

**MIAMI COUNTY
ENGINEER**

**SUBDIVISION
DESIGN AND
CONSTRUCTION
STANDARDS**

FOREWORD

This manual has been prepared to aid engineers in the preparation of subdivision plans and engineering design and to inform interested persons of the procedures and stands for design and construction of subdivision improvements in the unincorporated area of Miami County. The rules, standards, specifications, criteria, etc. are to supplement the Subdivision Regulations of the Miami County Planning Commission.

It is not the intent of this manual to take away from the designing engineer any responsibility for the technical adequacy of his design or freedom to use his engineering judgment and discretion in the practice of his profession. It is recognized that matters of engineering design cannot be set out in writing to cover all situations, however, the design standards as set out herein represent good engineering practice. Any design methods or criteria different than that listed will receive consideration for approval, provided the proposed variances and the reasons for their use are submitted to the County Engineer's Office.

The County Engineer, at any time during design or construction, shall have the authority to modify any engineering or construction detail, whenever required for the protection of the public interest.

SECTION 100
BOND FOR INSTALLATION OF IMPROVEMENTS

100 Bond

- A. In order that the county has the assurances that the construction and installation of such improvements as streets, curbs, sanitary sewers, storm sewers, water lines, storm-water storage facilities, etc. will be constructed, the Subdivider shall enter into the following agreements:
1. Prior to approval of the record plat by the Miami County Commissioners, the Developer shall enter into a contract with the County Commissioners assuring performance of all provisions of the Planning Commission regulations and the construction standards as set forth in these specifications. The contract forms are available in the office of the Miami County Engineer.
 2. The Developer shall also furnish a bond executed by a surety company, certified check or approved letter of credit with no expiration date, to the Board of County Commissioners covering the estimated cost of required improvements plus 10% for contingencies.

101 CONDITIONS

- A. The security shall provide that the Subdivider, his heirs, successors and assigns, their agents or servants, will comply with all applicable terms, conditions, provisions, and requirements of these regulations, and will faithfully perform and complete the work of constructing and installing such facilities or improvements in accordance with such laws and regulations.
- B. Before said security is accepted, it shall be approved by the proper administrative officials.
- C. Whenever a cash deposit is made, the same shall be made to the County Treasurer of Miami County.

- D. Preceding the acceptance of the Developer's security, an itemized list of materials and their cost shall be submitted to the Miami County Engineer. Construction cost estimates shall reflect realistic and current bid prices.

102 EXTENSION OF TIME

- A. If the construction or installation of any improvement or facility, other than the final lift of asphalt, for which guarantee has been made by the Developer in the form of a security, is not completed within eighteen (18) months from the date of the Subdivider's contract the Developer may request the Miami County Board of Commissioners to grant an extension, Miami County will use as much of the security as necessary to complete the construction of the improvements.
- B. The same shall apply whenever construction of improvements is not performed in accordance with applicable standards and specifications.

103 INSPECTION FEES

- A. An inspection fee of \$50.00 per platted lot will be charged to cover the Miami County Engineer's expenses for record plat reviews, construction drawing review, and general construction inspection of all roadway related items, including any and all associated drainage features.
- B. A cashier's or certified check in the designated amount will be deposited with the Miami County Engineer. This deposit will be made in conjunction with the performance security.

104 COMPLETION OF WORK

- A. As required improvements are completed, approved, and accepted, the Miami County Board of Commissioners may, with the concurrence of the Miami County Engineer, reduce the amount of the security.

105 MAINTENANCE BOND

- A. Upon acceptable completion of installation of the required improvements, the Subdivider shall execute a maintenance bond or certified check, escrow account, approved letter of credit or other means of security with the Board of County Commissioners equaling ten percent (10%) of the cost of construction. At the end of the one (1) year maintenance period, the Miami County Engineer shall issue a letter to the Board of County Commissioners, and such letter shall be sufficient evidence for the release of the security by Miami County. The final lift of asphalt shall be covered under a separate maintenance bond that shall run for a period of one (1) year following acceptance of said final lift. In lieu of the above, one maintenance bond is permissible that will run for a period of eighteen (18) months following final acceptance of all items except final course asphalt.

106 ACCEPTANCE

- A. When the proper administrative officials, following final inspection of a subdivision, certify to the Miami County Board of County Commissioners, that all improvements have been constructed in accordance with County specifications, the Miami County Board of County Commissioners may proceed to accept the facilities for which the security was posted.

107 FAILURE TO COMPLY

- A. In the event the improvements under this Subdivider's Contract are not completed within eighteen (18) months after the execution date of the Contract, or that in the opinion of the Miami County Engineer or Miami County Sanitary Engineer that the Subdivider is not constructing the improvements in accordance with the provisions of the Subdivider's Contract, Miami County shall proceed with the work and hold the Subdivider and the Surety jointly responsible for the cost thereof.

SECTION 200

CONSTRUCTION PROCEDURE AND MATERIALS

200 GENERAL

- A. The Subdivider shall design and construct improvements not less than the standards outlined in these regulations. The work shall be done under Miami County supervision and shall be completed within the time fixed or agreed upon by the Miami County Board of Commissioners.
- B. It is the responsibility of the Developer and his engineer to investigate local conditions that may require additional improvements.

201 PRE-CONSTRUCTION MEETING

- A. A pre-construction meeting with the Miami County Engineer is required. The Subdivider, his contractor, his engineer, and representatives from utility companies involved shall be present at the meeting. It shall be the Developer's responsibility to arrange the pre-construction meeting.

202 MATERIALS

- A. All work and materials shall conform to the Ohio Department of Transportation, Construction and Materials Specifications, and the Standards and Specifications of Miami County, Ohio. Ohio Department of Transportation Standards are acceptable and may be required at the discretion of the County Engineer.

203 INSPECTIONS

- A. Periodic inspection during the installation of improvements shall be made by Miami County to insure conformity with the approved plans and specifications as required by these and other regulations. The Subdivider shall notify proper administrative officials at least twenty-

four (24) hours before each phase of the improvements is ready for inspection.

- 1) Normally these inspections for street and storm drainage shall be as follows:
 - a. Street coring operations.
 - b. Storm sewer and culvert installation.
 - c. Construction of manholes and catch basins.
 - d. Inspection of forms prior to placement of concrete curb and gutter.
 - e. Placement of concrete for curb and gutter.
 - f. Sub-base for street construction.
 - g. Placing of each lift of base.
 - h. Utility installation within street right-of-ways.
 - i. During each phase of road surfacing operation.
- B. The absence of an inspector from a plat during construction shall not relieve the Subdivider from full responsibility under this agreement.
- C. Weight and delivery tickets shall be furnished to the County Engineer to substantiate the type, quantity, and size of material used.

204 RESPONSIBILITY

- A. All work shall be under the control and supervision of the Subdivider until written final acceptance is given by the Miami County Engineer.

205 FINAL INSPECTION

- A. Upon completion of all the improvements, the Subdivider shall request, in writing, a final inspection by the Miami County Engineer and/or Miami County Sanitary Engineer as required under Section 711.091 of the Ohio Revised Code.

SECTION 300 SUBMISSION OF PLANS

300 CONSTRUCTION DRAWINGS

- A. Complete construction drawings signed and approved by a registered engineer shall be made for all new streets and other improvements to be constructed in any subdivision in Miami County outside of municipalities. Said drawings are to be approved by the County Engineer before any construction may begin and before the plat of said subdivision may be recorded.

- B. Submission of plans shall comply with Planning Commission regulations.

301 PLAN AND PROFILE

- A. The plan and profile shall be on 24" x 36" standard plan profile linen at a scale of 1" = 50' horizontal, 1" = 5' vertical or 1" = 40' horizontal, and 1" = 6' vertical as approved by the County Engineer.

- B. Plans and profiles shall show all necessary data in sufficient detail for the complete construction of all work and improvements to be made in the plat.

- C. All grade elevations shall be based on U.S.G.S. datum.

- D. More specifically, all plans and profiles shall show and include the following items:

GENERAL PLAN

- 1. Show all proposed lots, streets, and curbs, etc.
- 2. Existing pavements, headwalls, piers, etc.
- 3. Typical street and curb sections.
- 4. Construction notes.
- 5. Structural details.

6. North arrow (preferably up or to the right).
7. Street names.
8. Centerline stations (south to north and west to east where possible).
9. Easements for utilities and storm drainage.
10. Pavements and right-of-way widths.
11. Lot numbers and dimensions.
12. Curb radius at intersections (if not covered in notes).
13. Curve data; station of PC, PT, PCC.
14. Sheet reference.
15. Plat section lines (boundary lines) show stations.
16. Dimension utility locations.

GENERAL PROFILE

1. Existing centerline and proposed top of curb profiles.
2. Centerline stations.
3. Curb elevations at minimum 50 foot stations.
4. Label proposed centerline and top of curb profile.
5. Profile of sewers and utilities in easements through lots.
6. Stations and centerline elevations intersecting streets.
7. Label "curb elevations" at upper left hand corner of profile grid.
8. Inset title box in lower right corner.

STORM SEWER PLAN

1. Show proposed storm sewers, manholes, laterals, catch basins, headwalls, etc.
2. Label each span length and pipe size.
3. Station low points of grade and manholes.

STORM SEWER PROFILE

1. Show length of span, size, grade and class of pipe.
2. Label stormwater manholes, junction boxes, etc., and show centerline of streets and stations of each.
3. Show invert elevations of all pipe at manholes, headwalls, junction boxes, etc.
4. Show elevation on top of manhole or catch basin, when not in paved street or when in vertical curve portion of street.

SECTION 400 STORM SEWER DESIGN

400 REQUIRED SYSTEM

- A. All proposed subdivisions shall have a storm drainage system designed to serve the area being platted. It shall be compatible to any adjacent storm sewer systems and shall have in all cases a clear and unobstructed outlet.

- B. The storm sewer design shall be based on a post developed 10-year storm. It encompasses the hydraulic analysis and the design of all closed conduits including all inlets, manholes, or other appurtenances designed to collect stormwater from streets and lots including the necessary piping for the collection of sump pump drains.

401 HYDRAULIC ANALYSIS

- A. Storm sewers in proposed developments and streets shall be designed by the rational method according to the following formula: $Q = CiA$.

Where:

Q = Runoff in cubic feet per second (cfs)

C = Runoff coefficients. The minimum runoff coefficients are listed below according to development density.

Agricultural -- 0.30

Residential

 R-1AAA & R-1AA -- 0.35

 R-1A & R-1B -- 0.40

 R-1C & R-2 -- 0.45

 R-3 & R-4 -- 0.60

Business and Industrial Use:

The runoff coefficients for these uses will vary according to the area occupied by the buildings, sidewalks, streets, and parking areas. Each proposed plan will be evaluated separately to determine the runoff coefficient. If no proposed plan is available when designing the storm sewer system, runoff coefficient of 0.90 will be used. All plans and calculations used in evaluating the runoff coefficients will be submitted along with the computation sheets of the storm sewer design.

i = Rainfall intensity in inches per hour for a selected storm frequency. In determining i for storm sewers, the maximum allowable time of concentration, (T_c), at the initial inlet shall be 20 minutes. With a 10-year design frequency and an initial time of concentration of 20 minutes an intensity of 4 inches per hour shall be used, as shown on the intensity-duration curves chart. To determine i at the next inlet, determine the time of flow between inlets and add this to the initial time of concentration (20 minutes). Check this time versus time of concentration for area contributing directly to second inlet, and use larger of the two T_c 's. Using new T_c , find new intensity on intensity-duration curves chart.

A = Drainage area, in acres.

