City of Swartz Creek

Design Standards and Construction Specifications

September 8, 2004 (Final)

Compiled by:
Rowe Incorporated
6211 Taylor Drive
Flint, MI 48507
810•341•7500

Section 2 - Construction Specifications

DEFINITIONS

The following is a list of words and phrases defined for the purpose of their use in interpretation of the Design Standards and Construction Specifications Manual. These definitions shall apply in the interpretation, administration and enforcement of the Design Standards and Construction Specifications Manual. Words and phrases not specifically defined shall rely on their definition in the City of Swartz Creek's Zoning Ordinance, Land Division Control Ordinance, Condominium Regulations or its common or standard definition.

City - The City of Swartz Creek, Michigan, and its officers, employees and agents, including, but not limited to the City Council, City Planning Commission, City Staff, City Attorney, City Engineer, etc.

Contractor/Developer - The Contractor and/or the Developer is the person, partnership, corporation responsible for performing the work required by the City of Swartz Creek in accordance with the City of Swartz Creek's Design Standards and Construction Specifications Manual.

Design Standards - The applicable standards relevant to the planning, design and construction of infrastructure improvements within the City as adopted and contained in the City of Swartz Creek's Design Standard and Specifications Manual.

Engineer - The City of Swartz Creek's City Engineer, or other City officer, employee or agent acting on behalf of the City of Swartz Creek in the administration of the City's Design Standards and Specifications Manual.

Project Drawings/Plans - Include Site Plans, Plats, Condominium Site Plans, Project drawings and plans, etc. detailing the construction plans, requirements and specifications applicable to the City of Swartz Creek's Design Standards and Specifications Manual.

CITY OF SWARTZ CREEK

DESIGN STANDARDS AND CONSTRUCTION SPECIFICATIONS MANUAL

FEBRUARY 2004

Definitions

A. Major streets - Streets meeting one or more of the following:
   1. Streets that provide extensions to State trunk lines or County primary roads in facilitating through traffic.
   2. Streets that provide an integral network to service the traffic demands created by industrial, commercial, educational, or other traffic generating centers.
   3. Streets that provide for the circulation of traffic and around the central business district.
   4. Streets that are designated truck routes.
   5. Streets that collect traffic from an area served by an extensive network of local streets.

B. Local streets - streets not meeting any of the criteria for major streets.

General

A. Street Widths and Cross Sections

Streets shall be designed to meet or exceed the following width guidelines.

Type	Minimum Width (feet) Back of Curb to Back of Curb	Minimum Lane Width (feet)
Major Streets	30	13
*Local Streets	30	13
Boulevards (Per Lane)	28	12
Service Drives	28	12
Access Drives	24'-no curb	12

Note: for streets with parallel parking an additional 6' per side shall be added.

** Planning Commission may adjust road width to allow minimum lane width to be less than 13'*

Street cross sections shall include curb and gutter in accordance with concrete curb and gutter specification provided elsewhere in this document.

Street cross sections shall meet or exceed the details shown at the end of this section.

Pavement cross sections may have either a limestone base or full depth asphalt. All cross sections shall be subject to approval by the city.

Phased development shall use the same cross section throughout the entire project.

Concrete cross sections will be allowed, with thickness required to be determined by the City Engineer.

B. Boulevards and Islands

All islands shall be curbed in the same manner and in accordance with the same detail for curb and gutter used elsewhere.

Medians and islands shall have a minimum width of 10' from back of curb to back of curb. Hour glass and other odd shaped medians are not acceptable.

Material placed between the curbs shall be sodded earth, crushed limestone, or other materials approved by the City.

C. Cul-de-Sacs and Other Turn-arounds

Cul-de-sacs shall be avoided unless space restraints require such usage.

Cul-de-sacs should not exceed 750 feet in length.

Minimum radius for a cul-de-sac shall be 45 feet without an island and 55 feet with an island. See details at the end of this section.

Temporary cul-de-sac turnarounds shall have a minimum base of 8" crushed limestone.

"T" and "L" type turnarounds shall not be permitted.

D. Turning Radii at Intersections

Curb and gutter radii at intersections shall be as follows unless otherwise approved by the city:

	Radius (Back of Curb)
Major Streets	40'
Local Streets	30'
Commercial and Industrial Streets	50'

E. Turn Lanes/By-pass Lanes

Left turn lanes and bypass lanes should be considered on streets where traffic volumes are high enough or safety considerations are sufficient to warrant them. Such usage shall be determined on a case by case basis at the City's discretion.

F. Right-of-Way Requirements

County roads shall be of the width required by the Genesee County Road Commission.

All other street or roads shall have the following right-of-way widths:

	Minimum ROW Widths (Whichever is greater)	
Major Street	80' minimum	20' from back of curb
Local Street	66' minimum	18' from back of curb

Cul-de-sacs shall have a minimum right-of-way width of 18 feet beyond back of curb.

G. Sidewalks

Sidewalks shall have a minimum width of five feet.

Sidewalk shall match adjoining or existing sidewalk where possible. Sidewalks shall typically be placed one foot inside the ROW but not less than three feet from the back of curb.

Sidewalks shall "jog" around natural features (i.e. trees, etc.)

Integrated curb and sidewalk shall not be used.

Sidewalks shall have the following thickness:

Thru Commercial Drives	8" w/6" x 6" x #10 steel mesh
Thru Residential Drives	6"
Sidewalk Ramps	6"
All others	4"

Refer to drawings at the end of this section for cross sections.

Sidewalk transverse slopes shall not exceed 1/2 inch per foot. Transverse slopes less than 1/4 inch per foot shall not be used unless longitudinal drainage is provided. Longitudinal grades shall not exceed one inch per foot.

Sidewalk ramps shall be used at intersections where the sidewalk intersects a curb. Ramps shall not be steeper than one inch per foot. Ramps shall meet the requirements of the Americans With Disabilities Act.

H. Curb and Gutter

All curbing shall be concrete. No bituminous curbing shall be permitted.

Concrete curbing shall be standard MDOT details C4, D2 or Genesee County Road Commission 5d, unless otherwise approved by the City. Concrete curbing for major streets shall be C4 only. (Details are provided at the end of this section).

All curbing shall drain to catchbasins in the curb. Curbing shall be sloped using grades no less than 0.4% and a maximum grade of 6%. Catchbasins shall be spaced as specified elsewhere in this document.

Six inch edgedrain shall be used on all streets and connected into storm sewer catchbasins.

1. Suggested location for utilities

a. North and South Street

1) East Side

Storm Sewer	15'-0" to 23'-0" from centerline
Sanitary Sewer	20'-0" to 25'-0" from centerline

4 ft. Sidewalk	28'-0" to 32'-0" from centerline
Utility Conduit	30'-0" from centerline

2) West Side

Gas Main	19'-0" from centerline
Water Main	23'-0" to 25'-0" from centerline
*Utility Poles	27'-0" from centerline
4 ft. Sidewalk	28'-0" to 32'-0" from centerline
Utility Conduit	30'-0" from centerline

** Location also applicable if underground electric and telephone lines are used instead of overhead lines.*

b. East and West Street

1) North Side

Storm Sewer	15'-0" to 23'-0" from centerline
Sanitary Sewer	20'-0" to 25'-0" from centerline
4 ft. Sidewalk	28'-0" to 32'-0" from centerline
Utility Conduit	30'-0" from centerline

2) South Side

Gas Main	19'-0" from centerline
Water Main	23'-0" to 25'-0" from centerline
*Utility Poles	27'-0" from centerline
4 ft. Sidewalk	28'-0" to 32'-0" from centerline
Utility Conduit	30'-0" from centerline

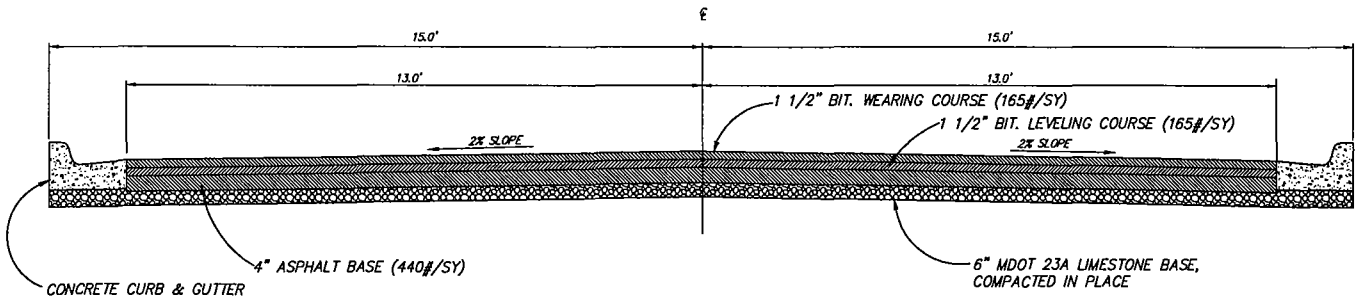
** Location also applicable if underground electric and telephone lines are used instead of overhead lines.*

I. Safety Path

The developer of a development project in any zoning district, except an individual single family home, shall provide non-motorized vehicle-pedestrian safety path segments in either existing or planned rights-of-way abutting the subject property for the full width of the subject property wherever safety paths are required on the city's adopted safety path plan. The developer may, at his/her option, deposit sufficient funds with the city to cover the actual cost for the city to install the required segment of the safety path.

All safety paths shall be constructed to the minimum standards adopted from time to time by resolution of the City of Swartz Creek, but not less than the following:

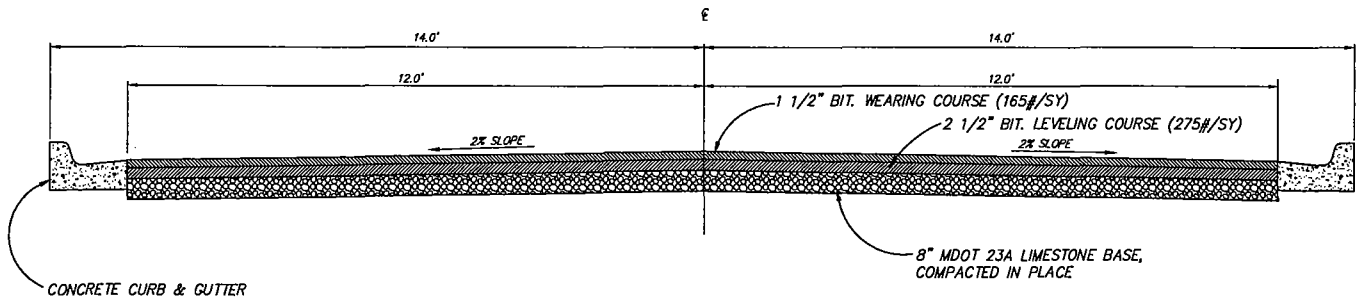
1. Minimum pavement width of eight (8) feet.
2. Minimum of three (3) inch bituminous surface on a three (3) inch aggregate base over a compacted subbase.
3. Aggregate path of 6" 23A Limestone may be allowed if found acceptable to the city.



MAJOR & LOCAL STREETS

(NOT TO SCALE)

NOTE: FULL DEPTH 9" ASPHALT PAVEMENT MAY BE SUBSTITUTED. PLANNING COMMISSION MAY ADJUST ROAD WIDTH TO ALLOW LANE WIDTH TO BE LESS THAN 13'-0"



SERVICE & ACCESS DRIVES

(NOT TO SCALE)

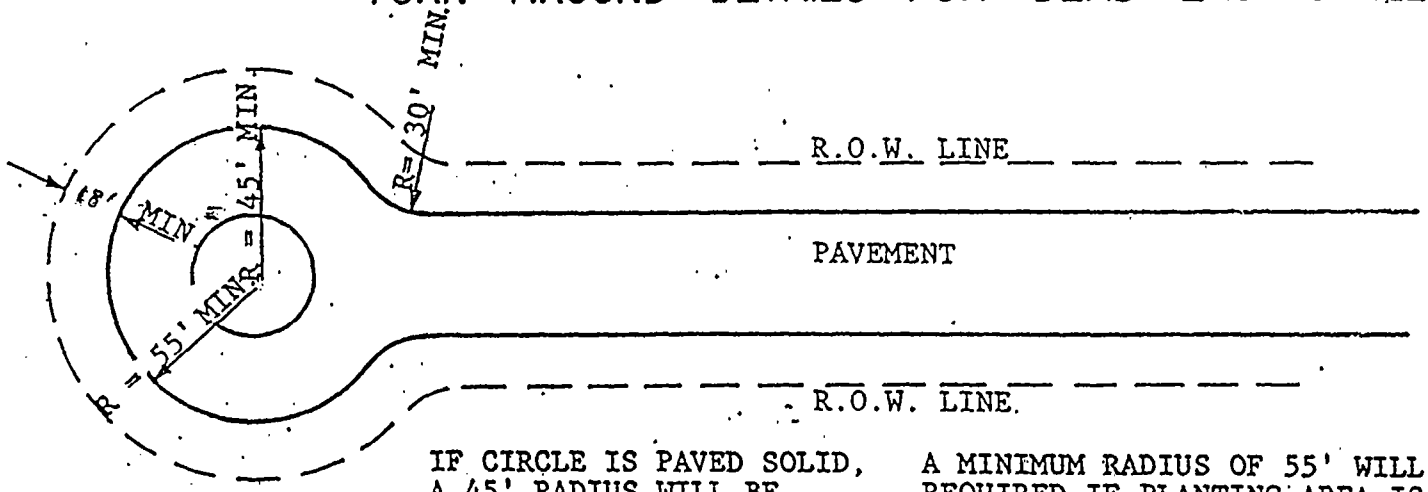
NOTE: ACCESS DRIVES ARE NOT REQUIRED TO INCLUDE CONCRETE CURB AND GUTTER

ROWE

PREPARED BY:
ROWE INC.
6211 TAYLOR DR.
FLINT, MI 48507

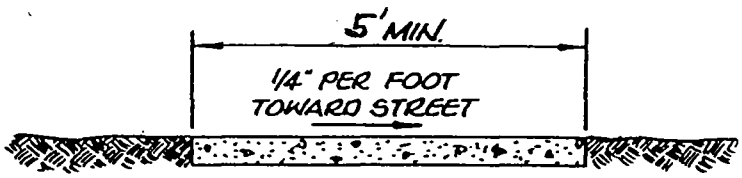
(810) 341-7500

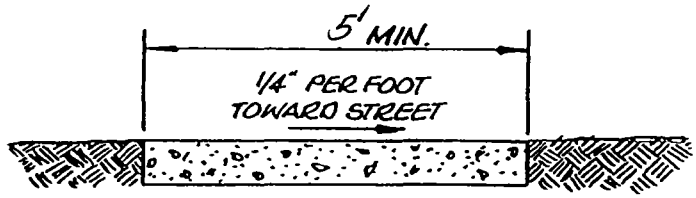
TURN AROUND DETAILS FOR DEAD END STREETS



IF CIRCLE IS PAVED SOLID, A 45' RADIUS WILL BE PERMITTED

A MINIMUM RADIUS OF 55' WILL BE REQUIRED IF PLANTING AREA IS APPROVED.



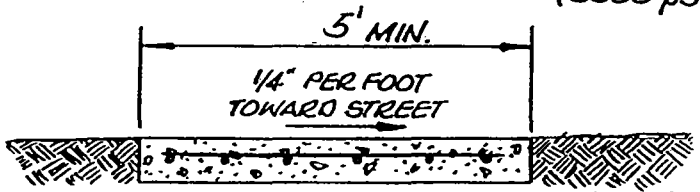


4" CONCRETE SIDEWALK

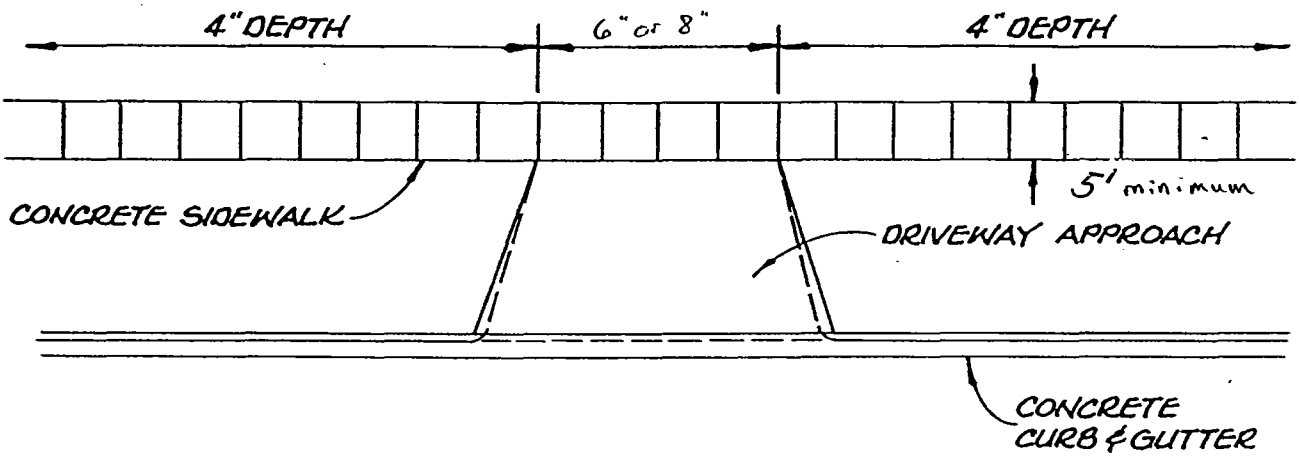
(3500 psi @ 28 DAYS)

6" CONCRETE SIDEWALK

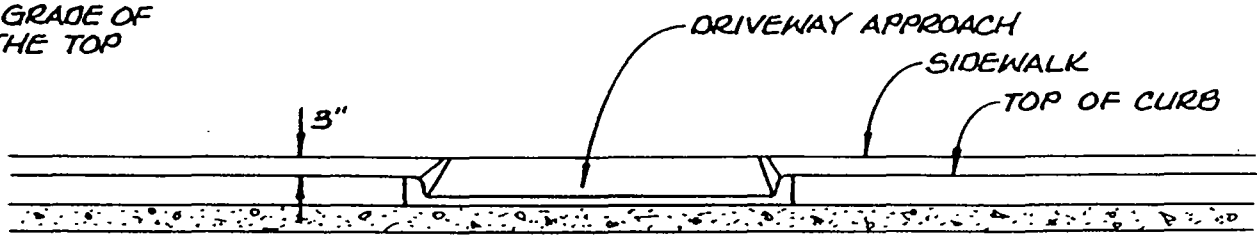
(FOR DRIVEWAYS & TRAFFIC AREAS)
(3500 psi @ 28 DAYS)



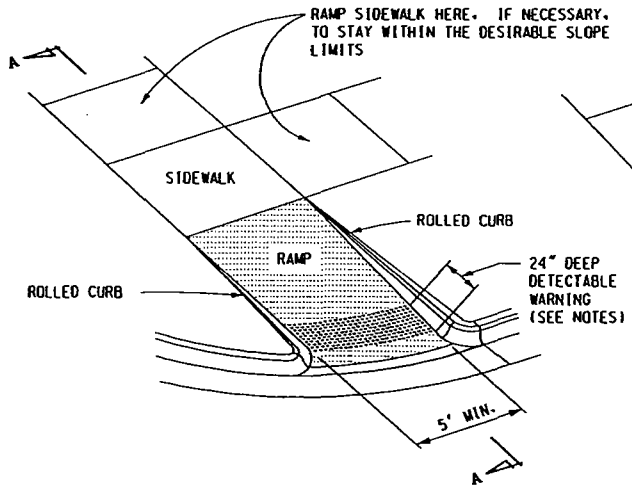
8" Concrete Sidewalk - Reinforced
(3500 PSI @ 28 Days)



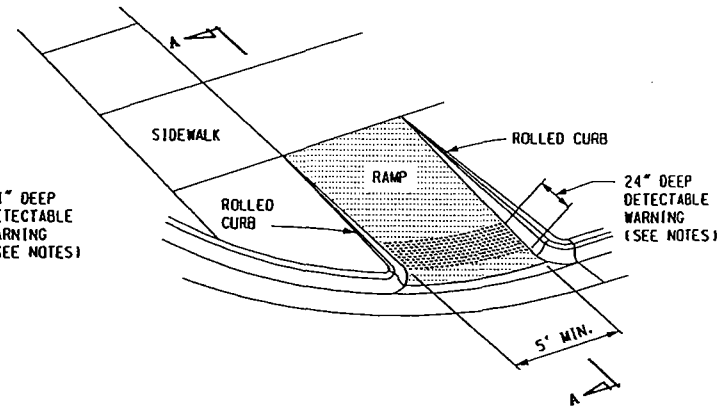
MAINTAIN A MINIMUM SIDEWALK GRADE OF 3" ABOVE THE TOP OF CURB.



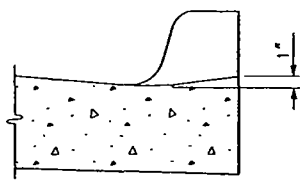
SIDEWALK DETAIL



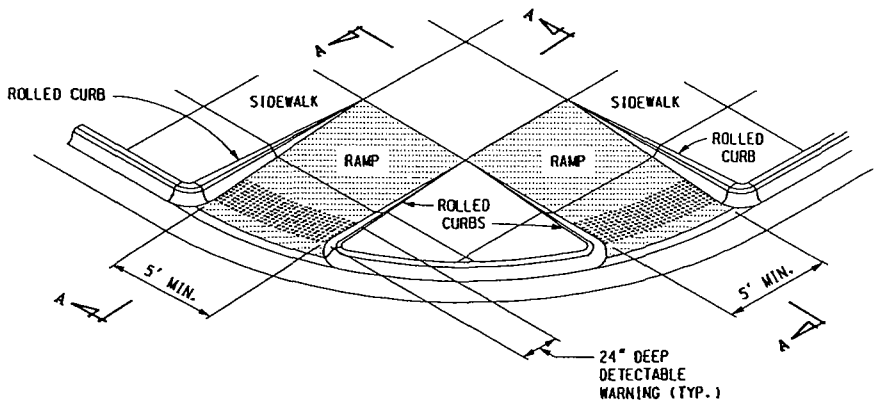
SIDEWALK RAMP TYPE 1



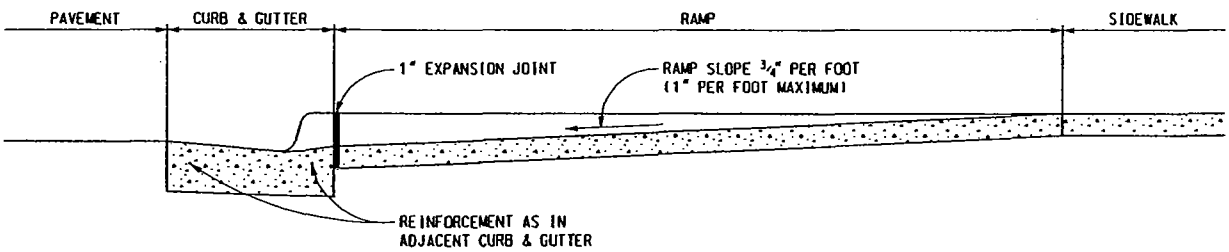
SIDEWALK RAMP TYPE 2



SECTION THROUGH CURB CUT
(TYPICAL ALL RAMP TYPES)



SIDEWALK RAMP TYPE 4
(TWO RAMPS ARE SHOWN)



SECTION A-A
(TYPICAL ALL RAMP DETAILS)

MDOT	ENGINEER OF CONSTRUCTION & TECHNOLOGY	ENGINEER - ROAD DESIGN	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR			
PREPARED BY DESIGN DIVISION	ENGINEER OF MAINTENANCE	ENGINEER OF DESIGN DEPARTMENT DIRECTOR Gregory J. Rosine	SIDEWALK RAMP DETAILS			
DRAWN BY: B.L.T. CHECKED BY: W.K.P.	ENGINEER OF TRAFFIC AND SAFETY	BY: CHIEF ENGINEER/DEPUTY DIRECTOR BUREAU OF HIGHWAY TECHNICAL SERVICES	F.H.W.A. APPROVAL	11-6-2002 PLAN DATE	R-28-D	SHEET 1 OF 3

LEGEND

SIDEWALK

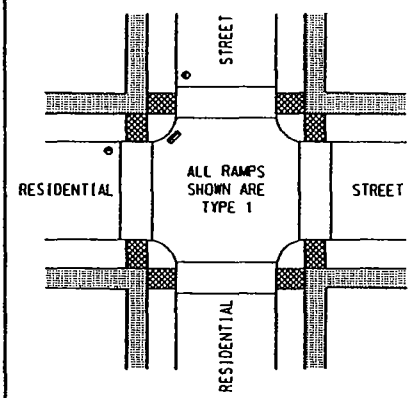
INDICATES PAY LIMITS OF SIDEWALK RAMPS TYPE 1, 2 AND 4

PREFERRED LOCATION OF DRAINAGE INLET (TYP.)

ALTERNATE LOCATION OF DRAINAGE INLET (TYP.)

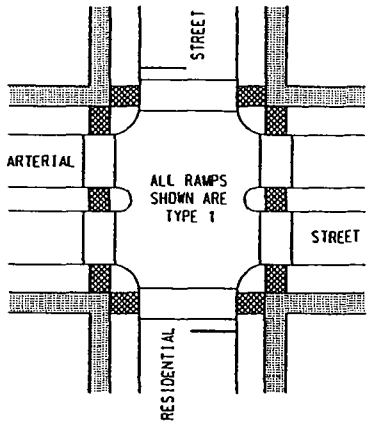
CROSSWALK MARKING

STOP LINE MARKING



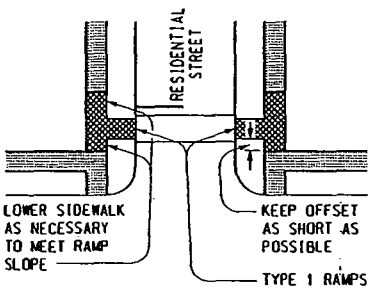
NORMAL TREATMENT IN RESIDENTIAL AREAS

A



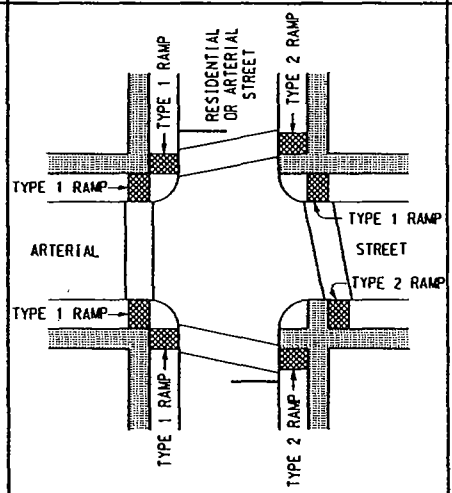
DIVIDED ARTERIAL STREET

B



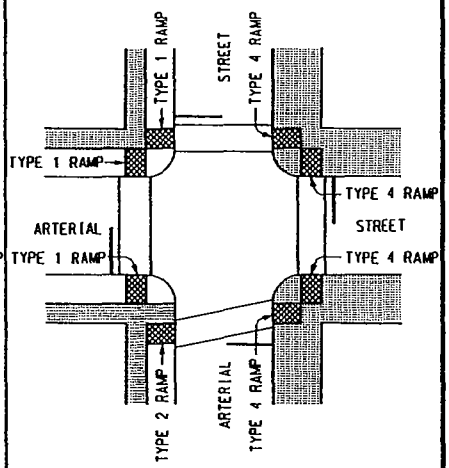
MAY BE USED ONLY WHERE TRAFFIC VOLUME IS LOW AND WHERE OTHER FEATURES MAKE DETAIL A IMPRACTICAL.

C



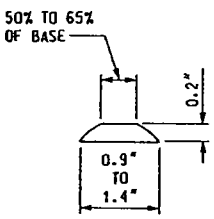
TYPICAL RAMP TREATMENTS SIGNALIZED INTERSECTIONS

D

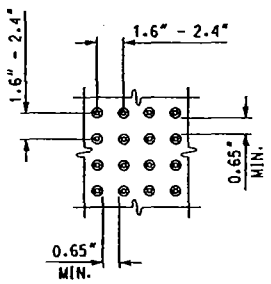


TYPICAL RAMP TREATMENTS TRAFFIC CONTROL ON BOTH STREETS

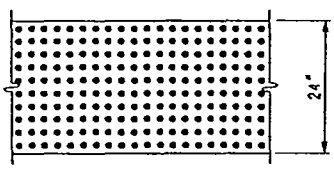
E



DOME SECTION



DOME SPACING



DOME ALIGNMENT

DETECTABLE WARNING DETAILS

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR

SIDEWALK RAMP DETAILS

F.H.W.A. APPROVAL	11-6-2002 PLAN DATE	R-28-D	SHEET 2 OF 3

NOTES:

DETAILS SPECIFIED ON THIS PLAN APPLY TO ALL CONSTRUCTION OR RECONSTRUCTION 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.

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 NORMAL GUTTER LINE PROFILE SHALL BE MAINTAINED THROUGH THE AREA OF THE RAMP.

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

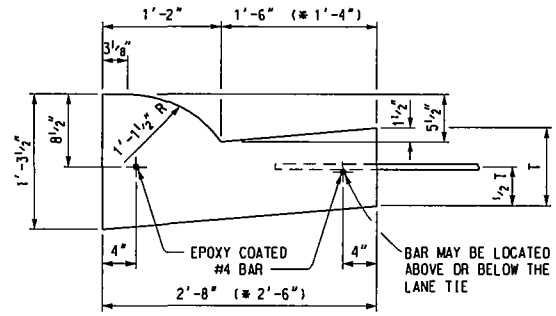
CROSSWALK AND STOP LINE MARKINGS, IF USED, SHALL BE SO LOCATED AS TO STOP TRAFFIC SHORT OF RAMP CROSSINGS. SPECIFIC DETAILS FOR MARKING APPLICATIONS ARE GIVEN IN THE "MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES".

DETECTABLE WARNINGS SHALL EXTEND THE FULL WIDTH OF THE CURB RAMP. THEY SHALL BE LOCATED SO THAT THE EDGE NEAREST THE CURB LINE IS 6" TO 8" FROM THE CURB LINE.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR

SIDEWALK RAMP DETAILS

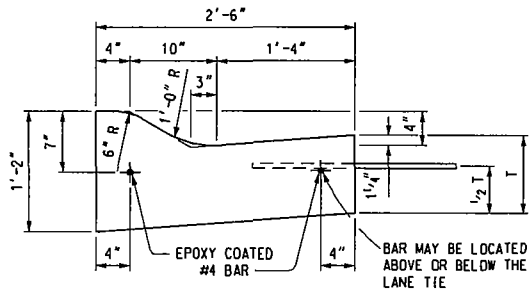
F.H.W.A. APPROVAL	11-6-2002 PLAN DATE	R-28-D	SHEET 3 OF 3



(* GUTTER PAN WIDTH MAY BE REDUCED WHEN APPROVED BY THE ENGINEER)

DETAIL	DIMENSION T	LANE TIES	CONCRETE CYD / LFT	CONCRETE CYD / LFT
B1	9"	AS SHOWN	0.0900	(* 0.0855)
B2	9"	OMITTED	0.0900	(* 0.0855)
B3	10"	AS SHOWN	0.0941	(* 0.0894)

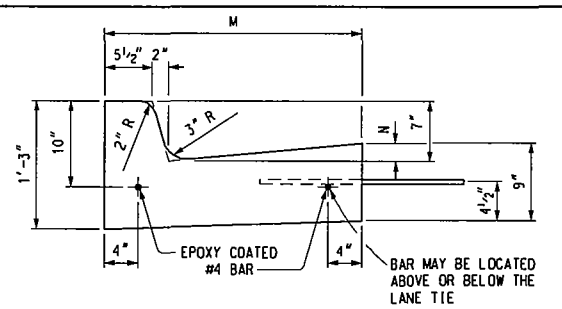
B



SEE NOTES WHEN PAVEMENT JOINT IS SEALED WITH NEOPRENE

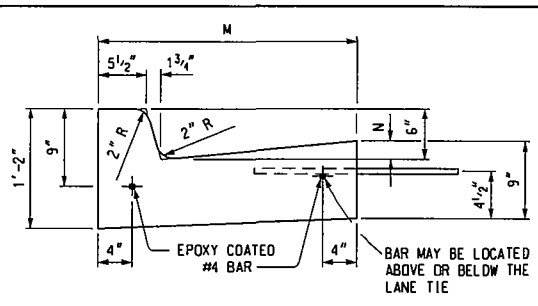
DETAIL	DIMENSION T	LANE TIES	CONCRETE CYD / LFT
D1	9"	AS SHOWN	0.0788
D2	9"	OMITTED	0.0788
D3	10"	AS SHOWN	0.0826

D



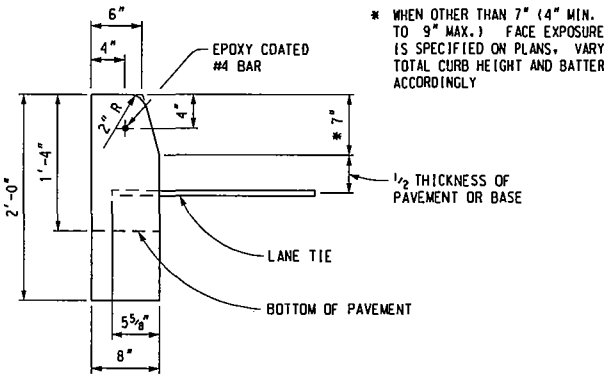
DETAIL	DIMENSION M	DIMENSION N	LANE TIES	CONCRETE CYD / LFT
C1	1'-6"	7/8"	AS SHOWN	0.0506
C2	1'-6"	7/8"	OMITTED	0.0506
C3	2'-0"	1 3/8"	AS SHOWN	0.0632
C4	2'-0"	1 3/8"	OMITTED	0.0632
C5	2'-6"	1 7/8"	AS SHOWN	0.0757
C6	2'-6"	1 7/8"	OMITTED	0.0757

C



DETAIL	DIMENSION M	DIMENSION N	LANE TIES	CONCRETE CYD / LFT
F1	1'-6"	7/8"	AS SHOWN	0.0484
F2	1'-6"	7/8"	OMITTED	0.0484
F3	2'-0"	1 3/8"	AS SHOWN	0.0610
F4	2'-0"	1 3/8"	OMITTED	0.0610
F5	2'-6"	1 7/8"	AS SHOWN	0.0737
F6	2'-6"	1 7/8"	OMITTED	0.0737

F



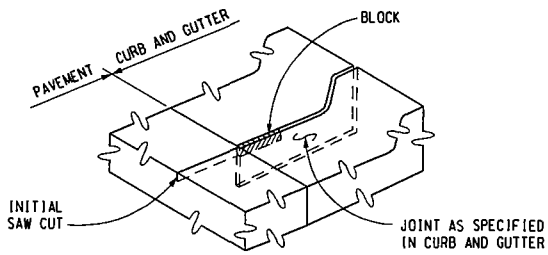
* WHEN OTHER THAN 7" (4" MIN. TO 9" MAX.) FACE EXPOSURE IS SPECIFIED ON PLANS, VARY TOTAL CURB HEIGHT AND BATTER ACCORDINGLY

DETAIL	CURB HEIGHT	LANE TIES	CONCRETE CYD / LFT
E1	1'-4"	AS SHOWN	0.0310
E2	1'-4"	OMITTED	0.0310
E4	2'-0"	OMITTED	0.0477

E

NOTE:

PLACE BLOCK IN FRONT EDGE OF GUTTER PAN. BLOCK WIDTH AND DEPTH SHALL BE THE SAME WIDTH AND DEPTH AS PROPOSED JOINT IN PAVEMENT. THE LENGTH OF BLOCK SHALL BE SUCH THAT THE FULL DEPTH OF THE JOINT IN CONCRETE PAVEMENT CAN BE OBTAINED. BLOCKED OUT AREA SHALL BE SEALED WITH THE SANE SEALER AS USED IN CONCRETE PAVEMENT.



PROVISION FOR SAW CUT

(TO BE MADE WHEN FINAL SAW CUT IN PAVEMENT IS MADE AFTER CURB AND GUTTER IS PLACED)

MDOT Michigan Department of Transportation

PREPARED BY DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

ENGINEER OF CONSTRUCTION & TECHNOLOGY

ENGINEER OF MAINTENANCE

ENGINEER OF TRAFFIC AND SAFETY

ENGINEER - ROAD DESIGN

ENGINEER OF DESIGN

DEPARTMENT DIRECTOR
Gregory J. Rosine

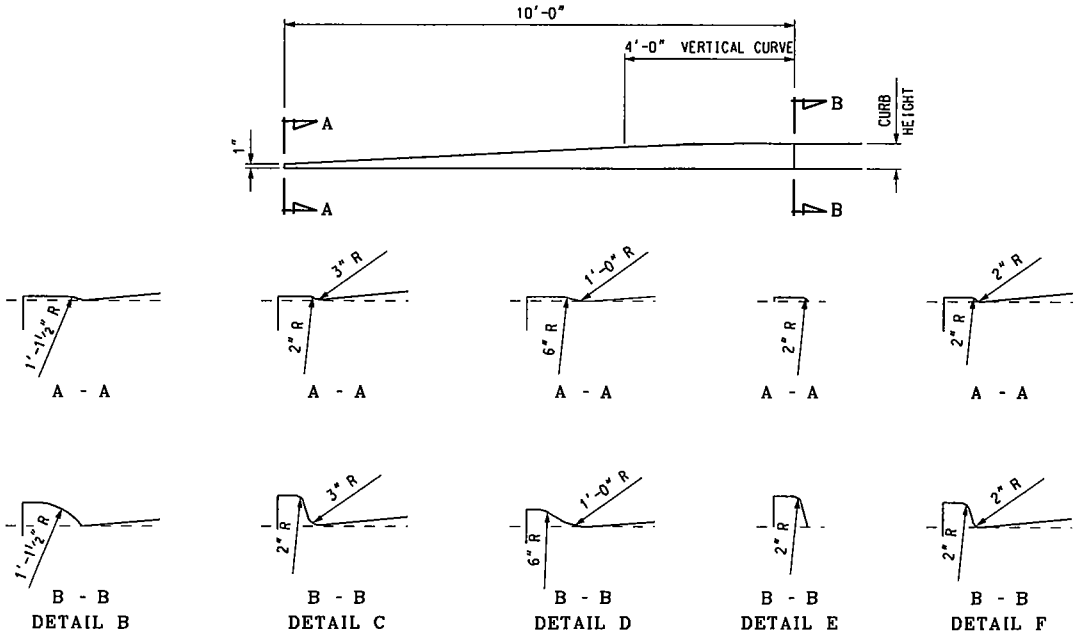
BY:
CHIEF ENGINEER/DEPUTY DIRECTOR
BUREAU OF HIGHWAY TECHNICAL SERVICES

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR

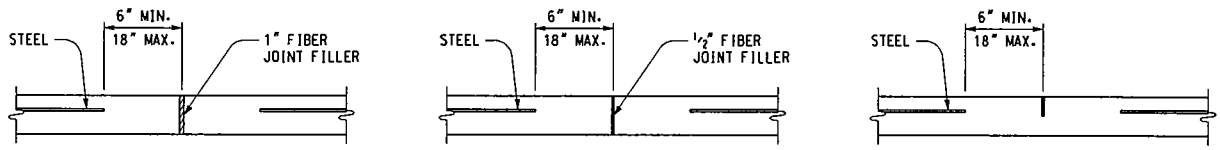
CONCRETE CURB AND CONCRETE CURB & GUTTER

9-14-2001 F.H.W.A. APPROVAL	2-22-2001 PLAN DATE	R-30-D	SHEET 1 OF 2

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.



CONCRETE CURB, CURB AND GUTTER ENDINGS



1" FIBER JOINT FILLER ½" FIBER JOINT FILLER CONTRACTION JOINT

NOTES:

CURB AND GUTTER RADII SHALL BE DIMENSIONED TO THE FRONT EDGE OF THE GUTTER PAN OR EDGE OF PAVEMENT.

CONCRETE CURB AND GUTTER ENDINGS WILL BE PAID FOR IN LINEAR FEET OF THE ADJACENT CURB DETAIL.

PAVEMENT REINFORCEMENT MAY BE SUBSTITUTED FOR THE EPOXY COATED #4 BARS SPECIFIED (TEMPERATURE STEEL), PROVIDED A MINIMUM OF 0.33 $in.^2$ OF LONGITUDINAL STEEL AREA IS FURNISHED.

JOINTS SHALL BE PLACED AT RIGHT ANGLES TO THE EDGE OF CONCRETE CURB AND GUTTER.

JOINTS DETAILED ON THE PLANS SHALL SUPERSEDE THOSE SPECIFIED ON THIS STANDARD PLAN.

BOTTOM SLOPE OF CURB AND GUTTER STRUCTURE MAY BE THE SAME SLOPE AS BOTTOM OF PAVEMENT. BACK OF CURB AND VERTICAL EDGE OF GUTTER PAN MAY HAVE A MAXIMUM ½" BATTER TO FACILITATE FORMING.

WHEN CURB AND GUTTER IS CAST INTEGRALLY, SEE CURRENT STANDARD PLAN R-31-SERIES.

OMIT LONGITUDINAL REINFORCEMENT WHEN CURB AND GUTTER IS TIED TO A NON-REINFORCED CONCRETE BASE COURSE OR PAVEMENT.

JOINTS IN CURB OR CURB AND GUTTER NOT TIED TO CONCRETE PAVEMENT; ADJACENT TO CONCRETE BASE COURSE; OR ADJACENT TO BITUMINOUS PAVEMENT:

A. PLACE 1" FIBER JOINT FILLER AT 400' MAXIMUM INTERVALS.

B. PLACE 1" FIBER JOINT FILLER AT SPRING POINTS OF INTERSECTING STREETS.

C. PLACE 1" FIBER JOINT FILLER IN ADJACENT CONTRACTION JOINTS EACH SIDE OF CATCH BASINS.

D. PLACE CONTRACTION JOINTS AT 40' MAXIMUM INTERVALS.

JOINTS IN CURB OR CURB AND GUTTER TIED TO JOINTED PAVEMENT

A. PLACE 1" FIBER JOINT FILLER OPPOSITE ALL TRANSVERSE EXPANSION JOINTS IN PAVEMENT.

B. PLACE ½" FIBER JOINT FILLER IN ADJACENT CONTRACTION JOINTS EACH SIDE OF CATCH BASINS.

C. PLACE CONTRACTION JOINTS OPPOSITE ALL TRANSVERSE CONTRACTION JOINTS IN PAVEMENT. WHEN THE PAVEMENT IS PLACED BETWEEN JUNE 1ST AND SEPTEMBER 15TH, AND THE CURB AND GUTTER IS PLACED AFTER OCTOBER 1ST, 1" FIBER JOINT FILLER SHALL BE PLACED IN ALL CURB OR CURB AND GUTTER CONTRACTION JOINTS.

D. A SYMBOL (B) JOINT SHALL BE PLACED BETWEEN CURB OR CURB AND GUTTER AND ADJACENT CONCRETE PAVEMENT AS SPECIFIED ON STANDARD PLAN R-41-SERIES.

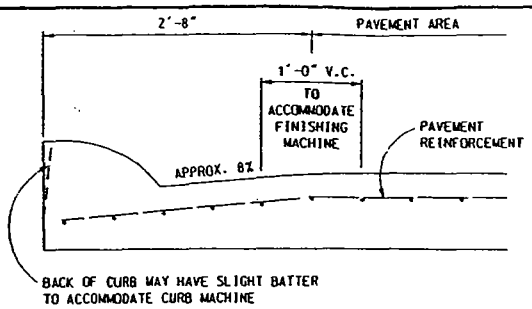
E. WHEN CURB AND GUTTER DETAIL D ADJOINS PAVEMENT SEALED WITH NEOPRENE, THE NEOPRENE JOINT SEALER SHALL BE CONTINUED IN ONE PIECE ACROSS THE CONTRACTION OR ½" FIBER JOINT AND TURNED DOWN OUTSIDE EDGE OF CURB.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR

CONCRETE CURB AND CONCRETE CURB & GUTTER

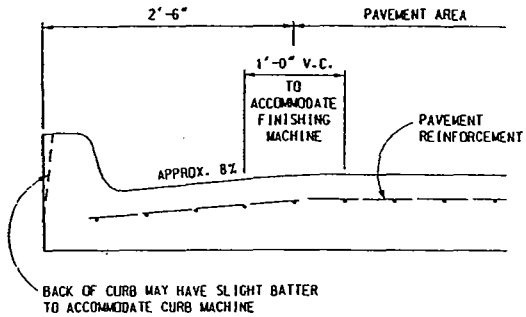
9-14-2001 F.H.W.A. APPROVAL	2-22-2001 PLAN DATE	R-30-D	SHEET 2 OF 2

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.



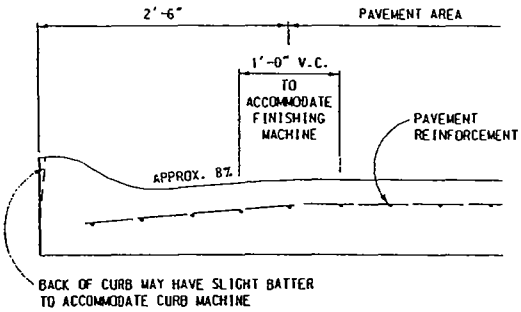
SECTION A - A

INTEGRAL CURB & GUTTER, DETAIL B



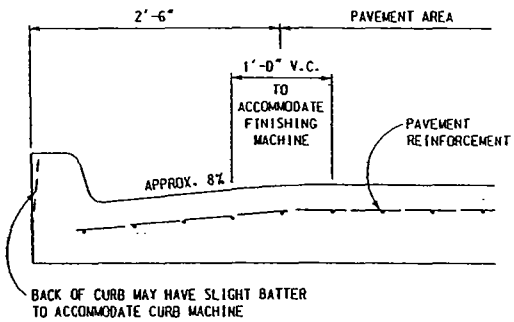
SECTION A - A

INTEGRAL CURB & GUTTER, DETAIL C



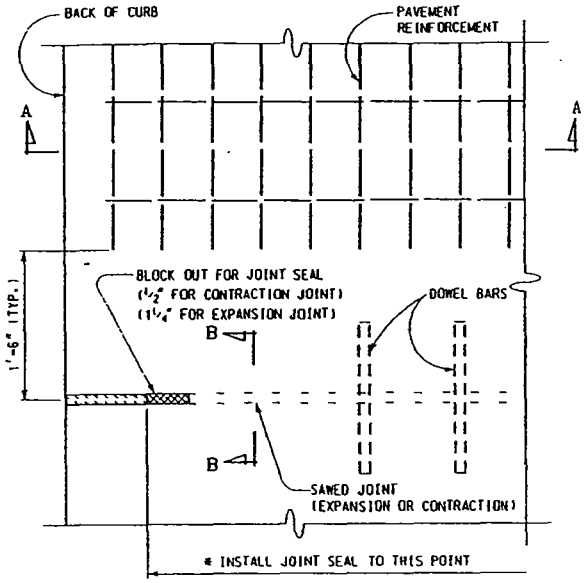
SECTION A - A

INTEGRAL CURB & GUTTER, DETAIL D



SECTION A - A

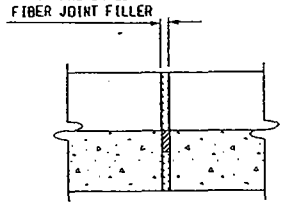
INTEGRAL CURB & GUTTER, DETAIL F



* WHEN CURB AND GUTTER, DETAIL D IS SPECIFIED AND NEOPRENE JOINT SEALER IS USED IN PAVEMENT, THE NEOPRENE JOINT SEALER SHALL BE CONTINUOUS ACROSS THE CURB AND GUTTER AND TURNED DOWN THE OUTSIDE EDGE.

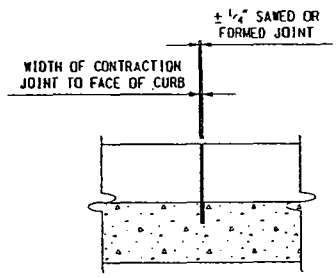
PLAN AT TRANSVERSE JOINT

NOTE:
WHEN PAVEMENT REINFORCEMENT IS EXTENDED INTO INTEGRAL CURB, IT SHALL BE PLACED AS SPECIFIED ON CURRENT STANDARD PLAN R-45-SERIES.



SECTION B - B

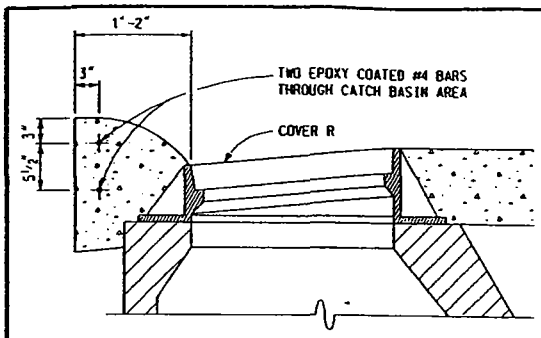
EXPANSION JOINT



SECTION B - B

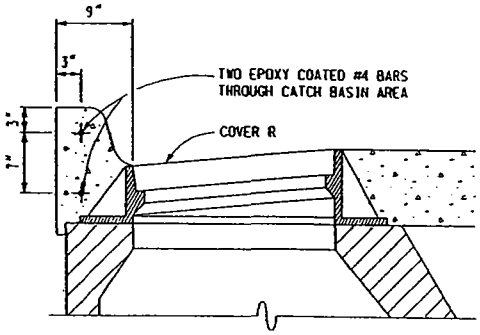
CONTRACTION JOINT

MDOT Michigan Department of Transportation PREPARED BY DESIGN DIVISION DRAWN BY: B.L.T. CHECKED BY: W.K.P.	ENGINEER OF CONSTRUCTION & TECHNOLOGY ENGINEER OF MAINTENANCE ENGINEER OF TRAFFIC AND SAFETY	ENGINEER - ROAD DESIGN ENGINEER OF DESIGN DEPARTMENT DIRECTOR Gregory J. Rosine BY: CHIEF ENGINEER/DEPUTY DIRECTOR BUREAU OF HIGHWAY TECHNICAL SERVICES	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR INTEGRAL CURB AND INTEGRAL CURB & GUTTER	F.H.W.A. APPROVAL	2-22-2001 PLAN DATE	R-31-C	SHEET 1 OF 2



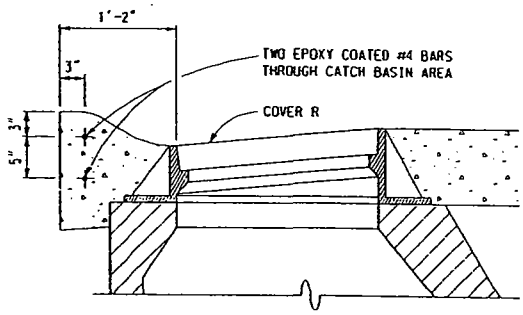
SECTION C - C

INTEGRAL CURB & GUTTER, DETAIL B



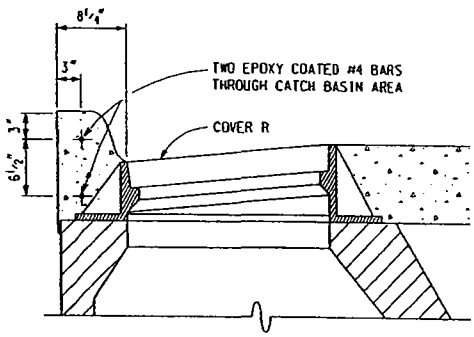
SECTION C - C

INTEGRAL CURB & GUTTER, DETAIL C



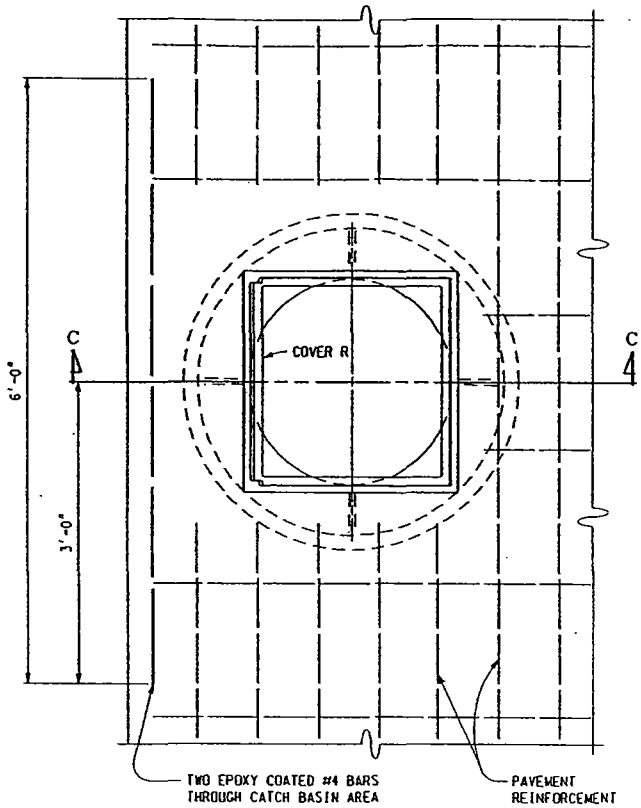
SECTION C - C

INTEGRAL CURB & GUTTER, DETAIL D



SECTION C - C

INTEGRAL CURB & GUTTER, DETAIL F



PLAN IN CATCH BASIN AREA

NOTES:

DETAILS OF CURB FACES ARE SPECIFIED ON STANDARD PLAN R-30-SERIES.

THE PAVEMENT REINFORCEMENT ILLUSTRATED, EXTENDED TO WITHIN 3" OF BACK OF INTEGRAL CURB OR INTEGRAL CURB AND GUTTER, MAY BE SUBSTITUTED FOR THE BAR REINFORCEMENT SPECIFIED ON STANDARD PLAN R-30-SERIES.

WHEN THE CURB PORTION IS POURED SEPARATE FROM THE INTEGRAL PAVEMENT AND GUTTER, AND DELAY EXCEEDS 30 MINUTES, EPOXY COATED #4 VERTICAL BARS SPACED AT 1'-0" CENTER TO CENTER SHALL BE USED TO TIE CURB AND UNDERLYING CONCRETE.

AGGREGATE BASE-CONCRETE, WHEN SPECIFIED ON TYPICAL CROSS SECTIONS, SHALL EXTEND 2'-0" BEYOND THE BACK OF INTEGRAL CURB AND GUTTER, EVEN IF THE GRADING SECTION MUST BE WIDENED TO DO SO. NO PAYMENT WILL BE MADE FOR THE ADDITIONAL AGGREGATE BASE-CONCRETE THAT IS REQUIRED TO CONSTRUCT THE INTEGRAL CURB AND GUTTER ALTERNATE.

TRANSVERSE JOINTS IN THE INTEGRAL CURB SHALL BE AS SPECIFIED ON THIS STANDARD PLAN AND THE PAVEMENT CROWN SHALL BE EXTENDED TO THE FACE OF THE CURB.

FIBER FILLER USED FOR PAVEMENT EXPANSION JOINTS SHALL EXTEND TO BACK OF CURB.

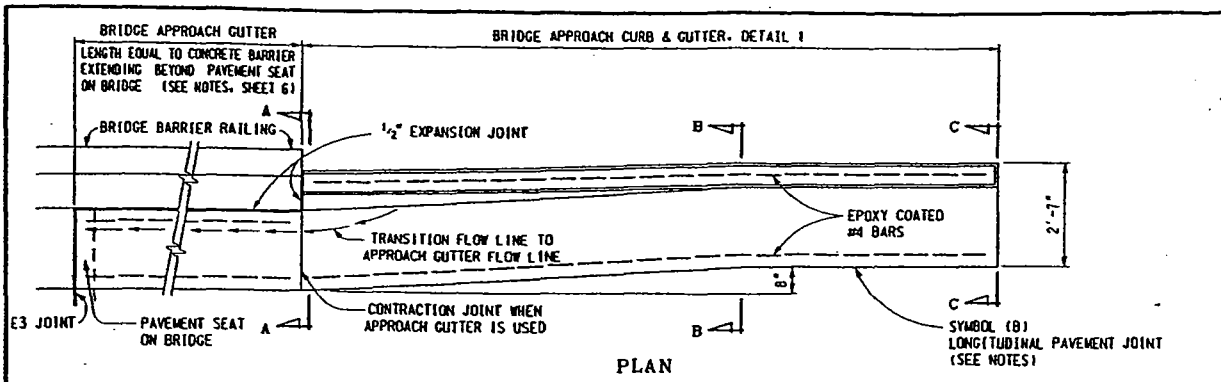
CATCH BASIN "COVER R" OR OTHER APPROVED COVERS SHALL BE SUBSTITUTED FOR COVERS SPECIFIED ON THE PLANS ONLY WHEN THE INTEGRAL CURB AND GUTTER ALTERNATE IS USED.

MICHIGAN DEPARTMENT OF TRANSPORTATION

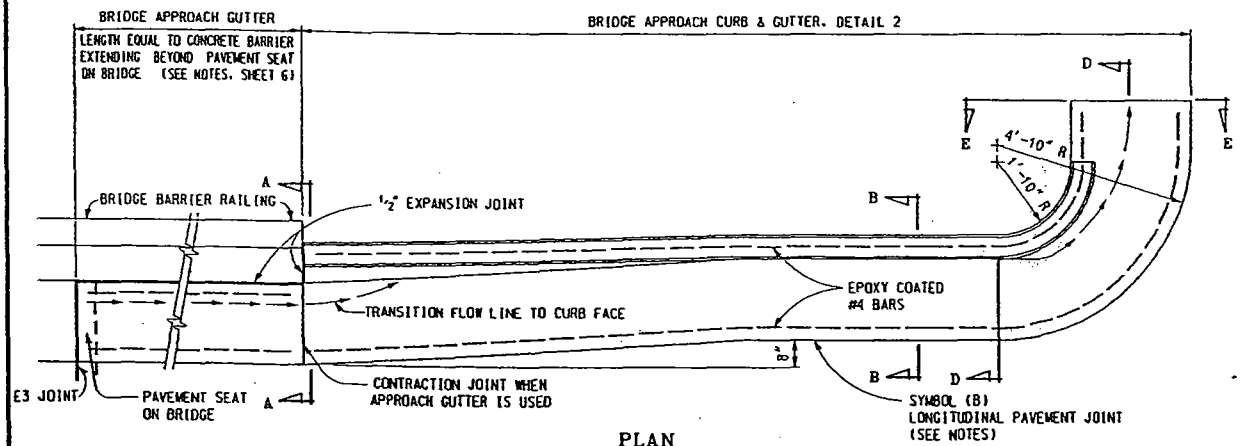
BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR

INTEGRAL CURB AND INTEGRAL CURB & GUTTER

F.H.W.A. APPROVAL	2-22-2001 PLAN DATE	R-31-C	SHEET 2 OF 2



BRIDGE APPROACH CURB & GUTTER, DETAIL 1



BRIDGE APPROACH CURB & GUTTER, DETAIL 2

MDOT Michigan Department of Transportation PREPARED BY DESIGN DIVISION DRAWN BY: B.L.T. CHECKED BY: W.K.P.	ENGINEER OF CONSTRUCTION & TECHNOLOGY ENGINEER OF MAINTENANCE ENGINEER OF TRAFFIC AND SAFETY	ENGINEER - ROAD DESIGN ENGINEER OF DESIGN DEPARTMENT DIRECTOR Gregory J. Rosine BY: CHIEF ENGINEER/DEPUTY DIRECTOR BUREAU OF HIGHWAY TECHNICAL SERVICES	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR APPROACH CURB & GUTTER DOWNSPOUTS (FOR BRIDGE BARRIER ON RURAL HIGHWAYS)		
			F.H.W.A. APPROVAL	2-23-2001 PLAN DATE	R-32-D	SHEET 1 OF 6

General

It is the intent of this document to provide general guidelines for street lighting for all Major and Local Streets within the City of Swartz Creek. Street lighting shall be designed to provide illumination for the highest level of safety for vehicular and pedestrian traffic with minimal intrusion into neighboring residences. All street lighting should be designed by a qualified professional engineer or Consumers Energy. All lighting designs, fixtures, etc. shall be reviewed and approved by the City.

