

City of Lawrenceburg, Indiana

Design, Construction and Materials
Specification Handbook

TABLE OF CONTENTS

Section	Page
INTRODUCTION	1
WATER & SEWER PLAN APPROVAL	5
PROJECT RELEASE	7
STORMWATER DRAINAGE	9
ROADWAY	17
SANITARY SEWER	22
WATER	
APPENDIXES	
Charts	A
Suggested Letter Format	B

INTRODUCTION

The Design, Construction and Material Specification Handbook applies to all construction within the Public Right-of-Way in the City of Lawrenceburg and for all construction of which the City has, or will have, maintenance responsibility.

Unless modified, deleted, replaced or otherwise changed by requirements contained in this Handbook, or contained in the city of Lawrenceburg Standard Construction Drawings construction requirements and material specifications SHALL CONFORM TO THE EDITION OF THE STATE OF INDIANA DEPARTMENT OF TRANSPORTATION CONSTRUCTION AND MATERIAL SPECIFICATIONS AND STATE DRAWINGS.

Unless modified, deleted, replaced or otherwise changed by requirements contained in this Handbook, traffic control SHALL CONFORM TO THE STATE OF INDIANA MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS.

Plans are approved subject to the condition of compliance with all applicable laws, rules, regulations and standards.

The proposed construction project may be constructed only in accordance with approved plans. There may be no deviation from the approved plans without the expressed, written approval of the City at Lawrenceburg.

Approval of project plans does not constitute an assurance that the proposed project will properly function, operate, or meet compliance with Federal, State or City laws and regulations.

DESIGN

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

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

INSPECTION OF CONSTRUCTION

Two (2) working days prior to the start or any at the work, the developer or contractor shall notify the City Engineer of his intent to commence work.

Inspection services shall be provided by the city for all construction projects including public work projects, subdivisions or any project which will be maintained in the future with public funds within the City.

The City may not provide for day-by-day inspection service and will not have the inspector act as the agent of the Developer, Contractor or Engineer. The work is under the control and supervision of the Developer/Contractor until written acceptance is given by the City Engineer. The City's inspector will check periodically as the work progresses, and will call to the attention of the person in charge of the work any deviations, omissions, or unsatisfactory work as noted. However, no acceptance of any portion of the work is to be inferred by the action or lack of action of the inspector.

CHANGES IN WORK

No construction or improvements shall be done in any manner different than that indicated on the approved plans unless such change shall first be approved by the City Engineer.

TESTING OF WORK

The developer, or his agent, performing/constructing the improvements shall pay for the testing of improvements to demonstrate compliance with this document. The City of

Lawrenceburg retains the right to require and may at its sole option and at the developer's expense require testing of concrete (concrete mix, concrete strength, etc.), roadway pavement (mix, thickness, etc.), soil and roadway subbase compaction densities, materials as well as other improvements to establish that the materials, workmanship and improvements meet the standards established herein. The exact nature, type and test procedure cannot be established for all situations. Any test method selected will be of common industry standard for the construction of public improvements in the state of Indiana

AS BUILT DRAWINGS

No Construction Project will be accepted by the city until "As Built" plans are submitted and approved by the city Engineer. At the completion of construction, the construction plans shall be revised as necessary to provide "As Built" plans. This work shall be done by the contractor's engineer, who was responsible for setting grades and the staking for improvements. "As Built" plans shall be submitted to the City Engineer.

No subdivision will be allowed to proceed from a Performance Bond to a Maintenance Bond until "As Built" plans are submitted and approved by the City Engineer.

One set of "As Built" plans shall be on reproducible Mylar. In addition, an electronic computer file of the "As Built" plans shall be provided to the City of Lawrenceburg on computer media compatible with the City's computer system. The electronic computer file shall be in a format compatible with ACAD release version compatible with the City of Lawrenceburg's GIS system. The "As Built" plans' elevation and reference points shall be referenced to the City of Lawrenceburg's 1994 data for both horizontal and vertical controls.

WATER AND SEWER PLAN APPROVAL

The purpose of this policy is to establish the procedure for submission of water and/or sewer plans to the IDEM for approval.

Prior to plans being submitted to IDEM for approval, they shall have been approved by the City of Lawrenceburg subject to IDEM's conditions and approval. When a complete set of city approved plans has been delivered to the City of Lawrenceburg the city will provide to the developer a letter of recommendation for approval by the IDEM. In the event of a conflict between the City of Lawrenceburg and IDEM requirements, IDEM requirements shall prevail.

It should be noted that the City of Lawrenceburg review relates directly to those sewers which are to become public sewers. Sewers which are non-public are required to meet City of Lawrenceburg performance standards as well as IDEM requirements.

It shall be the developer's (or his agent's) responsibility to assemble and submit data, plans and specifications for the submission to IDEM. Furthermore, all review, application, permit or other fees are payable by the developer.

For water and/or sewer improvements, the minimum documents required are:

Plans and Specifications	3 copies
Letter of transmittal to IDEM from Developer	1 copy
Letter from City of Lawrenceburg requesting IDEM approval	1 copy

At the same time IDEM's material is sent, one (1) complete copy set of all materials submitted to IDEM shall be sent to:

Utilities Director
City of Lawrenceburg Municipal Utilities
405 Main Street
Lawrenceburg, In 47025

Please note in the letter(s) at transmittal required above, that the City of Lawrenceburg shall be copied on all correspondence both to and from IDEM.

The developer is responsible for responding to IDEM questions and forwarding to IDEM all the information and responses. Responses to IDEM questions during review should be mailed to the IDEM representative involved and copied to the City of Lawrenceburg's Utilities Director. It is the developer's responsibility to provide corrected copies of material during the review process to the City so that the City has a complete set of plans as approved by IDEM.

When the City of Lawrenceburg is notified in writing by IDEM at plan approval, it will notify the Developer and sign off for construction authorization.

Those water and sewer improvements designated as public water and/or sewer improvements in a project come under the control of the City at the time the one (1) year maintenance period starts. Although under the control of the City, the developer is not relieved from responsibility for maintenance and repair of the public water and/or sewer improvements during the one (1) year maintenance period.

PROJECT RELEASE

The purpose at this section is to define the requirements and procedure for requesting the city of Lawrenceburg to accept a construction project. This section does not apply to public improvement projects performed under formal contract awarded by the City of Lawrenceburg. The conditions of acceptance for projects performed under formal contract, awarded by the City of Lawrenceburg shall be specified in the contract documents.

Projects covered under this procedure are projects performed by a party other than the City of Lawrenceburg and which the City of Lawrenceburg will own, operate, maintain or otherwise be responsible for in future years.

In order for the project to be accepted by the City of Lawrenceburg, the following conditions must be satisfied:

1. The project must meet city of Lawrenceburg's specifications for materials and construction specifications.
2. The project must have been inspected by City staff during construction.
3. Prior to the City's acceptance, the project must be on a one (1) year maintenance period. The person, firm or corporation requesting the city of Lawrenceburg to assume the improvements at the end at the one (1) year maintenance shall be responsible for all costs to repair material and/or workmanship defects in the project during the one (1) year maintenance period

In the event there is a defect in materials, workmanship or some other items which jeopardizes the Public's health, safety or welfare, the City may take immediate action to correct the problem.

This course of action in no way relieves the person firm or corporation of final responsibility for paying all costs including those direct costs incurred by the City, to correct defects during the maintenance period.

Prior to the one (1) year maintenance period beginning, the developer/contractor shall

- a. Post a maintenance bond or non-revocable letter of credit equal to 10% of the construction cost of the project or an amount established by the City Engineer, whichever is greater.

- b. Execute a legal document granting all right-of-ways, easements or other conditions to the city required to properly maintain and operate the improvement
- c. The project's construction must be complete in all respects including all construction punch-list items. It is not the intent of the city of Lawrenceburg to have the one (1) year maintenance period to be a time for punch-list completion.
- d. Submit a letter in a format acceptable to the City of Lawrenceburg formally requesting the City of Lawrenceburg to place the project in one (1) year maintenance period and upon successful completion of the maintenance period accept the project.

At the end of the maintenance period, the City of Lawrenceburg will provide a punch-list of any items requiring repairs prior to final acceptance. Once the punch list has been completed, the City Engineer, Utilities Director and Water & Sewer superintendent shall recommend to the Board of Works and the Common Council that they formally accept the project by passage of a resolution.

STORMWATER DRAINAGE SYSTEM

Storm water drainage systems, roadways and other drainage systems shall be designed to handle stormwater runoff as outlined herein.

Frequency of rain event

- Storm sewers, open ditches, driveway, culverts 10-year frequency
- Road culverts 25-year frequency
- Protection for buildings 50-year frequency

Runoff

- 25 acres or less Rational method $Q=CIA$
- 25 acres or more S.C.S.-TR-55 or other method approved by the City Engineer use chart A

Overland flow time

- First pavement inlet Minimum - 10 minutes
- First ditch catch basin Minimum - 10 minutes

Rainfall intensity

Use chart B

Run-off Coefficients

Weighted averages shall be used to define run-off coefficient.

<u>Type of area</u>	<u>Run-off coefficient</u>	
Business	0.60	0.75
Residential - Single family	0.40	0.50
Residential - Multi-Family	0.60	0.75
Industrial - Light	0.60	0.80
Industrial – Heavy	0.70	0.90
Parks, Cemeteries	0.25	0.40
Playgrounds	0.30	0.45
Railroad Yard	0.30	0.40
Woodland	0.20	0.40
Grassland	0.25	0.45
Cropland	0.50	0.70
Pavement	0.90	
Roofs	0.90	
Lawns, Dense soil, Flat, 0-2%	0.20	0.25
Lawns, Dense Soil, Avg. 6% or less	0.25	0.35
Lawns, Dense Soil, Steep, Over 6%	0.35	0.40

Stormwater Sewers

Pipe Size

Storm sewer pipes shall be sized to handle the anticipated stormwater run-off flows stormwater pipe size shall be sized based on the flow equation below. However, in no case shall the minimum stormwater drainage pipe be 15 inches (15")

Pipe Size (Manning formula) $Q = (1.486/n) * A * R^{2/3} * S^{1/2}$

Values of “n”

Plastic	0.009
Concrete	0.012
Corrugated Steel	see Chart C
Minimum Size	15"
Minimum Cover	2' (from top of pipe)
Minimum Slope (inlet lead)	1%
Minimum Mean Velocity	3.0 fps desired
Maximum mean velocity	10.0 fps
Maximum Manhole Spacing	400 ft. (36" and under)

Manhole Placement

Intersections, termini of sewers, changes in size and/or slope, changes in at alignment

(36" and under), places where inlet leads are to be connected.