- B. For drainage areas over 10 acres and for determining major storms the method explained in "Urban Hydrology for Small Water Sheds", Technical Release No. 55, should be used to provide peak rates of runoff.
- C. Runoff (Q) for the design of open ditches shall be calculated using the Rational Formula, Technical Release No. 55, or other method approved by the Miami County Engineer. The design shall be based on a 25-year storm frequency.

402 VELOCITIES OF FLOW IN STORM SYSTEMS

- A. The velocity of flow in pipes and open ditches will be calculated in accordance with the Manning's Formula:

$$V = \frac{1.486}{n} R^{2/3} S^{1/2}$$

Where: V = Velocity in feet per second

N = Manning's roughness coefficient concrete pipe n = 0.012

Open ditches n = 0.030

R = Hydraulic radius (Area v Wetted Perimeter)

S = Slope in feet per foot

- B. The minimum velocity in pipes and open ditches shall be 2 feet per second under full flow conditions. Outlet velocities between 5 feet per second and 20 feet per second from storm sewers or culverts into an open ditch will require rock channel protection. Outlet velocities less than 5 feet per second will generally require no protection unless otherwise directed by the Miami County Engineer.
- C. The flow in pipes and open ditches may be computed using Manning's Equation or may be taken from nomograph charts.

Manning's Equation: $Q = \frac{1.486}{n} (A) (R)^{2/3} (S)^{1/2}$

When: R = Hydraulic radius = A/P feet

S = Slope of pipe in ft/ft

n = Roughness coefficient

A = Cross sectional area in sq. ft.

P = Wetted perimeter ft.

Q = Flow (C.F.S.)

403 STORM SEWER COMPUTATION SUBMITTAL

- A. The following information will be submitted along with the storm sewer layout on the construction plans:

1. A topographical contour map at a scale of 1 inch to 100 feet. Existing contours at one foot (1') contour intervals for areas of zero percent (0%) to ten percent (10%) slope, in two foot (2') intervals for areas of ten percent (10%) to twenty percent (20%) slope and five foot (5') intervals for areas over twenty percent (20%) slope. Included on this map will be the incremental acreages contributing to each pipe section. The topographical map shall cover an area at least 200 feet beyond the platted boundaries.
2. A map outlining each drainage basin which contributes to the area being studied. This can be the U.S.G.S. map. All areas covered by petitioned county ditches shall be shown on this map.
3. A computation sheet of the storm sewer design.
4. Any channel running through the proposed subdivision with a drainage area of 30 acres or more shall have the rate of runoff determined on a 100-year frequency. Any proposed buildings in the channels flood plain are to be checked as to keep the minimum building elevation above the 100-year flood elevation.

404 PIPE REQUIREMENTS FOR STORM SEWER

- A. Pipe for storm sewers shall be concrete pipe unless otherwise approved by the County Engineer and shall be in accordance with applicable A.S.T.M. or Ohio Department of Transportation specifications.
- B. Minimum diameter of storm sewer laterals shall be twelve (12) inches.
- C. All storm sewers shall generally be offset parallel to and eight feet (8') from the centerline of proposed roads or streets.
- D. All storm sewer shall conform to the minimum requirements for cover as specified by the manufacturer.
- E. Where different size storm sewer pipe enter a storm manhole, the tops of the inner diameter shall be held at the same elevation. Elevations

shall be shown on the storm sewer profile for each of the inverts of the different pipes.

405 INLET REQUIREMENTS

- A. Stormwater flow in street gutters shall be intercepted by catch basins spaced at a maximum distance of 300 feet from another catch basin or high point.
- B. Curb inlets shall be placed in such a manner that no stormwater shall flow through any intersection.
- C. All changes in grade, alignment and the intersection of two or more sewers must take place in a manhole or combination manhole-catch basin.
- D. All inlets located in street sags or other low points must have a back up system as protections. In most cases, this back up system could be a drainage overflow swale running down a lot line to an acceptable outlet. The back up system may include an inlet or open grate manhole at a higher elevation.
- E. The capacity of the inlet shall not be less than the flow tributary to the inlet.
- F. Storm manholes shall be spaced at a maximum distance of 300 feet unless otherwise directed by the Engineer.

406 STORM SEWER SPECIFICATIONS FOR EXCAVATION

- A. The Contractor shall do all excavation of material encountered to depth shown on plans. Excavated materials not required for fill or backfill shall be removed from the site as directed by the Engineer.
- B. Excavation for manholes and other accessories shall have twelve inch (12") minimum and twenty-four inch (24") maximum clearance on all sides.

- C. Trenches shall be excavated to a width sufficient to allow for proper jointing of the conduit, and thorough compaction of the granular bedding and backfill material under and around the conduit, except that the width of the trench at the top of the conduit shall not exceed 12 inches on each side, or be less than 6 inches on each side of the conduit for pipe diameters or spans of 24 inches or less and not exceed 15 inches on each side, or be less than 6 inches on each side of the conduit for larger sizes.
- D. Banks of trenches shall be vertical unless otherwise approved by the Engineer, and work procedures shall meet O.S.H.A. standards. It shall be the responsibility of the Contractor to insure that all trenches and/or open excavations are sufficiently identified, barricaded, and shored to insure the safety of the general public, and the work force.
- E. Ground adjacent to all excavation shall be graded to prevent water running into the trench.
- F. The Contractor shall remove, by pumping or other means approved by the County Engineer, any water accumulated in the excavation. Trenches shall be kept dry for laying pipe.
- G. In rock, excavations shall be carried to a depth of $\frac{1}{4}$ the diameter of the pipe, but in no case less than six inches (6") below the bottom of the pipe.

407 STORM SEWER BEDDING

- A. Storm sewers both inside and outside of street areas shall be bedded in conformance with O.D.O.T. specifications 603.04 class B bedding. Bedding material shall be No. 57's unless otherwise approved by the County Engineer.

408 STORM SEWER BACKFILL

- A. Initial backfill area is defined as the area between the bedding (pipe bottom) and six inches (6") above the top of the pipe.

1. Initial backfill for any storm sewer within the street right-of-way area shall be No. 57's unless otherwise approved by the Engineer.
 2. Initial backfill for any storm sewer outside the street right-of-way area may consist of approved excavated material from the trench, but shall not contain stones larger than four inches (4") in diameter.
- B. The remainder of the backfill within the street right-of-way areas shall be granular material approved by the Miami County Engineer.
 - C. The remainder of the backfill outside the street right-of-way areas may be excavated material that is free from lumber and debris.
 - D. All backfill is to be compacted to at least the density of unexcavated adjacent material. This compaction shall be obtained by using approved rollers, vibration equipment or mechanical tampers to meet the requirements of the specifications.
 - E. Requirements for the backfilling of manholes, catch basins, and utility trenches shall be the same as pipe backfill.

409 SUMP PUMP LINES

- A. No sump pump lines may be tied to the sanitary sewer or to the curb. A separate pipe is to be run 12" - 18" behind the back of the curb and at an approximate depth of 2 – 3 feet and tied into the nearest possible catch basin or storm manhole. The pipe should be 6 inches in diameter SDR 35 or ARMCO A-2000, and run on a constant grade until discharge. Cleanouts should be spaced approximately every 200 feet, and at the end of each line. The sump pump line shall be placed on 4" of approved granular bedding and backfilled with approved granular material to a depth of 12" over the top of the pipe. Prior to making the sump connection, a permit must be obtained from the Miami County Engineer.

SECTION 500 CURB AND GUTTER

500 GENERAL

- A. Line and grade for all curb and gutter construction shall be set under the direction of the Developer's engineer. The Contractor shall work from said lines and grades as furnished by the Engineer and shall be responsible for protecting stakes and other markers as set.
- B. The curb and gutter shall be constructed to exact line and grade before the flexible pavement is placed.
- C. Curb and gutter shall be placed using either a curb machine or by using steel forms to form the front and back of the combined curb and gutter.
 - 1. If a curb machine is used, the concrete shall be placed in accordance with O.D.O.T. item 609.04 (C), and expansion joints provided as directed by the Engineer.
 - 2. If steel forms are used, the following specifications shall apply:
 - a. Curb section shall be a maximum of ten feet in length. One-half inch (1/2") pre-molded expansion joints shall be spaced fifty feet (50') apart but will not be required where full depth templates provide one-eighth inch (1/8") separation of the ten foot (10') sections.
 - b. All concrete shall be spaded thoroughly to insure contact with forms at all points and to eliminate honeycomb.
 - c. Flexible forms shall be used on all curves having a radii of 275' or less.
 - d. All utility trenches crossing the line of curb and gutter shall be thoroughly compacted and tamped to provide proper settlement prior to placing of the concrete. In

addition, a minimum of three 5/8-inch reinforcing rods shall be equal spaced two inches clear from the bottom of the curb adequately spanning the utility trench to eliminate future settlement of the curb and gutter.

- D. Curbs shall be formed to the cross-section as shown on the drawings with a mule or templates supported on the side forms.
- E. Concrete shall be given a reasonably smooth uniform flat finish or broom finish, all edges rounded. Gutter line shall be true to grade unobstructed by expansion material or uneven construction joints. All excavations for curb and gutter shall be made to allow for a minimum of 4" of 304 aggregate.
- F. The Contractor shall at all times provide protection against weather, rain, wind, storms, frost, and heat so as to maintain all work and materials free from injury or damage.
- G. Where the Contractor is performing work on or near the traveled portion of any highway, he shall provide and maintain guard lights and barricades to protect the public from obstructions, trenches, excavations, or other obstacles brought about by his construction.
- H. Concrete shall be Class "C" according to O.D.O.T. Specifications.
- I. Concrete shall have a minimum of six percent (6%) air entrainment. Preparation and curing of concrete shall be in accordance with Item 499 of the O.D.O.T. Specification. Excavated areas adjacent to face and back of curb and gutter shall be backfilled as soon as practical after removal of forms to assure maintenance of proper line and grade.
- J. Where fill is necessary to obtain proper sub-grade, approved crushed material shall be used for said fill, thoroughly tamped and compacted. All excavations shall be maintained in a dry condition prior to placing of concrete.

SECTION 600 CULVERTS AND BRIDGES

600 GENERAL

- A. A culvert or bridge is designed to carry water from one side of the road to the other. A single span culvert shall always be used in lieu of multiple spans. The only time a multiple opening culvert will be considered is when no other single span structure will function.

601 DESIGN

- A. Hydraulic Engineering Circular No. 5 is the recommended procedure for design. All culverts and bridges shall be designed for a 50-year storm frequency.
- B. All pipe culverts shall extend to the right-of-way lines of the road or street.
- C. A structure having a span of 100 feet or more shall be classified as a bridge and shall be designed for HS 20-44 loading. The maximum allowable head shall be 18" below the top of the curb. All bridges shall have a minimum width equal to the pavement width B/B curb plus 8 feet, and shall be adequately protected with guardrail in accordance with O.D.O.T. Specifications.

SECTION 700
RETENTION / DETENTION REQUIREMENTS

700 GENERAL

- A. On January 28, 1987, the Board of Miami County Commissioners passed a Resolution implementing Miami County's Stormwater Management Control Regulations. A copy of these regulations was filed with the Miami County Recorder in Miscellaneous Book 21, Page 585.
- B. All subdivision plans will be checked for compliance with said Stormwater Management Control Regulations prior to plan approval.
- C. A copy of these regulations may be obtained at the Miami County Engineer's Office.

