

RESOLUTION NO. R110911C
A RESOLUTION TO AMEND
THE STANDARD CONSTRUCTION DETAILS AND
CONSTRUCTION SPECIFICATIONS

WHEREAS, the Town of Fishers adopted Standard Construction Details and Construction Specifications for the purpose of providing a uniform standard for all street and sanitary sewer construction projects located within the jurisdiction of the Town of Fishers in January 2006, pursuant to Resolution R050106; amended pursuant to Resolution R081808J on December 1, 2008; and

WHEREAS, it is the recommendation of the Director of Engineering for the Town of Fishers to amend the Standard Construction Details and Construction Specifications, in part; and such proposed amendments are attached hereto as "Exhibit A";

WHEREAS, upon review and consideration, it is the opinion of the Town Council of the Town of Fishers to adopt the proposed amendments to the Standard Construction Details and Construction Specifications.

NOW THEREFORE, BE IT RESOLVED by the Town Council of the Town of Fishers meeting in regular session as follows:

Section 1. That the Town Council of the Town of Fishers adopts the proposed amendments attached herein as "Exhibit A" to the Standard Construction Details and Construction Specifications of the Town of Fishers.

Section 2. This Resolution shall be effective from and upon its adoption and the amendments and/or revisions shall be incorporated into the Standard Construction Details and Construction Specifications of the Town of Fishers.

ALL OF WHICH IS SO RESOLVED, this 9th day of Nov, 2011.

AYE

NAY

Scott A. Faultless

Scott A. Faultless,
President

Michael L Colby

Michael L Colby,
Vice President

Eileen N. Pritchard

Eileen N. Pritchard,
Member

Daniel E. Henke

Daniel E. Henke
Member

David C. George

David C. George,
Member

Edward H. Offerman

Edward H.
Offerman, Member

ATTEST:

Linda Gaye Cordell
Linda Gaye Cordell, Clerk-Treasurer, Town of Fishers, Indiana

DATE:

11/9/11

R110911C

Exhibit A



Construction Specifications

January 2006

Amended August, 18 2008

Amended November 1, 2011

Town of Fishers, Indiana

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Section 1. Introduction

1.1 Forward

- A) The purpose of these specifications is intended to provide a uniform standard for all street and sanitary sewer construction projects located within the jurisdiction of the Town of Fishers, Indiana. These specifications are intended to complement the Town of Fishers Standard Construction Details. Specifications for all storm sewer construction located within the jurisdiction of the Town of Fishers are provided in the Town of Fishers Stormwater Technical Standards Manual and the Standard Construction Details, current versions.
- B) At the time of project plan approval, a project is required to comply with the latest revision of standard specifications and details. Developers are encouraged to provide the latest revisions to their contractors before construction. Developer's engineers should not include other specifications and details unless required by the uniqueness of the project. Additional copies of any revision may be obtained from the Director of Engineering's office or on the Town's website (www.Fishers.in.us).
- C) These specifications and details are expected to be updated as new standards are developed and as errors and discrepancies are discovered. Please forward any comments to the Director of Engineering for consideration in future updates.

1.2 Contact Information

Director of Engineering	(317) 595-3160
Public Works Director	(317) 595-3160
Director of Wastewater Treatment	(317) 595-7003
IUPPS Utility Locate Service	1-800-382-5544

1.3 Referenced Documents

Town of Fishers Standard Construction Details

Town of Fishers Stormwater Technical Standards

Town of Fishers Transportation Plan

Town of Fishers Unified Development Ordinance

Indiana Department of Transportation (INDOT) Standard Specifications, Supplementals, and Standard Drawings

Indiana Department of Transportation (INDOT) Design Manual

AASHTO – A Policy on Geometric Design of Highways and Streets (AASHTO Manual or Green Book)

Manual on Uniform Traffic Control Devices (MUTCD)

ASTM / AASHTO standard specifications

ADA Standards for Accessible Design

Recommended Standards for Wastewater Facilities – A report of the Wastewater Committee of the Great Lakes – Upper Mississippi River

Other generally acceptable design standards, policies, and guides

1.4 Definitions

A) For the purpose of these Construction Standards and Details, the following definitions shall apply:

- 1) **Contractor** – Any individual, partnership, firm, corporation, or combination of same approved by the Town of Fishers to construct, install, maintain, repair and remove public or private street, sanitary sewer, or storm sewer facilities within the Town of Fisher's service area. This definition is intended to include all employees, sub-contractors and/or agents acting for or on behalf of the Contractor.
- 2) **Design Engineer** – The engineer sealing the construction plans; this definition is intended to include all employees, sub-contractors and/or agents acting for or on behalf of the Design Engineer.

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- 3) **Developer** – The person/company financially responsible for construction activity, or an owner of property who sells or leases, or offers lots for sale in a subdivision; this definition is intended to include all employees, sub-contractors and/or agents acting in the interest of the Developer.
- 4) **Director of Engineering** – The Director of the Town of Fishers Engineering Department, acting directly or through the duly authorized representatives.
- 5) **Sidewalk** - The portion of the right-of-way primarily constructed for the use of pedestrians.
- 6) **Specifications and Details** - A general term applied to all directions, provisions, and requirements pertaining to performance of the work.
- 7) **Street** - A general term denoting a public way for purposes of vehicular travel.
- 8) **Subgrade** – The upper portion of a roadbed upon which the pavement structure and shoulders are constructed.
- 9) **Town** – Town shall mean the Town of Fishers, Indiana, the municipality which has jurisdiction over its corporate limits.

1.5 Permit Applications

- A) The Developer shall procure at its own expense, all permits and licenses, pay charges and fees, and give all notices necessary and incidental to the due and lawful execution of the work.
- B) Contact the Town of Fishers Department of Engineering and/or Public Works for all required local permit applications for street, storm, or sanitary sewer construction.

Section 2. Streets

2.1 General

- A) The purpose of this section is to establish basic guidelines and certain minimum criteria for the design of streets and thoroughfares in the Town. Unusual circumstances or special designs requiring variance from the standards in this manual must be approved by the Town Technical Advisory Committee and the Director of Engineering.
- B) The criteria outlined in this section are intended to be used in conjunction with the Fishers Standard Construction Details.
- C) In order to provide consistency in the construction of pavement cross sections, standards have been adopted for new streets in the Town and in the Planning Area. All street pavements should be designed and constructed to the same standards regardless of whether it is a public or private street. The consistent design, construction, and inspection of rural streets will not only better serve the public in the planning area, but also citizens of the Town when these areas are annexed. In the event that a private street is not designed according to public street standards, the private street must be brought up to the public street standards prior to potential dedication to the Town.
- D) All streets, roads, alleys, access ways, commercial drives, etc., shall be designed and constructed in accordance with the latest edition of the Town of Fishers Construction Specifications, Town of Fishers Standard Construction Details, INDOT Design Manual, AASHTO Manual, INDOT Standard Specifications, the Town of Fishers Transportation Plan, good construction practice, and the recommendations and requirements of the Director of Engineering.
- E) Special attention will be required in regard to the subgrade conditions and street base materials. Underdrains shall be installed and shall be extended and connected to the storm drainage system. No connections of down spouts, sump pumps, etc., shall be allowed to connect to the street underdrains.
- F) Right-of-Way (ROW) widths shall be per the Town of Fishers Standard Construction Details. An additional 10 feet of full-width ROW can be requested for multi-use paths.
- G) Street signage shall be per the latest Indiana adopted version of the Manual on Uniform Traffic Control Devices (MUTCD).

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2.2 Design

A) Roadways shall be designed in accordance with the AASHTO Manual and the INDOT Design Manual, as applicable, however the following minimum requirements shall apply.

1) Design Speed

Minimum local street design speed shall be 25 mph with a maximum design speed of 35 mph and per subdivision type in the Unified Development Ordinance (UDO). Arterial and collector streets shall have a minimum design speed to 40 mph.

2) Visibility Requirements.

a) Stopping Sight Distance shall be provided in accordance with the AASHTO Manual; however the minimum Stopping Sight Distance shall be 200 feet on local streets, marginal access streets, and cul-de-sacs; and 150 feet on streets shorter than 500 feet.

b) Intersection Sight Distance shall be provided in accordance with the AASHTO Manual.

c) Minimum Distance Between Driveway and Parallel Adjacent Street shall be 25 feet for local streets, 300 feet for collectors, and 300 feet for arterials, as measured from the radius of the curve, unless otherwise approved by the Director of Engineering.

d) The following text shall be added to all plats: "No fence, wall, hedge, tree or shrub planting which obstructs sight lines and elevations between 2 and 8 feet above the street shall be placed or permitted to remain on any corner lot within the triangular area formed by the street right-of-way lines and a line connecting points 25 feet from the intersection of said street lines or in the case of a rounded property corner, from the intersection of the street right-of-way lines extended.

The same sight line limitations shall apply to any lot within ten feet of the intersection of a street right-of-way line with the edge of the driveway pavement or alley line.

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3) Vertical Design

- a) The maximum grade for local streets, marginal access streets and cul-de-sacs shall not exceed 7 percent, except for portions of streets not to exceed 600 feet in length where maximum grade shall not exceed 10 percent.
- b) The grades of intersecting streets, where vehicles are stored while waiting to enter the intersection, should be as flat as practical. The desirable grade within 100 feet of the intersection should be no more than 2 percent, or 5 percent maximum.
- c) The minimum grade of concrete streets and gutters shall be 0.5 percent. The minimum grade for all other types of streets and gutters shall be 0.6 percent.
- d) When the algebraic difference between two consecutive grades is greater than 1.0 percent, a vertical curve shall be provided in accordance with the AASHTO Manual.

4) Horizontal Design

- a) All streets shall conform to the Town of Fishers Construction Specifications and Standard Construction Details, unless otherwise approved by the Director of Engineering, and shall be designed and located in proper relation to existing streets and environment. Residential streets shall be designed to discourage high speed traffic and minimize excessive cuts and fills.
- b) The minimum centerline radius shall be 150 feet on local streets, marginal access streets and cul-de-sacs.
- c) Streets shall intersect each other at right angles whenever possible. The minimum intersection angle is 75°. For intersections of more than two streets, a round-a-bout design is preferred.
- d) Street centerlines shall align with existing streets unless otherwise approved by the Director of Engineering.
- e) In accordance with NFPA 1141 Section 3-9.2, Fire Department vehicular access to all structures under construction shall be provided at all times. In areas where ground

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surfaces are soft or likely to become soft, hard all-weather surface access roads shall be provided.

f) Bicycle Lanes

On primary arterials, bicycle lanes adjacent to the curb shall be 4 feet in width and bicycle lanes between lanes shall be 5 feet in width.

g) Passing Blisters shall be provided across from all subdivision entrances and commercial drives located on two lane roads. Passing blister design shall be in accordance with the INDOT Design Manual.

h) Right Turn Lanes, if required by the Director of Engineering, shall comply with the following:

i) The minimum taper length, for a 12 feet offset, shall be 100 feet.

ii) The minimum deceleration and storage length shall be 150 feet. Additional storage may be required by the Director of Engineering dependent on the number of vehicles per hour.

iii) Acceleration taper shall be 100 feet.

5) Cross Sections

a) The cross-section of all streets shall be as shown on the typical street sections in the Town of Fishers Standard Construction Details.

b) Underdrains are required under the curb for all Local, Collector, and Arterial Streets, as shown in the Town of Fishers Standard Construction Details.

c) Portland Cement Concrete Pavement (PCCP) – Typical pavement sections shall be as shown in the Town of Fishers Standard Construction Details. The thickness may be adjusted for special soil conditions or for special base preparation as determined by the Director of Engineering.

d) Hot Mix Asphalt (HMA) Pavement - Typical pavement sections shall be as shown in the Town of Fishers Standard Construction Details. The thickness may be adjusted for special soil conditions or for special base preparation as determined by the Director of Engineering.

