



**Town of Munster**

**Infrastructure Specifications**

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## **CHAPTER 1: EXCAVATION, RESTORATION AND CLEAN UP**

### **Section 1: Excavation and Backfill for Underground Conduits**

#### **1-1 Description**

For the purpose of this section, underground conduits shall be considered sewer pipe, water main, culverts, or any other pipe conduits indicated on the plans. Wherever the term "pipe" or "pipe line" is used, it shall mean underground conduit.

Excavation and backfill shall include all excavation backfilling, compacting, disposal of surplus material, restoration of all disturbed surface, and all other work incidental to the construction of trenches, including any additional excavation which may be required for manholes or other structures forming a part of the pipe line.

#### **1-2 Construction Details**

##### **1-2.01 Surface Removal:**

Along the proposed pipe lines as indicated on the plans, the contractor shall remove the surface materials only to such widths as will permit a trench to be excavated which will afford sufficient room for proper efficiency and proper construction. Where sidewalks, driveways, pavements and curb and gutter are encountered, care shall be taken to protect such against fracture or disturbance beyond reasonable working limits. In areas specified on the plans, the top twelve inches (12") shall be piled separately and preserved so that it may be restored after the remainder of the backfill is replaced.

##### **1-2.02 Excavation by Hand of Machine:**

When working space will permit, trenches may be excavated by machine, provided that by so doing, public and private improvements will not be subjected to an unreasonable amount of damage. If, however, excavation by machine methods cannot be made without material damage being done to public and private improvements, hand excavation shall be employed.

#### **1-2.03 Width of Excavation**

a. The bottom of the trench at and below the top of the pipe and inside the sheeting and bracing, if used, shall not exceed the following widths:

<u>Pipe Size</u>	<u>Width</u>	<u>Pipe Size</u>	<u>Width</u>	<u>Pipe Size</u>	<u>Width</u>
6"	2'6"	27"	4'3"	66"	9'1"
8"	2'6"	30"	4'7"	72"	9'8"
10"	2'6"	33"	5'4"	78"	10'3"
12"	2'8"	36"	5'8"	84"	10'10"
15"	2'10"	42"	6'3"	90"	11'5"
18"	3'2"	48"	6'10"	96"	12'0"
21"	3'8"	54"	7'11"	102"	12'7"
24"	4'0"	60"	8'6"	108"	13'2"

Note: The strength or class of pipe shall be as indicated on the plans or special provisions.

b. Trench sheeting and bracing or a trench shield shall be used as required by the rules and regulation of O.S.H.A. The bottom of the trench excavation shall conform to the details shown on the plan.

##### **1-2.04 Excavation below Grade:**

In cases where the excavation is carried beyond or below the lines and grades given by the Engineer, the Contractor shall refill all such excavated space with suitable granular material.

#### **1-2.05 Rock Excavation**

##### **1-2.05A General:**

Whenever "rock" is used as the name of an excavated material, it shall mean boulders or pieces of rock, concrete, or masonry measuring one-half (1/2) cubic yard or more, hard shale or solid ledge rock and masonry which, in the opinion of the Engineer, requires for its removal the continuous use of pneumatic tools or drilling or blasting.

##### **1-2.06 Braced and Sheeted Trenches**

##### **1-2.06A General:**

Open-cut trenches shall be sheeted and braced or otherwise protected as required by any governing

Federal, State or County laws and municipal ordinances, and as may be necessary to protect life, property, or the work. In any event, the minimum protection shall conform to the recommendations in O.S.H.A. Safety and Health Standards for Construction. A sand box or trench shield may be used in lieu of sheeting as permitted by O.S.H.A. and approved by the Engineer. When close-sheeting is used, it shall be so driven as to prevent adjacent soil from entering the trench either below or through such sheeting.

Where sheeting and bracing are used, the trench width shall be increased accordingly. The Engineer may order the sheeting driven to the full depth of the trench or to such additional depth as may be required for the protection of the work. Where soil in the lower limits of the trench has the necessary stability to meet the O.S.H.A. Standards, the Engineer, at his discretion, may permit the contractor to stop the driving of sheeting at such designated elevation above the trench bottom. The granting of permission by the Engineer, however, shall not relieve the Contractor in any degree from his full responsibility under the Contract. Sheeting and bracing which have been ordered left in place shall be cut off at the elevation ordered by the Engineer. Trench bracing, except that ordered left in place, may be removed when the backfilling has reached the respective levels of such bracing. Sheeting, except that ordered left in place, may be removed after the backfilling has been completed or has been brought to such an elevation as to permit its safe removal.

#### **1-2.07 Trenches With Sloping Sides, Limited:**

The Contractor may, at his option, where working conditions and right-of-way permit (as determined by the Engineer), excavate pipeline trenches with sloping sides, but with the following limitations:

- a. In general, only braced and vertical trenches will be permitted in traveled streets, alleys or narrow easements.
- b. Where trenches with sloping sides are permitted, the slopes shall not extend below the top of the sewer, and trench excavations below this point shall be made with vertical sides with widths not exceeding those specified herein before for the various sizes of pipe.

#### **1-2.08 Short Tunnels:**

In some instances, trees, fire hydrants, sidewalks and other obstructions may be encountered, the proximity of which may be a hindrance to open-cut excavation. In such cases, the Contractor shall excavate by means of short tunnels in order to protect such obstructions against damage.

#### **1-2.09 Piling Excavated Material:**

All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing streets, alleys, sidewalks and driveways. Fire hydrants under pressure, valve pit covers, valve boxes, curb stop boxes, or other utility controls shall be left unobstructed and accessible until the work is completed. Gutters shall be kept clear or other satisfactory provisions made for street drainage. Natural watercourses shall not be obstructed.

#### **1-2.10 Removal of Water:**

The Contractor shall, at all times during construction, provide and maintain ample means and devices with which to promptly remove and properly dispose of all water entering the excavations or other parts of the work until all work to be performed therein has been completed. No sanitary sewer shall be used for disposal of trench water.

#### **1-2.11 Safety**

##### **1-2.11A Barricades, Guards and Safety Provisions:**

To protect persons from injury and to avoid property damage, adequate barricades, construction signs, torches, red lanterns and guards, as required, shall be placed and maintained by the Contractor at his expense during the progress of the construction work and until it is safe for traffic to use the roads and streets. All material piles, equipment and pipe which may serve as obstructions to traffic shall be protected by proper lights when the visibility is poor. The rules and regulations of O.S.H.A. and appropriate authorities respecting safety provisions shall be observed.



#### **1-2.11B Structure Protection:**

Temporary support, adequate protection and maintenance of all underground and surface structures, water mains, drains, sewers and other obstructions encountered in the progress of the work shall be furnished by the Contractor under the direction of the Engineer. The structures which may have been disturbed shall be restored upon completion of the work.

#### **1-2.11C Protection of Property and Surface Structures:**

Trees, shrubbery, fences, poles and all other property and surface structures shall be protected during construction operations unless their removal for purposes of construction is authorized by the Engineer. Any fences, poles, or other man made surface improvements, which are moved or disturbed by the Contractor, shall be restored to the original conditions, after construction is completed. Any trees, shrubbery, or other vegetation, which are approved for removal or ordered for removal by the Engineer in order to facilitate construction operations, shall be removed completely, including stumps and roots, by the Contractor. Responsibility for any damage or claims for damage caused by construction operations to shrubbery or other landscape improvements which were not authorized for removal by the Engineer shall be assumed by the Contractor.

#### **1-2.12 Deviations Occasioned by Other Structures or Utilities:**

Whenever obstructions are encountered during the progress of the work and interfere to such an extent that an alteration in the plan is required, the Engineer shall have the authority to approve the plans and order a deviation from the line and grade or arrange with the owners of the structures for the removal, relocation or reconstruction of the obstructions. Where gas, water, telephone, electrical, hot water, steam, or other existing utilities are an impediment to the vertical or horizontal alignment of the proposed pipe line, the engineer shall require a change in grade or alignment or shall direct the Contractor to arrange with the owners of the utilities for their removal.

#### **1-2.13 Interruption to Utilities:**

The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures may be determined. Prior to proceeding with trench excavation, the Contractor shall contact all utility companies in the area to aid in locating their underground services.

The Contractor shall take all reasonable precautions against damage to existing utilities. However, in the event of a break in an existing water main, gas main, sewer or underground cable, he shall immediately notify the responsible official of the organization operating the utility interrupted. The Contractor shall lend all possible assistance in restoring services and shall assume all cost, charges, or claims connected with the interruption and repair of such services if the location of said utility was marked by the owner thereof prior to excavation.

#### **1-2.14 Maintenance of Traffic and Closing of Streets:**

The Contractor shall carry on the work in a manner, which will cause a minimum of interruption to traffic, and may not close a street to through travel without the express approval of the Director of Operations. Where traffic must cross open trenches, the Contractor shall provide suitable bridges at street intersections and driveways. The Contractor shall post, where directed by the Engineer, suitable signs indicating that a street is closed and necessary detour signs for the proper maintenance of traffic. Prior to closing of any driving lanes of a street, the Contractor shall notify responsible municipal authorities; including the Director of Operations, Police, Fire and School.

#### **1-2.14 Construction in Easements:**

In easements across private property, the Contractor shall be responsible and liable for all damage outside of the easement area. Trees, fences, shrubbery or other type of surface improvements located in the easements will require protection during construction. The provisions of paragraph 1-2.11 C above shall apply to all easement areas as well as to public right-of-way. Precautions shall be taken by adequate sheeting or other approved methods to prevent any cave-in or subsidence beyond the easement limits or damage to improvements within the easement. In general, the easement area is intended to provide reasonable access and

working area for efficient operation by the Contractor. Where easement space for the efficient operation is not provided, the Contractor shall be responsible for organizing his operations to perform within the restrictions indicated.

#### **1-2.16 Underground Conduit Constructed in Tunnel**

##### **1-2.16A General:**

Where required by the Engineer, pipe lines shall be constructed in tunnel. This work will be conducted in accordance with requirements of any permits obtained by the Owner from railroads or state or county highway departments for tunnel work or in accordance with the following paragraphs:

##### **1-2.16B Materials:**

Pipe materials shall be shown on the plans or as described in the special provisions.

##### **1-2.16C Excavation and Laying:**

Requirements for excavation, laying, and joints shall be those applicable for the type of pipe line involved, unless otherwise specified.

##### **1-2.16D Methods of Construction:**

1. The tunnel shall be only of sufficient width and height to provide free working space. The sides and roof of the tunnel shall be braced sufficiently to support the external loads and to prevent caving, bulging, and settlement of the earth.
2. The Contractor shall backfill all tunnels with well-compacted sand, fine gravel or stone screenings as rapidly as the conditions permit.
3. The backfill material shall be deposited in the tunnel in such a manner as not to injure or disturb the pipe. The filling of the tunnel shall be carried on simultaneously on both sides of the pipe in such a manner that injurious side pressures do not occur. Special care shall be taken to compact the backfill under the haunches of the pipe. The remainder of the tunnel, or such portion of the remainder as may be possible, shall then be backfilled by one (1) of the following

methods, at the option of the Contractor, if in the opinion of the Engineer the method is practicable.

a. The material shall be deposited in uniform layers not to exceed twelve (12") thick (loose measure) and such layer either inundated or deposited in water.

b. The tunnel shall be backfilled with loose material or only partly backfilled at a time. If necessary, and settlement secured in either case by introducing water through holes jetted into the material to a point approximately two feet (2') above the top of the pipe.

4. If neither of the above methods is practicable or can be used for only a portion of the backfill, the remainder of the tunnel shall be completely backfilled with material carefully deposited in layers and each layer compacted by ramming or tamping with tools approved by the Engineer.
5. When sheeting and bracing have been used, sufficient bracing shall be left across the trench as the backfilling progresses to hold the sides and top firmly in place without caving or settlement before the backfilling has been placed. This bracing may be removed as soon as practicable.
6. Any depressions which may develop within the area involved in the construction operations due to settlement of the backfilling material shall be filled in a manner meeting the approval of the Engineer.

##### **1-2.16E Use of Casing Pipe:**

The Contractor may, subject to the approval of the Engineer, use metal casing pipe as a tunnel liner in place of timber shoring for tunnel sections. The diameter, gauge and type of such pipe, method of placing and method of installing pipe within it shall be subject to the approval of the Engineer. The entire void space between tunnel liners and pipe shall be filled with compacted sand or other approved material if such method of construction is used.

#### **1-2.16F Jacking or Boring of Pipe:**

The Contractor may, subject to the approval of the Engineer, use special cast iron or specially designed reinforced concrete pipe jack and/or bored into position with or without tunnel liners, for tunneled sections of pipe. In such cases, all conditions of performance of the work shall be subject to the approval of the Engineer.

#### **1-2.17 Excavation and Foundation:**

The trench shall be excavated to an elevation of four inches (4") below the bottom of the pipe and so that the flow line of the finished sewer will be at the depth and grade specified or established by the Engineer.

Well compacted moist fine aggregate bedding material, at least four inches (4") in depth below the pipe, shall be placed the entire width of the trench and for the length of the pipe. The fine aggregate shall meet the approval of the Engineer and shall be compacted to his satisfaction by ramming or tamping with tools approved by the Engineer.

When pipe having bells or hubs is used, cross trenches, not more than two inches (2") wider than the bell or hub, shall be excavated to provide uniform bearing along the length of the pipe.

If the excavation has been made deeper than necessary, the foundation shall be brought to the proper grade by the addition of well compacted bedding material.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unsuitable soil, all such unsuitable soil under the pipe and for the width of the trench shall be removed and replaced with well compacted bedding material.

Where rock, in either ledge or boulder formation, is encountered, it shall be removed below grade and replaced with a cushion of well compacted bedding material having a thickness under the pipe of not less than eight inches (8").

#### **1-2.17A Concrete Cradle**

##### **1-2.17A(1) General:**

Where sub-grade conditions, in the opinion of the Engineer, warrant extra precautions for the bedding of pipe, the Engineer may require the construction of a concrete cradle to be installed in conformance with the size and dimensions indicated on the plans. All concrete used in concrete cradle shall have a minimum compressive strength of twenty-five hundred (2,500) psi at twenty-eight (28) days.

#### **1-2.18 Backfill:**

As soon as the condition of the pipe will permit, the entire width of the trench shall be backfilled, with moist fine aggregate to a height of at least the elevation of the center of the pipe. The fine aggregate shall be placed longitudinally along the pipe. The elevation of the backfill material on each side of the pipe shall be the same. Special care shall be taken to completely fill the space under the pipe. The fine aggregate backfill material shall be placed in four (4") inch layers, loose measurement, and compacted to the satisfaction of the Engineer by ramming or tamping with tools approved by the Engineer. The fine aggregate used for backfilling shall meet the approval of the Engineer.

The remainder of the trench and excavation shall be backfilled to the natural line or finished surface as rapidly as the condition of the sewer will permit. The backfill material shall consist of the excavated material or trench backfill; as herein specified. All backfill material shall be deposited in the trench or excavation in such a manner as not to damage the sewer. The filling of the trench shall be carried on simultaneously on both sides of the pipe in such a manner that injurious side pressures do not occur. The backfill for trenches and excavation made in the sub-grade of the proposed improvement, and for all trenches outside of the sub-grade where the inner edge of the trench is within two (2') feet of the edge of the proposed pavement, curb, gutter, curb and gutter, stabilized shoulder or sidewalk, shall be made with trench backfill material unless the excavated material meets the requirements of Section 211 of the Indiana State Highway Standard Specifications.

All backfill material up to a height of twelve (12") inches above the pipe shall be carefully deposited in uniform layers not exceeding four (4") inches thick (loose measure). The material in each layer shall be firmly compacted by ramming or tamping with tools approved by the

Engineer, in such a manner as not to disturb or injure the pipe. The backfilling above this height shall be done by Method 1, 2 or 3 below.

When required, trench backfill material or excavated material meeting the requirements of section 211 of the Indiana State Highway Specifications above the first twelve (12") inches above the pipe shall be compacted by either Method 2 or Method 3 specified below, or in accordance with Method 1 except that the compacted lifts shall not exceed four inches (4") in thickness.

Method 1: The material shall be deposited in uniform layers not exceeding twelve inches (12") thick (loose measure) and each layer shall be compacted by ramming or tamping with tools approved by the Engineer.

Method 2: The material shall be deposited in uniform layers not exceeding twelve inches (12") thick (loose measure), and each layer shall be either inundated or deposited in water.

Method 3: The trench shall be backfilled with loose material and settlement secured by introducing water through holes jetted into the backfill to a point approximately two feet (2') above the top of the pipe. The holes shall be spaced as directed by the Engineer, but shall not be any further than six (6') feet apart.

The water shall be injected at a pressure just sufficient to sink the holes at a moderate rate of speed. The pressure shall be such that the water will not cut cavities in the backfill material nor overflow the surface. If water does overflow the surface, it shall be drained into the jetted holes by means of shallow trenches. Water shall be injected as long as it will be absorbed by the backfill material and until samples taken from test holes in the trench show a satisfactory moisture content. The Contractor shall bore the test holes not more than fifty feet (50') apart and at such other locations in the trench designated by the Engineer. As soon as the water soaking has been completed, all holes shall be filled with soil and compacted by ramming with a tool approved by the Engineer.

Backfill material which has been water soaked shall be allowed to settle and dry for at least ten (10) days before any surface course or pavement is constructed on it. The length of time may be altered if deemed desirable by the Engineer.

Where the inner edge of the trench is within two feet (2') of the edge of the proposed pavement, curb, gutter, or curb and gutter, the provisions of this paragraph shall also apply.

At the end of the settling and drying period, the crusted top of the backfill material shall be scarified and, if necessary, sufficient backfill material added, as specified in Method 1, to complete the backfilling operations.

The method used for backfilling and compacting the backfilling material will be the choice of the Contractor. However, if the method used does not produce results satisfactory to the Engineer, the Contractor will be required to alter or change the method being used so that the resultant backfill will be satisfactory to the Engineer.

## **SECTION II: RESTORATION OF SURFACES**

### **2-1 General:**

Restoration of surfaces shall include the removal of the existing surface the disposal of surplus material, and the construction of new surfaces as indicated on the plans or special provisions. The type of surface restoration required shall be shown on the plans or described in the special provisions.

### **2-2 Construction Details**

#### **2-2.01 Temporary Surface Over Trench:**

Wherever conduits are constructed under traveled roadways, driveways, sidewalks, or other traveled surfaces, a temporary surface shall be placed over the top of the trench as soon as possible after compaction, as specified above, has been satisfactorily completed. The temporary surface shall consist of a minimum of six inches (6") of coarse aggregate conforming to the current specifications of the Indiana State Highway Specifications for Grade No. 53. The top of the temporary surface shall be smooth and meet the grade of the adjacent undisturbed surface. The temporary surface shall be maintained at the Contractor's expense until final restoration of the street surface is completed as specified. No permanent restoration of street surface shall be initiated until authorized by the Engineer.

## **2-2.02 Removal of Pavement, Sidewalk, Driveway and Curb:**

Wherever the pipe is located along or across an improved surface, the width of the trench shall be held as nearly as possible to the maximum width specified in Section 1-2.03. Where brick or concrete pavement, sidewalk, driveway or curbing is cut, the width of the cut shall exceed the actual width of the top of the trench by twelve inches (12") on each side or a total of two feet (2'). Exposed surfaces of portland cement or asphaltic concrete shall be cut with a pavement saw before breaking. Care shall be taken in cutting to insure that a straight joint is sawed.

## **2-2.03 Replacement of Permanent Type Pavement, Sidewalks, Driveways, Curbs, Gutters and Structures**

### **2-2.03A General:**

The Contractor shall restore (unless otherwise specified or ordered by the Engineer) all permanent type pavements, sidewalks, driveways, curbs, gutters, shrubbery, fences, poles and other property and surface structures removed or disturbed during or as a result of construction operations to a condition which is equal in appearance and quality to the condition that existed before the work began.

### **2-2.03B Portland Cement Concrete Pavement Surface:**

Where the existing pavement surface is portland cement concrete, the pavement replacement shall consist of ten inch (10") portland cement concrete pavement reinforced the same as adjacent pavement. Portland cement concrete shall conform to the applicable provisions of those specifications and shall have a compressive strength of thirty-five hundred pounds (3,500 lbs.) per square inch at twenty-eight (28) days. Construction methods for portland cement concrete pavement shall conform to Section 501 of the current requirements of the Indiana State Highway specifications for portland cement concrete pavement. Pavement joints in the replacement surface shall conform to and match the joints in the adjacent pavement area.

### **2-2.03C Bituminous Concrete Pavement Surface-Rigid Base:**

Where the existing pavement surface is bituminous concrete and the base consists of a rigid material such as brick, portland cement concrete, soil cement, natural cement or a combination of these materials, the base replacement shall consist of eight-inch (8") portland cement concrete base course reinforced as indicated by the Engineer. Portland cement concrete shall conform to applicable provisions of these specifications and shall have a compressive strength of thirty-five hundred (3,500 lbs.) per square inch at twenty-eight (28) days. Construction methods for portland cement concrete base course shall conform to Section 501 of the current requirements of the Indiana State Highway Specifications for portland cement concrete base course. The surface replacement shall consist of a bituminous prime coat and three inch (3") minimum thickness bituminous concrete surface course conforming to Section 403 of the Indiana State Highway specifications for Bituminous Concrete Surface Course.

### **2-2.03 D Bituminous Plant Mix Pavement or Bituminous Treated Surface Flexible Base:**

Where the existing pavement is bituminous plant mix material or bituminous surface treatment and the base consists of a flexible material such as gravel or crushed stone, the base replacement shall consist of an eight-inch (8") compacted thickness of material conforming to aggregate materials as described in the Indiana State Highway Specifications.

Placing and compacting of the base course material shall conform to the methods described in the above-referenced specifications for aggregate base course. The surface replacement shall consist of a bituminous prime coat and a bituminous surface plant mix three inches (3") in thickness conforming to the Indiana State Highway Specifications for Bituminous Surface Plant Mix.

### **2-2.03 E Concrete Sidewalks, Driveways, Curb, Curb and Gutter:**

When it is necessary to remove and replace concrete sidewalk, driveways, curb and gutter, replacements shall be made as follows:

- a. Concrete sidewalks, driveways, curbs and gutters shall be replaced with concrete meeting the applicable provisions

of these specifications and having a compressive strength of not less than thirty-five hundred (3,500) psi at twenty-eight (28) days. Minimum thickness shall be five inches (5") for sidewalks and seven inches (7") for driveways.

- b. Curb or curb and gutter dimensions and cross-sections shall conform, as nearly as practicable, with the existing installations. Sidewalks shall be finished to match existing adjacent sidewalk surfaces unless otherwise specified or directed by the Engineer. (See Sidewalks, Chapter 5 and Curb and Gutter, Chapter 3, Section 5-2.01).

#### **2-2.03 F Brick Sidewalks and Driveways:**

Brick sidewalks or driveways shall be replaced with brick, using salvage materials where in good condition. Where shown on the plans, or directed by the Engineer, brick sidewalks or driveways shall be replaced with concrete in accordance with subparagraph above.

#### **2-2.04 Replacing Existing Temporary Street and Alley Surfaces**

##### **2-2.04 A General:**

For the purpose of this specification, all existing street and alley surfaces shall be considered temporary except:

- a. Concrete or brick pavements;
- b. An asphaltic concrete or a bituminous treated surface over a soil cement, concrete, crushed stone or selected gravel base. Specifically included as temporary street surfaces, shall be compacted earth, cinders, shale, mixtures of gravel and earth or crushed stone and earth, whether or not these respective materials are further stabilized by road oil or bituminous surface treatment.

Where, in the opinion of the Engineer, the conduit is located in the traveled portion of the temporary street or alley traveled surface, a new temporary surface shall be constructed over the trench, as specified in 2-2.01 of this Section. After this surface has been placed, it shall be maintained by the Contractor until final restoration is authorized. Just prior to final

restoration, the entire width of the street to be restored shall be scarified. For final surface restoration, the Contractor shall apply a bituminous treatment to the entire width of the traveled surface, as ordered by the Engineer. The bituminous treatment shall consist of the application of a bituminous prime coat and a bituminous surface treatment corresponding to the materials and construction methods described in the Indiana State Highway Specifications for bituminous surface treatment.

The Engineer reserves the right to order the omission of BITUMINOUS SURFACE TREATMENT in any locations where such omission may be, in his opinion, in the public interest.

#### **2-2.05 Seeding and Sodding**

##### **2-2.05 A General:**

At locations indicated on the plans or special provisions or where designated by the Engineer, the Contractor shall prepare seed beds, furnish and spread fertilizers and furnish and spread fertilizers and furnish and plant the seed specified herein on disturbed areas.

##### **2-2.05 B Material:**

- a. Fertilizer shall be standard commercial 10-8-6 or 10-4-6 grade, uniform in composition, free flowing and suitable for application with approved equipment, delivered to the site in bags or other convenient containers each fully labeled, conforming to applicable State laws.
- b. Lime shall be ground limestone containing all of the finer particles obtained in the grinding process and ground sufficiently fine so that not less than eighty percent (80%) will pass through a No. 8 sieve. The calcium carbonate equivalent by the percent of material passing through the No. 8 sieve will be equal to or in excess of 0.72. the moisture content at the time of shipment must not exceed eight percent (8%).
- c. The classes of Seeding Mixture shall be designated on the plans and shall consist of one or more of the classes listed below. Seeding Mixtures from the specified class shall be designated by the Engineer, based on the season of the year when seeding

operations are performed. Spring seeding shall begin January 1 and terminate June 30 and Fall seeding shall begin July 1 and terminate December 31.

## SEEDING MIXTURES

Seeds	Lbs./Acre	Season to Use
<b>Class I</b>		
Kentucky Bluegrass	50	Spring
Perennial Ryegrass	20	
Redtop or Creeping Red Fescue	10	
Ladino or White Dutch Clover	5	
Kentucky Bluegrass	50	Fall
Perennial Ryegrass	20	
Redtop or Creeping Red Fescue	10	
Oats, Spring	48	
Kentucky Bluegrass	70	Spring or Fall
Redtop or Creeping Red Fescue	20	
<b>Class II</b>		
Kentucky 31 or Alto Fescue	50	Spring
Perennial Ryegrass	20	
Redtop or Creeping Red Fescue	10	
Ladino or White Dutch Clover	5	
Kentucky 31 or Alto Fescue	50	Spring
Perennial Ryegrass	20	
Redtop or Creeping Red Fescue	10	
Oats, Spring	48	
<b>Class III</b>		
Crown Vetch	20	Spring
Perennial Ryegrass	10	
Lespedeza, Ladino, Alfalfa or White Dutch Clover*	5	
Crown Vetch	20	Fall
Winter Vetch	40	

\* *Lespedeza shall not be sown north of U.S. 136*

The percent purity, germination and weed content shall meet the requirements as set forth in the Indiana State Highway Specifications.

## 2-2.05 C Preparation of Seed Bed:

- After the areas to be seeded have been brought to the proper grades and cleared of all stones, boulders and debris, the areas shall be thoroughly tilled to a depth of at least three inches (3") by discing, harrowing or other approved methods acceptable to the Engineer. The incorporation of fertilizer may be a part of the tillage operation specified above.
- Fertilizer shall be distributed uniformly at the rate of four hundred pounds (400 lbs.) per acre, over the area indicated to be fertilized, and shall be incorporated into the soil to a depth of at least three inches (3") by discing, harrowing, or other approved methods acceptable to the Engineer. The incorporation of fertilizer may be a part of the tillage operation specified above.
- Lime shall be distributed uniformly on all areas to be fertilized at the rate of one (1) ton to one (1) acre, and shall be incorporated in the soil to a depth of at least three inches (3") by discing, harrowing, or by other methods acceptable to the Engineer, immediately following or simultaneously with the incorporation of the fertilizing.

## 2.05 D Seeding Methods:

No seed shall be sown during high winds or when the ground is not in a proper condition for seeding, nor shall any seed be sown until the purity test has been completed for the seed to be used, and shows that the seed meets the noxious weed seed requirements. Equipment shall be operated in a manner to insure complete coverage of the entire area to be seeded. When seed or fertilizer is applied with a hydraulic seeder, the rate of application shall be not less than one thousand (1,000) gallons of slurry per acre. This slurry shall contain the proper quantity of seed or fertilizer specified per acre. When using a hydraulic seeder, the fertilizer nutrients and seed shall be applied in two (2) separate operations.

Within twelve (12) hours, all seed areas shall be rolled at right angles to the run-off with an approved type roller or cultipacker to compact the seedbed and place the seed in contact with the soil. On areas seeded with a hydraulic seeder, rolling shall not be required.

The optimum depth for seeding shall be one-quarter inch (1/4").

All legumes (clover, vetch, lespedeza, and alfalfa) shall be inoculated with the proper bacteria in the amounts and manner recommended by the manufacturer of the inoculant before sowing or being mixed with other seeds for sowing. The inoculation shall be furnished by the Contractor and shall be approved by the Engineer. The seed shall be sown, as soon as possible, after inoculation and seed that has been standing more than five (5) hours after inoculation shall be reinoculated before sowing. If legumes are applied by hydro seeder, three (3) times the normal amount of inoculation shall be used. The Contractor shall furnish the inoculant and the cost of furnishing it shall be included in the contract unit price per acre for Seeding of the class specified.

#### **2-2.05 E Replacement of Sodded Areas:**

At locations specified, or shown on the plans, or designated by the Engineer, the Contractor shall remove and carefully store the sod. Upon compaction of the trench in a manner satisfactory to the Engineer, the sod shall be replaced in a neat, workmanlike manner, over a minimum of two inches (2") of topsoil. Any deficiency in sod, necessary to restore the surface to a condition equal or better to that, which existed before construction operations began, will require new sodding to be performed by the Contractor. The Contractor shall maintain sodded areas until certification of completion by the Engineer.

#### **2-2.06 Disposal of Surplus Excavated Material:**

Surplus excavated soil, not needed for backfill shall be promptly removed from the site and transported to the Munster Landfill.

#### **2-2.07 Cleaning Up:**

All surplus materials and all tools and temporary structures shall be removed from the site by the Contractor. The construction site shall be left

clean and acceptable to the Engineers at the earliest possible date.

#### **2-2.08 Streets:**

All debris, sand, earth, resulting from evacuation, restoration or equipment transportation shall be promptly and thoroughly cleaned from streets, easements, alleys, curbs, driveways, gutters, and sidewalks to the satisfaction of the Engineer, within twenty (20) hours after notice. If such cleaning is not satisfactorily performed in a timely fashion, the Town shall clean the debris, and charge the Contractor accordingly.

### **Section III: Finishing and Clean-Up for Underground Conduits**

#### **3-1 Clean-up:**

Before acceptance of underground conduit construction, all pipes, manholes, catch basins, fire hydrants, and other appurtenances shall be cleaned of all debris and foreign material.

After all backfill has been completed, the ground surface shall be shaped to conform to the contour of adjacent surfaces. General clean up of the entire construction area shall otherwise conform to applicable requirements specified.



## **CHAPTER 2: WATER DISTRIBUTION**

### **SECTION 1: Pipe for Water Mains and Service Connections**

#### **1-1 General:**

These specifications cover the pipefitting and accessory items normally used for water distribution systems. Special considerations will be covered in the plans and special provisions.

Specification references made herein for manufactured materials such as pipe, hydrants, valves and fittings refer to designations for American Water Works Association (AWWA) or to American Standards Association (ASA), as they are effective on the date of call for bids.

Copies of these publications may be obtained at nominal cost from the American Water Works Association, 2 Park Avenue, New York, New York 10016, and from the American Standards Association, 10 East 40<sup>th</sup> Street, New York, New York 10016.

The type of pipe and fittings to be used in water mains shall be stated on the approved plans and approved by the Town Engineer.

#### **1-2 Pipe:**

The Contractor shall be responsible for all materials furnished by him and shall replace, at his own expense, all such material found defective in manufacture or damaged in handling after delivery by the manufacturer. This shall include the furnishing of all material and labor required for the replacement of installed material discovered defective prior to the final acceptance of the work.

The Contractor shall be responsible for the safe storage of material furnished by or to him, and accepted by him, and intended for the work, until it has been incorporated in the completed project. The interior of all pipe fittings and other accessories shall be kept free from dirt and foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage by freezing.

All newly installed water main shall be made of ductile iron in accordance with 1-2.02 unless specific site conditions would dictate the use of an alternate material. The town engineer shall

review the request and determine if an alternate material would be appropriate. The alternate material will consist of Polyvinyl Chloride (PVC) pressure pipe in accordance with 1-2.02A.

#### **1-2.01 Cast Iron Pipe:**

Cast iron pipe shall conform to the latest AWWA C106, C108, or C112. Cement lining, when included, shall conform to AWWA Standard 112. Class, thickness, designations, castings, markings, and testing shall be specified in the Special Provisions in accordance with ASA or AWWA designations.

#### **1-2.02 Ductile Cast Iron Pipe:**

Ductile cast iron pipe shall conform to ASA Specification A21.51 or AWWA C151, with a minimum Class 52 thickness designation, casting, marking, testing, etc., shall be as specified in the special provisions, in accordance with applicable ASA or AWWA designations.

#### **1-2.02A Polyvinyl Chloride Pressure Pipe**

PVC pressure pipe shall conform to AWWA C-900. The pressure class shall be as specified in the plans and special provisions, with a minimum pressure class of 150. The design engineer shall submit adequate documentation to assure that the proposed design will be adequate for its intended use.

#### **1-2.03 Pipe Fittings:**

All cast iron fittings shall conform to the latest ASA Specifications A21.10 for sort body, cast iron fittings twelve inches (12") or less, and AWWA C100 for fittings fourteen inches (14") and larger. Lining or other special items shall be specified in special provisions.

#### **1-2.03A Cast Iron Pipe Fittings:**

All cast iron fittings, two inch (2") through forty-eight inch (48"), shall conform to the latest ASA Specifications A21.10 and AWWA C110.

#### **1-2.04 Service Pipe, Stops, Fittings, and Boxes**

##### **1-2.04A Service Pipes:**

All service pipe shall be copper water tube, Type K, soft temper, for underground service, conforming to ASTM B-88 and B251. The pipe

shall be marked with the manufacturer's name or trademark and a mark indicative of the type of pipe. The outside diameter of the pipe and minimum weight per foot of the pipe shall not be less than that listed in ASTM B251, Table 11.

#### **1-2.04B Stops and Fittings:**

All corporation stops and curb stops shall be fabricated of brass and shall be provided with outlets suitable for copper connections. Curb stops shall be of the round-way type. Fittings for service pipe shall be copper and of the compression type.

#### **1-2.05 Specialty Valves:**

Specialty valves and fittings such as cutting-in valves, tapping sleeves and valves, inserting valves, and air release valves shall conform to the requirements of the AWWA provisions and shall be installed at locations indicated on the approved plans.

#### **1-2.06 Service Meter and Appurtenances:**

Service meters and appurtenances shall be located, furnished and installed in accordance with the requirements of the APWA provisions and the approved plans. Appurtenances where required, may include meter box, meter box cover, meter yoke, corporation cock, curb stop and incidental fittings.

### **SECTION II: Pipe Installation for Water Mains**

#### **2-1 General:**

Pipe shall be installed in accordance with the manufacturer's specifications and instruction for the type of pipe used and applicable AWWA standards, such as C600 and C603, unless modified or changed in the Special Provisions.

#### **2-2 Construction**

##### **2-2.01 Protection of Water Mains:**

Pipe lines designated to carry potable water that are laid in the vicinity of house sewers, storm drains or sanitary sewers shall meet the following conditions:

##### **2-2.01A Parallel Installation – Water Main and Sewers:**

Normal conditions – water mains shall be laid at least ten feet (10') horizontally from any sanitary sewer, storm sewer or sewer manhole, whenever possible; the distance shall be measured edge to edge.

##### **2-2.01B Unusual Conditions:**

When local conditions prevent a horizontal separation of ten feet (10'), a water main may be laid closer to a storm or sanitary sewer provided that:

- a. The bottom of the water main is at least eighteen inches (18") above the top of the sewer;
- b. Where this vertical separation cannot be obtained, the sewer shall be constructed of materials and with joints that are equivalent to water main standards of construction.

##### **2-2.01C Crossings – Water Mains and Sewers**

##### **2-2.01C(1) Normal Conditions:**

Water mains crossing house sewers, storm sewers or sanitary sewers shall be laid to provide a separation of at least eighteen inches (18") between the bottom of the water main and the top of the sewer.

##### **2-2.01C(2) Unusual Conditions:**

When local conditions prevent a vertical separation as described in 2-2.01C (1), the following construction shall be used.

- a. Sewers passing over or under water mains should be constructed of the materials described in 2-2.01B(2).
- b. Water mains passing under sewers shall, in addition, be protected by providing:
  1. A vertical separation of at least eighteen inches (18") between the bottom of the sewer and the top of the water main.
  2. Adequate structural support for the sewers to prevent excessive deflection of joints and settling on the breaking the water mains;

3. That the length of water pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.

#### **2-2.01D Sewer Manholes:**

No water pipe shall pass through or come into contact with any part of a sewer or sewer manhole.

#### **2-2.02 Excavation and Backfill:**

Excavation and backfill for water mains shall conform to the provisions of Section 1, 2 and 3 of the EXCAVATION AND CLEANUP Specifications and the requirements below.

##### **2-2.02A Depth of Pipe Cover:**

Unless otherwise shown on the approved plans, all pipe shall be laid to a minimum depth of five feet (5') measured from the existing ground surface or established grade to the top of the barrel of the pipe. In areas subject to subsequent excavation or fill, the mains shall be laid to grades shown on the approved plans.

##### **2-2.02B Trench Width:**

The trench width may vary and depend upon the size of pipe, depth of trench and the nature of excavated material encountered. In any case, the trench width shall be ample to permit the pipe to be laid and jointed properly and the backfill to be placed and compacted.

##### **2-2.02C Pipe Foundations:**

The trench, unless otherwise specified, shall have a flat bottom conforming to the grade to which the pipe is to be laid. The pipe shall be laid on sound soil cut true and even so that the barrel of the pipe will have a bearing for its full length. Bell holes shall be excavated for joints. Any part of the trench excavated below grade shall be corrected with an approved material and thoroughly compacted.

##### **2-2.02D Dewatering of Trench**

Where water is encountered in the trench, it shall be removed during pipe laying and jointing operations. Provisions shall be made to prevent floating of the pipe. Trench water shall not be allowed to enter the pipe at any time.

#### **2-2.03 Handling of the Pipe:**

All types of pipe shall be handled in such manner as will prevent damage to the pipe or coating. Accidental damage to pipe or coating shall be repaired to the satisfaction of the Engineer or be removed from the job and methods of handling shall be corrected to prevent further damage when called to the attention of the Contractor.

Threaded pipe ends shall be protected by couplings or other means until laid.

The pipe and fittings shall be inspected by the Contractor for defects while suspended above grade.

Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations and any pipe or fitting that has been installed with dirt or foreign material in it shall be removed, cleaned and relaid. At times when pipe laying is not in progress, the open ends of the pipe shall be closed by a watertight plug or by other means approved by the Engineer to ensure absolute cleanliness inside the pipe.