A. Intensity

All street lights within the City of Swartz Creek shall have a minimum Luminaire Rating of 8500 Lumens and provide a minimum intensity averaging 0.5 foot candles measured at the surface of the street along the entire length of street. The City may require a photometric plan (lighting grid) to determine the appropriateness of the proposed lighting layout and intensity. The City may differ from this requirement, requiring a higher or lower standard (Lumen Ratings and/or intensity) along Major Streets, Collector Streets and other areas deemed appropriate by the City due to traffic (vehicular and pedestrian), safety concerns, neighborhood character, etc.

B. Lighting Source

Street light lamps shall be High-Pressure Sodium or Metal Halide.

C. Fixture Heights/Poles

Street lighting poles shall have a minimum height of 12 feet and a maximum height of 20 feet, unless approved by the City. A pole height of 14 feet is preferred.

Street lighting poles shall be made of steel or fiberglass and shall be black/decorative. Steel poles or wooden posts shall not be permitted except as expressly permitted by the City.

D. Fixtures

All street lighting fixtures shall be reviewed by the City. Street lighting fixtures should compliment the City's existing street lighting system and historic character. Contemporary lighting fixtures shall not be permitted. Decorative or Traditional Street lighting Fixtures offered by Consumers Energy or other comparable fixtures may be approved by the City.

Street lights along Major Streets and any other location deemed appropriate by the City, shall be fitted with a bracket and electric outlet for hanging street decorations. A ground mounted electric outlet which may be properly secured shall also be provided.

E. Spacing

Street lights shall be placed at every street intersection to provide maximum illumination. Street lights on Boulevard Streets or entrances shall be placed on the outside of each lane at the intersection.

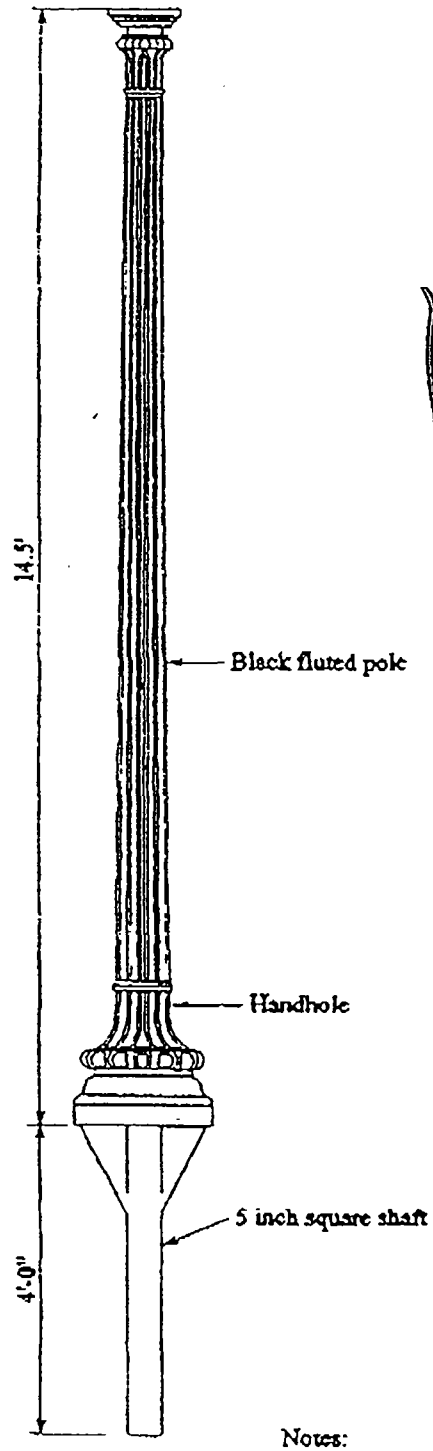
Street lights shall be staggered or on one side of a street utilizing, with staggered lighting on alternating sides of the street preferred. Street lights shall be spaced in such a manner that the separation between lighting patterns ("dark spots") does not exceed 10 feet. Utilizing street lights at each street intersection as the end points, street lights shall be spaced equally, as much as possible, between the end points; however, in no instance shall the spacing between lights shall be 105 feet on Local Streets and 80 feet on Major Streets. However, spacing may be reduced to increase lighting intensity and overlapping lighting patterns, along Major Streets, Collector Streets and other areas deemed appropriate by the City due to traffic (vehicular and pedestrian) safety concerns, neighborhood character, etc.

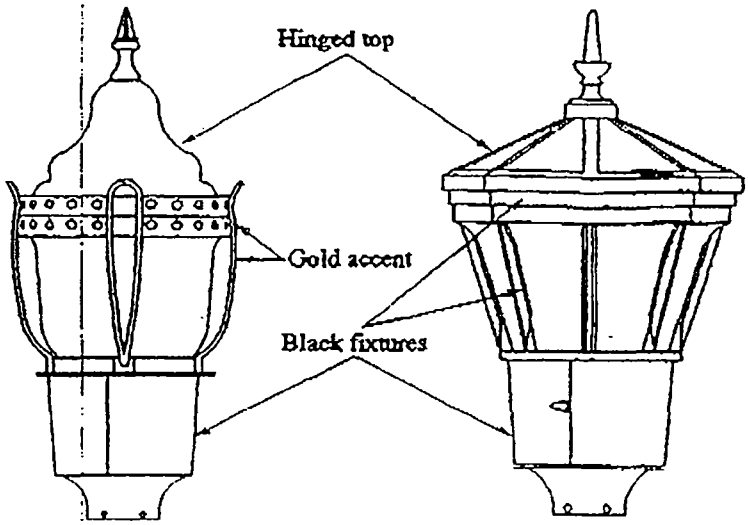
F. General Restrictions

All wiring shall be UL Listed for wet locations. No wiring shall be exposed.

All street lights shall have underground wiring. No overhead fixtures.

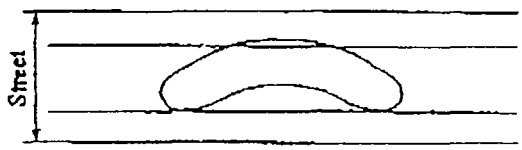
All illumination shall be constant, not flashing, moving or intermittent.





Acorn

Arlington



Light Distribution
Type III

Luminaire - 8500 Lum, 100 Watt, High Pressure Sodium with Photo Cell

A	B	C	D	E	F	G	H	
S	L			8'		A	C	Acorn
						A	R	Arlington

Pole - Fiberglass, Black, Fluted, 14.5Ft Mounting Height
Direct burial (one piece) pole shown will be by CMS entry

A	B	C	D	E	F	G	H
D	L	4		F	C	B	L, K	F C

Includes: 2/C #8 AL supply wire

Notes:

1. Anchor base poles available by special order.
2. Other pole heights available by special order.
3. These poles and fixtures are intended to be bundled as an aesthetics package and not combined with more basic components.

Premium Designs

General

A. Residential

All residential driveways within the road right-of-way shall be concrete with a minimum thickness of 6". Residential driveway shall have a minimum width of 10 feet or match the existing drive. No residential driveway shall be wider than 30 feet unless approved in writing by the City. Bituminous driveways will require approval by the city in writing.

Requirements for residential curb cuts shall be as follows:

Requirements	Local Streets 50 ft. R.O.W.	Collector Streets	Arterial Streets 80 ft. R.O.W. or more
Intersection to first curb cut from intersection corner radii	20 ft.	40 ft.	40 ft.
Minimum length of tangent curb between drives	4 ft.	4 ft.	4 ft.
Minimum curb cut	14 ft.	14 ft.	20 ft.
Maximum curb cut	26 ft.	30 ft.	50 ft.
Maximum amount of property frontage in drives	30%	35%	40%
Minimum width of drive at property line	10 ft.	10 ft.	10 ft.
Maximum width of drive at property line	20 ft.	24 ft.	30 ft.

B. Commercial

All commercial driveways within the road right-of-way shall be concrete with a minimum thickness of 8" and reinforced with 6" x 6" x 10" steel mesh. Commercial drives shall be of a width approved by the City.

Requirements for commercial curb cuts shall follow current Genesee County Road Commission Standards.

C. Industrial

Heavily traveled industrial drives shall be designed by a qualified professional engineer and approved by the City. Industrial drive widths shall be approved by the City.

D. Approaches

Approaches shall have adequate flares to provide a safe turning radius. Minimum flaring shall be 6 feet on the right side and 4 feet on the left. Flaring length shall be minimum of 10 feet. Flarings

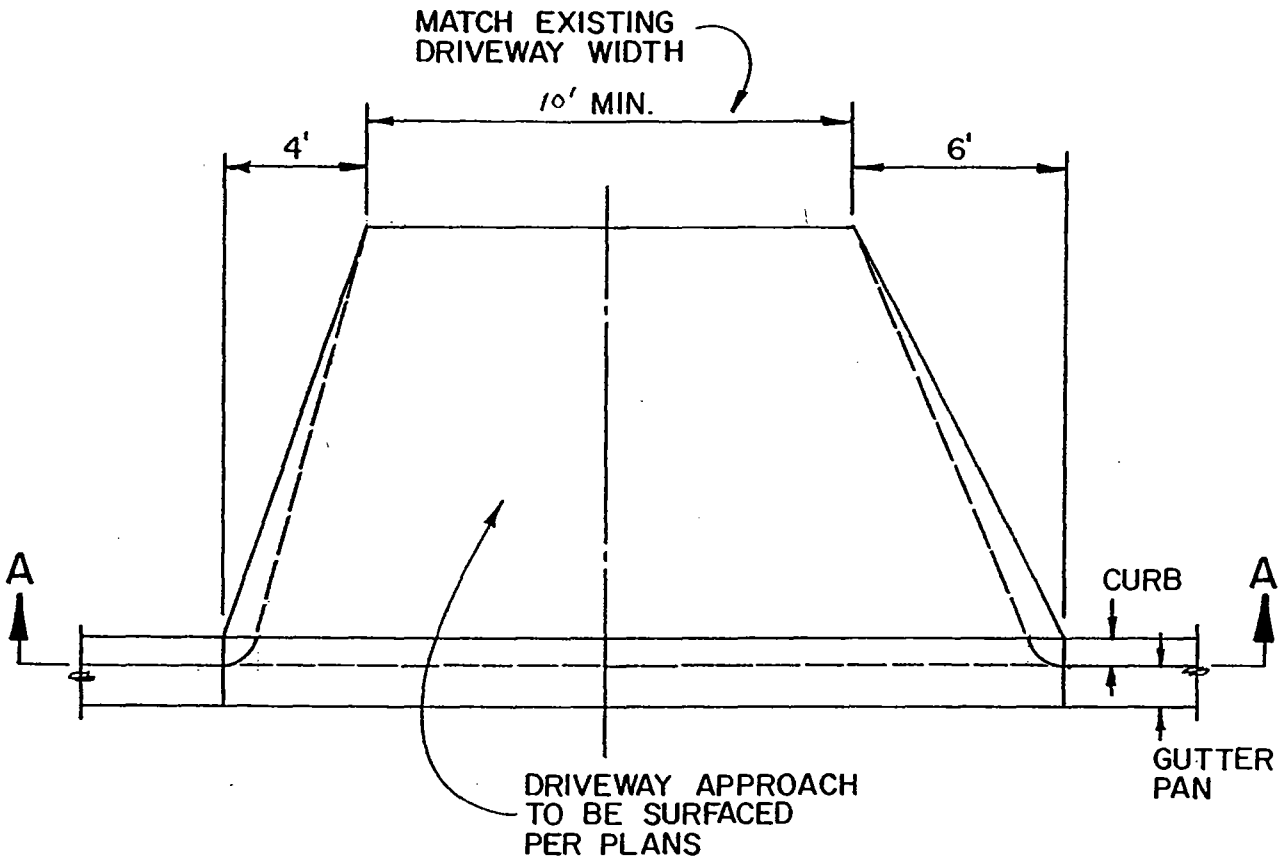
details are provided at the end of this section. If a residential driveway is wider than 20 feet, the flaring widths shall be adjusted to provide a maximum drive opening of 30 feet.

Commercial and industrial approaches shall be MDOT Type "M" openings when attached to an existing curbed street. (See details at the end of this section).

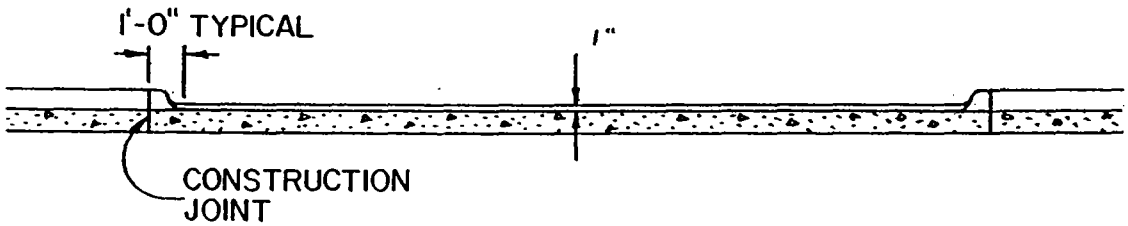
Driveways shall be constructed according to the Concrete Drive Construction Specification. Driveways shall be sloped to direct drainage to the street. Drive slopes shall not exceed 0.08 feet vertical to 1 foot horizontal.

E. Curb Removal

For residential approaches constructed on an existing curbed street, the curb and gutter shall be entirely removed or cut horizontally as shown in the Horizontal Curb Cutting detail (page 1-23). When an MDOT Type "M" approach is constructed on an existing curbed street, the curb and gutter must be entirely removed. The extent of the removal shall extend to the nearest joint past the spring line of the new curb.



DRIVEWAY APPROACH
PLAN



SECTION A-A

ROWE ENGINEERING, INC.	RESIDENTIAL DRIVEWAY DETAIL

HORIZONTAL
CURB
CUTTING

ACT 200, PA 1969 as amended, MCL 247.321, and the Administrative Rules promulgated pursuant to that, Act, R247.201 - 247.267, establish the statutory requirements for residential driveways. The following criteria were developed to provide additional direction and should be considered in determining whether curb is required in connection with driveway permits. Consideration should always be given to adjacent roadside characteristics which may require special attention of control for operational or safety purposes.

SPECIFICATIONS FOR DRIVEWAY APPROACHES REMOVAL AND/OR LOWER CONCRETE CURBING

#1. Curb removal shall comply with Genesee Co. Road Comm. Horizontal Concrete Curb Saw Specifications.

#2. The Applicant shall be required to construct the driveway approach:

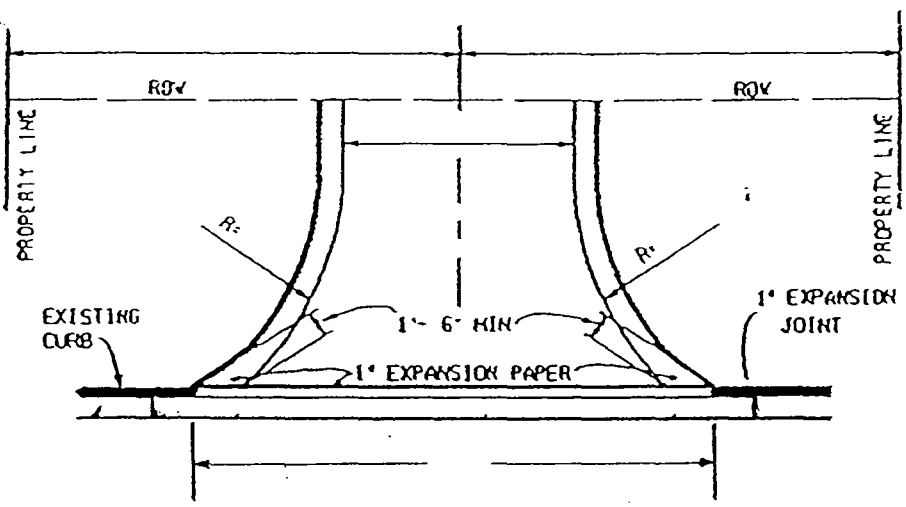
a. 10' min in width, with a minimum of 5' curbed radii.

#3. The Paved Driveway surface shall be equal to or better than the following:

a. 6" non-reinforced concrete over compacted subbase.

#4. The driveway surface shall be constructed as per the above specifications for the minimum of the first ten (10) feet, back of curb.

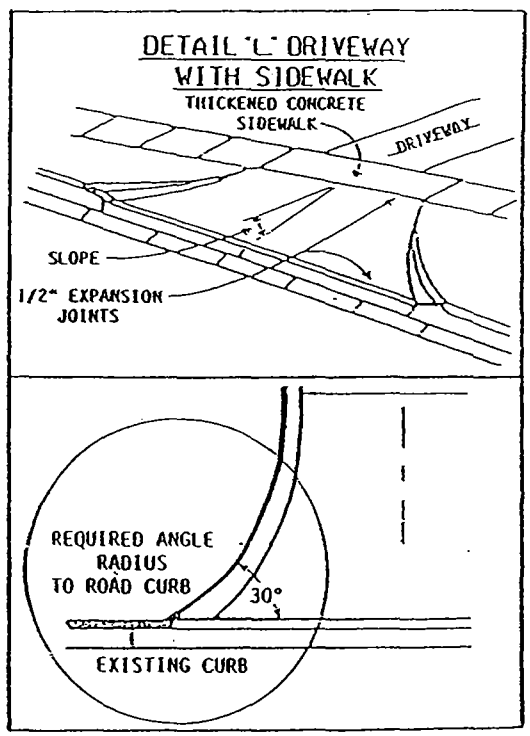
#5. The entire right-of-way shall be landscaped flush with top of curb as per specifications.



HORIZONTAL CURB SAW CUT

MAXIMUM CURB REMOVAL _____ LF.

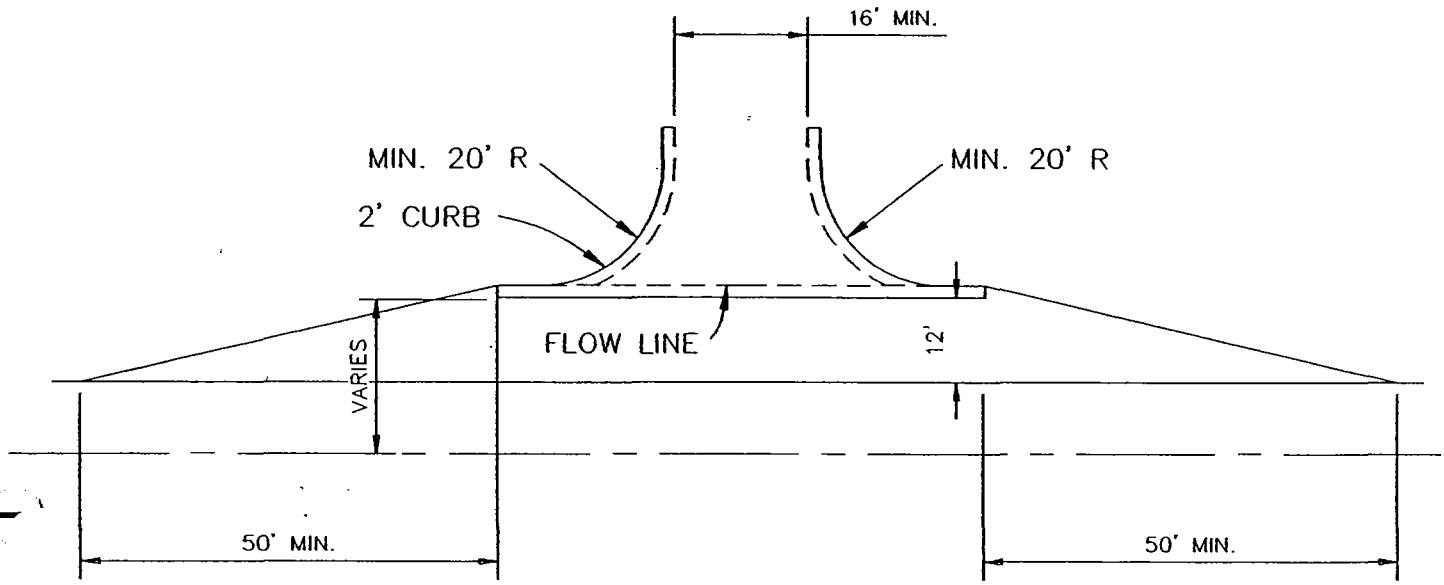
CONCRETE TWO WAY
DRIVE OPENING DETAIL 'L'



SKETCH TO ACCOMPANY APPLICATION FOR PERMIT

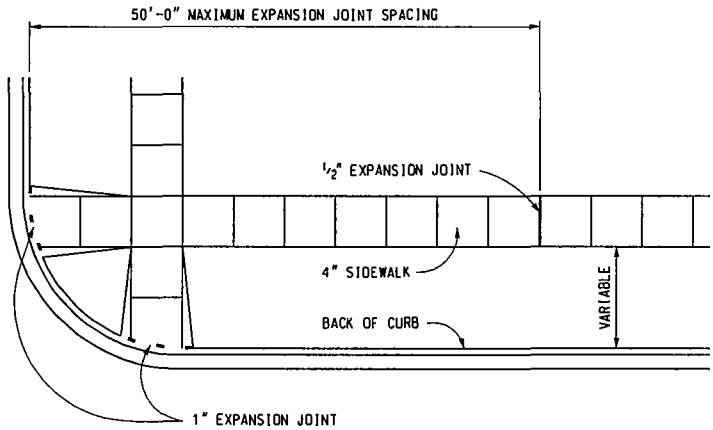
APPLICANT'S NAME (PRINT)

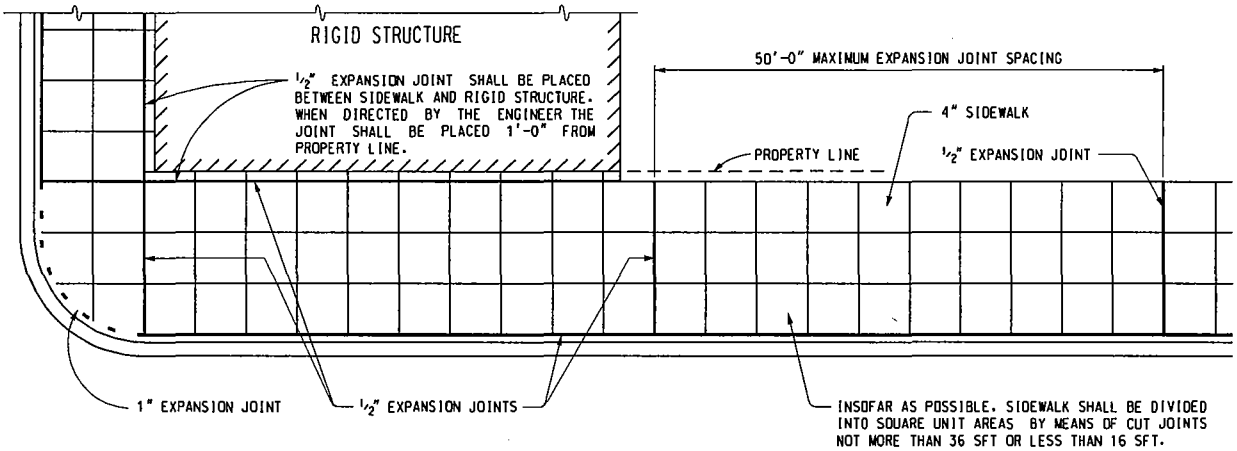
PERMIT NO._____



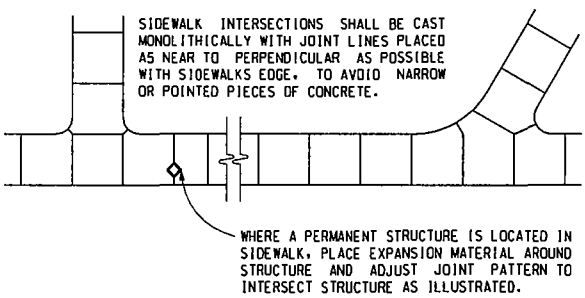
COMMERCIAL DRIVEWAY DETAIL
TYPE "M" OPENING ON UNCURBED ROAD

ROWE ENGINEERING, INC.	COMMERCIAL DRIVEWAY DETAIL

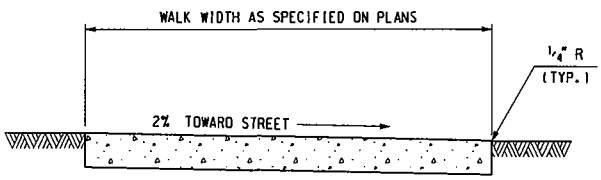




LOCATION OF JOINTS IN CONCRETE SIDEWALK



TYPICAL SIDEWALK JOINT LAYOUTS



4" CONCRETE SIDEWALK

MDOT Michigan Department of Transportation	ENGINEER OF CONSTRUCTION & TECHNOLOGY	ENGINEER - ROAD DESIGN	MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK
PREPARED BY DESIGN DIVISION	ENGINEER OF MAINTENANCE	ENGINEER OF DESIGN DEPARTMENT DIRECTOR Gregory J. Rosine	
DRAWN BY: B.L.T. CHECKED BY: W.K.P.	ENGINEER OF TRAFFIC AND SAFETY	BY: CHIEF ENGINEER/DEPUTY DIRECTOR BUREAU OF HIGHWAY TECHNICAL SERVICES	9-14-2001 F.H.W.A. APPROVAL 2-7-2001 PLAN DATE R-29-D SHEET 1 OF 4

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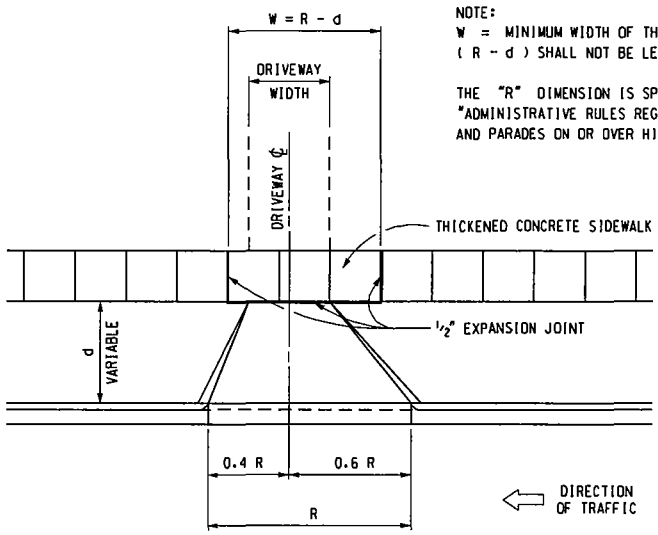
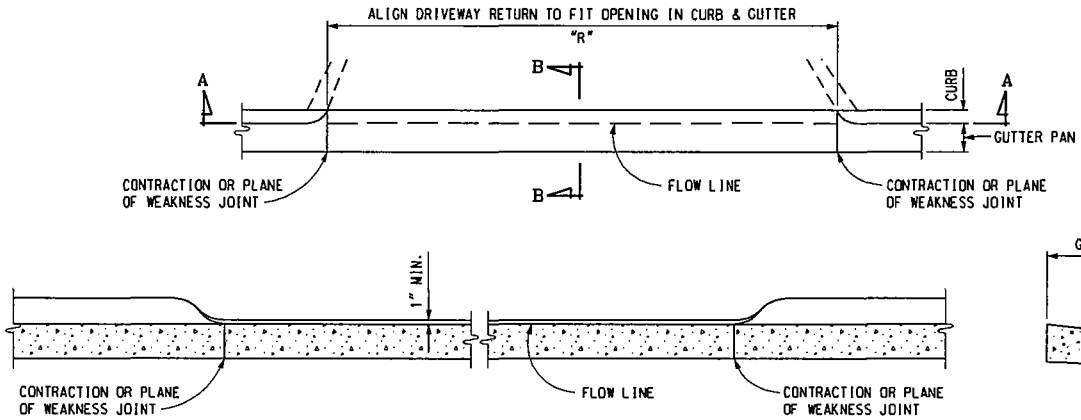


NOTE:
W = MINIMUM WIDTH OF THICKENED CONCRETE SIDEWALK.
(R - d) SHALL NOT BE LESS THAN DRIVEWAY WIDTH.

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

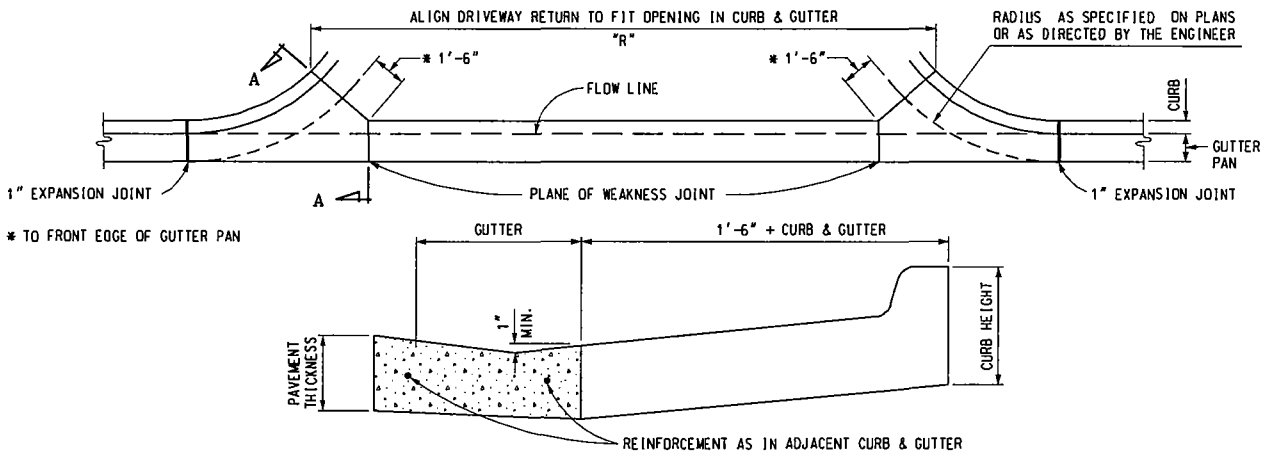
CONCRETE DRIVEWAY OPENING LAYOUT



SECTION A - A

SECTION B - B

CONCRETE DRIVEWAY OPENING, DETAIL L



SECTION A - A

CONCRETE DRIVEWAY OPENING, DETAIL M

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY TECHNICAL SERVICES STANDARD PLAN FOR

DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK

9-14-2001 F.H.W.A. APPROVAL	2-7-2001 PLAN DATE	R-29-D	SHEET 2 OF 4

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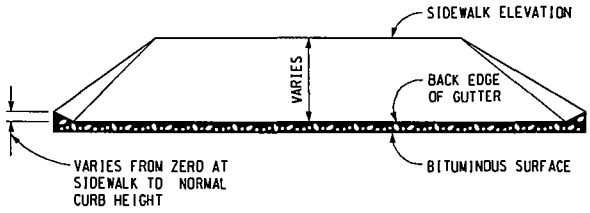
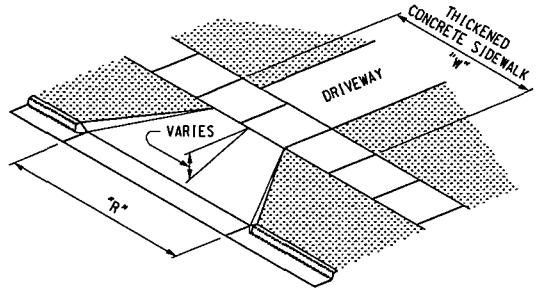
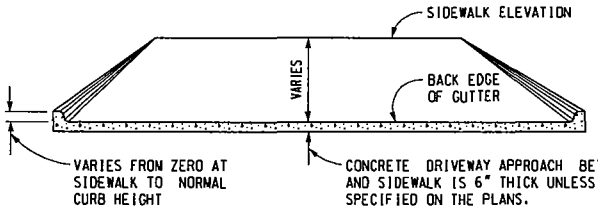
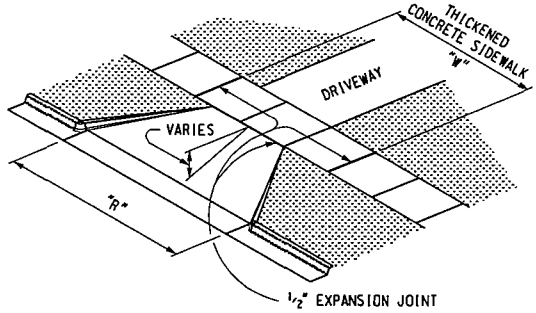




BITUMINOUS DRIVEWAY APPROACH

(TO BE USED WITH DETAIL L)





NOTES:

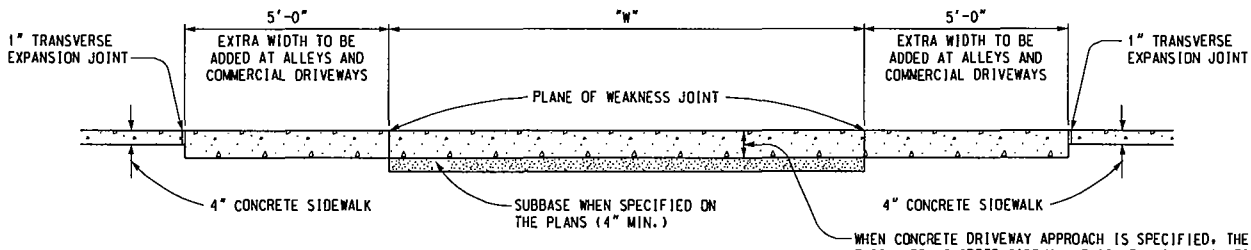
MONOLITHIC CURB IS INCLUDED IN THE CONCRETE DRIVEWAY APPROACH QUANTITY.

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 BITUMINOUS DRIVEWAY APPROACH IS SPECIFIED, THE THICKENED CONCRETE SIDEWALK THICKNESS IS 6" MINIMUM.

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 TECHNICAL SERVICES STANDARD PLAN FOR

DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK

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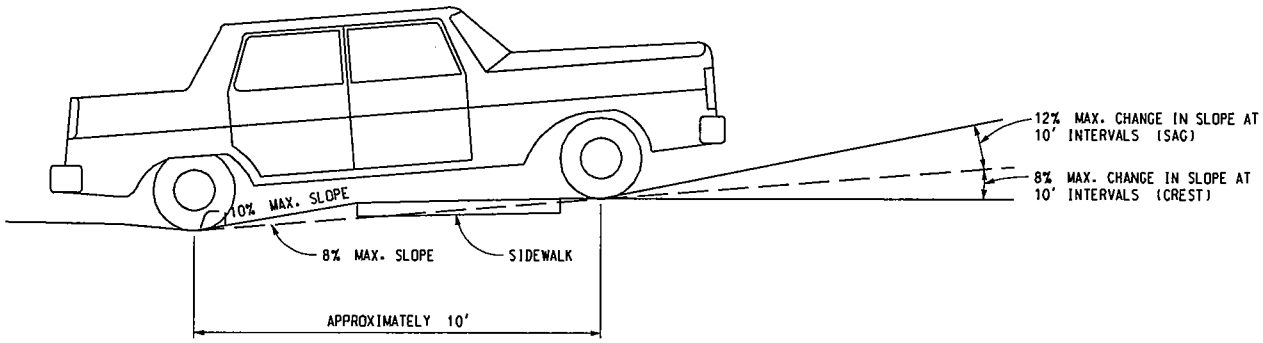
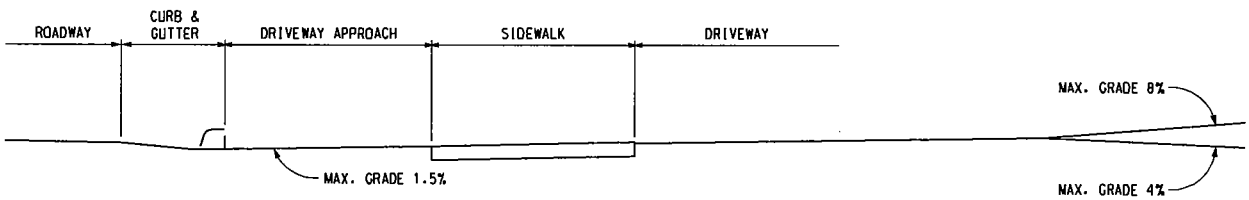


LOW VOLUME COMMERCIAL OR RESIDENTIAL DRIVEWAY SLOPES



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.

SIDEWALK TRANSVERSE SLOPE MAY VARY FROM 0% TO 4% TO MEET THE SIDE CONDITIONS. WHEN TRANSVERSE SLOPE IS LESS THAN 2%, 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 TECHNICAL SERVICES STANDARD PLAN FOR

DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK

9-14-2001 F.H.W.A. APPROVAL	2-7-2001 PLAN DATE	R-29-D	SHEET 4 OF 4

General

Parking lot design considerations will vary due to use considerations. The following design criteria is meant as a minimum guideline only. Parking lots will also need to follow requirements of current city zoning ordinances which pertain to parking.

A. Classifications

Parking lots can be grouped as follows:

1. Class "A" - Light duty driveways, school yards, playgrounds and small parking lots with less than forty stalls. This cross section is not suitable for heavy refuse truck pick-up or delivery service. In areas where this service is used, the commercial/industrial cross section should be used for routing to and from the service area.

2. Class "B" - Parking lots containing more than forty stalls, medium to heavy truck traffic, some commercial lots.

3. Class "C" - Industrial lots, heavy truck uses, some commercial lots, bus routes.

4. Class "D" - Parking areas where extremely heavy truck traffic is encountered should be designed on a per case basis by a qualified professional engineer.

Cross sections for the above mentioned groupings are provided found at the end of this section.

B. Service Drives

Service drives should utilize the Class "C" cross section. Design alternatives should be considered where extremely high volumes of truck traffic will be encountered.

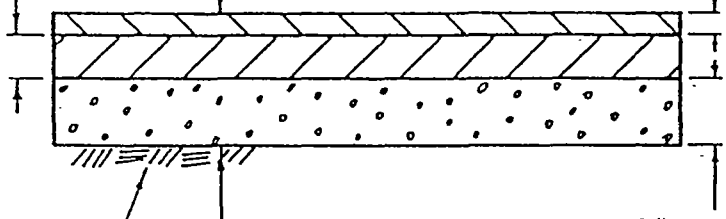
C. Alternate Cross Sections

Alternate cross sections designed by a qualified, licensed engineer and accompanied by supporting data will be considered.

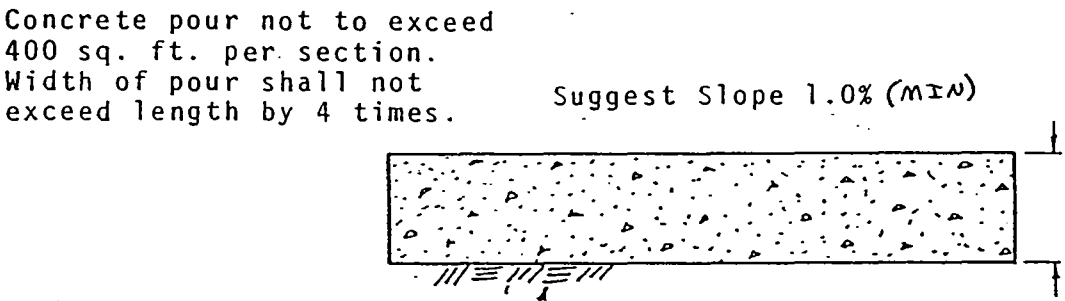
D. Curb

Concrete curb details are provided in the Streets and Roadways specification elsewhere in this document. Bituminous curbing will not be permitted. Curbing is not required in all situations.

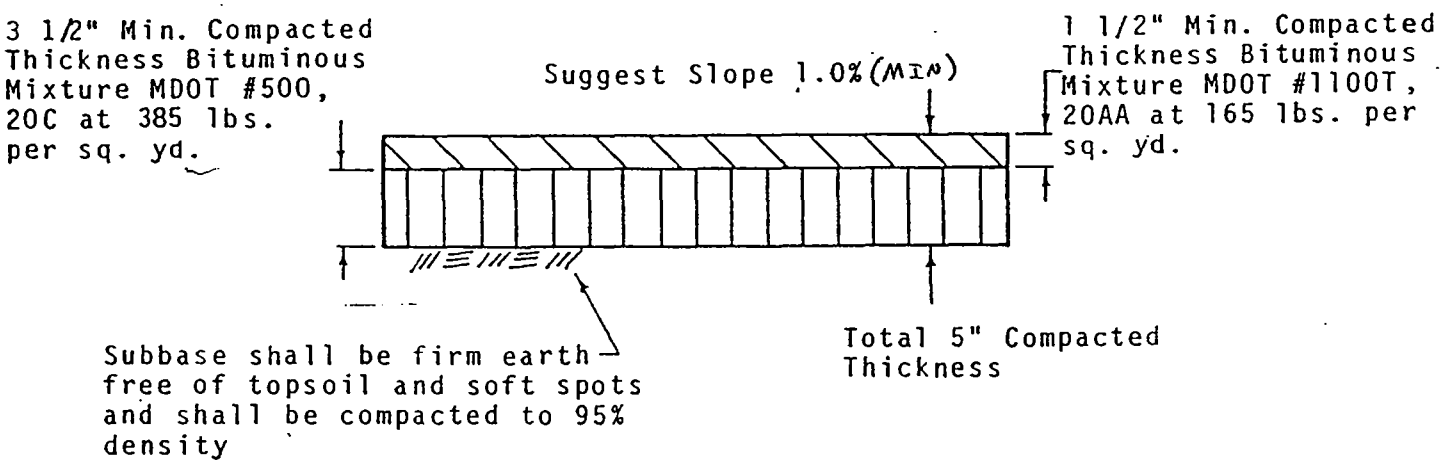
CLASS 'A'



LIMESTONE BASE WITH BLACKTOP SURFACE CROSS-SECTION



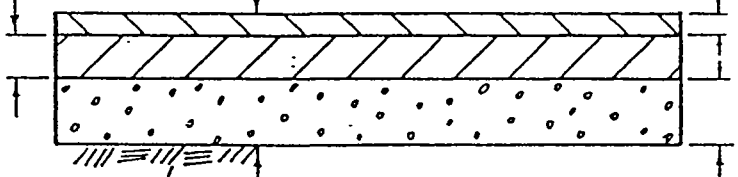
CONCRETE SLAB CROSS-SECTION



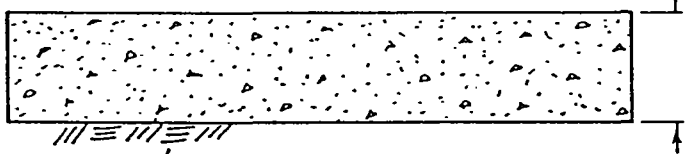
BLACKTOP BASE WITH BLACKTOP SURFACE CROSS-SECTION

The sections proposed here should be considered only as a guide for the Planning Commission and their delegated authority.

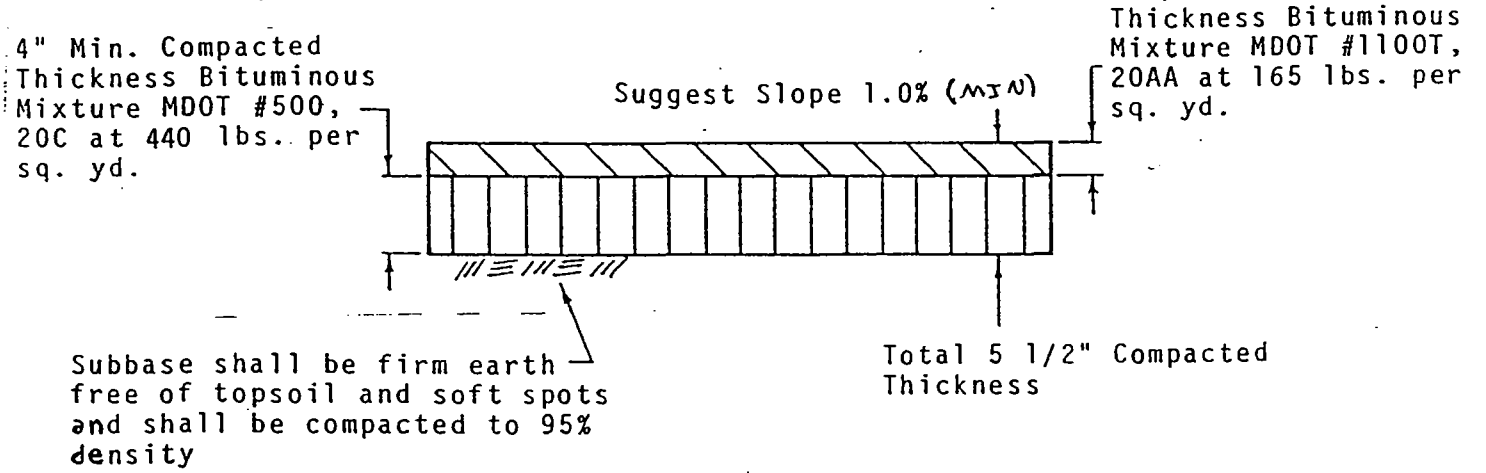
CLASS 'B'



LIMESTONE BASE WITH BLACKTOP SURFACE CROSS-SECTION



CONCRETE SLAB CROSS-SECTION



BLACKTOP BASE WITH BLACKTOP SURFACE CROSS-SECTION

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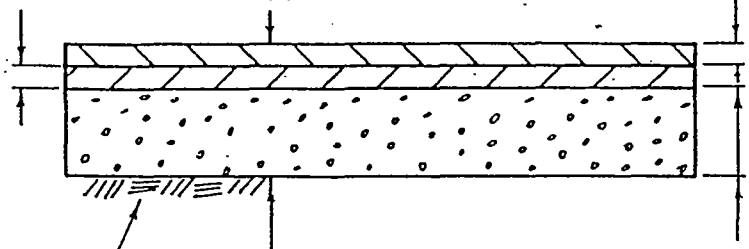
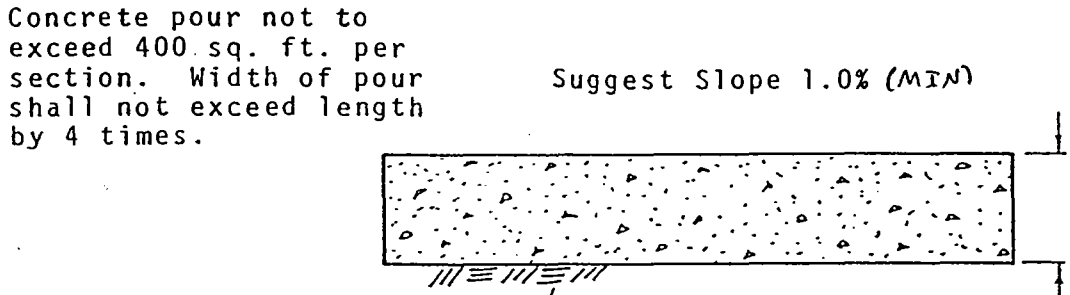
CLASS 'C'



LIMESTONE BASE WITH BLACKTOP SURFACE CROSS-SECTION



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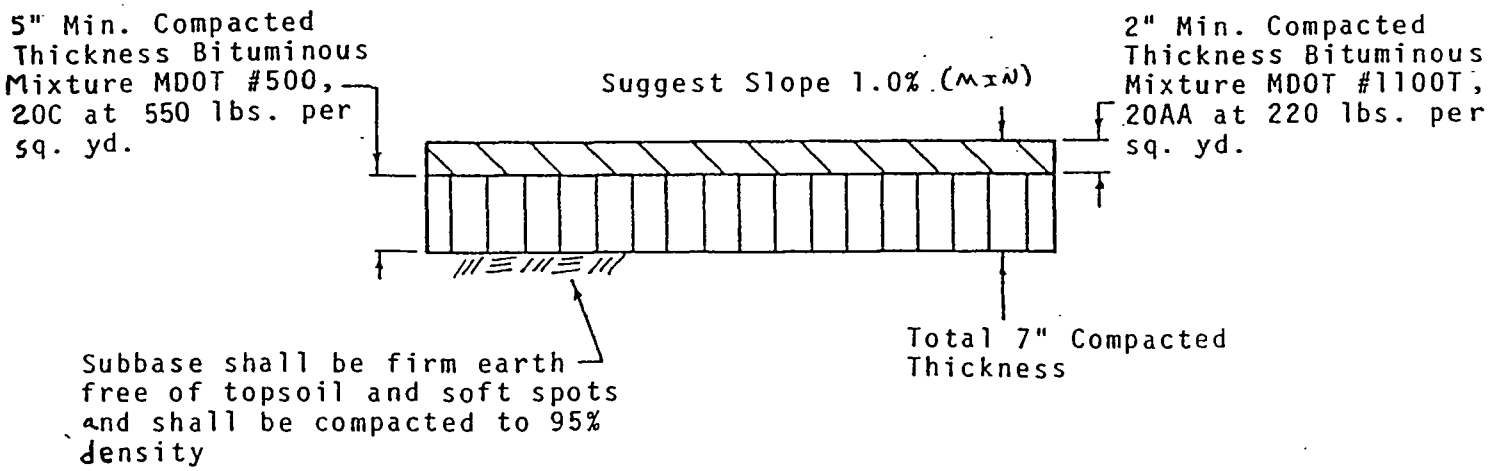


BLACKTOP BASE WITH BLACKTOP SURFACE CROSS-SECTION

The sections proposed here should be considered only as a guide for the Planning Commission and their delegated authority.

General

Watermain shall be sized to provide the volumes required by the proposed developments. Design shall include ample research to verify that the required volumes and pressures are available. No watermain smaller than 8" in diameter shall be permitted.

Watermain shall be looped whenever feasible in order to increase reliability. The City shall review all watermain layouts for adequate looping.

Watermains shall be designed to provide adequate volumes for fire fighting purposes. ISO standards shall be used as a minimum guideline to provide 1000 GPM for emergency use. Depending on the development, larger flow rates may be required.

All tees, plugs, bends, hydrants and similar fittings shall be braced to undisturbed ground by use of concrete thrust blocks. Details for thrust blocking are provided in the Watermain section of the Construction Specifications in the back of this document. See GCDC Standard Detail.

Whenever possible, watermain shall be located on the south side of an east-west street and on the west side of a north-south street.

Watermain materials shall be as specified in the Watermain section of the Construction specifications.

Watermain shall have a minimum of 5' of cover in all cases. Compacted sand backfill to 95% maximum density shall be used where the watermain is within the influence of a paved surface.

A. Service Leads

Service leads shall be type “K” copper with a minimum size of 1" in diameter. Service leads shall be sized according to volume and pressure requirements of the development.

All services shall include corporation at the main and curb stop inside of right-of-way. Curb stops shall be placed 1' inside right-of-way.

Service leads shall be installed as shown in the Watermain section of the Construction Specifications. See GCDC Standard Detail.

B. Valves

Valves shall be located at strategic points along the watermain to provide adequate isolation. Valves shall be located near tees and other looping measures. Spacing shall be a maximum of 1000 feet. Valves shall be placed at all tees and connections. Valve locations shall be reviewed by the City.

All valves 8" and smaller and outside of pavement shall be designed as direct bury valves and include the proper box and stand. Valves that fall within the pavement shall be within a manhole. Valves larger than 8" shall be provided with a 5' diameter manhole. Larger manholes may be required depending on the size of the valve.

All pressure tapping valves shall be enclosed within a 5' diameter manhole. (Larger manholes may be required for larger valves.)

Valves shall open counter clockwise unless otherwise specified by the City.

C. Hydrants

Hydrants shall be spaced to provide a maximum service radius of 250'. Hydrants should be positioned as close to lot lines as possible. Locations shall be approved by the City.

Hydrants shall be factory painted in accordance with AWWA C502 and color to meet City of Swartz Creek.

Hydrants shall be obtained from East Jordan Iron Works, model number EJIW 5BR or approved equal by the City.

General

All sanitary sewer shall be designed to the latest Genesee County standards and state standards, whichever is more stringent. The developer shall undertake sufficient research to determine if the sewer has adequate capacity to handle the anticipated volumes. Such research will be provided to the city at the city's request. City may require capacity analysis to account for both wet and dry weather flows.

All sanitary sewer shall be reviewed by the Genesee County Drain Commissioner Division of Water and Waste Services. An Act 98 Permit shall be required on all sanitary sewer construction.

Sanitary sewer shall, whenever possible, be installed on the north side of an east-west street and on the east side of a north-south street.

Sanitary sewers shall be designed with adequate slope to produce self-cleaning velocities and to provide capacity for future expansion.

Plans shall be sealed by a licensed professional engineer.

Designs shall incorporate the use of materials and sizes as specified in the Sanitary Sewer section of the Construction Specifications and shall meet the requirements of the Genesee County Drain Commissioner Division of Water and Waste Services.

A. Service Leads

All service leads within the right-of-way shall be a minimum of 6" diameter schedule 40 PVC. Service leads outside of the right-of-way shall be a minimum of 4" diameter schedule 40 PVC.

Service leads shall be installed as shown on details in the Sanitary Sewer section of the Construction Specifications. Service leads shall have a minimum slope of 1%.

Wyes for service leads shall be installed as shown on the details at the end of the Sanitary Sewer section of the Construction Specifications. See GCDC Standard Detail.

For service leads beyond the right-of-way, cleanouts shall be provided every 90 feet or at any bend 45º or greater.

B. Sewer Capacity

For all developments the city will determine existing capacity of sanitary sewer during plan review process. The developer may be required to provide capacity analysis data with city reviewing data to verify capacity.

Any upgrades to existing sanitary sewer or existing pump stations required by the increased capacity will require developer to be responsible for all design and construction costs.

A. Detention Basins

1. General Policy

Policy shall supercede all previous policies in regards to storm water management.

Storm water detention is necessary for all new developments in the city. Detention basins shall become publicly owned with an agreement with property owner that property owner shall maintain the detention basin at property owner's cost.

Detention basins shall be designed, using generally accepted engineering methods established by the Genesee County Drain Commissioner to detain storm water from the developed site. The detention basin outlet shall connect to an established drain system.

Detention basins shall be designed to store all runoff in excess of existing runoff for a 100-year storm. Runoff volumes shall be determined by calculating the time of concentration for the watershed area and applying the latest Genesee County Drain Commissioner rainfall intensity/duration curves or an equivalent method.

The Rational Method (Q=CIA) shall be used to determine the amount of existing runoff from the proposed development area.

All areas that are undeveloped shall be assumed to have a "C" value (runoff coefficient) of 0.20. Values of "C" for Residential Areas shall range from 0.4 to 0.5. Values of "C" for Commercial/Industrial areas shall range from 0.75 to 0.90 depending on the type of project and the amount of impervious surface vs lawn and other areas.

The volume of detention required shall be calculated by using a generally accepted method that evaluates the inflow minus the outflow over time to determine the maximum volume required.

Retention basins will not be allowed.

2. General Requirements

Underground detention systems where practical are most desirable by the city and upon review by the planning commission may be requested.

Storm water detention on improved parking surfaces shall be allowed to a maximum depth of six inches. The control of runoff for all methods however, shall be through pipe sizing. The use of restricted structure covers that could easily be changed or modified at a later date shall not be accepted.

All open detention basins having side slopes steeper than 1 vertical on 6 horizontal shall be fenced, except where their design is an integral part of the landscape, and where the City determines that depth and location are not hazardous. Fences shall be 8 feet high chain link.

Gates shall be 12 feet wide with double opening. The maximum side slopes of the basins shall be 1 vertical on 4 horizontal, with a 3 foot minimum shoulder inside the fence. Basins designed as an integral part of the landscape may vary from this requirement, with approval of the Planning Commission and the City.

Detention basins specifically designed architecturally and aesthetically for a location within such yard setback areas shall be approved as to their concept and location by the Planning Commission.

The entire detention basin must be seeded or sodded.

Concrete rip-rap is required at all pipe entrances to the basin. The minimum width of the rip-rap shall be twice the outside diameter of the pipe. The rip-rap shall extend from bottom of the basin to a minimum of 1' above the top of the pipe. Two types of rip-rap may be used: 1) field stone or broken concrete of four (4) inch minimum thickness and one (1) square foot minimum area. Broken concrete or stone shall be mortared to form a monolithic slab with a minimum thickness of eight (8) inches; 2) poured grade "A" concrete of four (4) inch minimum thickness. It shall be scored at a maximum of two (2) foot intervals. A two (2) foot deep poured concrete header shall be installed at the outer edges.

All pipe entering a detention basin shall have either a headwall or end section at the end of the pipe. Bar screens must be installed on all open ends of pipe twelve (12) inches or larger in diameter.

An overflow system must be provided. Where possible, an overflow structure shall be designed to outlet into an adequately sized storm sewer. There are two (2) possible alternate methods: 1) using an overflow pipe. The invert elevation of this pipe shall be above the maximum storage elevation of the basin. 2) a low point overflow. The low point of the basin shall be set at an elevation no lower than the maximum storage elevation of the basin. The overflow shall have rip-rap adequate to prevent scour. The overflow must be designed as to not flood adjacent properties, and the back-water elevation must be no higher than (1) foot below the lowest ground elevation of the developed area.

Detention basins that are gravity drained into a drainage ditch must have the outlet pipe invert above the normal water level of the drain. Where this is not possible a variance must be requested and the design shall include a back flow preventing device.

B. Storm Sewers

Storm sewers shall be sized using the Chezy-Manning equation ($Q=VA=\frac{1.49(A)(r_H)^{2/3}\sqrt{S}}{n}$) to determine the size required. The required capacity shall be determined using the rational method as mentioned above.
Storm sewers shall be designed using slopes to develop self cleaning velocities.

No storm sewer smaller than 12" in diameter shall be permitted without prior approval from the city.

Storm sewer design shall include adequate research by the developer to provide verification that the receiving storm sewers have adequate capacity.