SECTION 800

STREET DESIGN STANDARDS

800 GENERAL

- A. The Subdivider shall be responsible for the construction of all new streets within a subdivision.
- B. All streets within a subdivision shall be improved the full length and width of the street and a typical cross-section of all new streets shall be shown on the plan.
- C. Street classification shall be determined by the Planning Commission and shall comply with the Miami County Thoroughfare Plan.
- D. Street construction design is based upon the CBR value of the soil subgrade. The Miami County Engineer's Office in cooperation with the State Soil Conservation Service soils scientist and engineer have established CBR (California Bearing Ratio) values for each type of soil found in Miami County. For purposes of street construction standards, four classifications of soil have been established and an engineering design calculated for each classification. The Miami County Engineer shall make soil maps of the area proposed for development available at a nominal charge. The Consulting Engineer shall superimpose the proposed street layout on the soil map so that proper design standards may be determined. Where more than one soil type of varying CBR values occurs on a proposed street, design shall be made on the basis of the lowest CBR. While actual on-site testing is recognized as the proper method of determining the CBR values, the use of soil types may be utilized in lieu of on-site testing as a satisfactory substitute.

CBR VALUE	CLASSIFICATION	SOIL TYPE
6 and over	A	Casco (Cc), Eel (Ee), Fox (Fp, Ft, Fo, Fs), Genesee (Ge, Gn), Hennepin (He), Lorenzo (Lo), Martinsville (Ke), Medway (Md), Ockley (Oc), Rodman (Ro), Ross (Rs), Shoals (Sh), Sleth (Sl), Stonelick (Ge), Warsaw (Wd), Wea (We), Westland (Ws, Wt)
5	B	Blount (Bl), Celina (Ce, Cf), Corwin (Co), Miamian (Mi, Mj, Mk, MI), Milton (Mo, Mp), Morley (My, Mz), Odell (Ohio Department of Transportation), Plattville (Pl), Ritchey (Ri)
4	C	Algiers (Ag), Brookston (Br, Bs), Crosby (Cr, Cs), Millsdale (Mn), Pewama (Pe), Randolph (Rd)
3	D	Montgomery (Mt)
0	E	Edwards Muck (Ed), Linwood Muck (Li), McGuffy (Hli), Wallkill (Wa)
		Construction shall not be permitted in this classification. Soil may be removed and replaced or stabilized and a new CBR value certified by an approved soils testing engineering consultant before construction will be permitted.

801 STREET LAYOUT DESIGN STANDARDS

	Residential (Local)	Collector	Arterial
Minimum centerline grades	.40%	.40%	.40%
Maximum centerline grades	10%	10%	7%
Minimum length of vertical curve	50 ft.	50 ft.	100 ft.
Minimum centerline radius	200 ft.	300 ft.	600 ft.
Minimum length tangent between curves	50 ft.	50 ft.	100 ft.
Minimum back of curb radius	25 ft.	25 ft.	25 ft.
Minimum horizontal visibility	200 ft.	300 ft.	500 ft.
Minimum stopping sight distance (measured from 3.5 ft. eye-level to 6 inch object height)	200 ft.	300 ft.	500 ft.
Maximum centerline grade within 100 ft. of an intersection	3 %	3%	3%
Right-of-way width	50 ft.	60 ft.	80 ft.
Pavement width B/B curb	31 ft.	37 ft.	57 ft.

NOTE:

These are minimum design standards and may be required to be increased to comply with the Miami County Official Thoroughfare Plan.

802 STREET CLEARING AND SUBGRADE PREPARATION

- A. The first step in the actual construction of a street shall be the clearing and grubbing and scalping of the right-of-way and the removal of material prior to starting excavation, embankment (compacted fill) or shaping.
- B. All soft and/or wet areas encountered in the subgrade shall be stabilized with crushed stone or other approved method and/or properly drained by installation of French drains before preparation of the base course is completed.
- C. The road shall be cored to the proposed subgrade elevations, width of work area shall be two (2) feet greater than the dimension from back of curb to back of curb to allow space for forming of curbs. Embankment material shall be of suitable type and shall be placed in uniform layers not to exceed eight (8) inches when using sheeps foot rollers, or not to exceed four (4) inches when using other methods. Each layer shall be thoroughly compacted by rolling with a tamping roller until the "feet" of the roller ride clear without penetrating the earth, or compaction may be accomplished by the use of an approved pneumatic tired roller weighing 8 to 10 tons. In any case, the subgrade whether in cut or in fill shall be compacted to ninety (90) percent of Modified Procter Density.
- D. Embankment and subgrade which do not contain sufficient moisture to be thoroughly compacted to required density shall be sprinkled with water and rolled. The surface of the subgrade shall be uniform and free of holes, depressions and ruts and washes, and must be inspected by the County Engineer's Representative prior to placing of any base material.
- E. During the process of excavation, the roadway shall be maintained in such condition that it will be well drained at all times during construction.

803 BASE CONSTRUCTION

MATERIALS:

- A. Contractor shall notify County Engineer one week prior to construction of base as to the source of the materials he intends to use for the base.
- B. After installation of underground utilities and curb and gutter, subgrade shall be regarded to required cross-section before installing any base material.
- C. Place and compact first course of base to required line and grade. Material shall be graded to required cross-section and compacted to required density before placing following course.
- D. Place and compact second course of base to finished line and required cross-section. Aggregate for these courses shall conform to Ohio Department of Transportation Specifications, Section 703.04 for aggregate base: Items 304 to 411.

SIEVE SIZE	ITEM 304 % PASSING	ITEM 411 % PASSING
2 inch	100	100
1 inch	70 – 90	75 – 100
¾ inch	50 – 85	- - - - -
Number 4	25 – 60	25 – 60
Number 40	7 – 30	7 – 30
Number 200	0 – 15	0 – 15

- E. Placement and compaction of the base material shall be in accordance with Item 304.03 and Item 304.04 of the State of Ohio Department of Transportation Construction and Material Specifications.
- F. As an alternate for base construction, Item 301 – Bituminous Aggregate Base installed in accordance with State of Ohio Specifications and to a depth as specified in Miami County Standards. Each course of 301 shall be tacked, 0.1 gallon per square yard, Item 407, prior to placing of subsequent course.

804 ASPHALT FOR INTERMEDIATE AND SURFACE COURSE

- A. Asphalt pavement depths shall comply with those shown on typical sections included with these specifications.
- B. Intermediate (Item 402) course shall be placed in one lift with all materials, and compaction meeting Ohio Department of Transportation Specifications.
- C. The surface course (Item 404) shall be applied no sooner than 6 months and no later than 12 months following the placement of the intermediate course of asphalt. The intermediate course shall be cleaned and tacked with Item 407 tack coat prior to placing surface course.

SECTION 900 AS BUILT PLANS

900 AS BUILT PLAN REQUIREMENTS

- A. At the completion of construction, the original tracings shall be revised as necessary to provide “as built plans”. This work shall be done by the Subdivider’s Engineer, who was responsible for setting grades and staking for improvements. The “as built plans” shall include the following information:
 - 1. Location of all water and sanitary services.
 - 2. Final elevations and locations of curbs, storm sewers, inlets, drainage swales, detention/retention basins, etc., if different from previously approved plans.

- B. The original tracings shall become the property of the Miami County Engineer.

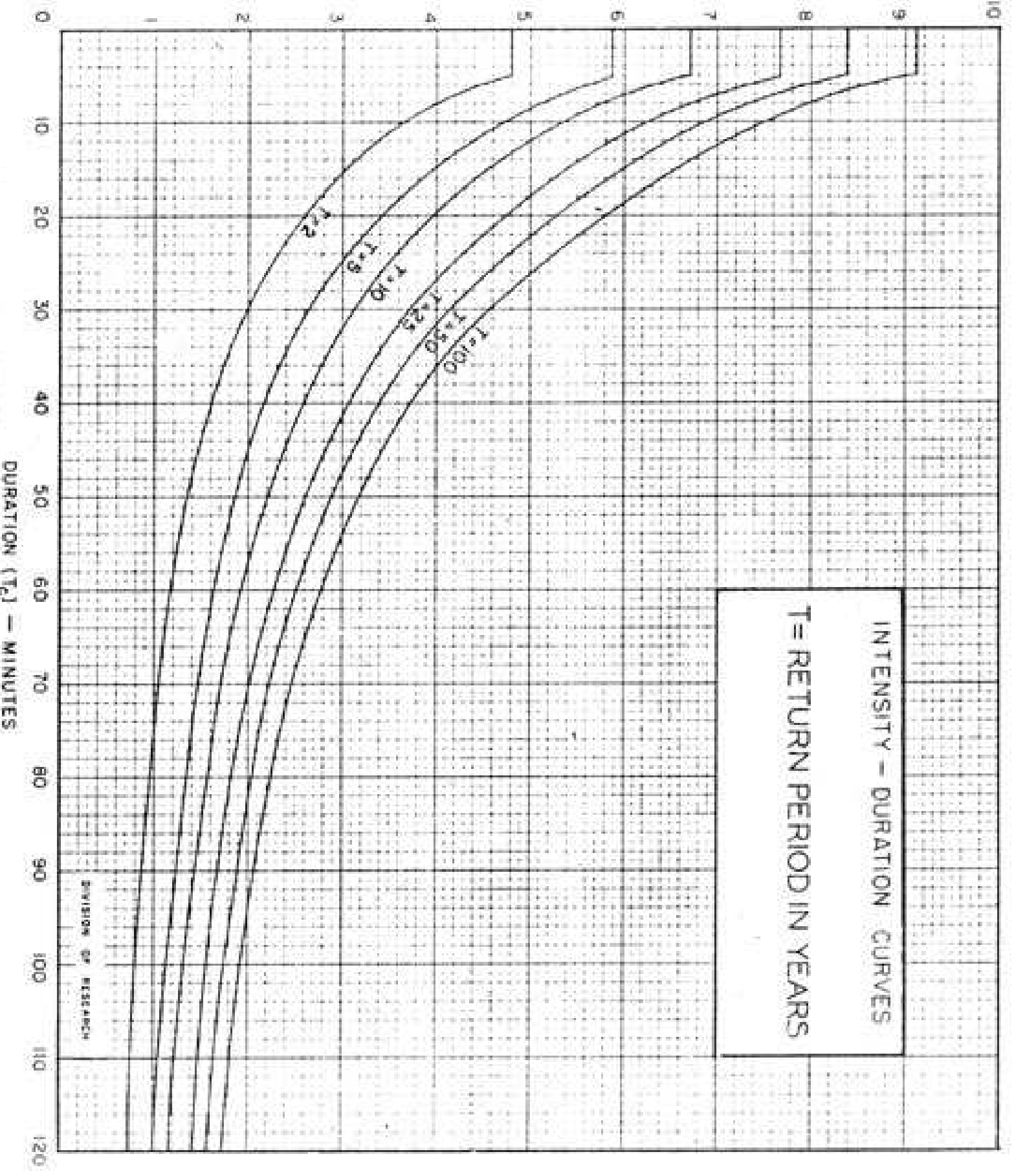
TYPICAL TITLE BOX

OFFICE OF MIAMI COUNTY ENGINEER TROY, OHIO		
PLAN AND PROFILE REDWOOD HILLS SUBDIVISION – SEC. 1		
REDWOOD DRIVE	FROM: TAYLOR ROAD TO: 985' NORTH OF TAYLOR ROAD	
REVISIONS		APPROVED _____ 200 ____
DATE	CHARACTER	BY
MIAMI COUNTY ENGINEER		APPROVED _____ 200 ____
MIAMI COUNTY ENGINEER		APPROVED _____ 200 ____
MIAMI COUNTY ENGINEER		APPROVED _____ 200 ____
PREPARED BY:		REGISTERED ENGINEER NO. _____
B.M. U.S.G.S. MON. AT N.E. CORNER TAYLOR ROAD AND NEAL ROAD ELEV. 851.62		
SCALE: 1" = 50' HORZ 1" = 5' VERT		