#### **2-2.04 Laying of Pipe on Curves:**

Long radius curves, either horizontal or vertical, may be laid with standard pipe by deflections at the joints. Where field conditions require deflection of curves not anticipated by the plans, the Engineer will determine the methods to be used.

Maximum deflections at pipe joints and laying radius for the various pipe lengths are as found in the following standards:

Cast Iron Pipe                      AWWA C600  
Bell and Spigot Joints only required for special conditions.

Cast Iron Pipe Mechanical Joints   AWWA C600

Cast Iron Pipe Push on Joints   AWWA C600

Ductile Cast Iron Pipe           Same as Cast Iron

When rubber gasketed pipe is laid on a curve, the pipe shall be jointed in a straight alignment and then deflected to the curved alignment. Trenches shall be made wider on curves for this purpose.

## **2-2.05 Cast Iron Pipe:**

### **2-2.05A Joints for Cast Iron Pipe:**

Joints for cast iron pipe shall be in accordance with the following applicable specifications unless otherwise noted:

1. Mechanical Joints – AWWA C111 and C600
2. Push-on Joints – AWWA C111 and C600
3. Bell and Spigot Pipe with Lead Joint – AWWA C600

### **2-2.05B Jointing Mechanical Joint Pipe:**

The outside of the spigot and inside of the bell of mechanical joint pipe shall be thoroughly cleaned to remove all foreign matter from the joint. The cast iron gland shall then be slipped on to the spigot end of the pipe with the lip extension of the gland toward the socket or bell end. The rubber gasket shall be placed on the spigot end with the thick edge toward the gland.

The pipe shall be pushed forward to completely seat the spigot end in the bell. The gasket shall then be pressed into place within the bell, being careful to have the gasket evenly located around the entire joint. The cast iron gland shall then be moved along the pipe into position and bolted.

### **2-2.05C Jointing Rubber Gasket Joint Pipe (AWWA C111):**

The inside of the bell shall be thoroughly cleaned to remove all foreign material from the joints. The circular rubber gasket shall be inserted in the gasket seat provided.

A thin film of gasket lubricant shall be applied to the inside surface of the gasket. Gasket lubricant shall be a solution of vegetable soap or other solution supplied by the pipe manufacturer and approved by the Engineer. The spigot end of the pipe shall be cleaned and entered into the rubber gasket in the bell, using care to keep the joint from contracting the ground. The joint shall then be completed by forcing the plain end into the seat of the bell. Pipe which is not furnished with a depth mark shall be marked before assembly to assure that the spigot end is inserted to the full depth of the joint.

Serrated brass wedges shall be provided for electrical thawing; two (2) per joint, for 3" through 12" pipe; four (4) for larger diameter pipe. Each wedge is driven into the opening between the plain end and the bell until snug. When four (4) wedges are used, they are inserted side by side, in pairs.

Field-cut pipe lengths shall be beveled to avoid damage to the gasket and facilitate making the joint.

### **2-2.06 Thrust Blocking:**

Blocking to prevent movement of lines under pressure shall be placed at all bends, tees, caps, valves and hydrants. They shall be constructed with portland cement concrete, a minimum of twelve inches (12") thick, placed between solid ground and the fittings, and shall be anchored in such a manner that pipe and fitting joints will be accessible for repairs. Restrained joints shall be used for all mains twelve inches (12") or larger. The restrained joints are to be designed in accordance with the latest DIPRA standards.

All bends of 11-1/4 degrees or greater, and all tees and plugs shall be trust protected to prevent movement of the lines under pressure.

### **2-2.07 Connections to Existing Mains:**

All connections to water mains in use shall be made by the Contractor unless otherwise provided in the special provisions. All crosses or other specials required to be inserted in an existing main shall be furnished and set by the Contractor.

### **2-2.08 Water Service Piping**

#### **2-2.08A General:**

Water service pipe shall be copper of three-quarter inch (3/4") internal diameter unless otherwise marked on the drawings or stated in the Special Provisions. They shall be installed in accordance with provisions in the EXCAVATION AND CLEANUP specifications.

#### **2-2.08B Excavation and Backfill:**

The Contractor shall open side trenches and construct services from the main to such depth and lengths as directed by the Engineer. Unless

otherwise directed, depths shall not be less than specified for water mains. Excavation and backfill of side trenches shall be as specified in the Excavation and Cleanup specifications.

#### **2-2.08C Laying Water Service Pipe:**

1. Underground water service pipe shall be laid not less than ten feet (10') horizontally from the building drain, and shall be separated therefrom by undisturbed or compacted earth.
2. Where conditions in paragraph (1) cannot be met, the water service pipe shall be installed in accordance with the following provisions:
  - a. The bottom of the water service pipe, at all points, shall be at least eighteen (18") above the top of the building drain line at its highest point.
  - b. The water service pipe shall be placed on a solid shelf excavated to one side on the common trench.
3. Where both the water service pipe and building drain line are installed with less separation than in paragraph (2) or in the same trench, the building drain line shall be constructed of cast iron soil pipe with leaded or screwed joints, type K hard-tempered copper pipe with sweated joints, or rigid plastic pipe as specified in the Indiana State Plumbing Code. The trench shall not be backfilled until the Engineer approves the installation.

#### **2-2.09 Water Service Connection:**

The Contractor shall make all taps for service connections and install the service pipe.

Each water service pipe shall be connected to the water main through a brass corporation stop. The main shall be tapped at an angle of forty-five degrees (45), with the vertical, and the stop must be turned so that the T-handle will be on top.

The service pipe shall be laid in the trench sufficiently weaving to allow not less than one foot (1') extra length in its entire length.

A curb stop shall be furnished and installed for each service at a location shown on the plans, specified or as directed by the Engineer. A cast iron service box shall be furnished and installed

over the curb stop and held in a truly vertical position, until sufficient backfill has been placed to insure permanent vertical alignment of the box. The top of the box shall be adjusted and set flush with the established ground surface grade.

#### **2-2.10 Pressure Testing on Water Mains:**

##### **2-2.10A Pressure Test:**

After the pipe has been laid and partly backfilled as specified herein, all newly laid pipe or any valved sections of it shall, unless otherwise expressly specified, be subjected to a hydrostatic pressure equal to fifty percent (50%) more than the operating pressure at the lowest elevation of the pipe section, but not to exceed the pressure rating of the type of pipe specified. The duration of each pressure test shall be for a period of not less than one (1) hour and not more than six (6) hours. The basic provisions of AWWA C600 and C603 shall be applicable.

##### **2-2.10B Procedure for Test:**

Each section of pipe to be tested, as determined by the Engineer, shall be slowly filled with water and the specified test pressure shall be applied by a means of a pump connected to the pipe in a satisfactory manner. The pump pipe connection and all necessary apparatus including gauges and meters shall be furnished by the Contractor. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made, if necessary, at points of highest elevation and afterwards tightly plugged. Any cracked or defective pipes, fittings, valves or hydrants discovered as a consequence of this pressure test shall be removed and replaced by the Contractor with sound material and the test shall be repeated until satisfactory to the Engineer. Provision of AWWA C600 and C603, where applicable, shall apply.

##### **2-2.10C Leakage Test:**

1. After completion of the pressure test, a leakage test shall be conducted to determine the quantity of water lost by leakage under the specified test pressure. Test pressure is defined as the maximum operating pressure of the section under test and is based on the elevation on the lowest point in the line or section under test corrected to the elevation of the test gauge. Applicable provisions of

AWWA C600 shall apply. Duration of each leakage test shall be a minimum of one (1) hour in addition to the pressure test period.

2. Allowable leakage in gallons per hour for pipeline shall not be greater than that determined by the formula:

$$L = \frac{ND}{P} \times 7400$$

**NOTE:**

L= Allowable leakage in gallons per hour.

N= Number of joints in length of pipeline tested.

D= Nominal diameter of the pipe in inches.

P= Average test pressure during leakage test in pounds per square inch gauge.

3. Leakage is defined as the quantity of water to be supplied in the newly laid pipe or any valved section under test, which is necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

4. Flanged pipe shall be "bottle tight."

## 2-2.11 Disinfection of Water Mains:

### 2-2.11A Flushing:

Sections of pipe to be disinfected shall first be flushed to remove any solids or contaminated material that may have become lodged in the pipe. If no hydrant is installed at the end of the main, then a tap should be provided large enough to develop a velocity of at least two and five-tenths feet (2.5') per second in the main. One (1) two and one-half inch (2 ½") hydrant opening will, under normal pressures, provide this velocity in pipe sizes up to and including twelve inch (12").

### 2-2.11B Requirement of Chlorine:

Before being placed into service, all new mains and repaired portions or extensions to existing mains shall be chlorinated so that a chlorine residual of not less than twenty-five (25) mg/l remains in the water after standing twenty-four (24) hours in the pipe.

### 2-2.11C Form of Applied Chlorine:

Chlorine shall be applied by one of the methods that follow subject to approval by the Engineer.

### 2-2.11C(1) Liquid Chlorine:

A chlorine gas-water mixture shall be applied by means of a solution-feed chlorinating device, or the dry gas may be fed directly through the proper devices for regulating the rate of flow and providing effective diffusion of the gas into the water within the pipe being treated. Chlorinating devices for feeding solutions of the chlorine gas, or the gas itself, must provide means for preventing the backflow of water into the chlorine.

### 2-2.11C(2) Chlorine-Bearing Compounds in Water:

A mixture of water and high-test calcium hypochlorite (65-70%Cl) may be substituted for the chlorine gas water mixture. The dry powder shall first be mixed as a paste and then thinned to a one percent (1%) chlorine solution by adding water to give a total quantity of seven and five-tenths (7.5) gallons of water per pound of dry powder. This solution shall be injected in one end of the section of main to be disinfected while filling the main with water in the amounts shown in the table, which follows:

Chlorine Requirements of Produce 50 Mg/L Concentration in 100 Foot of Pipe – by Diameter

Pipe Size Inches	100% Chlorine, Lb.	1%Chlorine Solution, Gals.
4	0.027	0.33
6	0.061	0.73
8	0.108	1.30
10	0.170	2.04
12	0.240	2.88

### 2-2.11C(3) Tablet Disinfection:

Tablet disinfection is best suited to short extensions (up to 2500 ft.) and smaller diameter mains (up to twelve inches). Since preliminary flushing must be eliminated in using this method, it should be utilized only when scrupulous cleanliness has been used in construction. It shall not be used if trench water of foreign material has entered the main or if the water is below 41 F.

Tablet should be placed in each section of pipe, hydrants, hydrant branches and other appurtenances. Tablets must be at the top of the

main and shall be attached by an adhesive, such as Permatex No. 1 or any alternative approved by the Engineer. Tablets in joints between pipe sections, hydrants, hydrant branches and or appurtenances are to be crushed and placed inside the annular space, rubbed like chalk in butt ends of sections to coat them if the type of assembly does not permit crushing.

In filling a section of piping with water when using the table method, water velocity shall be less than one foot (1') per second.

Number of 5-Grain Hypochlorite Tablets Required for a Dosage of 50 Mg/L per Length of Pipe Section

Pipe Size	Length of Pipe Section - Foot				
Inches	<13	18	20	30	40
2	1	1	1	1	1
4	1	1	1	1	1
6	2	2	2	2	2
8	2	3	3	5	6
10	3	5	5	7	9
12	5	6	7	10	14

#### 2-2.11D Point of Application:

The preferred point of application of the chlorinating agent is at the beginning of the pipeline extension of any valved section of it, and through a corporation stop inserted in the pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap made on the pressure side of the gate valve controlling the flow into the pipe line extension. Alternate points of application may be used when approved by or directed by the Engineer.

#### 2-2.11E Preventing Reverse Flow:

Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Check valves may be used if desired.

#### 2-2.11F Retention Period:

Treated water shall be retained in the pipe at least twenty-four (24) hours. After this period, the chlorine residual at pipe extremities and at other representative points shall be at least twenty-five (25) mg/l.

#### 2-2.11G Chlorinating the Valves and Hydrants:

In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipeline is filled with the chlorinating agent and under normal operating pressure.

#### 2-2.11H Final Flushing and Testing:

Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its length show upon test, a chlorine residual of less than 1mg/l. In the event chlorine is normally used in the source of supply, then the test shall show a residual of not in excess of that carried in the system.

After flushing, water samples collected on two (2) successive days from the treated piping system, as directed by the Engineer, shall show satisfactory bacteriological results. Bacteriological analyses must be performed by a laboratory approve by the Indiana State Board of Health.

#### 2-2.11I Repetition of Flushing and Testing:

Should the initial treatment result in an unsatisfactory bacterial test, the original chlorination procedure shall be repeated by the Contractor until satisfactory results are obtained.

### SECTION 3: Gate Valves for Water Mains

#### 3-1 Description:

The valves shall be suitable for ordinary waterworks service, intended to be installed in a normal position on buried pipe lines for water distribution systems.

#### 3-2 Materials

##### 3-2.01 Manufacture and Making:

The gate valves shall be standard pattern and shall have the name or mark of the manufacturer, size and working pressure plainly cast in raised letters on the valve body.

### 3-2.02 Type and Mounting:

The valve bodies shall be cast iron, mounted with approved non-corrosive metals. All wearing surfaces shall be bronze or other approved non-corrosive material and there shall be no moving bearing or contact surfaces of iron in contact with iron. Contact surfaces shall be machined and finished in the best workmanlike manner, and all wearing surfaces shall be easily renewable.

All gate valves shall be two-faced, non-rising stem double disc, with parallel seats of bronze or other approved wedging devices place between them. The stem shall be of high tensile strength bronze or other approved non-corrosive metal. All nonferrous brushing shall be of substantial thickness tightly fitted and pressed into machined seats. All valves shall open by turning to the left counter-clockwise, unless otherwise specified.

### 3-2.03 End Connections:

End connections of gate valves shall consist of one of the following types unless otherwise provided in the Special Provisions shown on the plans:

1. Mechanical Joints
2. Push-on (rubber-gasket) Joints
3. Bell End Joints, lead (only where required for special conditions)
4. Flange Joints
5. Screwed or Threaded Joints

### 3-2.04 Gate Valves 16-Inch and Larger:

Gate valves sixteen inch (16") and larger to be installed in a horizontal position in a horizontal pipeline shall be of the double-disc type and shall be equipped with solid bronze (Grade I of IV) or hardbabbitt tracks securely fastened in body and bonnet. The weight of the gates shall be carried on rollers throughout their entire length of travel. Babbitt metal for tracks shall conform to ASTM B23, Grade 3. For double-disc valves of the rolling disc type, the discs shall serve as rollers. For double-disc valves of other than the roller disc type, the discs shall be carried on solid bronze (Grade I, II, III or IV) rollers securely attached to them. All valves shall be equipped with bronze scrapers to traverse the tracks ahead of the rollers.

Valves sixteen-inch (16") and larger installed in vertical or inclined lines shall be equipped with hard babbitt tracks secured to the valve body and bonnet to support the lower disc during operation, and equipped with slides to assist the travel of the gate assembly. They shall be non-rising stem type and shall be equipped with approved rugged gate position indicators. The valves shall be provided with hand wheels of ample proportion.

All gears on gate valves shall be cut tooth steel gears housed in heavy cast iron grease cases or approved design.

When manually operated gate valves sixteen-inch (16") and larger are required, they should be equipped with a bypass and bypass valve. Bypass valve shall be of the same type as the main valve, shall be equipped with handwheel and shall have the stem in a vertical position unless otherwise indicated. Sizes shall be as follows:

<u>Valve Diameter (Inches)</u>	<u>Bypass Diameter(inches)</u>
16 to 20	3
24 to 30	4
36 to 42	6
48 and larger	8

All gate valves sixteen inches (16") and larger shall be geared with gearing designed for handwheel operation. Gear ratios shall not be less than as follows:

<u>Valve Diameter (Inches)</u>	<u>Gear Ratio</u>
16	2:1
20	2:1
24	2:1
30	3:1
36	3:1
42	4:1
48	4:1

### 3-2.05 Gate Valve Stem Seals:

All gate valves to and including twelve-inch (12") in size shall be furnished with the O-ring Stem Seals. Number, size and design shall conform to the AWWA Standards for gate valve O-ring Stem Seals. Valves larger than twelve inch (12") shall be equipped with packing glands.



### **3-2.06 Wrench Nuts:**

Wrench nuts shall be made of cast iron and shall be one and fifteen-sixteenths inches (1 15/16") square at the top, two inches (2") square at the base, one and three-fourths inches (1 3/4") high, unless otherwise approved by the Town Engineer. Nuts shall have a flanged base upon which shall be cast an arrow at least two inches (2") long showing the direction of opening. The work "open", in one half inch (1/2") or larger letters, shall be cast on the nut to clearly indicate the direction of opening the valve.

### **3-2.07 Tapping Valves:**

Tapping valves shall be furnished with flanged inlet end connections having a machined projection on the flanges to mate with a machined recess on the outlet ends shall conform in dimensions to the AWWA Standards for hub or mechanical joint conditions, except that the outside of the hub shall have a large flange for attaching a drilling machine. The seat opening of the valves shall be larger than normal size to permit full diameter cuts. Tapping sleeve or cross shall be of the same manufacturer as the tapping valve.

### **3-2.08 Hydrostatic Test Pressure at Factory:**

Each gate valve shall be tested at the factory for performance and operation prior to painting and shall be subjected to the following hydrostatic pressure tests: each three inch (3") to twelve inch (12") valve, inclusive, shall be subjected to hydrostatic pressure test under pressures of both three hundred (300) psi and one hundred seventy-five (175) psi, and each sixteen inch (16") to forty-eight inch (48") valve, inclusive, shall be subjected to test pressures of three hundred (300) psi and one hundred fifty (150) psi. These tests shall be conducted in accordance with provisions of AWWA C500. Tests for special valves shall be made as provided in the special provisions.

### **3-2.09 Painting at the Factory:**

After the factory test and inspection, all ferrous parts of the valves except finished or bearing surfaces shall be painted inside and out with two (2) coats of asphalt varnish.

### **3-3 Installation of Gate Valves:**

All gate valves shall be inspected upon delivery in the field to insure proper working order before installation. They shall be set and jointed to the pipe in the manner as set forth in the AWWA Standards for the type of connection ends furnished.

Valves under twelve inch (12") shall be installed in a vertical position and be provided with a standard valve chamber of cast iron valve box so arranged that no shock will be transmitted to the valve. The box shall be centered over the operating nut, and cast iron box cover shall be set flush with the road bed or finished surface. Valves twelve inches (12") and larger shall be installed in valve vaults.

After installation, all valves shall be subjected to the field test for piping as outlined in Section II of these specifications. Should any defects in materials or workmanship appear during these tests, the Contractor shall correct such defects with the least possible delay and to the satisfaction of the Engineer.

## **SECTION IV: Butterfly Valves for Water Mains**

### **4-1 Descriptions:**

Butterfly valves to be installed in water main distribution systems shall conform to AWWA C504-70 specifications. As specified, a valve may be one of the following types or classes as designated by plans or special provisions.

- A. Wafer Valves – Class 150B, in sizes through 20 inch.
- B. Short-Body Valves – All classes, in 3 to 72 inch size.
- C. Long-Body Valves – Class 75A, 75B, 150A and 150B in 3 to 72 inch sizes.

### **4-2 Data to Be Furnished by Contractor:**

If required, the Contractor shall submit, for approval by the Engineer, drawings showing the principal dimensions, general construction and materials used for all parts of the valves and operator. All work shall be done and all valves shall be furnished in accordance with these

drawings after they have been approved by the Engineer.

#### **4-3 Workmanship:**

Valve parts shall be designated, and manufacturing tolerances set, to provide interchangeability of parts between units of the same size and produced by any one manufacturer. When assembled, valves manufactured in accordance with this standard shall be well-fitted and smooth running, and body and shaft seal shall be water-tight. All equipment shall be guaranteed against defects in workmanship or materials for one (1) year after installation.

#### **4-4 Marking:**

Markings for other than wafer valves shall be cast on the body or shall be on cast plates with raised letters, attached to the valve body. The markings shall show the valve size, manufacturer, class and year of manufacture. The minimum size of letters shall be on quarter inch (1/4") for valves 3 to 12 inches in diameter, and one half inch (1/2") for valves larger than 12 inches in diameter. Corrosion-resistant plates, attached to the body with one-eighth inch (1/8") etched or engraved letters, may be used for markings on wafer valves.

#### **4-5 Painting:**

Unless otherwise specified, all internal steel or cast iron surfaces of each valve, except finished or bearing surfaces, shall be shop painted with two (2) coats of asphalt varnish conforming to Federal Specifications TT-V-51C. Exterior steel or cast iron surfaces of each valve, except finished or bearing surfaces, shall be shop painted with two (2) coats of zinc chromate conforming to Federal Specifications TT-P-645, or, in the case of valves for buried service, with two (2) Specification TT-V-51C.

### **SECTION V: Valve Vaults and Boxes for Water Main and Water Service**

#### **5-1 General:**

This section shall apply to the construction of standard valve vaults or chambers, special valve vaults or chambers, cast iron valve boxes, curb boxes and meter boxes, all in accordance with the Standard drawings. Deep valves shall be provided with cast iron valve boxes set over the

operating stem, except where otherwise specified or shown on the plan.

#### **5-2 Materials:**

##### **5-2.01 Ring and Cover and Valve Box Castings:**

Castings for cast iron ring and cover and for cast iron parts of valve boxes shall conform to the requirements of Standard Specifications for Gray Iron Castings, ASTM Designation A-48.

#### **5-3 Construction Details:**

##### **5-3.01 Valve Vaults (Or Basins):**

Valve vaults (or basins) shall be constructed of the size and dimension and at the location shown on the drawings or at the location as established by the Engineer.

Bottoms for valve vaults shall be constructed or cast-in-place concrete or pre-cast concrete sectional slabs as shown on the plans, and shall be placed on a minimum of five inches (5") or Grade CA 10 stone bedding. A one-half inch (1/2") mortar seal shall be placed over the bottom constructed of pre-cast concrete sectional slabs.

The first riser of valve vaults shall set full cement mortar bed and shall have full bearing on the base of bottom of said structure. Each riser will then have mastic jointing material applied to the outside edges of the tongue or spigot, and the succeeding riser or cone or flat top will then be set in place. All inside joints shall be sealed with cement mortar, and shall be struck smooth.

All pipes entering valve vaults shall be set in a full cement mortar bed and the opening in the structure around the pipe shall be bricked in using concrete brick and cement mortar, and shall be protected from bearing and weight of the vault or surface traffic.

Flat tops will be used on valve basins only in the event that it is impossible to use an offset cone or as deemed necessary by the Engineer.

Adjustment of all valve basins shall be accomplished with the use of pre-cast concrete rings only. Each ring used in adjustment will be placed on a full bed of cement mortar and the

inside joint of each ring will be sealed with cement mortar.

All frames will be set to the grade as set by the Engineer and will be roll mastic material approved by the Town Engineer.

### **5-3.02 Cast Iron Valve Boxes:**

Cast iron valve boxes as shown on the drawing are placed for enclosed gate valves of small size in lieu of gate valve chambers.

Adjustable cast iron valve boxes shall be set to position during backfilling operations so they will be in a vertical alignment to the gate valve operating stem. The lower casting of the unit shall be installed first in such a manner as to be cushioned and to not rest directly upon the body of the gate valve or upon the water main. The upper casting of the unit shall then be placed in proper alignment into such an elevation that its top will be at final grade. Backfilling around both units shall be placed and compacted to the satisfaction of the Engineer.

### **5-3.03 Curb Boxes:**

Curb boxes shall be screwed type, with the base threaded to attach to the curb stop, and of such construction that it shall be capable of extension to finished grade to conform to the depth of bury of the service line as provided in the specifications.

## **SECTION VI: Fire Hydrants**

### **6-1 Description:**

These specifications are to be used in conjunction with the AWWA Standard C502 for fire hydrants for ordinary water works service.

### **6-2 Materials**

#### **6-2.01 Materials for Hydrants and Appurtenances:**

All materials used in the production of fire hydrants for ordinary service shall conform to the specifications designated for each material listed in AWWA Standard C502.

The hydrant shall be of standard manufacture and of a pattern approved by the Town. The

name or mark of the manufacturer and size of each valve opening shall be plainly cast in raised letters and so placed on the hydrant barrel as to be visible after the hydrant is installed.

As a minimum requirement, all hydrants shall be designed for a working pressure of 150 lbs. per square inch and workmanship, design and material shall conform to the AWWA Standard C502. The hydrant bodies shall be cast iron, fully mounted with approved non-corrodible metals. All wearing surfaces shall be either bronze or some other approved non-corrodible material, and there shall be no moving bearing or contact surfaces of iron in contact with iron or steel. All contact surfaces shall be finished or machined in the best workmanlike manner and all wearing surfaces shall be easily renewable.

The design of the hydrant shall be such that all working parts may be removed through the top of the hydrant and shall have the required AWWA specified number of turns of the stem to open the gate an area equal to the valve opening. Any change in area of the water passage through the valve must have an easy curve, and all outlets must have round corners of good radius.

Lugs, if required for harnessing the hydrant to the connecting pipe from main in the street, shall be provided on the bell of the elbow or on the hydrant bottom casting. A drawing of the lug construction shall be submitted for approval, on request of the Engineer.

Hydrants shall be provided with a sidewalk flange. Breaking devices shall be at the sidewalk flange, which will allow the hydrant barrel to separate at this point with a minimum breakage of hydrant parts in case of damage. There shall also be provided, at this point, a safety stem coupling on the operating stem that will shear at the time of impact. Unless otherwise specified, all hydrants will be equipped with O-Ring seals.

#### **6-2.02 Hydrant Details:**

The dimensions and details of hydrant and nozzles, unless otherwise approved by the Town Engineer as follows:

	Hydrant 4-inch <u>Connect.</u>	Hydrant 6-inch <u>Connect.</u>
Hydrant connection pipe size inside diameter	4"	6"
Standpipe, minimum inside diameter	6"	7"
Length of hydrant from bottom of hydrant connection to sidewalk ring	as required by Town	5"
Valve opening, minimum diameter	4"	5"
<b>Thread Details:</b>		
Streamer nozzles, Number and size	1-3 ½ in. 2-2 in.	1-3 ½ in. 2-2 in.
Type of thread	National Standard	

All nozzles shall be fitted with cast iron threaded caps with operating nut of the same design and proportions as the hydrant stem nut. Caps shall be threaded to fit the corresponding nozzles and shall be fitted with suitable gaskets for positive water tightness under test pressures.

The operating nuts on hydrant stem and nozzle caps shall be the same for all sizes of hydrants. Dimensions shall be as follows:

Pattern of Nut	Tapered Pentagonal
Height	1-1/6 inch
Size of Pentagon	1.35 in. at bottom of nut, 1.23 in. at top of nut (measured from point to flat)

The hydrant valve shall open by turning to the left (counterclockwise).

#### 6-2.03 Factory Hydrostatic Test:

Before the hydrant is painted at the factory, it shall be subjected to an internal hydrostatic test of three hundred pounds (300 lbs.) per square inch with the hydrant valve in a closed position and again with the hydrant valve in an open position.

#### 6-2.04 Painting:

All iron parts of the hydrant, both inside and outside shall be thoroughly cleaned and painted. All inside surfaces and the outside surfaces below the ground line shall be coated with asphalt varnish. They shall be covered with two (2) coats, the first having dried thoroughly before the second is applied.

The outside of the hydrant above the finished ground line shall be thoroughly cleaned and thereafter painted with one (1) coat of paint of a durable composition, and one (1) additional coat of a color specified as follows:

Hydrants supplied by:

Eight inch (8") mains or larger shall be painted green

Six-inch (6") mains shall be painted yellow

Four-inch (4") mains shall be painted red

#### 6-3 Construction Details:

All hydrants on private property will be painted red. The top housing of the above hydrants will be painted with a yellow reflective type paint.

All hydrants placed along streets shall be located not less than thirty-six inches (36") radius of clearance from any obstruction will be maintained. The maximum street footage distance between hydrants in residential areas shall be four hundred feet (400') and in business and industrial areas three hundred feet (300'). Hydrants shall face the curb.

Hydrants shall be plumb and shall be set so that the lowest house connection is a minimum of twenty-four inches (24") and a maximum of thirty-six (36") above the surrounding finished grade, measured from ground level to the centerline of the steamer port. All hydrants shall be inspected in the field upon delivery to the job to insure proper operation before installation. A minimum of ¼ cubic yard of coarse stone, broken concrete, or like material shall be placed at and around the base of the hydrant to insure proper drainage of the hydrant after use. The blocking of the hydrant shall consist of a wedge of Portland Cement Concrete of not less than ¼ cubic yard extending from the hydrant to undisturbed soil and shall be so placed to form a

solid barrier adjacent to the hydrant base to counteract the pressure of waste exerted thereon. Care shall be taken to insure that weep holes are not covered by concrete. The hydrant shall be set on a concrete block to insure a firm bearing for the hydrants and moving and reconnecting of existing hydrants shall be handled in a manner similar to a new installation. The hydrant valve shall be located a minimum of three feet (3'), measured horizontally, from the centerline of the hydrant to the centerline of the valve.

## **CHAPTER III: PAVEMENT**

### **SECTION I: Earthwork**

#### **1-1 General:**

The General Requirements and Covenants and the Special Provisions are part of this Specification as herein specifically set forth and shall be referred to in detail by the Contractor.

#### **1-2 References:**

The Indiana Department "Standard Specification" as amended, are part of this Specification as referred to for the subjects and in the Articles listed below. Exceptions and Supplements to these Specifications are listed in 1-3.

#### **Article   Subject**

201	Clearing and Grabbing
202	Removal of Structures & Obstructions
202	Excavation & Embankment
206	Structure Excavation
207	Subgrade
208	Finishing Shoulders, Ditches & Slopes
209	Finishing Earth Graded Roads
210	Final Trimming & Cleaning
211	Special Fill & Backfill ("B" Borrow)
212	Stockpiled Selected Materials

#### **1-3 Exceptions and Supplements to State Specifications**

##### **1-3.01 Interruption of Utilities:**

If it is necessary in the prosecution of the work to interrupt existing drainage, sewers, or under drainage, conduits, utilities or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to protect and preserve or provide temporary services for same. On locating such

facilities, the Contractor shall notify the Engineer who will arrange for their removal if necessary. The Contractor shall satisfactorily repair all damages to such facilities or structures, which may result from any of his operations during the period of pavement construction.

##### **1-3.02 Interruption of Utilities:**

Unless otherwise specified, all areas outside paved areas shall be topsoiled. The thickness of topsoil shall be a minimum of four inches (4").

### **SECTION II: Base Course**

#### **2-1 References:**

The Indiana Highway Department's "Standard Specifications", as amended, are part of this specification as referred to for the subjects and in the Articles listed below. Exceptions and Supplements to these Specifications are listed in 2-2.

#### **Article   Subject**

301	Plant Mix Bituminous Base Course
302	Road Mix Bituminous Base Course
303	Compacted Aggregate Base, Surface or Shoulders
304	Subbase
305	Reconditioning
306	Portland Cement Treated Base
307	Portland Cement Concrete Base
308	Sodium Chloride Stabilized Aggregate Base Course
309	Bituminous Stabilized Subbase

#### **2-2 Exceptions**

##### **2-2.01 Testing:**

All materials to be incorporated in the work shall be tested in accordance with the methods and requirements of the State Specifications. The Contractor shall employ as established testing laboratory meeting with the approval of the Engineer to do all necessary testing if so requested. The laboratory shall furnish copies of all test and written approval of all material incorporated in the work. The cost of all testing shall be assumed by the Contractor.

## SECTION III: Pavements

### 3-1 References

The Indiana Highway Department "Standard Specifications", as amended, are part of this specification as referred to for the subjects and in the Articles listed below. Exceptions and Supplements to the Specification are listed in 3-2.

Article	Subject
401	Plant Mix Pavements – General
402	Hot Asphalt Emulsion (AE) Pavement
403	Hot Asphalt Concrete Pavement
404	Bituminous Coated Aggregate Pavement
405	Road Mix Bituminous Pavement
406	Cold Mix Bituminous Pavement
407	Seal Coat
408	Prime Coat
409	Tack Coat
501	Portland Cement Concrete Pavements
502	Cement Concrete Pavement

### 3-2 Exceptions and Supplements to State Specifications

#### 3-2.01 Delayed Surfacing

Where building construction is being executed along with, or adjacent to, the street improvements, the bituminous surface course shall not be placed until it has been determined by the Engineer that no more trucking of heavy building materials, brick, steel, concrete, lumber, etc. will be required. Before placing of the surface course, the binder course shall be swept, patched if necessary, and primed per State of Indiana Specifications.

#### 3-2.02 Testing:

All materials to be incorporated in the work shall be tested in accordance with the methods and requirements of the State Specifications. The Contractor shall employ an established testing laboratory meeting with the approval of the Engineer to do all necessary testing if requested. The laboratory shall furnish copies of all tests and written approval of all materials incorporated in the work. The cost of all testing shall be assumed by the Contractor.

The Contractor shall be responsible for furnishing laboratory test results from cores to be taken at locations as designated by the Engineer.

The density, thickness, gradation, and extraction of the finished bituminous pavement shall be obtained from specimens cut with a core drill. The diameter of the specimens in on case shall be less than 3 7/8 inches nor more than four inches (4"). Where stone base is used, the testing laboratory shall verify the thickness of the stone base.

The test specimens shall be removed at locations as designated by the Engineer and care shall be exercised to avoid damage to the specimens. The holes caused by the removal of the specimens shall be refilled immediately with a bituminous material meeting these specifications, compacted and finished to the satisfaction of the Engineer.

#### 3-2.03 Bituminous Concrete Surface Course, Class I (Modified):

When the Plans call for Bituminous Concrete Surface Course, Class I (Modified), the following exceptions to the State of Indiana Specifications shall apply:

The Course aggregate shall be in accordance with Section 403, except that portion passing the three eighths inch (3/8") sieve shall be 70-100%.

The use of a manufacture Stone Sand will be required and shall meet the specifications in accordance with Section 403 for fine aggregates.

## SECTION IV: Structures

### 4-1 References:

The Indiana Highway Department "Standard Specifications", as amended, are part of this specification as referred to for the subjects and in the Articles listed below:

Article	Subject
701	Piling
702	Structural Cement
703	Reinforcing Steel
704	Concrete Floor Slabs
705	Sidewalks on Structures
706	Railings
707	Pressed Concrete
708	Pneumatically Placed Mortar
710	Repointing Masonry in Structures

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<u>Article</u>	<u>Subject</u>
711	Steel Structures
712	Timber Structures
713	Temporary Bridges & Approaches
714	Concrete Box Culverts & Retaining Walls
715	Culverts, Storm & Sanitary Sewers
716	Jacked Pipe
717	Structural Plate Pipe, Pipe Arches & Arches
718	Under Drains
719	Tile Drains
720	Manholes, Inlets & Catchbasins
721	Automatic Drainage Gates

## **SECTION V: Incidental Construction**

### **5-1 References**

The Indiana Highway Department "Standard Specifications", as amended, are part of this specification as referred to for subjects and in the Articles listed below. Exceptions and Supplements to these Specifications are listed in 5-2.

<u>Article</u>	<u>Subject</u>
601	Guard Rail
602	Concrete Median Barrier
603	Fences
604	Sidewalks & Steps
605	Curbing
606	Standard Lip Gutter
607	Paved Side Ditch or Concrete Gutter
608	Shoulder Drains
609	Bituminous Shoulders
610	Surface for Approaches
611	Crossovers & Driveways
612	Undersealing
613	Salvaged Road Materials
614	Concrete Header
615	Monument & Markers
616	Riprap & Slopewall
617	Reconstructed Expansion Joint
618	Rumble Strips
619	Painting
620	Bituminous Patching Mixtures
621	Seeding & Sodding
622	Planting Trees, Shrubs & Vines

### **5-2 Exceptions and Supplements to State Specifications**

#### **5-2.01 Concrete Curb and Gutter:**

Concrete Curb and Gutter shall be constructed in accordance with State Specifications except herein modified.

- a. Expansion joints shall be three-quarter inch (3/4") in thickness, using pre-molded joint filler material and two (2), three-quarter inch (3/4") diameter smooth round dowel bars thirty inches (30") long, fully greased, placed in pairs at the ends of all radii, at roadway intersections, at the junction of new and existing curb, at all cold joints, at a minimum of forty-foot (40') intervals between said radii locations.
- b. Said dowel bars shall be placed so that half their length is on either side of the joint. On the same end of each bar, there shall be placed a plastic, pre-molded expansion tip, which will allow lateral expansion and movement. The dowel bars shall be placed such that they shall be encased in concrete, a minimum of three inches (3") in any direction.
- c. A roll curb shall be installed on all residential streets, (see Diagram A).
- d. A barrier curb shall be installed at all other locations, (see Diagram B).

## **SECTION VI: Materials**

### **6-1 References:**

The Indiana State Highway Department "Standard Specifications" as amended, are part of this specification as referred to for the subjects and in the Articles listed below:

<u>Article</u>	<u>Subject</u>
901	Hydraulic Cement
902	Bituminous Materials
903	Aggregates
904	Masonry Units
905	Joint Materials
906	Concrete, Clay & Plastic Drainage Components
907	Metal Pipe
908	Paint & Epoxy Penetrating Sealers
909	Metal Materials
910	Wood Materials
911	Concrete Curing Materials & Admixtures
912	Miscellaneous
913	Roadside Development Materials

- 914 Bridge Piles & Bearings  
915 Materials Certifications

## **CHAPTER IV: SANITARY SEWERS AND STORM DRAINS**

### **SECTION I: Pipe Materials for Sewers**

#### **1-1 Description:**

Pipe use in sanitary and/or storm sewer construction shall be concrete, vitrified clay or ABS/PVC composite pipe, unless otherwise approved by the Town Engineer. Bedding shall be continued for a minimum of six inches (6") over the top of pipe (twelve inches (12") is preferred). Mandrel testing is required for PVC pipe.

#### **1-2 General**

##### **1-2.01 References:**

Where reference is made to an ASTM or ASSHTO designation, it shall be the latest revision at time of approval.

##### **1-2.02 Dimensions:**

Pipe eight inches (8") in diameter and larger shall be furnished in units of not less than five feet (5'), except as noted in Section 1-3.01B.

##### **1-2.03 Certification:**

It shall be the responsibility of the pipe manufacturer to certify that pipe and joint material furnished is capable of withstanding the infiltration of exfiltration basis as specified or required.

#### **1-3 Materials**

##### **1-3.01 Pipe Materials**

The type, class and strength of pipe to be used shall be as shown on the plans, and approved by the Engineer prior to installation.

##### **1-3.01A Concrete Pipe, Non-Reinforced:**

Non-reinforced concrete pipe shall conform to ASTM Designation C-14, Table I (Standard Strength) or Table II (Extra Strength as specified).

##### **1-3.01B Concrete Pipe, Reinforced:**

Reinforced concrete pipe shall conform to ASTM Designation C-76. For pipes thirty inches (30") or more in diameter, the length of the unit shall be not less than seven feet six inches (7'6").

##### **1-3.01C Vitrified Clay Pipe:**

Vitrified Clay Pipe shall conform to ASTM Designation C-700 (Extra Strength).