Drop manholes are required at stream entrances for storm sewer outfalls if the difference between stream and pipe inverts is greater than 12". The manhole outlet pipe shall be directed to the flow of stream (not counter to the flow).

Inlet Spacing (for each side at street)

Stormwater drainage inlet spacing shall be at all low spots, where the street grade changes to a flatter slope, dead end of descending streets, at P.C. or P.T. of all intersection radius curves where the curb and gutter grade descends toward radius curve (locate on property line extended or at mid-lot). Stormwater inlets shall be located as outlined below:

Flat (0.3% - 1.0%)	150'-200' (normal conditions*)
Normal (1.0% - 5.0%)	250' (normal conditions)
Steep (5% plus)	250'-300' (normal conditions*)

- * Spacing shall be governed by a 2" allowable depth of gutter flow based upon a 10-minute time of concentration and a 10-year design storm if it would be less than the above spacing.

Unless otherwise approved by the city Engineer, catch basins shall be 30" in width by 30" in length inside to inside measurement. They shall either be precast or built of solid concrete ~lock. The inside edge of the rear wall shall be in line with the back or curb. The foundation shall consist of 6" class concrete on 6" gravel subgrade. Neenah R-3246-AL, "V" grate or approved equal frame and grates shall be used with the curb box set to 5" of opening. All grates shall be bicycle safe. Neenah R-3246-AL, "V" grate or approved equal frame and grates shall be used with the curb box set to 5" of opening shall be used if the curb grade is 2% or greater.

Outlet Protection

- < 5 fps	sodded ditch
- 5 fps to 12 fps	Dump rock
- Over 12 fps	special outlet protection

STORMWATER CHANNEL DESIGN

Policy on open ditches

Open Ditches shall be avoided wherever possible in a subdivision where pipe sizes are larger than thirty-six inches (36"), the requirement of stormwater sewer pipes may be waived in favor of ditches. If an open ditch is required~ the open ditch (channel) shall meet the following requirements.

Channel Size (Manning's formula) $Q = (1.468/n) * A * R^{2/3} * S^{1/2}$

Rock Lined channels	0.08
Grassed channels	0.03
Concrete or bituminous lining	0.015

Minimum Side Slopes (grass)

Desired 4:1

Minimum 2:1

Minimum free board

1'

Minimum Grade

Grass 0.5%

Concrete 0.35%

Channel Protection

Seeding 0% 2%

Sodding 2% - 5%

Lining Over 5% and at all channel curves and at junctions with other channels

Sump Pumps and Roof Drains

Sump pumps and roof drains are not permitted to be discharged into the sanitary sewer system or allowed to be discharged into the curb and gutter adjacent to the roadway. All subdivisions unless waived by the City Engineer shall provide satisfactory drainage facilities for disposal of water generated by sump pumps. Sump pumps shall be directed to a stormwater sewer system or a ditch or a swale built as part of the drainage plan. This system must be submitted with the construction drawings and approved by the City Engineer

CONSTRUCTION REQUIREMENTS AND MATERIAL SPECIFICATIONS

The construction requirements and material specifications shall conform to the latest edition of Indiana Department of Transportation and construction and Material specifications in addition to, the following:

Trench Excavation

Open no more trench in advance of pipe laying than is necessary to expedite the work. Excavate trenches to a width that will provide adequate working space, but not more than the maximum design width. Do not undercut trench wall. Excavate trenches below the pipe invert a sufficient distance to provide space for the pipe bedding carry trenches in ledge rock, compact rocky or gravelly soil, or other unyielding materials below the bottom of the pipe at least one-fourth (1/4) of the outside diameter at the pipe or six inches (6"), whichever is greater. Refill the space beneath the pipe with bedding material as specified for first class bedding.

Excavate pipe bell holes at each joint to provide full-length barrel support of the pipe and to prevent point loading at the bells or couplings.

Unless trench banks above the top of the pipe are cut back on a stable slope, sheet and brace trenches as necessary to prevent saving, or sliding to provide protection for workmen and the

Pipe and to protect adjacent structures and facilities. Do not remove trench sheeting unless the pipe strength is sufficient to support the external loads, including the weight of a prism of earth above the top of the pipe with trench width measured to the bank of the sheeting. Do not brace sheeting against pipe, knit brace it so that no concentrated loads or horizontal thrusts are transmitted to the pipes

In all cases over five feet (5') I depth, trenches must be braced, or an acceptable cage inserted, or the ditch must be laid back to the angle of repose to protect the people working in the excavation. In existing street rights of way permission must be obtained from the city Engineer to lay hack the slopes in a public right of way

Pipe Bedding

Standard pipe bedding shall be first class bedding. The pipe shall be bedded in crushed stone or rounded gravel-bedding material placed on the trench bottom. The bedding material shall have 95% passing a 3/4-inch sieve and 95% retained in a No. 4 sieve. The bedding shall have a minimum thickness beneath the pipe or six inches (6") or one fourth (1/4) of the outside diameter of the pipe, whichever is greater, and shall extend up the sides of the pipe to the horizontal centerline. Backfill from pipe horizontal centerline to a level not less than twelve inches (12") above the top of the pipe shall be of the bedding material. Hand placed backfill shall be finely divided materials free from debris, organic material and stones.

Carefully prepare bedding so that the pipe, after installation, will be true to line and grade. Surface grade will material or trench subgrade beneath the pipe to provide a uniform and continuous support beneath the pipe at all points between bell holes or pipe joints Density fill material beneath the pipe. After each pipe has been brought to grade, aligned, and placed in final position, deposit and densify sufficient bedding material under the haunches and on each side of the pipe to hold the pipe in proper position during subsequent pipe jointing, bedding and backfilling operations. Deposit bedding material uniformly and simultaneously on each side of the pipe to prevent lateral displacement.

Place pipe that is to be bedded on a concrete cradle or encased in concrete in proper position on temporary supports consisting of preshaped wood blocks or bricks with wood edges when necessary, rigidly anchor or weight the pipe to prevent floatation when the concrete is placed.

Place concrete for cradles, arches, or encasement uniformly on each side of the pipe and deposit at approximately its final position. Do not move concrete more than five feet (5') from its point of deposit. Concrete placed beneath the pipe shall be sufficiently workable so that the entire space beneath the pipe can be filled without excessive vibration.

Pipe Laying

Grade stakes shall be required prior to laying any pipeline and grade shall be controlled by either laser alignment or batter boards.

Protect pipe during handling against impact, shock, and free fall. Do not permit hooks to come

in contact with premolded joint surfaces. Handle pipe having premolded joint rings or attached couplings so that no weight, including the weight of the pipe itself will bear on or be supported by the jointing material. Take care to avoid dragging the spigot ring on the ground or allowing it to be damaged by contact with gravel, crushed stone, or other hard objects. After delivery alongside the trench, carefully examine each piece of pipe for roundness and specification compliance. Acceptable pipe may be marked with paint or other permanent marking material, so that the marks are plainly visible after installation in the trench and before the pipe is covered. Clean joint contact surfaces immediately prior to jointing. Use lubricants, primers, or adhesives as recommended by the pipe or joint manufacturer. Unless otherwise required, lay all pipe straight between changes in alignment and at uniform trade between changes in trade. Excavate bell holes for each pipe joint. When jointed in the trench the pipe shall form a true and smooth line. Keep trenches dry during pipe laying. Divert surface water from the trench area to the greatest extent practicable with causing damage to the adjacent property. Before pipe laying is started, remove all water that may have entered the trench. Whenever practicable start pipe laying at the lowest point and install the pipe so that the spigot ends point in the direction of flow

In all jointing operations, the trench shall be dry. Before making pipe joints, all surfaces of the pipe shall be clean and dry. Lubricants, primers, adhesives, and other joint preparation material shall be used as recommended by the pipe or joint manufacturer's specifications. One or more of the following joints may be used:

- A. Compression Joints - compression joints shall conform to ASTM specifications C443 for Concrete Pipe, and ASTM 0425 for Vitrified Clay pipe.
- B. Bituminous Joints, Mastic Type - After the tongue and groove or bell and spigot have been brushed and wiped clean and dry, and before the pipe is placed in position both tongue and groove or bell and spigot shall be coated with bituminous plastic cement. The bituminous plastic cement shall be used in sufficient quantity to completely fill the joint when the pipe is placed in final position. After the pipe has been placed in position and is set to its true alignment and grade, and blocked all surplus bituminous plastic cement within the pipe shall be removed and the joints painted or wiped. The joints on the outside of the pipe shall be completely filled and beveled from bell to barrel on bell and spigot pipes.
- C. Coupling Bands for Corrugated Steel Pipe - Unless otherwise specified, field joints shall be made with bands. Bands shall be at least 0.064 inches thickness and at least 10 1/2 inches wide. Sand sheets shall be made from the same base metal as the pipe and shall be made from the same base metal as the pipe and shall have the same coating. Bands shall have two (2) corrugations 7 5/8 inches center to center to conform to the inner corrugations of the rerolled ends of the pipe. Bands 12" diameter through 42" diameter shall be one-piece bands, greater than 42" diameter shall be two (2) piece. Bands shall be secured with a bar, bolt, and strap connector.

Backfilling Trenches

Unless other protection work is directed, back fill trenches immediately after the pipe is laid. In the case of concrete cradle bedding, delay backfilling until the concrete has set sufficiently to support the backfill load. Except for unusual circumstances (such as subaqueous installation) permit no water to rise in unbackfilled trenches after the pipe is

in place. Backfill material to be placed above pipe bedding shall be free of brush, debris and junk. Unless specifically authorized, place no rick or rock excavation on detritus in the upper eighteen inches (18") of the trench. Place no rock or stones having a dimension larger than six inches (6") within three feet (3') of the top of the pipe. Large stones may be placed in the remainder of the trench backfill only if well separated and arranged so that no interference with backfill settlement will result. Use puddling, jetting, or water flooding for consolidating backfill material only when approved by the City Engineer, particularly prone to water damage are sewers laid in heavy clay soils or during cold winter months. Water flooding or jetting in porous sand or gravel during warm periods may be recommended. In general, limit the addition of water during backfill to provide optimum moisture content for tamping procedure.