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e) Stabilized subgrade shall be defined as subgrade soil compacted to 100 percent of maximum dry density in accordance with INDOT Standard Specifications Section 207.

6) Geometrics

a) Radii of 25 feet, measured along the back of curb, shall be required where local streets intersect.

b) Radii of 40 feet or more, measured along the back of the curb, shall be required where a local street intersects a collector or arterial so that trucks may turn without encroachment.

c) Radii of 40 feet or more, measured along the back of the curb, shall be required where a collector street intersects another collector or arterial so that trucks may turn without encroachment. .

d) Cul-de-sac and Eyebrow design shall be according to the Town of Fishers Standard Construction Details.

e) Temporary Dead-Ends shall be provided in accordance with the Hammerhead Turnaround Requirements per the Town of Fishers Fire Department.

f) Pavement width shall be per the Town of Fishers Standard Construction Details.

7) Curb and Gutter

Curb and gutter for all Town streets shall be constructed of concrete. Arterial and collectors shall have a minimum vertical curb of 6 inches. Local streets shall have a roll curb.

8) Driveways

All driveways shall conform to the Town of Fishers Standard Construction Details. New driveways shall align with existing driveways unless otherwise approved by the Director of Engineering. Minimum distance between driveway and parallel adjacent street shall be 25 feet for local streets, 300 feet for collectors, and 300 feet for arterials unless otherwise approved by the Director of Engineering.

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9) Sidewalks and Paths

Where sidewalks, paths, or other pedestrian ways meet streets, the connections shall be in accordance with ADA Standards, as amended.

10) Fill and Trench Backfill.

- a) All utility trenches shall be backfilled as shown in the Town of Fishers Standard Construction Details.
- b) All work within trenches must be in accordance with the most recent INDOT and OSHA safety standards and regulations.

2.3 Materials

- A) All construction details are part of the latest version of Town of Fishers Standard Construction Details. The Director of Engineering shall review and approve or deny any alternative method. Any discrepancy, omission, or duplication of specification standards shall be brought to the attention of the Director of Engineering.
- B) Streets, sidewalks, curb and gutters and multiuse paths, where provided, shall be completed to grades shown on plans, profiles, and cross sections. Plans shall be prepared by a registered professional engineer and conform to the Town of Fishers Construction Specifications and Standard Construction Details.
- C) Roadways within the Town right-of-way may be constructed of Portland cement concrete pavement (PCCP) or hot mix asphalt (HMA) pavement.
 - 1) Streets may be of PCCP or HMA pavement.
 - 2) Sidewalks shall be Portland cement concrete (PCC).
 - 3) Curb and gutters shall be of PCC.
 - 4) Multiuse paths may be of PCC or HMA.
- D) Submittals shall be given to the Director of Engineering during construction:
 - 1) PCC tickets that indicate mix design.
 - 2) HMA tickets that indicate mix design.

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- 3) All reports of testing performed that includes, but is not limited to, temperatures, slump, air entrainment, density, and cylinder compressive strength.

E) Portland Cement Concrete Pavement (PCCP)

- 1) Portland cement concrete materials and construction shall be in accordance with INDOT Standard Specifications Section 501. In addition, the following shall govern and be met:
 - a) Subgrade shall conform to INDOT Standard Specifications Section 501.10 and Section 207. Subgrade shall be moist, but not muddy, at the time the concrete is placed. If required, it shall be sprinkled, but the method of sprinkling shall be such that mud or pools of water will not be formed.
 - b) Sub-base shall be in accordance with INDOT Standard Specification Section 302.
 - c) Weakened plane or transverse contraction joints, with approved dowel bar assembly, shall not exceed 20-foot spacing. A transverse contraction joint shall be placed at every manhole, catch basin, valve casing, and hand hole in line of pavement. The location of manholes and other structures in the pavement shall determine the exact location of joints. All joints must extend throughout side strips to full width of pavements. Transverse contraction joints will be a groove and conform to INDOT Standard Specifications Section 503.03 (a) and the Town of Fishers Standard Construction Details.
 - d) Work shall conform to INDOT Standard Specifications Section 503.3. If the width of pavement under construction between forms is greater than 13 feet, longitudinal joints must be constructed in accordance with INDOT Standard Specifications Section 503.03 (b).
 - e) Expansion joints shall be placed at each intersection shown on the plans and around every manhole, catch basin, valve casing, and hand hole in line of pavement. The joints shall conform to INDOT Standard Specifications Section 503.03 (f) and the Town of Fishers Standard Construction Details.
 - f) Concrete shall be machine finished except on widened portions, intersections, or other places where hand finishing will be permitted if authorized by the Director of Engineering. Finishing machines or vibrating strike-boards of design other than INDOT Standard Specifications will be permitted if work of equal quality is obtained.

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Authorization prior to construction is required. Work shall conform to INDOT Standard Specifications Section 504.03.

- g) Approved impervious membrane or sealing compounds are required for curing and must conform to INDOT Standard Specifications Section 504.04.

F) Hot Mix Asphalt (HMA) Pavement

- 1) HMA pavement shall be in accordance with INDOT Standard Specifications Section 401.
- 2) Subgrade shall be in accordance with INDOT Standard Specifications Section 207.

G) Curbs and Gutters

- 1) Curbs and gutters shall be constructed in accordance with INDOT Standard Specifications Section 605. Rolled curbs and gutters constructed adjacent to and at the same time as PCCP shall be constructed with the same concrete used for the PCCP streets.

H) Sidewalks and Pathways

- 1) PCCP sidewalks and PCC multi-use paths shall be constructed with concrete, Class A, in accordance with INDOT Standard Specifications Section 702. Construction of sidewalks and multi-use paths with the same concrete used for PCCP streets, in accordance with Section 2.3 (e) of these specifications, is permissible.
- 2) HMA multi-use paths shall be in accordance with INDOT Standard Specifications Section 402.

2.4 Execution

- A) All streets, curbs and gutters, sidewalks, and pathways shall be graded, surfaced, and improved to the dimensions required by the cross sections and the work shall generally conform to INDOT Standard Specifications, with exceptions as provided in these specifications.
- B) All roadway construction shall be inspected by the Director of Engineering or his designated representative prior to the placing of any base materials. The certification of the base materials and techniques by a professional testing laboratory shall be required. If pavement borings are deemed necessary by the Director of Engineering, the cost of the boring samples shall be borne by the Developer.

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- C) All pavement materials shall be certified in writing to the Town, as to their composition, mix, quantity delivered and compliance with the materials specified and/or referenced from the INDOT Standard Specifications.
- D) Pavements shall be free of cracks and other defects, as determined by the Director of Engineering, for a period of three years from the date of acceptance by the Town.
- E) All testing shall be performed by a certified agency approved by the Director of Engineering. The Developer will pay all testing costs. A complete certified copy of all records shall be provided to the Town.
- F) All work must meet Town requirements prior to acceptance. Upon the completion of all improvements and installations as required by the Town, the Developer must furnish the Department of Engineering and Public Works with the proper maintenance bonds.
- G) Upon completion of all improvements and installations accepted by the Town, Digital Plan information and Record Drawings certified by a registered Indiana Professional Engineer or Land Surveyor shall be submitted to the Town in Accordance with the most current Town of Fishers record drawing submittal requirements. A copy of the submittal standards is available from the Director of Engineering.

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Section 3. Sanitary Sewers

3.1 General

This section includes specifications for gravity sanitary sewer collection systems, and building laterals.

A) Details

- 1) All construction details shall be as shown on "Town of Fishers Standard Construction Details," latest revision. The Town must approve any other alternative method, discrepancy, omission, or duplication of specification standards.

B) Construction Plans

- 1) The plans for the installation of a sanitary sewer system shall be provided by the Petitioner and approved by the Town. Upon the completion and one week prior to acceptance, the Contractor must submit record drawings certified by a registered Indiana Professional Engineer or Land Surveyor for the installed sanitary sewer system to the Town.

C) Standards

- 1) Design, construction, and testing must comply with ASTM and IDEM standards.

D) Responsibilities

- 1) The Property Owner shall be responsible for all approvals, permits, and easements.

E) Submittals prior to construction

- 1) These submittals shall be given to a Town representative prior to construction:
 - a) Shop drawings for all sanitary sewer materials, including pipe, manholes, pipe couplings, wyes/tees, shall be submitted to the Town. Shop drawings shall be signed and sealed for compliance to specifications by the Contractor, and, reviewed and stamped by the Project Engineer with comments to the Contractor requiring compliance with Project Plans and Specifications.
 - b) Proposed detailed construction sequence including schedule for bypass pumping and connection to existing sanitary sewer system.

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- c) Permit for excavation within the Right-of-Way permit, if applicable.
- d) Copies of IDEM construction permit and all correspondence concerning deficient plans or approval of plans.

F) Submittals prior to Town Acceptance

- 1) These submittals shall be given to a Town representative prior to Town Acceptance:
 - a) Air, mandrel, and vacuum tests.
 - b) One set of record drawings showing information including, but not limited to, the following: building lateral locations, pipe slopes, invert elevations, top of casting elevations, horizontal locations, and other utility information encountered during construction. Upon completion of all improvements and installations accepted by the Town, Digital Plan information and Record Drawings certified by a registered Indiana Professional Engineer or Land Surveyor shall be submitted to the Town in accordance with "The Submission of Record Drawings and The Standardization of the Digital Information Submittal Format" adopted by the Town Council on September 7, 2004. A copy of the submittal standards is available from the Director of Engineering. The Record Drawings shall indicate Town supplied manhole numbers. These manhole numbers will be issued to the Director of Engineering after the paper format is submitted.

G) Sewer hook-ups

- 1) No sewer hook-ups can be made on any Town sewer unless the Property Owners/Contractors have the following in their possession:
 - a) A valid Building Permit (if applicable)
 - b) A Sewer Lateral Hook-On Permit. All lateral permits issued must have the appropriate street address and/or lot number, as well as the Contractor's name. If the Contractor has not yet been determined, then the Property Owner's name must appear on the permit.
 - c) A Street-Cut Permit (if applicable)

- 2) Roof drains, footing drains, sump pumps, and/or surface water drains shall not be connected to the sanitary sewer system, including temporary connections during construction.

3.2 Design

A) Benchmarks

- 1) Permanent and temporary elevation benchmarks shall be referenced on the plans.

B) Pipe Size and Slope

- 1) All sanitary sewer facilities shall be sized to accommodate anticipated flows from upstream service areas. The Property Owner shall contact the Town to determine applicability.
- 2) Gravity sewers shall be sized to maintain a minimum velocity of 2 feet per second. Gravity sewers shall be a minimum of 8 inches in diameter. Service laterals shall be a minimum of 6 inches in diameter.
- 3) Slopes
 - a) For gravity sewers, the slopes shall be calculated from center of manhole to center of manhole (not end of pipes). Design slopes above the minimum required slopes are encouraged; however, the gravity sewer pipes shall not be constructed below the following minimum grades:

6-inch (Building Lateral Only)	0.61%
8-inch	0.40 %
10-inch	0.28 %
12-inch	0.22 %
15-inch	0.15 %
18-inch	0.12%
21-inch	0.10 %
24-inch	0.08%

Pipes with slopes greater than 20 percent shall be anchored, in accordance with the Ten States Standards, current version.