##### **1-3.01D Galvanized Corrugated Metal Pipe:**

Galvanized corrugated metal pipe when approved shall conform to the material, fabrication, and inspection requirements of ASSHTO Designation M-36; except that gauges and types shall be noted on the plans.

##### **1-3.01E Cast of Ductile Iron Pipe:**

Cast of ductile iron pipe shall conform to ANSI Specification A 21-6 or A21-8, Class 150, tar coated or cement lined with mechanical or rubber ring joints.

##### **1-3.01F PVC or ABS Composite Pipe:**

PVC or ABS Composite pipe shall conform to ASTM Designation D-2680. Gasket joints shall be required for PVC composite pipe in accordance with ASTM Designation D-3212.

##### **1-3.01G PVC Plastic Pipe:**

PVC plastic pipe shall conform to Section 207-17 of the "Greenbook" Standard Specifications for Public Works Construction, 1997 Edition. Gasket joints shall be required for PVC pipe in accordance with this same section. SDR 35 or better must be used for sanitary and storm building sewers. SDR 35 or better must be used for sanitary and storm building sewers. SDR 26 or better must be used for all sanitary and storm sewer mains.

#### **1-3.02 Jointing Material**

##### **1-3.02A Flexible Gasketed Joints for Concrete Pipe:**

Flexible joints shall be rubber o-ring when used with concrete pipe.



### **1-3.02B Jointing Materials "Noble" Joints or Vitrified Clay Pipe:**

The "Nobel" joint material shall be required subject to the following conditions:

- a. The PVC collar installed on the pipe instead of the monolithic clay bell shall conform to ASTM specification D-1784. The collar shall be installed at the factory and shall be shrunk-fit onto a smooth clay pipe surface. The factory applied barrier between the PVC collar and the clay pipe shall be EVA (Ethylene Vinyl Acetate).
- b. The finished joint shall meet all material and performance tests specified under ASTM specification C-425.

### **1-3.03 Fittings:**

Unless otherwise specified, tee fittings shall be provided in the sanitary sewer main for service sewer connections; a log of all tee fitting locations shall be kept by the Contractor during installation and one (1) legible copy of each such log shall be turned over to the Town prior to acceptance. Tees shall be six inches (6") inside diameter, unless otherwise specified or noted. All fittings shall be of the same material as the pipe. Material joining the fitting to the pipe shall be free from cracks and shall adhere tightly to each jointing surface.

### **1-3.04 Cap for Fittings**

All fittings shall be capped with a plug of the same material as the pipe, and gasketed with the same gasket material as the pipe joint, or be of material approved by the Engineer. The plug shall be secured to withstand test pressures specified herein.

## **SECTION II: Pipe Laying, Jointing and Testing**

### **2-1 Construction Details**

#### **2-1.01 Survey Line and Grade:**

Survey line and grade control hubs at a fifty-foot (50') maximum spacing and at a change in line and grade shall be provided by the Contractor, except a greater interval may be used in conjunction with the use of a laser in maintaining line and grade.

The Contractor shall constantly check line and grade of the batter boards or laser beam and the pipe and in the event they do not meet specified limits described herein-after, the work shall be immediately stopped, the Engineer notified, and the cause remedied before proceeding with the work.

#### **2-1.02 Sewer Pipe Laying:**

Laying of sewer pipe shall be accompanied to line and grade in the trench only after it has been dewatered and the foundation and/or bedding has been prepared in accordance with the Technical Specifications for Excavation and Cleanup, Section I - Excavation and Backfill for Underground Conduits. Mud, silt, gravel and other foreign material shall be kept out of the pipe and off the jointing surfaces.

All pipe laid shall be retained in position so as to maintain alignment and joint closure until sufficient backfill has been completed to adequately hold the pipe in place. All pipe shall be laid to conform to the prescribed line and grade shown on the limits that follow. At least three (3) batter boards shall be maintained in position during all pipe-laying operations, unless a laser beam is used.

Variance from established line and grade shall not be greater than one thirty-second of an inch ( $1/32''$ ) per inch of pipe diameter and not to exceed one-half inch ( $1/2''$ ), provided that any such variation does not result in a level or reverse sloping invert; provided also that variation in the invert elevation between adjoining ends of pipe, due to non-concentricity of jointing surface and pipe interior surfaces, does not exceed one sixty-four of an inch ( $1/64''$ ) per inch of pipe diameter, or one-half inch ( $1/2''$ ) maximum.

The sewer pipe, unless otherwise approved by the Engineer, shall be laid upgrade from the point of connection on the existing sewer or from a designated starting point. The sewer pipe shall be installed with the bell and forward or upgrade, unless approved otherwise. When pipe laying is not in progress, the forward end of the pipe shall be kept tightly closed with an approved temporary plug.

### **2-1.02A Sewer Pipe and Watermain Separation:**

Sanitary sewers, house sewers or storm drains that are laid in the vicinity of pipe lines designated to carry potable water shall meet the following conditions as set forth in 2-1.02B (1) through 2-1.02D.

### **2-1.02B (1) Parallel Installation – Sewers and Watermains – Normal Conditions:**

Any sanitary sewer, storm or sewer manhole shall be located at least ten feet (10') horizontally from watermains, whenever possible; the location shall be measured from edge to edge.

### **2-1.02B (2) Parallel Installation – Sewers and Watermains – Unusual Conditions:**

When local conditions prevent a horizontal separation of ten feet (10'), a storm or sanitary sewer may be laid closer to a watermain provided that:

- a. The bottom of the watermain is at least eighteen inches (18") above the top of the sewer.
- b. Where this vertical separation cannot be obtained, the sewer shall be constructed of pressure-tight materials (Ductile-Iron Pipe ANSI A 21.51 or as approved by the Engineer.

### **2-1.02 C (2) Crossing-Sewers and Watermains – Unusual Conditions:**

When local conditions prevent a vertical separation as described in 2-1.02 C (1), the following construction shall be used:

- a. Sewers passing over or under watermains should be constructed of materials described in 2-1.02B (2b).
- b. Construction of sewers crossing over watermains shall insure additional protection to the watermains by providing:
  - (1) A vertical separation of at least eighteen inches (18") between the bottom of the sewer and the top of the watermain.
  - (2) Adequate structural support for the sewers to prevent excessive deflection of joints and setting on the breaking and watermains.

- (3) That the length of 2-1.02B (2b) type sewer pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the watermain.

### **2-1.02D Sewer Manholes:**

Sewer manholes shall be constructed so that no water pipe is in contact with or enclosed by any part of a sewer or sewer manhole.

### **2-1.03 Culvert Pipe:**

Laying of culvert pipe shall conform to the requirements of Section 2-1.02, except that variation from established line and grade, measured at each joint, shall not exceed one thirty-second inch (1/32") per inch of pipe diameter, and provided that resulting level on backsloping length of pipe does not occur.

### **2-1.04 Dewatering:**

Dewatering sufficient to maintain the water level at or below the surface of trench bottom or base of the bedding course shall be accomplished prior to pipe laying and jointing. The dewatering operation, however accomplished, shall be carried out so that it does not destroy or weaken the strength of the soil under or alongside the trench. The normal water table shall be restored to its natural level in such a manner as to not disturb the pipe and its foundation.

### **2-1.05 Bedding:**

Bedding, other than concrete embedment, shall consist of gravel, crushed gravel, crushed stone or crushed slag, 1/4" to 1" in size. As a minimum, the material shall conform to the requirements of Section 303 and 903 of the "Standard Specifications", Indiana Department of Highways or ASTM C-33. The gradation shall conform to gradation No. 53 of the Indiana Standard Specification. The pipe shall be laid so that it will be uniformly supported and entire length of the pipe barrel will have full bearing. No blocking of any kind shall be used to adjust the pipe to grade except when used with embedment concrete. Bedding shall be required for all sewer construction, except ductile iron pipe, and shall be of a thickness equal to one-fourth (1/4<sup>th</sup>) the outside diameter of the sewer pipe with a maximum thickness of eight inches (8"), and minimum thickness of four inches (4").

Where unsuitable material is encountered at the grade establishment, all such unsuitable soil shall be removed under the pipe and for the width of the trench, and shall be replaced with well-compacted material, to the satisfaction of the Engineer.

Where rock is encountered, it shall be removed below grade and replaced with a cushion of well-compacted bedding material having a thickness under the pipe of not less than eight inches (8").

#### **2-1.06 Plugs and Connections:**

Plugs for pipe branches, stubs or other open ends which are not to be immediately connected shall be made of an approved material and shall be secured in place with a joint comparable to the main line joint. Stoppers may be of an integrally cast breakout design.

#### **2-1.07 Pipe Markings:**

The markings on reinforced concrete pipe indicating the minor axis of the elliptical reinforcement shall be placed in a vertical plane (top or bottom) when the pipe is laid. The use of elliptical reinforcement must be specifically approved by the Engineer, otherwise, circular reinforcing is required.

#### **2-1.08 Pipe Jointing:**

Type of joint to be used will conform to the requirements of Section 1-3.02.

All pipe and jointing for sanitary sewers shall be subject to the tests specified in Section 2-1.11.

#### **2-1.08 A Gasket Type Joints:**

All extensions, additions and revisions of a sanitary sewer system shall be made with sewer pipe jointed by means of a flexible gasket, which shall be fabricated and installed in accordance with the specifications that follow. The material specifications of all approved flexible gasketing shall be in accordance with Section I.

Pipe handling after the gasket has been affixed, shall be carefully controlled to avoid disturbing the gasket and knocking it out of position or loading it with dirt or other foreign material. Any gaskets so disturbed shall be removed and replaced, cleaned and relubricated in required, before the jointing is attempted.

Care shall be taken to properly align the pipe before joints are entirely forced home. During insertion of the spigot, the pipe shall be partially supported by hand, sling or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned.

Sufficient pressure shall be applied in making the joint to assure that it is home, as described in the installation instructions provided by the pipe manufacturer. Sufficient restraint as specified in Section 2-1.02 shall be applied to the line to assure that joints once home are held so, until fill material under the alongside the pipe has been sufficiently compacted. At the end of the workday, the last pipe laid shall be blocked in an effective way to prevent creep "down time".

Pipe required to be laid on curved alignment shall be joined in straight alignment and then deflected, joint by joint. Special care shall be taken in blocking the pipe just previously laid by tamped fill or otherwise to resist the misarranging forces generated during compression of the joints being made.

#### **2-1.08 B Jointing of Dissimilar Pipes:**

For dissimilar pipes where suitable adapter couplings are not available, the jointing shall be accomplished with a special fabricator coupling or concrete encasement as approved by the Engineer.

#### **2-1.09 Sewer Lines Connections:**

Sewer line connections to trucks, mains, laterals, or side sewers shall be left uncovered until after an acceptance inspection has been made. After approval of the connection, the trench shall be backfilled as specified in section 1-2.20 of the Technical Specifications for Excavation and Cleanup, after first covering the bare pipe with select material compacted to a depth of six inches (6") above the crown of pipe.

No existing sewer shall be connected to a sanitary sewer unless specifically authorized in each instance by the Engineer. Storm drains and drain tile shall not be connected to a sanitary sewer or combination sewer.

#### **2-1.10 Services Risers:**

Where the depth of the sewer invert is greater than twelve feet (12') below the surface of the ground, a service riser shall be constructed to an elevation of ten feet (10') below the ground evaluation or as directed by the Engineer.

The service riser shall be constructed with a minimum six-inch (6") tee, placed to receive the six-inch (6") pipe. The tee shall be bedded as shown on Standard Drawings.

#### **2-1.11 Testing for Acceptance of Sanitary Sewer:**

Testing sanitary sewers for acceptability shall be conducted by the air pressure method in accordance with ASTM C828.

The sewer will be limited to 5% deflection. The Mandrel shall be 95% of the average inside diameter. Mandrel testing should not occur until a minimum of forty-five days (45) have elapsed since backfilling.

##### **2-1.11A Test Sections:**

Unless otherwise specified or directed by the Engineer, the first section of sanitary sewer constructed of approximately twelve hundred feet (1200') in length or the entire length of sewer, if it is less than twelve hundred feet (1200') shall be tested by the exfiltration, infiltration, or air testing method before additional excavation is permitted.

The Contractor may, at his option, divide the first section of sewer into subsections of more convenient length for testing. If the section or subsection tested does not pass the leakage test, it shall be repaired and the test repeated until a satisfactory test is obtained. Excavation shall not proceed beyond the first twelve hundred feet (1200') test section until test results for the entire twelve hundred are satisfactory.

In the event the first twelve hundred feet (1200') of sewer did not pass the leakage test on first trial (or if tested in subsection in the first trial for each of the subsections) the next subsection of sanitary sewer or approximately twelve hundred feet (1200') in length shall also be tested, repaired if necessary, and retested until a satisfactory test is obtained before additional excavation is started.

When favorable test results are obtained on first trial on a full twelve hundred foot (1200') in length shall also be tested, repaired if necessary, and retested until a satisfactory test is obtained before additional excavation is started.

When favorable test results are obtained on first trial on a full twelve hundred-foot (1200') section of pipe, the Engineer may designate additional sections for testing, if in his opinion, conditions warrant such. The Engineer reserves the right to select the location and lengths of additional test sections when construction operations or materials change or where construction difficulties indicate leakage may be present or inspections selected at random.

The Engineer shall notify the Contractor of the location where a test is to be required no later than fifteen (15) days after the sewer installation has been completed in the section to be tested. Unless otherwise authorized, the Contractor shall arrange to commence the test within fifteen (15) days after receiving notification by the Engineer, whichever date is later.

##### **2-1.11B Test Technique:**

All wyes, tees and stubs shall be plugged with flexible jointed caps, or acceptable alternate, securely fastened to withstand the internal test pressure. Such plugs or caps shall be readily removable.

The section of sewer to be tested shall have been trench backfilled and cleared. Pneumatic plugs (having a sealing length equal to or greater than the diameter of the pipe to be tested) placed in both ends of the pipe to be tested shall then be pressurized to 4psig above the average back pressure allowed to stabilize at least two (2) minutes.

After the stabilization period, the line shall be pressurized to 3.5 psig and the time in minutes measured for pressure to drop to 2.5 psig. If ground water is present, the air pressure within shall be increased to 3.5 psig above the level of the ground water and the drop of one pound (1lb.) of air pressure measured in minutes. The line being tested shall be deemed acceptable when the time taken for the one pound (1lb.) pressure drop is not less than that shown under 2-1.11C (3).

### **2-1.11C Allowable Leakage for Sanitary Sewers:**

Air leakage test results shall not be less than the time per inch of pipe diameter per length of sewer pipe as specified in the following "Air Test Table".

#### **Air Test Table**

**Specification Time (Min:sec) Required for Pressure Drop from 3 ½ to 2 ½ Psig When Testing One Pipe Diameter Only**

**(Exhibit A)**

### **2-1.11D Payment for Leakage Test:**

Payment for tests shall be the responsibility of the Contractor. If any section fails to meet the test, it shall be repaired at the Contractor's expense and retested until it meets the leakage limitation.

## **SECTION III: Manholes for Storm and Sanitary Sewers**

### **3-1 Description:**

Manholes shall be leak-tight and shall be constructed of pre-cast concrete units, or cast-in-place concrete only, all in compliance with approved plans and these specifications.

### **3-2 Materials**

#### **3-2.01 Reinforced Concrete:**

Reinforced concrete shall consist of portland cement, mineral aggregates and water, in which steel has been embedded in such manner that the steel and concrete set together.

##### **3-2.01A Cement:**

Portland cement shall conform to the requirements of the specifications for portland cement ASTM C150, any type, or it may be air-entraining portland cement conforming to ASTM C175.

##### **3-2.01B Wire Fabric Reinforcement:**

Reinforcement shall consist of wire conforming to ASTM A185.

#### **3-2.01C Bar Reinforcement:**

Bar reinforcement shall conform to ASTM A15, intermediate grade.

#### **3-2.01D Aggregates:**

Aggregates shall conform to ASTM C33, except that the requirements for gradation shall not apply to precast items.

#### **3-2.01E Mixtures:**

The aggregates shall be so sized and graded, and proportioned and thoroughly mixed in proportions of cement and water as well as will produce a homogeneous concrete mixture of such quality that the manhole components will conform to the strength and watertightness requirements of these specifications. Admixtures

#### **3-2.01F Curing**

Cast-in-place manhole components shall be moist-cured for a period of not less than seven (7) days except that when high-early-strength cement is used, the curing shall be not less than three (3) days. Pigmented membrane compound or other approved method may be applied in lieu of moist curing.

#### **3-2.01G Strength:**

All concrete placed under these specifications shall have a minimum compressive strength of thirty-five hundred (3,500) psi at twenty-eight (28) days. Strength determination shall be in accordance with ASTM C-39, unless otherwise approved by the Engineer.

#### **3-2.02 Steps:**

Manhole steps shall be plastic only and furnished and installed as shown on the approved plans.

#### **3-2.03 Cast Iron Frames, Covers and Steps:**

Castings shall conform to the requirements of gray iron castings ASTM A48 and conform to the details shown on the approved plans. They shall be adjusted to final grade with precast concrete rings and mortar. The castings shall be attached to manhole cone or riser ring by means of preformed rolled mastic as approved by the Engineer. Sanitary manholes shall be equipped with a water-tight gasketed lid to reduce surface

inflow. The type of lid specified will be subject to approval by the Town Engineer in writing.

#### **3-2.04 Precast Manhole Components:**

Precast manholes shall conform to ATSM C-478 and with design dimensions. Cones and sections shall be substantially free from fractures, large or deep cracks and surface roughness. Slabs shall be sound and free from gravel pockets.

#### **3-2.05 Adjusting Rings:**

Final adjustment of frames and grates to grade shall be accomplished through the use of precast concrete adjusting rings. The rings shall be designated to provide a structural capacity equal to the cones and sections. They shall have a device for positively positioning and securely fastening the ring to the frame so as to match the surface grade and slope and prevent movement when exposed to traffic loadings. Adjusting rings greater than nine inches (9") shall not be allowed.

#### **3-2.06 Monolithic Concrete Manholes:**

Monolithic concrete manholes shall conform to detailed shop drawings submitted to the Engineer for approval prior to beginning work and shall conform to the dimensional requirements specified. Walls and base shall be six inches (6") minimum thickness and space of steps shall be sixteen inches (16").

### **3-3 Construction Details**

#### **3-3.01 Foundation Preparation:**

##### **3-3.01A Dewatering:**

Dewatering of the site shall conform to the requirements for sewer trench dewatering in Section 2-1.04.

##### **3-3.01B Sub-Base Preparation:**

Adequate foundation for all manhole structures shall be obtained by removal and replacement of unsuitable material with well-graded granular material; or by tightening with coarse ballast rock, or by such other means as provided for foundation preparation of the connected sewers.

#### **3-3.02 Bedding:**

Precast base selections shall be placed on a well graded granular bedding course conforming to the requirements for sewer bedding in Section II, but not less than twelve inches (12") in thickness and extending to the limits of the excavation. The bedding course shall be firmly tamped and made smooth and level to assure uniform contact and support of the precast element.

#### **3-3.03 Cast in Place Bases:**

Unless otherwise specified, cast-in-place bases shall be at least six inches (6") in thickness and shall extend at least six inches (6") radially outside of the diameter of the manhole section. Bedding requirement shall be conducted in accordance with Section 3-3.02.

#### **3-3.04 Precast Manholes:**

Precast manholes may be constructed with a precast base section or a monolithic base structure as specified or shown on the approved plans.

A precast base section shall be carefully placed on the prepared bedding so as to be fully and uniformly supported in true alignment and making sure that all entering pipes can be inserted on proper grade.

All lift holes on precast elements for sanitary and storm sewer manholes shall be completely filled with an approved bitumastic material. All joints between precast elements on sanitary sewer manholes shall be made with an approved bitumastic material or an approved rubber gasket.

The first precast section shall be placed on the monolithic base structure before the base has taken initial set, and shall be carefully adjusted to true grade and alignment with all inlet pipes properly installed so as to form an integral watertight unit, or the section shall be mortared into a suitable groove provided in the top of the monolithic base. The first section shall be uniformly supported by the base concrete, and shall not bear directly on any of the pipes.

### **3-3.05 Monolithic Concrete Materials:**

Monolithic concrete manholes shall be constructed in accordance with the provisions of this Section and the details shown on the approved plans.

### **3-3.06 Excavation and Backfilling:**

In order to permit the joints to be mortared properly and also to permit compaction of the backfill material, the excavation shall be made to a diameter of at least twelve inches (12") greater than the diameter of the structure.

The space between the side of the excavation and the outer surfaces of the manhole, shall be backfilled with selected granular backfill if the manhole is in a pavement or if the nearest point of the excavation for the manhole falls within five feet (5') of the pavement edge or back of curb. If the structure falls beyond these limits, other backfilling material may be used, provided it meets with the approval of the Engineer. The backfill shall be compacted as provided in Section 1-2.20 of the Technical Specifications for Excavation and Cleanup. Excess excavated materials shall be disposed of in accordance with Section 2-2.06 of the Technical Specifications for Excavation and Cleanup.

### **3-3.07 Inlet and Outlet Pipes:**

Pipe or tile placed in the masonry for inlet or outlet connections shall extend through the wall and beyond the outside surface of the wall a sufficient distance to allow for connections, and the masonry shall be carefully constructed around them so as to prevent leakage along the outer surface.

### **3-3.08 Placing Castings:**

Casting placed on concrete or masonry surface shall be set by means of preformed, rolled mastic, as approved by the Engineer. Casting shall be set accurately to the finished elevation so that no subsequent adjustment will be necessary.

### **3-3.08A Streets at Grade:**

Where work is in paved streets or parking areas which have been brought to grade, not more than sixteen inches (16") shall be provided between the top of the cone or slab and the underside of

the manhole casting ring for adjustment of the casting ring to street or surface grade.

### **3-3.08B Streets or Alleys with No Established Grade:**

Where work is in the streets or other areas which have not been brought to grade, not less than four inches (4") no more than sixteen inches (16") shall be provided between the top of the cone or slab and the underside of the manhole casting ring for adjustment of the casting ring to street or surface grade.

The top of the manhole casting shall be flush with the street or ground surface unless otherwise directed by the Engineer.

### **3-3.08C Manholes Not Within Street or Alley Areas:**

Where work is in cultivated areas, the top of the casting, unless otherwise directed by the Engineer, shall be twelve inches (12") below the established ground surface.

### **3-3.08D Sealing Materials:**

Manholes which are not covered with earth and any other manholes indicated on the plans to be sealed shall be plugged and sealed with an approved bitumastic material.

### **3-3.09 Channels:**

Channels or Inverts shall be made to conform accurately to the sewer grade and shall be brought together smoothly with well rounded junctions, satisfactory to the Engineer, and in conformance with details shown on the approved plans.

### **3-3.10 Pipe Connections:**

Special care shall be taken to see that the openings through which pipes enter the structure are completely and firmly rammed full of jointing material consisting of nonshrinking grout. The manhole-sewer joint shall be completely coated with bituminous materials to ensure watertightness.

### **3-3.11 Drop Manhole Connections:**

Drop manhole connections shall conform, in all respects, to details shown on the approved drawings.

#### **3-3.12 Cleaning:**

All newly constructed manholes shall be cleaned of any accumulation of silt, debris, or foreign matter of any kind, and shall be free from such accumulations at the time of final inspection.

### **SECTION IV: Catch Basins, Inlet and Valve Vault Construction**

#### **4-1 Description:**

This work shall consist of catch basins, inlets, or valve vaults, together with the necessary cast iron frames and grates or lids, all constructed in accordance with the specifications where indicated or directed by the Engineer, and conforming in all respects to lines, grades and dimensions shown on the approved plans and furnished by the Engineer.

#### **4-2 Materials:**

All materials shall conform to the Material requirements for manholes in these specifications.

#### **4-3 Construction Methods**

##### **4-3.01 Concrete:**

Poured or precast concrete structures shall be constructed in accordance with applicable provisions of Section 3-2 and 3-3.

##### **4-3.02 Precast Reinforced Concrete Sections:**

Precast reinforced concrete sections shall be laid in accordance with the applicable Sections of 3-3.

##### **4-3.03 Placing Castings:**

Castings placed on concrete surfaces shall be set in accordance with the applicable Sections of 3-3.08.

##### **4-3.04 Excavation and Backfilling:**

In order to permit the joints to be mortared properly and also to permit proper compaction of the backfill material, the excavation shall be

made to a diameter of at least twelve inches (12") greater than the diameter of the structure.

#### **4-3.05 Inlet and Outlet Pipes:**

Pipe or tile placed in the masonry for inlet or outlet connections shall extend through the walls and beyond the outside surfaces of the walls, a sufficient distance to allow for connections, and the masonry shall be carefully constructed around them so as to prevent leakage along the outer surfaces.

#### **4-3.06 Curing and Protection:**

After the masonry work is completed, it shall be kept moist and protected from elements in a satisfactory manner for a period of not less than forty-eight (48) hours.

#### **4-3.07 Cleaning:**

All newly constructed catch basins, inlets, and similar structures shall be cleaned of any accumulation of silt, debris, or foreign matter of any kind, and shall be free from such accumulations at the time of final inspection.

#### **4-3.08 Bedding:**

Bedding requirements shall be conducted in accordance with Section 3-3.02.

### **SECTION V: Service Sewers**

#### **5-1 Cleanouts:**

Cleanouts shall be provided at locations and in accordance with details shown on the approved plans.

##### **5-1.01 Restoration, Finishing and Cleanup:**

The Contractor shall restore all paved surfaces, curbing, sidewalks, or other surfaces to their original condition in such manner as to meet the requirements of applicable sections. All surplus material and temporary structures, as well as all excess excavation shall be removed and the entire site of contractor operations shall be left in a neat and clean condition.



## **SECTION VI: Pipe Covering and Embankment for Conduit Construction**

### **6-1 Description:**

This section of the specification applies to the construction of pipe covering and embankment. Pipe covering shall be constructed where the invert of the pipe is so shallow that placing of earth over the pipe becomes necessary to provide a minimum depth of cover. Pipe cover and embankment shall be constructed where the invert of the pipe is above the existing ground and it becomes necessary to construct an embankment upon which the pipe and pipe covering is to be placed. The embankment and cover shall be constructed to lines shown on the drawings.

### **6-2 Construction Details**

#### **6-2.01 Pipe Bed:**

The area upon which the embankment for the pipe bed is to be stripped to the extent the Engineer directs to provide a firm bedding.

The embankment upon which the pipe is to be installed shall be constructed up to the spring line in six inch (6") lifts, each lift being compacted to a density equal to ninety-five percent (95%) of AASHTO T99 density. The material used in constructing the embankment shall be such that it will readily compact to required density. The Contractor may use any type of compacting equipment he wishes, provided the required end result is obtained and provided no damage occurs to surface or subsurface improvements.

#### **6-2.02 Pipe Cover:**

The pipe cover material above the compacted embankment shall be placed without compacting, and shall be shaped to the required section.

#### **6-2.03 Source of Material:**

The source of material shall be that which is specified by the Engineer.

## **CHAPTER V: SIDEWALKS**

### **SECTION I: Specification**

#### **1-1 General:**

The construction practices covered under this section shall be in compliance with the "Standard Specifications" of the Indiana State Highway, as prepared, adopted and amended, and as specifically modified herein. This work shall consist of Portland Cement Concrete Sidewalk and sidewalk aprons, constructed in one (1) course on a prepared subgrade and an aggregate base. The installation of the Portland Cement Concrete sidewalk shall conform with all requirements of Section 604 of the Standard Specifications, including all referred Sections except as modified herein.

### **SECTION II: General Requirements**

#### **2-1 Protection of Premises:**

The Contractor shall properly protect adjoining property from injury. Any damage to same must be repaired promptly. Particular care shall be exercised to protect all trees, including their roots.

Cleanup and restoration of parkways, lawns and related work shall be conducted at the Contractor's expense. Protection of freshly placed sidewalk to prevent defacing or damage to the surface will be the Contractor's responsibility. Damage areas must be repaired before concrete has set or must be removed and replaced at the Contractor's expense. Bituminous concrete driveways adjacent to sidewalks if damaged by excavation and from work shall be restored by the Contractor to their original state or better. Special attention must be given to preventing the occurrence of unsightly construction areas. The Contractor shall at all times, keep the work site free from accumulations of waste material and rubbish and upon completion shall immediately remove all tools, equipment, barricades, surplus materials and rubbish and shall leave completed work clean and ready to use.

#### **2-2 Defective Work:**

Defective work will be replaced at the Contractor's expense. Excessive flaking and checking within the maintenance period will be

considered case for replacement of areas so affected.

## **2-3 Construction Details:**

### **2-3.01 Water:**

The Contractor shall apply for permission for all water required and used in the construction of the work and comply with the requirements of the Water Department for the use of such water.

### **2-3.02 Dumpsite:**

The Contractor shall secure an approved site for dumping broken concrete and excavation spoils.

### **2-3.03 Material:**

Portland Cement Concrete used for sidewalk construction shall be Class A, six sack mix, air entrained and conform with the applicable paragraphs of Section 702 of the Standard Specifications.

### **2-3.04 Location:**

The public sidewalk, covered in this section, shall be located at the edge of the public right-of-way, except as otherwise indicated on the approved plans. The width of the sidewalk shall be determined by the Engineer and so indicated on the approved plans. Said sidewalk shall run continuously through driveways of any kind and shall remain at consistent grade.

### **2-3.05 Detail:**

Concrete sidewalks shall be five inches (5") thick. Sidewalks crossing driveways shall be seven inches (7") thick and reinforced with 6" x 6", ten (10) ga., welded wire reinforcing, in accordance with Section 909. The base and subgrade shall conform to the requirements of this section.

### **2-3.06 Excavation and Grading:**

This item or work includes all necessary excavation and disposal of surplus of the improvements. In the event imported material is needed to provide for the required grades, the Contractor shall use sand or gravel fill material at his own expense as may be required.

### **2-3.07 Concrete Removal:**

Any concrete removal shall conform to all applicable paragraphs of Section 604 of the Standard Specifications.

### **2-3.08 Subgrade:**

The subgrade, upon which any public sidewalk is to be placed, shall be compacted to obtain not less than ninety-five percent (95%) of the standard laboratory density in the subgrade.

The subgrade shall be constructed so that after being compacted, it will conform to the required alignment and grade stipulated in the approved plans.

### **2-3.09 Base Preparation:**

In addition to the Subgrade Preparation specified in the Indiana State Highway Standard Specifications, a minimum of two inches (2") of crushed stone or crushed gravel based, or four inches (4") of sand, conforming to State Specifications shall be placed over the entire area and compacted to the satisfaction of the Engineer. Any undercutting of the subgrade shall be backfilled and compacted with like material.

### **2-3.10 Finishing:**

Latinate worked to the surface must be removed before finishing. No coarse aggregate shall be closer than one-half inch (1/2") below the finished surface. Contraction joints shall be scored across the walk at five foot (5') intervals and one-half inch (1/2") premolded bituminous expansion joints shall be provided at all junctions with curbs, driveways, at the junction of existing (remaining) sidewalks, and at thirty-foot (30') intervals.

Portland Cement Concrete used for sidewalk construction shall be Class A six sack mix, air entrained and conform with the applicable paragraphs of Section 702 of the Standard Specifications.

### **2-3.11 Slope of Concrete Sidewalk:**

Unless otherwise specified on the Plans, forms for the sidewalk shall be set so that the slab will have a fall of one inch (1") vertical to four feet (4') horizontal away from the property line. Forms for the sidewalk aprons shall be set so that

the slab will have a uniform fall between the sidewalk proper and the curb grade.

### 2-3.12 Sidewalk Ramps

Sidewalk ramps shall be provided at all intersections, driveways, and curbs in accordance with current ADA standards. The ramp type for all sidewalks located on INDOT right-of-way shall be subject to the approval of INDOT.

## CHAPTER VI: PAVEMENT DESIGN STANDARDS

### SECTION I: Design Standards

#### 1-1 General:

The Town Engineer shall approve all pavement designs for new alleys, commercial service roads, public roads for industrial and residential subdivisions and arterial roads.

#### 1-2 Required Information:

- A. The following information shall be submitted to the Town's engineering department for the approval of pavement design at the time of preliminary subdivision approval:
1. Soil report by a qualified soil engineer.
  2. Results of a California Bearing Ration (CBR) test performed according to current AASHTO specifications.
  3. If a nonresidential street, a traffic volume study by a qualified traffic engineer.
  4. Pavement design calculations for all nonresidential streets and any residential street with a CBR of less than 2.0.
- B. Noncollector residential streets with a CBR of 2.0 or greater shall be constructed with one (1) of the following alternates:

#### CBR 2.0+

##### Bituminous Base

1.5" Bit Surf Course  
6" Bit Binder Course

##### Aggregate Base

1.5" Bit Surf Course  
1.5" Bit Binder Course  
10" Agg Base Course

- C. Collector residential streets with a CBR or 2.0 or greater shall be constructed with one (1) of the following alternates:

#### CBR 4.0+

##### Bituminous Base

1.5" Bit Surf Course  
2" Bit Binder Course  
7" Bit Base Course

##### Aggregate Base

1.5" Bit Surf Course  
4" Bit Binder Course  
11" Agg Base Course

#### CBR 3.0 – 4.0

1.5" Bit Surf Course  
2" Bit Binder Course  
9" Bit Base Course

1.5" Bit Surf Course  
4" Bit Binder Course  
16" Agg Base Course

#### CBR 2.0 – 3.0

1.5" Bit Surf Course  
2" Bit Binder Course  
9" Bit Base Course

1.5" Bit Surf Course  
4" Bit Binder Course  
16" Agg Base Course

**NOTE:** All materials and procedures shall be in accordance with applicable sections of the Indiana Department of Highway Standard Specifications. The use of Portland Cement Concrete as a substitute for bituminous may be approved by the Town Engineer after a detail design has been submitted and reviewed.

#### 2-1 Design Procedures:

All nonresidential streets and residential streets with a CBR of less than 2.0 shall be designed using the following procedure:

##### A. Definition of Terms:

**CBR – The California Bearing Ratio:** a measure of the support provided by the roadbed soils or by unbound granular materials.

**Passenger Vehicles (PV):** automobiles, pickup trucks, vans and other similar two-axle, four-tire vehicles.

**Single Units (SU):** trucks and buses having either two axles.

**Multiple Units (MU):** truck tractor semi-trailers, full trailer combination vehicles, and other combinations of a similar nature.

**Traffic Factor (TF):** the total number of 18-kip equivalent single axle load applications to the design lane anticipated during the design period, express in millions.

**Design Period (DP):** the number of years that a pavement is to carry a specific traffic volume and retain a minimum serviceability level.

**Structural Design Traffic:** the average daily traffic (ADT) estimated for the year representing one half the design period.

**Design Lane:** the lane carrying the greatest number of single and multiple units.

**Class I Road:** road designed as a two to four lane facility with a structural design traffic greater than 3500 ADT.

**Class II Road:** road designated as a two to four lane facility with a structural design traffic greater than 2000 and less than or equal to 3500 ADT.

**Class III Road:** road designed as a two-lane facility with a structure.

**Class IV Road:** road designed as a two-lane facility with structural design traffic less than 750 ADT.

**Structural Number (D):** an index number derived from an analysis of traffic and roadbed soil conditions which may be converted to a flexible pavement thickness through the use of suitable factors related to the types and strengths of material being used in the pavement structure.

## B. Traffic Factor:

The traffic factor shall be calculated based upon the following equations:

### Road Classification I

#### Traffic Factor Equation

$$TF = DP \left[ \frac{(0.15 \times P \times PV) + (132.5 \times S \times SU) + (482.53 \times M \times MU)}{1,000,000} \right]$$

### Road Classification II

#### Traffic Factor Equation

$$TF = DP \left[ \frac{(.15 \times P \times PV) + (112.06 \times S \times SU) + (385.81 \times M \times MU)}{1,000,000} \right]$$

### Road Classification III & IV

#### Traffic Factor Equation

$$TD = DP \left[ \frac{(.015 \times P \times PV) + (109.14 \times S \times SU) + (384.35 \times M \times MU)}{1,000,000} \right]$$

## Where

DP = Design Period = 20 years

PV, SU, MV = Structural Design Traffic at 10 years from date of construction.

For Class I & II  
PV = 90%  
SU = 7%  
MU = 3%

For Class III & IV  
PV = 95%  
SU = 3%  
MU = 2%

P,S,M = Percentage of PV, SU & MU in design lane.

For two lane facility  
P = 0.5 (50%)  
S = 0.5 (50%)  
M = 0.5 (50%)

For four lane facility  
P = 0.32 (32%)  
S = 0.45 (45%)  
M = 0.45 (45%)

## C. Structural Number: (required)

Based upon the calculated Traffic Factor and the CBR results, the required Structural Number D (required) is obtained by projecting a line through the Traffic Factor and the CBR on the appropriate design nomograph (Figures 1&2 attached).

## D. Structural Number (provided)

The provided Structural Number D (provided), an abstract number related to the strength required of the total pavement structure, is the summation of the layer thickness multiplied by appropriate strength coefficients. The equation to determine the Structural Number (provided) takes the following form:

$$D \text{ (provided)} = a$$

Where D (provided) = Structural Number Provided

The following coefficients shall be utilized for design purposes:

Bit Surface (Marshall Stability + 1700)	0.40
Bit Binder (Marshall Stability + 1700)	0.33
Bit Base (Marshall Stability + 1700)	0.33
Agg Base (IDOH No. 53)	0.13
Agg Subbase (IDOH No. 53)	0.13

#### E. Minimum Schedule

The pavement design provided shall utilize the following minimum thicknesses:

<u>Bituminous Base</u>	<u>Aggregate Base</u>
1.5" Bit Surf Course	1.5" Bit Surf Course
6" Bit Base Course	1.5" Bit Binder Course
	10.5" Agg Base Course

All other streets

<u>Bituminous Base</u>	<u>Aggregate Base</u>
1.5" Bit Surf Course	1.5" Bit Surf Course
2" Bit Binder Course	4" Bit Binder Course
7" Bit Base Course	11" Agg Base Course

**NOTE:** Aggregate Subbase may be used for stabilization of existing ground as may be necessary.

## CHAPTER VII: STORMWATER CONTROL

### SECTION I: REQUIREMENTS

#### 1-1 Intent

- A. The intent of these regulations is to diminish threats to public health and safety caused by the runoff of excessive stormwater, reduce economic losses to individuals and the community at large, promote the orderly development of land water resources and to conform to the requirements of statutes and drainage law. These provisions further regulate, guide and control drainage features of subdivisions and developments within the Town of Munster, and set forth standards for the design of the stormwater drainage facilities and systems.
- B. It is not the intent to take areas out of use for the sole purpose of storing excess stormwater, nor is it the purpose of storing excess stormwater, nor is it the purpose to

restrict land use of increase development costs. The basic purpose is to eliminate the storage or transportation of excess stormwater in or through habitable structures, or across land in a manner prejudicial to the public health and welfare. The use of "natural" paths of stormwater run-off to form "bypass" channels and the restriction of these channels to form storage areas is encouraged. Since political and ownership boundaries make the use of "natural" drainage patterns difficult, earthmoving that is accomplished to create enhanced land usage should be planned so as to provide stormwater drainage or radically change watershed boundaries.

