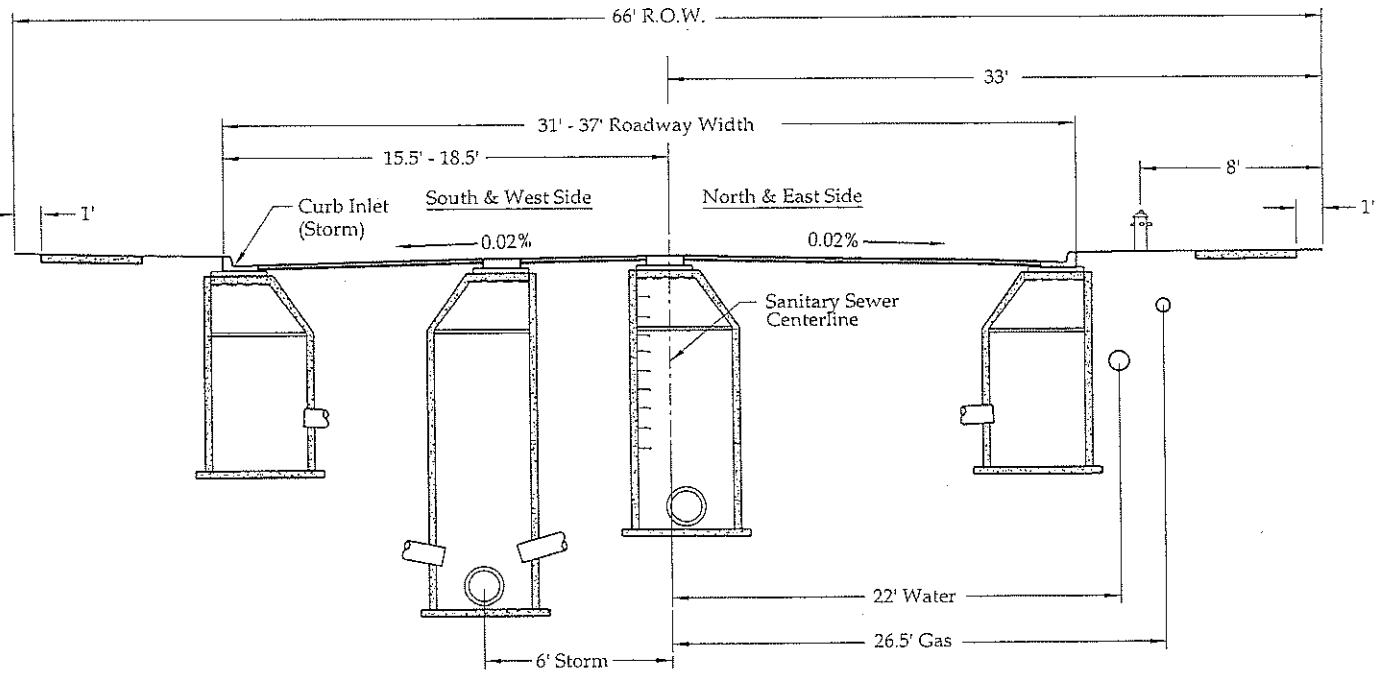
If sidewalk does not exist, it shall be constructed across the drive width at time of drive improvements per City Standard Construction Requirements and Requirements for Infrastructure handout.

A permit shall be obtained from the City for any work within the street right-of-way (ROW).

CITY OF BELDING	DETAIL NO. 12	REV NO.	DR BY: KJV CH BY: SVB	SCALE: NONE DATE: 10-28-05	RESURFACING OF EXISTING BITUMINOUS DRIVE APPROACHES

TYPICAL UTILITY LOCATION WITHIN 66' ROAD ROW

Sidewalk Notes:
1. Sidewalk shall be placed at 27' to 32' off centerline.
2. Sidewalk shall slope 2% toward centerline.



Electric, Cable and C.A.T.V.
1. Buried Cables (Electric, Telephone, C.A.T.V.) shall be within 10' wide Utility Easement outside of ROW on new Plats or Site Condominium developments.

CITY OF BELDING	DETAIL NO. 13	REV NO.	DR BY: ALC CH BY: SVB	SCALE: NONE DATE: 08-16-04	TYPICAL UTILITY LOCATION WITHIN 66' ROAD ROW

STANDARDS

STREET TREE STANDARDS FOR CITY SUBDIVISIONS.