C) Alignment

- 1) Sanitary sewer facilities and water mains shall be laid with at least a 10-foot horizontal separation distance, measured edge to edge. In cases where it is not practical to maintain a 10-foot separation, deviation may be allowed on a case-by-case basis.
- 2) There must be a minimum 18 inches vertical separation between the two pipes for crossings of water mains and sanitary sewer facilities, measured from the outside of the sanitary sewer facility to the outside of the water main. The crossing shall be arranged so that the sanitary sewer facility joints will be equidistant and as far as possible from the water main joints.
- 3) All sanitary sewer facilities shall have a minimum separation from drinking water wells in accordance with the Ten States Standards, current version.
- 4) For separations, horizontal or vertical, that are impossible to obtain, both the water main and sanitary sewer facility shall be constructed of ductile iron pipe with mechanical joints complying with public water supply design standards and be pressure tested to 150 pounds per square inch to assure water tightness before backfilling.
- 5) All sanitary sewer facilities shall be a minimum of 10-feet horizontally from top bank of all ditches, creeks, and ponds.
- 6) Castings shall be located so that drainage flows away from the casting.
- 7) From the lowest incoming pipe invert to the outlet pipe invert, there shall be a minimum 0.1 feet in elevation drop. There shall be a maximum 2.0 feet between the highest incoming pipe invert and the outlet pipe invert. Any drops in excess of 2 feet shall require an outside drop manhole structure.

D) Minimum Cover

1) Gravity Sewers

- a) Minimum depth of cover for mainline sewers shall be 54 inches. If the minimum depth cannot be obtained, the mainline gravity sewer shall be Ductile Iron Pipe, class 50, and have a minimum cover depth of 36 inches.

E) Building Lateral Cleanouts

- 1) Sewer main cleanouts are not acceptable for permanent end of runs but are acceptable as temporary for locations between sections of subdivisions.
- 2) A minimum 6-inch diameter cleanout shall be located 3-feet outside of the building, and every 100' of lateral length. A concrete pad as shown on the standard construction details must be placed around cleanout.

F) Elevations

- 1) Finish floor elevations, proposed or existing, for all lots shall be clearly stated. Where the sanitary drainage system of a building can discharge into the sewer by gravity flow, the lowest floor elevation where a plumbing fixture or floor drain is installed must be a minimum of one foot above the top of the lowest downstream or upstream manhole casting nearest to the subject lateral connection. Where part of the drainages system cannot be discharged to the sewer by gravity flow, this part of the system shall be discharged to a tightly covered and vented sump from which the contents shall be lifted (pumped) and discharged into the building gravity drainage system a minimum of one (1) foot above the top of the lowest downstream or upstream manhole casting nearest to the subject lateral connection.
- 2) Top of castings of all manhole structures shall be at least one foot above the 100-year flood elevation. In areas where this requirement is not met, lock down castings shall be specified.
- 3) The lowest elevation to receive gravity sanitary service must be one (1) foot above the top of manhole casting elevation of either the first upstream or downstream manhole on the public sewer to which connection is to be made. Those portions of the building not

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meeting the stated gravity sanitary service requirement shall be provided with a grinder pump system or Town approved equal discharging to the gravity building connection outside of the public right-of-way.

G) Manholes

- 1) Maximum distance between manholes shall be 500 feet. Manholes shall be placed where pipe alignment, slope, materials, and/or size changes.
- 2) The angle, between any inlet pipe and the outlet pipe, must be equal to or greater than 90°.
- 3) Minimum manhole diameters shall be as follows:

TABLE 1	
Pipe Size	Minimum Manhole Diameter
	Pipe Entering / Pipe Exiting at Deflection Angle 90° and greater
8" – 12"	48"
24"	48"
27" – 30"	60"

- 4) Outside drop manholes shall be provided in cases where the invert of any incoming sanitary sewer enters the manhole at elevations greater than twenty four (24) inches. Inside drop manholes are not permitted.

H) Easements

- 1) Should it be necessary to install gravity sewers outside of public right-of-way, the developer will be responsible for providing permanent easements, to be dedicated to the Town of Fishers.
- 2) The minimum required width of the permanent easements for gravity sanitary sewers shall be as follows:
 - a) For sewers with depth of up to 15 feet from finished grade, minimum easement width shall be 20 feet.
 - b) For sewers with depth, greater than 15 feet to 25 feet from finished grade, minimum easement width shall be 25 feet.

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c) For sewers with depth, greater than 25 feet from finished grade, minimum easement width shall be 30 feet.

3) All sanitary sewers shall be centered in the easement.

3.3 Materials

A) Gravity Sewers

- 1) PVC pipe diameters of 8 inches through 15 inches shall meet or exceed all the requirements of ASTM D 3034 and shall have a minimum cell classification of 12454 C. Reference should be made to ASTM D 1784 for a summarization of cell class properties. PVC pipe diameters greater than 15 inches shall meet or exceed all requirements of ASTM F 679 and shall have a minimum cell classification of 12454 C.
- 2) The minimum wall thickness of PVC pipe 8 inches through 15 inches in diameter shall conform to SDR 35, type PSM, as specified in ASTM D 3034. The minimum wall thickness for PVC pipe greater than 15 inches shall conform to T 1 as specified in ASTM F 679. PVC pipe shall have a minimum pipe stiffness of 46 pounds per square inch for each diameter when measured at 5 percent deflection and tested in accordance with ASTM D 2412.
- 3) PVC sewer pipe shall meet or exceed all requirements of ASTM F 794 or ASTM F 949 and shall have a minimum cell classification of 12454 C and a minimum uniform pipe stiffness of 50 pounds per square inch for each diameter when measured at 5 percent deflection and tested in accordance with ASTM D 2412.
- 4) Pipe joints shall have a bell wall, gasket groove and spigot which are integral with the pipe. The assembly of joints shall be in accordance with pipe manufacturers' recommendations and ASTM D 3212. Solvent cement joints shall not be allowed.
- 5) Pipe fittings shall be SDR 26 manufactured fittings made of PVC plastic having a cell classification of 12454 B or 12454 C as defined in ASTM D 1784. Saddle connections shall not be allowed for new construction. Lateral connections shall occur at SDR 26 Wyes.

Section 3 – Sanitary Sewers

- 6) Each pipe section shall be marked with the name of manufacturer, trademark or trade name, nominal pipe size, production/extrusion code, material and cell classification, and ASTM number.
- 7) Installation shall be in accordance with ASTM recommended practice D 2321.

B) Building Laterals

- 1) Pipe for building laterals shall be a minimum 6-inch PVC meeting the requirements of ASTM D 3034, SDR 35. Pipe shall have a flexible gasket push-on compression type joint. Cleanouts must be provided for each lateral and shall be 6-inch diameter minimum.

C) Manholes

- 1) Precast concrete manholes shall conform to ASTM C 478 with rubber type gaskets equal to ASTM C 443 and a minimum inside diameter of 48 inches. Monolithic cast-in-place manholes shall only be used with the prior written approval of the Town. The base and first riser section of the precast concrete manhole shall be integrally cast as one unit. Precast concrete cones shall be of the eccentric cone type. No "see through" lift holes shall be allowed on precast concrete manholes 48 inches in diameter. In addition to the rubber type gaskets, all joints shall receive a 1/2 inch diameter nonasphaltic mastic (Kent-Seal or as approved by the Town), conforming to ASHTO M 198 and federal specifications SS-S-210A. Sewer connection to manhole shall be Kor-N-Seal, A-Lok, Dura-Seal or as approved by the Town.
- 2) Where one solid riser or barrel section cannot be used, final adjustment in elevation of the frame and cover shall be accomplished by the use of a 4-inch minimum thickness adjusting ring to a maximum combined thickness of 12 inches. Brick or block shall not be used in the construction of a manhole or to adjust the elevation of the frame and cover. Non-hardening butyl rubber sealant shall be installed between cone, riser rings, and casting. Sealant shall meet or exceed ASTM 0990-94.
- 3) Manhole steps shall conform to ASTM C 478. Manholes shall be furnished with steps placed a maximum 16 inches apart with the first step placed no greater than 2 feet below the top of the frame.

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- 4) A 6-inch minimum width of butyl rubber coating on the exterior of the manhole shall be applied at each joint to prevent leakage.
- 5) Precast flow channel through manholes shall be U-shaped at a minimum width and depth equal to the diameter of the pipe extending between the pipe inverts. The bench walls must extend up from the flow channel to an elevation that creates a one-inch per foot minimum slope with the inner wall of the manhole section and shall have a slick finish.
- 6) Manhole covers shall be Type "A" cast iron ring and cover and must conform to ASTM A 48. All sanitary manholes that lay along a stream, swale, or open storm channel shall have locking or bolt down lids with an inside seal between the lid and casting. Sanitary manholes are not permitted to be located in a stream, or in the flowline of a swale, or open storm channel. Manhole lids shall be stamped "SANITARY SEWER." Casting shall be East Jordan Ironworks 1020 casting and 1022 lid, Neenah R1772-C, or equivalent.

D) Bedding and Backfill

- 1) Contractor shall comply with Bedding and Backfill requirements as required by the Town of Fishers Construction Standard Details Sheets.

3.4 Execution

A) Pre-Construction Conference

- 1) Before the start of any construction on the project site, a conference must be scheduled and completed with the Town and the Town Inspector.

B) Permits

- 1) The Contractor or Property Owner must obtain sewer permits at one time. The sewer permit must be obtained before connection can be made.

C) Utility Locations

- 1) The Contractor is responsible for determining the location of existing utilities 24 hours prior to any construction or excavating.
- 2) Two-inch wide sewer detection tape shall be laid 12 inches above top of pipe including mainline and laterals prior to sewer backfilling.

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D) Bench Marks

- 1) Permanent benchmarks shall be located or installed by a registered land surveyor.
- 2) Permanent benchmarks shall be reinforced concrete monument with a minimum of 36" in length and with identification plate for benchmark data/identification.

E) Building Laterals

- 1) Tight fitting, PVC caps shall be installed on the end of each lateral stub. Also, a metallic marker must be placed at the end of each lateral for future locating.
- 2) Lateral connections to the mainline sewer must be wye connections; no saddle connections will be allowed. No lateral shall directly discharge to a manhole unless approved by the Director of Engineering.
- 3) Sewer laterals, under no condition shall be backfilled until the Director of Engineering or a representative has inspected and located all work.
- 4) Turns made in lateral alignment shall be accomplished by utilizing 22-degree and/or 45-degree elbow fittings. The utilization of 90-degree elbow fittings is not permitted.
- 5) Sewer laterals, under no condition shall be backfilled until the Director of Engineering or a representative has inspected and located all work.

F) Manholes

- 1) Manholes shall be placed on a minimum 12 inches of No. 8 crushed stone that has been mechanically compacted. Where unstable or poor soil conditions exist, additional No. 2 crushed stone or Class B concrete shall be placed to form a stable base. The remainder of the manhole shall be backfilled using No.53 or No.8 stone. Stone shall be placed in 6-inch lifts and mechanically compacted to 95 percent maximum dry density as determined by ASTM D 698.
- 2) Joint seal system (Kent-Seal or as approved by Town) shall be installed using the Manufacturers written instructions. The top of the manhole casting and cone section shall be joint-sealed with inspection prior to backfilling.
- 3) Connections to all manholes, new or existing, shall be core drilled and booted. These taps shall be cored into the manhole between the spring line of the sewer or no more

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than 24 inches above the flow line. Manhole connections shall not protrude past the interior of the wall of the manhole. All pipe connections to the manhole shall not be grouted to verify watertight installation.