All backfill for storm sewers, sanitary sewers or water mains in roadway areas or that will be under curbs, or within five feet (5') of pavement or curb, shall be made with approved granular material. In all other areas the backfill material may consist of on-site material but the pipe must be covered with tamped bedding material to a depth of one foot (1') over the highest point of the pipe.

Headwalls

Unless waived in writing by the City Engineer, concrete with steel reinforced headwalls are required on all storm water pipe outlets. As a minimum, a half headwall is required. A full headwall is required to stabilize grade slopes. The top of a full headwall shall be parallel to final grade.

Full headwalls are required on both the inlet and outlet of stormwater pipes under driveways and other roadways which expose the pipe to possible crushing by vehicle traffic

Pipe Material Specification

Corrugated metal - All corrugated metal pipe shall be aluminum coated, welded seam and conform to INDOT.

Concrete Pipe - Unless waived by the City Engineer, all storm pipe under a public roadway 24ⁿ in diameter or less shall be concrete pipe with steel reinforcement and conform to INDOT.

PVC Pipe - PVC pipe may be used upon approval of the City Engineer. PVC may not be used under roadway, parking, or another paved area. PVC pipe shall be the highest quality, high strength. PVC pipe such as A-2000 corrugated PVC pipe or approved equal

ROADWAY

Intersection Design

At street and alley intersections, property line corners shall be rounded by an arc, the minimum radius of which shall be fifteen (15') and ten feet (10") respectively. In business districts a chord may be substituted for such arc

Street curb intersections shall be rounded by a radius of at least twenty-five feet (25').

The above minimum radii shall be increased when the smallest angle of intersections is less than ninety (90) degrees.

Minimum Pavement Widths

Minimum pavement widths measured back of curb to back of curb shall be as outlined herein.

Primary and secondary thoroughfares: forty-eight feet (48')

Collector streets: thirty-eight feet (38')

Industrial Streets: Forty-eight feet (48')

Local and minor streets: Twenty-eight feet (28)

Alleys: full width of right of way twenty feet (20')

The pavement at a turning circle at the end of a cul-de-sac street shall have a minimum outside diameter of eighty feet (80'). A "T" or "Y" shaped paved space, when approved by the City Engineer in place of a turning circle, shall extend entirely across the width of the street right-of-way and shall be at least twenty feet (20') wide with the flared portion rounded by minimum radii of twenty feet (20').

Minimum parking area shall be nine feet (9') wide. Parking space area shall be 171 square feet (9' X 19').

Street Design Standards**1

	<u>Primary & Secondary</u>	<u>Industrial</u>	<u>Collector</u>	<u>Local, Alley Cul-de-Sac</u>
Minimum centerline grade	0.5%	0.5%	0.5%	0.5%
Maximum centerline grade**2	5.0%	5.0%	5.0%	12.0%

Minimum length of Vertical Curve**3	100'	100'	50'	50'
Maximum Radius of Centerline Curve	575'	575'	400'	400'
Minimum Length of tangent between horizontal curves	100'	100'	50'	50'
Minimum back of curb or edge of pavement radius	40'	40'	25'	25'
Minimum stopping sight distance **4	400'	400'	300'	200'
Max. Centerline grade approaching intersection **5	2.0%	2.0%	4.0%	6.0%
Cul-de-Sac Pavement turnaround diameter back to back of curb **6	-----	100'	-----	80'
Minimum traffic lane width for multilane streets **7	12'	12'	11'	11'

Maximum driveway
grade shall be 15% 15% 15% 15%

**1 Any exceptions to these standards must be approved in writing by the City Engineer.

**2 Maximum grades for pedestrian way shall be twelve (12) percent unless steps are to be of an acceptable design are to be constructed.

**3 All changes in street grades shall be connected by vertical curves of a minimum length equivalent to fifteen (15) times the algebraic difference between the rates in grade

**4 Measured from an eye level of 3.5 feet to a six (6) inch object

**5 The grades shown shall apply for a distance of fifty (50') feet from an intersection with the curb line of another street.

**6 A "T" or "Y" shaped turn around shall not be used unless design has been approved by the City Engineer

**7 Underdrains - Unless waived by the City Engineer, eight inch (8") perforated underdrains shall be installed two feet (2') behind and parallel with the curb and two feet (2') below subgrade on both sides of the roadway. These shall be used to drain the subgrade and shall be used to tie into the sump pumps. The underdrains shall connect to a positive drainage outlet (i.e. curb insets) and shall be backfilled with granular material.

Curbing

All streets shall have curb and gutter sections on both sides of the paved roadway unless waived by the City Engineer. Curb and gutter shall be constructed with 4,000-pound high quality concrete.

Rigid Pavement

Concrete pavement shall be 7" continuous reinforced Portland Cement pavement with integral curb in accordance with INDOT regulations and placed on uniformly compacted subgrade shaped to conform to the grades of the pavement. Non-reinforced concrete pavement may not be used except upon approval of the City Engineer.

Longitudinal

Joints shall be required between adjoining lanes of pavement or between curb and gutter to control cracking in the longitudinal direction due to stresses in wide concrete slabs. Hook bolts are required to tie the lanes to prevent them from moving apart or settling unevenly hook bolts shall not be oiled.

Transverse Joints

False or impressed joints shall be constructed based on drawings submitted to and approved by the City Engineer. Edges shall be hand finished with approved type edging tools. Saw cutting of joints may be permitted with permission of the City Engineer. Saw cutting joints shall be 3/4 of the total pavement depth and sealed with approved sealer

Expansion Joint

Relief for compression stresses in hot weather is provided at unsymmetrical intersections. This relief is in the form of expansion joints. Non-extruding compressible material is placed in the transverse joint so that expansive forces can be relieved by the compressible material. Preformed compressible material is installed in a dowel assembly at the location of the expansion joint. The expansion material shall extend down to the top of the subgrade, and to the outside of the slab to allow free movement throughout the joint. The top of the expansion material shall be one inch (1") below the surface of the finished pavement and this area sealed with an asphalt base liquid sealing compound.

Construction Joints

Transverse bulkheads shall be placed at the end at each day's pour or when production is interrupted for more than thirty (30) minutes. These joints are formed by using a two inch (2") minimum thickness wood bulkhead or equal with holes at raid-depth spaced at 12 inch intervals for the insertion of smooth dowel bars. These joints are tied joints and are not designed to permit movement. The dowels shall be thoroughly cleaned of oil or any other substance that would prevent a bond between steel and concrete.

Flexible Pavement

Flexible pavement shall consist of a bituminous aggregate base course, tack coat, and a bituminous surface course over a uniformly compacted subgrade as outlined below.

	<u>Primary & Secondary</u>	<u>Industrial</u>	<u>Collector</u>	<u>Local, Alley Cul-de-Sac</u>
Compacted Subgrade (Minimum)	12"	12"	8"	8"
Bituminous Base Course	6"	6"	4"	3"
Bituminous Surface Course	2"	2"	2"	1.5"

Compacted Subgrade

Compacted subgrade shall be #53 limestone installed and compacted. The subgrade shall be

level to within 1/10 of one foot.

Bituminous Aggregate Base Course

This work shall consist of constructing a base course of aggregate and bituminous material spread and compacted on a prepared base surface. The maximum compacted depth shall be three inches (3") for each lift. The variation of the surface shall not exceed one-half inch (1/2")

Bituminous Surface Course

This work shall consist of a surface course of compacted asphaltic concrete constructed on a prepared base course of bituminous aggregate. Before the Surface course is installed, the surface of the bituminous base shall be repaired as necessary cleaned with a power broom or washed, brought to the proper cross section grades and tack coated.

Tack coat material shall conform to INDOT Spec. The rate at application for tack coat shall be 0.05 gallons per square yard unless otherwise indicated by the City Engineer upon completion of the surface course, all edges shall be sealed with a bituminous liquid as specified by the City Engineer.

Surface course shall be installed before maintenance period begins. Prior to installation of the surface course, all base features shall be repaired.

Sidewalks

Sidewalks shall be constructed of 4,000-pound concrete on a four-inch (4") gravel base. Sidewalks shall be sixty inches (60") wide and four inches (4") thick. Sidewalks shall be constructed in 60" by 60" squares edge finished with expansion joints.

Driveway Aprons

Driveway aprons shall be constructed of 4,000-pound concrete on a six-inch (6") gravel base. Driveway aprons shall have a maximum opening of 30 feet at its throat and shall be six inches (6") thick.

Sanitary Sewers

Introduction

Unless modified deleted, replaced or otherwise changed the latest published edition of the following documents shall be the accepted standard for materials and/or procedures for the construction modification, alteration, or expansion of Lawrenceburg's sewer system.

1. Laws and Regulations
2. Recommended standards for Sewage works (Ten State Standards)

If a conflict shall exist between reference sources, the more restrictive requirement shall prevail. The City Engineer shall provide interpretation, as requested.

Plan approval by the City of Lawrenceburg does not imply nor assure approval by IDEM.

Plans are approved subject to the conditions of compliance with all applicable laws, rules regulations and standards. The proposed project may be constructed only in accordance with the approved plans. There may be no deviation from the approved plans without the written approval of the city. Approval of the plans does not constitute an assurance that the proposed project will operate in compliance with all IDEM regulations.

As required by the City Engineer plans shall be submitted to IDEM for approval. The cost of submitting plans to the IDEM and review by IDEM shall be paid by the contractor. Construction shall not begin until such plans are approved by IDEM.

Due to Federal, State and City ordinances, all sewers connecting to the city of Lawrenceburg's public sewer system shall comply with city of Lawrenceburg standards

Determination of the amount of sewage

The average flow of sanitary sewage shall be computed on the basis of 100 gallons per capita.