Sump leads for each parcel shall be provided for all new storm sewers installed. Leads shall be a minimum of 4" PVC Schedule 40. The leads shall be placed with a minimum slope of 1% and 3' of cover.

C. Inlets/Catchbasins

Structures with more than one pipe shall be a minimum of 4 feet in diameter.

Structures 2 feet in diameter shall not be permitted for manhole depths greater than three feet.

Larger diameter structures should be considered when larger diameter pipes or multiple pipes are used.

Catchbasins shall be spaced no more than 350 feet from the crest of the road. Subsequent catchbasins shall be spaced a maximum of 400 feet apart. Catchbasins shall also be placed at intersections to prevent water from crossing an intersection.

Castings shall be to MDOT standards and sized to handle anticipated runoff volumes. Typical MDOT casting details are provided in the streets and roadways design section.

D. Culverts

Cross culverts shall be required at all drive locations that cross drainage and road side ditches. Crest drives are the only exception.

Culverts shall be placed to provide positive drainage. No culvert shall be placed flat or with backfall.

Culverts shall be sized according to the size of the existing ditches. Proper analysis and supporting calculations shall be provided for all culvert designs greater than 15 inches in diameter. Minimum culvert size shall be 12". All culvert sizes shall be subject to review by the City.

Culvert material shall be in accordance with the Culvert section of the Construction Specifications elsewhere in this document.

Storm Water Management
Submittal Requirements

The Owner/Developer must provide a Complete Storm Water Permit Submittal to the City of Swartz Creek for review by the City of Swartz Creek Engineer. This includes a completed permit application with calculations, complete set of the site drainage and grading plan, one copy of the calculations for allowable discharge and on-site storage requirements as prepared by a Registered Professional Engineer or Architect, any other support information, a completion of drainage checklist outlined below.

Complete the drainage checklist by checking each of the following items after you have verified they are clearly indicated on the plan.

☐ Total acres of site.

☐ Drainage district line showing all land to be drained through proposed drainage system including rear lot drainage system.

☐ Location of site including dimension to nearest intersection road or section line.

☐ Existing and proposed ground elevations at maximum 50' centers, including shots on perimeter of site and 100' beyond or contour lines at 1 foot intervals extending 100 feet beyond the site limits. Existing drainage patterns shown.

☐ Existing and proposed elevations of at edge of pavement or buildings within 100' of site.

☐ Existing and proposed elevations of top of curb, gutter, ditch line, and centerline of road at maximum 50' intervals within 50' of site.

☐ Site grading provides for collection of runoff on-site.

☐ Rim and invert elevations of existing catchbasins, manholes, sewers and culverts.

☐ Location of all existing and proposed utilities, watermain, storm drains, sanitary sewer and corresponding right-of-ways.

☐ Easements provided to city for review.

☐ Location of proposed lawn/landscape areas, paved areas and building location.

☐ Location, size, length, slope and type of proposed storm sewer and rear lot drains.

☐ Rim and invert elevation(s) of proposed manholes and catch basins, including rear lot drainage.

☐ Location of on-site storage showing contour lines for detention system and volume provided calculations for basin.

☐ Cross-sections, profiles, horizontal control and detailed volume calculations of proposed storm water detention areas.

☐ Drainage calculations showing existing and proposed drainage, including offsite tributary areas, if applicable.

☐ Location and elevation of emergency overflow.

☐ Floodplains and wetlands shown, if applicable.

☐ Drainage outlet is to an established drainage system within its established drainage district.

☐ Verification that storm sewer material, sizes, and minimum grades comply with stormwater management plan.

☐ Verification that rearlot drainage complies with stormwater management plan.

☐ Location and size and detail of proposed restrictor.

☐ Trench details, manholes detail, catch basin details, restrictor detail, curb detail, pavements detail storm water detention basin detail and top soil and seeding detail.

☐ Detailed hydrology and hydraulic calculations used for sizing storm sewer (can be submitted on separate form).

Beyond the City of Swartz Creek requirements, the developer must submit applications for permit with all agencies that regulate storm water within the area of development. These may include Michigan Department of Transportation, Michigan Department of Environmental Quality, Genesee County Drain Commissioner, Genesee County Road Commission and others.

City of Swartz Creek
Storm Water Discharge Permit Application

PROJECT NAME:	
Property Tax Identification #	
Site Plan Review Date:	Date Applied:
NAME OF DEVELOPER/OWNER:	**ENGINEER/ARCHITECT:**
Contact Person:	Contact Person:
Street Address:	Street Address:
City, State, ZIP:	City, State, ZIP:
Telephone:	Telephone:
Fax:	Fax:
PROJECT LOCATION:	
Street Address:	
Name of Subdivision/Plat:	
Drainage District:	

STORM WATER DESIGN INFORMATION (*Calculation must be submitted for verification. Calculation must have clearly labeled headings and clearly labeled formulas and clearly labeled units.)

Type of Development: Commercial Site, Industrial Site, Residential Platted, Residential Condominium, Other

* Area of development (acres):

* Area of contributing drainage district (acres):

* Area of existing impervious surface (acres):

* Area of proposed impervious surface (acres):

Unit allowable discharge (Qa) (cfs/ac.):

* Allowable discharge rate (Qa) (cfs):

* Total volume of storage required (Vt) (cu. ft.):

* Total volume of storage designed (cu. ft.):

100 year design stormwater detention storage elevation:

Emergency overflow maximum storage elevation:

Lowest finished floor elevation:

Outlet drain size and design flow capacity:

Outlet drain invert elevation:

* 100 year design discharge (cfs):

* Diameter of proposed restrictor (in.):

* Actual restricted discharge (cfs):

Authorized Signature Date

SITE GRADING

General

In general, developments should follow the existing contours of the land. Any changes which alter the established drainage patterns need to be addressed by the Developer.

Grading plans shall be provided for all projects. Individual lot grading plans may be necessary prior to the issuance of building permits.

Existing and proposed contours and drainage patterns shall be provided by the developer. Proposed grading of a site should not adversely impact drainage from adjacent projects.

Execution

A. Overall Site Grading

The proposed grading shall direct run-off into proposed or existing storm sewer facilities and maintain all proposed runoff on applicant's property prior to discharging to an approved outlet at the predeveloped rate.

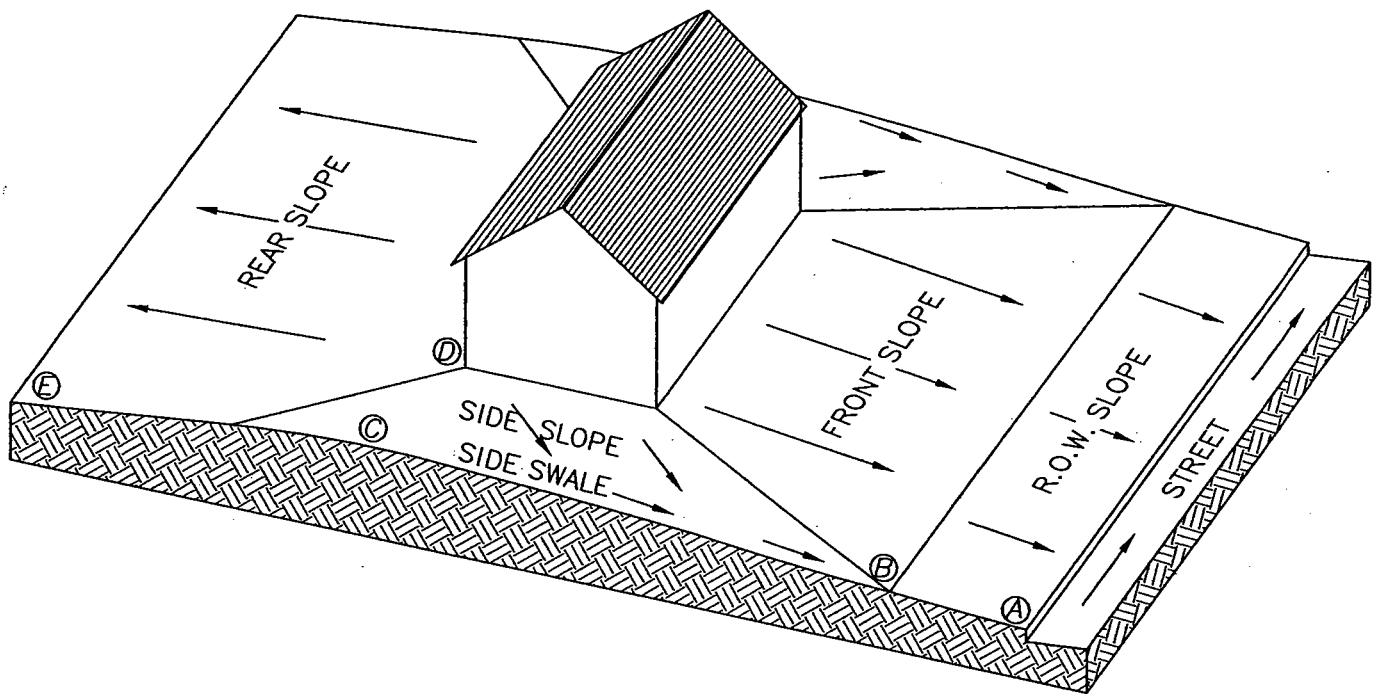
Please review the sections in this document which refer to maximum and minimum road grades; drainage calculations and outlet information; and landscaping requirements.

B. Lot Grading

Individual lots shall be graded to provide positive drainage away from proposed and existing structures.

A general guideline is provided on page 1-41. This template applies for maximum density-type developments where spacing between homes will not be large.

Rear and side yard swales may be required.



TYPICAL GRADING TEMPLATE

(NOT TO SCALE)

A–B R.O.W. SLOPE: 0.03'/FT SLOPE MIN.

B–C SIDE SWALE: 1% SLOPE MIN., 3% SLOPE MAX.

C–D SIDE SLOPE: 0.5' RISE TO H.G. MIN., 7% MAX.

C–E REAR SLOPE: 1% SLOPE MIN., 5% SLOPE MAX.

PREPARED BY
ROWE INCORPORATED
CORPORATE OFFICE
6211 Taylor Drive
(810)341-7500
LAPEER
128 N. Saginaw
(810)664-9411
MT. PLEASANT
127 S. Main St.
(517)772-2138

MAY 2003

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Soil Erosion and Sedimentation Control

General

Soil erosion and sedimentation control shall be designed using the latest Genesee County Standards. A Soil Erosion and Sedimentation Control Permit must be obtained from the Genesee County Drain Commissioner prior to start of construction. This permit shall be in accordance with Part 91, Soil Erosion & Sedimentation Control of the Natural Resources and Environmental Act, Act 451 as amended. The developer will be required to obtain NPDES permit from the State of Michigan in relation to storm water discharge from construction activities.

The Unified Keying System shall be used as a design guideline (provided at the end of this section). If specific details are required they shall be shown on the plans.

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

Inlet filters shall be used at all drainage structures to prevent sedimentation.

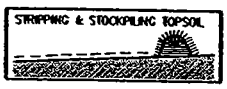
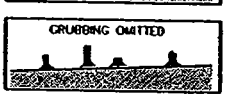
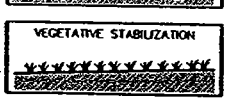
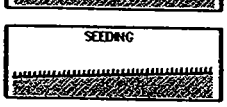
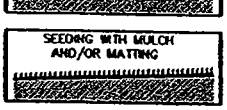
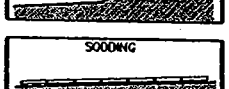
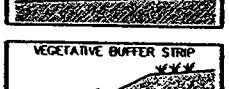
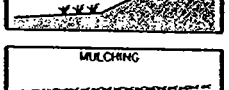
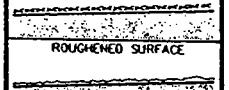
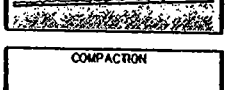
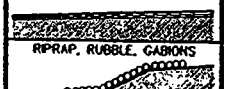
All disturbed areas shall receive 4" of topsoil and seeding in accordance with construction specifications.

Crushed Aggregate mud mats shall be used at the entrance of construction sites where a soil erosion permit is required.

All projects disturbing one to five acres shall follow the NPDES Storm Water Discharge Permit by rule, for construction activities as required under Public Act 245. Construction activities disturbing one acre or more require an NPDES Notice of Coverage Permit. The notice of coverage form for disturbing five acres or more shall be submitted through GCDC Division of Water and Waste Services with the Soil Erosion Control Permit Application.

MICHIGAN UNIFIED KEYING SYSTEM
SOIL EROSION SEDIMENTATION CONTROL MEASURES

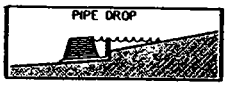
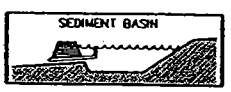
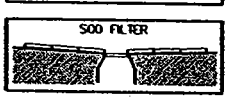
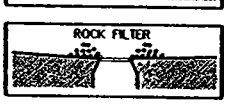
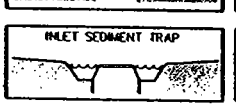
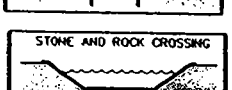
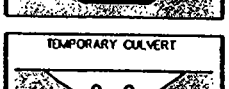
✱ INDICATES APPLICABILITY OF A SPECIFIC CONTROL MEASURE TO ONE OR MORE OF THE SEVEN PROBLEM AREAS

KEY	DETAIL	CHARACTERISTICS	A SLOPES	B STREAMS AND WATERWAYS	C SURFACE DRAINAGEWAYS	D ENCLOSED DRAINAGE (Inlet & Outfall Control)	E LARGE FLAT - SURFACE AREAS	F BORROW AND STOCKPILE AREAS	G ADJACENT PROPERTIES
1	 STRIPPING & STOCKPILING TOPSOIL	TOPSOIL MAY BE STOCKPILED ABOVE BORROW AREAS TO ACT AS A DIVERSION. STOCKPILE SHOULD BE TEMPORARILY SEEDED.	✱				✱	✱	
2	 SELECTIVE GRADING & SHAPING	WATER CAN BE DIVERTED TO MINIMIZE EROSION. FLATTER SLOPES EASE EROSION PROBLEMS.	✱				✱	✱	✱
3	 GRUBBING OMITTED	SAVES COST OF GRUBBING, PROVIDES NEW SPROUTS, RETAINS EXISTING ROOT MAT SYSTEM, REDUCES WIND FALL AT NEW FOREST EDGE DISCOURAGES EQUIPMENT ENTRANCE	✱				✱		✱
4	 VEGETATIVE STABILIZATION	MAY UTILIZE A VARIETY OF PLANT MATERIAL STABILIZES SOIL SLOWS RUNOFF VELOCITY FILTERS SEDIMENT FROM RUNOFF	✱	✱	✱		✱	✱	✱
5	 SEEDING	INEXPENSIVE AND VERY EFFECTIVE STABILIZES SOIL, THUS MINIMIZING EROSION PERMITS RUNOFF TO INFILTRATE SOIL, REDUCING RUNOFF VOLUME SHOULD INCLUDE PREPARED TOPSOIL BED	✱		✱		✱	✱	✱
6	 SEEDING WITH MULCH AND/OR MATTING	FACILITATES ESTABLISHMENT OF VEGETATIVE COVER EFFECTIVE FOR DRAINAGEWAYS WITH LOW VELOCITY EASILY PLACED IN SMALL QUANTITIES BY INEXPERIENCED PERSONNEL SHOULD INCLUDE PREPARED TOPSOIL BED	✱		✱			✱	✱
7	 HYDRO-SEEDING	EFFECTIVE ON LARGE AREAS MULCH TACKING AGENT USED TO PROVIDE IMMEDIATE PROTECTION UNTIL GRASS IS ROOTED SHOULD INCLUDE PREPARED TOPSOIL BED	✱				✱	✱	✱
8	 SODDING	PROVIDES IMMEDIATE PROTECTION CAN BE USED ON STEEP SLOPES WHERE SEED MAY BE DIFFICULT TO ESTABLISH EASY TO PLACE; MAY BE REPAIRED IF DAMAGED SHOULD INCLUDE PREPARED TOPSOIL BED	✱		✱		✱	✱	✱
9	 VEGETATIVE BUFFER STRIP	SLOWS RUNOFF VELOCITY FILTERS SEDIMENT FROM RUNOFF REDUCES VOLUME OF RUNOFF ON SLOPES	✱	✱					✱
10	 MULCHING	USED ALONE TO PROTECT EXPOSED AREAS FOR SHORT PERIODS PROTECTS SOIL FROM IMPACT OF FALLING RAIN PRESERVES SOIL MOISTURE AND PROTECTS GERMINATING SEED FROM TEMPERATURE EXTREMES	✱				✱	✱	
11	 ROUGHENED SURFACE	REDUCES VELOCITY AND INCREASES INFILTRATION RATES COLLECTS SEDIMENT HOLDS WATER, SEED, AND MULCH BETTER THAN SMOOTH SURFACES	✱				✱		
12	 COMPACTION	HELPS HOLD SOIL IN PLACE, MAKING EXPOSED AREAS LESS VULNERABLE TO EROSION	✱				✱		
13	 RIPRAP, RUBBLE, GABIONS	USED WHERE VEGETATION IS NOT EASILY ESTABLISHED EFFECTIVE FOR HIGH VELOCITIES OR HIGH CONCENTRATIONS PERMITS RUNOFF TO INFILTRATE SOIL DISSIPATES ENERGY FLOW AT SYSTEM OUTLETS	✱	✱	✱				

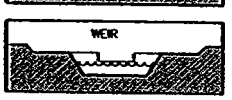
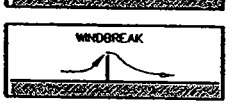
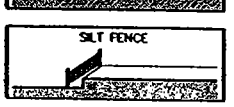
✱ INDICATES APPLICABILITY OF A SPECIFIC CONTROL MEASURE TO ONE OR MORE OF THE SEVEN PROBLEM AREAS

KEY	DETAIL	CHARACTERISTICS	A SLOPES	B STREAMS AND WATERWAYS	C SURFACE DRAINAGEWAYS	D ENCLOSED DRAINAGE (Inlet & Outfall Control)	E LARGE FLAT SURFACE AREAS	F BORROW AND STOCKPILE AREAS	G ADJACENT PROPERTIES
14	AGGREGATE COVER	STABILIZES SOIL SURFACE, THUS MINIMIZING EROSION PERMITS CONSTRUCTION TRAFFIC IN ADVERSE WEATHER MAY BE USED AS PART OF PERMANENT BASE CONSTRUCTION OF PAVED AREAS					✱		
15	PAVING	PROTECTS AREAS WHICH CANNOT OTHERWISE BE PROTECTED, BUT INCREASES RUNOFF VOLUME AND VELOCITY IRREGULAR SURFACE WILL HELP SLOW VELOCITY	✱				✱		
16	CURB & GUTTER	KEEPS HIGH VELOCITY RUNOFF ON PAVED AREAS FROM LEAVING PAVED SURFACE COLLECTS AND CONDUCTS RUNOFF TO ENCLOSED DRAINAGE SYSTEM OR PREPARED DRAINAGEWAY					✱		✱
17	BENCHES	REDUCES RUNOFF VELOCITY BY REDUCING EFFECTIVE SLOPE LENGTH COLLECTS SEDIMENT PROVIDES ACCESS TO SLOPES FOR SEEDING, MULCHING AND MAINTENANCE	✱					✱	
18	DIVERSION BERM	DIVERTS WATER FROM VULNERABLE AREAS COLLECTS AND DIRECTS WATER TO PREPARED DRAINAGEWAYS MAY BE PLACED AS PART OF NORMAL CONSTRUCTION OPERATION	✱					✱	✱
19	DIVERSION DITCH	COLLECTS AND DIVERTS WATER TO REDUCE EROSION POTENTIAL MAY BE INCORPORATED IN PERMANENT PROJECT DRAINAGE SYSTEMS	✱					✱	✱
20	BERM & DITCH	DIVERTS WATER TO A PREPARED DRAINAGEWAY MAY BE USED AT INTERVALS ACROSS SLOPE FACE TO REDUCE EFFECTIVE SLOPE LENGTH	✱					✱	✱
21	FILTER BERM	CONSTRUCTED OF GRAVEL OR STONE INTERCEPTS AND DIVERTS RUNOFF TO STABILIZED AREAS OR PREPARED DRAINAGE SYSTEMS SLOWS RUNOFF AND COLLECTS SEDIMENT	✱	✱					✱
22	BRUSH FILTER	USES SLASH AND LOGS FROM CLEARING OPERATIONS CAN BE COVERED AND SEEDED RATHER THAN REMOVED ELIMINATES NEED FOR BURNING OR REMOVAL OF MATERIAL FROM SITE							✱
23	BARE CHANNEL	LEAST EXPENSIVE FORM OF DRAINAGEWAY MAY BE USED ONLY WHERE GRADIENT IS VERY LOW AND WITH SOILS OF MINIMUM EROSION POTENTIAL			✱				
24	GRASS WATERWAY	MUCH MORE STABLE FORM OF DRAINAGEWAY THAN BARE CHANNEL GRASS TENDS TO SLOW RUNOFF AND FILTER OUT SEDIMENT USED WHERE BARE CHANNEL WOULD BE ERODED			✱				
25	SLOPE DRAIN (SURFACE PIPE)	PREVENTS EROSION ON SLOPES WHEN RUNOFF CANNOT BE DIVERTED TO EDGE OF SLOPE AREA USUALLY PERMANENT CAN BE CONSTRUCTED OR EXTENDED AS GRADING PROGRESSES	✱						
26	SLOPE DRAIN (PIPE CHUTE)	PREVENTS EROSION ON SLOPES WHEN RUNOFF CANNOT BE DIVERTED TO EDGE OF SLOPE AREA USUALLY PERMANENT CAN BE CONSTRUCTED OR EXTENDED AS GRADING PROGRESSES	✱						
27	SLOPE DRAIN (SUBSURFACE PIPE)	PREVENTS EROSION ON SLOPES WHEN RUNOFF CANNOT BE DIVERTED TO EDGE OF SLOPE AREA USUALLY PERMANENT CAN BE CONSTRUCTED AS GRADING PROGRESSES	✱						
28	DROP SPILLWAY	SLOWS VELOCITY OF FLOW, REDUCING EROSIVE CAPACITY		✱	✱				

✱ INDICATES APPLICABILITY OF A SPECIFIC CONTROL MEASURE TO ONE OR MORE OF THE SEVEN PROBLEM AREAS

KEY	DETAIL	CHARACTERISTICS	A SLOPES	B STREAMS AND WATERWAYS	C SURFACE DRAINAGEWAYS	D ENCLOSED DRAINAGE (Inlet & Outfall Control)	E LARGE FLAT SURFACE AREAS	F BORROW AND STOCKPILE AREAS	G ADJACENT PROPERTIES
29	 PIPE DROP	REDUCES RUNOFF VELOCITY REMOVES SEDIMENT AND TURBIDITY CAN BE DESIGNED TO HANDLE LARGE VOLUMES OF FLOW			✱				
30	 PIPE SPILLWAY	REMOVES SEDIMENT AND TURBIDITY FROM RUNOFF MAY BE PART OF PERMANENT EROSION CONTROL PLAN			✱				
31	 ENERGY DISIPATOR	SLOWS RUNOFF VELOCITY TO NON-EROSIVE LEVEL PERMITS SEDIMENT COLLECTION FROM RUNOFF	✱		✱	✱			
32	 LEVEL SPREADER	CONVERTS COLLECTED CHANNEL OR PIPE FLOW BACK TO SHEET FLOW AVOIDS CHANNEL EASEMENTS AND CONSTRUCTION OFF PROJECT SITE SIMPLE TO CONSTRUCT			✱				
33	 SEDIMENTATION TRAP	MAY BE CONSTRUCTED OF A VARIETY OF MATERIALS TRAPS SEDIMENT AND REDUCES VELOCITY OF FLOW CAN BE CLEANED AND EXPANDED AS NEEDED		✱	✱				
34	 SEDIMENT BASIN	TRAPS SEDIMENT RELEASES RUNOFF AT NON-EROSIVE RATES CONTROLS RUNOFF AT SYSTEM OUTLETS CAN BE VISUAL AMENITIES		✱	✱	✱			
35	 STORM SEWER	SYSTEM REMOVES COLLECTED RUNOFF FROM SITE, PARTICULARLY FROM PAVED AREAS CAN ACCEPT LARGE CONCENTRATIONS OF RUNOFF CONDUCTS RUNOFF TO MUNICIPAL SEWER SYSTEM OR STABILIZED OUTFALL LOCATION USE CATCH BASINS TO COLLECT SEDIMENT					✱		✱
36	 CATCH BASIN, DRAIN INLET	COLLECTS HIGH VELOCITY CONCENTRATED RUNOFF MAY USE FILTER CLOTH OVER INLET					✱		✱
37	 SOD FILTER	INEXPENSIVE AND EASY TO CONSTRUCT PROVIDES IMMEDIATE PROTECTION PROTECTS AREAS AROUND INLETS FROM EROSION				✱			
38	 STRAW BALE FILTER	INEXPENSIVE AND EASY TO CONSTRUCT CAN BE LOCATED AS NECESSARY TO COLLECT SEDIMENT MAY BE USED IN CONJUNCTION WITH SNOW FENCE FOR ADDED STABILITY				✱			✱
39	 ROCK FILTER	CAN UTILIZE MATERIAL FOUND ON SITE EASY TO CONSTRUCT FILTERS SEDIMENT FROM RUNOFF				✱			✱
40	 INLET SEDIMENT TRAP	EASY TO SHAPE COLLECTS SEDIMENT MAY BE CLEANED AND EXPANDED AS NEEDED				✱			
41	 STONE AND ROCK CROSSING	MAY BE ROCK OR CLEAN RUBBLE MINIMIZES STREAM TURBIDITY INEXPENSIVE MAY ALSO SERVE AS DITCH CHECK OR SEDIMENT TRAP		✱					
42	 TEMPORARY CULVERT	ELIMINATES STREAM TURBULENCE AND TURBIDITY PROVIDES UNOBSTRUCTED PASSAGE FOR FISH AND OTHER WATER LIFE CAPACITY FOR NORMAL FLOW CAN BE PROVIDED WITH STREAM WATER FLOWING OVER ROADWAY		✱					
43	 CULVERT SEDIMENT TRAP	EASY TO INSTALL AT INLET KEEPS CULVERT CLEAN AND FREE FLOWING MAY BE CONSTRUCTED OF LUMBER OR LOGS		✱					✱

✱ INDICATES APPLICABILITY OF A SPECIFIC CONTROL MEASURE TO ONE OR MORE OF THE SEVEN PROBLEM AREAS

KEY	DETAIL	CHARACTERISTICS	A SLOPES	B STREAMS AND WATERWAYS	C SURFACE DRAINAGEWAYS	D ENCLOSED DRAINAGE (Inlet & Outfall Control)	E LARGE FLAT SURFACE AREAS	F BORROW AND STOCKPILE AREAS	G ADJACENT PROPERTIES
44		DEFLECTS CURRENTS AWAY FROM STREAMBANK AREAS		✱					
45		NEW CHANNEL KEEPS NORMAL FLOWS AWAY FROM CONSTRUCTION REQUIRES STATE PERMIT		✱					
46		PROTECTS ERODIBLE BANK AREAS FROM STREAM CURRENTS DURING CONSTRUCTION MINIMAL DISRUPTION WHEN REMOVED		✱					
47		WORK CAN BE CONTINUED DURING MOST ANTICIPATED STREAM CONDITIONS CLEAR WATER CAN BE PUMPED DIRECTLY BACK INTO STREAM		✱					
48		PERMITS WORK TO CONTINUE DURING NORMAL STREAM STAGES CONTROLLED FLOODING CAN BE ACCOMPLISHED DURING PERIODS OF INACTIVITY		✱					
49		REDUCES FLOW VELOCITY CATCHES SEDIMENT CAN BE CONSTRUCTED OF LOGS, STRAW, HAY ROCK, LUMBER, MASONITY, OR SAND BAGS		✱	✱				
50		CONTROLS SEDIMENTATION IN LARGE STREAMS CAUSES MINIMAL TURBIDITY		✱	✱				
51		REDUCES GRADIENT WHERE SLOPES ARE EXTREMELY STEEP PERMITS RETENTION OF EXISTING VEGETATION, KEEPING SOIL STABLE IN CRITICAL AREAS MINIMIZES MAINTENANCE	✱						✱
52		PREVENTS PIPING AND SOIL SLIPPAGE ON CUT SLOPES	✱						✱
53		MINIMIZES WIND EROSION MAY BE SNOW FENCE					✱		
54		USES GEOTEXTILE FABRIC AND POSTS OR POLES. EASY TO CONSTRUCT AND LOCATE AS NECESSARY.			✱				✱

TRAFFIC CONTROL/SAFETY STANDARDS

General

A detailed plan for traffic control shall be provided on projects as determined necessary by the City of Swartz Creek. The Current Michigan Manual of Uniform Traffic Control Devices shall be referenced for all traffic control plans.

All traffic control plans shall be reviewed by the City as well as any governing authorities having jurisdiction in the construction area.

The intent of all traffic control is to limit the duration of any closure to the minimum time required to complete construction as well as to provide as much advance warning as possible while creating minimal confusion.

Any traffic control devices left in place overnight shall be lighted and maintained on a regular basis.

All excavations and hazardous areas shall be protected by barricades or snow fencing.

The City shall review and approve all detour plans prior to construction.

The City shall be notified of any road closures or traffic alterations a minimum of 3 business days in advance.

Insurance

The following insurance requirements are suggested amounts and shall be used as a guideline only.

A. Developer's Liability Insurance

The limits of liability for the insurance required by this section shall provide the following coverages for not less than the following amounts or greater where required by Laws and Regulations:

	MINIMUM LIMITS
WORKERS COMPENSATION	
Part One: Compensation	Statutory
Part Two: Employee's Liability:	
accident	$1,000,000
disease	$1,000,000
GENERAL LIABILITY ("1973" form)	
Combined Single Limit Each Occurrence Limit	$2,000,000
Combined Single Limit Aggregate Limit	$2,000,000
COMPREHENSIVE AUTOMOBILE LIABILITY	
Bodily Injury-Each Occurrence Limit	$500,000
Property Damage-Each Occurrence Limit	$250,000
OR	
Combined Single Limit	$1,000,000
No Fault	Statutory
OWNER'S AND CONTRACTOR'S PROTECTIVE LIABILITY ("1973" form)	
Bodily Injury-Each Occurrence Limit	$500,000
Property Damage-Each Occurrence Limit	$250,000
Property Damage-Aggregate Limit	$500,000
OR	
Combined Single Limit	$1,000,000
UMBRELLA or EXCESS LIABILITY	$1,000,000

The Owner's and Contractor's Protective Liability Insurance shall include the following persons or entities as insureds:

(1) The City of Swartz Creek and its representatives, officers and employees.
(2) Engineer

If an Owner's and Contractors protective liability is not required, consider naming the following as additional insureds in the Contractor's liability policy:

(1) The City of Swartz Creek and its representatives, officers and employees.
(2) Engineer

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS that _____as Principal, hereafter called Developer, and _____ _____as Surety, hereinafter called Surety, are held and firmly bound unto City of Swartz Creek as Obligee, hereinafter called Owner, in the amount of _____ Dollars ($_____)

for the payment whereof Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, Developer has by written agreement dated _____ 20__ entered into a Contract with Owner for _____ in accordance with drawings and specifications prepared by _____ which Contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if contractor shall promptly and faithfully perform said Contract, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

a. The Surety hereby waives notice of any alteration or extension of time made by the Owner.

b. Whenever Contract shall be, and declared by Owner to be in default under the Contract, the Owner having performed Owner's obligations thereunder, the Surety may promptly remedy the default, or shall promptly.

    1. Complete the Contract in accordance with its terms and conditions, or

    2. Obtain a bid or bids for submission to Owner for completing the Contract in accordance with its terms and conditions, and upon determination by Owner and Surety of the lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as work progresses (even though there should be a default or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the Contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the Contract price", as used in this paragraph, shall mean, the total amount payable by Owner to Contractor under the contract and any amendments thereto, less the amount properly paid by Owner to contractor.

c. Any suit under this bond must be instituted before the expiration of two (2) years from the date on which final payment under the Contract falls due.

d. No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators or successors of Owner.

SIGNED AND SEALED this _____ day of _____A.D.20__.

In the presence of : _____(Seal)
Principal

_____ _____
Witness Title

_____(Seal)

_____ _____
Witness Title

MAINTENANCE AND GUARANTEE BOND

KNOW ALL MEN BY THESE PRESENTS, That _____,

Developer, as principal and_____
as surety, are held and firmly bound unto _____in the sum of _____ Dollars

($_____) good and lawful money of the United States of America, to be paid to the City of Swartz Creek, its legal representatives and assigns, for which payment well and truly made, we bind ourselves, our heirs, executors, administrators, successors and assigns, and each and every one of them jointly and severally, firmly by these presents.

Sealed with our seals and dated this_____ day of _____, A.D., 20__.

WHEREAS, the above named principal has entered into a certain written contract with _____, dated this____day of_____, A.D., 20___, wherein the said principal covenanted and agreed as follows, to wit:

_____

_____

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that by and under said contract, the above named principal has agreed with the City of Swartz Creek that for a period of two years from the date of final City acceptance to keep in good order and repair any defect in all the work done under said contract either; by the principal or his sub-contractors, or his material suppliers, that may develop during said period due to improper materials, defective equipment, workmanship or arrangements, and any other work affected in making good such imperfections, shall also be made good all without expense to the City of Swartz Creek, excepting only such part or parts of said work as may have been disturbed without the consent or approval of the principal after the final acceptance of the work, and that when ever directed so to do by the City of Swartz Creek, by notice served WILL PROCEED at once to make such repairs as directed by City of Swartz Creek; and in case of failure so to do within one week from the date of service of such notice, or within reasonable time not less than one week, as shall be fixed in said notice, then the City of Swartz Creek shall have the right to purchase such materials and employ such labor and equipment as may be necessary for the purpose, and to undertake, do and make such repairs, and charge the expense thereof to, and receive same from said principal or surety.

If any repair is necessary to be made at once to protect life and property, then and in that case, the City of Swartz Creek may take immediate steps to repair or barricade such defects without notice to the contractor. In such accounting the City of Swartz Creek shall not be held to obtain the lowest figures for the doing of the work, or any part thereof, but all sums actually paid therefore shall be charged to the principal or surety. In this connection the judgement of City of Swartz Creek is final and conclusive. If the said principal for a period of two (2) years from the date of payment of Final Estimate, shall keep said work so constructed under said contract in good order and repair, excepting only such part or parts of said work which may have been disturbed without the consent or approval of said principal after the final acceptance of the same, and

shall whenever notice is given as hereinbefore specified, at once proceed to make repair as in said notice directed, or shall reimburse City of Swartz Creek for any expense incurred by making such repairs, should the principal or surety fail to do as hereinbefore specified, and shall fully indemnify, defend and save harmless the City of Swartz Creek from all suits and actions for damage of every name and description brought or claimed against it for or on account of any injury or damage to person or property received or sustained by any party or parties, by or from any of the acts of omissions or through the negligence of said principal, servants, agents or employees in the prosecution of the work included in said contract, and from any and all claims arising under the Workmen's Compensation Act, so-called, of the State of Michigan, then the above obligation shall be void, otherwise to remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed by their respective authorized officers this _____ day of _____A.D., 20___.

Signed, Sealed and Delivered
In the Presence of:

_____ _____(L.S.)

_____ _____(L.S.)

_____ _____(L.S.)

NOTE; Bond must show complete NAME AND ADDRESS OF LOCAL AGENT AND HOME COMPANY.

SECTION 2
CONSTRUCTION SPECIFICATIONS

RIGHT OF WAY PERMIT REQUIREMENTS AND INSPECTION

A. Necessity

No person, firm or corporation shall dig or tear up any pavement, sidewalk or crosswalk, or dig any hole, ditch, drain or sewer, in any street, alley or public property, without first obtaining a permit from the City.

It shall be the duty of such person, firm or corporation, upon being granted a permit as herein above required to maintain all traffic control devices and to immediately refill and restore, resurface or repave such street, alley or other public property so that the same will be in as good condition as before, it shall further be the duty of such person, firm or corporation to erect and maintain during the progress of the work a good and sufficient barrier around any cut, trench or excavation in such manner as to prevent accidents, and to place and keep upon such barrier suitable and sufficient colored lights during the night.

A separate permit must be obtained for each occasion and such permit shall specify the location of the cut, trench or excavation to be made.

B. Requirements

Right of Way Permit Form available at City Hall is to be completed by the applicant. (Sample enclosed at the end of this section).

$2,000 Performance Bond (sometimes called Surety Bond or Permit & License Bond) - usually provided by an insurance company. This bond must be effective for 2 years from the date of final acceptance of the work to be performed in the right of way.

The City of Swartz Creek will charge an inspection fee, based upon City of Swartz Creek permit fee schedule.

FOR A RIGHT OF WAY INSPECTION PLEASE CALL THE CITY OF SWARTZ CREEK TO MAKE ARRANGEMENTS FOR INSPECTION.

APPLICATION AND PERMIT
FOR USE OF
CITY OF SWARTZ CREEK
PUBLIC RIGHT-OF-WAY

DO NOT WRITE IN THIS SPACE

PERMIT NO.

APPL. DATE | DATE ISSUED

BOND NO. | BOND AMOUNT

$

(Print in ink or type)

APPLICANT'S NAME	CONTRACTOR'S NAME (INDIVIDUAL COMPANY, ETC.)
MAILING ADDRESS	MAILING ADDRESS
CITY STATE ZIP	CITY STATE ZIP
TELEPHONE NO.	TELEPHONE NO.

REQUEST: I do hereby make application for a permit to use the right-of-way at the following location:

(Give distance & direction from nearest main intersection)

For a period commencing and ending ; for the following purposes (provide a detailed description of the desired facility and/or activity):

I certify that I accept the following: 1. Commencement of work set forth in the permit application constitutes acceptance of the permit as issued. 2. Failure to object within ten (10) days to the permit as issued constitutes acceptance of the permit as issued. 3. If this permit is accepted by either of the above methods I will comply with the provisions of the permit.

Applicant's Signature Title Date

Authorized Agent Signature Date
(I hereby certify that I am acting as authorized agent on behalf of the named applicant.)

APPROVED FOR CITY OF SWARTZ CREEK BY: DATE

NOTICE OF COMPLETION

The Notice of Completion was received: By:

FINAL INSPECTION REPORT

	Yes	No
Work covered by permit has been completed satisfactorily	☐	☐
Recommend performance bond be released	☐	☐
Have all other charges been paid?	☐	☐

Remarks:

INSPECTED BY:

BY: DATE

CERTIFICATE OF FINAL INSPECTION

ISSUANCE DATE BY:

Permit Conditions

GENERAL CONDITIONS: This permit is issued subject to the following conditions:

- Issuance of this permit does not relieve permittee from meeting any and all requirements of law, or of other public bodies or agencies.
- This permittee agrees as a condition of this permit to provide and maintain all necessary precautions to prevent injury or damage to persons and property from operations covered by this permit and to furnish, install and maintain all necessary traffic control and protection during permittee's operations in accordance with the Michigan Manual of Uniform Control Devices.
- Performance of the requirements of this permit is the responsibility of the permittee and the permittee shall complete all operations for which this permit is issued in accordance with the conditions of this permit and by the specified completion date. The permittee shall meet all requirements of the current City of Swartz Creek standards for construction and applicable rules and regulations.
- The permittee shall be responsible for the cost of restoration of the highway facilities and right-of-way determined by the City of be damaged as a result of the activities of the permittee.
- The permittee shall save harmless the City of Swartz Creek against any and all claims for damages arising from operations covered by this permit and upon request, shall furnish proof of insurance coverage fo the term of this permit in an amount prespecified.
- The permittee, upon request of the City, shall immediately remove, cease operations and surrender this permit or alter or relocate, at the permittee's own expense, the facility for which this permit is granted. Upon failure to do so the City may take any necessary action to protect the highway interest and the permittee shall reimburse the City for its costs in doing same. The permittee expressly waives any right to claim or compensation in the event this permit is revoked.
- The permittee shall upon the request by the City furnish a performance surety deposit in the form of a bond, cash or certified check, in such amount as deemed necessary by the City to guarantee restoration of the public right-of-way or performance under the conditions of the permit.
- The permittee hereby acknowledges and agrees that the City has the right to demand completion by the permittee, or the performance surety or to complete any incomplete activity authorized by this permit which adversely affects the operation and/or maintenance of the public right-of-way or which is not completed by the expiration date of the permit.
- The permittee further acknowledges that he shall immediately reimburse the City in full for all such costs incurred by the City upon receipt of billing and that upon failure to pay, the City may effect payment with the performance surety deposit. Should the surety deposit by insufficient to cover expenses incurred by the City, the permittee shall pay such deficiency upon billing by the City. If the surety deposit exceeds the expense incurred by the City, upon completion of the work to the satisfaction of the City, any excess will be returned to the depositor.
- The City reserves the right during the time any or all of the work is being performed to assign an inspector to protect the highway interest and to charge the permittee all such costs incurred.
- The permittee shall notify the City upon completion of all work accomplished under the provisions of this permit. A certificate of final inspection shall be issued by the City to the applicant one year after said notification and subject to a final inspection to determine whether all provisions of the permit have been adhered to. The surety deposit, when required, will not be released until the certificate of final inspection is issued and all billable charges to the permittee have been paid.

WATER/SEWER TAP PERMIT INSTRUCTIONS

A. Requirements

Water/Sewer Tap Permit Application Form to be completed by the applicant. (A sample is provided at the end of this section).

Required fees for water and sewer taps - to be computed pursuant to fee schedule.

Inspection fee will be charged for each water and sewer by the City to cover associated inspection costs with fee according to current city fee schedule.

City of Swartz Creek requires an inspection to be performed at time of utility installation. 24 hour notice is required prior to an inspection date.

Inspector will need to witness water and sewer tap being made and all underground pipe for proper installation and material in accordance with City specifications.

If an inspection is not scheduled, the Contractor performing the work will be required to dig up the utilities at their cost, so an inspection can be done, also water will not be turned on until an inspection has been performed.

Deposit and inspection fees will be based upon City of Swartz Creek current fee schedule.

FOR A WATER OR SEWER TAP INSPECTION, PLEASE CALL THE CITY OF SWARTZ CREEK TO MAKE ARRANGEMENTS FOR INSPECTION.

APPLICATION FOR WATER/SEWER TAP PERMIT
City of Swartz Creek No. _____

☐ New Tap ☐ Additional Tap ☐ Disconnection ☐ Replacement

Service Address:

Lot Number: Subdivision:

Type of Facility: ☐ Single Family Residential ☐ Multiple Family Residential (Units ____)
☐ Office or Commercial ☐ Industrial, Government or Institutional

Gross Floor Area of Building (square feet):

Applicant:

Billing Address:

Contractor Name:

Contractor License Number:

Street Cut Permit Number:

Tap Size: ☐ Storm _____ ☐ Sanitary _____ ☐ Water _____
Number of Connections: ☐ Storm _____ ☐ Sanitary _____ ☐ Water _____

Approximate date of service installation: _____ NOTE: Please call _____ for sewer or _____ for water 24 hours in advance to schedule inspection.

APPLICANT TO PROVIDE AND FILL IN ALL INFORMATION ABOVE.

OFFICE USE BELOW

Tap Number:

Computation Fees	(Sewer)	Total:	by:
	(Water)	Total:	by:

INSPECTION REPORT

Type of Tap: Tap Made by:

Type of Material Used:

Condition of Tap:

Condition of Sampling Manhole:

Remarks

CITY INSPECTION REQUIREMENTS FOR LAND IMPROVEMENTS

A. Definitions

The following definitions apply to the respective terms as they are used in this section

1. Land Improvements

Any paving, grading or filling of land or changing of surface drainage of land and the construction or installation of sanitary sewer, storm sewer, watermain or storm water detention basin.

a. Exceptions

1) Resurfacing of existing areas that do not affect the course of drainage as determined by the city engineer.
2) Residential driveways.

2. Grading

Any change or alteration of existing ground surface elevations by excavation or filling.

3. Surface Drainage

Any storm water collecting on or flowing over the surface of the ground.

B. Permit Required

No person shall commence land improvements on any parcel of land without having first applied for and received a land improvement construction permit in accordance with this section.

C. Application for Land Improvement Permit

1. Application

Prior to the construction or installation of land improvements on any parcel of land, the owner of such land or an agent having the written authorization of the owner, shall submit an application for a land improvement permit with the department. The application shall include the estimated cost of the land improvements, estimated time schedule for construction (number of estimated construction days required), the appropriate plan review fee and plans and specifications.

2. Plans and Specifications

The plans and specifications shall be prepared by and signed and sealed by a professional engineer. Plans detailing parcel surveys must be signed and sealed by a licensed land surveyor.

Plans shall be prepared on 24" x 36" size sheets and shall generally be drawn to scale of not more than 50 feet to the inch. The drawings shall contain sufficient detail to properly show the proposed locations and methods of construction or grading. The city engineer may require the plans to be drawn to a scale of 20 feet to the inch when deemed necessary for proper review.

Three (3) complete sets of plans and specifications shall be submitted with the permit application.

After completion of the project, as-built plans, in an electronic format and acceptable to the city, must be submitted showing the exact location of all land improvements prior to final approval of the project by the city. These plans must be prepared and certified by the owner's engineer.

D. Duties of Department

Upon receipt of the permit application, plans and specifications, cost estimate and plan review fee, the Department shall transmit copies to the appropriate departments for their review.

E. Review

The city engineer shall review the plans and specifications and approve the same if they comply with the city's design and construction standards and meet all site plan review approval requirements. In the event any item does not comply with said standards, the plans shall be returned to the land owner or agent, with notations as to any deficiency. The land developer or owner shall resubmit the required number of copies of corrected plans directly to the city engineer. Upon approval of the plans and specifications, the city engineer shall notify the owner or agent of such approval.

F. Issuance of Permit

Following approval of the plans and specifications, a land development construction permit will be issued upon receipt of the following:

1. Inspection fees, as required herein.

2. Performance Bond.

3. All approvals and/or permits from other governmental agencies having jurisdiction if applicable.

G. Inspection

No land improvements shall be undertaken without city inspection. Any facilities installed without inspection may be required to be removed and reinstalled at the owner's expense, with proper city inspection.

H. Inspection Fees

Inspection fees shall be deposited with the city to cover the inspection costs. Deposit shall be based on estimated construction schedule provided by applicant. A set hourly rate will be provided to the applicant in relation to inspection costs.

In the event the developer exceeds the estimated time, the developer shall be billed at the hourly rate. Any unused portion of the fee shall be returned to the applicant at the completion of the project. If the deposit is used up prior to completing the project, the city may require the applicant to deposit an additional amount based on an estimated construction schedule provided by applicant, to finalize the project. The city may require receipt of the deposit prior to allowing construction to continue.

I. Performance Bond

The owner or contractor shall post a performance bond in the name of the city and guaranteeing completion of land improvements. The amount of the bond shall be equal to the construction cost.

APPLICATION AND PERMIT FOR LAND IMPROVEMENTS CITY OF SWARTZ CREEK

DO NOT WRITE IN THIS SPACE

PERMIT NO.

APPL. DATE | DATE ISSUED

BOND NO. | BOND AMOUNT

$

(Print in ink or type)

APPLICANT'S NAME			CONTRACTOR'S NAME (INDIVIDUAL COMPANY, ETC.)		
MAILING ADDRESS			MAILING ADDRESS		
CITY	STATE	ZIP	CITY	STATE	ZIP
TELEPHONE NO.			TELEPHONE NO.		

REQUEST: I do hereby make application for a permit to perform land improvements at the following location:

(Give distance & direction from nearest main intersection)

For a period commencing and ending ; for the following purposes (provide a detailed description of the activity):

Estimated days of construction: Estimated cost of land improvements: $

Plan review fee (1% of estimated construction cost or $750, whichever is greater) $

Construction plans and specifications shall be provided with permit.

Applicant's Signature Title Date

Authorized Agent Signature Date
(I hereby certify that I am acting as authorized agent on behalf of the named applicant.)

APPROVED FOR CITY OF SWARTZ CREEK BY: DATE

NOTICE OF COMPLETION

The Notice of Completion was received: By:

FINAL INSPECTION REPORT

	Yes	No
Work covered by permit has been completed satisfactorily	☐	☐
Recommend performance bond be released	☐	☐
Have all other charges been paid?	☐	☐

Remarks:

INSPECTED BY:

BY: DATE

CERTIFICATE OF FINAL INSPECTION

ISSUANCE DATE BY:

ADJUSTING/RECONSTRUCTING STRUCTURE COVERS

A. Adjusting Structure Covers

1. General

Adjusting covers shall apply where the elevation of the cover is not changed more than 6" and no other alterations are necessary.

The Contractor shall adjust drainage structure covers where shown on the plans or directed by the City. On projects where drainage structure covers are to be adjusted to meet a new bituminous surface, final adjustment shall be made after all base and leveling courses have been constructed, if any, and just before the final wearing course is placed.

2. Execution

Adjustment of covers shall be made by adding or removing grade rings, block, or brick. Concrete grade rings, block, or brick shall be set in mortar. Joints shall be struck and properly pointed and the exposed surfaces shall be true and smooth. The entire exterior or the new structure shall be plastered with 1/2" of mortar.

B. Adjusting Water Shut-off Valve Covers

Valve boxes shall be raised to the proposed finish grade. These valve boxes are of the screw type. Extensions may be required and they will be approved by the City. Any excavation required shall be filled with 3500 psi concrete.

C. Reconstructing Structures

1. General

Reconstructing covers shall apply where the elevation of the cover is changed more than 6" or other alterations are necessary.

The Contractor shall reconstruct the drainage structure to conform to the details shown on the plans. Where reconstruction to the top of footing is necessary, the work shall be considered a new structure.

2. Execution

Reconstruction of structure shall be made by adding or removing grade rings, block, or brick. Concrete grade rings, block, or brick shall be set in mortar. Joints shall be struck and properly pointed and the exposed surfaces shall be true and smooth. The entire exterior or the new structure shall be plastered with 1/2" of mortar.

BITUMINOUS PAVING

A. Materials

1. Bituminous Mixtures

Materials shall meet the requirements of the latest Michigan Department of Transportation Standard Specifications for Construction.

Bituminous mixtures and application rates shall be as shown on the plans.

2. Aggregate

Aggregate for base under a proposed bituminous pavement shall meet the requirements for either Series 22A or 23A aggregate, as specified in the latest Michigan Department of Transportation Standard Specifications for Construction, unless noted otherwise on the plans or in the proposal.

B. Construction of Bituminous Pavements

1. Equipment

Equipment shall meet the requirements of the latest Michigan Department of Transportation Standard Specifications for Construction.

2. Preparation of Aggregate Base (for pavements constructed on an aggregate base).

An aggregate base, of the thickness shown on the plans, shall be constructed on a prepared subgrade. The subgrade shall be free of unstable or yielding soils or organic material and shall be compacted to at least 95 percent of its maximum density as determined by ASTM D1557. Unstable, yielding, and organic soils shall be excavated and replaced with suitable soil.

The aggregate base shall be constructed of aggregate meeting the requirements of Series 23A aggregate as specified in the Latest MDOT Standard Specifications for Construction, unless another aggregate is called for on the plans in the project specifications, or directed by the City. The aggregate shall be placed in lifts not less than three (3) inches nor more than six (6) inches and compacted to at least 95 percent of its maximum density as determined by the One Point Michigan Cone Test, as described in the MDOT Density Control Handbook. The finish grade of the aggregate shall be graded and shaped to the dimensions and elevations required within a tolerance of 3/4 inches.

3. Preparation of Existing Pavement (for overlays)

Catch basins, manhole covers, valve boxes, and water shutoffs shall be adjusted before placement of the surface course.

The existing pavement surface shall be thoroughly cleaned of all dirt and debris. Joints and cracks in the existing pavement shall be cleaned of all dirt and debris. The Contractor shall not place any pavement courses until the existing surface has been inspected and approved by the City.

Existing bituminous patches with a high bituminous content which may cause bleeding or instability, as determined by the City, shall be removed. Holes, depressions, cracks, and removed patches shall be patched with bituminous material, flush with the existing pavement.

A bituminous bond coat shall be uniformly applied in advance of paving using a pressure distributor. The rate of application shall be as specified by the City; the rate will be between 0 and 0.10 gallons per square yard.

Paving shall not be placed until the bond coat has cured.

4. Transportation of Mixtures

   Transportation of mixtures shall meet the requirements of the latest edition of the Michigan Department of Transportation Standard Specifications for Construction.

5. Placing Bituminous Pavement

   Construction procedures shall meet the requirements of the latest edition of the Michigan Department of Transportation Specifications for Construction.

6. Weather and Seasonal Limitations

   Neither bituminous mixtures nor bond coats are to be placed when rain is threatening nor when the moisture on the surface would prevent satisfactory bonding.

   Bituminous pavements shall not be constructed before May 5 nor after November 15 unless otherwise approved by the City. The temperature, as measured in the shade, shall exceed the following before placing bituminous pavements.

Temperature of Surface being Overlaid, Degree F	Thickness of Proposed Bituminous Pavement, lbs/sy
50	less than 120
40	120 to 200
35	more than 200

7. Developer shall provide bond for final bituminous wearing course to allow majority of building to be completed prior to placing wearing course. Final wearing course shall be placed within two years after leveling course is applied.

CLEANUP AND RESTORATION

A. General

The Contractor shall restore areas disturbed by construction activities to a condition reasonably close to their condition before the project, unless shown otherwise on the plans. Restoration work should be performed as soon as possible after construction work is completed in a particular area.

Upon the completion of work in an area, all excess materials, debris, equipment, and similar items shall be removed from the project area by the Contractor, and disposed of properly.

B. Materials

1. Topsoil

Topsoil shall be dark, organic, natural soil suitable for sustaining vegetation. Topsoil shall be screened to remove any debris and foreign matter. Topsoil from outside of the grading limits shall be approved by the City.

2. Seed

Seed mixtures shall meet the requirements for purity and germination as specified in the proceedings of the association of official seed analysis, rules for testing seeds.

Seed shall be supplied in durable bags with a tag specifying the supplier, lot number, net weight, purity, germination and mixture proportion.

Seed mixture shall be composed of certified seed of the purity, germination and proportions by weight shown below.

Seed	Minimum Purity	Minimum Germination	Mixing Proportions
Kentucky Blue Grass	98%	80%	30%
Perennial Rye Grass	96%	85%	20%
Creeping Red Fescue	97%	85%	50%

3. Fertilizer

Fertilizer shall be ready mixed granular chemical fertilizer containing equal amounts by weight of available nitrogen (N), readily available phosphorus acid (P205), and total available potash (K20) mixed with not less than 40% by weight filler.

Fertilizer shall be supplied in suitable bags, with the net weight of the contents and guaranteed analysis shown therein, or in bulk with certification of the fertilizer analysis and net weight of the shipment.

C. Execution

1. Restoration

Unless otherwise provided; aggregate surfaces, bituminous pavements, and concrete pavements shall be restored by construction of similar replacement surfaces. Aggregate surfaces shall be replaced with the materials and thicknesses described in the specification for aggregate surfaces. Bituminous pavement shall be replaced with the cross sections(s) shown on the plans and in accordance with the specification for bituminous paving. Concrete pavement shall be replaced with pavement in accordance with the specification for Concrete Driveways and Miscellaneous Pavement.

Turf areas shall be restored by re-establishing the turf as described in the specification. All areas disturbed by construction that are not to be surfaced with aggregate or pavement shall be restored with 4" of topsoil, fertilized and seeded.

Turf areas to be seeded shall be properly graded, sloped, and shaped with an allowance for the thickness of the topsoil layer. The earth bed upon which topsoil will be placed shall be friable to a depth of at least four inches. Earth beds not in a friable condition shall be harrowed with a disk, spring tooth drag, or similar equipment.

After 4" of topsoil has been spread on a prepared area, any large clods or lumps shall be broken and all stones larger than 1 inch diameter, rocks, roots, litter and other foreign debris shall be raked up and disposed of.

2. Placement of Fertilizer, Seed, and Mulch

Fertilizer shall be evenly applied at a rate which will provide 240 pounds per acre of chemical fertilizer nutrients, in equal proportions of Nitrogen, Phosphoric Acid, and Potash.

Seed mixtures shall be applied at a uniform rate of 150 pounds per acre. Areas where a visual inspection fails to yield an average of two seeds per square inch shall be reseeded at the Developer's expense.

When seed, fertilizer, and mulch are to be applied hydraulically, they shall be mixed in the specified proportions with water to produce a slurry and then uniformly applied under pressure at the specified rates on the areas to be restored with turf. When wood cellulose mulch materials are used, it shall be added after the seed and fertilizer have been thoroughly mixed. The mixture shall be constantly agitated from the time they are mixed until they are applied. Mixtures shall be applied within eight hours of mixing.

If mulch adhesives are used, the Developer shall protect signs, traffic, structures, and other objects from being marked or disfigured by the adhesive material. Mulch adhesives shall be applied by spraying simultaneously or immediately following the mulch application. Asphalt emulsion adhesives shall be applied at a rate of 150 gallons/acre; latex based adhesives shall be applied at a rate of 400 gallons/acre.

If mulch net is used to anchor the mulch, the net shall be spread over the mulch layer and secured with staples driven into the ground. The net shall not be held in contact with the ground.

The Developer shall thoroughly water the earth beds and seeded areas at such times, in such locations, and in such amounts as may be required to obtain good growth. Areas where turf does not become well established shall be reworked by the Developer. Areas that produce sparse turf growth shall be reworked, reseeded and mulched until turf has been established.

Mailboxes, fences, signs, ornaments, and similar items shall be replaced at the completion of construction. Posts shall be installed plumb. Items that are lost or stolen shall be repaired or replaced at the Contractor's expense. Repairs or replacements shall meet the City's approval.

3. Temporary Restoration of Driving Surfaces

Where a pavement or gravel surface is removed as a result of construction activities, a temporary surface shall be provided and maintained by the Developer until the permanent surface is provided. Unless otherwise directed, the temporary surface shall be twelve (12) inches of aggregate compacted to at least 95 percent of its maximum density (ASTM D1557) and graded to meet the adjacent, remaining surfaces. Aggregate shall meet the requirements of Series 23A as described in the latest Michigan Department of Transportation Specifications.

The Contractor shall regrade the temporary surface and add additional aggregate at intervals necessary to maintain them in a relatively smooth condition.

TREES AND LANDSCAPING

A. Review

Trees and landscaping requirements are found in the City of Swartz Creek Zoning Code Ordinance and review may be required by the City Planner.

B. Installation

Trees/landscaping shall be installed in a sound workman line manner and conform to the American Standard for Nursery Stock ANSIZ60.1. If building or paving construction is completed during a planting season, then no certificate of occupancy will be issued unless the landscaping meets the requirements herein provided. If building or paving construction is completed in an off planting season, the certificate of occupancy will be issued only after the developer provides a performance bond to ensure installation of required landscaping in the next planting season.