All city subdivisions final platted hereinafter shall be required to provide a street tree plan which meets the following criteria:

1. **MINIMUM TREE REQUIREMENTS.**

Plant material size and measurement must conform to the American Standard for Nursery Stock 1986 Edition, as published by the American Association of Nurserymen, Inc.. Street trees shall consist of canopy trees, as defined below and meeting the following minimum requirements:

(a) Size. Medium or large trees which can reach a mature height of approximately 40 feet or greater are required. The minimum trunk caliper of street trees, at the time of planting, measured six inches above the ground in accordance with the *American Nurseryman Standards* shall be as follows:

Street Tree Type	***Minimum Trunk Caliper At Time of Planting:***	***Mature Height Restrictions***
Shade Tree	2.5" trunk caliper balled and burlapped or equivalent	Approx. 40' or greater

(b) Number. One tree shall be provided for every 40 feet of street frontage. The City may approve a Master Street Tree Plan that varies from this requirement to allow for driveways, utilities, and intersection visibility requirements.

(c) Minimum Species Diversity. The following minimum requirements shall apply to all master street tree plans. To prevent uniform insect or disease susceptibility, a mix of species shall be provided to promote diversity. The number of tree species required to be planted shall be in accordance with the following requirements:

Number of Trees Per Plat	***Minimum number of species***
1-10	**1**
11-20	**2**
21+	**3**

(d) Acceptable Street Trees. The City has provided a list of trees that shall be acceptable to satisfy the requirements for master street tree plans. This list shall be amended as the City deems necessary.

ACCEPTABLE

SCIENTIFIC NAME	**COMMON NAME**	*** HEIGHT at MATURITY**
Acer platanoides & var.	Norway Maple	T
Acer rubrum & var.	Red Maple	T
Acer saccharum & var.	Sugar Maple	T
Acer x freemanii	Freeman Maple	T
Liriodendron tulipifera	Tuliptree	T
Platanus x acerifolia 'Bloodgood'	Bloodgood London Planetree	T
Pyrus calleryana 'Aristocrat'	Aristocrat Callery Pear	M
Pyrus calleryana 'Autumn Blaze'	Autumn Blaze Callery Pear	M

Pyrus calleryana 'Chanticleer'	Chanticleer Callery Pear	M
Quercus palustris	Pin Oak	T
Quercus rubra	Red Oak	T
Tilia cordata	Littleleaf Linden	T
Tilia cordata 'Chancellor'	Chancellor Linden	T
Tilia cordata 'Corzam'	Corzam Linden	M
Tilia cordata 'Glenleven'	Glenleven Linden	T
Tilia cordata 'Greenspire'	Greenspire Littleleaf Linden	T
Zelkova serrata 'Green Vase'	Green Vase Japanese Zelkova	T
Zelkova serrata 'Village Green'	Village Green Japanese Zelkova	T

M MEDIUM – 35 TO 45 FEET TALL
T TALL – 50 FEET OR MORE

(e) Un-Acceptable Street Trees. The City has provided a list of trees that shall be un-acceptable and shall not be planted within the street right-of-way. This list shall be amended as the City deems necessary.

UN-ACCEPTABLE							
		PROBLEMS*					
SCIENTIFIC NAME	COMMON NAME	WW	I	D	SL	MF	SR
Acer negundo	Boxelder	X	X				X
Betula (all species)	Birch	X	X				
Elaeagnus angustifolia	Russian Olive	X		X	X		
Picea pungens	Blue Spruce			X			
Populus (all species)	Poplar	X	X	X			
Prunus cerasifera	Purple-leaf Plum		X	X	X		
Malus (all species)	Crab Apple		X	X		X	
Salix (all species)	Willow	X	X	X			
Sorbus acuparia	European Mountain Ash		X	X		X	
Ulmus (most species)	Elm		X	X			
Acer saccharinum	Silver Maple	X					X
Platanus occidentialis	Sycamore			X		X	
Morus (all species)	Mulberry	X				X	X
Gleditisia tricanthos	Honeylocust (thorned)					X	
Robina pseudoacacia	Block Locust					X	X
Ailanthus altissima	Tree of Heaven	X					
Juglans (all species)	Walnut					X	
Carya (all species)	Hickory					X	
Maclura pomifera	Osage Orange					X	
Aesculus hippocastanum	Horsechestnut					X	
Aesculus octandra	Yellow Buckeye					X	
Aesculus glabra	Ohio buckeye					X	
Tilia Americana	American Basswood	X					

** **Problem Codes**
WW WEAK WOODED
I INSECT PROBLEMS
D DISEASE PROBLEMS
SL SHORT LIVED
MF MESSY FRUITS
SR SHALLOW ROOTED

2. **PLANTING LOCATION AND CLUSTERING.**

(a) Location in Residential Zoning Districts. Street trees shall be located in the front-yard, building setback and/or adjacent to the right-of-way at a distance not greater than ten (10) feet from the boundary line of the right-of-way. Street trees shall not be planted until after planned utilities have been installed. Trees shall be planted no closer than eight (8) feet from existing underground utility lines whenver practical. On corner lots, no tree shall be planted nearer than thirty-five (35) feet from the intersecting curb lines of the two streets. No tree shall be planted between the curb and the sidewalk if the clear space is less than 5 feet wide. Variations from these spacing requirements subject to approval of City Staff.

(b) Location in all other zoning districts. Street trees shall be located either within the street right-of-way or within the required front yard building setback, PROVIDED, no tree is located farther than 30 feet from the back of the curb, with the exception of lots on the radius of a cul-de-sac which shall be located not greater than 45 feet from the back of the curb. Street trees shall not be planted until planned utilities have been installed. Trees shall be planted no closer than 8 feet from existing utility lines. On corner lots, no tree shall be planted nearer than thirty-five (35) feet from the intersecting curb lines of the two streets. No tree shall be planted between the curb and the sidewalk if the clear space is less than 5 feet wide.

(c) Clustering. Street trees shall be evenly spaced along the street frontage unless one or more of the following conditions exist: a) the lot is on a corner; b) the presence of existing trees, which interrupt the even spacing of trees; c) topographic conditions (i.e. steep gradient, rock outcroppings), based on City evaluation, dictate building location and driveway placement which interrupts the even spacing of street trees.

(d) Overhead Lines and Fixtures. If the planting shall be subject to the following requirements: a) the canopy of the tree(s) shall be no closer than 10 feet from the overhead lines and its mature height unless otherwise approved by City staff; and; b) tree(s) shall be planted at least 15 feet away from any streetlight or fire hydrant.

3. **TIMING OF LANDSCAPE PLACEMENT**

(1) Trees shall be installed, after other public improvements, if water is available for their care and maintenance. The property owner or his designee shall be required to guarantee planting of the tree at the time a building permit application is submitted.

(2) Street trees shall be planted prior to final building inspection or the issuance of an occupancy permit. Consideration shall be given to seasons of the year and adverse weather conditions in requiring completion of tree planting PROVIDED, the guarantee for planting is extended to the date of completion of tree planting.

(3) Guarantee shall be provided in one of the following forms:

(a) A performance agreement be signed to guarantee planting of the

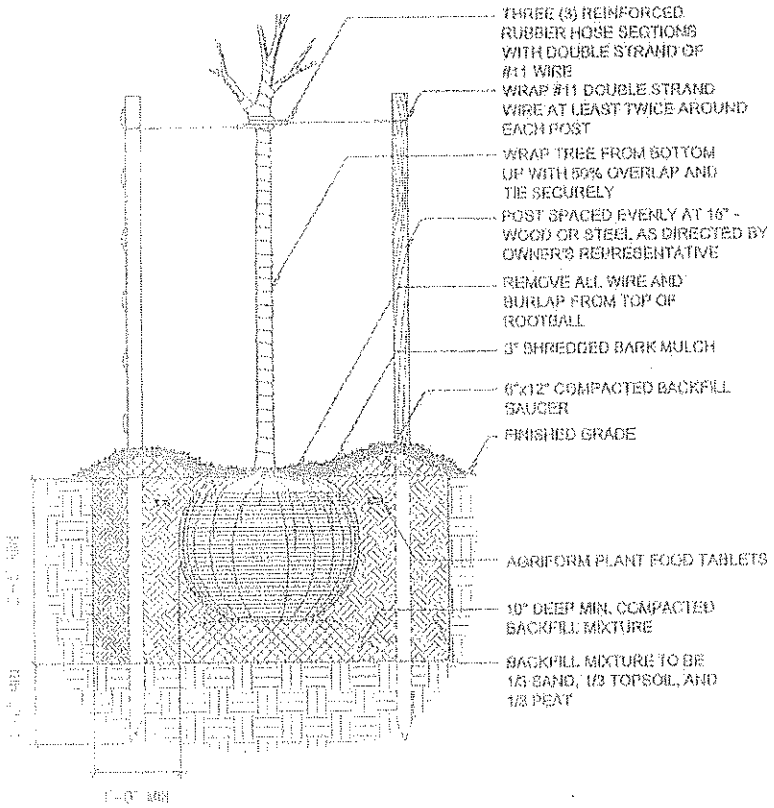
street trees. The performance agreement would make issuance of an occupancy permit subject to completion of the installation of street trees. If season of the year becomes a problem, another form of guarantee can be substituted to permit the issuance of an occupancy permit; or,

(b) A cash escrow deposit in a federally insured commercial bank or savings and loan institution authorized to do business in the State of Michigan. This escrow deposit shall be invested and reinvested by such bank or savings and loan, the interest or discount from which shall be paid to the subdivider upon final release of such escrow deposit . Money will be withdrawn to pay the developer or a designated nursery after the installation of said trees and prior to the issuance of a final certificate of inspection; or

(c) The City may, at its discretion, accept an irrevocable letter of credit from a financial institution or a corporate surety performance bond in lieu of a cash escrow deposit to insure the planting of the required street trees.

4. INSTALLATION DETAILS

Street trees shall be installed per the following detail:



TREE PLANTING DETAIL

NOT TO SCALE

5. ON-GOING MAINTENANCE

(a) The on-going maintenance of trees planted in the City right-of-way shall be in accordance with the following maintenance provisions :

Developer shall be required to provide maintenance of all newly installed plantings for a period of 12 months beginning at the time of acceptance. Maintenance to include spraying for insects and disease, pruning dead branches, inspection for adequate watering. Developer must guarantee all trees for a 12 month period from date of acceptance to be in good, healthy, and flourishing condition. Developer to replace all failed plants in-kind.

(b) For all other required street trees not covered by this section and/or developments requiring a site plan, the on-going maintenance of trees, once planted, shall be the responsibility of the property owner adjacent to the public right-of-way or private street. If a street tree dies or fails to be planted within one calendar year of issuance of an occupancy permit, the City shall notify the property owner of the need to plant or replace the tree(s) as applicable. Should the property owner fail to plant or replace the tree within one-hundred and twenty (120) days of notification, the City shall reserve the right to cause the required trees to be installed and the cost of the tree(s), plus the cost of installation of the tree(s), shall be assessed to the property owner.

STREET/SITE LIGHT STANDARDS

The City of Belding finds it necessary to establish guidelines for the installation of exterior lighting in all residential and non-residential zoning districts. The purpose and intent of establishing these guidelines are as follows:

- To reduce glare and light pollution as a result of unnecessary and improperly designed light fixtures.
- To prevent light trespass into residential homes.
- To provide safe roadways for motorists, cyclists and pedestrians.
- To conserve energy by promoting efficient and cost effective lighting.
- To allow for flexibility in the style of lighting fixtures.
- To provide sufficient illumination for safety, convenience and security.
- To assist residents, business and property owners, city departments, the Planning Commission, City Council, and other governmental agencies in bringing outdoor lighting into conformance with the purposes of this policy.

The City shall consider the following guidelines and criteria at the time a building permit is applied for, and in the case of projects that require the review and approval of a site plan by the Planning Commission and/or City Council, such guidelines shall be considered as part of the site plan review process. The developer shall install and be responsible for all costs associated with the installation and maintenance of streetlights in accordance with these standards including but not limited to streetlights, fixtures, poles, fixed equipment and equipment associated with the operation of the lights will be installed at no cost to the City.

PHOTOMETRIC PLAN REQUIREMENTS

1) The City may request additional information, as it deems necessary in determining whether or not the following guidelines are being met. Such information may include, but shall not be limited to: lighting plans with a layout of the proposed fixture locations photometric data showing the spatial distribution of the output of the proposed fixtures, and manufacturers catalog cuts that present a description of the equipment, including glare reduction devices, lamps, and mounting heights.

a. All applications for site plan review, conditional use, or subdivisions, except applications for duplexes and single family homes shall include lighting plans showing location, type, and height of all fixtures and poles, and photometrics in foot-candle output of all proposed and existing fixtures on-site and within fifty (50) feet of the site. On-site lighting to be included in the calculations shall include, but is not limited to, lighting for parking lot, canopies, eyebrow lighting, recessed lighting along the building front and/or overhang, and interior building light. Rejection or acceptance of the photometric plan shall be based on these standards.

b. The photometric plan shall include a table showing the average, minimum, and maximum foot-candles on the site, and the calculations deriving the averages. In addition, a fixture detail shall be submitted including pictures of each fixture, and proposed wattage per fixture. The photometric plan shall not include time averaging or other alternative methods of measurement.

ALLOWABLE ILLUMINATION LEVELS

	Location/Use	Maximum Illumination (foot-candles)	Average Illumination (foot-candles)
1	Parking Lot	5.0	2.5
	Perimeter Parking	3.0	1.5
2	Property Boundary	0.5	
	Adjacent to Residential	0.5	
	Approach and Driveways	1.5	
	W/in 10 ft. of driveway at property line	0.5	
3	Accessory Uses	3.0	
	Within 15 ft. of residential	0.5	
	Within 15 ft. of non-residential	1.0	
	Within 15 ft. of approach	1.5	
4	Canopies, drive-thru, overhangs	50.0	30.0
5	Building exteriors	5.0	
6	Streets, Roadways		
	Local		0.7
	Collector		0.9
	Arterial		1.6
7	Specialty Lighting		
	Vehicle Display Lots - Front Row	15.0	10.0
	All purpose sports field		40.0
	Golf Driving Range at tee		20.0
	Basketball, Volleyball		20.0
	Tennis		50.0

POLE/MOUNTING HEIGHT REQUIREMENTS

Pole heights shall be per the following standards with respect to the following uses:

Location	Maximum Height (ft.)
Parking Lots/Vehicular Areas	25 ft.
Building and/or Walls	25 ft. or eave overhang, whichever is lowest
Pedestrian Walkways	15 ft. (Commercial or Residential)
Streets, Roadways	
Local	15 ft.
Collector	20 ft.
Arterial	25 ft.
Specialty Lighting	Variance is required for lighting fixtures in excess of 25 ft. in height.

a) Measurements: Lighting height shall be measured from the closest onsite paved surface, not including sidewalks or curbs, to the top of the luminaire.

b) Specialty Lighting: Fixtures heights may exceed the maximum height for each specific location or type of use upon variance approval.

c) Poles shall be located at least three and a half feet (2.5') from the back of the curb in a landscape area.

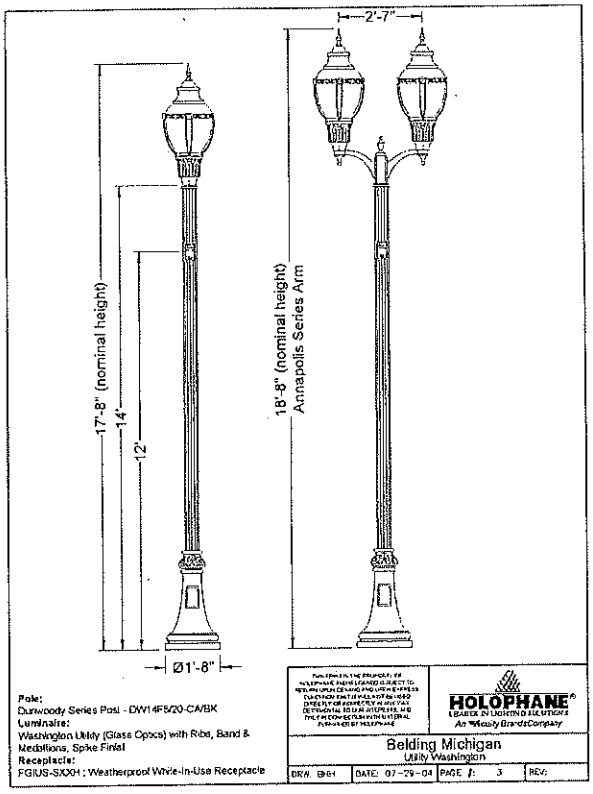
d) Decorative Poles

City of Belding Decorative Pole Standard (Subject to change):

Holophane Dunwoody Series 14-foot fluted aluminum pole with anchor base. Single luminaire for residential areas and walkways. Twin luminaire to be used in Central Business District and at key locations as determined by City Staff.

Site plan showing light pole locations and shop/ orientation drawings for all fixtures to be submitted for approval by City staff prior to placement of order. GFI outlet to be oriented toward sidewalk unless otherwise approved by City.

All fixtures to be supplied with decorative bands, medallion, final and decorative full top cover.



e) Light pole locations shall not be allowed within any sidewalk. Spacing along streets and sidewalks shall be as follows:

I. Walkways - a minimum 2.5 ft. from the back of the curb or edge of walk with a spacing of 100 - 120 ft. max. on center
II. Arterial - a minimum 2.5 ft. from the back of the curb with a spacing of 100 - 120 ft. max. on center
III. Collector - staggered formation with a spacing of 130 - 150 ft. max. on center
IV. Local - staggered formation with a spacing of 150 ft. max. on center.

Final spacing in all above cases to be subject to modification based on actual site conditions and approval by City staff.

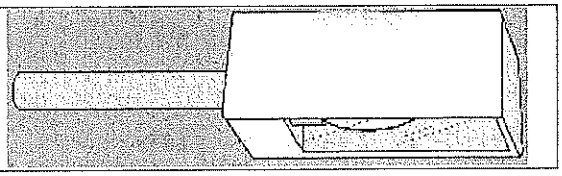
f) Landscaping - Light pole locations shall take into account tree and other landscaping locations as indicated on the landscaping plan. No light shall be placed closer than 20 feet form center of light to tree without approval by City Staff.

g) Site plan showing light pole locations, lighting system distribution items and shop/ orientation drawings for all products associated with the installation of decorative lights to be submitted for approval by City staff prior to placement of order. GFI outlet to be oriented toward sidewalk unless otherwise approved by City. Site plan shall be prepared by Registered Landscape Architect, Professional or Electrical Engineer.

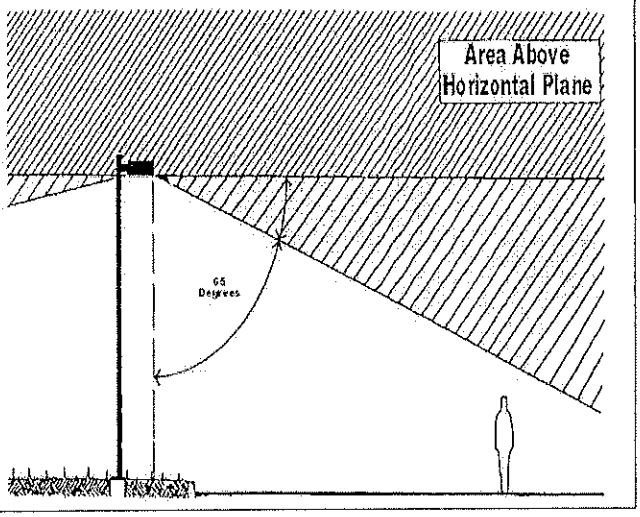
LUMINAIRE REQUIREMENTS

Luminaire:

1. The light source (bulb) for any exterior lighting, whether for externally lit signs, entrance doors, street lights, or service or drop-off areas, shall not be visible from public view, regardless of mounting height. Bulbs shall be recessed into the fixture and the lens shall be flat and frosted.

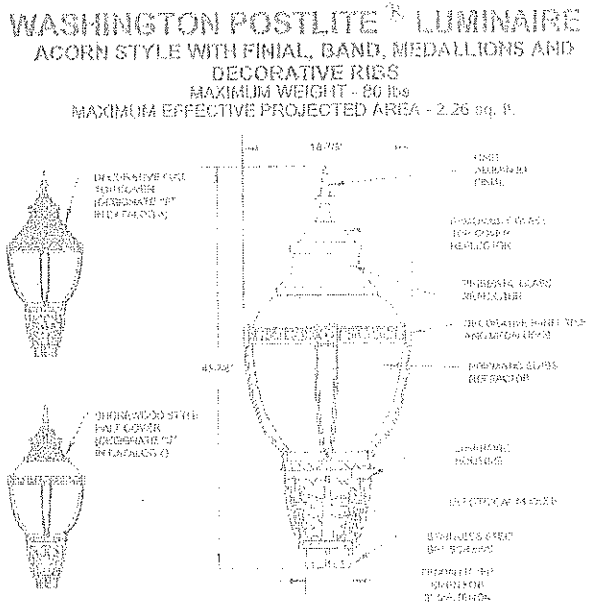
Recessed - A lamp built into a horizontal fixture or portion of a fixture, so that the lamp is fully cut-off and no part of the lamp extends or protrudes beyond the underside of a fixture or portion of a fixture.	