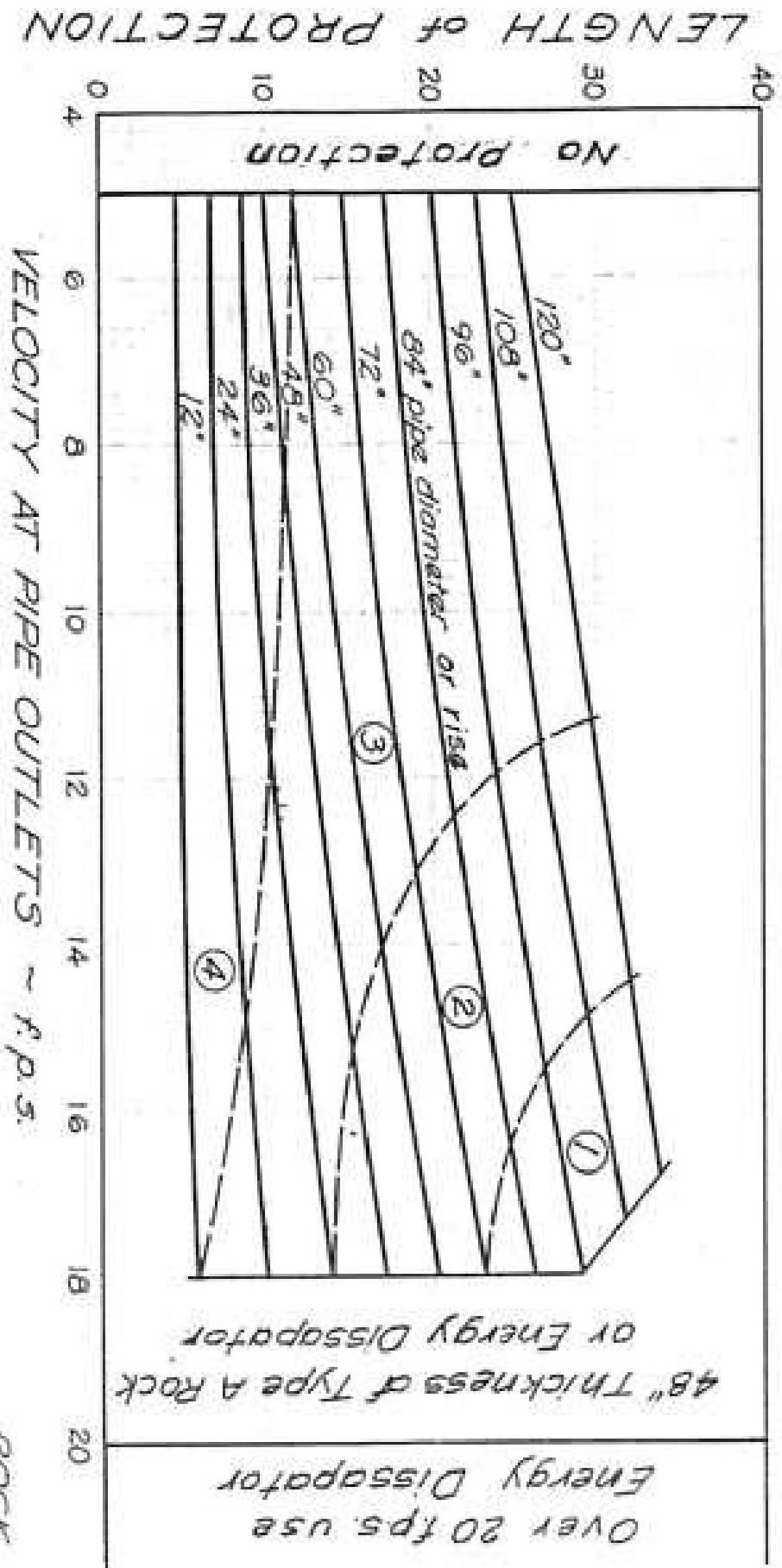
1/2" BORDER

NOTE - ALL CONSTRUCTION DRAWINGS SHALL HAVE A 1/2" BORDER
ALL PROFILE GRID LINES UNDER TITLE BOX SHALL BE REMOVED

INTENSITY (I) - INCHES PER HOUR



ROCK CHANNEL PROTECTION OF CULVERT AND STORM SEWER OUTLETS



NOTES

Rock size (6", 12", 18") indicates the square opening on which 85% of the material by weight will be retained.

Minimum width of protection shall be twice the pipe diameter, with 4' being the very minimum

(Where a stream bed will withstand the calculated velocity without erosion, no rock channel protection will be required)

LEGEND

- ① 48" of 18" rock A
- ② 36" of 18" rock A
- ③ 30" of 12" rock B
- ④ 18" of 6" rock C

ROCK TYPE

Fig. 122-1
Oct. 1981

MINIMUM COVER DEPTHS
Circular Concrete Pipe - Class "B" Bedding

TABLE 1

Pipe Dia.	Height of Cover over top of pipe									
	0'-6"	1'-0"	1'-6"	2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	5'-0"	
12"	5	4	2	2	2	2	2	2	2	2
15"	5	4	2	2	2	2	2	2	2	2
18"	5	4	2	2	2	2	2	2	2	2
21"	4	4	2	2	2	2	2	2	2	2
24"	4	3	2	2	2	2	2	2	2	2
27"	4	3	2	2	2	2	2	2	2	2
30"	3	3	2	2	2	2	2	2	2	2
33"	3	2	2	2	2	2	2	2	2	2
36"	3	2	2	2	2	2	2	2	2	2
42"	2	2	2	2	2	2	2	2	2	2

MINIMUM COVER DEPTHS
Circular Concrete Pipe - Class "C" Bedding

TABLE II

Pipe Dia.	0'-6"	1'-0"	Height of 1'-6"	2'-0"	Cover of 2'-6"	over 3'-0"	top of 3'-6"	of pipe 4'-0"	5'-0"
12"	5+	4	3	2	2	2	2	2	2
15"	5+	4	3	2	2	2	2	2	2
18"	5	4	3	2	2	2	2	2	2
21"	5	4	3	2	2	2	2	2	2
24"	5	4	3	2	2	2	2	2	2
27"	4	4	3	2	2	2	2	2	2
30"	4	3	2	2	2	2	2	2	2
33"	4	3	2	2	2	2	2	2	2
36"	4	3	2	2	2	2	2	2	2
42"	3	2	2	2	2	2	2	2	2
48"	3	2	2	2	2	2	2	2	2
54"	2	2	2	2	2	2	2	2	2

MINIMUM COVER DEPTHS
Horizontal Elliptical Concrete Pipe - Class "B" Bedding

TABLE III

Pipe Dia.	0'-6"	1'-0"	Height of 1'-6"	2'-0"	Cover 2'-6"	over 3'-0"	top 3'-6"	of pipe 4'-0"	5'-0"
14"x23"	HE-4	HE-3	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2
19"x30"	HE-3	HE-3	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2
22"x34"	HE-3	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2
24"x38"	HE-3	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2
27"x42"	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2

MINIMUM COVER DEPTHS
Horizontal Elliptical Concrete Pipe - Class "C" Bedding

TABLE IV

Pipe Dia.	0'-6"	1'-0"	Height of 1'-6"	2'-0"	Cover 2'-6"	over 3'-0"	top 3'-6"	of pipe 4'-0"	5'-0"
14"x23"	HE-4+	HE-4	HE-3	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2
19"x30"	HE-4	HE-3	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2
22"x34"	HE-4	HE-3	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2
24"x38"	HE-3	HE-3	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2
27"x42"	HE-3	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2
29"x45"	HE-3	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2
32"x49"	HE-3	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2
33"x53"	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2	HE-2

CAPACITY OF A GRATE CATCH BASIN IN A SUMP (WATER PONDED ON THE GRATE)