C. Material Removal

Tree stakes, guy wires and tree wrap are to be removed after one year.

D. Maintenance

Plant materials shall be maintained in a healthy growing condition, neat and orderly in appearance. If any plant material dies or becomes diseased, they shall be replaced within thirty (3) days of written notice from the City or within an extended time period as specified in said notice.

CONCRETE CURB AND GUTTER

A. General

1. Work Included

This work includes all preparation, forming, concrete production and placement, finishing, jointing, reinforcing, curing, protection, and restoration for the construction of concrete curb and gutter.

The concrete curb and gutter shall be constructed substantially in accordance with the cross section provided on the City approved plans.

Curb and gutter may be constructed either by slip-forming or using fixed forms.

B. Products

1. Materials

a. Portland cement shall meet the requirements of ASTM C150.
b. Coarse aggregate shall meet the requirements of Class 6A aggregate as described in the latest Michigan Department of Transportation Specification for Construction.
c. Reinforcing steel shall be grade 60 steel bars meeting the requirements ASTM A615, A616, or A617.
d. White membrane curing compound shall conform to ASTM C309, Type 2, Class B vehicle.
e. Fiber joint filler shall meet the requirements of ASTM D1751.

2. Mixtures

Concrete for driveways and miscellaneous pavements shall be transit mixed concrete in accordance with ASTM C94.

Air content shall be 4-6%, slump shall be 1-4 inches, and compressive strength shall be at least 3500 psi after 28 days. Concrete shall contain at least six sacks of cement per cubic yard of concrete.

C. Execution

1. Removal of Existing Curb and Gutter

Where the proposed curb and gutter is to replace existing curb and gutter, the existing curb and gutter shall be removed in accordance with the requirements for pavement removal, included elsewhere in these documents.

2. Preparation

The base shall be excavated, filled, and shaped as required to construct the proposed curb and gutter at the elevations and alignment required. The base shall be compacted to at least 95% of its maximum unit weight as determined by ASTM D1557. Soft and yielding material shall be excavated and replaced with suitable soils.

Forms, if used, shall extend the full depth of the concrete. Face forms for the exposed curb face are not required. Forms shall be of sufficient strength and staked to prevent springing or yielding after placement of concrete. Flexible forms capable of making a smooth arc shall be used for curved sections.

Steel reinforcement shall be placed as shown on the plans. Reinforcing shall be spliced and held in place in a manner approved by the City. Splices shall be overlapped by 10 inches.

3. Placing Concrete

Concrete shall not be placed until the forms or the prepared grade (if slip forming) have been inspected by the city. Concrete shall be deposited to the full depths and spaded or vibrated to ensure proper consolidation.

Joints shall be constructed perpendicular to the surfaces and shall not vary more than 1/4 inch from their designated position. Contraction joints shall be spaced at 50 foot intervals and shall be at least 1/4 the thickness of the section. Steel reinforcing shall not extend through contraction joints. Expansion joints shall be constructed at spring points, at intervals not exceeding 400 feet, and 10 to 50 feet each side of a drainage structure. Expansion joints shall be 1 inch thick and extend through the full cross section of the curb and gutter. Plane-of-weakness joints shall be provided at uniform spacing, not exceeding 10 feet. Plane-of-weakness joints shall extend through at least 1/4 the thickness of the section.

The edges of the gutter, the back of the top edge of curb, and all transverse joints shall be rounded with a finishing tool having a radius of 1/4 inch. The face of the curb, at the top and bottom, shall be shaped with suitable tools to provide the required radius.

Any material required to fill low spots shall be obtained from the mixture used in the work. Exposed surfaces shall be finished smooth and even by means of a moistened wood float, followed by light brushing.

The gutter and top of curb shall not vary more than 3/16 inch in 10 feet when using a 10 foot straight edge. Other surfaces shall not vary more than 3/8 inch in 10 feet.

Water shall not be added as an aid to finishing.

Exposed concrete surfaces shall be cured using white membrane curing compound applied uniformly at a rate of 200 square feet per gallon. Curing compound shall be applied regardless of temperature or humidity conditions.

4. Protection

   Concrete shall not be placed until the air away from artificial heat is at least 25°F and rising. Concrete shall be protected from damage by freezing or precipitation.

   The Contractor shall provide barricading and security as necessary to protect fresh concrete from accidental damage or vandalism. Damaged concrete shall be removed to a joint and replaced at the Contractors expense.

5. Cleanup and Restoration

   Forms shall be removed when the concrete has attained sufficient strength. After removal of forms, the curb and gutter shall be backfilled.

   Areas to be restored with turf shall be backfilled with suitable soil, compacted, and surfaced with three inches of topsoil such that the topsoil surface is flush with the top of curb. Areas to be surfaced with pavement or sidewalk shall be backfilled with sand to the bottom of the proposed pavement, sidewalk, or base, and compacted.

   Where curb and gutter is constructed adjacent to an existing pavement, the void between the curb and gutter and the pavement shall be filled full depth with material in kind as the existing pavement.

CONCRETE DRIVES AND MISCELLANEOUS CONCRETE PAVEMENT

A. General

1. Work Included

This work includes all preparation, forming, concrete production and placement, finishing, jointing, reinforcing, curing, protection, and restoration for the construction of concrete driveways and miscellaneous concrete pavement.

2. Minimum Driveway Cross Sections

Driveways shall be constructed of concrete to the following minimum cross sections, unless otherwise directed.

a. Commercial or industrial driveways, subject to heavy truck traffic: 8" thick reinforced with 6" x 6" x#10 steel mesh.
b. Residential driveways: 6 inches thick.

B. Products

1. Materials

a. Portland cement shall meet the requirements of ASTM C150.
b. Coarse aggregate shall meet the requirements of Class 6A aggregate as described in the latest Michigan Department of Transportation Specifications for Construction.
c. Reinforcing steel shall be grade 60 steel bars meeting the requirements of ASTM A615, A616, or A617.
d. White membrane curing compound shall conform to ASTM C309, Type 2, Class B vehicle.
e. Fiber joint filler shall meet the requirements of ASTM D1751.

2. Mixtures

Concrete for driveways and miscellaneous pavements shall be transit mixed concrete in accordance with ASTM C94.

Air content shall be 4-6%, slump shall be 1-4 inches, and compressive strength shall be at least 3500 psi after 28 days. Concrete shall contain at least six sacks of cement per cubic yard of concrete.

C. Execution

1. Coordination of Traffic

Hazardous areas shall be barricaded to protect pedestrian and vehicular traffic.

Work shall be scheduled so that access is maintained to driveways and entrances through the project area to the extent possible. Where a driveway or entrance must be closed for a period, the property owner or occupant shall be notified in advance of the closing.

2. Preparation

The base shall be excavated, filled, and shaped as required to construct pavement of the required thickness at the proposed grades and alignment. The base shall be compacted to at least 95% of its maximum unit weight as determined by ASTM D1557. Soft and yielding soils shall be excavated and replaced with suitable soils.

Forms shall extend the full depth of the concrete. Forms shall be of sufficient strength and staked to prevent springing or yielding after placement of concrete.

Driveway grades shall not exceed one foot per ten feet.

Where steel reinforcement is used, it shall be spliced and held in place in a manner approved by the Engineer. Splices shall be overlapped by ten inches.

3. Placement of Concrete

Concrete shall not be placed until the forms have been inspected by the City.

Concrete shall be deposited to the proper depth and spaded or vibrated to ensure proper consolidation.

Joints shall be constructed perpendicular to surfaces and shall not vary more than 1/4 inch from their designated position. Transverse plane-of-weakness joints shall be placed at intervals not exceeding ten feet.

In irregularly shaped areas, joints shall be perpendicular as much as possible.

Expansion joints shall be constructed using 1/2 inch fiber joint filler as follows:

a. At intervals not exceeding 50 feet.
b. At fixed objects such as curbs, sidewalks, and buildings.
c. At intersections and changes in direction.

Any material required to fill low spots shall be obtained from the mixture used in the work. Exposed surfaces of the concrete slab shall be finished smooth and even by means of a moistened wood float, followed by a light brushing perpendicular to sidewalk. Water shall not be added to the concrete surface as an aid to finishing. The top edges of the slab and all transverse joints shall be rounded with a finishing tool having a radius of 1/4 inch. Pavement surfaces shall not vary more than 3/8 inch from the alignment and typical cross section.

Exposed concrete surfaces shall be cured using white membrane curing compound applied uniformly at a rate of 200 square feet per gallon. Curing compound shall be applied regardless of temperature or humidity conditions.

4. Protection

   Concrete shall not be placed unless the temperature of the air away from artificial heat is at least 25°F and rising. Concrete shall be protected from damage caused by freezing or rain.

   The Developer shall provide sufficient barricading and security to protect fresh concrete from accidental damage or vandalism. Damaged concrete shall be removed to a joint and replaced at the Developer's expense.

5. Cleanup

   After the concrete has attained sufficient strength, the forms shall be removed.

CONCRETE SIDEWALKS

A. General

1. Work Included

This work includes all preparation, forming, concrete production and placement, finishing, jointing, reinforcing, curing, protection, and restoration for the construction of concrete sidewalks meeting current American with Disability (ADA) requirements for slope.

2. Minimum Sidewalk Cross Sections

Sidewalk shall be constructed to the following minimum cross sections, unless otherwise directed.

a. Sidewalk through commercial or industrial driveways, subject to heavy truck traffic: 8" thick reinforced with 6" x 6" x#10 steel mesh.
b. Sidewalk through other driveways: 6 inches thick.
c. Sidewalk ramps: 6 inches thick.
d. All other sidewalk: 4 inches thick.

B. Products

1. Materials

a. Portland cement shall meet the requirements of ASTM C150.
b. Coarse aggregate shall meet the requirements of Class 6A aggregate as described in the latest Michigan Department of Transportation Specifications for Construction.
c. Reinforcing steel shall meet the requirements of ASTM D1751. Steel shall be grade 60.
d. White membrane curing compound shall conform to ASTM C309, Type 2, Class B vehicle.

2. Mixtures

Concrete for sidewalks shall be transit mixed concrete in accordance with ASTM C94.

Air content shall be 4-6%, slump shall be 1-4 inches, and compressive strength shall be at least 3500 psi after 28 days. Concrete shall contain at least six sacks of cement per cubic yard of concrete.

C. Construction Requirements

1. Coordination of Traffic

Hazardous areas shall be barricaded to protect pedestrian and vehicular traffic.

Work shall be scheduled so that access is maintained to driveways and entrances through the project area to the extent possible. Where a driveway or entrance must be closed for a period, the property owner or occupant shall be notified in advance of the closing.

2. Preparation

The base shall be excavated, filled, and shaped as required to construct pavement of the required thickness at the proposed grades and alignment. The base shall be compacted to at least 95% of its maximum unit weight as determined by ASTM D1557. Soft and yielding soils shall be excavated and replaced with suitable soils.

Forms shall extend the full depth of the concrete. Forms shall be of sufficient strength and staked to prevent springing or yielding after placement of concrete.

Sidewalk transverse slopes shall not exceed 1/2 inch per foot. Transverse slopes less than 1/4 inch per foot shall not be used unless longitudinal drainage is provided. Longitudinal grades shall not exceed one inch per foot.

Sidewalk ramps shall be constructed at intersections where the sidewalk intersects a curb and where otherwise directed. Ramps shall not be steeper than one inch per foot.

Where steel reinforcement is used, it shall be spliced and held in place in a manner approved by the City. Splices shall be overlapped by ten inches.

3. Placement of Concrete

Concrete shall not be placed until the forms have been inspected by the City.

Concrete shall be deposited to the proper depth and spaded or vibrated to ensure proper consolidation.

Joints shall be constructed perpendicular to surfaces and shall not vary more than 1/4 inch from their designated position. Transverse plane-of-weakness joints shall be placed at intervals equal to the width of the sidewalk, except as follows.

a. Where the sidewalk abuts an existing sidewalk, joints shall coincide.
b. Joint spacing shall not exceed six feet.
c. In irregularly shaped areas, joints shall be perpendicular as much as possible.
d. Individual slab size shall be between 16 square feet and 36 square feet, as much as possible.

Expansion joints shall be constructed using 1/2 inch fiber joint filler as follows:

a. At intervals not exceeding 50 feet.
b. At fixed objects such as poles, stairs, manholes, drain inlets, curbs, and buildings.
c. At intersections and changes in direction.

Any material required to fill low spots shall be obtained from the mixture used in the work. Exposed surfaces of the concrete slab shall be finished smooth and even by means of a moistened wood float, followed by a light brushing perpendicular to sidewalk. Water shall not be added to the concrete surface as an aid to finishing. The top edges of the slab and all transverse joints shall be rounded with a finishing tool having a radius of 1/4 inch. Pavement surfaces shall not vary more than 3/8 inch from the alignment and typical cross section.

Exposed concrete surfaces shall be cured using white membrane curing compound applied uniformly at a rate of 200 square feet per gallon. Curing compound shall be applied regardless of temperature or humidity conditions.

4. Protection

   Concrete shall not be placed when the air temperature is less than 25 degrees F. Concrete shall be protected from damage caused by freezing or rain.

   The Contractor shall provide sufficient barricading and security to protect fresh concrete from accidental damage or vandalism. Damaged concrete shall be removed to a joint and replaced at the Contractor's expense.

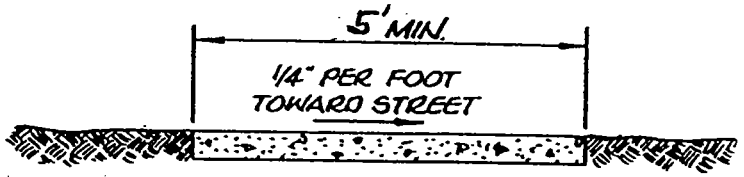
5. Cleanup

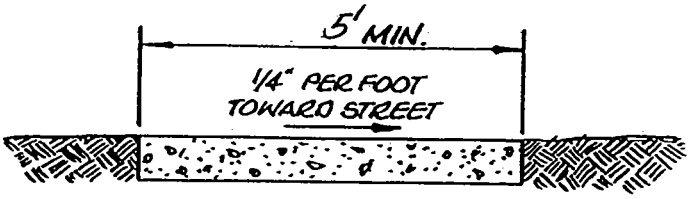
   After the concrete has attained sufficient strength, the forms shall be removed.

6. Standard Details

   See attached Standards for typical sidewalk details.

7. Developer shall submit bond for sidewalk construction to require sidewalk to be installed within two years after completion of infrastructure. Allow sidewalk to be constructed as homes are constructed; however, if homes are not complete within a two year period, all remaining sidewalk shall be constructed as required in approved construction plans.



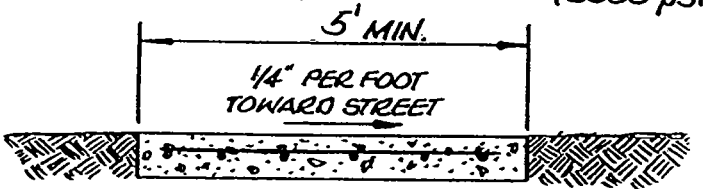


4" CONCRETE SIDEWALK

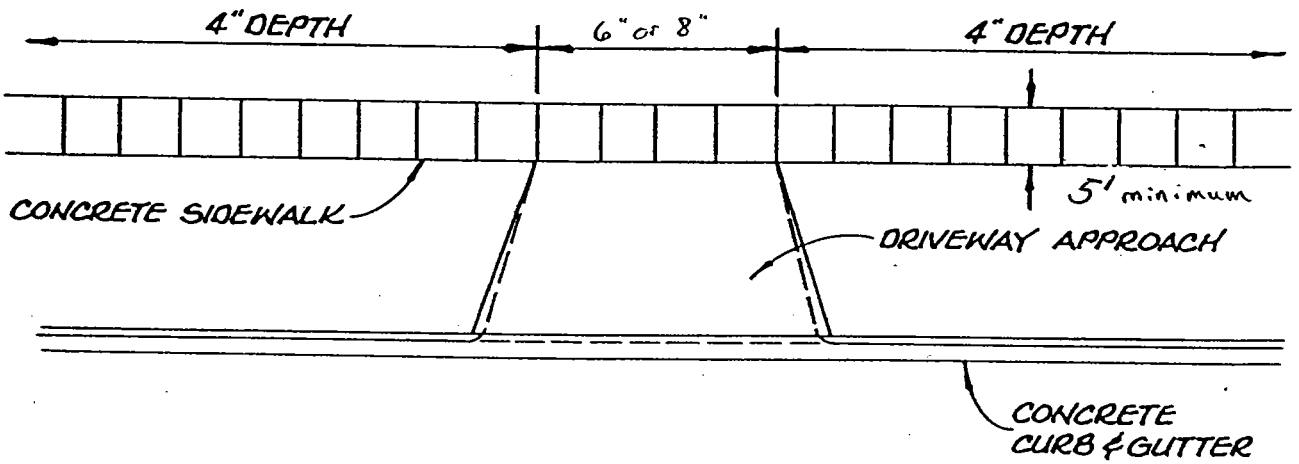
(3500 psi @ 28 DAYS)

6" CONCRETE SIDEWALK

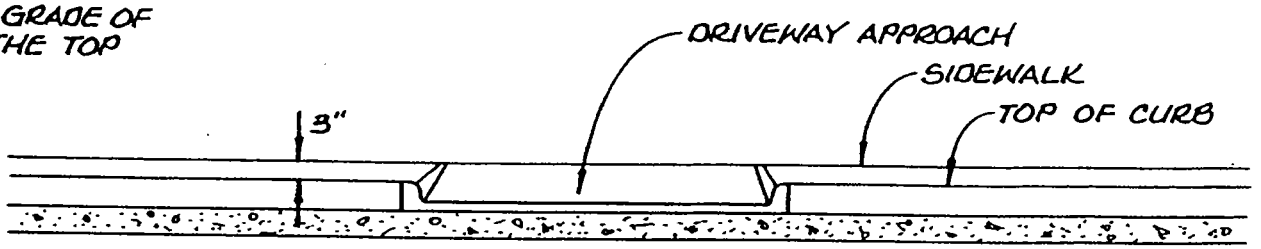
(FOR DRIVEWAYS & TRAFFIC AREAS)
(3500 psi @ 28 DAYS)



8" Concrete Side walk - Reinforced
(3500 PSI @ 28 Days)



MAINTAIN A MINIMUM SIDEWALK GRADE OF 3" ABOVE THE TOP OF CURB.



SIDEWALK DETAIL

CULVERTS

A. General

This work includes constructing new culverts of the size and type shown on the plans. Excavation, laying and jointing the pipe, and backfilling are included.

B. Materials

Culverts shall be of the size(s) shown on the plans. Materials shall be one of the following unless a specific type, class, or thickness is called for on the plans or in the proposal.

1. Corrugated Galvanized Steel Pipe

Corrugated galvanized steel pipe with circular cross-section and reformed corrugated galvanized steel pipe with pipe-arch shape shall conform to the requirements of AASHTO M-36. The Developer shall furnish the City with two copies of a certification of compliance with the chemical requirements of the base metal, as specified in AASHTO M-36.

Corrugated metal pipe culverts shall be provided in accordance with the following table, unless a particular gage is specifically called for on the approved plans.

Round Pipe Size or Arch Pipe Span	Minimum Gage Acceptable with 2-2/3" x 1/2" Corrugations	Minimum Gage Acceptable With 3" x 1" Corrugations
12"	16	
15"	16	
18"	16	
21"	16	
24"	16	
30"	14	
36"	14	16
42"	14	14
48"	12	14
54"	10	14
60"	8	12

For pipe arch shapes, minimum thickness shall be based on the next larger size if the actual span dimension is not listed.

2. Culvert End Sections

Culvert end sections shall be flared and beveled to conform with ditch slopes.

Metal end sections shall conform with AASHTO M36, where applicable. The metallic coating on the end sections shall be the same as on the pipe. End sections shall be furnished complete with coupling bands or hardware necessary for connecting them to the end of the pipe culvert.

C. Construction Methods

1. Excavation and Bedding

The Developer shall call MISS DIG (1-800-482-7171) to arrange for staking of underground utilities in advance of performing any excavation.

The Developer shall excavate to the depths indicated on the plans material of whatever nature is encountered. Existing pipes that are to be replaced, headwalls, rip rap, and similar items may be encountered in addition to soil.

Where unsound material underlying the proposed culvert is encountered, the City shall be notified immediately. If in the City's opinion the material is unsuitable, the Contractor shall remove the material to the limits defined by the City. The unsuitable material shall be replaced to the grade of the proposed culvert with sand, compacted in 10 inch lifts to at least 95% of its maximum unit weight (ASTM D 1557). If required by the City, any unsuitable material below the proposed culvert will be excavated and replaced with compacted sand.

Culvert bedding shall be constructed in accordance with the details shown on the plans. Where rock or hardpan is encountered, the trench shall be undercut four inches and a sand bedding, compacted to 95% of its maximum unit weight (ASTM D 1557) shall be provided. In stable soils, the soil under the pipe shall be hand excavated and shaped to fit the surface of the pipe. The excavation shall be to a depth necessary to support the bottom 1/4 of the pipe circumference.

The area at each end of the pipe shall be excavated and shaped to provide a smooth transition to the adjacent ditch or swale.

2. Special Requirements for Corrugated Steel Pipe Culverts

a. Repair of Damaged Galvanized Surfaces:

The Contractor shall take special care when removing salvaging, storing, handling, or placing new culverts or culverts that are to be relayed so that they are not dented, scraped, or the galvanized coating is otherwise damaged.

Large diameter or long culverts shall be provided with shop attached lift rings to facilitate handling. Lift holes shall not be cut in corrugated steel pipe.

Saw cut ends of corrugated steel pipe shall be reasonably free from excessive jagged burrs or sharp spurs.

Surfaces on which the spelter coating has been damaged, whether by transporting, handling, or installation, shall be repaired thoroughly cleaned by wire brushing and then painted with two (2) coats of zinc rich paint conforming to federal specification: Paint, High Zinc Dust Content, Galvanizing Repair (Ready Mixed Type), MIL-P-21035.

b. Laying and Jointing Pipe:

All pipe shall be laid true to the lines and grades given. Each length shall have full, firm bearing throughout its length.

Separate sections of corrugated pipe shall be securely joined together with standard corrugated metal bands. The bands may be up to two standard thicknesses lighter than the culvert, but shall not be less than 0.64 inches (16 gage). Bands for culverts shall not be less than the following widths:

Pipe Diameter	Band Minimum Width
up to & including 18"	7 inches
21" through 60"	12 inches
over 60"	24 inches

The corrugations of the band shall match those of the pipes being joined. The band shall be secured with bolts and angles. Couplings may be either one piece or two pieces. Smooth coupling bands, dimpled bands, and helical-rod and lug bands will not be considered acceptable.

3. End Sections

End sections shall be attached to the ends of pipe culverts, where directed. Metal end sections shall be used on metal culverts and on smooth lined plastic pipe culverts. Concrete end sections shall be used on concrete pipe culverts. Metal end sections may be used on concrete pipes if sized larger than the outside diameter of the pipe.

End sections shall be installed on firm ground. The slope adjacent to the end section shall be graded and shaped to meet the geometry of the end section.

4. Backfill

Backfill shall be placed evenly and alternately on each side of the pipe. Backfill shall be placed in 8 inch lifts and hand compacted to at least twelve inches over the crown of the pipe. Backfill material shall be sand and shall be compacted to at least 95% of the maximum unit weight (as determined by ASTM D 1557).

Backfill above 12 inches above the top of the pipe shall be sand and shall be compacted to 95% of its maximum unit weight (ASTM D 1557).

The Contractor shall provide a sufficient cushion of earth over culvert to protect it from damage if heavy equipment will be operated over it before backfilling and surfacing is complete.

In any case, pipe that is broken, bent, or otherwise damaged by the Developer's operations shall be removed and replaced, at the Developer's expense.

5. Cleanout

The Developer shall maintain all existing and proposed culverts free of sediment and debris until final acceptance.

EDGEDRAIN

A. General

This work shall consist of constructing edgedrains, including excavation and backfilling, as described herein.

B. Materials

1. Pipe

Corrugated plastic pipe used for edgedrains shall be perforated uniformly along the length and circumference and shall be wrapped in geotextile. Corrugated plastic pipe used for edgedrain outlet shall be non perforated. Corrugated plastic piping shall meet the requirements of AASHTO M 252 for polyethylene piping.

2. Geotextiles

Geotextile wrapped edgedrain shall be packaged and delivered in ultraviolet resistant wrapping, and in addition, shall be stored and handled carefully and in accordance with manufacturer's recommendations. Torn, deteriorated, or punctured geotextiles shall not be used unless repaired to the satisfaction of the City. See Section 8.09 of the latest edition of Michigan Department of Transportation Standard Specifications for Construction for the Geotextile Technical requirements.

C. Execution

1. Utility Notification

The Developer shall be responsible for contacting, coordinating, and working with the utility companies such that the project proceeds in an orderly and productive manner. The Developer is also responsible for protecting the existing utilities. Changes resulting from damaged utilities are to be incurred by the Developer.

2. Excavating the Trench and Laying Underdrain

All edgedrains shall have the trench excavated and the material removed from the trench area by a wheel or chain trencher or other positive volume removal method(s) approved by the City. The trench shall be constructed to the dimensions shown on the plans. The trench for the edgedrain shall be constructed after the subbase has been placed and compacted.

Plastic pipe, or geotextile wrapping which has deteriorated due to ultraviolet exposure (sunlight) during storage or has been damaged in placing will be rejected.

Backfill material for excavated trenches shall be placed on sections of edge drain only after that section has been approved by the City for backfilling.

Edgedrains shall be backfilled as shown on the approved plans. The granular material shall be carefully placed around the pipe until the drain is completely covered to a depth of at least 12 inches. The remainder of the backfill shall be placed in layers not exceeding 12 inches in depth, unless otherwise approved, and compacted to at least 95 percent of maximum unit weight.

The edgedrain outlet shall be laid to a minimum slope of 2 percent. The outlet trench shall not be backfilled until the City has inspected and approved the outlet. The outlet shall be temporarily secured or the outlet end section placed so that positive drainage of the system is available after outlet construction.

The outlet ending shall be located as shown on the plans or as directed by the City. All outlet endings shall be fitted with a rodent screen.

Edgedrains installed on the project shall be maintained and shall be reasonably free from accumulations of silt, debris, and other foreign matter at the time of final acceptance.

PAVEMENT REMOVAL AND RESTORATION

A. General

1. Work Included

This work includes removal of an existing pavement, including streets, driveways, sidewalks, curb and/or gutter, and parking areas. For purposes of the work "pavement removal", pavement may include bituminous, concrete, or brick.

B. Execution

1. Pavement Removal (including curb and gutter removal)

Pavement shall be removed to an existing joint or to a sawed joint. An existing crack is not suitable for the limit of removal. Sawed joints for pavement removal are to be either parallel or perpendicular to the longitudinal centerline. Sawed joints shall extend substantially through the full thickness of the pavement so that a "clean break" is made and that the adjacent pavement or structures that are to remain are not damaged. If adjacent pavement or structures that are to remain are damaged as a result of the developer's removal operations, they shall be replaced to the City's satisfaction at the Developer's expense.

Broken concrete, bituminous, brick, and other debris resulting from pavement removal operations shall become the Developer's property and disposed of properly by him.

Where pavements are encountered that are composed of more than one material or multiple courses of the same material, the pavement shall be removed in its entirety and all components shall be considered part of the same pavement area.

The Developer shall provide sufficient barricades and fences to protect pedestrians and vehicles from hazardous areas.

2. Restoration

The Developer shall provide the City with a detailed list of pavement cut locations. Prior to starting any restoration work in the right-of-way, the City will paint the limits of all areas to be replaced. The Developer shall use the details at the end of this section for repair guidelines.

All disturbed areas below the road base shall be backfilled with granular material (MDOT Class II) compacted in 1 foot lifts to 95% of maximum unit of weight. Compaction testing shall be performed by a Certified Testing Company with written results submitted to the City.

Flowable fill may be used as an alternative to granular fill provided that maximum compaction is obtained (see flowable fill specification later in this section).

Contractor shall maintain traffic using an approved traffic control plan during all restoration work.

Excavated material may not be used as backfill material.

Pavement replacement shall be according to bituminous paving specifications. Cross sections shall meet or exceed the existing cross sections.

The Developer shall coordinate inspection of daily repairs with the City.

All roadway surface, shoulders and curbs adjacent to the work area must be cleared of spoils and resurfaced or replaced if damaged.

C. Flowable Fill

1. 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 MDOT Standard Specifications current edition or as stated. All flowable fill after setting is intended to be removable by conventional mechanical excavation methods.

2. Materials

		Specific Gravities ***
Portland Cement	B.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	2.50
Water	8.11 MDOT Std. Spec's	1.00

*Except there is no limit in the loss on ignition.
**Except that 100% shall pass 3/4-inch sieve.
***Specific gravity values used for mix proportions given. If material used differs from these values, appropriate adjustments should be made.

D. Optional Flowable Fill (FF) Mixtures

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

Portland Cement		100 lbs/CYD
Fly Ash	(Class F)	2000 lbs/CYD
Water	Sufficient water to produce the desired flowability (approx. 80 gal/CYD)	

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

Portland Cement		50 lbs/CYD
Fly Ash	(Class F)	500 lbs/CYD
Granular material		2850 lbs/CYD
Water	Sufficient water to produce the desired flowability (approx. 40 gallons)	

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

Fly Ash	(Class C)	300 lbs/CYD
Granular material		3150 lbs/CYD
Water	Sufficient water to produce the desired flowability (approx. 40 gallons)	

E. Transporting and Construction Methods

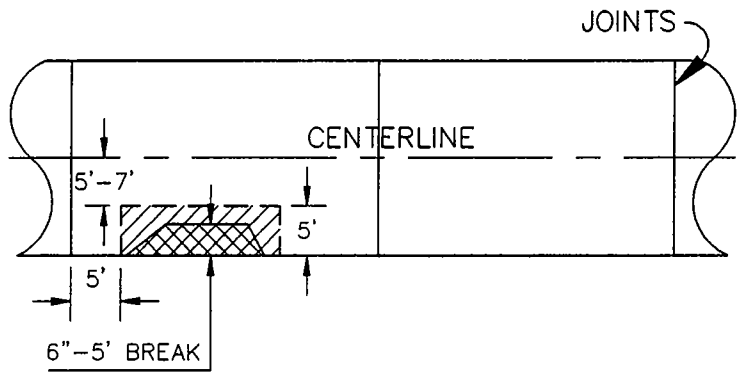
The temperature of the flowable fill mix as manufactured and delivered shall be at least 50ºF.

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

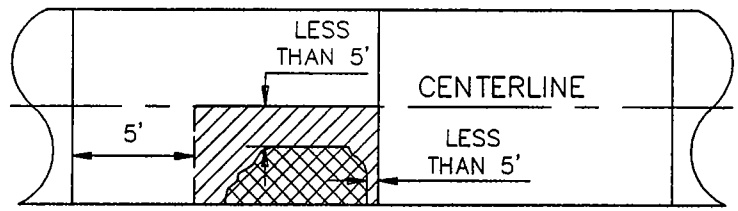
During placement operations around manholes and in utility trenches, care shall be used to avoid dislocating any pipes due to fluid pressure from the flowable fill by even placing of the material. Any pipes within the backfill area should be considered for securing to avoid buoyant effect of flowable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

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

REPAIR OF CONCRETE PVMT.



PVMT. BREAK & SAW CUT MORE THAN 5' FROM EXISTING JOINTS



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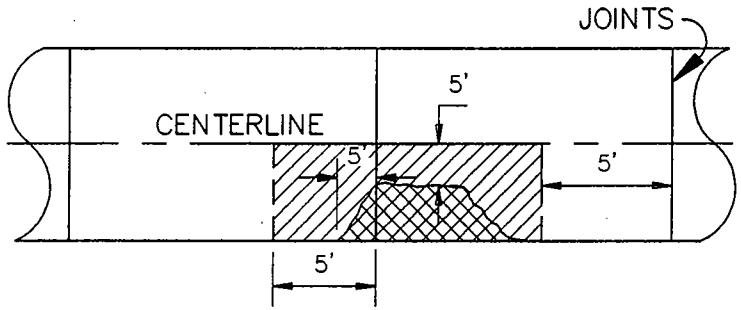
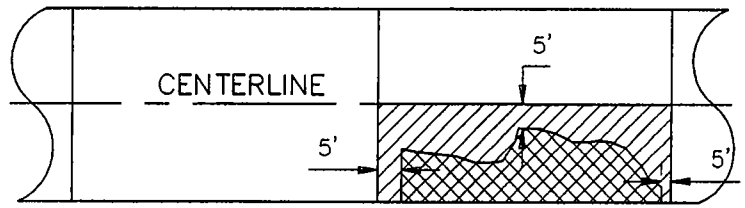


PVMT. BREAK CROSSING JOINT



REMOVING ENTIRE SLAB

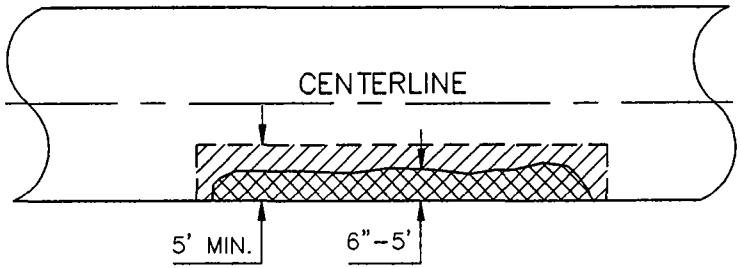
AREA TO BE REMOVED AND REPLACED

SAW CUT MIN. 5" DEEP

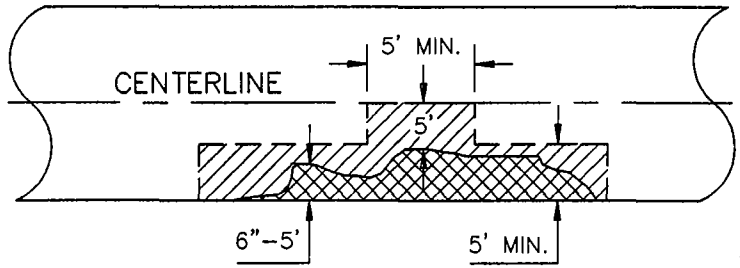
PAVEMENT BREAK

CONCRETE MUST BE GRADE "A" MIN. 3500 P.S.I. WITH ALL WIRE, ROD-S & HOOK BOLTS REPLACED.

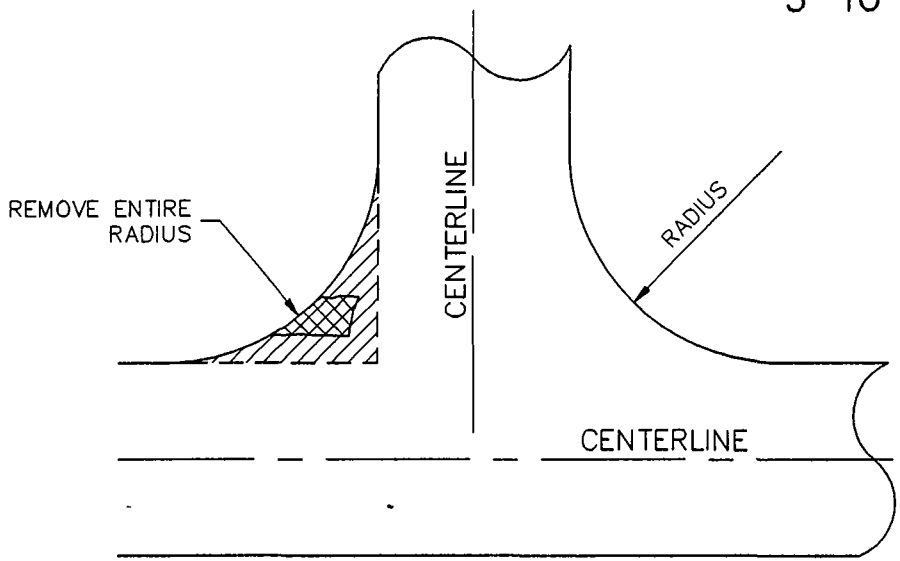
REPAIR OF ASPHALT ROADS



ASPHALT BROKEN LESS THAN 5'



ASPHALT BROKEN FROM LESS THAN 5' TO MORE THAN 5'



CUTTING OR BREAKING RADIUS AT INTERSECTION

AREA TO BE REMOVED AND REPLACED

SAW CUT

PAVEMENT BREAK

SANITARY SEWER

A. General

1. Work Included

The Developer shall supply all labor, material and equipment required for the installation and testing of all gravity sanitary sewers and appurtenances in compliance with these general specifications, project specifications and the contract drawings. Proposed construction shall meet current edition Genesee County Standard Specifications for construction of public sanitary sewers and watermains. In all instances the particular project specifications or details will meet or exceed the requirements found in these specifications.

2. Shop Drawings

The Developer shall submit shop drawings to the City prior to construction for the following items.

a. Pipe, fittings and joint material.

b. Full details of all castings.

Certificates of compliance will be required by the City. The City retains the final approval of materials submitted as an "or equal".

3. Standards

Where materials or methods of construction are listed as being in conformance with Genesee County Drain Commissioner-WWS and Ten States Standard, it shall refer to the latest edition of the standard specification or any interim revision.

B. Products

1. Materials

All material or equipment supplied shall be new and shall be of first class ingredients and construction, designed and guaranteed to perform the service required.

a. Concrete Pipe

All reinforced concrete pipe shall conform to ASTM C-76 with circular reinforcement, wall thickness B and concrete with a minimum cement content of 6.5 sacks per cubic yard of concrete. Pipe class shall be Class IV unless otherwise specified.

b. PVC Pipe

All PVC pipe shall be ASTM gasketed sewer pipe with a SDR of 26 or lower.

c. Ductile Iron Pipe

All ductile iron pipe for gravity sanitary sewer lines shall be Class 53. Cement lining in accordance with ASA A 21.4 is required on the interior of all ductile iron pipe.

d. Precast Structures

See Genesee County Drain Commissioner Standard Details for precast structure requirements.

2. Material Testing

All materials to be incorporated in the construction of gravity sewers and appurtenances shall be subject to inspection and tests as specified by ASTM, ASA or AWWA regulations. The City reserves the right to subject any material supplied for a particular project to an independent testing laboratory. Such tests if scheduled shall be paid for by the Developer. The results of such tests shall govern in material acceptance.

The Developer will be required to supply the City with a certificate of testing or actual test results stating that the material to be used is in conformance with the specifications prior to using material for construction.

C. Execution

1. Excavations

The Contractor shall call MISS DIG (1-800-482-7171) to arrange for staking of underground utilities in advance of performing any excavation.

Excavation shall include the clearing the site of the work, the loosening, loading, removing, transporting and disposing of all materials, wet or dry, necessary to be removed to construct all sewers and appurtenances to the lines, grades and locations shown on the project drawings. The Developer must assume the risk of completing the work and shall be responsible for the cost of removal of quicksand, hardpan, boulders, clay, rubbish, unforeseen obstacles, underground conduits, gas pipe, drain tile, telephone ducts, tree roots, watermains masonry structures, railroad tracks, pavements and sidewalks and the delay or damage occasioned by the same, whether these obstacles are shown on the project drawings or not.

The location of sewers, conduits and structures, as shown on the project drawings, shall be selected to provide the least possible interference with or the crossing of existing utilities. The City reserves the right to make minor variations in the location of these items during the construction to meet any changed conditions discovered during the construction.

The location of existing piping and underground utilities, such as gas mains, water mains, electric duct lines, telephone conduits, etc., as shown on the project drawings, are to have been determined from the best available information by actual surveys, or furnished and taken from the records of the parent utility companies and drawings of the existing facilities. However, the City does not assume responsibility for the possibility that during construction, utilities other than those shown may be encountered, or that actual location of those shown may be different from the locations designated on the project drawings.

At the locations wherein detailed positions of these facilities become necessary to the new construction, the Developer shall at his own expense, furnish all labor and tools to either verify and substantiate the record drawing location, or definitely establish the position of the facilities.

Unless otherwise specified on the project drawings, all concrete and asphalt surfaced pavements shall be sawed before removal.

Necessary arrangements shall be made by the Developer with all persons, firms, corporations owning or using any poles, pipes, tracks, or conduits, etc., affected by the construction of the project, to maintain and protect such facilities during construction with the cost of any such protection paid by the Developer. In the event that any existing gas pipes, water pipes, conduits, sewers, tile drains or poles are blocked or interfered with by the excavation required on this project, the Developer shall maintain them in continuous operation, and restore them to the same condition as they were prior to the start of this project.

Excavated material shall not be placed on grass plots unless there is no other suitable place to put it. Excavated material shall be placed on pavements or sidewalks only on the written approval of the City.

Sidewalks and pavements must in no case be blocked or obstructed by excavated material, except on the authorization of the City, and then only when adequate provisions have been made for a satisfactory temporary passage of pedestrians and vehicles. Adequate bridging and planked crossings must be provided and maintained across all open trenches for pedestrians and vehicles. Barriers, lights, flares and watchmen shall be provided and maintained by the Developer at all trenches, excavations and embankments.

The Developer shall be responsible for the furnishing and installation of all temporary sheeting, shoring, timbering and bracing required to maintain the excavation in a condition to furnish safe working conditions and to permit the safe and efficient installation of all items of work. The Developer shall further, at his own expense, shore up, or otherwise protect all fences, shrubs, buildings, walls, walks, curbs or other property adjacent to any excavation which might be disturbed during the progress of the work. The Developer will be held liable for any damage which may result to neighboring property from excavation or construction operations.

Lumber used for sheeting may consist of any species which will satisfactorily stand driving. It shall be sawn or hewn with square corners, and shall be free from worm holes, loose knots, wind shakes, decayed or unsound portions, or other defects which might impair its strength or

tightness. Minimum thickness shall be 2 inch nominal. Lumber for bracing shall be No. 2 common yard lumber or timber in less than (6) inch sizes, and common structural grade on timbers six (6) inches and over in thickness.

The sheeting and bracing shall be removed as the work progresses in such a manner as to prevent the caving in of the excavations, or any damage to the masonry. While being drawn, all vacancies left by the sheeting and bracing shall be carefully filled with fine sand and rammed by special tools, or puddles as directed by the City.

Sheeting, shoring, timbering and bracing for open trenches and excavations may be ordered left in place by the City when in its opinion such is necessary for the protection of the work, the public or the adjacent property.

The Developer shall supply all temporary supports and braces that may be necessary to secure a safe prosecution of the work until the permanent structure is complete; at his own expense or concurrently with the completion of the permanent structure.

The Developer shall do all ditching, pumping, well pointing and bailing, build all drains and do all other work necessary to keep the excavation clear of groundwater, sewage or storm water during the progress of the work, and until the finished work is safe from injury. Where the excavation is wet sand, and suitable construction conditions cannot be obtained by other methods, the Developer shall install and operate a pumping system connected with well points, so as to drain the same effectually. No masonry or pipe shall be laid in water and water shall not be allowed to rise over masonry until concrete or mortar has set at least 48 hours. All water pumped or drained from the work shall be disposed of in a manner satisfactory to the City and all entities having jurisdiction without damage to adjacent property or to other work under construction. Necessary precautions shall be taken to protect all construction against flooding. The Developer shall supply water to home owners if wells go dry due to construction.

Whenever the excavation is carried beyond the lines and grades shown on the project drawings, or given by the City, the Developer shall at his own expense, refill all such excavated space with sand material and in such a manner as may be directed. Beneath and around concrete structures, space excavated without authority shall be thoroughly compacted when refilling, or if deemed necessary by the City, shall be refilled with concrete at the Developer's expense.

If the materials encountered on any excavation are not suitable for structural foundations, or if necessary to go an additional depth or width from the designated on the project drawings to provide proper bearing for pipe or masonry, or to construct pile or plank foundations, the Developer shall make such additional excavations outside the regular limits of the work as may be directed by the City. The cost of such additional excavation shall be the Developer's responsibility.

Excavated material shall be deposited so as to interfere as little as possible with the excavation of the whole work or its several parts, and in such a manner that for each purpose the most suitable material may be placed in its final position but not in a manner to interfere with the

satisfactory carrying out of the work. Such material as cannot be placed in its final position in fills and embankments shall be removed to a temporary spoil bank, from which it shall later be taken and placed in embankment or fills.

Unsuitable and surplus excavated material not incorporated in the improvement shall be disposed of by the Developer at his own expense unless otherwise designated.

If private land is used by the Developer as a spoil site, the Developer shall obtain written permission from the owner or agent of the land agreeing to its use for this purpose and provide the project city with a certified copy of such agreement.

2. Trench Excavation

The ground shall be excavated in open trenches, of sufficient width and depth to provide ample room within the limits of the excavation, or lines of sheeting and bracing, for the proper construction of the sanitary sewer and its appurtenances as shown on the contract drawings and for removing any material which the City may deem unsuitable for foundation.

The excavation of the trench shall not advance more than 200 feet ahead of the completed masonry and pipe work, except where in the opinion of the City, it is necessary to drain wet ground.

When trench excavation is carried ahead of contemplated masonry and pipe work, the elevation of the bottom of the trench shall be continually checked to the satisfaction of the City. Excavation made below that necessary for the proper installation of the sewers, masonry and appurtenances shall be refilled only with sand or fine gravel, or properly graded crushed rock, thoroughly compacted, all at the Developer's expense.

In clay excavation the bottom of the trench shall be excavated to a minimum depth of four (4) inches below the bottom of the pipe barrel and this space refilled with clean low void sand or other non-compressible fine low void material satisfactory to the City. Refill shall be slightly rounded to provide as much bearing area as possible for the lower quarter of the pipe. Clay shall be interpreted to mean all soils other than rock, sand or gravel. In sand and gravel excavation the bottom of the excavation shall be slightly rounded to provide as much bearing area as possible for the lower quarter of the pipe.

When excessive ground water is encountered in the bottom of the non dewatered system trench, the trench shall be excavated to a depth of six (6) inches below the bottom of the pipe barrel and this space refilled with a graded stone material satisfactory to the City. Refill shall be slightly rounded to provide as much bearing area as possible for the lower quarter of the pipe. Any excavation that requires well pointing shall have the pipe bedding stone.

All sanitary sewer or pipe of the bell and spigot type is to be installed in the trench with bell holes of sufficient depth dug across the bottom of the trench to accommodate the bell.

The following construction methods shall be strictly adhered to concerning trench width and backfill requirements.

a. Trench widths shall be according to Genesee County Drain Commissioner - Standard Detail.

b. For depth of excavation 8'-13' the pipe shall be placed on a 4" cushion of sand that has been shaped to fit the lower 1/4 of the pipe and the bell holes dug out. The sand shall extend 8 inches over the top of the barrel of the pipe.

c. For depth of excavation 14'-19' the pipe shall be placed on a 4" cushion of graded stone that has been shaped to fit the lower 1/4 of the pipe and the bell holes dug out. The graded stone shall extend to the springline of the pipe. The area from the springline to 8" over the barrel of the pipe shall be backfilled with sand or graded stone.

d. For depths of excavation greater than 19' the placing and backfill shall be the same as for 14'-19' depths. Modifications to the above noted on the plan sheets shall supercede these requirements.

e. For large size pipes the trench width shall be 8" greater than the outside diameter of the pipe. Any deviations to the above trench widths must be approved in writing by the City.

3. Structure Excavation

Excavation for manholes or special structures shall be made to the depth and dimensions necessary for the proper installations of all structures shown on the contract drawings. Care shall be taken that the foundation area of the structure is not excavated below grade except when rock is encountered. Where masonry is built directly against the sides or bottom of the excavations, the final trimming shall be done just before the masonry is placed.

4. Foundations, Strengthening

Whenever the ground is sufficiently firm and unyielding, the masonry shall be laid directly on the sand or crushed stone bedding of the excavation and pipes or conduits shall be laid as specified.

When so designated on the project drawings, or ordered by the City, excavated areas shall be strengthened for foundation purposes by furnishing and placing crushed rock or gravel refill, concrete cradle or encasement, timber cradles, timber poling or a combination of these materials.

After the excavation is opened and to grade, it will be examined by the City who will determine whether or not it is a satisfactory foundation for masonry or pipes, or if it is necessary to stabilize the base. Where deemed necessary by the City a soil load test shall be made at the Developer's expense to determine the safe bearing capacity of the ground.

5. Tunnel Construction - Bore and Jack

Excavation in casings made beneath existing structures, across railroad right-of-way, existing pavements and sidewalks for the installation of sanitary sewer pipe or force main shall be of sufficient size to permit the installation of the pipe and shall have a minimum diameter as shown on the following table.

The outer steel casing shall be of sufficient strength to meet the loading conditions of H-20 loading for pavements and Cooper E-72 loading for railroad tunnels. The casing shall also have a minimum wall thickness according to the following table;

Inside Pipe Diameter	Minimum Casing Diameter Inches	Minimum Required Thickness Inches
6"	12" O.D.	.375
8"	20" O.D.	.375
10"	20" O.D.	.375
12"	24" O.D.	.375
15"	30" O.D.	.406
18"	36" O.D.	.469
21"	36" O.D.	.469
24"	42" O.D.	.500
27"	48" O.D.	.500

All work performed beneath existing structures, across railroad right-of-ways, and under pavements shall be performed in accordance with the requirements of the parties of agencies having jurisdiction over these locations. The Developer shall contact the parties or agencies prior to starting work and shall meet all requirements of the parties or to be taken in performing the tunnel work. All costs involved in meeting these requirements shall be paid for by the Developer.

A suitable approach trench shall be opened, adjacent to the toe of the slope of the embankment. The approach trench shall be long enough to provide sufficient working room. Guide timbers or rails for keeping the casing on line and grade shall be installed in the bottom of the trench, and heavy timber backstop supports installed at the rear of the trench bearing or "pushing frame" shall be built and furnished to fit or match the end of the pipe to be jacked, so that the pressure of the jacks will be evenly distributed over the end of the pipe. Two (2) hydraulic jacks of sufficient power shall be used to apply pushing or jacking pressure. Excavation shall not exceed six (6) inches ahead of the lead pipe. Excavation at the top and sides may be approximately one (1) inch greater than the outside periphery of the pipe. Bottom excavation shall be accurately cut to line and grade. Adjoining sections of steel pipe shall be welded with a continuous weld. Pipe shall be jacked upgrade where possible. Any undercutting at bore pit shall be stone filled.

Casing shall begin a minimum of five (5) feet from the back of curb on all city streets and local roads, a minimum of ten (10) feet from edge of pavement on all open ditch sections, measured at right angles to the pavement.

It shall be the Developer's responsibility to protect the original line and grade stakes as set. Should the stakes become destroyed or damaged, the cost of their replacement will be borne by the Developer.

The junction of two or more sewers shall be made in strict conformance with the project drawings.

New sewer connections with old existing sewers shall be made within a manhole. All construction shall begin at an infiltration test manhole with no connection to the existing sewer until the proposed sewer has been inspected by the City.

Where no old manhole exists at the point of connection, a new manhole shall be constructed of the size and type shown on the project drawings.

When connections are made with sewers carrying sewage or water, special care must be taken that no part of the work is built under water, a flume or dam must be installed, and pumping maintained if necessary to keep the new work in the dry until completed and concrete or mortar has set up.

Openings provided in manholes for future sewer extensions shall consist of one (1) bell end pipe of the size required extending to the outside wall of manhole with a watertight tile stopper.

6. Pipe Laying

Each pipe shall be laid on an even, firm bed, so that no uneven strain will come to any part of the pipe. Particular care shall be exercised to prevent the pipes bearing on the sockets. Bell holes for bell and spigot pipe shall be dug at each point as specified before. Each pipe shall be laid in conformity with the line and grade stakes and in the presence of the inspector. The bell-end of the pipe shall be laid up-grade.

The interior of the sewer shall, as the work progresses, be cleaned of all dirt, jointing material and superfluous materials of every description.

All pipe shall be completely shoved home. On pipe of the tongue and groove type, 30" diameter and larger, pressure must be applied to the center of each pipe as it is laid by a winch and cable or other mechanical means properly set and operated to insure that the spigot is all the way home in the socket, and that the sewer joint is of uniform size throughout the circumference of the pipe.

Laying holes in pipe if used shall be tapered and shall be plugged before backfilling with a tapered concrete plug set in mortar or mastic.

Pipes laid in tunnel or casing pipe shall be supported on suitable blocks cut or grouted into position to place the invert of the sewer or drain at the slope and to the elevations indicated on the project drawings.

7. Pipe Joints

In all jointing operations the trench must be dewatered when joints are made and kept dewatered until sufficient time has elapsed to assure efficient hardening of the jointing material. Bell and spigot, or tongue and groove ends of the pipe shall first be wiped clean before actual jointing operations are started. The type of joint to be installed shall be as specifically designated in the project Drawings.

Joints between consecutive bell and spigot or tongue and groove pipe shall be made with a rubber gasket. The gasket shall be fitted over the tongue or spigot of each pipe, as recommended by the manufacturer, and the pipe entered into the bell or groove and shoved home. The remainder of the joint space for pipes in excess of 36" shall be pointed up with mortar.

a. Ductile Iron Pipe Joints

Before any joints are made or the spigot of pipes placed in the bells, the spigots, bells, gaskets and glands shall be thoroughly cleaned and all foreign materials removed from their surfaces.

Joining mechanical joint pipe and fittings, the gland, followed by the gasket shall be placed over the plain end of the pipe, the gasket and socket brushed with soapy water and the pipe inserted into the bell. The gasket and socket shall then be pushed into position so that it is evenly seated in the bell and the gland moved into position against the face of the gasket. The bolts shall be inserted and made finger tight. The bolts shall then be tightened up with a torque wrench to complete the joint.

In joining gasket type pipe and fittings, the gasket shall be seated evenly around the inside of the bell in the groove or recess provided and the inside of the gasket lubricated with lubricant furnished by the joint manufacturer. The spigot of the next pipe shall then be aligned with the bell and started into the bell until it contacts the gasket. The joint shall then be completed by forcing the spigot past the gasket until it makes contact with the base of the socket. Pressure to force the spigot home shall be applied by means of a bar, a special lever or a mechanical jack-type assembly tool.

b. Factory-Fabricated Resilient Material Joints for Clay Pipe.

In joining clay pipe with a factory-fabricated resilient material joints, the bell and the spigot of the pipes shall be thoroughly cleaned, the joint material assembled on the spigot if it is made up of more than one part, the joint material for both bell and spigot coated with lubricant or adhesive, furnished by the joint manufacturer, the spigot entered into the bell and the pipe forced home by means of a bar or mechanical pipe puller.

c. Concrete Pipe Joints

In joining concrete pipe, the bell and pigot of the pipes shall be thoroughly cleaned. Joints shall be mastic type. All joints shall be thoroughly sealed.

8. Connections for Service Pipes

Service connections for house sewer shall be provided in the main sewers as shown on the project drawings. The exact location shall be as indicated on the approved plans.

All sewer connection openings on bell and spigot pipe shall be "Y" branches with the outlet being six (6) inches in internal diameter. All sewer connection openings on concrete pipe of the tongue and groove type shall be cast in place with the shape, size and dimension of the opening corresponding to the bell end of a standard sewer pipe six (6) inches in internal diameter.

"Y" branches are acceptable for service connections. The installation of house services shall follow the installation of the main line by not more than 30 days unless written authorization is received from the City to delay the installation of these house services for a period greater than 30 days after the sewer is installed. It shall be the Developer's responsibility to install service leads at a sufficient depth to service house basements if the main line sewer is sufficiently deep.

The Developer shall place a hardwood stake on the property line directly opposite each opening left in the sewer. The hardwood stake shall be 8 feet long and a minimum size of 2" by 4". The Developer shall locate and keep a record in tabular form of all manhole and sewer opening locations by measurement to the nearest downstream opening. All manhole locations shall be witnessed by at least two ties to existing topographic features. This record shall be delivered to the City monthly during the progress of the work. When constructing sanitary sewer connections in wet ground, place a 45 degree bend at the property end of the connection and install enough house lead to bring the connection above the natural ground water level.

For service connections where the main line is less than 10 feet deep the Developer need not supply a riser connection for the service lead. The service connection shall be left at a depth of 8' to 10' below the ground at the property line. The Developer has the option of installing the house lead at an incline or using a riser section for sewers less than 10 feet deep.

When the invert of the sanitary sewer is in excess of 10 feet a riser section shall be used to raise the service connection to a point approximately 10 ft. below the surface of the ground. All service connections shall be installed in accordance with the standard details. (See GCDC SD-3 at the end of this section).

Riser pipes and joints shall be vitrified clay pipe C-700 extra strength, schedule 40 PVC or SDR 26. All openings shall be plugged with an air tight stopper. A sewer lead on an existing sewer system shall be connected by an existing "y" branch. When a "y" branch location is not available, a "Y" branch with an outlet with a six (6) inch internal diameter will be installed into existing sewer main. If conditions do not allow a "y" branch to be installed, a flexible saddle with stainless steel bands will be used to create a circular cut on the sewer main.

Service leads on easements or adjacent to property lines shall extend a minimum of one pipe length from the main line sewer. All service leads shall be a minimum of 6" diameter pipe to the property line.

9. Structures and Appurtenances

All special structures or manholes shall be constructed at the locations and to the details shown on the contract drawings. Manholes shall be constructed of monolithic concrete or precast concrete rings. The use of precast flexible joint sanitary sewer manholes is approved. See the GCDC standard detail SD-9 for requirements.

Concrete and reinforcing steel shall be installed to the details shown on the project drawings.

Precast concrete rings shall be laid with "O" ring joint and with full mortar on all joints inside and outside.

Additional inlet pipes, placed through manhole sidewalls, shall extend through the walls a sufficient distance to allow connection on the outside. Such pipes shall be struck smooth on the inside in line with the inside wall of the manhole. The manhole masonry shall be carefully constructed around all pipes, so as to prevent leakage along the outer surfaces.

The manhole frame and cover shall be as specified in the project specifications. Manhole covers shall be labeled “Sanitary Sewer”.

10. Backfill

Unless otherwise directed, all trenches and excavation shall be backfilled as soon as joints have acquired a suitable degree of hardness and the work shall be prosecuted expeditiously after it has commenced. No sewers shall be backfilled above the top of the pipe until the sewer elevations, gradient, alignment, and the pipe joints have been checked, inspected and approved by the construction observer. All pipe shall be held in place by cable and winch or other suitable method satisfactory to the construction observer during backfill operations so that there will be no movement in the pipe joints. Excavations for structures shall be backfilled as soon as they have developed sufficient strength to resist backfilling loads and forces.

The trench shall be backfilled to eight (8) inches over the barrel of the pipe with clean low void sand or other non-compressible fine low void material, satisfactory to the City. The backfill within the trench area shall be placed as noted under construction methods, trench excavation. See GCDC Standard Detail for backfill.

The remainder of the trench shall be backfilled by using the material originally excavated from the ditch to a height slightly above the original elevation of the ground or as hereinafter specified. Rocks, debris, trees, stumps or other rubbish shall not be used as backfill material.