- C. It is intended that the stormwater from all developments requiring stormwater retention or detention shall be released at a rate that will not exceed the stormwater run-off rate from the site in its undeveloped state.

### SECTION II: General Requirements

#### 2-1 General Requirements:

- A. **Allowable Release Rate:** The release rate of stormwater from all developments requiring detention shall not exceed the stormwater run-off from the area in its natural undeveloped state. (The Town will not accept a release rate greater than that calculated for a two (2) year frequency storm with a run-off coefficient of 0.15, unless the applicant can show by detailed calculations, which are acceptable to the Town, that the capacity of the natural outlet sewers serving the area is greater.
- B. **Bypass:** Ability to bypass through the development being designed, the flow from all upstream areas resulting from a storm of design frequency (assuming the upstream land is fully developed or as proposed under comprehensive zoning plans). The bypass flow rate shall be computed using a storm frequency of not less than five (5) year intensity and a runoff coefficient of not less than 0.35.
- C. **Contiguous:** Means adjacent to the touching at one (1) point or more, if the properties are separated by an easement or dedicated right-of-way, they shall be considered contagious.

**D. Interest:** Means property interest or contractual interest, legal or equitable, directly or indirect, in part or in full, including option to buy; in the case of shareholder interest, the shareholder shall be deemed to have an interest if he owns or controls five percent (5%) or more of the shares.

**E. One Hundred Year Frequency Rainfall:** A storm intensity measured in inches per year over a twenty-four (24) hour period as studied by the U.S. Weather Bureau and which has a one percent (1%) per year chance of occurring.

**F. Owner:** Means record titleholder or a beneficiary of a land trust which is the record titleholder, and includes singular and plural; if the owner is other than an individual, the term includes beneficiaries, agents shareholders, officers and directors.

**G. Ownership:** Means holding of record title of any beneficial interest.

**H. Run-Off Coefficient:** Character variables which involve testing of precipitation, soil, moisture, infiltration, detention, ground slope, ground cover evaporation, and shape of the drainage area. For R-1 single-family developments a minimum of 30% lot coverage shall be used for the impervious area on the lot. For R-2 single-family developments a minimum of 35% lot coverage shall be used for the impervious area on the lot. Also the minimum "C" factor to be used for the developed state shall be 0.45 for pervious and 0.90 for impervious unless adequate documentation is provided to justify a lesser value.

**I. Two Year Frequency Rainfall:** A storm intensity measured in inches per hour over a twenty-four (24) hour period as studied by the U.S. Weather Bureau and which has fifty percent (50%) per year chance of occurring.

**J. Storm Sewers:** Storm sewers shall be designed with a minimum velocity of 3 ft/sec.

## 2-2 Jurisdiction

### A. Types of Developments Requiring Detention:

1. All commercial and industrial regardless of area;
2. All single and/or two (2) family developments of four (4) or more contiguous lots;
3. All multi-family building(s) of three (3) or more units/buildings regardless of area.

## 2-4 Exemptions:

- A. Under the provisions of this Ordinance, stormwater detention facilities meeting the criteria and requirements established herein are not required by the Town for the following projects, provided that the available outlet capacity is adequate as calculated by the Design Engineer and approved by the Town. If the outlet capacity is not adequate, then detention as determined by the Town will be required to store that portion of the runoff exceeding the outlet capacity.
- B. Any area presently served by a detention pond which has the capacity to control the proposed improvement.
- C. Any construction either residential, commercial, or industrial which is constructed in a manner which will not result in the reduction of undeveloped or grass areas (i.e. building addition on an existing parking lot).

## SECTION III: Required Submissions

### 3-1 Subdivision Required:

- A. Plans and specifications for drainage and detention features are required and shall be submitted for review and approval as part of subdivision engineering features.
- B. Specific design calculations and details shall be provided when the final plans and specifications are presented for review. Sample calculations illustrating the provisions of this section and definitions of

terminology shall be furnished by the Town Engineer, upon request.

- C. The subdivision design engineer shall submit a master stormwater management plan, which will list the parameters to be used in the ultimate design. Preliminary detention calculations will be provided which will document sufficient acreage is reserved in the proposed land plan to provide for the estimated volume. The master stormwater management plan will be submitted for the Town's review prior to proceeding with the final design.

### **3-2 Subdivision Not Required:**

- A. Before building permits are issued by the Town, the owner shall furnish, as part of the submittal, plans and calculations showing, in adequate detail, the manner in which detention requirements will be satisfied. If, as part of the preliminary plans and design, it is proposed that the detention requirements will be satisfied by providing on-site detention facilities shall be designed such that the minimum size of the area served by such facilities shall not be less than three (3) acres of tributary area serviced by a single control device.
- B. The areas for which detention facilities are being designed shall be delineated on the preliminary plans. If a developer owns a tract of land larger than three (3) acres each, such lot shall be jointly developed so that the minimum area for which detention facilities are designed shall not be less than the recommended three (3) acres.
- C. Individual buildings developed within the area of the subject detention control area, shall conform to the preliminary plans. Said preliminary plans for a specific parcel shall be made part of the individual development project, as outlined herein.

### **3-3 Allowable Release Rates:**

Because of the generally flat conditions of the land in this area, channel configurations cut by nature and capacity of existing sewers are generally unable to handle the runoff from high intensity rainfalls, which results in flooding of lower land area. In order to not increase the runoff from proposed developments, the release

rate of stormwater must be limited to the carrying capacity of these natural channels or sewers. The Town will accept, as a minimum design, a release rate from a storm having a two (2) year frequency and a runoff coefficient of 0.15. The Town Engineer may accept or reject any and all of the detention control methods or related calculations.

### **3-4 Design Storm:**

The live detention storage to be provided will be calculated on the basis of the 100-year frequency rainfall, as published by the U.S. Weather Bureau for this area. The detention volume required will be that necessary to handle the runoff of a 100-year rainfall, for any and all durations, from the fully developed discharged during the same duration at the approved two (2) year release rate.

## **SECTION IV: Outlet Control Sizing**

### **4-1 Special Provisions:**

- A. Detention ponds shall be provided for all development types previously mentioned. However, for many developments, the actual land area being improved using the two(2) year storm release will result in a very small diameter restrictor pipe diameter.
- B. In order to provide a minimum standard for a restrictor size, a minimum three inch (3") diameter and a length of two feet (2') shall be smaller than the three inches (3"), the plans shall reflect the require size.
- C. As an alternate or additional control measure, there are catch basin frames with manufactured three-quarter inch (3/4") or one-inch (1") diameter holes precast in the lids. This type of restrictor may be used to further reduce the inflow rate, but must be used in conjunction with the minimum restricted outlet control within the catch basin.

### **4-2 Multiple Outlets:**

- A. To eliminate small multiple outlets, designs generally requiring a release pipe of less than three inches (3") are not recommended. In order to calculate the overland flow time of concentration, the following formulas are to be used:



1. For lengths less than one thousand feet (1000'), use the attached Figure 3 graph or the formula:

$$T_o = 0.625 (L/S)$$

Where

$T_o$  = overland flow time (min)  
 $L$  = overland length (ft)  
 $S$  = slope of ground (ft/ft)

2. For lengths of one thousand feet (1,000') and greater, use the following formula:

$$T_o = \frac{1.8 (1.1-C)L}{S}$$

Where

$T_o$  = overland flow time (min)  
 $L$  = overland length (ft)  
 $C$  = runoff coefficient (0.15)  
 $S$  = slope of ground (as PERCENT)

3. To calculate the allowable two (2) year release rate, the following data shall be used:

<u>Storm</u> (hrs)	<u>Duration</u> (min)	<u>Intensity</u> (in/hr)
0.17	10	3.55
0.33	20	2.60
0.50	30	2.10
0.67	40	1.80
0.83	50	1.60
1.00	60	1.40
1.50	90	1.05
2.00	120	0.80
3.00	180	0.60

#### 4-3 Outlet Control:

- A. Outlet control structures shall be designed to operate as simply as possible and shall require little or no attention for proper operation.
- B. Velocity of discharge shall be limited to 2.0 feet per second at the point of discharge, unless discharge is made into a storm sewer, or protected embankment. All energy dissipation and velocity attenuation shall be accomplished on the site being developed.

- C. Hydraulic and hydrologic calculations shall be submitted to substantiate all design features.

#### 4-4 Design of Detention Ponds:

- A. Dry bottom stormwater storage areas shall be designed to serve a secondary purpose for recreation, open space, or other types of uses that will not be adversely affected by occasional or intermittent flooding. The method of carrying the low flow through or around the pond shall be approved by the Town Engineer. Low flow swales are discouraged. However, if approved, underdrains must be provided.

- B. The entire pond shall be finished using topsoil and sod, or by using topsoil and hydro-seed.

- C. Minimum grades for grassed bottoms shall be two percent (2%) with a maximum slope of ten percent (10%). Pond side slopes shall not exceed a slope ratio of four feet (4') horizontal to one-foot (1') vertical.

- D. Wet bottom storage ponds shall be designed so sufficient capacity is provided for the calculated detention requirements.

1. The Normal Pool shall be established at an elevation that can maintained, (within the limits of seasonal fluctuations), by rainfall runoff and normal groundwater recharge during a years average rainfall.

2. The side slopes and bottom depths shall be designed to maintain the biologic health of the pond and life-safety of the people.

3. Shoreline or sidebank erosion protection shall be provided by structural or non-structural ground cover (rip-rap, vegetation cover) above and below the normal water elevation to resist erosive wave action, ice reaction, or other seasonal reactions to the side slopes.

- E. Each detention pond, regardless of tributary service area, shall provide a method of overflow in the event of a restrictor failure or a storm in excess of a 100 year frequency.



The point(s) of discharge shall be directed towards the street, or other adequate source of stormwater collection.

- F. During the construction of the detention pond(s), steps shall be incorporated into the engineering design to prevent downstream erosion of earth, and washing debris into existing draining facilities.
- G. Detention ponds shall be designed with a setback off the right-of-way of ten feet (10') plus two feet (2') for every one-foot (1') of depth to the pond bottom.

#### **4-5 Easement for Public Detention Ponds:**

- A. All detention pond facilities not maintained by individual property owner(s) shall be located within a drainage easement granted to the Town.

#### **4-6 Bonding:**

- A. Where required, the costs for stormwater detention/retention pond construction shall be included in the engineering estimate for the total site improvements.

#### **4-7 Innovative Practices:**

- A. The "REQUIREMENTS" of this Ordinance are promulgated to establish standards for conventional methods of retention and detention of stormwater. Some physiographic and geologic features of the terrain will permit successful discharge of surface stormwater accumulations to granular sub-surface areas. It is not the intent of these "REQUIREMENTS" to inhibit the design of such subsurface facilities.
- B. The design of sub-surface discharge (or other innovative) facilities shall be substantiated by site-specific testing data and hydrologic calculations based upon rational design principles.
- C. Consideration of innovative facilities shall include an examination of siltation-protection features and analysis of maintenance problems.

## **CHAPTER VIII: STANDARD STREET LIGHTS**

### **SECTION I: GENERAL**

#### **1-1 Intent:**

It is the intent of this chapter to identify regulations, design standards, and procedures necessary to secure the timely and appropriate installation of a street lighting system, which will improve traffic safety by providing illumination to improve visibility, resulting in the reduction of preventable vehicular and pedestrian accidents. The described system is designed to illuminate intersections, vertical and horizontal curves and mid-block locations on extraordinarily long blocks. The described street lighting system is specifically not intended, to provide a deterrent to neighborhood crime or to illuminate private property.

#### **1-2 Requirements:**

All developments which include the installation of new streets or the substantial improvement of existing streets shall be required to pay for the installation of a street lighting system as described in this chapter.

#### **1-3 Responsibility:**

The party responsible for installing required subdivision improvements shall be responsible for reimbursing the Town for the cost of an approved street lighting system. This public improvement, like all others, becomes the property of the Town, after the expiration of the specified maintenance period. The Town shall be responsible for the installation of the standard street light system.

### **SECTION II: Design Requirements**

#### **2-1 Spacing:**

Lighting shall be provided at all street intersections; near or at the end of all dead end or cul-de-sac locations, in excess of two hundred (200) feet in length, measured along the centerline of said street, from the intersection of curb lines to the end of the public right-of-way; and at the approximate midpoint of street segments in between intersections in excess of five hundred (500) feet in length, measured from the intersection of curb lines.

## **2-2 Mounting Height:**

The luminaire shall be a minimum of twenty-five (25) and a maximum of forty (40) feet, above the top curb immediately adjacent.

## **2-3 Luminaire:**

All luminaire shall be one-hundred and fifty (150) watt, high pressure sodium, capable of producing 16,000 lumens of illumination. They shall also be of flush lens, anti-vandalism type, capable of shielding light from adjacent private property.

## **2-4 Illumination Pattern:**

The required street lighting system shall be capable of meeting or exceeding the illumination pattern, minimums, maximums, and average, as identified in Figure 4.

### **SECTION III: Procedures:**

#### **3-1 Required Submittals:**

As a part of the submittals required prior to engineering approval the developer shall submit a preliminary plat showing the proposed location of streetlights.

#### **3-2 Design Approval:**

Approval of the street light system design shall be given as a part of the overall engineering approval for the development.

#### **3-3 Performance Bond:**

The estimated cost of the street light system design shall be given as a part of the overall engineering approval for the development.

### **SECTION IV: Operation and Maintenance Requirements**

#### **4-1 General:**

The party responsible for the installation of the required subdivision improvements shall be responsible for reimbursing the Town for operating and maintaining the street lighting system once installed during the required maintenance period.

## **4-2 Duration:**

The operation and maintenance period duration shall be two (2) years from the date of installation.

## **4-3 Inspection:**

A final inspection of the system shall be conducted prior to the termination of the operation and maintenance period to determine if the Town will then assume responsibility for the system.

## **CHAPTER IX: SIGNAGE**

### **SECTION I: General**

#### **1-1 Intent:**

It is the intent of this chapter to identify regulations, design standards and procedures necessary to secure the timely and appropriate installation of street and traffic signs, which will improve traffic safety by providing uniform, standardized signage treatment, resulting in the reduction of preventable vehicular and pedestrian accidents.

#### **1-2 Requirement:**

All developments which include the installation of new streets of the substantial improvement of existing streets shall be required to install street signage as described in this chapter.

#### **1-3 Responsibility:**

The party responsible for installing required subdivision improvements shall be responsible for the purchase of an approved signage system. This public improvement, like all others, becomes the property of the Town, after the expiration of the specified maintenance period. The Town shall be responsible for the installation of street and traffic signs.

#### **1-4 Timing:**

The signage system shall be promptly installed when deemed necessary by the Town, however, in no case shall the system be installed prior to the issuance of the first building permit in the affected subdivision.

### **1-5 Phasing:**

Street signs shall be installed as a whole system, in accordance with that portion of the overall subdivision, which is eligible for the issuance of building permits.

## **SECTION II: Design Requirements**

### **2-1 Standards:**

Street and traffic signs shall be required in accordance with the procedures and requirements as outlined in the most recent edition of the Indiana Manual on Uniform Traffic Control Devices.

### **2-2 Interpretation:**

The Town shall interpret the Indiana Manual on Uniform Traffic Control Devices for purposes identified in this chapter.

### **2-3 Construction Specifications**

## **SECTION III: Procedures**

### **3-1 Design:**

After the developer has submitted an engineering plan for review, the Town shall:

- a. identify all necessary signage,
- b. determine a cost estimate for same,
- c. submit (a) and (b) to the developer for review and acceptance.

### **3-2 Performance Bond:**

The estimated cost of the signage system shall be included in the amount of the performance bond necessary to insure proper installation of required improvement, should such a bond become necessary.

### **3-3 Performance Inspection:**

After installation of the signage system by the Town the developer is required to inspect the system and approve the Town's performance.

### **3-4 Payment:**

After performance approval, the Town shall invoice the developer for the cost of installing the signage system. Said amount shall remain as

an element of the performance bond until the invoice is paid in full.

### **3-5 Maintenance:**

Maintenance for the signage system becomes the responsibility of the Town upon the payment in full of the invoiced amount.

## **CHAPTER X: SUPPLEMENTAL DECORATIVE STREETLIGHTS**

### **SECTION I: General**

#### **1-1 Definitions:**

- A. **Standard Streetlights** – Residential streetlights as defined in Chapter 8 of the Town of Munster Infrastructure Specifications, as amended.
- B. **Supplemental Decorative Street Lights** – Supplemental streetlights on public right-of-way in addition to standard streetlights not owned or operated by the Town.

#### **1-2 Intent:**

It is the intent of this chapter to identify regulations, design standards and procedures necessary to allow property owners and property owners associations to install supplemental decorative streetlights within the public right-of-way. The installation of supplemental decorative street light systems can not be used as a substitute for the standard municipal street lighting. All subdivisions shall have standard streetlights as required by the Town Code and Chapter VIII of these Infrastructure Specifications.

#### **1-3 Requirement:**

All developments which include the installation of new streets or the substantial improvements of existing streets shall be required to install a standard street lighting system as described in Chapter VIII. Installation of a supplemental decorative street lighting system is optional. The decision to install a supplemental decorative street light system rest with the property owner and/or a property owners association.

#### **1-4 Responsibility:**

The individual property owner or a group of property owners acting in concert shall be responsible for the purchase, installation, operation and maintenance of any supplemental decorative streetlight system.

- A. Any individual wishing to install such a system shall provide the Town with proof of property ownership.
- B. Any group wishing to install supplemental decorative streetlights shall provide the Town with a copy of their articles of incorporation and a list of the names and addresses of members, identifying officers and representatives of the group.
- C. Any individual or group installing a supplemental decorative streetlight system shall provide the Town with a recordable document accepting full responsibility for all costs and liability associated with the installation, operation and maintenance of the system.

### **SECTION II: Design Requirements**

#### **2-1 Plan Submittal:**

Property owners and associations wishing to install supplemental decorative streetlights shall submit a complete set of plans for the system, including:

- A. A preliminary plat showing the location of:
  - 1. the supplemental decorative street light fixtures;
  - 2. all associated conduits, pipes and electrical equipment;
  - 3. all existing or proposed utility systems and structures in the parkway; and,
  - 4. all NIPSCO feeds and equipment needed to serve the proposed system.
- B. Detailed specifications from the manufacturer describing the luminaire, electrical components, and illumination spread pattern of the fixture.

The Town reserves the rights to reject any plan that will adversely impact any existing or proposed public improvements.

### **SECTION III: Operation and Maintenance Requirements**

#### **3-1 General:**

The party responsible for the installation of the supplemental decorative streetlight system shall be responsible for operation and maintaining the system once installed. If the responsible party fails to maintain the supplemental decorative streetlight system, the Town shall have the right to require that the system be removed. All removal costs shall be born by the party responsible for its installation.

#### **3-2 Maintenance Bond Required:**

At the time of installation, the Town and the responsible party shall agree upon the amount of a bond to guarantee the annual maintenance and, if necessary, removal of the supplemental decorative streetlight system. The responsible party shall provide the bond, which shall be renewable, every three (3) years.

## **CHAPTER XI: SUBSTITUTE STREETLIGHTS**

### **SECTION I: General**

#### **1-1 Definitions:**

- A. **Standard Streetlights** – Streetlights as defined in Chapter 8 of the Town of Munster Infrastructure Specifications, as amended.
- B. **Supplemental Decorative Street Lights** – Supplemental streetlights on public right-of-way in addition to standard streetlights.
- C. **Substitute Streetlights** – An alternative street lighting system owned or operated by the Town located on public right-of-way intended to substitute for a standard streetlight system.

#### **1-2 Intent:**

It is the intent of this chapter to identify regulations, design standards and procedures necessary to allow developers, property owners and property owners associations to install alternative streetlights in multifamily, commercial, and industrial developments. Said systems shall be located within the public right-of-way in fulfillment of the requirement identified in Section 26-368. The installation of substitute street light systems can be used in place of the standard municipal street lighting only if it meets the design standards and procedures stipulated in this chapter.

#### **1-3 Requirement:**

All developments which include the installation of new streets or the substantial improvements of existing streets shall be required to install an approved street lighting system functionally equivalent to the standard street lights as described in Chapter VIII. Installation of a substitute street lighting system is optional. The decision to install a substitute street light system rests with the developer, property owner and/or a property owners association.

#### **1-4 Responsibility:**

The individual property owner or a group of property owners acting in concert shall be responsible for the purchase, installation, operation, and maintenance for a two-(2) year period of any substitute streetlight system.

- A. Any individual wishing to install such a system shall provide the Town with proof of property ownership.



- B. Any group wishing to install substitute streetlights shall provide the Town with a copy of their articles of incorporation and a list of the names and addresses of members, identifying officers and representatives of the group.
- C. Any individual or group installing a substitute streetlight system shall provide the Town with a recordable document accepting full responsibility for all costs and liability associated with the installation, operation and maintenance for a two-(2) year period of the system.

## **SECTION II: Design Requirements**

### **2-1 Required Submittals:**

- A. Developers, property owners and associations wishing to install substitute streetlights shall submit a complete set of plans for the system, including a preliminary plat showing the location of the substitute street light fixtures; all associated conduits, pipes and electrical equipment; all existing or proposed utility systems and structures in the parkway; and, all NIPSCO feeds and equipment needed to serve the proposed system.
- B. Detailed specifications must be submitted from the manufacturer describing the luminaries, electrical components, and illumination spread pattern of the fixture.
- C. The Town reserves the rights to reject any plan that will adversely impact any existing or proposed public improvements.

### **2-2 Specifications**

- A. The illumination levels and pattern must meet or exceed the requirements of a standard street lights as described in Chapter VIII.
- B. The town must find that the substitute street system will result in an aesthetically pleasing system, and similar if not identical to other existing alternative street lighting systems, which will not impose an undue maintenance burden on the Town of Munster.
- C. The developer, property owner, or association must supply the Town with 10% of the number of complete lighting units being installed as spares or replacements.
- D. The wiring, controller, foundations, and standards must be installed in accordance with Town specifications.
- E. A permit to install the lighting system must be issued by the Town before commencing installation.





### **SECTION III: Operation and Maintenance Requirements**

#### **3-1 Payment:**

The party responsible for the installation of the substitute streetlight system shall be required to pay the difference between the charges for energy and maintenance for a standard street lighting system for this same development, and the proposed substitute system. The amount paid shall be in the form of a lump sum, payable to the Town, and shall be determined by multiplying the number of lights by the annual per light differential, multiplied by a ten (10) year responsibility period.

#### **3-2 Maintenance Responsibility:**

The party responsible for the installation of the substitute streetlight system shall be responsible for operation and maintenance of the system once installed for a two- (2) year period.

#### **3-3 Maintenance Bond Required:**

At the time of installation, the Town and the responsible party shall agree upon the amount of a bond to guarantee the annual maintenance of the substitute streetlight system. If the responsible party fails to maintain the substitute streetlight system during the two- (2) year maintenance period, the Town shall use the proceeds of the required bond to maintain the system.



**EXHIBIT A**  
**AIR TEST TABLE**

Specification Time (min:sec) Required for Pressure Drop Form 3-1/2 to 2-1/2 PSIG When Testing One Pipe Diameter Only

Length of  
Sewer Pipe  
in Feet

Pipe Diameter, Inches

	4	6	8	10	12	15	18	21	24
25	0:04	0:10	0:18	0:28	0:40	1:02	1:29	2:01	2:38
50	0:09	0:20	0:35	0:55	1:19	2:04	2:58	4:03	5:17
75	0:13	0:30	0:53	1:23	1:59	3:06	4:27	6:04	7:55
100	0:18	0:40	1:10	1:50	2:38	4:08	5:56	8:05	10:34
125	0:22	0:50	1:28	2:18	3:18	5:09	7:26	9:55	11:20
150	0:26	0:59	1:46	2:45	3:58	6:11	8:30		
175	0:31	1:09	2:03	3:13	4:37	7:05			
200	0:35	1:19	2:21	3:40	5:17				12:06
225	0:40	1:29	2:38	4:08	5:40			10:25	13:36
250	0:44	1:39	2:56	4:35			8:31	11:35	15:07
275	0:48	1:49	3:14	4:43			9:21	12:44	16:38
300	0:53	1:59	3:31				10:12	13:53	18:09
350	1:02	2:19	3:47			8:16	11:54	16:12	21:10
400	1:10	2:38			6:03	9:27	13:36	18:31	24:12
450	1:19	2:50			6:48	10:38	15:19	20:50	27:13
500	1:28			5:14	7:34	11:49	17:01	23:09	30:14



FLEXIBLE PAVEMENT DESIGN  
CLASS I ROADS AND STREETS

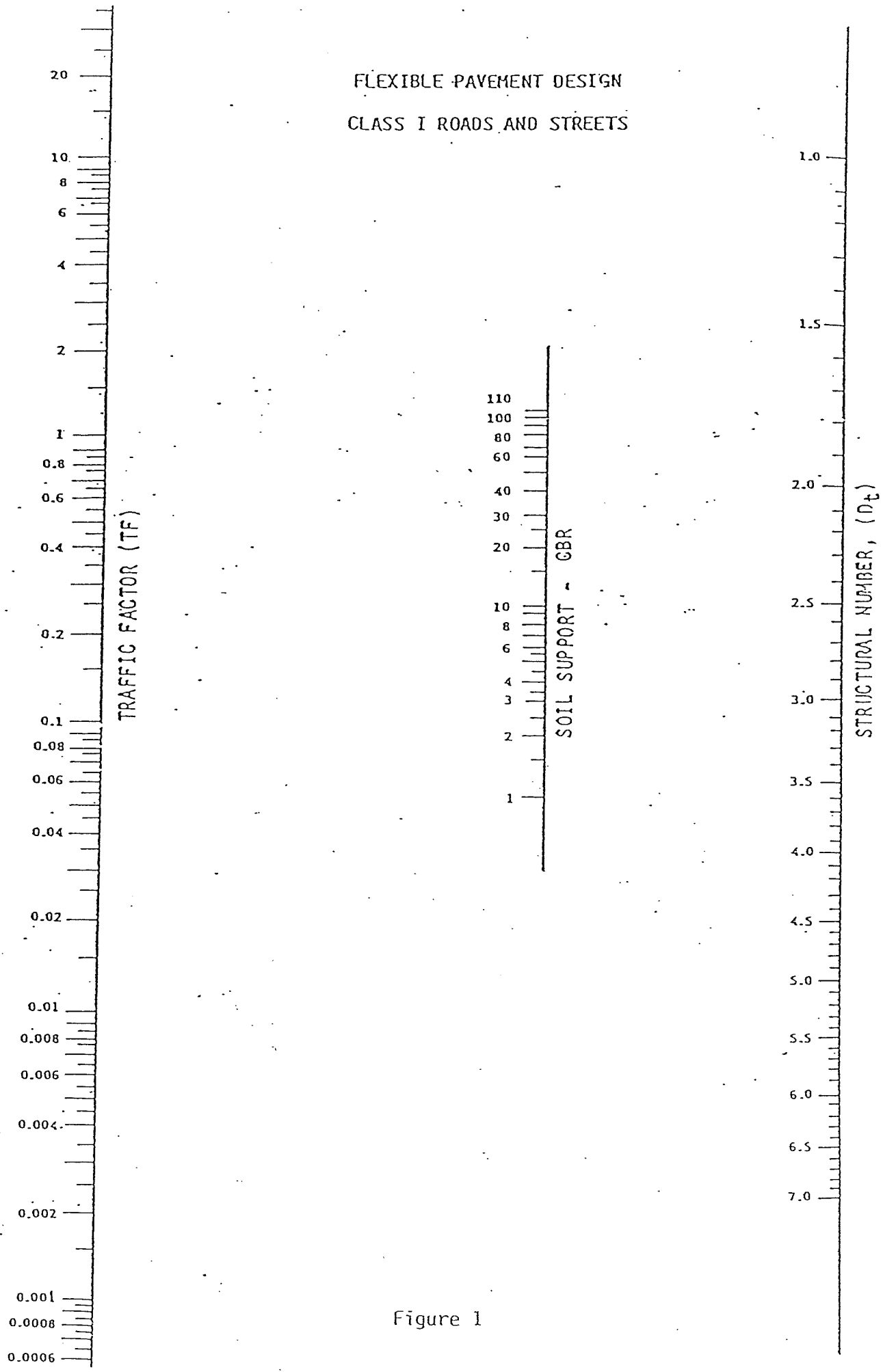


Figure 1

FLEXIBLE PAVEMENT DESIGN  
CLASS II, CLASS III, AND CLASS IV  
ROADS AND STREETS

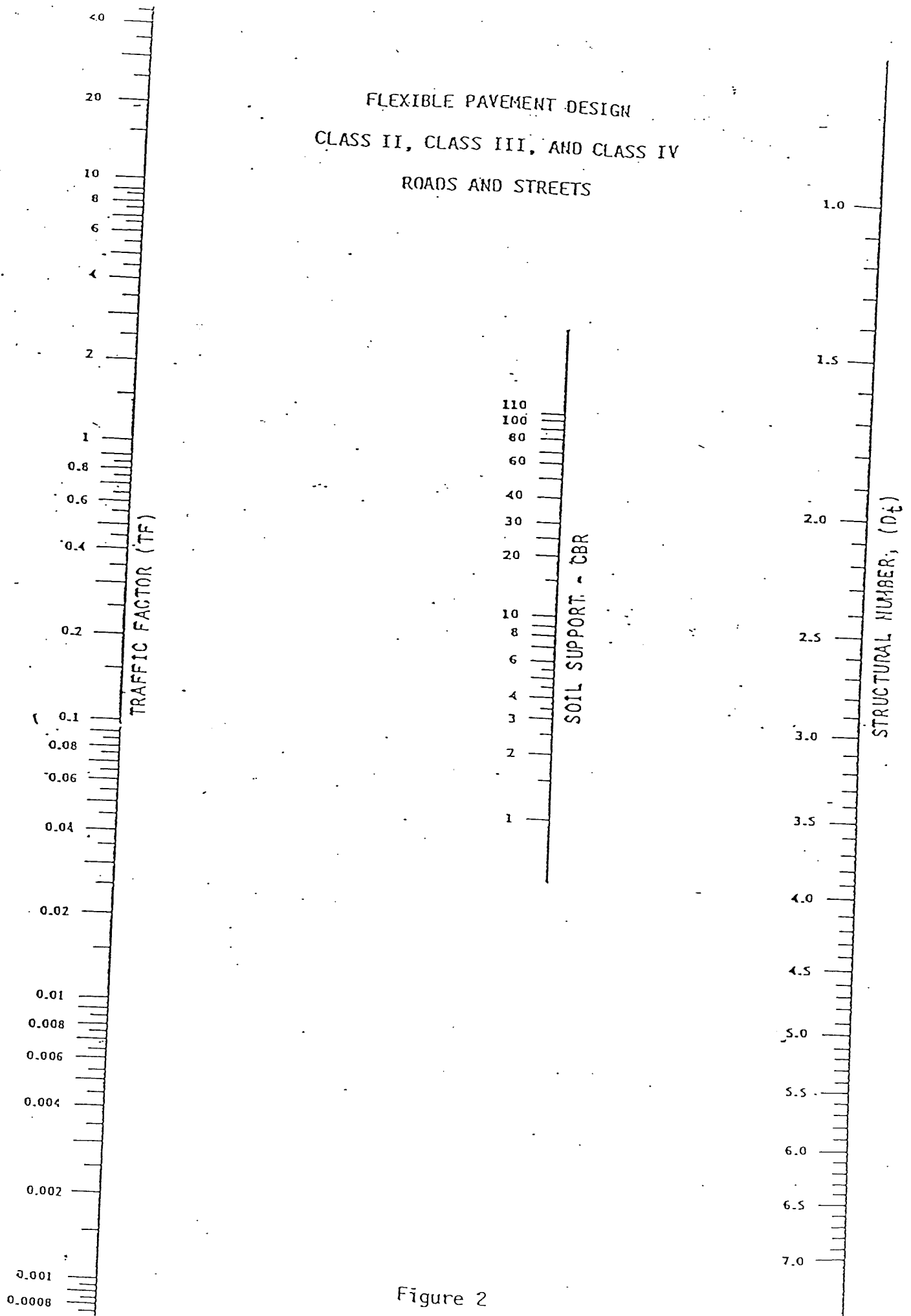


Figure 2

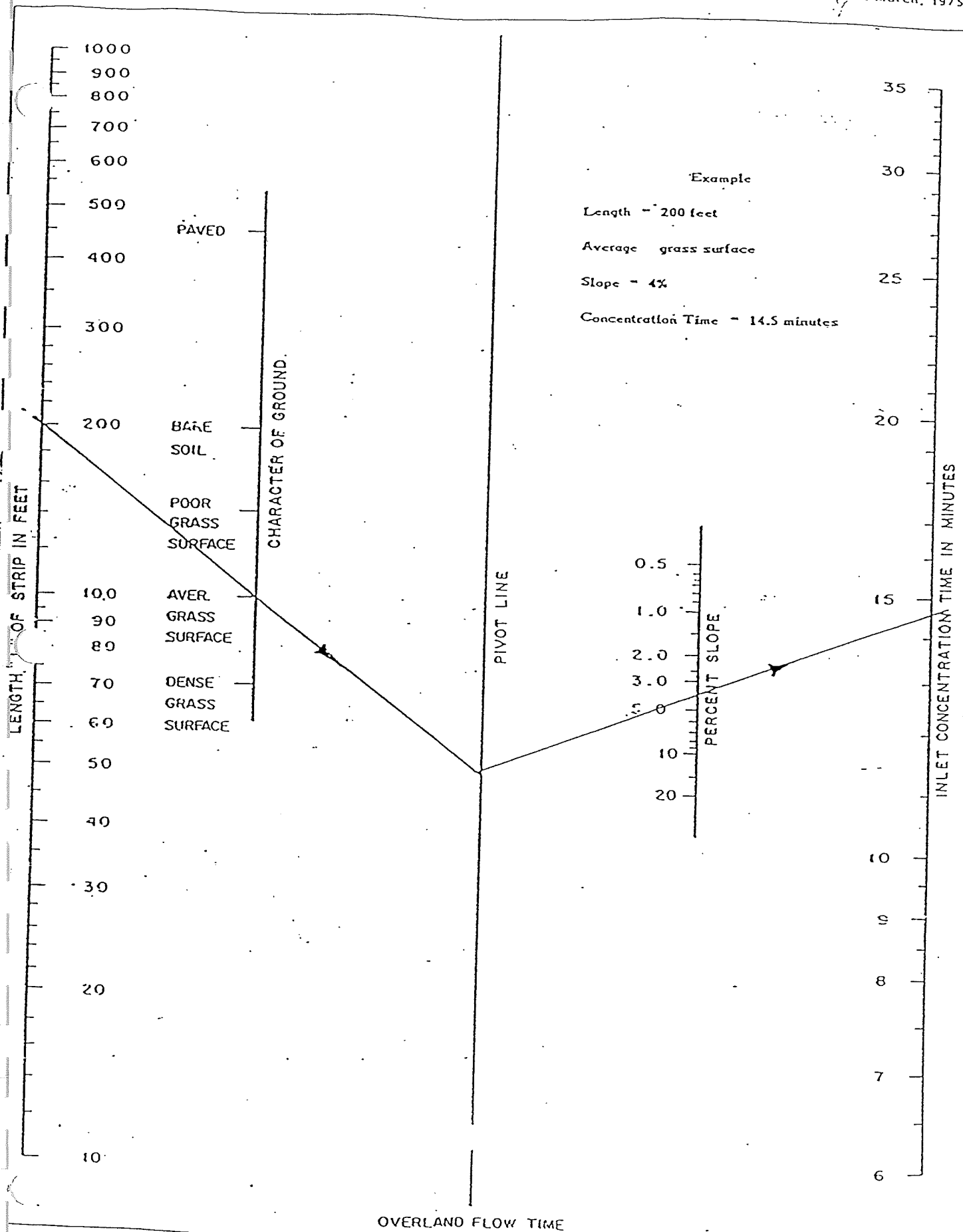
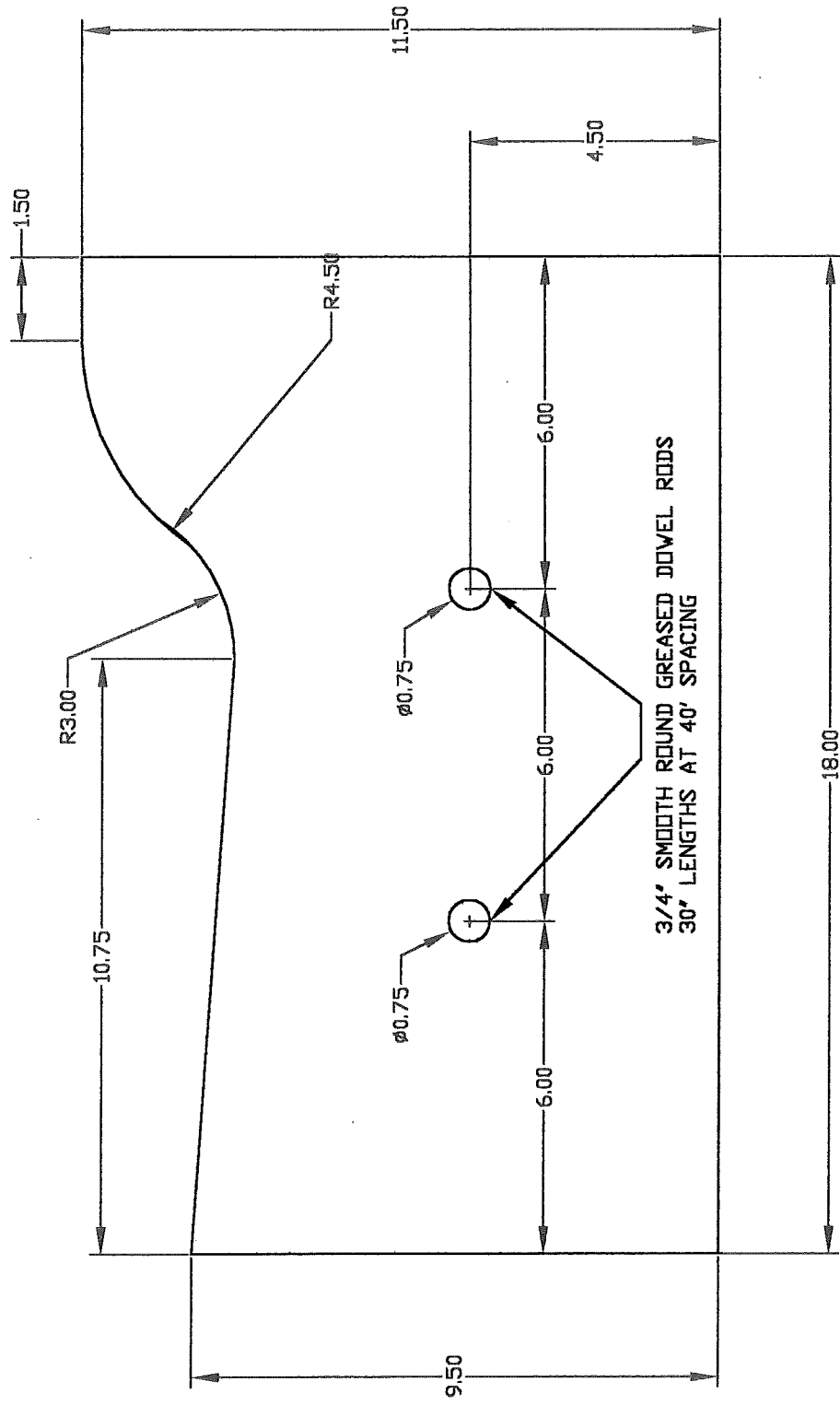