The estimated flows listed are to be used only for the design of sewers and lift stations and should not be used in the design of treatment plants.

<u>Mainwater Source</u>	<u>Estimated Average Flow</u> (gallons per day)
Apartments	
One bedroom	250
Two bedrooms	300
Three bedrooms	350
Assembly Halls	
Per seat	2
Bowling Alleys (no food service)	
Per lane	7
Churches	
Small-per sanctuary seat	3-5

Large with kitchen-per sanctuary seat	5-7
Dance Halls	
Per person at maximum capacity	2
Factories	
No showers-per employee	25
With showers-per employee	35
Family Dwelling	
Per Person	100
Food Service Operation	
Ordinary restaurant (not 24 hours) per seat	35
24 hour restaurant per seat	50
Banquet rooms-per seat	5
Restaurant along freeway per seat	100
Tavern (very little food service) per seat	35
Curb Service (drive-in) per car space	50
Hospitals	
No resident personnel- per bed	300
Laundries	
Coin operated- per machine (standard size)	400
Hotels/Motels	
Per Unit	100
Nursing and Rest Homes	
Per patient	150
Per employee	100
Office building (exclusive of cafeteria or office)	
Per employee per shift	20
Playgrounds and Daytime Parks	
With toilet facility-per person	5
With showers, bathhouse toilets-per person	10
Schools	
Elementary (not including showers or cafeteria)-per person	10
High and Junior High (not including showers or cafeteria)-per student	15
Add for Cafeteria-per student	5
Add for Showers-per student	5
Service Stations	1000
Shopping Centers (without food service or laundries)- per area of floor space	0.2/sq.ft.
Swimming Pool (average with hot showers)	

Per swimmer	3-5
Theaters	
Movie-per seat	5
Trailer Parks (mobile home parks)	
Per trailer space	300

Peak Flows

Sanitary sewers shall be designed on a peak flow basis using a peak factor of four (4) times the total calculated average daily wastewater flow for lateral sewers and a peak factor of 2.5 for sub-mains and trunk sewers. Pumps and force mains should be designed to carry the peak flow of all the sewers that discharge into the lift station. The peak flow for areas which do not have a 24-hour run-off period shall be calculated as follows

$$\text{Peak Factor} = \frac{(\text{Calculated wastewater flow} \times 24 \text{ hours})}{\text{Run-off period (In Hours)}} \text{ gpd}$$

Peak Factor = 4.0 for Sewer mains
Peak Factor = 2.5 for Trunk sewers

<u>Entity</u>	<u>Run-off period</u>
Municipality	24 hours
Factories	length of Shift
Subdivisions (over 250 homes)	24 hours
Subdivisions (under 250 homes)	16 hours
Hospitals	12-24 hours
Schools	8 hours
Restaurants	16 hours
Mobile Home Parks	12 hours
Motels	4 hours.

(use of other run-off periods must be documented)

Infiltration

An allowance of 35% at the daily peak sanitary flows shall be added to the above peak sanitary flows to establish daily infiltration levels to the treatment plants drainage basin.

Details of design and construction

Minimum Size

All public sanitary sewers conveying raw sewage shall be at least eight inches (8") in diameter. Sanitary sewer laterals shall be at least six inch (6") diameter and shall be run to within five feet (5') of the building and tied directly to the building sewer.

Depth

In general, sewers shall be deep enough to prevent freezing and to receive sewage from basements and cellars.

Location

Public sewer mains shall be installed in public right-of-way or upon approval, in a public utility easement. A sewer maintenance area shall be provided by the formula.

$$(2.5 \times \text{depth of sewer line}) + \text{ten (10) feet}$$

This sewer maintenance area shall be no less than twenty feet (20') and shall be totally within the public right-of-way or public utility easement. It should be evenly divided on both sides of the sewer line.

Flow Velocity

All sanitary sewers shall be designed to give a mean velocity of at least 2.0 feet per second, when flowing full this is based on Manning's formula using an "n" factor of 0.013 in design. Use of other "n" values will be considered if shown justifiable on the basis of extensive field data. When velocities greater than fifteen feet per second (15 fps) are expected, provisions should be made to protect against displacement and erosion of the pipe.

Minimum Allowable Slope

The minimum allowable slope shall be that which results in a velocity of at least two feet per second (2 fps) when the sewer pipe flows at 1/4 of full depth. Sewers 24 inches or less shall be laid with uniform slope and straight alignment between manholes. The line and grade alignment shall be checked with laser instruments wherever possible; use of batter boards is also acceptable.

sewer size	Min. Slope to Obtain 2.0 FPS velocity (ft./ (n-0.013)	Approx. capacity Minimum Slope (GPD)	Approx. Capacity Minimum slope (CFS)
6"	0.60	271,000	0.42
8"	0.40	520,000	0.80
10"	0.28	750,000	1.16
12"	0.22	1,100,000	1.70
15"	0.15	1,680,000	2.60
18"	0.12	2,330,000	3.60

Steep Slopes

If plans are submitted for approval with a slope less than the minimum, the consulting engineer must show justification for that recommendation.

Sewers on 15% slope or greater shall be anchored with concrete anchors Spaced as following:

- a. Not over 36 feet center to center on grades 15 percent to 35 percent.
- B Not over 24 feet center to center on grades 35 percent to 50 percent.
- c. Not over 6 feet center to center on grades 50 percent and over.

Changes in Pipe Size

When a smaller sewer discharges into a larger one, the invert of the larger sewer must be lowered sufficiently to maintain the same energy gradient. An approximate method to accomplish this is to place the 0.8 depth point of both sewers at the same elevation.

When a larger sewer discharges into a smaller one the invert at the smaller sewer should not be raised to maintain the same energy gradient.

Connections

Roof drains, foundation, drains and all other clean water connections to the sanitary sewer system are prohibited. The following shall appear on sanitary sewer plans and construction plans submitted to the City and IDEM for review:

“No buildings shall be connected to a sewer lateral until the building is under roof. Roof drains, foundation drains, foundation sump pumps and all other clean water connections are prohibited to be connected to the sanitary sewer system.”

Protection of Water Supplies

There shall be no physical connection between a public and private potable water system and a sewer, or its appurtenance, which would permit passage of any sewage into the potable supply.

Parallel Installation

Sanitary sewers and manholes shall be laid at least ten feet (10') horizontally from any existing or proposed water main. When local conditions prevent a separation of ten feet (10'), sewer line may be laid closer than ten feet (10') to a water main if it is laid in a separate trench if it is laid in the same trench, the water main must be located at one side on a bench of undisturbed earth. In either case, the elevation of the crown or the sewer must be at least eighteen inches (18") below the invert of the water main.

When it is impossible to obtain proper horizontal and vertical separation as stipulated above, the water main should be constructed of mechanical-joint D.I. iron pipe. The sewer shall be constructed on mechanical-joint D.I. iron pipe and both services should be pressure tested to assure water tightness.

Crossings

Whenever sewers must cross under water mains, the sewer shall be laid at such an elevation that the top of the sewer is at least eighteen inches (18") below the bottom of the water main when the elevation of the sewer cannot be buried to meet the above requirement, the water main shall be relocated to provide this separation or reconstructed with slip-on or mechanical-joint D.I. iron pipe which will withstand a 50 psi pressure test for a distance of ten feet on each side over the sewer. One full length of water main should be centered over the sewer so that both joints will be as far from the sewer as possible.

Laterals

The size and slope of sewer laterals shall be subject to the approval of the city, but in no event shall the diameter be less than six inches (6").

Slope

The slope of the six-inch (6") pipe shall be not less than one eighth (1/8) inch per foot (1.04%), and the general requirement shall be a slope at one quarter (1/4) inch per foot (2.0%).

Location

No sewer lateral shall be laid parallel to within five feet (5') of any bearing wall which might thereby be weakened.

Depth

The minimum sewer lateral depth shall be thirty-six inches (36") to afford protection from frost.

Alignment

The sewer lateral shall be laid at uniform grade and in straight alignment. Changes in direction shall be made only with properly curved pipe and fittings.

Clean Outs

Clean outs on the sewer laterals shall be built at all horizontal or vertical changes of direction of sewer laterals. Clean outs shall be a minimum of 4" along straight segments of pipe, clean outs are required every 100 feet outside the right-of-way as measured from the right-of-way. A pipe lateral shall be connected to the building clean out by a commercial fitting; cement grout shall not be used. Multiple buildings may be connected to a common service lateral, if the individual branches to units are connected outside the buildings (manifold-like). If a common service lateral is used to serve multiple buildings, it must connect to the public service main in a manhole and terminate in a manhole it over 150 feet in length,

All cleanouts shall have metallic caps/plugs for locating with detectors. The cap/plug shall not

have a protruding operating nut but rather a recessed operating nut. Installation of cleanouts in traffic areas should be avoided, however, if such installation is required, materials shall be capable of bearing traffic vehicle weight. Cleanouts constructed of plastic material in paved areas are unacceptable.

Bedding

All sewer laterals must be embedded and compacted in sand, pea gravel, or grits to twelve inches (12") above the top of the sewer lateral.

Backfill

Backfill material within street right-of-way shall be granular material compacted in place outside the right-of-way, the backfill may consist of excavated material.

Connections

Connections to the sanitary sewer main shall only be located at existing "Y" or "T" connections on the main. When none exist on the main, a saddle wye or other commercial connection fitting shall be installed and the satin cut in a neat even manner and the connection rendered watertight by means of mastic seal and concrete encasement. Cast iron pipe or approved equal, four inches (4") in diameter minimum, shall be installed under the footing to a point five feet (5') or less from the building. The connection between the four inches (4") and six inches (6") shall be by means of a rubber donut gasket or a commercial connection specifically manufactured for connecting sanitary sewer pipe.

Materials

Pipe and joint materials shall conform in all respects to the material requirements outlined in this Section.

The lateral connections shall be of premium joint construction and be of the same material as the street sewer in order to minimize infiltration at the connection between street main and house lateral. Extra strength ABS solid wall, plastic pipe may be used on a provisional basis on approval of the city Engineer. When joint material and/or dimensions are not compatible, a commercial adaptor shall be provided.