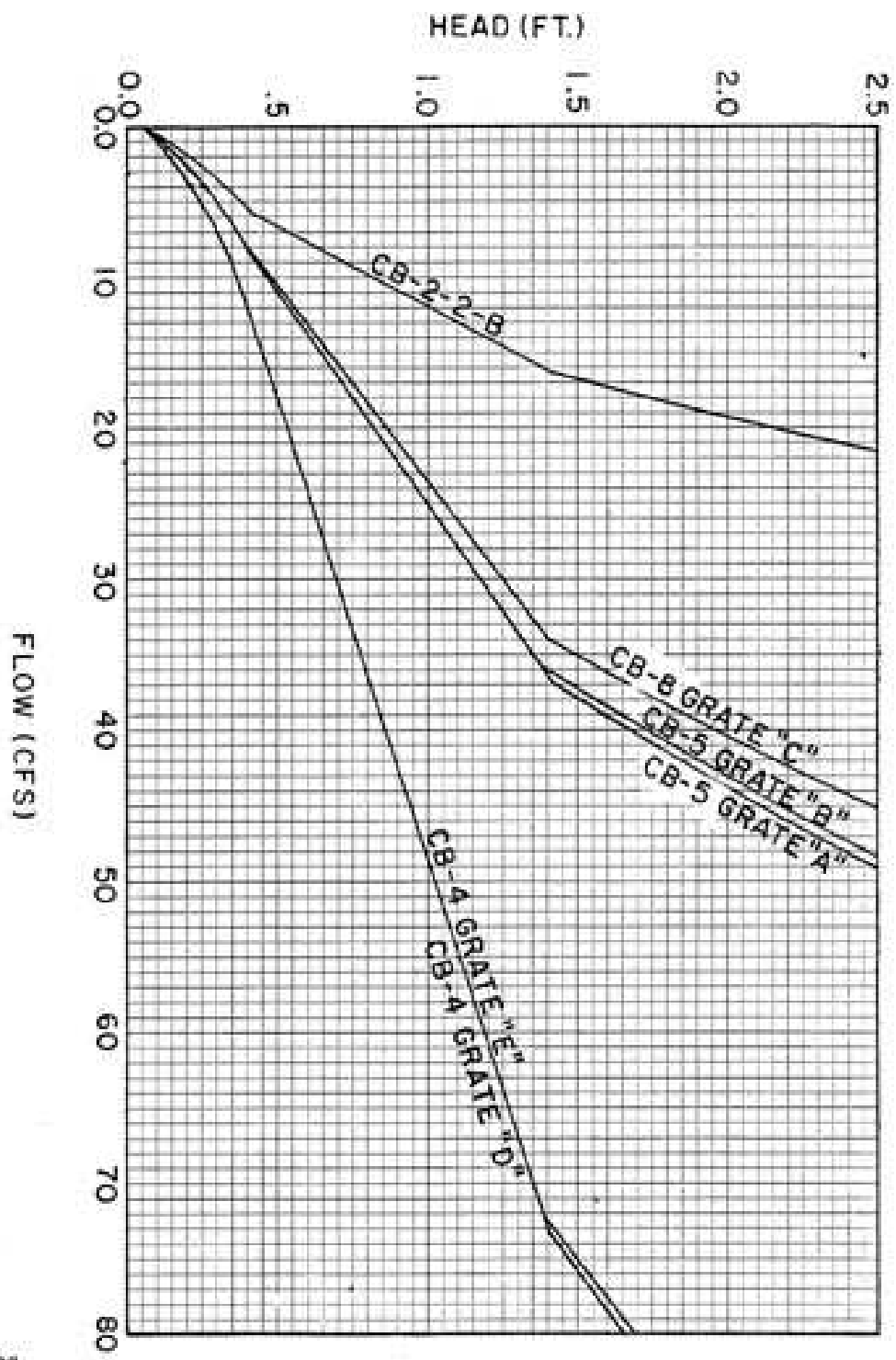
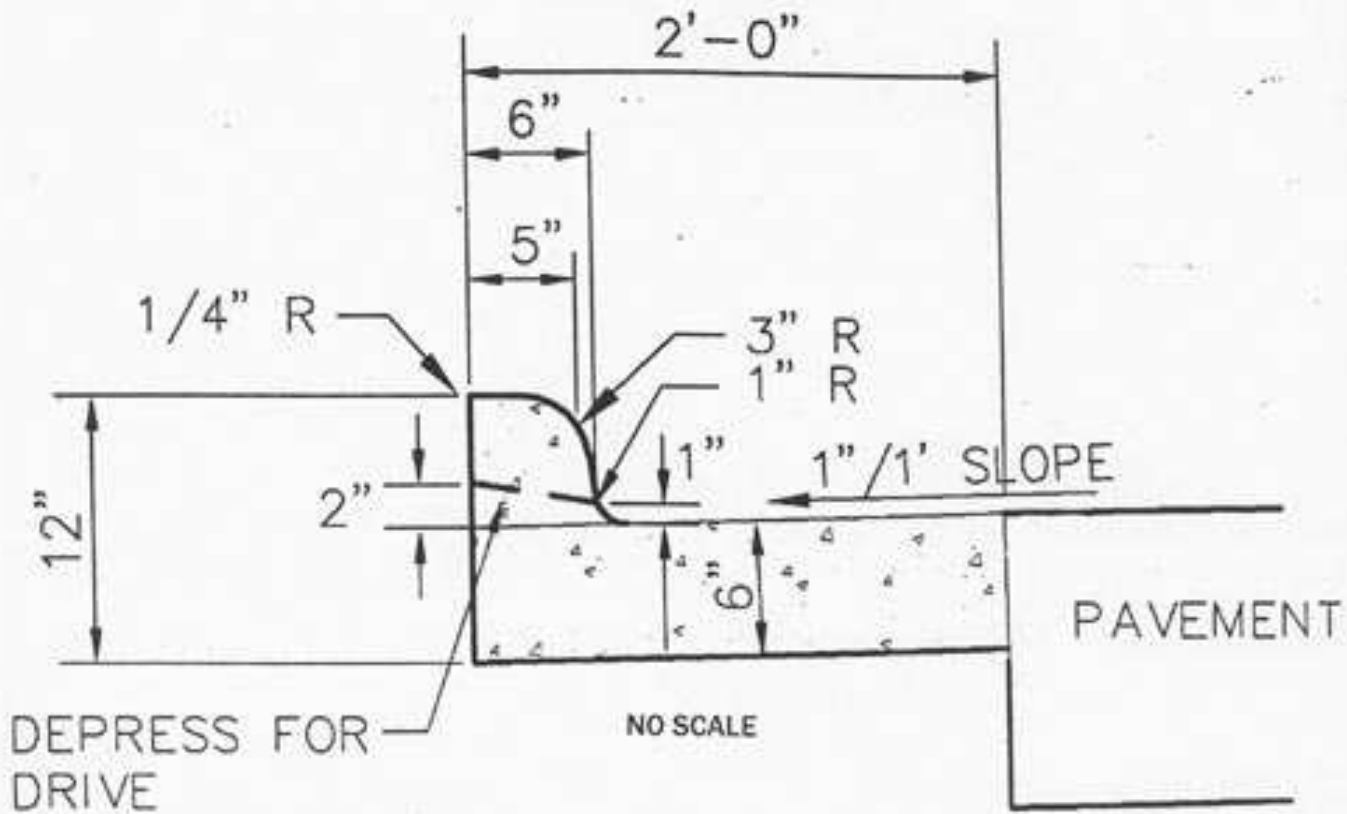
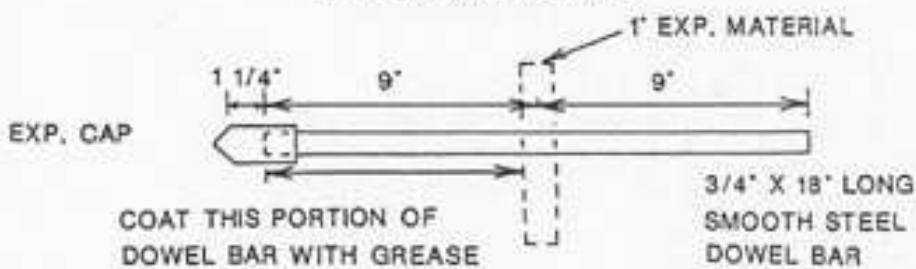


Fig. 1153-1
Oct. 1981

COMBINATION CURB & GUTTER



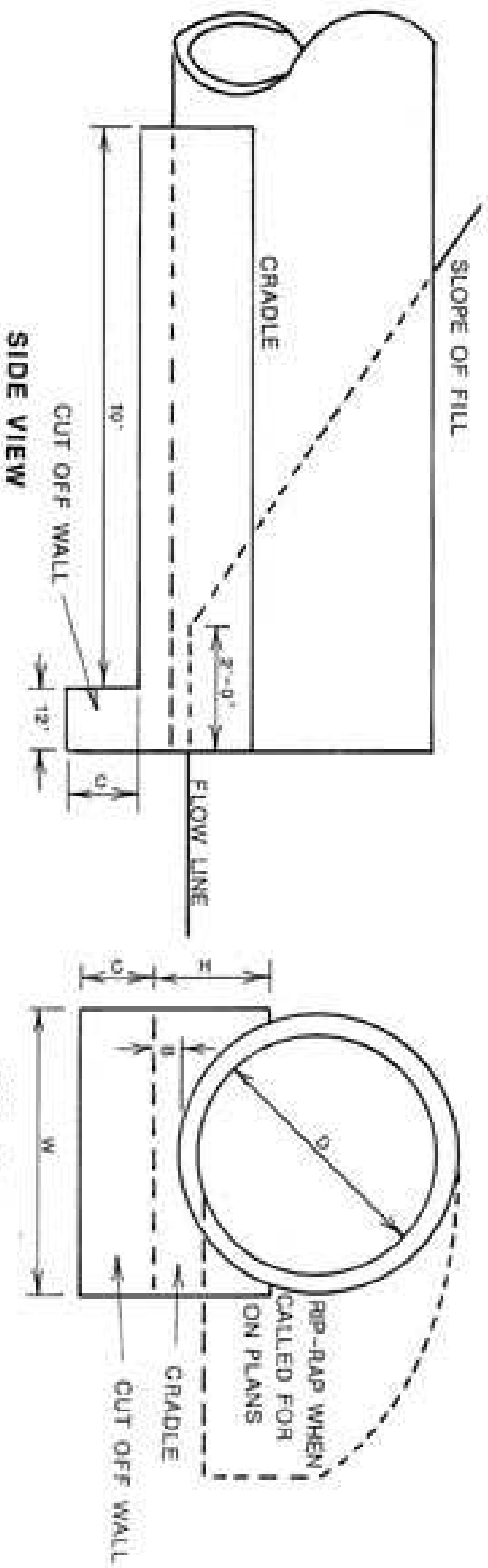
DOWEL BAR DETAIL



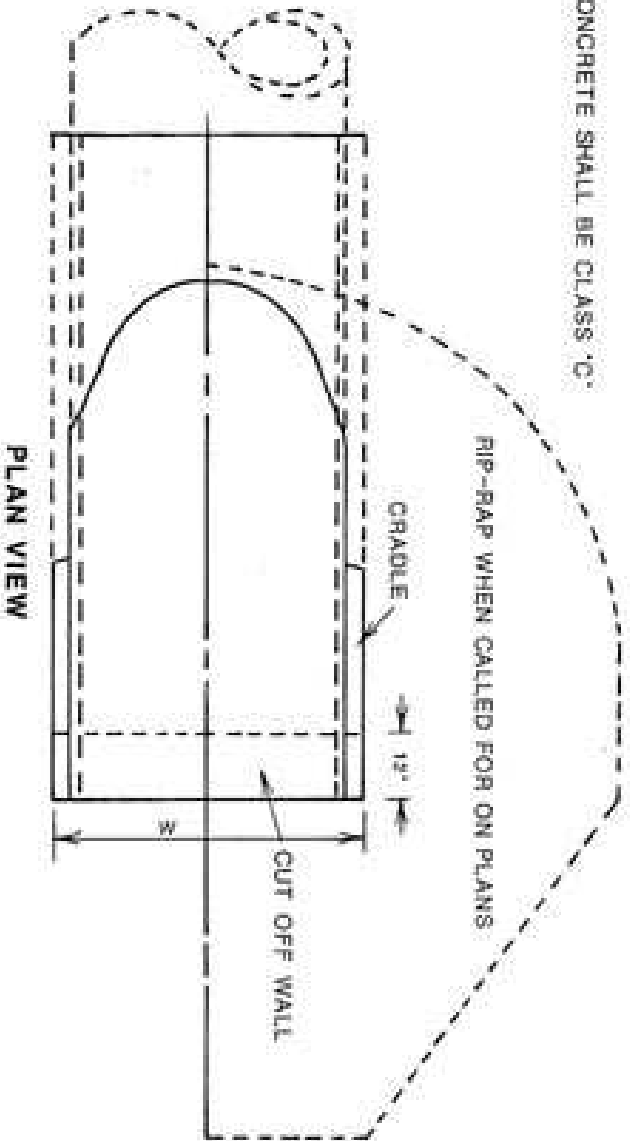
NOTES FOR CURBS & GUTTERS

- 1) CONCRETE FOR CURBS AND GUTTERS SHALL BE ODOT CLASS C
- 2) AN APPROVED CURING AGENT SHALL BE APPLIED AFTER FINISHING
- 3) 1" EXPANSION JOINTS SHALL BE INSTALLED AT CATCH BASINS AND AT POINTS OF CURVATURE
- 4) TWO (2) SMOOTH STEEL DOWEL BARS, 3/4" X 18" LONG, WITH EXPANSION CAPS SHALL BE INSTALLED AT EACH EXPANSION JOINT AS SHOWN IN DETAIL
- 5) CONTRACTION JOINTS SHALL BE PROVIDED AT 10' INTERVALS

PIPE CRADLE DETAIL

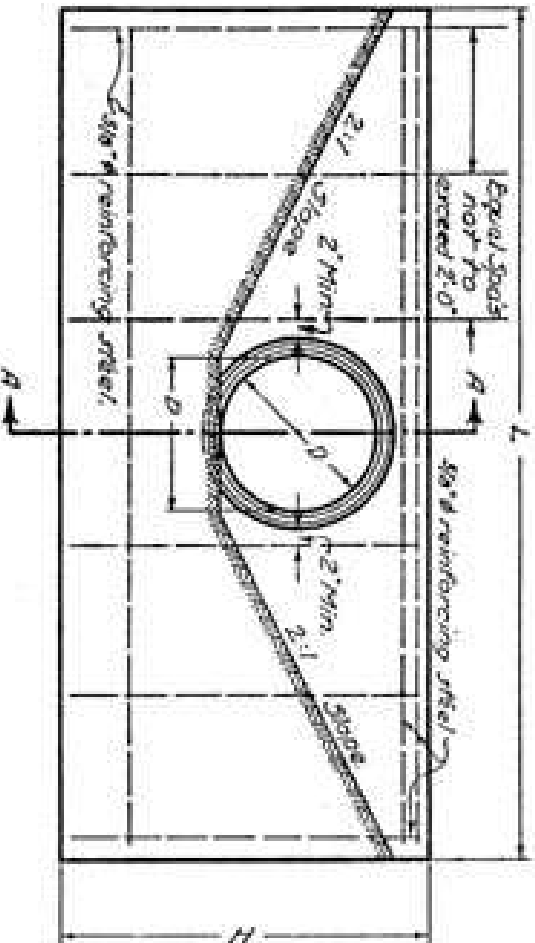


CONCRETE SHALL BE CLASS 'C'