Figure 3

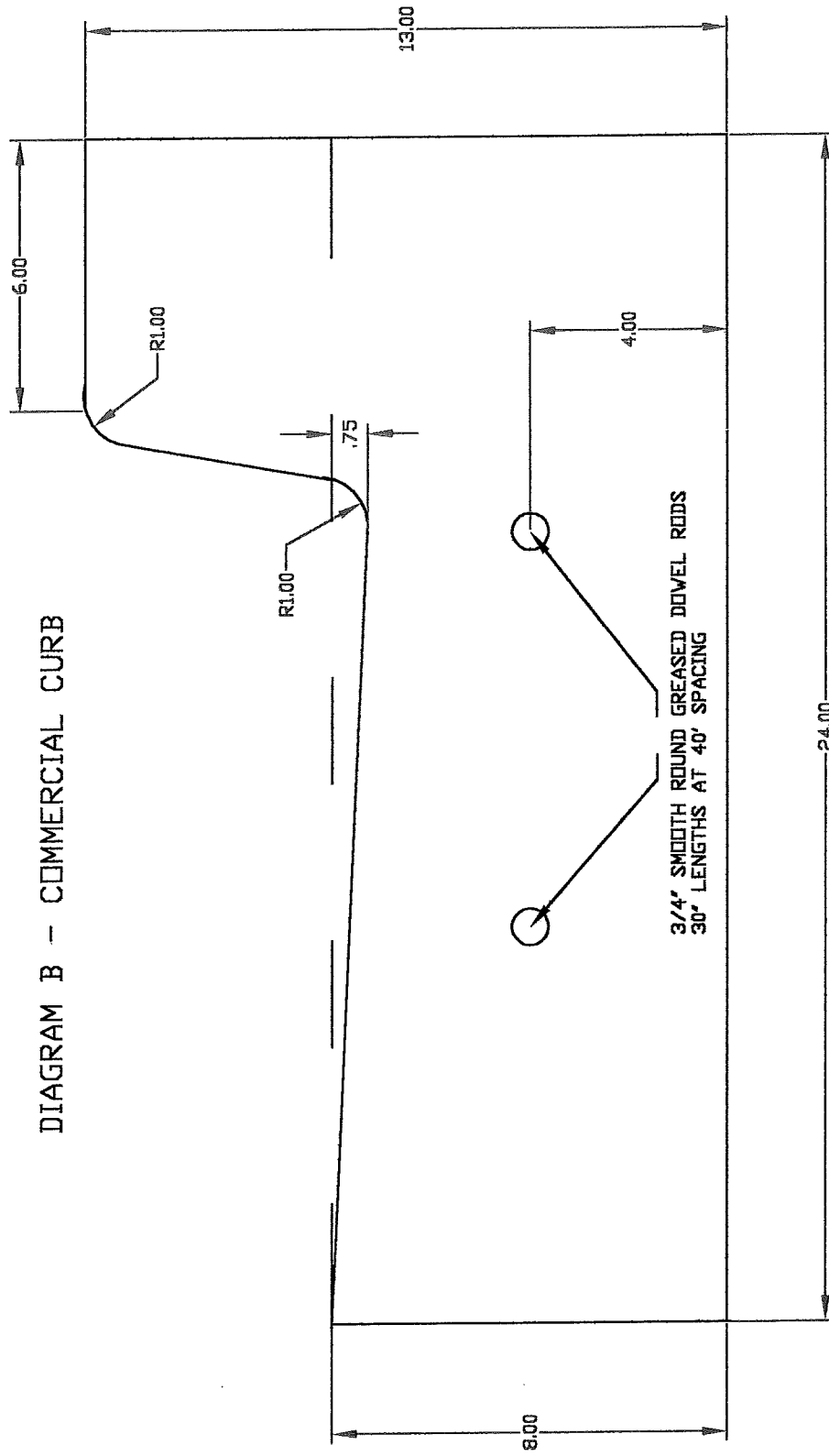
DIAGRAM A - RESIDENTIAL CURB



NOTE: ALL DIMENSIONS ARE IN INCHES

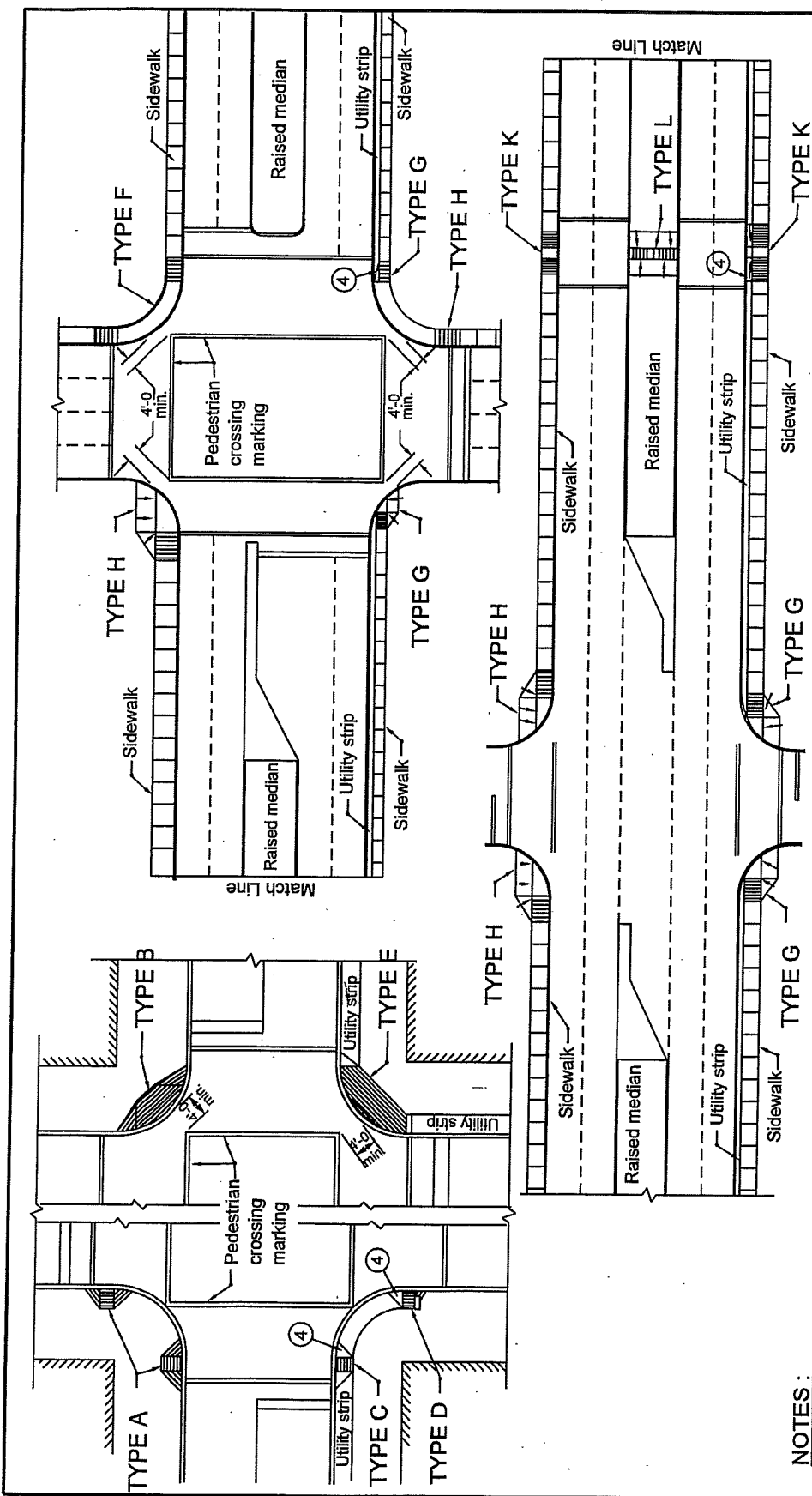


DIAGRAM B - COMMERCIAL CURB



NOTE: ALL DIMENSIONS ARE IN INCHES

15m x 7m



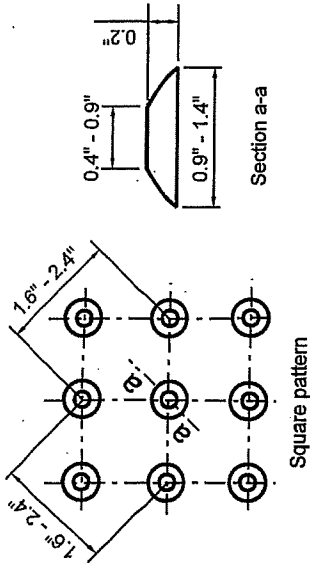
**NOTES:**

1. The curb ramp type includes the ramp and flared sides as indicated by the hatched lines on the details. A top level landing for every curb ramp shall be provided.
2. For details of sidewalk curb types see Standard Drawings E 604-SWCR-03 to -11.
3. The curb ramps shall be placed within the marked crosswalk area.
- ④ Flared side of sidewalk curb ramp next to utility strip shall be sodded.
5. See Standard Drawings E 604-SWCR-02 for General Notes.

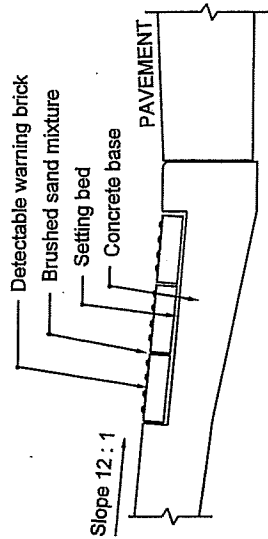
INDIANA DEPARTMENT OF TRANSPORTATION	
LOCATION PLAN FOR SIDEWALK CURB RAMPS	
SEPTEMBER 2003	
STANDARD DRAWING NO. E 604-SWCR-01	
	/s/ Anthony L. Litwinski DESIGN STANDARDS ENGINEER DATE 9-02-03
/s/ Richard K. Smither CHIEF HIGHWAY ENGINEER DATE 9-02-03	

## GENERAL NOTES:

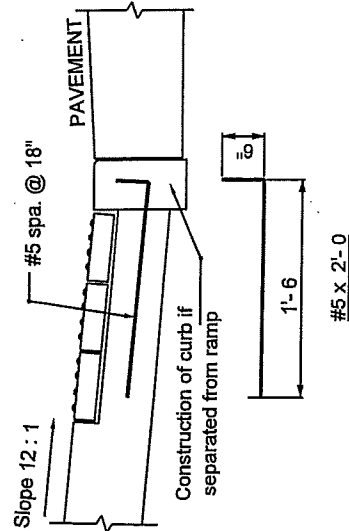
- ① These dimensions are based on a 6 in. curb height. They shall be proportionally adjusted for other curb heights.
- ② Where site infeasibility precludes construction to the width shown, such width may be decreased to a minimum of 3'-0."
- ③ The bottom edge of the curb ramp shall be flush with the edge of adjacent pavement and gutter line.
- ④ Landing areas at the top of curb ramps shall have maximum cross slope of 50 : 1 in any direction. When site infeasibility precludes a landing slope of 50 : 1 in any direction, the slope perpendicular to the curb face shall not exceed 50 : 1.
- ⑤ If site infeasibility precludes construction to the width shown, the landing width may be decreased to 3'-0" minimum. The running slope of the curb ramp may be steepened to a maximum of 10 : 1 for a maximum 6 in. rise.
6. Drainage inlets should be located uphill from curb ramps to prevent puddles at the path of travel.
7. See Standard Drawing E 604-SWCR-12 for improved access on narrow sidewalks.
8. Algebraic difference in grade between the base of curb ramp and the gutter shall be limited to less than 11%. If it is not practical, a 2'-0" wide level strip shall be provided. See detail sketch.



## TRUNCATED DOMES USED IN DETECTABLE WARNINGS



## BRICK SURFACE CONSTRUCTION



## ALTERNATE CURB CONSTRUCTION

8.33 % + 5 % = 13.33 % > 11 %

8.33 % maximum

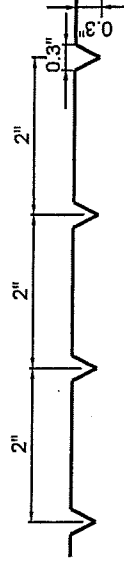
5 % maximum

Provide 2'-0 level strip if algebraic difference exceeds 11%

2'-0

Provide curb as required, may be monolithic with level strip.

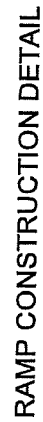
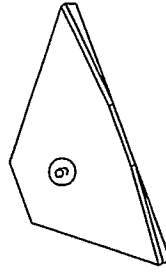
## CHANGE OF GRADE



## DETAIL OF RAMP GROOVES

INDIANA DEPARTMENT OF TRANSPORTATION	
SIDEWALK CURB RAMPS	
GENERAL NOTES & DETAILS	
SEPTEMBER 2003	
STANDARD DRAWING NO. E 604-SWCR-02	
	9-25-03 DATE DESIGN STANDARDS ENGINEER
	9-25-03 DATE CHIEF HIGHWAY ENGINEER

- ⑥ See Standard Drawing E 604-SWCR-02 for groove details.
- ⑦ See Standard Drawing E 604-SWCR-02 for details of the detectable warning.
- ⑧ See Standard Drawing E 604-SWCR-02 for alternate curb construction.
- ⑨ Indicated area denotes pay limits.
10. See Standard Drawing E 604-SWCR-01 and -02 for Location Plan and General Notes respectively.



**INDIANA DEPARTMENT OF TRANSPORTATION**

**SIDEWALK CURB RAMP  
TYPE A**

**SEPTEMBER 2003**

STANDARD DRAWING NO. E 604-SWCR-03

151 Anthony L. Uremovich 9-02-03  
DESIGN STANDARDS ENGINEER DATE

/s/ Richard L Sumner 9-02-03  
CHIEF HIGHWAY ENGINEER DATE

SEPTEMBER 2003  
STANDARD DRAWING NO. E 604-SWCR-03

DESIGN STANDARD'S ENGINEER

PROFESSOR OF ENGINEERING

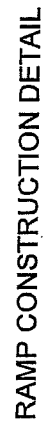
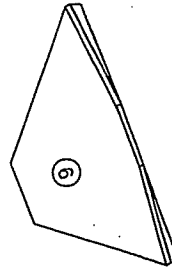
STATE OF CALIFORNIA

10033

1/5/ Richard L. Sumner  
CHIEF HIGHWAY ENGINEER

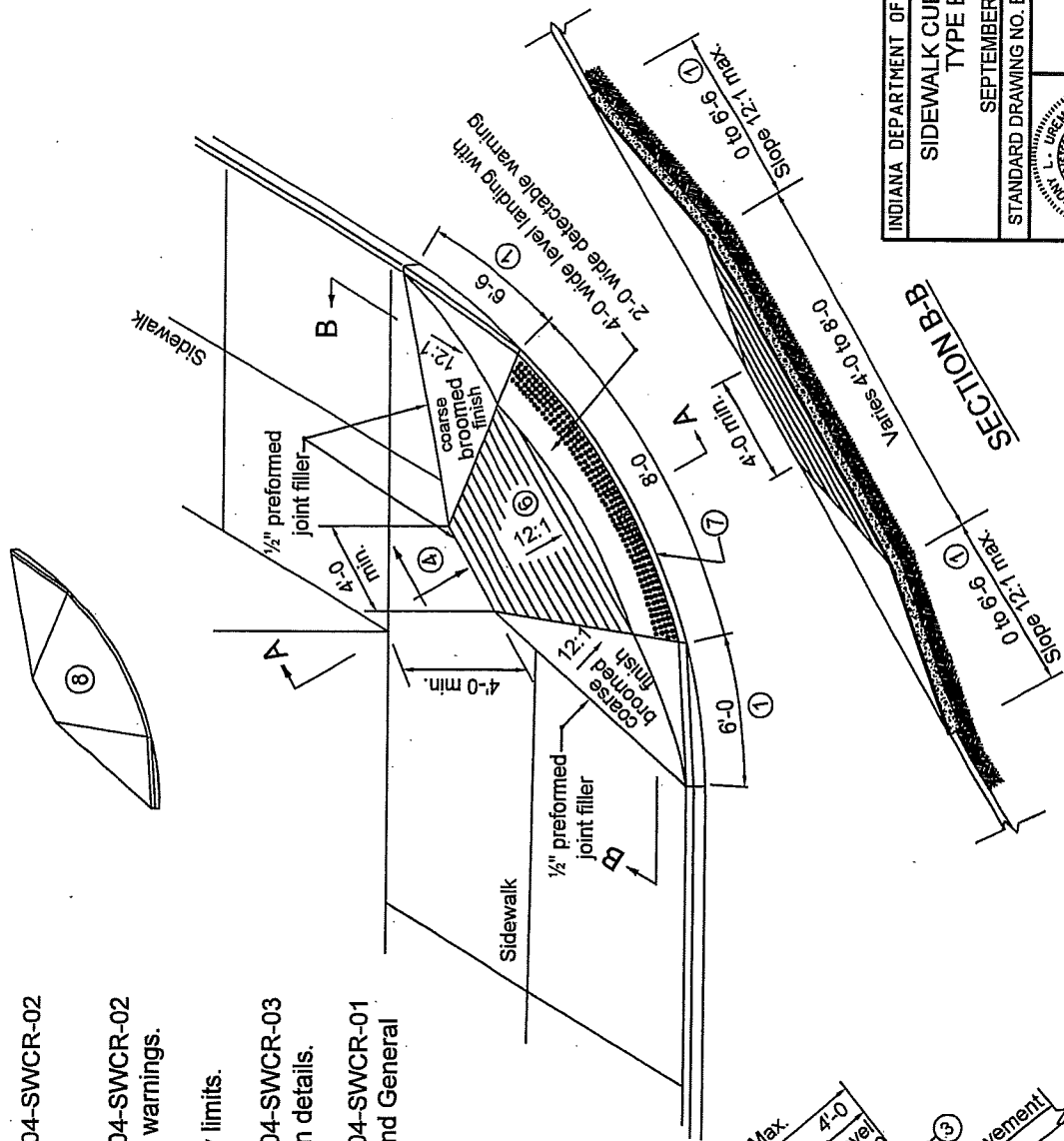
9-02-03  
DATE

- ⑥ See Standard Drawing E 604-SWCR-02 for groove details.
- ⑦ See Standard Drawing E 604-SWCR-02 for details of the detectable warning.
- ⑧ See Standard Drawing E 604-SWCR-02 for alternate curb construction.
- ⑨ Indicated area denotes pay limits.
10. See Standard Drawing E 604-SWCR-01 and -02 for Location Plan and General Notes respectively.



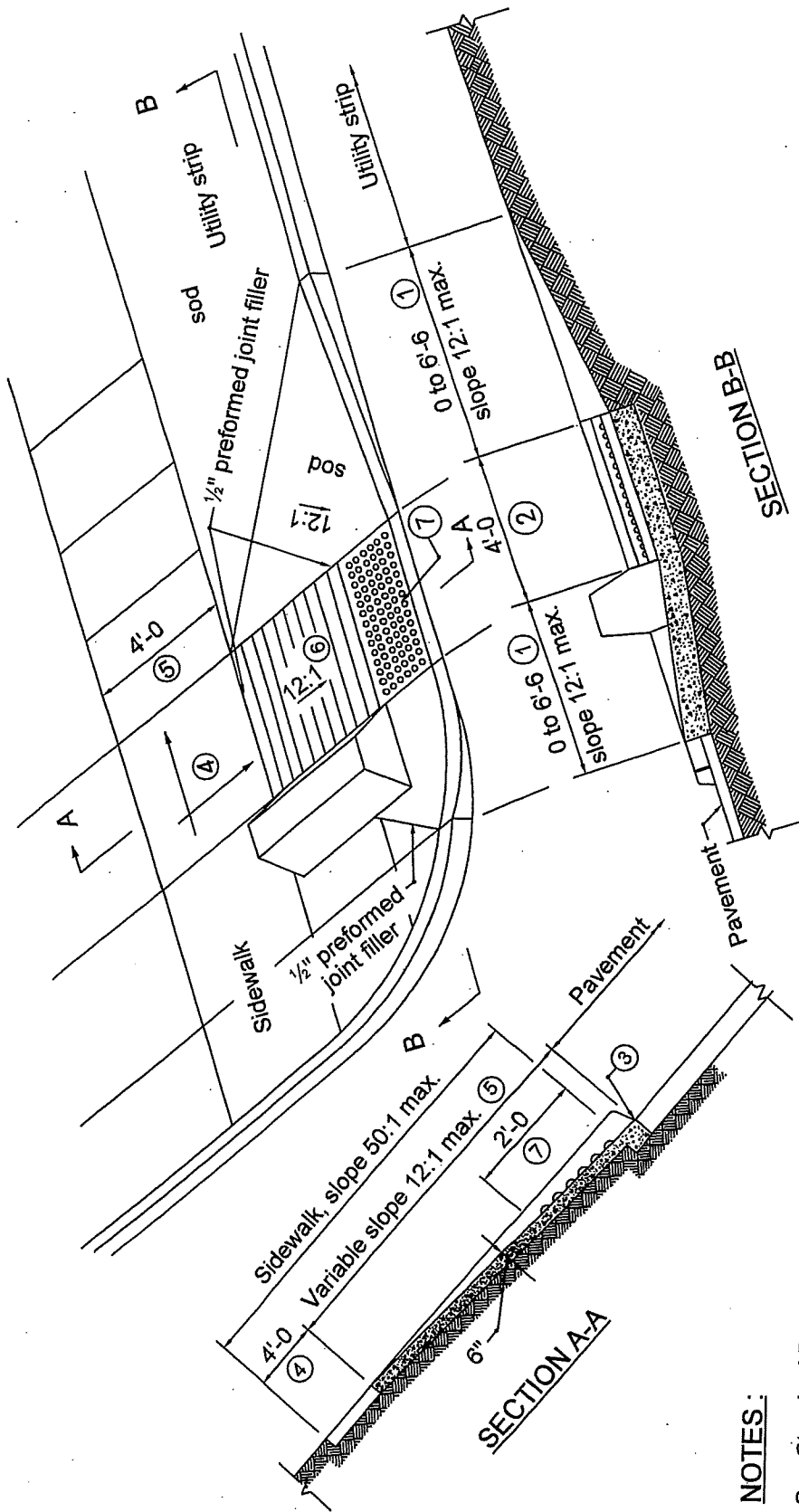
# NOTES:

- ⑥ See Standard Drawing E 604-SWCR-02 for groove details.
- ⑦ See Standard Drawing E 604-SWCR-02 for details of the detectable warnings.
- ⑧ Indicated area denotes pay limits.
9. See Standard Drawing E 604-SWCR-03 for typical ramp construction details.
10. See Standard Drawing E 604-SWCR-01 and -02 for Location Plan and General Notes respectively.



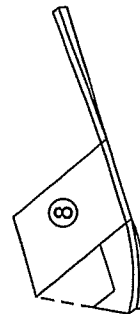
INDIANA DEPARTMENT OF TRANSPORTATION	
SIDEWALK CURB RAMP TYPE B	
SEPTEMBER 2003	
STANDARD DRAWING NO. E 604-SWCR-04	
DESIGNED BY L. L. Anderson DESIGN STANDARDS ENGINEER	DATE 9-02-03
CHECKED BY Richard L. Sumner CHIEF HIGHWAY ENGINEER	DATE 9-02-03





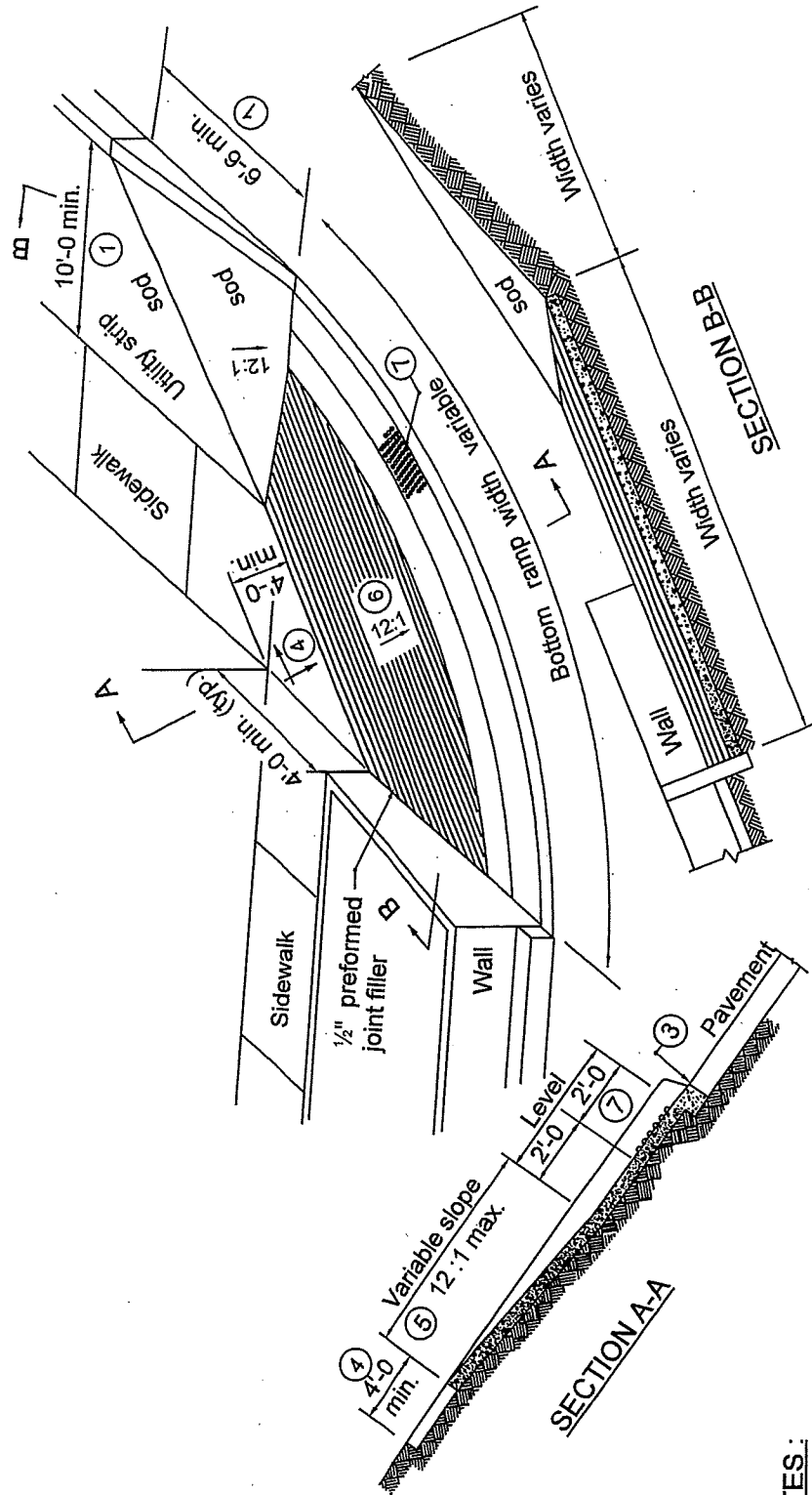
# **NOTES:**

- ⑥ See Standard Drawing E 604-SWCR-02 for groove details.
- ⑦ See Standard Drawing E 604-SWCR-02 for details of the detectable warnings.
- ⑧ Indicated area denotes pay limits.
9. See Standard Drawing E 604-SWCR-03 for typical ramp construction details.
10. See Standard Drawing E 604-SWCR-01 and -02 for Plan Location and General Notes respectively.



INDIANA DEPARTMENT OF TRANSPORTATION	
SIDEWALK RAMP CURB TYPE D	
SEPTEMBER 2003	
STANDARD DRAWING NO. E 604-SWCR-06	
L. URBANOVICH No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER	/s/ Anthony L. Urbanovich DESIGN STANDARDS ENGINEER 9-02-03 DATE
L. URBANOVICH No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER	/s/ Richard L. Sumrider CHIEF HIGHWAY ENGINEER 9-02-03 DATE





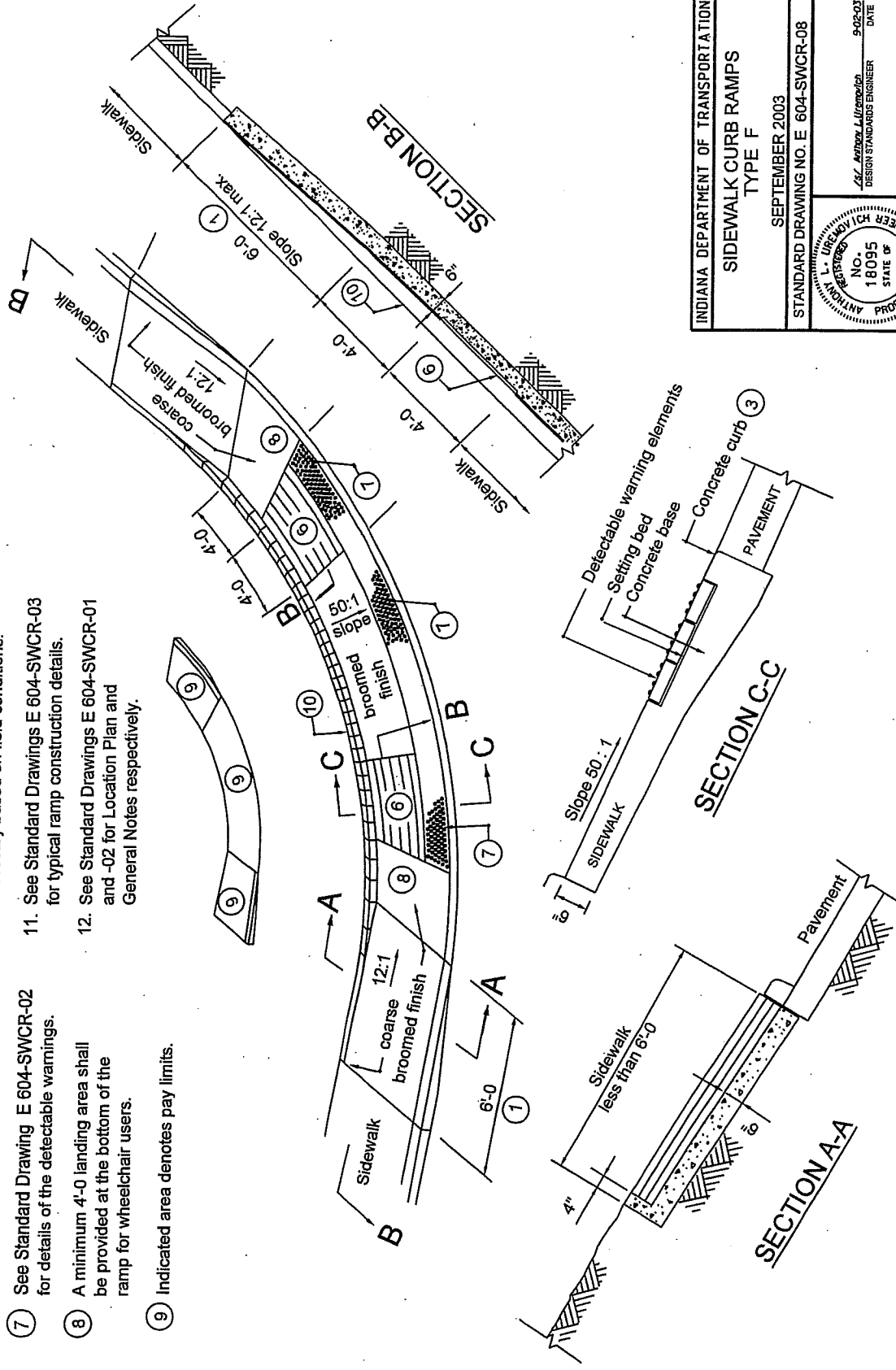
# **NOTES:**

- ⑥ See Standard Drawing E 604-SWCR-02 for groove details.
- ⑦ See Standard Drawing E 604-SWCR-02 for details of detectable warning surface.
- ⑧ Indicated area denotes pay limits.
9. See Standard Drawing E 604-SWCR-03 for typical ramp construction details.
10. See Standard Drawing E 604-SWCR-01 and -02 for Plan Location and General Notes respectively.

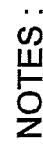
INDIANA DEPARTMENT OF TRANSPORTATION	
SIDEWALK CURB RAMPS TYPE E	
SEPTEMBER 2003	
STANDARD DRAWING NO. E 604-SWCR-07	
L. L. LUTHELMAN No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER	9-05-03 DATE DESIGN STANDARDS ENGINEER 9-05-03 DATE DESIGN STANDARDS ENGINEER


# NOTES:

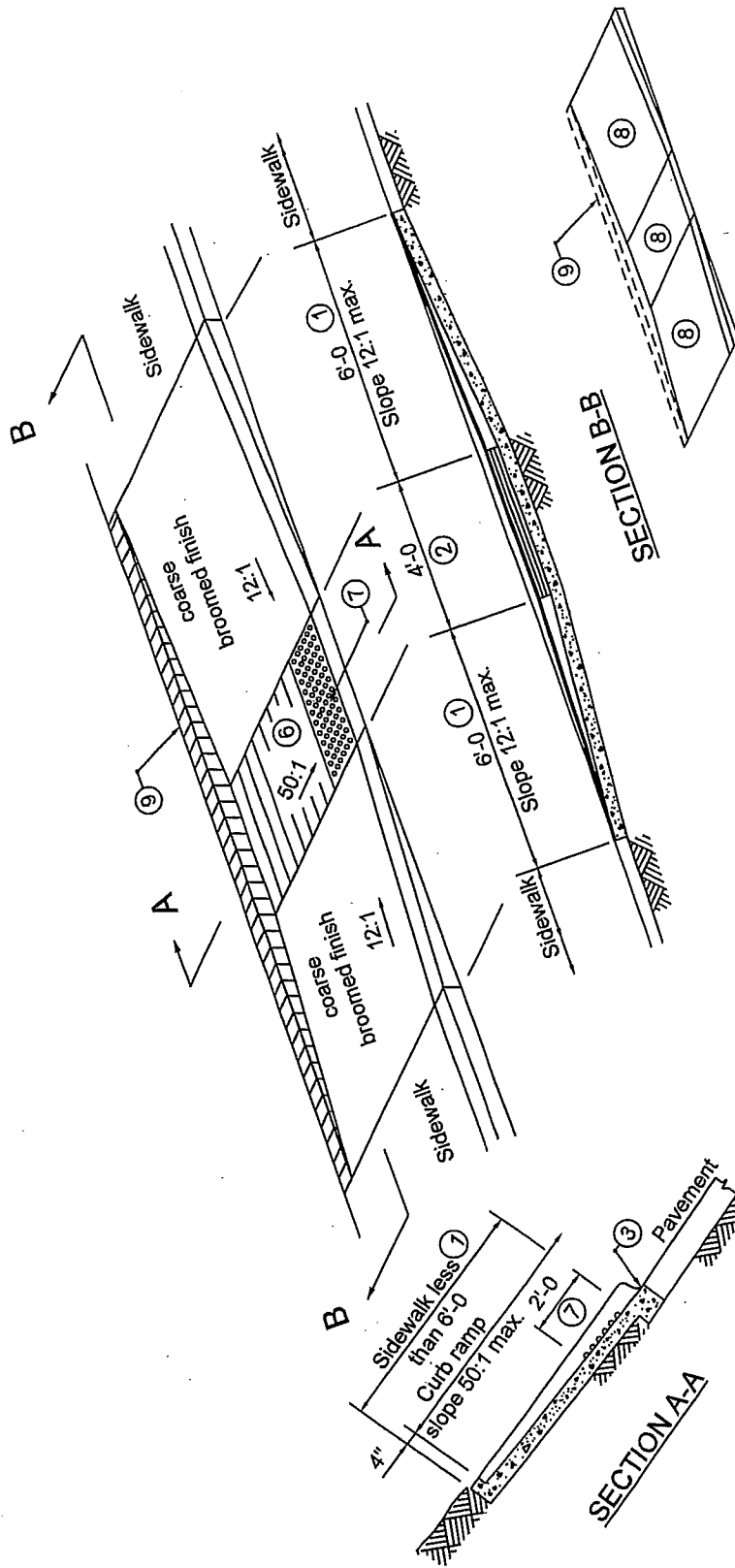
- ⑥ See Standard Drawing E 604-SWCR-02 for groove details.
- ⑦ See Standard Drawing E 604-SWCR-02 for details of the detectable warnings.
- ⑧ A minimum 4'-0" landing area shall be provided at the bottom of the ramp for wheelchair users.
- ⑨ Indicated area denotes pay limits.
- ⑩ Curb or wall shall be used when necessary based on field conditions.
11. See Standard Drawings E 604-SWCR-03 for typical ramp construction details.
12. See Standard Drawings E 604-SWCR-01 and -02 for Location Plan and General Notes respectively.