- 4) Drop manholes shall be either precast or cast-in-place exterior drop manholes, installed with a 20-foot section of ductile iron pipe, upstream of drop, in accordance with the Fishers Standard Details. Ductile iron pipe must meet ASTM A 746 or ANSI/AWWA C151/A21.51 with exterior asphaltic coating (for buried service) and interior special asphaltic lining (for buried and exposed service) conforming to all appropriate requirements for seal coat described in ANSI/AWWA C104/A21.4. Thickness design of DI pipe must be in accordance with ANSI/AWWA C150/A21.50. Provide thickness class as indicated on construction plans, or as a minimum: six (6) to twenty (20) inch diameter – class 50, minimum.
- 5) All sanitary manholes shall be vacuum tested with castings per ASTM C 1244 93 following full installation. All sanitary manhole sections shall be vacuum tested in the shop prior to shipment.

G) Drainage

- 1) Roof drains, footing drains, sump pumps, and/or surface water drains shall not be connected to the sanitary sewer system, including temporary connections during construction.

H) Backfill

- 1) Bedding and backfill dimensions shall have a minimum trench width as designated on the standard construction details.
- 2) Fill placed under any street or sidewalk shall be compacted to 95 percent maximum density as determined by ASTM D 1557.

I) Safety and Spills

- 1) CONTRACTORS ARE SOLELY RESPONSIBLE FOR ALL SEWAGE SPILLS that occur as a result of their work. The Contractor must have an action plan to anticipate problems connecting to existing sewers and pumping sewage around a work site.

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- 2) CONTRACTORS ARE RESPONSIBLE FOR SAFETY AT THE JOB SITE. They shall make provisions for a safe working environment for their own crews, as well as Town personnel and inspectors. The project site shall be in compliance with all OSHA safety regulations, including but not limited to construction trench safety and confined safety entry regulations.
- 3) Should unknown active utilities be damaged during excavation work, work must be stopped immediately. Do not proceed with work until decision has been reached regarding repair, removal, or relocation of utilities. The Contractor must give notice to the appropriate utility.

J) Testing

1) Leakage Testing

- a) The Town shall be given 24 hour written notice of the required leakage testing procedure to be performed by the contractor. Contractor shall utilize a liquid-filled gauge for pressure measurements in test. Low pressure air shall be slowly introduced into the sealed line until the internal air pressure reaches 4 PSIG plus the groundwater head divided by 2.31 (maximum test pressure is 9 PSIG).
- b) At a stable internal air pressure within 0.5 PSIG of the initial internal air pressure, timing shall commence with a stopwatch or similar device of 99.8 percent accuracy. Timing shall end when the internal air pressure drops 1 PSIG below the stable internal air pressure.
- c) The line shall be accepted if the time shown in Tables 2, 3, and 4 for the designated pipe size and length elapses before the air pressure drops 1 PSIG below the stable internal air pressure at which time the test can be discontinued for the accepted line.

d) These tests shall be observed and certified by a representative of the Town.

TABLE 2	
In areas where groundwater is known to exist, the Contractor and Engineer shall determine the extent of groundwater over the invert of the pipe and apply additional pressure to the test pressure as follows. In no case should the starting test pressure exceed 9.0 psig.	
Extent of groundwater over invert of pipe	Pounds of pressure to be added to test pressure
1 feet	0.5
2 feet	0.8
3 feet	1.3
4 feet	1.7
5 feet	2.1
6 feet	2.6
8 feet	3.4
10 feet	4.3
12 feet	5.2

TABLE 3	
If the pressure does not fall below 2.5 psi from 3.5 psi in the following situations, the pipe will be accepted. The length of pipe shall be any length between manholes.	
Size (inches)	Time allowed for pressure to drop from 3.5 to 2.5 psi
6	3 minutes
8	4 minutes
10	5 minutes
12	5-1/2 minutes
15	7-1/2 minutes
18	8-1/2 minutes
21	10 minutes
24	11-1/2 minutes
27	13 minutes
30	14-1/2 minutes
33	15-1/2 minutes
36	17 minutes
TABLE 4	
If the pipe does not meet the above test, the time shall be computed by the following expression: t = k / c	
where t =	time in seconds for air pressure inside of pipe to decrease from 3.5 to 2.5 psi
k =	0.011 x d ² x L
c =	0.0003883 d x L (if c is 1, or less, use value of 1 for c)
d =	inside pipe diameter of pipe under test (inches)
L =	length of pipe under test (feet)

2) Mandrel Testing and Televising

- a) A 5 percent "GO-NO-GO" Mandrel Deflection Test shall be performed on all gravity sanitary sewer pipes.
- b) These pipes shall be mandrelled with a rigid device sized to pass 5 percent or less deflection (or deformation) of the base inside diameter of the pipe. The mandrel test shall be conducted no earlier than 30 days after reaching final trench backfill grade, provided that in the opinion of the Engineer sufficient water densification or rainfall has occurred to thoroughly settle the soil throughout the entire trench depth. If densification, in the opinion of the Director of Engineering, has not been achieved within the 30 day time frame, the mandrel size shall be increased to measure a deflection limit of 3 percent.
- c) The mandrel (GO-NO-GO) device shall be cylindrical in shape and constructed with 9 or 10 evenly spaced arms or prongs. Mandrels with fewer arms shall not be allowed due to being insufficiently accurate. The mandrel diameter dimension "D" shall be equal to the inside diameter of the sanitary sewer. Allowances for pipe wall thickness tolerances or ovality (from heat, shipping, poor production, etc.) shall not be deducted from the "D" dimension, but shall be counted as part of the 5 percent or lesser deflection allowance. Each pipe material/type required to be Mandrel tested shall be tested with a mandrel approved by the pipe manufacturer and meeting the requirements of this Section. The "D" mandrel dimension shall carry a tolerance of +/-0.01 inches.
- d) The mandrel shall be hand pulled through all sewer lines and any section or sewer not passing the mandrel shall be uncovered, replaced or repaired to the Engineer's satisfaction and retested.

- e) The contact length (L) shall be measured between points of contact on the mandrel arm. The length shall not be less than as shown on Table 5 below:

TABLE 5			
9 Arm Mandrel Deflection			
D DIMENSIONS FOR ASTM D3034- SDR 35 Sewer Pipe			
Nominal Diameter (inches)	Length (inches)	3% Deflection (inches)	5% Deflection (inches)
8	8	7.71	7.56
10	10	9.63	9.45
12	10	11.46	11.26
15	12	14.03	13.78
10 Arm Mandrel Deflection			
D DIMENSIONS FOR ASTM D3034- SDR 35 Sewer Pipe			
Nominal Diameter (inches)	Length (inches)	3% Deflection (inches)	5% Deflection (inches)
8	8	7.71	7.58
10	10	9.65	9.48
12	10	11.48	11.29
15	12	14.06	13.82

- f) Contractor shall provide proving rings to check the mandrel. Drawings of mandrels with complete dimensions shall be furnished by the Contractor to the Town upon request for each diameter and specification of pipe.

g) Testing Form: Contractor must submit the results of the mandrel test with the following information:

- Project Name
- Contractor
- Date of Test
- Manhole ID numbers
- Diameter of Sewer (Inches)
- Type of Mandrel (9-arm, 10-arm)
- Proving Ring Check (serial number of proving ring)
- Pass/ Fail
- Testing Operator's Signature
- Town Representative's Signature

3) Manhole Testing

- a) All manholes must be vacuum tested after installation, repair or modification.
- b) The Town may require additional vacuum tests if the manhole casting is not bolted to the structure prior to the test.
- c) Manhole boots must be secured to prevent movement while the vacuum is drawn.
- d) Installation and operation of vacuum equipment and indicating devices must be in accordance with manufacturer's recommendations and performance specifications that have been provided by the manufacturer and accepted by the Town.
- e) All manholes shall be negative air pressure (vacuum) testing methods in accordance with ASTM C1244-93. These tests shall be performed by the Contractor and observed and confirmed by a representative of the Town.
- f) Stub outs, manhole boots and pipe plugs must be secured to prevent movement while the vacuum is drawn.

- g) Installation and operation of vacuum equipment and indicating devices must be in accordance with manufacturer's recommendations and performance specifications that have been provided by the manufacturer and acceptable to the Town.
- h) Procedures: With the vacuum tester set in place:
 - i) Inflate the compression band to 40 psi to affect a seal between the vacuum base and the structure.
 - ii) Connect the vacuum pump to the outlet port with the valve open.
 - iii) Draw a vacuum 10" of Hg. and close the valve.
- i) Acceptance standards for leakage will be established from the elapsed time for a negative pressure change from ten (10) inches to nine (9) inches of mercury. The maximum allowable leakage rate for a four-foot diameter manhole must be in accordance with Table 6 below:

TABLE 6	
Manhole Depth	Minimum Elapsed time for a Pressure Change of 1 Inch HG
10 ft or less	60 seconds
10 feet < Depth < 15 feet	75 seconds
15 feet < Depth < 25 feet	90 seconds

For manholes five feet in diameter, add an additional 15 seconds and for manholes six feet in diameter, add an additional 30 seconds to the time requirements for four-foot diameter manholes. For all manholes deeper than 25 feet, the Director of Engineering will determine the applicable minimum elapsed time.

- j) Retest:
 - i) If the manhole fails the test, necessary repairs must be made and the vacuum test and repairs must be repeated until the manhole passes the test.
 - ii) If manhole joint seals are pulled out during the vacuum test, the manhole must be disassembled and the joints replaced.
- k) Visual:
 - i) Manholes will be subject to visual inspection with all visual leaks being repaired.

- l) Testing Form:
 - i) Contractor must submit the results of the vacuum test with the following information:
 - Project Name
 - Contractor
 - Date of Test
 - Manhole ID number
 - Manhole Diameter
 - Manhole Depth
 - Test Duration (Seconds)
 - Pressure Drop (Inches of Mercury)
 - Pass/ Fail
 - Testing Operator's Signature
 - Engineer's Representative Signature

4) Closed Closed Circuit Television Inspection

- a) Sections of sewer will be inspected by closed circuit television at the discretion of the Fishers Director of Engineering. All television inspections must be performed in a manner acceptable to the Director of Engineering.
- b) The Contractor must furnish all equipment, a qualified television technician, a trained supervisor and sufficient personnel to perform all the work required in the inspection operation.
- c) The Contractor must furnish spare cameras and related equipment to prevent delays due to equipment breakdowns. Cameras must be equipped with remote-control focusing devices, remote-control devices to adjust the light intensity and enough cable must be furnished to inspect one thousand (1,000) lineal feet of sewer in a continuous operation. The camera must be small enough to pass through a six (6) inch opening.
- d) The Contractor must clean the sewer, where required, one section at a time. After the sewer is cleaned, the television camera must be attached to the end of a cable

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so that it can be pulled through the pipe. The camera must trail a line of steel cable which will be attached to a winch of sufficient size to be able to pull back or retrieve the camera whenever necessary.

- e) The camera must transmit a continuous color image to the color television monitor. This image must be clear and sharp enough to enable those viewing the monitor to be able to easily see the interior condition of the pipe being inspected. A continuous distance log, zeroed at the starting manhole, must be displayed on the monitor at all times.
- f) For each television inspection unit being used, the Contractor must provide a mobile air-conditioned viewing room large enough to accommodate at least three (3) people for the purpose of viewing the monitor while the inspection is in progress. Minimum size of the monitors will be seventeen (17) inches, measured diagonally across the viewing screen.
- g) The Contractor must furnish all equipment required for making a continuous VHS videotape of the view which appears on the monitor.
- h) The Town of Fishers Director of Engineering must be present at all times during television inspection of the sewers and will indicate to the Contractor whatever data is required to be logged and prepared for record purposes. The Contractor must prepare and furnish to Town of Fishers Director of Engineering and the Developer not less than two (2) copies of the final record, videotape and report of all inspection work done.
- i) Final Inspection
 - i) Within six (6) months prior to conveyance, the Town of Fishers Director of Engineering will conduct an inspection ("Final Inspection") at Developer's expense. The Final Inspection will consist of a walk-through and television inspection of the Project to identify any defects. The Final Inspection may also consist of flow monitoring, and smoke, infiltration, exfiltration, vacuum, deflection or low-pressure air tests as determined by The Town of Fishers Director of Engineering.