Sewer Main Pipe Materials

Pvc

PVC gravity sewer pipe conforming to ASTM Material specification ASTM D-3034-SDR35 may be installed on a provisional basis. Said pipe shall be installed as specified by the manufacturer. Installation of PVC shall meet the manufacturer's recommendations for bedding, depth limitations and backfill requirements. When manufacturer's recommendations are in conflict with specification presented herein, the more restrictive requirements shall be used. Pipe

seals shall meet ASTM D-3212 specification.

Class IV and V (as specified by ASTM) bedding shall not be used with the installation of PVC sewer pipe.

Other Pipe

Use of other type of pipe is prohibited unless approved by the City Engineer. Should a developer desire to use other types of pipe, he/she must submit a written request to the City stating the type of pipe, proposed use, location, and manufacturer's technical information. The developer must receive written permission from the city before proceeding with the pipe installation.

Joints

Sewer joints shall be premium joints and shall be designed to minimize infiltration and to prevent entrance at roots. In all jointing operations the trench shall be dry before making pipe joints. All surfaces of the pipe to be jointed and all parts of the joint shall be clean and dry.

Vitrified Clay

Vitrified clay pipe may only be used for repairing existing vitrified pipe. Vitrified clay pipe used for repairs shall have premium joints of either the Wedge Lock or unilock construction conforming to ASTM C-425-71 special care shall be taken when O-ring pipe is used to insure that the "T" branches are compatible with the joint to be used on the lateral joints for laterals shall be O-ring, unilock, or Wedge Lock type.

Each joint, regardless of size, shall be coated with lubricating material as specified and supplied by the pipe manufacturer.

Manholes

Manholes shall be installed in accordance with City of Lawrenceburg standard Construction drawings. In addition, all precast reinforced concrete manholes shall include the sidewall rings and the base. The cone shall be the eccentric type. The joint between manhole sections shall be O-ring or equal approved by the City Engineer. At points of pipe inlet, the precast base manhole shall contain a Wedge Lock or O-ring joint or approved equal, which is sufficiently flexible to prevent shear of the pipe due to differential settling. Grouted joints between sections and cast in place bases are not acceptable. Joints between manhole Sections which are cast in place must be constructed with keyways.

Manhole castings shall be made of cast iron capable of supporting H-20 traffic Loads. All lids shall have at least four (4) ventilation holes; water tight manhole covers are to be used wherever the manhole cover may be flooded by street run-off stormwater drainage swale high water or as required by the City Engineer. Watertight castings shall be R-1772-B or approved equal. Steps inside the manhole shall be polypropylene encapsulated steel spaced a maximum of twelve (12) inches apart. The standard base shall be precast by the manufacturer.

Manholes shall be installed at the end or each sewer line and/or service lateral having a length greater than 150 feet at all changes in grade, size, alignment, and at all pipe intersections. Manholes shall also be installed at distances not greater than 400 feet for sewers. Locating manholes in sidewalks shall be avoided wherever possible

Drop inlets shall be avoided wherever possible, where they are required, a drop pipe shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Drop manholes shall be constructed with an outside drop connection inside drops shall only be used when tying into any existing sewer main and upon approval of the City Engineer. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the invert should be filleted to prevent solids deposition. Wherever possible, the height of manhole sections shall be selected in order to allow the manhole casting to be set directly in the top cone at the required elevation rather than using brick to raise the casting in areas where manholes are located in streets, the casting and cover shall be installed at the same grade as the street by use of an adjustable casting extension or other approved method.

The minimum diameter of manholes shall be 48 inches; larger diameters are preferable. A minimum access opening of twenty-two inches (22") shall be provided.

The flow channel through manhole should be made to conform in shape, slope, and smoothness to that of the sewers

The base of the manhole shall have openings for the sewer pipe cast to the alignment and elevations as part of the base openings, so as to form a watertight connection. The channel and bench shall be integrally cast or formed as part of the manhole base. The manhole base shall be set on a six-inch (6") granular base with a four-foot (4') minimum depth. The granular material shall be the same as required for pipe bedding as specified elsewhere in these regulations. Cast in place bases shall be used at locations where a manhole is constructed around an existing main. At all other locations precast bases shall be used. Other types of manholes, cones, castings, steps, and bases may be used only after permission has been granted in writing by the City.

Final grade adjustment of manhole casting shall be made by brick or other approved method. No material which will decay, such as wood, shall be used as manhole casting adjustment. The height of adjustment by brick or other acceptable means shall not exceed the minimum height at a precast riser collar section available for increasing the height of the manhole~

Pipe Installation

Sanitary sewer pipe shall be installed in accordance with ASTM C-12-72.

Open no more trench in advance of pipe laying than is necessary to expedite the work. Excavate trenches to a width that will provide adequate working space, but not more than the maximum design width. Do not undercut trench wall. Excavate trenches below the pipe invert a sufficient distance to provide space for the pipe bedding. Carry trenches in ledge rock, compact rocky or gravelly soil, or other unyielding materials below the bottom of the pipe at least one-fourth (1/4)

of the outside diameter of the pipe or four inches (4”), whichever is greater. Refill the space beneath the pipe with bedding material as specified for first class bedding.

Excavate pipe bell holes at each joint to provide full-length barrel support of the pipe and to prevent point loading at the bells or couplings.

Unless trench banks above the top of the pipe are cut back at a stable slope, sheet and brace trenches as necessary to prevent saving, or sliding to provide protection for workmen and the pipe, and to protect adjacent structures and facilities. Do not remove trench sheeting unless the pipe strength is sufficient to support the external loads including the weight of a prism of earth above the top of the pipe with trench width measured to the bank of the sheeting. Do not brace sheeting against pipe, but brace it so that no concentrated loads or horizontal threats are transmitted to the pipe.

In all cases over six feet (6') in depth trenches must be braces or an acceptable cage inserted, or the ditch must be laid back to the angle of repose to protect the people working in the excavation. In existing street rights or way, permission must be obtained from the wastewater superintendent to lay back the slopes in a public right of way

Handling Pipe

Protect pipe during handling against impact shocks and tree fall. Do not permit hooks to come in contact with premolded joint surfaces. Handle pipe having premolded joint rings or attached couplings so that no weight, including the weight of the pipe itself will bear on or be supported by the jointing material. Take care to avoid dragging the spigot ring on the ground or allowing it to be damaged by contact with gravel, crushed stone, or other hard objects. After delivery alongside the trench, carefully examine each piece of pipe for roundness and specification compliance. Acceptable pipe may be marked with paint or other permanent marking material so that the marks are plainly visible after installation in the trench and before the pipe is covered.

Laying Pipe and Pipe Bedding

Standard pipe bedding shall be first class bedding. The pipe shall be bedded in crushed stone or rounded gravel, bedding material placed on the trench bottom. The bedding material shall have 95% passing a 3/4-inch sieve and 95% retained in a No. 4 sieve. The bedding shall have a minimum thickness beneath the pipe of six inches (6”) or one fourth (1/4) of the outside diameter of the pipe, whichever is greater, and shall extend up the sides of the pipe to the horizontal centerline. Backfill from pipe horizontal centerline to a level not less than twelve inches (12”) above the top of the pipe shall be of the bedding material. Hand placed backfill shall be finely divided materials free from debris, organic material and stones.

Carefully prepare bedding so that the pipe, after installation, will be true to line and grade. Surface grade will material or trench subgrade beneath the pipe to provide a uniform and continuous support beneath the pipe at all points between bell holes or pipe joints. Densify fill material beneath the pipe. After each pipe has been brought to grade, aligned, and placed in final position deposit and densify sufficient bedding material under the haunches and on each side of

the pipe to hold the pipe in proper position during subsequent pipe jointing, bedding and backfilling operations. Deposit bedding material uniformly and simultaneously on each side of the pipe to prevent lateral displacement

Place pipe that is to be added in a concrete cradle or encased in concrete in proper position on temporary supports consisting of preshaped wood blocks or brick with wood edges. When necessary, rigidly anchor or weight the pipe to prevent floatation when the concrete is placed.

Place concrete for cradles, arches, or encasement uniformly on each side of the pipe and deposit at approximately its final position do not pour concrete more than five feet (5 ft) front its point of deposit. Concrete placed beneath the pipe shall be sufficiently workable so that the entire space beneath the pipe can be filled excessive vibration.

Grade stakes shall be required prior to laying any pipe. Line and grade shall be controlled by either laser alignment or batter boards.

Clean joint contact surfaces immediately prior to jointing. Use lubricants, primer, or adhesives as recommended by the pipe or joint manufacturer. Unless otherwise required, lay all pipe straight between changes in alignment and at uniform grade between changes in grade. Excavate bell holes for each pipe joint when jointed in the trench, the pipe shall form a true and smooth line. Keep trenches dry during pipe laying. Divert surface water from the trench area to the greatest extent practicable with causing damage to the adjacent property. Before pipe laying is started, remove all water that may have entered the trench. Whenever practicable start pipe laying at the lowest point and install the pipe so that the spigot ends point in the direction of flow.

Unless otherwise required, lay all pipe straight between changes in alignment and at uniform grade between changes in grade. Excavate bell holes for each pipe joint. When jointed in the trench, the pipe shall form a true and smooth line. Keep trenches dry during pipe laying. Divert surface water from the trench area to the greatest extent practicable without causing damage to the adjacent property. Before pipe laying is started remove all water that may have entered the trench.

Backfilling Trenches

Unless other protection work is directed, back fill trenches immediately after the pipe is laid. In the case of concrete cradle bedding, delay backfilling until the concrete has set sufficiently to support the back till load. Except for unusual circumstances (such as subaqueous installation) permit no water to rise in unbackfilled trenches after the pipe is in place. Backfill material to be placed above pipe bedding shall be free of brush, debris and junk. Unless specifically authorized, place no brick or rock excavation on detritus in the upper eighteen inches (18") of the trench. Place no rock or stones having a dimension larger than six inches (6") within three feet (3') of the top of the pipe. Large stones may be placed in the remainder of the trench backfill only if well separated and arranged so that no interference with backfill settlement will result. Use puddling, jetting, or water flooding for consolidating backfill material only when approved by the Wastewater

Superintendent, particularly prone to water damage are sewers laid in heavy clay soils or during cold winter months. Water flooding or jetting in porous sand or gravel during warm periods may be recommended. In general, limit the addition of water during backfill to provide optimum moisture content for tamping procedure.