INDIANA DEPARTMENT OF TRANSPORTATION	
SIDEWALK CURB RAMPS TYPE F	
SEPTEMBER 2003	
STANDARD DRAWING NO. E 604-SWCR-08	
	9-02-03 DATE DESIGN STANDARDS ENGINEER 18/ Richard A. Switzer DATE CHIEF HIGHWAY ENGINEER



- |   |  |                                    |  |                 |
|---|--|------------------------------------|--|-----------------|
| INDIANA DEPARTMENT OF TRANSPORTATION  | SIDEWALK CURB'S RAMPS'S<br>TYPE G AND TYPE H<br>SEPTEMBER 2003 | STANDARD DRAWING NO. E 604-SWCR-09 | <i>L.V. Anthony, L. Urazmitch</i><br>DESIGN STANDARDS ENGINEER | 9-02-03<br>DATE |
|   |  |                                    | <i>L.V. Richard, L. Switzer</i><br>CHIEF HIGHWAY ENGINEER      | 9-02-03<br>DATE |
|  |  |                                    | DESIGN STANDARDS ENGINEER                                      |                 |



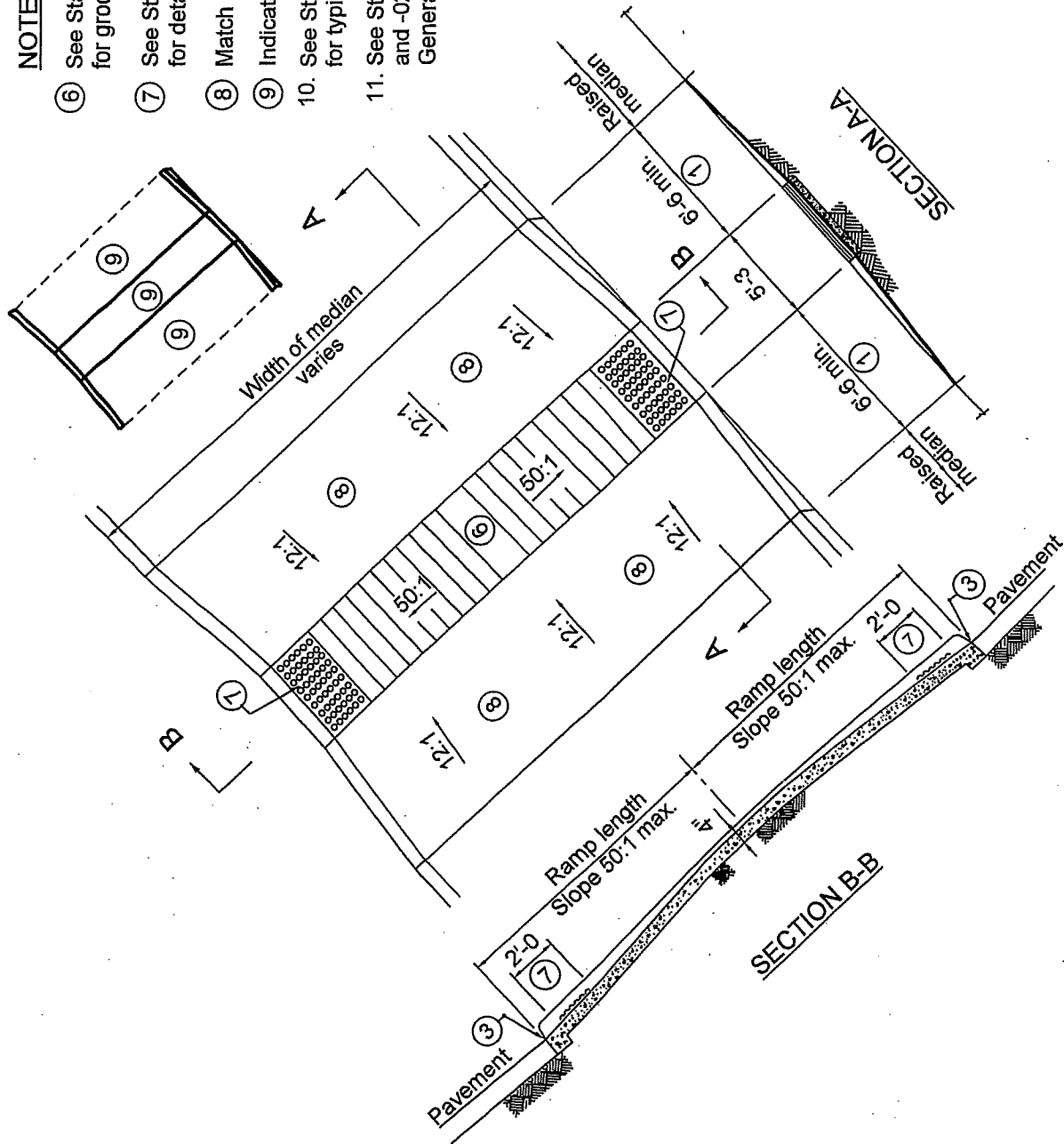
# NOTES :

- ⑥ See Standard Drawing E 604-SWCR-02 for groove details.
- ⑦ See Standard Drawing E 604-SWCR-02 for details of detectable warnings surface.
- ⑧ Indicated area denotes pay limits
- ⑨ Curb optional. Shall be used when necessary based on field conditions.
10. See Standard Drawing E 604-SWCR-03 for typical ramp construction details.
11. See Standard Drawing E 604-SWCR-01 and -02 for Location Plan and General Notes respectively.

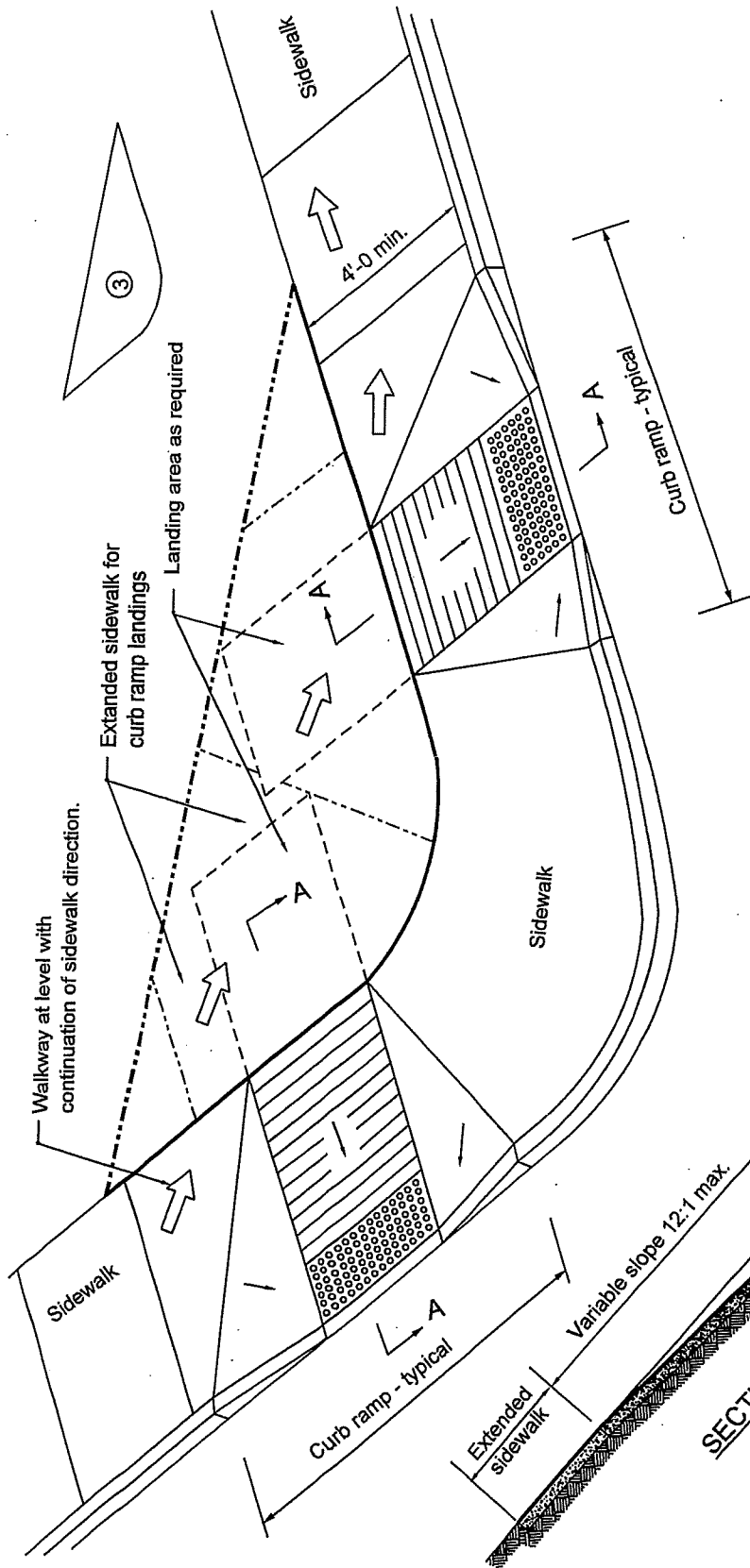
INDIANA DEPARTMENT OF TRANSPORTATION	
SIDEWALK CURB RAMP TYPE K	
SEPTEMBER 2003	
STANDARD DRAWING NO. E 604-SWCR-10	
L. UNGERLICH No. 18095 STATE OF INDIANA PROFESSIONAL ENGINEER	/s/ Anthony L. Ungerlich DESIGN STANDARDS ENGINEER DATE 9-02-03
/s/ Richard K. Smutzer CHIEF HIGHWAY ENGINEER DATE 9-02-03	

**NOTES:**

- ⑥ See Standard Drawing E 604-SWCR-02 for groove details.
- ⑦ See Standard Drawing E 604-SWCR-02 for details of the detectable warnings.
- ⑧ Match material in place.
- ⑨ Indicated area denotes pay limits.
10. See Standard Drawing E 604-SWCR-03 for typical ramp construction details.
11. See Standard Drawing E 604-SWCR-01 and -02 for Location Plan and General Notes respectively.



INDIANA DEPARTMENT OF TRANSPORTATION	
SIDEWALK CURB RAMPS TYPE L	
SEPTEMBER 2003	
STANDARD DRAWING NO. E 604-SWCR-11	
/s/ Anthony L. Lirio DESIGN STANDARDS ENGINEER DATE 9-02-03	/s/ Richard K. Sauter CHIEF HIGHWAY ENGINEER DATE 9-02-03



# **NOTES:**

1. Additional right-of-way to widen sidewalks if applicable to improve accessibility on narrow sidewalks.
2. See Standard Drawing E 604-SWCR-02 and -03 to -11 for General Notes and typical curb ramps details respectively.
- ③ Indicated area denotes additional pay limits for improved access.

INDIANA DEPARTMENT OF TRANSPORTATION

## **SIDEWALK CURB RAMP'S IMPROVED ACCESS**

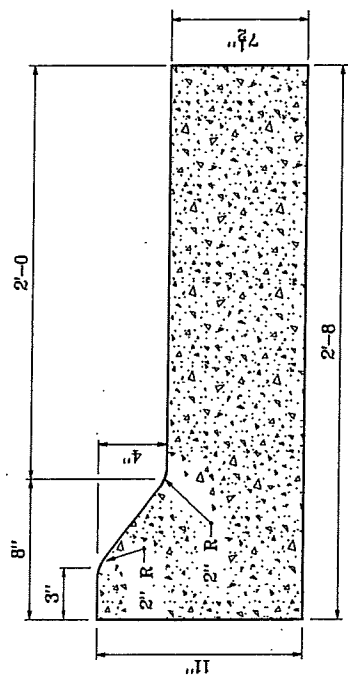
SEPTEMBER 2003

STANDARD DRAWING NO. E 604-SWCR-12

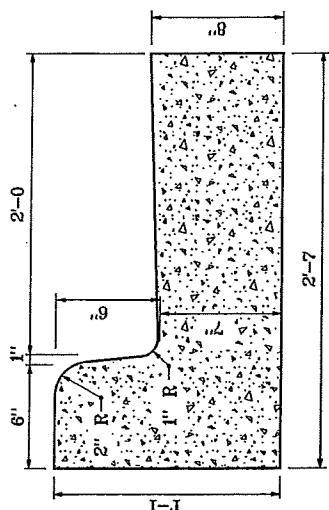


/s/ Andrew L. Urelwicz  
DESIGN STANDARDS ENGINEER  
9-02-03  
DATE

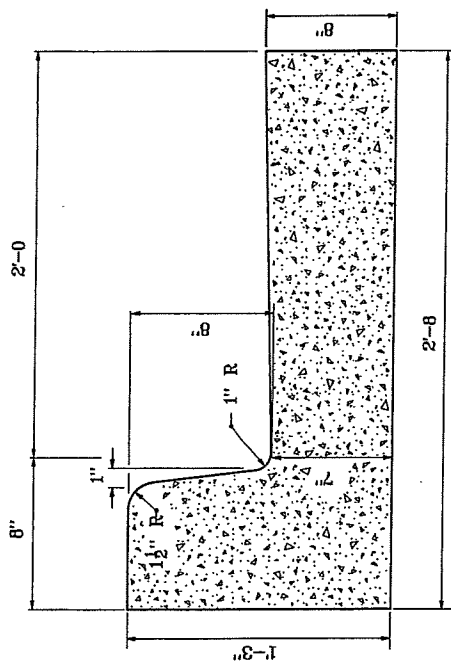
/s/ Richard K. Smutzer  
CHIEF HIGHWAY ENGINEER  
9-02-03  
DATE



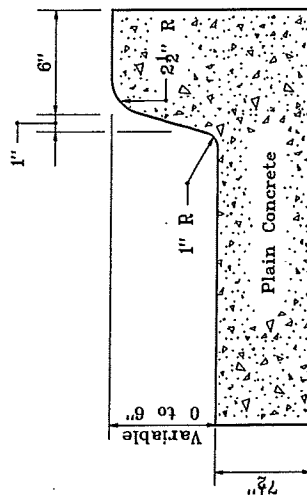
### COMBINED CONCRETE CURB AND GUTTER, TYPE B (MOUNTABLE)



# COMBINED CONCRETE CURB AND GUTTER (BARRIER)



**COMBINED CONCRETE CURB  
AND GUTTER, TYPE C  
(BARRIER)**



## MONOLITHIC CURB

INDIANA DEPARTMENT OF TRANSPORTATION

## COMBINED CONCRETE CURB AND GUTTER

SEPTEMBER 1999

STANDARD DRAWING NO. E 605-CCCG-01

DETAILS PLACED IN THIS FORMAT	11-15-99
-------------------------------	----------

/s/ Anthony L. Uremovich 11-15-99  
DESIGN STANDARDS ENGINEER DATE

/s/ Anthony L. Krasmovich 16-15-99

DESIGN STANDARDS ENGINEER	DATE
---------------------------	------

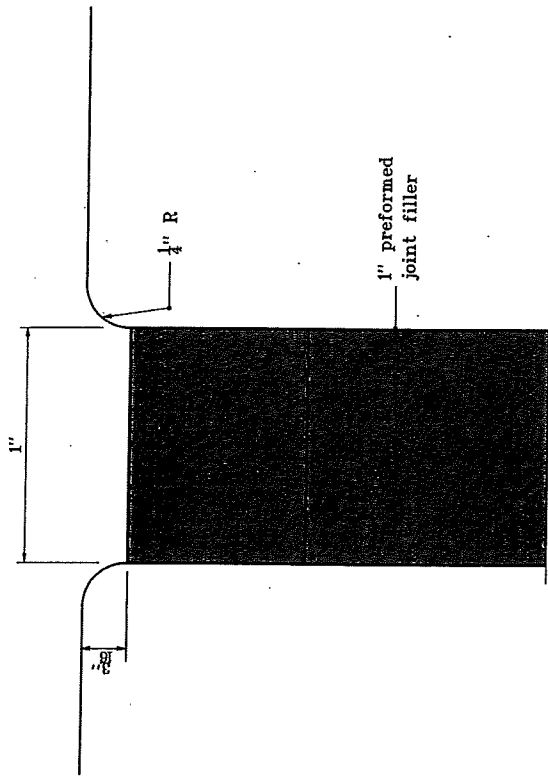
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/s/ Firooz Zandi 11-15-99

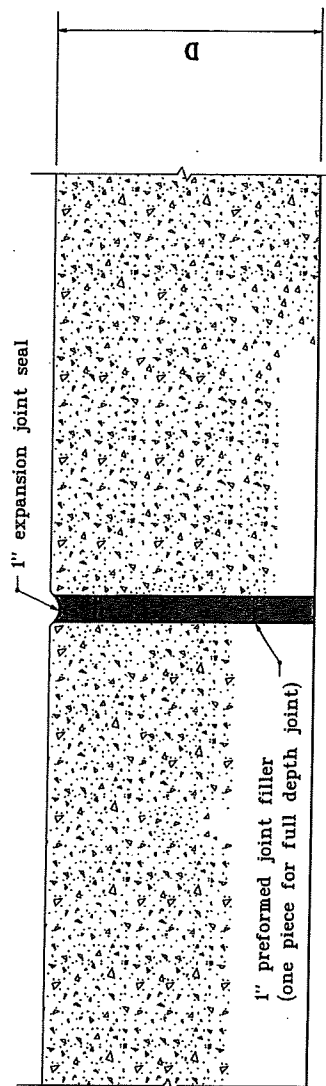
CHIEF HIGHWAY ENGINEER	DATE
CHIEF HIGHWAY ENGINEER	DATE

ORIGINAL APPROVED  
5-10-59

**PRESENTING STANDARDS MGT997**



SILICONE JOINT  
SEALANT



SECTION THROUGH JOINT

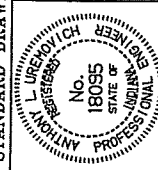
INDIANA DEPARTMENT OF TRANSPORTATION

SIDEWALK

EXPANSION JOINT

SEPTEMBER 1999

STANDARD DRAWING NO. E 604-CCSJ-01

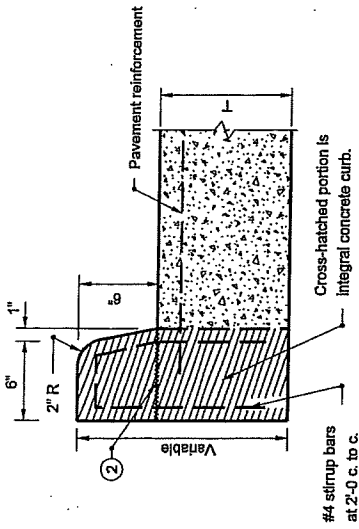


/s/ Anthony L. Uremovitch 9-01-99  
DESIGN STANDARDS ENGINEER DATE

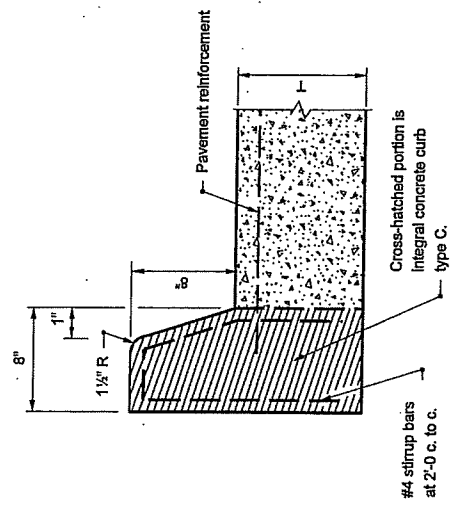
/s/ Donald W. Lucas 9-01-99  
CHIEF HIGHWAY ENGINEER DATE

DESIGN STANDARDS ENGINEER

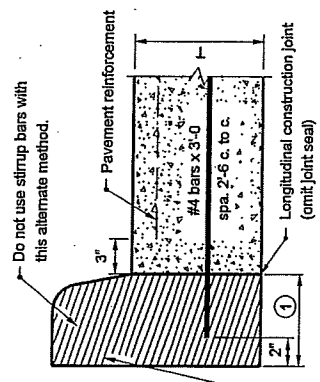




INTEGRAL CONCRETE CURB  
(BARRIER)  
TYPE C



INTEGRAL CONCRETE CURB  
(MOUNTABLE)  
TYPE B



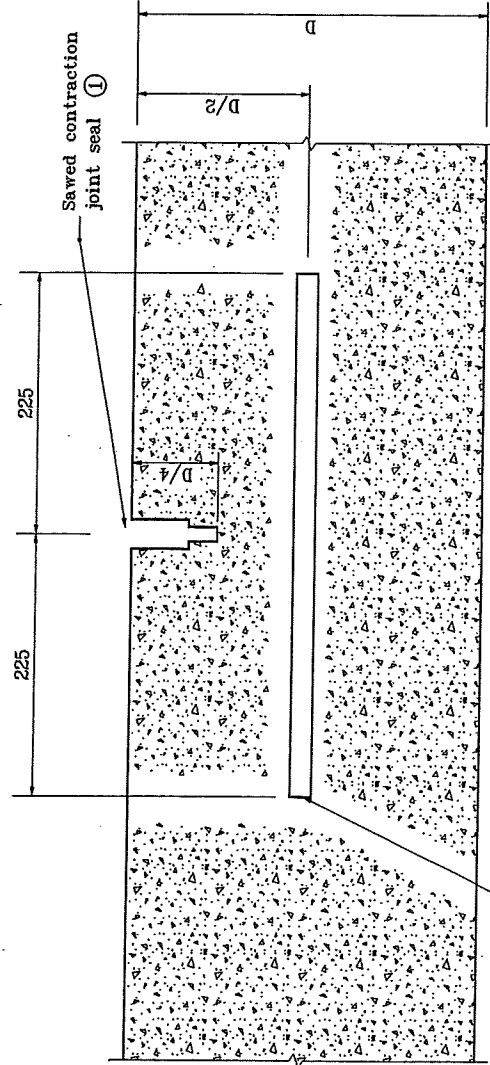
INTEGRAL CONCRETE CURB  
(BARRIER)  
TYPE B

ALTERNATE METHOD  
OF CONSTRUCTION FOR ALL TYPES  
OF INTEGRAL CONCRETE CURB

- NOTES**
- 1" 8" for integral concrete curb type B or C and 7" for integral concrete curb.
  - 2" Concrete below this line may be poured with the pavement.
- LEGEND**
- T = Nominal pavement thickness

INDIANA DEPARTMENT OF TRANSPORTATION	
INTEGRAL CONCRETE CURB	
SEPTEMBER 2004	
STANDARD DRAWING NO. E 605-CCIN-01	
	/s/ Richard L. Vogt DESIGN STANDARDS ENGINEER DATE 9-01-04
	/s/ Richard K. Smith CHIEF HIGHWAY ENGINEER DATE 9-01-04

DOWEL BAR SIZES	
Pavement Thickness, D	Minimum Dowel Bar Diameter
Less than 225	25
225 through 300	32
Greater than 300	38



Epoxy coated dowel bars at 300 c/c, at 150 min. from edge of PCCP  
(See table for minimum dowel bar diameter)

### LONGITUDINAL SECTION THROUGH PCCP

All dimensions are in mm unless otherwise specified.

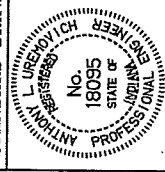
INDIANA DEPARTMENT OF TRANSPORTATION

TYPE D-1

CONTRACTION JOINT

SEPTEMBER 1999

STANDARD DRAWING NO. 503-CCPJ-01

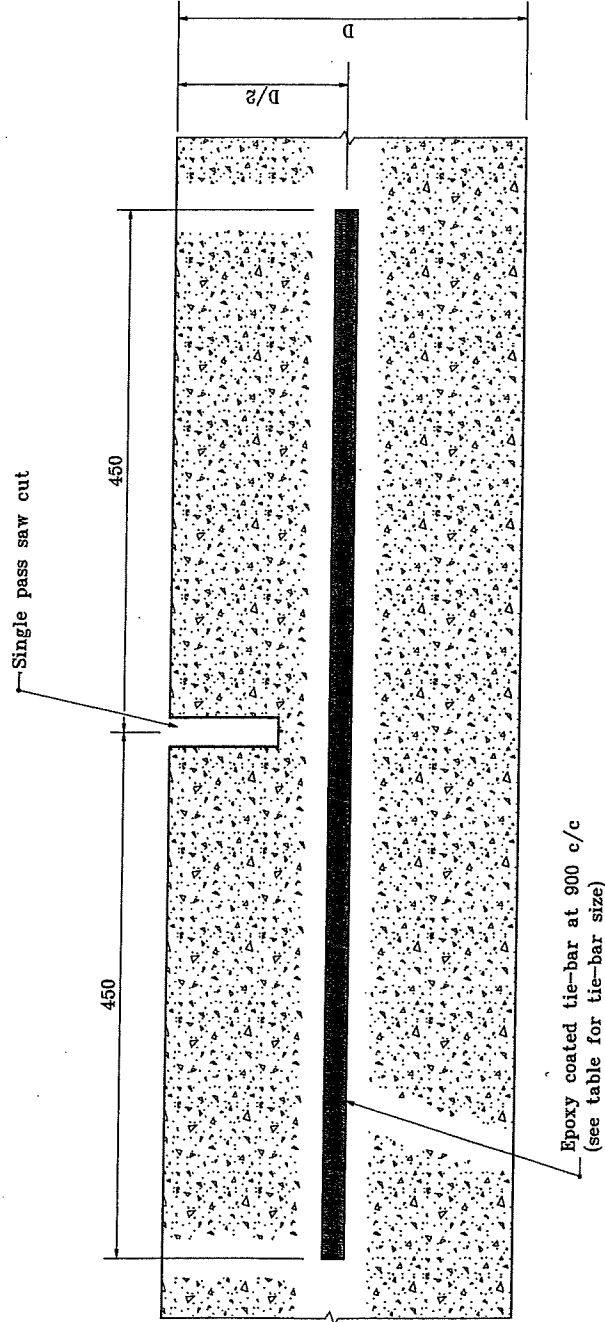


/s/ Anthony L. Uremovich 9-01-99  
DESIGN STANDARDS ENGINEER DATE

/s/ Donald W. Lucas 9-01-99  
CHIEF HIGHWAY ENGINEER DATE

Source Sheet: CCPJ3

TIE-BAR SIZES FOR LONGITUDINAL JOINT	
Pavement Thickness, D	Tie Bar Size
Less than 225	#16
225 through 300	#19
Greater than 300	#22



# TRANSVERSE SECTION THROUGH CONCRETE PCCP

All dimensions are in mm unless otherwise specified.

INDIANA DEPARTMENT OF TRANSPORTATION

## LONGITUDINAL JOINT

SEPTEMBER 1999

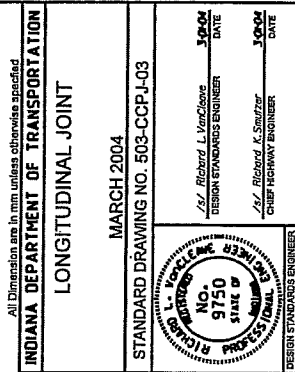
STANDARD DRAWING NO. 503-CCPJ-02



/s/ Anthony L. Uremovich 9-01-99  
DESIGN STANDARDS ENGINEER DATE

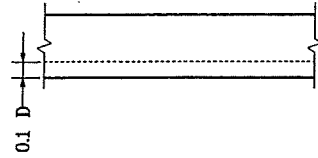
/s/ Donald F. Lucas 9-01-99  
CHIEF HIGHWAY ENGINEER DATE

Source Sheet: CCPJ1

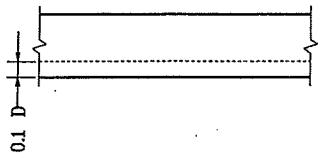


# NOTES

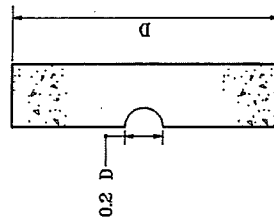
1. See Standard Drawings 503-CCPJ-01, -02, and -03 for sawed construction joint sealant options.



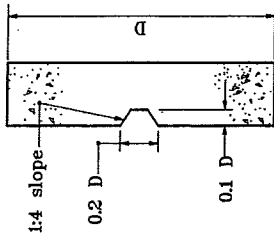
PLAN



PLAN



ELEVATION



ELEVATION

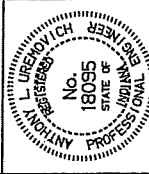
All dimensions are in mm unless otherwise specified.

INDIANA DEPARTMENT OF TRANSPORTATION

## LONGITUDINAL KEYWAY JOINT

SEPTEMBER 1989

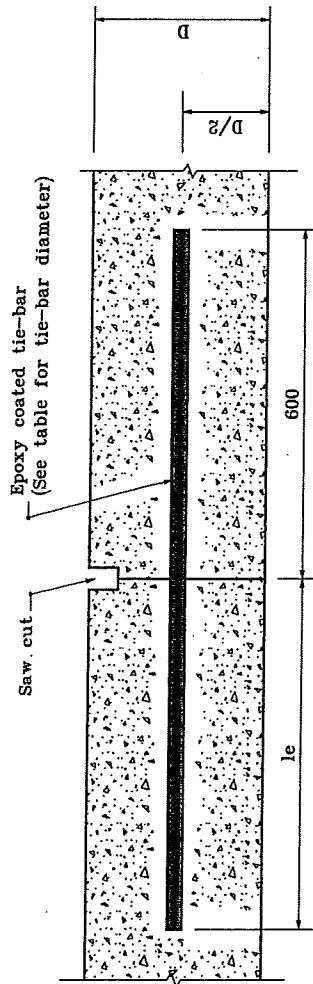
STANDARD DRAWING NO. 503-CCPJ-04



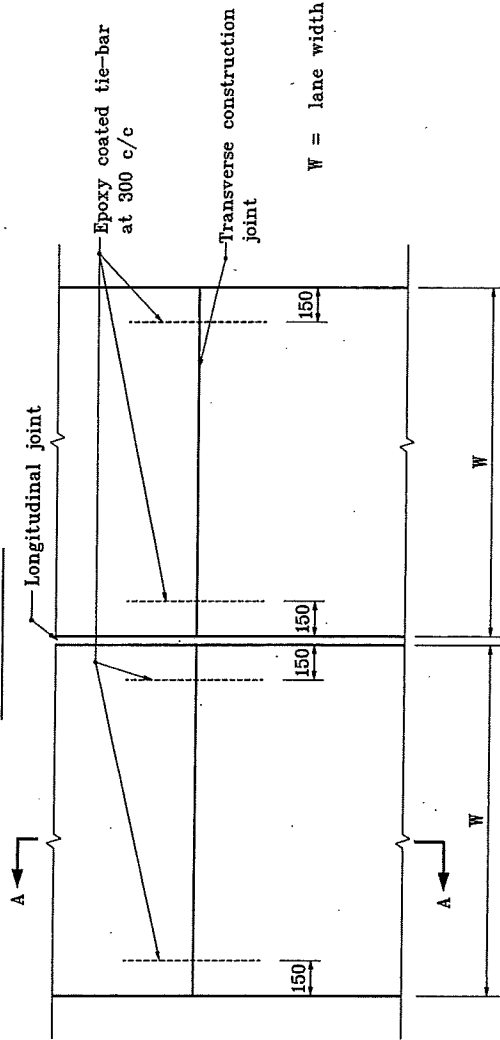
/s/ Anthony L. Uremovich 9-07-99  
DESIGN STANDARDS ENGINEER DATE

/s/ Donald W. Lucas 9-07-99  
CHIEF HIGHWAY ENGINEER DATE

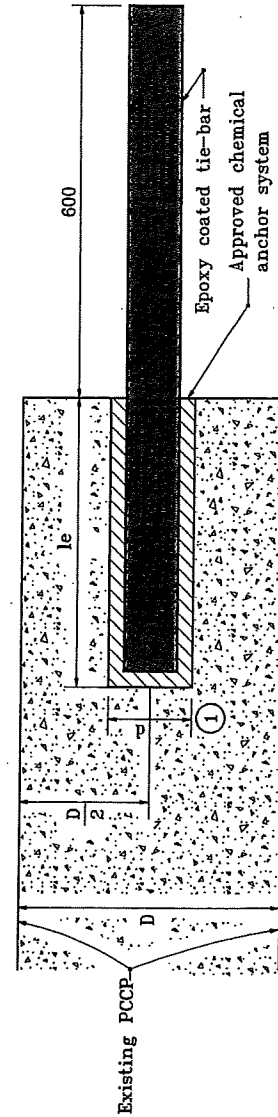
Source Sheet: CCPJ4



SECTION A-A



PLAN



RETROFIT CONSTRUCTION TIE-BAR EMBEDMENT DETAIL

**NOTES**

- ① Diameter of drilled hole d shall be in accordance with the chemical anchor system manufacturer's instructions.

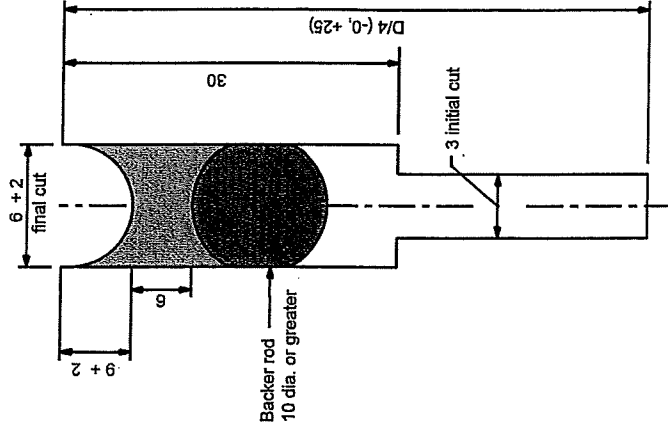
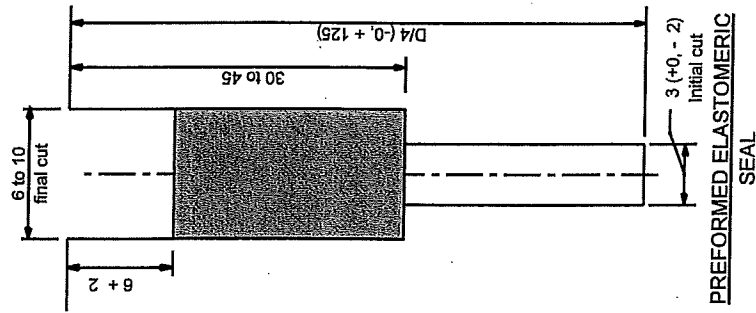
TIE-BAR SIZES FOR TRANSVERSE CONSTRUCTION JOINT		
Pavement Thickness, D	Tie Bar Size	Min. le
Less than 225	#16	300
225 through 300	#25	500
Greater than 300	#32	600

All dimensions are in mm unless otherwise specified.

INDIANA DEPARTMENT OF TRANSPORTATION	
<b>TRANSVERSE CONSTRUCTION JOINT</b>	
SEPTEMBER 1999	
STANDARD DRAWING NO. 503-CCPJ-05	
/s/ Anthony L. Uremovitch DESIGN STANDARDS ENGINEER	9-01-99 DATE
/s/ Donald W. Lucas CHIEF HIGHWAY ENGINEER	9-01-99 DATE

# **NOTES**

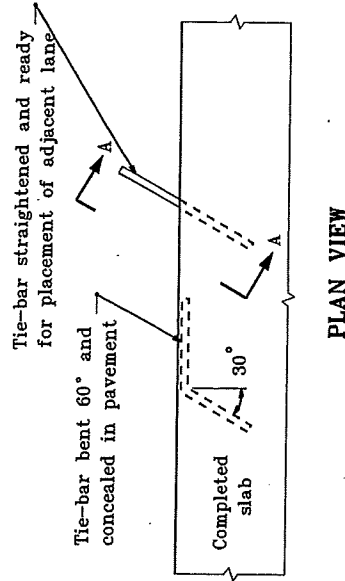
1. Transverse joints shall be constructed perpendicular to the centerline with a maximum spacing of 5500 unless otherwise specified.
2. The configuration of the preformed elastomeric joint seal shall be a 14 to 16 wide seal with at least a five cell internal design. The seal height shall be 14 to 21 in uncompressed stage.
3. For transverse construction joints, the initial saw cut may be eliminated.



**TYPE D-1 SAWED CONTRACTION  
JOINT SEALANT OPTIONS**

All Dimensions are in mm unless otherwise specified	
INDIANA DEPARTMENT OF TRANSPORTATION	
TRANSVERSE JOINT SEALS	
MARCH 2004	
STANDARD DRAWING NO. 503-CCPJ-06	
	/s/ Richard L. VanCleave DESIGN STANDARDS ENGINEER DATE 3-01-04
/s/ Richard K. Smither CHIEF HIGHWAY ENGINEER DATE 3-01-04	

TIE-BAR SIZES FOR LONGITUDINAL CONSTRUCTION JOINT		
Pavement Thickness, D	Tie-Bar Size	Spacing
Less than 225	#16	900 c/c
225 through 300	#19	900 c/c
Greater than 300	#19 or #22	600 c/c 900 c/c



PLAN VIEW

# METHOD OF PLACING TIE-BAR FOR LONGITUDINAL CONSTRUCTION JOINT

SECTION A-A

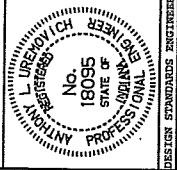
All dimensions are in mm unless otherwise specified.

INDIANA DEPARTMENT OF TRANSPORTATION

LONGITUDINAL CONSTRUCTION JOINT

SEPTEMBER 1999

STANDARD DRAWING NO. 503-CCPJ-07



/s/ Anthony L. Uremovich 9-01-99  
DESIGN STANDARDS ENGINEER DATE

/s/ Donald W. Lucas 9-01-99  
CHIEF HIGHWAY ENGINEER DATE

Source Sheet: CCPJ2



TIE-BAR SIZES FOR LONGITUDINAL CONSTRUCTION JOINT		
Pavement Thickness, D	Tie-Bar Size	Spacing
Less than 225	#16	900 c/c
225 through 300	#19	900 c/c
Greater than 300	#19 or #22	600 c/c 900 c/c



INDIANA DEPARTMENT OF TRANSPORTATION

**JOINT**

SEPTEMBER 1999

STANDARD DRAWING NO. 503-CCPJ-07

/s/ Anthony L. Dremovich 9-01-99  
DESIGN STANDARDS ENGINEER DATE

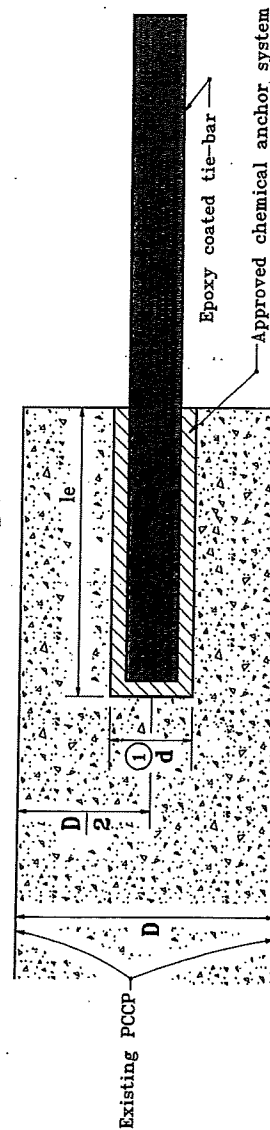
/s/ Donald W. Lucas 9-01-99  
CHIEF HIGHWAY ENGINEER DATE

Source Sheet: CCPJ2

# NOTES

- ① Diameter of drilled hole (d) shall be in accordance with the chemical anchor system manufacturer's instructions.

PAVEMENT THICKNESS, D	LONGITUDINAL CONSTRUCTION JOINT Tie-bars at 900 c/c	
	TIE-BAR SIZE	MIN. LENGTH OF EMBEDMENT, $l_e$
Less than 225	#16	300
225 to 300	#22	380
Greater than 300	#25	450



RETROFIT CONSTRUCTION TIE-BAR EMBEDMENT DETAIL

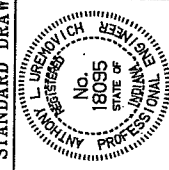
All dimensions are in mm unless otherwise specified.