11. Infiltration Testing - Sanitary Sewers

The amount of infiltration into the sanitary sewer construction under this project shall be measured by use of an infiltration manhole where called for on the plans or by a V-notched sharp crested weir. The weir shall be furnished and installed by the Contractor as directed by

the City. Maximum allowable infiltration shall be 250 gallons per mile per inch diameter of sewer per 24 hour day at any time. The joint shall be tight and visible leakage in the joints or excess of the specified amount shall be repaired at the Contractor's expense by any means found to be necessary.

All sewers shall be subjected to the above infiltration test prior to being accepted by the City. All sewers 24" in diameter or smaller shall be subjected to an air test in addition to the above infiltration test.

The Contractor shall be required to furnish the City with acceptable air test results for each 1,000 foot segment prior to further construction.

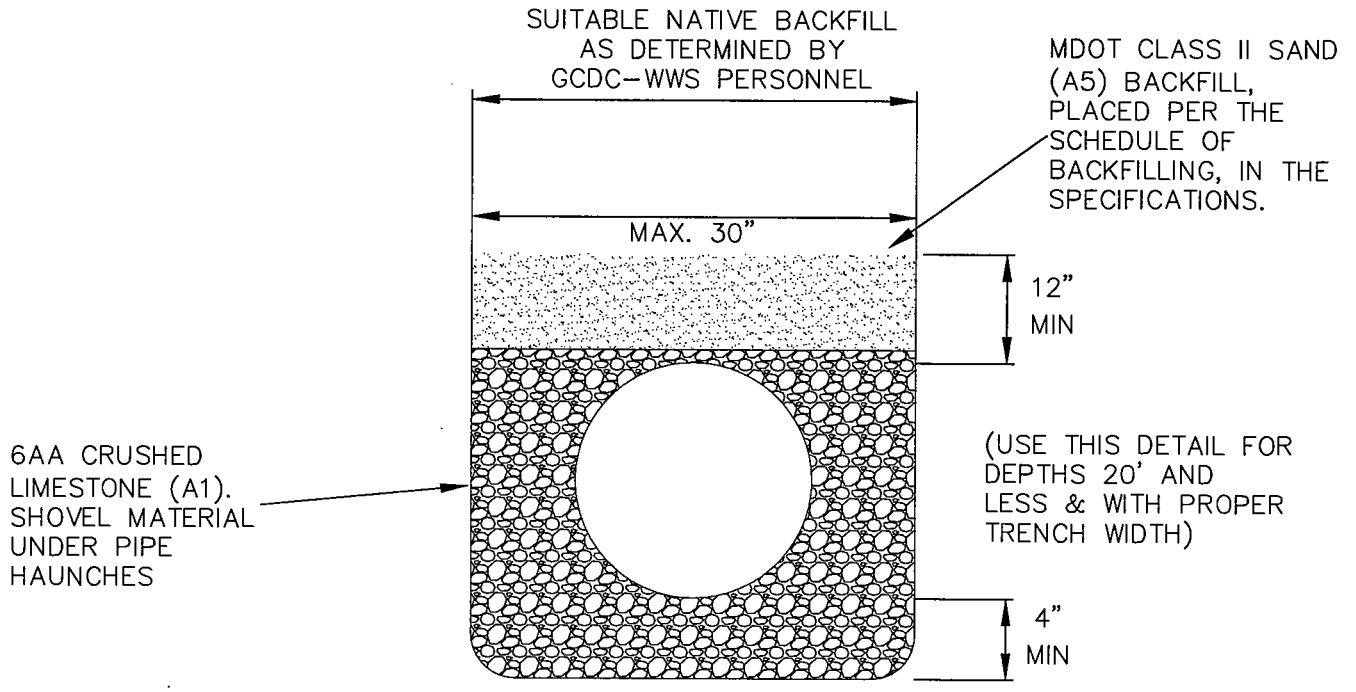
The procedure for air testing of sewers shall follow the testing requirements outlined in the current edition of GCDC Standard Specifications for the construction of public sanitary sewers and watermains.

If a sewer fails to pass any of the previously described tests, the Contractor shall determine the location of the leaks, repair them and retest the sewer. The tests shall be repeated until satisfactory results are obtained.

Method of testing and measurement shall be approved by the GCDC. The Contractor shall provide the necessary equipment and labor for making tests, and the cost of same.

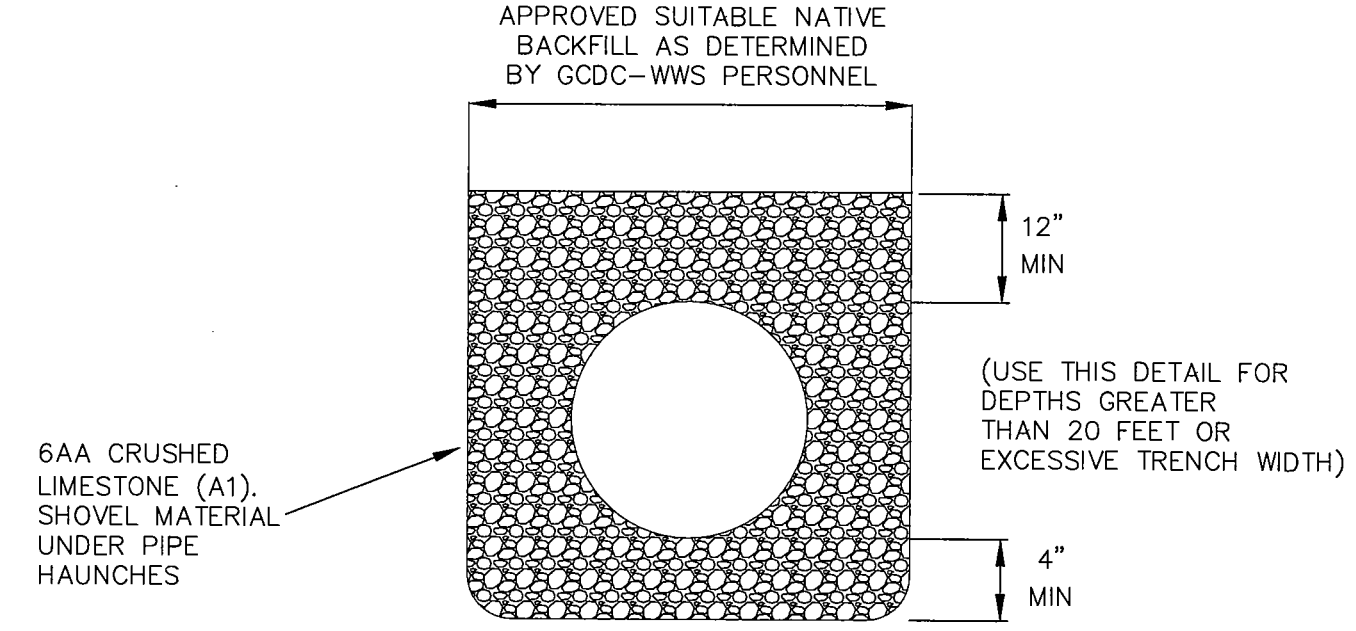
Chemical or cement grouting will not be considered an acceptable method of repairing leaking pipe, joints or structural failures, except where specifically approved by the City. In this regard the decision of the City shall be final.

The following technical details (SD-1 through SD-12) are standards required by the Genesee County Drain Commissioner. All sanitary sewer construction shall follow the current Genesee County Drain Commissioner requirements and plans shall include the current standard detail sheets provided by Genesee County Drain Commissioner.

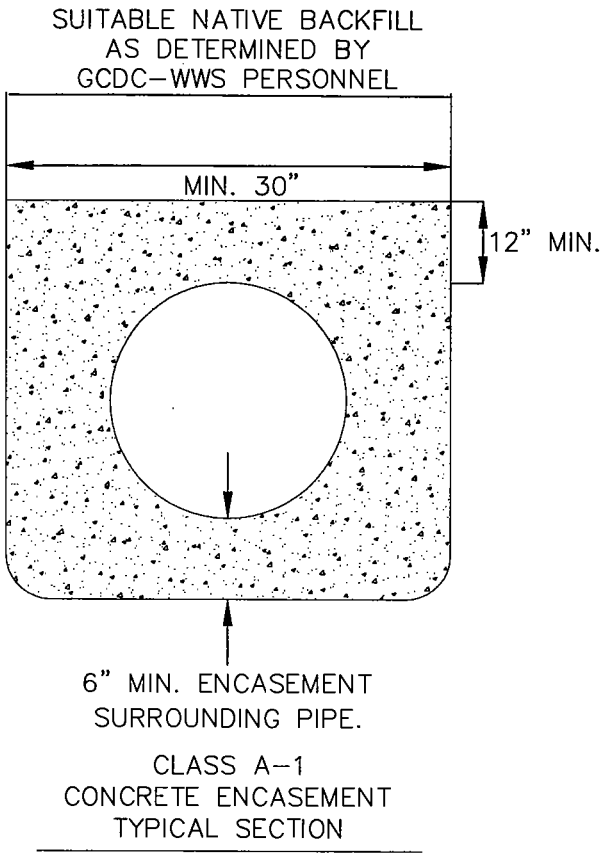


CLASS "B-1" BEDDING
CRUSHED STONE

SEE GCDC-WWS SPECIFICATIONS FOR TRENCHES	
DIAMETER	MAX. TRENCH WIDTH
8"-12"	30"
15"-18"	36"
> 21"	GCDC-WWS APPROVAL



CLASS "B-2" BEDDING
CRUSHED STONE ENCASEMENT



CLASS A–1
CONCRETE ENCASEMENT
TYPICAL SECTION

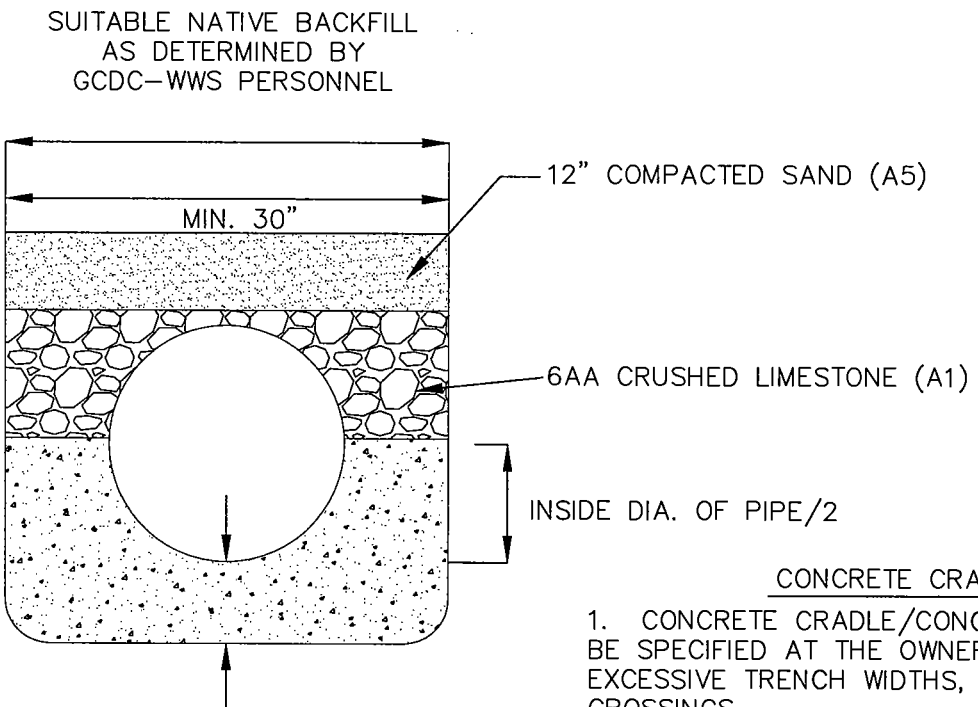
CONCRETE ENCASEMENT NOTES

1. CONCRETE ENCASEMENT SHALL BE USED UNDER ALL RIVERS, STREAMS, OR COUNTY DRAINS WHERE THE WIDTH FROM THE TOP OF BANK TO TOP OF BANK IS IN EXCESS OF 10 FEET AND/OR THE CROWN OF THE SEWER IS NOT COVERED BY 3 FEET.

2. CONCRETE ENCASEMENT SHALL EXTEND A DISTANCE OF 10 FEET BEYOND THE TOP OF THE BANK ON EACH SIDE OF THE WATERWAY. (MINIMUM ENCASEMENT OF 30 FEET.) THE LOCATION OF THE TOP OF BANK TO BE DETERMINED BY GCDC–WWS PERSONNEL.

3. PLACE 2500 PSI CONCRETE AGAINST UNDISTURBED EARTH FOR THE ENTIRE WIDTH OF THE TRENCH.

4. CONTRACTOR SHALL TAKE THE NECESSARY STEPS TO PREVENT PIPE FROM FLOATING.



CLASS A–2
CONCRETE CRADLE

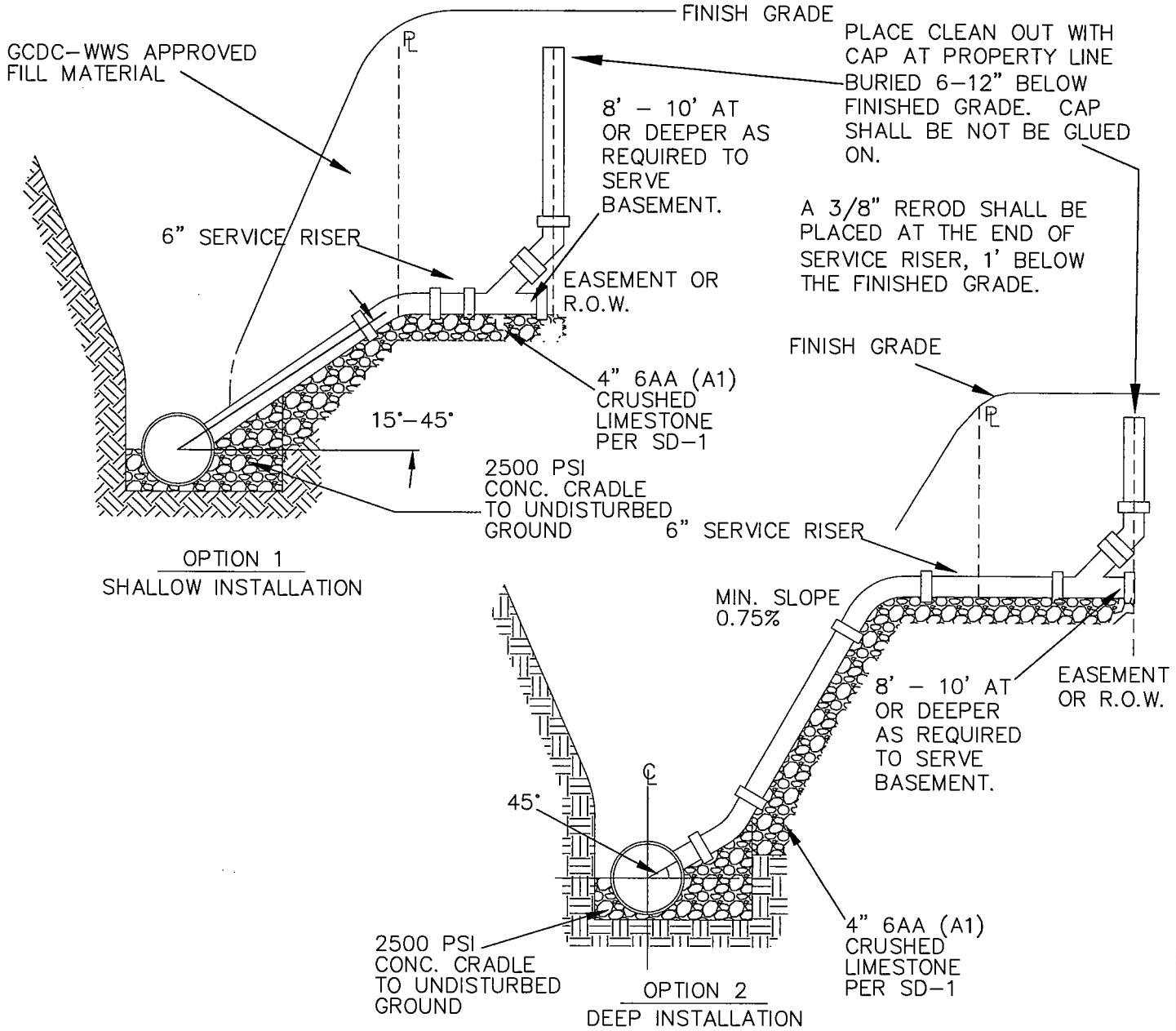
CONCRETE CRADLE NOTE

1. CONCRETE CRADLE/CONCRETE ENCASEMENT MAY BE SPECIFIED AT THE OWNERS DISCRETION FOR EXCESSIVE TRENCH WIDTHS, DEPTHS, UTILITY CROSSINGS.

2. PLACE 2500 PSI CONCRETE AGAINST UNDISTURBED EARTH FOR THE ENTIRE WIDTH OF TRENCH TO THE SPRINGLINE.

SD–2

PROTECTION OF SANITARY SEWERS BY CONCRETE ENCASEMENT OR CRADLE



NOTES

1. DESIGN ENGINEER & CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING CURRENT LOT SPLITS AND ENSURING THAT ALL LOTS ON BOTH SIDES OF THE ROAD ARE SERVED TO THEIR RESPECTIVE PROPERTY LINE OR EASEMENT LINE.

2. SERVICE RISERS SHALL BE 6" PVC WITH A MINIMUM SDR OF 26, OR OTHER AS REQUIRED FOR DEPTH. TEES OR WYES ARE ACCEPTABLE.

3. ALL SERVICE RISERS SHALL BE CARRIED TO WITHIN 1 FOOT OF THE PROPERTY LINE, SEALED WITH AN AIRTIGHT PLUG AND MARKED WITH 3/8" REROD SHALL BE BE PLACED AT THE END OF THE SERVICE RISER, 1' BELOW THE FINISHED GRADE.

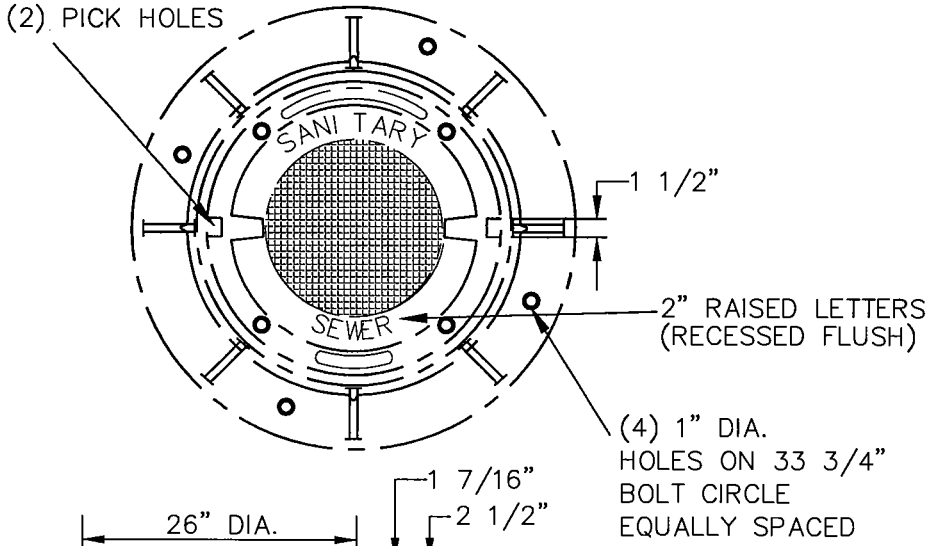
4. SERVICE RISERS MEASUREMENT IS HORIZONTAL ALONG THE CENTERLINE OF THE LEAD AS CONSTRUCTED FROM THE MAIN TO THE PLUG. PAYMENT SHALL BE MEASURED HORIZONTAL, NOT VERTICAL.

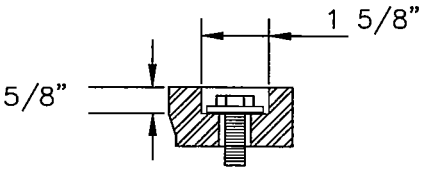
5. THERE SHALL BE NO 90° BENDS ALLOWED IN THE SERVICE RISERS.

6. CLEAN OUTS ARE REQUIRED EVERY 90 FEET.

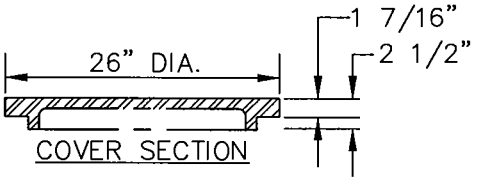
SD–3

RISER AND SERVICE LEAD

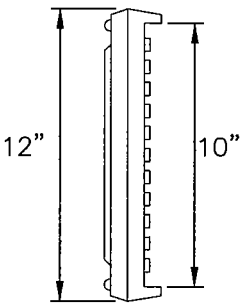


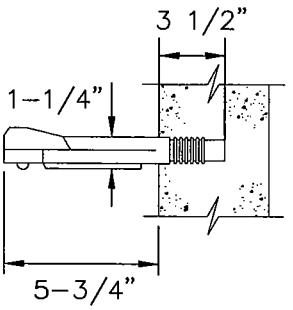


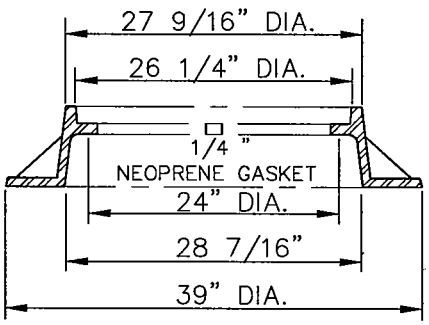
BOLT DETAIL



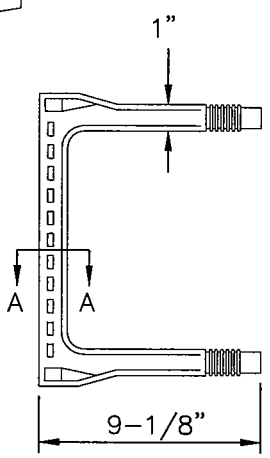
COVER SECTION







FRAME SECTION



MANHOLE FRAME NOTES

1. THE FRAME SHALL HAVE FOUR 7/8" ANCHOR BASE FLANGE HOLES WITH BOLT CIRCLE TO MATCH MANHOLE CONE.

2. ALL BEARING SURFACES SHALL BE MACHINED.

3. FRAMES AND COVERS SHALL BE BOLT DOWN WATER TIGHT: EAST JORDAN IRON WORKS, INC. #1040 ZPT TYPE A SOLID, NEENAH FOUNDRY CO. #R-1916-F, OR APPROVED GCDC-WWS ALTERNATE.

4. THE WORD "SANITARY SEWER" SHALL BE CAST IN THE CENTER OF THE COVER.

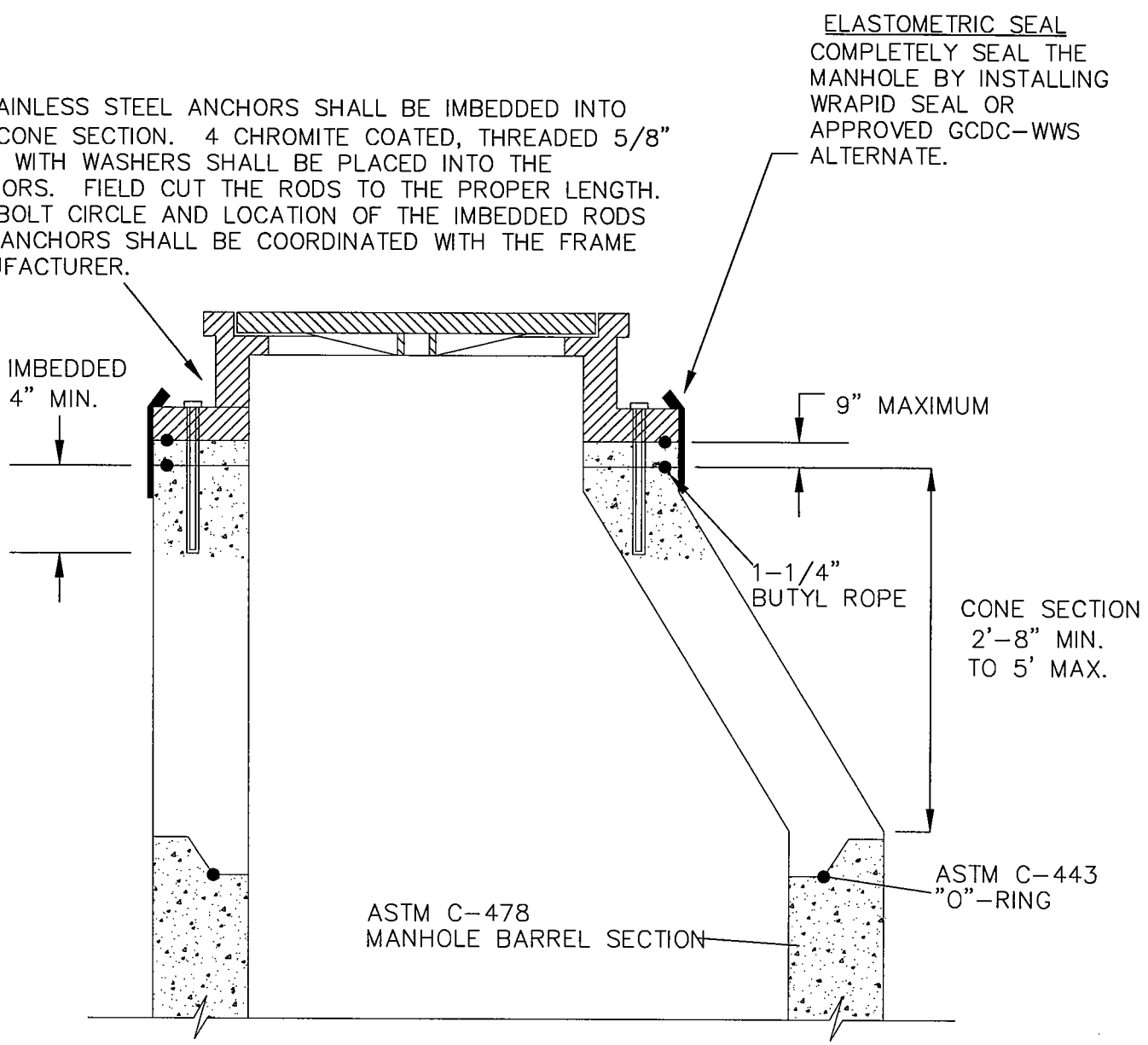
5. COVER SHALL BE BOLTED TO THE FRAME WITH FOUR 1/2"-13 NC HEX HEAD STAINLESS STEEL BOLTS AND WASHERS WITH RUBBER GASKETS

MANHOLE STEP NOTES

1. MANHOLE STEPS SHALL BE CAST INTEGRALLY WITH PRECAST MANHOLE.

2. STEPS SHALL BE COPOLYMER POLYPROPYLENE PLASTIC WITH 1/2" STEEL REINFORCEMENT.

3. STEPS SHALL BE M.A. INDUSTRIES PS-1-PF, AMERICAN STEP CO. ML-10, OR APPROVED GCDC-WWS ALTERNATE.

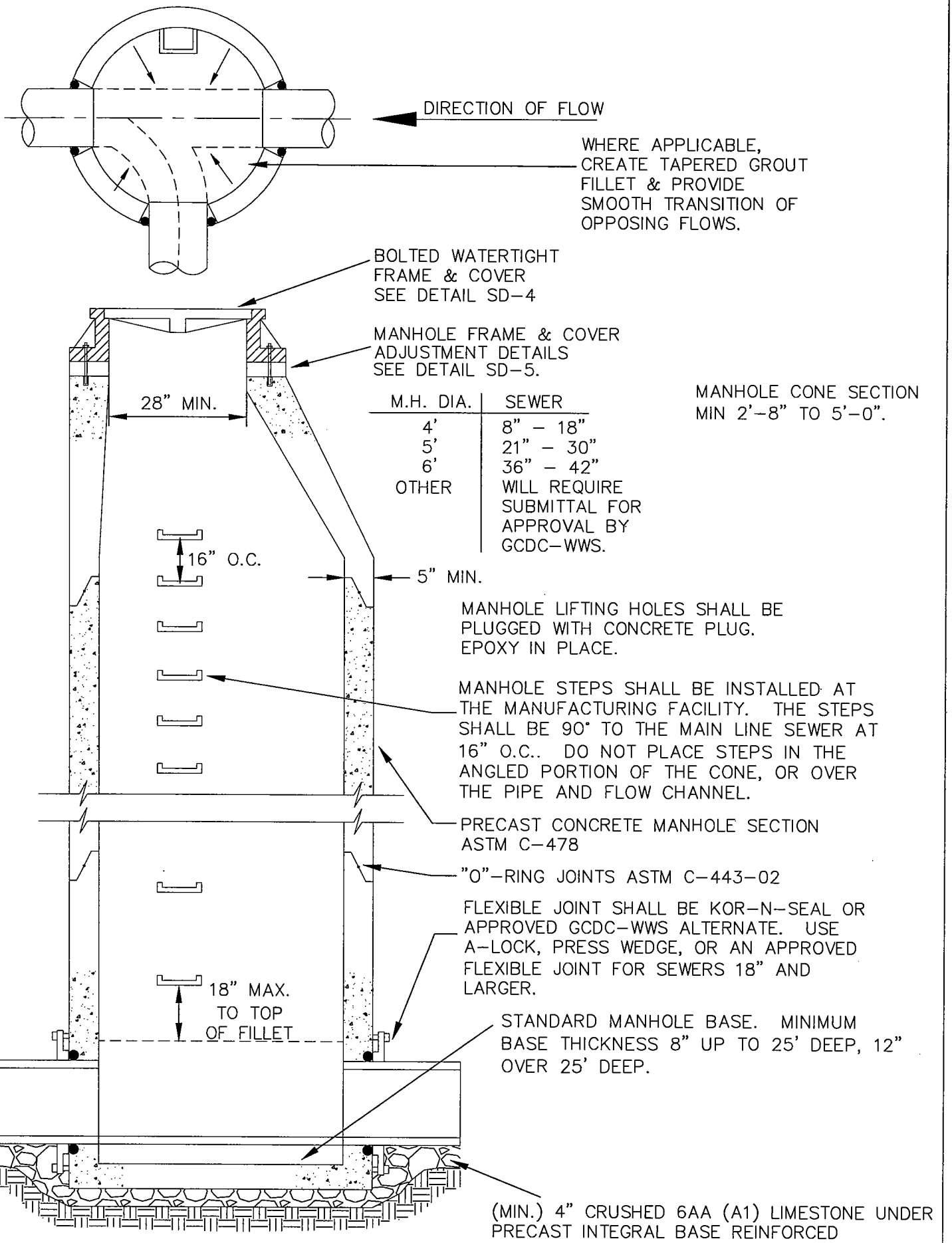


NOTES

1. DURING THE FINAL INSPECTION FINAL ADJUSTMENT SHALL BE AS DIRECTED BY GCDC–WWS FIELD PERSONNEL. MAXIMUM ADJUSTMENT ALLOWED SHALL BE 9". THE USE OF BLOCK OR BRICK FOR ADJUSTMENT SHALL NOT BE PERMITTED.

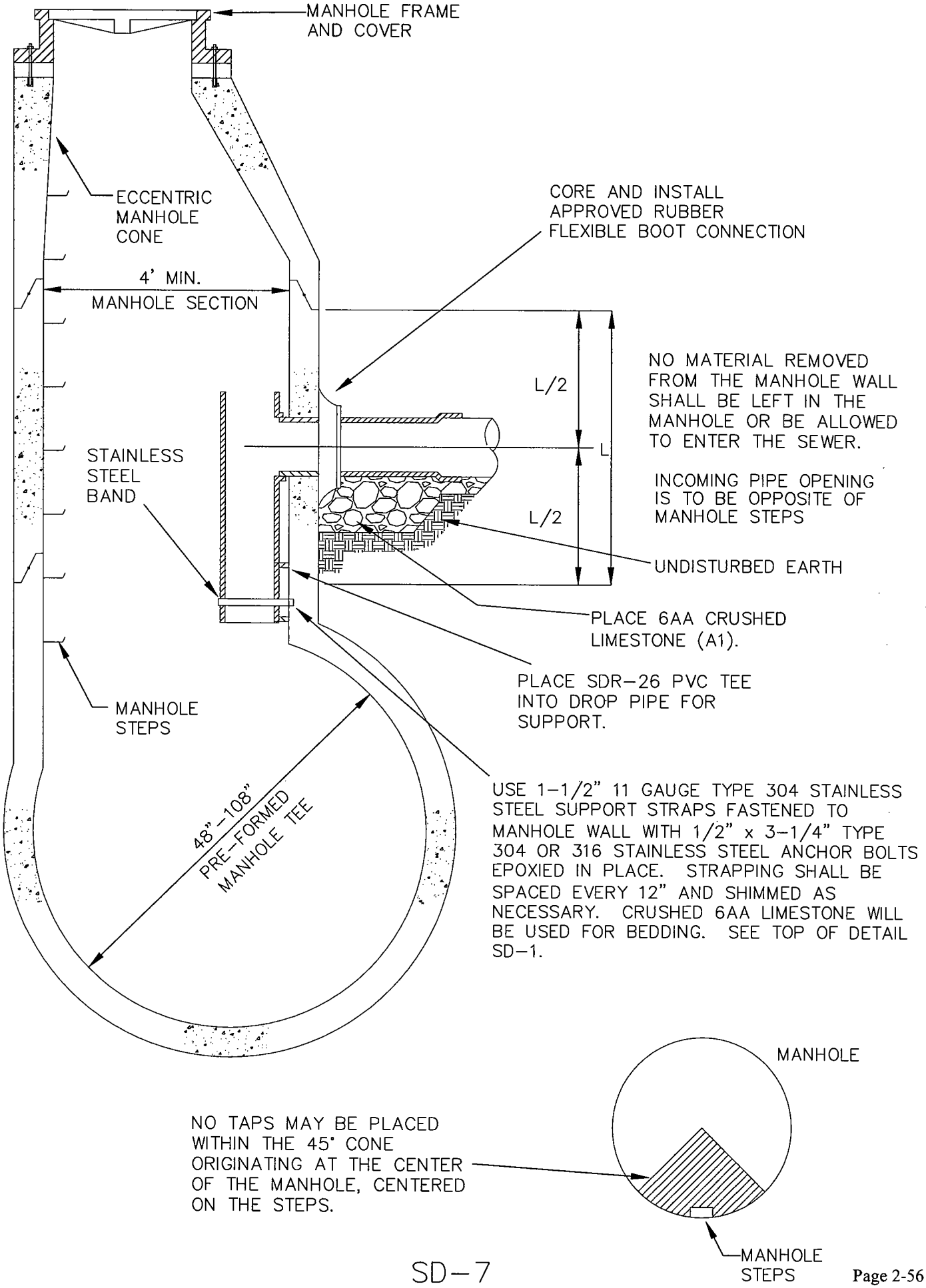
2. PERMISSIBLE GRADE RING SIZES FOR MANHOLE ADJUSTMENT SHALL BE 3", 4", OR 6" AS REQUIRED TO FINISH GRADE. NOTE: A MAXIMUM OF TWO GRADE RINGS WILL BE ALLOWED.

3. CONTRACTOR SHALL USE AN APPROVED 1–1/4" PRE–FORMED BUTYL RUBBER JOINT SEALANT BETWEEN GRADE RING, MANHOLE FRAME, & MANHOLE SECTION. USE MORTAR FOR MANHOLES IN ROADWAYS.



SD-6

PRECAST FLEXIBLE JOINT MANHOLE



SD-7

CONNECTION TO "T" MANHOLE

NOTES

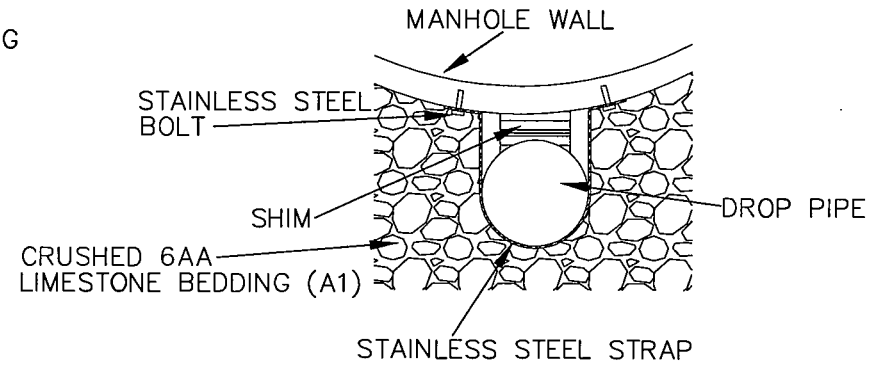
1. A DROP PIPE CONNECTION IS REQUIRED FOR ALL SEWERS WHERE INCOMING INVERT ELEVATIONS EXCEEDS 30" ABOVE OUTLET INVERT ELEVATION.

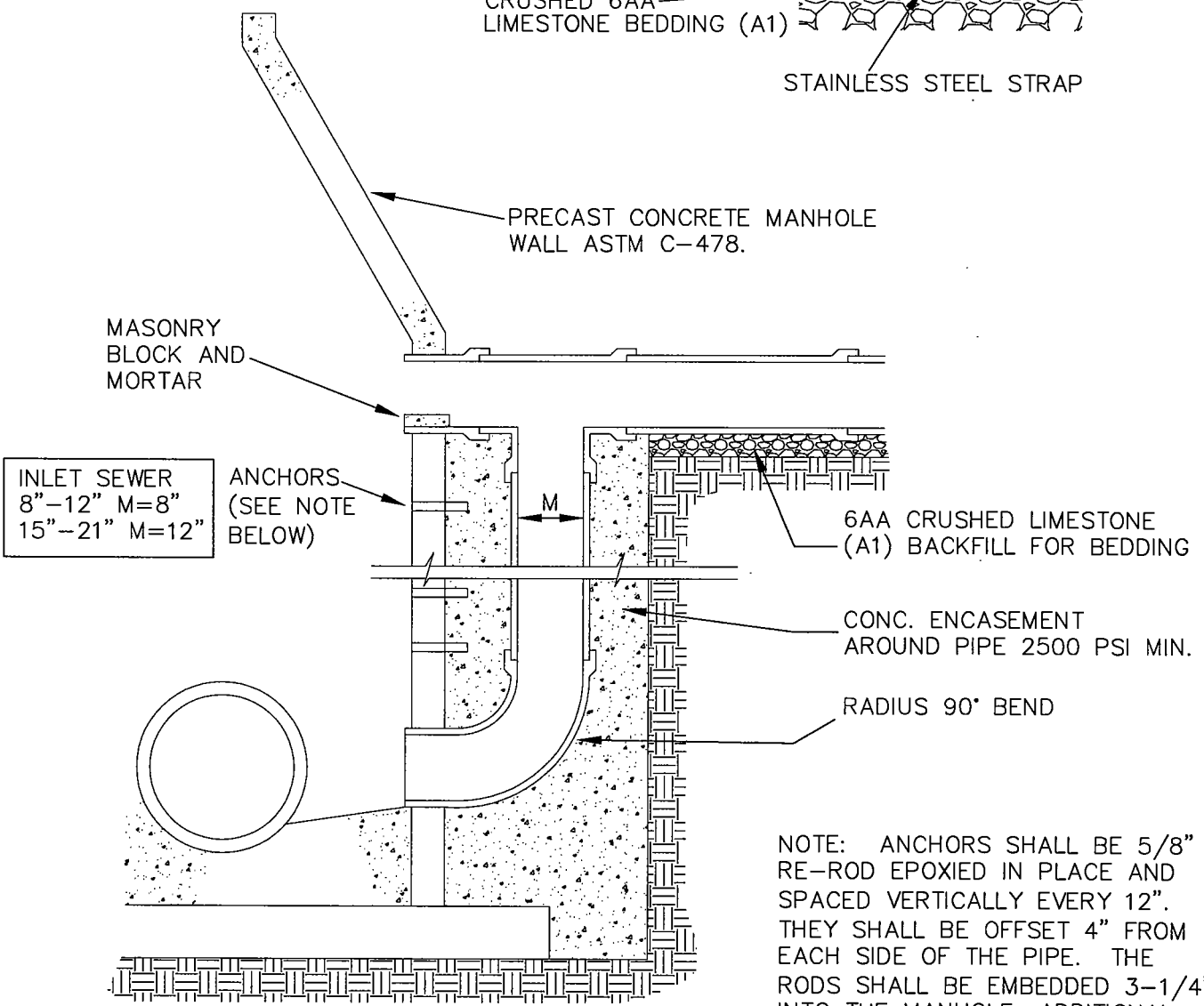
2. DROP PIPE SHALL BE THE SAME MATERIAL AS THE MAIN LINE WITH PREMIUM O-RING JOINTS.

3. OBTAIN APPROVAL FROM GCDC-WWS PRIOR TO POURING CONCRETE ENCASEMENT ON EXISTING MANHOLES.

ALTERNATE METHOD

USE 1-1/2" 11 GAUGE TYPE 304 STAINLESS STEEL SUPPORT STRAPS FASTENED TO MANHOLE WALL WITH 1/2" x 3-1/4" TYPE 304 OR 316 STAINLESS STEEL ANCHOR BOLTS EPOXIED IN PLACE. STRAPPING SHALL BE SPACED EVERY 12" AND SHIMMED AS NECESSARY. CRUSHED 6AA LIMESTONE WILL BE USED FOR BEDDING. THE CRUSHED STONE SHALL ENCASE THE PIPE A MINIMUM OF 6" IN ALL DIRECTIONS FROM THE PIPE. SEE DETAIL BELOW.





NOTE: ANCHORS SHALL BE 5/8" RE-ROD EPOXIED IN PLACE AND SPACED VERTICALLY EVERY 12". THEY SHALL BE OFFSET 4" FROM EACH SIDE OF THE PIPE. THE RODS SHALL BE EMBEDDED 3-1/4" INTO THE MANHOLE; ADDITIONAL ANCHORING WILL BE REQUIRED IF PIPE IS GREATER THAN 8" IN DIAMETER.

SD-8
CONCRETE ENCASED EXTERNAL DROP PIPE

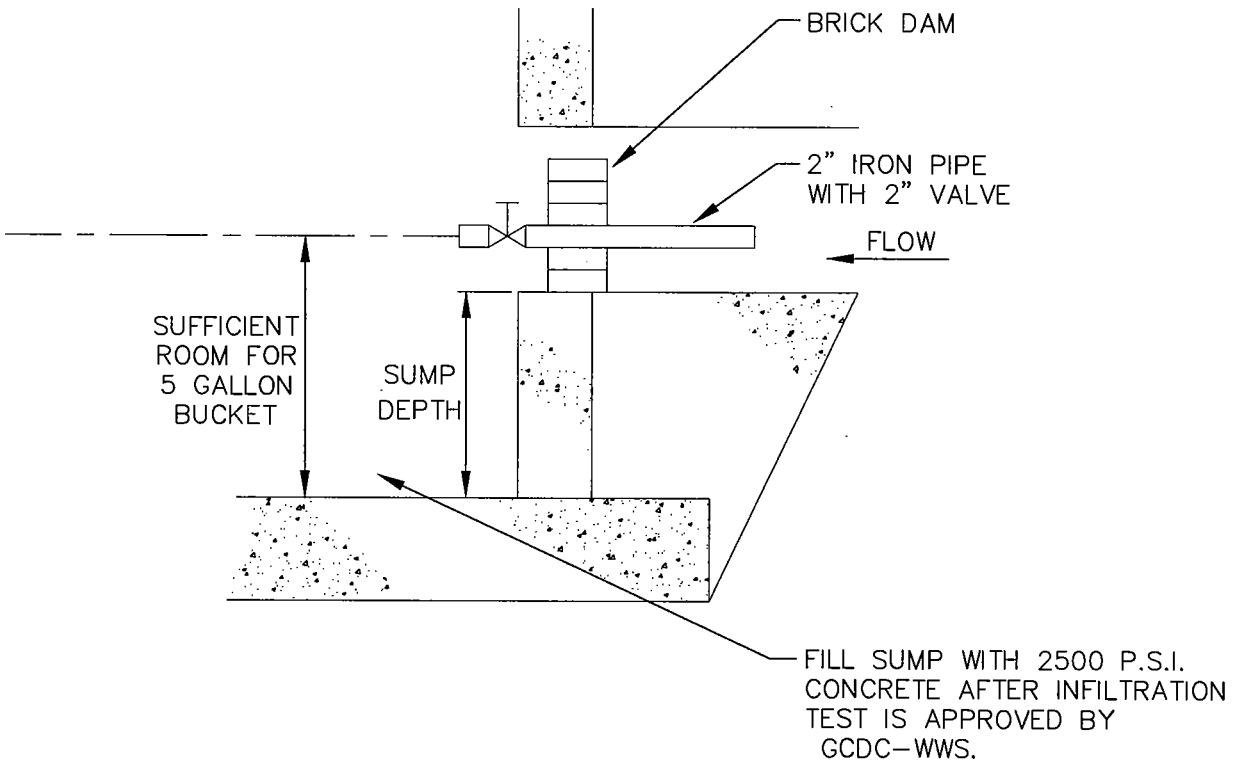
NOTES

1. ALL SANITARY SEWERS SHALL BE TESTED FOR INFILTRATION.

2. A NEW INFILTRATION TEST MANHOLE MUST BE CONSTRUCTED FOR EACH SEPARATE DIVISION OR SECTION OF A PROJECT. (SEE DETAIL)

3. NO CONNECTION SHALL BE MADE TO THE EXISTING SANITARY SEWER SYSTEM UNTIL ALL TESTING OF THE SEWER HAS BEEN PERFORMED AND APPROVED BY GCDC–WWS PERSONNEL.

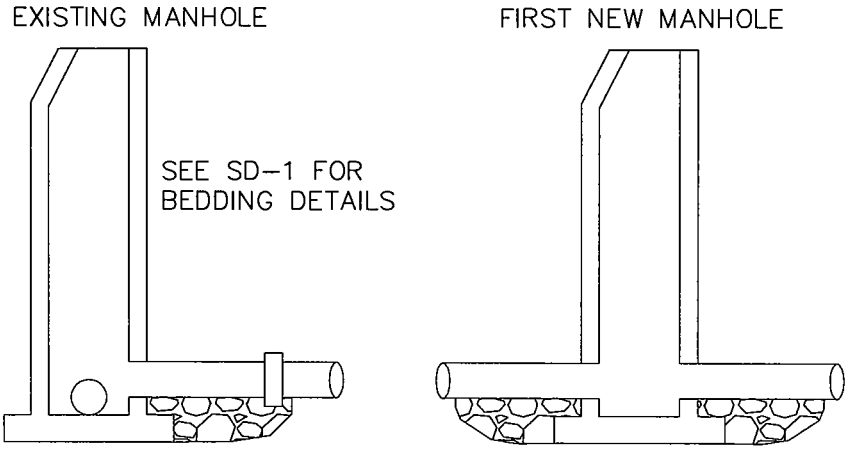
4. TESTING WEIRS ARE AVAILABLE FROM GCDC–WWS WITH PRIOR NOTICE. ALL EXTENSIONS OF 8"–21" SEWER SHALL BE AIR TESTED. ALL LINES 24" AND LARGER SHALL BE TESTED WITH A "V" NOTCH WEIR.



SD–9

INFILTRATION TEST MANHOLE

METHOD #1
FINAL CONNECTION PROCEDURE



1. BEGIN WORK AT THE FIRST MANHOLE.

2. TEST, TELEVISE AND CLEAN ALL WORK UPGRADE.

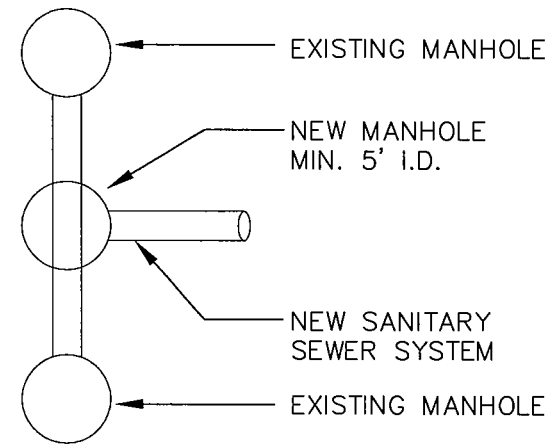
3. OBTAIN APPROVAL FROM GCDC-WWS TO TIE INTO THE EXISTING SYSTEM.

4. CONSTRUCT THE SEWER LINE BETWEEN THE FIRST MANHOLE AND THE EXISTING MANHOLE.

5. TEST, TELEVISE AND CLEAN THE SEWER LINE.

6. OBTAIN FINAL APPROVAL FROM GCDC-WWS.

METHOD #2
FINAL CONNECTION PROCEDURE



1. USE AN APPROVED PRECAST SLAB.

2. CONSTRUCT THE FIRST MANHOLE OVER THE EXISTING SEWER WITHOUT REMOVING THE EXISTING MAIN.

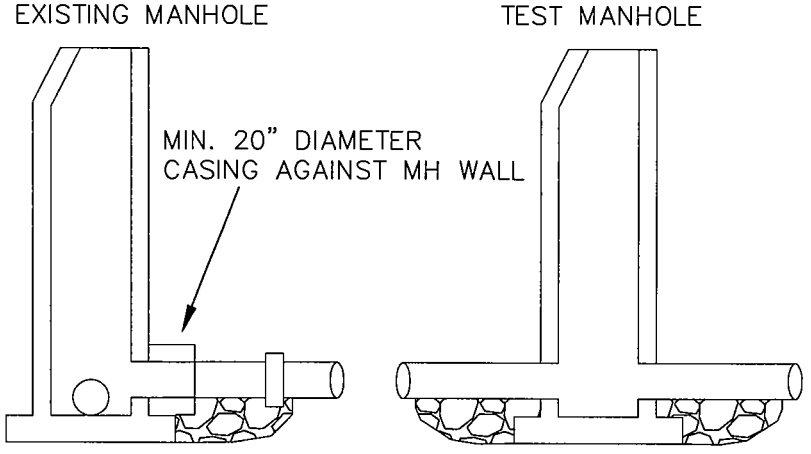
3. TEST, TELEVISE, AND CLEAN ALL WORK IN THE SYSTEM.

4. OBTAIN APPROVAL FROM GCDC-WWS FOR EXISTING PIPE REMOVAL & FINAL CONNECTION.

5. SAW CUT & REMOVE PIPE SECTION AFTER RECEIPT OF APPROVAL, AND POUR THE FLOW CHANNEL.

6. CONTRACTOR RESPONSIBLE TO CATCH DEBRIS & PREVENT IT FROM ENTERING THE SEWER.

METHOD #3
FINAL CONNECTION PROCEDURE



1. BEGIN WORK AT THE TEST MANHOLE.

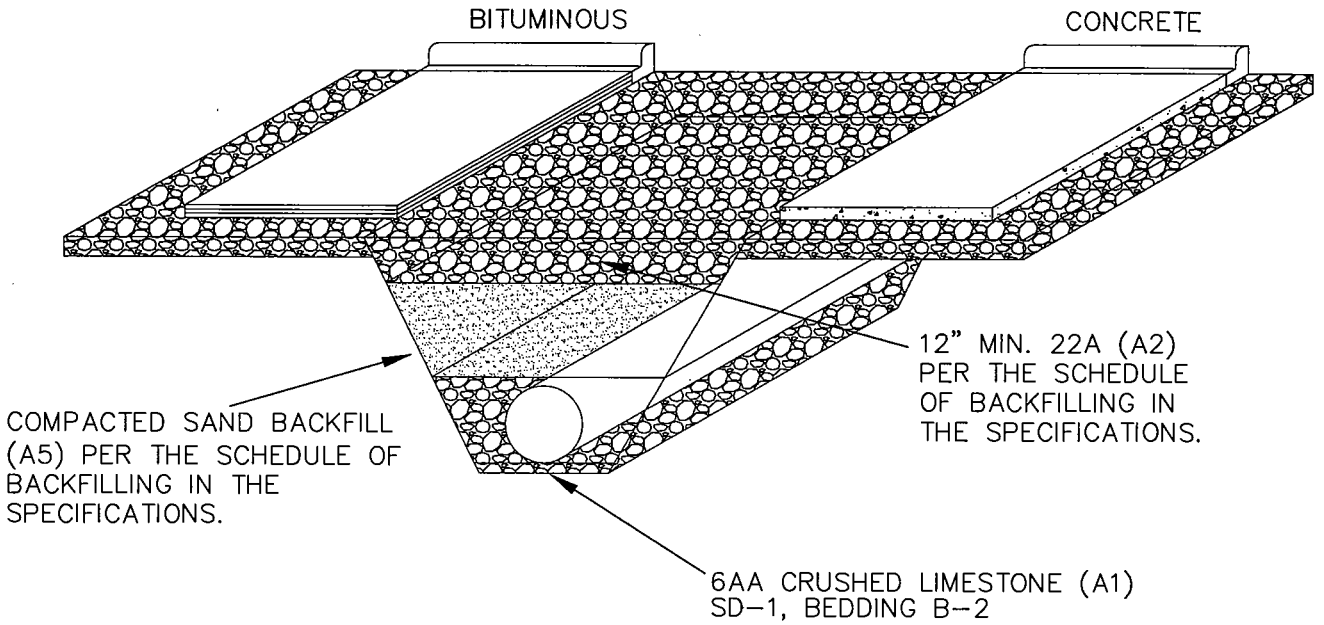
2. ALL WORK UPGRADE MUST BE CLEAN & FREE OF DEBRIS BEFORE COMPLETING ANY INSTALLATION OF SEWER LINE BETWEEN TEST MANHOLE & EXISTING MANHOLE.

3. OBTAIN APPROVAL FROM GCDC-WWS PERSONNEL TO BORE DIRECTLY THROUGH MANHOLE WALL. NOTE: PROVIDE NECESSARY DOCUMENTATION TO DEMONSTRATE NECESSITY TO UTILIZE THIS PROCEDURE. FIELD/SITE VISIT MAY BE NECESSARY.

4. CONTRACTOR RESPONSIBLE TO MAINTAIN GRADE & MATCH INVERTS AS CALLED FOR ON APPROVED CONSTRUCTION PLANS. CONTRACTOR ALSO REQUIRED TO PROVIDE POSITIVE SEAL AROUND MANHOLE PENETRATION VIA FLEXIBLE RUBBER BOOT.

SD-10

SANITARY SEWER FINAL CONNECTION



SPECIAL REQUIREMENTS FOR OPEN CUTTING HARD SURFACE AND/OR GRAVEL ROADS

1. THE CONTRACTOR SHALL ACQUIRE A SPECIAL OPEN CUT APPROVAL FROM THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS.

2. THE CONTRACTOR SHALL SUPPLY CONTINGENT LIABILITY INSURANCE FOR THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS.

3. THE PROTECTION OF THE WORK SHALL BE IN ACCORDANCE WITH THE "MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES, PART 6". BARRICADES, WARNING AND LIGHTING NECESSARY FOR PUBLIC SAFETY TO BE APPROVED BY THE ENGINEER AND THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS PRIOR TO STARTING CONSTRUCTION.

4. CONTRACTOR SHALL EXCAVATE ALL MATERIAL TO PROPOSED GRADE.

5. THE SANITARY SEWER SHALL BE PLACED ON 6AA CRUSHED LIMESTONE (A1) BEDDING, PER SD-1 B-2 BEDDING.

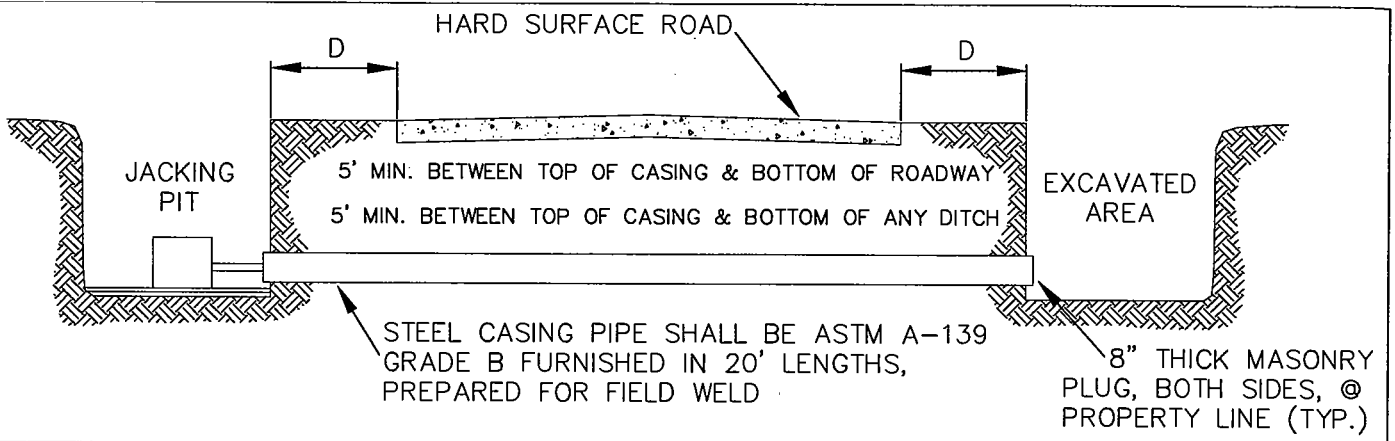
6. ALL BACKFILL SHALL BE MDOT CLASS II SAND (A5), PLACED PER THE SCHEDULE OF BACKFILLING.

7. THE SAND BACKFILL SHALL EXTEND FROM THE OUTSIDE EDGE OF SHOULDER TO OUTSIDE EDGE OF SHOULDER, OR FOR CURB AND GUTTER SECTIONS, SHALL BE EXTENDED 5' FROM THE OUTSIDE EDGE OF THE CURB TO THE OUTSIDE EDGE OF THE GUTTER.

8. THE FINAL 12" OF ALL BACKFILL SHALL BE 22A LIMESTONE (A2) SUBBASE MODIFIED PER GCRC SPECIFICATIONS. ALL SHOULDERS SHALL BE REPAIRED PER THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS.

9. THE CONTRACTOR SHALL REPLACE THE ROAD SURFACE WITH THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS APPROVED MATERIAL.

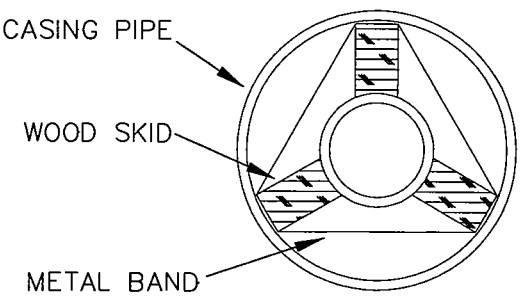
10. CONTRACTOR SHALL MAINTAIN TEMPORARY ACCESS TO ALL AREAS DURING CONSTRUCTION. A PUBLIC ROAD MAY BE CLOSED FOR 1/2 WIDTH CONSTRUCTION WITH GCRC APPROVAL BUT THE CLOSING TIME CANNOT EXCEED 8 HOURS. CONTRACTOR MAY USE SHOULDERS AND TEMPORARY PATCHES TO KEEP A ROAD OPEN.