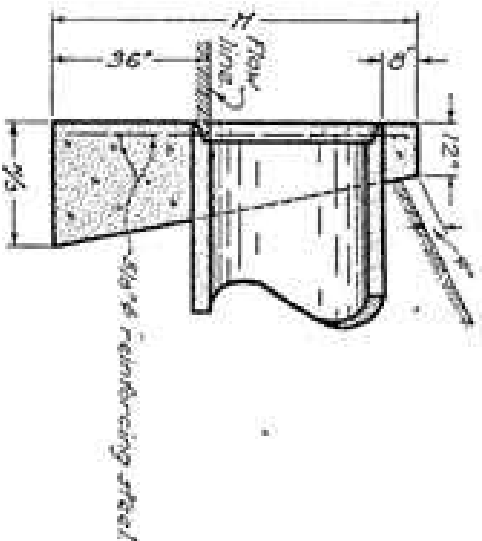


D	B	C	H	W
12"	6"	1'-4"	0'-11"	1'-10"
15"	6"	1'-4"	1'-0"	2'-1"
18"	6"	1'-4"	1'-2"	2'-5"
24"	6"	1'-3"	1'-4"	2'-11"
27"	6"	1'-3"	1'-5"	3'-3"
30"	6"	1'-3"	1'-6"	3'-6"
33"	6"	1'-3"	1'-7"	3'-10"
36"	6"	1'-3"	1'-8"	4'-1"
42"	6"	2'-2"	1'-11"	4'-8"
48"	6"	2'-2"	2'-1"	5'-3"
54"	8"	1'-11"	2'-4"	5'-11"

HEADWALL DETAIL



ELEVATION



SECTION A-A

NOTES

CONCRETE shall be Class "C" REINFORCING STEEL BARS shall be 1/2 inch round.

DIMENSIONS AND QUANTITIES are shown for circular sections only. It will be necessary to determine dimensions for the headwall required for reinforced elliptical concrete pipe or corrugated metal pipe arches in accordance with the equations listed on this drawing. Chamfer all exposed corners 1/4 of an inch.

FOUNDATION Where the soil borings indicate a bearing capacity of less than 2600 pounds per square foot it will be necessary to increase the width of the base.

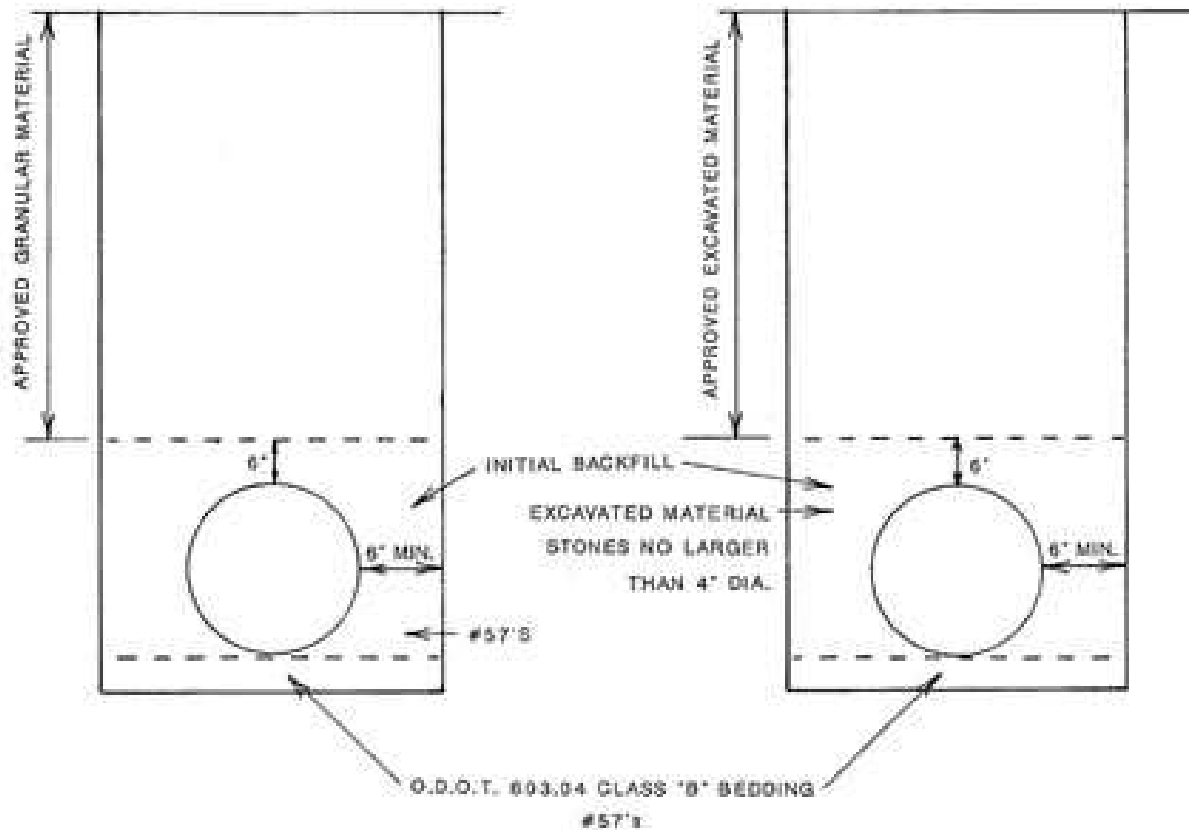
DIMENSIONS		QUANTITIES ONE HEADWALL		
DIAMETER	H	L	CONCRETE CU YDS	REINFORCING STEEL LBS
12"	5'-0"	5'-6"	1.2	20
15"	5'-2"	7'-0"	1.7	41
18"	5'-5"	8'-4"	2.2	57
21"	5'-8"	9'-8"	2.8	62
24"	5'-11"	11'-0"	3.3	69
30"	6'-5"	13'-8"	4.7	92
36"	7'-0"	16'-4"	6.5	105

- L = REGULAR SECTIONS
- L = ELIPTICAL OR OBL-ACRN = 40' x 41'
- L = REGULAR SECTIONS = 0' x 41'
- H = ELIPTICAL OR OBL-ACRN = 0' x 41'
- D = DIAMETER OR SIDE
- S = SIDE OF PIPE
- T = THICKNESS OF BASE
- L = LENGTH OF HEADWALL
- H = HEIGHT OF HEADWALL

TYPICAL TRENCH DETAILS

CONDUITS INSIDE
RIGHT-OF-WAY

STORM SEWER OUTSIDE
RIGHT-OF-WAY



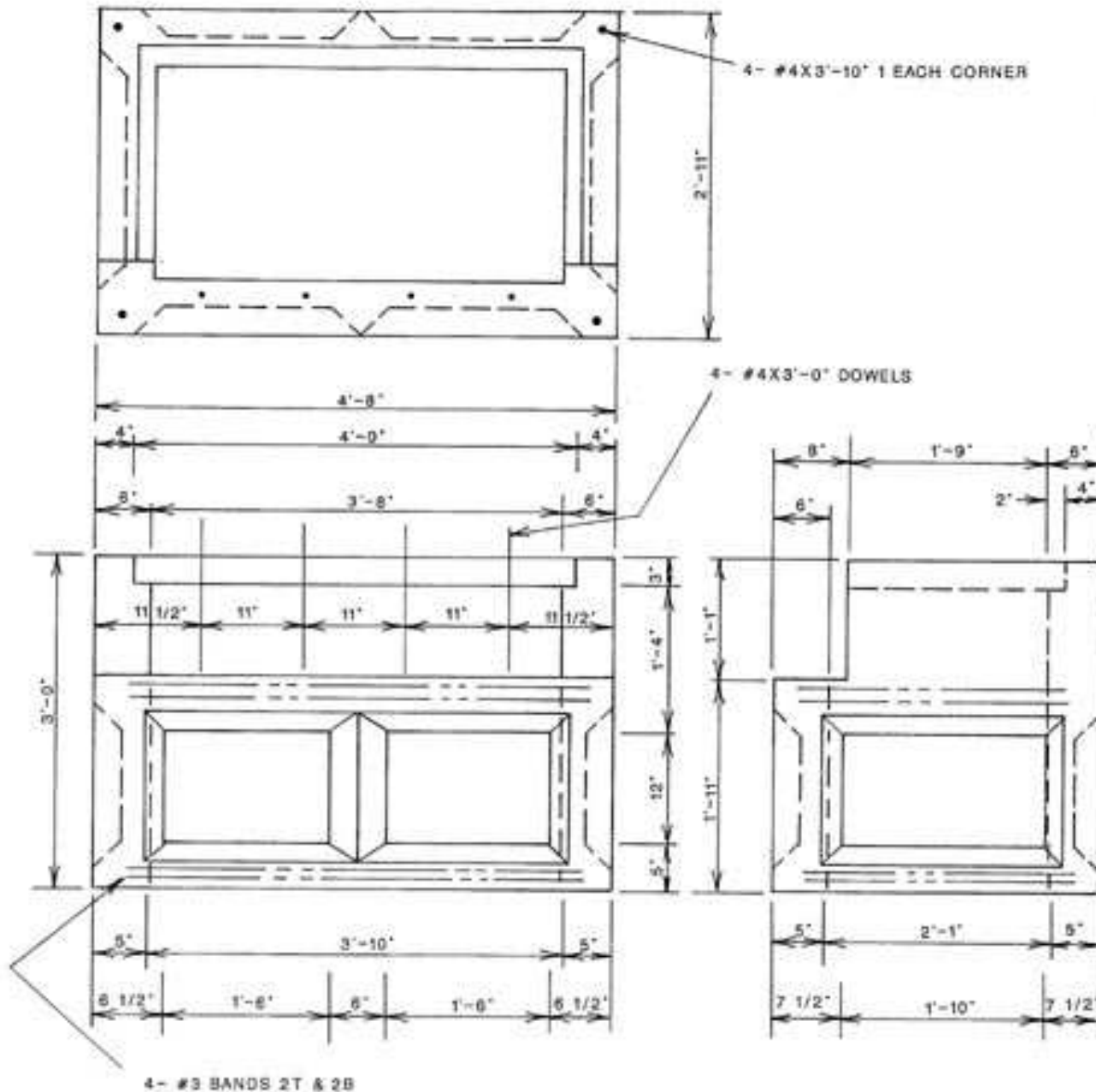
NOTES:

ALL BACKFILL IS TO BE COMPACTED TO AT LEAST THE DENSITY OF THE UNEXCAVATED ADJACENT MATERIAL.

REQUIREMENTS FOR THE BACKFILLING OF MANHOLES, CATCH BASINS AND OTHER APPROPRIATE STRUCTURES AND UTILITY TRENCHES SHALL BE THE SAME AS PIPE BACKFILL.

TYPICAL CATCH BASIN

TYPE D PRECAST CONCRETE



DEPTHS SHOWN ARE TYPICAL. ACTUAL DEPTHS MAY VARY.