INDIANA DEPARTMENT OF TRANSPORTATION

LONGITUDINAL CONSTRUCTION JOINT

SEPTEMBER 1999

STANDARD DRAWING NO. 503-CCPJ-08



/s/ Anthony L. Uremovich 9-01-99  
DESIGN STANDARDS ENGINEER DATE

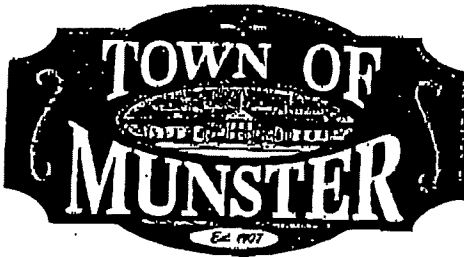
/s/ Donald W. Lucas 9-01-99  
CHIEF HIGHWAY ENGINEER DATE

Source Sheet: CCPJ2

\*\*\*\*\*  
\*\*\* TX REPORT \*\*\*  
\*\*\*\*\*

TRANSMISSION OK

TX/RX NO 3740  
CONNECTION TEL 914142918841  
SUBADDRESS  
CONNECTION ID  
ST. TIME 07/28 12:12  
USAGE T 02'13  
PGS. 6  
RESULT OK



1005 Ridge Road  
Munster, Indiana 46321  
219-836-8810  
Fax: 219-836-8350

**fax** t r a n s m i t t a l

to:

TODD STILL MARKER

fax:

1-414-291-8841

from:

JAMES MANDON

date:

7/28/03





1005 Ridge Road  
Munster, Indiana 46321  
219-836-8810  
Fax: 219-836-8350

# fax t r a n s m i t t a l

to:

TODD STILL MARKER

fax:

1-44-291-8841

from:

JAMES MANDON

date:

7/28/03

re:

REQUESTED COPY

pages:

INCLUDING COVER SHEET

6

NOTES:



## **CHAPTER VII: STORMWATER CONTROL**

### **SECTION I: REQUIREMENTS**

#### **1-1 Intent**

- A. The intent of these regulations is to diminish threats to public health and safety caused by the runoff of excessive stormwater, reduce economic losses to individuals and the community at large, promote the orderly development of land water resources and to conform to the requirements of statutes and drainage law. These provisions further regulate, guide and control drainage features of subdivisions and developments within the Town of Munster, and set forth standards for the design of the stormwater drainage facilities and systems.
- B. It is not the intent to take areas out of use for the sole purpose of storing excess stormwater, nor is it the purpose of storing excess stormwater, nor is it the purpose to restrict land use of increase development costs. The basic purpose is to eliminate the storage or transportation of excess stormwater in or through habitable structures, or across land in a manner prejudicial to the public health and welfare. The use of "natural" paths of stormwater run-off to form "bypass" channels and the restriction of these channels to form storage areas is encouraged. Since political and ownership boundaries make the use of "natural" drainage patterns difficult, earthmoving that is accomplished to create enhanced land usage should be planned so as to provide stormwater drainage or radically change watershed boundaries.
- C. It is intended that the stormwater from all developments requiring stormwater retention or detention shall be released at a rate that will not exceed the stormwater run-off rate from the site in its undeveloped state.

#### **SECTION II: General Requirements**

##### **2-1 General Requirements:**

- A. **Allowable Release Rate:** The release rate of stormwater from all developments requiring detention shall not exceed the stormwater run-off from the area in its

natural undeveloped state. (The Town will not accept a release rate greater than that calculated for a two (2) year frequency storm with a run-off coefficient of 0.15, unless the applicant can show by detailed calculations, which are acceptable to the Town, that the capacity of the natural outlet sewers serving the area is greater.

- B. **Bypass:** Ability to bypass through the development being designed, the flow from all upstream areas resulting from a storm of design frequency (assuming the upstream land is fully developed or as proposed under comprehensive zoning plans). The bypass flow rate shall be computed using a storm frequency of not less than five (5) year intensity and a runoff coefficient of not less than 0.35.
- C. **Contiguous:** Means adjacent to the touching at one (1) point or more, if the properties are separated by an easement or dedicated right-of-way, they shall be considered contiguous.
- D. **Interest:** Means property interest or contractual interest, legal or equitable, directly or indirect, in part or in full, including option to buy; in the case of shareholder interest, the shareholder shall be deemed to have an interest if he owns or controls five percent (5%) or more of the shares.
- E. **One Hundred Year Frequency Rainfall:** A storm intensity measured in inches per year over a twenty-four (24) hour period as studied by the U.S. Weather Bureau and which has a one percent (1%) per year chance of occurring.
- F. **Owner:** Means record titleholder or a beneficiary of a land trust which is the record titleholder, and includes singular and plural; if the owner is other than an individual, the term includes beneficiaries, agents shareholders, officers and directors.
- G. **Ownership:** Means holding of record title of any beneficial interest.
- H. **Run-Off Coefficient:** Character variables which involve testing of precipitation, soil, moisture, infiltration, detention, ground slope, ground cover evaporation, and shape

of the drainage area. For R-1 single-family developments a minimum of 30% lot coverage shall be used for the impervious area on the lot. For R-2 single-family developments a minimum of 35% lot coverage shall be used for the impervious area on the lot. Also the minimum "C" factor to be used for the developed state shall be 0.45 for pervious and 0.90 for impervious unless adequate documentation is provided to justify a lesser value.

- I. **Two Year Frequency Rainfall:** A storm intensity measured in inches per hour over a twenty-four (24) hour period as studied by the U.S. Weather Bureau and which has fifty percent (50%) per year chance of occurring.
- J. **Storm Sewers:** Storm sewers shall be designed with a minimum velocity of 3 ft/sec.

## **2-2 Jurisdiction**

### **A. Types of Developments Requiring Detention:**

- 1. All commercial and industrial regardless of area;
- 2. All single and/or two (2) family developments of four (4) or more contiguous lots;
- 3. All multi-family building(s) of three (3) or more units/buildings regardless of area.

## **2-4 Exemptions:**

- A. Under the provisions of this Ordinance, stormwater detention facilities meeting the criteria and requirements established herein are not required by the Town for the following projects, provided that the available outlet capacity is adequate as calculated by the Design Engineer and approved by the Town. If the outlet capacity is not adequate, then detention as determined by the Town will be required to store that portion of the runoff exceeding the outlet capacity.

- B. Any area presently served by a detention pond which has the capacity to control the proposed improvement.
- C. Any construction either residential, commercial, or industrial which is constructed in a manner which will not result in the reduction of undeveloped or grass areas (i.e. building addition on an existing parking lot).

## **SECTION III: Required Submissions**

### **3-1 Subdivision Required:**

- A. Plans and specifications for drainage and detention features are required and shall be submitted for review and approval as part of subdivision engineering features.
- B. Specific design calculations and details shall be provided when the final plans and specifications are presented for review. Sample calculations illustrating the provisions of this section and definitions of terminology shall be furnished by the Town Engineer, upon request.
- C. The subdivision design engineer shall submit a master stormwater management plan, which will list the parameters to be used in the ultimate design. Preliminary detention calculations will be provided which will document sufficient acreage is reserved in the proposed land plan to provide for the estimated volume. The master stormwater management plan will be submitted for the Town's review prior to proceeding with the final design.

### **3-2 Subdivision Not Required:**

- A. Before building permits are issued by the Town, the owner shall furnish, as part of the submittal, plans and calculations showing, in adequate detail, the manner in which detention requirements will be satisfied. If, as part of the preliminary plans and design, it is proposed that the detention requirements will be satisfied by providing on-site detention facilities shall be designed such that the minimum size of the area served by such facilities shall not be less than three (3) acres of tributary area serviced by a single control device.



- B. The areas for which detention facilities are being designed shall be delineated on the preliminary plans. If a developer owns a tract of land larger than three (3) acres each, such lot shall be jointly developed so that the minimum area for which detention facilities are designed shall not be less than the recommended three (3) acres.
- C. Individual buildings developed within the area of the subject detention control area, shall conform to the preliminary plans. Said preliminary plans for a specific parcel shall be made part of the individual development project, as outlined herein.

### 3-3 Allowable Release Rates:

Because of the generally flat conditions of the land in this area, channel configurations cut by nature and capacity of existing sewers are generally unable to handle the runoff from high intensity rainfalls, which results in flooding of lower land area. In order to not increase the runoff from proposed developments, the release rate of stormwater must be limited to the carrying capacity of these natural channels or sewers. The Town will accept, as a minimum design, a release rate from a storm having a two (2) year frequency and a runoff coefficient of 0.15. The Town Engineer may accept or reject any and all of the detention control methods or related calculations.

### 3-4 Design Storm:

The live detention storage to be provided will be calculated on the basis of the 100-year frequency rainfall, as published by the U.S. Weather Bureau for this area. The detention volume required will be that necessary to handle the runoff of a 100-year rainfall, for any and all durations, from the fully developed discharged during the same duration at the approved two (2) year release rate.

## SECTION IV: Outlet Control Sizing

### 4-1 Special Provisions:

- A. Detention ponds shall be provided for all development types previously mentioned. However, for many developments, the actual land area being improved using the two(2) year storm release will result in a very small diameter restrictor pipe diameter.

- B. In order to provide a minimum standard for a restrictor size, a minimum three inch (3") diameter and a length of two feet (2') shall be smaller than the three inches (3"), the plans shall reflect the require size.
- C. As an alternate or additional control measure, there are catch basin frames with manufactured three-quarter inch (3/4") or one-inch (1") diameter holes precast in the lids. This type of restrictor may be used to further reduce the inflow rate, but must be used in conjunction with the minimum restricted outlet control within the catch basin.

### 4-2 Multiple Outlets:

- A. To eliminate small multiple outlets, designs generally requiring a release pipe of less than three inches (3") are not recommended. In order to calculate the overland flow time of concentration, the following formulas are to be used:

1. For lengths less than one thousand feet (1000'), use the attached Figure 3 graph or the formula:

$$T_o = 0.625 (L/S)$$

Where

$T_o$  = overland flow time (min)

$L$  = overland length (ft)

$S$  = slope of ground (ft/ft)

2. For lengths of one thousand feet (1,000') and greater, use the following formula:

$$T_o = \frac{1.8 (1.1-C)L}{S}$$

Where

$T_o$  = overland flow time (min)

$L$  = overland length (ft)

$C$  = runoff coefficient (0.15)

$S$  = slope of ground (as PERCENT)

3. To calculate the allowable two (2) year release rate, the following date shall be used:

<u>Storm</u> (hrs)	<u>Duration</u> (min)	<u>Intensity</u> (in/hr)
0.17	10	3.55
0.33	20	2.60
0.50	30	2.10
0.67	40	1.80
0.83	50	1.60
1.00	60	1.40
1.50	90	1.05
2.00	120	0.80
3.00	180	0.60

#### **4-3 Outlet Control:**

- A. Outlet control structures shall be designed to operate as simply as possible and shall require little or no attention for proper operation.
- B. Velocity of discharge shall be limited to 2.0 feet per second at the point of discharge, unless discharge is made into a storm sewer, or protected embankment. All energy dissipation and velocity attenuation shall be accomplished on the site being developed.
- C. Hydraulic and hydrologic calculations shall be submitted to substantiate all design features.

#### **4-4 Design of Detention Ponds:**

- A. Dry bottom stormwater storage areas shall be designed to serve a secondary purpose for recreation, open space, or other types of uses that will not be adversely affected by occasional or intermittent flooding. The method of carrying the low flow through or around the pond shall be approved by the Town Engineer. Low flow swales are discouraged. However, if approved, underdrains must be provided.
- B. The entire pond shall be finished using topsoil and sod, or by using topsoil and hydro-seed.
- C. Minimum grades for grassed bottoms shall be two percent (2%) with a maximum slope of ten percent (10%). Pond side slopes shall not exceed a slope ratio of four feet (4') horizontal to one-foot (1') vertical.
- D. Wet bottom storage ponds shall be designed so sufficient capacity is provided for the calculated detention requirements.

1. The Normal Pool shall be established at an elevation that can maintained, (within the limits of seasonal fluctuations), by rainfall runoff and normal groundwater recharge during a years average rainfall.
2. The side slopes and bottom depths shall be designed to maintain the biologic health of the pond and life-safety of the people.
3. Shoreline or sidebank erosion protection shall be provided by structural or non-structural ground cover (rip-rap, vegetation cover) above and below the normal water elevation to resist erosive wave action, ice reaction, or other seasonal reactions to the side slopes.

- E. Each detention pond, regardless of tributary service area, shall provide a method of overflow in the event of a restrictor failure or a storm in excess of a 100 year frequency. The point(s) of discharge shall be directed towards the street, or other adequate source of stormwater collection.
- F. During the construction of the detention pond(s), steps shall be incorporated into the engineering design to prevent downstream erosion of earth, and washing debris into existing draining facilities.
- G. Detention ponds shall be designed with a setback off the right-of-way of ten feet (10') plus two feet (2') for every one-foot (1') of depth to the pond bottom.

#### **4-5 Easement for Public Detention Ponds:**

- A. All detention pond facilities not maintained by individual property owner(s) shall be located within a drainage easement granted to the Town.

#### **4-6 Bonding:**

- A. Where required, the costs for stormwater detention/retention pond construction shall be included in the engineering estimate for the total site improvements.

#### **4-7 Innovative Practices:**

- A. The "REQUIREMENTS" of this Ordinance are promulgated to establish standards for conventional methods of retention and detention of stormwater. Some physiographic and geologic features of the terrain will permit successful discharge of surface stormwater accumulations to granular sub-surface areas. It is not the intent of these "REQUIREMENTS" to inhibit the design of such subsurface facilities.
- B. The design of sub-surface discharge (or other innovative) facilities shall be substantiated by site-specific testing data and hydrologic calculations based upon rational design principles.
- C. Consideration of innovative facilities shall include an examination of siltation-protection features and analysis of maintenance problems.



## Jim Mandon

---

**From:** Gerry Andrisko  
**nt:** Wednesday, August 06, 2003 3:47 PM  
**To:** Jim Mandon  
**Subject:** RE: hydrants

-----Original Message-----

**From:** Jim Mandon  
**Sent:** Wednesday, August 06, 2003 2:33 PM  
**To:** Gerry Andrisko; Jim Knesek  
**Subject:** hydrants

Pls. indicate your current requirement for type of hydrants. The infrastructure specs. do not mention a brand, only port sizes and turn direction.

**[Gerry Andrisko]**

Our current specifications call for Mueller Super Centurion 250 fire hydrants with a 5 1/4" valve opening. Depth of bury dependent on trench depth. All hydrants are to be traffic models.



## UNDERGROUND PIPE &amp; VALVE, INC.

574 KENNEDY AVENUE

SCHERERVILLE, IN 46375

PHONE: 219-865-9113

FAX: 219-865-9127

## FAX COVER PAGE

TO: JimFROM: MOE

COMPANY PHONE: \_\_\_\_\_

FAX NUMBER: 836 - 8350

DATE &amp; TIME: \_\_\_\_\_

PAGES 5 + COVER PAGERE: MUNSTER BUS GARAGE

ADDITIONAL INFO: \_\_\_\_\_

Jim,

THIS IS ALL I COULD  
COME UP WITH. I HOPE  
IT HELPS.

THANKS AGAIN,MOE





INNOVATIVE DRAINAGE AND WATER CONSERVATION SOLUTIONS



## BLUE SEAL PIPE, WATERTIGHT PERFORMANCE

THE PERFORMANCE YOU EXPECT. THE INNOVATIONS YOU NEED.

With over a century of experience, we're experts when it comes to drainage, providing innovative solutions for all kinds of applications. Our HDPE pipe delivers superior value while providing physical strength and structural design that just cannot be matched by metal or concrete.

Hancor's new patent pending, highly engineered composite pipe joining system, a unique combination of three different materials, is being described as the best watertight solution on the market.

BLUE SEAL is a gravity flow, watertight pipe ideal for storm sewers, detention systems, and cross slope or edge drains. Other applications include golf courses, sports playing fields, or parking lot drainage, as well as irrigation ditch enclosures.

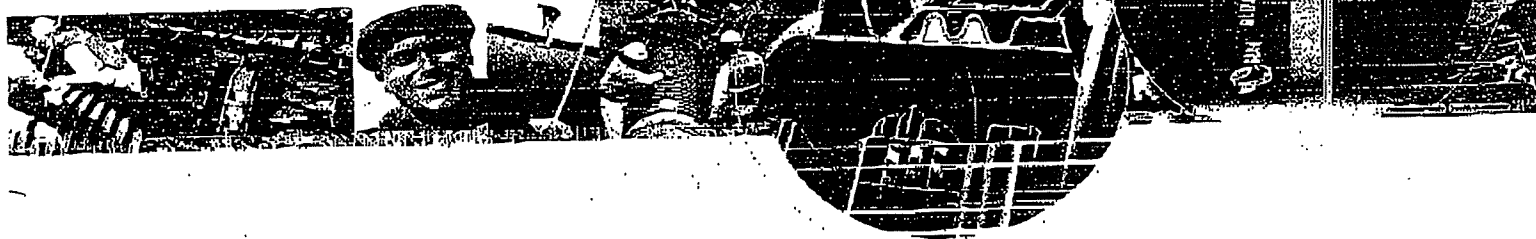
Available in a complete range of sizes from 12" - 60" (300 - 1500mm) diameters, this Hancor exclusive solution is 3rd party verified to meet 10.8 psi pressure and vacuum testing requirements and EPA Phase II Best Management Practices. Once again, Hancor leads the way in offering a 60" corrugated HDPE verified watertight joining system.

The unique feature that sets this system apart from any other is a highly engineered integral bell-and-spigot system that utilizes expanding structural foam technology for gasket support. This revolutionary coupling system maintains bell dimension after pressurization providing uniform tolerances to ensure the highest consistent performance not found in the corrugated pipe industry. Hancor's multicomposite reinforced bell design is easily recognized by its blue product identification wrap.

### 5 YEAR WARRANTY

BLUE SEAL, Hancor's new highly engineered composite pipe joining system is backed by an industry exclusive 5 year limited warranty.

**Hancor Service:** Hancor representatives and engineers are committed to providing you with the answers to all your questions, including specifications, installation, backfill recommendations and more.



### FEATURES

- Meets 10.8 psi water pressure and vacuum testing requirements.
- Addresses EPA Phase II Best Management Practices for long-term service reliability.
- Lightweight, high strength composite system requires less labor time for faster installations and reduced costs.
- Bell and gasket corrugation reinforcement provides uniform support not found in the corrugated polyethylene pipe industry.
- Fast bell-and-spigot joint assembly with unsurpassed structural integrity.
- HDPE pipe provides superior resistance to prevent rusting, deterioration or crumbling.

### BENEFITS

- Provides a visible commitment to better water quality, minimizing environmental impact.
- Prevents the contamination of soil and local waters from harmful substances such as sediment from construction runoff, lawn care products or automobile emissions.
- Avoids possible joint infiltration of sands and fines resulting in sinkholes and differential settlement to adjacent structures.
- Reduces the risk of blockage caused by vegetation infiltration into joints.
- Reduces soil migration.
- Exclusive 5 year limited warranty for superior value.

## INNOVATIVE DRAINAGE AND WATER CONSERVATION SOLUTIONS



Buy it and forget it.

**BLUE SEAL™ PIPE SPECIFICATIONS**

Diameter: 12" - 60" (300 - 1500mm)

Length:

- 20' (6m) for 12" - 30" (300 - 750mm) diameter pipe.
- 20.5' (6.24m) for 36" - 60" (900 - 1500mm) diameter pipe.

Specifications: AASHTO M294, Type S and AASHTO MP7, Type S.

Joint Performance: Watertight

Joining System: Bell-and-spigot

Gasket: Polyisoprene meeting ASTM F477

Fittings and Accessories: Hancor offers a full line of fittings for all diameters of Hancor pipe.

**SCOPE**

This specification describes 12" - 60" (300 - 1500mm) Hancor BLUE SEAL pipe for use in gravity flow applications.

**PIPE REQUIREMENTS**

BLUE SEAL pipe shall have a smooth interior and annular exterior corrugations.

- 12" - 48" (300 - 1200mm) shall meet AASHTO M294, Type S.
- 60" (1500mm) meets AASHTO MP7, Type S.
- Manning's "n" value for use in design shall be no less than 0.010.

**MATERIAL PROPERTIES**

Pipe and fitting material shall be high-density polyethylene meeting ASTM D3350 minimum cell classification 335400C. The pipe material shall be Hancor Resin 8™, which is a high stress crack resistant material evaluated using the single point notched constant tensile load (SP-NCTL) test. Average SP-NCTL test specimens must exceed 24 hrs. with no test result less than 17 hrs. The closed cell structural foam core must have a free rise density no less than

3 lbs./ft.<sup>3</sup> and compressive strength no less than 20 lbs./in.<sup>2</sup>.

**JOINT PERFORMANCE**

Pipe shall be joined with the BLUE SEAL™ joint meeting the requirements of AASHTO M294, or AASHTO MP7. 12" - 60" (300 - 1500mm) shall be watertight according to the requirements of ASTM D3212. Gaskets shall be made of polyisoprene, meeting the requirements of ASTM F477 with the addition that the gaskets shall not have any visible cracking when tested according to ASTM D1149 after 72 hours exposure in 50 PPHM ozone at 104° Fahrenheit. Gaskets shall be installed by the pipe manufacturer and covered with a removable wrap to ensure the gasket is free from debris. 12" - 30" (300 - 750mm) bells shall include a reinforcing rib at the flare OD to assure meeting roundness tolerances and enhance proper joint assembly. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly. 24" - 60" (600 - 1500mm) diameters shall have a reinforced bell-and-spigot, including a bell tolerance device. The bell tolerance device shall be installed by the manufacturer and covered with a protective wrap. The gasket corrugation shall be reinforced with a closed cell structural foam core.

**FITTINGS**

Fittings conform to AASHTO M294 or AASHTO MP7. Fabricated fittings are welded at all accessible interior and exterior junctions.

**WATERTIGHT FIELD TEST PERFORMANCE**

To assure watertight field performance, verification may be accomplished using ASTM F 1417 or ASTM C 969 test procedures. Appropriate safety precautions must be used when field testing any pipe material.

Pipe I.D., in. (mm)	12 (300)	15 (375)	18 (450)	24 (600)	30 (750)	36 (900)	42 (1050)	48 (1200)	60 (1500)
Pipe O.D., in. (mm)	14.2 (361)	17.7 (450)	21.5 (546)	28.1 (721)	35.0 (914)	41.4 (1052)	48.0 (1219)	55.0 (1397)	67.3 (1709)
Flare O.D., in. (mm)	15.4 (391)	19.6 (498)	23.9 (607)	29.9 (759)	37.9 (963)	43.6 (1107)	50.4 (1280)	57.4 (1458)	73.7 (1872)
Pitch, in. (mm)	2.0 (51)	2.4 (61)	3.0 (76)	4.0 (102)	4.0 (102)	4.5 (117)	5.8 (147)	5.8 (147)	7.8 (198)
Approx. Weight, lb./20 ft. stick (kg/6m stick)	70 (32)	100 (45)	130 (59)	220 (100)	330 (150)	400 (182)	500 (227)	597 (260)	861 (315)

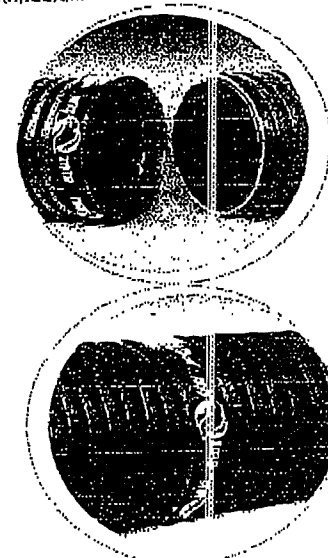
All Hancor products are subject to a limited warranty and purchasers are solely responsible for installation and use of Hancor products and determining whether a product is suited for any specific needs. Please consult a full copy of Hancor's Terms and Conditions for Sale for further details.

**INSTALLATION**

Installation should be in accordance with ASTM D2321, with the exception that minimum cover in trafficked areas for 12" - 48" (300 - 1200mm) diameters is 1 ft. (0.3m), and for 60" (1500mm) diameters, 1.5 ft. (0.5m).

**QUALITY ASSURANCE**

All corrugated polyethylene pipe meeting or exceeding AASHTO M294 or MP7 shall only be provided by manufacturers listed by the Plastic Pipe Institute (PPI) as having met the requirements of the PPI sponsored third-party certification program. All AASHTO M294 and MP7 pipe shall be clearly marked with a certification program mark or logo representing the supplied pipe is in compliance with all applicable standards.

**Direct Contact****Customer Service**

888 FOR PIPE (387-7473)

Fax 888-FAX PIPE (325-7473) 24 hours a day

**Application Engineering**

For technical questions, call

800-2HANCOR (24 4-6267), ext. 809

**Electronic Media****Web Site**

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## HANCOR BLUE SEAL™ PIPE SPECIFICATIONS

### Scope

This specification describes 12- through 60-inch (300 to 1500 mm) Hancor BLUE SEAL™ pipe for use in gravity flow applications.

### Pipe Requirements

BLUE SEAL™ pipe shall have a smooth interior and annular exterior corrugations.

- 12- through 48-inch (300 to 1200 mm) shall meet AASHTO M294, Type S.
- 60-inch (1500 mm) shall meet AASHTO MP 7, Type S.
- Manning's "n" value for use in design shall not be less than 0.010.

### Joint Performance

Pipe shall be joined with the BLUE SEAL™ joint meeting the requirements of AASHTO M294, or AASHTO MP7.

12- through 60-inch (300 to 1500 mm) shall be watertight according to the requirements of ASTM D3212. Gaskets shall be made of polyisoprene meeting the requirements of ASTM F477 with the addition that the gaskets shall not have any visible cracking when tested according to ASTM D1149 after 72 hour exposure in 50 PPHM ozone at 104° Fahrenheit. Gaskets shall be installed by the pipe manufacturer and covered with a removable wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.

36- through 60-inch (900 to 1500 mm) diameters shall have a reinforced bell & spigot including a bell tolerance device and an axial reinforcing bridge plate between the bell and the first external corrugation. The bell, bridging, and expansion resistance rings shall be covered with a protective wrap. The gasket corrugation shall be reinforced with a closed cell structural foam core.

### Fittings

Fittings shall conform to AASHTO M294 or AASHTO MP7. Fabricated fittings shall be welded at all accessible interior and exterior junctions.

### Material Properties

Pipe and fitting material shall be high-density polyethylene meeting ASTM D3350 minimum cell classification 335420C. The closed cell structural core must have a density no less than 6 lbs/ft<sup>3</sup> and compressive strength no less than 20 lbs/in<sup>2</sup>.

### Installation

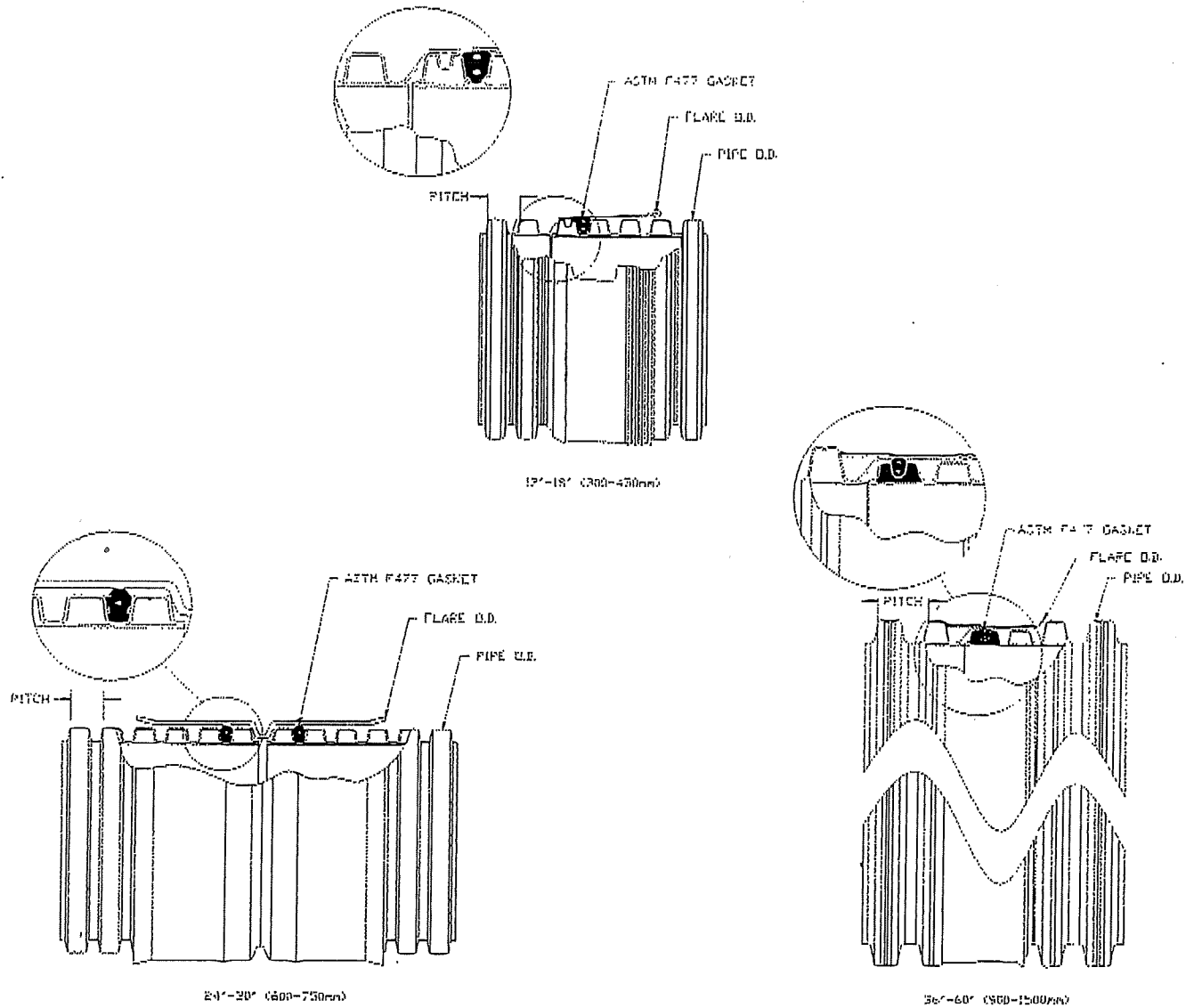
Installation shall be in accordance with ASTM D2321, with the exception that minimum cover in trafficked areas for 12- through 48-inch (300 to 1200 mm) diameters shall be 1 ft. (0.3 m) and for 60-inch (1500 mm) diameter, the minimum cover shall be 1.5 ft. (0.5 m).

### Pipe Dimensions

	Nominal Diameter, in (mm)								
Pipe I.D., in. (mm)	12 (300)	15 (375)	18 (450)	24 (600)	30 (750)	36 (900)	42 (1050)	48 (1200)	60 (1500)
Pipe O.D., in. (mm)	14.2 (361)	17.7 (450)	21.5 (546)	28.4 (721)	36.0 (914)	41.4 (1052)	48.0 (1219)	55.0 (1397)	67.1 (1709)
Flare O.D., in. (mm)	15.4 (391)	19.6 (498)	23.9 (607)	29.9 (759)	37.9 (963)	43.6 (1107)	50.8 (1290)	57.4 (1458)	73.7 (1872)
Pitch, in. (mm)	2.0 (51)	2.4 (61)	3.0 (76)	4.0 (102)	4.0 (102)	4.8 (117)	5.8 (147)	5.8 (147)	7.1 (181)
Approx. Weight, Lb/20 ft. stick (Kg/6m stick)	70 (32)	100 (48)	130 (59)	220 (100)	330 (150)	400 (182)	500 (227)	597 (260)	86 (315)

# BLUE SEAL™ JOINT SYSTEM

(Joint configuration & availability subject to change without notice.)



## CARRAS-SZANY-KUHN &amp; ASSOCIATES P.C., ARCHITECTS

Nathan A. Carras, AIA

Daniel R. Szany, AIA

Thomas E. Kuhn, AIA, CSI

## FAX COVER SHEET

DATE 12/16/04 NUMBER OF SHEETS (INCLUDING TRANSMITTAL SHEET)  
TO: JIM MANDON FAX# 836-8350  
COMPANY: TOWN OF MUNSTER  
RE: SCHOOL TOWN SERVICE CENTER (BUS BARN)  
NOTES: PLEASE TAKE A LOOK AT THIS AS AN ALTERNATE TO SCH 401K  
IT IS CONSIDERABLY STRONGER WITH THE RIBS  
LET ME KNOW IF THIS IS OK  
FROM: DAN SZANY  
FAX #: (219) 322-6047

6919 Lincoln Highway

P.O. Box 179

Schererville, Indiana 46375

(219) 322-5950



11/18/04 TUE 08:51 FAX

**FRATCO****Francesville Drain Tile Corporation**

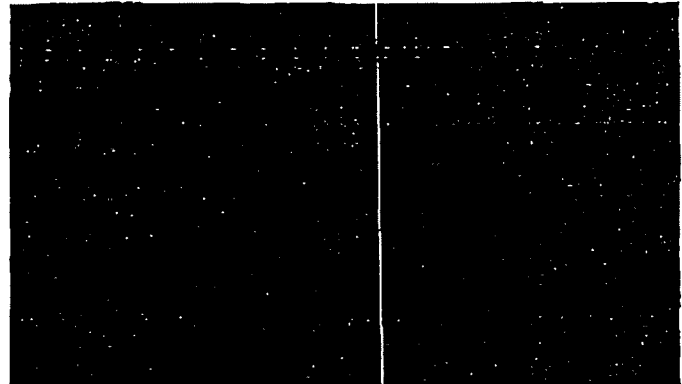
POST OFFICE BOX 368 - FRANCESVILLE, INDIANA 47848-0368 - PHONE: (219) 567-9133

## SMOOTH-CORR PIPE WITH INTEGRAL BELL COUPLER

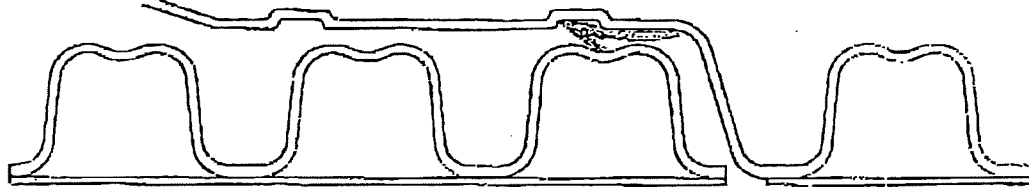
Deliver features that make the customer's job easier. That's always been our philosophy. FRATCO's line of smooth-corr pipe with integral bell coupler does just this.

For any application, be it storm sewer, retention systems, culverts, parking lots... FRATCO smooth corr pipe can get the job done. And thanks to the handy 13' sections, no special sized equipment (like long trench boxes) are needed, and less effort is required in handling of each piece.

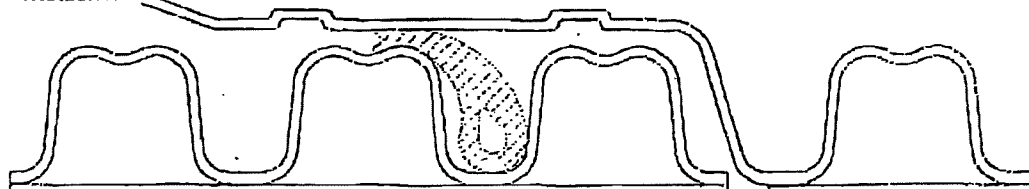
<b>Diameters:</b>	10" - 36" (100 - 900 mm)
<b>Length:</b>	13' (4 m)
<b>Specifications:</b>	AASHTO M252, Type S AASHTO M294, Type S ASTM F477 ASTM D3350, min. class 324420C
<b>Gaskets:</b>	Silt tight and Water tight available
<b>Fittings:</b>	FRATCO manufactures a full range of fittings and accessories for all products



Cross-section of FRATCO belled joint with glueless soil tight gasket. In gravity flow applications, this gasket is also leak resistant and fully complies with ASTM F477. High-performance design means no defective, "foam and glue" joints will arrive at the job site. Once the ringed gasket is snapped into place at our facilities, it's virtually impossible to remove!



Cross-section of FRATCO belled joint with water tight gasket. This high-performance gasket ensures no water leakage past the joint, and fully complies with ASTM F477. This gasket performs in even the toughest environments and installation conditions.



CORRUGATED HDPE DRAINAGE PIPE

11/16/04 TUE 08:50 FAX

001

**FRATCO**

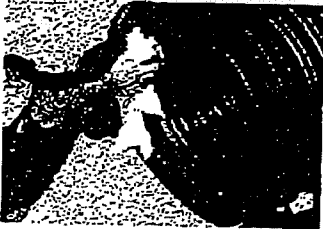
## INSTALLATION CONSIDERATIONS FOR SMOOTH-CORR PIPE

HDPE pipe has so many advantages when compared to its competitors. It's easier to handle, less prone to damage during shipment, and many times more resistant to chemicals and abrasion. When properly installed, you can be rewarded with a 100 year service life!

FRATCO provides smooth-corr pipe and fittings with integral bell couplers for situations that require either soil tight or heavy duty water tight joints. While assembling these joints couldn't be easier, there are some considerations to be aware of before proceeding.

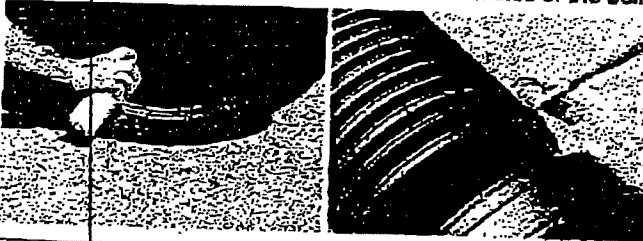
### #2 - CLEAN LOOSE DIRT FROM BELL, SPIGOT, AND GASKET

Wipe any loose dirt from inside of bell, spigot, and gasket. Surfaces should be as clean as possible to provide a good seal.



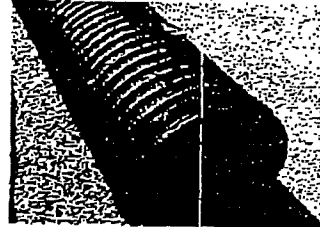
### #4 - APPLY LUBRICANT TO GASKET SURFACE.

When using FRATCO's soil-tight gaskets, which are installed in the bell, apply a thin film of lubricant to the gasket. In the case of water-tight gaskets, apply a more liberal film of lubricant to both the gasket surface and the inside of the bell.



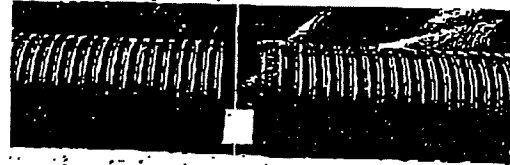
### #1 - REMOVE PROTECTIVE WRAPPING FROM WATER TIGHT GASKET

If your FRATCO pipe was ordered with water tight gaskets installed, remove the protective wrapping before inserting the spigot end into the bell. Inspect the gasket for cleanliness at this time.



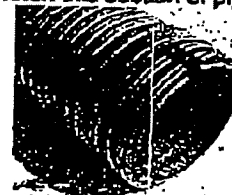
### #3 - RELIEVE ANY PRESSURE ON PIPE BELL.

The bell on FRATCO's pipe is slightly larger than the pipe's O.D.. FRATCO recommends that a "bell hole" be used in your installation. A "bell hole" is a slight depression in the bedding immediately under the bell. This allows the pipe to stay "on grade" as well as minimize any stress on the pipe joint. Simply loosening the bedding with a shovel under the bell is usually adequate.