- ii) After the Final Inspection has been performed, the Town of Fishers Director of Engineering will provide a written summary, or punch list, of items which require corrective action. Developer must complete all punch list items within forty-five (45) days from the date of issuance of the punch list. If, after the above forty-five (45) day period has expired, and in sole opinion of Town of Fishers Director of Engineering, the punch list items have not been corrected, then the Contractor and/or Developer may be required to pay the Town of Fishers \$100 per day damages until the items are corrected.
- iii) Developer must rectify all defects identified during the Final Inspection in a manner acceptable to The Town of Fishers prior to Sanitary Sewer Facilities being conveyed to Fishers.

Section 4. Sanitary Sewer Pump Station/Force Main

4.1 General

This section includes specifications for sanitary sewer pump station/ force main systems.

A) Details

- 1) All construction details shall be as shown on "Town of Fishers Standard Construction Details," latest revision. The Town must approve any other alternative method, discrepancy, omission, or duplication of specification standards.

B) Construction Plans

- 1) The plans for the installation of a sanitary sewer system shall be provided by the Petitioner and approved by the Town. Upon the completion and one week prior to acceptance, the Contractor must submit record drawings certified by a registered Indiana Professional Engineer or Land Surveyor for the installed sanitary sewer system to the Town.

C) Standards

- 1) Design, construction, and testing must comply with ASTM and IDEM standards.

D) Responsibilities

- 1) The Property Owner shall be responsible for all approvals, permits, and easements.

E) Submittals prior to construction

- 1) These submittals shall be given to a Town representative prior to construction:
 - a) Shop drawings for all sanitary sewer materials, including pipe, pipe couplings, wyes/tees, pump station structures and equipment, air release valve cleanout structures/equipment shall be submitted to the Town. Shop drawings shall be signed and sealed for compliance to specifications by the Contractor, and, reviewed and stamped by the Project Engineer with comments to the Contractor requiring compliance with Project Plans and Specifications.
 - b) Proposed detailed construction sequence including schedule for bypass pumping and connection to existing sanitary sewer system.

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- c) Permit for excavation within the Right-of-Way permit, if applicable.
- d) Copies of IDEM construction permit and all correspondence concerning deficient plans or approval of plans.

F) Submittals prior to Town Acceptance

- 1) These submittals shall be given to a Town representative prior to Town Acceptance:
 - a) Hydrostatic, vacuum, and pump-down tests.
 - b) One set of record drawings showing information including, but not limited to, the following: building lateral locations, invert elevations, top of casting elevations, horizontal locations, and other utility information encountered during construction. Upon completion of all improvements and installations accepted by the Town, Digital Plan information and Record Drawings certified by a registered Indiana Professional Engineer or Land Surveyor shall be submitted to the Town in accordance with "The Submission of Record Drawings and The Standardization of the Digital Information Submittal Format" adopted by the Town Council on September 7, 2004. A copy of the submittal standards is available from the Director of Engineering. The Record Drawings shall indicate Town supplied manhole numbers. These manhole numbers will be issued to the Director of Engineering after the paper format is submitted.

G) Operation and Maintenance Manuals

- 1) Four (4) operation and maintenance manuals shall be submitted to the Town of Fishers
- 2) Manuals shall include, at a minimum:
 - Operation instructions
 - Maintenance instructions
 - Recommended spare parts list
 - Lubrication schedules
 - Structural diagrams
 - As-built wiring diagrams
 - Bill of materials

- H) Pump warranty, provided by the pump manufacturer, shall be submitted to the Town of Fishers for review and approval. The pump warranty shall warrant the units being supplied

to the Owner against defects in workmanship and materials for a period of five (5) years under normal use, operation and service. The warranty shall be in printed form and apply to all similar units.

4.2 Design

A) Benchmarks

- 1) Permanent and temporary elevation benchmarks shall be referenced on the plans.

B) Force Main Size

- 1) Force mains shall be sized to maintain a minimum cleansing velocity of 2 feet per second.
- 2) Velocities in force mains greater than eight (8) ft/s are not acceptable.
- 3) Force mains shall be a minimum of 4 inches in diameter unless approved by the Town. Minimum acceptable force main diameter, for use with grinder pumps, shall be two (2) inches.
- 4) "Common force main systems" will not be permitted. "Low pressure force main systems" will be reviewed by the Town on a case-by-case basis.
- 5) Force mains shall be designed to resist hydraulic forces and prevent water hammers.

C) Alignment

- 1) Sanitary sewer facilities and water mains shall be laid with at least a 10-foot horizontal separation distance, measured edge to edge. In cases where it is not practical to maintain a 10-foot separation, deviation may be allowed on a case-by-case basis.
- 2) There must be a minimum 18 inches vertical separation between the two pipes for crossings of water mains and sanitary sewer facilities, measured from the outside of the sanitary sewer facility to the outside of the water main. The crossing shall be arranged so that the sanitary sewer facility joints will be equidistant and as far as possible from the water main joints.
- 3) All sanitary sewer facilities shall have a minimum separation from drinking water wells in accordance with the Ten States Standards, current version.

- 4) All sanitary sewer facilities shall be a minimum of 10-feet horizontally from top bank of all ditches, creeks, and ponds.
- 5) Castings shall be located so that drainage flows away from the casting.

D) Minimum Cover

- 1) A minimum depth of cover for force mains shall be 54 inches.

E) Elevations

- 1) Force main high points: Air/vacuum relief valves shall be located at all high points along the force main. Additional valve placement may be required as directed by the Director of Engineering.
- 2) Force main low points: Clean out valves shall be located at all low points along the force main. Additional valve placement may be required as directed by the Director of Engineering.

F) Pump Station Structures and Equipment

- 1) Sanitary sewer pump stations will be permitted only upon the submittal of an economic analysis to the Director of Engineering, proving to the satisfaction of the Director that the pump station exhibits a lower 50-year life cycle cost than that of a gravity sewer.
- 2) Design Engineer shall obtain approval on pump station /force main design prior to construction. Design Engineer shall submit the following documentation to the Fishers Director of Engineering for review and approval:
 - a) Project plans and specifications
 - b) Force main head calculations.
 - c) Plots of pump curve and system curve, provided in feet of total dynamic head (TDH) versus gallons per minute of flow, with complete force main head calculations supporting curves.
 - d) Wet well detention/float setting calculations.
 - e) Buoyancy calculations for all pump station structures. Minimum safety factor of 2.0 shall be utilized.

- 3) All wet wells shall be designed for ultimate peak flow in accordance with flows required by Fishers Planning Department.
- 4) High water alarm shall be six inches below flow line of the lowest incoming pipe.

G) Easements

- 1) The developer will be responsible for providing a permanent easement for the placement of the pump station, to be dedicated to the Town of Fishers. The dimensions and boundaries of the easement shall be approved by the Fishers Director of Engineering.
- 2) Should it be necessary to install force mains outside of public right-of-way, the developer will be responsible for providing permanent easements, to be dedicated to the Town of Fishers.
- 3) The minimum required width of the permanent easements for force mains shall have a minimum width of 20 feet.
- 4) All force mains shall be centered in the easement.

4.3 Materials – Submersible Pump Station Structures and Equipment

A) General Requirements

- 1) Furnish all labor, equipment and material to construct a submersible pumping station consisting of pumps, motors, wet well, separate valve vault, separate meter pit, valves, piping, hatches, guide rails, pump removal components, control center, mercury float switches, remote monitor package, interconnecting electrical wiring, incoming power supply and all other features regularly and normally required as a part of a complete and functional facility. All work to be in accordance with site requirements, details in the plans, these specifications and the manufactures recommendations.
- 2) All of the mechanical and electrical equipment shall be an integral package supplied by the pump manufacturer with local representation so as to provide undivided responsibility. The package shall be equal in construction and performance to Hydromatic Pump equipment and other specific requirements set forth herein and in the approved plans.

- 3) Any exceptions to this specification or associated approved plans shall be submitted in writing and clearly stated. The exceptions must be approved by the Project Engineer and the Town of Fishers prior to proceeding with work.
 - 4) All components of the pump station that are exposed to weather shall be constructed of material that is resistant to corrosion and will not surface protection throughout the expected life of the pump station. In general, these materials are stainless steel, aluminum, fiberglass reinforced polyester (FRP) and ultraviolet stabilized PVC.
- B) Operating Conditions of pump station shall be determined by the Project Engineer and approved by the Town of Fishers.
- C) Pumping Equipment:
- 1) Pumps shall be of the submersible type for handling raw unscreened sewage. Pump volute, motor and seal housing are to be high quality gray cast iron. Impeller shall be either cast iron or cast bronze of a non-clog design capable of handling minimum 3-3/4" sphere solids, fibrous material, heavy sludge and other matter found in normal sewage applications. Impeller shall have pump out vanes on the back shroud of the impeller to keep pumped material away from the seal area and increase operating life. Impeller shall be either slip fit or taper fit with key to securely lock the impeller to the driving shaft. The pump volute shall be fit with a replaceable bronze wear ring to minimize wear on the impeller and help achieve longer balanced operating life. All fasteners shall be of stainless steel. The Town of Fishers provides an option, upon request by the Director of Engineering, for the project pump specifications to provide "cutter" or "chopper" type pumps, based on the quantity of fibrous materials in the raw wastewater accepted by the proposed pump station.
 - 2) All mating surfaces where water tight sealing is required shall be machined and fitted with nitrile rubber O-rings. Sealing shall be accomplished when metal-to-metal contact is made, resulting in controlled compression of the rubber O-rings without requirement of a specific torque limit.
 - 3) The pump shall be provided with a mechanical rotating shaft seal system running in an oil reservoir having separate, constantly lubricated lapped seal faces. The lower seal unit between the pump and oil chamber shall consist of one (1) stationary seat and one (1) rotating ring held in place by its own spring. The lower seal shall be removable without

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disassembling the seal chamber. The upper seal between the motor and the seal chamber shall be of the same design with its own separate spring system. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. Seal shall be fitted on a 303 stainless steel shaft sleeve. Shaft seals with conventional double seal utilizing a single spring between the two seals and requiring a pressure differential to offset external pressure shall not be considered acceptable nor equal to the dual independent seal system specified. The shaft sealing system shall be capable of operating submerged to pressures equivalent to two hundred (200) feet. No seal damage shall result from operating the pump unit out of its liquid environment. The seal system shall not rely upon the pumped media for lubrication. The seal chamber shall also be equipped with a seal failure sensor probe which will sense water intrusion through the lower seal. This sensor is to be connected to an alarm in the control panel to indicate lower seal failure.

- 4) The stator winding, rotor and bearings are to be mounted in a sealed submersible type housing. Insulation utilized in the stator windings shall be class F with maximum temperature capability of 155 degrees Centigrade. Motor housing shall be filled with a high-dielectric oil to give superior heat transfer and allow the bearings to run in a clean, well lubricated environment; or the housing shall be air filled with grease lubricated bearings. The pump and motor are to be specifically designed so that they may be operated partially or completely submerged in the liquid being pumped. The pump should not require cooling water jackets. Stators shall be securely held in place with a removable end ring and threaded fasteners so that it may be easily removed in the field without use of heat or a press.