CASTING NOS.

R-3312A NEENAH

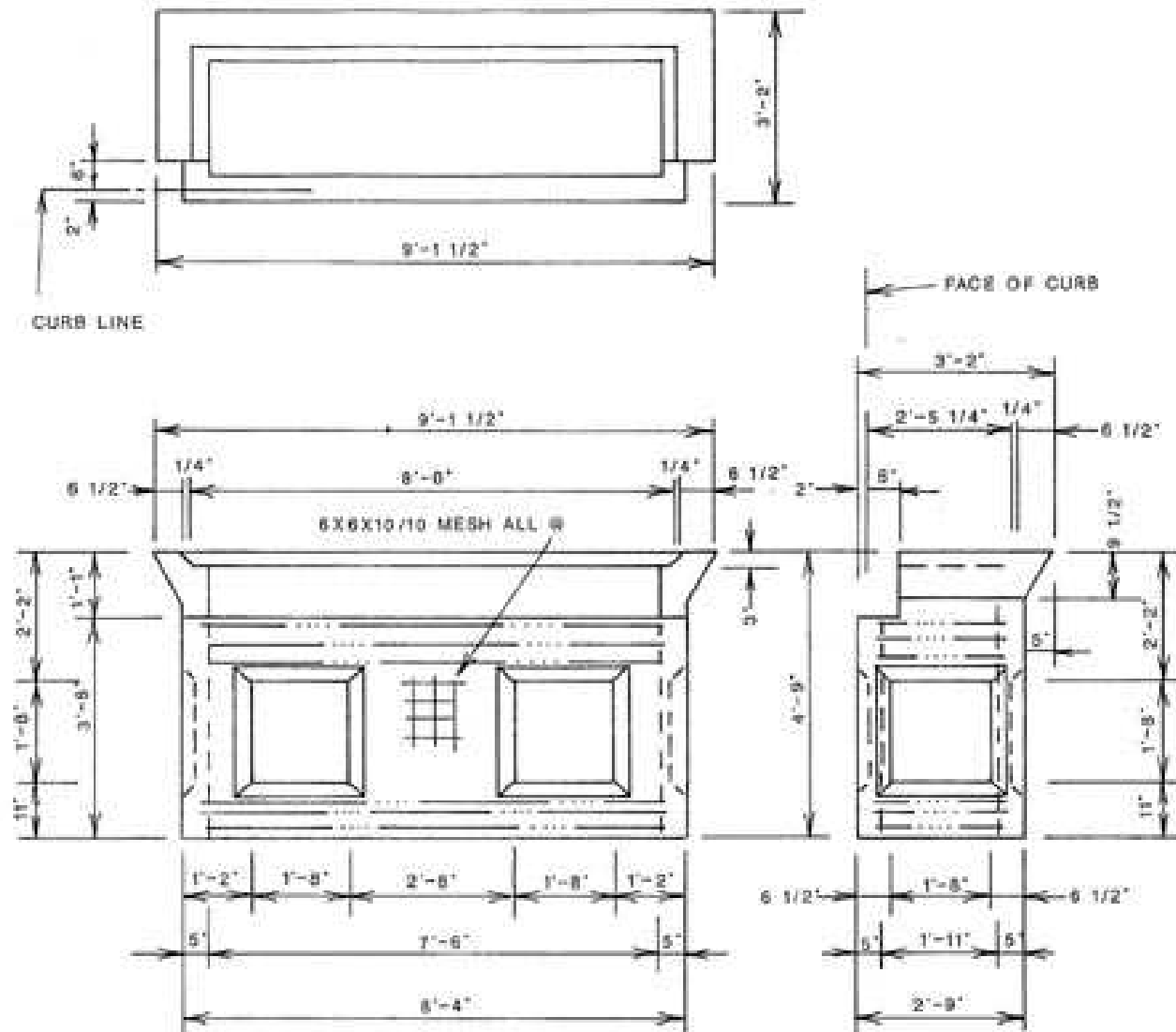
E.J.I.W. 7485

NOTE:

CATCH BASINS PROVIDED WITHOUT PRECAST CONCRETE BOTTOMS SHALL BE FINISHED WITH A MIN. 5' O.D.O.T. CLASS 'C' CONCRETE BOTTOM DURING FIELD CONSTRUCTION.

TYPICAL DOUBLE CATCH BASIN

TYPE B PRECAST CONCRETE



CASTING NOS.

7486 E.J.I.W.

R3312B NEENAH

REINFORCEMENT

8- #5X10'-11" BENT  IN PAIRS W/2 PAIRS T & B.

4- #4X10'-11" BENT  IN PAIRS W/1 PAIR T & B.

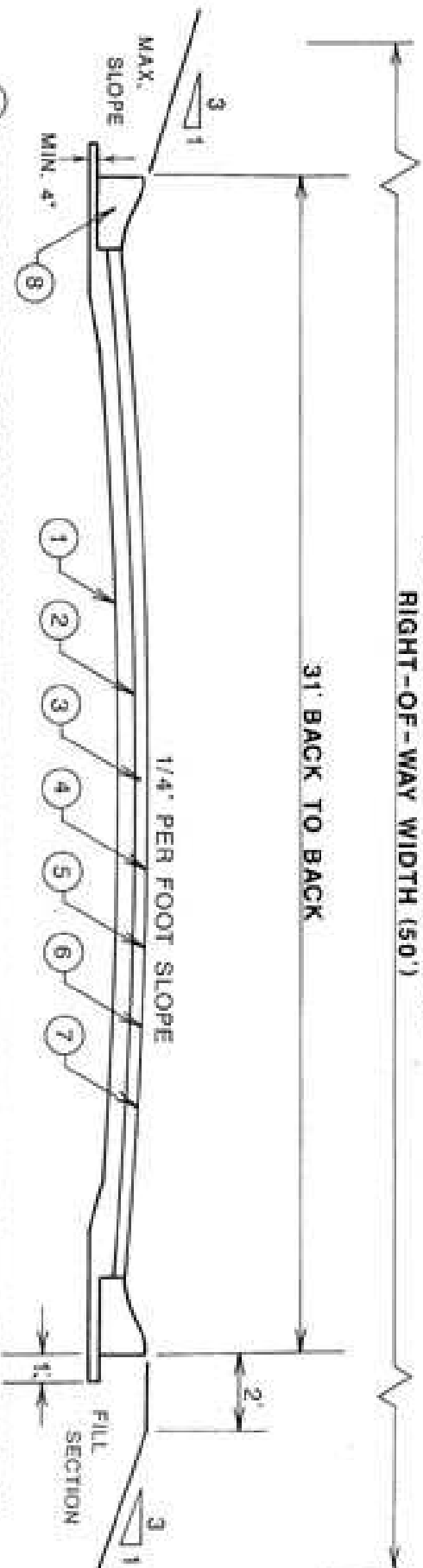
NOTES:

CATCH BASINS PROVIDED WITHOUT PRECAST CONCRETE BOTTOMS SHALL BE FINISHED WITH A MIN. 5" O.D.O.T. CLASS 'C' CONCRETE BOTTOM DURING FIELD CONSTRUCTION.

DEPTHS SHOWN ARE TYPICAL. ACTUAL DEPTHS MAY VARY.

TYPICAL STREET CROSS SECTION

"RESIDENTIAL" OR "LOCAL"
RIGHT-OF-WAY WIDTH (50')



- 1 SUBGRADE SHALL BE GRADED AND COMPACTED TWO FEET GREATER THAN THE BACK OF CURB DIMENSION AND GENERALLY FOLLOW THE FINISHED STREET PROFILE EXCEPT FOR WARPED SECTION UNDER CURBS.

ITEM	AGGREGATE BASE AND SURFACE			
	SOIL CLASSIFICATION			
1	A	B	C	D
2	30:4	5'	5'	6'
3	30:4	4'	5'	5'
4	40:8	0.5 GAL./S.Y.		
5	40:2	1 1/2"	1 1/2"	1 1/2"
6	40:7	0.1 GAL./S.Y.		
7	40:4	1'	1'	1'
8	40:2	SEE DETAIL		

ITEM	FULL DEPTH ALTERNATE			
	SOIL CLASSIFICATION			
1	A	B	C	D
2	30:1	3'	3'	3 1/2'
3	30:1	2'	3'	3'
4	40:7	0.1 GAL./S.Y.		
5	40:4	1 1/4"	1 1/4"	1 1/4"

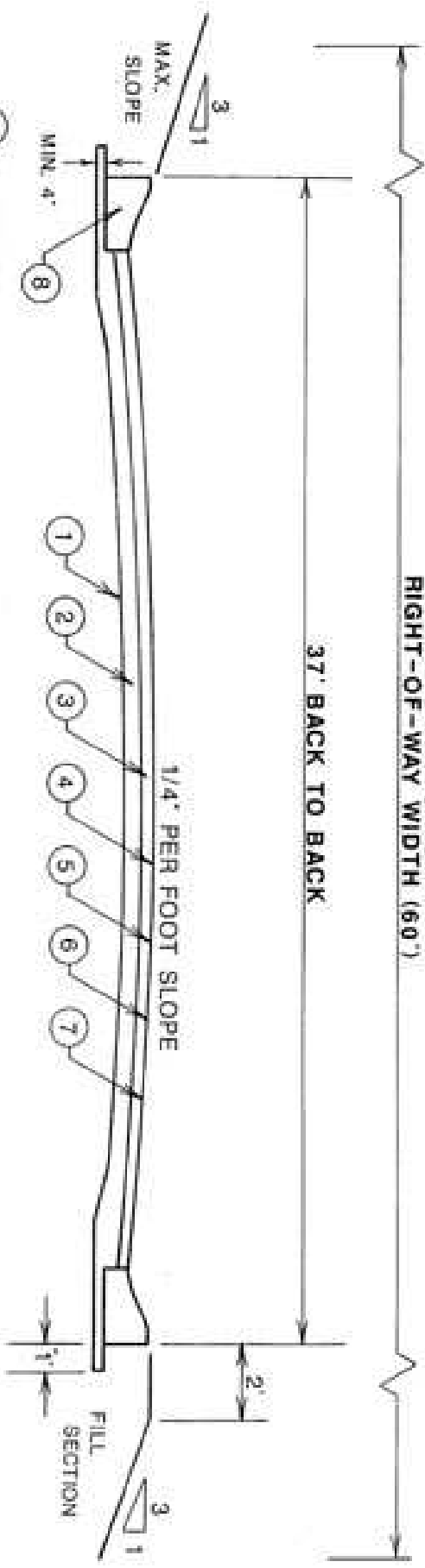
AN ALTERNATE CONCRETE STREET SECTION IS ACCEPTABLE, PROPOSED CONCRETE SECTION SHALL BE SUBMITTED BY THE PLAT ENGINEER FOR COUNTY APPROVAL.

ALL MATERIALS AND WORK SHALL BE IN CONFORMANCE WITH O.D.O.T. STANDARD SPECIFICATIONS.

TYPICAL STREET CROSS SECTION

COLLECTOR
RIGHT-OF-WAY WIDTH (60')

37' BACK TO BACK



- 1 SUBGRADE SHALL BE GRADED AND COMPACTED TWO FEET GREATER THAN THE BACK OF CURB DIMENSION AND GENERALLY FOLLOW THE FINISHED STREET PROFILE EXCEPT FOR WARPED SECTION UNDER CURBS.