All backfill for sanitary sewers or force mains in roadway areas or that will be under curbs, or within five feet (5') of pavement or curb, shall be made with approved granular material. In all other areas the backfill material may consist of on-site material but the pipe must be covered with tamped bedding material to a depth of one foot (1') over the highest point of the pipe.

Concrete Encasement

In areas requiring concrete encasement, ductile iron Class 50 shall be used unless waived by the Wastewater superintendent concrete encasement is required where sanitary sewers cross under streams, drainage swales, points of heavy loading or at other locations directed by the city.

Concrete encasement shall completely surround the pipe and shall have a minimum thickness at any point at one fourth (1/4) of the outside diameter of the pipe or four inches (4")~ whichever is greater. In addition, four (4) reinforcing bars of a size selected by the Engineer shall be evenly spaced around the pipe and have a length equal to the length of the encasement.

Concrete encasement provides additional field supporting strength. Wherever the strength of the pipe is not sufficient to support the external loads, the encasement should be assigned to provide the necessary additional strength.

Always protect pipe against impact hooks and free fall during handling. Do not permit hooks to come in contact with premolded joint surfaces.

Handle pipe having premolded joint rings or attached couplings so that no weight, including the weight of the pipe itself, will bear on or be supported by the jointing material take care to avoid dragging the spigot ring on the ground or damaging it by contact with gravel, crushed stone, or other hard objects

After delivery alongside the trench, carefully examine each piece of pipe for roundness and specification compliance. Acceptable pipe may be marked with paint or other permanent marking material so that the marks are plainly visible after installation in the trench and before the pipe is covered.

Clean joint contact surfaces immediately prior to jointing. Use lubricants, primer, or adhesives as recommended by the pipe or joint manufacturer.

Unless otherwise required, lay all pipe straight between changes in alignment and at uniform grade between changes in grade. Excavate bell holes for each pipe joint when jointed in the trench, the pipe shall form a true and smooth line. Keep trenches dry during pipe laying. Divert surface water from the trench area to the greatest extent practicable with causing damage to the adjacent property. Before pipe laying is started, remove all water that may have entered the

trench.

Whenever practicable start pipe laying at the lowest point and install the pipe so that the spigot ends point in the direction of flow.

The intent of these specifications is to secure a sanitary sewer system with a minimum amount of infiltration. To this end, all sewer pipes and manholes shall be inspected and tested for leakage.

Sewer pipe joints shall be tight and all visible leakage shall be repaired in a manner approved by the City of Lawrenceburg.

The leakage outward or inward (exfiltration or infiltration) shall not exceed 50 gallons per inch of pipe diameter per mil. per day for any section of the system. An exfiltration or infiltration test shall be performed with a minimum positive head of 2 feet. All sanitary sewer mains shall be air tested. The air test shall, as a minimum, conform to the test procedure described In ASTM C820-76T.

All air tests must be done in the presence of the City's Construction Inspector who will determine if the tested pipe span is acceptable. Air testing is done after backfilling. The air test is conducted between two consecutive manholes. All pipe outlets must be plugged in the section being tested using suitable test plugs. One of these plugs must be tapped and used for filling the test section with compressed air.

Air shall be slowly supplied until the internal pressure of the test section reaches five (5) psi and hold above 4.5 psi for not less than 2 minutes. Add air, if required, to maintain the pressure above 4.5 psi. At the end of the 2 minute stabilization period note the pressure reading (must be above 4.5 psi) and begin the time period. If the pressure drops 0.5 psi in less than the specified time, the pipe shall have failed the test and shall be repaired as required and re-tested. When the groundwater is above the sewer being tested, the required pressure shall be increased 0.43 psi for each foot that the groundwater table is above the invert of the sewer pipe. If the time for the pressure to drop 0.5 psi is 125% or less of the time specified, the line shall immediately be repressurized to 4.5 psi and the test repeated. The pressure gage used for the test shall have minimum divisions of 0.10 psi.

<u>Sewer Size (Inches)</u>	<u>Test Time (Minutes)</u>
6	3
8	4
10	5
12	6
15	7.5
18	9
21	10.5
24	12

If building sewers have been installed before the air test, they shall be considered part of the sewer main pipe to which they are connected and no adjustment of test time shall be allowed.

At the time of the test each manhole shall be inspected by the City Inspector to determine possible leaks. Manholes which are questionable shall be water tested.

Deflection of the PVC sewer pipe diameter shall not exceed 5%. All installed pipe shall be tested for deflection 30 or more days after the trench has been backfilled to finish grade. The PVC pipe shall be tested with a “go-no-go” mandrel pulled by hand. No mechanical pulling device shall be used. Pipe failing the deflection test shall be replaced.

Other Requirements

Sewers must be straight between manholes and will be tested for straightness by flashing a light between manholes.

Building Permits for structures in a new development shall not be issued until the sewers serving the structure have been tested and passed. This prevents the unauthorized connection of a structure to a sewer thus preventing a test. Model houses, for sales display only and not for immediate occupancy, may be built prior to construction of the sanitary sewers. These houses shall not be connected to the sanitary sewer system and will not have occupancy permits issued until the sanitary sewers are tested and accepted by the City.

At the completion of construction~ the contractor shall supply the City with one (1) set of reproducible plans to indicate any and all deviations from the original plans. These plans must be clearly marked "AS BUILT" on every sheet with all sewer service lateral locations manhole inverts and line distances verified by a post-construction survey made at the contractor's expense.

Water Supply

Introduction

Unless modified, deleted, replaced or otherwise changed, the latest published edition of the following documents shall be the accepted standard for materials and/or procedures for the construction, modification, alteration, or expansion of Lawrenceburg's public water distribution system:

1. IDEM Laws and Regulations.
2. American Water Works Association Standards
3. Recommended Standards for Water Works (Ten State Standards).

If a conflict shall exist between reference sources, the more restrictive requirement shall prevail. The Water Superintendent shall provide interpretation as requested.

Plan approval by the City of Lawrenceburg does not imply nor assure approval by IDEM.

Plans are approved subject to the conditions of compliance with all applicable laws, rules, regulations and standards. The proposed project may be constructed only in accordance with the

approved plans. There may be no deviation from the approved plans **without** the written approval from the City. Approval of the plans does not constitute an assurance that the proposed project will operate in compliance with all IDEM regulations.

As required by the Water Superintendent, plans shall be submitted to IDEM for approval. The cost of submitting plans to IDEM and review by IDEM shall be paid for by the contractor. Construction shall not begin until such plans are approved by IDEM or unless the Water Superintendent issues a Written conditional release.

Determination of Water Use

Water lines must be sized to meet present water consumption and projected average and maximum daily demands, including fire flow demand. The design engineer shall provide calculations to establish water usage demands.

Public water mains should be installed in public right of way or upon approval in a public utility easement.

Using the water line as a center line, there shall be a total of fifteen feet (15') (seven point five (7.5) feet of center of the water main) of open area for maintenance of the water main. Public water mains shall not be closer than ten feet (10') to buildings

Dead Ends

Dead-ends shall be minimized by looping of mains with multiple feed points. Where dead-ends occur they shall terminate with a fire hydrant or blow-off for flushing purposes~ Water lines shall not exceed 500 feet without looping unless waived by the Water Superintendent

Pipe Size

The minimum size of public water mains shall be eight inches (8") in diameter. Larger size mains will be required if necessary to allow withdrawal of required fire fighting flows while maintaining minimum pressure.

Any change in sizing shall be justified by hydraulic analysis and only upon the approval of the Water Superintendent.

Pressure

All water mains including those not designed to provide fire protection shall be designed to maintain a minimum pressure of 30 psi at ground level and should have a maximum pressure of 110 psi at all points in the distribution system under all conditions of flow. The normal working pressure in the distribution system should be approximately 70 psi. Pressure reducing valves (PRV) are required to be installed on the water service when the static pressure is 80 psi or greater.

Water Main Pine

Only Ductile Iron pipe shall be used for the construction of public sewer mains. The class of pipe required shall be determined as outlined in AWWA C150/A21.50-81 or its latest update except that in no case shall class 51 water be used. All Pipe shall be clearly marked as to class by the manufacturer. Under no condition shall pipe line deflection measured between joints exceed the manufacturer's published recommended standard for that type of pipe the maximum deflection at push-on joints and/or mechanical joints shall be 5 degrees. If deflections of 5 degrees are closer together than the standard length of pipe (approximately 18') except at fittings, concrete blocking shall be installed in accordance with the plans or as directed by the Water superintendent.

All pipe fittings shall be mechanical joint fittings and shall be of a working pressure class 250 mechanical joints shall conform to A.S.A. specification A21.11. Bolts and nuts shall be high strength, corrosion resistant alloy, such as 'Cor-Ten' or approved equal. Fittings shall be "short body" cast iron, Gray iron or Ductile iron fittings conforming in all aspects (i.e. laying length, wall thickness, weight, strength or metal, etc.) to A.S.A. specification A21.10. Pipe joints shall be Fastite, Wyton, Super Bell-Tite, or approved equal.

A bituminous seal coat shall be applied to the outside of the fitting, All cast iron pipe fittings shall be cement lined and seal coated in accordance with A.S.A. specification A21-4-1971

Fire Protection

The standard grading schedule of the American Insurance Association and related agencies should be followed in all cases for purposes of fire protection.

Mains not intended to carry fire flows shall not be connected to fire hydrants.

Public fire hydrants shall be spaced or located as follows:

- 1 In areas where the required fire flow, as determined by the Fire Official, is more than 2,000 gpm, fire hydrants shall be spaced or located not more than 300 feet apart.
2. In areas where the required fire flow, as determined by the Fire Official, is not more than 2,000 gpm, fire hydrants shall be spaced or located not more than 400 feet apart.