### #5 - USE A "BELL INSERT" WHEN PUSHING ON PIPE WITH MACHINE

When assembling a water tight and some soil tight joints, it is necessary to push on the length of the pipe with an excavator bucket, etc... Protect the bell by inserting a short section of pipe into it. For easy removal, notch this section of pipe as shown.



CORRUGATED HDPE DRAINAGE PIPE



## UNDERGROUND PIPE &amp; VALVE, INC.

574 KENNEDY AVENUE

SCHERERVILLE, IN 46375

PHONE: 219-865-9113

FAX: 219-865-9127

## FAX COVER PAGE

TO:

JIM

FROM:

NOE

COMPANY PHONE:

FAX NUMBER:

836-8350

DATE &amp; TIME:

PAGES

7

+ COVER PAGE

RE:

ADDITIONAL INFO:

JIM,

I'VE BEEN TALKING TO

RON HANKIN. HANKIN IS EVERY

SPEC SITUATION ON THE PIPE

WE STOCK.

THANKS AGAIN.

NOE



# Specification Data Sheet Sewer Pipe-Gasketed and Solvent Weld

## Product Description

### Short Form Specification:

- 4" - 15" SDR 35 ASTM D-3034
- 18" - 24" SDR 35 ASTM F-679
- 4" - 15" SDR 26 ASTM D-3034
- 18" - 21" SDR 26 ASTM F-679

### Hug-Tite™ Gasketed and SWB Pipe:

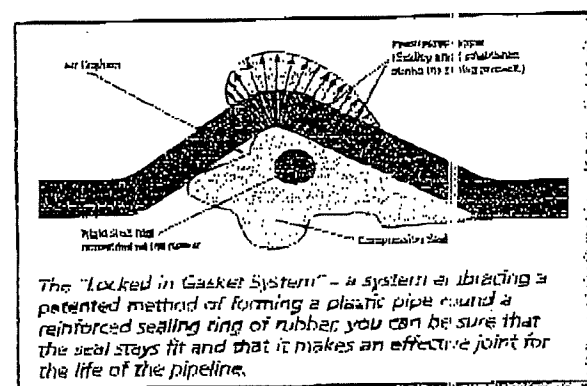
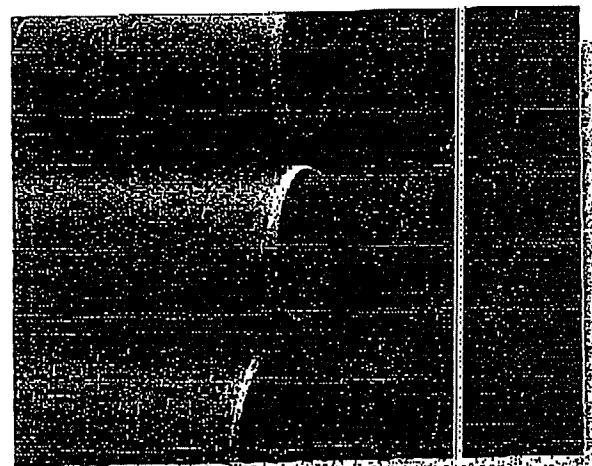
Freedom Plastics' 4" - 15" SDR 35 and SDR 26 sewer pipe will meet or exceed all performance specifications of ASTM D-3034, when tested in accordance with ASTM D-2122.

Freedom Plastics' Hug-Tite™ 18" - 24" SDR 35 and 18" - 21" SDR 26 heavy wall gasketed sewer pipe will meet or exceed all performance specifications of ASTM F-679, when tested in accordance with ASTM D-2122. Freedom's SDR 35 F-679 sewer pipe is manufactured to T-1 wall, or a true SDR 26.

The basic material used in the manufacture of this pipe conforms to ASTM D-1784 with a cell classification of 12454-B. Freedom's sewer pipe is colored green for quick in-ground identification as sewer-main pipe. Minimum pipe stiffness values are 46psi for SDR 35, and 115psi for SDR 26.

Hug-Tite™ sewer pipe gaskets are a factory installed, locked-in Rieber type, conforming to ASTM F-477. The gasket joint conforms to ASTM D-3212, section 3.1.1.

Hug-Tite™ gasketed sewer pipe (4" - 24") and Solvent weld bell sewer pipe (8" - 15") is available in a 13-foot laying length (13-foot plus the bell length). 4" and 6" solvent weld bell sewer pipe is available in 10-foot lengths.



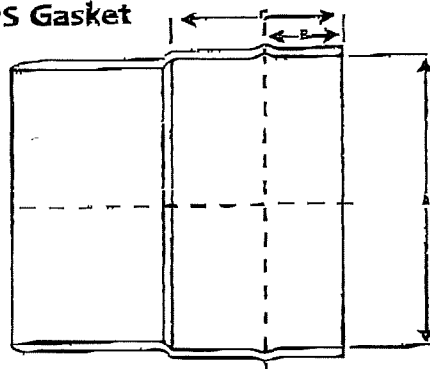
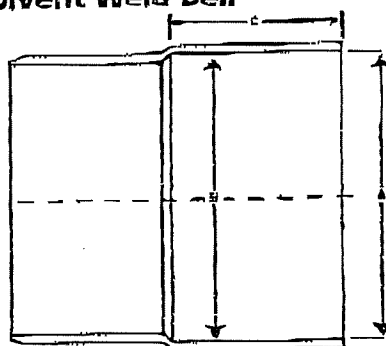
Product Dimensional Data					
Pipe Size (Inches)	Average O.D.	SDR 35		SDR 26	
		Min. Wall Thickness	Weight Per Foot	Min. Wall Thickness	Weight Per Foot
4"	4.215	0.120	1.070	0.162	1.350
6"	6.275	0.180	2.300	0.241	3.000
8"	8.400	0.240	4.120	0.323	5.410
10"	10.500	0.300	6.430	0.404	8.510
12"	12.500	0.360	9.190	0.481	12.150
15"	15.300	0.437	13.770	0.588	18.680
18"	18.701	0.536	20.250	0.719	27.840
21"	22.049	0.632	31.079	0.848	41.130
24"	24.803	0.711	39.735		

Pipe materials meet or exceed cell classification 12454-B

**FP** Freedom Plastics, Inc.

ISO 9001

The information in this document is given as guidelines only and is subject to change without notice.

**Bell-End Dimensional Data****IPS Gasket****Solvent Weld Bell**

Pipe Size	IPS Gasket			Solvent Weld Bell		
	A	B	C	A	B	C
1/2	—	—	—	0.848	0.836	1.000
3/4	—	—	—	1.058	1.046	1.250
1	—	—	—	1.325	1.310	1.500
1 1/4	—	—	—	1.670	1.655	1.750
1 1/2	—	—	—	1.912	1.894	2.000
2	2.387	—	4.000	2.387	2.363	2.750
2 1/2	2.875	—	5.750	2.875	2.861	3.000
3	3.516	—	6.000	3.516	3.484	3.250
4	4.518	—	6.000	4.518	4.482	4.000
6	6.647	—	7.000	6.647	6.603	6.000
8	8.655	—	8.000	8.655	8.598	6.500
10	10.776	—	9.000	10.776	10.722	7.500
12	12.778	—	9.000	12.778	12.721	8.500

Tolerance of Product Specifications is applicable to nominal dimensions. The above drawings are not engineered and are provided to show approximate profile scheme.

**Product Identification**

Freedom Plastics' IPS pressure pipe is colored white, and utilizing state-of-the-art inkjet printing, marked at specific intervals to clearly identify the following on the pipe:

**Example for 12" Gasketed IPS CL160 pipe:**

TOP & BOTTOM: 12" FREEDOM PVC 1120 SDR 26 ASTM D-2241

NSF-pw 160PSI @ 73(degrees)F PG, LINE#, DATE, SHIFT

**Violet Pipe:** Freedom Plastics manufactures Violet colored IPS pressure pipe for Reclaimed Water systems, and contains the following printing on the pipe:  
**Caution - Do Not Drink - Reclaimed Water.**



**PPFA**



**Freedom Plastics, Inc.**

**CORPORATE/NORTH PLANT**  
215 South Arch Street,  
P.O. Box 1488  
Janesville, WI 53547-1488  
TEL: 800-356-9432  
FAX: 808-754-6134

**WEST PLANT**  
640 South Hwy. 91  
Preston, Idaho 83263  
TEL: 208-852-2000  
FAX: 208-852-3020

**SOUTH PLANT**  
3206 Enterprise Road  
Fort Pierce, FL 34982  
TEL: 800-432-6149  
FAX: 772-465-1592

**ISO 9001 CERTIFIED**

E-mail:  
custsvc@freedomplastics.com  
www.freedomplastics.com

Distributed By:

**Product Packaging Data**

Pallet & Truckload Quantities				
Pipe Size	Ft./Pallet	Pallets/Truckload	Ft./Pallet	Pallets/Truckload
	Janesville, WI Plant		Fort Pierce, FL Plant	
1/2	9600	28	9600	8
3/4	6000	28	6000	6
1	4800	28	4800	8
1 1/4	4800	28	4800	8
1 1/2	2580	32	3360	8
2	1760	32	1980	8
2 1/2	1360	28	1360	8
3	1620	16	1620	16
4	1020	16	1020	16
6	480	16	480	16
8	280	16	240	16
10	240	12	160	16
12	120 & 160	12	120 & 160	12

# Specification Data Sheet

## Schedule 40 & 80 PVC Pipe

### Product Description

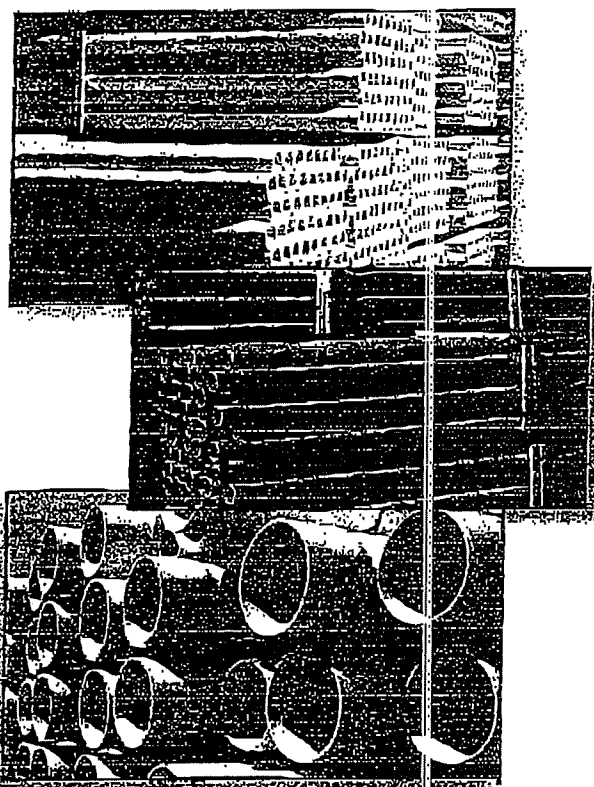
#### IPS Pressure Pipe Short Form Specification:

- 1/2" - 24" Schedule 40 ASTM D-1785
- 1 1/4" - 12" Schedule 40 ASTM D-2665
- 1/2" - 12" Schedule 80 ASTM D-1785

All Freedom Plastics' Schedule 40 and Schedule 80 pressure pipe will meet or exceed all performance specifications of ASTM D-1785, when tested in accordance with ASTM D-2122. The basic material used in the manufacture of this pipe conforms to ASTM D-1784 with a cell classification of 12454-B, type 1 grade 1.

Freedom Plastics' Schedule 40 (1 1/4" - 12") pipe is dual-rated for Drain, Waste, and Vent (DWV) pipe, and will meet or exceed all performance specifications of ASTM D-2665 when tested in accordance with ASTM D-2122.

Both Schedule 40 and Schedule 80 pipe is available in either Plain End or Solvent Weld Bell in 20-foot overall lengths. Solvent weld bell pipe ends are an integral part of the pipe and are included in the overall length. Various sizes of Schedule 40 pipe are also available in 10-foot overall length. Contact factory for details.



#### Product Dimensional Data

Pipe Size (Inches)	Average O.D.	Min. Wall Thickness	Schedule 40 Weight Per Foot	PSI Rating	Min. Wall Thickness	Schedule 80 Weight Per Foot	PSI Rating
1/2"	0.840	0.109	0.160	600	0.147	0.203	850
3/4"	1.050	0.113	0.210	450	0.154	0.276	690
1"	1.315	0.133	0.315	450	0.179	0.407	630
1 1/4"	1.660	0.140	0.427	370	0.191	0.561	520
1 1/2"	1.900	0.145	0.510	330	0.200	0.682	470
2"	2.375	0.154	0.690	280	0.213	0.943	400
2 1/2"	2.875	0.203	1.090	300	0.276	1.443	470
3"	3.500	0.216	1.430	260	0.300	1.928	370
4"	4.500	0.237	2.030	220	0.337	2.821	320
6"	6.625	0.280	3.570	180	0.432	5.384	280
8"	8.625	0.322	5.280	160	0.500	8.184	250
10"	10.750	0.365	7.620	140	0.593	12.135	230
12"	12.750	0.406	10.080	130	0.687	16.687	230
14"	14.000	0.437	11.810	120			
16"	16.000	0.500	15.416	120			
18"	18.000	0.562	20.977	130			
20"	20.000	0.593	23.620	120			
24"	24.000	0.687	32.756	120			

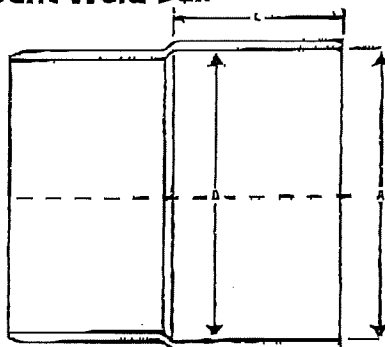
Pipe materials meet or exceed cell classification 12454-B

**FP** Freedom Plastics, Inc.

ISO 9001

The information in this document is given as guidelines only and is subject to change without notice.

## Bell-End Dimensional Data Solvent Weld Bell



## Product Identification

Freedom Plastics' Schedule 40 pipe is colored white and Schedule 80 pipe is colored gray. Freedom utilizes state-of-the-art inkjet printing at specific intervals to clearly identify the following on the pipe:

**Example for 12" SWB Schedule 40 - Dual rated pipe:**

TOP & BOTTOM:

12" FREEDOM PVC 1120 SCH40 ASTMD-1785

NSF-pw ASTMD-2665 NSF-dw 130PSI

© 73(degrees)F FG, LINE#, DATE, SHIFT

Solvent Weld Bell			
Pipe Size	A	B	C
1/2"	0.848	0.836	1.000
3/4"	1.058	1.046	1.250
1"	1.325	1.310	1.500
1 1/4"	1.675	1.655	1.750
1 1/2"	1.915	1.895	2.000
2"	2.390	2.370	2.000
2 1/2"	2.875	2.860	2.000
3"	3.520	3.495	4.000
4"	4.520	4.495	4.000
6"	6.647	6.614	6.000
8"	8.655	8.610	6.500
10"	10.780	10.735	7.500
12"	12.780	12.735	8.500
14"	14.056	13.985	9.000
16"	16.076	15.980	9.000
18"	18.039	17.980	12.000
20"	20.047	19.980	12.000
24"	24.063	23.970	12.000

Tolerances of Product Specifications are applicable to nominal dimensions. The above drawings are not engineered and are provided to show approximate profile scheme.



PPFR



**FP** Freedom Plastics, Inc.

**CORPORATE/NORTH PLANT**  
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P.O. Box 1488  
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FAX: 608-754-6134

**WEST PLANT**  
640 South Hwy. 91  
Preston, Idaho 83263  
TEL: 208-852-2000  
FAX: 208-852-2020

**SOUTH PLANT**  
3206 Enterprise Road  
Fort Pierce, FL 34982  
TEL: 800-432-6143  
FAX: 772-465-1592

ISO 9001 CERTIFIED

E-mail:  
custsvc@freedomplastics.com  
www.freedomplastics.com

Distributed By:

## Product Packaging Data

Pallet & Truckload Quantities				
Pipe Size	FT/Pallet Janesville, WI Plant	Pallets/ Truckload	FT/Pallet Fort Pierce, FL Plant	Pallets/ Truckload
1/2"	9600	28	9600	28
3/4"	6000	28	6000	28
1"	4800	28	4800	28
1 1/4"	4800	28	4800	28
1 1/2"	2580	32	3360	28
2"	1760	32	1980	28
2 1/2"	1360	28	1360	28
3"	1620	16	1620	16
4"	1020	16	1020	16
6"	480	16	480	16
8"	280	16	240	16
10"	240	12	160	16
12"	120 & 160	12	120 & 160	12
14"	120	12	80	16
16"	80	20	40	20
18"	40 & 60	20	40 & 60	20
20"	40	16		
24"	40	12		

# Specification Data Sheet Iron Pipe Size (IPS) Pressure Pipe

## Product Description

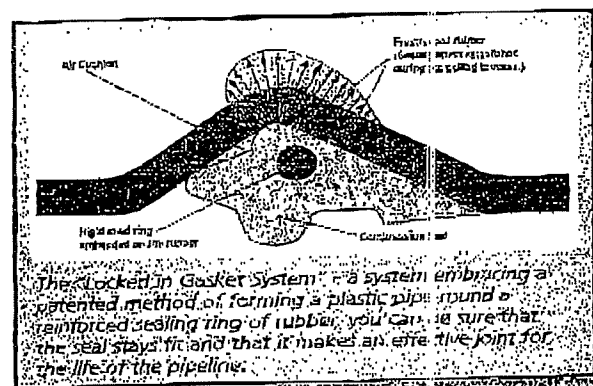
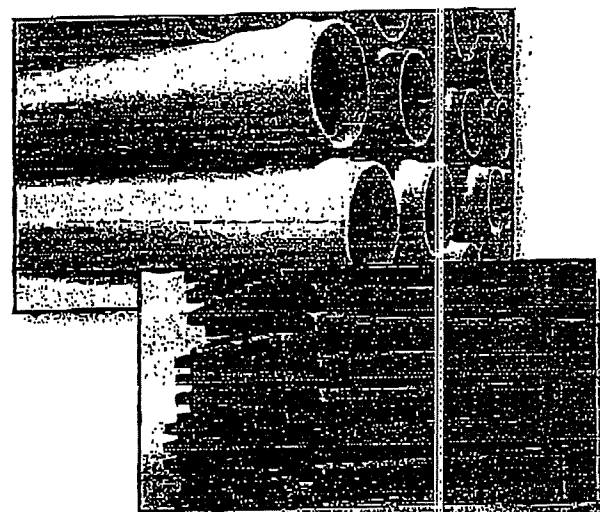
### Short Form Specification:

- 1/2"	SDR 13.5	CL315	ASTM D-2241
- 4" - 8"	SDR 17	CL250	ASTM D-2241
- 3/4" - 12"	SDR 21	CL200	ASTM D-2241
- 1 1/4" - 12"	SDR 26	CL160	ASTM D-2241
- 2 1/2" - 12"	SDR 32.5	CL125	ASTM D-2241
- 3" - 12"	SDR 41	CL100	ASTM D-2241

All Freedom Plastics' PVC IPS pressure pipe will meet or exceed all performance specifications of ASTM D-2241, when tested in accordance with ASTM D-2122. By meeting the ASTM Specification D-2241, Freedom pipe is suitable for potable water systems.

The basic material used in the manufacture of this pipe conforms to ASTM D-1784 with a cell classification of 17454-B, type 1 grade 1. Standard IPS pressure pipe is white in color. Violet colored pipe is also available for Reclaimed Water Systems.

Solvent weld bell and Gasketed bell IPS pressure pipe is available in a 20-foot laying lengths (20-foot plus the bell). The gasketed bell ends for this pipe are the locked-in Rieber type. These joints shall conform to ASTM D-3139, Section 3.1.2. The gaskets conform to ASTM F-477.



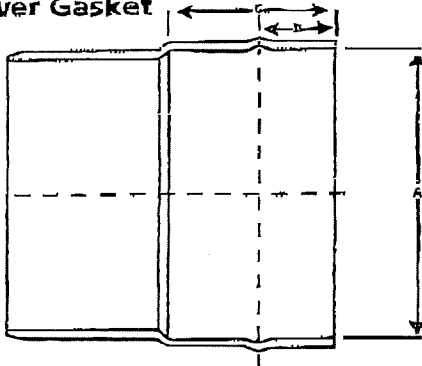
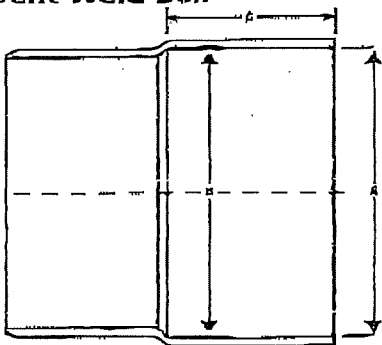
## Product Dimensional Data

Pipe Size Inches	Avg. O.D. Inches	CL315-SDR13.5	CL250-SDR17	CL200-SDR21	CL160-SDR26	CL125-SDR32.5	CL100-SDR41
1/2"	0.840	0.062 / 0.105					
3/4"	1.050			0.060 / 0.131			
1"	1.315			0.063 / 0.174			
1 1/4"	1.680			0.079 / 0.265	0.064 / 0.222		
1 1/2"	1.900			0.090 / 0.330	0.073 / 0.270		
2"	2.375			0.112 / 0.510	0.091 / 0.420	0.073 / 0.326	
2 1/2"	2.875			0.157 / 0.750	0.110 / 0.610	0.088 / 0.518	
3"	3.500			0.157 / 1.120	0.135 / 0.910	0.108 / 0.763	0.085 / 0.616
4"	4.500		0.265 / 2.260	0.214 / 1.840	0.173 / 1.510	0.138 / 1.235	0.110 / 1.005
5"	5.625		0.390 / 4.940	0.316 / 4.010	0.255 / 3.270	0.204 / 2.658	0.162 / 2.145
6"	6.625		0.508 / 6.420	0.410 / 6.770	0.332 / 5.540	0.265 / 4.458	0.210 / 3.583
8"	8.750			0.519 / 10.520	0.413 / 8.590	0.331 / 6.940	0.262 / 5.572
10"	10.750			0.606 / 14.790	0.490 / 12.080	0.392 / 9.736	0.311 / 8.060

**FP** Freedom Plastics, Inc.

ISO 9001

The information in this document is given as guidelines only and is subject to change without notice.

**Bell-End Dimensional Data****Sewer Gasket****Solvent Weld Bell**

Pipe Size	Sewer Gasket			Solvent Weld Bell		
	A	B	C	A	B	C
4"	4.235	1.00	4.00	4.235	4.210	3.00
6"	6.305	2.00	4.75	6.305	6.270	6.00
8"	8.424	2.50	5.50	8.424	8.388	6.50
10"	10.530	3.00	6.50	10.530	10.485	6.50
12"	12.536	3.50	7.25	12.536	12.482	7.00
15"	15.346	4.00	8.25	15.346	15.277	8.00
18"	18.733	4.50	9.00	NA	NA	NA
21"	22.082	5.00	10.25	NA	NA	NA
24"	24.841	5.50	11.75	NA	NA	NA

\* The B dimension is a Maximum Value.  
Tolerances of Product specifications are applicable to nominal dimensions. The above drawings are not engineered and are provided to show approximate profile scheme.

**Product Identification**

Freedom Plastics' Sewer pipe is conveniently colored green for quick in-ground identification as sewer pipe. Freedom utilizes state-of-the-art inkjet printing, marked at specific intervals to clearly identify the following on the pipe:

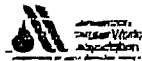
Example for 12" Gasketed Sewer pipe:

TOP & BOTTOM: 12" FREEDOM MBM 12454-B SHR 35 TYPE  
PSM PVC SEWER PIPE ASTM D-3034, LINE#, DATE, SHIFT



ISO 9001 Certified

PPFA



Freedom Plastics, Inc.

**CORPORATE/NORTH PLANT**  
215 South Arch Street,  
P.O. Box 1488  
Janesville, WI 53547-1488  
TEL: 800-356-9432  
FAX: 608-754-6134

**WEST PLANT**  
640 South Hwy. 91  
Preston, Idaho 83263  
TEL: 800-635-2790  
FAX: 208-852-3020

**SOUTH PLANT**  
3205 Enterprise Road  
Fort Pierce, FL 34983  
TEL: 800-492-6149  
FAX: 772-465-1592

ISO 9001 CERTIFIED

E-mail:  
custsvc@freedomplastics.com  
www.freedomplastics.com

Distributed By:

05/02

**Product Packaging Data**

Pallet & Truckload Quantities				
Pipe Size	Janesville, WI Plant		Fort Pierce, FL Plant	
	Feet Per Pallet	Pallets Per Truckload	Feet Per Pallet	Pallets Per Truckload
4"	**840/1092	24/18	**1140/988	16/18
6"	**400/520	24/18	**480/429	16/18
8"	312	18	**240/182	16/18
10"	156	18	156	18
12"	104	24	78	24
15"	78	18	78	18
18"	26 & 39	30		
21"	26	24		
24"	26	18		

\*WI: 4" & 6" Lists 10-foot SWB / 13-foot Gasketed  
\*\*FL: 4" - 8" Lists 20-foot SWB / 13-foot Gasketed




\*\*\*\*\*  
\*\*\* TX REPORT \*\*\*  
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TRANSMISSION OK

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PGS. 1  
RESULT OK

## TOWN OF MUNSTER FACSIMILE

To: Thomas Harrison, Hebron Plumbing  
From: James M. Mandon, PE, Town Engineer   
Fax No. 988-3600  
Date: June 25, 2003

Number of pages including this cover sheet: 1

Remarks: ADS N-12 has been determined to be "functionally" equivalent to PVC-SDR35, and as such may be used for sanitary and storm "service" lines. Further, the town code provides that a "service" line is one which is privately owned and only services one customer. Therefore, building sewers, parking lot drains, etc. would be considered "service" lines.



# TOWN OF MUNSTER

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# TOWN OF MUNSTER

## FACSIMILE

To: Sue, Hebron Plumbing

From: James M. Mandon, PE, Town Engineer *JM*

Fax No. 1-219-988-3600

Date: June 20, 2003

Number of pages including this cover sheet: 2

Remarks: In accordance with Section 1-3.01G, "SDR 35 or better must be used for sanitary and storm building sewers". A copy of this Section is attached.



- 914 Bridge Piles & Bearings  
915 Materials Certifications

## **CHAPTER IV: SANITARY SEWERS AND STORM DRAINS**

### **SECTION I: Pipe Materials for Sewers**

#### **1-1 Description:**

Pipe use in sanitary and/or storm sewer construction shall be concrete, vitrified clay or ABS/PVC composite pipe, unless otherwise approved by the Town Engineer. Bedding shall be continued for a minimum of six inches (6") over the top of pipe (twelve inches (12") is preferred). Mandrel testing is required for PVC pipe.

#### **1-2 General**

##### **1-2.01 References:**

Where reference is made to an ASTM or ASSHTO designation, it shall be the latest revision at time of approval.

##### **1-2.02 Dimensions:**

Pipe eight inches (8") in diameter and larger shall be furnished in units of not less than five feet (5'), except as noted in Section 1-3.01B.

##### **1-2.03 Certification:**

It shall be the responsibility of the pipe manufacturer to certify that pipe and joint material furnished is capable of withstanding the infiltration of exfiltration basis as specified or required.

#### **1-3 Materials**

##### **1-3.01 Pipe Materials**

The type, class and strength of pipe to be used shall be as shown on the plans, and approved by the Engineer prior to installation.

##### **1-3.01A Concrete Pipe, Non-Reinforced:**

Non-reinforced concrete pipe shall conform to ASTM Designation C-14, Table I (Standard Strength) or Table II (Extra Strength as specified).

##### **1-3.01B Concrete Pipe, Reinforced:**

Reinforced concrete pipe shall conform to ASTM Designation C-76. For pipes thirty inches (30") or more in diameter, the length of the unit shall be not less than seven feet six inches (7'6").

##### **1-3.01C Vitrified Clay Pipe:**

Vitrified Clay Pipe shall conform to ASTM Designation C-700 (Extra Strength).

##### **1-3.01D Galvanized Corrugated Metal Pipe:**

Galvanized corrugated metal pipe when approved shall conform to the material, fabrication, and inspection requirements of ASSHTO Designation M-36; except that gauges and types shall be noted on the plans.

##### **1-3.01E Cast of Ductile Iron Pipe:**

Cast of ductile iron pipe shall conform to ANSI Specification A 21-6 or A21-8, Class 150, tar coated or cement lined with mechanical or rubber ring joints.

##### **1-3.01F PVC or ABS Composite Pipe:**

PVC or ABS Composite pipe shall conform to ASTM Designation D-2680. Gasket joints shall be required for PVC composite pipe in accordance with ASTM Designation D-3212.

##### **1-3.01G PVC Plastic Pipe:**

PVC plastic pipe shall conform to Section 207-17 of the "Greenbook" Standard Specifications for Public Works Construction, 1997 Edition. Gasket joints shall be required for PVC pipe in accordance with this same section. SDR 35 or better must be used for sanitary and storm building sewers. SDR 35 or better must be used for sanitary and storm building sewers. SDR 26 or better must be used for all sanitary and storm sewer mains.

#### **1-3.02 Jointing Material**

##### **1-3.02A Flexible Gasketed Joints for Concrete Pipe:**

Flexible joints shall be rubber o-ring when used with concrete pipe.





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\*\*\* TX REPORT \*\*\*  
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TRANSMISSION OK

TX/RX NO 3328  
CONNECTION TEL 912199883600  
SUBADDRESS  
CONNECTION ID  
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USAGE T 00'42  
PGS. 2  
RESULT OK

## TOWN OF MUNSTER FACSIMILE

To: Sue, Hebron Plumbing

From: James M. Mandon, PE, Town Engineer *JMM*

Fax No. 1-219-988-3600

Date: June 20, 2003

Number of pages including this cover sheet: 2

Remarks: In accordance with Section 1-3.01G, "SDR 35 or better must be used for sanitary and storm building sewers". A copy of this Section is attached.



# FAX COVER SHEET

**HEBRON PLUMBING AND HEATING, Inc.**

352 South 700 West, Hebron, IN 46341-9706

Phone 219-988-4177 Fax 219-988-3600

Send to: ENGINEER, TOWN OF MUNSTER	From: TOM HARRISON
Attention: JIM MANDON	Date: 6-24-03
Fax Number: 219-836-8350	Phone Number:

☐ **Reply**

☒ Reply ASAP

☐ *Please comment*

☐ Please review

☐ *For your information*

Total pages, including cover: 2

### COMMENTS

[illegible]



# **Hebron Plumbing & Heating, Inc.**

352 South 700 West, Hebron, IN 46341 • Ph (219) 988-4177 • FAX (219) 988-3600

June 24, 2003

James M. Mandon, Town Engineer  
TOWN OF MUNSTER  
1005 Ridge Road  
Munster, Indiana 46321-1849

Re: WALGREENS # 7708

Dear Jim:

As per our discussions over the past week, it is my understand that it has meet with your approval for me to use ADS N-12 pipe and fittings for the service lines for the storm and sanitary sewers on the above job. Would you be so kind as to document this acceptance on the bottom of this correspondence and return it to me?

Thank you very much for your time and interest in this project.

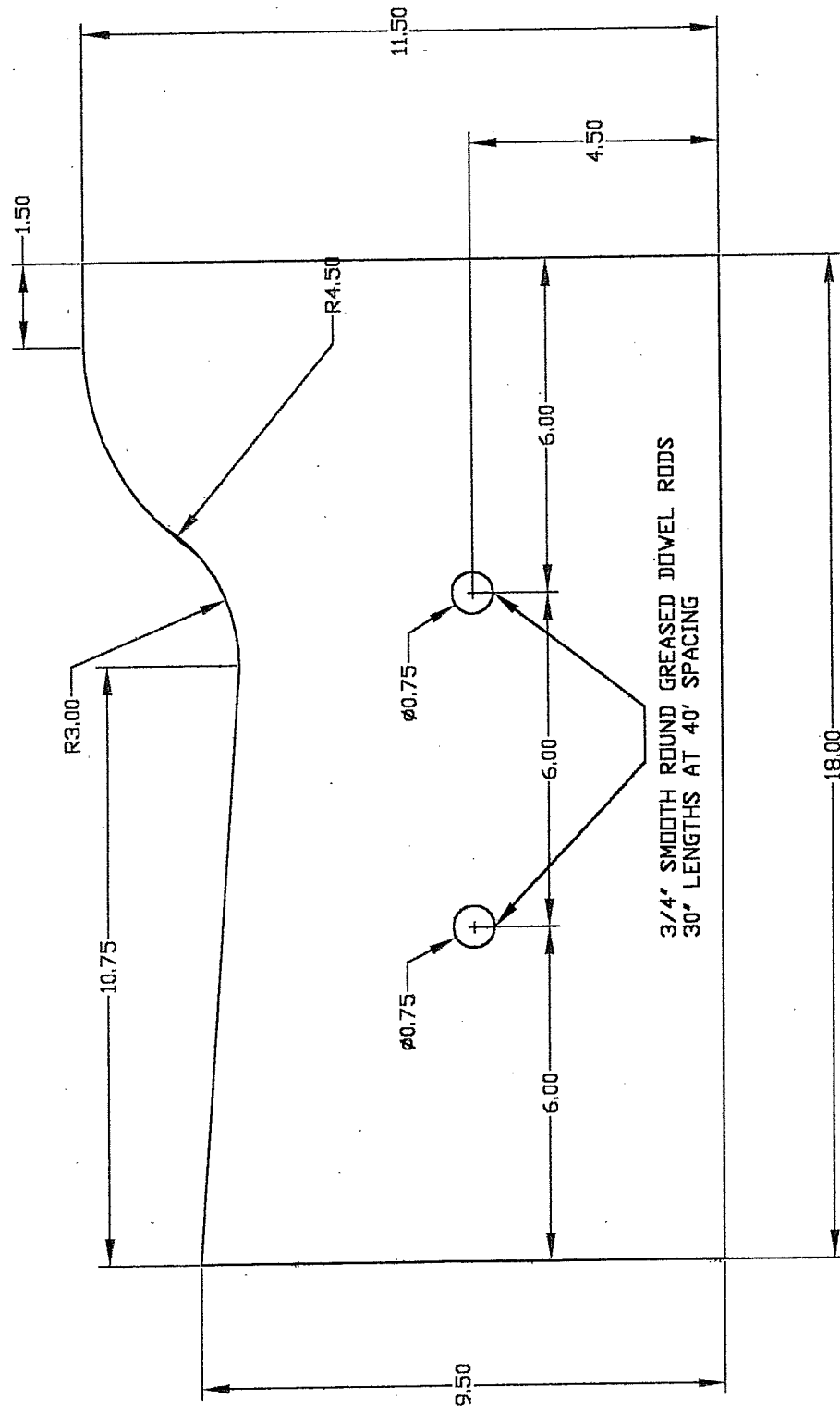
Yours Truly,



HEBRON PLUMBING AND HEATING, Inc.  
Thomas G. Harrison, President



DIAGRAM A - RESIDENTIAL CURB

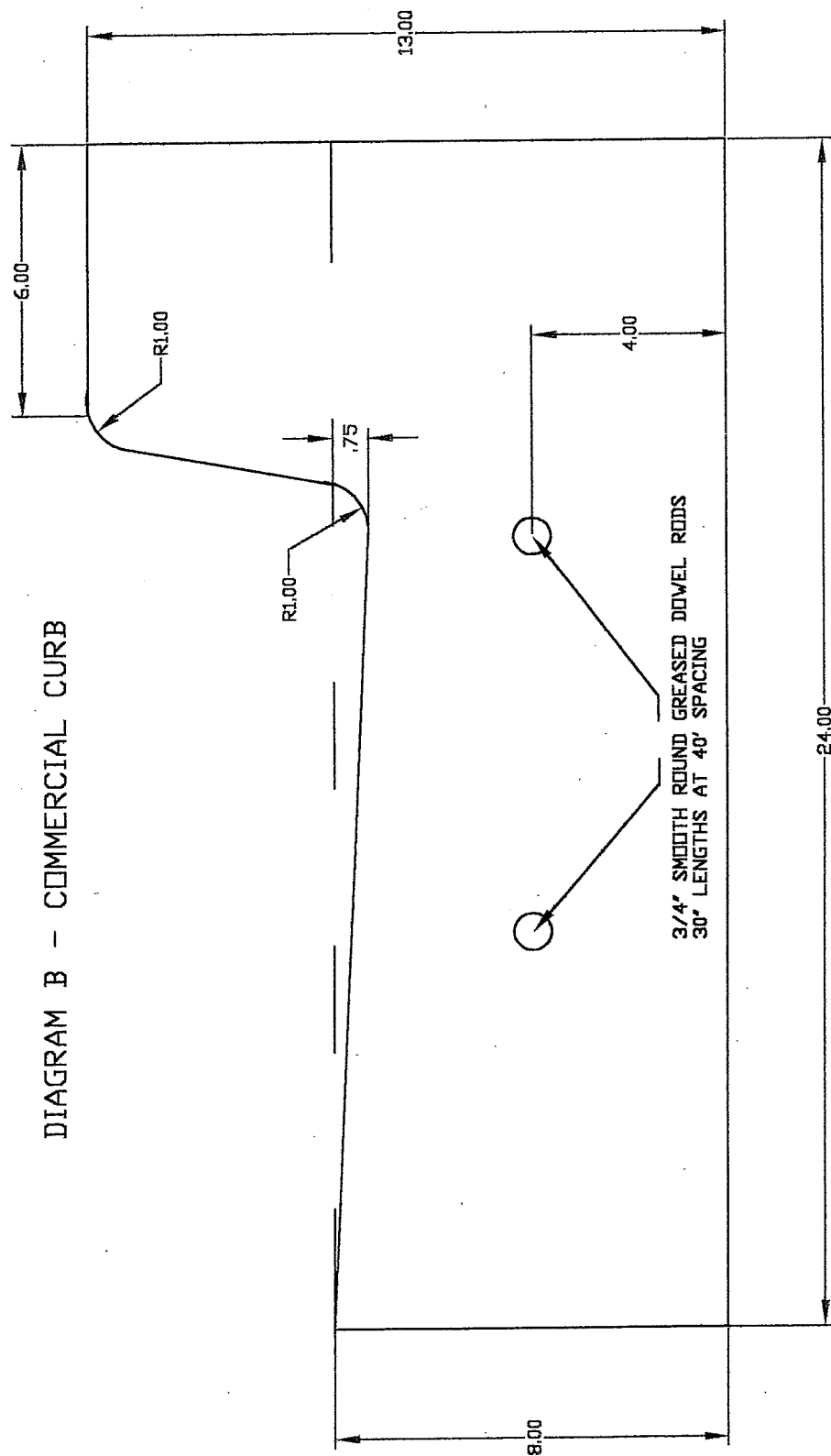


NOTE: ALL DIMENSIONS ARE IN INCHES





DIAGRAM B - COMMERCIAL CURB



NOTE: ALL DIMENSIONS ARE IN INCHES