Shaft shall be of stainless steel and supported by ball bearings. Motor shall be provided with heat sensing units attached to the motor windings, which shall be connected to the control panel to shut down the pump if overheating occurs.

- 5) Pump motor cable and heat sensor /seal failure sensor cable shall be suitable for submersible pump applications and this shall be indicated by a code or legend permanently embossed on the cable. Cable sizing shall conform to NEC specifications for pump motors and shall be of adequate size to allow motor voltage conversion without replacing the cable. Cable of the proper length shall be provided to eliminate the need for splices or junction boxes between pump and 'Control Center'. The cable shall enter

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the motor through a cord cap assembly which is double-sealed allowing disassembly and disconnect of the wires at the motor and still not damage the sealed characteristics of the motor housing.

- 6) The pump mounting base shall include adjustable guide rail supports and a discharge connection with a one hundred twenty-five (125) pound standard flange. The base and the discharge piping shall be permanently mounted in place. The base plates shall be anchored in place utilizing epoxy type anchors with stainless steel studs and nuts as manufactured by HILTI Fasteners, Inc.
- 7) All piping inside pump station wet well, valve vault and meter pit structures shall be ductile iron pipe, and extended ten feet outside of each structure, in accordance with the ductile iron force main pipe section of these specifications.
- 8) A rail system shall be provided for easy removal of the pump and motor assembly for inspection and service. The system shall not require a man to enter the wet well to remove the pump and motor assembly. Two (2) rails of two (2) inch stainless steel pipe or one (1) rail of fiberglass reinforced plastic (FRP) I-Beam shall be provided for each pump. The guide rails shall be positioned and supported by the pump mounting base. The guide rails shall be aligned vertically and supported at the top by an attachment to the access hatch frame. One (1) intermediate guide rail support is required for each fifteen (15) feet of guide rail length for stainless steel pipe and one for each nine (9) feet of guide rail length for FRP I-Beam rail.
- 9) The pumps shall be equipped with sliding brackets or rail guides. To insure easy removal of the pumps, the rail guides attached to each pump shall not encircle the rails. A stainless steel lifting chain of adequate length for the wet well depth shall be provided for each pump.
- 10) The rails and rail guides shall function to allow the complete weight of the pumping unit to be lifted on dead center without binding and stressing the pump housing. The rail system shall function to automatically align the pumping unit to the discharge connection by a simple downward movement of the pump. No twisting or angle approach will be considered acceptable. The actual sealing of the discharge interface will be of the hydraulically sealing diaphragm type assembly with removable Buna-N diaphragm as supplied by Hydromatic Pump.

D) Wet Well, Valve Vault, Meter Pit and Accessories:

- 1) The wet well, valve vault, and meter pit are to be constructed of precast concrete. The actual arrangement of the structures is to be as shown in the approved plans. The wet well top shall be provided with a four (4) inch PVC vent having a downward pointing inlet and screen over the inlet opening. The Town of Fishers provides an option, upon request by the Director of Engineering, for the project specifications to require a carbon filter on the vent based on the need for odor control.
- 2) The wet well, valve vault, meter pit, flat tops and base slabs are to be constructed of precast reinforced concrete manhole sections conforming to ASTM C-478. All joints between precast sections shall be made with an approved rubber O-ring in accordance with ASTM C-443. In addition, the outside wall below grade is to be coated with bituminous waterproofing material. The top and bottom of the chambers shall be precast or may be poured in place concrete if approved by the Project Engineer and the Town of Fishers. Steps shall be provided in the valve vault and meter pit only.
- 3) The pump supplier shall to provide an aluminum two (2)-door (for duplex pump station), or, three (3)- door (for triplex pump station) access hatch frame and door assembly to be installed in the concrete wet well top. This door assembly shall provide access for removal of the pumps and shall support the guide rails. The doors shall be provided with lifting handle, safety latch to hold door in the open position and a hasp suitable for a padlock. The doors shall have a non-skid finish.
- 4) An aluminum single door access hatch frame and door assembly, similar to the one described above, shall be provided for use as entry to the valve vault and the meter pit. Minimum opening for the valve box entry shall be thirty-six (36) inches by thirty-six (36) inches. The valve vault door shall be offset over the steps provided in the valve vault.
- 5) A rubber flapper check valve (APCO Valve Series 100 or Town-approved equal) and an eccentric plug valve (Clow Corporation Valve Division, or Town- approved equal) shall be installed in the valve vault in each pump's discharge piping. All piping from pump base elbows, through the valve vault and exiting the valve vault shall be ductile iron. All elbows, tees and cross piece fittings shall be cast iron. A PVC drain pipe and check valve shall be installed to drain the valve vault back to the wet well.

- 6) An additional eccentric plug valve (Clow, or Town- approved equal) shall be provided in the valve vault to allow access to the force main for bypass pumping. The bypass valve shall have an upward directed elbow and a 6" male aluminum Cam Lock fitting to allow attachment of Town owned bypass pumping equipment. The wet well shall be provided with a 6" ductile iron suction pipe for use in bypass pumping. The pipe shall be protruded through the wet well top and be provided with an elbow and 6" male aluminum Cam Lock fitting with cap.

E) Disconnect Switch:

- 1) A single main fusible or breaker disconnect switch of adequate size to provide power for the 'Control Center' and its related components shall be provided by the Contractor.
- 2) The disconnect switch shall be housed in a NEMA 4X stainless steel enclosure with an external operation handle capable of being locked in the ON position.

F) Control Center:

- 1) The control center shall be built in a NEMA 4X stainless steel enclosure and shall be suitable for the specified horsepower and voltage for the pumping equipment. The outer door of the panel shall be hinged dead front with provisions for locking with a padlock. Inside shall be a separate hinged panel to protect all electrical components. H-O-A switches, run lights, circuit breakers, etc. shall be mounted such that only the faces protrude through the inside swing panel and no wiring is connected to the back side of the inside swing panel.
- 2) A circuit breaker and NEMA rated starter with three (3) leg overload protection and manual reset shall be provided for each pump. Starters shall have auxiliary contacts, on three phase applications, to operate both pumps on over-ride condition. A separate circuit breaker shall be supplied for power to the control circuit. The control center shall include an extra circuit breaker of adequate size to provide 115 volt, single (1) phase power for remote monitor panel. The control center shall include a voltage transformer to reduce supply voltage such as 115 volt, single (1) phase and 12 volt transformers for pump controller voltage. Included in the panel shall be a duplex pump controller model 11967-5 by Digital Control Corp and shall be SCADA ready. A green light and H-O-A switch shall be provided for each pump. A terminal strip shall be provided to make field

connections of pump power leads, float switches, seal sensor leads, and remote monitor panel interconnections.

- 3) A time delay relay shall be provided to delay start of second pump should power outage occur.
- 4) The control center shall incorporate connections for heat sensors which are installed in the pumps. The connection shall disconnect the starter upon high temperature signal, and will automatically reconnect when condition has been corrected.
- 5) The control center shall incorporate connections for seal failure sensors which are installed in the pumps. The panel will have a seal failure alarm light for each pump. This alarm indicates failure of the lower mechanical seal in the pump. This will be an alarm light only and will not shut down the pump.
- 6) The control center shall include an hour meter for each pump to register the elapsed operating time of each pump.
- 7) The control center shall have a high water alarm built-in the main enclosure. The high water alarm shall consist of a flashing alarm light with red Lexan plastic cover or red glass globe with metal guard mounted on top of the enclosure such that it is visible from all directions. An alarm horn shall be mounted on the side of the enclosure. A push to test horn and light button as well as a push to silence horn button shall be provided and mounted on the side of the enclosure.
- 8) The control center shall include a condensate heater to protect against condensation inside the enclosure. The heater shall be placed so as not to damage any other component or wiring in the control center.
- 9) The control center shall include lightning protection and a phase monitor relay to shut down the control circuit and protect the equipment due to loss of phase or phase reversal. The three phase sequence voltage relay shall be of the eight pin connector type.
- 10) The control center shall incorporate an alternator selector switch to allow selection of automatic alternation or manual selection of the lead pump.
- 11) The control center shall include a GFI convenience outlet with a 20 AMP breaker and suitable transformer or power supply to provide 110 single (1) phase power to the convenience outlet.

- 12) The control center shall be suitable for connection to a remote monitor package. The main control must include the following interconnection capability:
- Circuit breaker to power remote monitor panel as described above.
 - Relay contact to signal high water alarm.
 - Relay contact to signal tripping of the overload of any of the pumps.
 - Relay contact to transmit signal of seal failure trip of any of the pumps.
- 13) A minimum four (4) inch PVC schedule 40 wall conduit shall be provided from the wet well to the control center which will allow the pump power cables, sensor cables and float switch cables to be pulled through without difficulty and allow the use of one (1) piece cables from the pumps and float switches to the control center. The conduit shall be sealed at the control center to avoid entrance of sewer gases into the control panel.
- 14) The control center and associated components shall be mounted on a panel stand constructed of aluminum.
- 15) All components of the control center shall be American made and available from local sources. In particular, items such as circuit breakers, overload protection, relays, etc. shall be available and in stock by local sources.
- 16) In order to maintain unit responsibility and warranty on the pumping equipment and control center, the control center must be accepted in writing by the pump manufacturer, as suitable for operation with the pumping equipment.

G) Level Control:

- 1) Primary level control and alarm signal shall be a submersible pressure transducer with a 4-20mA output signal for the pump controller. The Town of Fishers provides an option, upon request by the Director of Engineering, for the pump station specifications to provide ultra sonic level sensors, in lieu of pressure transducers.
- 2) Back-up level control shall be sealed float type "low mercury" or "no mercury" switches control sump level and alarm signal. The tube switches shall be sealed in a solid polyurethane float for corrosion and shock resistance. The support wire shall have a heavy Neoprene jacket and a weight shall be attached to the cord above the float to hold the float in place in the sump. The floats shall also be capable of supporting themselves

from a wiring channel support bar or capable of being attached to a plastic chain with weight at the bottom of the chain.

H) Manual Transfer Switch – The contractor shall supply and install a three way switch lockable in all positions for the town’s emergency generator. A three-pole, weatherproof receptacle shall be installed in the electric plane, and a power cable provided to connect the emergency generator to the receptacle. The Design Engineer shall coordinate with the Fishers Director of Engineering to provide compatibility of switch and cable with the town’s generator. The Director of Engineering will have the option to specify on-site emergency generator set for the project pump station.

I) Cedar Fences

1) Product

a) All wood products incorporated into the fence must be select Western Red Cedar graded as #2 Premium Select by the Western Wood Products Association.

b) The wood must be of the nominal dressed dry size indicated on the Cedar Fence Detail of The Town of Fishers’ Pump station and Force Main Standard Details sheet.

2) Top, Bottom and Mid Rails

a) Fence must have continuous top, bottom and mid rails of cedar two by fours (2" x 4") for its full length.

b) Rails must be attached to posts with a galvanized wood adapter clamp designed for that purpose.

3) Terminal, Corner and Gate Posts

a) Posts must be four (4) inch outside diameter galvanized pipe weighing 5.79 pounds per lineal foot.

b) Roll form sections, schedule 40 or equal.

c) Posts must have ball caps on top to exclude moisture.

d) Posts must be braced with tension bars and truss rods to adjacent line post.

e) As an alternate, four (4) inch by four (4) inch treated lumber corner posts may be used except on the face of the gate.

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4) Line Posts

- a) Line posts must be three (3) inch outside diameter galvanized pipe weighing 2.72 pounds per lineal foot.
- b) Roll form sections, schedule 40, or equal.
- c) Posts must have ball caps on top to exclude moisture.
- d) As an alternate, four (4) inch by four (4) inch treated lumber line posts may be used except on the face of the gate.