SIZE AND MATERIAL	MIN. CASING DIA. O.D. INCHES	MIN. WALL THICKNESS INCHES
8" D.I. PRESSURE PIPE OR SMALLER	12.75	0.375
6" SANITARY SEWER V.C.P. OR P.V.C.		
10"-12" D.I. PRESSURE	20.00	0.375
8"-10" SANITARY SEWER		
16" D.I. PRESSURE PIPE	24.00	0.375
12"-15" SANITARY SEWER		
18"-24" D.I. PRESSURE	30.00	0.406
18" SANITARY SEWER CONCRETE		
21"-24" SANITARY SEWER CONCRETE	36.00	0.469

MDOT
D=30' FOR TRAFFIC OVER 45 MPH
D=20' FOR TRAFFIC UNDER 45 MPH

GCRC
D=10' FOR ROADS WITH SHOULDER/DITCH
D=5' FOR ROADS WITH CURB AND GUTTER



NOTES

1. ALL BORE AND JACK OPERATIONS WITHIN THE ROAD R.O.W. WILL REQUIRE A PERMIT FROM THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS.

2. THE CONTRACTOR SHALL ABIDE BY ALL SAFETY PRECAUTIONS INCLUDING THE MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES, PART 6 AS REQUIRED BY THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS.

3. THE CONTRACTOR SHALL PROTECT AND RESTORE ALL PROPERTY.

4. THE CONTRACTOR SHALL NAME THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS AS AN ADDITIONAL NAMED INSURED FOR CONTINGENT LIABILITY FOR THE PROPOSED CONSTRUCTION.

5. THE CONTRACTOR SHALL ABIDE BY ALL CONDITIONS STATED IN THE GCRC MEMO OF 9-1-75 LABELED SANITARY SEWER AND WATERMAIN INSTALLATION WITHIN THE LIMITS OF COUNTY HIGHWAYS OR THE REQUIREMENTS OF THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS.

6. THE SHEETING OF THE FRONT FACE OF THE BORE PIT WILL BE REQUIRED IF UNSTABLE SOIL CONDITIONS ARE ENCOUNTERED.

7. THE AUGER MUST ALWAYS PROCEED THE CASING PIPE HEAD.

8. THE CONTRACTOR SHALL NOTIFY THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS A MINIMUM OF 72 HOURS PRIOR TO BEGINNING CONSTRUCTION.

9. WOOD SKIDS AND STAINLESS STEEL METAL BANDS MUST BE INSTALLED FOR ALL BORES TO KEEP THE CARRIER PIPE ON LINE AND GRADE. THE MAXIMUM DISTANCE FROM THE I.D. OF THE CASING PIPE TO THE OUTSIDE EDGE OF THE SKID SHALL BE 1".

10. THE ENDS OF THE CASING PIPE SHALL BE BULK HEADED WITH AN 8" WATER TIGHT MASONRY BULKHEAD.

SD-12
BORE & JACK CONSTRUCTION ON ALL ROADS

SANITARY FORCEMAIN

A. General

1. Work Included

This work includes furnishing all labor, equipment, and material to construct sanitary forcemain.

2. Submittals

Submittal data shall be provided to the City for the following before the materials are ordered.

a. Pipe, fittings, and joint materials
b. Air release valves

3. Standards

Where materials or methods of construction are listed as being in conformance with Genesee County Drain Commissioner-WWS and Ten States Standard, it shall refer to the latest edition of the standard specification or any interim revision.

B. Products

1. Pipe

The material as called for on the project drawings for sanitary forcemain shall be constructed with SDR 21 material and meet all requirements for said specific material by Genesee County standards. Pipe joints shall be push-on type meeting the requirements of ASTM D3139. All forcemain shall have a minimum working pressure of 200 psi, and shall have the same outside diameter as ductile iron pipe. All bends, tees, and wyes, and other fittings shall meet the same requirements as the main.

All bends, tees, and other fittings resulting in a change in direction of twenty-two degrees and larger shall be restricted with thrust blocks or as directed by the City.

2. Fittings

All bends, tees, wyes and other special fittings used on the forcemain shall be cast iron Class 250 conforming to ANSI/AWWA-C110/A21.10 or ductile iron Class 350 conforming to AWWA-C153/A21.53-84 with cement mortar linings in accordance with ANSI/AWWA-C104/A21.4. Fitting joints shall be push-on type or mechanical joint, shall match the pipe being used and shall conform to ANSI/AWWA-C111/A21.11.

3. Air Release Valves

Air release devices installed on forcemains shall be the automatic type with a working pressure range of 0 to 300 psi, and a venting capacity range of 200 to 250 S.C.F.M. The air release device shall be preceded by a one inch bronze globe valve and shall be equipped with suitable flushing connections. Automatic air release valves shall be Valmatic Model 38 or equal.

4. Manholes

Forcemain manhole shall be constructed of a minimum of four feet diameter precast manhole sections conforming to ASTM C-478-79 with modified joint and premium rubber gasket conforming to ASTM C-443-79. Manhole sections shall be installed on an eight inch thick precast base slabs unless integrally cast wall and slab sections are used. Manhole steps shall be cast iron or copolymer polypropylene plastic. Steps shall conform to M.A. Industries PS-1-PF with twelve inch over-all dimension and 1/2 inch grade 60 steel reinforcement, Neenah Foundry Company, R-1981-S or R-1982-G or East Jordan Iron Works, Inc. Model 8513 or approved equal. Manhole steps shall be spaced at fifteen inches. Manhole frames and covers shall be East Jordan Model 1040 Type A, or equal, with solid covers. The words "SANITARY SEWERS" shall be cast into each cover in large raised letters. Precast concrete grade rings shall be used to bring the cover to grade. The maximum adjustment using concrete grade rings shall be eighteen inches as measured from the top of the cone section to the bottom of the manhole frame. A layer of mortar shall be placed between each adjustment ring, between the bottom ring and the cone and between the top ring and the frame. Likewise, the manhole frame and all adjusting rings shall be wrapped with concrete mortar to within 1 1/2 inches of the top of the casting.

C. Execution

1. Construction Methods

a. Excavation

The Developer shall perform all excavation of whatever materials encountered to the depths indicated or as otherwise specified. The excavation shall provide a minimum of five feet of cover over the top of the forcemain as measured from final grade. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. Excavated materials stored along the trench shall be placed in a manner that will not cause damage to trees, shrubs, fences, or other property.

Excess excavated materials and unsuitable materials for backfill shall be removed from the project site and properly disposed of by the Developer.

Excavation shall be by open cut.

Grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping, or by other approved methods. Sheeting and shoring shall be done as may be necessary for the protection of the work and for the safety of personnel.

The trench shall be defined as that portion of the sewer from the bottom of the excavation to a point twelve inches over the crown of the pipe. Trenches shall be of adequate width to facilitate proper laying of forcemains. Trenches shall not be greater than thirty inches wide.

The trench shall be excavated true to line so that the distance from the outside edge of the pipe to the trench wall does not vary by over six inches from either side. The banks of the pipe trench shall be as nearly vertical as practicable. The bottom of the trench shall be over-excavated four inches and backfilled with sand, accurately graded to provide uniform bearing and support along the entire length of each section of the pipe. Bell holes shall be provided in the bedding to accommodate bell sections. Stones shall be removed from the bedding material in order to avoid point loadings. Care shall be taken not to excavate below the four inch depth indicated. Over depths shall be backfilled with sand or fine gravel at the contractor's expense. Whenever unstable soil is encountered in the trench bottom which the City considers is incapable of properly supporting the pipe, such material shall be removed to the depth required and for such length as the City may designate. The trench shall be backfilled to trench bottom grade with crushed stone or other material approved by the City.

Unless otherwise indicated, trenches for forcemains and appurtenances shall be graded to avoid high points with the necessity of placing vacuum and relief valves in the forcemain. Trenches shall be of a depth to provide a minimum cover over the top of the pipe of five feet from the existing ground surface or the indicated finished grade, whichever is lower.

The excavation of the trench shall not advance ahead of the pipe work, except where in the opinion of the City it is necessary to drain wet ground.

b. Adjustment of Grade and Alignment

The City reserves the right to make minor variations in the alignment and grade of forcemain during construction to meet any changed conditions which may be encountered.

c. Pipe Installation

Pipe located inside structures or above ground shall be rigidly supported as shown on the plans or as specified herein. The full length of each section of underground pipe shall rest solidly upon the four inch sand cushion with recesses only to accommodate pipe bells and joints. Any pipe which has its alignment, grade or joints disturbed after laying shall be taken up and relayed. The interior of all pipe shall be thoroughly cleaned of all foreign matter before being installed and shall be kept clean during laying operations. The pipe shall not be laid in water, or when trench or weather conditions are unsuitable for work.

When the work is not in progress, open ends of pipes shall be securely closed so that no water, earth, rodents or other foreign substances can enter the line. Any section of pipe found to be defective either before or after laying shall be replaced with new pipe at no expense to the City.

Pipe materials shall be handled in such a manner as to insure delivery on the site and final installation in a sound, undamaged condition. Care shall be taken not to split or damage the ends of the pipe or cause injury to pipe coatings or linings. The pipe shall be loaded and unloaded using hoists in a manner so as to avoid shock or damage and shall not be dropped, skidded or rolled against other pipe. If any part of the coating or lining is damaged, the repair thereof, shall be made by the contractor at his expense, in a manner satisfactory to the City. Pipe delivered with split plain ends may be trimmed to remove the split portions, provided the cut is made at least six inches toward the bell end of the last evidence of the split. Cutting shall be at the expense of the Developer.

Any cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe or lining and so as to leave a smooth end at right angle to the axis of the pipe. Cutting shall be done by means of an approved type mechanical cutter or saw.

Pipe shall be examined for defects while suspended in a sling prior to being lowered into place. All damaged, defective or unsound material will be rejected and shall be removed immediately from the site or destroyed. All lumps, blisters and excess coal-tar coating shall be removed from the inside of the bell and outside of the spigot and these areas wire brushed and wiped clean using a dry oil-free rag. The pipe shall be cleaned of all foreign material prior to laying and no debris, tools, clothing or other materials shall be allowed in the pipe during the laying operation. Pipe shall be laid in a dry trench with bell ends facing the direction of laying, and shall have a minimum of five feet of cover. After placing a length of pipe in the trench, and after installing the gasket and applying the gasket lubricant, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade.

The pipe shall be secured in place with approved backfill material tamped under it. Pipe which does not allow a sufficient and uniform space for joints shall be removed and replaced with pipe of proper dimensions to insure such uniform space.

Precautions shall be taken to prevent dirt from entering the joint space.

Whenever it is necessary to deflect pipe from a straight line either in the vertical or horizontal plane, to avoid obstructions or where long radius curves are permitted, the amount of deflection allowed shall not exceed the values shown in the following table:

Nominal Pipe Size (Inches)	"Slip-on Joint" Maximum Deflection 18' Length (Inches per Length)	Mechanical Joint Maximum Deflection 18' Length (Inches per Length)
3	19	31
4	19	31
6	19	27
8	19	20
10	19	20
12	19	20
14	11	13 1/2
16	11	13 1/2

Before any joints are made or the spigot of pipes placed in the bells, the spigots, bells, gaskets and glands shall be thoroughly cleaned and all foreign materials removed from their surfaces.

In joining mechanical joint pipe and fittings, the gland, followed by the gasket, shall be placed over the plain end of the pipe, the gasket and socket shall be brushed with soapy water, and the pipe inserted into the bell. The gasket shall then be pushed into position so that it is evenly seated in the bell and the gland moved into position against the face of the gasket. The bolts shall be inserted and made finger tight. The bolts shall then be tightened up with a torque wrench to complete the joint.

In joining gasket type pipe fittings, the gasket shall be seated evenly around the inside of the bell in the groove or recess provided, and the inside of the gasket lubricated with lubricant furnished by the joint manufacturer. The spigot of the next pipe shall then be aligned with the bell and started into the bell until it contacts the gaskets. The joint shall then be completed by forcing the spigot past the gasket until it makes contact with the base of the socket. Pressure to force the spigot home shall be applied by means of a bar, a special lever, or a mechanical jack-type assembly tool.

Concrete encasement shall be provided at the locations shown on the plans or where directed by the City. It shall be placed in conformance with details shown on the plans. Concrete shall have a minimum 28 day compressive strength of 3000 psi.

The Developer shall furnish and place horizontal and/or vertical thrust blocks at all plugs, caps, tees and fittings whether or not indicated on the drawings.

d. Bedding and Backfill

The bottom of the trench shall be over-excavated four inches and backfilled with sand, accurately graded to provide uniform bearing and support along the pipe barrel. Blocking under the pipe is strictly prohibited. The backfill material from the sand bedding to a point over the crown of the pipe shall be carefully selected excavated material, except where sand

backfill is required, and shall be compacted so as to completely remove all voids. The backfill material shall be placed evenly on each side of the forcemain to avoid any lateral movement of the new forcemain. The backfill material in this portion of the trench shall be free from stones, lumps, clumps or frozen conglomerates larger than three inches in any dimension. The remainder of the backfill shall be placed carefully so as not to damage the work.

Whenever compaction is required, it shall be accomplished using suitable mechanical compaction equipment approved by the City.

The areas of sand backfill as called for on the plans shall be performed in accordance with the requirements of the Michigan Department of Transportation.

2. Testing

Within a reasonable length of time following pipe laying, the Contractor shall complete all work necessary to perform hydrostatic pressure testing. Where feasible, the forcemain shall be tested in sections of 2500 to 3000 feet in length. The Contractor shall provide at his expense, all labor, supervision, pumps, measuring devices, power and water necessary for conducting the hydrostatic tests. The Contractor shall be responsible for conducting preliminary hydrostatic tests on forcemains to insure that they will sustain the required test pressures. All leaks and defects discovered during preliminary testing shall be repaired, and the forcemains shall be re-tested. Immediately after the forcemains have passed such preliminary tests, the Developer shall contact and notify the City of the day, date and time of the final hydrostatic test which shall be performed in the presence of the City.

After the pipe has been laid and backfilled as specified, the Developer shall fill the line or a valved section thereof with water in such a manner as to expel all air from the pipe. Expulsion of air shall be accomplished through fire hydrants or through corporation stops installed by the contractor. At the close of the test, the Developer shall remove all corporation stops and plug all tap holes with brass plugs.

All forcemain pipe laid shall be subjected to a hydrostatic pressure of 150 psi at the elevation of the highest point in the forcemain tested. The duration of the test shall be at least two hours, or such additional time as may be necessary to establish that the condition of the piping installation is satisfactory. Any cracked or defective pipe or fittings, shall be removed and replaced with sound material at the Developer's expense and the test repeated to the satisfaction of the City.

Leakage is defined as the quantity of water which must be supplied into a newly laid pipe, or valved section thereof, in order to maintain the specified test pressure. No pipe line installed will be accepted until the total leakage measured over the two hour period is less than one-quarter gallon per inch diameter of pipe per 1,000 feet. All visible leaks must be corrected.

Should any test of pipe installed disclose leakage greater than that specified above, the Developer shall, at his own expense, locate and repair the pipe or joints that show evidence of leakage and repeat the test until the leakage is within the specified allowance.

SUBMERSIBLE SEWAGE PUMP STATION SPECIFICATIONS

A. General

This specification describes the requirements for furnishing, installing, and placing into satisfactory operation a submersible sewage pump station. This work includes grading for off road parking; furnishing and placing protection bollards; excavating and backfilling; furnishing and placing a valve vault and wetwell, furnishing and installing pumps, piping, fittings, valves; furnishing and installing electrical systems for power and control; and start up and testing of the completed system. The Developer is to supply a completely operational unit.

THE SPECIFICATIONS IN THIS SECTION ARE INTENDED TO BE GENERIC FOR ALL SUBMERSIBLE SEWAGE PUMPING STATIONS. DATA SHOWN ON THE PROJECT DRAWINGS OR SPECIFICATIONS SUPERSEDE THESE SPECIFICATIONS. SUBMERSIBLE SEWAGE PUMP STATION DESIGN CONSTRUCTION SHALL MEET ALL REQUIREMENTS OUTLINED IN GCDC STANDARD SPECIFICATIONS FOR THE CONSTRUCTION OF PUBLIC SANITARY SEWERS AND WATERMAINS, CURRENT EDITION.

B. Standards

Where materials or methods of construction are listed as being in conformance with Genesee County Drain Commissioner-WWS and Ten States Standard, it shall refer to the latest edition of the standard specification or any interim revision.

C. Shop Drawings

The Developer shall submit five (5) copies of shop drawings of equipment to the City for review and approval prior to fabricating or shipping.

Drawings and technical data shall be provided for the following:

1. Submersible Pumps
2. Valves; check valve and gate valves
3. Pipe, fittings, and joints
4. Pipe layout drawings
5. Pump control with enclosure panel including wiring and control diagrams
6. Guide Rails
7. Paint system
8. Precast concrete structures with precast concrete roof and aluminum hatches
9. Main electrical disconnect
10. Buoyancy calculations

D. Operating Conditions

Each pump shall be capable of delivering a specified discharge of unscreened sewage against a total dynamic head as specified. All openings and passages shall be large enough to permit the passage of a three inch diameter sphere and any trash or stringy material which can pass through a four inch residential plumbing system.

E. Station

Each pumping unit shall be a totally enclosed submersible grinder pumping unit. Data is to be shown on the project drawings.

1. Submersible Sewage Pump

The pumps shall be capable of handling raw, unscreened sewage. The design shall be such that the pump unit will be automatically and firmly connected to the discharge piping when lowered into place on its mating discharge connection, permanently installed in the wet well. The pump shall be easily removable for inspection or service, requiring no bolts, nuts or other fastenings to be disconnected. For this purpose, there shall be no need for personnel to enter the wet well. Each pump shall be fitted with a 7/16" high strength, hot dipped galvanized steel chain of adequate length to permit raising and lowering the pump for inspection or removal. The pump, with its appurtenances and cable, shall be capable of continuous submergence underwater without loss of watertight integrity.

All major parts, such as the stator casing, oil casing, sliding bracket, volute and impeller shall be of gray iron. All surfaces coming into contact with sewage shall be protected by a coating resistant to sewage. All exposed bolts and nuts shall be of stainless steel.

A wear ring system shall be installed to provide efficient sealing between the volute and impeller. The impeller shall be gray cast iron of non-clogging design, capable of handling solids, fibrous material, heavy sludge and other matter found in normal sewage applications. The impeller shall be constructed with a long through let without acute turns. The impeller shall be dynamically balanced. Static and dynamic balancing operations shall not deform or weaken it. The impeller shall be a slip fit to the shaft and key driven. Non-corroding fasteners shall be used.

Each pump shall be provided with a mechanical rotating shaft seal system running in an oil reservoir having separate, constantly hydro-dynamically lubricated lapped seal faces. The (lower) seal unit between the pump and oil chamber shall contain one stationary and one positively driven rotating tungsten-carbide ring. The (upper) seal unit between the oil sump and motor housing shall contain one stationary tungsten-carbide ring and one positively driven rotating carbon ring. Each interface shall be held in contact by its own spring system supplemented by external liquid pressures. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. The shaft sealing system shall be capable of operating submerged to depths of, or pressures equivalent to 165 feet. No seal

damage shall result from operating the pumping unit out of its liquid environment. The seal system shall not rely upon the pumped media for lubrication.

A sliding guide bracket shall be an integral part of the pump unit. The volute casing shall have a machined discharge flange to automatically and firmly connect with the cast iron discharge connection, which when bolted to the floor of the sump and discharge line, will receive the pump discharge connecting flange without the need of adjustment, fasteners, clamps or similar devices. Installation of the pump unit to the discharge connection shall be the result of a simple linear downward motion of the pump unit guided by guide bar(s). No other motion of the pump unit, such as tilting or rotating, shall be required. No portion of the pump unit shall bear directly on the floor of the wet well. There shall be no more than a 90° bend allowed between the volute discharge flange and station piping.

The pump motor shall be housed in an air-filled watertight casing and shall have moisture resistant Class F 155°C insulation. The motor shall be NEMA Design B and designed for continuous duty.

The cable entry water seal design shall be such that specific torque requirements insure a watertight and submersible seal. Epoxies, silicones or other secondary sealing systems shall not be required. The cable entry junction box and motor shall be separated by a stator lead sealing gland or terminal board which shall isolate the motor interior from foreign materials gaining access through the pump top.

Pump motor cable installed shall be suitable for submersible pump applications and this shall be indicated by a code or legend permanently embossed on the cable. Cable sizing shall conform to NEC specifications for pump motors and shall be of adequate size to allow motor voltage conversion without replacing the cable.

All mating surfaces of major parts shall be machined and fitted with O-rings where watertight sealing is required. Machining and fitting shall be such that sealing is accomplished by automatic compression in 2 planes and O-ring contact made on four surfaces. Tolerances of all parts shall be such that allows replacement of any part without additional machining required to insure sealing as described above. No secondary sealing compounds, greases or other devices shall be needed.

An electrical probe shall be mounted in the oil chamber for the purpose of detecting water in the chamber. A device in the control panel shall transmit a low voltage, low amperage signal to the probe and energize a warning lamp on the panel in the event water is detected.

2. Piping

   a. Discharge Piping

      Pipe shall be Class 53 ductile iron conforming to ANSI/AWWA - C151/A21.51. Ductile iron pipe shall be cement-lined in accordance with ANSI/AWWA - C104/A214.

Pipe joints outside of structures shall be mechanical type, conforming to ANSI/AWWA - C111/A21.11. Mechanical joints shall be made using retainer glands.

Pipe joints within structures shall be flanged type, conforming to ANSI/AWWA - C115/A21.15.

Pipe fittings shall be constructed in accordance with ANSI/AWWA - C110/A21.10.

b. Drain Piping, Vents

Pipe and fittings shall be PVC plastic conforming to ASTM D 1785, Schedule 80. Joints shall be solvent welded.

3. Valves

a. Plug Valve

Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with flanged connections faced and drilled to the ANSI 125/150 lb. standard.

Valve bodies shall be of ASTM A126 Class B cast iron in compliance with AWWA Standard C-504-70 Section 6.4. All exposed nuts, bolts, springs, washers, etc. shall be zinc plated. Resilient plug facings shall be of neoprene, suitable for use with sewage.

Valves shall be furnished with corrosion resistant seats which comply with AWWA Standard C-504-73 Section 7 paragraph 7.2 and with AWWA Standard C-504-70 Section 9 paragraph 9.4.

Valves shall be furnished with replaceable, sleeve-type bearings in the upper and lower journals. These bearings shall comply with AWWA Standard C-507-73 Section 8 paragraphs 8.1, 8.3 and 8.4 and with AWWA Standard C-504-70 Section 10.

Valve shaft seals shall comply with AWWA Standard C-507-73 Section 10 and with AWWA C-504-70 Section 11.

Valve pressure ratings shall be 175 psi and shall be established by hydrostatic tests as specified by ANSI Standard B16-1-1967. Valves shall provide drip-tight shut-off up to the full pressure rating.

b. Check Valve

Check valves shall conform to AWWA - C500 and suitable for working pressure of 175 psi. Check valves shall be of the spring and lever type. Check valves shall have flanged ends.

4. Concrete Valve Vault And Wetwell

   Concrete valve vault and wetwell shall be precast concrete structures. The base and top slabs shall be of the dimensions and reinforcing shown on the plans. Concrete shall have a 28 day compressive strength of 3500 psi. Reinforcing steel shall be grade 60.

   The vertical sections of the structures shall be reinforced concrete pipe manufactured in accordance with ASTM C76, Class I.

   Holes for pipes penetrating the structure walls shall be cored.

5. Access Hatches

   Two access hatches shall be furnished and installed at the nominal dimensions required on the drawings. Each shall be hinged and equipped with a hasp suitable for use with a padlock.

   The hatch for the pump chamber shall be located to permit removal of the pumps. The exact location shall be as shown on the pump manufacturer's drawings. The hatch for the valve chamber shall be located as shown on the contract drawings.

   Doors shall be fabricated of checkered aluminum plate with frames fabricated of 1/4 aluminum angles. Each door leaf shall have a safety handle to maintain the door in the open position. Doors shall be designed to support a uniform load of 150 pounds per square foot. Doors and frames shall have a mill finish. A bituminous coating shall be provided on surfaces that will contact concrete. A "Confined Entry" notice shall be painted on the aluminum hatch.

6. Junction Box

   A NEMA 4X junction box, fully gasketed, shall be mounted in the wetwell.

7. Pressure Gauge

   A pressure gauge shall be installed in the valve manhole. The pressure gauge shall have graduated reading from 0 to 100 psig. The gauge shall be provided with a diaphram to seal the fluid in the gauge from the sewage. The pressure gauge shall be supplied with a 4 1/2 inch dial.

8. Emergency Bypass Piping

   The valve manhole shall be equipped with emergency bypass piping to allow for emergency wet well discharged by means of a portable pump.

9. Electric Controls

   Furnish and install one automatic duplex pump control center in a NEMA 3R door in door enclosure. For each pump, the control center shall include an individual disconnect switch, three

phase overload protection with manual reset, and a magnetic contractor. A 110 volt control circuit transformer with disconnect and overload protection shall be included. An automatic alternator shall be provided. Overload and disconnect functions shall be provided by a single magnetic-hydraulic, temperature-insensitive component. Components shall be sized and coordinated with the motors provided. Control system design shall provide for both, manual and automatic operations. A solid-state sensing device for each pump shall be located in the panel. The device shall send a low voltage, low current signal to the seal failure probes in the pumps and energize a warning lamp on the panel face in the event that water enters the pump. Refer to drawing at the end of this section for typical control panel.

10. Liquid Level Sensors

    Furnish and install five liquid level sensors. The sensors shall be non-floating, displacement type switches. They shall be rated for milliwatt power levels. Brackets shall be furnished and installed for mounting the sensors. The brackets shall allow easy adjustment of level settings.

F. Electrical Work

The Developer shall furnish and install a primary service junction box, primary disconnect switch, generator plug with transfer switch, wire, conduit, meter and meter socket all meeting the requirements of the National Electric Code and the local power company. The Developer shall make connection to the electrical power supply as installed by Consumers Power Company and shall assume the responsibility to furnish all labor and materials to complete the system beyond Consumer's terminus point. All electrical equipment shall have an electrical inspection by the state Inspector prior to putting the station in service.

1. Power Source

   The power drop to service the station will be furnished by the Developer. The power supply from the power pole to the meter pedestal and from the meter pedestal to the pump station shall be constructed underground. The power drop furnished by the Developer will include a pole mounted transformer and will terminate at the meter socket.

2. Primary Switch

   A primary switch shall be furnished by the Developer and located so that an easy disconnect can be made for all power to the station. The primary switch shall be of the 3 pole, gang operated, heavy duty type in NEMA 3R enclosure with locking capability.

3. Pole Mounted Transformer

   A pole mounted transformer will be furnished and installed by the power company and paid for by the Developer.

4. Grounding

All equipment shall be adequately grounded in accordance with the N.E.C.

G. Installation

1. Inspection

The pump manufacturer shall furnish a factory trained supervisor to check the installation shall be present to place the station in initial operation and instruct regular operating personnel in the proper care and maintenance of the station. The City may elect to have the factory supervisor return within 90 days to re-adjust operation of the station at no cost to the City.

2. Excavation

The Developer shall perform all excavation of every description and of whatever substance encountered to the depths indicated on the construction drawings or as required for the proper installation of the valve vault and wetwell. The Developer shall be responsible for conducting his operations in a safe and orderly manner in conformance with Michigan P.A. 154 and all subsequent revisions (Commonly referred to as MIOSHA Regulations).

3. Backfilling

The excavation shall be backfilled with 6A crushed stone under the supervision of the City. Backfill shall be compacted to at least 95% of its maximum unit weight, as determined by ASTM D1557.

H. Painting

Pump discharge piping ferrous brackets, and other ferrous items within the wetwell shall be painted with 14.0 to 20.0 mils coal tar epoxy. The pipe surface shall have been prepared for painting by near white blast cleaning in accordance with SSPC-SP10.

Pumps and items that are pre-painted before delivery shall be touched up where the coating has been damaged through shipping, handling, and installation. The touch up paint shall be of the same type used for the original painting.

Piping, valves, and ferrous items in the valve chamber shall be painted with 3.0 to 5.0 mils epoxy primer and 4.0 to 6.0 mils epoxy-polyamide. The surfaces shall be commercial blast cleaned according to SSPC - SP6, before painting.

I. Guarantee

All the equipment furnished under this item of the specifications shall be guaranteed for a period of 2 years from the date of acceptance thereof against defective materials, design and workmanship. Upon receipt of notice from the City of failure of any part of the guaranteed equipment during the

guarantee period, the affected part or parts shall be replaced promptly by and at the expense of the Contractor, including the costs of parts and labor, except such items which are normally consumed in service such as oil, grease, light bulbs and pump seals which shall be considered a part of routine maintenance and station up-keep.

J. Notifications

Consumers Power Company shall be given the name of the electrical contractor at the time of the power request.

After the station is installed the electrical contractor must have an electrical inspection by the State Inspector. Inspection must be approved prior to Consumers Power setting the meter.

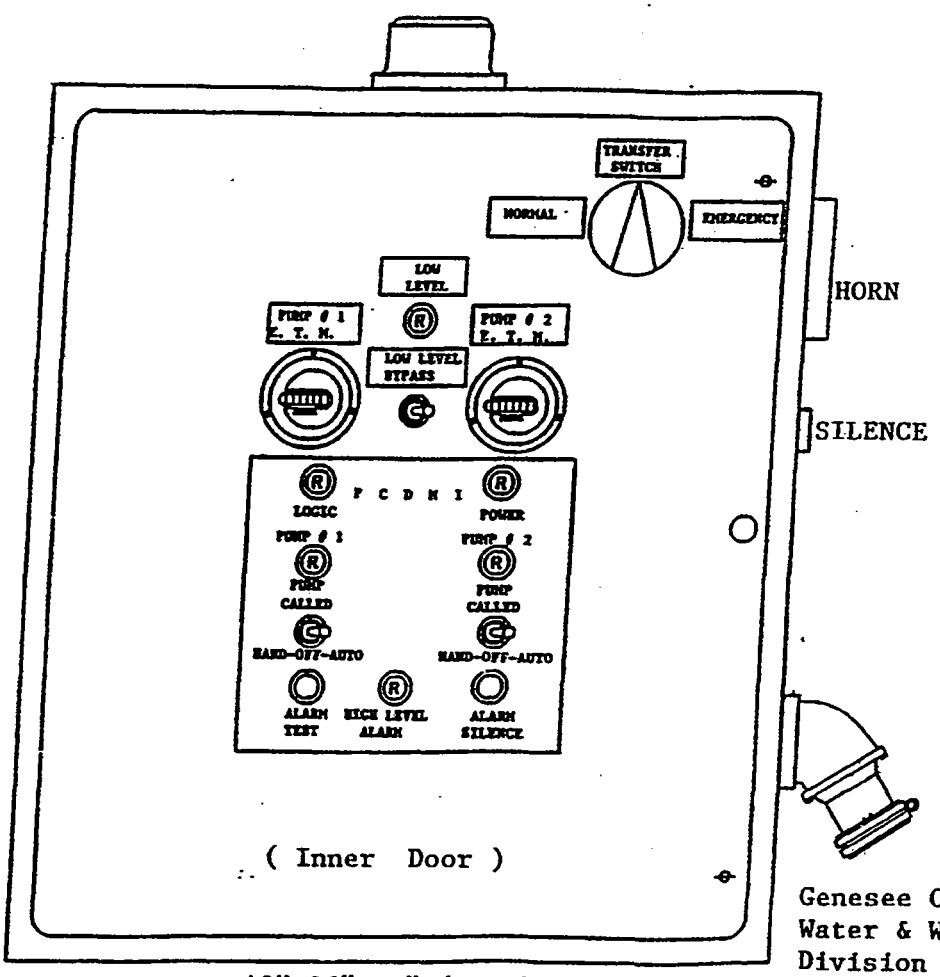
After the meter is set, electric bills will go to the Owner for processing.

K. Buoyancy

Buoyancy is to be controlled by means of a concrete ring which will be attached to the wetwell for the pumping station. The basin supplier shall provide buoyancy calculations and means of preventing floatation with the shop drawing submittal.

L. Site Work

All areas disturbed by construction activities shall be restored by topsoil, fertilizer, seeding and mulching. Parking areas and access drives as detailed on the project drawing shall have 12 inches of MDOT 23A road gravel applied.



42"x36"x12" (typ.)
(Battery back-up w/charger reqd.)

Genesee County
Water & Waste
Division
Compatible

SOIL EROSION-SEDIMENTATION CONTROL

A. General

1. Work Included

   Provide permanent and/or temporary erosion and sedimentation control as called for on the plans and as required by the County Soil Erosion Agent and permit.

2. General Soil Erosion-Sedimentation Content Procedures
   a. Minimize disturbed areas.
   b. Stabilize and protect disturbed areas as soon as possible.
   c. Maintain low storm water runoff velocities.
   d. Protect disturbed areas from runoff.
   e. Retain sediment within the construction area.

3. Permit

   The Developer shall apply for and obtain a Soil erosion and sedimentation control permit from the Genesee County Drain Commissioner-WWS as required by law. The Developer shall pay all permit fees.

4. Scheduling

   Control measures shall be constructed by the Developer prior to the time construction starts uphill or upstream from the control measure location. Removal and cleanup of temporary control structures shall be provided by the Developer within one week after the control measure is no longer needed.

B. Products

1. Sodding:
   a. 1990 MDOT, Sec. 6.51.01 through 6.51.04, Sec. 8.21.12 or latest version.
   b. Temporary Measures: Class B sod.

2. Seeding:
   a. 1990 MDOT, Sec. 6.52.01 through 6.52.07, or latest version.
   b. Temporary Measures: Cereal Rye Seed.

3. Mulching:
   a. Temporary Measures: MDOT, Sec. 6.54.01 through 6.54.04 or latest version. Required as specified on plans and/or in Project Specifications.

C. Execution

1. General

The Developer shall abide with all applicable rules and regulations as established by the State of Michigan and the City of Swartz Creek pursuant to Part 91 of Act 451 as amended. (Soil Erosion and Sedimentation Control Act).

The Unified Keying System for erosion control measures shall be included with the construction plans. Specific erosion control measures, if required, are to be indicated on the plans.

Even if a specified erosion control measure is not called out on the plans or identified by the City, this does not relieve the Developer from his obligation under the above Act to properly control and/or prevent all erosion caused by the Developer's construction operation.

2. Sediment Removal

The Developer shall take such steps as are necessary to assure the retention and removal of any sediment which enters an existing storm sewer or open ditch along the construction route before said sewer or ditch discharges into a stream or pond.

If eroded material is allowed to enter a storm sewer system is shall be the Developer's responsibility to see that all catch basins and manholes are cleaned following construction prior to final approval.

3. Street Cleaning

No sediment shall be permitted on city streets. In the event that sediment is deposited on the paved surface, the developer shall remove it immediately,

If a construction access road is to be used, it shall include a mud mat of crushed concrete (minimum size of 100' x 20'). The mud mat shall be maintained throughout the project.

STORM SEWERS

A. General

This work includes construction of pipe storm sewers, drainage structures, and appurtenances. Drainage structures include catch basins, inlets, manholes, and manhole tees.

B. Materials

Reinforced Concrete Pipe - Pipe shall meet ASTM C76. Where no class is shown on the drawings or on the proposal, Class III or better shall be provided.

Joints shall be mastic type.

Reinforced concrete pipe is identified on the plans and on the proposal by the designation C76 and a roman numeral indicating the pipe class.

Reinforced concrete pipe to be installed by jacking shall be Class V and shall be provided with full circular reinforcement. Pipe joints shall be butt type.

1. End Sections

   End sections shall be flared and beveled to conform with ditch slopes.

   Concrete end sections shall be constructed of precast concrete and reinforcement conforming to the requirements of AASHTO M 170 (ASTM C76), Class II. Connection of end section to concrete pipe shall be made by tongue and groove joints.

2. Drainage Structures

   Drainage structures shall be precast concrete units meeting the requirements of ASTM C478. Drainage structures shall be four feet in diameter, unless shown otherwise on the plans approved by the City. Precast concrete grade rings, meeting ASTM C 478 shall be used to adjust the top of the structure to the final grade. At least 6 inches, but not more than 18 inches of vertical adjustment shall be provided with grade rings.

   Manhole steps shall be provided in drainage structures where shown on the plans. Manhole steps shall be copolymer polypropylene plastic, equal to M.A. Industries PS-IPF with a 12 inch overall dimension and 1/2" grade 60 steel reinforcement.

3. Castings

   Castings shall conform to the requirements of AASHTO M 105. The weights of castings shall not be less than described in the following table:

Cover Designation	Description	Min Weight (lb)	E.J.I.W. No.
A	Solid cover	375	1040 (labeled "Storm Sewer)
C	Low curb inlet	500	7066
D	Flat grate	435	5105
E	Beehive	200	6508
K	High curb inlet	500	704
X	Large clear opening	515	1890

All exposed surfaces of castings shall be completely coated with coal tar pitch varnish to which sufficient oil has been added to make a smooth coating which shall be tough and tenacious when cold, and shall not be tacky or brittle, nor have any tendency to scale off. Castings shall be Class 30 grey iron.

C. Execution

1. Open Cut Construction of Storm Sewers

Trench excavation shall begin at the outlet end of the system and proceed toward the upper end, unless otherwise directed. The trench shall be excavated in reasonably close conformity with the lines and grades of the flow line shown on the plans or established by the City.

The trench shall be of sufficient width to provide free working space and to permit ramming and compacting the backfill around the pipe. The bottom of the trench shall be shaped so that the pipe will be uniformly supported and recesses shall be excavated to receive the bells. The trench shall be excavated at least 4 inches below the elevation established for the bottom of the pipe. Any excavation below the grade for the bottom of the pipe shall be replaced with sand, thoroughly compacted.

The Developer shall furnish, install, and operate pumps well points, wells, discharge piping and other equipment necessary to provide a dry excavation and work are. All water pumped from the project shall be disposed of in a manner acceptable to the City.

Where unstable soil conditions, or obstructions other than rock, require excavation of the sewer trench below the elevation shown on the approved plans, such excavation shall be made to the dimensions authorized by the City. Unstable soil removed by undercutting shall be replaced with stone meeting the gradation of MDOT, Class 6A.

Sections of sewer pipe shall be carefully laid in the prepared trench, bell ends upgrade, with the spigot end fully entered in the adjacent bell. Each section shall have firm bearing throughout its length and shall be substantially true to the line and grade required. The use of blocks to bring sections to grade will not be permitted.

Circular concrete pipe with lift holes shall be installed with the lift holes on top of the pipe. Holes shall be plugged with suitable concrete plugs before backfilling.

Existing live sewers that are to remain shall be carefully protected during construction of the new sewers. If they are damaged in any way, they shall be immediately repaired or replaced, as directed by the City.

All junctions with house or building leads shall be made in a manner acceptable to the City.

Flexible watertight joints shall be installed in accordance with the Manufacturer's recommendations.

Connections to sewers owned by other agencies shall be done in accordance with their requirements.

Connections to existing sewers having a plug or bulkhead shall be made with a watertight joint. The plug or bulkhead shall be removed without damage to the sewer, and the plug material shall be removed from the sewer and properly disposed of.

If there are no openings in the existing pipe or structures at the point of connection, an opening shall be cut or chipped in concrete pipe or the structure sufficiently large to permit 3 inches of mortar to be packed around the entering pipe and the mortar pointed up smooth and flush with the inner wall. Pipe passing through pipe or structure walls shall be cut at the end to conform with the shape of the inside of the wall and to be flush therewith. On the outside of the pipe or structure, the entering pipe shall be encased with sufficient mortar to provide bearing under the pipe. Any existing pipe broken or cracked while making the connection shall be replaced at the Developer’s expense.

When replacing an existing sewer, connections to the original sewer or drain that are encountered shall be reconnected to the new sewer.

Backfill shall be placed only after the pipe has been inspected and approved by the City.

Backfill shall be placed in layers not to exceed 12 inches in thickness. Backfill within the 1 on 1 influence of a roadbed or structure shall be sand, compacted to not less than 95% of its maximum unit weight (ASTM D1557).

Backfill for sewers outside the limits of the roadbed or structures shall be suitable material excavated from the trench. Backfill placed within 12 inches of the pipe shall not contain stones larger than 2 inches. Sound earth, free from large stones and lumps, shall be carefully placed under and around the pipe in layers. Each layer shall be thoroughly compacted without displacing the sections, until the sewer is completely covered to a depth of at least one foot. The balance of the backfill shall be placed in layers, each layer shall be thoroughly compacted by hand tamping or approved mechanical methods.

Sewers shall be reasonably free of accumulation of silt debris and other foreign matter at the time of final acceptance.

2. Sewer Installation by Jacking

Sewers shall be installed by jacking where shown on the approved plans. Installation procedures shall be such that the roadbed or railroad above the sewer is not disturbed. (Installation details are provided at the end of this section.)

The pipe shall be jacked into place according to the required line and grade, shown on the approved plans.

The excavation ahead of the pipe shall be approximately one inch larger than the outside diameter of the pipe at the top and taper off towards the invert. The excavation shall not be carried ahead of the pipe far enough to cause caving of the earth. A steel cutting edge or shield may be attached to the front section of pipe to form and to cut the required opening for the pipe.

The approach trench shall be large enough to accommodate at least one section of pipe, jacks, and blocking. Two rails or sills shall be laid in the bottom of the trench to keep the pipe at the established line and grade.

Voids between the excavation and the pipe shall be filled using filler materials and placing methods, as approved by the City.

Concrete pipe joints shall be protected from crushing due to jacking pressures. Upon completion of the jacking operations, joints shall be filled with mortar, wiped, and finished smooth. The joints shall be thoroughly wet before the mortar is placed.

3. End Sections

End sections shall be attached to the ends of pipe culverts, where directed. Metal end sections shall be used on metal culverts and on smooth lined plastic pipe culverts. Concrete end sections shall be used on concrete pipe culverts.

End sections shall be installed on firm ground. The slope adjacent to the end section shall be graded and shaped to meet the geometry of the end section.

4. Drainage Structures

The Developer shall excavate to the depths and widths required for construction of drainage structures. Unsound material at the proposed structure bottom shall be excavated to the dimensions directed by the City and replaced with stone meeting the gradation of MDOT Class 6A.

Precast concrete units shall be placed on a 6 inch sand base, leveled and thoroughly compacted. Joints shall be sealed with mortar. Joints shall be thoroughly wetted prior to sealing. The joints inside the structure shall be flush with the walls. Joints shall be completely filled with mortar.

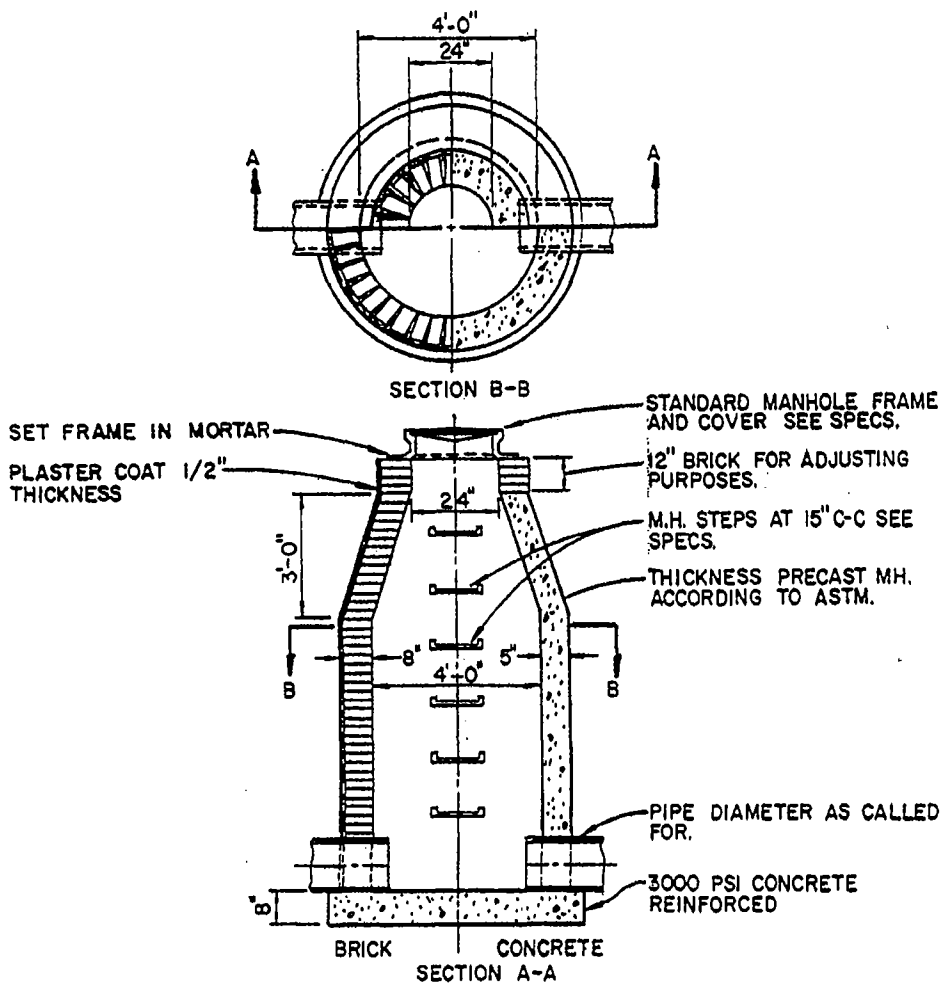
Pipe or tile connections to concrete drainage structures shall extend through the structure wall and be cut flush with the inside surface. The opening around the pipe shall be neatly filled with mortar to prevent leakage.

The excavation for drainage structures shall be backfilled in layers not more than 12 inches in thickness. Backfill within the 1 on 1 influence of a roadbed or structure shall be backfilled with sand and compacted to at least 95% of its maximum unit weight (ASTM D1557).

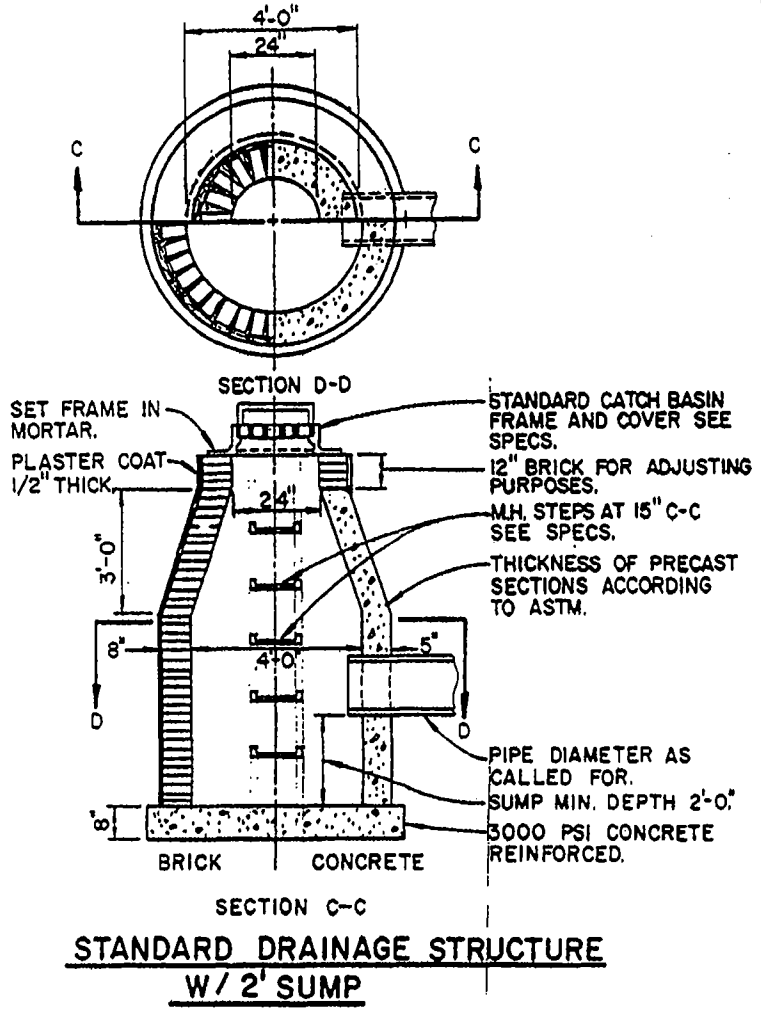
Drainage structure covers shall be new and adjusted to the finish elevation using precast concrete grade rings. Covers shall be of the types shown at the end of Section 1.1. Covers and grade rings shall be set in full mortar beds. Structure cones shall be either concentric or eccentric.

Cover elevations given on the plans are for information only. The final elevation will be determined in the field, based on as-constructed conditions. All final elevations shall be approved by the City.

Drainage structures shall be maintained reasonably free of accumulations of silt, debris, and other foreign matter at the time of final acceptance.



STANDARD DRAINAGE STRUCTURE

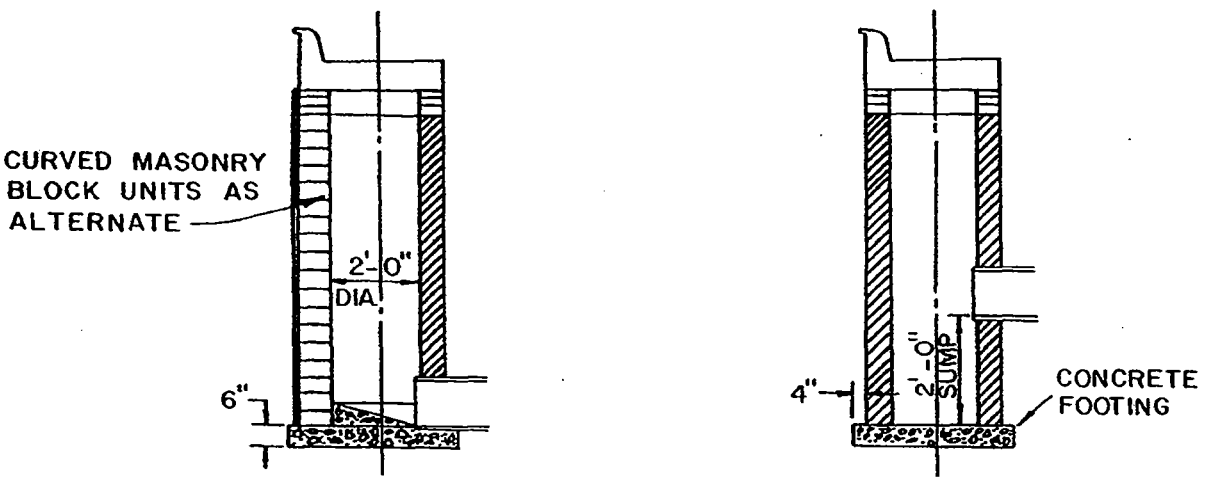


STANDARD DRAINAGE STRUCTURE W/ 2' SUMP

Note: 1. Structure cones shall be either concentric or eccentric. Flat top structures may be used in place of cones when necessary.

2. 4' minimum diameter manholes are required. Larger size manholes are required for multiple (≥ 2) pipes with diameters of 24" and larger.

PLAN VIEW
(WITH COVER REMOVED)

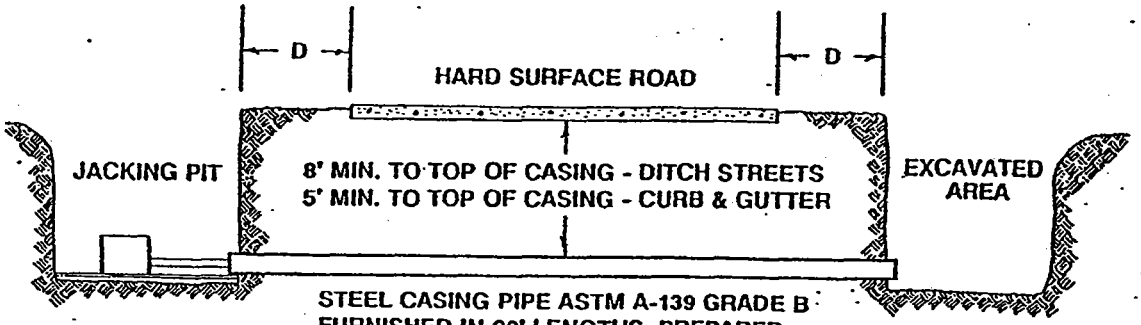


SECTIONAL VIEW

INLET 2' CATCH BASIN

1. FINAL ADJUSTMENT OF COVER IS TO BE MADE WITH BRICK AND MORTAR AS DIRECTED BY THE ENGINEER.
2. PRECAST CONCRETE SECTIONS SHALL CONFORM TO ASTM C-478.
3. APPLY 1/2" THICK CEMENT PLASTER COAT ON THE OUTSIDE OF ALL MASONRY UNITS AND JOINTS.

ROWE ENGINEERING, INC.	INLET & 2' CATCH BASIN	



STEEL CASING PIPE ASTM A-139 GRADE B FURNISHED IN 20' LENGTHS, PREPARED FOR FIELD WELD

D = 10' FOR SHOULDER/DITCH STREETS
D = 5' FOR CURB AND GUTTER STREETS

NOTES

1. All boring and jacking operations within GENESEE COUNTY ROAD R.O.W. under the jurisdiction of the road commission will require department approval and the completion of permit form .
2. The contractor shall name the GENESEE COUNTY ROAD COMMISSION as an additional named insured for contingent liability caused by the proposed construction .
3. The contractor shall abide by all Road Commission safety precautions including the MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES .
4. The contractor shall protect and/or restore all property within the road R.O.W. .
5. Contractor shall abide by all conditions stated in the Road Commission memo of 9/1/75 labeled sanitary sewer and watermain installation within the limits of county highways .
6. The sheeting of the front face of the boring pit will be required if unstable soil conditions are encountered.
7. The casing pipe must always precede the auger head.
8. The contractor shall notify the permitting agent 72 hours prior to beginning construction .
9. A wood skid and metal band must be installed at all joints to maintain alignment.

SIZE AND MATERIAL	MIN. CASING DIA. O.D. INCHES	MIN. WALL THICKNESS INCHES
8"D.I. watermain or smaller	12.75	0.375
6"sanitary sewer V.C.P. or P.V.C.		
10"-12"D.I.watermain	20.00	0.375
8"-10"sanitary sewer		
16"D.I.watermain	24.00	0.375
12"-15"sanitary sewer		
20"-24"D.I.watermain	30.00	0.406
18"sanitary sewer Conc.		
21"-24"sanitary sewer Conc.	36.00	0.469

SD - 6

GENESEE COUNTY DRAIN COMMISSIONER
DIVISION OF WATER AND WASTE SERVICES

BORE & JACK CONSTRUCTION
ON COUNTY ROADS

Date: 9/90 Appvd. by: RCJ

TRAFFIC CONTROL

A. General

The Developer shall execute all work in a manner such that traffic is maintained and access is provided to all residences, businesses, and commercial establishments.

The Contractor and Developer shall provide the City with 24 hour emergency contact numbers.

B. Products

Signing and barricading shall be provided by the Developer in accordance with the details on the approved plans, the latest edition of the Michigan Manual of Uniform Traffic Control Devices, and the requirements of the road agency. Signs and barricades left in place after dark shall be lighted.

C. Execution

1. Maintain Access to all Properties

   It shall be the Developer's responsibility to notify residents or occupants of property along the project of temporary closures of driveways or roads. Sufficient advance warning shall be provided to allow notification of all affected parties.

   The duration of any closure shall be limited to the minimum length of time necessary to complete the particular task requiring the closure. In no case, shall a closure extend overnight.

   Upon completion of pipe installation or other work requiring a closure, the area shall be backfilled and regraded to meet adjacent grades. A temporary gravel driving surface shall be provided and maintained by the Developer. The gravel shall meet the requirements of 23A series aggregate, as specified in the latest edition of the MDOT Standard Specifications for Construction. The gravel shall be placed to a depth of at least eight inches.

2. Protection of Hazardous Areas

   Excavation and hazardous areas shall be protected by barricades or snow fence. Barricades left in place at night shall be lighted.

3. Corrective Action

   If in the City's opinion inadequate protection or maintenance of traffic is provided, the City will attempt to contact the Developer and notify him of the deficiency. If the Contractor cannot be notified or fails to make prompt corrections, the City may authorize that said deficiencies be corrected by others. The cost of making such corrections will be charged to the Developer.

WATERMAIN

A. General

The Developer shall install watermain and appurtenances in accordance with this specification. This work includes excavation, pipelaying, backfilling, and testing.

The Developer shall protect existing utilities during construction whether the existing utilities are shown on the plans or not. Utilities damaged by construction shall be repaired in a manner satisfactory to the City and at the Developer's expense. The Developer shall call Miss Dig, 1-800-482-7171, for staking and locating the existing utilities.

The Department of Public Works will assist the Developer in locating existing water service leads and mains.

All valve openings or closing shall be performed by the City DPW Department only.

The Developer shall contact the Department of Public Works to schedule work that may interfere with existing water service.

B. Standards

Where materials or methods of construction are listed as being in conformance with Genesee County Drain Commissioner-WWS and Ten States Standard, it shall refer to the latest edition of the standard specification or any interim revision.

C. Density Required

The maximum density of granular soil will be determined by the One Point Michigan Cone Test. The maximum density of cohesive soils will be determined by the One Point T-99 Test. The procedures for compaction testing are outlined in the current edition GCDC-WWS standard specifications of sewers and watermains.

D. Materials

1. Pipe

Pipe must be ductile iron pipe. Ductile iron pipe shall meet ANSI A21.51/AWWA C151. Pipe shall be cement lined and shall meet ANSI A21.4/AWWA C104. Pipe wall thickness shall conform to ANSI A21.50/AWWA C150 and shall be of the following thicknesses:

Pipe Size	Pipe Class
6"	53
8"	53
10"	53
12"	54

Pipe Size	Pipe Class
14"	54
16"	54

The pipe manufacturer and class shall be marked on each length of pipe.

Electrical conductivity devices shall be used on all rubber gasketed joints. Serrated silicon bronze wedges shall be used on push-on type joints and rubber gaskets shall be used on mechanical joints.

Joints for buried pipe shall be either mechanical type or push-on type in accordance with ANSI A21.11/AWWA C111. Working pressure shall be 350 psi. Provide electrical conductivity at each joint.

Polyethylene wrap shall be used. All pipe shall be wrapped, except in manholes. Cross laminating high density and manufactured of virgin polyethylene conforming to ASTMA-674-80.