2. All fixtures, except wall mount and decorative fixtures, must be horizontal, and full cut-off type fixtures. Wall mount fixtures shall be full cut-off and fully shielded to prevent glare. All outdoor light fixtures should be equipped with or be capable of being back fitted with light directing devices such as shields, visors or hoods when necessary to redirect offending light distribution.

Flat lens "shoebox" or full cutoff design with horizontally aligned flush-mounted (non-protruding) lens style light fixtures are required over sag-lens or drop lens fixtures, which tend to waste energy and produce unnecessary glare.	

3. Directional fixtures such as floodlights, spot lights and sign lights shall be installed or aimed so that they do not shine directly into the window of a neighboring residence, directly into a roadway, or skyward. Photocells with timers are required that allow a floodlight to go on at dusk and off by 11:00 p.m. All light fixtures shall be located, aimed or shielded so to minimize stray light trespassing across property boundaries.

4. Decorative type lights along pedestrian walkways shall have stacked reflectors directing light downwards.

City of Belding Decorative Luminaire Standard (Subject to change): **Holophane Washington Series 150 watt High Pressure Sodium Luminaire with decorative bands, medallion, final and decorative full top cover.**	

5. Lamps shall be high-pressure sodium or metal halide. The use of mercury vapor lamps is prohibited. Maximum wattage for a specific use/location is as follows:

Location	Maximum Wattage (per luminaire)
Parking Lots/Vehicular Areas	400
Building and/or Walls	250
Pedestrian Walkways	150-175
Streets, Roadways	
Local	150-175
Collector	175-250
Arterial	250-400
Specialty Lighting	Variance is required

INSTALLATION REQUIREMENTS

Street lighting and poles shall be wired for underground service and all wiring shall be placed in conduit.

1. Smooth-Wall Schedule 40 PVC Conduit.

   Smooth-wall polyvinyl chloride (PVC) conduit, fittings and accessories must be manufactured from polyvinyl chloride meeting ASTM D 1784 and must comply with all the applicable requirements of NEMA TC2 and UL 651.

2. Electrical Wire and Cable.

   All wire and cable must conform to the National Electrical Code (NEC) and any local ordinances that apply and must meet all applicable ASTM specifications. Cable must be UL approved. Conductors must be coated soft drawn copper and be standard American Wire Gauge (AWG) sizes. All wire and cable must have the size, voltage rating, type of insulation and the manufacturer's name permanently marked on the outer covering at regular intervals. The manufacturer must furnish to the City all splicing or terminating information necessary for proper installation of the cable. Bare ground conductors must be soft drawn copper.

   a) Any cable used for an electric service entrance run must have a rating that includes a USE rating.

   b) Cable sized No. 2 AWG and smaller must be UL listed Type RHH/RHW and may be Type RHH/RHW/USE.

   c) Cable sized larger than No. 2 AWG must be UL listed Type RHH/RHW/USE.

   d) The UL listing mark, cable voltage, insulation type and ratings, as well as the cable size must all be clearly printed on the cable in a color contrasting with the insulation color.

3. Light Standard Foundation.

   a) Concrete. Maximum strength to be 4,000 PSI concrete.

   b) Steel Reinforcement. Use steel reinforcement as required by manufacturer.

   c) Anchor Bolts, Nuts and Washers. Anchor bolts, nuts and washers must meet manufacturer's recommendations for specified light and pole. Anchor bolts must be sized and placed (specified bolt circle) per the details for the specified light.

   d) Ground Rods. Use 8 foot, copper clad steel 5/8-inch diameter ground rod.

   e) Grounding Wire. Grounding wire for the street lighting unit must be No. 6 stranded bare copper wire.

   f) Conduit. Conduit must be provided in the foundation to allow for placement of conductors and grounding wires.

   g) Direct bury light pole extensions may be used only with approval by City staff.