5) Tension Bars and Truss Rods

- a) Tension bars for braces must be hot-dipped galvanized and have a nominal size of three eighths (0.375) inch by three quarter (0.75) inch.
- b) Truss rods for braces must be hot-dipped galvanized and be three eighths (0.375) inch diameter.

6) Fittings

- a) All caps, beveled tension and brace bands and connectors must be galvanized pressed steel, malleable steel or cast steel.

7) Gate Frames

- a) Gate frames must be constructed of schedule 40 pipe. The minimum pipe diameter for gate frames must be two and an half (2.5) inch; however, larger diameter pipe may be required for gate leaves wider than seven (7) feet. Gate frames must be of welded construction and all welds cleaned and touched up. Bars, fittings, caps and other components used in construction of gates must be the same grade as previously specified.
- b) The minimum width of vehicle access gates must be fourteen (14) feet.

8) Appurtenances

- a) Engineer must approve all hardware (latching, hinges, locking devices, etc.). Samples or shop drawings must be submitted to the Director of Engineering for approval.

- b) All gate hardware must be of heavy duty industrial design. Hardware subject to movement must be field painted with touch-up paint specifically formulated for this purpose.
- c) Double swing gates must have hold-closed and hold-back devices installed to engage frames in closed and open (minimum ninety (90) degree) positions. Latching devices must have provisions for the Town of Fishers' padlocks (purchased from the Town of Fishers).

4.4 Materials – Force Main System

A) Force Main

1) PVC Pipe

- a) PVC pipe must meet ANSI/AWWA C900 for 4-inch pipe or ASTM D 2241. The design and manufacture of pipe must meet minimum requirements of a working pressure of 150 pounds per square inch plus 100 pounds per square inch surge and a safety factor of 2 at the depth of cover indicated on the plans. Wall thickness of pipe and integral bell must have a minimum dimension ratio of 21 (SDR or DR).
- b) PVC compounds shall equal or exceed ASTM D 1784 class 12454-B.
- c) Push-on joints with bell integrally cast into pipe shall be provided. The joint must comply with ASTM D 3139 and the physical requirements of Uni-Bell PVC Pipe Association' UNI-B-1 "Recommended Specifications for Thermoplastic Pipe Joints, Pressure and Non-Pressure Applications."
- d) Elastomeric gaskets, as provided in ASTM F 477 shall be used. Gaskets must meet all applicable requirements of ANSI A-21.11.
- e) PVC fittings for pipe smaller than 4 inches must be fabricated in such a manner as will provide strength and water tightness at least equal to the class and material of the adjacent main line pipe to which they are joined. Pipe 4 inches and larger must utilize ductile iron fittings.

2) HDPE Pipe

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- a) Materials used for the manufacture of HDPE pipe and fittings must be extra high molecular weight, high density HDPE 3408 polyethylene resin. The pipe must be extruded from virgin resin meeting the specifications of ASTM D 3350 with a minimum cell classification of HDPE 345434C. Fittings must be manufactured from the same resin type and cell classification as the pipe itself.
- b) The pipe and fittings must contain no recycled compound except that generated in the manufacturer's own plant from resin of the same raw material.
- c) The material must be listed by PPI ("Plastics Pipe Institute", a division of the Society of the Plastics Industry) in its pipe grade registry technical report (TR).
- d) A 73° Fahrenheit hydrostatic design basis of 1,600 pounds per square inch and a 140° Fahrenheit hydrostatic design basis of 800 pounds per square inch.
- e) The manufacturer must conform to ISO 9001.
- f) Pipe supplied must have a nominal iron pipe size outside diameter.
- g) Pipe and fittings having a diameter of 3 inches and larger must be made to the dimensions and tolerances specified in ASTM F 714 with a cell class of PE 345434C. Pipe and fittings with diameters less than 3 inches must be made to the dimensions and tolerances set forth in ASTM D 3035 with a cell class of PE 3408.
- h) Fittings must be manufactured in accordance with ASTM D 3261. Fittings must be manufactured by injection molding, a combination of extrusion and machining, or fabricated from PE pipe conforming to this specification.
- i) Fittings must be fully pressure rated and provide a working pressure equal to that of the adjacent pipe with an included 2-to-1 safety factor.
- j) The pipe and fittings must be homogeneous throughout and free of visible cracks, holes, voids, foreign inclusions, or other defects that may affect the wall integrity.
- k) The pipe and fittings for horizontal directional drilling must be a minimum DR of 9. Pipe and fittings used in open cut installations must be a minimum of DR 11.
- l) Joints
 - i) The butt fusion process should be used to join sections of HDPE pipe into continuous lengths above ground at the job site. The joining method must be by

the heat fusion method and must be performed in strict accordance with the pipe manufacturer's recommendations. The heat fusion equipment used in the joining procedures must be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements, alignment and interracial fusion pressure.

- ii) Properly executed electrofusion fittings may be used.
 - iii) Socket fusion, extrusion welding, hot gas welding or threading and gluing of HDPE pipe will not be accepted.
 - iv) Mechanical joint adapters are required to mechanically connect HDPE pipe to main line valves 3 inches or larger. Two-inch valves and smaller must be connected by compression fittings.
 - v) Refer to the manufacturer's recommendations for proper installation procedures.
 - vi) Fused segments of pipe must be handled so as to avoid damage to the pipe. Chains or cable type chokers must be avoided when lifting fused sections of pipe. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections.
- 3) Ductile Iron (DI) Pipe
- a) Ductile iron pipe must meet ASTM A 746 or ANSI/AWWA C151/A21.51 with exterior asphaltic coating (for buried service) and interior special asphaltic lining (for buried and exposed service) conforming to all appropriate requirements for seal coat described in ANSI/AWWA C104/A21.4. Thickness design of DI pipe must be in accordance with ANSI/AWWA C150/A21.50.
 - b) Provide thickness class as indicated on Construction Plans, or, as a minimum:
 - i) Four (4) inch diameter – Class 51, minimum.
 - ii) Six (6) to twenty (20) inch diameter – Class 50 minimum
 - c) All DI pipe, fittings and restrained joints must be wrapped with a minimum of eight (8) mil polyethylene conforming to ANSI/AWWA C105/A21.5 prior to being backfilled. Polyethylene adhesive tape is required for closure of all open edges against pipe or fitting.

- d) All exposed DI pipe, including pipe with pump station/force main manholes, must be painted with three (3) coats of Tnemec Company, Inc. two (2) part epoxy paint Hi-Build Epoxoilne Series 66 (66-INO1) as supplied by JD Petro o Franklin, IN .
 - i) All surfaces must be cleaned as directed by paint manufacturer and Engineer but at a minimum the exposed wet well piping must receive SSPC. The Society for Protective Coatings (“SSPC”) SSPC-SP5/NACE 1 white metal blast cleaning and valve vault piping must receive SSPC-SP3 power tool cleaning.
 - ii) Thinning of factory mixed paint will not be permitted.
- e) Joints on DI pipe must be the integral bell type push-on joint meeting ANSI/AWWA C111/A21.11 mechanical joint (“MJ”) meeting ANSI/AWWA C111/A21.15 or flanged joint meeting ANSI/AWWA C110/A21.10, C153/A21.53 or C115/A21.15. Buried accessories for mechanical and flanged joints must be alloy steel “T” head bolts (for MJ) or heavy hex head/hex head bolts (for flanged) and heavy hex nuts of coarse thread series class 2A external and class 2B internal per ASME/ANSI B1.1. Accessories for flanged joints in exposed services must be cadmium plated high tensile steel meeting the thread requirements of coarse thread series class 2B.
- f) Provide flange joints for all exposed piping.
- g) Provide mechanical sleeve type coupling where specified or indicated.
- h) Provide anchored couplings where indicated or where restraint is required to withstand specified operating or hydrostatic test pressure.

B) Air Release and Cleanout Manholes and Equipment

- 1) Precast concrete manholes shall conform to ASTM C 478 with rubber type gaskets equal to ASTM C 443 and a minimum inside diameter of 48 inches. Monolithic cast-in-place manholes shall only be used with the prior written approval of the Town. The base and first riser section of the precast concrete manhole shall be integrally cast as one unit. Precast concrete cones shall be of the eccentric cone type. No “see through” lift holes shall be allowed on precast concrete manholes 48 inches in diameter or less. In addition to the rubber type gaskets, all joints shall receive a 1/2 inch diameter nonasphaltic mastic (Kent-Seal or as approved by the Town), conforming to ASHTO M

198 and federal specifications SS-S-210A. Sewer connection to manhole shall be Kor-N-Seal, A-Lok, Dura-Seal or as approved by the Town.

- 2) Where one solid riser or barrel section cannot be used, final adjustment in elevation of the frame and cover shall be accomplished by the use of a 4-inch minimum thickness adjusting ring to a maximum combined thickness of 12 inches. Brick or block shall not be used in the construction of a manhole or to adjust the elevation of the frame and cover. Non-hardening butyl rubber sealant shall be installed between cone, riser rings, and casting. Sealant shall meet or exceed ASTM 0990-94.
- 3) Manhole steps shall conform to ASTM C 478. Manholes shall be furnished with steps placed a maximum 16 inches apart with the first step placed no greater than 2 feet below the top of the frame.
- 4) Joint seal system for the setting of a manhole casting shall be Infi-Shield Uniband or equivalent. The manufactured joint seal shall be made of a high quality EPDM rubber with a minimum thickness of 60 millimeters that meets or exceeds ASTM C 923. The joint shall have 2-inch wide mastic strips on the top and bottom of the roll. The mastic shall be non-hardening butyl rubber sealant that meets or exceeds ASTM 0990-94. The seal shall be designed to prevent leakage of water into the manhole.
- 5) Manhole covers shall be Type "A" cast iron ring and cover and must conform to ASTM A 48. All sanitary manholes that lay in or along a stream, swale, or open storm channel shall have locking or bolt down lids with an inside seal between the lid and casting. Manhole lids shall be stamped "SANITARY SEWER." Casting shall be East Jordan Ironworks 1020 casting and 1022 lid, Neenah R1772-C, or equivalent.
- 6) Minimum manhole diameter shall be 48-inches, for force main systems with force main sizes 4-inch diameter to 24-inch diameter.
- 7) All piping inside force main air release and cleanout structures shall be ductile iron pipe and extended ten feet outside of each structure, in accordance with the ductile iron pipe section of these specifications.
- 8) Air/vacuum release valves shall be A.R.I. Model D-025, or equal.

C) Bedding and Backfill

- 1) Contractor shall comply with Bedding and Backfill requirements as required by the Town of Fishers Construction Standard Details Sheets.

4.5 Execution

A) Pre-Construction Conference

- 1) Before the start of any construction on the project site, a conference must be scheduled and completed with the Town and the Town Inspector.

B) Permits

- 1) The Contractor or Property Owner must obtain sewer permits at one time. The sewer permit must be obtained before connection can be made.

C) Utility Location

- 1) The Contractor is responsible for determining the location of existing utilities 24 hours prior to any construction or excavating.
- 2) Two-inch wide sewer detection tape shall be laid 12 inches above top of pipe including mainline and laterals prior to sewer backfilling.

D) Bench Marks

- 1) Permanent benchmarks shall be located or installed by a registered land surveyor.
- 2) Permanent benchmarks shall be reinforced concrete monument with a minimum of 36" in length and with identification plate for benchmark data/identification.

E) Submersible Pump Station

- 1) The pump station shall be provided with an access drive to the nearest public right-of-way.
- 2) Access drive shall include paved area around the pump station adequate for utility trucks to turn around, remove pumps and service equipment.
- 3) The control panels and generator receptacle must be located within ten (10) feet of the pump station drive so that a portable generator can be readily connected to the generator receptacle.