2. Fittings

Fittings shall be mechanical joint type, ductile iron as follows: Fittings shall meet ANSI A21.10/AWWA C110 and ANSI A21.11/AWWA C111. Fittings shall be cement lined in accordance with ANSI A21.4/AWWA C114. Rubber gasket joints shall meet ANSI A21.11/AWWA C111. Fittings shall be rated for 250 psi, or more. Provide electrical conductivity at each joint. Compact ductile iron fittings are acceptable.

3. Gate Valves

Gate valves shall be iron body, non-rising stem, resilient wedge type meeting the requirements of AWWA C509. Gate valves shall be designed for direct bury application.

Gate valves shall open counter clockwise.

Gate valves 8" or larger are to be placed in a water valve manhole minimum diameter of manhole is 4 foot manhole frame and cover, East Jordan 1040 Type “A” or Neenah 1642 Solid Cover. Manhole cover will be labeled with “Water”. Center operating nut will be located in middle of frame and cover. Step shall be an approved design.

Gate valves shall be placed a maximum distance apart of 1,000 feet and shall be placed on all sides of watermain tees.

4. Hydrants

Hydrants shall meet or exceed AWWA C502-94. Hydrants shall match EJIW 5BR (Square NWJ), National Standard Threads, with all nozzles located eighteen inches above ground level.

Hydrant shall have twin 4" pumper nozzles.

Hydrants shall be obtained from East Jordan Iron Works or any other source approved by the City.

Nozzle caps shall be securely chained to the barrel. Hydrants shall be of the breakable flange type such that neither barrel nor stem are damaged upon impact and that no water is lost. Hydrants shall be designed so that the direction of the nozzles can be changed by rotating the above-ground section.

Hydrants shall be factory painted in accordance with AWWA C502 and to match City of Swartz Creek Fire Department coding.

Hydrants shall be provided with a drain which is plugged at the time of delivery. Hydrants are to be of the "dry top" design to prevent freezing.

If removal of the seat valve requires a special wrench, one shall be provided. The wrench shall operate the valve stem at the point of removal of the above-ground section.

Operating nut size and shape shall be in accordance with the fire department standards. Hydrants shall open clockwise and shall be placed so the main nozzle faces the street.

5. Copper Pipe

   Copper pipe shall be constructed of Type K, soft temper copper tubing for underground use, in accordance with ASTM B-88 and B-251. The manufacturer and pipe type shall be marked on the outside of the pipe. The weight per foot of copper tubing shall meet or exceed that specified by ASTM B-251, Table II.

6. Stops and Fittings

   Corporation stops, curb stops, and fittings shall be fabricated of brass.

7. Service Boxes

   Water services boxes shall be of a style conforming to the GCDC standard. Boxes shall be adjustable, a minimum of six inches above and below finish grade.

   Water service box should be placed on right-of-way line.

8. Valve Boxes and Valve Manholes

   Valve boxes shall be made of good quality cast iron and shall be of the sectional type. The lower section shall be a minimum of five inches in diameter, enlarged at the base to fit around the bonnet of the valve. The upper section shall be arranged to slide or screw down over the adjoining lower section and shall be full diameter throughout. Valve boxes shall be provided

with cast iron lids or covers. Lids or covers shall be marked "WATER". The over-all length of valve boxes shall be sufficient to permit the top to be set flush with the final ground surface grade. Valve boxes shall be as manufactured by Traverse City Iron Works, Clow Corporation or equal.

Where valve manholes are used, an exterior seal of Wrapid Seal shall be installed to seal the manhole.

E. Pipe Excavation

The Developer shall excavate all materials to a minimum depth of 5 feet. Excavation shall include the removal of rock, dirt, abandoned pipelines, old foundations, stumps and roots and similar materials encountered. Pipe excavation shall follow procedures stated below and the GCDC standard specifications for the construction of public sanitary sewer and watermains, current edition.

Excavated material that is suitable for backfill material shall be neatly piled adjacent to the excavation so as to prevent cave-ins of the excavation and damage to adjacent trees, shrubs, fences and other property.

The excavated area shall be kept free of water at all times. Sheeting and shoring shall be provided, if necessary, for the protection of the workers.

Excavated material that is not to be used as backfill shall be disposed of by the Developer.

Backfilling shall follow immediately behind trench excavation and pipelaying operations. In no case shall more than 100 feet of trench excavation be open at any one time. Any excavation left open and unattended shall be protected with lighted Type II barricades and a "snow fence" constructed around the perimeter of the excavation.

The Developer shall excavate to the depths required to construct the watermain and appurtenances as described on the plans. For watermain construction, trench excavation shall be to a depth sufficient to provide at least five feet cover over the top of the pipe and a four-inch sand cushion below the pipe. The trench width at a level of twelve inches above the pipe shall be no greater than 32 inches in width.

In areas where the proposed construction may interfere with existing utilities, additional excavation may be required to determine the exact location of said existing utilities.

1. Pipe Handling

Pipe shall be handled in such a manner as to prevent the ends from splitting, damages to the protective coatings and other undesirable conditions. Pipe shall not be dropped, skidded or rolled into other pipe. Repairs to damaged pipe must be approved by the City.

2. Pipe Cutting

Pipe cutting shall be done in a neat and workmanlike manner without damage to the pipe or lining and as to leave a smooth end at right angles to the axis of the pipe. Cutting shall be done by an approved mechanical saw or cutter. Hydraulic squeeze cutters are not acceptable.

3. Pipelaying

Pipe located inside structures shall be rigidly supported.

Pipe laid underground shall be uniformly supported through its entire length on a four-inch cushion of sand. A depression shall be carved out of the sand cushion to accommodate the pipe bells.

Pipe shall be inspected for defects, debris or dirt while suspended in a sling prior to lowering it into the trench. Defective pipe shall be removed from the project site, immediately. Lumps, blisters and excess coal tar coating shall be removed from inside the bell and outside the spigot. These areas shall be wire-brushed and wiped clean with a dry oil-free rag. No debris, tools, clothing or other materials shall be allowed in the pipe.

Pipe shall be laid in a dry trench with bell ends facing in the direction of laying. After placing a length of pipe in the trench, and after installing the gasket and applying the gasket lubricant, the spigot end shall be centered in the bell and the pipe pushed home and brought to the correct line and grade. The pipe shall be secured in place by tamping sand around it. Precautions shall be taken to prevent soil from entering the joint space.

A watertight plug shall be inserted in the open end(s) of the pipe to prevent water, soil, animals or other foreign matter from entering the pipe during the construction phase.

When it is necessary to deflect pipe from a straight line, either horizontally or vertically, the deflection shall not exceed the following values:

Nominal Pipe Size (In)	"Push on" Joint Maximum Deflection (Inches/18 ft. length)	Mechanical Joint Maximum Deflection (Inches/18 ft. length)
6	19	27
8	19	20
10	19	20
12	19	20
14	11	13
16	11	13

4. Jointing

   Mechanical and "push on" joints shall be installed in accordance with the joint manufacturer's recommendations. Copies of such recommendations shall be furnished to the City prior to the start of construction.

   Flange faces of flanged joints shall be thoroughly cleaned with a wire brush and the pipe carefully aligned. The gasket shall then be inserted between the flanges and the bolts and nuts installed. Tightening of the bolts shall be done evenly around the flange so as to uniformly distribute the stress carried by the bolts.

5. Backfilling

   Backfilling shall be in accordance with the trench detail called for on the approved plans and per the GCDC Standard Specifications for the construction of public sanitary sewers and watermains.

6. Separation and Cover

   Where the proposed watermain crosses under an existing utility, the proposed watermain shall be deflected above or below the existing utility in accordance with the following:

   a. Maintain 5'-0" cover over top of proposed watermain.

   b. Maintain at least eighteen inches of vertical separation and ten foot of horizontal separation between the outside of the proposed watermain and the outside of a sewer, drain pipe, or catch basin lead.

   c. Maintain at least one foot of vertical separation between the outside of the proposed watermain and the outside of an existing utility other than a sewer, drain or catch basin lead.

   d. When crossing an exiting sewer, drain pipe, or catch basin lead, construct the proposed watermain so that its joints are equidistant from the utility being crossed.

   e. Maintain at least ten feet of horizontal separation between the proposed watermain and sewers, drains, or catch basin leads.

7. Hydrants and Valves Location

   a. General

      Hydrants and valves shall be located in a green belt area as shown on the approved plans or as otherwise directed by the City. Failure by the Developer to locate said hydrants or valves as called for, may result in Developer correcting the error at his own expense.

b. Setting Hydrants

Hydrant bowls shall be set on a 1'6" x 1'6" x 4 inch concrete slab and braced to undisturbed soil with a concrete thrust block with a bearing area as called for on the plans. Hydrants shall be set perfectly plumb. Hydrant valves shall be located three feet from the hydrant, unless otherwise directed by the City. Hydrants shall be set so the main nozzle faces the street.

Excavations for the construction of hydrants and hydrant leads shall be backfilled with sand and compacted. That portion of the excavation outside the one on one influence of an existing or proposed roadway, sidewalk, driveway, parking lot, structure, or railroad and at least six inches above the pipe may be backfilled with suitable excavated material, and compacted.

c. Removal of Hydrants

Where shown on the approved plans or otherwise directed by the City, the Developer shall remove existing hydrants. The ground shall be excavated to the depth of the hydrant lead. The watermain shall be "shut down" by the Water Department. The Developer shall remove the hydrant, lead, valve and box. The fitting on the main shall be plugged and blocked. The excavation shall be backfilled with sand and compacted. The hydrant and valve and box shall be delivered to the Water Department service yard. That portion of the excavation that is outside the one on one influence of the existing or proposed roadway and at least six inches above the pipe, may be backfilled with suitable excavated material and compacted.

d. Setting Valves

Valves shall be examined by the Developer prior to lowering in the trench. All nuts and bolts shall be checked to assure tightness.

Valves shall be installed with the valve closed, supported on two 2" x 6" x 18" hardwood blocks and vertically plumb. The valve box shall be set plumb and its axis shall be in line with the stem. Valve boxes shall have the ability for future adjustments of up to six inches, above or below grade.

e. Cutting-in Valves

Where shown on the plans or directed by the City, the Developer shall install a new valve on an existing line. The existing main shall be uncovered by the Developer. A section of the existing main shall then be cut out. The length will vary depending on the valve and sleeve dimensions. A mechanical joint cutting-in sleeve shall be slid over one end of the pipe, a gate valve over the other end. After the gate valve is in the "home" position, slide the sleeve into the gate valve. Position the gaskets and tighten the three mechanical joints to the manufacturer's specifications. The valve shall be plumb. Provide support under the valve by placing two 2" x 6" x 18" hardwood boards. Inspect for leaks. Place valve box

over gate valve and adjust to proposed grade. Backfill with sand and compact. That part of the excavation that is not within the one on one influence of an existing or proposed roadway or railway and at least six inches above the watermain may be backfilled with suitable excavated material and compacted.

f. Reconnection of Existing Hydrants

Where the approved plans call for reconnection of an existing hydrant to a new main, the Contractor shall excavate as necessary to locate the existing hydrant lead. The lead shall be cut in a location directed by the City. The Developer shall then connect the hydrant to the new main by the use of sleeves, tees, elbows, six inch ductile iron pipe and a six inch gate valve and box as conditions require. The excavation shall be backfilled with sand and compacted. That portion of the excavation outside of the one on one influence of an existing or proposed roadway or railroad may be backfilled using suitable excavated material and compacted.

8. Reaction Backing

All tees, plugs, bends, hydrants, offsets and similar fittings shall be braced to undisturbed ground by use of concrete thrust blocks. Concrete for use as thrust blocks shall have a 28 day compressive strength of not less than 3000 PSI. The thrust block shall be placed so that the pipe, valve, hydrant or fitting joints are accessible for repair. Details of placement of thrust blocks shall be shown on the approved plans. Vertical bends shall require blocking and strapping as shown on the approved plans.

Thrust blocks and strapping are included in the watermain construction and the responsibility of the Developer.

9. Copper Pipe

a. New Services and Reconnections

Water services shall be constructed where shown on the approved plans or where directed by the City. No couplings shall be located under road pavement or within a 1 on 1 influence of the pavement.

Copper pipe shall be connected to the watermain through a brass corporation stop. The watermain shall be drilled and tapped under pressure by use of a tapping machine with a combination drill and tap of the appropriate size for the connection being installed.

After tapping the main and installing the corporation stop, the tap shall be tested by turning the corporation on and off. Any leakage detected visually shall be corrected by the Developer.

The service lead shall be constructed of Type K, copper pipe. The copper pipe shall be laid such that there is at least 24 inches of slack in the service line at the main. In other words,

the first three feet of trench adjacent to the main shall have at least five feet of copper pipe laid in it.

All joints of copper pipe shall be flanged or compression joints. After the copper pipe is in place and connected to the curb stop, the line shall be visually checked for leaks by closing the curb stop and opening the corporation stop.

The Developer shall leave the corporation stop in the open position, unless directed otherwise by the City.

The excavation resulting from copper pipe construction or reconnections and within the one on one influence of a roadway, driveway, sidewalk, parking lot, railroad or other structures shall be backfilled by the Contractor with sand and compacted. Excavations not within the one on one influence of structures or paved surfaces may be backfilled with suitable native soils and shall be compacted.

Copper pipe shall be buried a minimum of 5'-0" deep, unless otherwise directed.

10. Conflicts with Existing Utilities

Excavation shall be made sufficiently in advance of pipelaying operations so that watermain alignment can be adjusted to go above, below, or around existing pipes, structures, cables, or other obstacles that are encountered. Where such minor adjustments are made to the watermain alignment, they shall be the developer's responsibility.

Where existing electric cables, telephone cables, gas mains, or services are damaged, repairs shall be at the Contractor's expense. The repairs shall be made by the appropriate utility.

Where sewer leads are damaged, they shall be repaired by the Developer at no charge to the Owner or the City. Sewer leads shall be repaired with a section of schedule 40 PVC pipe of the size encountered. Pipe of the same material as that encountered can also be used. The damaged pipe shall be cut square and the "connection" area shall be thoroughly cleaned. A rubber gasketed sleeve coupling suitable for connecting the pipe sizes and materials encountered shall be furnished and installed by the developer at each reconnection or repair joint.

11. Restoration

Areas disturbed by construction activities shall be restored by the Developer.

12. Testing and Disinfection

a. Hydrostatic Pressure Testing

Watermain shall be hydrostatically tested immediately after the section to be tested is installed. The Developer shall provide all labor, equipment, and materials to perform the

test, including pumps, gauges, plugs, corporations, water, miscellaneous pipes and fittings, and a means of measuring lost water. The testing equipment shall be approved by the City.

The Developer shall fill the main through hydrants or corporations. After completion of the tests, corporations made for the purpose of testing shall be plugged. Water shall be added to the line and air expelled to provide a pressure of 150 psig. When the Developer has verified that all air is expelled and that the test pressure is maintained, the Developer shall notify the City to witness the test. The City shall be given at least a 24 hour notice. The test duration shall be two hours. Water shall be added during the test period as required to maintain the required pressure to the highest point in the system throughout the test period. The amount of water required to maintain the test pressure is the actual leakage.

The actual leakage shall not exceed the allowable leakage as tabulated below:

Pipe Size	Allowable leakage per 1000 feet of main (gallons/2 hours)
6"	1.10
8"	1.48
10"	1.84
12"	2.20
14"	2.58
16"	2.94

If unsatisfactory results are obtained, the Developer shall locate and repair the leak and the system shall be retested.

b. Disinfection

The Developer shall flush the watermain with potable water until discharge from the main runs clear. The main shall be chlorinated in accordance with AWWA C651. After the chlorination procedure is completed, the watermain shall be flushed again until the chlorine content is equal to that of the water being supplied. Sixteen hours or longer after the flushing, the Developer may begin collecting samples for bacteriological analysis. Samples shall be collected at 24 hour intervals until two consecutive satisfactory results are obtained. Samples shall be collected at the end opposite the chlorine injection, except that in long lines or where contamination is suspected, the City may require other sampling points.

Where satisfactory results are not obtained, the main shall be reflushed, redisinfected, and retested until satisfactory results are obtained.

F. Technical Details

The following technical details (SD2W through SD 17W) are standards required by the Genesee County Drain Commissioner. All watermain installation shall follow the current Genesee County

Drain Commissioner standards and construction plans shall include the current standard detail sheet for watermain construction as provided by the Genesee County Drain Commissioner.

Per City of Swartz Creek requirements, the curb box shall be a 5'6" curb box with arched pattern adjustable box - Mueller 020*034-152 with 1" x 42" connecting rod - Mueller 022*142.

NOTES

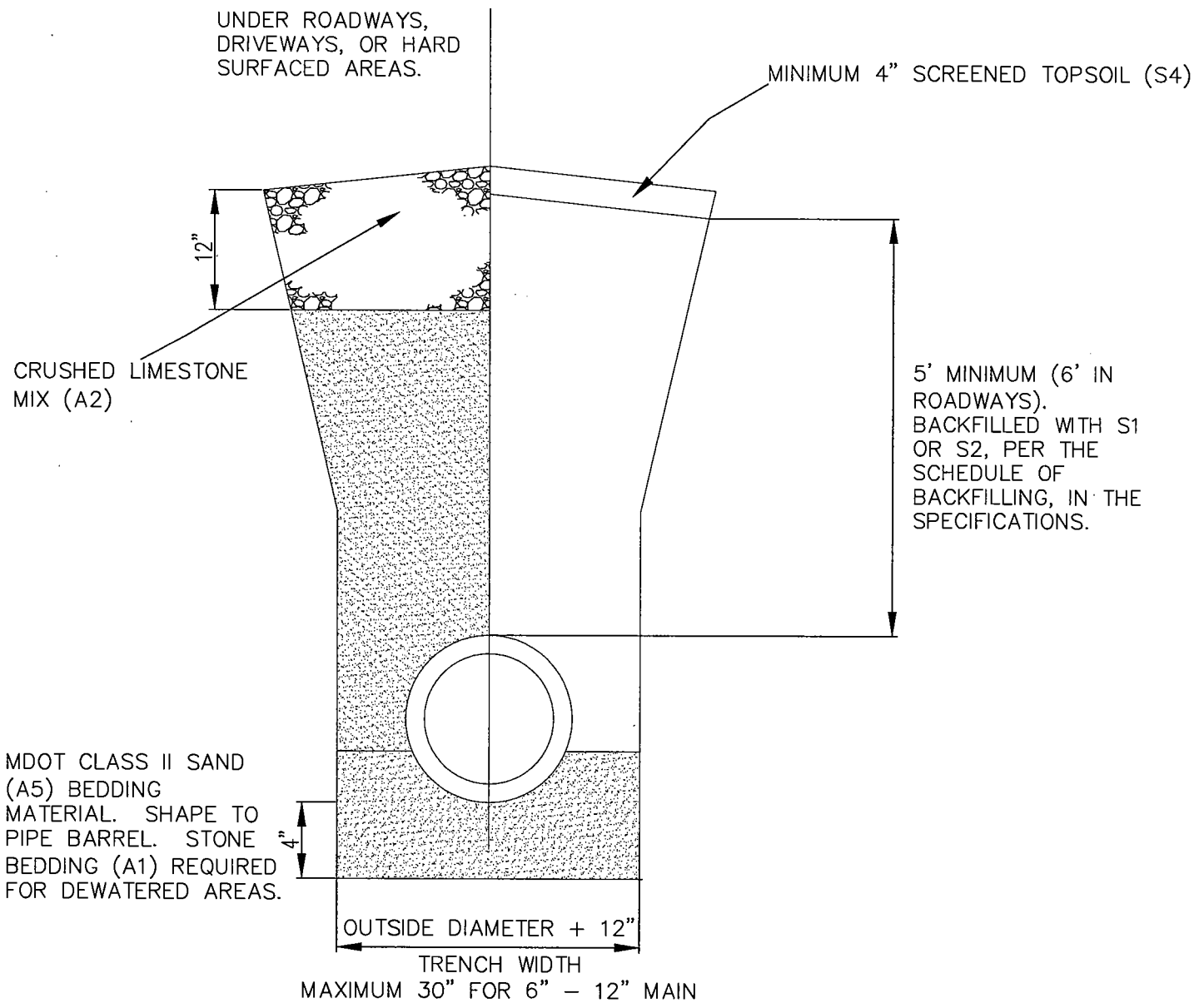
1. PLACE 12" OF CRUSHED LIMESTONE 22A (A2) ON THE COMPACTED SAND BACKFILL (A5) FOR ALL DRIVES, PARKING LOTS OR OTHER HARD SURFACED AREAS.

2. THE CONTRACTOR SHALL COMPACT THE SAND BACKFILL (A5) TO 95% OF THE MATERIAL UNIT WEIGHT BY MODIFIED PROCTOR ACROSS ALL ROADWAYS AND DRIVES PER THE SCHEDULE OF BACKFILLING IN THE SPECIFICATIONS. THIS INCLUDES SERVICE LEADS UNLESS BORED. THE CONTRACTOR SHALL DO THE TESTING WITH THE RESULTS SUBMITTED TO GCDC-WWS PRIOR TO FINAL TESTING.

3. WHERE THE GROUND ELEVATION AT THE TRENCH LINE IS ABOVE THE ELEVATION OF THE CENTERLINE OF THE ROAD, THE CONTRACTOR SHALL INSTALL THE PRESSURE PIPE 6' BELOW THE ELEVATION OF THE ROAD. THE EXTRA DEPTH SHALL BE NOTED ON THE AS-BUILT DRAWINGS.

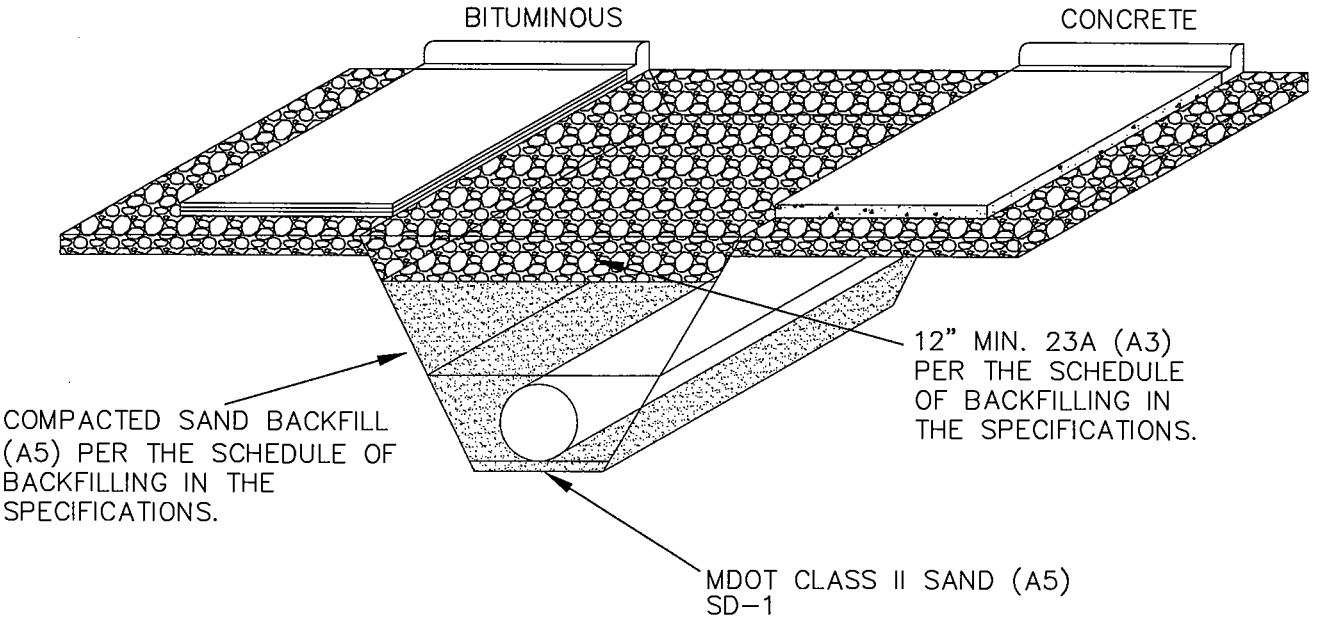
4. FOR ADDITIONAL CONSIDERATION OF PIPE ZONE EMBEDMENT CONDITIONS, SEE AWWA C600-99.

5. DESIGN ENGINEER SHALL REVIEW AND ADJUST PIPE THICKNESS DESIGN RECOMMENDATIONS IN AWWA C151/A21.51-02 FOR ADDITIONAL DEPTHS OF COVER.



SD-1

PRESSURE PIPE BEDDING AND BACKFILL



SPECIAL REQUIREMENTS FOR OPEN CUTTING HARD SURFACE AND/OR GRAVEL ROADS

1. THE CONTRACTOR SHALL ACQUIRE A SPECIAL OPEN CUT APPROVAL FROM THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS.

2. THE CONTRACTOR SHALL SUPPLY CONTINGENT LIABILITY INSURANCE FOR THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS.

3. THE PROTECTION OF THE WORK SHALL BE IN ACCORDANCE WITH THE "MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES, PART 6". BARRICADES, WARNING AND LIGHTING NECESSARY FOR PUBLIC SAFETY TO BE APPROVED BY THE ENGINEER AND THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS PRIOR TO STARTING CONSTRUCTION.

4. CONTRACTOR SHALL EXCAVATE ALL MATERIAL TO PROPOSED GRADE.

5. THE WATERMAIN SHALL BE PLACED ON MDOT CLASS II SAND (A5) BEDDING.

6. ALL BACKFILL SHALL BE MDOT CLASS II SAND (A5), PLACED PER THE SCHEDULE OF BACKFILLING.

7. THE SAND BACKFILL SHALL EXTEND FROM THE OUTSIDE EDGE OF SHOULDER TO OUTSIDE EDGE OF SHOULDER, OR FOR CURB AND GUTTER SECTIONS, SHALL BE EXTENDED 5' FROM THE OUTSIDE EDGE OF THE CURB TO THE OUTSIDE EDGE OF THE GUTTER.

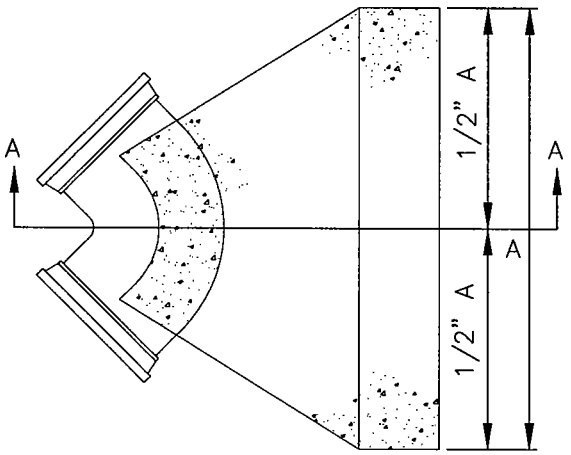
8. THE FINAL 12" OF ALL BACKFILL SHALL BE 22A LIMESTONE (A2) SUBBASE MODIFIED PER GCRC SPECIFICATIONS. ALL SHOULDERS SHALL BE REPAIRED PER THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS.

9. THE CONTRACTOR SHALL REPLACE THE ROAD SURFACE WITH THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS APPROVED MATERIAL.

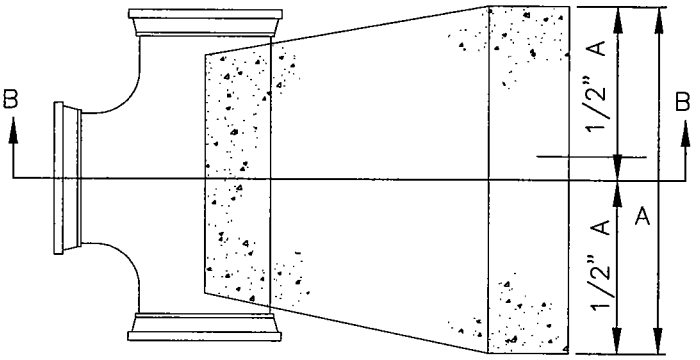
10. CONTRACTOR SHALL MAINTAIN TEMPORARY ACCESS TO ALL AREAS DURING CONSTRUCTION. A PUBLIC ROAD MAY BE CLOSED FOR 1/2 WIDTH CONSTRUCTION WITH AGENCY HAVING AUTHORITY OVER THE ROADWAYS APPROVAL BUT THE CLOSING TIME CANNOT EXCEED 8 HOURS. CONTRACTOR MAY USE SHOULDERS AND TEMPORARY PATCHES TO KEEP A ROAD OPEN.

TABLE INDICATES MINIMUM BEARING

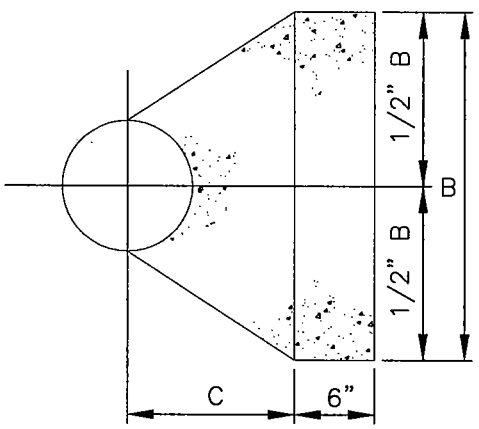
DIA. OF PIPE OR BRANCH OF TEE	90° BEND OR SMALLER			45° BEND			22 1/2° BEND			PLUGS, HYDRANTS AND TEES		
	A	B	C	A	B	C	A	B	C	A	B	C
6"	2'–0"	2'–0"	0'–9"	2'–0"	1'–0"	0'–9"	2'–0"	1'–0"	0'–9"	2'–0"	2'–0"	1'–0"
8"	3'–0"	2'–0"	1'–0"	2'–0"	2'–0"	1'–3"	2'–0"	1'–0"	1'–0"	3'–0"	2'–0"	1'–9"
12"	4'–0"	3'–0"	1'–6"	3'–0"	3'–0"	1'–6"	2'–0"	2'–0"	1'–6"	4'–0"	3'–0"	2'–0"
16"	6'–0"	4'–0"	1'–6"	4'–0"	4'–0"	1'–6"	3'–0"	3'–0"	1'–6"	5'–0"	4'–0"	2'–0"
24"	8'–0"	6'–6"	2'–0"	5'–0"	5'–0"	2'–0"	4'–0"	4'–0"	2'–0"	8'–0"	6'–0"	2'–6"



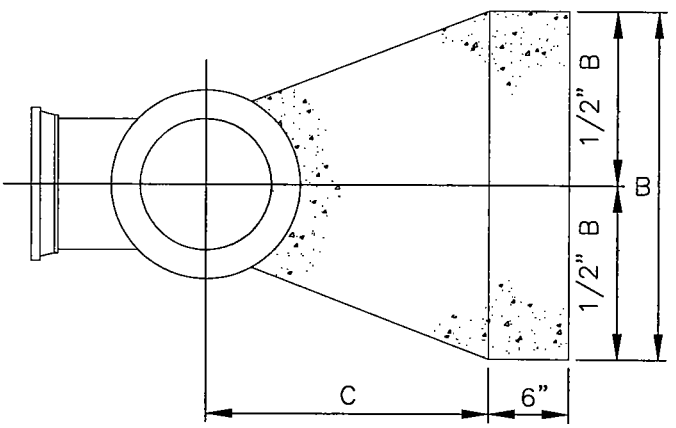
BEND – PLAN VIEW



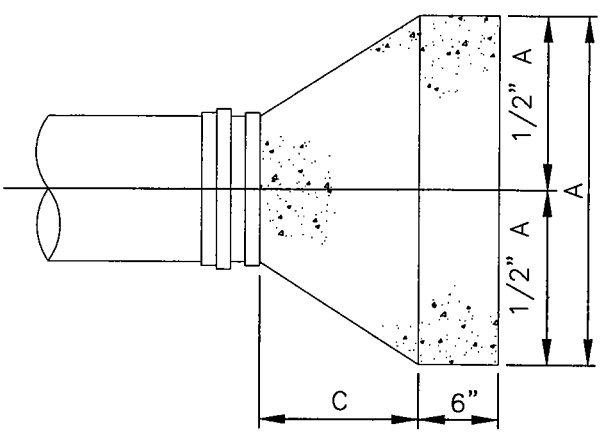
TEE – PLAN VIEW



SECTION A–A BEND



SECTION B–B TEE



PLUG

NOTES

1. CONTRACTOR SHALL USE GCDC–WWS APPROVED RESTRAINED JOINTS IN ADDITION TO THRUST BLOCKS.
2. USE 3000 PSI CONCRETE FOR ALL THRUST BLOCKS.
3. POUR AGAINST UNDISTURBED SOIL.
4. KEEP BOLTS, FITTINGS AND JOINTS CLEAR OF CONCRETE.
5. BEARING AREA IS FIGURED ON 2000–PSI SOIL CAPACITY.

MINIMUM PIPE RESTRAINT SCHEDULE FOR
GROUND BURIED PRESSURE PIPES [1]

LENGTH (IN FEET) OF RESTRAINT REQUIRED [2]

DEFLECTION ANGLE	22 1/2"	33 1/4"	45°	56 1/2"	67 1/2"	78 1/4"	90° TEE OR DEAD END
PIPE							
6"	3	6	11	16	23	29	37
8"	4	8	15	22	31	41	50
10"	5	11	18	28	38	49	61
12"	6	13	22	33	45	59	73
14"	7	14	25	37	52	68	84
16"	8	16	28	42	59	77	95
18"	8	18	31	47	66	86	107
20"	9	20	35	53	73	95	118
24"	11	23	40	61	85	111	138
30"	13	29	50	75	105	136	170
36"	15	34	59	88	123	160	199
42"	17	39	67	101	141	184	228
48"	19	43	75	113	157	206	255

NOTES

1. THIS TABLE IS BASED ON A TEST PRESSURE OF 180 PSI (OPERATING PRESSURE + WATER HAMMER). FOR OTHER TEST PROCEDURES, ALL VALUES ARE TO BE INCREASED OR DECREASED PROPORTIONALLY.

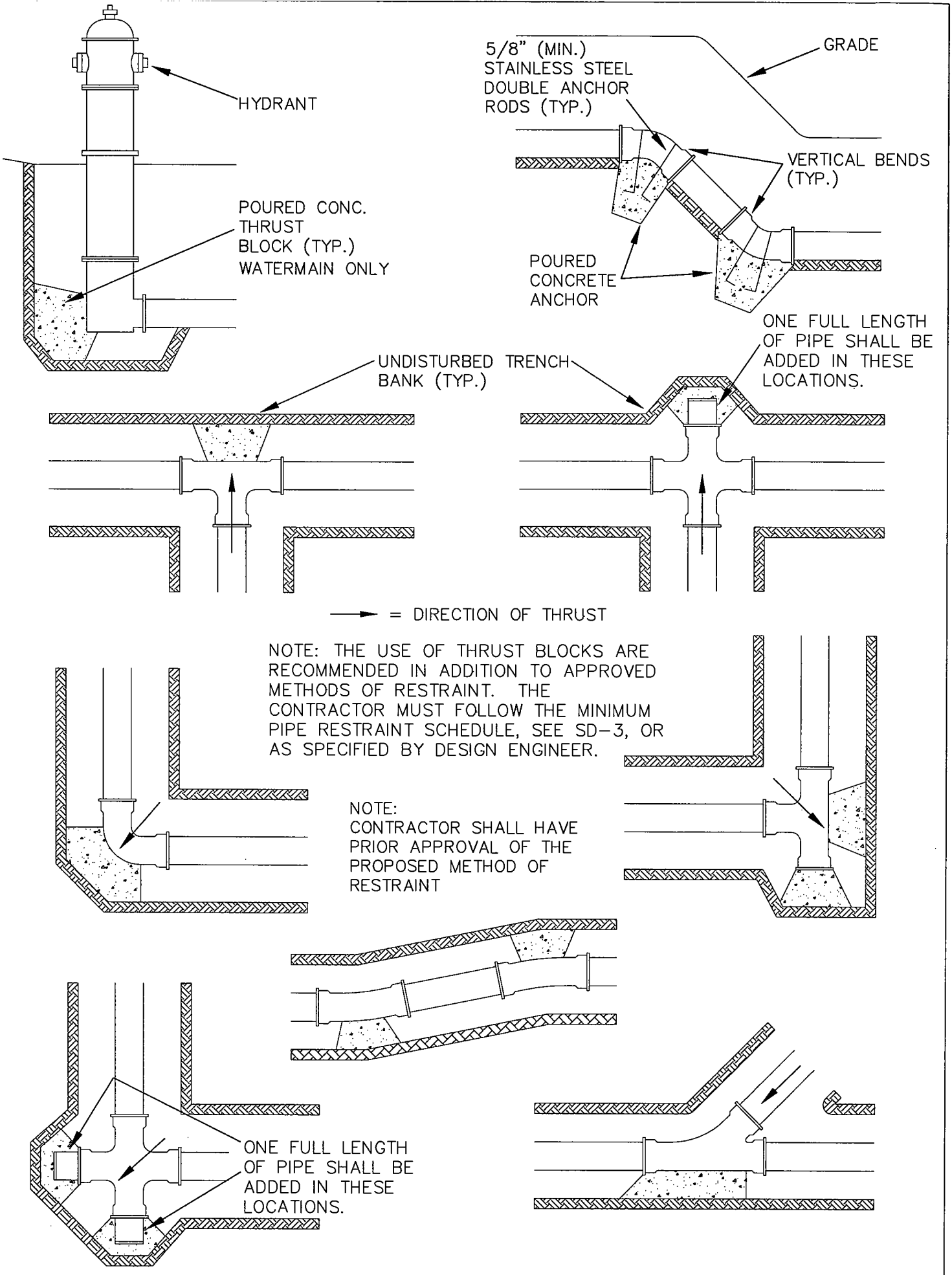
2. IN EACH DIRECTION FROM POINT OF DEFLECTION OR TERMINATION EXCEPT FOR A TEE AT WHICH ONLY THE BRANCH IN THE DIRECTION OF THE TEE STEM.

3. IF TIE RODS ARE APPROVED BY GCDC-WWS, THEY MUST BE STAINLESS STEEL GRADE 316 RODS & NUTS. PLACE (2) RODS 5/8 INCH DIAMETER MINIMUM FOR WATERMAIN 6 INCH TO 10 INCH, AND (4) RODS 5/8 INCH DIAMETER MINIMUM FOR 12 INCH AND LARGER.

4. CONTRACTOR SHALL USE GCDC-WWS APPROVED RESTRAINED JOINTS.

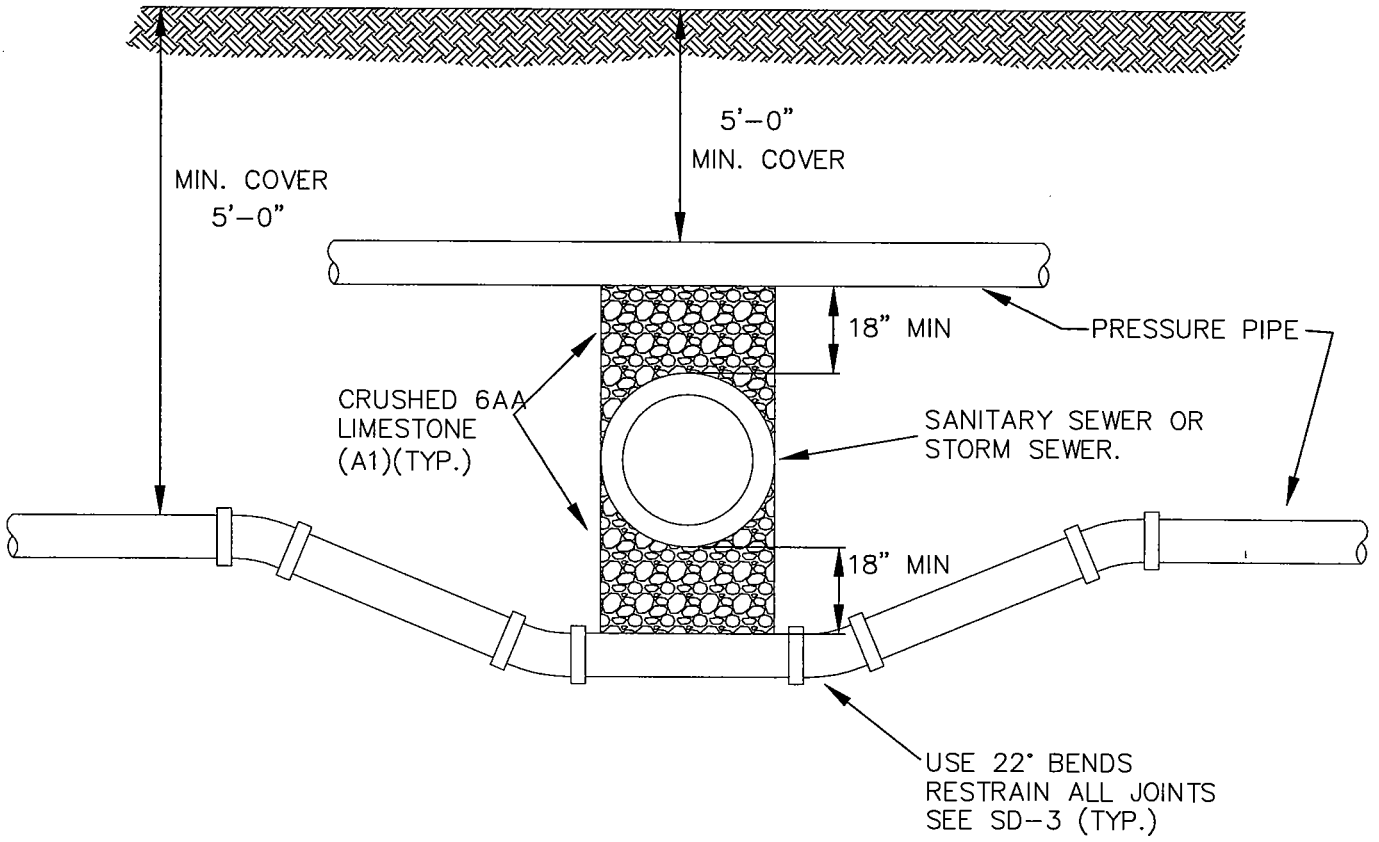
5. IN-LINE VALVES SHALL BE CONSIDERED DEAD ENDS IN BOTH DIRECTIONS.

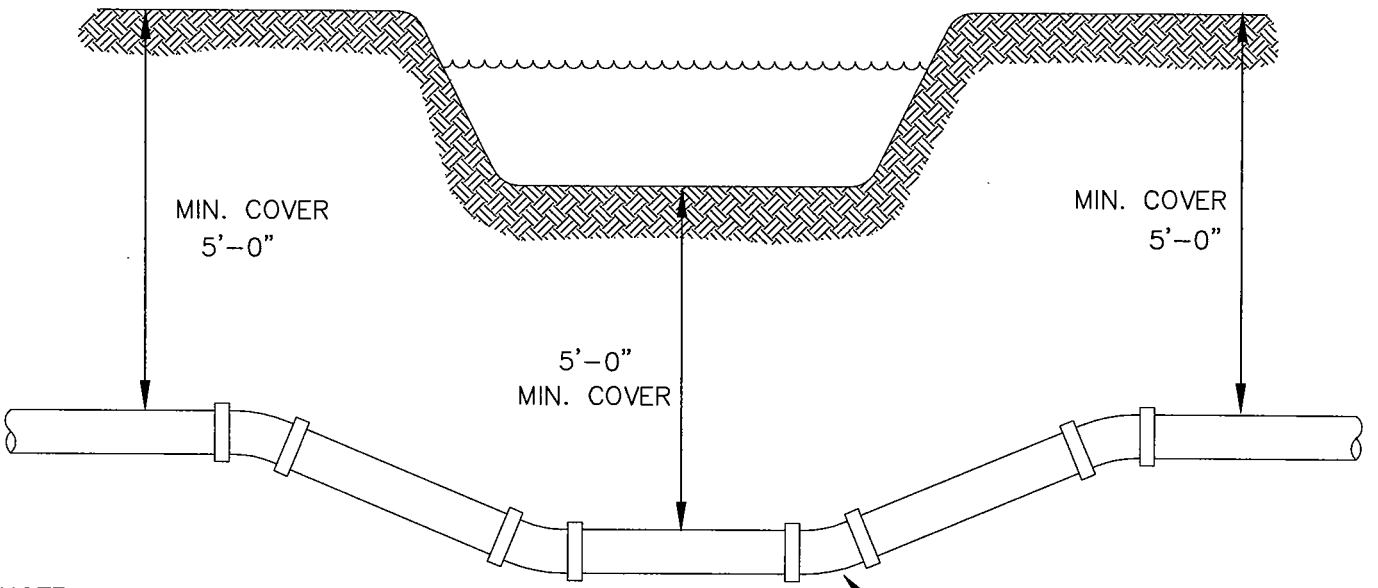
6. THIS TABLE IS PLACED HERE AS A MINIMUM REQUIREMENT FOR THRUST RESTRAINT OF GROUND BURIED PRESSURE PIPES AND NOT DOES ALLEVIATE THE DESIGN ENGINEER OF THE RESPONSIBILITY TO DESIGN PROPER THRUST RESTRAINT SPECIFIC TO THE PROPOSED PROJECT. IN THE CASE OF DUCTILE IRON PIPE, THE DESIGN ENGINEER SHALL FOLLOW THE APPLICABLE STANDARD AS SET FORTH IN THE LATEST EDITION FOR THRUST RESTRAINT DESIGN FROM THE DUCTILE IRON PIPE RESEARCH ASSOCIATION (DIPRA).



SD-5

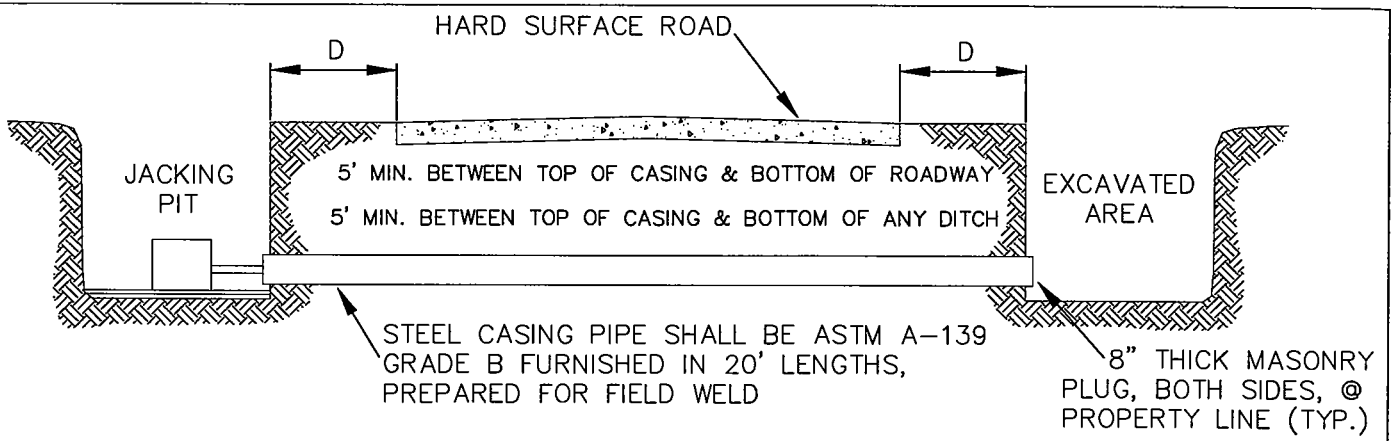
05/01/2004 LOCATION OF THRUST BLOCK RESTRAINT PRESSURE PIPE





NOTE:
THE DESIGN ENGINEER SHALL DETERMINE THE ACTUAL ELEVATION OF THE DRAIN BOTTOM IN THE FIELD AND PLACE IT ON THE PLAN AND PROFILE VIEW. CONCRETE ENCASEMENTS OR CRADLES SHALL BE INSTALLED WHERE SHOWN ON THE PLANS OR AS DIRECTED BY THE ON-SITE GCDC-WWS PERSONNEL.

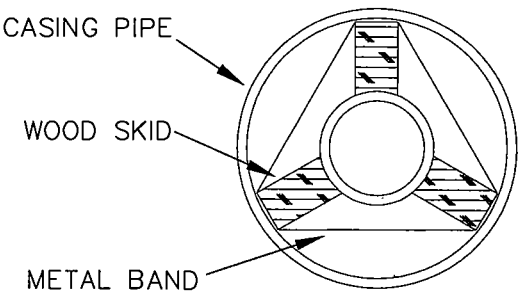
SD-6
WATERMAIN BURY AT COUNTY DRAIN, DITCH, OR STREAM



SIZE AND MATERIAL	MIN. CASING DIA. O.D. INCHES	MIN. WALL THICKNESS INCHES
8" D.I. PRESSURE PIPE OR SMALLER	12.75	0.375
6" SANITARY SEWER V.C.P. OR P.V.C.		
10"-12" D.I. PRESSURE	20.00	0.375
8"-10" SANITARY SEWER		
16" D.I. PRESSURE PIPE	24.00	0.375
12"-15" SANITARY SEWER		
18"-24" D.I. PRESSURE	30.00	0.406
18" SANITARY SEWER CONCRETE		
21"-24" SANITARY SEWER CONCRETE	36.00	0.469

MDOT
D=30' FOR TRAFFIC OVER 45 MPH
D=20' FOR TRAFFIC UNDER 45 MPH

GCRC
D=10' FOR ROADS WITH SHOULDER/DITCH
D=5' FOR ROADS WITH CURB AND GUTTER



NOTES

1. ALL BORE AND JACK OPERATIONS WITHIN THE ROAD R.O.W. WILL REQUIRE A PERMIT FROM THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS.

2. THE CONTRACTOR SHALL ABIDE BY ALL SAFETY PRECAUTIONS INCLUDING THE MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES, PART 6 AS REQUIRED BY THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS.

3. THE CONTRACTOR SHALL PROTECT AND RESTORE ALL PROPERTY.

4. THE CONTRACTOR SHALL NAME THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS AS AN ADDITIONAL NAMED INSURED FOR CONTINGENT LIABILITY FOR THE PROPOSED CONSTRUCTION.

5. THE CONTRACTOR SHALL ABIDE BY ALL CONDITIONS STATED IN THE GCRC MEMO OF 9-1-75 LABELED SANITARY SEWER AND WATERMAIN INSTALLATION WITHIN THE LIMITS OF COUNTY HIGHWAYS OR THE REQUIREMENTS OF THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS.

6. THE SHEETING OF THE FRONT FACE OF THE BORE PIT WILL BE REQUIRED IF UNSTABLE SOIL CONDITIONS ARE ENCOUNTERED.

7. THE AUGER MUST ALWAYS PROCEED THE CASING PIPE HEAD.

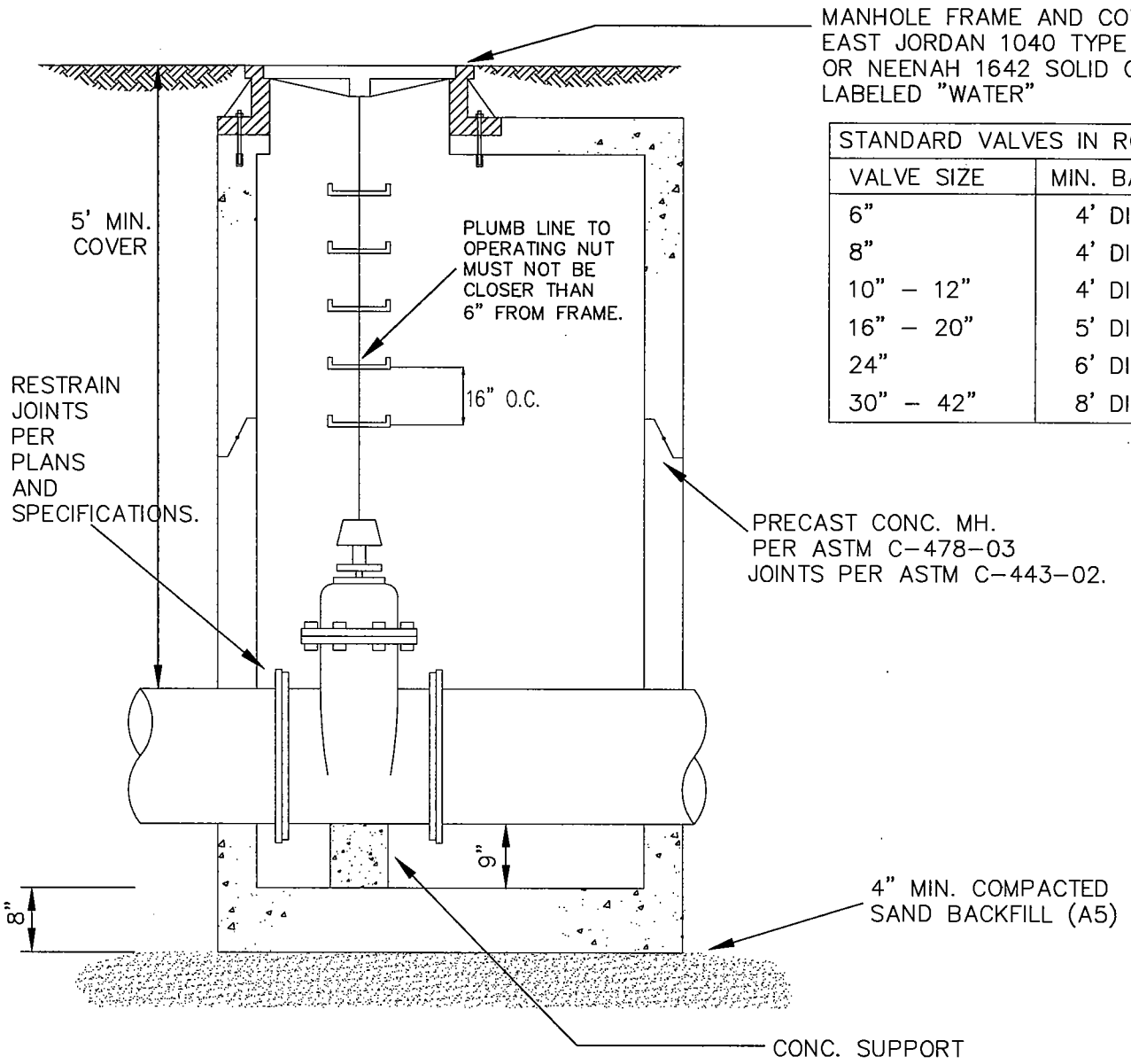
8. THE CONTRACTOR SHALL NOTIFY THE AGENCY HAVING AUTHORITY OVER THE ROADWAYS A MINIMUM OF 72 HOURS PRIOR TO BEGINNING CONSTRUCTION.

9. WOOD SKIDS AND STAINLESS STEEL METAL BANDS MUST BE INSTALLED FOR ALL BORES TO KEEP THE CARRIER PIPE ON LINE AND GRADE. THE MAXIMUM DISTANCE FROM THE I.D. OF THE CASING PIPE TO THE OUTSIDE EDGE OF THE SKID SHALL BE 1".

10. THE ENDS OF THE CASING PIPE SHALL BE BULK HEADED WITH AN 8" WATER TIGHT MASONRY BULKHEAD.

SD-7

BORE & JACK CONSTRUCTION ON ALL ROADS



STANDARD VALVES IN ROADWAYS	
VALVE SIZE	MIN. BASIN SIZE
6"	4' DIA. MH.
8"	4' DIA. MH.
10" – 12"	4' DIA. MH.
16" – 20"	5' DIA. MH.
24"	6' DIA. MH.
30" – 42"	8' DIA. MH.

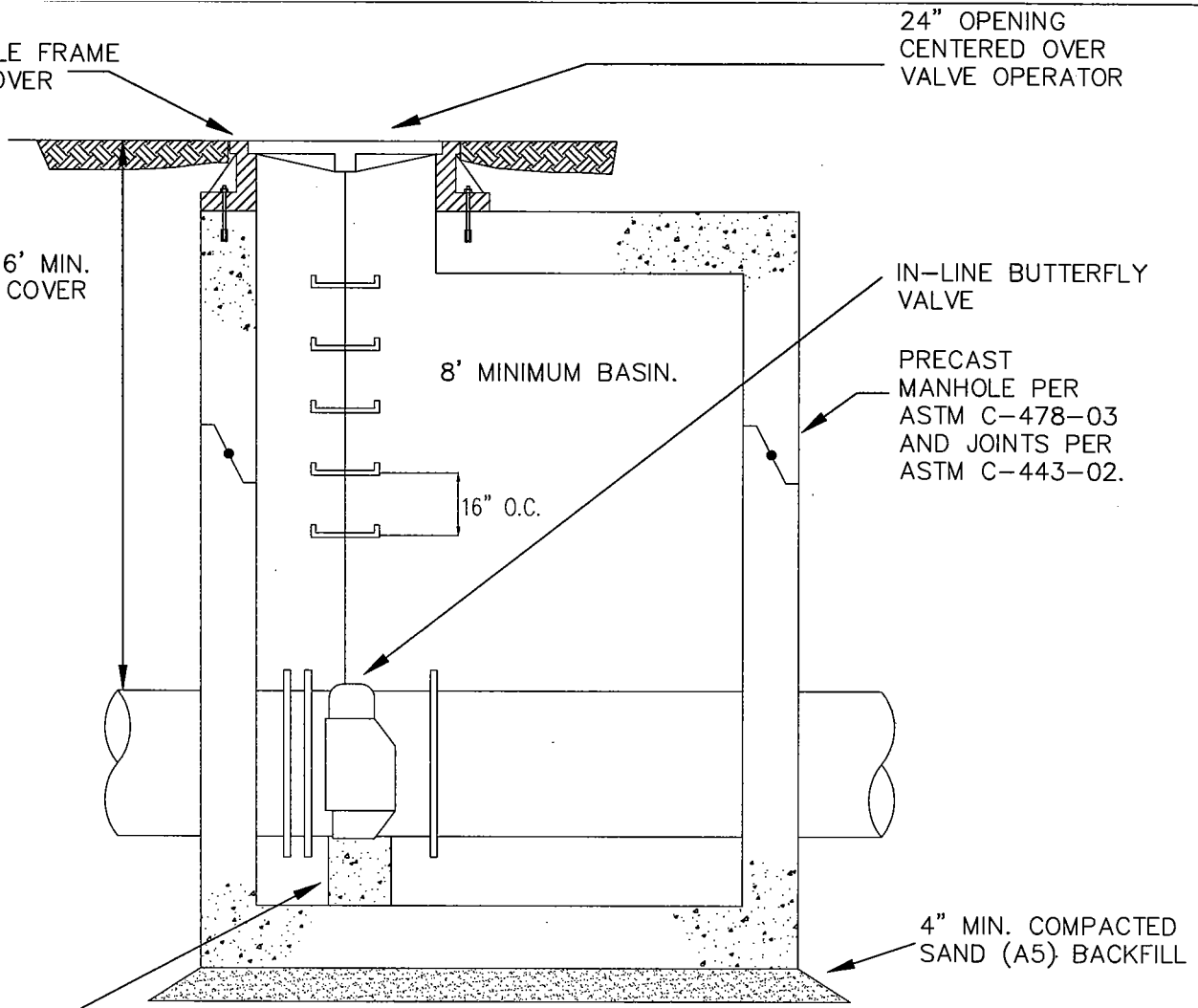
1. VALVE MANHOLES SHALL BE USED UNDER PAVED AREAS, SEE ABOVE TABLE. ALL PRESSURE TAPS & CUT-IN VALVES, 8" AND OVER, MUST BE ENCLOSED WITHIN A CONCRETE VALVE MANHOLE.