Private fire hydrants shall be located, installed, and maintained in accordance with the following:

- 1 Private fire hydrants shall be installed in accordance with all applicable laws, ordinances and rules and regulations of the City of Lawrenceburg Municipal Utilities and the following.
 - a. All private fire hydrants shall have an approved shut off valve installed in the fire hydrant lead not more than ten feet (10') from the fire hydrant. Such valves shall be accessible at all times.

b All private fire hydrants shall be installed not closer than two feet (2'), nor more than five feet (5') from a street, roadway, or driveway.

For the purpose of this requirement, spacing of fire hydrants, both public and private shall be determined by measuring the accessibility or travel distance of fire apparatus.

Valves

Chambers or pits containing valves, blow-offs, meters or other such appurtenances to a distribution system shall not be connected directly to any storm or sanitary sewer, nor shall blow offs or air-relief valves be connected directly to any sewer. Instead, they shall be drained to the surface of the ground where they are not subject to flooding.

The open end of an air-relief pipe should be extended from a manhole or enclosing chamber to a point at least one foot above ground and be provided with a screened downward facing elbow.

All valves shall close with clockwise turns and have a two inch (2") square wrench nut.

All valves greater than ten (10) inches in size shall be mechanical joint butterfly valves with gear operated closing mechanisms (AWWA C509).

All valves at a size ten (10) inches and smaller shall be mechanical joint resilient wedge gate valves (AWWA C509)

Valve boxes shall be "screw type" Clow F2450 or approved equal consisting of a base center and adjustable top section. Valve box cover shall be stamped "Water". Valve boxes for water mains and fire hydrants not located in pavement, shall have a concrete marker pad around the valves box top.

Sufficient valves shall be provided on water mains so inconvenience and public health hazards are minimized during repairs. Valves shall be located no less frequently than one per block or 800 foot intervals. The number valves and their location shall be approved by the Water Superintendent.

Fire Hydrants

Fire hydrants shall be connected only to water mains adequately sized to carry fire flows and in no case to lines smaller than six inches (6").

All fire hydrants shall have auxiliary valves for isolating water flow to the hydrant. All fire hydrants and auxiliary valves shall be positively locked to the water main by restrained joints. Rodding may be used if no other method is available and only upon approval of the Water Superintendent.

The horizontal center line of the large outlet port shall be a minimum of eighteen inches (18") and maximum of thirty inches (30") above final grade. In all cases, the manufacturer's

recommended relative elevation of the break flange to final grade shall be maintained

Hydrants shall be designed to 150 psi working pressure and shall be shop tested to 300 psi hydrostatic pressure with the main valve both open and closed. Under test, the valve shall not leak, the drain shall function and leakage into the bonnet shall not occur.

The barrel shall have a breakable safety section and/or bolts just above the ground line. Hydrants shall have a main valve opening of 5 1/4 inches, a 6-inch mechanical joint inlet to be suitable for setting in a trench 4' 6" deep, and shall be of the compression type, opening against the pressure. So that the main valve remains closed when the barrel is broken off.

Hydrants shall have a dry top and shall be self-draining, when the main valve is closed, through a bronze seat ring which has annular grooves and permits the water to drain throughout the circumference of the barrel, or by an equally effective drainage method. The drainage area shall be completely bronze. The upper part of the hydrant which contains the hydrant rod shall have rings to that the hydrant rod threads and lubricant are sealed from water at all times.

The hydrant shall also have antifriction bearings to take the upward thrust of the hydrant rod.

Hydrants shall be rotatable in a minimum of eight (8) positions in 360 degrees,

Public hydrants shall have two (2)- two and one-half (2 1/2) inch hose nozzles and one (1) steamer or pumper connection threaded to conform to the standards now in use as follows: 2 1/2" hose threads, 3 3/16 outside diameter, 7 threads per inch. Steamer threads 5 23/32" outside diameter 4 threads per inch. The operating nut and the nuts of the nozzle caps shall be pentagonal in shape, measuring one and one-half inches (1 1/2") from point to flat at the base conforming to the standard now in use.

All hydrants shall turn to the left or counter-clockwise to open.

Public hydrants shall be furnished without Cap chains and shall be painted OSHA safety yellow. Hydrants connected to a private water service shall meet all performance requirements of a public fire hydrant and shall be Painted OSHA safety red.

Where hydrant drains are not plugged, they should drain to the ground surface or to dry wells provided exclusively for that purpose.

Hydrant drains shall not be connected or located within ten feet (10') of storm or sanitary sewer.

Water Crossings

Surface water crossings, both over and under water, present special problems which should be discussed with the Water Superintendent before final plans are prepared.

For above water crossings, the pipe shall be adequately supported, protected from damage and treeing and accessible for repair or replacement. The pipe shall be of special construction having

flexible watertight joints. Valves shall be provided at both ends off water crossings so that the section can be isolated for test or repair. Permanent taps shall be made for testing and locating leaks.

Where the water main is constructed under a stream or drainage ditch, the pipe shall be protected with concrete encasement. This encasement shall extend a distance equal to the width of the channel measured from top of bank to top of bank. The encasement shall have a vertical thickness from pipe to surface equal to the diameter of the pipe and a horizontal thickness from pipe to surface of twice the diameter. The encasement shall be reinforced throughout the entire length with four (4)- number six (6) bars located near the corners and having a minimum of two inches (2") cover. All concrete used shall be Class C Concrete. Water shall not be permitted to flow over or in contact with the concrete for a minimum of twenty four (24) hours after placement.

Cross Connections

There shall be no connection between the water distribution system and any pipes, pumps, hydrants or tanks where there is a chance that contaminated water or other material may be discharged or drawn into the public water system.

Water Services

The Contractor shall provide each lot with an individual water service. The Contractor shall install the corporation stop, service line, curb stop and curb box in a suitable manner from the water main to the curb box.

Looping through water services or multiple metering systems to permit water to pass between public water mains is not permitted.

All underground water service pipe systems shall be thoroughly flushed before connection to any fire suppression system.

On four inch (4") and larger pressure taps, a full gasket type tapping sleeve shall be used. All pressure tapping shall be made under pressure.

The location of each curb stop shall be clearly marked with a "W" imprinted in the concrete curb near the top before the concrete hardens.

All installation work for water service shall be performed prior to the installation of the sidewalk and street asphalt.

The developer shall install the corporation stop on the water main while it is under pressure. The corporation stop shall be installed at either the two (2) o'clock or ten (10) o'clock position on the pipe; it must never be installed at the top of the pipe.

Three fourths (3/4) inch diameter type "K" copper pipe shall be the minimum size service

installed from the water main to each lot. A curb stop and box shall be installed between the curb and sidewalk for each lot. Each curb box shall be installed with a wooden stake painted blue and inserted eighteen (18) inches into the ground next to the curb box. The stake shall be thirty-six inches (36") above ground level.

The service pipe shall have a minimum depth of four feet (4') to prevent freezing. Adequate separation of water mains and sewers shall be maintained.

The curb stop box shall be free of mud and debris, straight, lids bolted in place, in good condition and easy to open. The contractor shall insure that the curb stops can be operated at all times.

Water Meter Pits

Metering pits shall be used. It is the contractor's responsibility to properly size the water service and metering system including the meter pit. Meters must be approved by the Water Superintendent for proposed service type and size. Applicant shall specify type and size of metering system, and shall provide expected flow ranges for low, average and peak flows. Meters shall be purchased from the City; they shall be sized to handle peak flows at 90% of rated capacity.

The meter pit shall be constructed as shown in City of Lawrenceburg drawing No. 75090.

All valves used in a meter pit setting with a service line of three (3) inches or larger shall be resilient wedge OS & Y rising stem gate valve.

All fittings inside of a pit with three (3) inch or larger service shall be flanged. A bypass line of the same size as the service line shall be installed on all meter pits with a service three (3) inch or larger, unless a second water service is connected permitting the meter setting to be isolated for maintenance.

There shall be a coupling between the water metering device and downstream valve.

When a dedicated water service is installed for fire suppression system, a post indicating valve (PIV) shall be installed on the water service line. A leak detector check valve and leak-monitoring meter shall be installed on the fire protection water service line. All detector checks installed in a pit shall have a bypass line of the same size as the detector check. All leak detection meters on detector checks shall be one (1) inch and purchased from the City.

Fire pumps and water booster pump system connected to public water shall have a low pressure shut off device that automatically shuts the pumping system down when the water main pressure drops below ten (10) psi. Water measuring devices on branch service lines which provide water for fire protection shall comply with AWWA's standards for the measuring device as applied to that service and shall be U.L. approved.

Separation of Water Mains and Sewers

The following factors should be considered in providing adequate separation between water mains and sewers:

1. Materials and type of joint for water and sewer pipe
2. Soil conditions
3. Service and branch connections into the water main and sewer lines.
4. Compensating variations in horizontal and vertical separation of water and sewer lines.
5. Space for repair and alterations of water and sewer pipe.
6. Off-setting of pipes around manholes.
7. No water pipe shall pass through or come into contact with any part of a sewer or sewer manhole.

Parallel Installation of Water and Sewer Lines

Under normal conditions, water mains shall be laid at least ten (10) feet horizontally from any sanitary sewer, storm sewer or sewer manhole. The distance shall be measured from edge of pipe to edge of pipe.

When conditions prevent a horizontal separation of ten (10) feet, a water main may be laid closer to a storm or sanitary sewer provided that the bottom of the water main is at least eighteen (18) inches above to top of the sewers.

Where this vertical separation cannot be obtained, the sewer shall be constructed of materials with joints that are equivalent to water main standards of construction. In addition, they shall be pressure tested to assure water tightness prior to backfilling.

Crossing of Water and Sewer Lines

Under normal conditions water mains shall not cross lateral sewers, storm sewers or sanitary sewers. Water mains shall be laid to provide a vertical separation of at least eighteen (18) inches between the bottom of the water main and the top of the sewer.

When conditions prevent a vertical separation at eighteen (18) inches, sewers shall be constructed of materials with joints that are equivalent to water main standards of construction and shall be pressure tested to assure water tightness before backfilling.

Water main passing under a sewer shall have the following additional protection:

A vertical separation of at least eighteen (18) inches between the bottom at the sewer and the top of the water main.

Adequate structural support for sewers to prevent excessive deflection of joints or settling on and breaking at the water mains.