ITEM	AGGREGATE BASE AND SURFACE			
	SOIL CLASSIFICATION			
1	A	B	C	D
2	30#	6"	8"	9"
3	30#	6"	7"	8"
4	40#	0.5 GAL./S. Y.		
5	40#	1 1/2"	1 1/2"	1 1/2"
6	40#	0.1 GAL./S. Y.		
7	40#	4"	1 1/2"	1 1/2"
8	40#	SEE DETAIL		

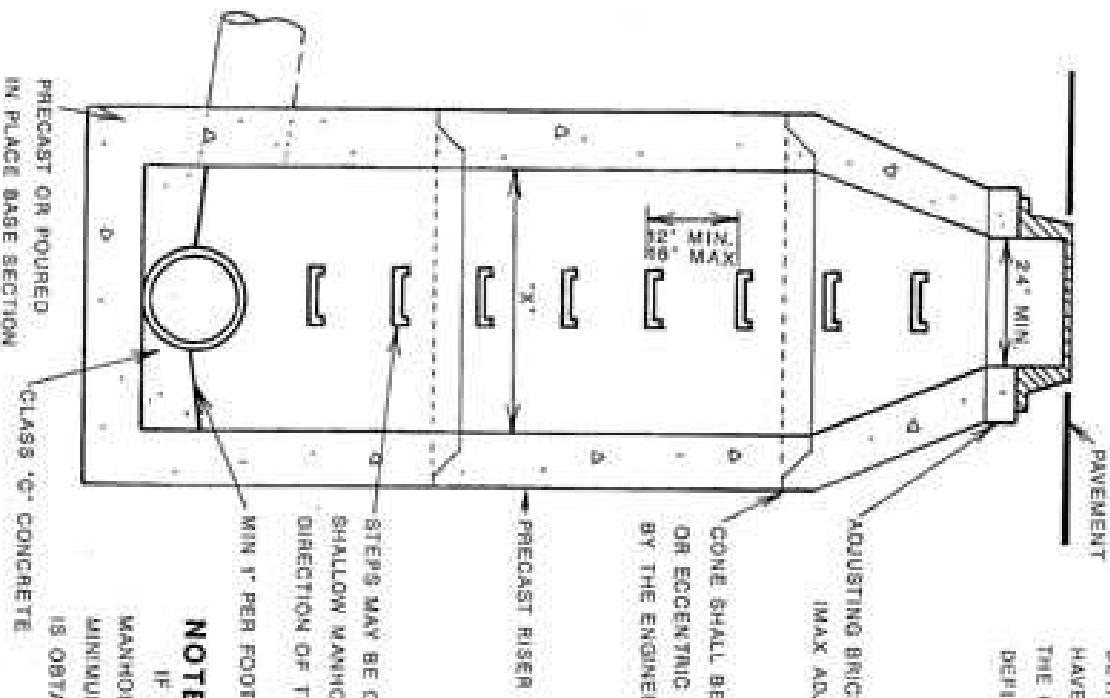
ITEM	FULL DEPTH ALTERNATE			
	SOIL CLASSIFICATION			
1	A	B	C	D
2	30#	4"	4"	4"
3	30#	2"	2 1/2"	3"
4	40#	0.1 GAL./S. Y.		
5	40#	1 1/2"	1 1/2"	1 1/2"

AN ALTERNATE CONCRETE STREET SECTION IS ACCEPTABLE BY THE PLAT ENGINEER FOR COUNTY APPROVAL. PROPOSED CONCRETE SECTION SHALL BE SUBMITTED ALL MATERIALS AND WORK SHALL BE IN CONFORMANCE WITH O.D.O.T. STANDARD SPECIFICATIONS.

TYPE "A" STORM MANHOLE

NOTE:

IF CONDITIONS REQUIRE CONSTRUCTION OF SHALLOW MANHOLES NOT IN CONFORMANCE WITH THE TYPICAL DETAILS SHOWN HEREON, THE CONTRACTOR SHALL HAVE HIS METHOD OF CONSTRUCTION APPROVED BY THE COUNTY ENGINEER. A SHALLOW MANHOLE IS DEFINED AS LESS THAN 5.0' IN DEPTH.



CONCRETE SHALL BE CONCENTRIC OR ECCENTRIC AS DIRECTED BY THE ENGINEER

ADJUSTING BRICK OR PRECAST RING (MAX ADJUSTMENT 0.1)

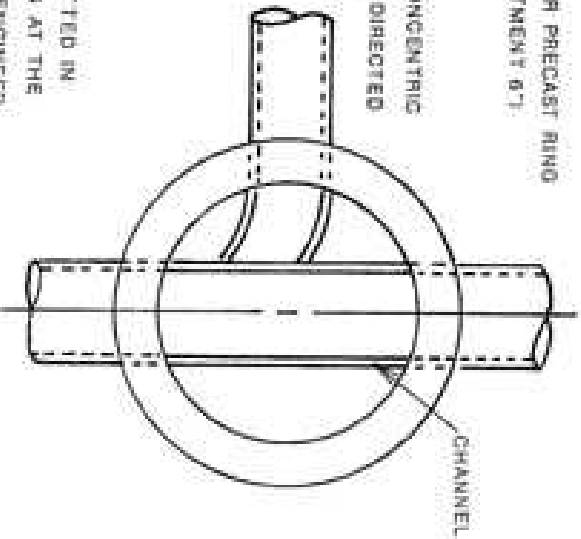
PRECAST RISER

STEPS MAY BE OMITTED IN SHALLOW MANHOLES AT THE DIRECTION OF THE ENGINEER

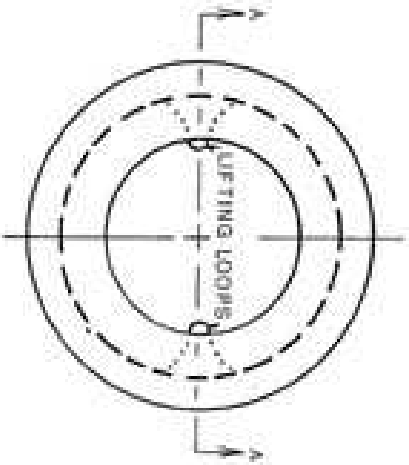
MIN 1" PER FOOT SLOPE

NOTE:

IF A NUMBER OF PIPES ENTER A MANHOLE, THE MANHOLE DIAMETER SHALL BE INCREASED ABOVE THE MINIMUM TABULAR VALUE SO THAT PROPER CLEARANCE IS OBTAINED.



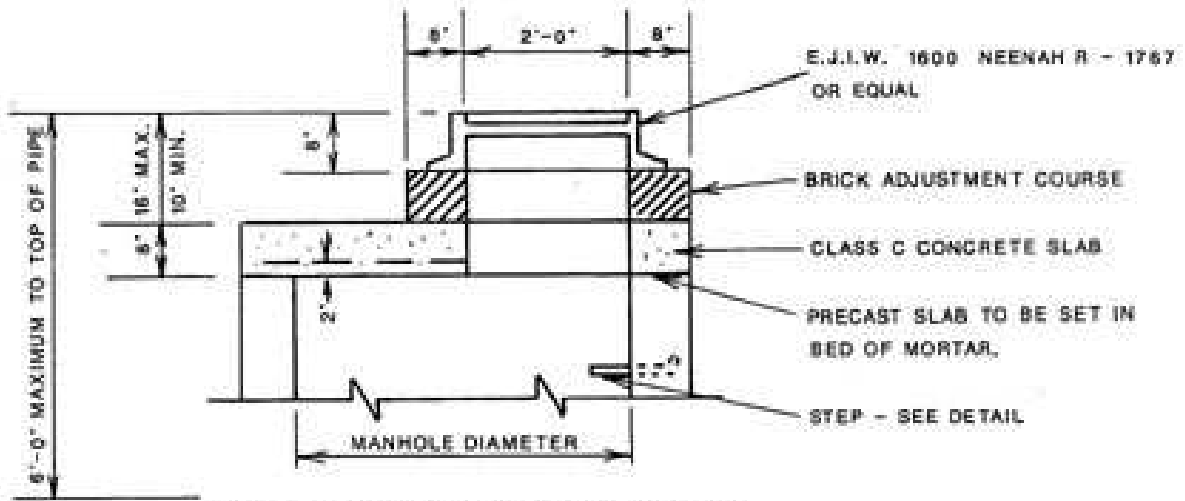
SECTIONAL PLAN



**SECTION A - A
PRECAST ADJUSTING RING**

PIPE SIZE	MANHOLE DIA.	MANHOLE DIA.
8" - 24"	4'	4'
27" - 42"	5'	5'
48" - 54"	6'	6'

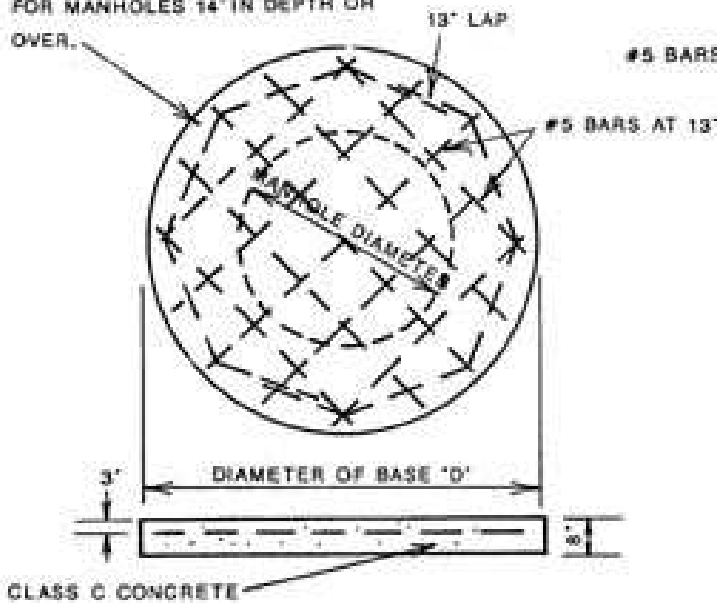
MANHOLE DETAILS



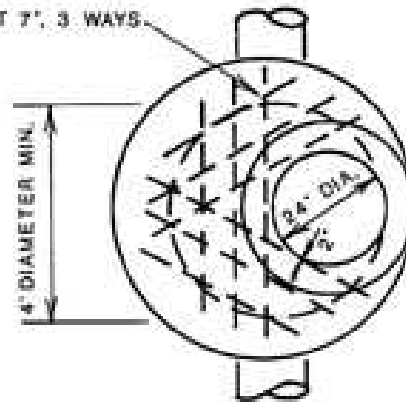
MANHOLE TOP CROSS SECTION

REINFORCING STEEL USED ONLY FOR MANHOLES 14" IN DEPTH OR OVER.

MANHOLE OPENING TO BE CENTERED OVER MAIN SEWER OUTLET PIPE.

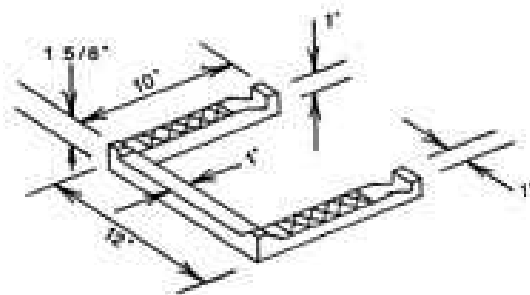


MANHOLE BASE



SLAB TOP FOR MANHOLE

MANHOLE BASE DIA. "D"			
DIA. OF M.H.	8" WALLS	12" WALLS	16" WALLS
4"	72" DIA.	80" DIA.	88" DIA.
5"	84" DIA.	92" DIA.	100" DIA.
6"	96" DIA.	104" DIA.	112" DIA.



MANHOLE STEP