- 4) The wet well, valve vault, and meter pit shall be enclosed at grade level with a reinforced concrete pad, rectangular in shape and extending a minimum of 1'-0" from the chambers' outside dimensions.
- 5) "Live" yard hydrant shall be installed inside fence area (if possible) and close to fence, to provide water service for pump station maintenance purposes, per Town of Fishers Standard Details. Contractor shall coordinate with the Indianapolis Water Company and obtain applicable local and state water permits before installing such drinking water facilities. Contractor shall provide backflow preventer, installation, testing, flushing, and disinfection of water main and hydrant system, in accordance with Indianapolis Water Company requirements.
- 6) Cedar Fence
 - a) Inspection
 - i) Verify that final grading in fence location is finished without irregularities that would interfere with fence installation.
 - ii) Do not commence work until unsatisfactory conditions have been corrected.
 - b) Preparation
 - i) Measure and lay out entire fence line.
 - ii) Measure parallel to surface of ground.
 - iii) Locate and mark position of posts.
 - iv) Locate line posts at equal distance spacing, not exceeding eight (8) feet on center.
 - v) Locate corner posts at positions where fence changes direction more than ten (10) degrees.
 - c) Fence Installation
 - i) Set posts in concrete footings, mix to provide three thousand five hundred (3,500) psi.

- ii) Slats must be attached in shadow box configuration (all line runs) and board on board configuration (all gates). Attach to the rails with aluminum screw shank nails.
 - iii) When new fence joins an old fence at any point, a corner or brace post must be set at the junction and be braced and anchored the same as for corner posts.
 - iv) Supply viewing access through fence for electric meter. Coordinate size and location of access with Engineer.
 - v) The bottom of the fence must be a maximum of four (4) inches from finished grade.
- d) Clear Wood Stain
- i) Stain all wood incorporated into the Project with a clear oil-based timber stain.
 - ii) Wood must be dry and free of all dirt, oil, grease and other surface contaminants before staining.
 - iii) Stain wood only when the humidity and temperature will be within the manufacturer's recommended application ranges for at least twenty-four (24) hours after the application.
 - iv) Provide two (2) coats, the first a thin coat by brush, and the second an equivalent minimum dry film thickness of two (2) mils by brush or spray. Allow first coat to dry for at least forty-eight (48) hours before application of the second coat. Product must be equal to Timber Stain Oil Base Clear as manufactured by MAB Paints.
- e) Adjust
- i) Adjust truss rods, brace rails and wires for rigid installation.
 - ii) Tighten hardware, fasteners and accessories.

F) Air Release and Cleanout Structures and Equipment

- 1) Force Main Air Release and Cleanout Structures shall be placed on a minimum 6 inches of No.8 crushed stone that has been mechanically compacted. Where unstable or poor soil conditions exist, additional No. 2 crushed stone or Class B concrete shall be placed to form a stable base. The remainder of the manhole shall be backfilled using No. 53 or No.8 stone. Stone shall be placed in 6-inch lifts and mechanically compacted to 95 percent maximum dry density as determined by ASTM D 698.
- 2) Joint seal system (Kent-Seal or as approved by the Town) shall be installed using the Manufacturers written instructions. The top of the manhole casting and cone section shall be joint-sealed with inspection prior to backfilling.
- 3) Connections to all manholes, new or existing, shall be core drilled and booted. These taps shall be cored into the manhole between the spring line of the sewer or no more than 24 inches above the flow line. Manhole connections shall not protrude past the interior of the wall of the manhole.
- 4) All sanitary manholes shall be vacuum tested with castings per ASTM C 1244 93 following full installation. All sanitary manhole sections shall be vacuum tested in the shop prior to shipment.

G) Backfill

- 1) Bedding and backfill dimensions shall have a minimum trench width as designated on the standard construction details.

H) Safety and Spills

- 1) CONTRACTORS ARE SOLELY RESPONSIBLE FOR ALL SEWAGE SPILLS that occur as a result of their work. The Contractor must have an action plan to anticipate problems connecting to existing sewers and pumping sewage around a work site.
- 2) CONTRACTORS ARE RESPONSIBLE FOR SAFETY AT THE JOB SITE. They shall make provisions for a safe working environment for their own crews, as well as Town personnel and inspectors. The project site shall be in compliance with all OSHA safety

regulations, including but not limited to construction trench safety and confined safety entry regulations.

- 3) Should unknown active utilities be damaged during excavation work, work must be stopped immediately. Do not proceed with work until decision has been reached regarding repair, removal, or relocation of utilities. The Contractor must give notice to the appropriate utility.

I) Testing

1) General Testing Requirements

- a) All testing must be conducted at the Contractor's expense in the presence of the Town.
- b) Notification must be provided at least five (5) days prior to any testing.
- c) All testing (except manhole vacuum testing) must be conducted after the final backfill has been in place and is undisturbed for at least thirty (30) days and after all other utilities have been installed. All concrete thrust blocks must have been in place for a period of at least ten (10) days prior to testing.
- d) At the Town's discretion, testing may be delayed or additional testing may be required, based upon weather conditions (inadequate precipitation to allow for adequate settlement, etc.) Also, testing may be delayed or additional testing may be required due to the installation of site improvements (including but not limited to fencing, signage, landscaping, site lighting and other sub surface improvements).
- e) If the Property Owner requires sanitary sewer service prior to final testing, a preliminary test may be performed, however, the Property Owner must provide, in writing, a guarantee that all cleaning and testing will be performed per the construction plans and the Town's then current standards, specifications and details.

2) Force Main Testing

- a) Hydrostatic pressure tests must be performed on all force mains.
- b) The hydrostatic pressure test must conform to ANSI/AWWA C600 and C605 procedures except as modified by these specifications.

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- c) Conduct test at pressure of at least 100 pounds per square inch or 1.5 times the operating pressure, whichever is greater.
- d) Maintain pressure for a minimum of 8 consecutive hours.
- e) Test pressure must not vary by more than 5 +/- pounds per square inch.
- f) During filling of the pipe and before the application of the specified test pressure, all air must be expelled from the force main by means of the air/vacuum release valves and, if necessary by additional taps at points of highest elevation. After the test is finished, the taps must be tightly plugged, unless otherwise specified.
- g) Limit fill rate of force main to available venting capacity. Fill rate must be regulated to limit velocity in force main when flowing full to not more than 1 foot per second.
- h) Test separately in segments between isolation valves, between an isolation valve and a test plug, or between test plugs.
- i) Contractor shall furnish and install test plugs, including all anchors, braces and other temporary or permanent devices to withstand hydrostatic pressure on plugs.
- j) Contractor is responsible for any damages caused by failure of the sanitary sewer facilities during testing of the project.
- k) Contractor shall refit and replace all pipes not meeting the leakage or pressure requirements.
- l) Contractor shall repair all visible leaks regardless of the amount of leakage.
- m) Contractor shall repeat hydrostatic pressure test as necessary:
 - After location of leaks and repair or replacements of defective joints, pipe or fittings.
 - Until satisfactory test results are obtained.
 - Open all air/vacuum release valves and verify proper operation.
- n) The system will not be considered complete until all leaks have been repaired and all tests have been passed to the satisfaction of the Director of Engineering.

3) Manhole Testing

- a) All air/vacuum release, clean-out and flow monitoring/metering manholes must be vacuum tested after installation, repair or modification.
- b) The Town may require additional vacuum tests if the manhole casting is not bolted to the structure prior to the test.
- c) Installation and operation of vacuum equipment and indicating devices must be in accordance with manufacturer's recommendations and performance specifications that have been provided by the manufacturer and accepted by the Town.
- d) All manholes shall be negative air pressure (vacuum) testing methods in accordance with ASTM C1244-93. These tests shall be performed by the Contractor and observed and confirmed by a representative of the Town.
- e) Stub outs, manhole boots and pipe plugs must be secured to prevent movement while the vacuum is drawn.
- f) Procedures: With the vacuum tester set in place:
 - i) Inflate the compression band to 40 psi to affect a seal between the vacuum base and the structure.
 - ii) Connect the vacuum pump to the outlet port with the valve open.
 - iii) Draw a vacuum 10" of Hg. and close the valve.
- g) Acceptance standards for leakage will be established from the elapsed time for a negative pressure change from ten (10) inches to nine (9) inches of mercury. The maximum allowable leakage rate for a four-foot diameter manhole must be in accordance with Table 7 below:

TABLE 7	
Manhole Depth	Minimum Elapsed time for a Pressure Change of 1 Inch HG
10 ft or less	60 seconds
10 feet < Depth < 15 feet	75 seconds
15 feet < Depth < 25 feet	90 seconds

For manholes five feet in diameter, add an additional 15 seconds and for manholes six feet in diameter, add an additional 30 seconds to the time requirements for four-foot diameter manholes. For all manholes deeper than 25 feet, the Director of Engineering will determine the applicable minimum elapsed time.

h) Retest:

- i) If the manhole fails the test, necessary repairs must be made and the vacuum test and repairs must be repeated until the manhole passes the test.
- ii) If manhole joint seals are pulled out during the vacuum test, the manhole must be disassembled and the joints replaced.

i) Visual:

- i) Manholes will be subject to visual inspection with all visual leaks being repaired.

j) Testing Form:

- i) Contractor must submit the results of the vacuum test with the following information:
 - Project Name
 - Contractor
 - Date of Test
 - Manhole ID number
 - Manhole Diameter
 - Manhole Depth
 - Test Duration (Seconds)
 - Pressure Drop (Inches of Mercury)
 - Pass/ Fail
 - Testing Operator's Signature
 - Engineer's Representative Signature

4) Pump Testing

- a) In order for the pump station/force main project to be approved and accepted by the Town of Fishers, upon completion of the project, the Developer shall be responsible for scheduling a pump station start-up test and inspection meeting with the Director

of Engineering, or other Fishers DPW representatives, in attendance, along with Contractor, Design Engineer, and Pump Manufacturer's representative.

- b) The Developer shall be responsible for assuring that the pump station is running properly and in accordance with the project design. During the start-up test and inspection meeting, the following tests shall be run:
 - i) The pump manufacturer's representative shall run a pump down test on all pumps and control panels and record the following test data (but not limited to the following test data), for submittal to the Fishers Director of Engineering, for Town approval.
 - (a) Conduct pump down test on all pumps, to check that pumps are operating at the designed pump conditions [flow (gpm) at total dynamic head (TDH)]
 - (b) Check pressure gauge readings and hour meter readings during pump down test.
 - (c) Check breaker switches.
 - (d) Check hand-off-automatic switches
 - (e) Check amperage
 - (f) Check automatic operation on all pumps and check float- and pressure transducer/level sensor-sequencing with pumps.
 - (g) Check seal failure/heat sensor
 - (h) Check all control components, alarm lights, horn activation
 - (i) Check float settings and recheck float elevations

- ii) The valve supplier and the flow meter supplier shall run applicable tests on all valves/flow meter and record the following test data (but not limited to the following test data). Submittal to the Fishers Director of Engineering, for Town approval.
 - (a) Check if flapper operating properly
 - (b) Check if packing leaks
 - (c) Check valve opening and closing
 - (d) Check flow meter readings up against the pump down test results.
- iii) If applicable, the SCADA system designer/supplier shall run tests on the SCADA system and record the test data, for submittal to the Fishers Director of Engineering, for Town approval.

Section 5. Storm Sewers

5.1 General

- A) Refer to Town of Fishers Stormwater Technical Standards Manual and the Standard Construction Details, current versions, which provides a uniform standard for all storm sewer construction located within the jurisdiction of the Town of Fishers.