The length of the water pipe centered at the point of crossing so joints will be equidistant from the sewer and as far away as possible from the sewer. No water pipe shall pass through or come into contact with any part of a sewer or sewer manhole.

General Installation Requirements of Water Mains

Water main pipe and fittings shall be laid on a good level foundation with no gaps or humps under the pipe or fittings. Pipe and fittings shall not be laid on blocks. Excavation shall be done by hand at joints to prevent the pipe and fittings being supported by the mechanical joint or bell.

Backfill, as specified elsewhere in these specifications, shall be placed with extreme care to assure a bedding of fine compacted material the full length of the pipe.

The pipe and fittings shall be thoroughly cleaned by swabbing before being lowered into the trench and shall be kept clean until the joints are completed. ALL OPEN ENDS ARE TO BE CLOSED WITH CAPS OR PLUGS AT ALL TIMES EXCEPT when pipe is actually being laid. All caps or plugs shall be properly installed and blocked in advance of testing mains. All securing and blocking shall be inspected by the Water Superintendent prior to hydrostatic testing.

Pipe hooks that extend inside the ends of the pipe shall not be used for handling the pipe since they could damage the cement lining. Joint bolts and nuts should be high strength, corrosion resistant alloy such as "Cor-Ten" or approved equal. All bolts shall be tightened with proper wrenches and must have equal tension.

Trenching, Grade and Cover

No trenching or laying of pipe or fittings shall be done until curb stakes have been set. Trench stakes may, in certain instances, be substituted for curb grade stakes.

The Contractor shall use digging equipment that produces an even bedding and foundation on which the pipe and/or fittings shall be installed. The bottom of the trench shall be level and free from lumps and holes, excessive loose dirt and large stones. If in rock, the bottom of the trench shall be under cut six inches (6") and then back filed with sand.

The contractor will establish all locations, lines and grades in advance of all work as long as practical. In addition, the Contractor will keep the Water Superintendent informed a reasonable time in advance of the times and places in which the Contractor intends to work.

All trenching, grade and cover work shall conform to the lines and grades given by the Engineer and shall be done according to the drawings and specifications, subject to such modifications as the Water Superintendent may determine to be necessary during the execution of the work. All water lines shall have a minimum of forty-eight (48) inches of cover except as approved by the Water Superintendent.

Thrust Blocking

All bends over 5 degrees shall be securely blocked against movement with concrete piers placed against undisturbed earth, in accordance with AWWA specification C600. All deflections over 5 degrees closer together than the standard length of pipe (approximately 18 feet) shall also be blocked against movement. Concrete used for blocking shall be Class C concrete.

Water mains shall have concrete thrust or “kicker” blocks at all pipe intersections and changes of direction to resist forces acting on the pipeline.

Concrete blocking shall be placed at least two (2) days in advance of testing the mains.

All caps or plugs used in mains to undergo hydrostatic test shall be properly installed and blocked in advance of testing mains. All securing and blocking of caps or plugs shall be inspected by the Water Division representative before the main is subjected to the pressure test

Duc lugs and threaded rods may only be used with the approval or the water superintendent and in no case shall be the sole retaining device on pipe size twelve inches (12”) or larger.

Backfilling

Excavated material shall be used for backfill except as otherwise specified. Material for backfilling shall be reasonably free of rubbish, mulch or other unsuitable materials such as large stones or rock.

Unless otherwise specified back fill material for the first twelve inches (12”) above the pipe shall be composed of two six inch (6”) layers of fine material with each layer tamped. Above twelve inches, the back fill shall consist of tamped nine inch (9”) layers until the surfaca is reached. If authorized by the Water Superintendent, backfill for all but the frst twelve inches (12”) may be compacted by flushing.

Backfilling roads, streets, driveways, right-of-ways or any other improved traffic areas shail be select and granular material approved by the Water Superintendent. The last ten inches (10”) of fill shall consist of gravel crushed stone. The city shall determine types of fill to be used.

This specification also applies to roadway areas scheduled to be paved within one (1) year from the date of water main installation.

The contractor shall remove and properly dispose of all surplus excavated materials from the work site In addition, contractor shall restore berm and unpaved driveways to original

conditions and reinstall any fencing, main boxes, signs, etc., removed for installation of water mains. Removal and disposal of surplus excavated materials shall be at contractor's expense.

The contractor shall use sod or seeding to restore any grass areas damaged or destroyed by the installation of mains. The use of sod or seeding shall be determined and mutually agreed upon by

both the contractor and the Water Superintendent. Reasonable protection and care(including any necessary watering) of sod or seed shall be maintained by the contractor for a period of thirty (30) days following their placement.

Testing, Disinfecting, and Flushing

The contractor shall pay the costs of testing, disinfecting, and flushing of the water mains.

Disinfection of the water main must take place before hydrostatic testing. A solution of hypochlorite using HTH or equal shall be introduced into the section of the line being disinfected sufficient to insure a chlorine dosage of at least 25 ppm in the main, while the solution is being applied, the water should be allowed to escape at the ends of the line until tests indicate that a dosage of at least 25 ppm has been obtained throughout the pipe. The chlorinated water shall be allowed to remain in the pipe for twenty-four (24) hours, after which a residual of at least 10 ppm shall be obtained. The disinfection shall be repeated until 10 ppm is obtained after twenty-four (24) hours, at which time the main shall be thoroughly flushed until the residual chlorine content is not greater than 1.0 ppm, and then tested to Ohio EPA standards.

If the bacteriological test is positive, the contractor must re-disinfect the pipe until the bacteriological test is negative, upon successful passing of the bacteriological test, the Water main shall be flushed to establish and maintain a chlorine residual no greater than 1 mg/l for six (6) hours.

The bacteriological test shall be performed by a laboratory approved by IDEM for such testing. The cost for all testing shall be paid by the contractor

Pressure Testing

All water lines shall be given a hydrostatic test to 200 psi, under which leakage shall not exceed ten (10) gallons per twenty-four (24) hours per inch of diameter per mile of pipe.

Loss of water pressure during test shall not exceed 10 psi in a twenty-four (24) hour period, nor 2 psi in a four (4) hour period.

- Where practicable pipe lines shall be tested between line valves or plugs in lengths of not more than fifteen hundred (1500) feet.
- Water line sections shall not be pressure tested until all service taps, branches, hydrant leads, etc., have been installed.

- Duration of test shall not be less than four (4) hours nor more than twenty-four (24) hours
- Where leaks are visible at exposed joints and/or evident on the surface where joints are covered, the joints shall be recaulked, repoured, bolts tightened or relaid and leakage minimized regardless of total leakage as shown by test.
- Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are met.
- A recording pressure gauge shall be used for the measurement; the pressure gauge is furnished either by the city or the contractor at the discretion of the water Superintendent
- The contractor shall, at his own expense, locate and repair all leaks. The main shall then be retested.
- After completion of the disinfection and testing procedures the main shall be flushed by the contractor under City supervision until the chlorine concentration is reduced to a level not exceeding 1.0 mg/l. The main shall be connected to the City's waste distribution system by the contractor under City supervision

Protection of Public Welfare

The Contractor shall conduct his work to interfere as little as possible with public travel. Whenever it is necessary to cross or interfere with railroads, intersecting streets, driveways public or private, crosswalks, or approaches to any buildings, he shall, at his own expense and in a manner satisfactory to the Water Superintendent, provide and maintain suitable and safe bridges or crossings for public travel. The Contractor shall promptly remove any temporary structure when ordered to do so by the Water Superintendent

All excavations and obstructions shall be properly barricaded, red-lighted, and flagged. The Contractor shall conform to all approved safety regulations in connection with the work

As Builts

At the completion of construction, the Contractor shall supply the city with one (1) set of reproducible plans to indicate any and all deviations from the original plans. These plans must be clearly marked "AS BUILT" on every sheet with all water services, fire hydrants and main valve locations verified by a postconstruction survey made at the contractor's expense.

DATE]

Mayor and Common Council
CITY OF LAWRENCEBURG
405 Main Street
Lawrenceburg, IN 47041

RE: [PROJECT NAME]

Dear Mayor and Common Council

I respectfully request that the following project be placed on its maintenance period.

Project Name: _____

Beginning Maintenance Period Date: _____

Ending Maintenance Period Date: _____

I certify that:

- 1) The project has been constructed in compliance with the approved construction drawings previously approved by the City Of Lawrenceburg; and
- 2) A 10% Maintenance Bond has been posted; and
- 3) All punch list items have been satisfied; and
- 4) The Utilities Director for the City Of Lawrenceburg Municipal Utilities has approved the improvements; and
- 5) The City Engineer has approved the improvements.
- 6) This project's "AS BUILT" documentation has been completed, certified as to accuracy and submitted and approved by the City Engineer.

I request the City Of Lawrenceburg's Common Council pass a resolution placing this project on maintenance period and releasing the project Performance Bond, but maintaining the Maintenance Bond.

Sincerely,

[SIGNATURE]

I recommend the above project be placed onto maintenance period for one year as outlined above

City Engineer

Date

I recommend the above project be placed onto maintenance period for one year as outlined above

Director of Public Utilities

Date

[DATE]

Mayor and Common Council
CITY OF LAWRENCEBURG
405 Main Street
Lawrenceburg, IN 47041

RE: [PROJECT NAME]

Dear Mayor and Common Council

I respectfully request that the following project be accepted by the City Of Lawrenceburg.

Project Name : _____

I hereby certify that

- 1) The project has been constructed in compliance with the approved construction drawings previously approved by the City Of Lawrenceburg; and
- 2) The project has completed a one-year maintenance period; and
- 3) The Utilities director for the City Of Lawrenceburg Municipal Development Utilities has approved the improvements and recommends acceptance of the project; and
- 4) The City Engineer has approved all of the improvements and recommends acceptance of the project; and
- 5) Any known defects have been corrected

I request the City Of Lawrenceburg's Common Council pass a resolution accepting this project and releasing any bonds being held on this property

Sincerely,

[SIGNATURE]

Based upon my inspection and review of the project file, I recommend acceptance of the project above.

City Engineer

Date

Based upon my inspection and review of the project file, I recommend acceptance of the project above.

Director of Public Utilities

Date