2. ALL OTHER VALVES ARE REQUIRED TO HAVE VALVE BOXES. SEE SD-12.

3. CENTER THE OPERATING NUT IN THE MIDDLE OF THE FRAME AND COVER.

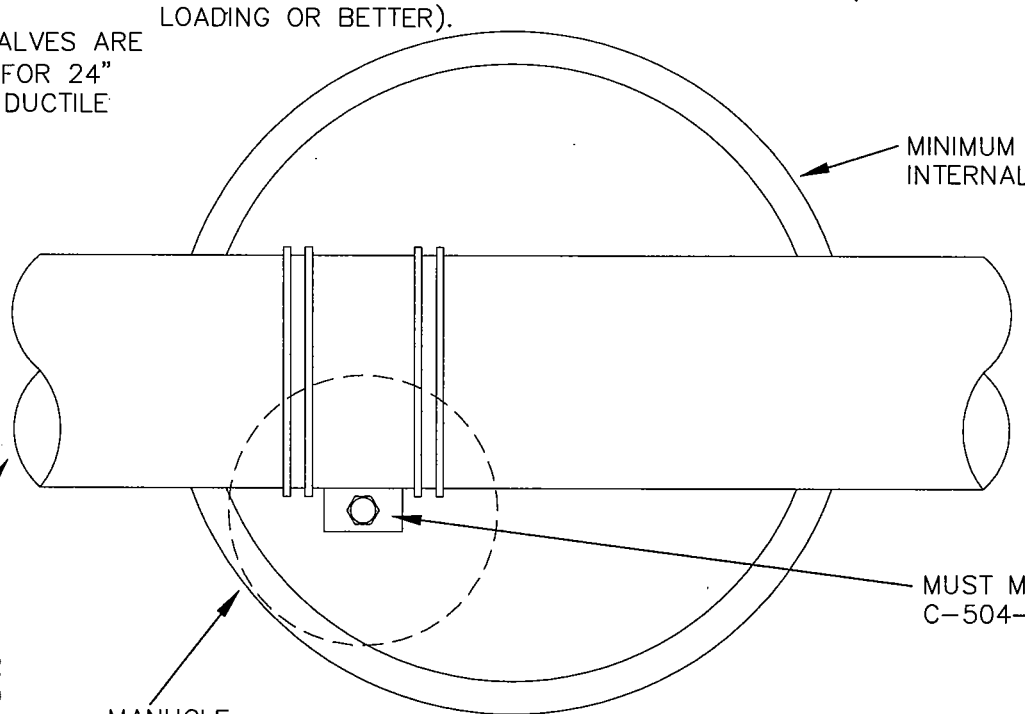
4. RESILIENT SEATED WEDGE GATE VALVES ARE MANDATORY UP TO 20". BUTTERFLY VALVES ARE ACCEPTABLE FOR SIZES 24" AND LARGER. SEE SD-9.

5. TWO CONCRETE ADJUSTING RINGS ARE ALLOWED WITH A TOTAL MAXIMUM ADJUSTMENT OF 9".



MANHOLE TOPS AND STRUCTURES SHALL MEET THE MINIMUM REQUIREMENT FOR TRAFFIC LOADING AS DETERMINED BY THE GCRC OR LOCAL MUNICIPALITY WITH JURISDICTION (HS 20 LOADING OR BETTER).

BUTTERFLY VALVES ARE ACCEPTABLE FOR 24" AND LARGER DUCTILE IRON PIPE.



SD-9

05/01/2004 IN-LINE BUTTERFLY VALVE IN ROADWAYS PRESSURE PIPE

NOTES

1. ALL PRESSURE TAPS MUST BE INSTALLED IN A CONCRETE VALVE MANHOLE.

2. ALL TAPPING SLEEVES SHALL BE MECHANICAL JOINT BY FLANGED OUTLET, ALL STAINLESS STEEL OR CAST IRON, BUILT IN TWO SECTIONS.

3. APPROVED MECHANICAL JOINT SLEEVE; ROMAC 452 ALL 316 STAINLESS STEEL, CLOW F5205, MUELLER H-615, AMERICAN DARLING H-1004, OR GCDC-WWS APPROVED ALTERNATE.

4. THE OUTLET FLANGE IS CLASS 125 ANS/B16.1.

5. THE TAPPING TEE SHALL HAVE A BUILT-IN TEST PLUG.

6. THE GASKET FOR MAINLINE SHALL BE MADE FOR THE PIPE MATERIAL IN PLACE, DUCTILE IRON CLASS 52-54.

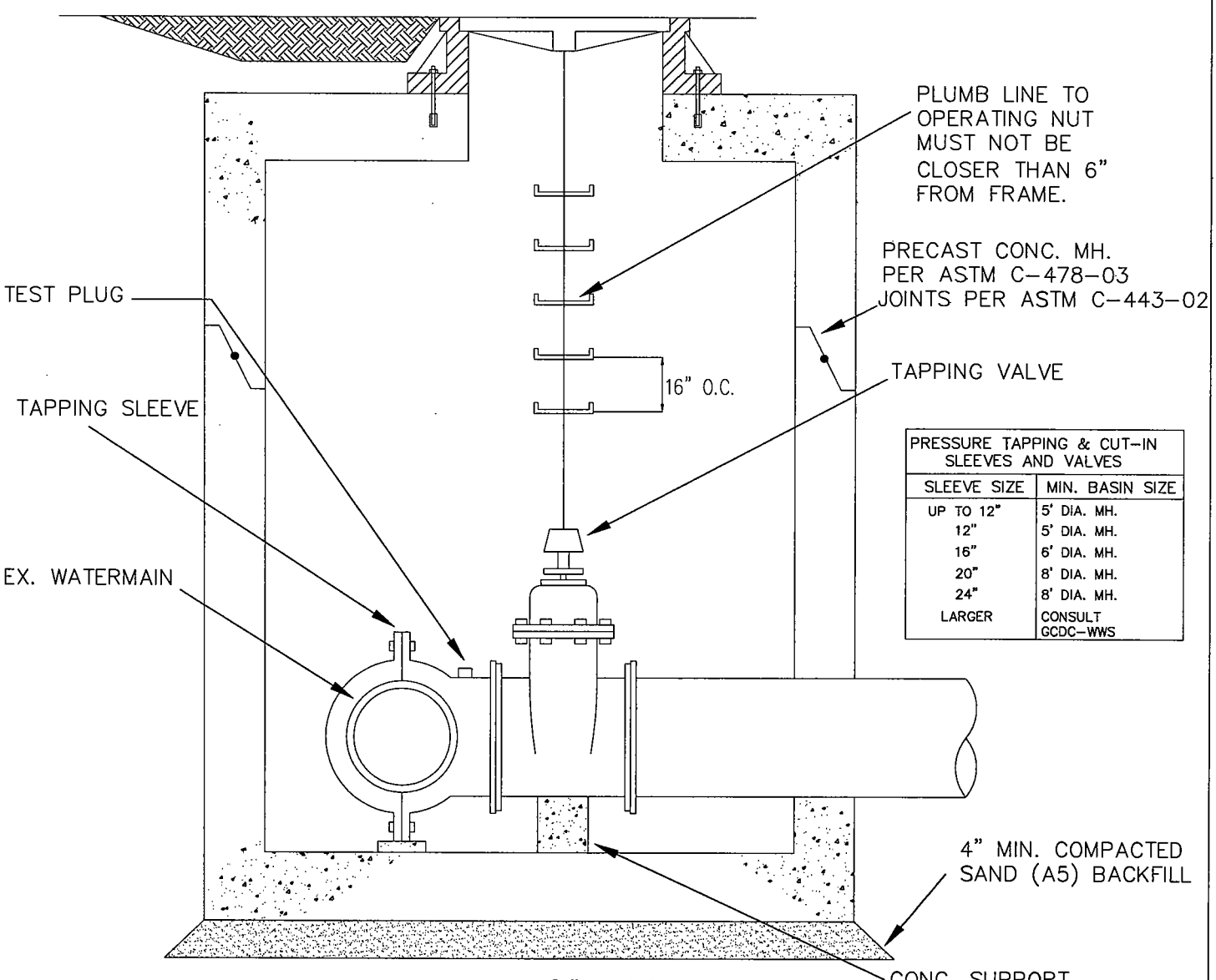
7. THE VALVE SHALL BE FLANGED BY RESTRAINED JOINT.

8. THE VALVE SHALL HAVE OVER SIZED SEAT RINGS TO PERMIT ENTRY OF THE TAPPING MACHINE CUTTERS.

9. THE VALVE SHALL MEET ALL REQUIREMENTS OF AWWA C509 OR C515.

10. THE TOP OPENING SHALL BE CENTERED ON THE VALVE OPERATING NUT.

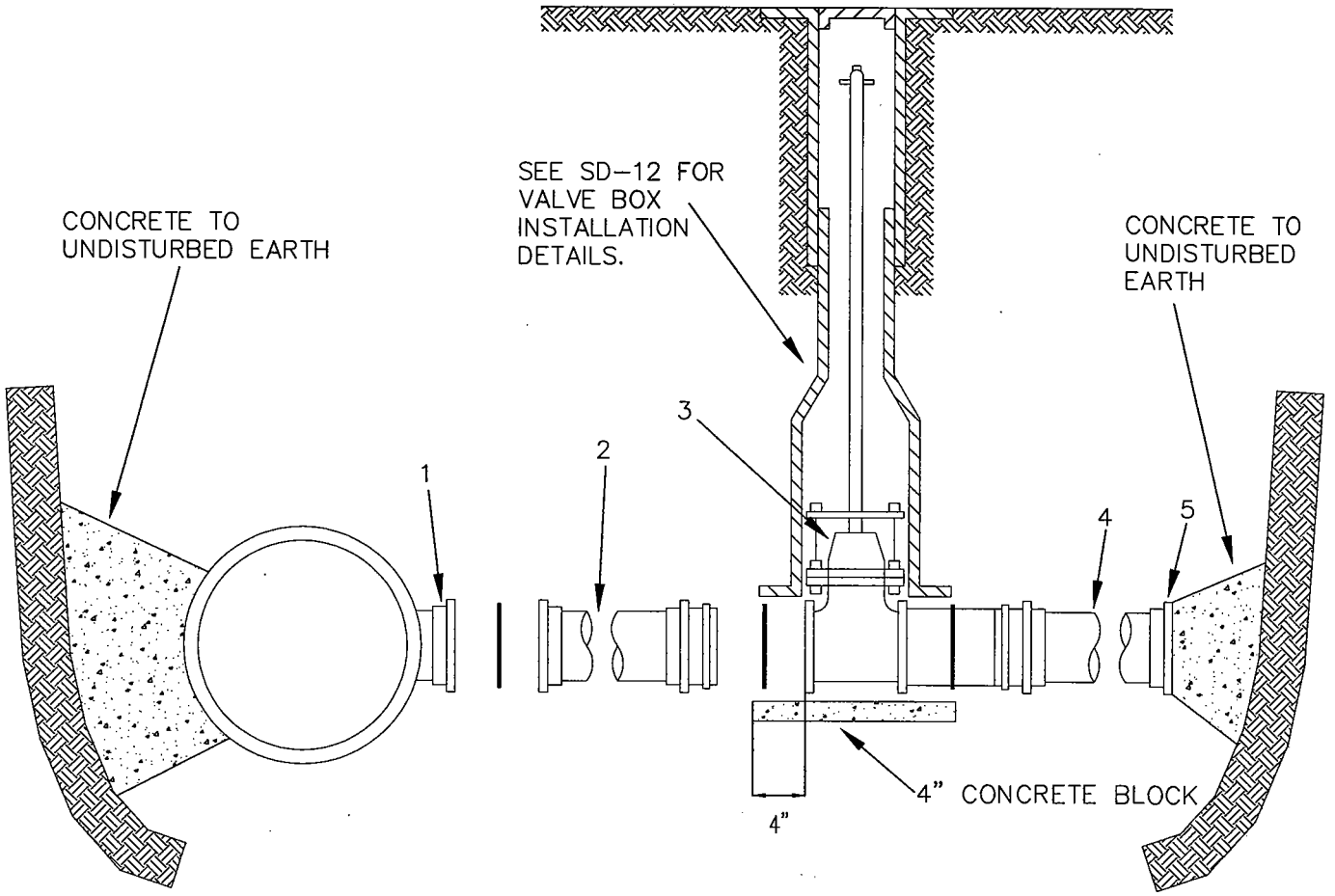
11. SET MANHOLE FRAME AND COVER ON TOP OF SLAB.



PRESSURE TAPPING & CUT-IN SLEEVES AND VALVES	
SLEEVE SIZE	MIN. BASIN SIZE
UP TO 12"	5' DIA. MH.
12"	5' DIA. MH.
16"	6' DIA. MH.
20"	8' DIA. MH.
24"	8' DIA. MH.
LARGER	CONSULT GCDC-WWS

SD-10

05/01/2004 PRESSURE TAPPING SLEEVE AND VALVE PRESSURE PIPE



1. RESTRAINED JOINT MAINLINE TEE WITH RESTRAINED JOINT OUTLET.

2. ANCHORING COUPLING

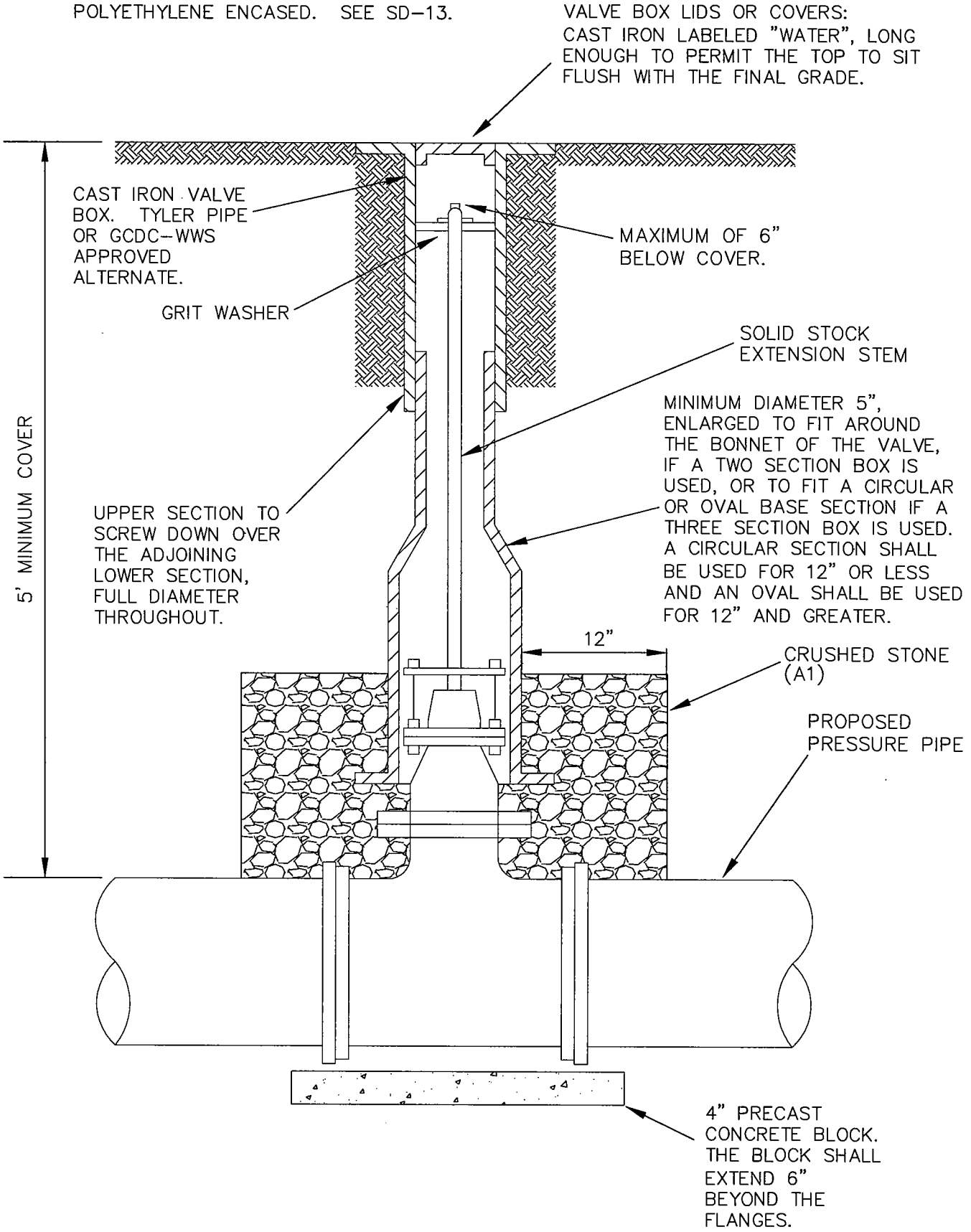
3. RESILIENT SEATED GATE VALVE MJ X MJ.

4. EXTEND A MINIMUM OF ONE PIPE LENGTH AFTER THE VALVE.

5. RESTRAIN AND PLUG. PLACE A CONCRETE BRACE TO UNDISTURBED EARTH. CONCRETE SHALL NOT COVER PLUGS, BOLTS, ETC.

6. ALL FITTINGS SHALL HAVE AN APPROVED METHOD OF RESTRAINT, INCLUDING FITTINGS INSIDE THE MANHOLE.

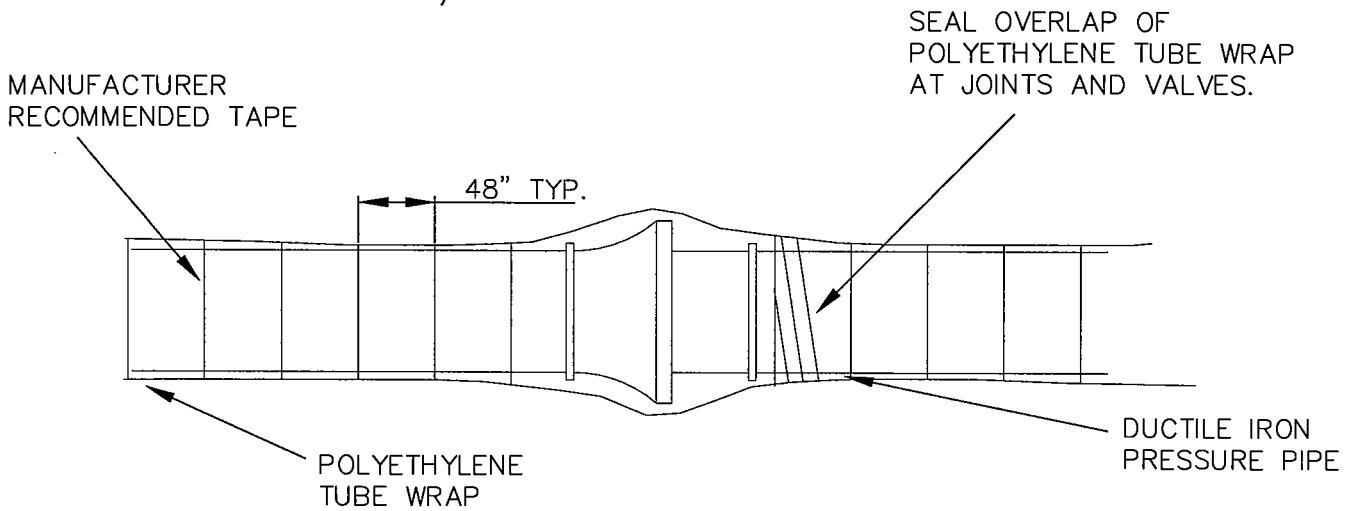
ALL BURIED VALVES NOT ENCLOSED IN A VALVE VAULT SHALL BE POLYETHYLENE ENCASED. SEE SD-13.



SD-12
VALVE BOX

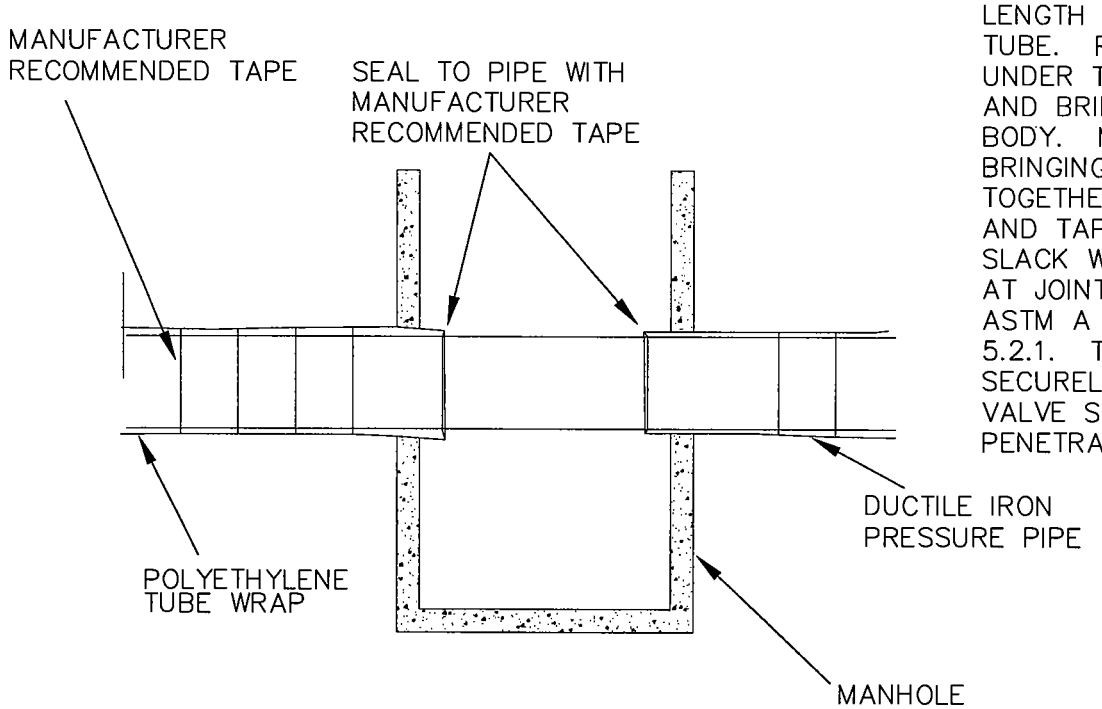
1. ALL PIPE SHALL BE WRAPPED, EXCEPT IN MANHOLES.

2. CIRCUMFERENTIAL WRAPS OF MANUFACTURER RECOMMENDED TAPE SHALL BE PLACED AT NO GREATER THAN FOUR FOOT INTERVALS ALONG THE BARREL OF THE PIPE WITH THE EXCESS FOLDED OVER THE TOP TO TAKE OUT EXCESS SLACK HELPING TO MINIMIZE THE SPACE BETWEEN THE POLYETHYLENE AND THE PIPE. COMPLETE THE INSTALLATION BY OVERLAPPING THE POLYETHYLENE TUBE WRAP AT EACH END AND SEAL ENDS PER AWWA C105/A21.5-99.

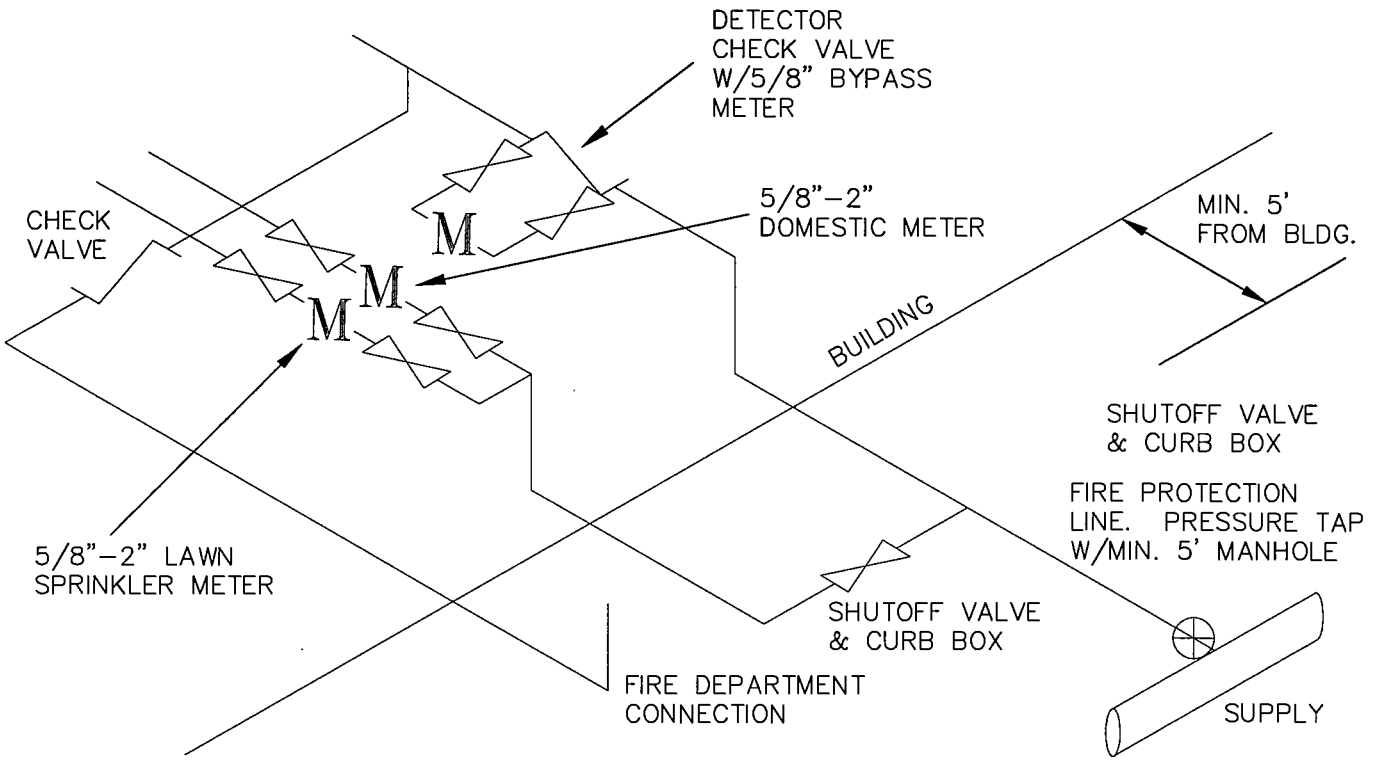


POLYETHYLENE WRAP: CROSS-LAMINATED HIGH DENSITY AND MANUFACTURED OF VIRGIN POLYETHYLENE MATERIAL CONFORMING TO THE REQUIREMENTS OF ASTM D-4976. RAW MATERIALS USED FOR THE FILM, ITS STRENGTH, THICKENS, TUBE SIZE, OR SHEET WIDTH MUST CONFORM TO AWWA C105/A21.5-99.

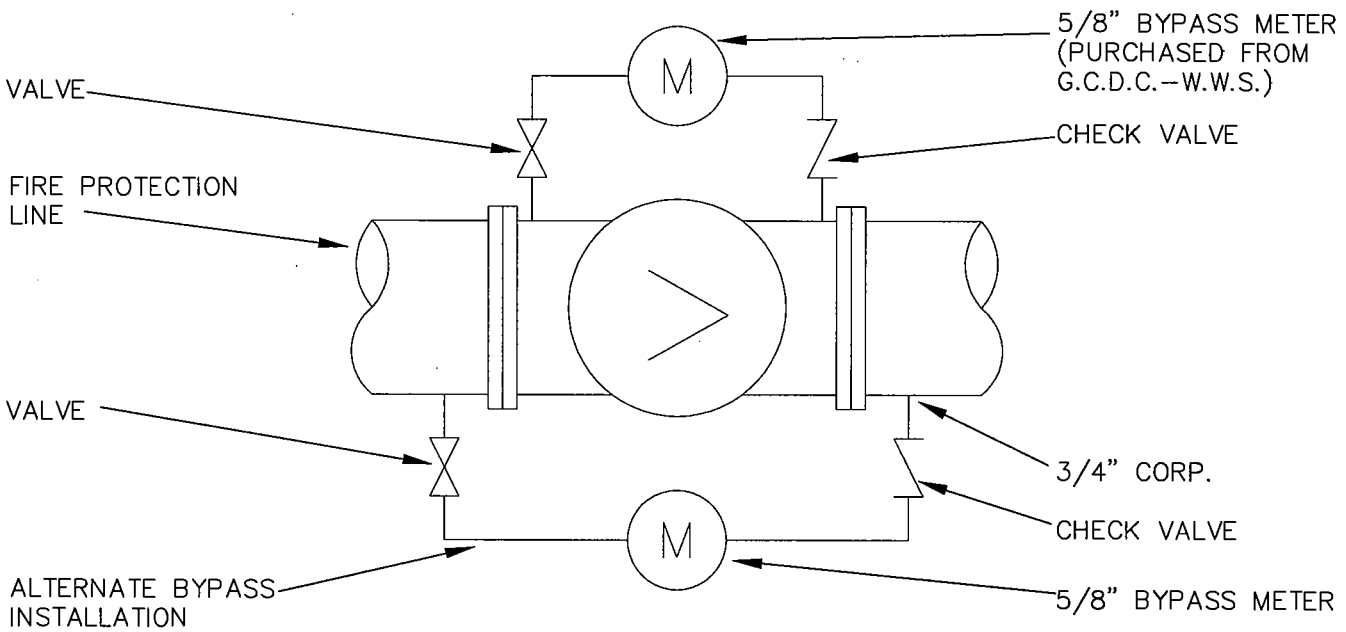
FOR ODD-SHAPED APPURTENANCES: WRAP VALVES, TEES, CROSSES, AND OTHER ODD-SHAPED PIECES WHICH CANNOT BE PRACTICALLY BE WRAPPED IN A TUBE, WITH A FLAT SHEET OR SPLIT LENGTH OF POLYETHYLENE TUBE, WITH A FLAT SHEET OR SPLIT LENGTH OF POLYETHYLENE TUBE. PASS THE SHEET UNDER THE APPURTENANCE AND BRING AROUND THE BODY. MAKE SEAMS BY BRINGING THE EDGES TOGETHER, FOLDING TWICE, AND TAPING DOWN. HANDLE SLACK WIDTH AND OVERLAP AT JOINTS AS DESCRIBED IN ASTM A 674-00 SECTION 5.2.1. TAPE POLYETHYLENE SECURELY IN PLACE AT VALVE STERN AND OTHER PENETRATIONS.



SD-13
POLYETHYLENE TUBE WRAP FOR DUCTILE IRON PIPE



FIRE PROTECTION LINE
VALVE & METER INSTALLATION



DETECTOR CHECK VALVE DETAIL

NOTE

DETECTOR CHECK VALVE SHALL BE MUELLER A–2500–602, OR GCDC–WWS APPROVED ALTERNATE, TAPPED AT FACTORY FOR BYPASS METER.

SD–14

FIRE SUPPRESSION LINE
VALVE & METER INSTALLATION

NOTES

1. WATER SERVICE SHALL BE TUNNELED UNDER EXISTING PAVEMENTS, SEE SD–7.

2. A 2"X4" WOODEN MARKER PLACED 1' UNDER THE FINISHED GRADE AND PAINTED BLUE IS REQUIRED FOR ALL WATER SERVICES NOT CONNECTED TO THE BUILDING.

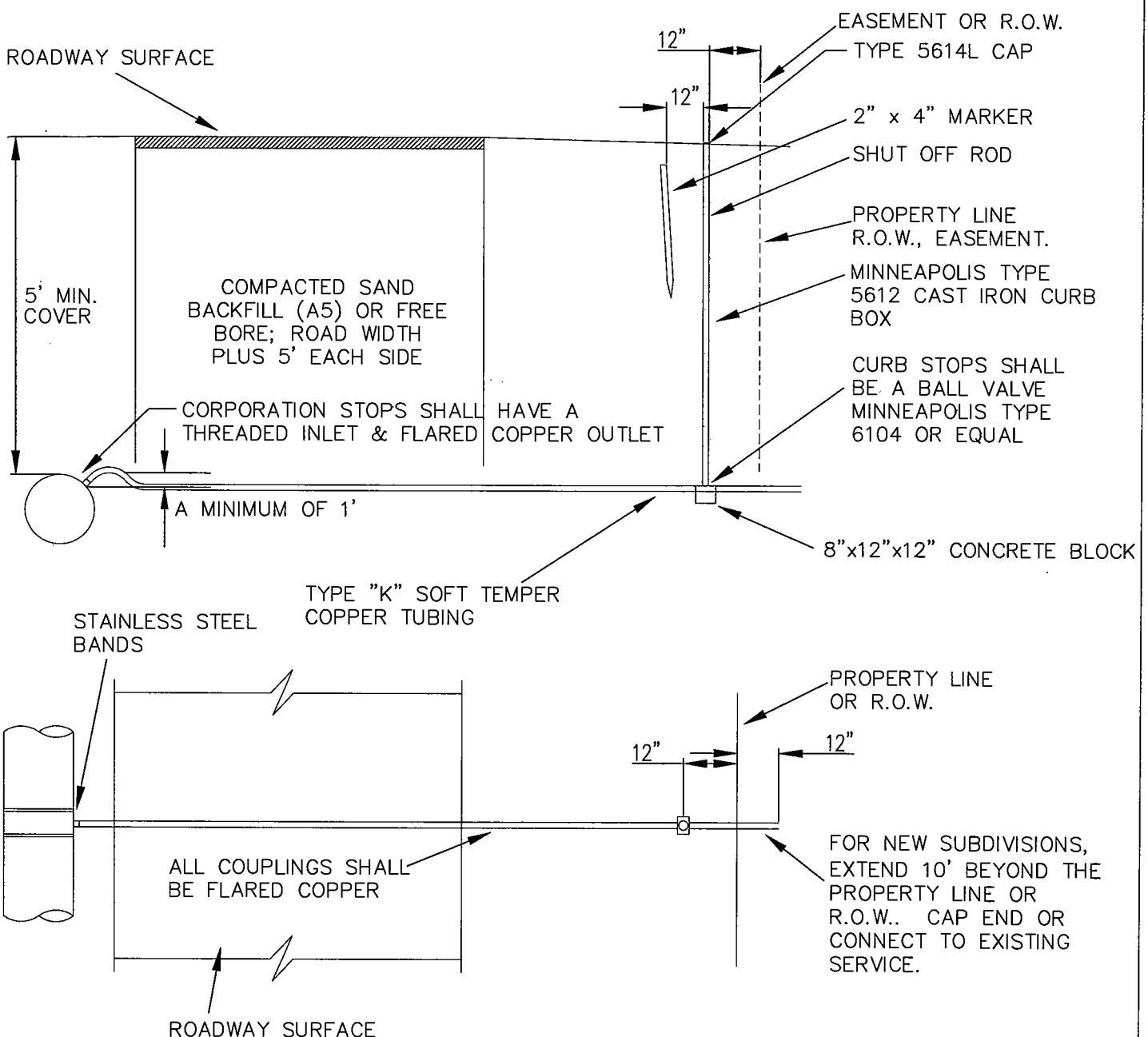
3. THE VALVE BOX SHALL BE EITHER DUCTILE IRON OR CAST IRON AND A MINIMUM OF 6' IN LENGTH. NO PLASTIC CURB BOXES SHALL BE ALLOWED.

4. CURB STOPS SHALL BE BALL VALVES FOR ¾", 1", 1½", AND 2" DIAMETERS WITH COPPER TO COPPER CONNECTIONS.

5. THE CORPORATION SHALL BE FORD FS 202 OR GCDC–WWS APPROVED ALTERNATE. USE BRASS DOUBLE SADDLES WITH STAINLESS BANDS FOR 1½" AND 2" TAPS.

6. IF THE PUBLIC WATERMAIN IS ON AN EASEMENT, THE CURB STOP SHALL BE PLACED AT THE EDGE OF THE EASEMENT CLOSEST TO THE BUILDING TO BE SERVED.

7. WATER SERVICE IS TO BE PLACED AT THE CENTER OF FRONTAGE, WITH SANITARY SERVICE.



SD–15
3/4" TO 2" WATER SERVICE CONNECTIONS

NOTES

1. THE PUMPER NOZZLE SHALL FACE THE STREET. PROVIDE A MINIMUM OF 10 FEET, MEASURED FROM THE NOZZLE, CLEAR OF ANY OBSTRUCTIONS.

2. SET THE HYDRANT GRADE LINE AT PROPOSED GRADE OR AS FIELD DIRECTED.

3. SET THE VALVE BOX COVER FLUSH WITH THE EXISTING GRADE LEVEL.

4. ALL WORK FROM THE CENTERLINE OF THE MAIN, TO AND INCLUDING THE HYDRANT, SHALL BE PAID FOR BY THE UNIT PRICE BID ITEM FOR HYDRANTS.

5. ALL JOINTS SHALL BE RESTRAINED BY GCDC–WWS APPROVED RESTRAINED JOINTS.

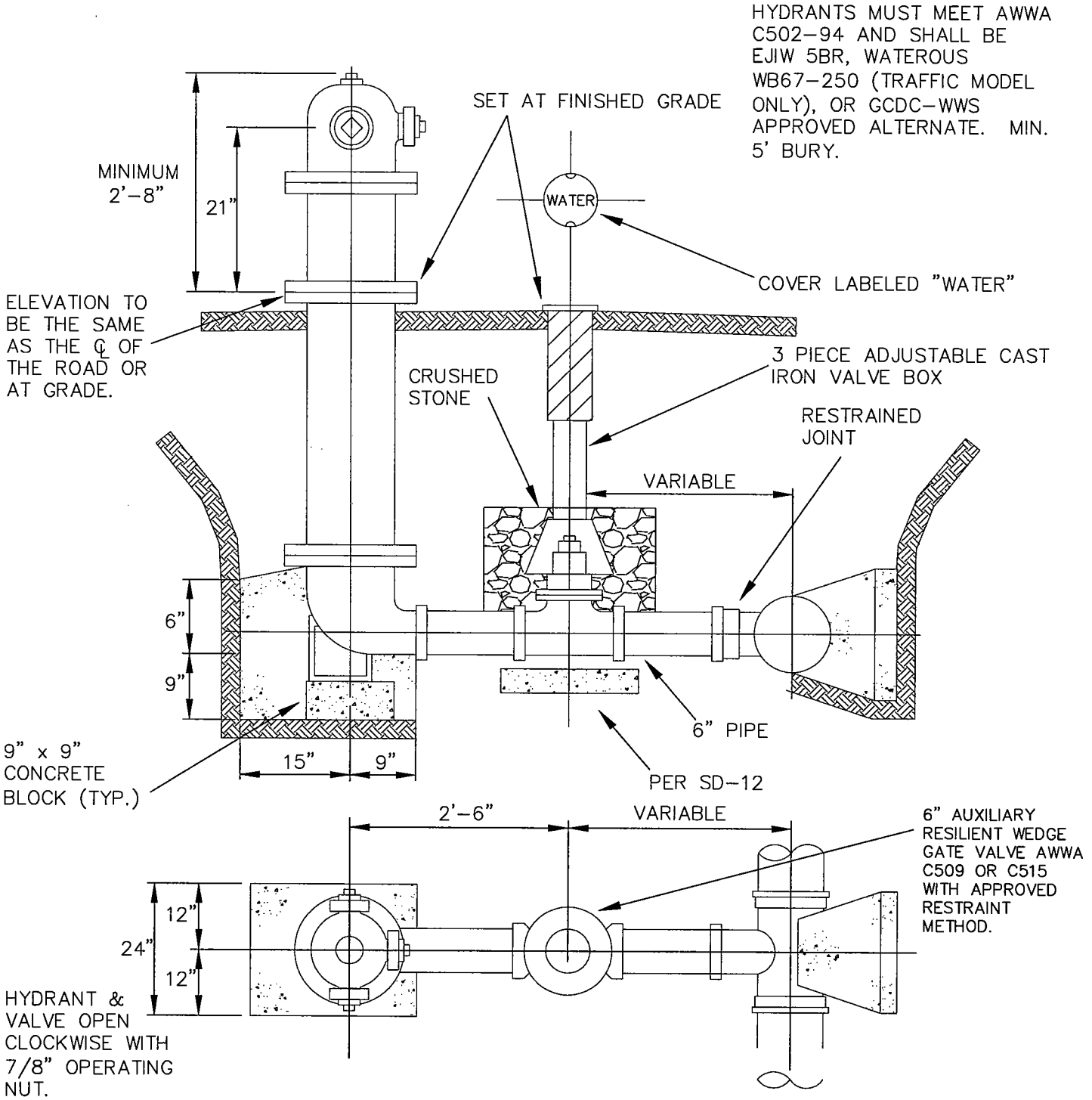
6. HYDRANT BARRELS ARE TO BE PAINTED YELLOW. CAPS WILL BE COLOR CODED TO MAIN SIZE: 6"–RED, 8"–ORANGE, 10" AND 12"–GREEN, 16" AND 20" –BROWN, 24" AND GREATER–BLUE.

7. 90" HYDRANT TEES ARE APPROVED WHERE SPACE REQUIREMENTS ARE LIMITED.

8. HYDRANT DRAIN SHALL BE PERMANENTLY SEALED AT THE FACTORY WITH A BRONZE PLUG.

9. THE HYDRANT SHOULD BE PLACED AT PROPERTY LINES AND WITHIN THE R.O.W. WHEN POSSIBLE.

10. LOCAL MUNICIPALITIES MAY REQUIRE STORZ FITTINGS. REFER TO PROJECT PLANS AND SPECIFICATIONS FOR SIZE AND TYPE.



SD–16

FIRE HYDRANT DETAIL

05/01/2004

(WATERMAIN ONLY)
PRESSURE PIPE

WATER SERVICE LEADS

A. General

The Developer shall install service leads and appurtenances in accordance with this specification. This work includes excavation, pipelaying, backfilling, and testing.

The Developer shall protect existing utilities during construction whether the existing utilities are shown on the plans or not. Utilities damaged by construction shall be repaired in a manner satisfactory to the City and at the Developer's expense. The Developer shall call Miss Dig, 1-800-482-7171, for staking and locating the existing utilities.

The Water Department will assist the Contractor in locating existing water service leads and mains and operating all existing valves.

The Contractor shall contact the Water Department to schedule work that may interfere with existing water service.

1. References

2.1 AWWA C651 - AWWA Standard for disinfecting watermains.
2.2 Density Control Handbook, Michigan Department of Transportation-latest edition.

2. Quality Assurance/Quality Control

a. Soil Density Testing

The maximum density of granular soil will be determined by the One Point Michigan Cone Test. The maximum density of cohesive soils will be determined by the One Point T-99 Test. The procedures for these tests are described in the Density Control Handbook, published by the Michigan Department of Transportation.

B. Products

1. Materials

a. Copper Pipe

Copper pipe shall be constructed of Type K, soft temper copper tubing for underground use, in accordance with ASTM B-88 and B-251. The manufacturer and pipe type shall be marked on the outside of the pipe. The weight per foot of copper tubing shall meet or exceed that specified by ASTM B-251, Table II.

b. Stops and Fittings

Corporation stops, curb stops, and fittings shall be fabricated of brass.

c. Service Boxes

Water services boxes shall be of a style conforming to the City's standard. Boxes shall be adjustable, a minimum of six inches above and below finish grade. Water service box shall be placed on right-of-way line.

C. Execution

1. Excavation

Any excavation left open and unattended shall be protected with lighted Type II barricades and a "snow fence" constructed around the perimeter of the excavation.

Excavated material that is suitable for backfill material shall be neatly piled adjacent to the excavation so as to prevent cave-ins of the excavation and damage to adjacent trees, shrubs, fences and other property.

The excavated area shall be kept free of water at all times. Sheeting and shoring shall be provided, if necessary, for the protection of the workers.

Excavated material that is not to be used as backfill shall be disposed of by the Developer.

The Contractor shall excavate to the depths required to construct the service leads as described on the plans. Trench excavation shall be to a depth sufficient to provide at least five feet cover over the top of the pipe and a four-inch sand cushion below the pipe and shall include the removal of rock, dirt, abandoned pipelines, old foundations, stumps and roots and similar materials encountered. The trench width at a level of twelve inches above the pipe shall be no greater than 32 inches in width.

In areas where the proposed construction may interfere with existing utilities, additional excavation may be required to determine the exact location of said existing utilities.

2. Copper Pipe

a. New Services

Water services shall be constructed where shown on the plans or where directed by the City.

Copper pipe shall be connected to the watermain through a brass corporation stop. The watermain shall be drilled and tapped under pressure by use of a tapping machine with a combination drill and tap of the appropriate size for the connection being installed.

After tapping the main and installing the corporation stop, the tap shall be tested by turning the corporation on and off. Any leakage detected visually shall be corrected by the Contractor.

The service lead shall be constructed of Type K, copper pipe. The copper pipe shall be laid such that there is at least 24 inches of slack in the service line at the main. In other words, the first three feet of trench adjacent to the main shall have at least five feet of copper pipe laid in it.

All joints of copper pipe shall be flanged joints. After the copper pipe is in place and connected to the curb stop, the line shall be visually checked for leaks by closing the curb stop and opening the corporation stop.

The Contractor shall leave the corporation stop in the open position, unless directed otherwise by the City.

The excavation resulting from copper pipe construction or reconnections and within the one on one influence of a roadway, driveway, sidewalk, parking lot, railroad or other structures shall be backfilled by the Contractor with sand and compacted. Excavations not within the one on one influence of structures or paved surfaces may be backfilled with suitable native soils and shall be compacted.

Copper pipe shall be buried a minimum of 5'-0" deep, unless otherwise directed.

3. Conflicts with Existing Utilities

Excavation shall be made sufficiently in advance of pipelaying operations so that alignment can be adjusted to go above, below, or around existing pipes, structures, cables, or other obstacles that are encountered.

Where existing electric cables, telephone cables, gas mains, or services are damaged; repairs shall be at the Contractor's expense. The repairs shall be made by the appropriate utility.

Where sewer leads are damaged, they shall be repaired by the Contractor at no charge to the Owner. Sewer leads shall be repaired with a section of schedule 40 PVC pipe of the size encountered. Pipe of the same material as that encountered can also be used. The damaged pipe shall be cut square and the "connection" area shall be thoroughly cleaned. A rubber gasketed sleeve coupling suitable for connecting the pipe sizes and materials encountered shall be furnished and installed by the Contractor or each reconnection or repair joint.

4. Restoration

Areas disturbed by construction activities shall be restored by the Contractor.

NOTES

1. WATER SERVICE SHALL BE TUNNELED UNDER EXISTING PAVEMENTS, SEE SD-7.

2. A 2"X4" WOODEN MARKER PLACED 1' UNDER THE FINISHED GRADE AND PAINTED BLUE IS REQUIRED FOR ALL WATER SERVICES NOT CONNECTED TO THE BUILDING.

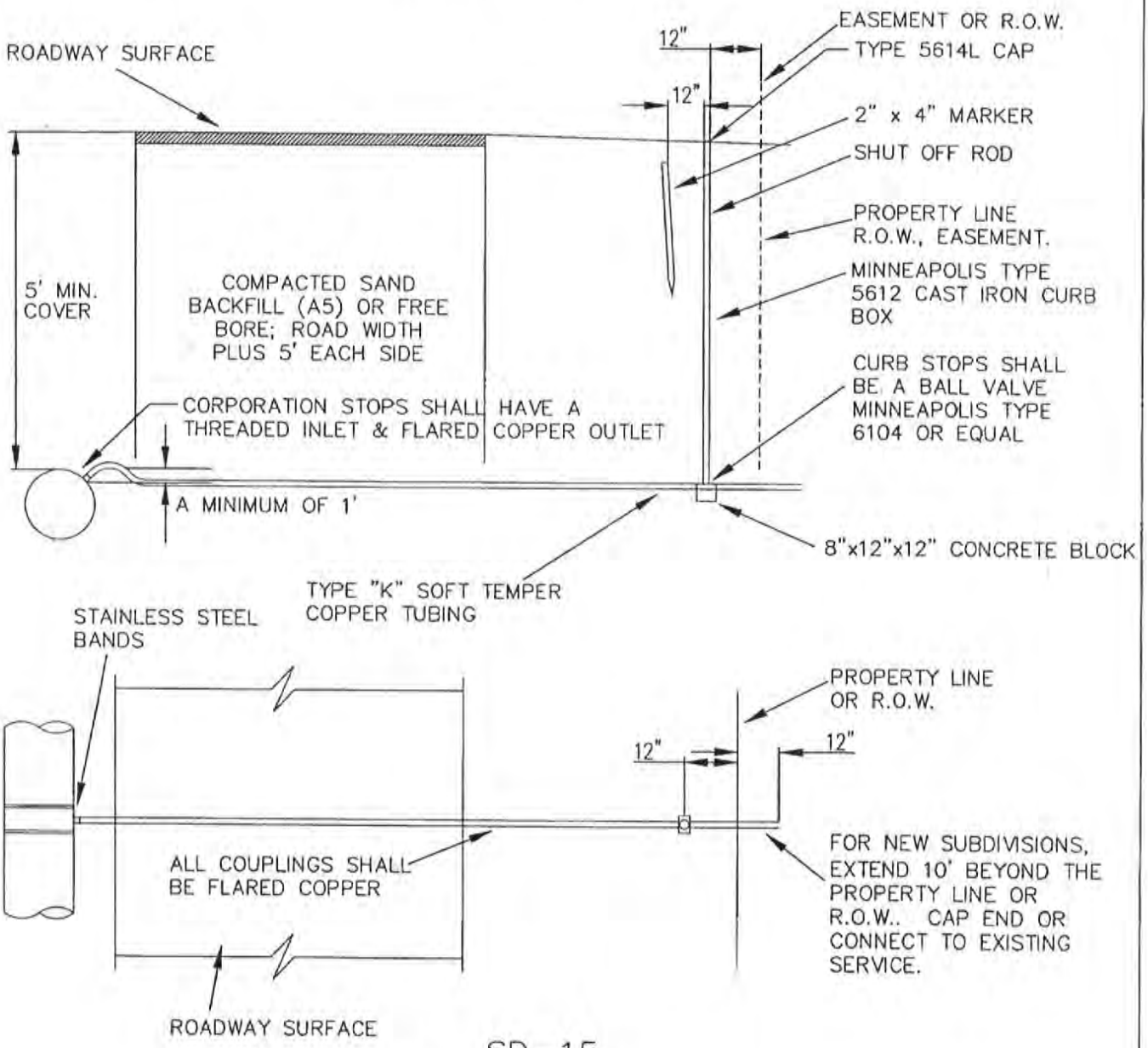
3. THE VALVE BOX SHALL BE EITHER DUCTILE IRON OR CAST IRON AND A MINIMUM OF 6' IN LENGTH. NO PLASTIC CURB BOXES SHALL BE ALLOWED.

4. CURB STOPS SHALL BE BALL VALVES FOR ¾", 1", 1½", AND 2" DIAMETERS WITH COPPER TO COPPER CONNECTIONS.

5. THE CORPORATION SHALL BE FORD FS 202 OR GCDC-WWS APPROVED ALTERNATE. USE BRASS DOUBLE SADDLES WITH STAINLESS BANDS FOR 1½" AND 2" TAPS.

6. IF THE PUBLIC WATERMAIN IS ON AN EASEMENT, THE CURB STOP SHALL BE PLACED AT THE EDGE OF THE EASEMENT CLOSEST TO THE BUILDING TO BE SERVED.

7. WATER SERVICE IS TO BE PLACED AT THE CENTER OF FRONTAGE, WITH SANITARY SERVICE.



SD-15
3/4" TO 2" WATER SERVICE CONNECTIONS

05/01/2004

WELL ABANDONMENT

A. General

1. Work Included

This section describes the responsibilities of the Developer for abandoning all existing water supply wells on the project. All procedures shall comply with Michigan Water Well Construction and Pump Installation Code and the rules promulgated thereunder the following excerpt from the rules for Part 127 Act 368 shall be followed for this project.

2. State Regulations

Well abandonment shall be performed in accordance with applicable state regulations. Selected excerpts of Part 127 - Act 368 of PA 1978 follow:

a. Rule 162 (1) An abandoned well shall be plugged by a well drilling contractor who is registered pursuant to the provisions of the act (2) A pump, a drop pipe, a packer, other equipment, debris or obstructions shall be removed from the well, if possible, before plugging.

b. Rule 163. (1) An abandoned well or dry hole shall be plugged as follows:

1) A well or dry hole that terminates in overburden shall be plugged by filling with any of the following materials:

A. Neat cement
B. Concrete grout
C. Bentonite chips
D. Bentonite pellets
E. Bentonite grout

c. Rule 164 Abandoned well plugging materials shall be placed as follows:

1) Bentonite chips or bentonite pellets shall be poured slowly into the top of the well to prevent bridging in the casing. Fine bentonite particles that accumulate in the shipping container shall not be used. The plugging operation shall continue until the bentonite chips or bentonite pellets appear at the ground surface. Upon completion of the plugging operation, water shall be placed into the casing or borehole to promote expansion of the bentonite above the static water level.

2) Neat cement, concrete grout, or bentonite grout shall be placed through a tremie pipe from the bottom of the well or dry hole to the ground surface.

3. Records

   The contractor shall complete and file a completed copy of the following abandoned well plugging record for each well that is plugged.

   SEE SAMPLE FORM ON NEXT PAGE

4. Procedures

   It shall be the Developer's responsibility to locate the wells on each parcel. Well logs may be available at the local Health Department.

   The Developer shall remove all pumping equipment, tanks, pipes, debris and other obstructions from the well casing. The homeowner shall have first salvage rights for any material removed from the casing or well pumping area. Material not requested by the property owner shall be salvaged for the Developer. All Developer salvaged material shall be removed from the site.

   The Developer shall measure the well depth and the casing diameter and record the information on the abandoned well plugging record. The Developer shall certify the type and quantity of material actually used to plug a well on the record.

   The Developer shall remove or cut off the well casing at a point below the pitless adaptor to eliminate interference with future site use. The remaining casing may be abandoned in place.

   The Developer shall mound and compact low permeability soil over the plugged well to prevent ponding of surface water.

   A copy of the abandoned well reporting form required by state law shall be filed with the property deed. The municipality, owner, and Genesee County Health Department shall also receive a copy of this report.

   All wells are to be inspected by Genesee County Health Department during the abandonment procedure. The Developer shall arrange for inspectors and pay fees for inspection, recording, or permits.

TAX NO:

MICHIGAN DEPARTMENT OF PUBLIC HEALTH
ABANDONED WELL PLUGGING RECORD

PERMIT NO:

1. LOCATION OF WELL

County	Township Name	Fraction 1/4 1/4 1/4	Section No.	Town No. N/S	Range No. E/W

Distance and Direction from Road Intersection

Street Address & City of Well Location

12 OWNER OF WELL
Address

Address Same as Well Location ☐ Yes ☐ No

2. WELL DEPTH: ft.

3. Date Plugging Completed / /

13. DROP PIPE/PUMPING EQUIPMENT REMOVED
☐ Yes ☐ No (Explain in COMMENTS)

4 USE: ☐ Single Family ☐ Type I Public ☐ Heat Pump
☐ Irrigation ☐ Type II Public ☐ _____
☐ Test Well ☐ Type III Public

14. PLUGGING MATERIAL:

Bentonite Chips	from ____ ft. to ____ ft.	____ 50# bags	
Bentonite Pellets	from ____ ft. to ____ ft.	____ 50# bags	
Bentonite Grout	from ____ ft. to ____ ft.	____ 50# bags	
Neat Cement	from ____ ft. to ____ ft.	____ 94# bags	
Cement Grout	from ____ ft. to ____ ft.	____ 94# bags	

Other _____

5. REASON FOR ABANDONING WELL
☐ New Well Drilled
☐ Municipal Water Hookup ☐ Unrepairable
☐ Other _____

6. CASING:
____ in. dia. to ____ ft. depth.
____ in. dia. to ____ ft. depth

7. CASING MATERIAL
☐ Steel ☐ Other _____
☐ Plastic

15. LOST CIRCULATION ZONE MATERIALS USED ☐ Yes ☐ No
Type _____ Quantity _____ Placed from ____ ft. to ____ ft.

8. CASING STATUS AFTER PLUGGING
☐ Buried ____ ft. below grade ☐ Removed
☐ Above Grade ____ in.

16. PLUGGING SKETCH (Complete if combination of materials was used.)
Show type of plugging materials and interval plugged.

MATERIAL _____ FEET BELOW GRADE

9. FLOWING WELL: ☐ Yes ☐ No

10. SITE SKETCH:
Show location of plugged well(s) relative to buildings, drives, roads, and other structures or landmarks on site. Include a North arrow.

11. COMMENTS

17. WATER WELL CONTRACTOR'S CERTIFICATION:
This well was plugged under my jurisdiction and this report is true to the best of my knowledge and belief.

REGISTERED BUSINESS NAME _____ REGISTRATION NO. _____

Address _____

Signed _____ Date _____
AUTHORIZED REPRESENTATIVE

NOTE: Plugging from well bottom up to ground surface is required.

Authority Act 368 PA 1978 Completion Required
Penalty: Completion of notification of any provision is a misdemeanor.

DRILLING CONTRACTOR COPY

DEMOLITION

A. General

1. Work Included

This work includes demolition of existing structures. This work also includes proper disposal of the materials resulting from the demolition.

The Developer shall take such precautions as necessary to protect existing equipment that is not to be removed from being damaged.

Developer shall obtain approval from City of Swartz Creek Department of Public Works and Swartz Creek Fire Department for demolition of any structure.

B. Execution

Developer shall coordinate with City and other utility owners the proper disconnection of existing utilities. Existing sanitary and water services shall be properly bulkheaded and abandoned to the city's satisfaction.

Where items are to be removed or demolished, it shall be done in a manner that does not damage adjacent structures, piping, equipment or other items that are to remain in place or are to be salvaged.

Damage to adjacent items that are not to be removed will be replaced or repaired at the developer's expense.

Broken concrete, debris, old piping materials and other items resulting from demolition shall become the developer's property and disposed of properly.

Demolition must be performed expeditiously.

CITY OF SWARTZ CREEK
UTILITY ABANDONMENT CHECKLIST

Date of inspection: Time:

Address:

Type of materials:

Water

Sewer

Cleanout out location

Curb box location

Size of Service

Water

Sewer

Ground condition

SKETCH: Include main, structure, clean-outs, and directions.

Water __ Remove Cross Connection (If well is for irrigation-non-potable use)
___ Filled Capped Procedure for well, if applicable
___ Service lead properly abandoned

Septic tank pumped and crushed: YES_____ NO_____

Sanitary lead properly bulkheaded: YES_____ NO_____

Inspector: Date: