FAYETTE COUNTY, INDIANA
&
THE CITY OF CONNERSVILLE, INDIANA

CONSTRUCTION STANDARDS

SPECIFICATIONS AND DETAILS

SEPTEMBER 2023

Common Council
City of Connersville, Indiana

ORDINANCE NO 7002

AN ORDINANCE ADOPTING FAYETTE COUNTY INDIANA AND THE CITY OF CONNERSVILLE, INDIANA CONSTRUCTION STANDARDS AND DETAILS

WHEREAS, the Board of Commissioners of Fayette County Indiana, and the Common Council of the City of Connersville on February 5, 2024, at a joint public hearing in the Chambers of the Common Council of the City of Connersville approved replacing with Construction Standards Fayette County, Indiana (Including City of Connersville) City in their entirety with the Fayette County Indiana and The City of Connersville, Indiana Construction Standards and Details.

WHEREAS, following the adoption all ordinances or parts of ordinances in conflict with the provisions of this Ordinance are hereby repealed.

NOW THEREFORE, BE IT ORDAINED by the COMMON COUNCIL OF THE CITY OF CONNERSVILLE INDIANA that the following Building Fayette County Indiana and The City of Connersville, Indiana Construction Standards and Details be adopted and that all ordinances or parts of ordinances in conflict with the provisions of this Ordinance are hereby repealed.

Enacted this 20th day of May 2024

Chad Frank, Mayor

ATTEST: Rosemary Brown

Rosemary Brown, Clerk-Treasurer

The foregoing Ordinance was presented by ~~me to the~~ Mayor of Connersville, Indiana for his approval on this 20th day of May 2024

Rosemary Brown

Rosemary Brown, Clerk-Treasurer

The foregoing Ordinance was presented to me by the Clerk-Treasurer of Connersville, Indiana on this 20th day of May 2024

Chad Frank, Mayor

Board of Commissioners
Fayette County, Indiana

ORDINANCE NO 2024-03

AN ORDINANCE ADOPTING FAYETTE COUNTY INDIANA AND THE CITY OF CONNERSVILLE, INDIANA CONSTRUCTION STANDARDS AND DETAILS

WHEREAS, the Board of Commissioners of Fayette County Indiana, and the Common Council of the City of Connersville on February 5, 2024 at a joint public hearing in the Chambers of the Common Council of the City of Connersville approved replacing with Construction Standards Fayette County, Indiana (Including City of Connersville) City in their entirety with the Fayette County Indiana and The City of Connersville, Indiana Construction Standards and Details.

WHEREAS, following the adoption all ordinances or parts of ordinances in conflict with the provisions of this Ordinance are hereby repealed..

NOW THEREFORE, BE IT ORDAINED by the BOARD OF COMMISSIONERS of FAYETTE COUNTY, INDIANA that the following Building Fayette County Indiana and The City of Connersville, Indiana Construction Standards and Details be adopted and that all ordinances or parts of ordinances in conflict with the provisions of this Ordinance are hereby repealed.

Enacted this 21st day of May, 2024

Board of Commissioners

Fayette County, Indiana

Dale L. Strong

Dale Strong, President

Dale Munson

Dale Munson, Vice-President

Tracie Bever

Tracie Bever

Attest: Jane E Downard

Jane Downard, Auditor

FAYETTE COUNTY, INDIANA

Commissioners
Dale Strong, President
Tracie Bever, Vice President
Dale Munson, Member

County Highway
Jay Halveland, Director of Operations

County Surveyor
Bill Macke

Area Plan Commission
Bill MacDaniel, Executive Director

CITY OF CONNERSVILLE

Mayor
Chad Frank

Board of Public Works & Safety
Jim Barrett, Member
Brian Doub, Member
Diana Phillips, Member
Becky Gibson, Member

Clerk/Treasurer
Rosemary Brown

Connersville Utilities
Brad Colter, Director of Utilities and Streets
Mike Bottomley, Utility Superintendent
Erin Johnson, Wastewater Superintendent/Assistant Director
David Kunkel, Water Treatment Plant Operator

TABLE OF CONTENTS

TECHNICAL SPECIFICATIONS

INDEX OF DETAILS

STANDARD DETAILS

DW – Drinking Water Systems

SS – Sanitary Sewer Systems

SW – Storm Water Systems

TECHNICAL SPECIFICATIONS

DIVISION 1
GENERAL REQUIREMENTS

FAYETTE COUNTY & CITY OF CONNERSVILLE
CONSTRUCTION STANDARDS
SEPTEMBER 2023

SECTION 01010 - SUMMARY ITEMS

PART 1 - GENERAL

1.01 General Items

A. Any new development or redevelopment within the City of Connersville (City) or the jurisdiction of the Fayette County Area Plan Commission (County) shall be designed and constructed in accordance with the Fayette County and City of Connersville Construction Standards – Specifications and Details.

B. The Approving Agency shall be the Fayette County Commissioners or the Connersville Board of Public Works and Safety.

C. The construction drawings and specifications for any new development or redevelopment within the City of Connersville or the jurisdiction of the Fayette County Area Plan Commission shall make reference to the Fayette County & City of Connersville Construction Standards and shall include all applicable standard details within each project's construction documents.

D. Details prepared by outside sources covering work which is not covered by these specifications and standards are the sole responsibility of the design engineer.

E. The County/City must approve all materials and any proposed deviations from the construction standards prior to construction and installation.

F. One set of plans "approved" by the County/City and the Indiana Department of Environmental Management (IDEM), if applicable, shall be maintained on the job at all times.

G. Notify the County/City a minimum of 48 hours prior to commencement of construction activities within 40 feet of a sanitary force main.

H. Trenchless installation methods shall be used for all waterway crossings unless otherwise approved by the County/City and any State or Federal permitting authority.

I. For roadway crossings, installation method (open trench and trenchless methods) must be approved by the County/City and any applicable permitting authority prior to construction.

J. Sump pump discharge piping shall connect to a piped stormwater conveyance or discharge over the ground to a swale or ditch. A sump pump shall not discharge over a sidewalk or to a street or paved surface. Upon approval by the County/City, a French drain may be used when soil conditions will promote infiltration into the ground and other alternatives are not available.

1.02 Contact information:

A. Fayette County:

Area Plan Commission	765-825-9808
Highway Department	765-825-5981
Surveyor	765-825-7466
Health Department	765-825-4013
Soil and Water Conservation District	765-825-4311
Emergency	765-825-9422 / 911

B. City of Connersville:

Area Plan Commission	765-825-9808
Utilities (Water, Sewer, & Stormwater)	765-825-2158
Street Department	765-825-1421
Parks & Recreation	765-825-5244
Police Department	765-825-2111
Fire Department	765-825-6061
Emergency	765-825-3524 / 911

1.03 Meetings

A. A pre-construction conference must be scheduled with the County/City a minimum two (2) business days prior to commencement of construction.

B. Pre-construction conference shall be scheduled through one of the following offices:

1. Fayette County – Area Plan Commission – 765-825-9808
2. City of Connersville – Connersville Utilities – 765-825-2158

C. No work shall begin prior to pre-construction meeting with the County/City.

1.04 Submittals

A. Final Design Drawings

1. Submit final design drawings and specifications in electronic format to Connersville Utilities and Area Planning Director for review. Review fees are as required by the County/City's Development Plan Permit.
2. Once the final design drawings and specifications have been reviewed, a plan review letter from the County/City will be provided to the applicant.
3. Revise the design drawings and specifications based on review comments and resubmit.
4. Reviewed and approved design drawings and specifications are required prior to construction. All other requirements as listed in this Specification must be met prior to construction.
5. Prior to scheduling a Pre-Construction conference, the Developer shall provide one (1) set marked "Final Approved Plans" (size ARCH 24x36 or ANSI D

22x34) and one (1) copy of any project manual or specification book, as applicable (size 8-1/2 x 11) and an electronic copy of each, the Final Approved Plans and Project Manual / Specifications. At the pre-construction meeting the drawings and any project manual or specification book will be stamped and one (1) copy of each should be available onsite at all times.

B. Construction Schedules

1. Progress schedules are to be submitted by the Contractor to the County/City prior to construction.
2. Provide complete sequence of construction by activity showing dates for beginning and completion of each element of construction.

C. Products and Materials

1. All materials furnished by the Contractor to be incorporated in the work shall be subject to inspection and approved by the County/City prior to installation.
2. Product data shall be submitted to the County/City for all utility pipe, utility structures, precast concrete structure coatings and sealants, manhole and catch basin frames and covers, hydrants, valves, casing pipe, all lift station equipment, concrete, asphalt and all associated materials necessary for a complete installation. Such data shall be of sufficient detail to enable the County/City to identify the particular product in question and determine its conformance to the County/City's requirements. Mark each copy to identify applicable products, models and options to be supplied.
3. Provide sufficient number of copies of each submittal to the County/City such that there is sufficient quantity for the County/City to retain 3 copies.

D. As-Built Drawings

1. Provide "as-built" drawings to Connersville Utilities and the Area Planning Director, but not until all construction items are in place and complete. The as-built drawings are to be a true representation of elements that exist as a result of the completed construction project. Plans should show any and all changes to design made during construction.
2. As-built plans must include all information in the approved construction plans including standards, details, utility sheets, and data tables. They should show as-built locations, elevations, and changes in a contrasting manner; such as color, bold, or highlighted on copies of the original construction plans. Nothing is to be blacked out, only XXX out. The cover sheet and sheets with as-built data or changes are to be labeled as "As-built".
3. As-built plans must be certified by a Registered Land Surveyor or Professional Engineer and must be dated and signed. Each sheet that has an as-built change must be stamped, dated, and signed by a Registered Land Surveyor or Professional Engineer.
    a. Sample Certification Statement:
        1) I hereby certify that the "As-built" data contained in these drawings was collected under my supervision and to the best of my knowledge represents the conditions as they exist on this project, and that the

construction generally conforms to the requirements set forth in the approved construction plans.

b. As-built horizontal locations (structures, appurtenances, etc.) shall be designated to the nearest 0.1 feet.
c. As-built elevations shall be designated to the nearest 0.01 feet.

4. As-built plans are to contain the following information, where applicable:
   a. Streets & Roadways
      1) Cross Section information is required at a minimum of every 100' station. Verify and label street back of curb to back of curb widths. Provide as-built elevations for: centerline, edge of pavement, top of curb and curb gutter line. Include curb gutter elevations around cul-de-sacs.
      2) Show as-built street centerline grade and elevations on the Street Profile views at a minimum of every 100' station.
      3) Show acceleration/deceleration lane and taper lengths, pavement widths, and edge of pavement elevations.
      4) Provide as-built cul-de-sac radius to back of curb, or to edge of pavement for a rural section.
      5) Confirm all street intersection radii placed, including transitional curves into cul-de-sacs.
      6) Show the final pavement section and curb type used. Cross out alternative sections.
      7) Provide as-built vertical curve high point and low point elevations. Include beginning and ending vertical curve elevations.
      8) Provide the station and elevation at termination point of stub streets.
      9) When there is a change in street width, show the as-built begin taper and end taper stations.
      10) Show temporary turn-around location, size, and constructed material type.
   b. Sanitary Sewer System
      1) Provide all manhole rim elevations, pipe sizes, invert elevations, pipe slopes, and pipe lengths along the centerline of the pipe, and materials installed.
      2) Show sewer as-built location, size, and material for all sewer laterals, providing distance of each lateral from the downstream manhole.
   c. Sanitary Force Main System
      1) Provide diameter and material of installed force main.
      2) Horizontal and vertical locations of all fittings, valves, and pipe deflections.
      3) Provide length between all fittings, valves, encasements, etc.
   d. Water
      1) Provide diameter and material of installed watermain.
      2) Horizontal and vertical locations of all fittings, valves, and pipe deflections.
      3) Provide length between all fittings, valves, hydrants, encasements, etc.
      4) Show existing main and location of tie-in.
      5) Show domestic service lines and meters, providing station and offset locations.

e. Storm Drainage System
    1) Provide final invert elevations for all storm sewers and culverts. Show pipe location if different than what's shown on the approved construction plans.
    2) Verify and show any and all ditch grades placed. Provide spot elevations for flow line of ditches and swales.
    3) Show final locations of all inlets, manholes and pipes. Provide the as-built station and offset.
    4) Verify and show locations of items such as paved side ditches, rip-rap dimensions, etc.
    5) Provide final rim elevations for all beehive inlets, grates, and castings.
    6) Indicate type and size of storm sewer structures placed (example: inlet box or manhole).
    7) Specify type of storm sewer castings used.
    8) Verify sumped catch basin structures by providing bottom of box elevations.
    9) If inlet castings were to be sumped, verify the elevation and note it on the as-built plans.
    10) Verify and show all as-built storm pipe length, size, material, class and slope.
    11) Show horizontal and vertical location of subsurface drainage pipes (underdrains).
    12) Headwalls or end sections are to be clearly noted and shown.
    13) Provide as-built detention volumes, side slopes, safety ledge, safety ramp, and spillway elevations and dimensions for all detention, retention, or infiltration basins.
    14) Provide location, top of casting and invert elevation of all post-construction water quality best management practices (BMPs). This may include hydrodynamic separators, rain gardens, infiltration trenches, oil/water separators, etc.

f. Miscellaneous
    1) Show all drainage and utility easements.
    2) Show relocated utility pole locations.
    3) Show street light pole location, and provide station and offset.
    4) Show guardrail location, indicate type and provide as-built length.

5. Provide **(1) PDF digital copy**, **(1) CAD digital copy (.dwg format version 2004 or higher) or other file type compatible with the County/City's software**, and **(1) hard copy** set of as-built drawings in accordance with these Standards.

1.05 Bond Requirements

A. Performance Bond

1. As a condition of approval and issuance of any County/City permit for construction of public streets, water, sanitary sewer, stormwater facilities, or any other public infrastructure or land disturbing activities within the public right-of-way, the applicant shall provide assurance in the form of a performance bond before construction begins. The amount of the assurance must be 100%

of the estimated cost of improvements. The bond amount shall be pre-approved by the County/City.

2. The County/City shall not accept required public improvements, nor release a performance bond, until the improvements have been satisfactorily completed in accordance with these specifications and acceptable as-built drawings have been reviewed and approved by the County/City.

B. Maintenance Bond

1. The Developer shall be required to file a maintenance bond with the County/City, prior to acceptance, in the amount of ten percent (10%) of the cost of all public improvements, and in a form satisfactory to the County/City Attorney, in order to assure the satisfactory condition of the required public improvements, for a period of three (3) years after the date of their acceptance by the County/City.

1.06 Coordination

A. Give the County/City a minimum of two (2) working days notice prior to commencement of any construction activities.

B. No water or sewer system construction may begin until approval from IDEM has been received by the County/City.

C. Advise the County/City of who the Contractor will be prior to the pre-construction conference. The County/City reserves the right to reject the Contractor.

D. Coordinate work with other Contractors and the County/City. Select order of work and establish schedule or working hours for construction and submit to the County/City. The County/City reserves the right to assure orderly and expeditious progress of work.

E. Maintain existing services affected by Contractors' operations under the contract. Schedule construction to minimize interruptions to existing services and inconvenience to others.

F. Contractor shall verify the location of all existing utilities at least 48 hours prior to any construction or excavation. Call Indiana811 at 811 or 1-800-382-5544.

G. During construction, all utilities shall be adequately supported to minimize damage. The contractor shall be responsible for repairing or replacing damaged utilities to the satisfaction of the approving agency and the owner of the affected utility.

H. Street closures must be approved by the County/City prior to beginning work.

I. Notify the County/City immediately upon the event of damage to any public street during the course of the work and requiring closure thereof. Contractor shall be responsible for repair and costs as determined by the County/City.

J. Notify the County/City immediately upon event of damage to any utility line. Contractor shall be responsible for repair and costs as determined by the

County/City. A representative from the County/City must be on-site to inspect repair prior to backfill.

K. Notify the County/City one (1) working day prior to working on weekends. There will be an additional cost for inspection on weekends to compensate for overtime.

1.07 Quality Control

A. All materials and each part or detail of the work shall be subject to inspection by the County/City at all times. The County/City shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

B. Provide quality-control services specified as required.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
2. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

1.08 Temporary Facilities

A. Provide the following temporary facilities:

1. Sanitary facilities
2. Trash Containers
3. Barricades and enclosures
4. Bulletin Board (for required notices and postings)

B. Sanitary Facilities

1. Provide sanitary facilities for use of all construction personnel including those of other contractors for the duration of the project as follows:
   a. Chemical units complete with weathertight enclosure adequately ventilated and equipped with latching door.
   b. Maintain chemical units weekly or at lesser periods if determined necessary. Chemical units shall be in accordance with all applicable rules and regulations.
   c. Furnish toilet paper and hand sanitizer for the chemical units and replenish supply whenever required.

C. Trash Containers

1. Provide a trash container for the disposal of packaging materials, pieces of broken pipe, rubbish, trash and other debris.
2. Empty trash containers as often as necessary to prevent overflowing, leaking and blowing debris, but not less than one time per week.

D. Barricades

1. Provide, erect and maintain all necessary barricades, suitable and sufficient danger signals and signs.
2. Take all necessary precautions for the protection and safety of the public, workmen, structures and equipment. Roads closed to traffic shall be protected by effective barricades. Obstructions shall be illuminated during hours of darkness.
3. Erect warning signs in advance of any location on the project where operations may interfere with the use of the road by traffic and at all intermediate points where the new work crosses or coincides with the existing road. Construct and erect warning signs in accordance with the Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD) and the Indiana Supplement, latest editions.

1.09 Rights of Access

A. Representatives of the County/City, Environmental Protection Agency and the State of Indiana shall have access to the work wherever it is in preparation or progress and that the Contractor will provide facilities for such access and inspection.

1.10 Safety and Health Regulations for Construction

A. The Contractor shall be solely responsible for all obligations prescribed as employer obligations under Chapter XVII of Title 29, Code of Federal Regulations, Part 1926, otherwise known as "Safety and Health Regulations for Construction and CFR Part 1910.46 Permit Required for Confined Space".

B. Upon request, provide the County/City with the name of the Contractor's Safety Officer, plus the on-site Safety Representative, if other than the Superintendent.

C. Safety must be kept at all times but the County/City is not responsible for overseeing these requirements.

1.11 Operations within Right-of-Way

A. In public thoroughfares, all operations of the Contractor, including those of temporary nature, must be confined within the applicable right-of-way limits.

B. If the methods of the construction are such as to require the use of land beyond the public thoroughfares, Contractor shall make his own arrangements with the property owners affected for the use of such additional land. Such additional agreements will not include any liability for the County/City.

C. Perform all construction in existing roadways between the hours of 9:00 am and 2:00 pm. Road closures shall be coordinated with the County/City prior to construction.

D. Prior to construction activity and if access will be through an existing roadway system (subdivision), the Contractor shall video the route and provide a copy to the County/City.

1.12 Permits

A. The Developer shall obtain all permits which are related to the design and construction of the completed facilities including providing copies to the County/City. Permits to be obtained by the Developer include, but are not limited to, permits from the following:

1. Fayette County
2. City of Connersville
3. Indiana Department of Environmental Management (IDEM) – Sanitary Sewer Construction Permit
4. IDEM Notice of Intent (NOI) to Construct a Water Main Extension
5. IDEM Construction Stormwater General Permit (CSGP)
6. IDEM Section 401 Water Quality Certifications
7. Indiana Department of Homeland Security Fire and Building and Safety Division
8. Indiana Department of Natural Resources
9. U.S. Army Corps of Engineers

B. The construction shall be performed in full accordance with any and all permit requirements.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 Site Maintenance

A. The working area shall be kept free, at all time, of tools, materials, and equipment not essential to the work in progress. Debris, waste materials, and rubbish shall not be allowed to accumulate and shall properly be disposed. On site burning of trash and debris is prohibited. On-site burial of trash and debris is prohibited.

B. If the Contractor should fail to maintain the project site, the County/City shall make the necessary arrangements to clean up the site at the Contractor's expense. If such action becomes necessary, in the opinion of the County/City, the County/City shall not be responsible for the inadvertent removal of materials which the Contractor would not have disposed of had he affected the required clean up.

C. Where material or debris has washed, flowed, blown, or been purposely deposited into watercourses, drains, ditches, inlets, or elsewhere as a result of the construction operation, such material or debris shall be entirely removed and satisfactorily disposed of immediately upon identification.

D. The Contractor shall be responsible to restore or replace any public or private property damaged by operations, equipment, or employees to a condition at least equal to that existing immediately prior to beginning the project.

E. The Contractor shall be responsible for the repair of any drainage tile broken or damaged during construction. The replacement pipe shall be installed with pea gravel or any other suitable granular backfill from the bottom of the trench to six inches above the top of the replacement pipe. The repair of the drainage tile shall be installed to the satisfaction of the property owner.

F. Repair all parking lots and drives to their original state of usefulness. Streets and side ditches shall be left in neat and operable condition.

G. Restore the grades to the original contours and condition.

H. The Contractor shall be responsible to maintain and mow property, including all easements, rights-of-way, and common areas. If the Contractor should fail to maintain the project site, the County/City shall make the necessary arrangements to mow the site at the Contractor's expense.

-END-

SECTION 01090 - REFERENCE STANDARDS

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. General reference standards, rules and regulations that govern construction work, alterations, repairs, mechanical installations and appliances connected therewith.
2. Abbreviations used in these Specifications.

1.02 Quality Assurance

A. Regulatory Requirements: Work shall comply with the following:

1. Occupational Safety and Health Act
2. Indiana State Construction Industry Safety Code
3. State Building rules and regulations of the Indiana Department of Homeland Security Fire and Building Safety Division
4. Indiana State Fire Marshal
5. Indiana Department of Environmental Management
6. Indiana Department of Natural Resources
7. Army Corps of Engineers
8. National Electric Code
9. National Electric Safety Code
10. Uniform Building Code
11. Life Safety Code
12. Utility regulations
13. Local ordinances, state, and federal rules and regulations pertaining to the Work

B. Such rules, regulations and ordinances are to be considered part of these Specifications.

C. Fees for licenses shall be paid by the Contractor.

1.03 Reference Abbreviations

A. Reference to a technical society, trade association or standards setting organization may be made in the Specifications by abbreviations in accordance with the following list:

AABC	Associated Air Balance Council
AAR	Association of American Railroads
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ACI	American Concrete Institute

ADC	Air Diffusion Council
AFBMA	Anti-Friction Bearing Manufacturers Association
A-E	Architect/Engineer
AGA	American Gas Association
AHAM	Association of Home Appliance Manufacturers
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
APA	The Engineered Wood Association
ARI	American Refrigeration Institute
ASCE	American Society of Civil Engineers
ASLA	American Society of Landscape Architects
ASME	American Society of Mechanical Engineers
ASSE	American Society of Safety Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWPA	American Wood Protection Association
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association
CABO	Council of American Building Officials
CAGI	Compressed Air and Gas Institute
CISPI	Cast Iron Soil Pipe Institute
CTI	Cooling Tower Institute
DHI	Door and Hardware Institute
DOH	Department of Health
DOT	Department of Transportation
FS	Federal Specifications
FHWA	Federal Highway Administration, Department of Transportation
FM	Associated Factory Mutual Laboratories
GANA	Glass Association of North America
HPVA	Hardwood Plywood and Veneer Association
ICEA	Insulated Cable Engineers Association
IDEM	Indiana Department of Environmental Management
IEEE	Institute of Electrical and Electronics Engineers
IFI	Industrial Fasteners Institute
IGCC	Insulating Glass Certification Council
INDOT	Indiana Department of Transportation
INDOTSS	Indiana Department of Transportation Standard Specifications
IPCEA	Insulated Power Cable Engineers Association
ISPC	Indiana State Plumbing Code
MIL	Military Specifications
MSS	Manufacturer’s Standardization Society
NAAMM	National Association of Architectural Metal Manufacturers
NACM	National Association of Chain Manufacturers
NAIMA	North American Insulation Manufacturers Association
NAVFAC	U.S. Naval Facilities Engineering Command

NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NETA	InterNational Electrical Testing Association
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NIST	National Institute of Standards and Technology
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
PCI	Precast Prestressed Concrete Institute
PDI	Plumbing and Drainage Institute
PFI	Pipe Fabricators Institute
SAE	Society of Automotive Engineers
SPECS	Specifications
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SPI	Society of the Plastics Industry
SSPC	The Society for Protective Coatings
STI	Steel Tank Institute
TCNA	Tile Council of North America
UL	Underwriter's Laboratories, Inc.
USBR	US Bureau of Reclamation
WWPA	Western Wood Products Association

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

-END-

TECHNICAL SPECIFICATIONS

DIVISION 2
TECHNICAL REQUIREMENTS

FAYETTE COUNTY & CITY OF CONNERSVILLE
CONSTRUCTION STANDARDS
SEPTEMBER 2023

SECTION 02101 – STORMWATER POLLUTION PREVENTION AND EROSION CONTROL

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Furnishing, installing, and maintaining all temporary and permanent control measures as shown on the Drawings, required by permits, and ordered by the County/City during the land disturbing activity.

1.02 References

A. Indiana Administrative Code (IAC), latest edition

B. Indiana Department of Transportation (INDOT) Standard Specifications, latest editions

1. Section 904 - Aggregates
2. Section 918 - Soil Fabrics

1.03 Definitions

A. Stabilized Areas: Disturbed areas which have established a minimum 70 percent uniform density of perennial vegetation coverage.

1.04 Submittals

A. For construction activities (clearing, grading, excavation and other land-disturbing activities) that results in the disturbance of one (1) acre or more of total land area:

1. Completed Construction Stormwater General Permit (CSGP)
2. IDEM Notice of Termination (NOT)

B. Include a note on the design plans stating, "Fayette County/The City of Connersville reserves the right to require additional onsite controls as deemed necessary to comply with the County/City's Drainage Standard Manual and applicable stormwater ordinances. All erosion and sediment controls, best management practices and pollution prevention measures must be installed and maintained in accordance with the Indiana Stormwater Quality Manual at a minimum.

PART 2 - PRODUCTS

2.01 Products

A. Temporary and Permanent Seed

1. Use temporary grass species that will not compete with the grasses sown later for permanent cover

2. Application: temporary or permanent stabilization must be initiated by the end of the seventh day the area is left idle. The stabilization activity must be completed within fourteen (14) days after initiation. Apply seeding to all disturbed areas to be left idle for 7-15 days or more during the growing season unless other erosion control measures are indicated on the Drawings.

B. Mulch

1. Hay, straw, fiber mats, netting, bark, or wood fiber
2. Straw mulch shall consist of threshed straw of cereal grain such as oats, wheat, barley, rye, and rice.
3. Free of objectionable weeds, seeds, or other material that may be detrimental to the planting being established.
4. Application: temporary or permanent stabilization must be initiated by the end of the seventh day the area is left idle. The stabilization activity must be completed within fourteen (14) days after initiation. Apply mulch to all areas that have been seeded and to disturbed areas to be left idle for 7 days or more outside of the growing season unless other measures are indicated on the Drawings.

C. Topsoil

1. Preserve and reuse topsoil.
2. Topsoil shall meet the following requirements:
   a. Natural, fertile, agricultural soil, capable of sustaining vigorous plant and lawn growth.
   b. Of uniform composition throughout without admixture of subsoil.
   c. Free of stones, lumps, clods, sticks larger than one inch, sod, live plants and roots, and other extraneous matter.
   d. Free of pollutant contamination.

D. Erosion Control Blanket: Provide

1. Use an erosion control blanket on slopes that are 3:1 or steeper or in areas of concentrated flow.
2. Use a product that is made of natural materials and will degrade in less than 12 months.
.

E. Silt Fence

1. Posts shall be either 2-inch diameter wood or equivalent metal posts with a minimum length of 3.5 feet. Metal posts shall have projections for fastening wire to them.
2. Anchor stakes shall be 1-inch by 2-inch wood stakes or equivalent metal stakes with a minimum length of 1.5 feet.
3. The fabric shall be purchased in a continuous roll, cut to the length of the barrier, to avoid the use of joints. When joints are necessary, splice filter fabric together only at a support post, wrap filter fabric around post to join, and seal securely.
4. Filter tubes or filter socks may be substituted for silt fence.

F. Filter Tubes or Filter Socks

1. Filter tubes or filter socks are used to filter sediment-laden runoff for sheet flow areas and may also be used across a swale as a check-dam.
2. Specify the tube/sock size on the plans based on anticipated flow and site conditions.
3. Provide a product that is made of a permeable netting filled with aggregate, compost or wood fibers.
4. Straw bales are not allowed for erosion control measures.

G. Turf Reinforcement Mat

1. Turf reinforcement mat is a three-dimensional matrix of polypropylene, nylon or other non-degradable material used to reinforce plant rooting system and the underlying soil material.

H. Riprap

1. Provide Revetment, Class 1, or Class 2 riprap in accordance with INDOT Standard Specification Section 904.
2. All riprap placed for pipe and outfall protection shall be extended a minimum of 10 feet.

I. Geotextile for Use under Riprap

1. Provide non-woven needle-punched or heat bonded geotextile consisting of strong, rot-resistant, chemically stable long-chain synthetic polymer materials which are dimensionally stable relative to each other.
2. Furnish geotextile which meets or exceeds INDOT Standard Specification Section 918.

PART 3 - EXECUTION

3.01 General

A. The site owner as identified in the stormwater permit shall be responsible for maintenance of soil erosion and sediment control measures throughout all phases of construction, and until final build-out of project is entirely complete, and no other land disturbing activities will occur. The site owner shall be responsible to ensure that individual lot owners, subcontractors, developers and any other entities performing land disturbing activities comply with the approved construction plan. The project site owner shall maintain overall responsibility and shall be the point of contact regarding IDEM CSGP compliance issues until the notice of termination is filed with IDEM.

B. Submit notice of termination (NOT) inspection request to the County/City ten (10) days prior to filing NOT with IDEM.

3.02 Individual Building Lots

A. The individual lot operator, whether owning or acting as the agent, shall be responsible for erosion and sediment control requirement associated with activities on individual lots.

B. Divert stormwater runoff away from the building by grading the lawn to provide at least 6 inches of vertical fall in the first 10 feet in horizontal distance.

C. Install and maintain stable construction entrance in the proposed driveway location by using No. 2 washed stone. Maintain by adding fresh stone.

D. Clean up sediment that is tracked or washed onto roads daily. Flushing roads with water is not acceptable. Cleared sediment shall be redistributed or disposed of in a manner that is in compliance with all applicable statutes and rules.

E. Adjacent lots disturbed by an individual lot operator shall be repaired and stabilized with permanent surface stabilization. Side yard swales shall be graded as specified in the plans.

F. Final stabilization is met when all land disturbing activities have been completed and a uniform perennial vegetative cover with a density of 70 percent or greater has been established on all unpaved areas and areas not covered by permanent structures, or equivalent permanent stabilization measures have been employed.

G. Rear yard swales are not to be disturbed following final grading of swale. Install erosion control blanket over seed to reestablish vegetation in disturbed swales.

H. Place perimeter protection inside drainage easement lines.

3.03 Installation and Maintenance

A. Silt Fence

1. The static slicing method is the preferred method for installing silt fence.
2. When trenching is implemented, place excavated material on the upslope side. In no instance is excavated material to be placed on the downslope side.
3. When standard strength filter fabric is used with a wire mesh support fence, fasten the filter fabric securely to the upslope side of the posts using heavy duty 1-inch wire staples, tie wires, or hog rings. The wire mesh and filter fabric shall extend into the trench a minimum of 2 inches and shall not extend more than 36 inches above the original ground surface.
4. When standard strength filter fabric is used without a wire mesh support fence, fasten the filter fabric securely to the upslope side of the posts using heavy duty 1-inch wire staples, tie wires, or hog rings. The filter fabric shall extend into the trench a minimum of 8 inches and shall not extend more than 36 inches above the original ground surface.
5. Do not staple filter fabric to existing trees.
6. Backfill the trench and compact the soil over the filter fabric on the upslope side.

7. Turn the ends of each silt fence segment in the uphill direction to collect sediment. This is commonly called "J-hook installation" or "hooking".
8. Remove silt fences when they have served their useful purpose, but not before the upslope area has been permanently stabilized.
9. Silt fence shall not be used as a diversion and shall not be installed across a pipe opening, stream, channel, ditch, swale, or other waterway.
10. Inspect silt fence barriers after each rainfall and at least daily during prolonged rainfall. Make any required repairs immediately.
11. Should the fabric decompose or become ineffective prior to the end of the expected usable life and the barrier is still necessary, replace the fabric promptly.
12. Inspect for sediment deposits after each storm event. Remove sediment deposits when the deposits reach approximately half the height of the barrier.
13. Till and smooth to conform to the existing grade and reseed any sediment deposits remaining in place after erosion and sediment control measures are no longer required and have been removed.

B. Filter Tubes or Filter Socks

1. If more than one tube/sock is used in a row, the ends must overlap.
2. Hold tube/socks in place by driving post through the center.
3. If a trench must be dug for installation of the tube/sock, excavated material must be placed on the upslope side. In no instance is excavated material to be placed on the downslope side.
4. Install product according to manufacturer’s instructions.

C. Inlet Protection

1. Install inlet protection at all stormwater inlets within the construction area, or in areas that receive runoff from disturbed areas, to prevent sediments, construction debris, and other potential stormwater pollutants from entering storm sewer inlets and catch basins.
2. For inlets within a road or driving lane inlet protection must be installed below the grate and be equipped with an overflow or bypass so that ponding water does not cause unsafe driving conditions.
3. After every rain event, inspect all inlet protection and remove accumulated sediment and debris collected by inlet protection practices and dispose of properly.
4. When cleaning or removing inlet protection, do not place sediment and debris in a ditch, stream, wetland, waterway or stormwater conveyance.
5. Inlet protection is to remain until land disturbing activities are complete and the upstream drainage areas are stabilized.

D. Erosion Control Blanket

1. Where construction disturbs slopes equal or steeper than 3 to 1 or within areas of concentrated flow, protect bare slopes with an erosion control blanket to prevent soil erosion.

2. When vegetation is to be established, follow requirements of Article 3.05. Place erosion control blanket over the seed. Anchor the blanket according to manufacturer's instructions to prevent the seed from washing away.
3. Use erosion control blanket in all back yard swales.
4. Install erosion control blanket in swales or ditches from top of bank to top of bank according to manufacturer's instructions. Overlap ends of adjacent blankets and trench or slice ends into the soil.

E. Turf Reinforcement Mat

1. Install product according to manufacturer's instructions.

F. Pumping Bags

1. Provide pumping bags to filter sediment from dewatering operations.
2. Properly dispose of used pumping bags.
3. Appropriately size the bags for the amount of flow.
4. Use pumping bags on an erosion resistant surface.
5. Do not discharge sediment-laden water from dewatering operations into or near stormwater conveyances, wetlands, rivers, streams, and impoundments or into natural or manmade channels leading thereto.

3.04 Managing Stockpiles

A. Manage soil stockpiles for wind erosion, stormwater erosion and sediment control.

B. Temporarily or permanently stabilize stockpiled soil that is scheduled or likely to be left inactive for 7 days or more with measures appropriate for the season in order to minimize erosion potential.

C. Position stockpiles away from any ditch, stream, wetland, or stormwater conveyance.

D. Install a stable construction drive (if necessary) to prevent tracking of soil onto roadways, if tracking of soil occurs continuous brooming of the roadway shall be required.

3.05 Establishing Vegetation

A. Stabilize all unpaved surfaces and areas not covered by permanent structures with permanent perennial vegetation.

B. Prior to seeding, disturbed areas must be graded to final grade and receive a minimum of 4 inches of topsoil.

C. Scarify the planting area to a minimum depth of 6 inches. Mix soil amendments such as fertilizer and lime if required, in the top 2 to 4 inches of topsoil with a disk or rake operated across the slope.

D. Apply seed uniformly and cover newly seeded areas with mulch or erosion control blanket. Mulch shall be anchored, crimped or applied with tackifiers to hold the mulch in place. Hydroseeding is an acceptable alternative method.

E. Keep seeded and fertilized areas adequately watered until germination of seed is completed and uniform grass cover is accomplished at a minimum of 70 percent density of vegetation coverage.

-END-

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.01 Summary

A. Section includes

1. Stripping, storage and redistribution of topsoil, cut and fill operations, and rough and finish grading within right-of-way
2. Excavation, backfilling, compaction, hauling, and disposal of materials within right-of-way
3. Dewatering operations within right-of-way
4. Pavement subgrade preparation and requirements within right-of-way

B. Related Sections

1. Section 02101 – Stormwater Pollution Prevention and Erosion Control
2. Section 02220 – Trenching Backfilling & Compaction for Utilities

1.02 References

A. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

B. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

C. Indiana Department of Transportation (INDOT) Standard Specifications, latest edition

1.03 Definitions

A. Pavement/Structure Loading Zone: The area within 5 feet of any edge of pavement, curb, gutter, sidewalk, building, structure, vault, tank, pad, or other load bearing feature.

B. Structural Fill: Material placed beneath foundations and structures and used to fill an excavation around the vertical sides of structures, directly over structures.

C. Plastic Clay: Soil type CH with a Liquid Limit above 50.

D. Common Excavation: All excavation not classified as rock excavation or excavation that is otherwise classified.

E. Rock Excavation

1. Igneous, metamorphic, and sedimentary rock which cannot be excavated without blasting or the use of a modern power shovel of no less than one cubic

yard capacity, properly used, having adequate power and in good running condition, or the use of other equivalent power equipment.

2. Boulders or detached stones each having a volume of one half (1/2) cubic yard or more.

F. Unclassified Excavation: Excavation of all materials of whatever character encountered in the Work.

G. Borrow: Approved material required for the construction of embankments or other portions of the Work, and obtained from offsite.

H. Unsuitable Material: Include frozen soil, relatively soft material, relatively wet material, deleterious material, plastic clays, or soils that exhibit a high organic content.

1.04 Submittals

A. Test Results

1. Structural fill material testing and classification results, including: material source, natural and optimum moisture content, sieve analysis, maximum dry density, classification.
2. Test report on borrow material soil classification (if applicable)
3. Field compaction test results
4. Subgrade evaluations

1.05 Quality Assurance

A. Qualifications

1. Provide the services of a qualified testing laboratory to perform all laboratory tests and evaluations.
2. Provide the services of a qualified testing agency experienced in geotechnical engineering and field determinations of soil suitability for the evaluation of foundations, pavements, and structures subgrade soils and conditions.

1.06 Job Conditions

A. Maintain benchmarks, monuments, and other reference points, and replace any that are disturbed or destroyed.

1.07 Warranty

A. Refill and restore to the original grade settlement in the backfill which takes place within the warranty period at no additional cost to the County/City. Restore the surface area where settlement has occurred, including, but not limited to seeding; fertilizing; erosion control; and restoration of streets, drives, yards, and sidewalks.

B. Guarantee survival of all disturbed and replaced trees and shrubs during the warranty period.

PART 2 - PRODUCTS

2.01 Materials

A. Regular Backfill

1. Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D2487, or a combination of these groups; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

B. Structural Fill

1. Coarse, well graded, clean sands and gravel-sand mixtures including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil types GW, GP, SW and SP are included in this class. Provide Class II material which meets the requirements of INDOT Standard Specifications Section 904 classification for Structure Backfill.
2. Lean Concrete
   a. Seven-Day Compressive Strength: 700 psi min.
   b. Material meeting Section 03300

C. Topsoil

1. Preserve and reuse topsoil.
2. Topsoil shall meet the following requirements:
   a. Natural, fertile, agricultural soil, capable of sustaining vigorous plant and lawn growth.
   b. Of uniform composition throughout without admixture of subsoil.
   c. Free of stones, lumps, clods, sticks larger than one inch, sod, live plants and roots, and other extraneous matter.
   d. Free of pollutant contamination.

PART 3 - EXECUTION

3.01 Preparation

A. Remove all topsoil at construction areas. Stockpile topsoil for use in finish grading operation. Do not use topsoil for fill.

B. Do not place fill materials until the subgrade and construction have been inspected by the County/City.

C. Before borrow or disposal operations begin, provide the County/City plans for the control of water including measures to keep sediment from entering streams.

3.02 Excavation

A. Keep open excavations free of water to avoid impacting the Work.

1. Provide and maintain adequate dewatering equipment to remove and dispose of surface water and groundwater entering excavations.
2. Use appropriate measures to prevent surface water from entering the excavation and to provide adequate drainage of the areas adjacent to the excavation.
3. Filter water from dewatering operations to remove sediment before discharge and disposal in accordance with Section 02101.

B. Protect open excavations by roping areas off, or with barricades or railings, to prevent injury to personnel. Comply with all applicable Occupational Safety and Health Administration (OSHA) regulations.

C. Excavate true to line and grade, and elevation at bottom of the excavation. Excavate to undisturbed structurally stable subsoil. Notify County/City where excavation, in order to reach such subsoil, must continue deeper than required by the elevations indicated on the Drawings. No additional payments will be made for unauthorized excess excavation.

D. Excavate to the dimensions indicated for new construction plus sufficient space as applicable to permit erection of forms, shoring, masonry, foundations, structure installations, and excavation inspections.

E. Excavate below structures, slabs and pavement to permit placement of subbase material.

F. Provide shoring or piling as required to protect excavation bank.

G. Boulders, if encountered, must be disposed of outside of the construction area.

3.03 Contaminated Soils and Groundwater

A. If suspected contaminated soils or groundwater are discovered during excavation, inform the County/City immediately and cease excavation.

B. Contact the corresponding regulatory agency based on the excavation location.

1. If the excavation is within the INDOT right-of way, contact INDOT Environmental Services Division (317-232-5113) and report the suspected contamination to the IDEM Emergency Response hotline (888-233-7745). Follow INDOT Site Assessment Guidelines for proper investigation and handling of the suspected contaminated soils or groundwater.
2. If the excavation is outside of the INDOT right-of-way, the developer will report the suspected contamination to IDEM Emergency Response. IDEM may direct the developer to additional regulatory agencies depending on the nature of the suspected contamination.

C. Keep suspected contaminated soils separate from soils that appear to be “clean” or uncontaminated.

1. DO NOT place suspected contaminated soils, in environmentally sensitive areas such as waterways, floodways, wetlands, karst features, or stormwater conveyances.
2. Place suspected contaminated soil on a plastic tarp and cover with an additional plastic tarp or place in containers (e.g. drums) with a lid.
3. Place a berm around the covered stockpile to ensure that soils are not blown by wind or carried by stormwater.
4. Follow the direction of the regulatory agency in handling, storage, characterization, and disposal of contaminated soils.

D. Manage suspected contaminated groundwater in the excavated area.

1. If the suspected contaminated groundwater must be removed from the excavated area, pump to covered containers (e.g. drums or totes) for proper disposal.
2. Follow all federal, state, and local disposal requirements for suspected contaminated groundwater.
    a. Discharging contaminated groundwater to a waterway or stormwater conveyance requires an emergency NPDES permit from IDEM’s Office of Water Quality. The contaminated groundwater must meet the NPDES drinking water quality standards. Contaminated groundwater may not be discharged until the permit is obtained (typically 90 days).
    b. Discharging contaminated groundwater to the sanitary sewer requires local approval and analytical tests per the local sewer use ordinance or wastewater discharge requirements.

3.04 Pavement Subgrade

A. Refer to Section 02501 – Standards of Roadway Construction

3.05 Filling and Backfilling

A. General

1. Once the subgrade has been approved by the Contractor’s testing agency and the County/City, fill and/or backfill the excavations to the required grades.
2. Suspend earthwork operations when satisfactory results cannot be obtained because of rain, freezing weather, or other unsatisfactory conditions in the field.
3. Material shall be of the proper moisture content before compaction. Do not perform filling or backfill if the material is too wet to permit proper compaction.
4. Place layers in the deepest portion of the fill first. As placement progresses, construct layers approximately parallel to the finished grade line.
5. Place layers in successive horizontal layers for the full width of the section and at the loose lift thickness specified.

3.06 Compaction

A. General

1. Compact fill using equipment capable of compacting each lift its full depth. Maintain moisture at optimum content during compaction operations.
2. Provide compacting equipment of the design, weight, and quantity to obtain the required soil compaction. Under no circumstances will a bulldozer or similar tracked vehicle be used as compacting equipment.
3. Use water distribution equipment with suitable sprinkling devices to add moisture to the soil, if required.
4. Compact areas inaccessible to a roller by mechanical tampers. Operate the equipment in such a manner that hardpan, cemented gravel, clay, or other chunky soil material are broken up into small particles and become incorporated with the material in the layer.
5. Compaction by flooding is not acceptable.
6. If a fill area excavation extends beyond the limits of that fill area definition, continue with the same fill material and compaction across the entire excavation unless approved by County/City.

B. Degree of Compaction

1. Compact to the limits specified below and in accordance with ASTM D698.
2. Fill areas within the Pavement Loading Zone:
   a. From bottom of fill to within 12” of top of fill: Place fill in 8” maximum loose lifts and compact each layer to 95% of maximum dry density (ASTM D698).
   b. Final 12” of fill: Place fill in 6” maximum loose lifts compacting the first 6” lift to 95% of maximum dry density (ASTM D698) and compacting the final 6” lift to 100% of maximum dry density (ASTM D698).
3. For all other fill areas: Place fill in 8" maximum loose lifts and compact each layer to 90% of maximum dry density (ASTM D698).

C. Field Density Testing

1. Pavement areas: Perform one field density test for every 400 lineal feet of single lane, on each lift, to ensure that adequate compaction is being achieved.

3.07 Grading

A. Furnish, operate, and maintain equipment necessary to control uniform layers, section, and smoothness of grade for maximum compaction and drainage.

B. Rough Grading

1. Evenly grade to an elevation 6 inches below the finish grade elevations indicated.
2. Protect all constructed items during grading operations, and repair if damaged.
3. All areas in the project, including excavated and filled sections and adjacent transition areas, shall be reasonably smooth, compacted, and free from irregular surface changes.

4. Provide a finish grade ordinarily obtainable from either blade-grader or scraper operations, unless otherwise specified.
5. The finished subgrade surface generally shall be not more than 0.3 feet above or below the established grade or approved cross-section, with due allowance for topsoil and seeding or sod as applicable.
6. All ditches, swales and gutters as applicable shall be finished to drain readily.
7. Provide grade rounding at top and bottom of banks and at other breaks in grade.

C. Protection

1. Protect newly graded areas from the action of the elements.
2. Repair settlement or washing that occurs prior to acceptance of the Work, and reestablish grades to the required elevations and slopes.
3. Fill to required subgrade levels any areas where settlement occurs.

D. Finish Grading

1. Proceed to finish elevations shown on Drawings with a tolerance of plus or minus 1/2 inch.
2. Rake subsoil clean of stones and debris. Scarify to a depth of 3 inches.
3. Spread stockpiled topsoil over prepared subgrade to a minimum depth of 6 inches, and roll until suitable for seeding or placement of sod as applicable.
4. Maintain surfaces and replace additional topsoil necessary to repair erosion.

E. Complete final restoration operations including grading, seeding, and/or other necessary treatments to blend the area into the surrounding landscape.

-END-

SECTION 02220 - TRENCHING, BACKFILLING AND COMPACTION FOR UTILITIES

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Performing surface preparation and excavation Work as required for the installation of utilities and appurtenances including excavation, trenching, bedding, backfilling, and other related Work.

B. Related Sections

1. Section 02101 - Stormwater Pollution Prevention and Erosion Control
2. Section 02660 - Water Mains
3. Section 02720 - Storm Sewer Systems
4. Section 02730 - Gravity Sanitary Sewer Systems

1.02 References

A. American Society for Testing and Materials (ASTM), latest editions

1. ASTM C403 - Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance
2. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
3. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
4. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
5. ASTM D6024 - Standard Test Method for Ball Drop on Controlled Low Strength Material (CLSM) to Determine Suitability for Load Application
6. ASTM D6103 - Standard Test Method for Flow Consistency of Controlled Low Strength Material (CLSM)

B. Indiana Department of Transportation (INDOT) Standard Specifications, latest edition

1. Section 213 – Flowable Backfill
2. Section 904 – Aggregates

C. Occupational Safety & Health Administration (OSHA) Regulations (Standards – 29 CFR), latest editions

1. Part 1926 – Safety and Health Regulations for Construction

1.03 Definitions

A. Bedding – Granular material placed beneath the pipe to establish line and grade and to provide pipe support.

B. Final (Trench) Backfill – Granular or other specified material placed from the top of the Initial Backfill to the top of the trench, or to just beneath the surface that is to be restored.

C. Granular Backfill – Class I or Class II material as described in 2.01 A and B.

D. Haunching – Granular or other specified material placed from the top of the bedding to the springline (center) of the pipe, installed uniformly in lifts on each side of the pipe, and shoveled under the sides of the pipe to provide resistance against soil and traffic loading.

E. Initial Backfill – Granular or other specified material placed from the springline of the pipe to the specified height above the crown of the pipe, to provide adequate pipe support and to protect the pipe from damage due to compaction of the final backfill.

F. Pavement/Structure Loading Zone - the area within 5 feet of any edge of pavement, curb, gutter, sidewalk, building, or other structure.

1.04 Submittals

A. Product Data

1. Class I material source and gradation
2. Class II material source and gradation
3. Flowable Fill Mix Design
    a. Provide mix design which includes:
        1) List of all ingredients
        2) Source of the materials
        3) Gradation of aggregates
        4) Names of admixtures and dosage rates
        5) Batch weights
        6) Mix design designation number
    b. If requested, provide a trial batch demonstration.
    c. Provide test data from a laboratory inspected by the Cement and Concrete Reference Laboratory that shows the proposed mix design is in accordance with the requirements listed in this specification.

B. Quality Control Submittals

1. Backfill Compaction Test Results
2. Flowable Fill Test Results
    a. Unconfined Compressive Strength
    b. Flow Consistency
    c. Setting and Early Strength

1.05 Quality Assurance

A. Qualifications

1. Provide the services of a qualified, independent testing laboratory to perform all field tests.
2. Trench backfill and surface restoration shall be conducted in a prompt manner.

1.06 Warranty

A. Refill and restore to the original grade settlement in the backfill which takes place within the 1-year warranty period at no additional cost to the County/City. Restore the surface area where settlement has occurred, including, but not limited to seeding, fertilizing, erosion control and restoration of streets, drives, yards, and sidewalks.

B. Guarantee all disturbed and replaced trees and shrubs for a period of 1 year from date of substantial completion of project.

PART 2 - PRODUCTS

2.01 Bedding and Backfill Material Classifications

A. Class I: Angular, well graded stone such as crushed stone. INDOT No. 8 coarse aggregate size meeting the following nominal sizes and percent passing will be considered an equivalent Class I material:

1. 100 percent passing 1-inch sieve
2. 75-95 percent passing 3/4-inch sieve
3. 40-70 percent passing 1/2-inch sieve
4. 20-50 percent passing 3/8-inch sieve
5. 0-15 percent passing No. 4 sieve

B. Class II: Coarse, well graded, clean sands and gravel-sand mixtures including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil types GW, GP, SW and SP are included in this class. Provide Class II material which meets the requirements of INDOT Standard Specifications Section 904 classification for Structure Backfill with maximum particle size

C. Excavated Material: Excavated material suitable for use as trench backfill must be clean and free of rocks and frozen soil lumps larger than 6 inches, wood, debris, or other extraneous material.

D. Flowable Fill: Removable, self-leveling, self-compacting, flowable material with a minimum unconfined compressive strength (28 day) of 50 psi and a maximum unconfined compressive strength of 100 psi at 28 days. Provide Removable Flowable Backfill material which meets the requirements of INDOT Standard

Specifications Section 213 and Section 904 classification for Type 4 Structure Backfill.

2.02 Sheeting and Bracing

A. Provide sheeting, shoring and bracing capable of sustaining the lateral forces of the trench and pit banks and that comply with all applicable OSHA requirements. Protective systems for excavations 20 feet deep or greater must be designed and certified by a registered Professional Engineer.

PART 3 - EXECUTION

3.01 Preparation

A. Planning

1. Maintain traffic flow at all streets and service drives during construction.
2. Comply with the terms and limits of easements. Obtain property access permission prior to accessing or traversing yards or fields outside easements.

B. Protection

1. Before any excavation is started, provide adequate protection for all lawns, trees, landscape work, shrubs, fences, hydrants, sidewalks, utility poles, and other objects that are to remain in place.
2. Maintain such protection for as long as necessary to prevent damage from operations.
3. Movable items such as mailboxes and roadway signs may be temporarily relocated during construction unless shown otherwise on the Drawings. Reinstall movable items in their original location immediately after backfilling and compacting is complete. Replace movable items damaged during construction with new items at the Contractor's expense.
4. Verify the location of existing storm sewers, sanitary sewers, water mains, gas mains, electric ducts, telephone ducts, utility services, and other underground structures. Determine the exact location of and the means of protection for these facilities and structures. Protect, support and maintain operation of these facilities during construction.

C. Site Preparation

1. Complete site clearing and grubbing.
2. Remove existing pavement and walks from the areas of excavation.
3. Strip topsoil and vegetation from the areas of excavation.
   a. Clean topsoil may be stockpiled for reuse.
   b. Do not mix grass, weeds, roots, brush, and stones larger than 1-inch in diameter with stockpiled topsoil. Dispose of root contaminated topsoil.

3.02 Excavating

A. Keep open excavations free of water to avoid impacting the work.

1. Provide and maintain adequate dewatering equipment to remove and dispose of surface water and groundwater entering excavations.
2. Use appropriate measures to prevent surface water from entering the excavation and to provide adequate drainage of the areas adjacent to the excavation.
3. Filter water from dewatering operations to remove sediment before discharge and disposal in accordance with Section 02101.

B. Excavate carefully and cautiously to avoid damaging existing underground utilities and structures.

1. Repair, or have repaired, existing utilities and structures broken or otherwise damaged during Construction.
2. Immediately bring to the attention of the County/City any unforeseen conflicts with existing utilities exposed during excavation and preparation of trenches and pits.
3. If proposed utility cannot be installed at locations shown on the Drawings, adjust its alignment or relocate the existing utilities as approved by the County/City.

C. Store excavated materials suitable and necessary for backfilling in a neat pile adjacent to the excavation in a manner that will not interfere with traffic. Do not place such materials at heights or within the proximity of excavations where they may cause earth slides or cave-ins. Do not stockpile excavated material closer than 2 feet from the top edge of the excavation wall at ground surface.

D. Remove excavated material not suitable for backfilling and excess suitable material from the job site. Dispose of the materials in accordance with all local, state, and federal regulations.

3.03 Sheeting and Bracing

A. Properly shore, sheet, brace, or cut back at the proper slope, all excavations to safely install utilities and to protect adjacent streets and structures.

B. The Contractor is responsible and accountable for all sheeting and bracing used and for damages to persons or property resulting from the improper quality, strength, placement, maintenance and removal of the sheeting, shoring, and bracing, including damage to trees, shrubs, walkways and other property.

3.04 Trenching

A. Excavate trenches to the depths and widths shown or as required for the proper installation of the pipe and appurtenances.

B. Excavate trenches for concrete box sections only as wide as is necessary to facilitate proper compaction of backfill material, provided the adjacent

embankment material is structurally adequate to provide the necessary side support. Verification of sufficient bearing strength of underlying soil foundation material, based upon manufacturer's instructions, shall be required for all reinforced concrete box section installations.

C. Excavate trenches in straight lines. Keep sides of trenches as near vertical as possible and properly sheet and/or brace, if required. Perform open cut excavation except where otherwise approved or noted on Drawings.

D. Provide a continuous, uniform bearing support for the pipe on bedding within the trench, dished to provide circumferential support to the lower third of each pipe. Dig out holes to receive pipe bells.

E. Remove rock and soft material encountered in the trench which, in the opinion of the County/City is incapable of providing adequate bearing to support the pipe. Remove material to accommodate the minimum specified bedding depth below the required elevation and fill with Class I or Class II material as specified.

F. Do not open more than 50 feet of trench in advance of the installed pipe, unless otherwise directed or permitted by the County/City. Excavate the trench within 6 inches of full depth for a distance of at least 30 feet in advance of the pipe installation, unless otherwise directed or permitted.

G. Support all sewer, gas, water or other pipes or conduits crossing the trench to prevent damage and service interruptions. The manner of supporting such pipes or conduits will be subject to the approval of the County/City or the inspector of the Utility involved.

H. Provide adequate sheeting and bracing in trenches and pits to protect life, property and the Work. Renew and maintain sheeting, planking, timbering, shoring, bracing, and bridging, and do not remove until sufficient backfill has been placed to protect the pipe.

I. Where rock is encountered in excavations, remove the rock by mechanical means. Use a rock trencher which produces excavated material commensurate to granular backfill, which can then be used as bedding for pipe in areas of rock excavation. Blasting is not permitted.

3.05 Trench Backfill

A. Specifications regarding trench backfilling also apply to excavated pits.

B. The contractor shall notify the County/City at least 24 hours prior to beginning backfill of excavation. Do not backfill trenches until all piping and utilities have been inspected by the County/City.

C. Backfill all trenches within State Highway right-of-way in accordance with INDOT Specifications. Backfill all trenches within the right-of-way of other public authorities having jurisdiction in accordance with requirements of the public authority.

D. For any trench that intersects any portion of the pavement/structure loading zone use Class I, Class II, or flowable fill backfill materials. The County/City shall have the authority to require flowable fill backfill when, in their opinion, minimum compaction cannot be obtained.

E. Comply with details shown on the Drawings for the placement of bedding and backfill materials for each pipe material.

F. Placement and Compaction

1. Class I, Class II, and Excavated Material
   a. Place Bedding, Haunching, and Initial Backfill materials in 6-inch balanced lifts to ensure proper compaction and filling of all voids.
      1) Class I material: Shovel slice or otherwise carefully place; walk or hand tamp into place.
      2) Class II material: For the first 24 inches of backfill over the pipe, use hand-operated tamping devices. Use standard mechanical methods (powered tampers, vibrators, etc.) for the remainder of the trench.
   b. Do not flood or puddle with water to consolidate backfill.
   c. Compaction
      1) Outside the pavement/structure loading zone:
         a) Place final backfill in maximum 12-inch lifts.
         b) Compact each layer to a minimum of 90 percent of the maximum Standard Proctor dry density.
         c) Additional compaction if required to minimize settling. Limited mounding of backfill above finish grade may be performed to compensate for settlement with the approval of the County/City.
         d) Place 6 inches of topsoil over areas to be seeded.
      2) Within the pavement/structure loading zone:
         a) Place final backfill in 6-inch lifts.
         b) Compact each layer to 95 percent of the maximum Standard Proctor dry density, except the final 12 inches under pavement, compact each 6-inch lift to 100 percent of the maximum Standard Proctor dry density.
         c) Prepare upper portion of trench for pavement replacement as applicable.
      3) Stone and unpaved driveways and alleys:
         a) Place final backfill in 6-inch lifts.
         b) Compact each layer to 95 percent of the maximum Standard Proctor dry density.
         c) Replace the last 12 inches of surface with the same material as the original surface unless otherwise specified and compact to 100 percent of the maximum Standard Proctor dry density.
2. Flowable Fill
   a. The flowable fill mix design shall be submitted to and approved by the County/City prior to placement.
   b. Flowable fill shall be mixed and placed as specified in INDOTSS 213.
   c. Discharge the mixture from mixing equipment into the space to be filled. Do not float pipe when placing flowable fill. Bring the flowable fill up uniformly to the fill line. Keep each filling stage continuous.

d. Protect flowable fill from freezing until the material has stiffened and bleeding water has subsided. As the temperature nears freezing, additional curing time may be needed.
e. Concrete may be placed on the flowable fill as soon as bleeding water has subsided. Place all pavements on flowable fill according to manufacturer's instructions.

G. Maintain backfilled trenches in a smooth and uniform condition until paving or seeding operations are completed.

3.06 Field Quality Control

A. Tests

1. Class II Compaction Tests: Perform compaction tests for Class II trench backfill material in accordance with ASTM D698 and as follows:
   a. At each road crossing: vertically at 2-foot intervals in the trench
   b. At every 1,000 feet longitudinally (minimum of one test) in roadways along the pipe alignment and vertically at 2-foot intervals in the trench
   c. Notify the County/City 24 hours prior to the tests so that they may be present for the compaction tests.
   d. When compaction test results are unsatisfactory, re-excavate, re-compact the backfill and retest until the specified compaction is obtained.
2. Flowable Fill Tests: Perform the following tests for flowable fill:
   a. Unconfined Compressive Strength
   b. Flow Test: Conduct flow consistency testing in accordance with ASTM D6103 by filling a 3-inch diameter by 6-inch high open ended cylinder placed on a smooth, nonporous, level surface. Pull the cylinder straight up within 5 seconds and measure the spread of the fill. The diameter of the spread shall be 8 inches or more with no noticeable segregation.
   c. Setting and Early Strength Test: Determine whether the flowable fill has hardened sufficiently for loads to be applied and construction activities to continue by conducting one of the following tests:
      1) Penetration Resistance test in accordance with ASTM C403 – minimum value of 500 psi required for loading
      2) Ball Drop test in accordance with ASTM D6024 – maximum indentation diameter of less than 3 inches required for loading

3.07 Material Disposal

A. All existing utility infrastructure and appurtenances (piping, structures, etc.) that are to be replaced or removed to allow for new construction are the responsibility of the Contractor unless otherwise designated. As these materials are excavated, remove them from the job site and dispose of them in accordance with applicable local, state and federal rules and regulations.

-END-

SECTION 02224 – TRENCHLESS EXCAVATION – HORIZONTAL BORINGS

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Horizontal boring of casing pipe and related Work beneath local roads.

B. Related Sections

1. Section 02200 - Earthwork
2. Section 02220 - Trenching, Backfilling and Compaction for Utilities
3. Section 02660 - Water Mains
4. Section 02720 - Storm Sewer Systems
5. Section 02730 - Gravity Sanitary Sewer Systems

1.02 Submittals

A. Quality Control Submittals: Before beginning any work, submit the following items to the County/City. Do not proceed with the work until such documents have been reviewed by the County/City. The review by the County/City of any plan or method shall not relieve the Contractor of his responsibility in any way.

1. Manufacturer's Certificate of Compliance certifying compliance with the referenced specifications and standards
2. Certified copies of reports of factory tests specified in this Section and required by the referenced standards
3. Plans and details describing materials and methods proposed by the Contractor for use in special crossings
4. Documentation of experience requirements per paragraph 1.03.

1.03 Quality Assurance

A. Qualifications

1. Demonstrate experience and expertise in horizontal bore installation methods by providing a list of 6 references for whom similar Work has been performed prior to commencing any Work. Include a name and telephone number for each contact.
2. Provide documentation showing successful completion of at least 10,000 linear feet of horizontal bore installation of piping or obtain the services of an experienced horizontal bore subcontractor meeting the experience requirements of this section to supervise the installation prior to commencing any Work. Conventional trenching is not considered applicable experience.
3. Adequately train all supervisory personnel and ensure they have at least 4 years of experience in pipe installation by horizontal bore. Submit the names and resumes of all supervisory field personnel for review by the County/City prior to commencing any Work.

B. Regulatory Requirements

1. Perform all horizontal bore Work in accordance with laws, permits, requirements and regulations of the authority having jurisdiction of the rights-of-way.
2. Necessary permits shall be obtained for the proposed boring(s) from the authority having jurisdiction.
3. Necessary traffic maintenance plans and boring pit locations shown in the Drawings shall be in accordance with required permits.
4. Give notification to the applicable agency or officials prior to the start of the Work and do not start the Work until all arrangements are completed and permission to start Work is given by the authority having jurisdiction.
5. The County/City or jurisdictional officials shall review, and modify if necessary, the scheduling of construction activities within the right-of-way in order to prevent interruption to traffic.
6. Complete Work in a careful, workmanlike manner to the satisfaction of the jurisdictional officials and the County/City.

C. General Procedures

1. Attend all meetings and provide data, reports, information, details, and construction schedules requested by the County/City.
2. Notify the County/City when each boring and receiving pit has been staked in the field. Do not proceed with the Work until the survey information is obtained for the respective boring location and is approved by the County/City.

PART 2 - PRODUCTS

2.01 Steel Pipe Casing

A. Welded steel pipe, new and unused, in accordance with ASTM A139 Grade B for “Electric Fusion of Welded Steel Pipe” with a minimum yield of 35,000 psi.

B. The inside diameter shall be at least 6 inches greater than the largest bell diameter of the carrier pipe.

C. The casing pipe and joints shall be capable of withstanding the loads of traffic, pavement, subgrade and other dead loads.

D. The casing pipe and joints shall be constructed to prevent leakage of any matter from the casing or carrier pipe throughout its entire length including the ends of the casing pipe.

E. The minimum wall thickness of the casing pipe shall be as shown in the following table:

Diameter of Casing	Minimum Wall Thickness (Inches) Under Road
Under 14"	0.250
14" to 16”	0.250
18"	0.250
20"	0.375
22"	0.375
24"	0.375
26"	0.375
28" to 30”	0.500
32"	0.500
34" to 36”	0.500
38" to 42”	0.500

F. The exterior walls of casing shall be coated with protective coal tar or bitumastic material, after the welding of each joint has been completed.

G. When casing is installed without benefit of a protective coating and the casing is not cathodically protected, the wall thickness shown above shall be increased to the nearest standard size, which is a minimum of 0.063 inch greater than the thickness shown except for diameter under 12-3/4 inches.

H. The diameter, gauge, ASTM specification and manufacturer's name must be marked on the exterior of each pipe length.

I. Install casing pipe spacers to provide uniform support throughout the entire length of the casing. Casing pipe spacers shall have stainless steel bands and risers, plastic liner and runners as manufactured by Cascade Waterworks Manufacturing Company or approved equal.

PART 3 - EXECUTION

3.01 General

A. Before beginning any Work, submit to the County/City plans and details describing the materials and methods proposed to be used for the Work. Do not proceed with the Work until such plans have been reviewed for conformity with the approved permit. The review by the County/City of any plan or method shall not relieve the Contractor of his responsibility in any way.

B. Open trenches shall be properly sheeted and braced in accordance with all applicable OSHA requirements. Provide sheeting where necessary to provide safe working conditions for employees and protection for roads, structures and utilities.

C. Install welded steel pipe casing in accordance with approved jacking and boring methods. Maintain the lines and grades shown for the entire length of the steel casing.

3.02 Installation of Casing and Carrier Pipes

A. Excavate the boring pit providing adequate clearance from the edge of the road right-of-way avoiding interruption to traffic. Excavation shall be in accordance with Section 02200.

B. Support existing, and replace damaged, structures or utilities encountered to the satisfaction of the County/City. Maintain pits during casing and carrier pipe installation.

C. Bore or jack the casing pipe into place to satisfactory alignment and grade for its entire length.

D. After casing is installed, push successive lengths of carrier pipe through to the length indicated on the Drawings. Make connections to the utility main.

E. The material of carrier pipe and type of pipe joint fittings shall be as specified in other Sections for the type of pipe, whether water main, gravity sanitary sewer, storm sewer, force main, or electrical conduit. Employ suitable methods to maintain tight joints to the satisfaction of the County/City.

F. Block up the ends of the casing pipe to prevent the entrance of foreign material but do not tightly seal. Grouting of the void space between the casing and the carrier pipe is not required.

G. Backfilling shall be as specified in Section 02220. Remove excess excavated material and debris from the site.

H. Each end of the casing pipe shall be referenced to a minimum of two (2) permanent reference points for Record Drawing purposes.

-END-

SECTION 02226 - TRENCHLESS EXCAVATION - DIRECTIONAL DRILLING

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Installation of force main, water main, sanitary sewer, and storm sewer by the directional drilling method, including all related Work, for a complete installation as shown on the Drawings and specified herein.

B. Related Sections

1. Section 02101 - Stormwater Pollution Prevention and Erosion Control
2. Section 02220 - Trenching, Backfilling and Compaction for Utilities
3. Section 02660 - Water Mains
4. Section 02720 - Storm Sewer Systems
5. Section 02730 - Gravity Sanitary Sewer Systems
6. Section 02732 - Testing Sanitary Sewers and Force Mains
7. Section 02737 - Force Main Sewer Systems

1.02 References

A. ASTM D1248 – Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable

1.03 Submittals

A. Quality Control Submittals

1. Details of equipment and written procedure with working drawings describing in detail the proposed boring method and the entire operation to be used.
2. Documentation of experience requirements per paragraph 1.04A.

1.04 Quality Assurance

A. Qualifications

1. Demonstrate experience and expertise in trenchless excavation methods by providing a list of 6 references for whom similar Work has been performed prior to commencing any Work. Include a name and telephone number for each contact.
2. Provide documentation showing successful completion of at least 50,000 linear feet of directional drilling or obtain the services of an experienced directional drilling subcontractor meeting the experience requirements of this section to supervise the installation prior to commencing any Work. Conventional trenching is not considered applicable experience.
3. Supervisory field personnel shall be adequately trained and have at least 4 years of experience in directional drilling. Submit the names and resumes of all supervisory field personnel for review by the County/City prior to commencing any Work.

B. Regulatory Requirements

1. Perform all directional drilling Work in accordance with laws, permits, requirements, and regulations of the authority having jurisdiction of the rights-of-way.

PART 2 - PRODUCTS

2.01 Carrier Pipe

A. Meet the requirements as specified in Section 02660 - Water Mains

B. Meet the requirements as specified in Section 02720 – Storm Sewer Systems

C. Meet the requirements as specified in Section 02730 – Gravity Sanitary Sewer Systems

D. Meet the requirements as specified in Section 02737 – Force Main Sewer Systems

PART 3 - EXECUTION

3.01 General

A. Attend all meetings and provide data, reports, information, details, and construction schedules requested by the County/City.

B. Complete the Work in a careful, workmanlike manner to the satisfaction of the County/City.

3.02 Examination

A. Verify the location of all known and unknown utilities and structures by test pitting prior to any boring or drilling. These utilities and structures may include, but are not limited to:

1. Underground utilities
    a. Storm drains
    b. Electric cables
    c. Water mains
    d. Sewer lines and septic systems
    e. Gas lines
    f. Telephone lines
    g. Fiber optic lines
    h. Cable television lines
    i. Wells
    j. Field drain tiles
2. Above-ground utilities and other obstructions
    a. Electric and telephone poles
    b. Buildings

c. Trees
d. Road signs

B. Be responsible for inspecting the site, conducting investigations, surveys and tests, including subsurface investigations and tests, that are necessary for the complete execution of all the work under this section.

3.03 Installation

A. General

1. Before beginning any Work, submit plans and details describing the materials and methods which are proposed for use. Do not proceed with the Work until such drawings and methods have been reviewed for conformity with the approved permit by the County/City. The review by the County/City of any drawings or method shall not relieve the Contractor of his responsibility in any way.
2. Notify the County/City 48 hours in advance of starting directional drilling Work. Do not begin the directional drilling until the County/City, or his authorized representative, is present at the job site and proper preparations for the operation have been made. The County/City's consensus for beginning the installation shall in no way relieve the Contractor of the responsibility for the satisfactory completion of the Work.
3. Do not cut or disturb pavement, asphalt, or excavate within the relative limits of the roadway surface to retrieve any lost boring appurtenances or equipment.
4. Maintain a log of drilling operations which includes vertical depths of the pipe at established horizontal intervals every 25 feet.

B. Equipment

1. The directional drilling system to be used must have the following features:
   a. The system shall be remotely steerable and permit electronic monitoring of tunnel depth and location. The system shall be able to control the depth and direction of the pipe and must be accurate to ± 2 inches.
   b. The system shall utilize a fluid-cutting process, using a liquid clay such as bentonite. This clay shall be totally inert and contain no risk to the environment.
   c. The liquid clay shall remain in the tunnel to increase the stability of the tunnel and to provide a lubricant to reduce frictional drag when the pipe is installed.
   d. Recover spoils by use of a vacuum system mounted on a vehicle for removal of the spoils.
      1) Do not discharge spoils into sewers or storm drains.
      2) Properly dispose of all spoil material.
   e. Equipment shall be fitted with a permanent, inherent alarm system capable of detecting an electrical current. The system shall have an audible alarm to warn the operator when the drill head nears electrified cables within a safe operating distance.

C. Mechanical, pneumatic, or water-jetting methods are not acceptable due to the risk of surface subsidence and damage.

D. Protection

1. Protect personnel against existing buried electrical cables that may be energized.
   a. Provide all crews with grounded safety mats, heavy gauge ground cables with connectors, hot boots, and gloves.
2. Where manholes or grinder pumps are to be installed, use adequate protection in the form of steel plates in traffic areas and timber shutters in other areas until such times as the manhole or grinder pump is installed, and the pit is backfilled and stabilized. Be responsible for maintaining these areas.

E. Drilling Procedure

1. Prior to any alterations to the Work site, video tape the entire Work area, including entry and exit points. Provide one copy of the video to the County/City and keep one copy for a period of 1 year following the completion of the project.
2. Grade or fill the Work site as indicated on the drawings, within the right-of-way, to provide a level working area. Make no alterations beyond what is required for operations. Confine all activities to the designated Work areas and construction limits.
3. Accurately survey the entire drill path and place entry and exit stakes in the appropriate locations within the areas indicated on the Drawings. If using a magnetic guidance system, survey the drill path for any surface geo-magnetic variations or anomalies.
4. Place environmental protection necessary to contain any hydraulic or drilling fluid spills, including berms, liners, turbidity curtains, and other erosion control measures as specified in Section 02101. Adhere to all environmental regulations. Do not store fuel and oil in bulk containers within 200 feet of any waterbody or wetland.
5. Place pipe resting on paved or hardened surfaces (i.e., sidewalks, asphalt, concrete, gravel, etc.) on pipe rollers before being pulled into the drill hole, with rollers spaced close enough to prevent excessive sagging and dragging of the pipe on rough surfaces which could scar the pipe.
6. Calibrate the directional drilling head locator at the start of the day and at each new directional drilling operation. Keep a daily calibration log for the County/City's review.
7. Ensure the directional drilling operator has full control of the direction of the drilling tool at all times. Abandon and fill shallow, misdirected, or other unsuccessful drills at the direction of the County/City.
8. The maximum drill angle shall be 15 degrees measured perpendicular to grade to the design depth elevation.
9. Drill a pilot hole on the drill path with no deviations greater than 5 percent of depth over a length of 100 feet. In the event the pilot hole does deviate from the drill path more than 5 percent of depth in 100 feet, notify the County/City. The County/City may require pull back and re-drill from the location along the drill path before the deviation.

10. In the event of a drilling fluid fracture, inadvertent returns, or returns loss occurs during pilot hole drilling operations, cease drilling. Wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a March funnel, and then wait another 30 minutes. If mud fracture or returns loss continues, cease operations, and notify the County/City. The County/City and Contractor will discuss additional options and Work will proceed accordingly.
11. Upon successful completion of the pilot hole, ream the drill hole to a minimum of 25 percent greater than the outside diameter of the pipe using appropriate tools. Do not attempt to ream, at one time, more than the drilling equipment and mud system are designed to safely handle.
12. After successfully reaming the drill hole to the required diameter, pull the pipe through the drill hole. In front of the pipe will be a swiveling mandrel. Once pull-back operations have commenced, operations must continue without interruption until the pipe is completely pulled into the drill hole. Do not apply more than the maximum safe pipe pull pressure at any time during pull-back operations.
13. Pull back 2 strands of tracer wire with the pipe.
    a. Tracer wire shall be Copperhead Direct Burial #12 AWG, solid steel core, hard drawn, extra-high strength, horizontal directional drill tracer wire with:
        1) 1150 pound average tensile break load,
        2) 45 mil high molecular weight-high density yellow polyethylene jacket complying with ASTM D1248, and
        3) 30 volt rating.
        4) Include the tracer wire in the cost of the pipe.
14. In the event the pipe becomes stuck during pull-back, cease pulling operations to allow any potential hydro-lock to subside and then commence pulling operations. If the pipe remains stuck, notify the County/City. The County/City and the Contractor will discuss options and then Work will proceed accordingly.
15. At drill pits and directional drilling entrances and exits to the surface, use a backhoe or equivalent to gradually return the bore depth to the prescribed depth.
16. Upon completion of drilling and pipe installation, remove spoils from starting and termination pits. Backfill and compact drill pits and directional drilling entrances and exits to the surface as specified in Section 02220. Restore pits to their original condition.

3.04 Field Quality Control

A. Maintain a daily calibration log of the directional drilling head locator. Provide completed forms or computer-generated output to the County/City daily for checking line and grade of the drilling operation.

B. Dig test/pressure relief holes (potholes) every 50 feet along the bore route to confirm alignment and grade, and to relieve subsurface pressure.

C. Allowable deviation in grade, as measured from the upstream manhole, shall be a maximum of 4 inches for 100-foot length of gravity sewer. At no point in the gravity sewer shall the slope be less than minimum required slope.

D. Allowable deviation in line shall be a maximum of 12 inches in any 100-foot section and shall not exceed 36 inches for the length of sewer.

E. Perform a post CCTV inspection of all gravity pipes as specified in Section 02732. A belly in the pipe that exceeds 10% of the pipe diameter, or otherwise determined in the opinion of the County/City, is not acceptable.

F. Replace sections of pipe that do not meet the above requirements. If the new pipe installed does not meet the above requirements, either grout and abandon the pipe in place, or remove the pipe and fill the void as directed by the County/City.

G. Perform all testing as required in other sections for the type of utility pipe installed.

-END-

SECTION 02500 – STANDARDS OF ROADWAY DESIGN

PART 1 - GENERAL

1.01 Frontage Roads

A. Developers shall be responsible for improvements to the existing roadway(s) that front their property. These improvements shall include, but are not limited to, the following items:

1. Construction of acceleration lanes, deceleration lanes, and passing blisters for each entrance or street intersection as indicated in the Standard Details.
2. In order to construct adequate acceleration lanes, deceleration lanes, and passing blisters, right-of-way shall be obtained which has a width consistent with the most current accepted Thoroughfare Plan.
3. The existing roadway along the development frontage shall be widened to match the width requirements based on the functional classification of the roadway as defined by the Thoroughfare Plan. Once widened, the entire roadway fronting the development shall be resurfaced for consistency.

B. Additional improvements may be required depending on field conditions and as determined by the County/City.

1.02 Topography and Arrangement

A. All streets shall be integrated with the existing and proposed systems of thoroughfares and dedicated street right-of-way as established on the Official Map and/or Comprehensive Plan.

B. Minor or local streets should be laid out to conform as much as possible to the topography to permit efficient drainage and utility systems, and to require the minimum number of streets necessary to provide convenient and safe access to property.

C. The arrangement of streets shall provide for the continuation of streets between adjacent properties when such continuation is necessary for convenient movement of traffic, effective fire protection, for efficient provision of utilities, and where such continuation is in accordance with the Thoroughfare Plan. If the adjacent property is undeveloped and the street must be a dead-end street temporarily, the right-of-way shall be extended to the property lines, unless prevented by topography or other physical conditions, or as otherwise approved by the County/City.

1.03 Design Standards

A. General

1. The general design standards for public roads are indicated in Tables 1.03A and 1.03B. Road classifications are as indicated by the Thoroughfare Plan; otherwise, it shall be determined by the County/City.

2. All subdivision development proposed to the Fayette County Area Planning Commission must use the Urban Section guidelines for all interior subdivision streets unless otherwise approved by the approving agency.
3. Primary Arterial Streets and By-Pass Routes are to be coordinated with the Fayette County Area Planning Commission and shall be in accordance with the minimum design standards outlined by the Subdivision Control Ordinance.
4. The following design standards shall apply to all roadways (Tables 1.03A & 1.03B):
   a. Minimum Grade: 0.5%
   b. Maximum Cul-de-Sac Length: 1000 ft
   c. Vertical curves shall be used at all change in grade and shall be a minimum length of 50 ft, but not less than 20 feet for each percent of algebraic difference in grade
5. All widths, lengths, distances, radii, and diameters indicated in Tables 1.03A and 1.03B below are minimum required. Greater dimensions may be provided.

Table 1.03A: Design Standards for Public Roads – Urban Section

Roadway Type	Urban Section			
	Residential	Feeder	Secondary Arterial	Primary Arterial
Minimum Width Right-of-way	60 ft	60 ft	70 ft	100 ft
Minimum Pavement Width (1)	26 ft	32 ft	36 ft	40 ft
Maximum Grade	7.5%	7.0%	(2)	(2)
Minimum Radius of Curve	100 ft	200 ft	(2)	(2)
Minimum Length of Tangent (3)	100 ft	100 ft	(2)	(2)
Minimum Sight Distance	200 ft	240 ft	(2)	(2)
Minimum Corner Radius (4)	20 ft	25 ft	(2)	(2)
Minimum Turn-around (5)	120 ft / 98 ft	N/A	N/A	N/A

Table 1.03B: Design Standards for Public Roads – Rural Section

Roadway Type	Rural Section			
	Local	Feeder	Secondary Arterial	Primary Arterial
Minimum Width Right-of-way	60 ft	60 ft	70 ft	100 ft
Minimum Pavement Width (1)	26 ft	36 ft	36 ft	36 ft
Minimum Side Ditch Depth (6)	2 ft	2 ft	2 ft	2 ft
Minimum Shoulder Width	4 ft	4 ft	6 ft	8 ft
Maximum Grade	7.5%	7.0%	(2)	(2)
Minimum Radius of Curve	100 ft	200 ft	(2)	(2)
Minimum Length of Tangent (3)	100 ft	100 ft	(2)	(2)
Minimum Sight Distance	200 ft	240 ft	(2)	(2)
Minimum Corner Radius (4)	20 ft	25 ft	(2)	(2)
Minimum Turn-around (5)	120 ft / 94 ft	N/A	N/A	N/A

Footnotes, Tables 1.03A & 1.03B:

1) 2 ft minimum curb and gutter width on each side of pavement in addition to pavement width specified for Urban Cross Section.
2) As required by Local Government Engineer and/or Indiana State Highway Commission.
3) Between reverse curves
4) Measured at curb on Urban Cross Sections, at pavement edge on Rural Cross Sections.
5) Diameter, measured at edge of right-of-way/edge of pavement, or back-to-back of curb on urban cross sections. Transitional curve into the turnaround within cul-de-sacs: 50', measured at edge of pavement or back of curb on urban cross sections.
6) Side ditch depth measured from road centerline to ditch invert.

1.04 Road Surfacing and Improvements

A. Developer shall construct all required curb and gutters and roadway improvements per to Section 02501 and the County/City standard drawings.

1.05 Excess Right-of-Way

A. Right-of-way widths in excess of standards designated in these specifications shall be required whenever additional width is necessary to provided adequate earth slopes (due to topography).

1.06 Sidewalks

A. Pedestrian facilities shall be designed in accordance with the Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG).

B. Curb ramps shall comply with the most current INDOT and ADA requirements. Refer to the INDOT Standard Drawings for general curb ramp types and configurations.

C. ADA curb ramps shall be located as shown on the plans or as directed by the County/City.

D. Curb ramps shall be provided where driveway curb extends across sidewalk.

E. Where new sidewalk connects to existing sidewalk, the width of the new sidewalk shall match the width of the existing sidewalk or be a minimum of 5 feet, whichever is greater.

F. A written request for variance may be submitted to the Fayette County Area Planning Commission to allow for the deletion of the 5 foot wide sidewalk from Commercial Feeder Streets. The sidewalks shall be constructed unless a written variance is issued by the Fayette County Area Planning Commission.

1.07 Underdrains

A. Urban Section

1. Pavement underdrains are required for all Urban Section streets as specified in Section 02710 and shown on the County/City standard drawings.
   a. A written request for variance may be submitted to the County/City to allow for the deletion of the pavement underdrain. The written request for variance shall be accompanied with a geotechnical report, which supports the omission of swale underdrains.
   b. The pavement underdrain shall be constructed unless a written variance is issued by the County/City.

B. Rural Section

1. Swale underdrains are required for all Rural Section roads as specified in Section 02710 and shown on the County/City standard drawings, unless otherwise approved as follows:
   a. A written request for variance may be submitted to the Fayette County Surveyor to allow for the deletion of the swale underdrain from Rural Feeder and/or Rural Local roads. The written request for variance shall be accompanied with a geotechnical report, which supports the omission of swale underdrains.
   b. The swale underdrain shall be constructed unless a written variance is issued by the Fayette County Surveyor.

1.08 Intersections

A. Streets shall be laid out so as to intersect as nearly as possible at right angles. A proposed intersection of two (2) new streets at an angle of less than seventy-five degrees (75°) shall not be acceptable. An oblique street should be curved approaching an intersection and should be approximately at right angle for at least one hundred (100) feet therefrom. Not more than two (2) streets shall intersect at any one point unless specifically approved by the County/City.

B. Proposed new intersections along one side of an existing street shall, wherever practicable, coincide with any existing intersection on the opposite side of such street. Street jogs with centerline offsets of less than one hundred fifty (150) feet shall not be permitted, except where the intersected street has a median without a break at either intersection.

C. Intersections shall be designed with a flat grade wherever practicable. At the approach to an intersection, a leveling area shall be provided having not greater than three percent (3%) rate at a distance of sixty (60) feet, measured from the nearest right-of-way line of the intersecting street.

D. Sight distance at intersections.

1. No fence, wall, hedge, tree, shrub, planting or other similar item which obstructs sight lines at elevation between two and one-half (2.5) and nine (9) feet above the crown of a street shall be permitted to remain on any corner lot within the triangular area formed by the street right-of-way lines and a line connecting points twenty-five (25) feet from the intersection of the street right-of way lines; or in the case of a rounded property corner, from the intersection of the street right-of-way lines extended.
2. The same sight line limitations shall apply to any lot within ten (10) feet from the intersection of a street right-of-way line with the edge of a driveway pavement or alley line. For corner lots, no driveway shall be located within seventy (70) feet of the intersection of two (2) street centerlines.

1.09 Easements

A. The subdivider shall be encouraged to design for the placement of utility lines underground, following the required standards and specifications established by each utility company. The location of each underground utility system shall be shown by appropriate easement lines on drawings.

B. Private utilities shall generally be located outside of public right-of-way except where street crossings are required. A utility easement having a minimum width of fifteen (15) feet shall be provided adjacent to the public right-of-way on each side of the public street.

1.10 End of Roadway

A. Roadways terminated for future extension and development shall conform to the following requirements and standards:

1. Temporary Cul-de-Sac
   a. Developers shall be responsible for constructing a temporary cul-de-sac on all streets with temporary termination as determined by the local fire department and the County/City.
   b. Temporary cul-de-sacs must provide appropriate drainage to prevent ponding. Street underdrains shall be extended the full length of temporary cul-de-sac.
2. Stubbed Streets
   a. Streets stubbed out within one hundred (100) feet of an intersection shall be provided with a standard barricade in lieu of a temporary cul-de-sac.
   b. With approval of the County/City, developer may provide End of Roadway Signage in lieu of a standard barricade.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

-END-

SECTION 02501 – STANDARDS OF ROADWAY CONSTRUCTION

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Preparing, furnishing and installation of pavement subgrade, aggregate base, curb and gutter, HMA pavement, concrete pavement, and sidewalks.

B. Related Sections: Related Work Specified in the following Section

1. Section 02200 - Earthwork
2. Section 02220 - Trenching, backfilling and Compaction for Utilities
3. Section 02710 - Underdrain Systems

1.02 References

A. Codes, specifications, and standards referred to by number or title shall form a part of this specification to the extent required by the reference thereto. Except as specifically modified in this specification, paving and surfacing operations, materials and testing will comply with the most current revisions of applicable sections per the latest version of the Indiana Department of Transportation Standard Specifications (INDOTSS).

1.03 Submittals

A. Pavement Subgrade

1. Field compaction test results
2. Proofroll results

B. Aggregate Base

1. Gradation and source
2. Field compaction test results
3. Proofroll results

C. HMA Pavement

1. HMA pavement mix design and source
2. HMA pavement test results

D. PCCP Pavement, Sidewalk, Curb & Gutter

1. Concrete mix design and source
2. Admixture product data
3. Paving plan showing locations of expansion and control joints
4. Joint filler product data
5. Concrete test results

1.04 General Requirements

A. Streets

1. Streets and alleys shall be graded, surfaced, and improved to the dimensions required by the cross-sections and the work shall be performed in the manner prescribed herein and the Indiana Department of Transportation (INDOT) Standard Specifications. Whenever a conflict between the two specifications arises, the greater standard shall apply.
2. Prior to placing the street and alley surfaces, adequate subsurface drainage (underdrains) for the street shall be provided by the subdivider.
3. Installation of or provisions for the installation of all underground utilities (including service laterals) to be placed under pavement areas shall be established prior to the construction of pavements.
4. Before any bond covering a street installation is released, the County/City or duly authorized representative may request that core borings of the street be provided, at the subdivider's expense, for thickness and/or compaction determination.
5. Prior to acceptance of concrete streets, subdividers must provide satisfactory test results from an independent testing laboratory to the County/City or duly authorized representative.
6. A developer may request permission from the County/City to delay the installation of the surface layer of asphalt until the binder layer of asphalt has had sufficient time to prove its durability under the stress of heavy construction traffic, but not to exceed one (1) year. The developer shall be required to submit a separate performance bond to cover the cost of the installation of the surface layer of asphalt and concrete curbs.
7. All traffic control devices shall comply with guidelines and requirements of the current edition of the Indiana Manual on Uniform Traffic Control Devices.

B. Typical pavement sections shall conform to the cross section shown in the Standard Details. The use of alternative cross sections shall be approved by the County/City.

C. Curb & gutter sections shall comply with the Standard Details. The use of alternative curb and gutter sections shall be approved by the County/City.

D. Sidewalks

1. For multi lot developments, sidewalk facilities within the right-of-way shall be installed in all areas where future construction is not anticipated (i.e. outlots and areas where no vehicular access is permitted) or as otherwise determined by the County/City. All ADA curb ramps for public streets shall be installed with the street and curb for the overall development. Sidewalk facilities within the right-of-way for all other lots shall be installed at the time of individual lot development or as determined by the County/City.
2. Pedestrian facilities shall be constructed in accordance with the Public Right-of-Way Accessibility Guidelines (PROWAG).

3. Curb ramps shall comply with the most current INDOT and ADA requirements. Refer to the INDOT Standard Drawings for general curb ramp types and configurations.
4. When sidewalks cross major street intersections within or adjacent to a subdivision, necessary traffic control devices such as painted crosswalks and signs shall be installed at the subdivider's expense at the discretion of the County/City.
5. When bike lanes are located on streets, they should be constructed to the same standards as the roadway on which they are located.
6. If not located within the public right-of-way, easements shall be provided for sidewalks.

E. Prior to starting any construction, arrangements shall be made for inspection of work to ensure compliance with plans and specifications approved by the County/City.

F. All construction must be approved by the County/City and notice of construction must be given to the County/City or duly authorized representative, two working days (not including holidays or weekends) prior to beginning work.

G. Where unusual or exceptional factors or conditions exist, the County/City may allow minor modifications of any provision of this Section. When such modifications are allowed, a detailed written statement of the reasons for such modifications shall be attached to all copies of construction plans.

1.05 Project Conditions and Weather Limitations

A. Paving and surfacing materials shall not be placed on a wet surface, pumping subbase or when weather conditions would prevent the proper construction of paving and surfacing.

B. Aggregates shall not be placed on frozen subgrade or subbase. Aggregates shall not be placed when ambient air temperature is below 32°F.

C. Asphalt materials are to be placed in accordance with INDOTSS 402 and 406.05.

D. Asphalt materials shall not be placed when the ambient air temperature is below 40°F.

E. Paving and surfacing materials shall not be placed when natural light is not sufficient to properly observe work or operations.

1.06 Grade Adjustments of Existing Structures

A. When paving over existing manhole frames, covers, gratings, valve boxes, etc., temporarily place 1/8" inch thick material over casting prior to paving over.

1.07 Contractor's Organization

A. The Contractor shall be a firm whose prime business is HMA or PCCP paving. The Contractor shall have a competent supervisor on the site during the progress of

the work, acting for the Contractor in all matters concerning the work. He shall have the authority to receive directions and act upon them for the County/City or designee.

B. The Contractor shall keep a set of approved Plans and Specifications available on the site and in good condition.

1.08 Traffic Control

A. The Developer's Engineer shall plan construction operations so that existing local traffic access can be maintained. During the construction, the Contractor will also maintain appropriate use of barricades, lights, flagmen and other protective devices, whether specified for the project or required by the local governing authority. Traffic control devices used for maintenance of traffic shall comply with the latest version of the Indiana Manual on Uniform Traffic Control Devices.

1.09 Definitions

A. Subgrade: The prepared and compacted soil immediately below the pavement or sidewalk system and extending to such depth as will affect the structural design.

B. Base Course: The layer of specified or selected material of designed thickness placed on a subgrade to support a base course and surface course.

C. Intermediate Course: The layer of specified or selected material of designed thickness placed on a base course to support a surface course.

D. Surface Course: The layer of specified or selected material of designed thickness placed on a base course or intermediate course to support the traffic load.

PART 2 - PRODUCTS

2.01 Underdrain

A. Underdrains to be in accordance with Section 02710.

2.02 Aggregate Base

A. Compacted aggregate No. 53, in accordance with INDOTSS 904.

2.03 Hot Mix Asphalt (HMA)

A. HMA pavement shall comply with the requirements of INDOTSS 400.

B. Hot mix asphalt (HMA) shall consist of an intimate mixture of coarse aggregate, fine aggregate (including mineral filler if required), and asphalt binder or emulsion combined in proportions specified in INDOTSS 402.

1. Tack Coat – Asphalt Emulsion, Tack AE-T in accordance with INDOTSS 902.

2. Performance Grade Asphalt Binder - PG 64-22, in accordance with INDOTSS 902 and 402 for the hot mix asphalt type specified.
3. Coarse aggregates shall comply with INDOTSS 904
4. Fine aggregates shall comply with INDOTSS 904

C. No recycled asphalt pavement (RAP) or reclaimed asphalt shingles (RAS) will be allowed in the HMA surface mixture.

D. At a minimum, HMA Type B shall be utilized for all Local and Feeder roadways, and HMA Type C shall be utilized for all Arterials, unless a higher category type is required per INDOTSS 402.04, or otherwise determined by an approved pavement design.

E. Tack coat is required between all HMA courses and shall comply with Section 406 of the INDOTSS.

F. An INDOT-approved Design Mix Formula shall be used and provided to the County/City for approval at least five (5) working days prior to any mix placed. Placement of asphalt will not be allowed to proceed without an approved job mix formula (JMF) and the County/City must be notified at least two working days prior to placing any asphalt. Asphalt placed without notification will be subject to removal.

2.04 Portland Cement Concrete (PCC)

A. Concrete pavement shall comply with the requirements of INDOTSS 500.

B. Concrete mixing and transportation shall be completed via transit mixed methods. Discharge from a truck agitator or a truck mixer shall be completed within ninety (90) minutes of mixing the water, cement, and aggregates. Concrete shall be uniformly mixed when delivered to the job site. Batch tickets for each load of concrete shall indicate the weight of cement and aggregates, volume of water, and the type and amount of any approved admixtures. When concrete is delivered in transit mixers, additional water shall not be added. Concrete shall be tested for slump before being incorporated into the work.

C. Portland cement concrete pavement shall comply with Section 502 of the INDOTSS. A concrete mix design including admixtures shall be provided to the County/City for approval at least five (5) working days prior to any concrete placed. Placement of concrete will not be allowed to proceed without an approved concrete mix design and the County/City must be notified at least two working days prior to placing any concrete. Concrete pavement placed without notification will be subject to removal.

D. Joint sealing compound to be Sealtight HI-SPEC (W.R. Meadows, Inc.) Hot-applied, single component, polymeric joint sealing compound (ASTM D3405), or approved equal. Placement per INDOTSS 503.05.

E. Concrete pavement shall be wet cured by using burlap, waterproof blankets, or ponding; or by using a membrane compound. If the membrane method is used,

the compound shall be Type 2, complying with AASHTO M148 for white pigmented compound. A pressure sprayer capable of applying a continuous uniform film to the pavement surfaces will be required.

F. Texturing shall be by brooming or by a drag acceptable to the County/City.

G. Concrete for drives shall be within 1/4 inch of the thickness specified, and have control joints at 10 foot maximum spacing. Control joints shall be 1/8 inch wide and 1/4 of the concrete depth.

2.05 Pavement Markings

A. Pavement Markings shall conform to INDOT and MUTCD standards and specifications.

2.06 Guardrail

A. Steel guardrail shall conform to INDOT standards and specifications.

PART 3 - EXECUTION

3.01 General

A. The Contractor is responsible to provide equipment, workmanship and materials required to achieve a finished product that meets these specifications.

B. Use compaction equipment suitable to the material being placed. Compacting equipment shall include at least one piece of equipment capable of providing a smooth even surface on the pavement surface course.

C. Prior to placing paving and surfacing materials, shape subgrade as required to produce finished pavement grades and cross-sections shown on drawings.

D. The Contractor shall notify the County/City a minimum of 48 hours prior to each day’s placement of aggregate base, curb, hot mix asphalt, and concrete.

E. Do not place paving and surfacing material before subgrade is reviewed (proof roll) and accepted by the County/City or designee. Do not place paving and surfacing materials on a frozen or muddy subgrade.

F. Provide adequate drainage at all times to prevent water from standing on subgrade, pavement or sidewalks.

G. The Owner or Contractor shall provide the County/City core samples of the existing pavement section prior to the design and construction of a connection to an existing public roadway with the exception of a residential private drive. This information may be used by the County/City to determine additional paving requirements.

H. Additional improvements may be required depending on field conditions and as determined by the County/City.

3.02 Subgrade

A. The subgrade material and testing shall comply with INDOTSS 207, before placement of aggregate base.

B. Subgrade Preparation

1. All excavation, filling, backfilling, grading, and compaction shall be performed in accordance with Section 02200 - Earthwork.
2. After all earth work is substantially complete and all utilities and drains have been installed and backfilled in accordance with Section 02220, the subgrade shall be brought to the lines and grades shown on the plans.
3. All soft yielding or otherwise unsuitable material which will not compact properly shall be removed. All rock encountered shall either be removed or broken off to conform with required cross sections. Any holes or depressions resulting from the removal of such unsuitable material shall be filled with approved material and compacted to conform with the surrounding subgrade surface. No placement of pavement shall be permitted on uninspected or unapproved subgrade and, at no time, when the subgrade is frozen or muddy. No hauling shall be done, nor equipment moved over the subgrade when its condition is such that undue distortion results. If these conditions are present, the subgrade shall be protected with adequate plank runways, mats, or other satisfactory means if hauling is to be done thereon.
4. Subgrade stabilization, including chemical modification, may be performed according to INDOT Specifications 207 and 215 to enhance subgrade strength and project constructability. The subgrade stabilization method shall be as determined by a Geotechnical Engineer based on tests of the in-situ materials and shall be approved by the County/City prior to stabilization. Subgrade stabilization shall not replace required base, intermediate or surface courses for the pavement.
5. Prepare all areas that will support pavements prior to subgrade evaluation. Remove all loose surficial soil, topsoil, and other unsuitable materials at least 5 feet beyond the limits of the proposed pavement and structures when feasible.
6. Once subgrade has reached the required elevations and dimensions, notify the County/City and Contractor’s testing agency so the subgrade can be evaluated. Do not place material on the subgrade until the subgrade has been inspected and approved by the County/City and Contractor’s testing agency.
7. During subgrade preparation and after its completion, adequate drainage shall be provided at all times to prevent water from standing on the subgrade. Subgrades shall be so constructed that it will have uniform density throughout.

3.03 Aggregate Base or Shoulders

A. Aggregate base shall consist of crushed aggregate. The aggregate type shall be suitable for the area in which the project is located. The aggregate thickness shall be as shown on the drawings and as specified herein.

B. Compacted aggregate materials and construction shall conform to INDOTSS 303.

C. If the required thickness of the aggregate exceeds 4 inches, the material shall be placed and compacted in separate lifts, no more than 6 inches of compacted depth.

D. If spreading devices are used which will ensure proper depth and alignment, forms will not be required; otherwise, forms shall be required. Forms shall be of wood or steel, adequate in depth, straight, of uniform dimensions and equipped with positive means for holding the form ends rigidly together and in line. Segregation of material shall be avoided by any spreading method used. No payment will be made for aggregate placed beyond the dimensions shown on the drawings.

E. Compact material in each lift after material is spread and shaped. Compact material to not less than 100% of maximum dry density as determined by AASHTO T99. Use construction procedures, including sufficient wetting and number of passes, to ensure specified density is attained.

F. The Contractor shall employ an independent testing laboratory to perform field density tests to demonstrate proper compaction of aggregate. In-place density test shall be completed for each lift for every 400 linear feet of traffic lane.

G. Under observation of the County/City and Contractor's testing agency, proofroll the aggregate base prior to placement of pavement or curbing. Any areas found to rut or deflect excessively must be corrected as directed by the County/City or a Geotechnical Engineer.

3.04 Curbs

A. The construction of curbs shall be in accordance with these specifications and standard details and INDOTSS 605.04. Curbs shall be constructed as shown on the plans and shall be in conformance with the lines and grades shown on the plans.

B. Excavation for curbs shall be made to the required depth, and the base upon which the curb is constructed shall be compacted to a firm, even surface to not less than 100% of maximum dry density as determined in accordance with AASHTO T99.

C. Concrete for curbs shall be Class A, 4,000 psi conforming to INDOTSS 702.

D. The curbs shall be constructed by the use of wood or metal forms; or the curb may be constructed using a curb slipform machine. Forms, if used, shall be straight, free from warped or bent sections, and shall extend for the entire depth of the curb and shall be securely held in place so that no deviation from alignment and grade will occur during placement of concrete. The concrete shall be consolidated by vibration or other acceptable methods. The top of the curb shall be floated smooth and the top outer corner rounded to a 1/4 inch radius.

E. The face, top, and gutter of curbs shall not have deviations or irregularities of more than 1/4 inch when checked with a 10-foot straightedge. Curb inlets shall be placed 1/4 inch lower than the adjacent gutter elevation.

F. Joints shall be placed at 10-foot intervals, unless otherwise shown or directed by the County/City. The joint shall be saw cut with uniform width, and to a depth of approximately 2.5 inches. Expansion joints shall be formed around all abutting structures such as inlets. Expansion joints shall be formed with 1/4 inch preformed joint material. Expansion joints shall be filled with joint sealant.

G. If existing curb is to be removed and replaced with new curb or new curb extended from existing curb, the existing curb shall be saw-cut full depth and removed to the nearest joint. New curb shall be doweled to the existing using an approved doweling system.

3.05 Hot Mix Asphalt (HMA)

A. This work shall consist of constructing one or more courses of HMA base, intermediate, wedge leveling, and/or surface mixtures on a prepared foundation in accordance with these specifications and in reasonably close conformance with the lines, grades, thicknesses, and typical cross sections shown on the plans or established by the County/City.

1. If the required finished depth of any course is to exceed four times the top size of the aggregate used as shown by actual screen analysis, the course shall be constructed in multiple lifts, as directed.
2. Mix type shall be as indicated on the drawings, without exception, unless otherwise approved in writing by the County/City.
   a. Job mix formulas shall be prepared and submitted for approval in accordance with INDOTSS 402. The job mix formula shall include standard asphalt mixture information including, but not limited to, aggregate gradation, binder content, maximum specific gravity, and air voids.
3. Materials and construction requirements shall comply with the requirements of INDOTSS 402.

B. Place and spread HMA with proper paving equipment. In areas inaccessible to a paving machine, place and spread HMA by other acceptable mechanical or hand methods.

C. Tack coat shall be placed on ALL horizontal and vertical existing asphalt or concrete surfaces before a new lift of HMA material is added. Apply tack coat uniformly at a rate of 0.06 gallon per square yard (0.000252 ton per square yard), resulting in a minimum of 90% coverage. If spray bar does not provide complete coverage, the tack coat operation shall be stopped until the equipment can produce the required coverage. If the equipment cannot produce the required coverage in a single pass, a second pass may be allowed or required, at the discretion of the County/City. The tack coat shall be allowed to cure over approximately 90% of the surface area before paving operations can begin.

1. Patch and clean existing surface. The surface shall be free of irregularities and provide a reasonably smooth and uniform surface to receive the tack coat. Remove and replace unstable corrugated areas with suitable patching materials.
2. Tack coat shall be placed in accordance with INDOTSS 406.

D. Placement and compaction of HMA shall conform to INDOTSS 402.

E. Place HMA used for wedging or leveling, approaches, and/or feathering by mechanical methods or acceptable hand methods for placing and spreading in accordance with INDOTSS 610.

F. HMA Surface shall be 9.5mm surface mix unless approved in writing by the County/City.

3.06 Portland Cement Concrete Pavement

A. Portland cement concrete pavement shall consist of a coarse aggregate base and a reinforced or unreinforced Portland cement concrete surface, as shown on the drawings.

1. Compacted aggregate No. 53 shall be used for subbase, unless otherwise shown or specified.
2. Pavement cross-section shall be as shown on drawings.

B. Portland cement concrete pavement operations and materials shall comply with INDOTSS 502 unless otherwise specified by the County/City.

1. Alternate equipment to that specified in INDOTSS 502 shall be allowed provided that line, grade, surface, smoothness and other requirements of the specifications are met.
2. The contractor must submit a join layout detail to the County/City. Joint locations and type shall be in accordance with the standard details. Expansion joints shall be required whenever new concrete abuts fixed objects or existing concrete surfaces, whether or not shown on the drawings.
3. Keyway construction, load transfer devices, tie bars and slab and ear reinforcement shall be installed as indicated on the standard details.
4. When concrete is placed, the subgrade shall be properly dampened.
5. Unless otherwise shown on the drawings, finishing and curing the concrete pavement shall conform to INDOTSS 504.
6. The Contractor shall always have materials available to protect the surface of concrete against rain. These materials shall consist of burlap, curing paper or plastic sheeting.
7. New concrete pavement shall be protected by the Contractor until opening to traffic is approved by the County/City. It shall not be opened to traffic until the field-cured concrete has attained a compressive strength of 4,000 psi.

3.07 Pavement Markings

A. Pavement markings are to be in accordance with all applicable standards of INDOTSS 808 and the construction plans.

B. Material for pavement markings shall be standard on HMA pavement or multi-component on Concrete pavement.

C. Contractor shall clean the new pavement surface to remove all dust, dirt, mud and debris prior to pavement marking.

3.08 Sidewalks

A. Sidewalks shall consist of a concrete pavement on compacted subgrade. Concrete shall be Class "A", 4,000 psi concrete conforming to INDOTSS 702.

B. Concrete shall be 4 inches thick, unless crossing driveways, where the concrete will be the same thickness of the adjacent concrete drive, a thickness equivalent to the existing HMA drive, or 6 inches thick, whichever is greater.

C. Compact base to not less than 95% of maximum dry density, as determined in accordance with AASHTO T99.

D. Proportion, mix, and place concrete as specified in INDOTSS 604 and 702. Sidewalk surfaces shall have a coarse broom finish. Edge all outside edges of sidewalk with a 1/4 inch radius.

E. Sidewalk joint spacing shall be as indicated on the standard drawings.

F. Form expansion joints, with 1/2 inch preformed expansion joint filler, around all abutting structures and appurtenances such as manhole, utility poles, hatches, and hydrants.

G. If existing sidewalk is to be removed and replaced with new sidewalk or new sidewalk extended from existing sidewalk, the existing sidewalk shall be saw-cut full depth and removed at the nearest joint of suitable quality or as directed by the County/City.

H. Curb ramps shall comply with the most current INDOT and ADA requirements. Refer to the INDOT Standard Drawings for general curb ramp types and configurations.

I. Crosswalk and stop line marking, if used, shall be located as to stop traffic short of pedestrian crossing and curb ramp(s).

3.09 Quality Assurance and Tolerances

A. Mixing Plant: Prior to placing any hot mix asphalt (HMA) pavement or Portland cement concrete pavement (PCCP), the Contractor shall provide the County/City or designee the name and location of the HMA or concrete mixing plant and the type and composition of mixes the Contractor proposes to use in the work.

B. Paving and surfacing shall comply with the tolerances specified in INDOTSS 402 and 502.

1. Subgrade and subbase shall be within 1/2 inch of dimensions indicated on drawings.
2. HMA base shall not vary more than 1/4 inch from a 10-foot straightedge.
3. PCCP surfaces shall not vary more than 1/8 inch from a 10-foot straightedge.

4. Finished surface shall be within 1/4 inch of dimensions indicated on drawings.

C. HMA and PCC pavement shall be installed by a contractor whose prime business is HMA or PCCP paving.

D. Testing Requirements - All testing shall be in accordance with the latest INDOT standard specifications. Where practicable, all tests shall be witnessed by the County/City. Contractor shall coordinate testing schedule with the County/City. The frequency of testing where shown is a minimum. Additional testing may be required at the direction of the County/City.

1. Subgrade
   a. Compaction (fill sections):
      1) All compaction shall be in accordance with Section 02200 - Earthwork. The upper six (6) inches of all subgrade shall be uniformly compacted to at least 100 percent standard density as determined by the provisions of AASHTO, T99, "Compaction and Density of Soils".
      2) In-place density test shall be completed for each lift for every 400 linear feet of traffic lane.
   b. Proofroll
      1) Under observation of the County/City and Contractor's testing agency, proofroll the subgrade in the location of the new pavement shown on the Drawings.
         a) The proofroll shall be performed in accordance with INDOT Specification 203.26, except that proof rolling may also be accomplished using a fully loaded tandem or tri-axle dump truck in lieu of the specified rubber tire roller.
            (1) Tandem Dump Truck – Gross Weight 48,000#
            (2) Tri-Axle Dump Truck – Gross Weight 68,000 #
      2) Roller marks less than 1/2" are acceptable, as are deflections less than 1/2" over the length of the roller or truck. Any areas found to rut, pump, or deflect excessively must be compacted in place or undercut and replaced with compacted structural fill, as directed by the County/City or a Geotechnical Engineer.
   c. Test results shall be submitted to the County/City prior to placing any material on the subgrade.
2. Aggregate Base
   a. Gradation – 1 test per 1000 tons or 1 per week
   b. Compaction
      1) Compact material to not less than 100% of maximum dry density as determined by AASHTO T99.
      2) In-place density test shall be completed for each lift for every 400 linear feet of traffic lane.
   c. Proofroll
      1) Under observation of the County/City and Contractor's testing agency, proofroll the aggregate base per 3.09.D.1.B prior to placement of pavement or curbing. Any areas found to rut or deflect excessively must be corrected as directed by the County/City or a Geotechnical Engineer.

d. Test results shall be submitted to the County/City prior to placing any material on the aggregate base.

3. Concrete
   a. The Contractor shall make the following tests at their cost and they shall be as specified in this Article. Perform tests in accordance with the following ASTM Specifications:

Test	ASTM Specification
Slump	C143
Air Content	C173
Test Cylinders	C31 or C513
Core Samples	C42

   b. Measure slump each time test beams or cylinders are to be made and at any other time requested by the County/City. The slump shall be as specified in INDOTSS 502, or as otherwise specified herein, unless specifically excepted by the County/City.
   c. Measure air content each time test beams or cylinders are to be made and at any other time requested by the County/City. The field test may be omitted if the air content is known prior to taking samples. The field test may not be omitted if fly ash is used in the mix.
   d. Concrete paving mixes shall comply with guidelines of INDOTSS 502 and shall meet the testing requirements of INDOTSS 502. However, in lieu of forming test beams as described in INDOTSS 502, the Contractor may substitute cylinder tests as follows:
      1) Make test cylinders in sets of four. Field cure one cylinder and break at seven days. Laboratory cure the remaining three cylinders and break at 28 days. The Contractor shall be responsible for handling and transportation of cylinders.
      2) If fly ash is used in the mix, a total set of seven cylinders shall be taken. The additional three cylinders shall be laboratory cured and broken at 56 days, if the 28-day strength does not meet specifications.
      3) Make one set of test cylinders for each 100 cubic yards, or fraction of 100 cubic yards, of concrete placed; or at other times requested by the County/City.
   e. A copy of all test results shall be submitted to the County/City for verification of specification compliance within one calendar week of testing.
   f. Unless otherwise specified, concrete shall have a 28-day compressive strength of 4,000 psi, as demonstrated by laboratory tests of cylinders.

4. Hot Mix Asphalt (HMA)
   a. Compaction requirements for HMA mixtures placed in accordance with INDOTSS 402 shall be controlled by in place density determined from cores cut from the compacted pavement. A minimum of two cores per section shall be cut for each course of each material or as directed by the County/City. Sections are defined as a maximum of 1041 tons of HMA base or intermediate or 624 Tons of HMA surface. The transverse core location shall be located so that the edge of the core will be no closer than 3 inches from a confined edge or 6 inches from a non-confined edge of the course being placed.

b. For compaction of HMA mixtures with quantities less than 104 tons per day, acceptance may be visual as determined by the County/City.
c. The Contractor along with their independent testing lab representative shall obtain cores in the presence of the County/City with a device that shall produce a uniform 6 inches in diameter pavement sample. Each HMA course shall be cored within one workday of placement. Damaged core(s) shall be discarded and replaced with a core from a nearby location as selected by the County/City.
d. The Contractor, in the presence of the County/City, shall mark the core to define the course to be tested. If the defined area is less than 1.5 times the maximum particle size, the core will be discarded and a core from a new random location will be selected for testing as determined by the County/City. Within one work day of coring operations the Contractor shall clean, dry, refill and compact the core holes with suitable material approved by the County/City.
e. The Contractor's testing lab representative shall take immediate possession of the cores. If the cores are subsequently damaged, additional coring within the specific section(s) will be required at locations to be determined by the County/City.
f. Each core shall be tested within one work day of coring operation to determine thickness, bulk specific gravity, aggregate gradation and binder content. Test results shall then be transmitted either verbally or by other means to both the Contractor and the County/City for verification before each subsequent HMA lift is placed.
    1) Average thickness of the cores shall not vary from the plan thickness more than 0.5 inches for HMA base and intermediate course(s) and 0.25 inches for HMA surface course(s) for acceptance in accordance with INDOTSS 105.03.
    2) The bulk specific gravity shall be determined in accordance with AASHTO T166 or AASHTO T 275. The in place density of a section for a mixture shall be expressed as:

        Density % = (BSG/MSG) * 100

        Where:
            BSG = bulk specific gravity as determined from independent testing laboratory
            MSG = maximum specific gravity as reported on job mix formula.

    3) The calculated density of the cores shall not be less than 90% nor more than 96% as set out above. Test results which are outside stated limits shall be considered and adjudicated as a failed material in accordance with INDOTSS 105.03.
g. The Contractor's independent testing laboratory representative shall determine the aggregate gradation and binder content of the core samples in accordance with ITM 571. Aggregate gradation shall be within tolerances set forth in INDOTSS 402.04 and binder content shall be within ±0.5 percent from the job mix formula. Test results which are outside the stated

limits shall be considered and adjudicated as a failed material in accordance with INDOTSS 105.03.

h. A copy of all core test results shall be submitted to the County/City for verification of specification compliance within one calendar week of core testing.

3.10 Protection

A. Maintain compacted aggregate base and surface true to line and grade and required density. Maintain base until pavement is placed. Maintain surface until job is complete.

B. Do not permit vehicular traffic of any kind on any HMA course until the HMA has hardened sufficiently not to be distorted beyond specified tolerances. Remove any foreign material which is on the surface of any course before the course is rolled or any subsequent course is placed.

C. Do not permit traffic on concrete pavement or walks until concrete has developed sufficient strength not to be marked or damaged. Do not permit vehicular traffic on concrete for at least 3 days.

D. Repair or replace damaged pavement and walks to the satisfaction of the County/City or designee.

3.11 As-Builts

A. “As-built” drawings required to be prepared and submitted to the County/City in accordance with Section 01010.

3.12 Cleanup

A. Clean up the job site following pavement and surfacing restoration. Remove all rubbish, excess materials, temporary structures, and equipment. Leave the work in a neat and presentable condition.

-END-

SECTION 02506 – SIGNAGE AND STREET LIGHTING

PART 1 - GENERAL

1.01 Signage

A. The Contractor/Developer shall provide and install all street name and road signs per current INDOT Standards and County/City details. All traffic signage in the County/City shall conform to the current Indiana Manual on Uniform Traffic Control Devices (MUTCD).

B. Materials shall be free of burrs, pits, and blemishes and shall present a smooth clean surface.

C. Sign blanks shall meet INDOT Specifications unless otherwise specified.

1.02 Street Lighting

A. Street lighting is required on all streets. Street lights on new local streets being constructed with a plat shall be shown on the lighting plan at intersections, within cul-de-sacs, and at specified locations requiring additional lighting.

B. The Developer shall be responsible for installing the street lights as part of the development construction. The monthly maintenance costs shall be the responsibility of the Homeowners' Association as established within the covenants and restrictions recorded with the Final Plat or Connersville Utilities with prior approval of the Connersville Board of Public Works.

1.03 Submittals

A. Street Lighting

1. A street lighting plan shall be submitted to the County/City and the Fayette County Area Planning Commission for approval. There is no minimum requirement for lighting levels, other than as stated in Section 1.02. The following items shall be included in the lighting plan:
   a. Product data for pole assembly (base, post, globe, bulb type, energy consumption, etc.)
   b. Location of each pole and transformer or junction box serving each luminary

PART 2 - PRODUCTS

2.01 Signage

A. Street Signs

1. Shall be signed at non-signalized intersections with two streets sign assemblies typically required.

2. Shall be 9-inch extruded aluminum (6063-T6) green background 3M Scotchlite 1177 or equal, with 6-inch tall white letters 3M Scotchlite White 3870 or equal.
3. Contractor shall supply and install all posts, signs, bolts, and hardware.
4. Street signs shall be mounted on 12 foot or 14 foot U-channel posts (2 pounds/foot).

B. Stop Signs

1. Shall be 30-inches, high intensity and in accordance with current Indiana Manual on Uniform Traffic Control Devices (MUTCD).
2. A multi-way stop intersection requires an “ALL WAY” supplementary sign 12-inches wide by 6-inches tall.
3. A 24-inch wide white thermoplastic stop bar shall extend across the approach lane. Stop bar shall be placed directly adjacent to stop sign. Both stop sign and stop bar shall be located such that a minimum 200 feet perpendicular sight distance is maintained at all times. Greater sight distances may be required by the County/City.
4. Contractor shall supply and install all posts, signs, bolts, and hardware.

C. Speed Limit & Regulatory Signs

1. Speed limit signs Shall be 24-inches X 36-inches, high intensity, and in accordance with current Indiana Manual on Uniform Traffic Control Devises (MUTCD).
2. Speed limit shall be as established by County/City.
3. Location of speed limit signs to be approved by County/City.
4. Regulatory signs shall be 36-inches X 36-inches, and in accordance with current Indiana Manual on Uniform Traffic Control Devises (MUTCD).
5. Contractor shall supply and install all posts, signs, bolts, and hardware.

2.02 Street Lighting

A. As submitted to and approved by the County/City and the Fayette County Area Planning Commission.

PART 3 - EXECUTION

3.01 Signage

A. Sign posts shall be driven into the ground. No excavation shall be done to place sign posts. Posts shall not be set in concrete.

-END-

SECTION 02535 – PAVEMENT, CURB AND SIDEWALK RESTORATION

PART 1 - GENERAL

1.01 Summary

A. Section Includes

1. Providing all labor, tools, equipment and materials necessary to restore pavement, sidewalks, curbs and gutters to as good or better condition than existed prior to construction.
2. Preparing and resurfacing existing paved areas including streets, drives, parking lots, etc.

B. Related Sections

1. Section 02220 - Trenching, Backfilling and Compaction for Utilities
2. Section 02501 - Standards of Roadway Construction

1.02 References

A. Indiana Department of Transportation (INDOT) Standard Specifications, latest edition

1.03 Quality Assurance

A. Qualifications

1. Obtain materials from the same source throughout the Project.
2. Submit name of the asphalt mixing plant to the County/City for approval.
3. Submit job mix design on an INDOT Material and Test Division standard form or similar form

B. Regulatory Requirements

1. Perform Work and provide materials in accordance with INDOT Standard Specifications Sections 402, 403, 405, 406, 409 and 904.

1.04 Project/Site Conditions

A. Environmental Requirements: Do not apply asphalt materials if subgrade is wet or excessively damp or if the following conditions are not met:

1. Tack Coat: Minimum surface temperature of 60 degrees F.
2. Asphalt Base Course: Minimum surface temperature of 40 degrees F and rising at time of placement.
3. Asphalt Surface Course: Minimum surface temperature of 60 degrees F at time of placement.

PART 2 - PRODUCTS

2.01 Materials

A. Hot Mix Asphalt

1. Refer to Section 02501

B. Portland Cement concrete (PCC)

1. Refer to Section 02501

C. Temporary Pavement Repair

1. High Performance Cold Patch Mixture #1 (UPM) – For use in wet and cold conditions and workable at temperatures as low as -15°F.
2. High Performance Cold Patch Mixture #2 (CM300) – For use in wet and cold conditions and workable at temperatures as low as 32°F.

PART 3 - EXECUTION

3.01 General:

A. Maintenance of any street restoration or repair shall be the responsibility of the individual utility or developer authorized to make such repair until the street has been resurfaced.

3.02 Permanent Pavement Restoration

A. Permanent restoration shall commence immediately upon completion of utility work and be complete within ten (10) working days unless the County/City grants a longer period. Request for extension shall be in written form and accompanied with a repair schedule.

B. Clean areas to be paved or surfaced. Remove temporary pavement materials such as cold mix which are not part of the permanent pavement, and all deleterious and unsuitable materials.

C. Existing pavement saw cuts shall be in straight lines and perpendicular to the curb where possible. Edges of broken pavement shall be squared off to provide neat edge for paving.

D. Prior to tack coating subbase and edges, the existing surface shall be free of irregularities to provide a reasonable smooth and uniform surface to receive treatment. The edges of existing pavement shall be cleaned to permit adhesion. Tack coat shall not be applied to wet surfaces or when the air temperature is below 45°f. Tack coat may be rolled, brushed or mopped. All excess tack coat shall be squeegeed from the surface.

E. Install pavement in accordance with Section 02501.

F. Match the finish elevations, lines and grades of replacement pavement to the original elevations, lines and grades.

G. A two (2) inch wide bond of crack sealant is to be applied along the joint between the existing and new pavement. Sealant is to be applied in accordance with INDOT Specifications.

H. All pavement restoration materials to be per current INDOT Standard Specifications.

3.03 Temporary Pavement Repair

Temporary street restoration is intended to be an interim measure until conditions allow for permanent restoration of the street. The County/City realizes that at times, temporary restoration is necessary, such as, during the winter season when the asphalt plants are closed and when freezing temperatures make permanent restoration not feasible or when permit work precedes County/City street reconstruction or rehabilitation permit holders are to minimize the use of temporary restorations when possible. Any work undertaken before November 1 shall be permanently restored before the fall asphalt plant closings. Only work undertaken on or after November 1 may be carried over to permanent restoration in the following spring season all temporary restoration placed during the winter season must be permanently restored within four (4) weeks of spring asphalt plant openings, but no later than May 15th. The County/City may grant extensions beyond May 15th for permanent restorations when requested in writing and accompanied with a repair schedule, inventory of existing temporary restorations, and statement indicating the reason(s) for the extension.

A. Existing pavement initial saw cut to be 5" minimum depth to obtain straight lines perpendicular from the curb edge and neat edge for paving. Edges of broken pavement shall be squared off and trimmed to neat straight lines.

B. Temporary pavement material is to be 6 1/2 inches thick hot mix asphalt, asphalt cold patch, bag asphalt and crush stone are unacceptable for use. The use of steel street plates must be requested in written form and accompanied with a repair schedule.

C. During winter season when the permanent patch cannot be completed within 10 working days (November 1 thru April 14), if hot mix asphalt is not available, use INDOT approved "High Performance Cold Patch" or equal INDOT approved material.

D. All materials are to be compacted to form a firm and smooth transition between old and new surface grade. Do not apply hot mix asphalt on a wet surface.

E. Upon completion of backfilling, temporary pavement on streets shall be place by the end of the work day.

3.04 Special Surface Streets

A. Any special surfaces shall be restored in-kind (i.e. brick, cobblestone, etc). The permit holder shall salvage as much of the existing material as possible for reuse in the restoration, supplying any remaining material required for the restoration.

3.05 Concrete Sidewalk, Curb and Gutter, and Driveways

A. General

1. Use concrete forms that are straight and free from warp. Extend forms the full depth of concrete.
2. Clean the forms of foreign matter and oil the forms before placing concrete.
3. Cut existing concrete in neat parallel lines with no uneven or jagged edges.
4. Spade concrete to avoid a honeycomb appearance and float the surface with a wood float to prevent surface irregularities.
5. Match the finish elevations, lines, and grades of concrete Work to the original elevations, lines, and grades unless otherwise noted on Drawings.

B. Perpendicular Crossings

1. Remove existing sidewalks to a minimum of two (2) feet beyond the sides of the trench and to the nearest construction or expansion joint (whichever is greater) where excavation crosses sidewalks.
2. Replace in kind all removed sidewalks, curbs and gutters and concrete driveways with respect to thickness and area dimensions.

C. Replacement Concrete

1. Remove existing concrete completely.
2. Shape and compact the subgrade to a firm, even surface.
3. Remove unsuitable materials and replace with suitable materials.
   a. Remove all soft, yielding, or other unsuitable material which cannot be compacted satisfactorily.
   b. Remove or break off all rock encountered to at least 6 inches below the subgrade surface.
   c. Fill any holes or depressions resulting from the removal of unsuitable material with satisfactory material and compact to conform with the surrounding subgrade surface.
4. Construct concrete sidewalks, curbs and gutters and driveways to the sections shown on the Drawings.
5. Where shown, construct concrete ramps including detectable warning elements.

3.06 Construction Joints

1. In general, install joints to match the existing joints in regard to type and spacing.

2. Where concrete sidewalk or pavement is constructed adjacent to the curb, place expansion and contraction joints at the same locations in the curb as the pavement slab.
3. Expansion Joints: Place preformed 1/2-inch joint filler around all appurtenances, such as manholes and utility poles which extend into and through sidewalks, and between the sidewalk and any fixed structure such as a building.
    a. Extend the joint filler the full depth of the concrete and make flush with the surface of the adjacent concrete.
    b. Form expansion joints transverse across sidewalks and curbs and gutters at a maximum spacing of 50 feet for tangent sections and 20 feet for radial sections.
    c. If no concrete pavement is being placed at the time of curb construction, place expansion joints at the ends of all returns and at intervals not to exceed 100 feet. Install contraction joints at maximum 20-foot spacing.
    d. Expansion joints between the curb and the drive shall be doweled by 1/2-inch bars at 3 feet on center.
    e. Seal expansion joints in the sidewalks, driveways, ramps, and curbs.
4. Contraction Joints: Provide transverse contraction joints at a maximum spacing of 5 feet, formed by a jointing tool, trowel or similar means. Extend the joint approximately 1/4 of the concrete depth and make approximately 1/8-inch wide.

3.07 Finishing

A. Provide a light broom finish on sidewalks.

B. Tool edges and joints with 1/4-inch radius.

3.08 Protection

A. Protect new concrete from traffic.

1. Cure concrete a minimum of 5 days for sidewalks and 14 days for curbs and gutters or until the minimum design compressive strength is attained, whichever is less.
2. Do not allow traffic on concrete pavement for a minimum of 7 days.

B. Replace all sidewalks, curbs and gutters and drives damaged by Contractor's operations for no additional payment.

C. The Contractor is responsible for pavement and sidewalk placed during rain or cold weather. Remove and replace any and all pavement and sidewalk damaged by rain or low temperatures for no additional payment.

-END-

SECTION 02660 - WATER MAINS

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Furnishing and installing all water mains, fittings, valves, hydrants, casings and appurtenances as required for completing the work as shown on the Drawings and as specified herein.

B. Related Sections

1. Section 02220 - Trenching, Backfilling and Compaction for Utilities
2. Section 02224 - Trenchless Excavation – Horizontal Borings
3. Section 02226 - Trenchless Excavation – Directional Drilling
4. Section 02661 - Water Services
5. Section 02675 - Disinfection

1.02 References

A. American Society of Mechanical Engineers (ASME), latest editions

1. ASME B16 - Standards of Pipes and Fittings
2. ASME B18 - Hex Cap Screw, Hex Bolt, Machine Bolt fasteners
3. ASME B31 - Standards of Pressure Piping

B. American Society for Testing and Materials (ASTM), latest editions

1. ASTM A194 - Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
2. ASTM A307 - Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength
3. ASTM C94 - Standard Specification for Ready-Mixed Concrete
4. ASTM D1330 - Rubber Sheet Gaskets
5. ASTM D1784 - Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
6. ASTM D3139 - Plastic Pressure Pipes Using Flexible Elastomeric Seals
7. ASTM D3261 - Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
8. ASTM D3350 - Polyethylene Plastics Pipe and Fittings Materials
9. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe

C. American Water Works Association (AWWA) Standards, latest editions

1. AWWA C104 - Cement Mortar Lining for Ductile Iron Pipe and Fittings
2. AWWA C110 - Ductile Iron and Gray Pipe Fittings
3. AWWA C111 - Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings

4. AWWA C151 - Ductile Iron Pipe, Centrifugally Cast
5. AWWA C153 - Ductile Iron Compact Fittings for Water Service (3-inch through 64-inch)
6. AWWA C207 - Steel Pipe Flanges for Waterworks Service (4-inch through 144-inch)
7. AWWA C502 - Dry Barrel Hydrants
8. AWWA C509 - Resilient-Seated Gate Valves for Water Supply Service
9. AWWA C600 - Installation of Ductile-Iron Water Mains and their Appurtenances
10. AWWA C605 - Underground Installation of PVC Pressure Pipe and Fittings for Water
11. AWWA C651 - Disinfecting Water Mains
12. AWWA C900 - PVC Pipe and Fabricated Fittings (4-inch through 12-inch) for Water Transmission and Distribution
13. AWWA C905 - PVC Pipe and Fabricated Fittings (14-inch through 48-inch) for Water Transmission and Distribution
14. AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, (4-inch through 63-inch), for Water Distribution and Transmission

D. Indiana Department of Environmental Management (IDEM) Regulations in 327 of the Indiana Administrative Code (IAC), latest edition

1.03 Submittals

A. Product Data

1. Pipe
2. Valves
3. Casing Pipe
4. Fittings
5. Air relief valves
6. Joint restraints
7. Hydrants
8. Other related items and appurtenances

B. Test Results

1. Hydrostatic test
2. Continuity test
3. Fusion joint log (HDPE Pipe)

C. Other Items

1. HDPE bonding qualifications

1.04 Quality Assurance

A. HDPE Pipe: Bonders and bonding operators shall be qualified in the use of the written bonding procedure specification (BPS) as required by ASME B31.3, Chapter VII, paragraph A-328. Qualification records certifying that bonders and

bonding operators employed to perform the fusion bonding are qualified in the BPS shall be submitted prior to the commencement of fusion bonding work. Bonders and bonding operators shall be qualified for the specific fusion bonding equipment utilized in the fusion bonding work.

1.05 Delivery, Storage, and Handling

A. Acceptance at Site

1. Deliver, store and handle all materials in accordance with manufacturer's recommendations.
2. Load and unload all pipe, fittings, valves, hydrants, and appurtenances by hoists. Do not drop materials. Do not skid or roll materials on or against each other. Use padded slings, hooks and pipe tongs to handle materials in a manner to prevent damage.
3. Pipe possessing defects including, but not limited to, the following will be rejected for installation:
   a. Variations from straight centerline
   b. Elliptical shape in round pipe
   c. Lack of rigidity
   d. Illegible markings as required herein
   e. Bruised, broken, or otherwise damaged metallic or bituminous coating or liner, as applicable
   f. Deep or excessive gouges, dents, bends, or scratches on the pipe wall
   g. Fractures, punctures, or cracks passing through the pipe wall
   h. Damaged or cracked ends where such damage would prevent making a satisfactory joint
4. All materials deemed damaged by the County/City will not be accepted.

B. Storage and Protection

1. Store materials in an area safe from damage and deterioration. Keep the interior of pipe, fittings, valves, hydrants and appurtenances free from dirt and foreign matter. Drain and store valves and hydrants in a manner to prevent damage from freezing. Store gaskets in a cool location out of direct sunlight, and free from contact with petroleum products.
2. Do not stack any pipe higher than recommended by manufacturer. Do not stack fittings, valves, and hydrants.

1.06 Warranty

A. Locate and repair leaks that occur within the 1-year warranty period on any and all installed water mains at no cost to the County/City.

PART 2 - PRODUCTS

2.01 General

A. All pipes, fittings, valves, hydrants, and appurtenances shall be new and unused.

2.02 Ductile Iron (DI) and Polyvinyl Chloride (PVC) Water Main Pipe and Fittings

A. Ductile Iron (DI) Pipe

1. Provide pipe centrifugally cast in metal or sand-lined molds and conforming to AWWA C151. Provide pipe with a minimum of:
   a. 350 PSI rated water working pressure for 12-inch diameter and smaller pipe
   b. 250 PSI rated water working pressure for 14-inch diameter and larger pipe
2. Pipe joint and gasket: push-on type joints and gaskets conforming to AWWA C111 unless otherwise noted on the Drawings or specified herein.
3. DI River Crossing Pipe joints: ball and socket type joints made specifically for river crossing pipe.
4. Pipe markings: Mark each length of pipe with manufacturer's name or trademark, pipe class, and year of manufacture.
5. Provide DI pipe in 18-foot nominal laying lengths.
6. Manufacturers
   a. Tyton Joint pipe as manufactured by U.S. Pipe
   b. Fastite Joint pipe as manufactured by American
   c. Or approved equal

B. Polyvinyl Chloride (PVC) Pipe C900 or C905 (Ductile Iron O.D.)

1. Provide PVC pipe conforming to AWWA C900 or C905 as applicable and having Dimension Ratio of DR 18.
2. Pipe materials: conform to ASTM D1784, Class 12454-A or Class 12454-B virgin compounds with hydrostatic design basis of 4,000 psi.
3. Pipe joint and gasket: conforming to ASTM D3139 for joints; single gasket bell and spigot type, the bells being formed integrally with the pipe; bell consisting of a factory-installed solid cross section elastomeric gasket which meets the requirements of ASTM F477.
4. Manufacturers
   a. JM Eagle
   b. North American Pipe Corporation
   c. National Pipe and Plastics, Inc.
   d. Or approved equal

C. Ductile Iron Fittings

1. Provide mechanical joint DI fittings conforming to AWWA C153 and AWWA C110.
   a. Use restrained joints in addition to thrust blocking for 90° bends, tees, and dead-ends crosses.
   b. Concrete thrust blocks in lieu of mechanical restraint may be used only with the written approval of the County/City.
2. Gaskets: conforming to AWWA C111.
3. Provide fittings as manufactured by Clow Water Systems Company, Tyler Union, or approved equal.

D. Fitting Restraints

1. Series 1100 Megalug by EBAA Iron for DI pipe (3- to 48-inch diameter)
2. Series 2000 PV Megalug by EBAA Iron for C900 or C905 PVC pipe (3- to 36-inch diameter)
3. JCM 610 Sur-Grip Restrainer by JCM for DI, or C900 PVC pipe (4- to 12-inch diameter)
4. JCM 610 Sur-Grip Restrainer by JCM for C905 PVC pipe (14- to 30-inch diameter)
5. Ford Meter Box Uni-Flange Series 1400 Restrainer for DI pipe (3- to 36-inch diameter)

E. Joint Restraint

1. Series 1500/1600 Bell Restraint Harness by EBAA Iron for C900 PVC pipe (4- to 12-inch diameter)
2. Series 2800 Megalug Restraint Harness by EBAA Iron for C905 PVC pipe (14- to 48-inch diameter)
3. Series 1700 Megalug Restraint Harness by EBAA Iron for DI pipe (4- to 48-inch diameter)
4. Field Lok 350 Gaskets by U.S. Pipe & Foundry Company for DI pipe (4- to 24-inch diameter)
5. Flex-Ring Joint System by American Ductile Iron Pipe for DI pipe (14- to 48-inch diameter)
6. JCM 620 Sur-Grip Bell Joint Restrainer for DI or C900 PVC pipe (4- to 12-inch diameter)
7. JCM 621 Sur-Grip Bell Joint Restrainer by JCM for C905 PVC pipe (14- to 30-inch diameter)
8. Grip Ring Series 600 Pipe Restraining System manufactured by ROMAC Industries, Inc. for DI pipe and PVC pipe (4- to 12-inch diameter)
9. Ford Meter Box Uni-Flange Series 1390 Joint Restrainer for C900 or C905 PVC pipe (black body) (4- to 36-inch diameter)
10. Ford Meter Box Uni-Flange Series 1390 Joint Restrainer for DI pipe (black body) (4- to 16-inch diameter)

F. Pipe Joint Restraints in Casing Pipe

1. Provide restrained joints for all pipe installed in steel casing.
2. Ductile Iron Pipe
   a. TR Flex RJ pipe by U.S. Pipe (4”-36”)
   b. HP Lok RJ pipe by U.S. Pipe (30”-64”)
   c. Fastite Joint Pipe with Fast-Grip Gasket by American (4”-24”)
   d. Flex-Ring Joint Pipe by American (14”-54”)
   e. Approved equal with any pipe joint restraints listed in Article 2.02E as applicable, with the exception of Field Lok 350 gaskets by U.S. Pipe which shall not be used within casing.

G. Coatings - Furnish DI pipe and fittings which have a standard thickness cement mortar lining as specified in AWWA C104 and a bituminous seal outside coating as specified in AWWA C151.

H. Nuts and Bolts

1. Furnish high-strength, heat treated cast iron nuts and bolts conforming to AWWA C111. Nuts shall be hexagon and bolts shall be tee head.
2. Nuts and bolts for tapping sleeves shall be stainless steel.

2.03 High Density Polyethylene (HDPE) Water Main

A. Use of HDPE water main requires pre-approval by County/City and shall only be considered for Horizontal Directional Drilling installations.

B. Pipe

1. Provide HDPE pipe conforming to AWWA C906. Supply HDPE pipe manufactured from high density, extra high molecular weight polyethylene and conforming to PE Standard Code PE 4710. Polyethylene pipe shall have a minimum cell classification of 445574C per the requirements of ASTM D3350.
2. Supply minimum DR-9 HDPE pipe designed and manufactured to pressure class 250. Supply HDPE pipe designed to withstand crushing, buckling and deformation resulting in ovality at a depth of bury indicated. Furnish HDPE pipe designed and manufactured in ductile iron pipe size.
3. Do not deflect HDPE pipe on a radius of less than 50 times the pipe diameter or less than the manufacturer's recommendation. If an HDPE fitting, flange or mechanical joint is present within the length of pipe to be deflected, do not deflect on a radius of less than 100 times the pipe diameter.
4. Provide HDPE pipe which has a blue shell or blue permanent striping and the AWWA specification stamp embedment or permanent blue-line print clearly and continuously marked longitudinally along the outside pipe wall.

C. Fittings

1. Provide HDPE fittings manufactured from high density, extra high molecular weight polyethylene conforming to PE Standard Code PE 4710. All HDPE fittings shall have a minimum cell classification of 445574C per the requirements of ASTM D3350.
2. Furnish fabricated polyethylene fittings designed and manufactured for one pressure class rating higher than the pressure class rating of the pipe specified in this section.
3. Provide HDPE fittings manufactured per the requirements of ASTM D3261 and which are injection molded or fabricated using a combination of extrusion and machining. Provide HDPE fittings manufactured from HDPE pipe specified in this section. Supply HDPE fittings manufactured or fabricated in facilities designed for that purpose. Field fabricated HDPE fittings will not be allowed.
4. Provide HDPE fittings which have a blue shell or permanent blue striping and the AWWA pipe specification stamp embedment or permanent blue-line print clearly and continuously marked longitudinally along the outside wall.

D. Flange Backup Rings and Gaskets

1. Provide flange backup rings conforming to AWWA C207. Supply ring type Class D with bolting dimensions conforming to ASTM B16.5.
2. Furnish flange backup rings having fusion-bonded epoxy coating applied to all exterior and interior exposed surfaces with a minimum dry film thickness of 4 mil.
3. Provide flange gaskets which are synthetic red rubber (SBR) hardness (Shore A) 80 +/- 5, ring or full face, 1/8-inch thick and conforming to ASTM D1330 grades I and II. Asbestos gaskets will not be allowed.
4. Supply flange to flange connection bolts which are carbon steel, ASTM A307 grade B for Class D flanges. Supply nuts conforming to ASTM A194 grade 2H. Furnish bolts and nuts having regular unfinished hexagonal dimensions in accordance with ASTM B18.2.1 for wrench head bolts and nuts and wrench openings. Minimum bolt lengths shall be the sum of the mating flange maximum thicknesses, the gasket and the depth of nut plus 1/8-inch minimum before torqueing.

E. Mechanical Joints

1. Use polyethylene mechanical joint adaptors when making connections to mechanical joint fittings and when connecting to dissimilar pipe materials (e.g., ductile iron). Supply polyethylene mechanical joint adaptors complying with the specifications contained herein for HDPE fittings. Connect polyethylene mechanical joint adaptor to mechanical joint fitting by means of a mechanical joint gland and gasket in accordance with the specifications regarding mechanical joint ductile iron fittings contained herein and in accordance with AWWA C110, AWWA C111 and AWWA C153. Meg-A-Lugs and Field-Lok gaskets will not be allowed for use with polyethylene mechanical joint adaptors.
2. Provide “Harvey” style polyethylene mechanical joint adaptors (transition coupling) which include a stainless steel stiffener inserted into the inside of the mechanical seal end of the adaptor to provide additional axial strength and prevent pipe diameter reduction at the seal. Provide transition coupling as a kit complete with gasket, mechanical gland, bolts and nuts per this section.

F. Pipe Markings

1. Each length of pipe shall be clearly marked with the following information at a minimum, conforming to AWWA C906:
   a. Nominal size and diameter base
   b. Dimension ratio (DR-9)
   c. Manufacturer's name or trademark
   d. Material designation code (PE 4710)
   e. Pressure class (PC 250)
   f. AWWA designation number (AWWA C906)
   g. Manufacturer's production (lot) code
   h. Date of manufacture
   i. Seal or mark of testing agency certifying tubing for potable water service

2.04 Polyethylene Encasement

A. Provide high-density, cross laminated polyethylene film with a minimum thickness of 4 mils conforming to ANSI/AWWA C105/A21.5.

2.05 Valves

A. Gate Valves

1. Provide resilient seated gate valves with mechanical joint ends conforming to AWWA C509 or AWWA C515.
2. Iron body with bronze stem nuts, glands and bushings, and shall be non-rising stem type with O-ring packing.
3. Valves shall open counterclockwise (left) and have a 2-inch operating nut.
4. Provide gate valves as manufactured by Mueller Company, Model No. A236020, or equal model manufactured by Kennedy, with prior approval of County/City.

B. Tapping Valves

1. Valve
   a. Iron body, non-rising stem gate valves conforming to AWWA C515. Supply valve gates, gate rings and body-seat rings which are oversized to permit entry and exit of tapping machine cutters.
   b. Valve end connecting to a tapping sleeve shall have a flange for bolting to the sleeve. The flange shall have a tongue which fits a recess in the tapping sleeve.
   c. Valve end connecting to the plain end of water main pipe or adapter shall be mechanical joint.
   d. Valves shall open counterclockwise (left) and have a 2-inch operating nut.

2. Tapping Sleeve
   a. Stainless steel with a stainless steel flange end branch connection fabricated in accordance with AWWA C223.
   b. Oversized branch connection with inside diameter to permit entry and exit of tapping machine cutters.
   c. Flange end shall have a recess to center the tapping valve.

C. Insertion Valves

1. Provide tapping valve and sleeve assembly designed to drill and ream the pipe and install the insertion valve without any interruption in water service.
2. Provide valve assembly containing a ductile iron casting insert coated with styrene butadiene rubber compound and which seals on the inside diameter of the insertion valve sleeve neck and the lower half of the water main.
3. Valve stem and nut assembly: conforming to AWWA C500.
4. Bolts, nuts, and washers: Type 304 stainless steel.
5. Tapping sleeve: Type 304 stainless steel.
6. Coating: epoxy coated to 10-12 mils; lined and coated with fusion-bonded epoxy meeting the requirements of AWWA C213.

7. Gaskets: styrene butadiene rubber (SBR) compound which provides a positive 360-degree seal on the pipe and with a resilient seal at the pipe sleeve and valve insertion junction.
8. Valves shall open counterclockwise (left) and have a 2-inch operating nut.
9. Provide inserting valve and sleeve assembly as manufactured by Romac Industries, Inc., or approved equal.

D. Air Release Valves

1. Cast iron body, cover, and baffle, with stainless steel float brass water diffuser and Buna-N seat.
2. Install air release valves in meter boxes, vented as shown on Drawings.
3. Manufacturers
   a. Model 200A as manufactured by Apco Valve
   b. Model #VM22 as manufactured by Val-Matic Valve Corp.
   c. Or approved equal.

2.06 Valve Boxes

A. Provide all buried valves with adjustable 5-1/4-inch diameter valve boxes with a minimum thickness of 3/16 inch, constructed so that the removable cover will not be thrown out by travel over it.

B. Provide cast iron, extension type valve boxes with slide or screw type adjustment to permit movement of the top section without transmitting forces onto the valve body.

C. The valve box shall rest on the valve bonnet and be centered over the valve, and the top of the section shall be approximately on line with nut at top of valve stem. The entire assembly shall be plumb.

D. Covers for valve boxes on water service valves shall be marked "WATER".

2.07 Hydrant Assemblies

A. Manufacturers

1. Mueller company, Model No. A423
2. Or equal model by Kennedy with prior approval of County/City

B. Standard Fire Hydrants

1. Provide dry barrel, compression shutoff, traffic model hydrants conforming to AWWA C502 with 5-1/4-inch main valve opening, 6-inch mechanical joint inlets, two 2-1/2-inch hose nozzles with national standard threads, and one 4-1/2-inch pumper nozzle with a 5-inch Storz connection.
2. Supply hydrants with nozzle threads and operating directions consistent with existing hydrants in the City’s distribution system.

C. Auxiliary Gate Valves

1. Install 6-inch auxiliary gate valve with each hydrant.
2. Refer to Paragraph 2.04A for gate valve specifications.

D. Hydrant Coating

1. Provide each hydrant with a 2-component exterior grade full gloss polyurethane exterior enamel topcoat.
2. Provide hydrant colors as follows:
   a. Public hydrant: safety yellow-4 with gloss black caps
   b. Private hydrant: safety red
3. Touch-up painting for field repairs shall be in accordance with Manufacturer's instructions.

2.08 Tracer Wire

A. Install tracer wire with all PVC and HDPE pipe as shown on the standard details.

B. Provide solid 12-gauge AWG copper wire.

C. Supply 3M Direct Bury splice kits (KIK 3M) consisting of tubes prefilled with silicone electrical insulating gel or approved equal.

D. On pipe installed by horizontal bore, pull 2 strands of tracer wire with pipe. Provide Copperhead Direct Burial 12 AWG solid, steel core hard drawn extra high strength.

2.09 Meter Pits

A. Provide meter pits, and related items as indicated on the Standard Details and in accordance with Section 02661.

2.10 Additional Items

A. Concrete Blocking - Provide minimum 2,000 psi compressive strength concrete blocking where indicated in the standard specifications and drawings.

B. Cast-in-Place Concrete - Provide ready-mixed concrete meeting the requirements of ASTM C94. Each cubic yard of concrete shall have:

1. Cement - minimum 6 bags
2. Air Content - 5 to 7 percent
3. Coarse Aggregate Size - maximum 1-1/2 inches
4. Slump - 3 to 5 inches
5. Compressive Strength - 4,000 psi unless noted otherwise

C. Cross Connection Control

1. When existing water mains are used to supply test water, they should be protected from backflow contamination by temporarily installing a double check valve assembly between the test and supply main or by other means approved

by the County/City. Prior to pressure and leakage testing, remove the temporary backflow prevention and isolate the main under test from the existing supply main.

PART 3 - EXECUTION

3.01 General

A. Contractor shall allow the County/City the opportunity to inspect the installation of the pipe and bedding material prior to proceeding with backfilling an open trench. The County/City shall be given 48 hours' notice of the contractor's intent to install water piping and structures.

B. Inspect water mains, fittings, valves, hydrants, and appurtenances prior to installation and promptly remove damaged or unsuitable materials from the job site. Replace damaged or unsuitable materials with new and unused materials.

C. Install all water mains, fittings, valves, hydrants, casing and appurtenances as shown on the Standard Details and as specified in this Section. Do not install pipe when, in the opinion of the County/City, trench conditions are unsuitable.

D. Follow manufacturer's installation procedures when installing water mains, fittings, valves, hydrants and appurtenances.

3.02 Installation of Water Mains

A. Install water mains to the lines shown, except as specified in this Section.

B. Install all DI water mains and accessories in accordance with AWWA C600.

C. Water mains installed parallel to existing sanitary sewers, sewage force mains, or storm sewers shall have a minimum horizontal separation of 10 feet measured from edge of pipe to edge of pipe. Where local conditions prevent this separation, water mains shall be installed with the bottom of the water main at least 18 inches above the top of the sewer.

D. Water mains crossing sanitary sewers, sewage force mains, or storm sewers shall have a minimum vertical separation of 18 inches measured from edge of pipe to edge of pipe. This separation shall apply whether the water main is above or below the sewer or force main. Install water mains so that a full length of pipe is centered on the sewer or force main. No water main shall pass through or come in contact with any part of a sanitary sewer manhole.

E. Install water mains with a minimum depth of cover of 48 inches.

F. Do not install water mains under roadways or curbs unless crossing the roadway at 90 degrees or specifically approved by the County/City.

G. Installed piping systems shall be temporarily plugged at the end of each day's work or other interruption of progress on a given line. Plugging shall be installed in a

manner satisfactory to the County/City, and it shall be adequate to prevent entry of animals into the pipe or the entrance or insertion of deleterious materials.

H. Follow manufacturer's installation procedures when installing water mains, fittings, valves, hydrants and appurtenances.

I. Excavate trenches to widths which provide adequate working space for proper pipe installation, jointing and embedment. Shape the bottom of trench to give uniform circumferential support to the lower quarter of each pipe. Lay pipe with bell ends facing in the direction of laying.

J. Lower pipe, fittings, valves and hydrants into trench by hand, by means of hoists or ropes, or by other suitable tools or equipment which will not damage materials, coatings or linings. Do not drop or dump pipe, fittings, valves or hydrants into trench.

K. As each length of pipe is installed, join the pipe to the previously installed pipe. Bring the pipe to the correct line and grade and secure in place with bedding tamped under and around each side of the pipe. Deposit and compact backfill material uniformly and simultaneously on each side of the pipe to prevent lateral displacement.

L. Wherever it is necessary to deflect pipe from a straight line in either a vertical or horizontal plane, the amount of deflection allowed shall not exceed that allowed by the pipe manufacturer’s specifications or two inches. If the alignment requires joint deflections in excess of the allowable, furnish and install fittings or a sufficient number of shorter lengths of pipe.

M. Where crossing under ditches or streams, the standard depth of the trench required shall be maintained. Standard special fittings shall be used if required to depress the pipe, but in no case shall the approach to the crossing be laid at an angle greater than forty-five degrees with the horizontal plane.

N. Unless otherwise approved by the County/City, approach ditches with a gradual slope in the water main as to avoid the use of special construction methods or fittings.

O. Cut pipe in a neat and workmanlike manner without damage to the cement lining of DI pipe. Use a cutting machine so as to leave smooth ends at right angles to the axis of the pipe. Flame cutting with an oxyacetylene torch shall not be allowed on DI pipe. For bell and spigot joint installation, bevel the edges of all field-cut pipe after cutting. For mechanical joint installation do not bevel the pipe end. Remove all burs that form as a result of field cutting the pipe, whether the pipe end is beveled or not.

P. Fusion Bonding Procedure for HDPE Pipe

1. The method of joining polyethylene pipe to polyethylene pipe or polyethylene fitting, other than those shown as flanged or otherwise mechanically connected, shall be by means of butt-fusion or sidewall fusion in accordance

with the polyethylene pipe manufacturer's written bonding procedure specifications (BPS) and conforming to ASME B31.3, Chapter VII, paragraph A-328. BPS shall include, but not be limited to, cutting and facing requirements and shall utilize a data logger, such as the “Datalogger” manufactured by McElroy Manufacturing, Inc., to monitor and record the assembly of each butt-fusion or sidewall fusion joint.

2. Materials to be butt-fused or sidewall fused shall be from Standard Code PE 4710 and 445574C cell classification. Mechanical sleeves and saddles will not be allowed for branch or service connections.
3. Fusion bonding equipment specified in the BPS shall be clean and in proper operating condition capable of meeting all conditions and requirements of the pipe and bonding equipment manufacturer, including temperature, alignment and fusion pressure. Equipment heater performance shall be tested and certified prior to use for fusion bonding each day at start up and at one other time each day, no sooner than 4 hours after start up. A data logger for quality control shall electronically log each fusion joint, except as noted above. Logged fusion joints shall be stored in the data logger unit such that it can be downloaded. Logged fusion joints shall be printed weekly and submitted within 2 days of the completion of last fusion joint to the County/City for review. One fusion joint for every 5 days of fusing bonding work will be removed and forwarded to a certified lab for testing. Testing shall include bend back tests of the fused joint per AWWA C906.
4. Electrofusion method of joining shall not be used except to connect adjacent directionally drilled sections in the trench bottom or for service saddles installed in the trench bottom.

Q. Allow HDPE pipe to reach ambient temperature for the installed condition before final cutting, installation of concrete restraint system, or connection of transition couplings.

3.03 Connections to Existing Water Mains

A. Locate the existing water mains vertically and horizontally, and verify their exact size, material and condition in advance of making connections.

B. Perform any new connection that may cause loss of service to an existing customer after 10:00 pm and before 6:00 am.

3.04 Installation of Fittings, Valves, Hydrants, and Appurtenances

A. General

1. Clean the interiors of all fittings, valves and hydrants of foreign matter prior to installation. Inspect valves and hydrants in open and closed positions to ensure all parts are in working condition.
2. Wrap all fittings in polyethylene encasement.
3. Provide adequate poured concrete and thrust restraint for all hydrants, valves and fittings such as bends, tees and plugs as shown on the Standard Details or a minimum of one full length of pipe on each side of all valves and fittings, whichever is more stringent.

4. Provide thrust restraint as shown on the Standard Details or a minimum of one full length of pipe on each side of all valves and fittings, whichever is more stringent.
5. Where poured concrete is used, place concrete between fitting and solid trench wall where shown on the Standard Details. Poured concrete shall be quick set with a minimum of 2,000 psi compressive strength. Form concrete thrust block in place and do not cover bolted glands. Place a sheet of polyethylene plastic wrap between the main or fitting and poured concrete prior to placement of the concrete.

B. Valves

1. Place valves vertically on solid concrete block as shown on the Standard Details and bed them solidly. The valve box shall rest on the valve bonnet and be centered over the valve, and the top of the section shall be approximately on line with nut at top of valve stem. The entire assembly shall be plumb.
2. Place and compact backfill in lifts around valve box so valve box remains plumb. Tamp backfill on all sides of each valve box to the undisturbed trench face.
3. Adjust valve box covers so they are flush with finished grade. Re-adjust covers as necessary so that they remain flush with the finished grade after final paving and grading work is complete.
4. Isolation valves shall be required to provide zonal isolation. Maximum valve spacing shall be 800 feet or one per block, whichever is less. No valves shall be installed in the street, unless pre-approved by the County/City.
5. Valve placement at intersections shall be as follows:
   a. 4 valves at cross (one on each branch)
   b. 3 valves at tee (one on each branch)
6. Install air release valves in meter pits as shown on the Standard Details in locations as directed by the County/City.

C. Hydrants

1. All hydrants shall be installed with a minimum bury not less than that required for the water mains. Check the hydrant locations and determine whether the hydrant requires a deeper bury depth.
2. Set hydrants plumb with the pumper nozzle facing toward the street or drive surface. Set hydrants so the centerline of hydrant outlet nozzles are not less than 18 inches nor more than 20 inches above finish grade. Provide hydrant extensions where required to obtain proper elevation. Install hydrants as shown on the Standard Details. Provide washed coarse gravel at hydrant shoe to ensure proper drainage of hydrant barrel. Place and compact backfill around hydrant to finish grade so that hydrant remains plumb. Furnish and install an auxiliary gate valve and valve box on each hydrant branch connection.
3. All hydrant installations must be inspected by the County/City prior to backfilling.
4. At locations where a new hydrant assembly is to be installed on an existing water main, install new tee in the existing main to connect the new lead to the new hydrant assembly.

5. At locations where an existing hydrant is on a water main 6-inch or larger and is to be replaced with a new hydrant assembly and existing hydrant lead is smaller than required for the new hydrant, remove the existing tee, lead, valve, and hydrant. Install a new tee in the existing main with a new lead to the new hydrant assembly. Damage to hydrant coating shall be field repaired in accordance with the hydrant manufacturer's recommendations or the hydrant shall be replaced at no additional cost to the County/City.
6. A standard fire hydrant with auxiliary gate valve is required at all dead end water mains. No blow-offs are allowed.
7. Hydrants shall be provided at each street intersection and at intermediate points between intersections or as directed by the County/City or Fire Department.
8. The maximum spacing between fire hydrants in residential neighborhoods and residentially zoned areas shall be 500 feet.
9. The maximum spacing between fire hydrants in commercial and industrial zoned areas shall be 300 feet.

D. Tracer Wire

1. Install tracer wire on pipe by taping to pipe in 15- to 20-foot intervals. Do not wrap wire around pipe. Install tracer wire on inside of all valve boxes with enough wire to extend 2 feet above the box.
2. Assemble tracer wire splices and branch connections with 12 AWG splice kits suitable for underground installation. Remove 1/2-inch of insulation from wire. Tie together wires using an overhand knot to prevent pull apart and use a split bolt connector or solder to connect for electrical continuity. Seal connection with epoxy contained in splice kit and wrap with tape.

3.05 Field Quality Control

A. Filling and Disinfection

1. Fill and sterilize all new water mains, services, leads and appurtenances in accordance with AWWA C651 and Section 02675. Each section of water main shall be complete and concrete thrust blocking shall have been in place for not less than 10 days prior to being tested.
2. Fill the new mains with water from the Utility distribution system. Expel all air from the mains as they are filled. Tap the water main at high points, if necessary, to assure removal of all air.
3. Flush all water mains and fire hydrants prior to disinfection. Flush mains with a flushing velocity of at least 2.5 feet per second. Flush water mains and hydrants until the water discharged is clear.
4. Disinfect all new water mains, valves, and other items prior to placing in service in accordance with Section 02675.

B. Continuity Test

1. Conduct continuity test on all tracer wire. All tracer wire found not to be continuous after testing shall be repaired or replaced at no additional cost to the County/City.

C. Valve Assembly Pressure Test

1. After a tapping valve or sleeve or a cut in tee and valve are properly supported and installed, perform a hydrostatic pressure test of the entire assembly to a pressure of 150 psi for 10 minutes. If any leaks are present, repair the assembly at no additional cost to the County/City.

D. Hydrostatic Leakage Test

1. The County/City shall be given 24 hour notice of the required pressure and leakage test. The Pressure and leakage testing shall be performed by the Contractor.
2. Hydrostatically test all water mains installed. Perform leakage test under a hydrostatic pressure in accordance with AWWA C600 and these specifications. The hydrostatic pressure shall be 150 psi or 1-1/2 times the working pressure at the point of testing, whichever is greater, but shall not exceed 150 psi at the lowest point in elevation of the system being tested. Allow the pipeline to stabilize at the test pressure before conducting the hydrostatic test.
3. The hydrostatic test shall be at least 2 hours in duration. Maintain the test pressure within +/-5 psi during the test period by adding makeup water using a test pump. At the end of the test duration, return the line pressure to the original test pressure by adding makeup water. Accurately measure the total amount of makeup water added during and at the end of the test duration, or leakage, in gallons by means of a water meter installed on the supply side of the pressure pump.
4. The pipe installation will not be accepted if the leakage is greater than that determined by the following formula in which L is the allowable leakage, in gallons per hour; S is the length of pipeline tested, in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gage.:
   a. Ductile Iron $L=0.0000068SD(P)^{1/2}$ See Table 3.05-1
   b. Polyvinyl Chloride $L=0.0000068SD(P)^{1/2}$ See Table 3.05-2
   c. Polyethylene See Table 3.05-3
5. Where the leakage rate exceeds the permissible maximum, locate and repair the leak or leaks. Repeat the leakage test until the test results are acceptable.
6. Repair all leaks discovered within the warranty period and retest the repaired segments to confirm leaks have been stopped.

Table 3.05-1: Allowable Leakage for Ductile Iron Pipe per 1000 ft. of Pipeline* - gph

Average Test Pressure	Nominal Pipe Diameter – in.								
psi	6	8	10	12	14	16	18	20	24
300	0.70	0.94	1.17	1.40	1.64	1.87	2.11	2.34	2.81
275	0.67	0.90	1.12	1.34	1.57	1.79	2.02	2.24	2.69
250	0.64	0.85	1.07	1.28	1.50	1.71	1.92	2.14	2.56
225	0.61	0.81	1.01	1.22	1.42	1.62	1.82	2.03	2.43
200	0.57	0.76	0.96	1.15	1.34	1.53	1.72	1.91	2.29
175	0.54	0.72	0.89	1.07	1.25	1.43	1.61	1.79	2.15
150	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99
125	0.45	0.60	0.76	0.91	1.06	1.21	1.36	1.51	1.81
100	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.62

**If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.*

Table 3.05-2 – Allowable Leakage for PVC Plastic Pipe with Elastomeric Joints – gph
(Allowable Leakage per 1,000 Ft. or 50 Joints)*

Average Test Pressure	Nominal Pipe Diameter – in.								
psi	6	8	10	12	14	16	18	20	24
300	0.70	0.94	1.17	1.40	1.64	1.87	2.11	2.34	2.81
275	0.67	0.90	1.12	1.34	1.57	1.79	2.02	2.24	2.69
250	0.64	0.85	1.07	1.28	1.50	1.71	1.92	2.14	2.56
225	0.61	0.81	1.01	1.22	1.42	1.62	1.82	2.03	2.43
200	0.57	0.76	0.96	1.15	1.34	1.53	1.72	1.91	2.29
175	0.54	0.72	0.89	1.07	1.25	1.43	1.61	1.79	2.15
150	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99
125	0.45	0.60	0.76	0.91	1.06	1.21	1.36	1.51	1.81
100	0.41	0.54	0.68	0.81	0.95	1.08	1.22	1.35	1.62

**If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.*

Table 3.05-3 – Allowance for Expansion of HDPE Pipe Under Pressure* for Ambient Conditions

Nominal Pipe Size	Allowance for Expansion (U.S. Gal per 100 Ft. of Pipe)		
	1-Hour Test	**2-Hour Test**	**3-Hour Test**
Inch	Gallon	Gallon	Gallon
6	0.30	0.60	0.90
8	0.50	1.00	1.50
10	0.75	1.30	2.10
12	1.10	2.30	3.40
14	1.40	2.80	4.20
16	1.70	3.30	5.00
18	2.20	4.30	6.50
20	2.80	5.50	8.00
22	3.50	7.00	10.50
24	4.50	8.90	13.30

**These allowances only apply to the test phase and not the initial expansion phase. In addition, they assume that the pipe is being tested for a system design pressure equal to the pipe's pressure class. If the pipe is being tested to a lower system design pressure, the above allowances should be reduced by the ratio of the system design pressure to the pipe's pressure class.*

3.06 As-Builts

A. “As-built” drawings required to be prepared and submitted to the County/City in accordance with Section 01010.

-END-

SECTION 02661 - WATER SERVICES

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Water service connections to County/City water mains, including service taps, service lines, meter pits and appurtenances as required for completing the work shown or specified.

B. Related Sections

1. Section 02220 - Trenching, Backfilling and Compaction for Utilities
2. Section 02660 - Water Mains
3. Section 02675 - Disinfection

1.02 References

A. American Society for Testing and Materials (ASTM), latest editions

1. ASTM B88 - Seamless Copper Water Tube
2. ASTM B251 - General Requirements for Wrought Seamless Copper and Copper-Alloy Tube
3. ASTM D2239 - Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter
4. ASTM D3350 - Polyethylene Plastics Pipe and Fittings Materials

B. American Water Works Association (AWWA), latest editions

1. AWWA C651 - Disinfecting Water Mains
2. AWWA C800 - Underground Service Line Valves and Fittings
3. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing (1/2-inch through 3-inch) for Water Service

C. Indiana Department of Environmental Management (IDEM) Regulations in 327 of the Indiana Administrative Code (IAC), latest edition

D. Indiana Plumbing Code, latest edition

E. NSF Standard 14 – Plastic Pipe System Components

F. Indiana Administrative Code 327 IAC 8-10 – Cross Connections; Control; Operation

G. City of Connersville Ordinance No. 5349 – Protection of public water system due to backflow of contaminants through the water service connection into the public water system.

1.03 Submittals

A. Product Data

1. Service Lines
2. Meter Pits
3. Fittings
4. Backflow / Cross Connection Control Devices
5. Other related items and appurtenances

1.04 Delivery, Storage, and Handling

A. Acceptance at Site

1. Deliver, store and handle all materials in accordance with manufacturer's recommendations.
2. Load and unload all tubing, fittings, meter pits, and appurtenances by hoists. Do not drop materials. Do not skid or roll materials on or against each other. Use padded slings, hooks and pipe tongs to handle materials in a manner to prevent damage.
3. All meter pits, brass fittings, and lids/rings shall be delivered to the job site and be the Developers/Contractors responsibility.
4. All materials deemed damaged by the County/City will not be accepted.

B. Storage and Protection

1. Store materials in an area safe from damage and deterioration. Keep the interior of tubing, fittings, and appurtenances free from dirt and foreign matter. Drain and store materials in a manner to prevent damage from freezing. Store gaskets in a cool location out of direct sunlight and free from contact with petroleum products.

1.05 Items to Be Provided By the County/City

A. The County/City will supply the water meter for single-family domestic uses. All other items required for the complete installation shall be provided by the Contractor.

PART 2 - PRODUCTS

2.01 General

A. All services lines, meter pits, and appurtenances shall be new, unused and conforming to AWWA C800.

B. Provide products that meet the Reduction of Lead in Drinking Water Act.

2.02 Service Saddles

A. Tapping saddles shall only be used for service taps 2-inch diameter and smaller. Refer to Section 02660 for larger diameter tapping. Taps 1-inch diameter and smaller in ductile iron pipe may be direct tapped without a tapping saddle except when otherwise directed by the County/City.

B. Provide saddles manufactured and tested in accordance with AWWA C800.

1. Mueller Series S-13000 (hinged)
2. Or approved equal.

2.03 Corporation Stops

A. Provide corporation stops manufactured and tested in accordance with AWWA C800. The inlet connection shall have standard AWWA tapered threads unless otherwise specified by the County/City. The outlet connection shall be copper or brass compression connection end. The sizes shall match the size of the service line.

B. Acceptable manufacturers:

1. Mueller Series 300 Ball Type Corporation Valves
2. Or approved equal

2.04 Service Line Material

A. Copper Service Line Tubing

1. Provide Type “K” copper service line tubing meeting the requirements of ASTM B88 and B251. The pipe size (3/4”, 1”, 1-1/2”, or 2”) shall be approved by the County/City.
2. Each length of pipe shall be clearly marked with the following information at a minimum, in conformance with AWWA C800:
   a. Manufacturer's name or trade mark
   b. Type of pipe
   c. Outside diameter of pipe
   d. Minimum weight per foot (not less than that listed in ASTM B251)

B. High Density Polyethylene (HDPE)

1. Provide DR-9 HDPE tubing in accordance with AWWA C901, ASTM 3350, ASTM D2239, and NSF 14. Pipe sizes (3/4”, 1”, 1-1/2”, 2” and 3”) shall be approved by the County/City. Supply HDPE pipe manufactured from high density, extra high molecular weight polyethylene and conforming to PE Standard Code PE 4710. Polyethylene pipe shall have a minimum cell classification of 445574C per the requirements of ASTM D3350.
2. Polyethylene pipe sizing shall be copper tube size (CTS), except that all 3” HDPE pipe shall be IPS.
3. Polyethylene service line color shall be blue.

4. Provide stainless steel stiffeners for HDPE service line.
5. Each length of pipe shall be clearly marked with the following information at a minimum, in conformance with AWWA C901:
    a. Nominal size and diameter base
    b. Dimension ratio or minimum wall thickness (DR-9)
    c. Manufacturer's name or trademark
    d. Material designation code (PE 4710)
    e. Pressure class (PC 250)
    f. AWWA designation number (AWWA C901)
    g. Manufacturer's production (lot) code
    h. Date of manufacture
    i. Seal or mark of testing agency certifying tubing for potable water service

2.05 Tracer Wire

A. Install tracer wire with all HDPE service lines.

B. Provide solid 12-gauge AWG copper wire.

C. Supply 3M Direct Bury splice kits (KIK 3M) consisting of tubes prefilled with silicone electrical insulating gel or approved equal.

D. On pipe installed by horizontal bore, pull 2 strands of tracer wire with pipe. Provide Copperhead Direct Burial 12 AWG solid, steel core hard drawn extra high strength.

2.06 Meter Pits

A. Pit

1. Meter pits for services 2-inch and smaller shall be round corrugated (or ribbed) plastic tile with straight walls.
    a. The meter pit inside diameter and depth shall be as follows:
        1) Single 3/4-inch service, meter pit shall be 20-inch diameter by 36-inches tall (meter to be provided and installed by County/City)
        2) Dual 3/4-inch service, meter pit shall be 24-inch diameter by 36-inches tall (meters to be provided and installed by County/City)
        3) 1-inch service, meter pit shall be 24-inch diameter by 36-inches tall (meter to be approved by County/City and provided and installed by Contractor)
        4) 2-inch service, meter pit shall be 36-inch diameter by 48-inches tall (meter to be approved by County/City and provided and installed by Contractor)
    b. Acceptable manufacturers:
        1) Plastic Meter Pits by EJ USA (East Jordan)
        2) White dual wall, corrugated HDPE Meter Pits by ADS
        3) Corrugated HDPE Meter Pits by FRATCO
2. Meter pits for services 3-inch and larger shall be precast concrete vault approved by the County/City, or located inside the building as approved by the County/City.

B. Meter Setter

1. 5/8-inch x 3/4-inch meter
   a. Acceptable manufacturers:
      1) Ford
      2) Mueller
2. 1-inch meter
   a. Acceptable manufacturers:
      1) Ford
      2) Mueller
3. For meters larger than 1-inch, setter to be approved by County/City.

C. Meter Pit Ring/Cover and Lid

1. Single 3/4-inch service, Mueller Ring & Lid or approved equal.
2. Dual 3/4-inch service, Mueller Ring with Monitor Ring & Lid or approved equal.
3. 1-inch service, Mueller Ring with Monitor Ring & Lid or approved equal.
4. Larger than 1-inch service, 3 piece monitor top to be approved by County/City.

D. Yoke U-Branch Assembly (dual meter pit only)

1. Mueller (1-inch x 3/4-inch x 7-1/2-inch) or approved equal.

E. Meters

1. Meters for single-family domestic uses will be provided for and installed by the County/City.
2. All meters, other than single-family domestic uses to be provided for and installed by the Contractor as follows:
   a. Radio read meter as manufactured by Neptune Technology Group and approved by the County/City.

2.07 Cross Connection Control

A. A cross connection is any physical connection or arrangement between two otherwise separate systems, one of which contains potable water from the City of Connersville water system, and the other, water from a private source, water of unknown or questionable safety, or steam, gases, or chemicals, whereby there may be a flow from one system to the other, the direction of flow depending on the pressure differential between the two systems.

B. Wherever a cross connection hazard is identified (according to 327 IAC 8-10, Indiana Plumbing Code, or by the City or County); an appropriate cross connection control device meeting the requirements of 327 IAC 8-10, the Indiana Plumbing Code, and the City of Connersville Ordinance No. 5349 shall be incorporated.

C. All consumers using toxic or hazardous liquids, all hospitals, mortuaries, wastewater treatment plants, laboratories, and all other hazardous users shall install and maintain a reduced pressure principal backflow preventer in the main water line serving each building on the premises. The backflow preventer must be

installed in an easily accessible location not subject to flooding or freezing. Reduced pressure principle backflow preventers shall not be installed below ground level.

PART 3 - EXECUTION

3.01 General

A. Request for water service shall be directed through the Utility Department, (765) 825-2158.

B. A minimum of 24 hours advance notice is required for all water taps and meter sets. No water taps or meter sets shall be made without a written work order issued from the County/City.

C. When setting water meter pits or installing water main taps all specifications below shall be followed and enforced. Any alterations to these specifications must be approved by the County/City.

D. Service line length and placement must be approved by the County/City. No taps will be permitted under driveways.

E. A total count of the meter pits is required as soon as the County/City approves the construction drawings.

F. Trenching and backfilling shall be in accordance with Section 02220 - Trenching, Backfilling, and Compaction for Utilities.

G. Inspect water services, fittings, meter pits and appurtenances prior to installation and promptly remove damaged or unsuitable materials from the job site. Replace damaged or unsuitable materials with new and unused materials.

H. Install all water services, fittings, meter pits and appurtenances as shown on the Standard Details and as specified in this Section. Do not install items when, in the opinion of the County/City, trench conditions are unsuitable.

I. Absolutely no electrical boxes, transformers, or telephone boxes are to be installed between the water meter pit location and the proposed building structure.

J. Direct taps will be made on a Monday, Tuesday, or Wednesday, unless otherwise instructed by the County/City.

3.02 Items to Be Installed By the County/City

A. The County/City will install the meter for single family domestic uses. All other installation is the responsibility of the Contractor.

3.03 Installation of Water Services

A. Follow manufacturer's installation procedures for installation.

B. All service lines shall be buried to a minimum depth of cover of 48 inches.

C. All services shall be sized per the Indiana Plumbing Code.

D. Install all service lines in accordance with AWWA C800.

E. Expose the water main (at least a 4-foot by 4-foot hole is required) and provide a safe and dry working area with safe and easy access into and out of the excavation. The County/City may, at their discretion, refuse to work in an unsafe hole or trench.

F. Where new meters are installed on opposite sides of road from new mains, push services under road to connect to meters. No open cutting of road surfaces will be allowed for service lines.

G. Excavate trenches to widths which provide adequate working space for proper pipe installation, jointing and embedment.

H. Cut pipe in a neat and workmanlike manner. Use a cutting machine so as to leave smooth ends at right angles to the axis of the pipe. Remove all burs that form as a result of field cutting the pipe, whether the pipe end is beveled or not.

I. No joints will be allowed in service lines.

J. Install cross connection control device, as required, per Indiana Plumbing Code.

K. Install tracer wire on pipe by taping to pipe in 15- to 20-foot intervals. Do not wrap wire around pipe. Assemble tracer wire splices and branch connections with 12 AWG splice kits suitable for underground installation. Remove 1/2-inch of insulation from wire. Tie together wires using an overhand knot to prevent pull apart and use a split bolt connector or solder to connect for electrical continuity. Seal connection with epoxy contained in splice kit and wrap with tape.

L. Do not cut or drill meter pits.

3.04 Installation of Meter Pits

A. Follow manufacturer's installation procedures for installation.

B. Be responsible for laying all service lines to meter pit location and setting meter pit.

C. Be responsible for setting meter pit and finished grade of pit. If meter pit must be raised or lowered at a later date it is the installing Contractor's responsibility. No brick or block will be approved. The meter pit must be excavated and reset in order to raise or lower pit.

3.05 Installation of Building Meters

A. Any water meter to be installed inside a building must be first approved by the County/City.

B. Water meters to be installed inside a building must be equipped with a remote reading device approved by the County/City and paid for by the Contractor. Be responsible for installing the appropriate water meter setters inside the building before the meter is to be set.

3.06 Commercial Domestic Water Taps

A. The County/City will allow domestic water service connections to a commercial building fire main under the following conditions:

1. Domestic water service tap shall be made between the public/private water main and the Post Indicator Valve (P.I.V.) on the fire suppression main. No domestic water taps may be installed between the P.I.V. and the building.
2. Upon completion of work and prior to placing the system in operation, sterilize the fire suppression main and domestic service connection per Section 02675 – Disinfection.

3.07 Field Quality Control

A. Install, flush, and perform leakage test on service lines in accordance with the Indiana Plumbing Code.

B. Continuity Test

1. Conduct continuity test on all tracer wire. All tracer wire found not to be continuous after testing shall be repaired or replaced at no additional cost to the County/City.

3.08 As-Builts

A. “As-built” drawings required to be prepared and submitted to the County/City in accordance with Section 01010.

-END-

SECTION 02675 - DISINFECTION

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Disinfection of all potable water lines, valves, hydrants, service connections, and all other appurtenances which are to store, handle or carry potable water. Furnish all labor, water, chemical and equipment, including taps, corporation stops, temporary pumps and other items necessary to perform the Work.

B. Related Sections

1. Section 02660 – Water Mains

1.02 References

A. All disinfection Work shall be acceptable to the Indiana Department of Environmental Management. If any requirements of this section are in conflict with requirements of the authority of disinfection, those of the authority shall govern.

B. American Water Works Association (AWWA), latest editions

1. AWWA C651 – Disinfecting Water Mains

C. Indiana Plumbing Code

1.03 Submittals

A. Quality Control Submittals

1. Prior to starting any disinfection Work, furnish for the County/City's review a detailed outline of the proposed sequence of operation, disinfection method to be used, manner of filling and flushing units, source and quality of water to be used, and disposal of heavily chlorinated water.

B. Test Results

1. Submit copies of all bacteriological and chlorine residual test results to County/City.

1.04 Quality Assurance

A. Perform all Work for and in connection with disinfection under the direction of an experienced supervisor.

B. All equipment used in disinfection Work shall be in proper working condition and shall be adequate for the specified Work.

PART 2 - PRODUCTS

2.01 Materials

A. Liquid chlorine, sodium hypochlorite solution, and calcium hypochlorite granules or tablets, as identified by AWWA as acceptable disinfection materials.

PART 3 - EXECUTION

3.01 Preparation

A. Perform pressure and leakage tests prior to disinfection when specified in related sections.

B. The County/City shall be given 24 hour notice of the required disinfection. All flushing and disinfection procedures are to be performed by the Contractor.

C. Thoroughly flush all pipes to remove foreign material. The source of potable water shall be flushed prior to use to ensure that contaminants or debris are not introduced into the new pipes.

D. Release entrapped air at high points and fill the unit with water when specified in related sections.

E. Provide necessary corporation cocks and vent piping in the event that complete venting cannot be accomplished through available outlets.

F. Prevent admission of contaminated water into previously disinfected units.

3.02 Application

A. Disinfection Procedures for Water Mains, Valves, Fittings, and Appurtenances

1. Disinfect by one of the three methods described in AWWA C651: tablet, continuous feed, or slug.
   a. Tablet Method
      1) Perform in accordance with AWWA C651.
      2) Do not use calcium hypochlorite on solvent-weld plastic or screwed-joint steel pipe due to the danger of fire or explosion.
      3) Keep pipe and appurtenances clean and dry during construction.
      4) Place calcium hypochlorite granules or tablets to give an average chlorine dose of 25 mg/L as follows:
         a) During construction, place calcium hypochlorite granules at the upstream end of the first section of pipe, at the upstream end of each branch, and at 500-foot intervals.
         b) During construction, place 5-gram calcium hypochlorite tables in each section of pipe. Also, place 1 tablet in each hydrant, hydrant branch, and other appurtenances. Attach tablets using a food grade adhesive.

5) After installation is complete, fill the water main slowly and ensure that all air pockets are eliminated.
6) The chlorinated water shall remain in the pipe for at least 24 hours. If the water temperature is less that 41 degrees Fahrenheit, the chlorinated water shall remain in the pipe for at least 48 hours. Operate valves and hydrants during this time to ensure disinfection of appurtenances.
7) At the end of the retention period, the chlorine residual shall not be less than 10 mg/L.

b. Continuous-Feed Method
1) Perform in accordance with AWWA C651.
2) Perform a preliminary flushing of the water main to eliminate air pockets and remove particulates. The flushing velocity shall be not less than 2.5 feet per second.
3) Provide a water supply through a temporary connection from a backflow protected source at a constant, measured rate.
4) Chlorine Solution shall be prepared based on a chlorine gas-water solution or 1 percent chlorine solution prepared with calcium hypochlorite-water or sodium hypochlorite-water mixture.
5) Direct-feed chlorinators, which operate from the gas pressure in the chlorine cylinder, shall not be used for the application of liquid chlorine. Apply liquid chlorine with a solution feed, vacuum operated chlorinator and booster pump.
6) Hypochlorite solutions may be fed using a powered chemical feed pump designed for feeding chlorine solution.
7) At a point not more than 10 feet downstream from the beginning of the new main, feed the new water main with a dose of chlorine at a constant rate such that the feed water will have not less than 25 mg/L free chlorine.
8) Chlorine application shall not cease until the entire main is filled with heavily chlorinated water.
9) The chlorinated water shall remain in the pipe for at least 24 hours.
10) Operate valves and hydrants during this time to ensure disinfection of appurtenances.
11) At the end of the retention period, the chlorine residual shall not be less than 10 mg/L.

c. Slug Method
1) Perform in accordance with AWWA C651.
2) Perform a preliminary flushing of the water main to eliminate air pockets and remove particulates. The flushing velocity shall be not less than 2.5 feet per second.
3) Provide a water supply through a temporary connection from a backflow protected source at a constant, measured rate.
4) At a point not more than 10 feet downstream from the beginning of the new main, feed the new water main with a dose of chlorine at a constant rate such that the feed water will have not less than 100 mg/L free chlorine. Measure the chlorine feed at regular intervals to verify the feed concentration.

5) The free chlorine residual shall be measured in the slug as it moves through the main and shall not drop below 50 mg/L at any time during the 3-hour testing period.
6) All interior surfaces shall be exposed to the heavily chlorinated water for at least 3 hours.
7) Operate valves and hydrants during this time to ensure disinfection of appurtenances.

2. To prevent damage, the heavily chlorinated water shall be flushed from the system as quickly as possible following the applicable retention period. The piping system shall be flushed until the water is found to be comparable to that of the Utility or not less than 1 mg/L.
3. Do not permit flushing water to discharge into existing water mains.

B. Disinfection of Items to be Immediately Returned to Service

1. Perform in accordance with AWWA C651.
2. Apply liberal quantities of hypochlorite to open trench areas when an existing water main or service connection is opened and the excavation is wet.
3. Disinfect pipe, fittings or appurtenances by thoroughly flushing and swabbing with a 5 percent solution of calcium hypochlorite immediately prior to assembly.
4. Following swabbing, flush the unit until replacement water in the system is proven to be comparable in quality to the water which will enter that unit or system. Flush toward the Work location from both directions. Flushing shall be started as soon as the repairs are complete and shall be continued until discolored water is eliminated.
5. After appropriate procedures of disinfection and flushing have been completed, the existing main may be returned to service prior to completion of verification of disinfection in order to minimize the time customers are without water.

C. Disinfection of Service Lines and Accessories

1. Perform in accordance with the Indiana Plumbing Code.
2. Flush the piping with clean, potable water until only potable water appears at the points of outlet.
3. Disinfect the system according to one of the following procedures:
   a. Fill the system with a water – chlorine solution containing at least 50 mg/L of free chlorine. Retain the heavily chlorinated water in the system for at least 24 hours.
   b. Fill the system with a water – chlorine solution containing at least 300 mg/L of free chlorine. Retain the heavily chlorinated water in the system for at least 3 hours.
4. Following disinfection, flush the system with clean, potable water until the chlorine in the water coming from the system does not exceed the chlorine residual in the flushing water.
5. Verification of disinfection for service lines is not required.

3.03 Verification of Disinfection

A. After application of disinfection is complete, perform final flushing of heavily chlorinated water, unless specified otherwise.

B. Before the system is placed in service, obtain 2 successive water samples 24 hours apart and have them tested for bacteriological analysis. The taking of samples and the bacteriological testing shall be carried out by the County/City.

C. If samples do not prove satisfactory, the system shall be re-chlorinated and re-sampled until 2 successive water samples taken 24 hours apart have tested satisfactory.

D. Assume the expense of taking and testing additional samples until satisfactory samples are obtained.

E. Assume the expense of all water for subsequent fillings of the pipelines and equipment.

3.04 Disposal of Waste

A. Properly dispose of all heavily chlorinated water by neutralization and in accordance with the regulations of the local health department, Indiana Department of Environmental Management, and AWWA standards.

B. Dispose of heavily chlorinated water as required by AWWA C651, Appendix C.

C. Obtain written authorization from County/City sewer department before discharging heavily chlorinated water to sanitary sewer system.

-END-

SECTION 02710 - UNDERDRAIN SYSTEMS

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Furnishing and installing underdrains, French drains, fittings, appurtenances, and other materials as shown on the Drawings and specified herein.

B. Related Sections

1. Section 02220 - Trenching, Backfilling and Compaction for Utilities
2. Section 02501 - Standards of Roadway Construction

1.02 References

A. American Association of State Highway and Transportation Officials (AASHTO), latest editions

1. AASHTO M252 - Standard Specification for Corrugated Polyethylene Drainage Pipe
2. AASHTO M294 - Standard Specification for Corrugated Polyethylene Pipe 12- to 60-in. Diameter

B. American Society for Testing and Materials (ASTM), latest editions

1. ASTM C94 - Standard Specification for Ready-Mixed Concrete
2. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
3. ASTM D4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
4. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity
5. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles
6. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
7. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile
8. ASTM D6241 - Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using 50-mm Probe

C. Indiana Department of Transportation (INDOT) Standard Specifications, latest edition

1. Section 702 - Structural Concrete
2. Section 715 - Pipe Culverts, and Storm and Sanitary Sewers

3. Section 718 - Underdrains
4. Section 904 - Aggregates

1.03 Submittals

A. Product Data

1. Aggregate – source and gradation
2. Pipe
3. Geotextile
4. Concrete Mix Design for Concrete Collars
5. Concrete Mix Design for Outlet Protectors

B. Quality Assurance/Control Submittals

1. Video inspection recorded on a digital media storage device compatible for playback on a personal computer (USB flash drive acceptable).
2. Runsheet logs

1.04 Delivery, Storage, and Handling

A. Pipe possessing defects including, but not limited to the following, will be rejected for installation:

1. Variations from straight centerline
2. Elliptical shape in round pipe
3. Lack of rigidity
4. Illegible markings as required herein
5. Deep or excessive gouges, dents, bends, or scratches on the pipe wall
6. Fractures, punctures, or cracks passing through the pipe wall
7. Damaged or cracked ends where such damage would prevent making a satisfactory joint

B. Geotextile possessing defects including, but not limited to the following, will be rejected for installation:

1. Rips or punctures passing through the material
2. Deterioration from light, temperature, or other unsatisfactory conditions

C. Storage and Protection

1. Protect plastic pipes from extreme temperatures and ultraviolet radiation.
2. Store gaskets in a cool location out of direct sunlight and free from contact with petroleum products.
3. Store and handle geotextiles in accordance with the manufacturer's instructions. Do not expose geotextile to direct sunlight, ultraviolet rays, temperatures greater than 140 degrees Fahrenheit, mud, dirt, dust, or debris to the extent that its strength, toughness, or permeability requirements are diminished.

PART 2 - PRODUCTS

2.01 Aggregate Backfill

A. Provide coarse aggregates, class E or higher, in accordance with INDOT Standard Specification Section 904. Provide aggregates No. 8, No. 5, and No. 2 with gradations in accordance with INDOT Standard Specification Section 904. Furnish washed aggregates where indicated.

2.02 Pipe and Accessories

A. Underdrain

1. Provide perforated corrugated polyethylene drainage pipe (PCPP) and fittings in accordance with AASHTO M252 (for 3 to 10-inch diameter) or AASHTO M294 (for 12 to 36-inch diameter).
2. Provide perforated Schedule 40 Polyvinyl Chloride (PVC) pipe in accordance with ASTM D1785.

B. Cleanouts

1. Provide non-perforated Schedule 40 PVC pipe and fittings in accordance with ASTM D1785.
2. Provide solid lid casting which is designed to fit in the pipe bell and sized appropriately for the diameter of pipe installed. Furnish model number R-4044 as manufactured by Neenah Foundry or approved equal.

C. Rodent Screen: Provide rodent screens in accordance with INDOT Standard Specifications Section 718.

2.03 Geotextile

A. Provide non-woven needle punched or heat bonded geotextile consisting of strong, rot resistant, chemically stable long-chain synthetic polymer materials which are dimensionally stable relative to each other. The geotextile plastic yarn or fibers shall consist of at least 85 percent by weight of polyolefins, polyesters, or polyamides, and shall resist deterioration from ultraviolet and heat exposure.

B. Geotextile shall meet or exceed the following requirements:

TEST	METHOD	REQUIREMENTS
Grab Strength	ASTM D4632	80 lb (355.8 N)
Seam Strength (mfrd. & field)	ASTM D4632	70 lb (311.4 N)
Puncture Strength	ASTM D6241	25 lb (111.2 N)
Trapezoid Tear	ASTM D4533	25 lb (111.2 N)
Apparent Opening Size	ASTM D4751	Sieve No. 50 max.
Permeability	ASTM D4491	0.1 mm/sec
Ultraviolet Degradation (150 hrs.)	ASTM D4355	70% strength retained

2.04 Concrete Collars and Cradles

A. Provide ready-mixed concrete which meets the requirements of ASTM C94. Each cubic yard of concrete shall contain the following:

1.	Cement:	6 bag minimum
2.	Air content:	5 to 7 percent
3.	Coarse aggregate size:	1-1/2 inches maximum
4.	Slump:	3 to 5 inches
5.	Compressive strength:	4,000 psi

2.05 Outlet Protectors

A. Provide Class A concrete in accordance with INDOT Standard Specifications Section 702.

PART 3 - EXECUTION

3.01 General

A. Provide all tools, labor, and equipment necessary for the safe and expeditious installation of all underdrains, French drains, and appurtenances as shown on the Drawings and specified herein.

B. Perform all clearing, grubbing, excavation, trenching, bedding, and backfilling required in accordance with Section 02220.

3.02 Trenching

A. Trenches shall be excavated to the dimensions and grade required by the Drawings or as directed in the field by the County/City.

B. Provide a minimum clearance of 4 inches on each side of the pipe for the width of the trench.

C. Excavate to design grade to provide a smooth, graded surface free of debris, large cavities, and exposed rocks greater than 3 inches in diameter.

3.03 Installation

A. After excavating to design grade, cut geotextile to a width sufficient to provide for non-tight placement in trenches and overlaps of the ends of adjacent rolls.

B. Avoid contamination of the geotextile during construction. If contamination occurs, remove and replace geotextile with new material.

C. Place the geotextile with the machine direction in the direction of water flow in the drainage system. Place loosely, but with no wrinkles or folds.

D. Overlap the ends and edges of subsequent rolls and parallel rolls of geotextile a minimum of 1 foot. The upstream geotextile shall always be overlapped over the downstream geotextile. Join seams which are required in the longitudinal direction by means of either sewing or overlapping. Overlapped seams shall have a minimum overlap equal to the width of the trench.

E. Place perforated pipe with the perforations facing down and securely join the pipe sections with the appropriate coupling, fitting or bands. Lay non-perforated pipe with the bell end upgrade and with open joints wrapped with suitable material to permit entry of water, or unwrapped as shown on the Drawings.

F. Take necessary precautions to protect pipe and tile. Damaged sections shall be replaced by the Contractor for no additional payment.

3.04 Backfilling

A. Place drainage aggregate immediately following placement of the geotextile and underdrain.

B. Place aggregate in a manner which minimizes contamination of the underdrain pipe.

3.05 As-Builts

A. “As-built” drawings required to be prepared and submitted to the County/City in accordance with Section 01010.

-END-

SECTION 02715 - HYBRID DITCH SYSTEMS

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Providing hybrid ditch pipes, drain basins, and appurtenances.

B. Related Sections

1. Section 02220 - Trenching, Backfilling and Compaction for Utilities

1.02 References

A. American Association of State Highway and Transportation Officials (AASHTO), latest editions

1. AASHTO M252 - Standard Specification for Corrugated Polyethylene Drainage Pipe
2. AASHTO M294 - Standard Specification for Corrugated Polyethylene Pipe 12- to 60-in. Diameter

B. American Society for Testing and Materials (ASTM), latest editions

1. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
2. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))
3. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
4. ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
5. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
6. ASTM D4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus
7. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity
8. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles
9. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
10. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile

11. ASTM D6241 - Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using 50-mm Probe
12. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
13. ASTM F2306 - Standard Specification for 12 to 60-inch Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Application

C. Indiana Department of Transportation (INDOT) Standard Specifications, latest edition

1. Section 904 - Aggregates
2. Section 907 - Concrete, Clay, and Plastic Drainage Components
3. Section 918 - Soil Fabrics

1.03 Submittals

A. Product Data

1. Aggregate – source and gradation
2. Pipe
3. Castings
4. Geotextile

B. Shop Drawings

1. Structures

1.04 Delivery, Storage, and Handling

A. Pipe possessing defects including, but not limited to the following, will be rejected for installation:

1. Variations from straight centerline
2. Elliptical shape in round pipe
3. Lack of rigidity
4. Illegible markings as required herein
5. Deep or excessive gouges, dents, bends, or scratches on the pipe wall
6. Fractures, punctures, or cracks passing through the pipe wall
7. Damaged or cracked ends where such damage would prevent making a satisfactory joint

B. Geotextile possessing defects including, but not limited to the following, will be rejected for installation:

1. Rips or punctures passing through the material
2. Deterioration from light, temperature, or other unsatisfactory conditions

C. Storage and Protection

1. Protect plastic pipes from extreme temperatures and ultraviolet radiation.
2. Store gaskets in a cool location out of direct sunlight and free from contact with petroleum products.
3. Store and handle geotextiles in accordance with the manufacturer's instructions. Do not expose geotextile to direct sunlight, ultraviolet rays, temperatures greater than 140 degrees Fahrenheit, mud, dirt, dust, or debris to the extent that its strength, toughness, or permeability requirements are diminished.

PART 2 - PRODUCTS

2.01 Aggregate Backfill

A. Double-washed coarse aggregate No. 8, class E or higher, in accordance with INDOT Standard Specification Section 904.

B. Fine aggregate No. 23 sand, in accordance with INDOT Standard Specification Section 904.

2.02 High Density Polyethylene (HDPE) Pipe

A. Pipe Material

1. Dual wall corrugated HDPE pipe and fittings, consisting of an annular outer corrugated pipe wall and a smooth inner wall, in accordance with ASTM F2306 and INDOT Standard Specification Section 907.
2. Provide perforated corrugated polyethylene drainage pipe (PCPP) and fittings in accordance with AASHTO M252 (for 4- to 10-inch diameter) or AASHTO M294 (for 12- to 36-inch diameter), ASTM F2306, and INDOT Standard Specification Section 907. Perforations shall be AASHTO Class II.
3. Pipe and fittings material shall be in accordance with ASTM D3350:
   a. Virgin high-density polyethylene with a minimum cell class of 424420C for 4- to 10-inch diameter pipe or 435400C for 12- to 36-inch diameter pipe.

B. Joints

1. Bell and spigot joints conforming to ASTM F2306
2. Gaskets conforming to ASTM F477

C. Fittings

1. Provide fittings of the same manufacturer for each type of HDPE pipe.
2. Manufactured fittings such as wyes, tees, elbows, or adaptors will not be accepted for use in place of drain basins unless otherwise indicated on the Drawings.

D. Pipe Markings

1. Each length of HDPE pipe shall be clearly marked with the following information at a minimum:
   a. Name of manufacturer or identification symbol
   b. Nominal pipe size
   c. Product/extrusion code

2.03 Pipe Accessories

A. Pipe to Structure Connections

1. Pipe penetration holes shall be either pre-formed by manufacturer or core drilled in the field.
2. Provide flexible neoprene molded boot or resilient seal conforming to ASTM C923.
   a. Provide Kor-N-Seal boot as manufactured by National Pollution Control Systems, Inc. or approved equal.
   b. Provide resilient seal as manufactured by A-Lok or approved equal.

2.04 Precast Concrete Inlets, Catch Basins, and Accessories

A. Provide precast inlets, catch basins, and accessories as specified in Section 02720.

2.05 Drain Basins and Accessories

A. Structures

1. Provide PVC drain basins which are manufactured from PVC pipe stock, utilizing a thermo-molding process to re-form the pipe stock to the furnished configuration. Drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified type of pipe.
2. Minimum cell class in accordance with ASTM D1784
   a. Cell class 12364 for 12-inch to 15-inch diameter pipes
   b. Cell class 12454 for 18-inch to 36-inch diameter pipes
3. PVC structure joints shall conform to ASTM D3212. Flexible elastomeric seals shall conform to ASTM F477.
4. Provide Nyloplast drain basins as manufactured by Advanced Drainage Systems, Inc. or approved equal.

B. Castings

1. Cast iron or ductile iron frames and covers to match the diameter of the drain basin installed. Road and highway grates shall meet minimum H-20 load rating.

2.06 Geotextile

A. Non-woven needle punched or heat bonded geotextile consisting of strong, rot-resistant, chemically stable long-chain synthetic polymer materials which are dimensionally stable relative to each other including selvedges.

B. Furnish geotextile which meets or exceeds INDOT Standard Specification Section 918 and the following requirements:

TEST	*METHOD*	*REQUIREMENT*
Grab Strength	ASTM D4632	80 lb (355.8 N)
Seam Strength (mfrd. & field)	ASTM D4632	70 lb (311.4 N)
Puncture Strength	ASTM D6241	25 lb (111.2 N)
Trapezoid Tear	ASTM D4533	25 lb (111.2 N)
Apparent Opening Size	ASTM D4751	Sieve No. 50 max.
Permeability	ASTM D4491	0.1 mm/sec
Ultraviolet Degradation (150 hrs.)	ASTM D4355	70% strength retained

PART 3 - EXECUTION

3.01 Examination

A. Verification of Conditions

1. Before installing piping, verify location, depth, type of joint needed, and size of pipe to which connection is proposed.
2. Assure that lines can be run as proposed. Notify County/City immediately for approval of any necessary deviation before lines are run.
3. Work all lengths of pipe into place without forcing.

3.02 Installation

A. General

1. Perform clearing, grubbing, excavation, trenching, bedding, and backfilling required in accordance with Section 02220.

B. Bedding and Backfill

1. Place aggregate in a manner which minimizes contamination of the hybrid ditch pipe.
2. Place coarse aggregate bedding and backfill material in 6 to 8-inch balanced lifts to ensure proper compaction and filling of all voids. Hand tamp or "walk" aggregate into place.
3. Place fine aggregate backfill material in maximum 12-inch balanced lifts to ensure proper compaction. Compact each lift to 95 percent of Standard Proctor dry density in accordance with ASTM D698.

C. Pipe and Accessories

1. Lay hybrid ditch pipe uniformly to line and grade so that finished pipe will present a uniform conduit.
2. Set line and grade by means of laser beam and target for alignment and grade.
3. Lay pipe progressively upgrade in a manner to form close, concentric joints with smooth bottom inverts.
4. Maintain 18 inches of vertical separation and 10 feet of horizontal separation between new hybrid ditch pipe and new or existing water mains unless otherwise directed. Notify County/City immediately of all instances where separation cannot be maintained.
5. After joint is made, place sufficient bedding material along each side of the pipe to prevent conditions that might tend to move the pipe offline or grade.
6. Temporarily plug installed piping systems at end of each day's Work or other interruption of progress on a given line. Plug shall be adequate to prevent entry of animals and entrance or insertion of deleterious materials and shall be installed in a manner satisfactory to the County/City.
7. Securely attach fabricated branches for wyes and tees to wall of pipe in such a manner as to not restrict or otherwise interfere with flow characteristics of the pipe.
8. Install boot and saddle connectors for all taps to concrete and RCP pipe.
9. Ensure smooth trench bottom free from large, exposed rocks greater than 3 inches in diameter, and cover trench bottom with geotextile and No. 8 double-washed aggregate. Install pipe with perforations facing downward at a minimum grade of 0.10 percent and 2 feet minimum to 4 feet maximum cover. Cover perforated pipe with No. 8 double-washed aggregate to a minimum of 12 inches above the pipe crown. Fold geotextile around aggregate and backfill as specified and as shown on the Drawings.
10. If any existing drainage tile systems are encountered during construction, reconstruct the tile to its original conditions or connect tile to the new storm drainage system as approved by the County/City.

D. Drain Basins and Accessories

1. Join pipe bell spigot to the structure body by use of a swage mechanical joint.
2. Bed and backfill drain basins as specified for PVC pipe in Section 02200.
3. Install drain basins so axis of structure is vertical.
4. Unless otherwise indicated, set castings for all structures at finish grade level. Inline drain and drain basin bodies shall be cut to final grade. No brick, stone, or concrete block will be permitted to set the casting to the finish grade level. Adjust castings to the satisfaction of the County/City.
5. For H-20 load rate installations, pour a concrete ring under and around the grate and frame per the manufacturer's instructions.
6. Remove all debris and excess soil from structures after installation and prior to flushing the storm sewer pipes.

E. Connection to Existing Structures

1. Core drill new pipe penetration at the proper location where the pipe enters the structure.

2. Install flexible neoprene molded boot or resilient seal to secure the pipe in the structure wall.

3.03 Field Quality Control

A. Tests

1. Deflection Test for Flexible Pipes
   a. Pipe materials considered flexible include:
      1) HDPE
      2) PCPP
   b. Perform testing in presence of County/City.
   c. Perform deflection testing on all flexible pipes after the final backfill has been in place for at least 30 days.
   d. Perform deflection test using a mandrel pulled by hand. The mandrel (go/no-go) device shall be cylindrical in shape and constructed with 9 or 10 evenly spaced arms or prongs.
   e. No pipe shall exceed a vertical deflection of 5 percent. Uncover, replace, and retest any pipe not passing the deflection test until a satisfactory result is achieved.

B. Inspection

1. Closed-circuit Television Inspection (CCTV)
   a. Televise all pipe segments more than 40 feet in length.
   b. Perform all CCTV inspection in presence of County/City.
   c. Clean all new pipe segments by “flooding” prior to CCTV inspection. The image shall be clear, so the interior condition of the pipe is easily evaluated.
   d. Correct all unacceptable conditions found during the CCTV inspection and re-televise until no unacceptable conditions are found.
   e. Unacceptable conditions are conditions that adversely affect the ability of the system to function as designed or to be properly maintained and may include, but are not limited to, the following:
      1) Protruding taps
      2) Cracked or faulty pipe
      3) Misaligned or deformed pipe
      4) Debris in line
      5) Excessive gaps at joints
      6) Bellies or sags with a depth greater than or equal to 10 percent of the pipe diameter (maximum of 3 inches) or a length greater than 25 feet
   f. Submit a copy of the CCTV recording within 14 calendar days of the inspection on a digital media storage device compatible for playback on a personal computer (USB flash drive acceptable).
2. Closed-circuit Television Inspection (CCTV) requirement may be waived by the County/City if portions of the system determined to be infeasible for CCTV operations.

3.04 Cleaning

A. Clean all new pipe segments with high pressure water jet after installation and before testing.

3.05 As-Builts

A. “As-built” drawings required to be prepared and submitted to the County/City in accordance with Section 01010.

-END-

SECTION 02720 - STORM SEWER SYSTEMS

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Furnishing and installing storm sewers, inlets, catch basins, manholes, other drainage structures, and appurtenances.

B. Related Sections

1. Section 02220 - Trenching, Backfilling and Compaction for Utilities

1.02 References

A. American Association of State Highway and Transportation Officials (AASHTO), latest editions

1. CONCRETE
   a. AASHTO M86 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe (ASTM C14)
   b. AASHTO M170 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (ASTM C76)
   c. AASHTO M199 - Standard Specification for Precast Reinforced Concrete Manhole Sections (ASTM C478)
   d. AASHTO M207 - Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe (ASTM C507)
2. PLASTIC
   a. AASHTO M294 - Standard Specification for Corrugated Polyethylene Pipe (12 to 60-in) Diameter

B. American Society for Testing and Materials (ASTM), latest editions

1. CONCRETE
   a. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
   b. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe
   c. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
   d. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
   e. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections
   f. ASTM C507 - Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
   g. ASTM C928 - Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs

h. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
i. ASTM C1433 - Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
j. ASTM C1577 - Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers Design According to AASHTO LRFD

2. CASTINGS
   a. ASTM A48 - Standard Specification for Gray Iron Castings
3. PLASTIC
   a. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
   b. ASTM D1784 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
   c. ASTM D2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
   d. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
   e. ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
   f. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
   g. ASTM D4101 - Standard Classification System and Basis for Specification for Polypropylene Injection and Extrusion Materials
   h. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
   i. ASTM F679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
   j. ASTM F2306 - Standard Specification for 12 to 60-inch Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Application
   k. ASTM F2764 - Standard Specification for 6 to 60 in. Polypropylene (PP) Double and Triple Wall Pipe and Fittings for Non-Pressure Sewer Applications
   l. ASTM F2881 - Standard Specification for 12 to 60 in. Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications

C. Indiana Department of Transportation (INDOT) Standard Specifications, latest edition

1. Section 901 - PCC Materials
2. Section 904 - Aggregates
3. Section 907 - Concrete, Clay, and Plastic Drainage Components
4. Section 910 - Metal Materials

1.03 Submittals

A. Product Data

1. Pipe
2. End Sections
3. Structures
4. Castings
5. Manhole Steps

1.04 Delivery, Storage, and Handling

A. Pipe possessing defects including, but not limited to the following, will be rejected for installation:

1. Variations from straight centerline
2. Elliptical shape in round pipe
3. Lack of rigidity
4. Illegible markings as required herein
5. Bruised, broken, or otherwise damaged metallic or bituminous coating or liner, as applicable
6. Deep or excessive gouges, dents, bends, or scratches on the pipe wall
7. Fractures, punctures, or cracks passing through the pipe wall
8. Damaged or cracked ends where such damage would prevent making a satisfactory joint

B. Concrete pipe and structures possessing defects including, but not limited to the following, will be rejected for installation:

1. Fractures or cracks passing through the wall
2. Honeycombed or open texture which would adversely affect the function of the sections
3. Ends of sections are not normal to the walls and centerline of the section

C. Storage and Protection

1. Store materials in an area safe from damage and deterioration.
2. Protect plastic pipes from extreme temperatures and ultraviolet radiation.
3. Keep interior of pipe, fittings, manhole sections, and appurtenances free from dirt and foreign matter.
4. Store gaskets in a cool location out of direct sunlight and free from contact with petroleum products.
5. Inspect all pipe, structures, and appurtenances prior to installation and promptly remove damaged or unsuitable materials. Replace with new and unused materials.

PART 2 - PRODUCTS

2.01 Storm sewers shall be gasket type, reinforced concrete pipe (RCP), polyvinyl chloride (PVC) pipe, or high-density polyethylene (HDPE) pipe. The minimum pipe size shall be 12-inch diameter.

2.02 High Density Polyethylene (HDPE) Pipe

A. Pipe Material

1. HDPE pipe for culverts and storm sewers which are 12 to 36 inches in diameter. HDPE pipe shall not be used for culverts and storm sewers over 36 inches in diameter without written approval from the County/City.
2. Dual wall corrugated HDPE pipe and fittings, consisting of an annular outer corrugated pipe wall and a smooth inner wall, in accordance with AASHTO M294 Type S or Type D, and INDOT Standard Specification Section 907.
3. Pipe and fittings material shall be, in accordance with ASTM D3350, virgin high-density polyethylene with a minimum cell class of 435400C.
4. Manufacturers
   a. Sure-Lok by Hancor, Inc.
   b. N-12 Soil-Tight by Advanced Drainage Systems, Inc.
   c. Or approved equal

B. Joints

1. Bell and spigot joints in conformance with ASTM D3212
2. Gasket material in conformance with ASTM F477

C. Fittings

1. Manufactured fittings such as wyes, tees, elbows, or adaptors will not be accepted for use in place of storm sewer manholes, inlets, catch basins, or drain basins unless otherwise approved by the County/City.

D. Pipe Markings

1. Provide pipe with each length clearly marked with the following information:
   a. Name of manufacturer or identification symbol
   b. Nominal pipe size
   c. Product/extrusion code

2.03 Polypropylene Pipe

A. Pipe Material

1. 12-inch through 24-inch diameter: Double wall polypropylene pipe with a smooth interior and annular exterior corrugations in accordance with ASTM F2881
2. 30-inch through 60-inch diameter: Triple wall polypropylene pipe with a smooth interior and exterior surface in accordance with ASTM F2764

3. Pipe shall have minimum stiffness of 46 psi when tested in accordance with ASTM D2412.

B. Fittings and Joints

1. Gasketed integral bell and spigot joint meeting the requirements of ASTM F2881 for pipe sizes from 12-inch through 24-inch and ASTM F2764 for pipe sizes from 30-inch to 60-inch.
2. Fittings conforming to ASTM F2881 and ASTM F2764.

C. Pipe Markings

1. Provide pipe with each length clearly marked with the following information:
   a. Name of manufacturer or identification symbol
   b. Nominal pipe size
   c. Product/extrusion code

2.04 Polyvinyl Chloride (PVC) Pipe

A. Pipe Material

1. Solid wall gravity flow PVC storm sewer pipe and fittings with bell and spigot joints with elastomeric seals and smooth inner walls in accordance with ASTM D3034 (SDR-35, 12-inch to 15-inch diameter), ASTM F679 (PS 46, 18- to 36-inch diameter), and INDOT Standard Specification Section 907.
2. Minimum cell class in accordance with ASTM D1784:
   a. Cell class 12364 for 12-inch to 15-inch diameter pipes
   b. Cell class 12454 for 18-inch to 36-inch diameter pipes.
3. Pipe shall have minimum stiffness of 46 psi when tested in accordance with ASTM D2412.
4. Manufacturers
   a. Sani-21 by Diamond Plastics Corporation
   b. Ring-Tite by JM Eagle
   c. Or approved equal

B. Joints

1. Flexible, gasketed compression type joints so that, when assembled, the gasket inside the bell is compressed radially on the pipe spigot to form a soil-tight seal. Assemble joints in accordance with the pipe manufacturer's instructions and ASTM D3212.
2. Gaskets conforming to ASTM F477

C. Fittings

1. Manufactured fittings such as wyes, tees, elbows, or adaptors will not be accepted for use in place of storm sewer manholes, inlets, catch basins, or drain basins unless otherwise approved by the County/City.

D. Pipe Markings

1. Provide pipe with each length clearly marked with the following information:
   a. Name of manufacturer or identification symbol
   b. Trade name or trademark
   c. Nominal pipe size
   d. Production/extrusion code
   e. Material and cell class designation
   f. ASTM designation

2.05 Reinforced Concrete Pipe (RCP)

A. Pipe Material

1. Class III, IV, or V Wall B type RCP conforming to ASTM C76, AASHTO M170, and INDOT Standard Specification Section 907.
   a. Pipe class for depth of fill over pipe
      1) 2 feet or less – Class V
      2) Between 2 feet and 10 feet – Class III
      3) Between 10 feet and 16 feet – Class IV
      4) 16 feet or greater – Class V
2. Provide elliptical RCP conforming to ASTM C507, AASHTO M207, and INDOT Standard Specification Section 907.
   a. Pipe class for depth of fill over pipe
      1) 3 feet or less – HE-IV
      2) Between 3 feet and 8 feet – HE-III

B. Joints

1. Tongue and groove joints with compression type rubber gasket conforming to ASTM C443.

C. Fittings

1. Manufactured fittings such as wyes, tees, elbows, or adaptors will not be accepted for use in place of storm sewer manholes, inlets, catch basins, or drain basins unless otherwise approved by the County/City.

D. Lift holes are only allowed in concrete pipe with an inside diameter more than 54 inches.

E. Pipe Markings

1. Provide pipe with each length clearly marked with the following information:
   a. Name of manufacturer or identification symbol
   b. Date of manufacturer
   c. Nominal pipe size
   d. Class of pipe, specification designation

2.06 Lift Holes in Concrete Structures and Pipe

A. Lift holes shall only be allowed in precast concrete structures, sections, and pipe as specified below. All permissible lift holes shall be machine cast or drilled.

B. Lift Hole Repairs

1. Use stiff, non-shrink, rapid setting, rapid hardening, concrete patching material meeting the requirements of ASTM C928 R-2 or R-3 and mixed in accordance with manufacturer's installation instructions.
2. Hand-place the material after first washing out the hole with water. Completely fill the void created by the lift hole with the material.
3. Cover the repaired area with a minimum 12 x 12-inch piece of joint wrap material secured to the pipe.
4. Secure the joint wrap material to the pipe using a method that holds the fabric in place during the placement and compaction of backfill. Use grout mixtures, mastics, or strapping devices to secure the fabric to the pipe.
5. Lift hole repairs shall be properly finished, cured, and sound.

C. Lift hole plugs are not acceptable.

D. Any alternate methods shall be submitted to County/City for review.

2.07 Pipe Accessories

A. Concrete End Sections

1. Provide concrete end sections in accordance with INDOT Standard Specification Section 907.
2. Concrete end sections shall be the same grade and strength as specified for the connecting pipe.
3. Reinforcement in the non-tapered portion of the end section shall be the same as specified for the connecting pipe.
4. Provide concrete pipe toe anchors on all concrete end sections.
5. Furnish 3/4-inch coarse thread hook bolts and nuts in accordance with ASTM A307. Hook bolts and nuts shall be galvanized in accordance with ASTM A153.
6. Furnish trash guard for all end sections which are 18 inches in diameter and larger. Trash guards shall have a maximum clear opening of 6 inches and be removable.

B. Outfall Protection

1. Provide hard armoring material as required for outfall protection. Refer to Section 02101 – Stormwater Pollution Prevention and Erosion Control.

2.08 Precast Concrete Manholes, Inlets, Catch Basins and Accessories

A. Lift holes: Provide precast concrete sections with no more than 3 holes cast or drilled in the section for handling.

B. Precast Concrete Manholes

1. Adjusting rings:
   a. Supply a minimum of 1 adjusting ring for each manhole.
   b. Minimum of 4 inches and maximum of 12 inches in height for new manholes.
   c. Supply precast concrete riser sections for adjustment greater than 12 inches in height.
2. Provide precast concrete manholes
   a. Cone section: eccentric cone section conforming to ASTM C478
   b. Joints shall conform to ASTM C443
   c. Flat top: where necessary, provide flat top section conforming to ASTM C478
3. Bases and Risers/barrels conforming to ASTM C478, AASHTO M199, and INDOT Standard Specification Section 907.
4. Precast concrete floor or form with Class A concrete. Floor shall be sloped to the sewer invert.
5. Gaskets shall be 1/2-inch diameter flexible butyl rubber conforming to ASTM C990 for all manhole section joints, including the chimney section(s) and frame/casting. Provide Kent seal or approved equal.

C. Precast Concrete Inlets and Catch Basins

1. Provide precast concrete catch basins and inlets to the dimensions as shown on the Drawings.
2. Provide RCP Class II, Wall B for yard inlet structures.
3. All inlets and catch basins shall be in accordance with INDOT Standard Specifications.

D. Castings

1. Cast iron frames and covers in accordance with ASTM A48 Class 35B and INDOT Standard Specification Section 910.
2. Supply all frames and covers from one manufacturer.
3. Provide frames and covers rated for traffic, of non-rocking design, with machined horizontal and vertical bearing surfaces.
4. Provide manhole frame and cover as shown in schedule below or approved equal. Storm manhole covers shall have the words “STORM SEWER” cast in recessed letters 2 inches in height.
5. Provide inlet and catch basin frames and covers as shown in schedule below or approved equal. Refer to standard details for curb and structure types.
6. Inlets shall be pre-cast with a pollution prevention message such as “NO DUMPING, DRAINS TO STREAM”.

7. Storm Structure Casting Schedule:

Structure Type	*Casting Type*	*Neenah Model*	*EJIW Model*
Manhole	Solid Cover	R-1772	1020 Type A Cover
Manhole	Flat Grate	R-2501-G	1020 Type M2 Grate
Catch Basin Type B/ Inlet Type B	Chair Back Curb & Gutter at Sag (Type II)	R-3246-C	7030 M2 Grate and T1 Back
Catch Basin Type B/ Inlet Type B	Chair Back Curb & Gutter on Grade (Type II)	R-3246-L	7030 M6 Grate and T1 Back
Catch Basin Type A/ Inlet Type A	Roll Curb & Gutter at Sag (Type I)	R-3501-R	7495 M3 Grate
Catch Basin Type A/ Inlet Type A	Roll Curb & Gutter On Grade (Type I)	R-3501-TR R-3501-TL	7495 M1 or M2 Grate
Catch Basin Type B/ Inlet Type B	Flat Grate	R-3405	5250
Manhole	Swale Inlet	R-4342	6489

E. Steps

1. Provide steps in all structures 4 feet deep or greater in accordance with AASHTO M199 and INDOT Standard Specification Section 907 with:
   a. Minimum 10 inches of clear step width
   b. Copolymer polypropylene coated steel steps meeting the requirements of ASTM D4101 and composed of deformed 1/2-inch minimum diameter reinforcing steel in accordance with ASTM A615, Grade 60.
   c. Non-coated cast iron steps will not be accepted.
2. Manufacturers
   a. Neenah R-1981-J
   b. East Jordan No. 8512
   c. M.A. Industries PS 1-PF
   d. Or approved equal

F. Pipe to Structure Connections

1. Pipe penetration holes shall be either pre-formed by manufacturer or core drilled in the field.
2. For RCP, provide non-shrink grout mixture of 2 parts No. 23 fine aggregate in accordance with INDOT Standard Specification Section 904 and 1 part Portland cement.

3. For HDPE, Polypropylene, and PVC pipe, provide flexible neoprene molded boot or resilient seal which conforms to ASTM C923.
    a. Provide Kor-N-Seal boot as manufactured by National Pollution Control Systems, Inc. or approved equal.
    b. Provide resilient seal as manufactured by A-Lok or approved equal.

2.09 Cast-in-place Structures

A. Cast-in-place structures shall require the prior written approval of the County/City.

PART 3 - EXECUTION

3.01 General

A. Contractor shall allow the County/City the opportunity to inspect the installation of the pipe and bedding material prior to proceeding with backfilling an open trench. The County/City shall be given 48 hours' notice of the contractor's intent to install storm sewer piping and structures.

3.02 Examination

A. Verification of Conditions

1. Before installing piping, verify location, depth, type of joint needed, and size of pipe to which connection is proposed.
2. Assure that lines can be run as proposed. Notify County/City immediately for approval of any necessary deviation before lines are run.
3. Work all lengths of pipe into place without forcing.

3.03 Installation

A. Storm Sewer Pipe and Accessories

1. Lay storm sewer pipe uniformly to line and grade so that finished storm sewer will present a uniform conduit.
2. Set line and grade by means of laser beam and target for alignment and grade.
3. Lay storm sewer pipe progressively upgrade in a manner to form close, concentric joints with smooth bottom inverts.
4. Maintain 18 inches of vertical separation and 10 feet of horizontal separation between new storm sewer and new or existing water mains unless otherwise directed. Notify County/City immediately of all instances where separation cannot be maintained.
5. After joint is made, place sufficient bedding material along each side of the pipe to prevent conditions that might tend to move the pipe off line or grade.
6. Temporarily plug installed piping systems at end of each day's Work or other interruption of progress on a given line. Plug shall be adequate to prevent entry of animals and entrance or insertion of deleterious materials and shall be installed in a manner satisfactory to the County/City.

7. Complete all field-cutting of pipe in a neat, trim manner using a hand or power saw. Field cutting of closed profile pipe requires any exposed channels be sealed in accordance with the manufacturer's instruction.
8. Install trash guards on all pipe end sections 18 inches and larger in diameter.
9. If any existing drainage tile systems are encountered during construction, reconstruct the tile to its original conditions or connect tile to the new storm drainage system as approved by the County/City.

B. Precast Concrete Manholes, Inlets, Catch Basins, and Accessories

1. Install storm structures to provide a maximum structure spacing of 400 feet.
2. Unless otherwise indicated, provide 0.1 foot sewer invert drop through manholes.
3. Keep structure excavations free from water during construction.
4. Fill all areas excavated below the depth required for the manhole base with compacted granular backfill or No. 8 crushed stone.
5. Install precast concrete risers and adjusting rings in such combination that the manhole frame will be at the proper elevation.
6. Install manhole frame to grade and centered.
7. Install steps beginning at 8 inches below the top of the cone or flat top section. Install steps at 10 inches on center minimum to 16 inches on center maximum, continuous and spaced uniformly.
8. Install steps with minimum 3-inch wall embedment and minimum 4-inch clear distance projection from the wall as measured from the point of embedment.
9. Install precast concrete base, risers, cone, and flat top sections so that the axis of the manhole is vertical.
10. Install precast concrete inlets and catch basins so that the axis of the structure is vertical.
11. Install gaskets for joints in accordance with the manufacturer's instructions. Wrap riser joints with external joint seals in accordance with manufacturer's instructions.
12. Prior to backfilling, fill all holes used for handling with rapid setting patch material or with precast concrete plugs secured with Portland cement mortar.
13. Unless otherwise indicated, set castings for all structures at finish grade level. Adjust castings to the satisfaction of the County/City, at Contractor's expense.
14. Remove all debris and excess soil from structures after installation and prior to flushing the storm sewer pipes, to the satisfaction of the County/City.

C. Doghouse Manholes

1. The following requirements are in addition to Article 3.03B:
2. Excavate sufficiently below existing pipe where doghouse manhole is to be placed, to allow for placement of crushed stone bedding and minimum base section thickness.
3. Use forms for pouring concrete base; do not use earth trench in lieu of forms.
4. Install steel reinforcement and pour concrete base
5. Pour concrete around existing pipe.
6. Saw cut cleanly and remove the top half of existing pipe after manhole is constructed.

D. Connection to Existing Structures

1. Core drill new pipe penetration at the proper location where the pipe enters the structure.
2. For RCP, fill the annular space between the pipe and structure wall with grout as specified in Article 2.08F.2 of this Section.
3. For HDPE and PVC pipe, install flexible neoprene molded boot or resilient seal to secure the pipe in the structure wall as noted in Article 2.08F.3 of this Section.

3.04 Field Quality Control

A. Tests

1. Deflection Test for Flexible Pipes
   a. Pipe materials considered flexible include:
      1) HDPE
      2) Polypropylene
      3) PVC
   b. Perform testing in presence of County/City. Notify the County/City 48 hours prior to the testing procedure.
   c. Perform deflection testing on all flexible pipes after the final backfill has been in place for at least 30 days.
   d. Perform deflection test using a mandrel pulled by hand. The mandrel (go/no-go) device shall be cylindrical in shape and constructed with 9 or 10 evenly spaced arms or prongs.
   e. No pipe shall exceed a vertical deflection of 5 percent. Uncover, replace, and retest any pipe not passing the deflection test until a satisfactory result is achieved.

B. Inspection

1. Closed-circuit Television Inspection (CCTV)
   a. Televise all mainline storm sewers (manhole to manhole).
   b. Televise all lateral storm sewers (manhole to inlet, inlet to inlet, etc.) more than 40 feet in length.
   c. Perform all CCTV inspection in presence of County/City. Notify the County/City 48 hours prior to the testing procedure.
   d. Clean all new storm sewers prior to CCTV inspection. The image shall be clear, so the interior condition of the pipe is easily evaluated.
   e. Correct all unacceptable conditions found during the CCTV inspection and re-televise until no unacceptable conditions are found.
   f. Unacceptable conditions are conditions that adversely affect the ability of the system to function as designed or to be properly maintained and may include, but are not limited to, the following:
      1) Protruding taps
      2) Cracked or faulty pipe
      3) Misaligned or deformed pipe
      4) Debris in line
      5) Infiltration/exfiltration

6) Excessive gaps at joints
7) Bellies or sags with a depth greater than or equal to 10 percent of the pipe diameter (maximum of 3 inches) or a length greater than 25 feet

g. Submit a copy of the CCTV recording within 14 calendar days of the inspection on a digital media storage device compatible for playback on a personal computer (USB flash drive acceptable).

3.05 As-Builts

A. “As-built” drawings required to be prepared and submitted to the County/City in accordance with Section 01010.

3.06 Cleaning

A. Clean all new storm sewers after installation and before testing to the satisfaction of the County/City.

-END-

SECTION 02730 – GRAVITY SANITARY SEWER SYSTEMS

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Furnishing and installing gravity sanitary sewers, services, manholes, and appurtenances.

B. Related Sections

1. Section 02220 - Trenching, Backfilling and Compacting for Utilities
2. Section 02732 - Testing Sanitary Sewers and Force Mains
3. Section 02737 - Force Main Sewer Systems

1.02 References

A. American Association of State Highway and Transportation Officials (AASHTO), latest editions

1. AASHTO M198 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
2. AASHTO M199 - Standard Specification for Precast Reinforced Concrete Manhole Sections

B. American National Standards Institute (ANSI), latest editions

1. ANSI A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
2. ANSI A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
3. ANSI A21.51 - Ductile-Iron Pipe, Centrifugally Cast, for Water

C. American Society for Testing and Materials (ASTM), latest editions

1. ASTM A48 - Standard Specification for Gray Iron Castings
2. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
3. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe
4. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
5. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections
6. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
7. ASTM C928 - Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs

8. ASTM C1613 - Standard Specification for Precast Concrete Grease Interceptor Tanks
9. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Application
10. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
11. ASTM D3212 - Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
12. ASTM D4101 - Standard Specification for Polypropylene Injection and Extrusion Materials
13. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
14. ASTM F679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
15. ASTM F1803 - Standard Specification for Poly(Vinyl Chloride) (PVC) Closed Profile Gravity Pipe and Fittings Based on Controlled Inside Diameter

D. American Water Works Association (AWWA) Standards, latest editions

1. AWWA C104 - Cement Mortar Lining for Ductile Iron Pipe and Fittings
2. AWWA C110 - Ductile Iron and Gray Pipe Fittings
3. AWWA C151 - Ductile Iron Pipe, Centrifugally Cast

E. Indiana Department of Transportation (INDOT) Standard Specifications, latest edition

1. Section 901 - PCC Materials
2. Section 907 - Concrete, Clay, and Plastic Drainage Components
3. Section 910 - Metal Materials

F. Indiana Plumbing Code, latest edition

1.03 Submittals

A. Shop Drawings, as applicable

1. Pipe
2. Fittings
3. Structures
4. Castings
5. Grease Interceptors
6. Oil Separators

1.04 Delivery, Storage, and Handling

A. Acceptance at Site

1. Pipe possessing defects including, but not limited to the following, will be rejected for installation:
   a. Variations from straight centerline
   b. Elliptical shape in round pipe
   c. Lack of rigidity
   d. Illegible markings as required herein
   e. Bruised, broken, or otherwise damaged metallic or bituminous coating or liner, as applicable
   f. Deep or excessive gouges, dents, bends, or scratches on the pipe wall
   g. Fractures, punctures, or cracks passing through the pipe wall
   h. Damaged or cracked ends
2. Concrete structures possessing defects including, but not limited to the following, will be rejected for installation:
   a. Fractures or cracks passing through the wall
   b. Honeycombed or open texture which would adversely affect the function of the box sections
   c. Ends of sections are not normal to the walls and centerline of the section

B. Storage and Protection

1. Protect plastic pipes from extreme temperatures and ultraviolet radiation.

PART 2 - PRODUCTS

2.01 Polyvinyl Chloride (PVC) Pipe

A. Pipe Material

1. Provide solid wall PVC pipe for gravity sanitary sewers 8 to 48 inches in diameter.
   a. For pipe sizes 15 inches and less which are less than 15 feet deep, provide SDR-35 PVC conforming to ASTM D3034.
   b. For pipe sizes 15 inches and less which are 15 feet deep or deeper, provide SDR-26 PVC conforming to ASTM D3034.
   c. For pipe sizes 15 inches and less which are within 10 feet or a water main or 50 feet of a water well, regardless of depth, provide SDR-21 PVC conforming to ASTM D3034.
   d. For pipe sizes 18 to 48 inches, regardless of depth, provide PVC PS75 conforming to ASTM F679.

B. Joints: Bell and spigot type with elastomeric seals per ASTM D3212, with gaskets conforming to ASTM F477. Solvent cement joints are not be permitted.

C. Fittings

1. Provide tees equal to or greater than the class of the adjacent main line pipe to which they are jointed.
2. Provide fittings that conform to corresponding class and internal diameter of specified pipe.
3. Provide joints of the same type as used on the adjoining pipe.
4. Securely attach fabricated branches for wyes and tees to the wall of the pipe in a watertight manner and flush with the inside surface of the pipe.

D. Service Laterals

1. The owner, his agent or representative shall agree to construct and maintain the building sewer service and connections in accordance with the provisions of City Ordinance 51.27 or any other County/City regulations regulating the same.
2. Building service laterals shall be a minimum of 6-inch diameter PVC of the same class as the adjacent sanitary sewer main, conforming to ASTM D3034.
3. A minimum of one clean-out shall be installed for each lateral. Where the length of a lateral exceeds 100 feet, then one clean-out shall be installed for every 100 feet of lateral length.

E. Pipe Markings

1. Each length of PVC pipe shall be clearly marked with the following information at a minimum:
   a. Name of manufacturer or identification symbol
   b. Trade name or trademark
   c. Nominal pipe size
   d. Production/extrusion code
   e. Material and cell class designation
   f. ASTM designation

2.02 Ductile Iron (DI) Pipe

A. Pipe and Fitting Material

1. Provide DI pipe for sanitary sewers which are 8 to 60 inches in diameter.
2. Provide DI pipe and fittings in conformance with the requirements of ANSI/AWWA A21.51/C151 and ASTM A746.
3. Pressure Class: 350 psi
4. Provide pipe and fittings with bituminous-coated exterior complying with ANSI/AWWA A21.51/C151 and ANSI/AWWA A21.10/C110.
5. Provide pipes, fittings and adapters with interior cement mortar lining and a bituminous seal coat meeting the requirements of ANSI/AWWA A21.4/C104.

B. Joints

1. Supply pipe with push-on type joints conforming to ANSI A21.11/AWWA C111.

2. Supply fittings with push-on or mechanical joints rated for 150 psi working pressure.

C. Pipe Markings

1. Each length of pipe shall be clearly marked with the following information:
   a. Manufacturer's name or trademark
   b. Nominal pipe size
   c. Pipe class
   d. Year of manufacture

2.03 Manhole and Accessories

A. General

1. Provide precast concrete sections with no more than 3 holes cast or drilled in the section for handling. No “see through” lift holes shall be allowed on manholes 48 inches in diameter or less.
2. Provide rapid setting patch material in accordance with ASTM C928 and INDOT Standard Specification Section 901 or precast concrete plugs for filling all holes used for handling.

B. Precast Concrete Manholes

1. Adjusting rings:
   a. Supply a minimum of 1 adjusting ring for each manhole.
   b. Minimum of 4 inches and maximum of 12 inches in height for new manholes.
   c. Supply precast concrete riser sections for adjustment greater than 12 inches in height.
2. Provide precast concrete eccentric cone section which conforms to ASTM C478. Flat top sections require preapproval by County/City. Provide a 24-inch opening.
3. Provide precast concrete manhole risers/barrels which conform to ASTM C478, AASHTO M199, INDOT Standard Specification Section 907.
4. Manhole bases:
   a. Provide precast concrete manhole bases which conforms to ASTM C478, AASHTO M199, and INDOT Standard Specification Section 907.
5. For doghouse manhole base, provide precast concrete base with "doghouse" openings.
6. Manhole benchwalls: precast or constructed using a concrete mixture with a low cure time and the ability to be troweled to a smooth finish.
   a. 28-day compressive strength of no less than 4,000 psi.
7. Provide 1/2-inch diameter flexible butyl rubber joint gaskets conforming to ASTM C443 and AASHTO M198 for all manhole section joints as shown on the Drawings. In addition to the rubber type gaskets, all joints shall receive a 1/2-inch diameter nonasphaltic mastic (Kent-Seal or approved equal) conforming to AASHTO M198.
8. Provide butyl rubber 6-inches above and 6-inches below each outside joint, 1/4-inch minimum with 80 guage stretch wrap.

9. Provide interior epoxy coating on all manholes receiving forcemain discharge, on all lift station wet wells, and any manholes receiving industrial waste. Provide the following materials:
    a. Corrosion Barrier Coating shall be Mainstay DS-5 Ultra High Build Epoxy Coating.
        1) Composition: 100 percent solids, modified epoxy coating
        2) Thickness: Minimum of 100 mils in 1 or 2 coats
        3) Number of Components: 2
        4) Finish: Gloss
        5) Color: Shall be chosen by the Owner (White, Light Grey, or Light Blue)
10. Inside drop manholes are not permitted.
11. Sumps are not permitted in manhole structures.

C. Cast-in-place Manholes

1. Cast-in-place manholes shall require the prior written approval of the County/City.

D. Castings

1. Provide cast iron frames and covers in accordance with ASTM A48 Class 35B and INDOT Standard Specification Section 910.
2. Supply all frames and covers from one manufacturer.
3. Furnish traffic-rated frames and covers with machined horizontal and vertical bearing surfaces. Frames and covers shall have a grooved rubber gasket with concealed pick holes.
4. Provide bolt-down frames and covers, where directed by the County/City.
5. Provide manhole frame and cover as shown in casting schedule below or approved equal. Sanitary manhole covers shall have the words “SANITARY SEWER” cast in 2-inch raised letters.
6. Sanitary Manhole Casting Schedule:

Casting Type	Neenah Model	EJIW Model
Standard Manhole	R-1772	1022Z1
Watertight Manhole	R-1772 w/ locking lid	1022Z1WT

7. Provide a butyl rubber base exterior backplaster material 1/4-inch minimum thickness, from 2-inches below bottom adjusting ring to covering the base of the casting.

E. Pipe to Structure Connections

1. Pipe penetration holes shall be either pre-formed by manufacturer or core drilled in the field.
2. Provide flexible neoprene molded boot or resilient seal which conforms to ASTM C923.
    a. Provide Kor-N-Seal boot as manufactured by National Pollution Control Systems, Inc. or approved equal.

b. Provide resilient seal as manufactured by A-Lok or approved equal.

2.04 Tracer Wire

A. Furnish tracer wire for service laterals, from sewer main to building.

B. For pipe installed by open excavation or within a casing, provide one strand of solid 12 AWG copper wire for the entire length of pipe.

C. For pipe installed by horizontal directional drilling, provide 2 strands of 12 AWG solid, steel core hard drawn extra high strength copper tracer wire for the entire length of pipe. Supply Copperhead Direct Burial tracer wire or approved equal.

D. Provide splice kits suitable for underground installation for splices and branch connections. Seal connection with epoxy contained in splice kit and wrap with waterproof tape.

PART 3 - EXECUTION

3.01 General

A. Contractor shall allow the County/City the opportunity to inspect the installation of the pipe and bedding material prior to proceeding with backfilling an open trench. The County/City shall be given 48 hours' notice of the contractor's intent to install sewer piping and structures.

B. Do not install pipe when, in the opinion of the County/City, trench conditions are unsuitable.

C. Follow manufacturer's installation instructions when installing pipe, fittings, structures, and appurtenances.

3.02 Examination

A. Verification of Conditions

1. Before installing piping, verify location, depth, type of joint needed, and size of pipe to which connection is proposed.
2. Verify lines can be run as proposed. Refer any necessary deviation to the County/City for final approval before lines are run.

3.03 Installation

A. Gravity Sanitary Sewer Pipe, Service Lateral, and Accessories

1. The installation of PVC gravity sewer pipe shall meet the installation requirements of ASTM D2321.
2. Accurately dimension all lengths of pipe to measurements established at the site, and work into place without forcing.

3. Cut sections of pipe using proper equipment such as a chop saw to provide a beveled end.
4. Alternate sewer pipe materials consisting of ductile iron or SDR-21 PVC pipe must be used when one or more of the following conditions apply:
    a. Where sewers or laterals must cross under existing water mains and cannot achieve or maintain 18 inches of clearance, use alternate pipe materials for at least one full pipe length centered under the crossing.
    b. Where sewers or laterals must be routed horizontally with less than 10 feet of clearance from existing water mains, use alternative pipe materials for entire length.
5. Lay sewer pipe uniformly to line and grade so that the finished sewer will present a uniform conduit.
6. Minimum allowable cover shall be 48-inches over the top of sanitary sewer pipes and services in public right-of-way or private access roads, and a minimum cover of 36-inches in all other locations. Shallower depth of cover may be considered under conditions where engineering design will alleviate concern for surface loadings and frost heave.
7. Set line and grade by means of laser beam and target for alignment and grade.
8. Lay sewer pipe progressively upgrade with bell upstream in a manner to form close, concentric joints with smooth bottom inverts.
9. After joint is made, place sufficient bedding material along each side of the pipe to prevent conditions that might tend to move the pipe off line or grade.
10. Temporarily plug installed piping systems at end of each day's Work, or other interruption of progress on a given line. Install plugging in a manner satisfactory to the County/City, and adequate to prevent entry of groundwater, mud, stone, debris and animals into the pipe or the entrance or insertion of deleterious materials.
11. New installed pipe shall not be used for groundwater dewatering. Contractor to install dewatering wells to prevent groundwater from entering new pipe.
12. Securely attach fabricated branches for wyes and tees to wall of pipe in such a manner as to not restrict or otherwise interfere with flow characteristics of the pipe.
13. Where applicable, install laterals at a normal slope of 1/4-inch per foot. Minimum slope shall be 1/8-inch per foot.
14. Install a mechanical plug at the end of each lateral and at the end of all sewer stubs. Install the lateral at a depth of approximately 5 feet to allow each customer to connect to the end of the lateral.
15. Install a metal T-fencepost at the end of each sewer lateral for marking. Protect markers and verify that all laterals have been properly marked.
16. When curbs are available, engrave a 3-inch high by 1/8-inch deep “S” on the curb directly above each service lateral. Where curbs are not available, notch the sidewalk directly above each service lateral.
17. Tracer Wire
    a. Install tracer wire on service lines, taped to pipe in 15 to 20-foot intervals. Do not wrap wire around pipe.
    b. Install tracer wire from sanitary sewer main to cleanout and from cleanout to building.

B. Standard Manholes

1. Manholes shall be installed at distance not greater than 400 feet.
2. Keep structure excavations free from water during construction.
3. Fill areas excavated below the depth required for the structure's base with No. 8 crushed stone at Contractor’s expense.
4. Set top of casting at elevation to prevent surface water infiltration in areas of flooding or ponding.
   a. Install precast concrete risers and adjusting rings in such combination that the manhole frame will be at the proper elevation.
   b. Structures shall be completely constructed to proper finished grade before curbs, asphalt, or other pavement may be installed.
   c. Patching and filling under frames will not be permitted.
5. Install manhole frame to grade and centered.
6. For manholes in pavement areas, the frame and top of casting shall be set 1/4” below finished pavement grade.
7. Install precast concrete base, risers, cone, and flat top sections so that the axis of the manhole is vertical.
8. Install gaskets for joints in accordance with the manufacturer’s instructions.
9. Apply a trowelable grade butyl rubber base exterior backplaster material 1/4-inch minimum thickness (when dry) on the exterior of the manhole at each joint, extending 6 inches above and 6 inches below the joint. Wrap joints with 80 gauge stretch wrap.
10. Apply external butyl rubber base backplaster material over the flange of the manhole frame to 2-inches below the bottom of the lowest adjusting ring. Install in accordance with manufacturer’s instructions.
11. Prior to backfilling, fill all holes used for handling with rapid setting patch material or with precast concrete plugs secured with Portland cement mortar.
12. Where applicable, prepare manhole surface for coating and install coatings per manufacturer’s recommendations. Coat manhole walls and inside of cover entirely.
13. Unless otherwise indicated, set castings for all structures at finish grade level. Adjust castings to the satisfaction of the County/City.
14. Benchwalls: minimum 1/2-inch per foot slope starting at the manhole wall/benchwall interface and then slope towards the top of the trough.
15. Trough; minimum depth equal to the diameter of the incoming and exiting sewers.
16. Wrap manhole frames located in pavement in minimum 3/8-inch preformed joint filler extending from the top to the bottom of the frame.

C. Doghouse Manholes

1. Doghouse manholes shall meet the requirements listed above and be approved by the County/City.
2. Excavate sufficiently below existing pipe where doghouse manhole is to be placed, in order to allow for placement of crushed stone bedding and minimum base section thickness.
3. Use forms for pouring concrete base; do not use earth trench in lieu of forms.
4. Install steel reinforcement and pour concrete base.

5. Pour concrete around existing pipe.
6. Saw cut cleanly and remove the top half of existing pipe after manhole is constructed.

D. Pipe to Structure Connections

1. Core drill new pipe penetration into existing structure at the proper location where the pipe enters the structure.
2. Install flexible neoprene molded boot or resilient seal to secure the pipe in the structure wall as noted in Article 2.03E.2 of this Section.

3.04 Field Quality Control

A. Sewers

1. Test all installed sanitary sewer systems in accordance with Section 02732.

B. Service Laterals

1. All services shall be inspected by the County/City prior to backfilling. The County/City inspection department, Phone 765-825-2158, shall be notified when the sewer construction for each installation is to begin. The connection to the public sewer, and the pipe joint at the building outlet shall be made under the supervision of the County/City.

3.05 Cleaning

A. Provide all necessary equipment required for proper completion of the flushing of manholes and piping systems.

B. Remove all debris and excess soil from manhole after construction and prior to flushing the sewer pipes.

C. Remove all debris and excess soil from all pipe installed by flushing with clean water. If flushing is not adequate to clean the pipes, clean the pipes by jetting and to the satisfaction of the County/City.

3.06 As-Builts

A. “As-built” drawings required to be prepared and submitted to the County/City in accordance with Section 01010.

-END-

SECTION 02732 - TESTING SANITARY SEWERS AND FORCE MAINS

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Testing of the gravity sewers, force mains, and structures installed as applicable.

B. Related Sections

1. Section 02730 - Gravity Sanitary Sewer Systems
2. Section 02737 - Force Main Sewer Systems

1.02 References

A. American Society for Testing and Materials (ASTM), latest editions

1. ASTM F1417, Standard Practice for Installation Acceptance of Plastic Non-Pressure Sewer Lines Using Low Pressure Air

1.03 Submittals

A. Submittals and testing results must be provided to the County/City electronically.

B. Test Results

1. Gravity pipe televising recording
2. Gravity pipe air test
3. Gravity pipe joint test
4. Gravity pipe infiltration test
5. Gravity pipe exfiltration test
6. Gravity pipe deflection test
7. Force main hydrostatic test
8. Force main leakage test
9. Tracer wire continuity test
10. Manhole vacuum test

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.01 General

A. Provide all necessary equipment and instrumentation required for proper completion of the testing of manholes and piping systems.

B. All tests shall be made in the presence of the County/City. Preliminary tests made by the Contractor without being observed by the County/City will not be accepted. Notify the County/City at least 48 hours (not including holidays or weekends) before any work is to be inspected or tested for the following items:

1. Daily work schedule, including any changes in work schedule;
2. Prior notification if work is to be performed on weekends and/or holidays;
3. Date tests are to be performed; and,
4. Date as-built verification is to be performed.

C. Contractor shall provide notice to the County/City of the planned commencement of construction thirty (30) days prior to such commencement.

D. All defects in piping systems shall be repaired and/or replaced and retested until acceptable to the County/City. Repairs shall be made to the standard of quality specified for the entire system.

E. Sections of the system may be tested separately, but any defect which may develop in a section previously tested and accepted shall be promptly corrected and retested.

F. All manholes and piping systems shall be tested in accordance with these test methods in addition to any test required by Indiana Department of Environmental Management (IDEM), State or Local plumbing codes and/or building authorities.

G. Sanitary lateral inspections shall be visually conducted prior to backfilling.

3.02 Gravity Sewer Testing

A. Gravity Sewer Television Inspection

1. Televise all mainline sewers 8 inches or greater in diameter (manhole to manhole).
2. Perform all CCTV inspection in presence of County/City.
3. Clean all new sanitary sewers by jetting and vacuuming prior to CCTV inspection. The image shall be clear, so the interior condition of the pipe is easily evaluated.
4. Correct all unacceptable conditions found during the CCTV inspection and re-televise until no unacceptable conditions are found.
5. Submit a copy of the CCTV recording within 14 calendar days of the inspection on a digital media storage device compatible for playback on a personal computer (USB flash drive acceptable).

B. Air Test

1. Furnish all equipment and personnel required to make tests including pipe stoppers, air compressor, air storage tank, pressure regulating valves, pressure gauges, stopwatch, etc.
2. Take precautions necessary, including blocking of stoppers or plugs, to protect the safety of property and personnel.

3. Test the sanitary sewer line in increments between manholes in accordance with ASTM F1417.
   a. Seal the line at each end. The seal at one end shall have an orifice through which to pass air into the pipe. Connect an air supply line that contains an on-off gas valve and a pressure gauge having a range of 0 to 5 psi, with minimum divisions of 0.10 psi, and an accuracy of ± 0.04 psi.
   b. Pressurize the pipe line under test to 4 psig. Allow the line to stabilize between 4 psig and 3.5 psig for a period of no less than 5 minutes. If necessary, add air to the line to maintain the pressure above 3.5 psig.
   c. After the stabilization period, close the gas valve. When the line pressure stabilizes above 3.5 psig, commence timing with a stopwatch. Allow the stopwatch to run until the line pressure drops 1.0 psig or the allowable time in Table 1 is exceeded.
   d. If the pipe line to be tested is beneath the ground water level, increase the test pressure 0.433 psi for each foot the ground water level is above the crown of the pipe.
   e. Allowable time shall be as shown in Table 1. If the time lapse is greater than that specified, the section undergoing testing will have passed. If the time lapse is less than that specified, the line has not passed the test and the Contractor shall be required to make all repairs and retest.
   f. Building sewers may be allowed to be installed during the construction of the main line sewer only upon writing request and writing response by the County/City. This request shall be clearly delineated on the design plans and standards submitted for approval. If Building sewers are approved for construction by the County/City as part of the main line sewer, they shall be included in the test and their lengths may be ignored for computing the required test times.

Table 1: Minimum Specified Time Required for a 1.0 psig Pressure Drop For Size and Length of Pipe Indicated, Q=0.0015 cu. ft. per min. per sq. ft.

Pipe Dia., In.	Minimum Time, min:s	Length for Minimum Time, ft.	Time for Longer Length, s	Specification Time for Length(L) Shown, min:s							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
6	5:40	398	0.864 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	189	3.418 L	11:20	11:20	11:20	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	66:22	79:45	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106.50	124:38	142:26	60:15
33	31:10	72	26.852 L	43:06	64:38	86:10	107:48	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

C. Deflection/Mandrel Test for Flexible Pipes

1. Pipe materials considered flexible include the following:
   a. PVC

2. 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.
3. Perform testing in presence of County/City. The Contractor shall provide proving rings to check the mandrel. Drawings of mandrels with complete dimensions shall be furnished to the County/City upon request for each diameter and standard type.
4. Perform deflection/mandrel testing on all flexible pipes after the final backfill has been in place at least 30 days.
5. Perform deflection test using a mandrel pulled by hand. The mandrel (go/no-go) device shall be cylindrical in shape and constructed with 9 or 10 evenly spaced arms or prongs.
6. No pipe shall exceed a vertical deflection of 5 percent. Uncover, replace, and retest any pipe not passing the deflection test until a satisfactory result is achieved.

3.03 Force Main Testing

A. Tests for exposed piping shall be made before insulation is placed and prior to concealment within any building construction.

B. Conduct pressure and leakage tests for buried piping after all jointing operations and backfilling are completed, and concrete reaction blocks and restraints have cured at least 14 days. Piping tested before backfill is in place shall be retested after compacted backfill is placed.

C. Sections of piping between valves, and other short sections of line may be isolated for testing. If shorter sections are tested, provide test plugs or bulkheads at the ends of the test section. Provide all anchors, braces, and other devices required to withstand the test pressure without imposing any thrust on the pipe line.

D. Hydrostatic Test

1. All sewage force mains shall pass a hydrostatic pressure test as specified.
2. Slowly fill the piping system with water and expel all air from the pipe. Care shall be taken that all air release valves are installed and open in the section being filled, and that the rate of filling does not exceed the venting capacity of the air release valves.
3. After the section of line to be tested has been filled with water, the specified test pressure shall be applied and maintained for a minimum period of 2 hours and for such additional period necessary for the County/City to complete the inspection of the line under test.
4. If defects are noted, repairs shall be made and the test repeated until all parts of the line withstand the test pressure.
5. Hydrostatic test pressure shall be 150 percent of design pressure, but not less than 100 psi.
6. Test duration shall be 2 hours.

E. Leakage Test

1. All buried piping with slip-type or mechanical joints shall pass a leakage test. No leakage is allowed in exposed piping or buried piping with flanged, threaded, welded or mechanical joints.
2. After the specified hydrostatic test has been completed, the line shall be subjected to leakage test under a hydrostatic pressure the same as the pressure specified for the hydrostatic test.
3. The pressure shall be maintained within a maximum variation of 5 percent during the entire leakage test. Leakage measurements shall not be started until a constant test pressure has been established. The line leakage shall be measured by means of a water meter installed on the supply side of the pressure pump, or method as approved by the County/City.
   a. The tested section will not be accepted if it has a leakage rate in excess of that rate determined by the formula:
      L = 0.000135 ND(P)1/2 in which;
      L = Maximum permissible leakage rate, in gallons per hour, throughout the entire length of line being tested.
      N = Number of gasketed joints (two for each flexible coupling joint) in the line under test.
      D = Nominal internal diameter (in inches) of the pipe.
      P = The actual pressure in psig on all joints in the tested portion of the line. This actual pressure shall be determined by finding the difference between the average elevation of all tested pipe joints and the elevation of the pressure gauge and adding the difference in elevation head to the required pressure.
   b. Where the leakage rate exceeds the permissible maximum, the Contractor shall locate and repair leaking joints to the extent required to reduce the total leakage to the required amount.
   c. All leaks discovered within 1 year from the date of final acceptance of the work shall be located, repaired and retested by the Contractor, regardless of the total line leakage rate.

3.04 Tracer Wire Continuity Testing

A. Conduct continuity test on all tracer wire. All tracer wire found not to be continuous after testing shall be repaired or replaced.

3.05 Manhole Vacuum Testing

A. Conduct a vacuum test on all manholes to ensure watertightness and manhole integrity.

B. The equipment required to conduct a vacuum test on manholes includes inflatable pipe plugs, test head, vacuum pump, flexible air hose and a vacuum gage.

1. Provide test equipment designed specifically for the purpose of testing manholes and capable of drawing a vacuum of 10 inches of mercury (in-Hg).
2. Manufacturer: P.A. Glazier, Inc., Worchester, Massachusetts, 10002, or as approved by the County/City.

C. Procedure for conducting an air test on manholes:

1. Test each manhole immediately after assembly and prior to setting the casting or backfilling around the structure. If a test must be performed after backfilling, Contractor is responsible for all re-excavation required to locate and correct all leaks that have been identified.
2. All pipes entering the manhole shall be securely plugged and adequately braced against the inside of the manhole to prevent being drawn out of the manhole.
3. Place the test head on the inside of the cone section and seal with an inflatable seal.
4. Draw a vacuum of 10 in-Hg and shut the vacuum pump off. With the valves closed, measure the time for the vacuum to drop to 9 in-Hg. The manhole shall pass if the time is greater than the following:

Depth (ft)	Diameter (in)				
	48	54	60	66	72
	Time (s)				
8	20	23	26	29	33
10	25	29	33	36	41
12	30	35	39	43	49
14	35	41	46	51	57
16	40	46	52	58	67
18	45	52	59	65	73
20	50	53	65	72	81
22	55	64	72	79	89
24	59	69	78	87	97
26	64	75	85	94	105
28	69	81	91	101	113
30	74	87	96	106	121

5. Contractor shall submit the results of each manhole vacuum test to the County/City. Such reports shall include the following, at a minimum:
   a. A description of the location of the manhole;
   b. The time, date, and weather of the test;
   c. A list of all persons present;
   d. Diameter and depth of the manhole;
   e. Allowable test results;
   f. Actual test results to be compared with the County/City Inspector's results.

3.06 Lift Station Testing

A. Lift station pump testing will be performed by the Wastewater Superintendent or representative during the lift station's final inspection. The Contractor shall be responsible for providing the clean water to run the pumps and perform the test(s).

B. Manufacturer's Start-Up

1. Prior to the County/City's final inspection of the lift station equipment, the Contractor shall be responsible for coordinating start-up activities with the pump manufacturer's representative in accordance with the manufacturer's requirements. The Wastewater Superintendent or representative must be present at the time of manufacturer's start-up.
2. Any deficiencies in equipment and/or workmanship noted during the manufacturer's start-up shall be remedied by the Contractor prior to final inspection.
3. Upon successful completion of the manufacturer's start-up, the manufacturer shall deliver to the Contractor:
   a. Three (3) copies of a letter certifying that all pumping and electrical equipment has been installed and is operating in accordance with manufacturer's requirements;
   b. Two (2) sets of Operation and Maintenance Manuals; and
   c. One (1) complete set of spare parts.

C. Final Inspection

1. The Contractor shall provide the following pump test equipment and materials:
   a. Water to conduct test;
   b. Amp/volt meter;
   c. Stop watch;
   d. Calibrated test gauge to measure operating head. The gauge shall be calibrated in feet of water from 0 to 100 feet in one foot increments; and
   e. Manufacturer's pump performance curves.
2. The Wastewater Superintendent or representative attending the final inspection shall re-check any deficiencies. The County/City's Inspector shall then complete a cursory final inspection checklist and perform pump down tests, which shall include the following:
   a. Manual check of all level ON-OFF operation, alarm, and run lights;
   b. Determination of inflow rate;
   c. Determination of pump capacity for each pump individual and both/all pumps simultaneously;
   d. Determination of pump capacity with force main full. Verification of full force main shall be determined by pressure gauge provided by Contractor. Force main shall be considered full when the line pressure stabilizes; and
   e. Plot performance of each pump or pump curves provided by Contractor.
3. The Contractor shall provide all water necessary to conduct the pumping tests, and shall provide a connection for the test gauge on the blind-flanged tee in the valve vault. The stem connection shall be equipped with a plug valve to close the connection after testing is complete. The connection shall be left in place and shall be suitable for use as an air bleed off.

4. The pumping test results must meet or exceed the design pumping criteria approved by the County/City to successfully pass the final inspection. Any deficiencies noted during the final inspection shall be repaired/replaced by the Contractor to the satisfaction of the County/City and re-inspected/re-tested prior to final acceptance.

-END-

SECTION 02737 – FORCE MAIN SEWER SYSTEMS

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Furnishing and installing force mains, air release valves, and appurtenances as shown on the Drawings and as specified herein.

B. Related Sections

1. Section 02220 - Trenching, Backfilling and Compaction for Utilities
2. Section 02224 - Trenchless Excavation – Horizontal Boring
3. Section 02226 - Trenchless Excavation – Directional Drilling
4. Section 02732 - Testing Sanitary Sewers and Force Mains

1.02 References

A. American Society for Testing and Materials (ASTM), latest editions

1. ASTM D1248 - Standard Specification for Polyethylene Plastic Molding and Extrusion
2. ASTM D1784 - Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
3. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
4. ASTM D3035 – Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
5. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
6. ASTM D3261 – Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
7. ASTM D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
8. ASTM F714 – Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
9. ASTM F477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
10. ASTM F2206 - Standard Specification for Fabricated Fittings of Butt-Fused Polyethylene (PE)
11. ASTM F2620 - Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings
12. ASTM F3190 - Standard Practice for Heat Fusion Equipment (HFE) Operator Qualification on Polyethylene (PE) and Polyamide (PA) Pipe and Fittings

B. American Water Works Association (AWWA), latest editions

1. AWWA C104 - Cement Mortar Lining for Ductile Iron Pipe and Fittings
2. AWWA C110 - Ductile Iron and Gray Pipe Fittings
3. AWWA C111 - Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings
4. AWWA C151 - Ductile Iron Pipe, Centrifugally Cast
5. AWWA C153 - Ductile Iron Compact Fittings for Water Service (3-inch through 64-inch)
6. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 3/4 In. Through 3 In. for Water Service
7. AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In. for Waterworks

1.03 Submittals

A. Shop Drawings

1. Pipe
2. Fittings
3. Air Release Valves
4. Joint Restraints
5. Other related items and appurtenance

B. Test Results

1. Hydrostatic test
2. Leakage test
3. Continuity test
4. Fusion joint log

1.04 Delivery, Storage and Handling

A. Store materials in an area safe from damage and deterioration. Damaged or defective pipe and appurtenances shall be removed from the site and replaced.

B. Keep the interior of pipe, fittings, manhole sections and appurtenances free from dirt and foreign matter.

C. Store gaskets in a cool location out of direct sunlight and free from contact with petroleum products.

PART 2 - PRODUCTS

2.01 General

A. All pipe, fittings, and appurtenances shall be new and unused.

B. Each length of pipe and fitting shall be plainly stamped, marked or color coded to meet the specified standard as to weight, class, and type, and bear the manufacturer's trademark or name.

2.02 High Density Polyethylene (HDPE) Pipe and Fittings

A. Use of HDPE water main requires pre-approval by County/City and shall only be considered for Horizontal Directional Drilling installations.

B. Pipe

1. Materials to be fusion bonded shall be from the same manufacturer.
2. Manufactured from extra high molecular weight, high density polyethylene, PE 4710 resin meeting the material properties of ASTM D3350, cell classification 445574C.
3. The outside diameter of the pipe shall be based on the iron pipe size (IPS) sizing system and meeting the OD tolerance requirements of ASTM D3035 and ASTM F714.
4. Minimum pressure class per AWWA C901/AWWA C906 shall be 200 psi/DR 11.
5. Pipe markings shall be in accordance with ASTM D3350 requirements and include manufacturer’s tradename, nominal pipe size, DR and pressure rating, PE material (PE 4710), ASTM standard, date of manufacture.

C. Fittings

1. Manufactured from extra high molecular weight, high density polyethylene, PE 4710 resin, of the same manufacturer as the pipe to which fusion bonding is intended. Cell classification shall be 445574C per ASTM D3350.
2. Provide molded PE 4710 fittings manufactured in accordance with ASTM D3261, such that when fused to the pipe it creates one homogenous system. Fittings may be machined from extruded or molded stock.
3. Special and non-standard fittings may be custom fabricated by the fitting manufacturer in accordance with ASTM F2206 provided the fittings meet the same technical specification, equivalent pressure rating, and equivalent DR as the PE 4710 HDPE pipe. Field-fabricated fittings are not acceptable.
4. Branch Saddle Reducing Tees shall be used to connect Air Release Valves to force mains. Saddles shall be main line size by 4" with 4" flange adapter and back-up ring, and 4" x 2" NPT companion flange.
5. Fitting markings shall be in accordance with ASTM D3261 requirements and include at a minimum manufacturer’s name or trademark, size, and ASTM standard, and as space allows material designation, and date of manufacture.

D. Flange Backup Rings and Gaskets

1. Provide flange backup rings conforming to AWWA C207; Class D with bolting dimensions conforming to ASTM B16.5.
2. Flange backup ring coating: fusion-bonded epoxy applied to all exterior and interior exposed surfaces with a minimum dry film thickness of 4 mil.

3. Flange gaskets: synthetic red rubber (SBR) hardness (Shore A) 80 +/- 5, ring or full face, 1/8-inch thick and conform to ASTM D1330 grades I and II. Asbestos gaskets are not allowed.
4. Bolts and Nuts
5. Flange to flange connection bolts: carbon steel, ASTM A307 grade B for Class D flanges.
6. Nuts: conforming to ASTM A194 grade 2H.
7. Furnish bolts and nuts having regular unfinished hexagonal dimensions in accordance with ASTM B18.2.1 for wrench head bolts and nuts and wrench openings.
8. Minimum bolt lengths shall be the sum of the mating flange maximum thicknesses, the gasket and the depth of nut plus 1/8 inch minimum before torquing.

E. HDPE Mechanical Joint Adapter

1. Use polyethylene mechanical joint adaptors when making connections to mechanical joint fittings and when connecting to dissimilar pipe materials such as PVC or ductile iron.
2. Connect polyethylene adaptor to mechanical joint fitting using a mechanical joint gland and gasket and in accordance with the specifications regarding mechanical joint ductile iron fittings. Meg-A-Lugs and Field-Lok gaskets are not allowed for use with polyethylene mechanical joint adaptors.
3. Provide “Harvey” style polyethylene mechanical joint adaptors that include a stainless steel stiffener inserted into the inside of the mechanical seal end of the adaptor to provide additional axial strength and prevent pipe diameter reduction at the seal.
4. Provide mechanical joint adaptors as a kit complete with adaptor, gasket, mechanical gland, stiffener, bolts and nuts.

F. General Fusion Bonding Procedure

1. Piping joints and fittings, other than those shown as flanged or otherwise mechanically connected, shall be butt heat fusion bonded in accordance with the requirements of ASTM F2620.
2. The joining method shall be performed in strict accordance with the pipe manufacturer's requirements.
3. Heat and fuse the ends of two pipes together to form a leak free bond and joint weld strength at least equal to the tensile strength of the pipe.
   a. Prepare pipe ends by clamping and facing.
   b. Put the ends contact with the heater until the appropriate size bead is formed.
   c. Remove the heater and bring pipe ends together with the force required to form the fusion bead. Maintain this force until the pipe joint has cooled.
4. Electrofusion method of joining shall not be used except to connect adjacent directionally drilled sections in the trench bottom or for service saddles installed in the trench bottom.

G. Fusion Equipment

1. Fusion equipment shall be:
   a. Capable of meeting all parameters of the job and be in proper operating condition. Equipment heater performance shall be tested and certified prior to use for fusion bonding.
   b. Designed to properly hold the size of the pipes being fused, and have enough hydraulic force to reach the required fusion pressure during all fusion conditions.
   c. Capable of meeting all conditions required by the pipe manufacturer, including temperature, alignment, and fusion pressure.
2. Each butt fusion joint shall be logged electronically by the fusion equipment, for quality control, by such equipment as DataLogger® manufactured by McElroy Manufacturing, Inc. Logged fusion joints shall be stored in the data logger unit, so the records can be downloaded and printed weekly for submittal to the County/City.

H. Fusion Operators Qualifications

1. The fusion operator shall be qualified as a Heat Fusion Operator in accordance with ASTM F3190 and be capable of meeting all parameters of the job.
2. The fusion operator shall be thoroughly familiar with and trained on the selected fusion equipment being used. Such training shall include at least the following:
   a. Safety, basic maintenance, and troubleshooting
   b. Equipment features and components and how they operate
   c. Hydraulic operation (if applicable)
   d. Determining required fusion pressure and how to set on machine
   e. Heater operation and temperature requirements and adjustment
   f. Data logging device
3. Qualification records certifying that fusion operators employed to complete fusion bonding are qualified shall be submitted prior to commencement of fusion bonding work.

2.03 Polyvinyl Chloride (PVC) Pipe

A. Provide PVC pipe made of compounds conforming to ASTM D1784, cell classification 12454.

B. Pipe shall be iron pipe size (IPS) with a minimum pressure rating/class conforming to ASTM D2241/AWWA C900, DR 21 (200 psi) for force mains 4-inch diameter or greater and DR 26 (160 psi) for force mains smaller than 4-inch.

C. Pipe joints shall be single gasket bell and spigot type, the bells being formed integrally with the pipe conforming to ASTM D3139. Provide elastomeric gaskets conforming to ASTM F477.

D. Each length of pipe shall be marked to show manufacturer’s name or trademark, pipe pressure class, and year of manufacture.

E. Provide ductile iron fittings, fitting restraints, and pipe joint restraints as specified herein, where shown on Drawings, or otherwise specified.

1. PVC Restrained Joint Pipe can be used in lieu pipe joint restraints
   a. CertainTeed Certa-Lok Yelomine (sizes 2” to 16”)
   b. Or approved equal

2.04 Ductile Iron (DI) Pipe

A. Pipe shall be centrifugally cast in metal or sand-lined molds and shall conform to AWWA C151.

1. Minimum pressure class shall be
   a. 350 PSI rated water working pressure for 12-inch diameter and smaller pipe
   b. 250 PSI rated water working pressure for 14-inch diameter and larger pipe
2. Each length of pipe shall be marked to show manufacturer’s name or trademark, pipe pressure class, and year of manufacture.
3. Pipe joints: push-on type and conforming to AWWA C111.
4. Manufacturers
   a. U.S. Pipe - Tyton Joint pipe
   b. American Ductile Iron Pipe - Fastite Joint pipe
   c. Or approved equal.

B. Provide mechanical joint ductile iron fittings conforming to AWWA C153 and AWWA C110. Use restrained joints in addition to thrust blocking.

C. Provide ductile iron fittings, fitting restraints, and pipe joint restraints as specified herein where shown on Drawings or otherwise specified.

D. Coatings - all pipe and fittings shall have a standard thickness cement mortar lining as specified in AWWA C104 and an outside coating as specified in AWWA C151.

E. Gaskets for mechanical joints and push-on joints shall conform to AWWA C111.

2.05 Ductile Iron Fittings, Fitting Restraints, and Pipe Joint Restraints

A. Provide mechanical joint DI fittings conforming to AWWA C153 and AWWA C110.

1. Use restrained joints in addition to thrust blocking for 90° bends, tees, and dead-ends.
2. Concrete thrust blocks in lieu of mechanical restraint may be used only with the written approval of the County/City.

B. Gaskets: conforming to AWWA C111.

C. Fitting Restraints

1. Series 1100 Megalug by EBAA Iron for DI pipe
2. Series 2000 PV Megalug by EBAA Iron for PVC pipe
3. JCM 610 Sur-Grip Restrainer by JCM for DI, or C900 PVC pipe

4. JCM 610 Sur-Grip Restrainer by JCM for IPS PVC
5. JCM 610 Sur-Grip Restrainer by JCM for C905 PVC pipe
6. Ford Meter Box Uni-Flange Series 1400 Restrainer for DI pipe
7. Ford Meter Box Uni-Flange Series 1500 Restrainer for PVC pipe

D. Pipe Joint Restraints

1. Series 1500/1600 Bell Restraint Harness by EBAA Iron for C900 PVC pipe
2. Series 6500 Bell restraint Harness by EBAA Iron for IPS PVC pipe
3. Series 2800 Megalug Restraint Harness by EBAA Iron for C905 PVC pipe
4. Series 1700 Megalug Restraint Harness by EBAA Iron for DI pipe
5. Field Lok 350 Gaskets by U.S. Pipe & Foundry Company for DI pipe
6. Flex-Ring Joint System by American Ductile Iron Pipe for DI pipe
7. JCM 620 Sur-Grip Bell Joint Restrainer for DI or C900 PVC pipe
8. JCM 620 Sur-Grip Bell Joint Restrainer for IPS PVC pipe
9. JCM 621 Sur-Grip Bell Joint Restrainer by JCM for C905 PVC pipe
10. Grip Ring Series 600 Pipe Restraining System manufactured by ROMAC Industries, Inc. for DI pipe and PVC pipe
11. Ford Meter Box Uni-Flange Series 1390 Joint Restrainer for C900 or C905 PVC pipe or IPS PVC pipe
12. Ford Meter Box Uni-Flange Series 1390 Joint Restrainer for DI pipe

2.06 Plug Valves and Boxes

A. Valve

1. Provide eccentric plug valves for wastewater service which are non-lubricated with a resilient seating surface.
2. Buried valves shall have mechanical joint ends conforming to ANSI/AWWA C110 requirements.
3. Port areas shall be at least 80 percent of full pipe area.
4. Valves shall have permanently lubricated stainless steel slave-type bearings, or other lubricated type bearings, in the upper and lower stem journals.
5. Valve seats shall be corrosion resistant with a high nickel content.
6. Bonnet shaft seals shall be capable of being replaced while force main and valve remain in service, thereby eliminating the need to take pumping station out of service.
7. All exposed nuts, bolts, springs and washers shall be zinc-coated steel.
8. Buried valves, 8 inches and larger, shall have worm-gear actuators. Buried valves smaller than 8 inch shall have totally enclosed and sealed operators with a 2 inch square AWWA operating nut.
9. Plug valves shall be capable of providing drip-tight shutoff with flow in either direction up to the valve's rated operating pressure.
10. The plug face material shall be nitrile-butadiene, Neoprene or as approved by the County/City.
11. Valves and actuators for buried service shall have seals on all shafts and gaskets on valve and actuator covers to prevent the entry of fluid.
12. Actuator shall be capable of fully seating and unseating the valve and have a maximum torque of 50 foot-pounds on operating nuts.
13. Valves shall be DeZurik, Val-Matic, or equal.

B. Valve Box

1. All buried valves shall have an extension stem, cast or ductile iron valve box and cover, and tee-wrench.

2.07 Sewage Air and Vacuum Valves

A. Sewage Air Release and Air Vacuum Valve shall have cast iron body and cover with a 2-inch N.P.T. inlet and 1-inch N.P.T. outlet with a stainless steel float and float guide. See also Air/Vacuum release valve and vault.

B. Provide valve as manufactured by Val-Matic Valve and Manufacturing Co., or approved equal.

2.08 Valve Vault

A. Structure

1. Provide precast concrete sections with no more than 3 holes cast or drilled in the section for handling.
2. Provide rapid setting patch material in accordance with ASTM C928 and INDOT Standard Specification Section 901 or precast concrete plugs for filling all holes used for handling.
3. Provide square precast concrete vaults which conform to ASTM C913 and C890 and as indicated on Drawings.

B. Casting

1. Provide cast iron frames and covers in accordance with ASTM A48 Class 35B and INDOT Standard Specification Section 910.
2. Supply all frames and covers from one manufacturer.
3. Furnish frames and covers which are rated for traffic, of non-rocking design, and have machined horizontal and vertical bearing surfaces. Frames and lids shall be watertight and have a grooved rubber gasket with concealed pick holes.
4. Provide frame and cover as shown on standard detail, or approved equal.

2.09 Tracer Wire

A. Furnish tracer wire for PVC pipe.

B. For pipe installed by open excavation or within a casing, provide one strand of solid 10-gauge AWG copper wire for the entire length of pipe.

C. For pipe installed by horizontal directional drilling, provide 2 strands of 10-gauge solid, steel core hard drawn extra high strength copper tracer wire for the entire length of pipe. Supply Copperhead Direct Burial tracer wire, or approved equal.

D. Provide splice kits suitable for underground installation for splices and branch connections. Seal connection with epoxy contained in splice kit and wrap with waterproof tape.

2.10 Location Material

A. Location material shall be metallic type tape such as Terra Tape Detectable as manufactured by Reef Industries, Inc. or approved equal. Location material shall be marked with “Caution Sewer Line Buried Below”.

2.11 Force Main Marker Post

A. Provide model PMP 7CE with lid C2 as manufactured by Handley Industries, or approved equal.

B. One (1) marker post shall be installed every 500 feet of force main installed, and at any major deflection in the pipeline.

C. The following information shall be clearly printed on force main marker post:

1. Connersville Utilities
2. Sanitary Sewer Line Buried Below
3. Emergency Contact: 765-825-3524 / 911
4. Caution Sewer Pipeline

PART 3 - EXECUTION

3.01 General

A. Contractor shall allow the County/City the opportunity to inspect the installation of the pipe and bedding material prior to proceeding with backfilling an open trench. The County/City shall be given 48 hours’ notice of the contractor’s intent to install force main piping and structures.

B. Inspect force mains, fittings, valves, and appurtenances prior to installation and promptly remove damaged or unsuitable materials from the job site. Replace damaged or unsuitable materials with new and unused materials.

C. Install all force mains, fittings, valves, and appurtenances as shown on the Standard Details and as specified in this Section. Do not install pipe when, in the opinion of the County/City, trench conditions are unsuitable.

D. Follow manufacturer's installation procedures when installing force mains, fittings, valves, and appurtenances.

3.02 Installation of Force Mains

A. Before installing piping, verify location, depth, type of joint needed, and size of pipe to which connection is proposed. Verify the lines can be run as contemplated. Any necessary deviation shall be referred to the County/City for final approval before lines are run.

B. All lengths of pipe shall be dimensioned accurately to measurements established at the site, and worked into place without forcing. Cut sections of pipe shall be cut using pipe cutters to provide a square end.

C. Lay sewer pipe progressively upgrade with bell upstream in a manner to form close, concentric joints with smooth bottom inverts.

D. Lay force main uniformly to line and grade so that the finished sewer will present a uniform bore. The Contractor, at his own expense, shall set force main alignment and grade for all sewers for the minimum depth of cover or as otherwise shown on the Drawings.

E. Avoid constructing "high points" in the force main other than those shown on the Drawings. Install Air Release Valves necessary to vent accumulated air and gases trapped at these "high points".

F. Tracer Wire shall be installed on PVC pipe

1. Tape to pipe in 15 to 20 foot intervals.
2. Do not wrap wire around pipe.
3. Install tracer wire boxes at intervals not to exceed 2,000 feet.
4. Coil tracer wire inside meter box with enough wire to extend two feet above the box.
5. Install tracer wire on outside of all valve boxes between collar and box.
6. Seal splices and branch connections with epoxy and wrap with tape. Provide a continuity test on all tracer wire installed.

G. Install length of extension stems on valve boxes so that plug valve operating nut is 9 to 12 inches below the ground surface.

H. Temporarily plug installed piping systems at the end of each day's work, or other interruption of progress on a given line. Plug shall be adequate to prevent entry of animals and entrance or insertion of deleterious materials and shall be installed in a manner satisfactory to the County/City.

I. HDPE Pipe Fusion Bonding Procedure

1. Piping joints other than those shown as flanged or otherwise mechanically connected shall be butt fusion bonded in accordance with a written bonding procedure specification (BPS) as required by ANSI/ASME B31.3, Chapter VII, paragraph A-328. BPS shall include cutting and facing requirements and shall utilize a data logger.
2. Materials to be fusion bonded shall be from the same manufacturer.
3. Bonders and bonding operators shall be qualified in the use of the BPS as required by ANSI/ASME B31.3, Chapter VII, paragraph A-328. Qualification records certifying that borders and bonding operators employed to complete fusion bonding are qualified in the BPS shall be submitted prior to commencement of fusion bonding work.
4. Bonding equipment specified in the BPS shall be in proper operating condition. Equipment heater performance shall be tested and certified prior to use for

fusion bonding. Bonders and bonding operators shall be qualified for the specific bonding equipment utilized in the fusion bonding work.

5. The joining method shall be performed in strict accordance with the pipe manufacturer's requirements. The butt fusion equipment used in the jointing procedure shall be capable of meeting all conditions required by the pipe manufacturer, including temperature, alignment and fusion pressure. Heat fusion joining shall be 100 percent efficient offering a joint weld strength at least equal to the tensile strength of the pipe. Each butt fusion joint shall be logged electronically by the butt fusion unit, for quality control, by such equipment as The Data Logger manufactured by McElroy Manufacturing, Inc. Logged fusion joints shall be stored in the Data Logger unit, such that it can be downloaded and printed weekly for submittal to the County/City.

J. PVC pipe installed by open cut shall be joined at grade level and lowered into the trench using nylon slings to avoid damage to the pipe. Chains or cable type chokers must be avoided when lifting sections of pipe.

K. Horizontal directional drilling of HDPE and PVC pipe shall be as specified in Section 02226 – Trenchless Excavation – Directional Drilling.

L. Install location material above force main between 18 to 24 inches deep.

3.03 Sewage Air and Vacuum Valves

A. Keep structure excavations free from water during construction.

B. Fill all areas excavated below the depth required for the structure's base with No. 8 crushed stone at Contractor’s expense.

C. Install vault sections so that the axis of the structure is vertical.

D. Prior to backfilling, fill all holes used for handling with rapid setting patch material or with precast concrete plugs secured with Portland cement mortar.

3.04 Cleaning

A. Provide all necessary equipment required for proper completion of the flushing of structures and piping systems. Source, quality, and disposal of water shall be approved by the County/City.

B. Remove all debris and excess soil from all pipe installed under this Contract by cleaning with clean water. It shall be the Contractor's responsibility to obtain necessary water and equipment to flush the pipes to the satisfaction of the County/City.

C. Water used for cleaning is not to enter existing sanitary sewer system.

3.05 Field Quality Control

A. Hydrostatic & Leakage Test

1. Perform hydrostatic leakage test in accordance with Section 02732 prior to placing system in service.

B. Continuity Test

1. Conduct continuity test on all tracer wire. All tracer wire found not to be continuous after testing shall be repaired or replaced.

3.06 As-Builts

A. “As-built” drawings required to be prepared and submitted to the County/City in accordance with Section 01010.

-END-

SECTION 02739 - SUBMERSIBLE LIFT STATION

PART 1 - GENERAL

1.01 Summary

A. Section includes: The installation of submersible lift station with centrifugal chopper pumps as shown in the Standard Details including pumps, motor, base elbow, hatches with safety grating, slide rails, wet well and valve vault, controls, piping and valves, and other appurtenances.

B. 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.

C. Developer or Contractor shall be responsible for all costs associated with abandonment or relocation of an existing lift station.

1.02 General and Design Requirements

A. This section pertains to the requirement for sanitary sewer lift stations designed and constructed by a Developer or Contractor.

B. The Developer must show that it is not physically possible or economically feasible to provide gravity service into a public sewer. No lift station shall be approved for a project unless a 50-year life cycle analysis is submitted to the County/City to demonstrate that it will be more cost effective for the County/City in lieu of constructing a deeper gravity sewer.

C. All sewage lift stations that are connected to the City of Connersville collection system must be approved by the Indiana Department of Environmental Management (IDEM) and by the City of Connersville. The lift station must meet the requirements of this Section and the Standard Details.

D. Any exceptions to this Standard or associated approved Plans shall be submitted in writing and clearly stated. The exceptions must be approved by the County/City prior to proceeding with the work.

E. All components of the lift station that are exposed to weather shall be constructed of material that is resistant to corrosion and will not require surface protection throughout the expected life of the lift station. In general, these materials are stainless steel, aluminum, fiberglass reinforced polyester (FRP) and ultraviolet stabilized PVC.

F. Inlet piping shall be located such that the sewage discharging into the wet well does not fall directly onto one or both of the submersible pumps. Utilize baffle as depicted in standard details.

G. All lift stations shall be designed and constructed in accordance with IDEM and Ten States Standards. All design criteria and calculations shall be submitted to the County/City for approval.

H. In accordance with Ten States Standards, 2014 edition, indicating, totalizing, and recording flow measurement shall be provided at pumping stations with a 350 gpm (22 L/s) or greater design peak hourly flow, or at any pumping stations with variable frequency drives.

I. Provide buoyancy calculations to support design. Assume an empty dry wet well and complete submersion.

J. Vaughan chopper pumps shall be provided to accommodate peak hourly flow with the largest pump out of service. A minimum of two (2) pumps shall be provided at each lift station.

K. Force mains shall be designed to maintain a minimum of 2.5 feet per second in order to avoid solids deposition in the pipe. Minimum force main size shall be 4-inches in diameter unless specifically authorized by the County/City.

L. Service and replacement parts for all components of the lift station must be readily available in the local area within 40 miles of the City of Connersville.

M. The wet well is a Class 1, Division 1, Groups C and D environment. All components installed in the wet well shall be rated accordingly.

N. Lift Station Location

1. Locate the lift station in such a manner that it is accessible by means of a paved surface (street grade) with parking area for 2 service vehicles without obstructing any adjacent sidewalks or streets. Drive shall provide adequate access for a vacuum truck. Layout must be approved by the County/City.
2. Landscaping/fencing may be required in locations where visual qualities are a consideration or for safety and equipment protection. A landscaping plan shall be submitted to the County/City for review.
3. Provide access in the area surrounding the lift station for possible future maintenance purposes and the future addition of a second wet well. Provide a minimum area of 1,200 square feet. Future additional wet well should be able to be installed without interruption of original wet well. Site layout shall include site of future wet well. Show utility easements on the Plans.
4. The lift station site shall be located above the 100-year flood elevation as established by the IDNR.

O. Lift Station Design

1. Lift stations shall be wet well/valve vault design utilizing submersible pumps in the wet well with a separate valve vault. Provisions for draining the valve vault into the wet well shall be made.
2. Provisions shall be made for connection to the County/City's portable generators in the event of a power failure.

P. Lift Station Enclosure

1. A lift station enclosure shall be designed to protect the controls against inclement weather and be designed not to conflict with the maintenance of the wet well/valve vault. The design shall be approved by the City's Wastewater Superintendent and Utility Coordinator.

Q. Wet Well Sizing Criteria

1. The wet well storage below the lowest inlet shall be a minimum of 5'-0" and shall also meet the following criteria:
   a. OFF level to be set at the pump manufacturer's recommended level but no less than 1'-0" from the bottom of the wet well.
   b. The distance between the OFF level and the lead pump ON level shall be set to provide storage capacity in gallons equal to:

$$\frac{15 \times \text{Rated Pump GPM}}{4} \quad \text{(i.e. 15 minute cycle minimum)}$$

   c. The lag pump ON level shall be set a minimum of 6 inches above the lead pump ON level. Lag pump shall have a time delay relay, adjustable from 0 to 60 seconds.
   d. The high water alarm shall be set a minimum of 6 inches above the lag pump ON level.
   e. All level settings shall be set a minimum of 6 inches below the lowest invert elevation into the wet well.
   f. All float switch level set points shall be set below the lowest inlet into the wet well.

1.03 Quality Assurance

A. Standardization - All equipment shall be of the latest and most modern design. All similar components shall be manufactured and furnished by one manufacturer unless specifically allowed otherwise in writing by the County/City.

B. Provide manufacturer's warranty as specified in this Section.

C. Provide field test results in Start-Up Certification Report as specified in this section.

D. The pumping equipment, controls, and accessories shall be an integral package supplied by a pump supplier with local representation so as to provide undivided responsibility.

1.04 Submittals

A. Submit the following to the County/City for review:

1. Certified copies of factory tests and reports, if specified in this Section or required by the referenced standards.
2. Descriptive information including catalogue cuts and manufacturer's specifications for all components.

3. Copy of manufacturer's standard warranty for each type of equipment provided. Shop drawings with performance data, descriptive literature, weights and dimensions, and other physical characteristics verifying compliance with this Section including certified pump curves, motor starting and full-load amps, and motor horsepower and data, and other specific pump information. When numerous options and sizes are shown, the shop drawings shall be marked to clearly indicate the size and types specific to this Section and project.
4. Electrical:
    a. Submit all electrical requirements for each piece of equipment including voltage, phase, and load data.
    b. Provide wiring diagrams for each piece of equipment. For example, submitting one diagram for all pumps is not acceptable.
    c. “Typical” diagrams are not acceptable. Manufacturer’s standard diagrams may be submitted if they are made specific for this project by:
        1) Showing all included options, special items, etc.
        2) Unused options or features shall be crossed out or deleted.
        3) Identify the drawing with project name, equipment name, and tag number, e.g., “Connersville, “XXX” Lift Station Pump No. X”
    d. Telemetry plan
5. A material list indicating items to be furnished by the equipment manufacturer.
6. List of which components and materials shall be shipped preassembled and parts list for the other components and materials. Weights and physical dimensions shall be indicated for each part, assembly, and/or package to be shipped.
7. Manufacturer's installation instructions and recommended testing procedures.
8. Material Safety Data Sheets (MSDS) for any and all oils or chemicals utilized for lift station operation and maintenance.
9. Provide start-up certification report specified in this Section.
10. Operation and Maintenance Manuals
    a. Three (3) hard-copy Operation and Maintenance Manuals, and three (3) book-marked, pdf copies on CD or DVD, for all components of the lift station.
    b. Manuals shall include, at a minimum:
        1) Operation Instructions
        2) Maintenance Instructions and Schedule
        3) Recommended Spare Parts List
        4) Lubrication Schedules
        5) Structural Diagrams
        6) As-built Wiring Diagrams
        7) Bill of Materials

1.05 Warranty

A. The manufacturer of the equipment furnished under this Section shall be responsible for the proper operation of the system when installed according to his instructions.

B. Pump warranty shall be provided by the pump manufacturer and shall warrant the units being supplied to the County/City against defects in workmanship and materials for a period of five (5) years prorated from the start-up date. The

warranty shall be in printed form and apply to all similar units. A copy of the warranty statement shall be submitted with the shop drawings.

C. All Work shall be warranted by the Developer and Contractor to be free from defective material and workmanship for a period of one year from the date of acceptance of the lift station by the County/City. Replace defective materials, components, and workmanship during this time, including but not limited to all materials, labor, shipping, and transportation, at no cost to the County/City. Warranty work performed during this one year period shall also be warranted to be free from defective material or workmanship for a period of one year from the date the warranty work is completed and shall be addressed in the same manner at no additional cost to the County/City.

1.06 Spare Parts and Special Tools

A. The manufacturer shall furnish one set of all special tools necessary for normal operation, maintenance and calibration.

B. Provide all manufacturer's recommended spare parts for each unit, as well as any spare parts identified in this specification section or the special requirements. As a minimum, a spare O-Ring Kit package shall be supplied with each pump.

1.07 Product Delivery, Storage and Handling

A. The Contractor shall be responsible for the delivery, storage, and handling of products. Store products in accordance with the manufacturer's recommended procedures.

B. Load and unload all pumps, motors, and appurtenances by hoists or skidding. Do no drop products. Do not skid or roll products on or against other products. Attach slings and hooks in such a manner to prevent damage to products.

C. The pumps furnished shall be packaged in such a manner as to provide ample protection from damage during handling, shipment, and outdoor storage at the station site. All openings shall be capped with dustproof closures and all edges sealed or taped to provide a dust-tight closure.

D. Promptly remove damaged products from the job site. Replace damaged products with undamaged products.

PART 2 - PRODUCTS

2.01 Submersible Sewage Chopper Pumps (3”-6” S-Series Submersible Chopper Pumps. Refer to Manufacturer specifications for larger sizes).

A. Requirements

1. Actual lift station dimensions, control settings, and pump selection to be as indicated by the Design Engineer on the Data Sheet.

2. Provide two (2) identical submersible sewage chopper pumps. Each submersible chopper pump shall be specifically designed to pump waste solids at heavy consistencies without plugging or dewatering of the solids. Materials shall be chopped/macerated and conditioned by the pump as an integral part of the pumping action. Each pump must have demonstrated the ability to chop through and pump high concentrations of solids such as plastics, heavy rags, grease and hair balls, wood, paper products and stringy materials without plugging, both in tests and field applications.
3. Pumps shall be equipped with submersible cable suitable for submersible pump applications of length necessary from each pump to its respective remote control panel (RCP). The power cable shall be sized according to NEC and ICEA standards.
4. Pumps shall be Vaughan S series submersible chopper pumps. Usage cases of the Vaughan SE series shall be determined upon consultation with the manufacturer concerning the needs of the project. Specific model dimensions of the chopper pumps shall be determined by the needs of the project. All other pump manufacturers require preapproval by the County/City.

B. Pump Discharge Connection: Each pump shall be automatically and firmly connected to the discharge connection elbow guided by two stainless steel guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. The pump discharge elbow shall be cast iron with mounting feet and 150 lb. flange.

C. Casing: Shall be of volute design, spiraling outward to the Class 125 flanged centerline discharge. Casing shall be ductile cast iron with all water passages to be smooth, and free of blowholes and imperfections for good flow characteristics. Casing shall include a replaceable Rockwell C 60 alloy steel cutter to cut against the rotating impeller pump-out vanes for removing fiber and debris.

D. Impeller: Shall be semi-open type with pump out vanes to reduce seal area pressure. Chopping/maceration of materials shall be accomplished by the action of the cupped and sharpened leading edges of the impeller blades moving across the cutter bar at the intake openings, with a set clearance between the impeller and cutter bar of 0.015-0.025” cold. Impeller shall be cast alloy steel heat treated to minimum Rockwell C 60 and dynamically balanced. The impeller shall be keyed to the shaft and shall have no axial adjustments and no set screws.

E. Cutter Bar Plate: Shall be recessed into the pump casing and shall contain at least 2 shear bars extending diametrically across the intake opening to within 0.010-0.030” of the rotating cutter nut tooth, for the purpose of preventing intake opening blockage and wrapping of debris at the shaft area. Chopper pumps utilizing individually mounted shear bars shall not be acceptable. Cutter bar shall be alloy steel heat-treated to minimum Rockwell C 60.

F. Cutter Nut: The impeller shall be secured to the shaft using a cutter nut, designed to cut stringy materials and prevent binding using a raised, rotating cutter tooth. The cutter nut shall be cast alloy steel heat treated to minimum Rockwell C 60.

G. Upper Cutter: Shall be threaded into the casing or back pull-out adapter plate behind the impeller, designed to cut against the pump-out vanes and the impeller hub, reducing and removing stringy materials from the mechanical seal area. Upper cutter shall be cast alloy steel heat treated to minimum Rockwell C 60. The upper cutter teeth are positioned as closely as possible to the center of shaft rotation to minimize cutting torque and nuisance motor tripping. The ratio of upper cutter cutting diameter to shaft diameter in the upper cutter area of the pump shall be 3.0 or less.

H. Pump Shafting: Shafting shall be heat treated alloy steel, with a minimum diameter of 1.5 inches in order to minimize deflection during solids chopping.

I. Bearing Housing: Shall be ductile cast iron, and machined with piloted bearing fits for concentricity of all components. Piloted motor mount shall securely align motor on top of bearing housing.

J. Thrust Bearings: Shaft thrust in both directions shall be taken up by two back-to-back mounted single-row angular contact ball bearings, or a matched set of face to face tapered roller bearings, with a minimum L-10 rated life of 100,000 hours. Overhang from the centerline of the lower thrust bearing to the seal faces shall be a maximum of 1.7". A third mechanical seal (two in motor) shall also be provided to isolate the bearings from the pumped media. The third seal, as well as the thrust bearings shall be oil bath lubricated in the bearing housing by ISO Grade 46 oil. Shaft overhang exceeding 1.7 inches from the center of the lowest thrust bearing to the seal faces shall be considered unacceptable.

K. Pump Mechanical Seal: The mechanical seal shall be located immediately behind the impeller hub to maximize the flushing available from the impeller pump-out vanes. The seal shall be a cartridge-type mechanical seal with Viton O-rings and silicon carbide (or tungsten carbide) faces. This cartridge seal shall be pre-assembled and pre-tested so that no seal settings or adjustments are required from the installer. Any springs used to push the seal faces together must be shielded from the fluid to be pumped. The cartridge shall also include a 17-4PH, heat-treated seal sleeve and a ductile cast iron seal gland.

L. Automatic Oil Level Monitor: An oil level switch shall be mounted at the top of the wet well, with a hose feeding down to the side of the bearing housing to monitor oil level and shut off the motor in event of low oil level. A relay shall be included for mounting in the motor control panel.

M. Shaft Coupling: The submersible motor shall be close coupled directly to the pump shaft using a solid sleeve coupling, which is keyed to both the pump and motor shafts. Slip clutches and shear pins between the shaft and the motor are considered unacceptable.

N. Shafting: Pump shafting shall be AISI 4140 heat treated. The pump shaft shall directly couple to the motor shaft, with a bolt and keyway.

O. Submersible Motor: The submersible motor shall be U/L or FM listed and suitable for Class I, Group C & D, Division I hazardous locations, rated at __ HP, ___ RPM,

__ Volts, 60 Hertz and 3 phase, 1.15 service factor (1.0 for Continuous In-Air) with Class F insulation. Motor shall have tandem mechanical seals in oil bath and dual moisture sensing probes. Moisture probes must be connected to indicate water intrusion. The lower motor seal shall be exposed only to the lubricant in the pump bearing housing, with no exposure to the pumped media. Motor shall include two normally closed automatic resetting thermostats connected in series and embedded in adjoining phases. The thermostats must be connected per local, state, and/or the National Electric Code to maintain hazardous location rating and to disable motor starter if overheating occurs. Motor frame shall be cast iron, and all external hardware and shaft shall be stainless steel. Motor shall be sized for non-overloading conditions.

P. Stainless Steel Nameplate: Shall be attached to the pump giving the manufacturer's model and serial number, rated capacity, head, speed and all pertinent data.

Q. Guide Rail System: Provide a guide rail system consisting of two galvanized or stainless steel guide rails (by others), cast ductile iron pump guide bracket, cast ductile iron discharge elbow with mounting feet and Class 125 flanges, 316 stainless steel upper guide rail mounting bracket, and 316 stainless steel intermediate guide rail stiffener bracket every 10 feet.

R. Surface Preparation: Solvent wash, sandblast, and coat with minimum 30 MDFT Tnemec Perma-Shield PL Series 431 epoxy (except motor).

2.02 Concrete Wet Well and Valve Vault

A. The Contractor shall furnish and install a monolithic concrete or precast manhole type wet well as indicated on the Details. Pump and related equipment shall be installed and/or mounted as shown.

B. A concrete vault shall be furnished and installed to house the valves and appurtenances. Provide an aluminum access ladder in the valve vault as shown on the Details. Square valve vault structures shall conform to requirements of ASTM Specification C913 and C890. Valve vault shall be constructed same as described for manholes in specification Section 02730.

C. Circular precast wet well structures shall conform to requirements of ASTM Specification C478. Wet well shall be constructed same as described for manholes in specification Section 02730. Wet well shall be vacuum tested per specification Section 02732.

D. All pipe penetrations into wet well and valve vault shall be core drilled. Seal all pipe penetrations with link seal for a watertight connection.

E. Provide suitable ballast to prevent floatation in the event of high water tables.

F. Provide 3-inch diameter PVC drain from valve vault to wet well. Furnish with 3-inch flapper valve inside wet well to prevent drain back of wastewater into the valve vault.

G. Furnish valve vault with aluminum ladder.

H. The wet well interior walls and cover shall be coated to protect against infiltration and hydrogen sulfide corrosion. Provide the following materials:

1. Restoration Mortar – Mainstay ML-72 Sprayable Microsilica Cement Mortar. Low shrinkage, high strength, sprayable microsilica mortar.
   a. Composition: Blend of cements, microsilica, thermoplastic fibers, densifiers, and modifiers. Mortar shall not contain calcium aluminate cements or aggregates.
   b. Compressive Strength, ASTM C109
      1) 1 Day: 3,000 psi
      2) 28 Days: 10,000 psi
   c. Flexural Strength, ASTM C78
      1) 1 Day: 535 psi
      2) 28 Days: 1,400 psi
   d. Tensile Strength
      1) 1 Day: 330 psi
      2) 28 Days: 790 psi
   e. Shrinkage, ASTM C596
      1) 28 Days @ 90%; 0.01 percent
   f. Uniaxial Tensile Bond Strength, ACI 503R, Appendix A
      1) 28 Day: Greater than 500 psi over high strength concrete (5,000 psi compression strength concrete – bond strength governed by substrate tensile strength). Minimum acceptable bond = 145 psi.
   g. Color: Dark gray
2. Corrosion Barrier Coating shall be Mainstay DS-5 Ultra High Build Epoxy Coating.
   a. Composition: 100 percent solids, modified epoxy coating
   b. Thickness: Minimum of 100 mils in 1 or 2 coats
   c. Number of Components: 2
   d. Finish: Gloss
   e. Color: Shall be chosen by the Owner (White, Light Grey, or Light Blue)

2.03 Pump Discharge Piping

A. Pump discharge piping within the wet well and valve vault shall be flanged ductile iron pipe conforming to the following requirements:

1. Pipe - ANSI A21.51 and AWWA C151 Class 350 per 02732 or 250 depending on size.
2. Fittings - ANSI A21.1 and AWWA C110 Class 250.
3. Flanges - ANSI A21.15 with 1/8" thick neoprene gaskets
4. Coatings - Piping shall meet AWWA 21.4A and receive one coat bituminous paint inside and out, except exposed exterior surfaces which shall receive the following exterior coating system:
   a. Prime Coat – Organic Zinc-Rich Urethane, 1 coat, 2.5-3.5 mils DFT
   b. Finish Coat - Aliphatic Acrylic Polyurethane, 2 coats, 2.0-5.0 mils DFT – Color to be determined by the County/City.
5. Nuts - ANSI B18.2

6. Bolts - ASTM A307

B. Buried pump discharge piping shall conform to Specification Section 02737 – Force Main Sewer Systems.

C. Plug Valves

1. Eccentric Plug Valves for wastewater service shall be non-lubricated with a resilient sealing surface. Valves located in the valve vault shall have flanged ends conforming to ANSI/AWWA C110 requirements. Port areas shall be at least 80% of full pipe area. Valves shall have permanently lubricated stainless steel slave-type bearings, or other lubricated type bearings, in the upper and lower stem journals. Valve seats shall be corrosion resistant, having a high nickel content.
2. Bonnet shaft seals shall be capable of being replaced while line and valve remain in service, thereby eliminating the need to take pumping station out of service. All exposed nuts, bolts, springs and washers shall be stainless steel. Means of actuation shall be by handwheel and geared actuator.
3. The valves shall be capable of providing drip-tight shutoff with flow in either direction up to the valve's rated operating pressure. Flanged valves shall be faced and drilled to ANSI B.16.1, Class 125 standard. Flanges of valves shall have face-to-face dimensions of ANSI/AWWA standard gate valves.
4. The plug face material shall be nitrile-butadiene, Neoprene or as approved by the County/City.
5. Each actuator shall be capable of seating and unseating the valve and have a maximum torque 50 foot-pounds.
6. Valves shall be DeZurik; Mueller; or equal.

D. Check Valves

1. Check valves for wastewater service in sizes 4 inches and larger shall be the single disc, swing check design, outside weight and lever, non-slam, cast iron ASTM A-126, Class B body and bonnet, bronze seat ring and disk plate, bolted cover, flanged ends, 175 psig working pressure. Valves of 4-inch diameter shall have bronze disk. Valves larger than 4 inches shall have ductile iron or cast iron disk in accordance with ASTM B536 or ASTM A126 Class B. Hinge pin shall be 316 stainless steel. Check valves shall meet or exceed ANSI/AWWA C508 and be suitable for use in a horizontal position. Flanges shall conform in dimensions and drilling to ANSI B16.1. Check valves shall be Mueller, or equal.

2.04 Accessories

A. Aluminum Hatches

1. Frame shall be 1/4-inch extruded aluminum with built-in neoprene cushion and with strap anchors bolted to exterior. Cover leaf shall be 1/4-inch aluminum reinforced with aluminum stiffeners as required. Stainless steel hinges shall be bolted to underside and pivot on all stainless bolts and hardware shall be used. The cover shall open to 90 degrees and lock automatically in that

position. A vinyl grip handle shall be provided to release and close the cover with one hand. Covers shall be built to withstand a live load of 300 pounds per square foot, and equipped with a snap lock and removable handle. When closed, covers shall not protrude above the operating surface in which they are installed. Factory finish shall be aluminum lacquer. Surface contacting concrete shall have bituminous coating. Covers shall be diamond pattern plate. Aluminum hatches shall be Bilco, USEMCO, USF, Halliday, or approved equal.

2. Provide wet well and valve vault hatch doors which are aluminum single (or double as required) leaf access hatches with locking hasp. Hatch doors shall have lifting handles, safety latch, hasp for padlock, and nonskid surface finish. All hatch doors shall have spring-assist and anti-slam device.
3. Wet well hatches shall be sized and provided by the pump manufacturer specifically for the submersible pumps provided, and shall not contain intermediate support bars across the clear opening.
4. When flush mounted covers are furnished, provide two wrenches at each lift station for opening covers.
5. Safety Grating
   a. Safety grating shall be furnished integral with the hatch for the wet well to prevent falling into the pit when the hatch lids are opened. The wet well access hatch shall be equipped with a safety grating panel under each hatch leaf. Each safety grating panel shall be molded in one piece. The grating shall be designed to withstand a minimum live load of 300 psf. Deflection shall not exceed 1/150th of the span.
   b. Grate openings shall allow for visual inspection, limited maintenance, and float adjustments while the safety grate is closed. The design of the hatch must assure that the grate is closed prior to the hatch doors being closed.
   c. Each grate shall be equipped with torsion rod lift assistance for ease of operation and a hold open arm shall be included which will lock the grate in the 90° position once opened. Hold open arm shall be aluminum with a stainless steel release handle. All other hardware included shall be Type 316 stainless steel. The grate shall be coated with a high visibility safety color coating.
   d. Design of the system must assure fall-through protection is in place after the door has been closed, thereby protecting the next operator.
   e. The opening arm shall be equipped with a controlled confined space entry locking device that will prevent unauthorized entry to the confined space.
   f. The safety grating shall be furnished by the same manufacturer as the aluminum hatch to assure compatibility.
6. Hatches and safety grating shall be sized to allow for removal of pumps, valves, etc. without conflict.

B. Slide Rail System

1. A slide 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.
2. Two (2) rails of two (2) inch stainless steel pipe 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 attachment to the access hatch frame.

3. One (1) intermediate guide rail support is required for each ten (10) feet of guide rail length for stainless steel pipe.
4. The pumps shall be equipped with sliding brackets or rail guides. To ensure easy removal of the pumps, the rail guides attached to each pump shall not encircle the rails.
5. A stainless steel lifting cable of adequate length for the basin depth shall be provided for each pump.
6. The rails and the 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.

C. Portable Hoist

1. A surface-mounted socket shall be provided and anchored into the top of the concrete slab over the wet well for each pump. Any additional reinforcing or appurtenances required to install the socket assembly shall be provided by the manufacturer or Contractor. Socket size to be coordinated with Connersville Utilities.

D. Cable Holder

1. Provide a stainless steel cable and chain holder to be mounted inside the hatch opening of the top slab of the wet well to support the pump power and control cables and lifting cable.

E. Hydrant

1. Provide 2-inch post type water hydrant with backflow prevention for potable water supply. Provide hydrant model Mueller A41/42 or approved equal.

2.05 Electrical and Controls

A. All conduit from the wet well to control panels shall have conduits sealed where they enter the control to prevent gases from entering from the wet well The classification of the wet well is Class 1 Division 1 Group D.

B. Provide PVC Schedule 80 rigid conduit 18-inches above to 18-inches below grade, with PVC Schedule 40 conduit up to the all enclosures.

C. Include link type seals where conduits enter the wet well. Link Seal model #S-316 or equal.

D. Power conductors shall be type THWN-THHN: For dry and wet locations; max dry location operating temperature 90 Deg. C. Insulation shall be flame-retardant, moisture-resistant and heat-resistant thermoplastic; outer covering shall be nylon jacket. All conductors shall be copper.

E. All terminals shall be rated for copper conductors. Dual rated lugs shall be acceptable.

F. Provide a solidly grounded service ground electrode system. Include an equipment grounding conductor for all circuits.

G. Provide stainless steel Kellems-type grips to support all cables from the cable holder in the wet well.

H. Provide post mounted dusk to dawn electric light to provide light to entire wet well, valve vault, and parking area. Depending upon location, a motion detector type light may be used if preapproved by the County/City. Provide flip switch for light inside control panel.

I. Provide NEMA 4X stainless steel enclosure for enclosing electrical controls. Access door shall be capable of being secured shut and shall have an automatic heavy-duty hold-open with release handle to keep door open while maintenance is performed.

J. The manufacturer of the control systems shall be a UL listed shop for industrial control systems and shall provide evidence of such on request from the County/City. All electrical and control components shall be domestically manufactured.

K. A circuit breaker and NEMA rated magnetic starter with three (3) leg overload protection and manual reset shall be provided for each pump. Motors 10 Hp and larger shall have Reduced Voltage Solid State Starters (soft starts). Starters shall have auxiliary contacts to operate both pumps on override 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 to be used for all control functions. A green run 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, heat sensor leads, and remote monitor panel interconnections.

L. Provide the following electrical and control components:

1. Separate elapsed time meters for each pump
2. Individual breaker for each pump in the control panel (lock-out/tag-out)
3. Pump moisture seal probe alarm
4. Telemetering interface connection capability
5. Thermostatically controlled electric strip heater for moisture control
6. Loss of phase monitor on each motor
7. Lightning surge protection
8. Duplex 110 volt, GFI, electric receptacle inside panel
9. Alternator selector switch
10. Heat sensor to indicate clogged pumps - connection shall disconnect starter upon high temperature signal and will automatically reconnect when condition has been corrected
11. Intrinsically safe barrier compatible with the float switches.

M. Provide moisture and temperature sensing relays for all pumps and motors installed in the pump control enclosures. Provide wiring diagrams and directions on how the relays are to be connected to protect the pump and motor per the warranty requirements.

N. Provide the following float switches for level control, or as otherwise approved by the County/City.

1. High Level Alarm
2. Lag Pump On
3. Lead Pump On
4. Pumps Off
5. Low Level Alarm

O. Provide audible and visual alarms with external silencer. Alarm should only activate on the following conditions:

1. Power Fail
2. High Level

P. Furnish cellular telemetry control equipment which is compatible with pumping equipment controls and with current County/City equipment. Consult with owner for current model. The following signals should be monitored:

1. Power Fail
2. High Level
3. Flow (if flow meter is required)

Q. Provide engraved nameplates for all major devices and equipment. Include detailed instructions on the connection and transferring over to a portable generator. Identify and label all conductors with Brady style labels.

R. Final as-built drawings shall be attached to the inside of the front panel door. A list of all legends shall be included.

S. All component parts in the control panel shall be permanently marked and identified as they are indicated on the drawings. Marking shall be on the back plate adjacent to the component. All control conductors shall be identified with wire markers at each end as close as practical to the end of conductor.

T. All panels shall be tested to the power requirements as shown on the plans to assure proper operation of all the components. Each control function shall be activated to check for proper indication.

U. Furnish all hazard identifications such as "Confined Space" and "High Voltage - Authorized Personnel Only" posted signs.

V. All control equipment shall be guaranteed for a period of three (3) years from the date shipment. The guarantee is effective against all defects in workmanship

and/or defective component. The warranty is limited to replacement or repair of the defective equipment.

W. Lift Station Control Panel, Motors and associated equipment shall be designed for 240V, 3 phase for motors 5HP and less. Lift Station Control Panel, Motors and associated equipment shall be designed for 480V, 3 phase for motors 7.5HP and greater. See drawings, consult with owner and electrical utility to confirm Lift Station Voltage.

2.06 Emergency Generator Connection

A. Furnish and install a manual transfer switch as shown on the Drawings and as specified herein. The manual transfer switch shall be Westinghouse MTSS, or approved equal, 2-pole, double throw, 100 amp, 600 volt, A.C., 60 hertz, NEMA 4X enclosure, with lockable devices (key lock), positive mechanical interlocking by means of a walking beam interlock, common load bus, solid neutral bar, auxiliary contact normal source, auxiliary contact for emergency source, indicating lights for each position.

B. Furnish and install emergency generator receptacle to match Hubbell connectors as shown and described on the Drawings.

2.07 Identification Sign

A. Provide red plastic engraved identification sign that is 8-1/2 inches wide by 6 inches tall. Sign text shall be white in color and minimum 1/2-inch high letters in Arial Black font. Coordinate sign text and lift station name with the County/City, e.g. "City of Connersville Sewer Utility, ____ Lift Station, In Case of Emergency Call Connersville Utilities 765-825-2158", including “No Public Access” sign per ADA code.

2.08 Fencing (as required by the County/City)

A. Provide a vinyl coated 6'-0" chain link fence with a #9 tension wire at the bottom of the fence. Refer also to standard detail for additional fence requirements.

B. Provide a 3'-0" pedestrian gate.

C. Provide a double gate for maintenance access. Size to be determined by Sanitary Sewer Supervisor or Utilities Administrator.

D. Alternate fencing products to be approved by the County/City.

2.09 Magnetic Flow Meter

A. When required per Section 1.02.H, a magnetic flow meter and an eccentric plug valve shall be installed on the discharge piping. A minimum clearance of twelve (12) inches shall be allowed between the top, bottom and all sides of the meter to allow maintenance. Provide ductile iron grooved joint spool piece for magnetic flow meter. Straight sections of pipe upstream and downstream of the magnetic flow meter shall be per manufacturer’s recommendation.

B. Provide magnetic flow meter that meets the following:

1. Size meter to maintain average velocity of 3 ft/sec.
2. System accuracy of +/- 5% of flow rate with 10:1 turndown.
3. Meter body shall include the following:
   a. Utilize low frequency dc pulse.
   b. Accidental submergence rating of 30 ft. water for 48 hours.
   c. Polyurethane or hard rubber liner, 316 stainless steel electrodes.
   d. Provide with 316 stainless steel grounding rings, use of grounding probes not acceptable.
   e. Suitable for Class 1, Division II, Hazardous classified location.
   f. Include isolating plug valves after meter body to facilitate meter removal.
   g. Maintain minimum of 5 upstream and 3 downstream unobstructed pipe diameters before and after meter body. Provide separate meter vault to meet dimensional requirement.
4. Transmitter:
   a. 120 VAC, 60 Hz power.
   b. For outdoor locations, mount on Pump Control Panel internal swing out panel.
   c. Provide pulsed DC voltage to meter body magnet coils.
   d. Integral keypad/display.
   e. Automatic empty pipe detection.
5. Acceptable magnetic flow meter manufactures include Sparling, Siemens or approved equal.

PART 3 - EXECUTION

3.01 Installation

A. All equipment shall be installed in accordance with the manufacturer's published instructions, and in accordance with all state and local codes, ordinances and regulations.

B. Terminate force main tracer wire in a manufactured test station box, Handley Industries model T4 or approved equal. Locate test station adjacent to lift station concrete pad.

C. Install level control device so that it is easily accessible and removable from the wet well hatch.

D. Prepare wet well surface for coating and install coatings per manufacturer's recommendations. Coat wet well walls and inside of cover entirely.

E. Coordinate with the County/City to determine antenna placement location. Bury all cables for antenna in rigid conduit.

F. Secure seal failure cable to power cord with wire ties to keep together from the pump into the conduit to the control panel.

G. The Contractor shall adjust, lubricate and leave the pumping system in proper working condition. Wrap excess cable in a neat, orderly fashion within the wet well.

H. Contractor shall provide spare parts to the County/City as described herein.

3.02 Backfill & Compaction

A. Backfill around wet well and around and under valve vault shall be compacted. Place fill in 6” to 8” maximum balanced lifts and compact each layer to 95% of Modified Proctor dry density in accordance with ASTM D-1557. Compaction of backfill shall be by hand tamping or approved mechanical tamping device. Perform compaction tests every two vertical feet and for every one hundred (100) square feet. Notify the County/City twenty-four (24) hours prior to the tests so they may be present for the compaction tests. Employ and pay for the services of an independent testing laboratory to perform field density tests to ensure that proper compaction is obtained. Submit compaction test results to the County/City.

3.03 Abandonment of Existing Lift Station

A. Remove all equipment, cap all piping, and remove structure and concrete pad to a minimum of 4 feet below finished grade.

B. Completely clean all structures. The County/City shall inspect all structures prior to backfill.

C. Return all equipment to the County/City.

3.04 Cleaning Up

A. Upon completion of work, the Contractor shall remove all construction equipment and temporary materials, and he shall also dispose of all rubbish and other unsightly debris caused by operations and shall leave the premises in as good or better condition than found.

B. Clean wet well via Vac-Truck prior to final inspection and acceptance by the County/City.

C. Clean lift station and all sewer lines of mud and gravel before testing of the lift station is performed.

3.05 Field Testing

A. Perform exfiltration testing for lift station wet well.

1. Plug all inlet lines before starting presoak period.
2. Presoak period shall be at least 4 hours.
3. Following presoak period, fill structure to a depth of 6 inches below the top structure joint.
4. Test period shall be 2 hours. A detectable leakage shall be corrected and retesting accomplished.

B. The manufacturer's representative shall perform a pumping test (utilizing water) of each new pump as soon as practical after the pumping equipment is installed. The Contractor is responsible for coordinating the testing of the pumps. The pumping test shall determine the capacity, discharge pressure, horsepower draw, and efficiency of each pumping unit under actual operating conditions. The duration of each pump test shall be at least ten (10) minutes of continuous operation. Include all as-installed test data and pump curves in Start-Up Certification Report.

C. Flow meters and pressure gauges installed as a part of the project shall be used to determine the pumping rates and pressures. The Contractor will not be required to install temporary flow meters and gauges for pump testing. Where flow meters are not provided, a wet-well draw down test shall be performed to verify pump performance.

D. Field testing shall be performed after discharge piping is installed and shall include the following:

1. The pump shall be visually inspected to confirm that it is built in accordance with specification as to horsepower, voltage, phase and hertz.
2. The motor seal and housing chambers shall be meggered for infinity to test for moisture content and/or insulation defects.
3. Pump shall be allowed to run dry to check for proper rotation.
4. Discharge piping shall be attached, the pump submerged in water, and amp readings shall be taken in each leg to check for an imbalanced stator winding. If there is a significant difference in readings, the stator windings shall be checked with a bridge to determine if an unbalanced resistance exists. If so, the stator shall be replaced.
5. The pump shall be removed from the water, meggered again, dried and the motor housing filled with dielectric oil.

E. Defects in the new equipment or failure to meet the specified performance shall be corrected by the Contractor. The County/City reserves the right to reject the pump if the Contractor fails or refuses to make the corrections required to meet the specified performance; or the improved pumping units, when tested, fail to meet the specified performance.

3.06 Manufacturer's Service and Start-Up Certification Report

A. Notify the County/City a 72 hours in advance (not including weekends or holidays) of start-up operation.

B. The Contractor shall provide the services of a qualified representative of the pump manufacturer for a minimum of one day per pump station to perform the following tasks:

1. Inspect the installation of the equipment.
2. Place the equipment in operation and make any necessary adjustments.
3. Perform Field Tests specified above.

4. Perform tests specified in this Section and recommended by the equipment manufacturer.
5. Instruct the County/City 's personnel in the proper operation and maintenance (O&M) of the equipment (8 hours of training).

C. If equipment is not completed for proper start-up and training procedures, the representative shall reschedule another visit at no additional cost to the County/City. Training will not be permitted without proper start-up and testing tasks. An abstract or outline of the start-up, testing, and training procedures shall be provided to the County/City at least 5 days prior to the scheduled visit. Manufacturer's operation and maintenance manuals and materials shall be incorporated in the training procedures, with emphasis on items or materials of greatest importance.

D. A typed, bound report covering the manufacturer's representative's findings shall be submitted to the Wastewater Superintendent of the City of Connersville for review and approval. The report shall (1) describe the start-up procedures taken; (2) include any inspections performed; (3) outline in detail any deficiencies observed along with the corrective measures taken; and (4) include the results of all field tests, including necessary graphs, charts, tables, etc., specified in this Section or required by the referenced standards. The report shall certify that the equipment is properly installed and functioning for the purpose intended. The report must be received and reviewed by the County/City prior to the equipment being put into permanent operation.

E. The Contractor shall bear all expenses associated with the start-up, testing, and training procedures and report described above, including labor, transportation, lodging, and material costs.

3.07 As-Builts

A. “As-built” drawings required to be prepared and submitted to the County/City in accordance with Section 01010.

DATA SHEET

SUBMERSIBLE SEWAGE CENTRIFUGAL CHOPPER PUMPS

A. Raw Sewage Pumps

1. TITLE: _____
2. LOCATION: _____
3. QUANTITY: _____
4. OPERATING CONDITIONS: The pumps shall operate within the entire pumping range specified without cavitation and exceeding the vibration limits established by the Hydraulic Institute.

   a. Material to be Pumped: Raw sewage within temperature range of 33°- 80°F.

   b. Pump Curve:

Condition	Discharge Rate	TDH	Overall Efficiency
1st Curve Point	gpm	ft	%
2nd Curve Point	gpm	ft	%
3rd Curve Point	gpm	ft	%

   A single pump shall be able to pump _____ gpm at _____ TDH at _____ Hz and _____ % pump efficiency.

   Two pumps in parallel shall pump _____ gpm at _____ TDH at _____ Hz and _____ % pump efficiency.

5. SPECIFICATIONS:

   a. Type: Submersible Chopper
   b. Minimum Sphere Diameter: _____
   c. Pump Speed: _____ rpm
   d. Discharge Connection: ____ inches
   e. Impeller Material: _____
   f. Impeller Diameter: ____ inches
   g. Motor Data:
      1) Horsepower: _____ hp
      2) Speed: _____ rpm
      3) Voltage: _____ V
      4) Phase: 3
      5) Hertz: 60
      6) Service Factor: 1.15

6. MANUFACTURERS: Vaughan Chopper Pumps

-END-

SECTION 02742 – SANITARY WASTE INTERCEPTORS

PART 1 - GENERAL

1.01 Summary

A. Section Includes: Furnishing and installing sanitary waste interceptors and separators.

B. Related Sections

1. Section 02220 - Trenching, Backfilling and Compacting for Utilities
2. Section 02730 – Gravity Sanitary Sewer Systems

1.02 References

A. American Society of Mechanical Engineers (ASME), latest editions

1. ASME A112.14.3 - Hydromechanical Grease Interceptors
2. ASME A112.14.4 - Grease Removal Devices
3. ASME A112.14.6 - FOG (Fats, Oils, and Greases) Disposal Systems

B. Plumbing and Drainage Institute (PDI), latest editions

1. PDI G101 - Testing and Rating Procedure for Hydro Mechanical Grease Interceptors
2. PDI G101 - Testing and Rating Procedure for Hydro Mechanical Grease Interceptors

C. American Society for Testing and Materials (ASTM), latest editions

1. ASTM C1613 - Standard Specification for Precast Concrete Grease Interceptor Tanks

D. Indiana Plumbing Code, latest edition

E. International Plumbing Code, latest edition

F. Uniform Plumbing Code, latest edition

1.03 Submittals

A. Shop Drawings, as applicable.

B. Sizing Calculations for Hydromechanical Grease Interceptors, Gravity Grease Interceptors, and/or Oil Separators

1.04 Applicability

A. Grease Interceptors – A Grease interceptor shall be required to receive the drainage from fixtures and equipment with grease-laden waste located in food preparation areas, such as in restaurants, hotel kitchens, hospitals, school kitchens, bars, factory cafeterias and clubs.

B. Oil Separator – Repair garages and gasoline stations with grease racks or grease pits, and factories that have oily, flammable, or both types of wastes as a result of manufacturing, storage, maintenance, repair, or testing processes, shall be provided with an oil or flammable liquid interceptor that shall be connected to necessary floor drains.

PART 2 - PRODUCTS

2.01 Hydromechanical Grease Interceptors, Gravity Grease Interceptors, and Oil Separators shall conform to the following requirements.

A. Sizing Requirements – Sizing methods described herein are intended as guidance in determining grease trap / interceptor / oil separator sizes that will afford the sanitary sewer system a minimum degree of protection against grease, oil, and other obstructing materials. Sizing determinations are based on operational data provided by business owners or their contractors. In approving a customer's interceptor or separator design, the County/City does not accept liability for the failure of a system to adequately treat wastewater to achieve effluent quality requirements. It is the responsibility of the generator and/or contractors to ensure the appropriate level of treatment necessary for compliance with environmental and wastewater regulations.

1. Hydromechanical Grease Interceptors and Gravity Grease Interceptors
    a. Minimum acceptable interceptor sizing shall be in accordance with one of the following:
        1) International Plumbing Code;
        2) Uniform Plumbing Code;
        3) Alternative Method Supplied by Professional Engineer or Master Plumber
2. Oil Separators
    a. Design, size, and location of pretreatment devices must be in accordance with the International Plumbing Code or the Uniform Plumbing Code and submitted by a licensed plumbing contractor or professional engineer for review and approval.

B. Adequate structural strength shall be provided to accommodate vehicular traffic where applicable.

PART 3 - EXECUTION

3.01 Existing Waste Interceptors

A. Existing interceptors and/or oil separators shall be approved by the County/City prior to occupancy.

1. Sizing calculations of existing interceptors/separators shall be submitted to County/City for review and approval.
2. Existing interceptors/separators shall be cleaned prior to County/City inspection.

3.02 Installation Requirements

A. Interceptors and/or oil separators shall be approved by the County/City prior to installation.

B. Install Grease Interceptors and Oil Separators in accordance with the manufacturer’s recommendations.

C. Follow manufacturer's installation instructions when installing pipe, fittings, structures, and appurtenances.

3.03 Testing Requirements

A. Grease interceptor installation and testing procedures shall follow ASTM C1613 Standard Specification for Precast Concrete Grease Interceptor Tanks, or the Plumbing and Drainage Institute PDI G101 Testing and Rating Procedure for Hydro Mechanical Grease Interceptors, and the manufacturer’s recommendations.

3.04 Maintenance

A. Interceptors/separators shall be maintained in efficient operating condition by periodic removal of accumulated grease, scum, oil, or other floating substances and solids deposited in the interceptor/separator.

B. interceptors shall generally be pumped out by a permitted hauler once it becomes 25% full of solids and grease and at a minimum, every 3 to 6 months.

3.05 As-Builts

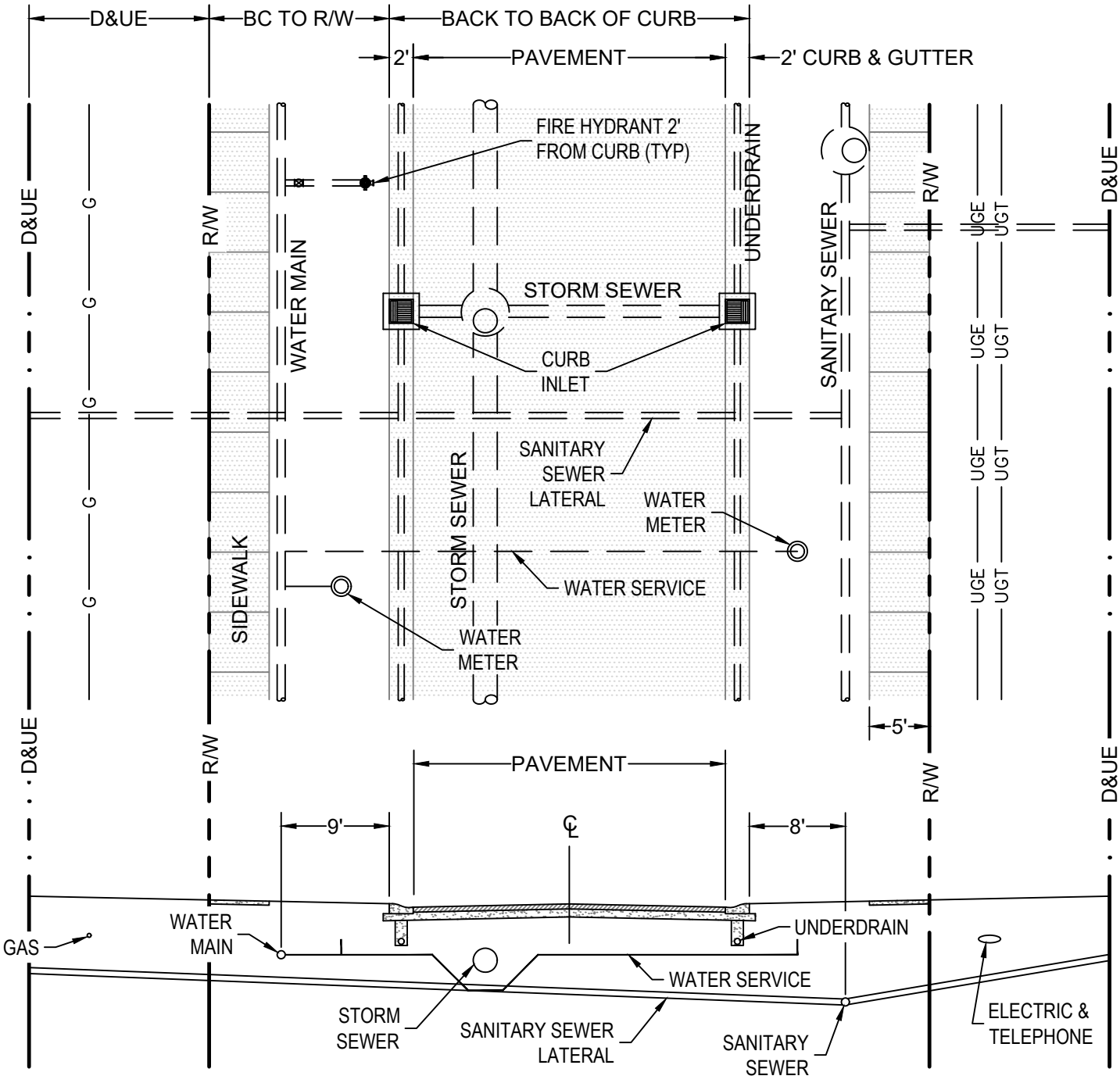
A. “As-built” drawings required to be prepared and submitted to the County/City in accordance with Section 01010.

-END-

STANDARD DETAILS

GE - GENERAL

TABLE OF CONTENTS



NOTES:

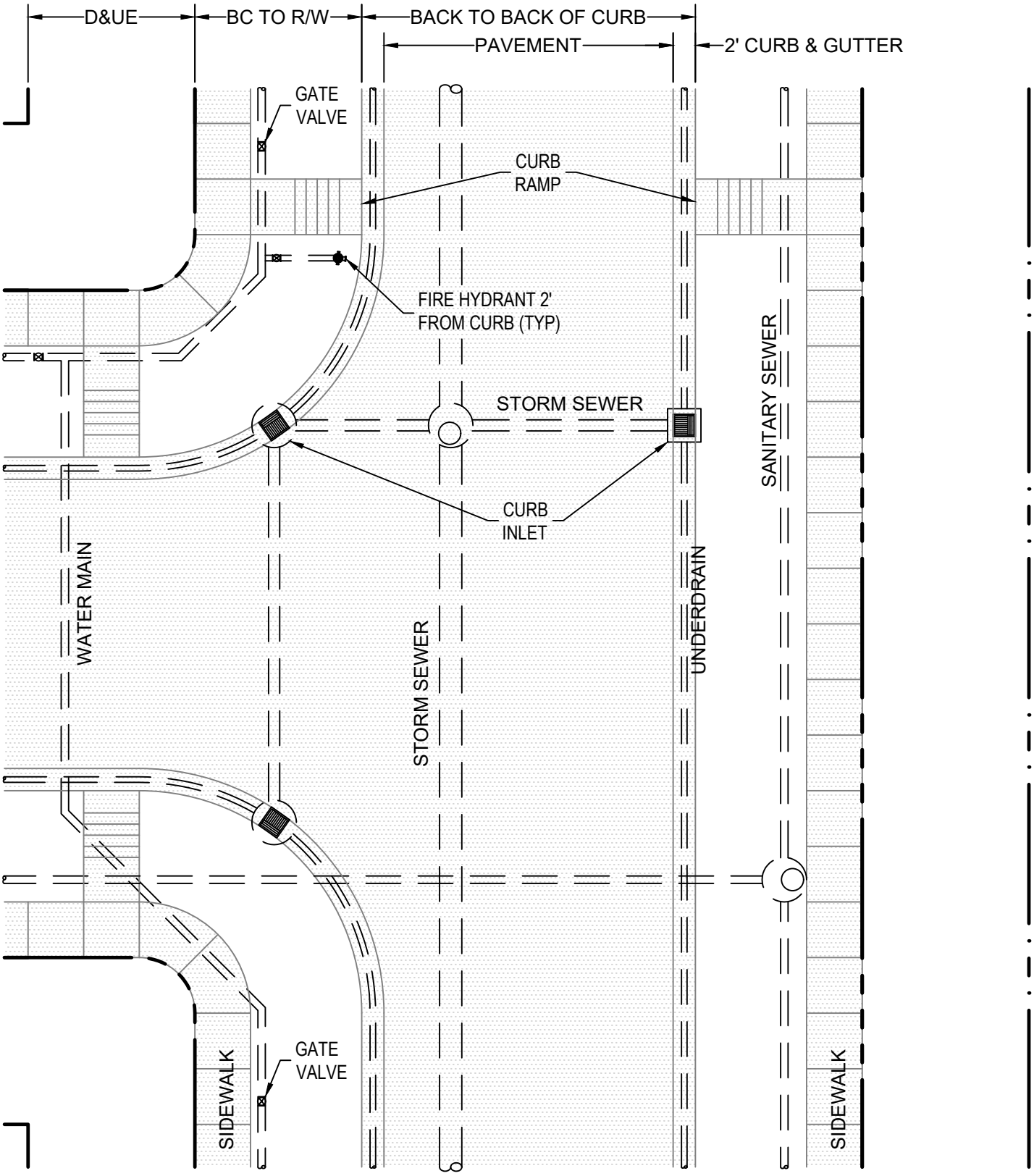
1. THE UTILITY LOCATIONS SHOWN ARE TYPICAL. ACTUAL LOCATIONS WILL VARY DEPENDING ON PROJECT. ALTERNATE UTILITY LOCATIONS FROM THAT SHOWN ABOVE SHALL BE APPROVED BY THE CITY/COUNTY.
2. LOCATE ALL PRIVATE UTILITIES OUTSIDE OF PUBLIC RIGHT-OF-WAY.
3. TERMINATE PRIVATE SANITARY SEWER LATERALS AT THE DRAINAGE & UTILITY EASEMENT (D&UE).

GENERAL UTILITY LOCATION PLAN & SECTION

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. GE-01
DATE: SEP 2023



NOTES:

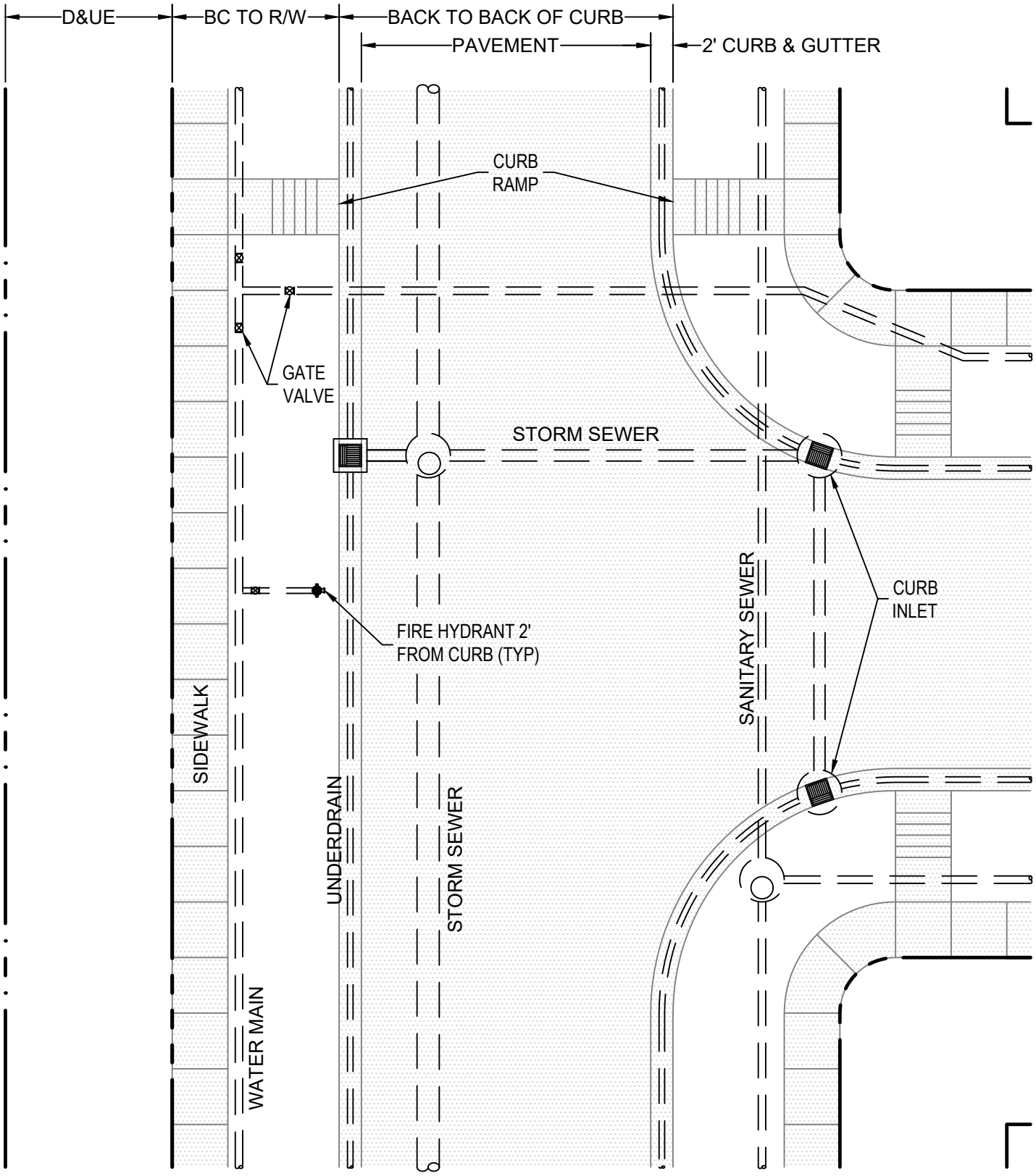
1. THE UTILITY LOCATIONS SHOWN ARE TYPICAL. ACTUAL LOCATIONS WILL VARY DEPENDING ON PROJECT. ALTERNATE UTILITY LOCATIONS FROM THAT SHOWN ABOVE SHALL BE APPROVED BY THE CITY/COUNTY.

GENERAL UTILITY LOCATION PLAN - T INTERSECTION 1

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. GE-02
DATE: SEP 2023



NOTES:

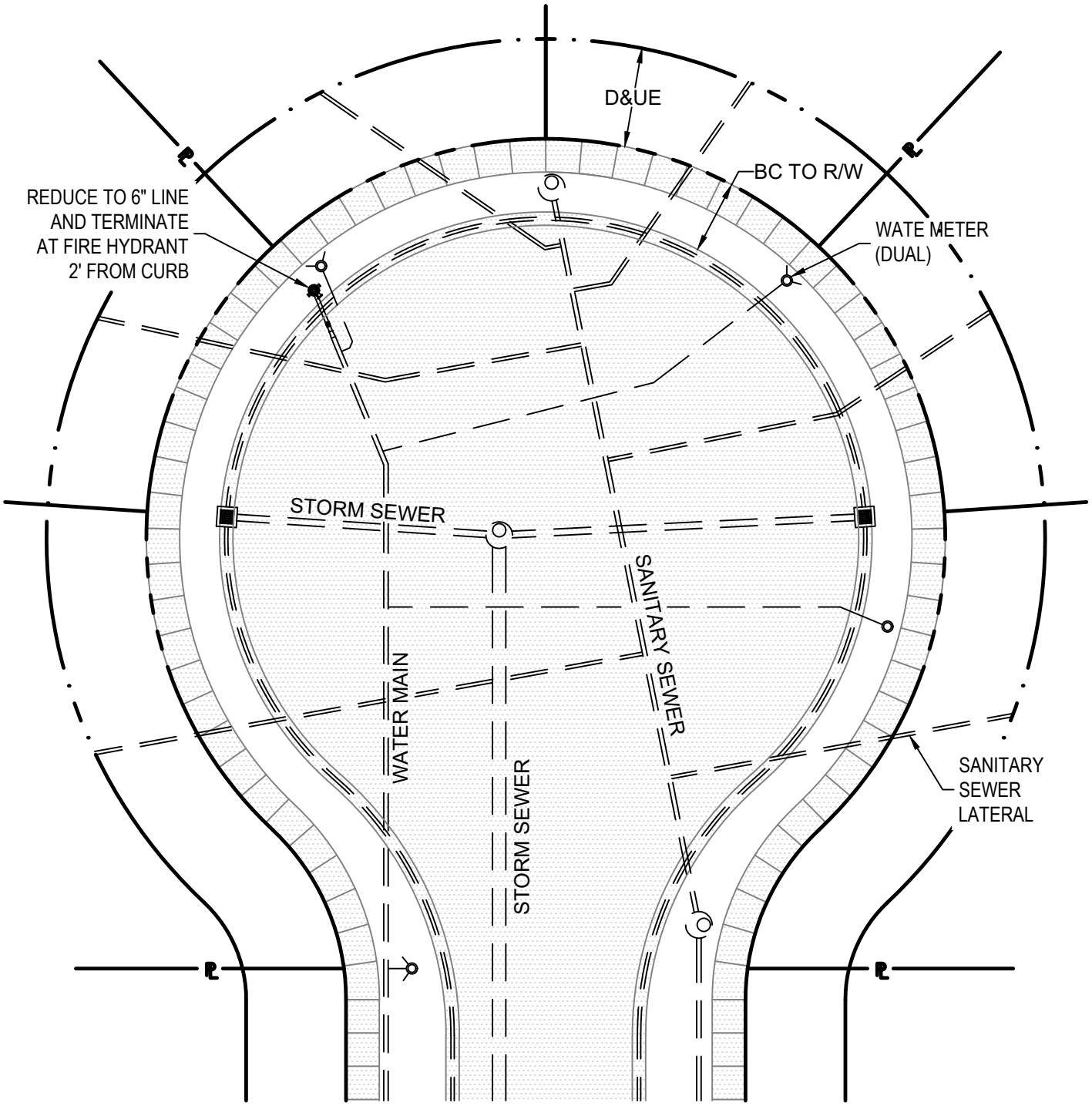
1. THE UTILITY LOCATIONS SHOWN ARE TYPICAL. ACTUAL LOCATIONS WILL VARY DEPENDING ON PROJECT. ALTERNATE UTILITY LOCATIONS FROM THAT SHOWN ABOVE SHALL BE APPROVED BY THE CITY/COUNTY.

GENERAL UTILITY LOCATION PLAN - T INTERSECTION 2

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. GE-03
DATE: SEP 2023



NOTES:

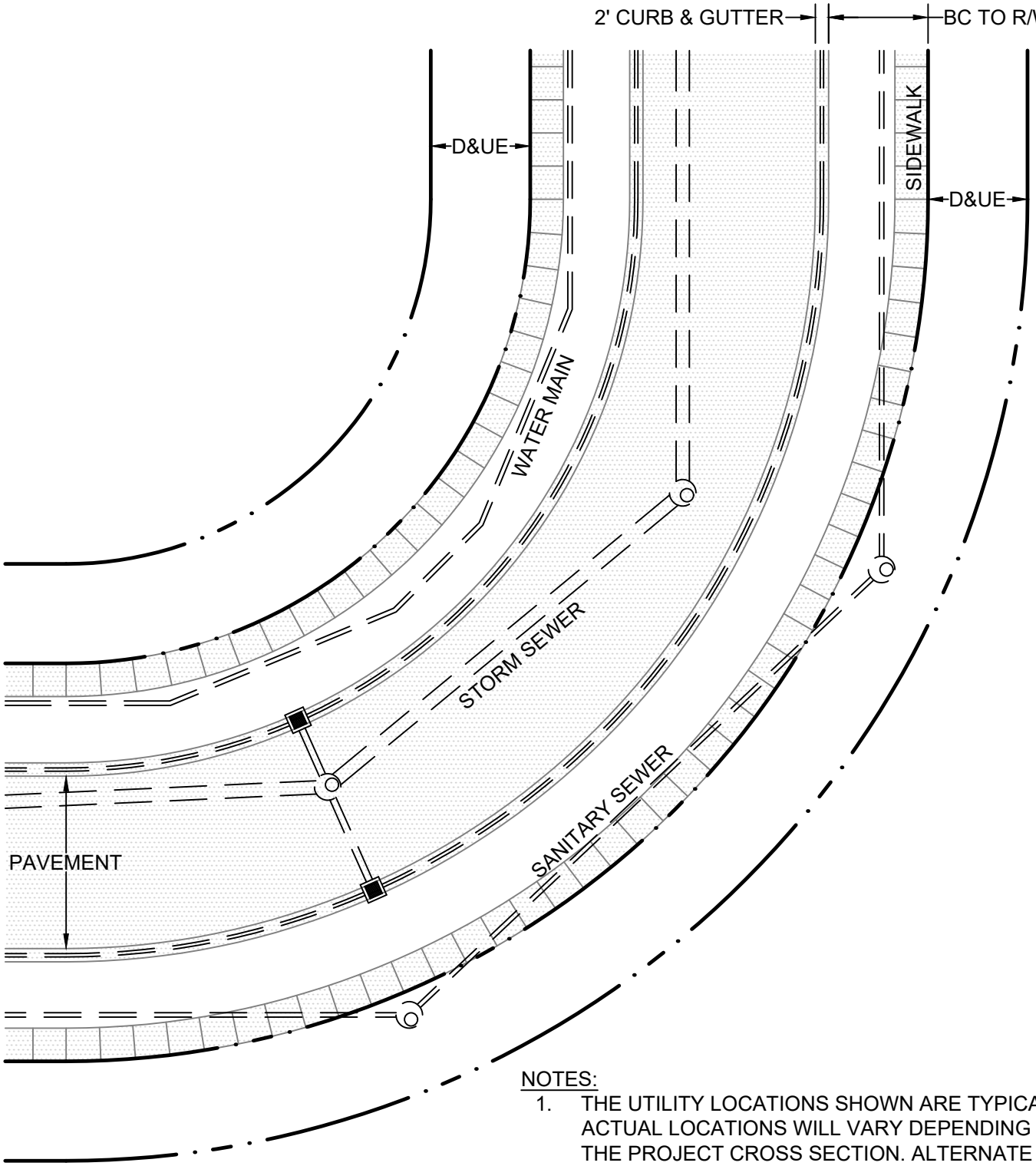
1. THE UTILITY LOCATIONS SHOWN ARE TYPICAL. ACTUAL LOCATIONS WILL VARY DEPENDING ON PROJECT. ALTERNATE UTILITY LOCATIONS FROM THAT SHOWN ABOVE SHALL BE APPROVED BY THE CITY/COUNTY.

GENERAL UTILITY LOCATION PLAN - CUL-DE-SAC

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. GE-04
DATE: SEP 2023



NOTES:

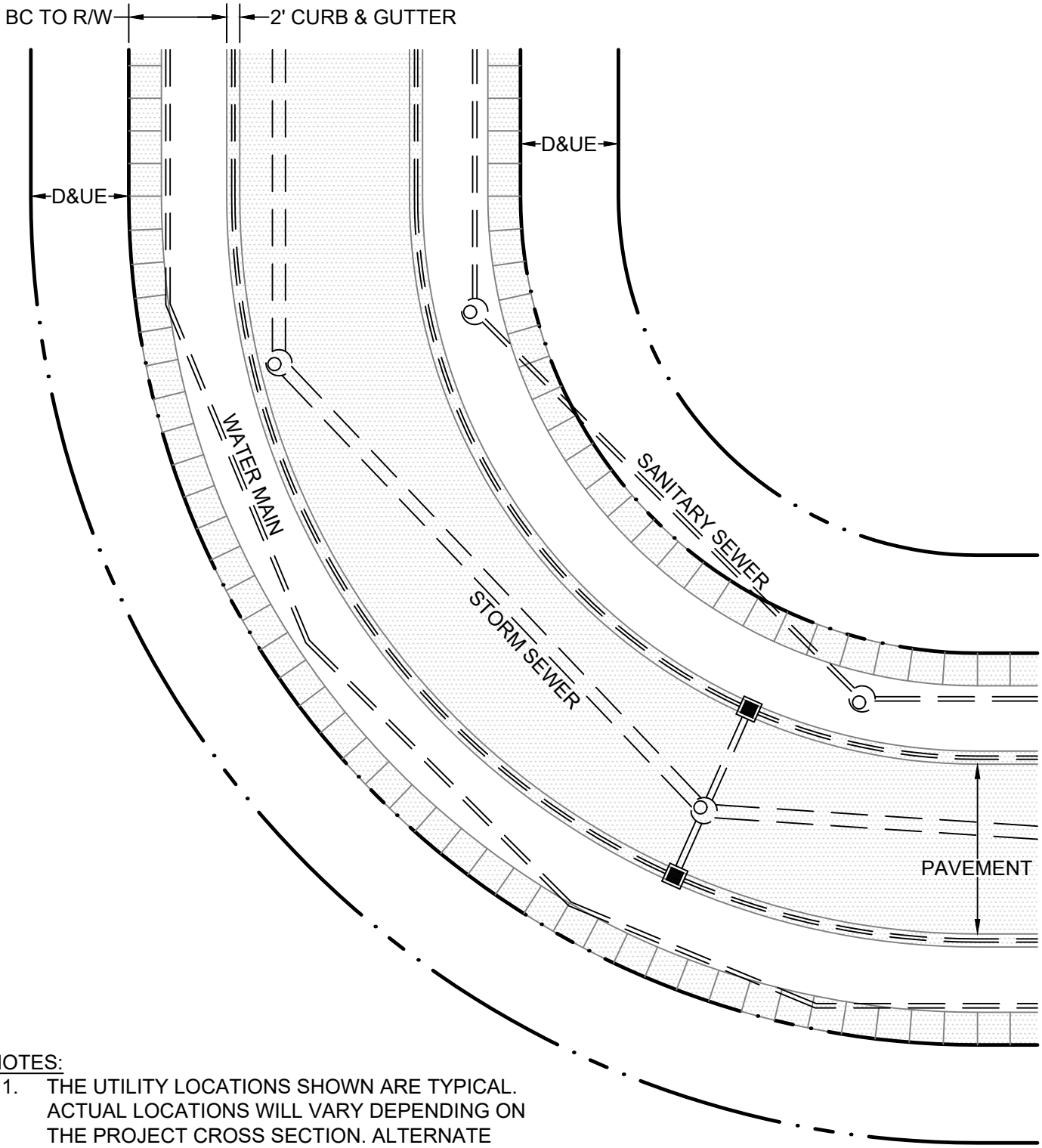
1. THE UTILITY LOCATIONS SHOWN ARE TYPICAL. ACTUAL LOCATIONS WILL VARY DEPENDING ON THE PROJECT CROSS SECTION. ALTERNATE UTILITY LOCATIONS FROM THAT SHOWN ABOVE SHALL BE APPROVED BY THE CITY/COUNTY.

GENERAL UTILITY LOCATION PLAN - CURVE 1

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. GE-05
DATE: SEP 2023



NOTES:

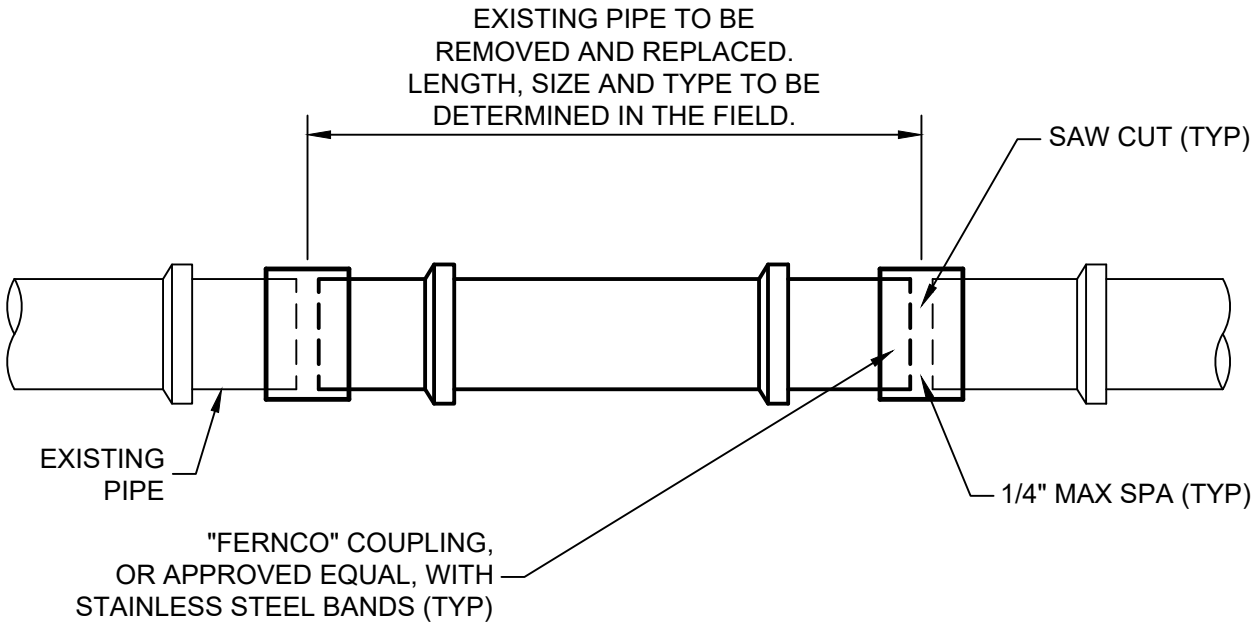
1. THE UTILITY LOCATIONS SHOWN ARE TYPICAL. ACTUAL LOCATIONS WILL VARY DEPENDING ON THE PROJECT CROSS SECTION. ALTERNATE UTILITY LOCATIONS FROM THAT SHOWN ABOVE SHALL BE APPROVED BY THE CITY/COUNTY.

GENERAL UTILITY LOCATION PLAN - CURVE 2

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. GE-06
DATE: SEP 2023

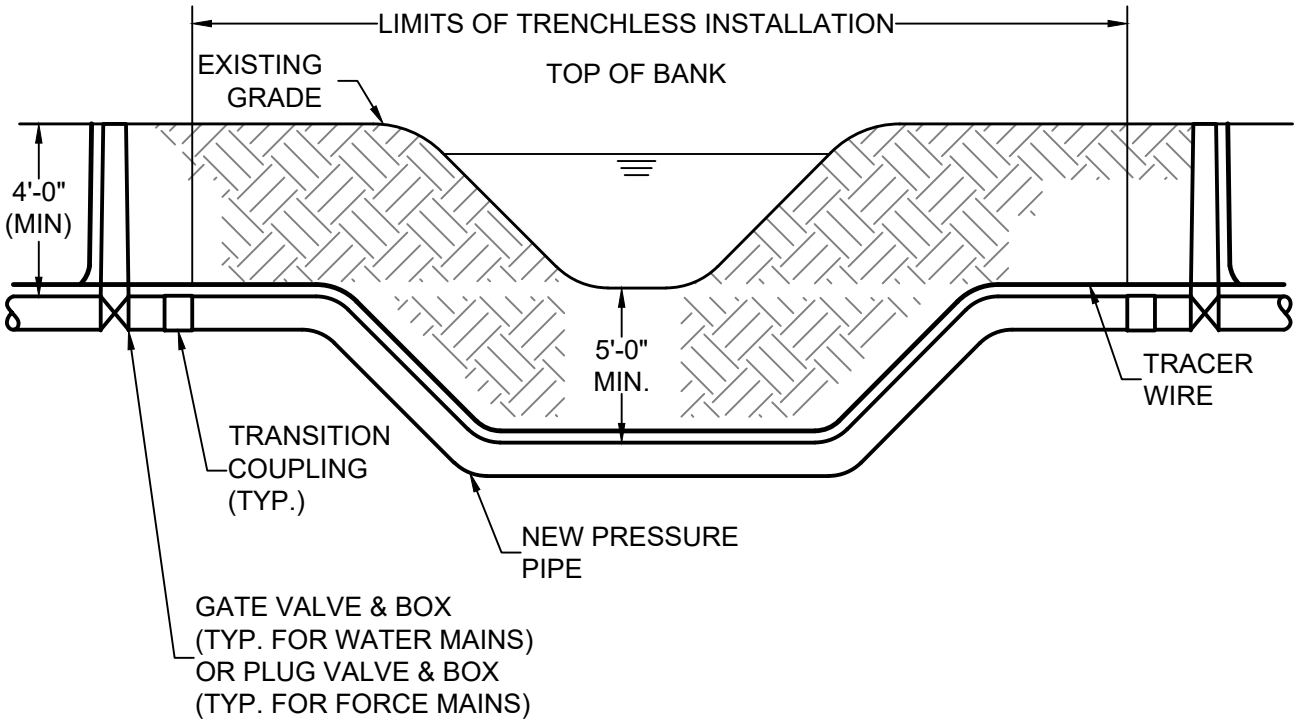


GRAVITY SEWER REPAIR

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. GE-07
DATE: SEP 2023



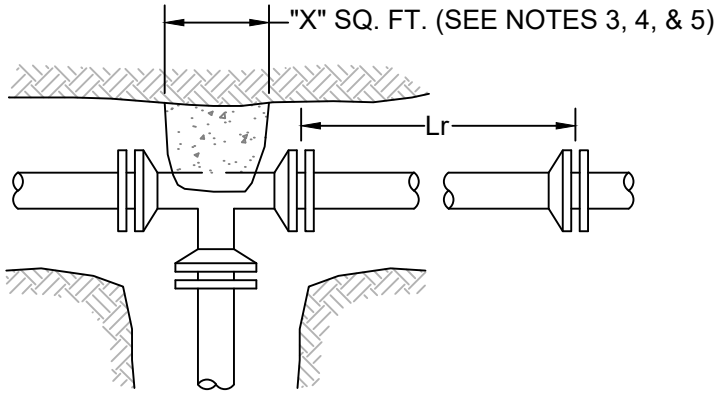
PRESSURE PIPE CROSSING WATERWAY

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. GE-08
DATE: SEP 2023

MINIMUM LENGTH OF RESTRAINED JOINT P.V.C. PIPE EACH SIDE OF FITTING (FEET)					
PIPE SIZE	**6"**	**8"**	**10"**	**12"**	**16"**
DEAD END WITH THRUST BLOCK (SEE NOTE 4)	37	46	54	61	76
HORIZONTAL 90° OR VERTICAL 45° DOWN	18	23	27	31	38
HORIZONTAL 45° OR VERTICAL 22 1/2° DOWN	9	11	13	15	18
HORIZONTAL 22 1/2° OR VERTICAL 11 1/4° DOWN	5	6	7	8	9
HORIZONTAL 11 1/4°	2	2	3	3	4
TEE WITH THRUST BLOCK (SEE NOTE 4)					
2 < Lr < 5	29	38	46	54	69
5 < Lr < 10	17	27	35	43	58
Lr > 10	0	8	17	25	41



NOTES:

1. LENGTH OF RESTRAINT MEASURED FROM CENTERLINE OF FITTING REQUIRING RESTRAINT. LENGTH OF RESTRAINT FOR VERTICAL BENDS UP ARE EQUAL TO THAT FOR HORIZONTAL BENDS.
2. LENTGH OF RESTRAINT BASED UPON 48" COVER, 150 PSI PRESSURE, AND ASTM 2487 SOIL TYPES CL, ML, SC, SM, SP, SW, GC, GM, GP, & GW. FOR LESS COVER, HIGHER PRESSURE, OR ASTM D2487 SOIL TYPES PT, OH, CH, MH, & OL, CONSULT CONNERSVILLE UTILITIES.
3. CONCRETE THRUST BLOCKS IN LIEU OF MECHANICAL RESTRAINT MAY BE USED ONLY WITH THE WRITTEN APPROVAL OF CONNERSVILLE UTILITIES.
4. 90° BENDS, TEES AND DEAD-END CROSSES REQUIRE CONCRETE THRUST BLOCKS IN ADDITION TO BRANCH RESTRAINT LENGH. "X" AREA FOR CONCRETE THRUST BLOCKS PER DETAIL SHALL BE AS FOLLOWS: 8, 13, 19, 27, & 44 SQUARE FEET FOR 6, 8, 10, 12, & 16 IN PIPE, RESPECTIVELY. OTHER THAN RESTRAINT OF MJ FITTINGS ADJACENT TO TEE, NO RUN RESTRAINT LENGTH IS REQUIRED.
5. CONCRETE SHALL NOT BE ALLOWED TO COME IN CONTACT WITH ANY JOINT, FLANGES, GASKETS, BOLTS OR NUTS. FOUR MIL HIGH DENSITY POLYETHYLENE PLASTIC SHALL BE USED TO COVER ALL FITTINGS, PIPING AND VALVES PRIOR TO POURING THE THRUST BLOCK.
6. REFER TO COUNTY/CITY STANDARD SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

PRESSURE PIPE JOINT RESTRAINT

SCALE: NONE

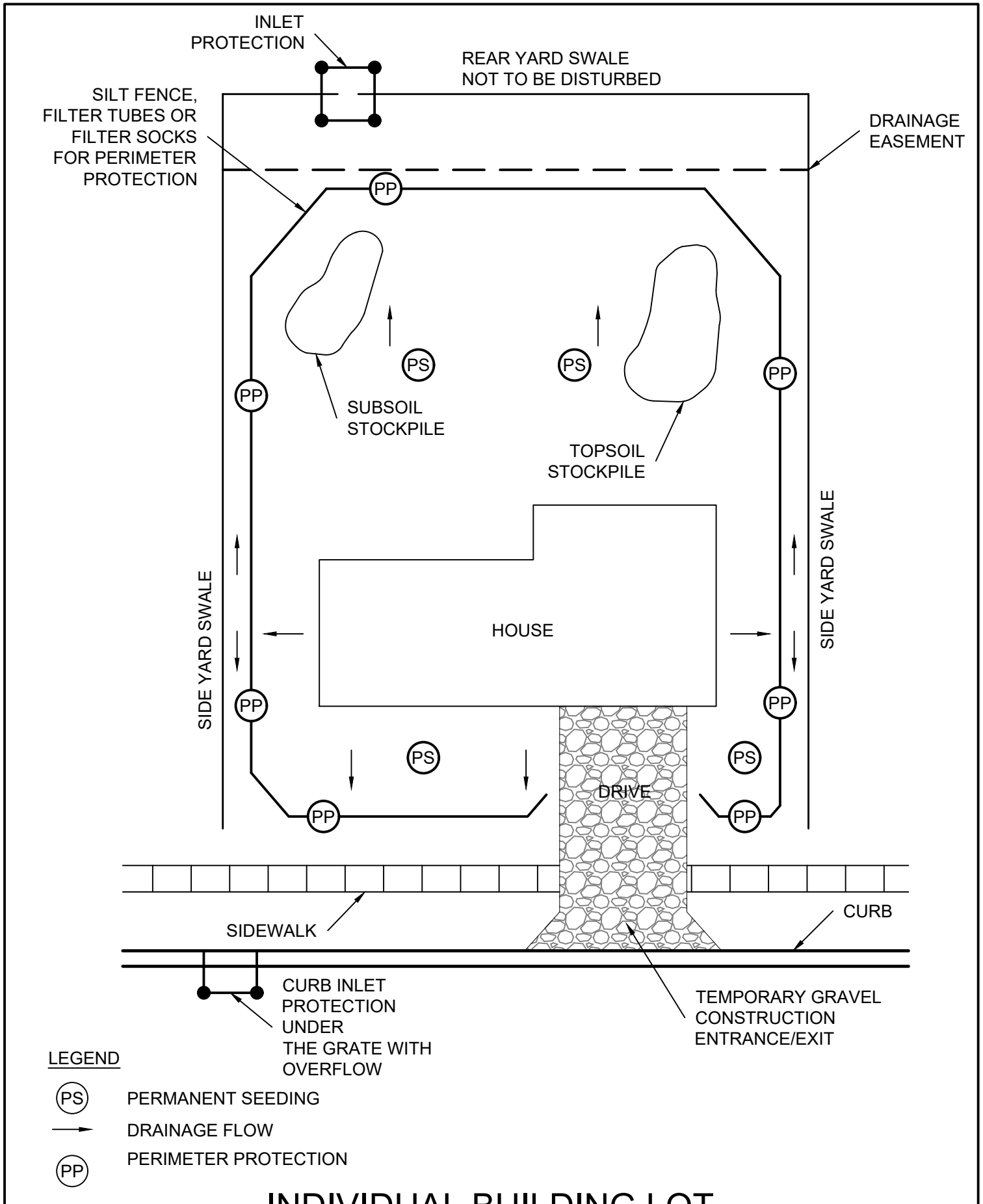
FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. GE-09
DATE: SEP 2023

STANDARD DETAILS

EC – EROSION AND SEDIMENT CONTROL

TABLE OF CONTENTS

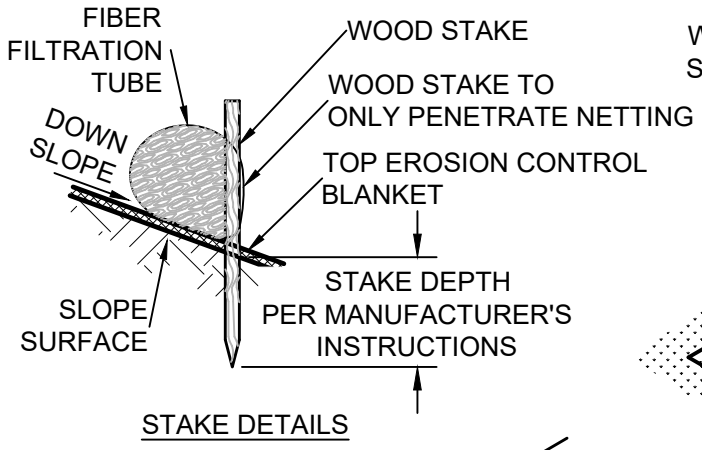


INDIVIDUAL BUILDING LOT

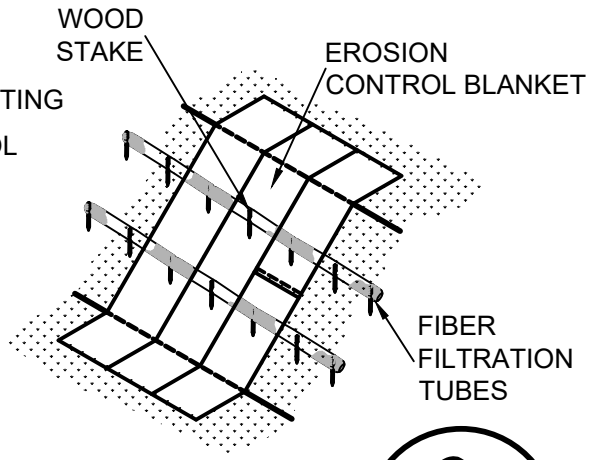
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

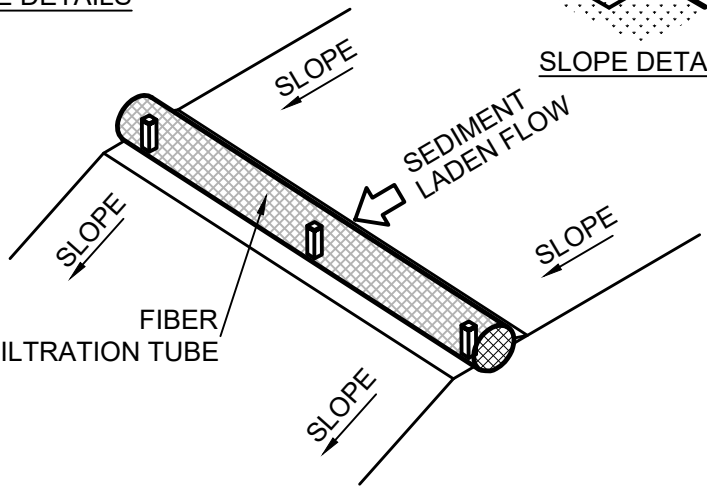
DETAIL NO. EC-01
DATE: SEP 2023

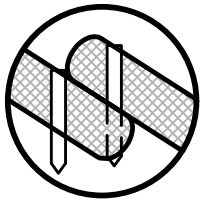


STAKE DETAILS



SLOPE DETAIL





VIEW OF
OVERLAPPED TUBES

APPLICATIONS:

1. TOP OF SLOPES.
2. AT PROJECT PERIMETER.

INSTALLATION:

1. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
2. USE THE APPROPRIATE SIZE, LENGTH AND DISTANCE BETWEEN TUBES AS SPECIFIED BY THE MANUFACTURER.
3. ENTRENCH PER MANUFACTURER'S INSTRUCTIONS.

MAINTENANCE:

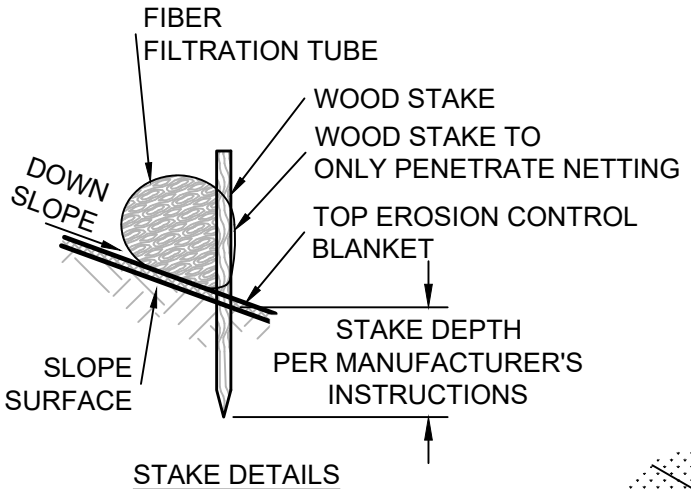
1. REMOVE ALL ACCUMULATED SEDIMENT WHEN IT REACHES 1/4 THE HEIGHT OF THE TUBE.
2. REPAIR ERODED AND DAMAGED AREAS.
3. IF PONDING BECOMES EXCESSIVE DUE TO REDUCED FILTERING CAPACITY, REMOVE THE TUBE AND EITHER RECONSTRUCT OR REPLACE WITH NEW PRODUCT.
4. INSPECT WITHIN 24 HOURS OF A RAIN EVENT AND AT LEAST ONCE EVERY 7 CALENDAR DAYS.

FIBER FILTRATION TUBES - SLOPE

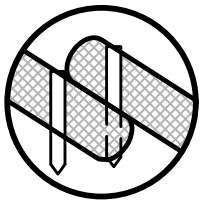
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

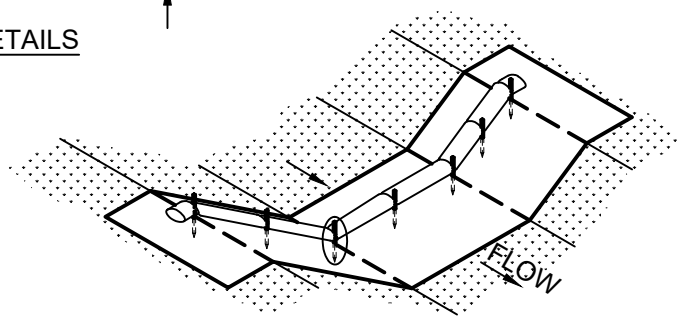
DETAIL NO. EC-02
DATE: SEP 2023



STAKE DETAILS



VIEW OF
OVERLAPPED TUBES



CHANNEL DETAIL

APPLICATIONS:

1. DOWN-GRADIENT OF A PROJECT LIMITS.
2. ACROSS DITCHES OR SWALES.
3. TO SLOW FLOWS AND FILTER SEDIMENTS.

INSTALLATION:

1. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
2. USE THE APPROPRIATE SIZE, LENGTH AND DISTANCE BETWEEN TUBES AS SPECIFIED BY THE MANUFACTURER.
3. ENTRENCH PER MANUFACTURER'S INSTRUCTIONS.

MAINTENANCE:

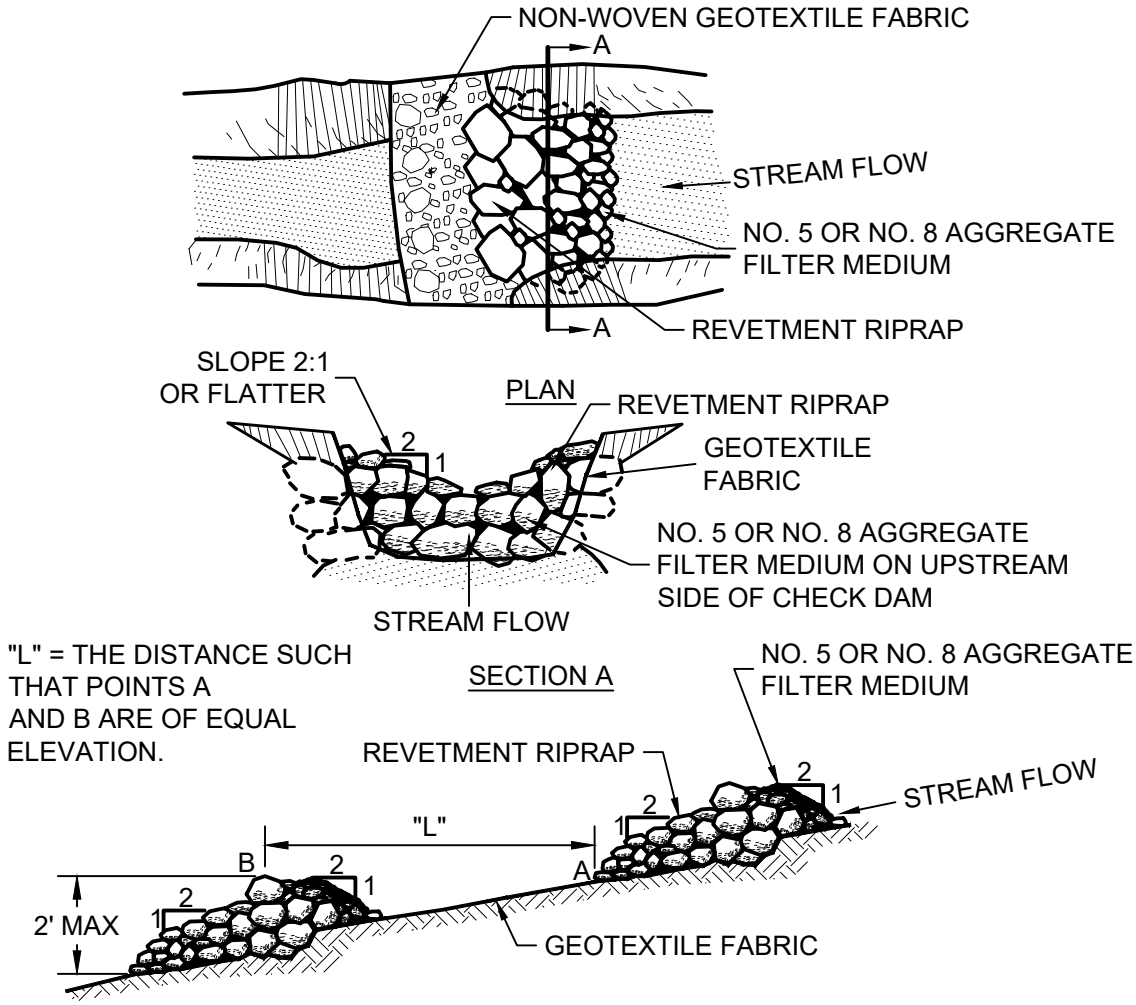
1. REMOVE ALL ACCUMULATED SEDIMENT WHEN IT REACHES 1/4 THE HEIGHT OF THE TUBE.
2. REPAIR ERODED AND DAMAGED AREAS.
3. IF PONDING BECOMES EXCESSIVE DUE TO REDUCED FILTERING CAPACITY, REMOVE THE TUBE AND EITHER RECONSTRUCT OR REPLACE WITH NEW PRODUCT.
4. INSPECT WITHIN 24 HOURS OF A RAIN EVENT AND AT LEAST ONCE EVERY 7 CALENDAR DAYS.

FIBER FILTRATION TUBES - CHANNEL

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. EC-03
DATE: SEP 2023



NOTES:

1. SPACE CHECK DAMS AS SHOWN IN SITE EROSION CONTROL PLAN.
2. INSTALL AN EROSION RESISTANT LINING IN THE CHANNEL BELOW THE LOWER MOST DAM THAT EXTENDS A MINIMUM OF 6' DOWNSTREAM.

MAINTENANCE:

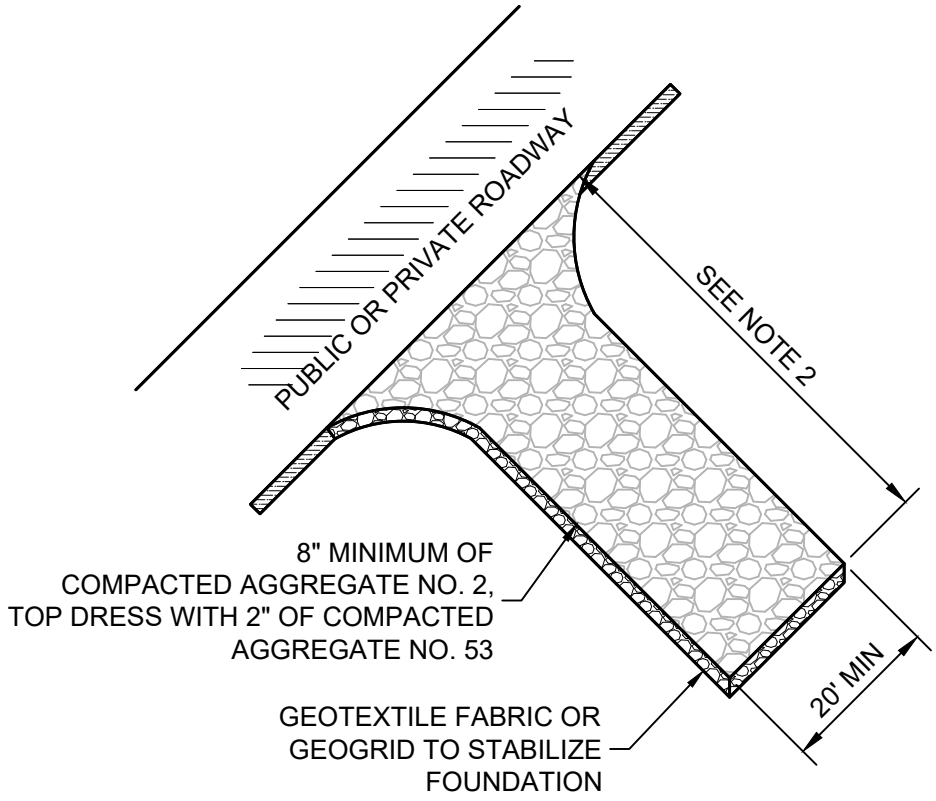
1. INSPECT WITHIN 24 HOURS OF EACH RAIN EVENT AND AT LEAST ONCE EVERY 7 CALENDAR DAYS.
2. REMOVE ACCUMULATED SEDIMENT WHEN IT REACHES 1/2 THE HEIGHT OF THE DAM.
3. ADD RIPRAP AND AGGREGATE AS NEEDED.
4. WHEN DAMS ARE NO LONGER NEEDED, REMOVE RIPRAP AND AGGREGATE, AND STABILIZE THE CHANNEL.

RIPRAP CHECK DAM

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. EC-04
DATE: SEP 2023



NOTES:

1. PLACE CONSTRUCTION ENTRANCE AS SHOWN ON THE PLANS AND AT ALL TEMPORARY CONSTRUCTION DRIVES THAT ARE INSTALLED.
2. FOR LARGE SITES (2 ACRES OR LARGER) THE MINIMUM LENGTH IS 150'. FOR SMALLER SITES (LESS THAN 2 ACRES) THE MINIMUM LENGTH IS 50'.
3. PROVIDE CULVERT OR OTHER METHODS AS NECESSARY TO MAINTAIN POSITIVE DRAINAGE.

MAINTENANCE:

1. INSPECT DAILY AND REPLACE DISPLACED STONE.
2. IMMEDIATELY REMOVE MUD AND SEDIMENT TRACKED ONTO ADJACENT ROADWAY.
3. RESHAPE PAD AS NEEDED FOR DRAINAGE AND RUNOFF CONTROL.
4. AT COMPLETION OF PROJECT COMPLETELY REMOVE AND RESTORE SITE TO ORIGINAL CONDITIONS, OR AS APPLICABLE USE FOR BASE OF NEW PERMANENT DRIVE, MAINTAINING DESIGN ELEVATIONS AND SECTION.

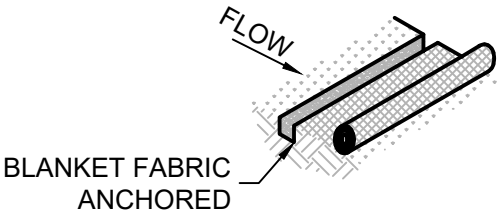
CONSTRUCTION ENTRANCE

SCALE: NONE

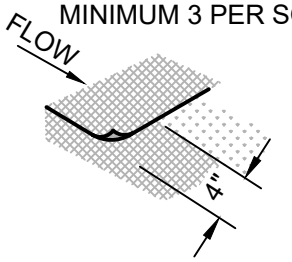
FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. EC-05
DATE: SEP 2023

① BURY UPSLOPE END OF BLANKET IN A TRENCH 6" DEEP BY 6" WIDE.

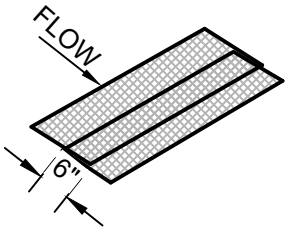


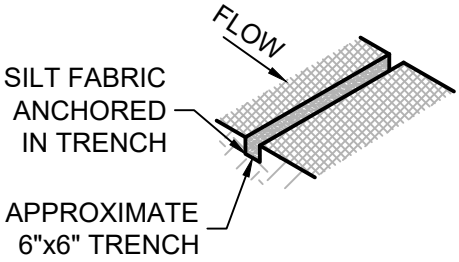
② USE A 4" OVERLAP WHEREVER TWO WIDTHS OF BLANKET ARE APPLIED SIDE BY SIDE. STAPLE PATTERN: MINIMUM 3 PER SQUARE YARD.

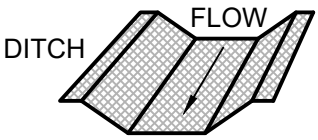


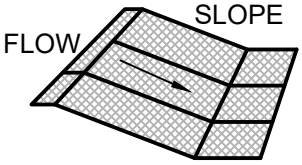
③ USE A 6" OVERLAP WHEREVER ONE ROLL OF BLANKET ENDS AND ANOTHER BEGINS.

④ CHECK SLOTS SHOULD BE MADE EVERY 18'. INSERT A FOLD OF THE BLANKET INTO A TRENCH 6" WIDE BY 6" DEEP AND TAMP FIRMLY. LAY THE BLANKET SMOOTHLY ON THE SURFACE OF THE SOIL: DO NOT STRETCH THE BLANKET, AND DO NOT ALLOW WRINKLES. INSTALL STAPLE 20" ON CENTER IN TRENCH.









PLACE BLANKET PARALLEL TO THE DIRECTION OF FLOW. DO NOT JOIN STRIPS IN THE CENTER OF THE DITCH. USE CHECK SLOTS AS REQUIRED.

PLACE BLANKET PARALLEL TO THE DIRECTION OF FLOW AND ANCHOR SECURELY. BRING BLANKET TO A LEVEL AREA BEFORE TERMINATING THE INSTALLATION.

PRODUCT:

1. NORTH AMERICAN GREEN SC150, OR EQUAL.

NOTES:

1. PROTECT THE SLOPES WITH AN EROSION CONTROL BLANKET WHERE CONSTRUCTION DISTURBS SLOPES EQUAL OR STEEPER THAN 3:1.

MAINTENANCE:

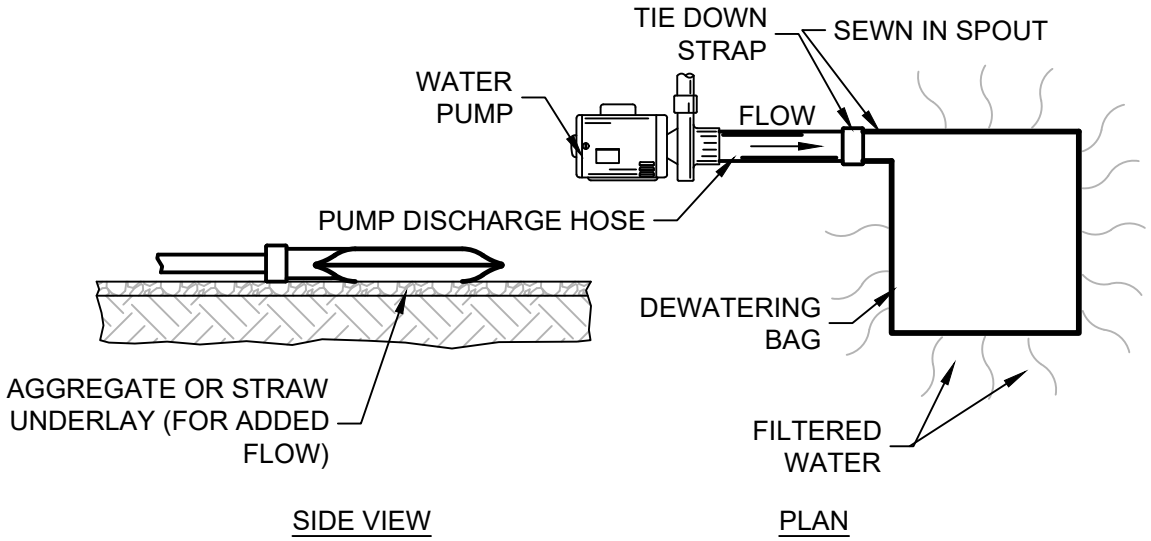
1. INSPECT FOR EROSION AFTER EACH STORM EVENT DURING VEGETATION ESTABLISHMENT, AND AT LEAST ONCE EVERY 7 CALENDAR DAYS.
2. IF ANY AREAS SHOW EROSION, PULL BACK THAT PORTION OF THE BLANKET, ADD SOIL, RESEED, RELAY AND STAPLE THE BLANKET.
3. CHECK AREAS PERIODICALLY AFTER VEGETATION ESTABLISHMENT.

EROSION CONTROL BLANKET

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. EC-06
DATE: SEP 2023



MECHANICAL PROPERTIES	TEST METHOD	UNITS	INDUSTRY STANDARD
GRAB TENSILE STRENGTH	ASTM D4632	kN (LB)	0.9 (205) X 0.9 (205)
GRAB TENSILE ELONGATION	ASTM D4632	%	50 X 50
PUNCTURE STRENGTH	ASTM D4833	kN (LB)	0.58 (130)
MULLEN BURST STRENGTH	ASTM D3786	kPa (PSI)	2618 (380)
TRAPEZOID TEAR STRENGTH	ASTM D4533	kN (LB)	0.36 (80) X 0.36 (80)
UV RESISTANCE	ASTM D4355	%	70
APPARENT OPENING SIZE	ASTM D4751	Mm (US STD SIEVE)	0.180 (80)
FLOW RATE	ASTM D4491	1/MIN/M² (GAL/MIN/FT²)	3866 (95)
PERMITTIVITY	ASTM D4491	S^{-1}	1.2

MAINTENANCE:

1. DURING THE ACTIVE DEWATERING PROCESS, INSPECTION OF THE PUMPING BAG SHOULD BE REVIEWED FREQUENTLY. SPECIAL ATTENTION SHOULD BE PAID TO THE BUFFER AREA FOR ANY SIGN OF EROSION AND CONCENTRATION OF FLOW. OBSERVE WHERE POSSIBLE THE VISUAL QUALITY OF THE EFFLUENT AND DETERMINE IF ADDITIONAL TREATMENT CAN BE PROVIDED.
2. DISPOSE OF ACCUMULATED SEDIMENT REMOVED DURING PUMPING OPERATIONS IN CONFORMANCE WITH THE SPECIFICATIONS.
3. REPLACE THE BAG OR DISPOSE OF SILT WHEN HALF FULL OF SEDIMENT OR WHEN SEDIMENT HAS REDUCED THE FLOW RATE TO AN IMPRACTICAL RATE.

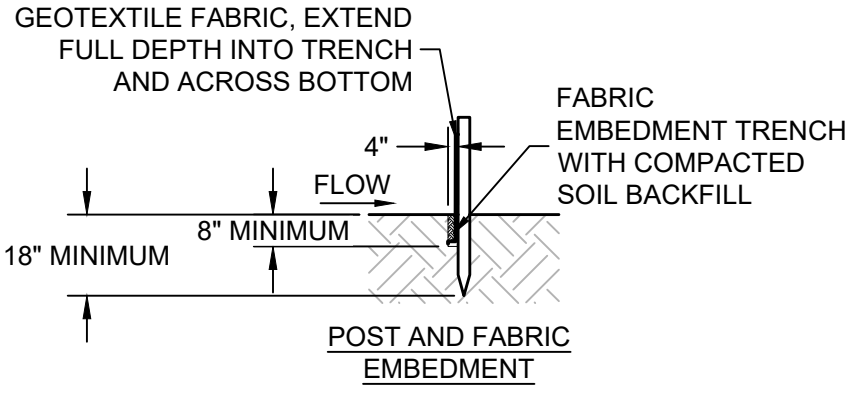
SOURCE:
KRISTAR
DANDY DEWATERING BAG
SEDCATCH

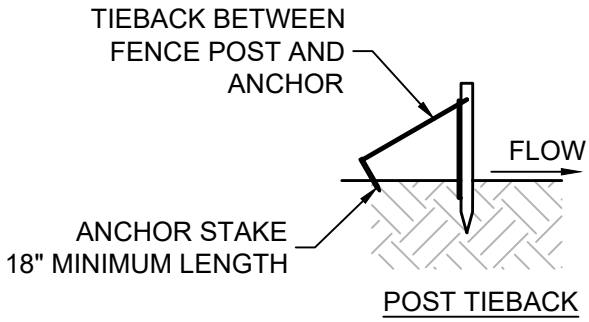
PUMPING BAG

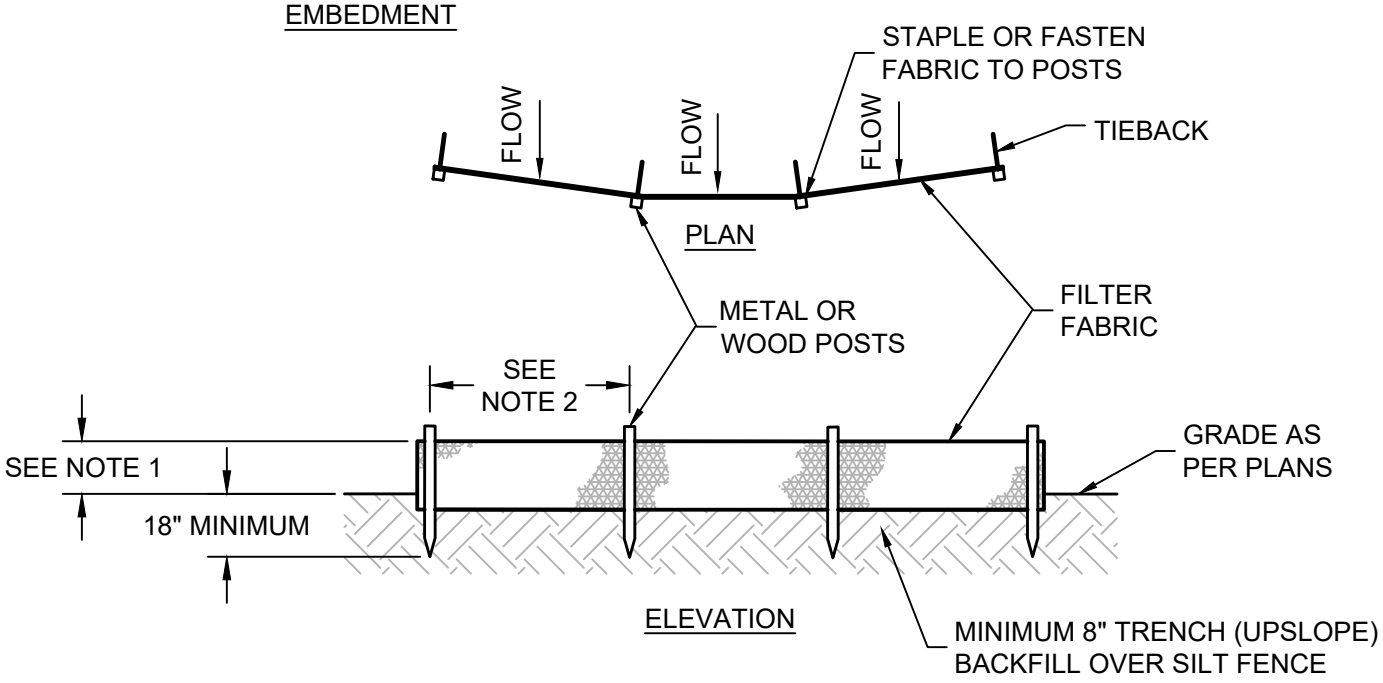
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. EC-07
DATE: SEP 2023







NOTES:

1. THE HEIGHT OF THE BARRIER SHALL BE A MINIMUM OF 18" AND A MAXIMUM OF 30".
2. POSTS SHALL BE SPACED A MAXIMUM OF 6' APART AT THE BARRIER LOCATION AND DRIVEN SECURELY INTO THE GROUND (MINIMUM OF 18"). WHEN STANDARD STRENGTH FABRIC IS USED WITH THE WIRE SUPPORT FENCE, POST SPACING SHALL NOT EXCEED 8'.
3. BACKFILL THE TRENCH AND COMPACT THE SOIL OVER THE FILTER FABRIC.
4. REMOVE SILT FENCES WHEN THEY HAVE SERVED THEIR USEFUL PURPOSE, BUT NOT BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED.
5. SILT FENCE SHALL NOT BE USED AS A DIVERSION AND SHALL NOT BE INSTALLED ACROSS A STREAM, CHANNEL, DITCH, SWALE, ETC.

MAINTENANCE:

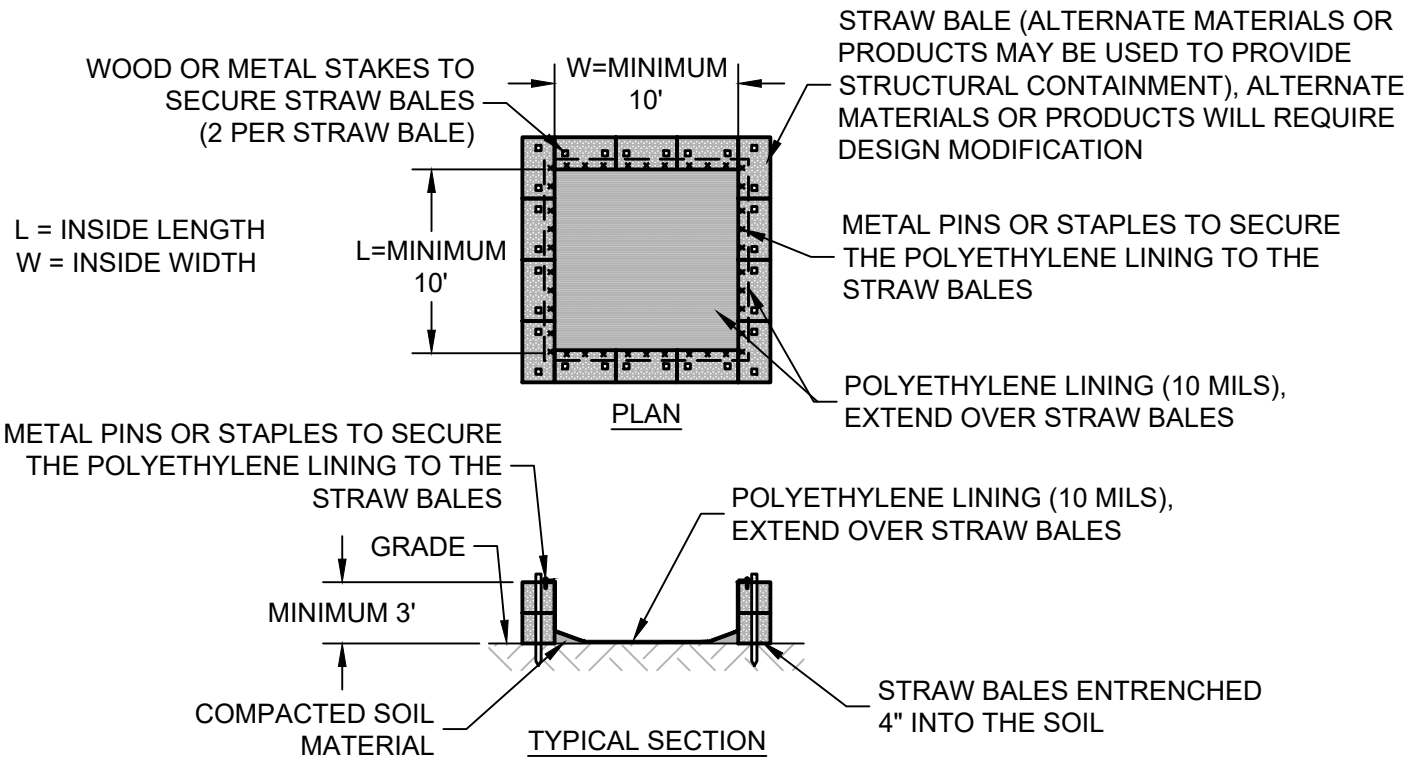
1. INSPECT AFTER EACH RAINFALL AND DAILY DURING PROLONGED RAINFALL. INSPECT AT LEAST ONCE EVERY 7 CALENDAR DAYS.
2. REPLACE OR REPAIR FABRIC IMMEDIATELY IF IT DECOMPOSES OR IS INEFFECTIVE.
3. SEDIMENT DEPOSITS SHOULD BE REMOVED AFTER EACH STORM EVENT. THEY MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY HALF THE HEIGHT OF THE BARRIER.
4. SPREAD ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE SILT FENCE IS NO LONGER REQUIRED AND DRESS TO CONFORM WITH THE FINISHED GRADING.

SILT FENCE

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. EC-08
DATE: SEP 2023



NOTES:

1. LOCATE WASHOUTS AT LEAST 50' FROM ANY CREEKS, WETLANDS, DITCHES, KARST FEATURES, OR STORM DRAIN/CONVEYANCES.

WASHOUT PROCEDURES:

1. DO NOT LEAVE EXCESS MUD IN THE CHUTES OR HOPPER AFTER POURING CONCRETE. MAKE EVERY EFFORT TO EMPTY THE CHUTE AND HOPPER AT THE POUR. THE LESS MATERIAL LEFT IN THE CHUTES AND HOPPER, THE QUICKER AND EASIER THE CLEANOUT. SMALL AMOUNTS OF EXCESS CONCRETE (NOT WASHOUT WATER) MAY BE DISPOSED OF IN AREAS THAT WILL NOT FLOW TO AN AREA THAT IS TO BE PROTECTED.
2. STOP WASHING OUT IN AN AREA IF YOU OBSERVE WATER RUNNING OFF THE DESIGNATED AREA OR IF THE WATER IS NOT BEING CONTAINED WITHIN THE WASHOUT AREA.
3. DO NOT WASH OUT OR DRAIN WASTE WATERS TO STORM DRAINS, WETLANDS, STREAMS, RIVERS, CREEKS, DITCHES OR STREETS.

MAINTENANCE:

1. INSPECT CONCRETE WASHOUT AREA DAILY AND AFTER EACH STORM EVENT
   A. CHECK CAPACITY OF WASHOUT
   B. REPAIR THE WASHOUT STRUCTURE AND LINER, AS NEEDED, OR CONSTRUCT A NEW SYSTEM.
   C. LIQUID THAT COLLECTS IN THE WASHOUT AREA COULD BE HIGH IN ALKALINITY AND COULD CONTAIN POLLUTANTS. LIQUIT MUST BE DISPOSED OF OFFSITE AS WASTERWATER.

CONCRETE WASHOUT

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

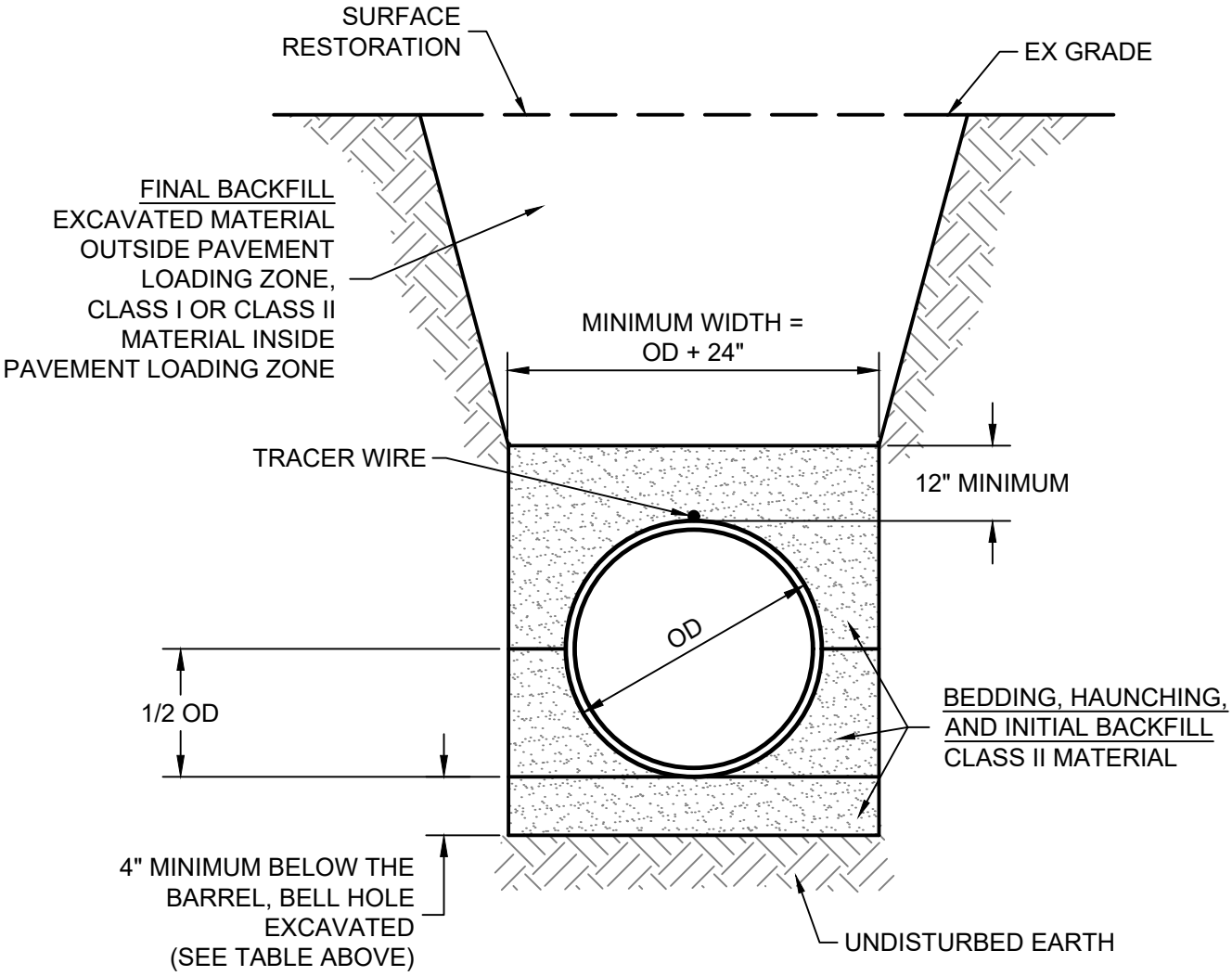
DETAIL NO. EC-09
DATE: SEP 2023

STANDARD DETAILS

TB – TRENCHING AND BACKFILLING

TABLE OF CONTENTS

PIPE SIZE	3" TO 16"	18" TO 30"	32" AND OVER
BEDDING BELOW THE PIPE BARREL	4"	OD / 4	8"



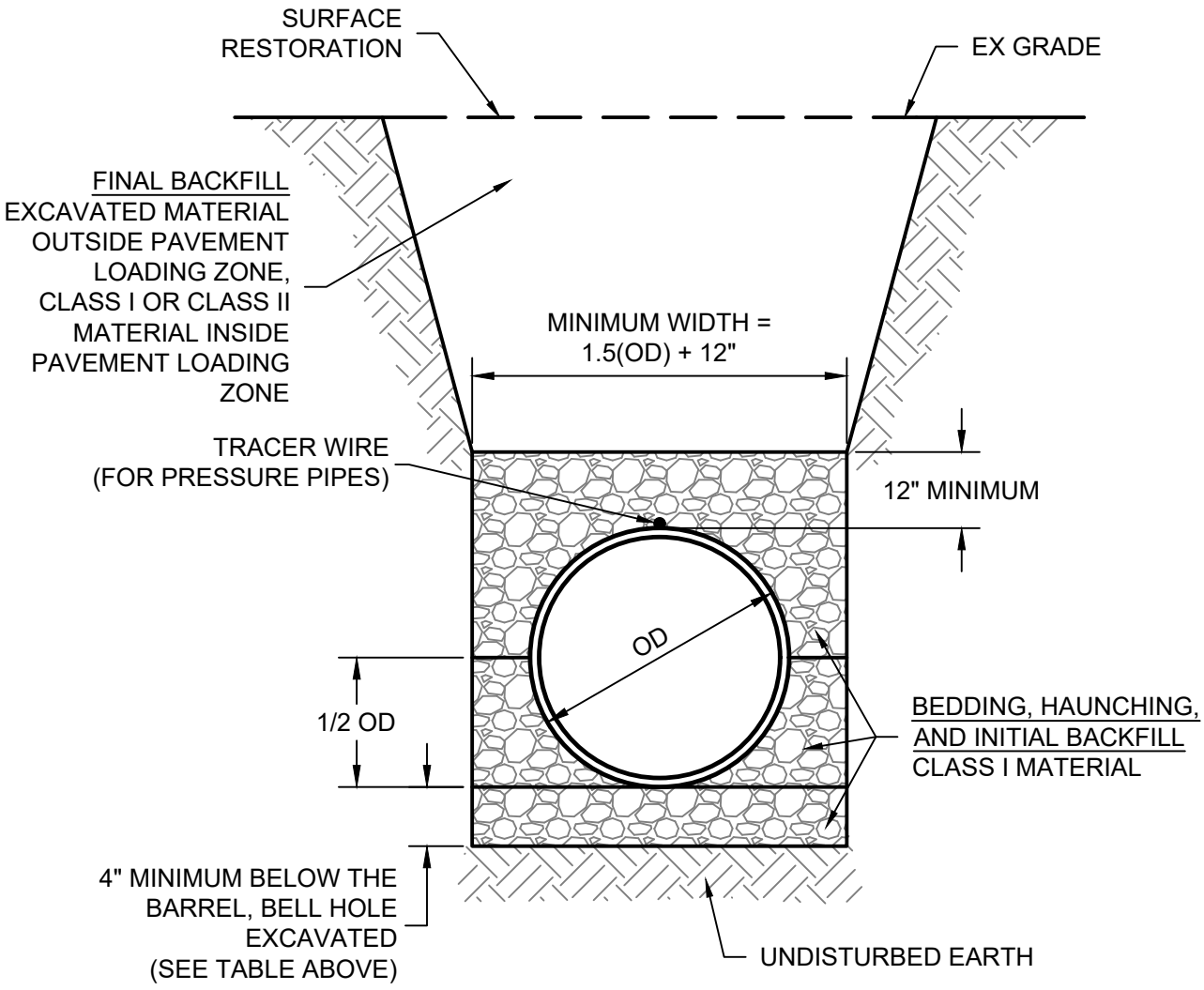
RIGID PRESSURE PIPE TRENCH (DI)

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TB-01
DATE: SEP 2023

PIPE SIZE	8" TO 16"	18" TO 30"	33" AND OVER
BEDDING BELOW THE PIPE BARREL	4"	OD / 4	8"



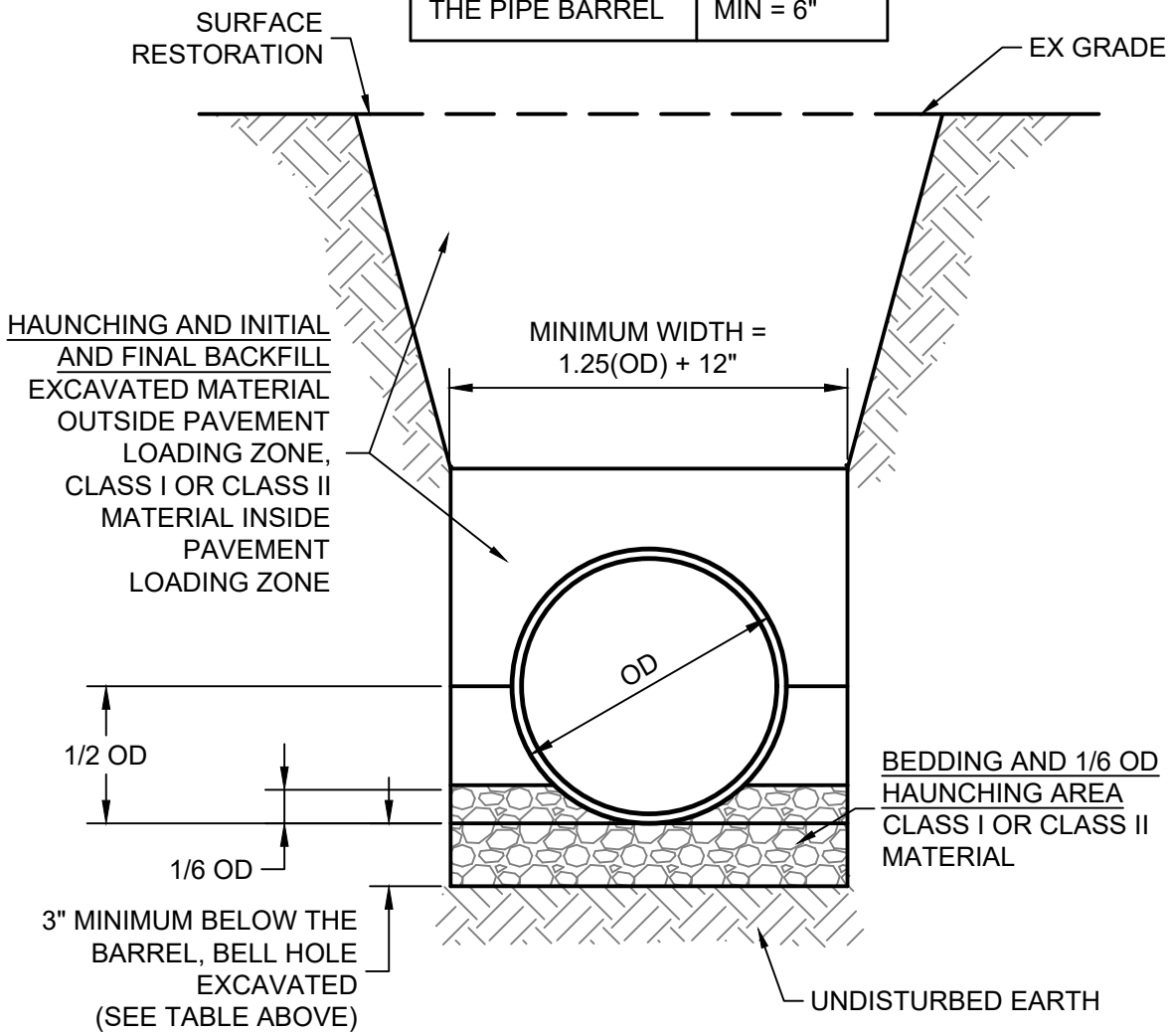
FLEXIBLE PIPE TRENCH (PVC)

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TB-02
DATE: SEP 2023

SOIL FOUNDATION	
BEDDING BELOW THE PIPE BARREL	OD / 24 MIN = 3"
ROCK FOUNDATION	
BEDDING BELOW THE PIPE BARREL	OD / 12 MIN = 6"



RIGID GRAVITY PIPE TRENCH (RCP)

SCALE: NONE

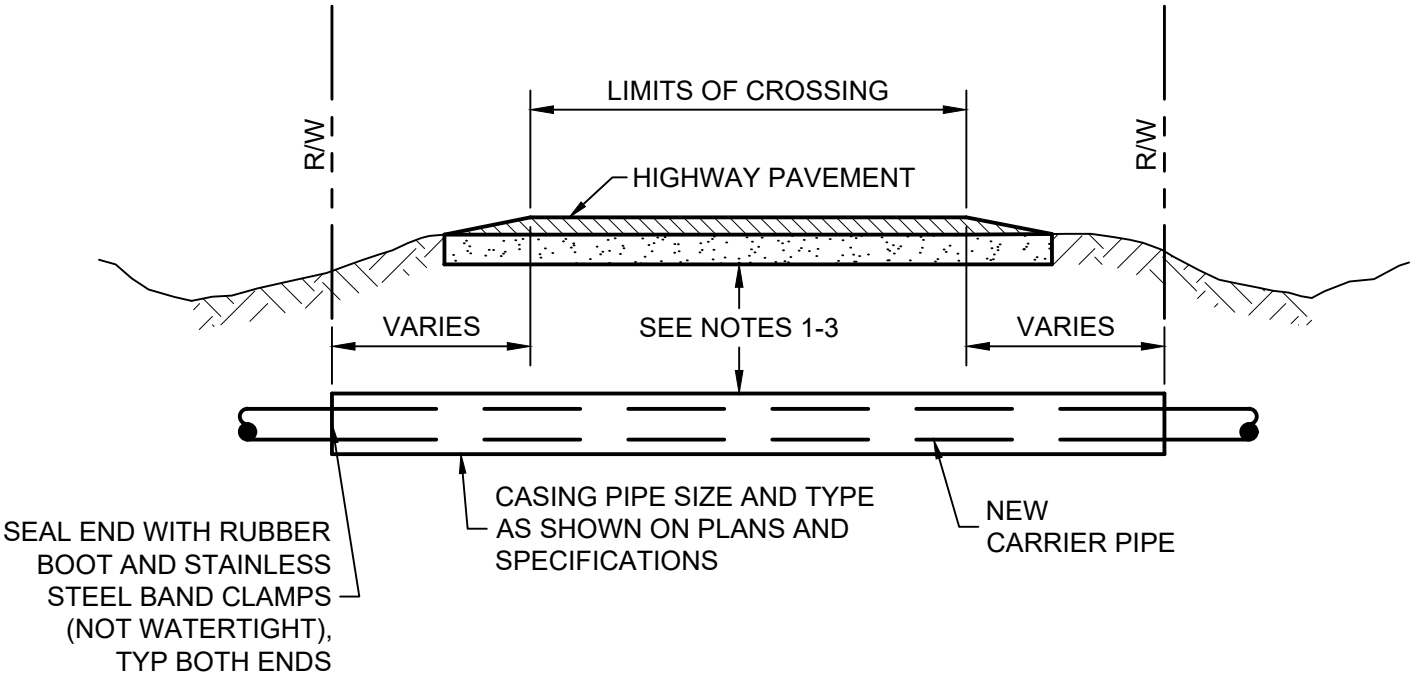
FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

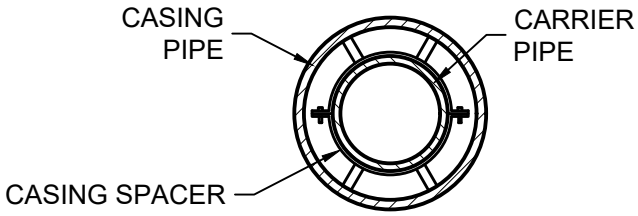
DETAIL NO. TB-03
DATE: SEP 2023

STANDARD DETAILS

TL – TRENCHLESS INSTALLATION

TABLE OF CONTENTS





NOTES:

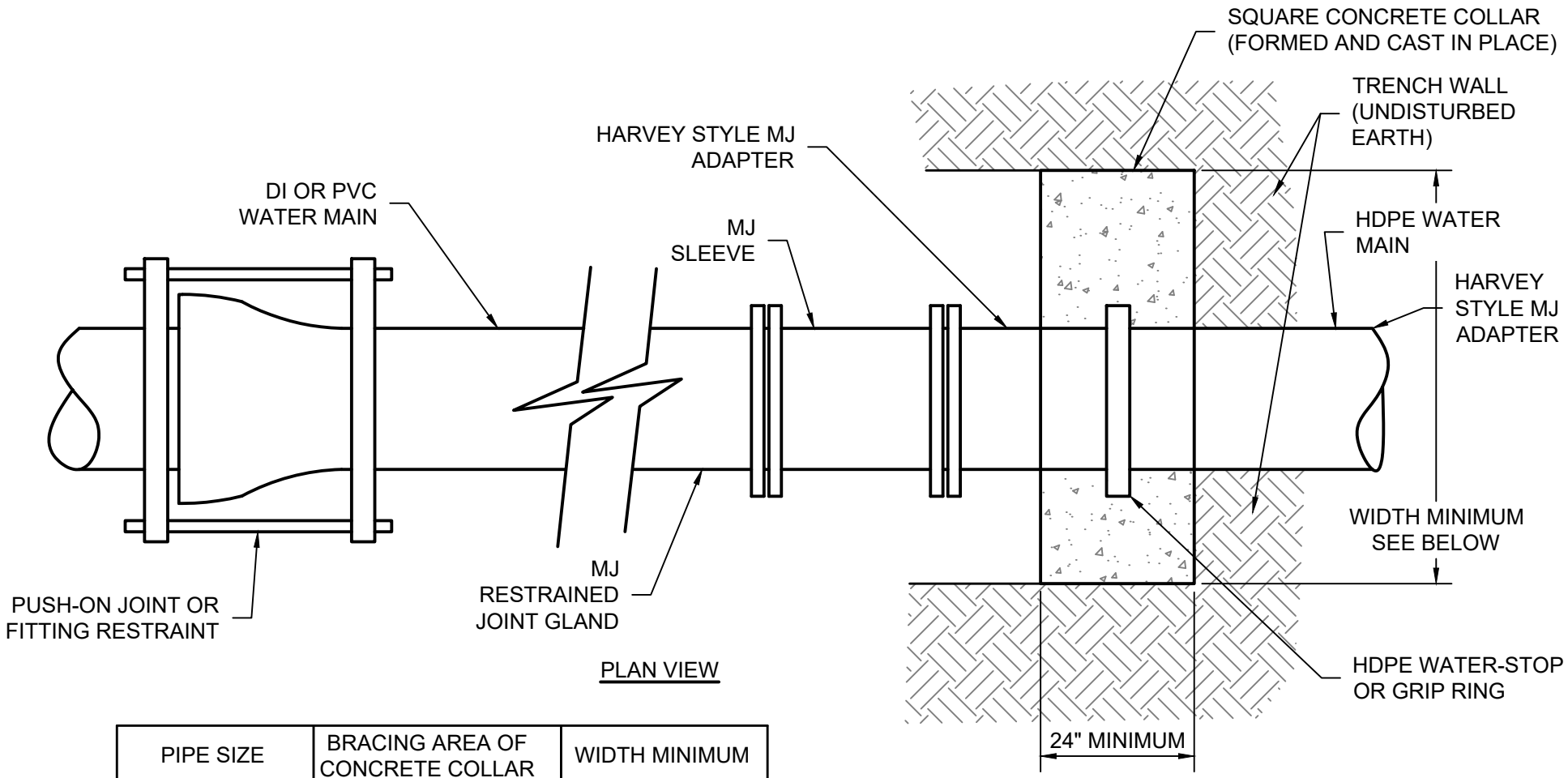
1. WATERWAY CROSSINGS: CASING PIPE SHALL BE AT LEAST 5'0" BELOW WATERWAY BOTTOM.
2. HIGHWAY/ROADWAY CROSSINGS: CASING PIPE SHALL BE AT LEAST 4'-6" BELOW ROADWAY SUBBASE.
3. RAILROAD CROSSINGS: CASING PIPE DEPTH SHALL BE APPROVED BY RAILROAD OWNER.

CASING PIPE

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TL-01
DATE: SEP 2023



PLAN VIEW

PIPE SIZE	BRACING AREA OF CONCRETE COLLAR	WIDTH MINIMUM
6"	5 SF	3'-0"
8"	9 SF	3'-6"
12"	18 SF	4'-3"
16"	21 SF	4'-9"
20"	24 SF	5'-0"

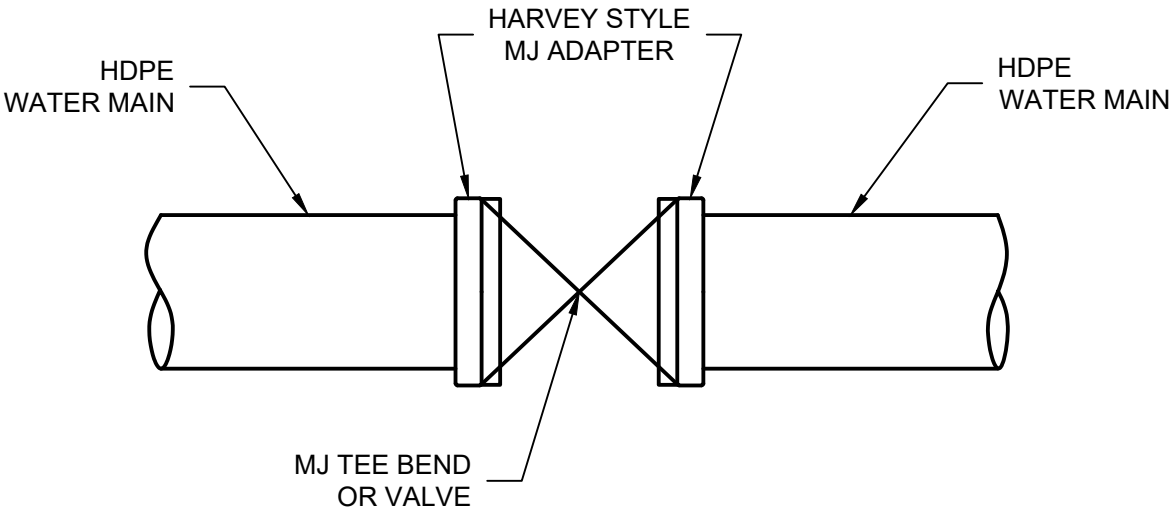
APPLIES TO DIRECTIONAL DRILLING INSTALLATIONS ONLY

HDPE PIPE TRANSITION

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TL-02
DATE: SEP 2023



APPLIES TO DIRECTIONAL DRILLING INSTALLATIONS ONLY

HDPE FITTING TRANSITION

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

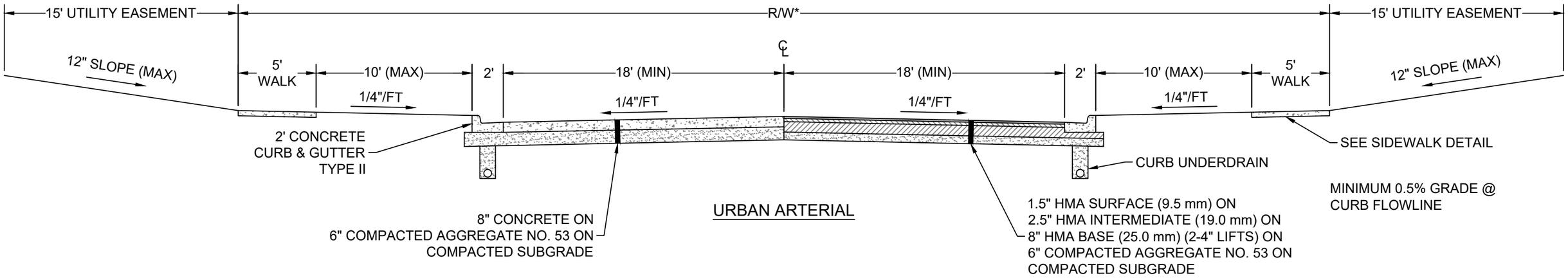
DETAIL NO. TL-03
DATE: SEP 2023

STANDARD DETAILS

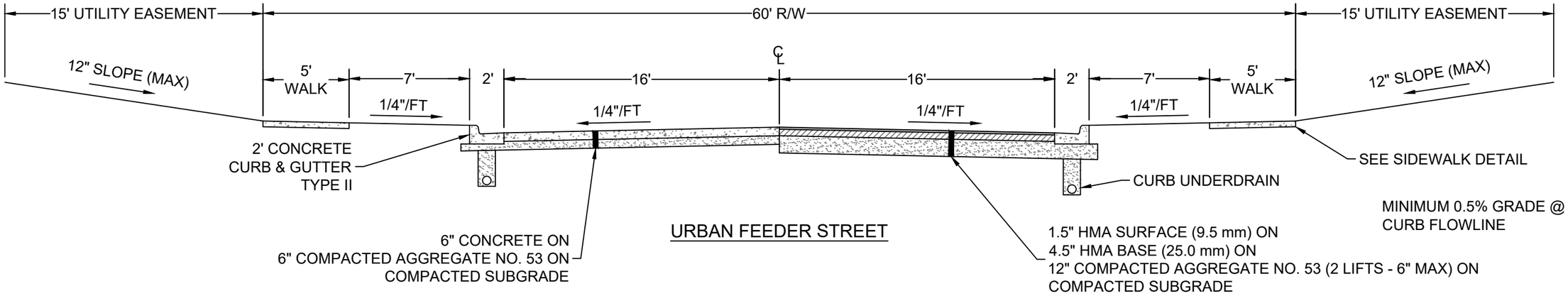
TR - TRANSPORTATION

TABLE OF CONTENTS

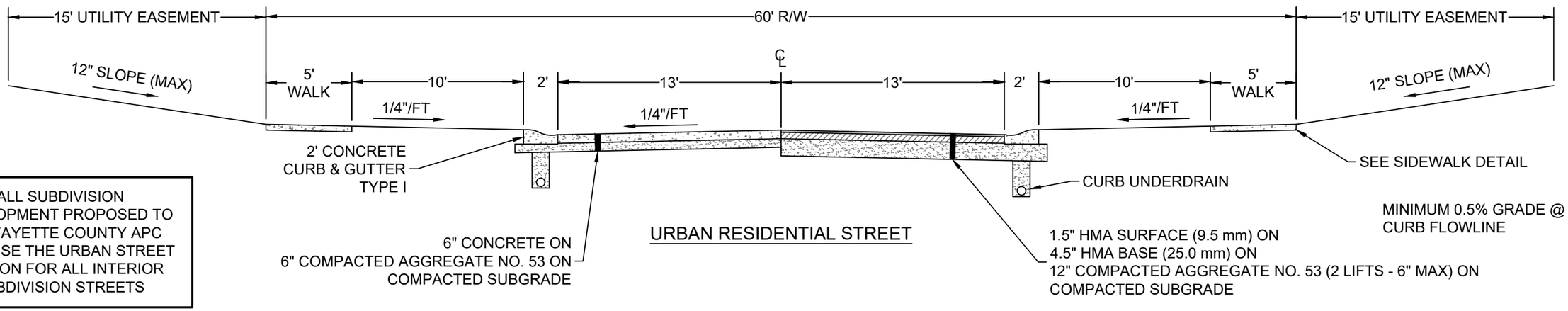
*R/W WIDTH FOR URBAN PRIMARY ARTERIAL IS 100'
*R/W WIDTH FOR URBAN SECONDARY ARTERIAL IS 70'



URBAN ARTERIAL



URBAN FEEDER STREET



URBAN RESIDENTIAL STREET

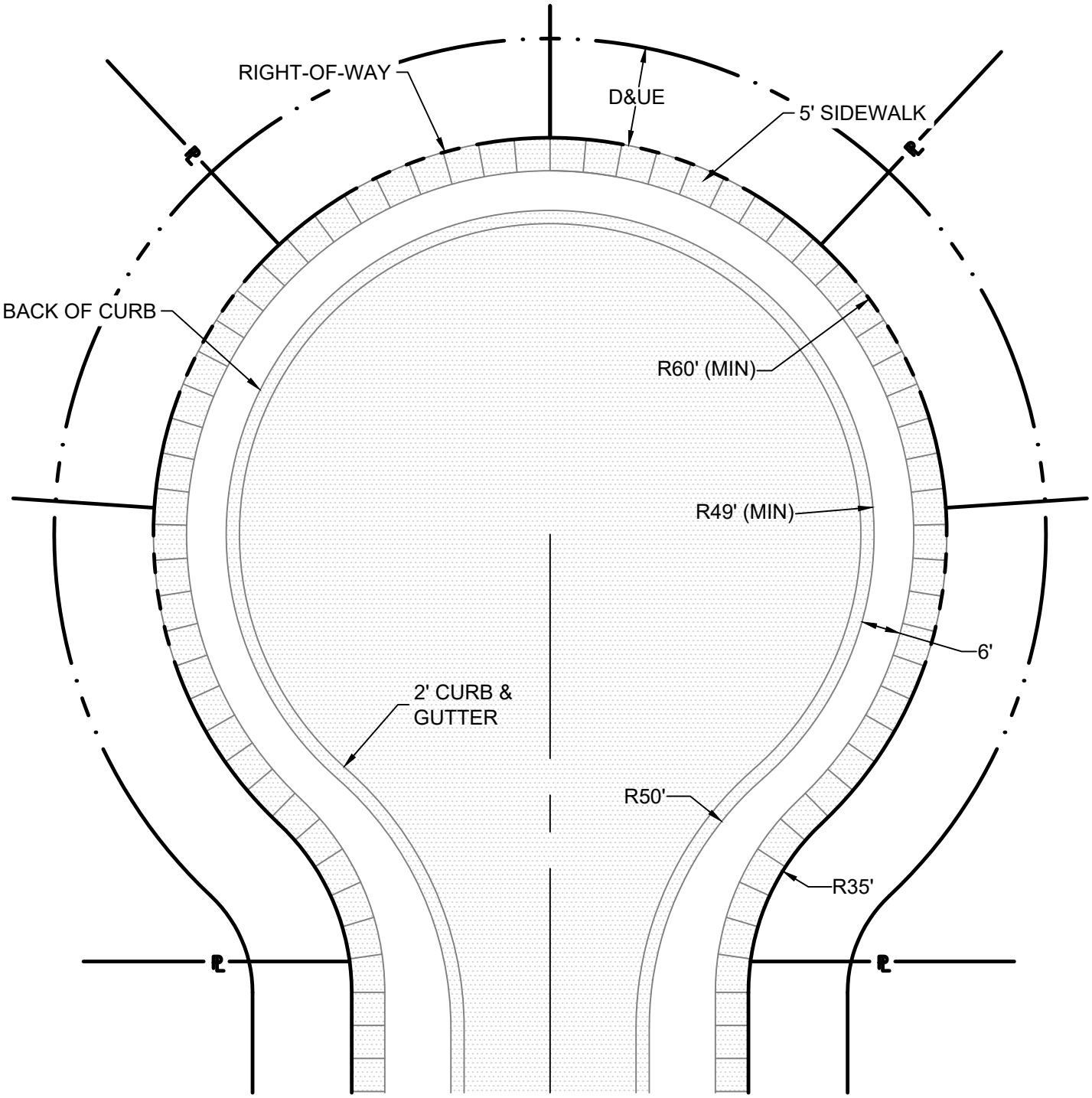
ALL SUBDIVISION DEVELOPMENT PROPOSED TO THE FAYETTE COUNTY APC MUST USE THE URBAN STREET SECTION FOR ALL INTERIOR SUBDIVISION STREETS

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

URBAN STREET SECTIONS

SCALE: NONE

DETAIL NO. TR-01
DATE: SEP 2023



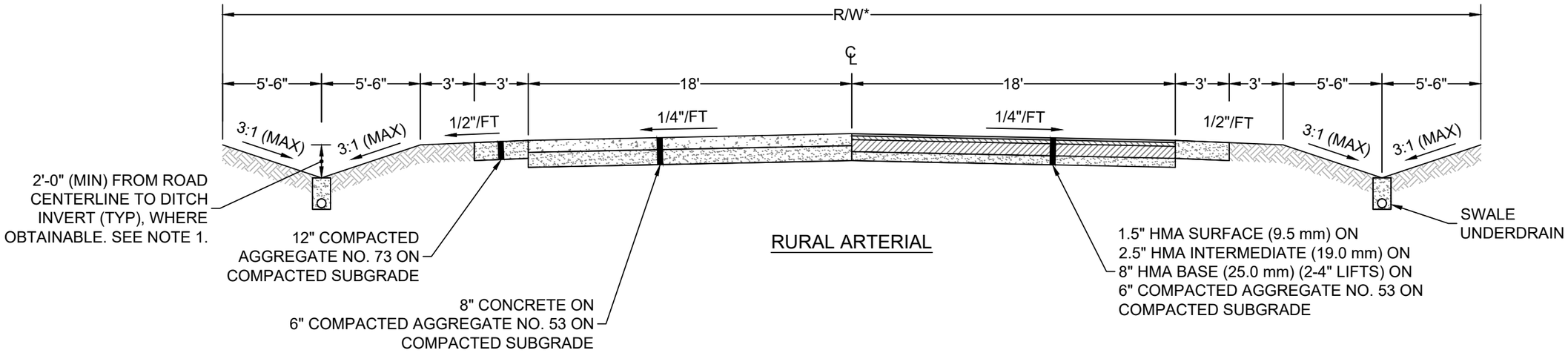
URBAN CUL-DE-SAC

SCALE: NONE

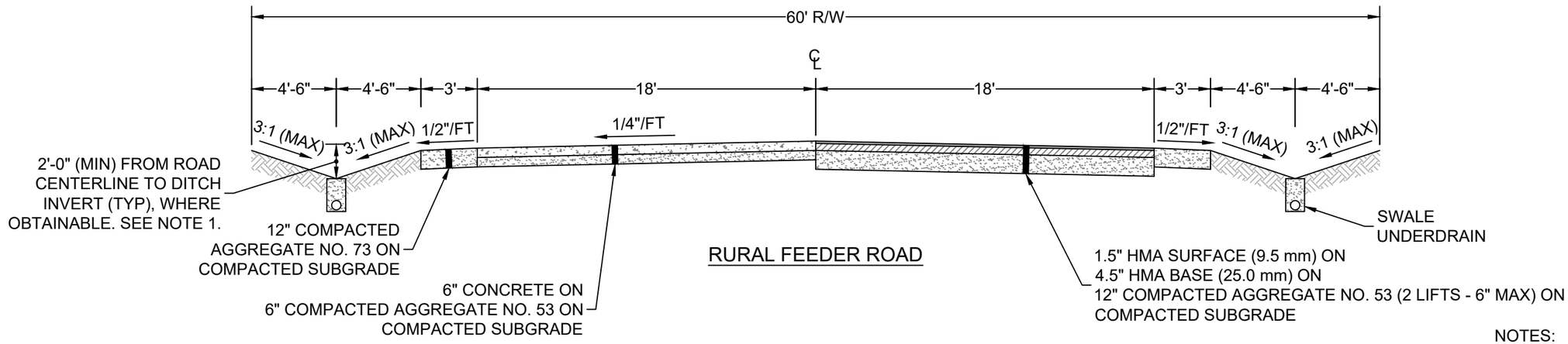
FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-02
DATE: SEP 2023

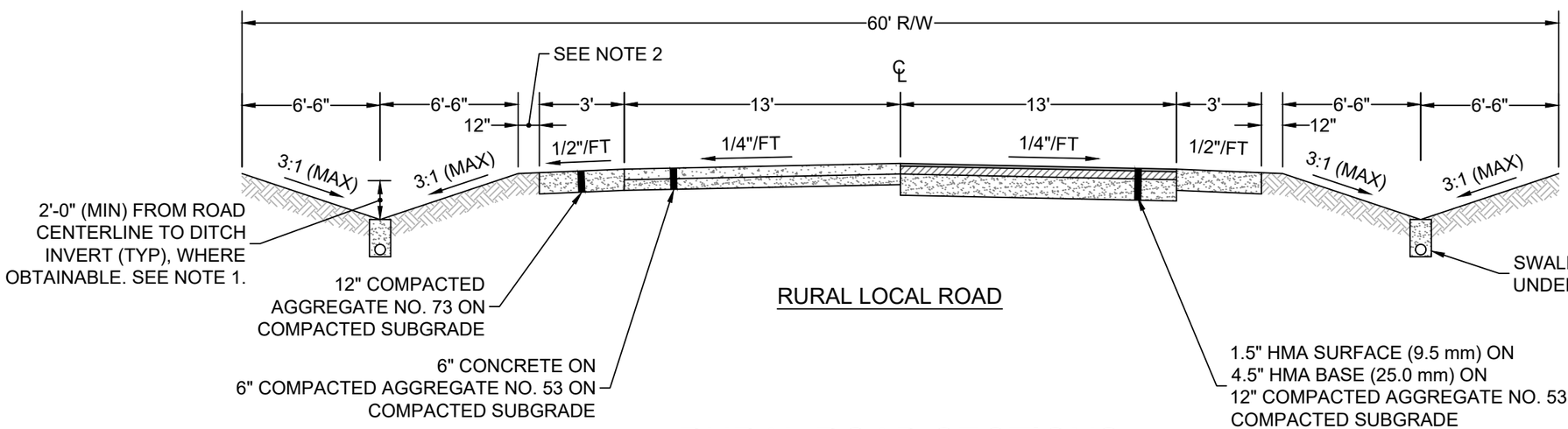
*R/W WIDTH FOR RURAL PRIMARY ARTERIAL IS 100'
*R/W WIDTH FOR RURAL SECONDARY ARTERIAL IS 70'



RURAL ARTERIAL



RURAL FEEDER ROAD



RURAL LOCAL ROAD

NOTES:

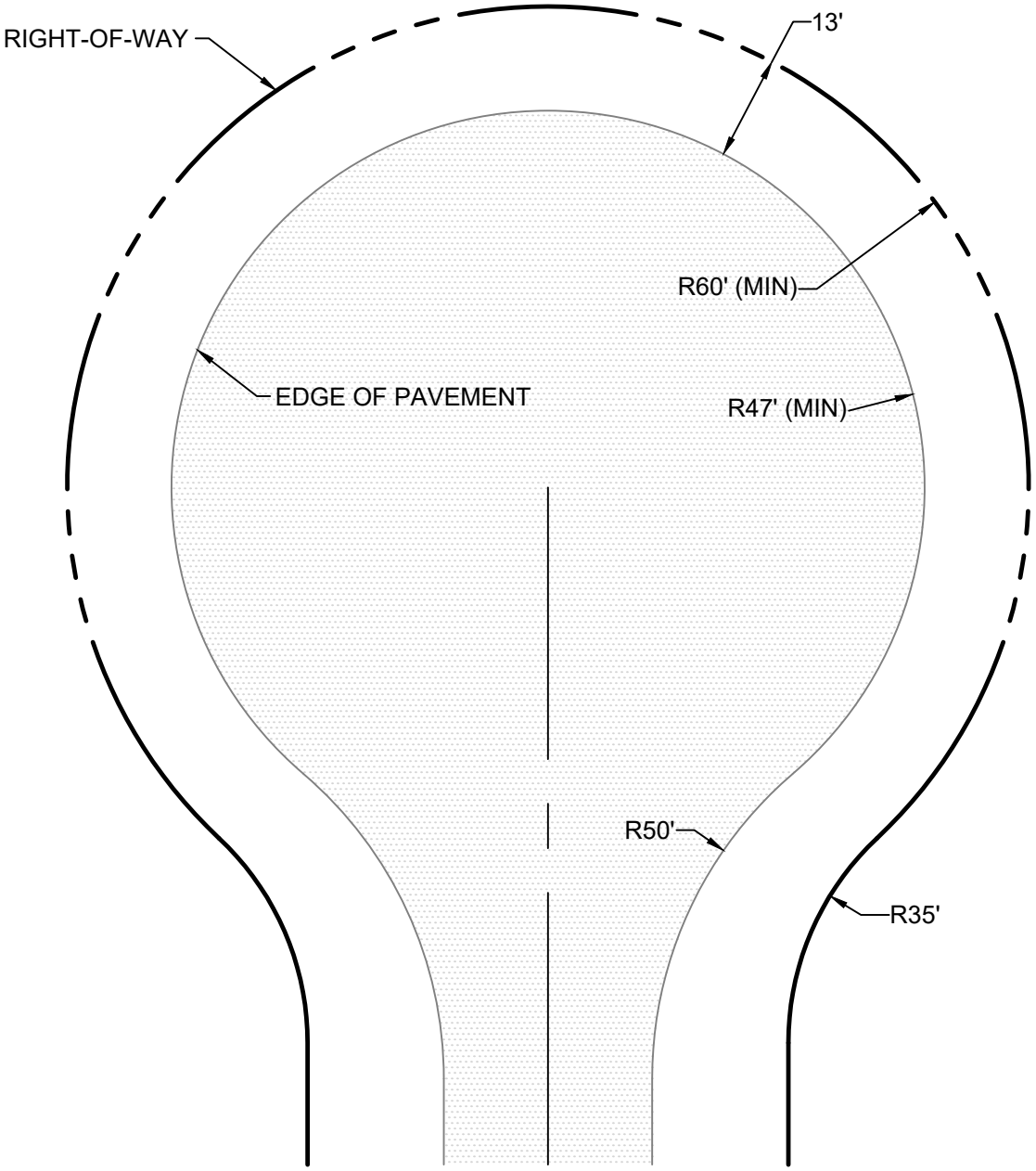
1. WHEN RIGHT-OF-WAY CONDITIONS DO NOT WARRANT A 3:1 SWALE SIDE SLOPE, A 2:1 SIDE SLOPE MAY BE USED. OTHERWISE, A WRITTEN REQUEST FOR VARIANCE SHALL BE SUBMITTED TO THE COUNTY FOR APPROVAL.
2. FOR A RURAL LOCAL ROAD WITH GUARDRAIL, USE 3'-0" IN LIEU OF 12" TO ALLOW FOR GUARDAIL INSTALLATION.

RURAL ROAD SECTIONS

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-03
DATE: SEP 2023



RURAL CUL-DE-SAC

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-04
DATE: SEP 2023

① PASSING BLISTER SHALL BE REQUIRED. IF INSUFFICIENT RIGHT-OF-WAY CAN NOT BE ACQUIRED THE COUNTY/CITY MAY AT ITS DISCRETION MODIFY THE PASSING BLISTER.

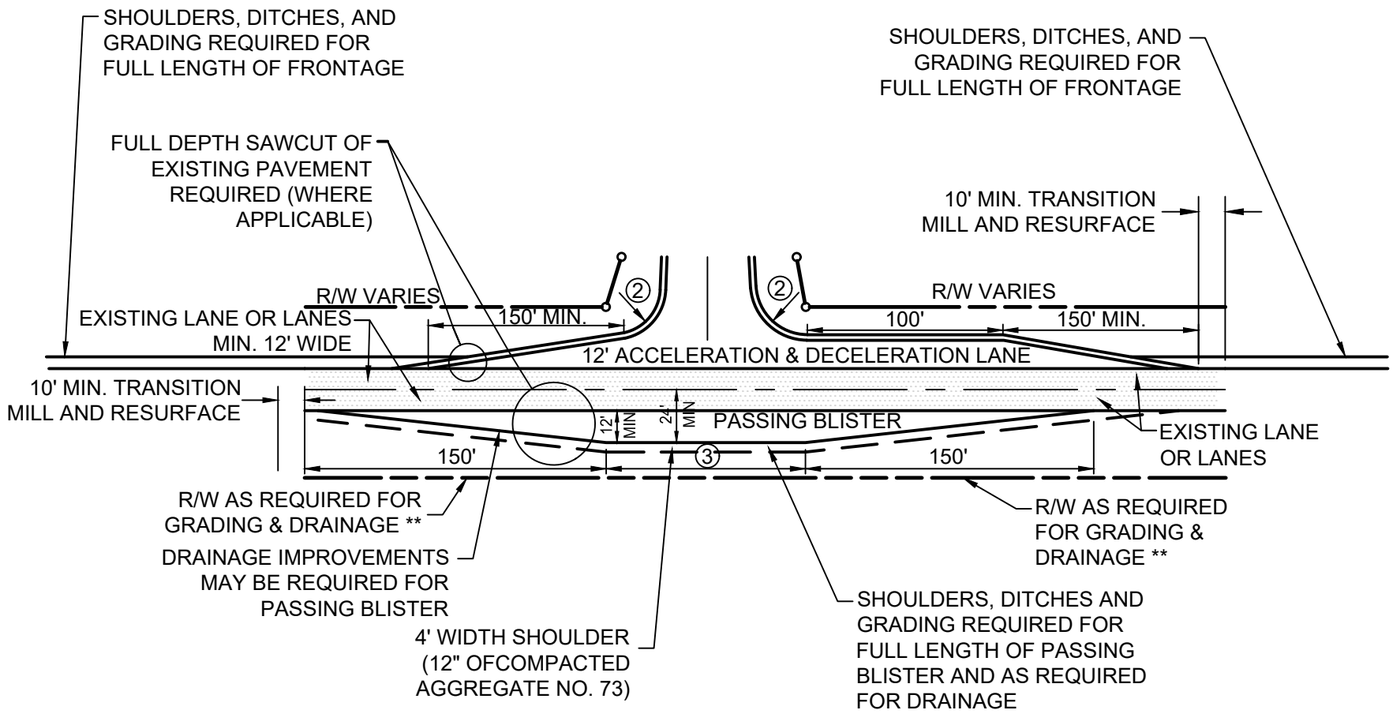
② MINIMUM ENTRANCE RADIUS REQUIREMENTS:
RESIDENTIAL = 40'
COMMERCIAL/INDUSTRIAL, ARTERIAL= 50'

③ MINIMUM PASSING BLISTER LENGTH REQUIREMENTS:
RESIDENTIAL = 100'
COMMERCIAL/INDUSTRIAL,ARTERIAL = 150'

NOTE:
THIS DRAWING REPRESENTS THE MINIMUM STANDARDS FOR AN ENTRANCE. LARGER AND/OR LONGER ACCELERATION AND DECELERATION LANES SHALL BE REQUIRED BASED UPON THE ROADWAY CLASSIFICATION AND POSTED SPEED LIMIT TO ADEQUATELY SERVE THE ANTICIPATED TYPES AND VOLUMES OF TRAFFIC GENERATED BY SPECIFIC DEVELOPMENTS. LENGTH OF ACCELERATION AND DECELERATION LANES MAY BE MODIFIED WHEN WARRANTED AT THE DISCRETION OF THE COUNTY/CITY.

* TAPER AS NEEDED FOR DESIGN VEHICLE

** DEVELOPER REQUIRED TO PROVIDE ADEQUATE RIGHT-OF-WAY FOR PASSING BLISTER & NECESSARY DRAINAGE IMPROVEMENTS



ROADWAY IMPROVEMENT REQUIREMENTS:

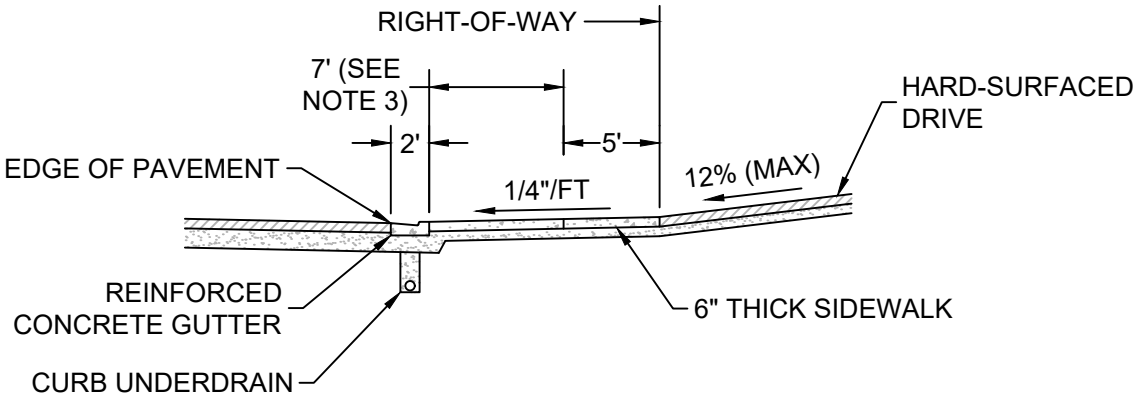
1. THE MAIN ROAD SHALL BE RECONSTRUCTED FOR THE ENTIRE LENGTH OF THE PASSING BLISTER AND ACCEL/DECEL LANE IMPROVEMENTS. ALTERNATIVELY, DEPENDENT UPON THE EXISTING PAVEMENT THICKNESS, WIDTH AND CONDITION, AS DETERMINED BY A GEOTECHNICAL INVESTIGATION, PAVEMENT IMPROVEMENT RECOMMENDATIONS FROM A REGISTERED P.E. EXPERIENCED IN PAVEMENT DESIGN MAY BE CONSIDERED FOR APPROVAL.
2. SAW CUT EXISTING ASPHALT PAVEMENT AT THE LIMITS OF CONSTRUCTION OF THE ACCEL/DECEL LANES AND PASSING BLISTER.
3. ALL EXISTING ASPHALT PAVEMENT SHALL BE REMOVED THROUGH THE LENGTH OF WIDENING. IF THE EXISTING PAVEMENT "DOES NOT" MEET THE MINIMUM PAVEMENT SECTIONS FOR THE ROADWAY CLASSIFICATION DESIGNATED IN THE STANDARDS, THE GEOTECHNICAL ENGINEER MAY RECOMMEND A MODIFICATION TO THE EXISTING PAVEMENT TO MEET THIS EQUIVALENT ROADWAY CLASSIFICATION. WHERE EXISTING PAVEMENT IS TO REMAIN, UTILIZE APPLICABLE PAVEMENT TIE-IN.
4. PREPARE SUBGRADE FOR NEW PASSING BLISTER, ACCELERATION & DECELERATION LANES, AND MAIN ROADWAY ACCORDING TO THE COUNTY/CITY STANDARDS AND DETAILS.
5. ASPHALT PAVING OF THE PASSING BLISTER AND ACCELERATION AND DECELERATION LANES SHALL MEET THE MINIMUM REQUIREMENTS OF THE COUNTY/CITY.
6. ASPHALT THICKNESS OF THE MAIN ROAD LANES SHALL MEET THE MINIMUM REQUIREMENTS OF THE COUNTY/CITY, OR MATCH THE DEPTH OF EXISTING ASPHALT, WHICHEVER IS GREATER.
7. MILL EXISTING ROAD 1.5" DEEP A MINIMUM OF 10' BEYOND THE ROADWAY REPLACEMENT LIMITS AT EACH END. CONTINUE 1.5" HMA SURFACE PAVING OVER THE MILLED AREA TO PROVIDE A SMOOTH TRANSITION BETWEEN NEW AND EXISTING ASPHALT PAVEMENT.
8. CURBING OR A TWO (2) FOOT STONE SHOULDER (12" DEPTH #73 STONE) SHALL BE EXTENDED THE ENTIRE LENGTH OF THE ACCELERATION AND DECELERATION LANES.
9. IMPROVEMENTS SHALL BE MADE AS NECESSARY TO PROVIDE APPROPRIATE DRAINAGE WHERE THE PASSING BLISTER IS CONSTRUCTED.
10. ADDITIONAL RIGHT OF WAY SHALL BE ACQUIRED AS NECESSARY TO CONSTRUCT PROPER DRAINAGE IMPROVEMENTS AT PASSING BLISTER.

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

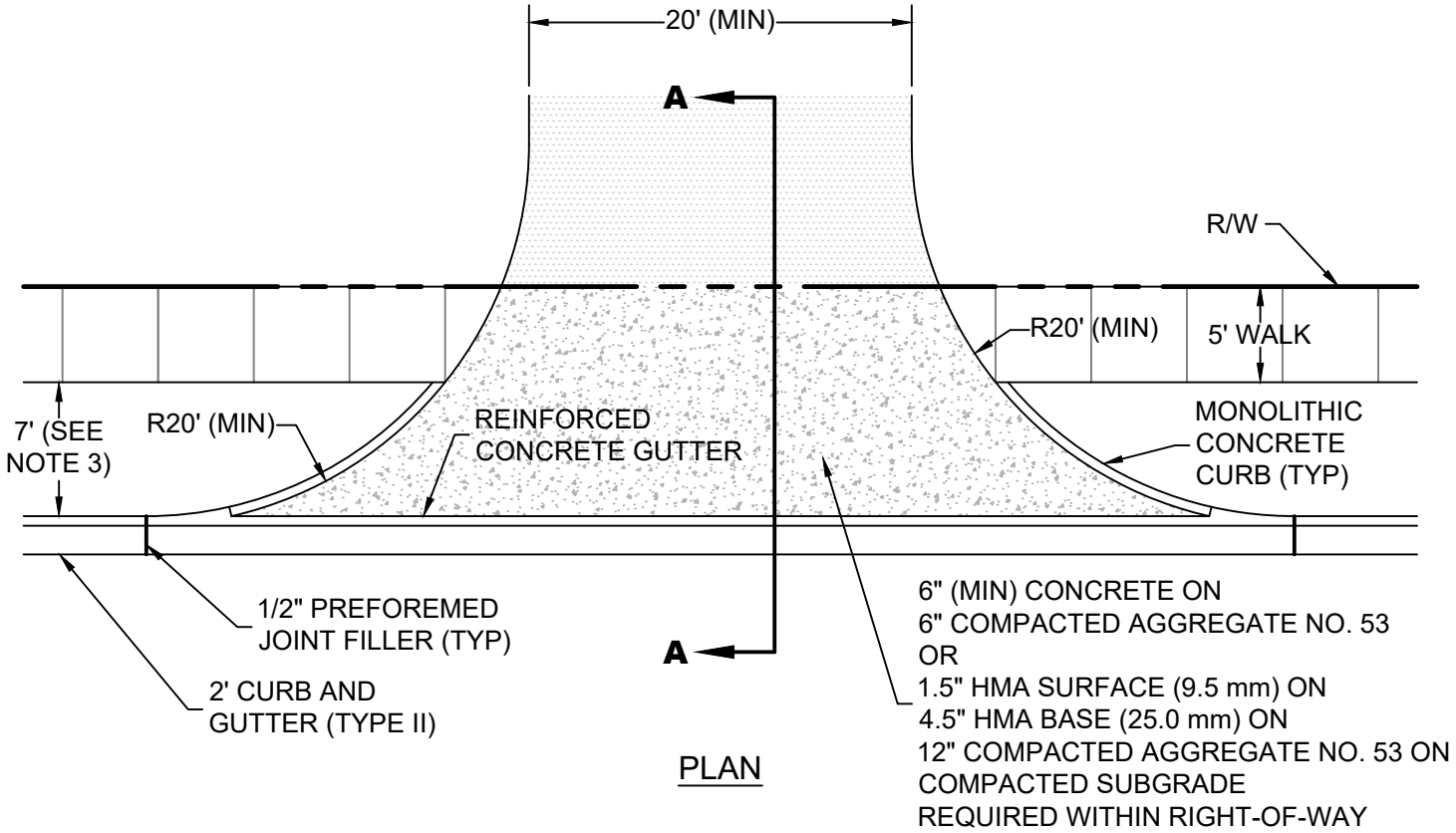
MAJOR COMMERCIAL AND SUBDIVISION ENTRANCE REQUIREMENTS

SCALE: NONE

DETAIL NO. TR-05
DATE: SEP 2023



SECTION A-A



PLAN

NOTES:

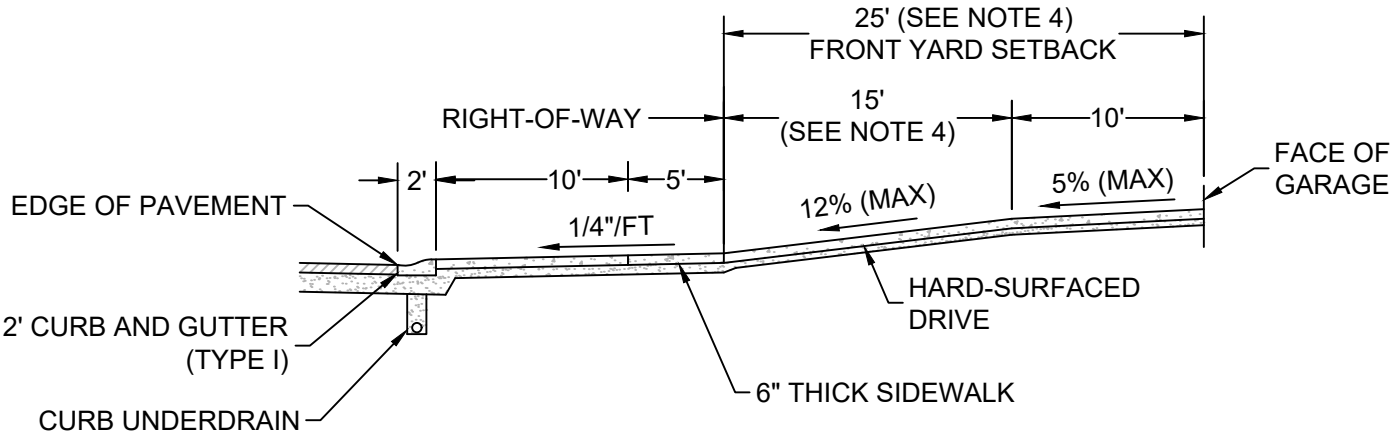
1. THE MAXIMUM ALGEBRAIC DIFFERENCE IN GRADES FOR ANY 10 FOOT INTERVAL SHALL NOT EXCEED 8% FOR CREST VERTICAL CURVES, NOR 10% FOR ANY SAG VERTICAL CURVES.
2. CONCRETE DRIVES REQUIRE CONTROL JOINTS AT A MAXIMUM OF EVERY 10 FEET EACH WAY.
3. USE THE ACTUAL PLANTING STRIP WIDTH AS PROVIDED BASED ON CLASSIFICATION OF STREET.

COMMERCIAL PRIVATE DRIVE
URBAN SECTION

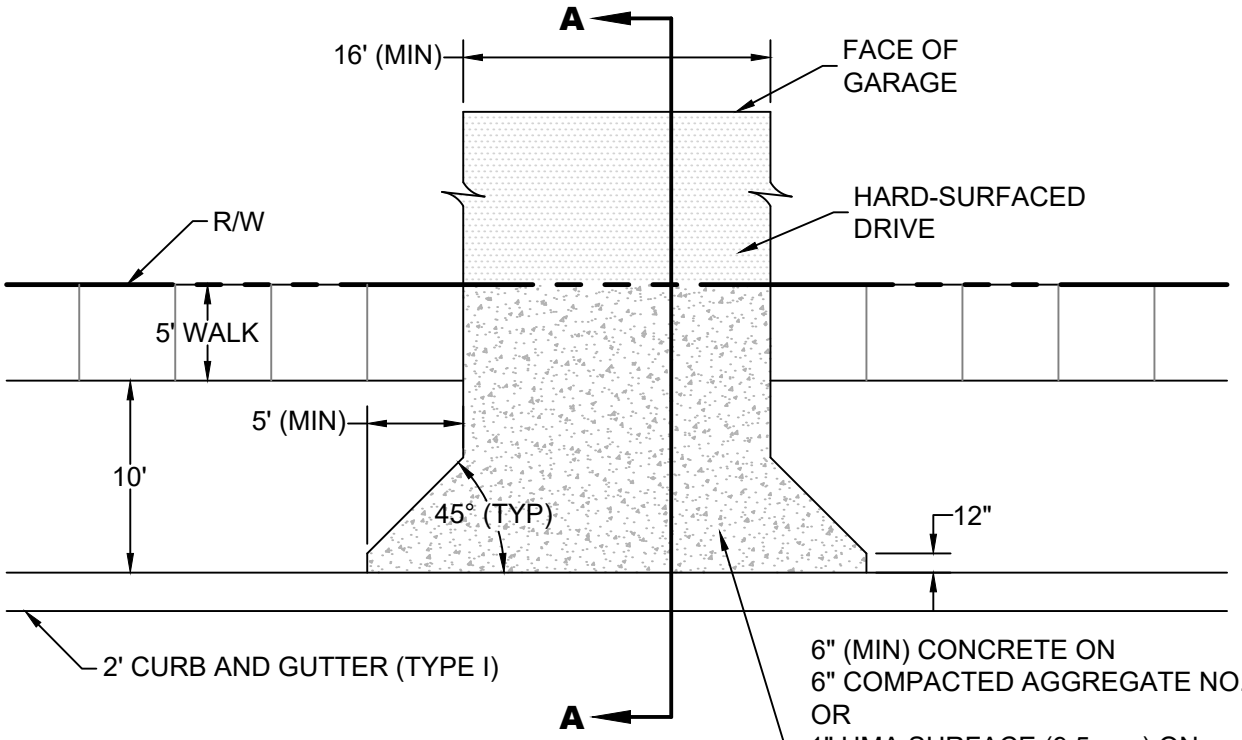
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-06
DATE: SEP 2023



SECTION A-A



PLAN

6" (MIN) CONCRETE ON
6" COMPACTED AGGREGATE NO. 53
OR
1" HMA SURFACE (9.5 mm) ON
3" HMA BASE (25.0 mm) ON
6" COMPACTED AGGREGATE NO. 53 ON
COMPACTED SUBGRADE
REQUIRED WITHIN RIGHT-OF-WAY

NOTES:

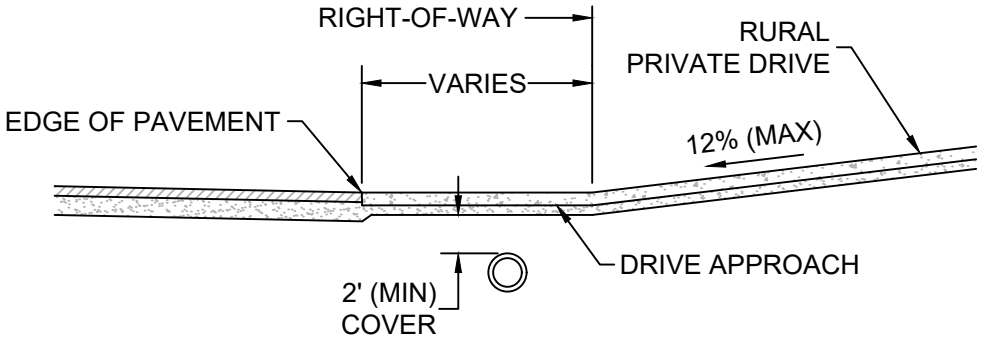
1. THE MAXIMUM ALGEBRAIC DIFFERENCE IN GRADES FOR ANY 10 FOOT INTERVAL SHALL NOT EXCEED 8% FOR CREST VERTICAL CURVES, NOR 10% FOR ANY SAG VERTICAL CURVES.
2. THE FRONTAGE OF ALL LOTS SHALL DRAIN TO ADJACENT STREETS EXCEPT WITH THE PRIOR APPROVAL OF THE COUNTY/CITY.
3. CONCRETE DRIVES REQUIRED CONTROL JOINTS AT A MAXIMUM OF EVERY 10 FEET EACH WAY.
4. USE ACTUAL SETBACK AS PROVIDED BY COUNTY/CITY ZONING ORDINANCE.

RESIDENTIAL PRIVATE DRIVE
URBAN SECTION

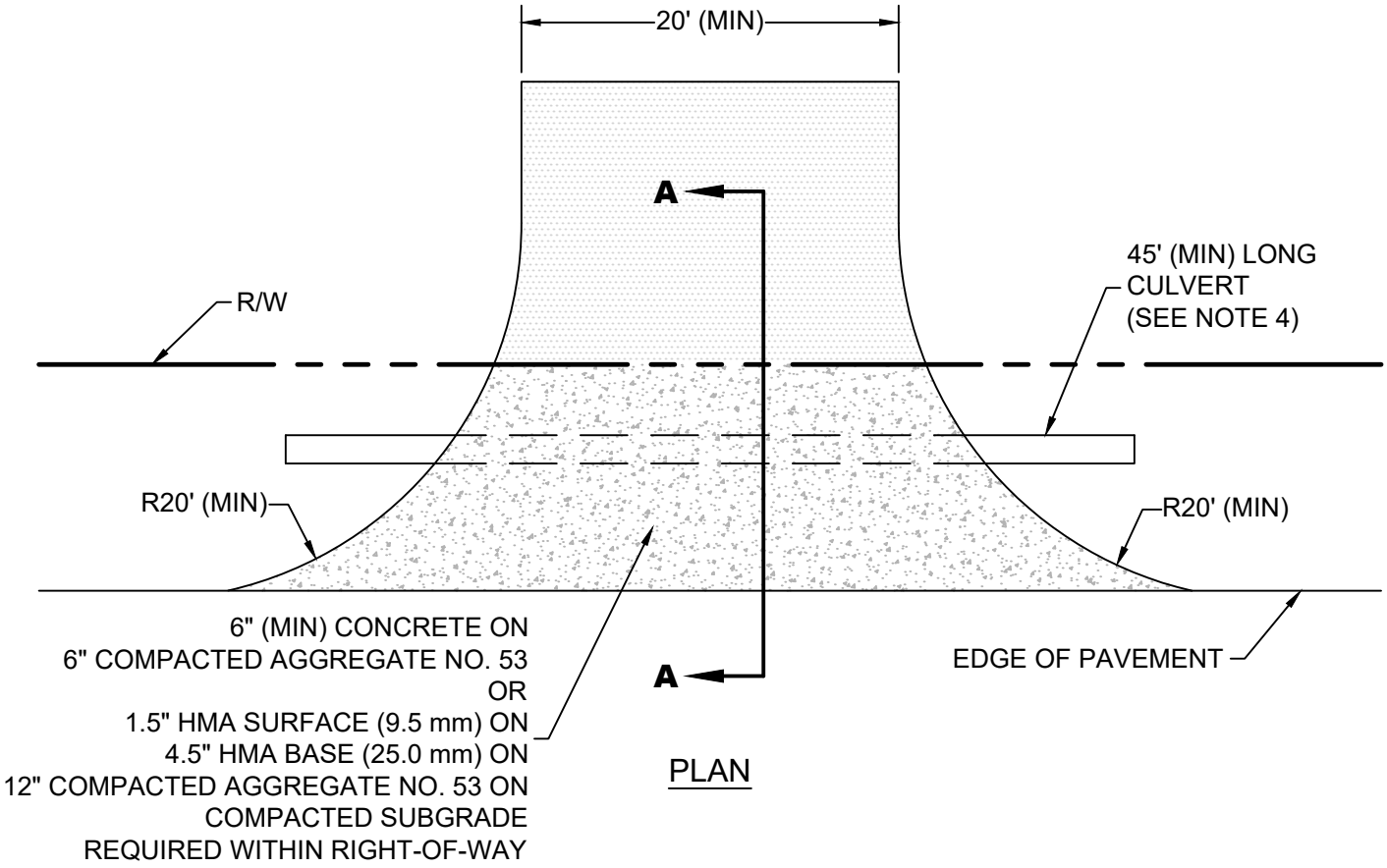
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-07
DATE: SEP 2023



SECTION A-A



PLAN

NOTES:

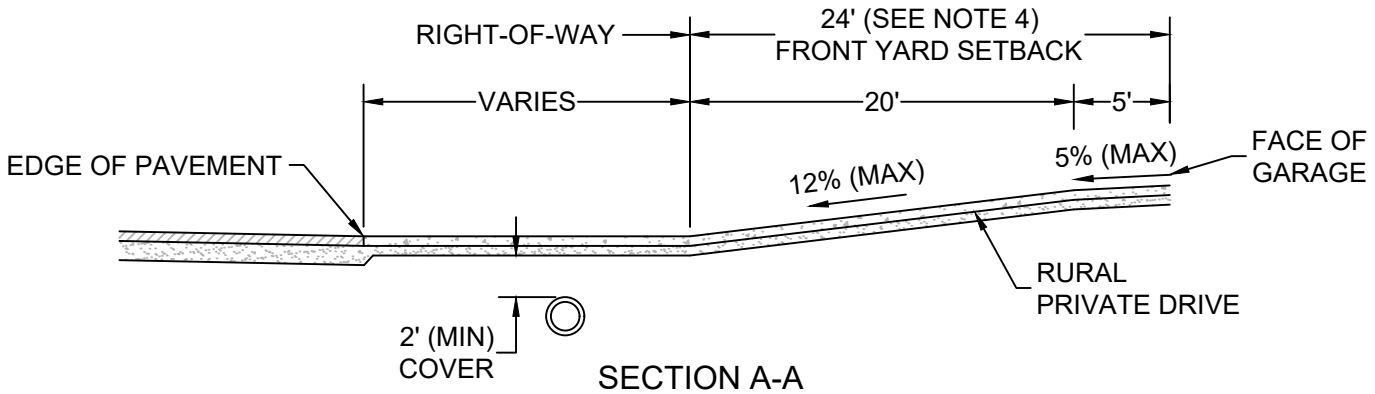
1. THE MAXIMUM ALGEBRAIC DIFFERENCE IN GRADES FOR ANY 10 FOOT INTERVAL SHALL NOT EXCEED 8% FOR CREST VERTICAL CURVES, NOR 10% FOR ANY SAG VERTICAL CURVES.
2. CONCRETE DRIVES REQUIRED CONTROL JOINTS AT A MAXIMUM OF EVERY 10 FEET EACH WAY.
3. WHERE A NEW COMMERCIAL DRIVE IS TO BE CONNECTED TO A NEW STREET/ROADWAY, THE COMMERCIAL DRIVE PAVEMENT SECTION SHALL MATCH THE STREET/ROADWAY PAVEMENT SECTION WITHIN THE RIGHT-OF-WAY.
4. REINFORCED CONCRETE PIPE SHALL COMPLY WITH COUNTY/CITY STANDARD DETAILS AND SPECIFICATIONS. CULVERT PIPE SIZE SHALL BE SUPPORTED BY CALCULATIONS BY DESIGN ENGINEER AND APPROVED BY THE COUNTY.

COMMERCIAL PRIVATE DRIVE
RURAL SECTION

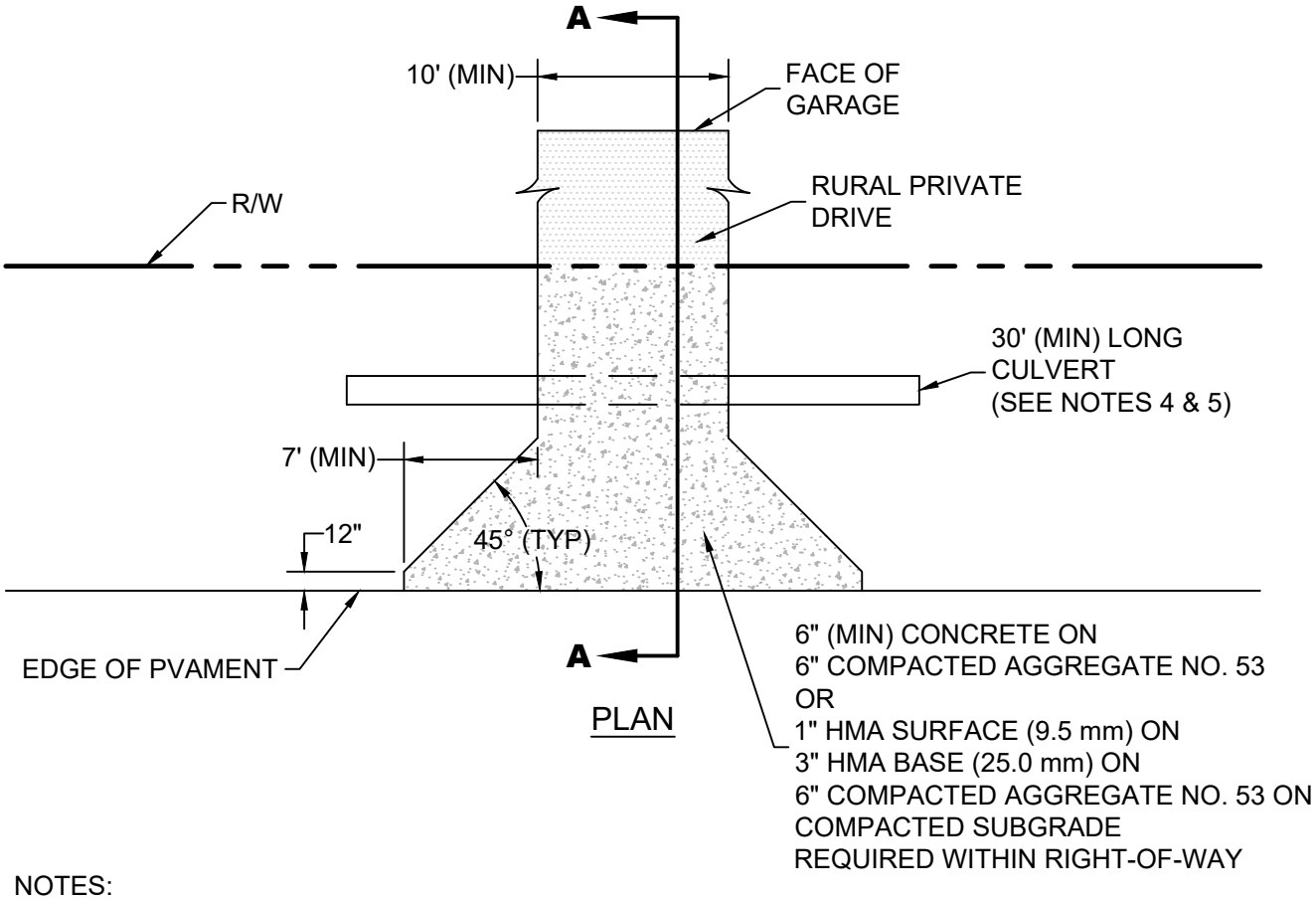
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-08
DATE: SEP 2023



SECTION A-A



PLAN

NOTES:

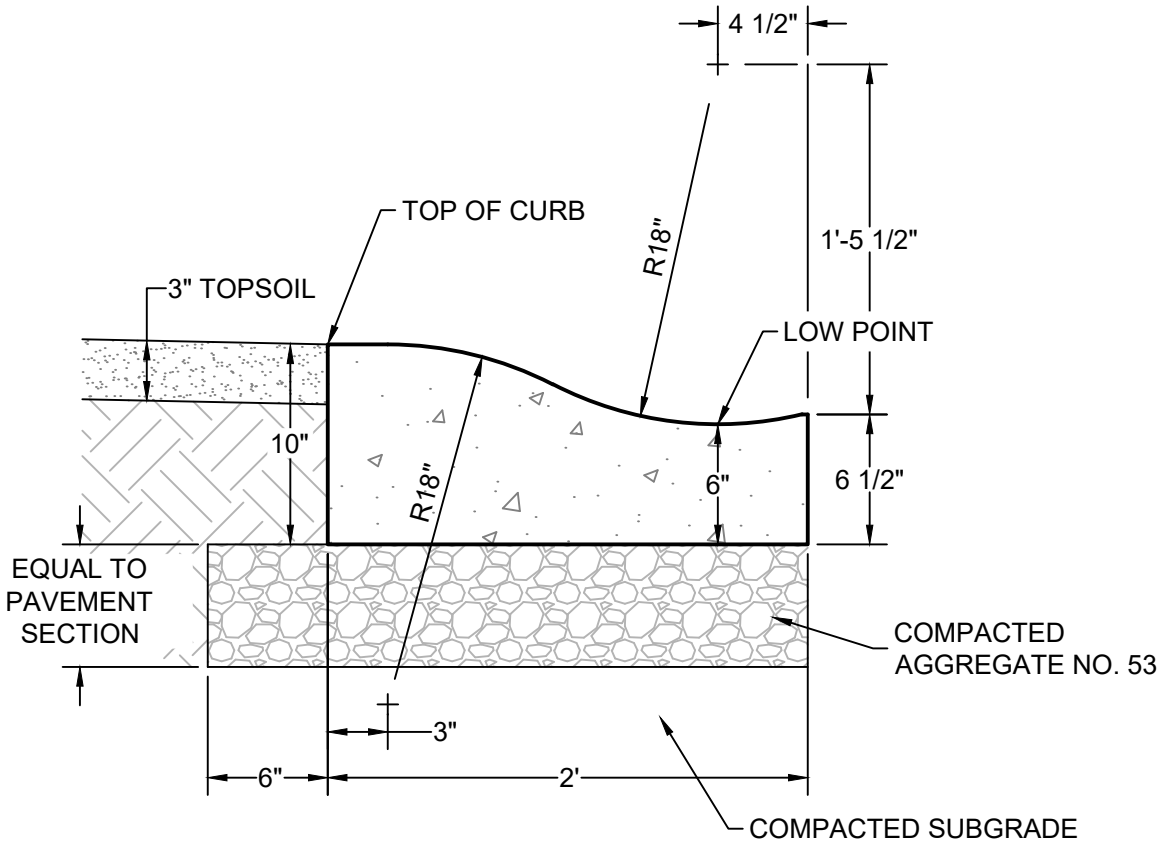
1. THE MAXIMUM ALGEBRAIC DIFFERENCE IN GRADES FOR ANY 10 FOOT INTERVAL SHALL NOT EXCEED 8% FOR CREST VERTICAL CURVES, NOR 10% FOR ANY SAG VERTICAL CURVES.
2. THE FRONTAGE OF ALL LOTS SHALL DRAIN TO ADJACENT STREETS EXCEPT WITH THE PRIOR APPROVAL OF THE COUNTY/CITY.
3. CONCRETE DRIVES REQUIRED CONTROL JOINTS AT A MAXIMUM OF EVERY 10 FEET EACH WAY.
4. CULVERT PIPE LENGTH MAY BE REDUCED TO 24' LENGTH IF CONCRETE HEADWALLS ARE USED.
5. REINFORCED CONCRETE PIPE SHALL COMPLY WITH COUNTY/CITY STANDARD DETAILS AND SPECIFICATIONS. CULVERT PIPE SIZE SHALL BE SUPPORTED BY CALCULATIONS BY DESIGN ENGINEER AND APPROVED BY THE COUNTY.

RESIDENTIAL PRIVATE DRIVE
RURAL SECTION

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-09
DATE: SEP 2023



NOTES:

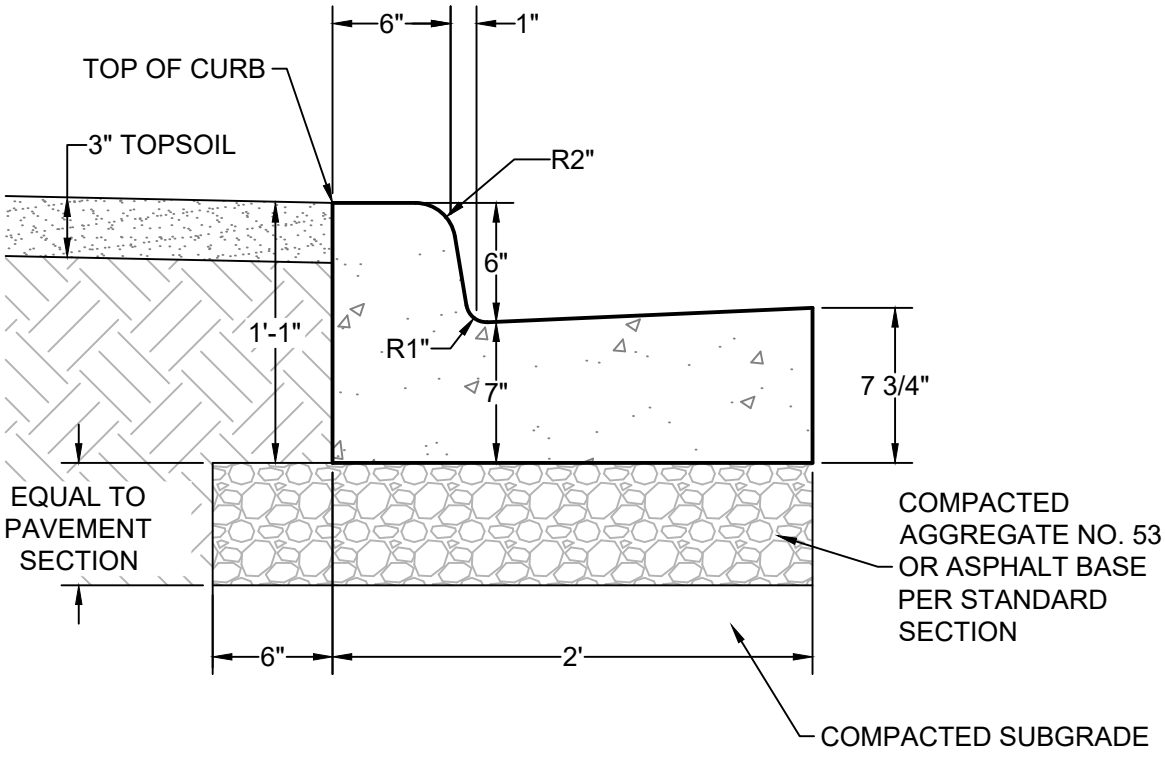
1. REFER TO COUNTY/CITY SPECIFICATIONS FOR MATERIAL AND CONSTRUCTION REQUIREMENTS

CONCRETE CURB AND GUTTER
TYPE I
(2' ROLLED CURB)

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-10
DATE: SEP 2023



NOTES:

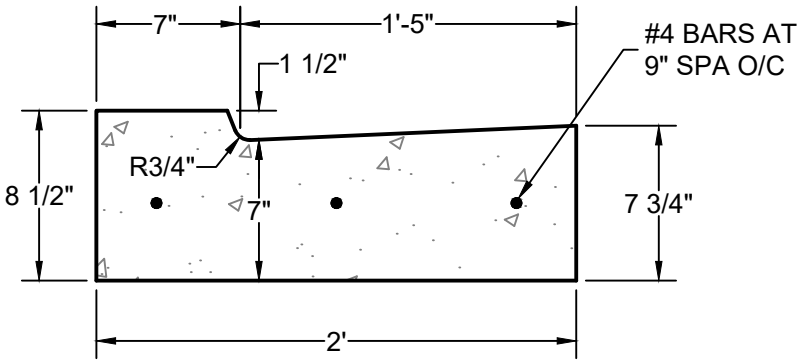
1. REFER TO COUNTY/CITY SPECIFICATIONS FOR MATERIAL AND CONSTRUCTION REQUIREMENTS

CONCRETE CURB AND GUTTER
TYPE II
(2' CHAIR BACK CURB)

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-11
DATE: SEP 2023



NOTES:

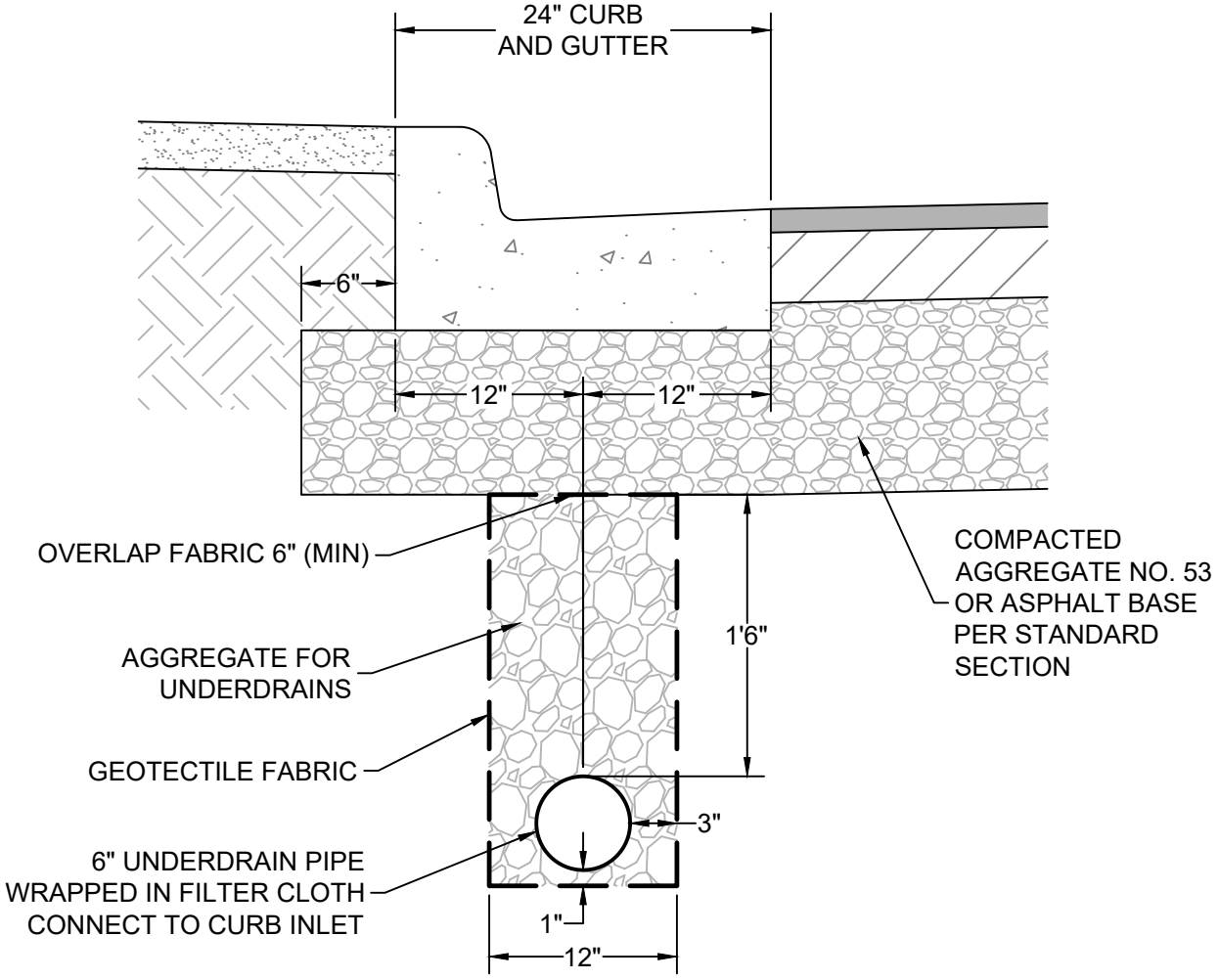
1. REINFORCED CONCRETE GUTTER IS REQUIRED AT ALL PRIVATE DRIVES THAT INTERSECT AN URBAN PUBLIC ROAD WITH CURB AND GUTTER TYPE II OR SIMILAR.
2. REFER TO COUNTY/CITY SPECIFICATIONS FOR MATERIAL AND CONSTRUCTION REQUIREMENTS

REINFORCED CONCRETE GUTTER

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-12
DATE: SEP 2023



NOTES:

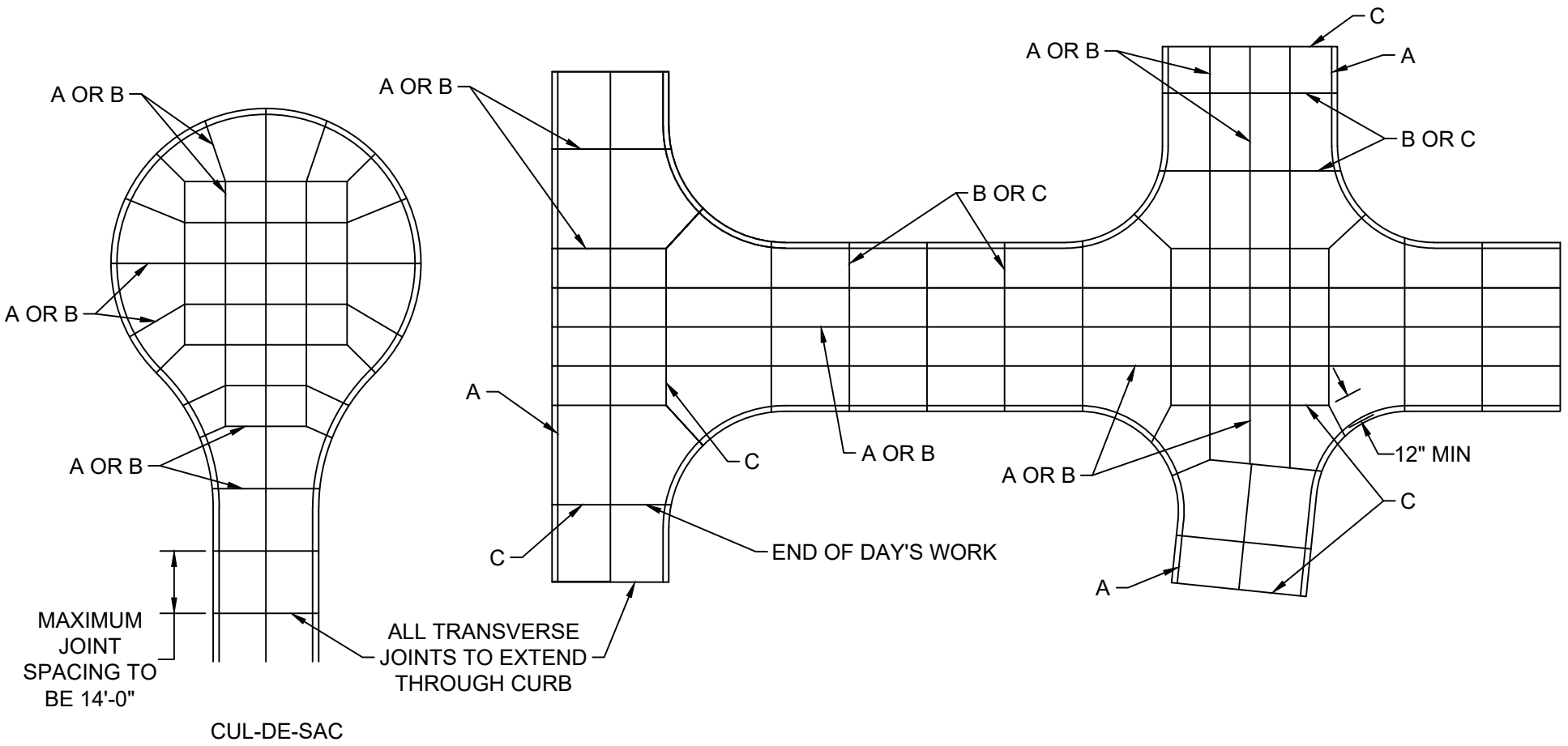
1. REFER TO COUNTY/CITY SPECIFICATIONS FOR MATERIALS AND CONSTRUCTION REQUIREMENTS

CURB UNDERDRAIN

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-13
DATE: SEP 2023



NOTES:

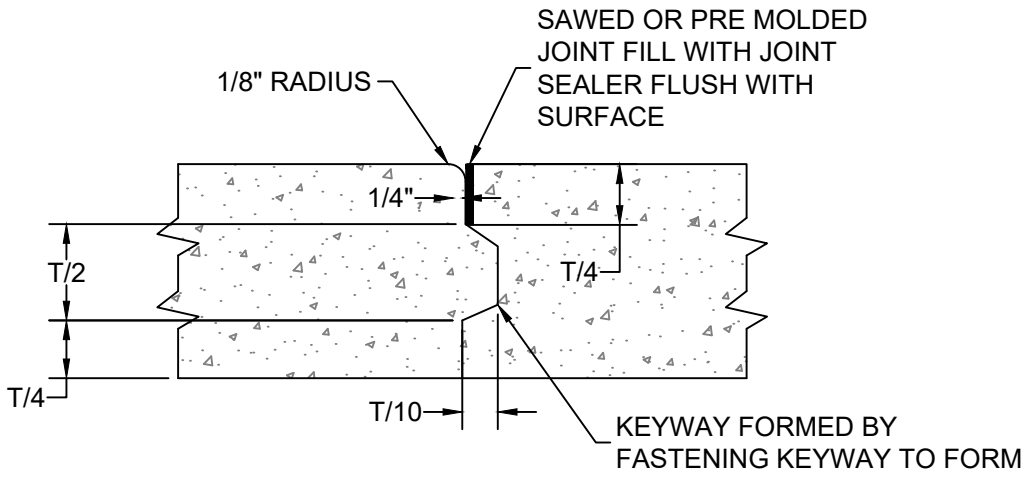
1. STREET AND OR CURB WITH A FAILURE MUST BE REMOVED TO THE NEAREST TRANSVERSE/LONGITUDINAL JOINT. REPOUR USING TYPE C STREET TIE-IN DETAIL. CURB REPLACEMENT ALSO REQUIRES USING CONCRETE CURT TIE-IN DETAIL.
2. THE CONTRACTOR MUST SUBMIT A JOINT LAYOUT DETAIL TO THE COUNTY/CITY. JOINT LOCATIONS AND TYPE SHALL BE IN ACCORDANCE WITH THE COUNTY/CITY STANDARDS.
3. REFER TO COUNTY/CITY STANDARDS FOR JOINT SEALING REQUIREMENTS.

CONCRETE JOINT LAYOUT

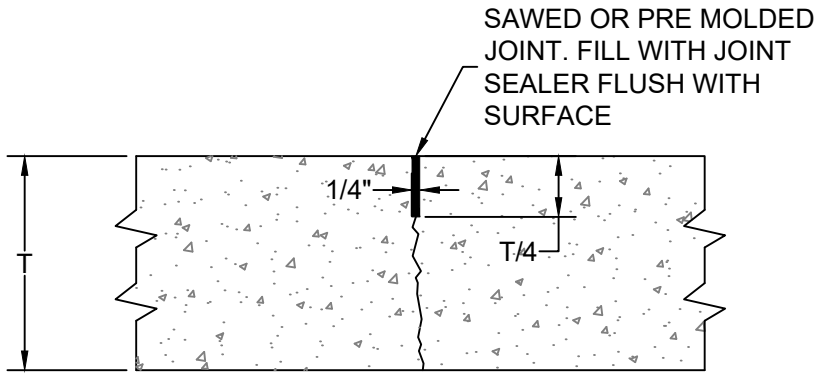
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

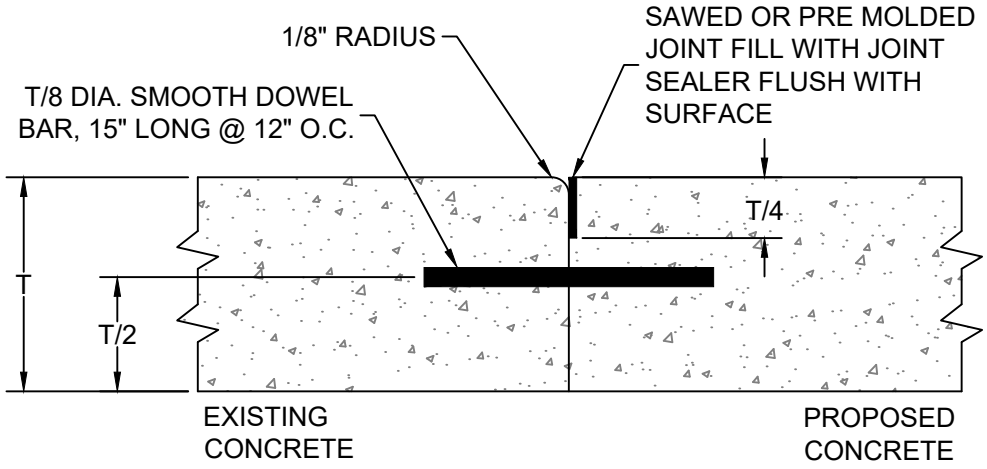
DETAIL NO. TR-14
DATE: SEP 2023



TYPE A
LONGITUDINAL CONSTRUCTION JOINT



TYPE B
SAWED TRANSVERSE OR
LONGITUDINAL CONTRACTION JOINT



SAWCUT EXISTING PAVEMENT FULL DEPTH OR FORMED BULKHEAD AT END OF DAY POUR

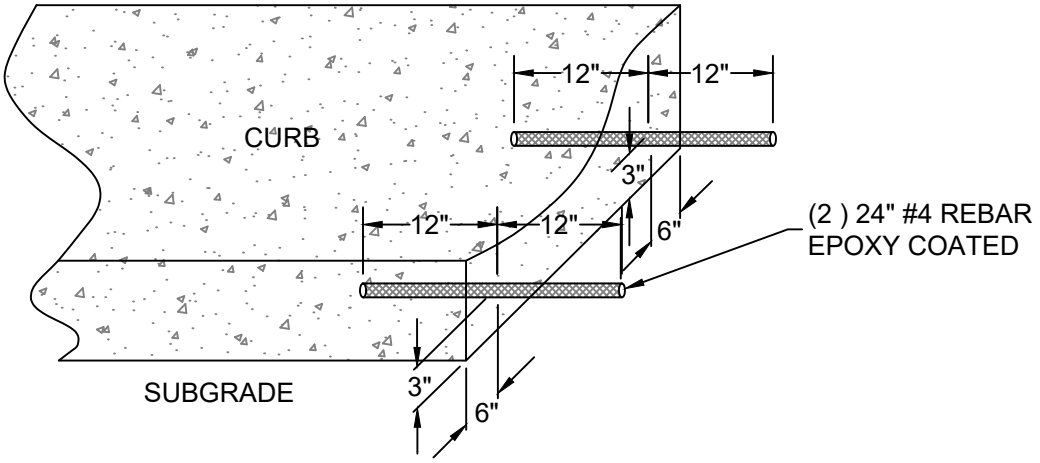
TYPE C
TRANSVERSE CONSTRUCTION JOINT

CONCRETE JOINT TYPES

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-15
DATE: SEP 2023



NOTE:

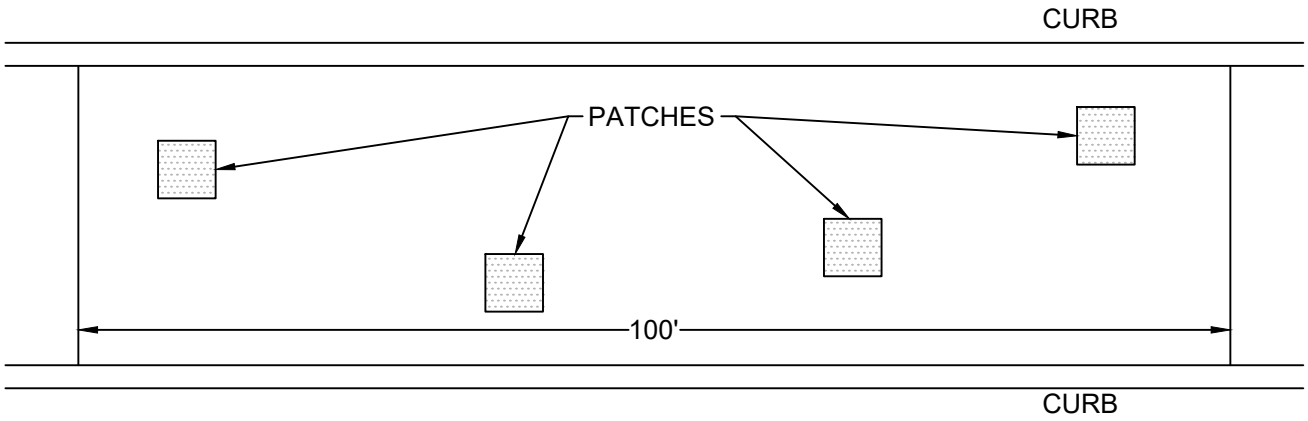
1. REBAR REINFORCEMENT IS TO BE CHEMICALLY ANCHORED INTO THE EXISTING CURB WITH EPOXY GROUT PER THE MANUFACTURER'S GUIDELINES FOR PLACEMENT.
2. REBAR IS TO BE CENTERED AT THE JOINT.

CONCRETE CURB TIE-IN

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-16
DATE: SEP 2023

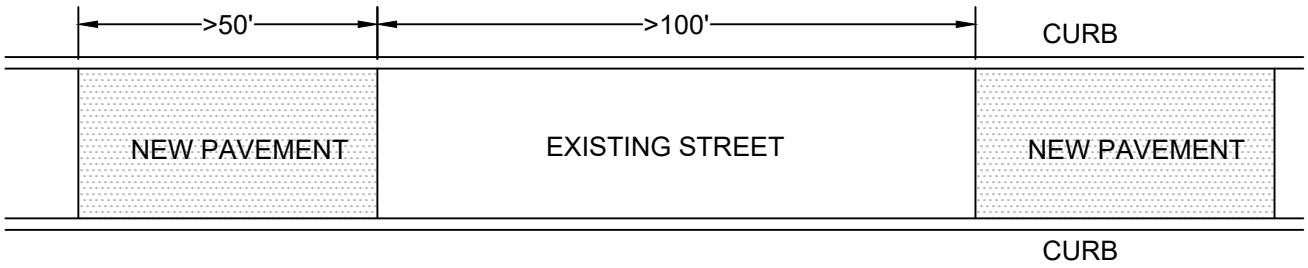


MULTIPLE CUTS SHALL BE DEFINED AS COUNTY ROAD / CITY STREET OR ALLEY, ASPHALT OR CONCRETE, THAT HAVE THE FOLLOWING CONDITIONS:

1. FOUR (4) OR MORE PATCHES PER 100 LINEAL FEET OF ROADWAY WITHIN A ONE (1) YEAR PERIOR OF TIME, AND

2. AREA CUT IS GREATER THAN 64 S.F. IN 100 LINEAL FEET OF ROADWAY WITHIN A ONE (1) YEAR PERIOR OF TIME.

MULTIPLE CUTS TO BE RESTORED AS FOLLOWS:



1. NEW PAVEMENT AREAS SHALL NOT HAVE GAPS OF LESS THAN 100 FEET.

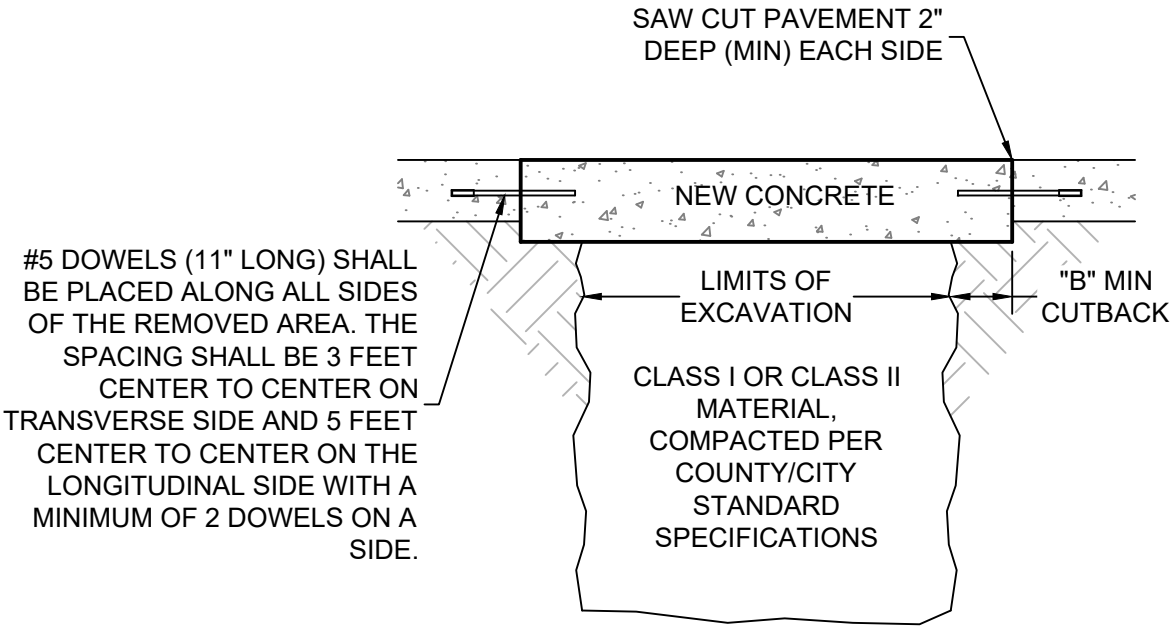
2. MINIMUM LENGTH OF NEW PAVEMENT SHALL BE 50 FEET.

PAVEMENT REPLACEMENT FOR MULTIPLE OR LARGE CUTS

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-17
DATE: SEP 2023



FINAL CUTBACK TABLE	
B	TRENCH WIDTH
6"	3'-0" OR LESS
9"	3'-1" TO 5'-0"
12"	5'-1" OR GREATER

NOTES:

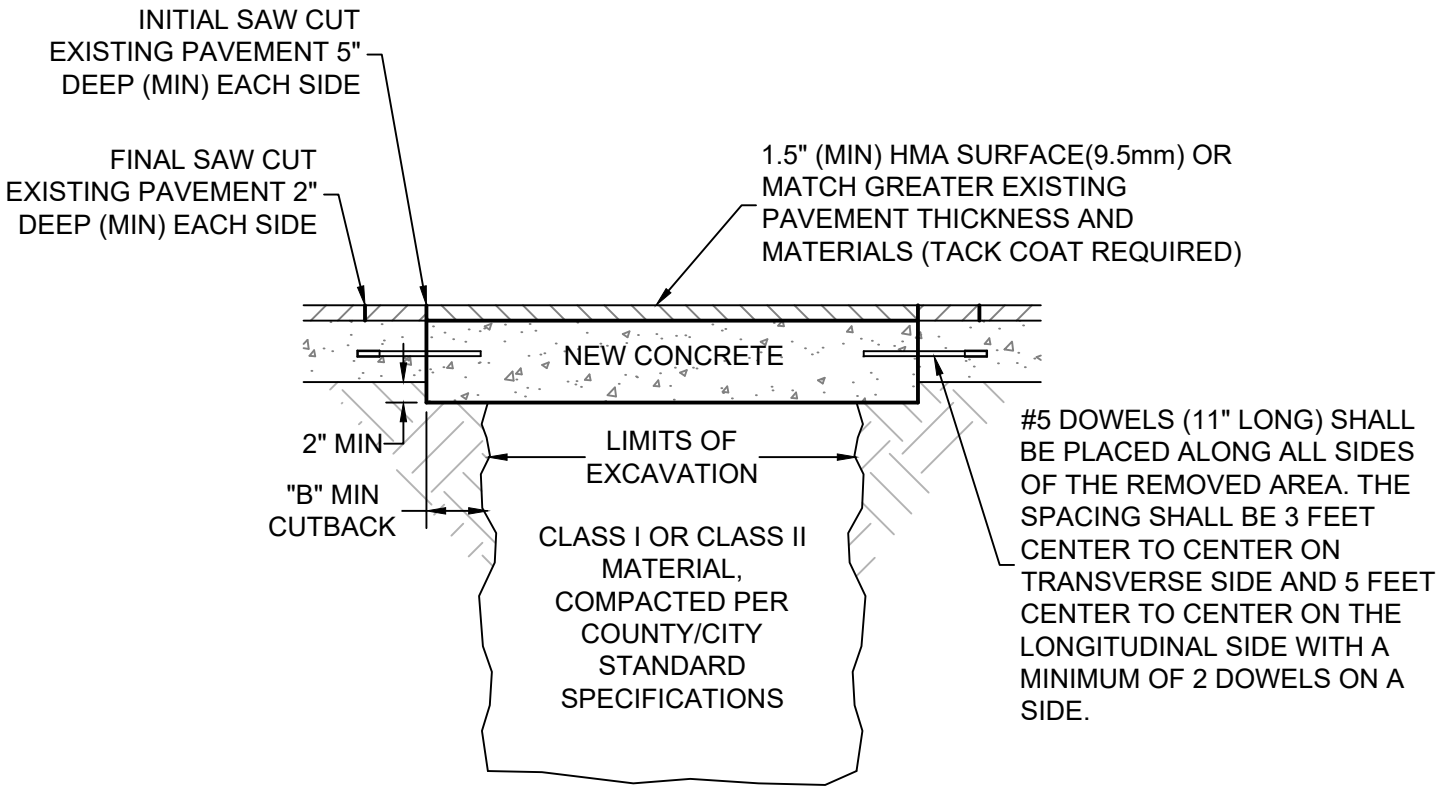
1. REFER TO COUNTY/CITY STANDARD SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS

CONCRETE PAVEMENT REPAIR

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-18
DATE: SEP 2023



FINAL CUTBACK TABLE	
B	TRENCH WIDTH
6"	3'-0" OR LESS
9"	3'-1" TO 5'-0"
12"	5'-1" OR GREATER

NOTES:

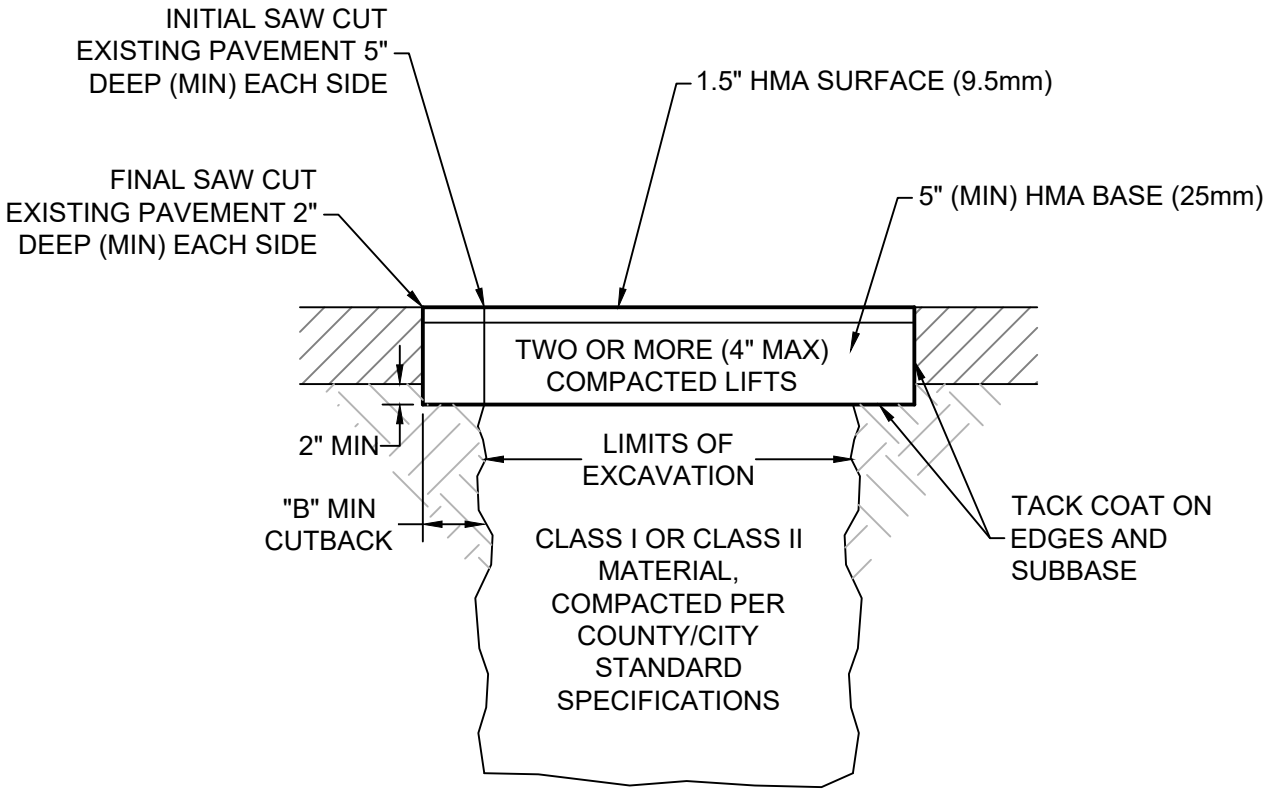
1. REFER TO COUNTY/CITY STANDARD SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS

ASPHALT OVER CONCRETE PAVEMENT REPAIR

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-19
DATE: SEP 2023



FINAL CUTBACK TABLE	
B	TRENCH WIDTH
6"	3'-0" OR LESS
9"	3'-1" TO 5'-0"
12"	5'-1" OR GREATER

NOTES:

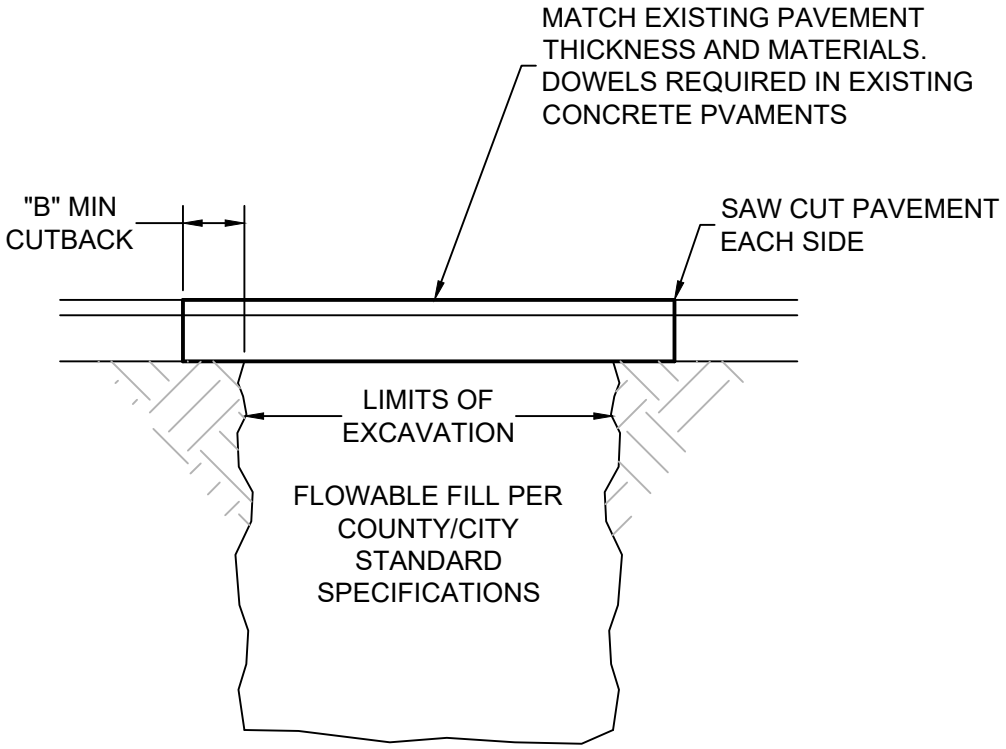
1. REFER TO COUNTY/CITY STANDARD SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS

ASPHALT PAVEMENT REPAIR

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-20
DATE: SEP 2023



FINAL CUTBACK TABLE	
B	TRENCH WIDTH
6"	3'-0" OR LESS
9"	3'-1" TO 5'-0"
12"	5'-1" OR GREATER

NOTES:

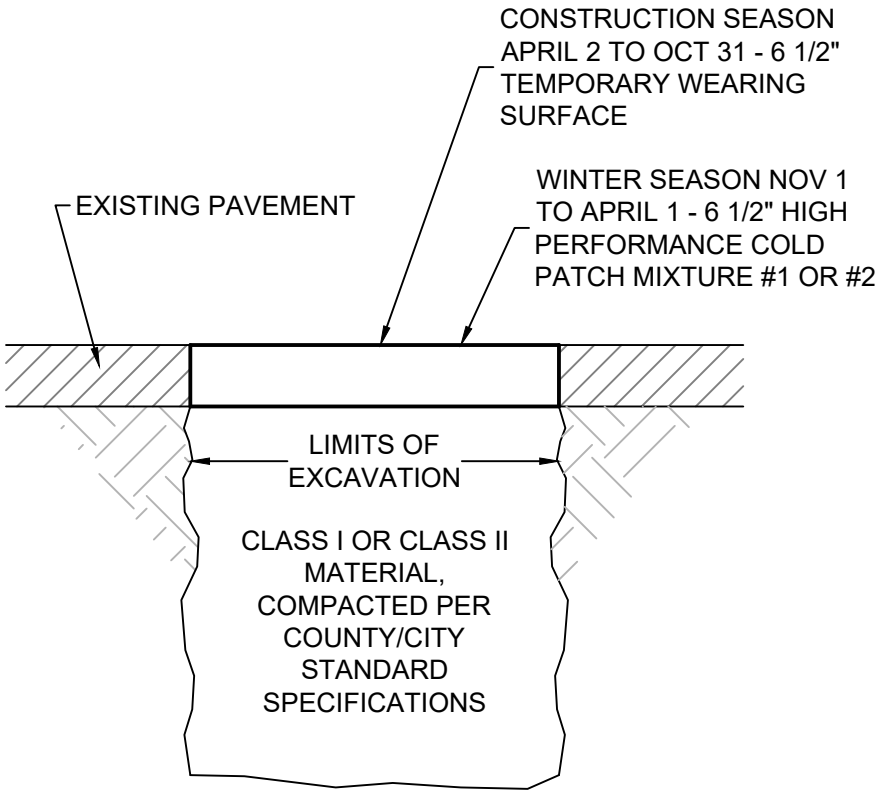
1. REFER TO COUNTY/CITY STANDARD SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS

PAVEMENT REPAIR WITH FLOWABLE FILL

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-21
DATE: SEP 2023



NOTES:

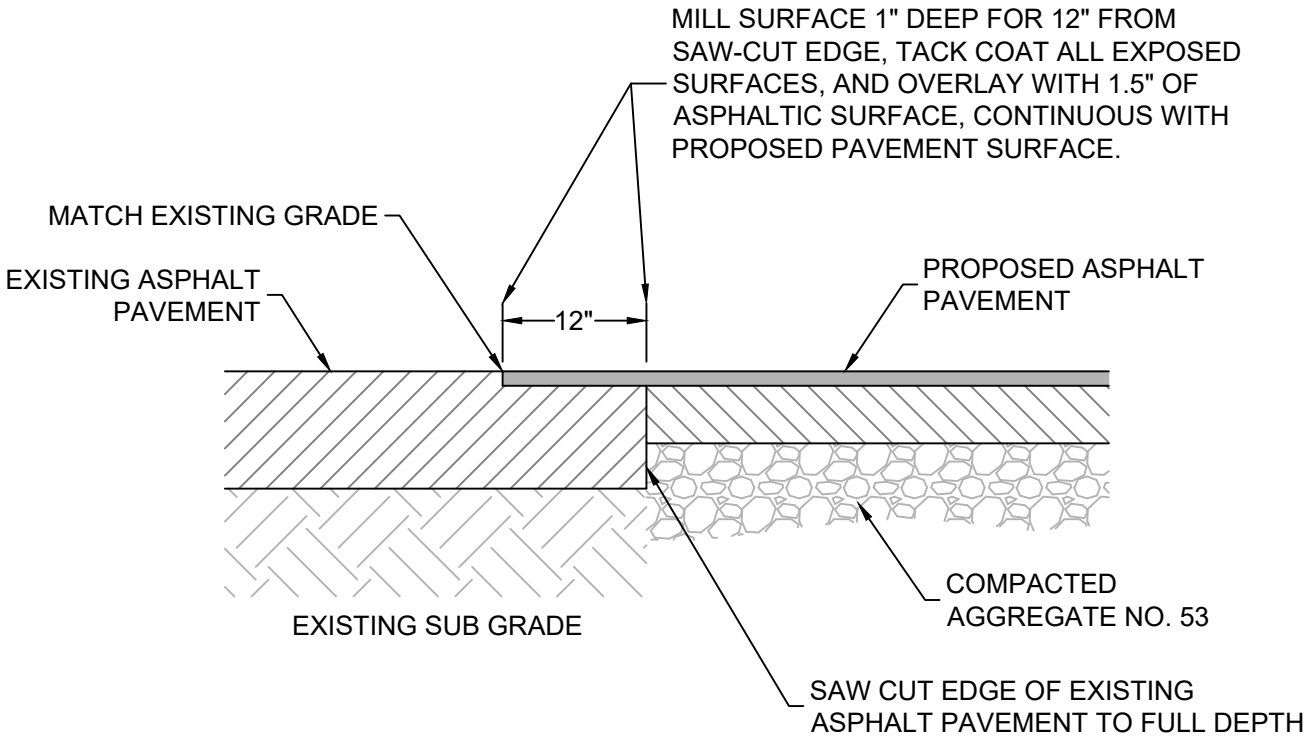
1. REFER TO COUNTY/CITY STANDARD SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS

TEMPORARY ASPHALT REPAIR

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-22
DATE: SEP 2023

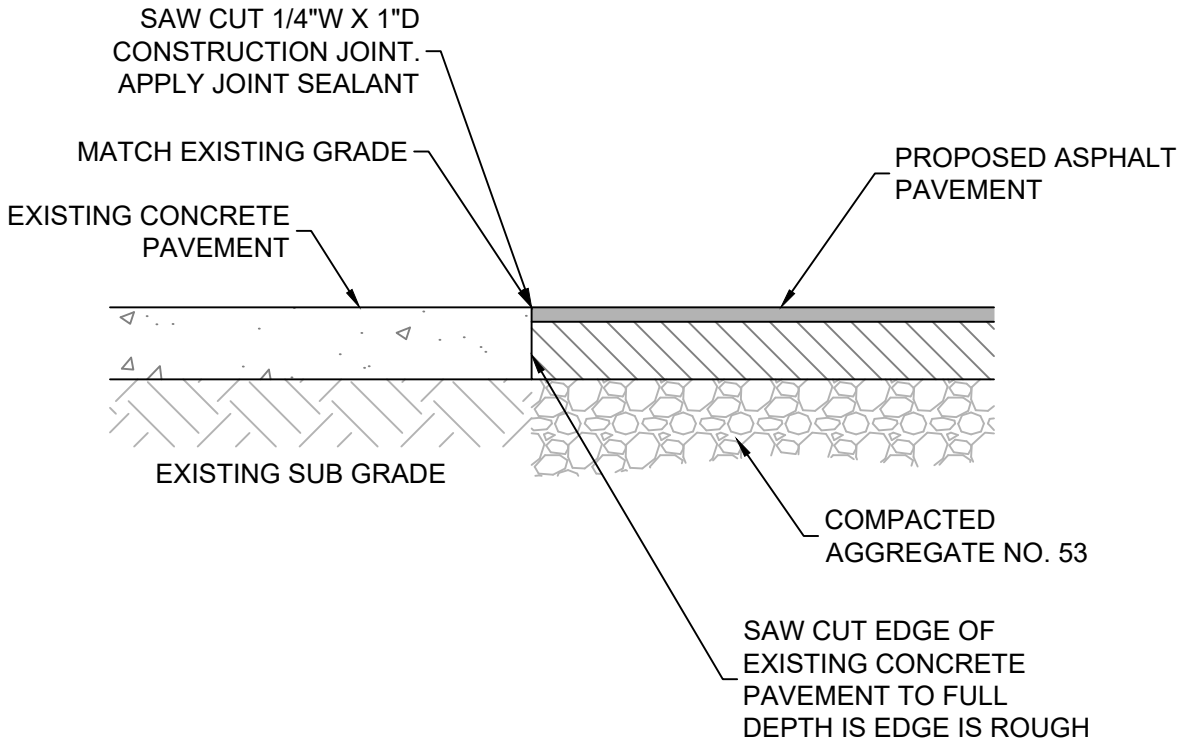


LAP JOINT

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-23
DATE: SEP 2023

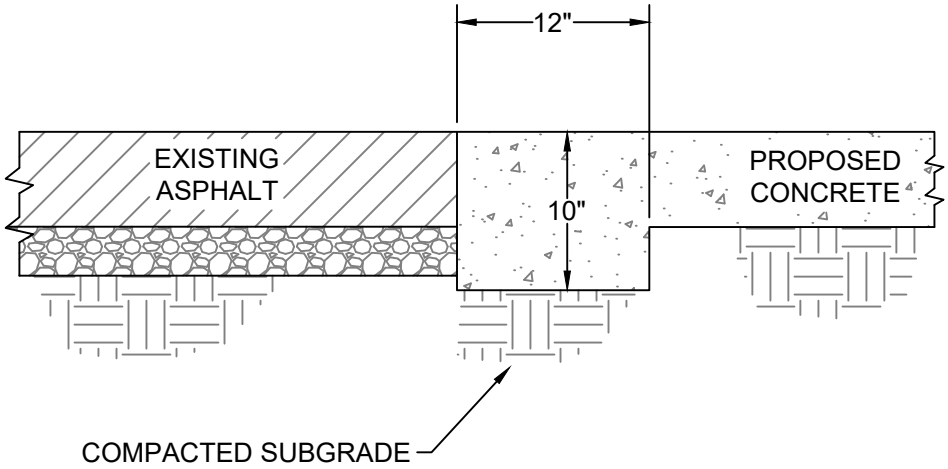


BUTT JOINT

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-24
DATE: SEP 2023

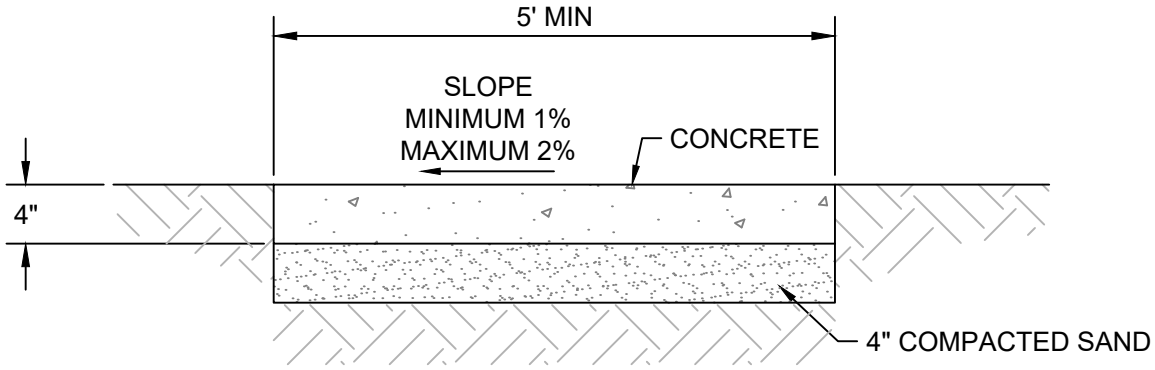


CONCRETE TO ASPHALT STREET TIE-IN

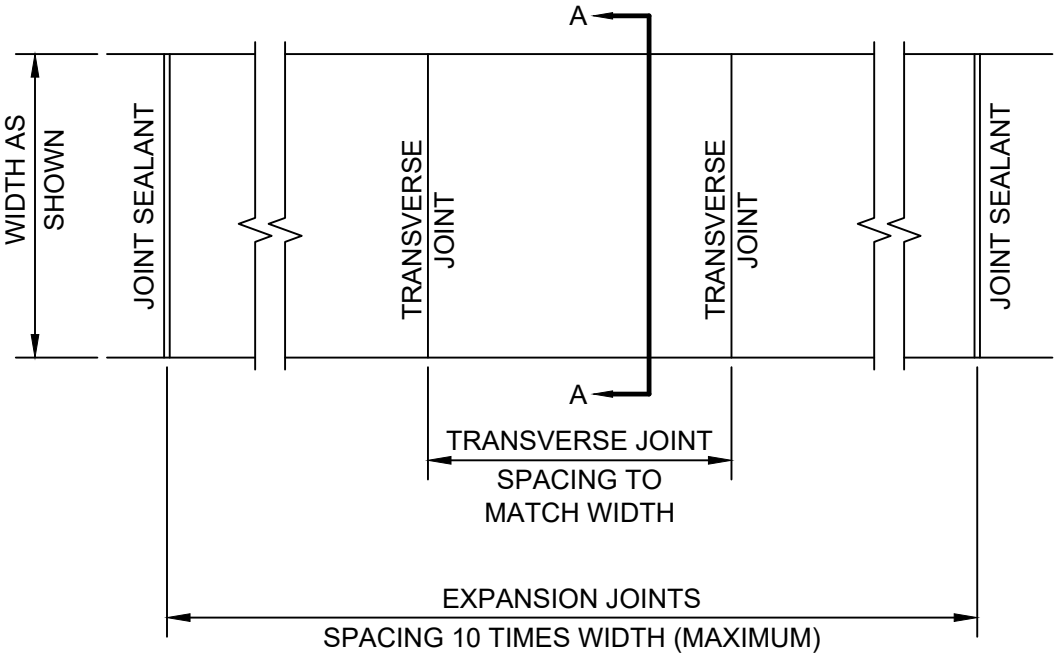
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-25
DATE: SEP 2023



TYPICAL SIDEWALK SECTION A



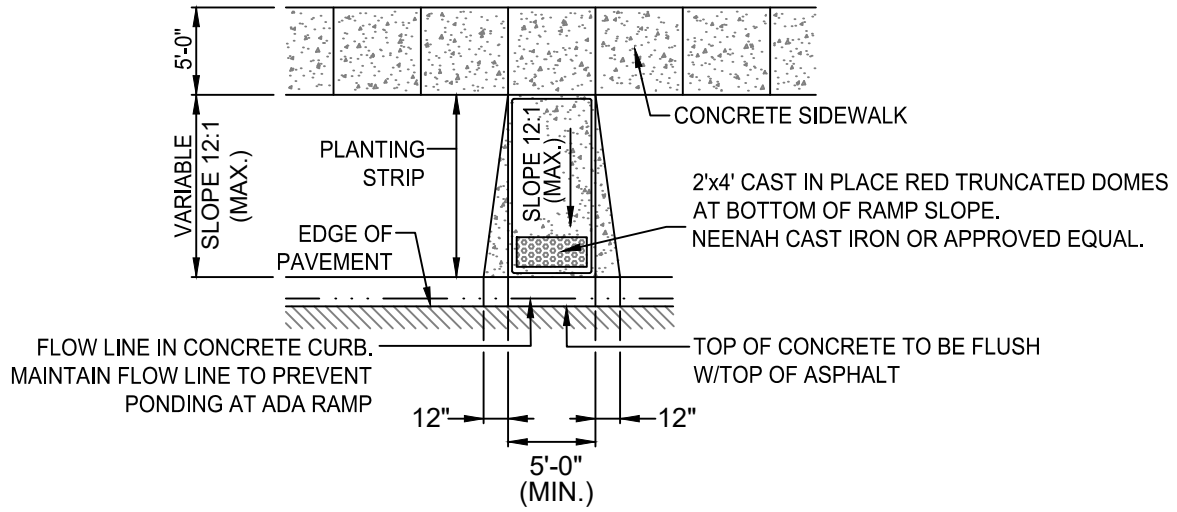
PLAN VIEW

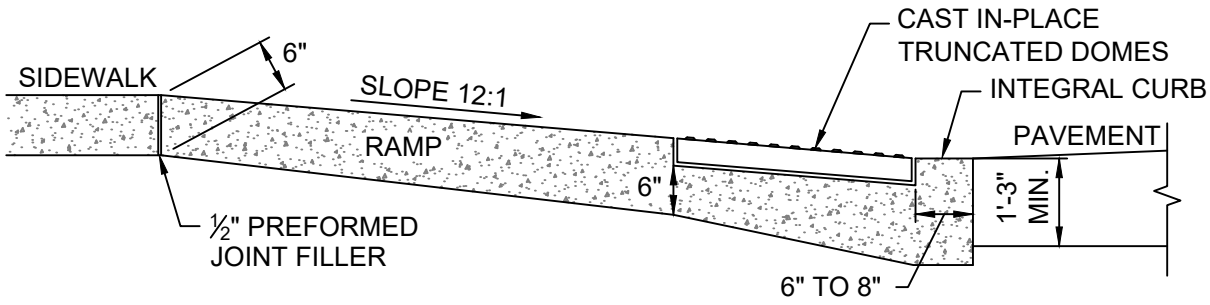
CONCRETE SIDEWALK

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-26
DATE: SEP 2023





NOTE:

1. CURB RAMPS SHALL BE PROVIDED AT THE POINT OF TANGENCY OF THE RADIUS AT ALL CORNERS OF EVERY STREET INTERSECTION WHERE THERE IS AN EXISTING OR PROPOSED SIDEWALK AND CURB AND AS OTHERWISE DIRECTED BY THE COUNTY/CITY.

2. CURB RAMPS WITHIN THE PUBLIC RIGHT-OF-WAY MUST CONFORM TO THE LATEST PROWAG AND ADA STANDARDS FOR DESIGN AND CONSTRUCTION.

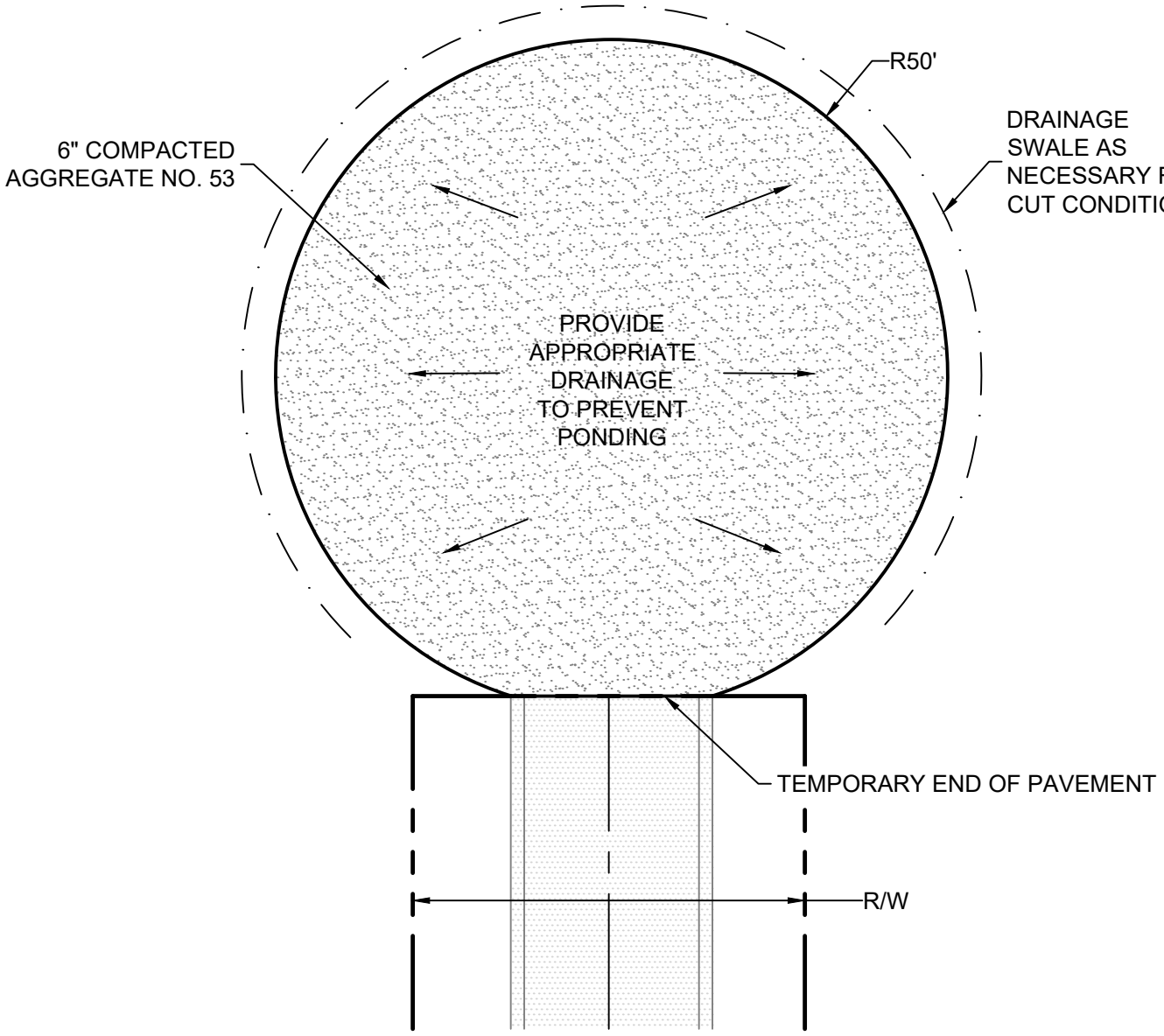
3. CURB RAMPS SHALL BE PERPENDICULAR TO THE DIRECTION OF TRAVEL ON ADJACENT ROADWAY.

CURB RAMP

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-27
DATE: SEP 2023



NOTES:

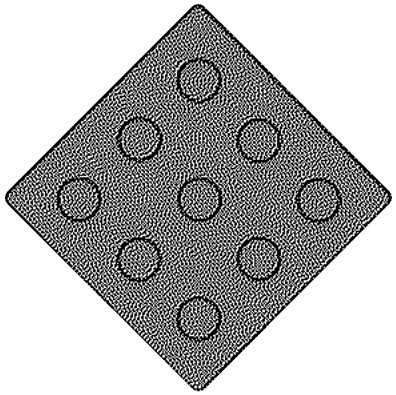
1. DEVELOPERS SHALL BE RESPONSIBLE FOR CONSTRUCTING TEMPORARY TURNAROUND ON ALL ROADS WITH TEMPORARY TERMINATION MORE THAN 100 FEET FROM AN INTERSECTION, OR AS OTHERWISE DETERMINED BY THE COUNTY/CITY.
2. TEMPORARY TURNAROUNDS SHALL BE LOCATED WITHIN A TEMPORARY EASEMENT OR RIGHT-OF-WAY.
3. LOT ACCESS WILL NOT BE PERMITTED FROM A TEMPORARY TURNAROUND.
4. ALTERNATE TEMPORARY TURNAROUND CONFIGURATIONS, SUCH AS HAMMERHEAD TURNAROUNDS, MAY BE APPROVED BY THE COUNTY/CITY AND THE FIRE DEPARTMENT.

TEMPORARY TURNAROUND

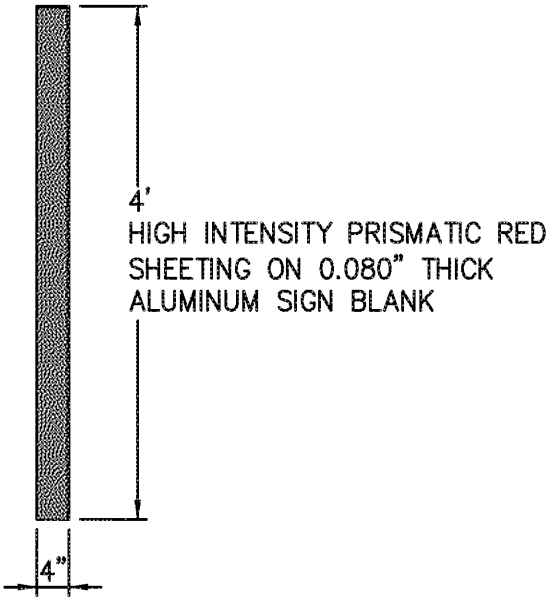
SCALE: NONE

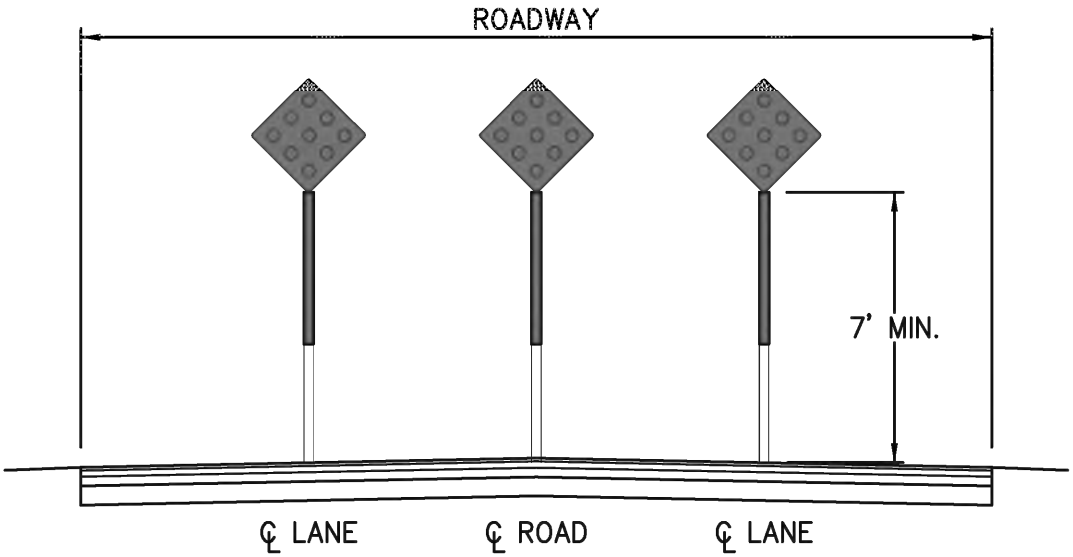
FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-28
DATE: SEP 2023



OM4-1





NOTE:

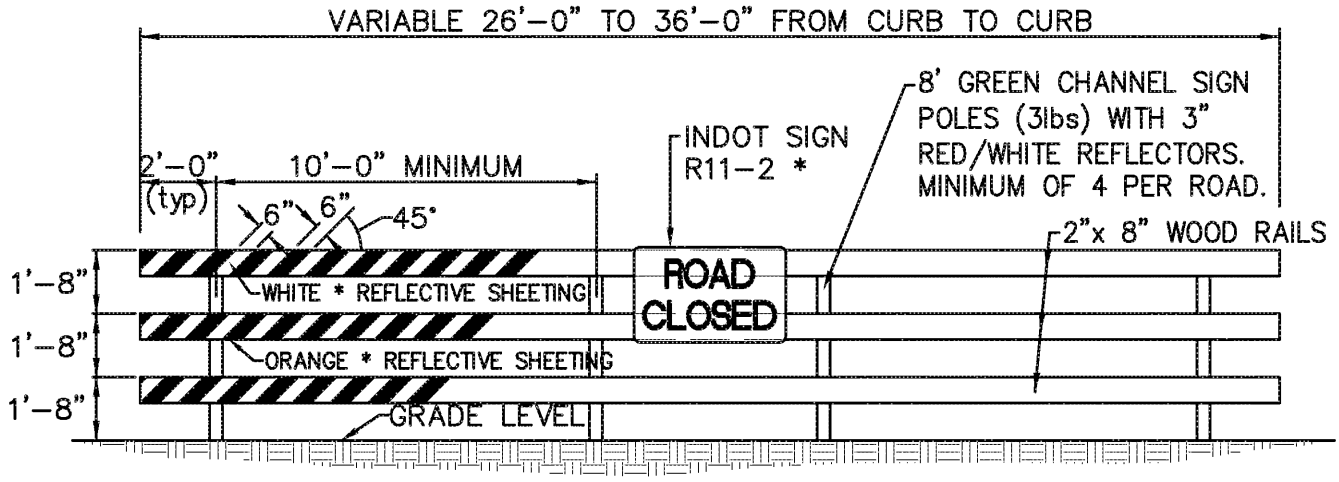
POSTS SHALL BE GALVANIZED 10 GUAGE U-CHANNEL POSTS OR 2 ¼" GALVANIZED SQUARE POSTS, WITH ANCHORS.

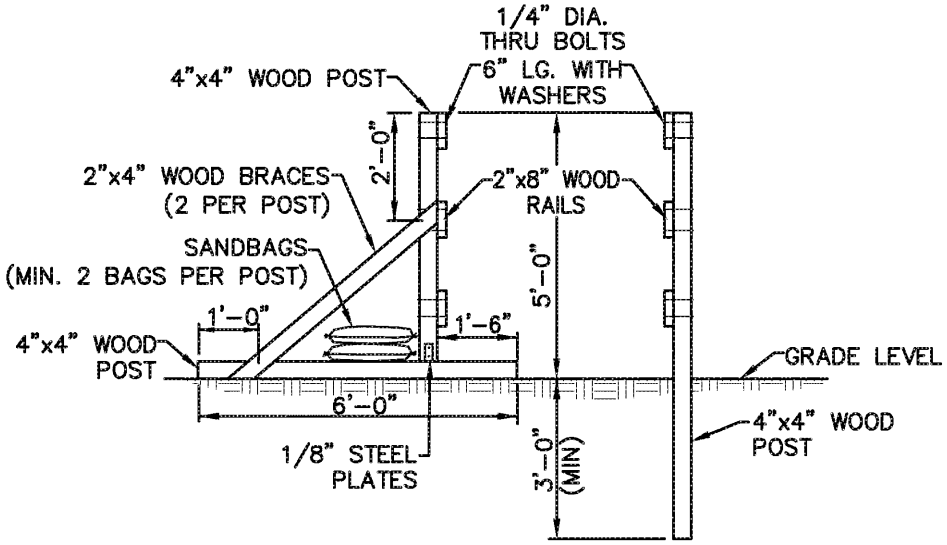
END OF ROAD

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-29
DATE: SEP 2023





GENERAL NOTES

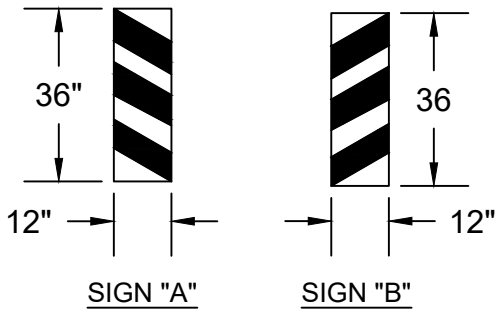
1. LOCATION OF BARRICADE AS PER PLANS.
2. *REFLECTIVE SHEETING TO BE IN ACCORDANCE WITH INDOT STANDARD SPECIFICATION 912.10.
3. **SEE INDOT STANDARD DETOUR SIGNS DETAILS.
4. REFER TO SECTION 800 OF THE INDIANA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS AND LATEST ADDITION OF INDIANA MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.

STANDARD BARRICADE

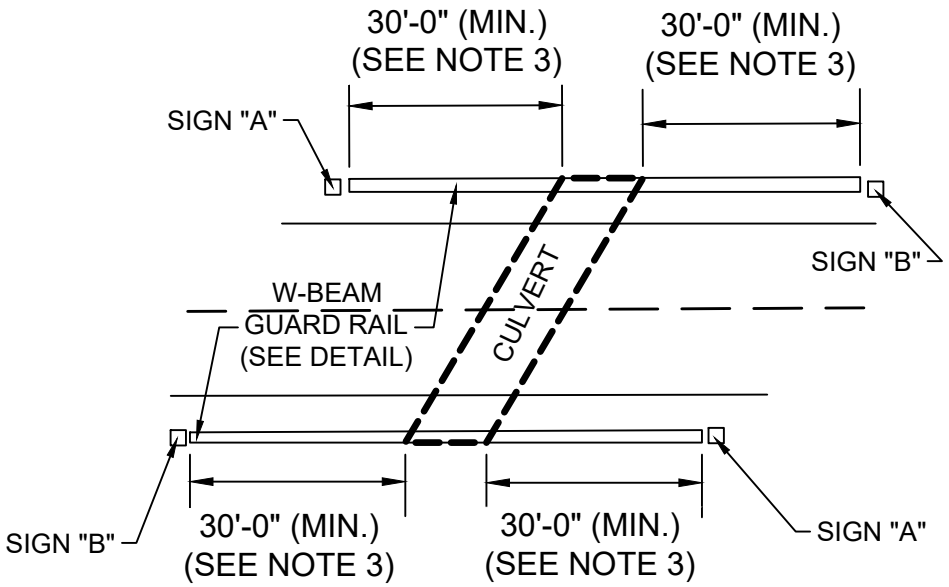
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-30
DATE: SEP 2023



TYPICAL TYPE 3 OBJECT MARKERS



PLAN VIEW

NOTES:

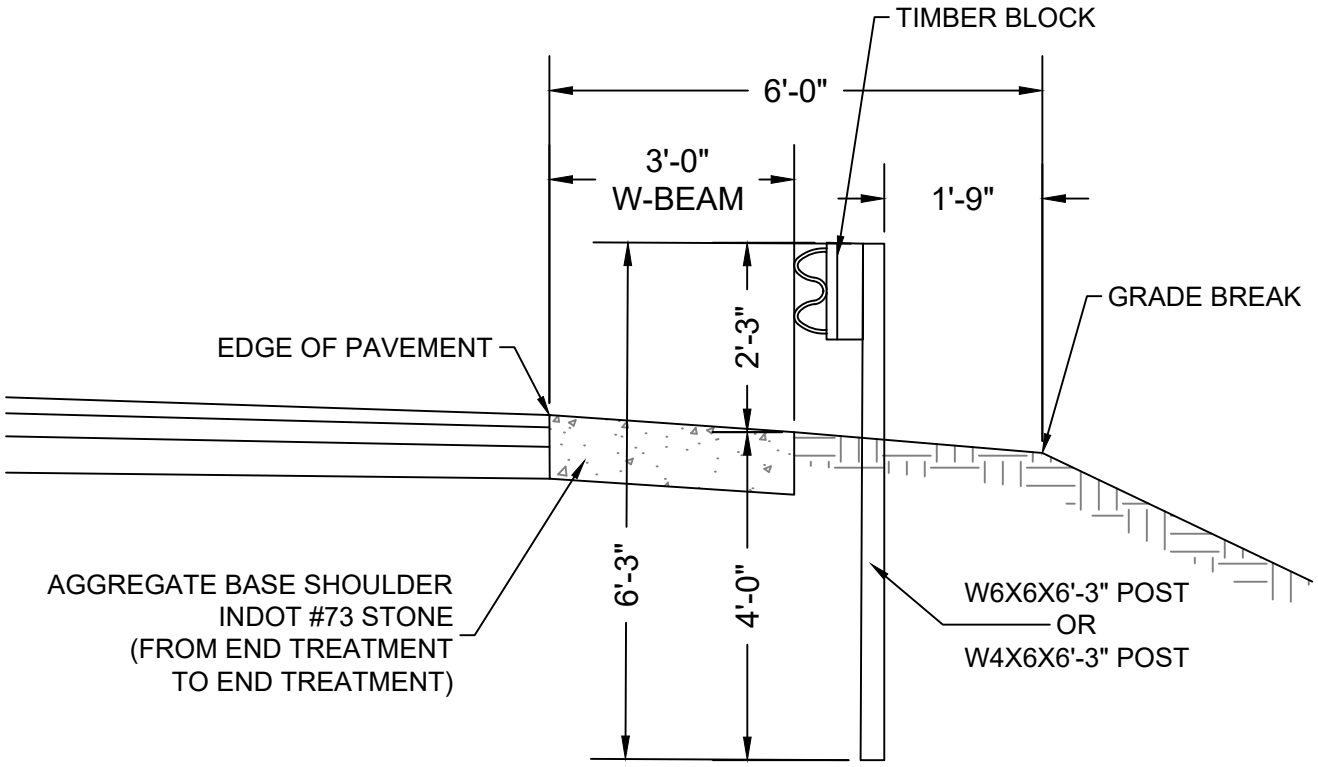
1. GUARD RAIL END TREATMENT SHALL CONSIST OF SETTING POSTS IN CONCRETE TO A DEPTH OF 4'-9". INTERIM POSTS NEED NOT TO BE SET IN CONCRETE.
2. SIGN A AND SIGN B SHALL BE YELLOW AND BLACK HIGH INTENSITY AND IN ACCORDANCE WITH THE MOST RECENT INDIANA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, TYPICAL 3 OBJECT MARKERS.
3. LENGTH OF GUARDRAIL MAY VARY. CONTRACTOR SHALL CONTACT THE FAYETTE COUNTY HIGHWAY DEPARTMENT FOR THE REQUIRED GUARDRAIL LENGTH.

TYPICAL GUARDRAIL REQUIREMENT

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-31
DATE: SEP 2023



NOTE:

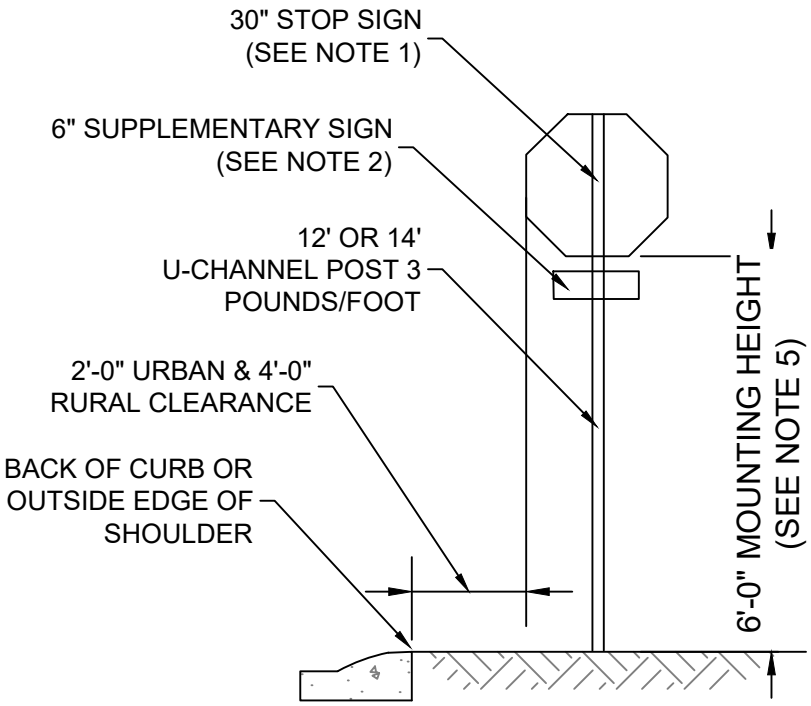
W6X6 POSTS SHALL BE AT 12'-0" MAXIMUM AND W4X6 SHALL BE SPACED AT 6'-3" MAXIMUM, UNLESS APPROVED OTHERWISE BY THE FAYETTE COUNTY HIGHWAY DEPARTMENT.

GUARD RAIL W-BEAM

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-32
DATE: SEP 2023



NOTE:
ALL BOLTS AND HARDWARE SHALL BE ZINC COATED

NOTES:

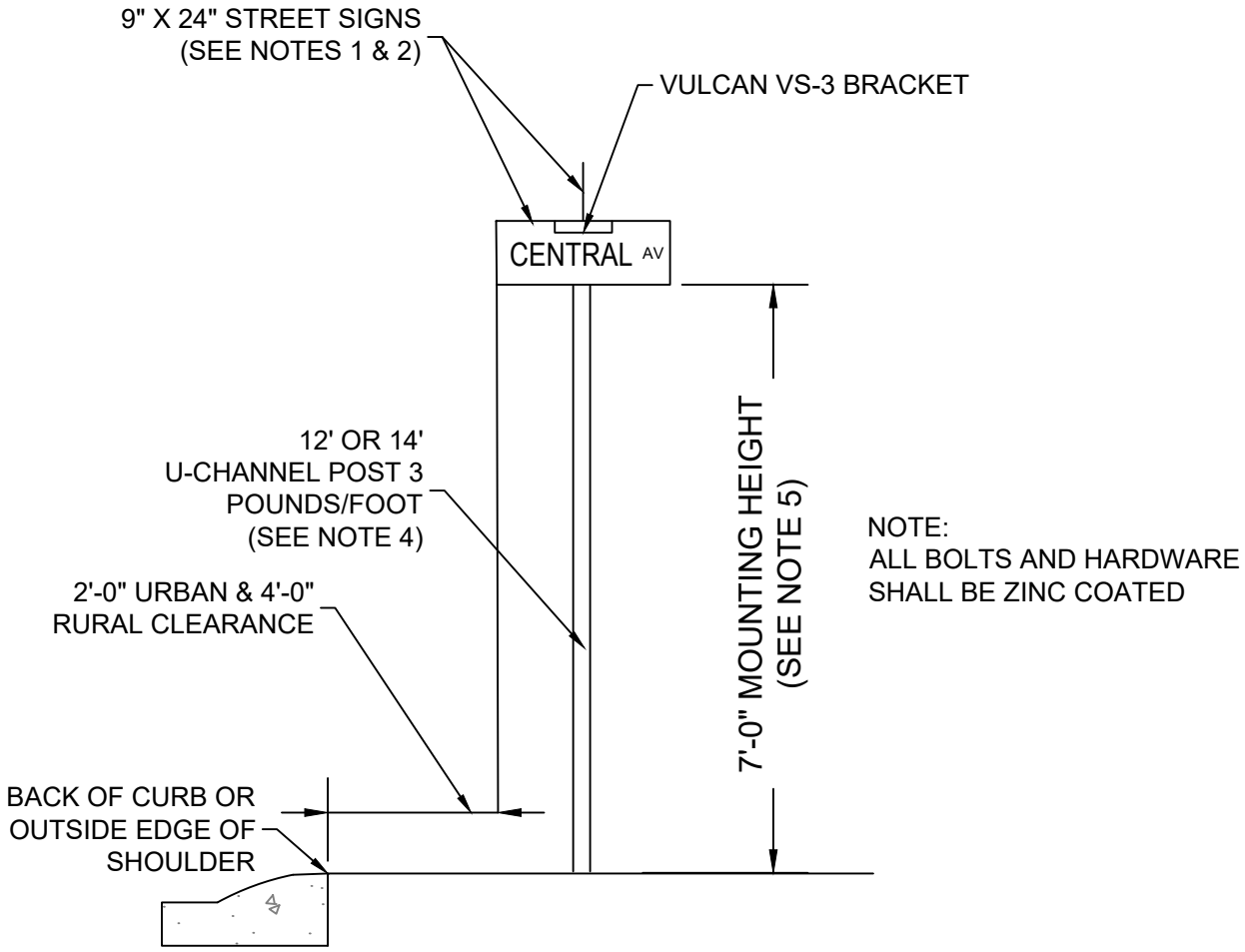
1. STOP SIGN SHALL BE HIGH INTENSITY AND IN ACCORDANCE WITH MOST RECENT INDIANA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
2. A MULTI-WAY STOP INTERSECTION REQUIRES AN "ALL WAY" SUPPLEMENTARY SIGN 12" WIDE BY 6" TALL.
3. CONTRACTOR SHALL SUPPLY AND INSTALL ALL POSTS, SIGNS, BOLTS AND HARDWARE.
4. A 24" WIDE WHITE THERMOPLASTIC STOP BAR SHALL EXTEND ACROSS APPROACH LANE. STOP BAR SHALL BE PLACED DIRECTLY ADJACENT TO THE STOP SIGN. BOTH STOP SIGN AND STOP BAR SHALL BE LOCATED SUCH THAT A MINIMUM 200 FEET PERPENDICULAR SIGHT DISTANCE MAY BE REQUIRED BY THE FAYETTE COUNTY COMMISSIONERS/CONNERSVILLE CITY ENGINEER.
5. AT RURAL ROAD LOCATIONS, MOUNTING HEIGHT SHALL BE MEASURED FROM PAVEMENT EDGE TO BOTTOM OF REGULATORY SIGN.

TYPICAL STOP SIGN

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-33
DATE: SEP 2023



NOTES:

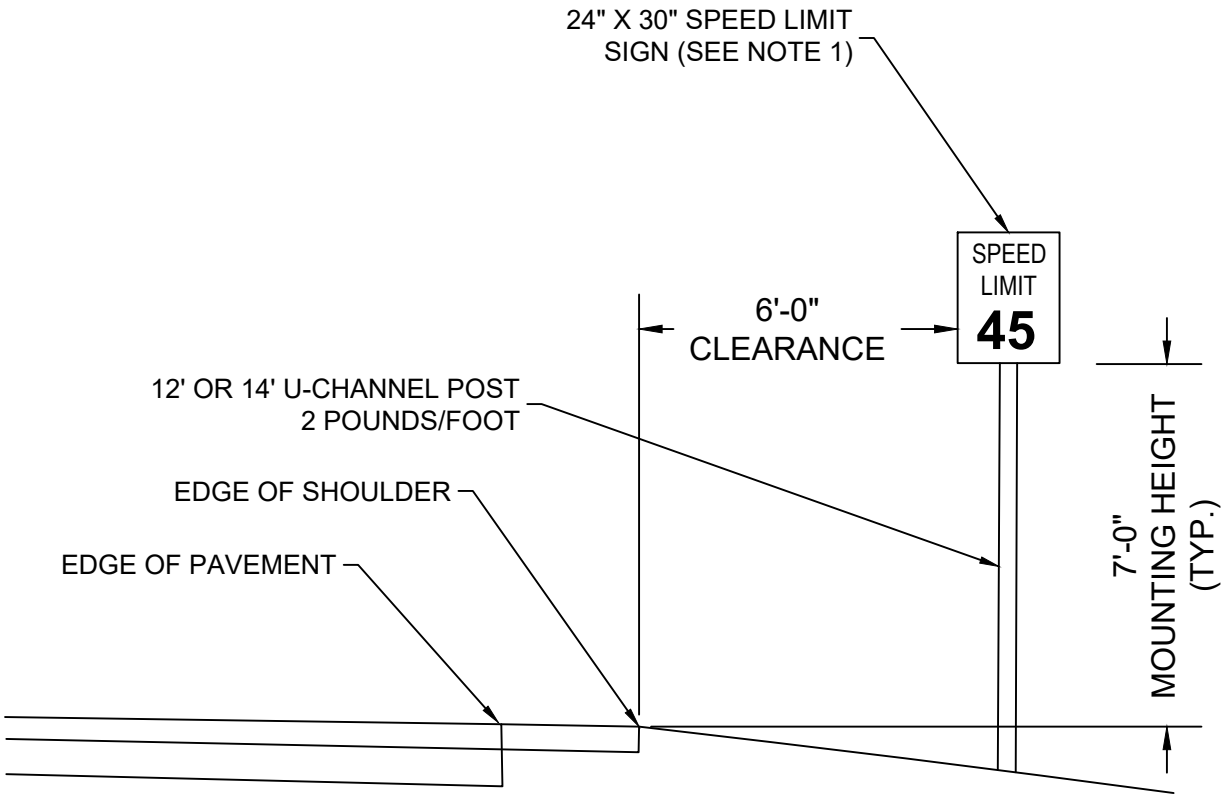
1. STREETS SHALL BE SIGNED AT NON-SIGNALIZED INTERSECTIONS WITH 2 SUCH STREET SIGN ASSEMBLIES TYPICALLY REQUIRED.
2. STREET SIGNS SHALL BE 9" X 24" TALL EXTRUDED ALUMINUM (6063-T6) GREEN BACKGROUND 3M SCOTCHLITE WHITE 1177 OR EQUAL WITH 6" TALL WHITE LETTERS 3M SCOTCHLITE WHITE 3870 OR EQUAL.
3. CONTRACTOR SHALL SUPPLY AND INSTALL ALL POSTS, SIGNS, BOLTS AND HARDWARE.
4. STREET SIGNS, SHALL BE MOUNTED ON 12' OR 14' U-CHANNEL POSTS (2 POUNDS/FOOT).
5. AT RURAL ROAD INTERSECTIONS, MOUNTING HEIGHT SHALL BE MEASURED FROM PAVEMENT EDGE TO BOTTOM OF REGULATORY SIGN.

TYPICAL STREET SIGN

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-34
DATE: SEP 2023



NOTE:
ALL BOLTS AND HARDWARE
SHALL BE ZINC COATED

NOTES:

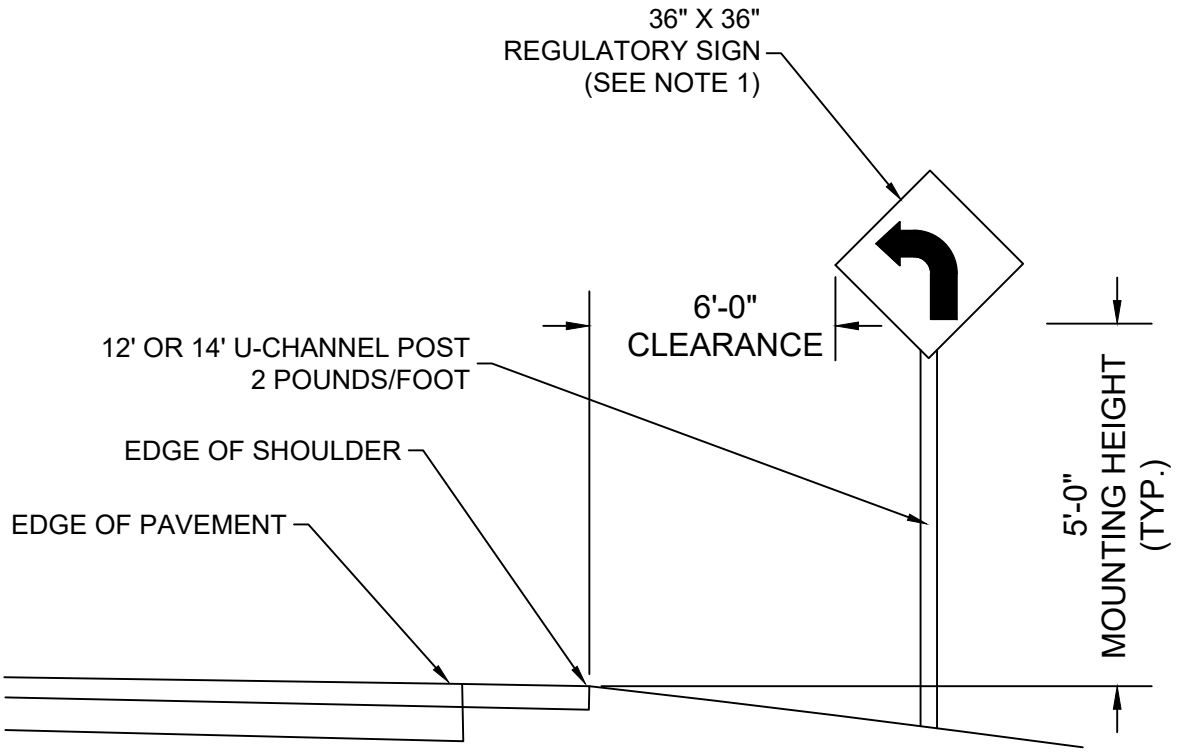
1. SPEED LIMIT SIGN SHALL BE HIGH INTENSITY AND IN ACCORDANCE WITH THE MOST RECENT INDIANA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES. CONSULT THE FAYETTE COUNTY COMMISSIONERS/CONNERSVILLE CITY ENGINEER FOR SPEED LIMIT OF EACH ROAD.
2. AT RURAL ROAD LOCATIONS, MOUNTING HEIGHT SHALL BE MEASURED FROM PAVEMENT EDGE TO BOTTOM OF REGULATORY SIGN.
3. CONTRACTOR SHALL SUPPLY AND INSTALL ALL POSTS, SIGNS, BOLTS AND HARDWARE.
4. LOCATION OF SPEED LIMIT SIGNS SHALL BE APPROVED BY THE FAYETTE COUNTY COMMISSIONERS/CONNERSVILLE CITY ENGINEER.

TYPICAL SPEED LIMIT SIGN

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-35
DATE: SEP 2023



NOTE:
ALL BOLTS AND HARDWARE
SHALL BE ZINC COATED

NOTES:

1. REGULATORY SIGNS SHALL BE 36" NY 36" IN SIZE AND IN ACCORDANCE WITH THE MOST RECENT INDIANA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.
2. AT RURAL ROAD LOCATIONS, MOUNTING HEIGHT SHALL BE MEASURED FROM PAVEMENT EDGE TO BOTTOM OF REGULATORY SIGN.
3. CONTRACTOR SHALL SUPPLY AND INSTALL ALL POSTS, SIGNS, BOLTS AND HARDWARE.
4. LOCATION OF SPEED LIMIT SIGNS SHALL BE APPROVED BY THE FAYETTE COUNTY COMMISSIONERS/CONNERSVILLE CITY ENGINEER.

TYPICAL REGULATORY SIGN REQUIREMENTS

SCALE: NONE

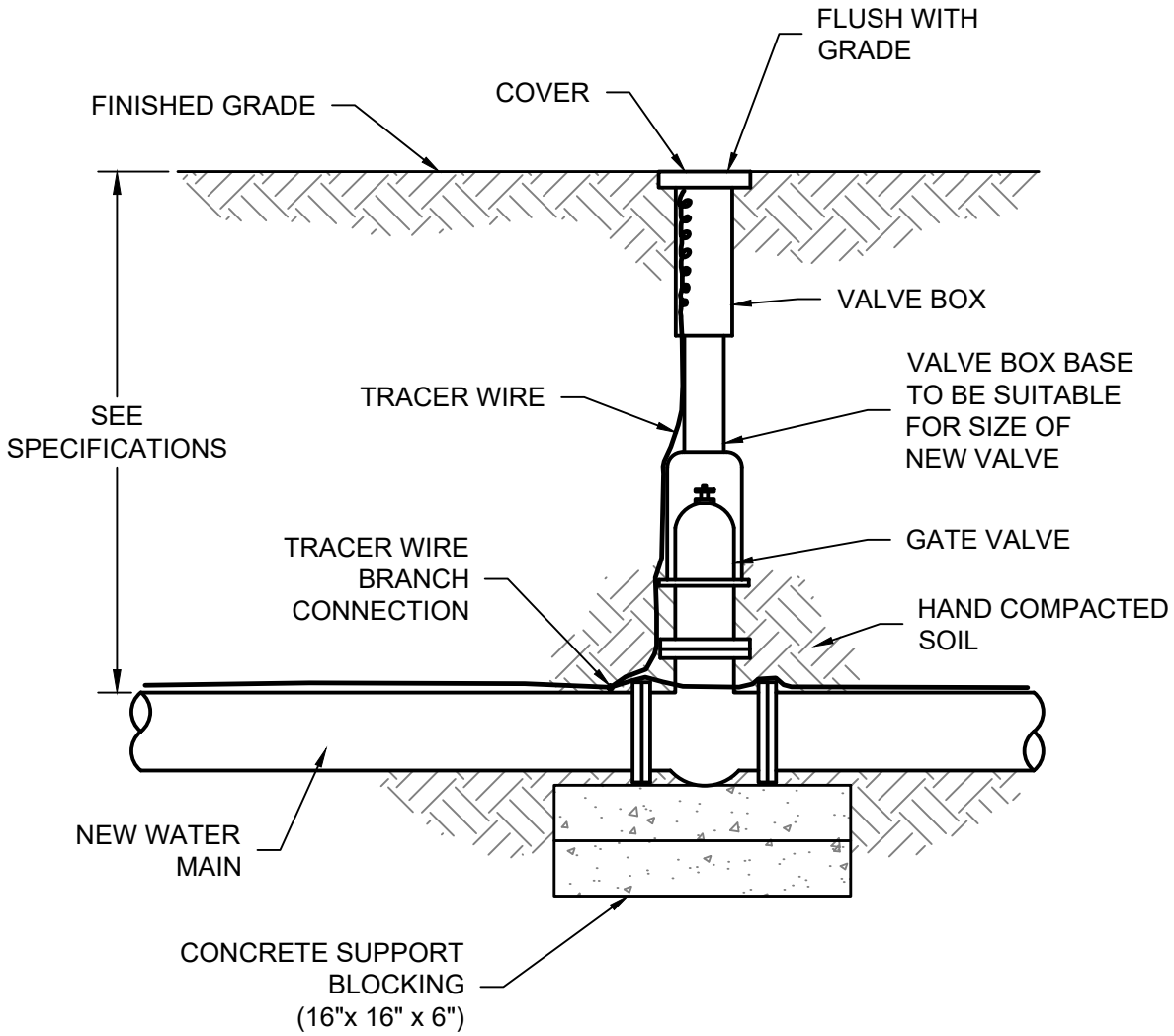
FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. TR-36
DATE: SEP 2023

STANDARD DETAILS

DW - DRINKING WATER SYSTEMS

TABLE OF CONTENTS

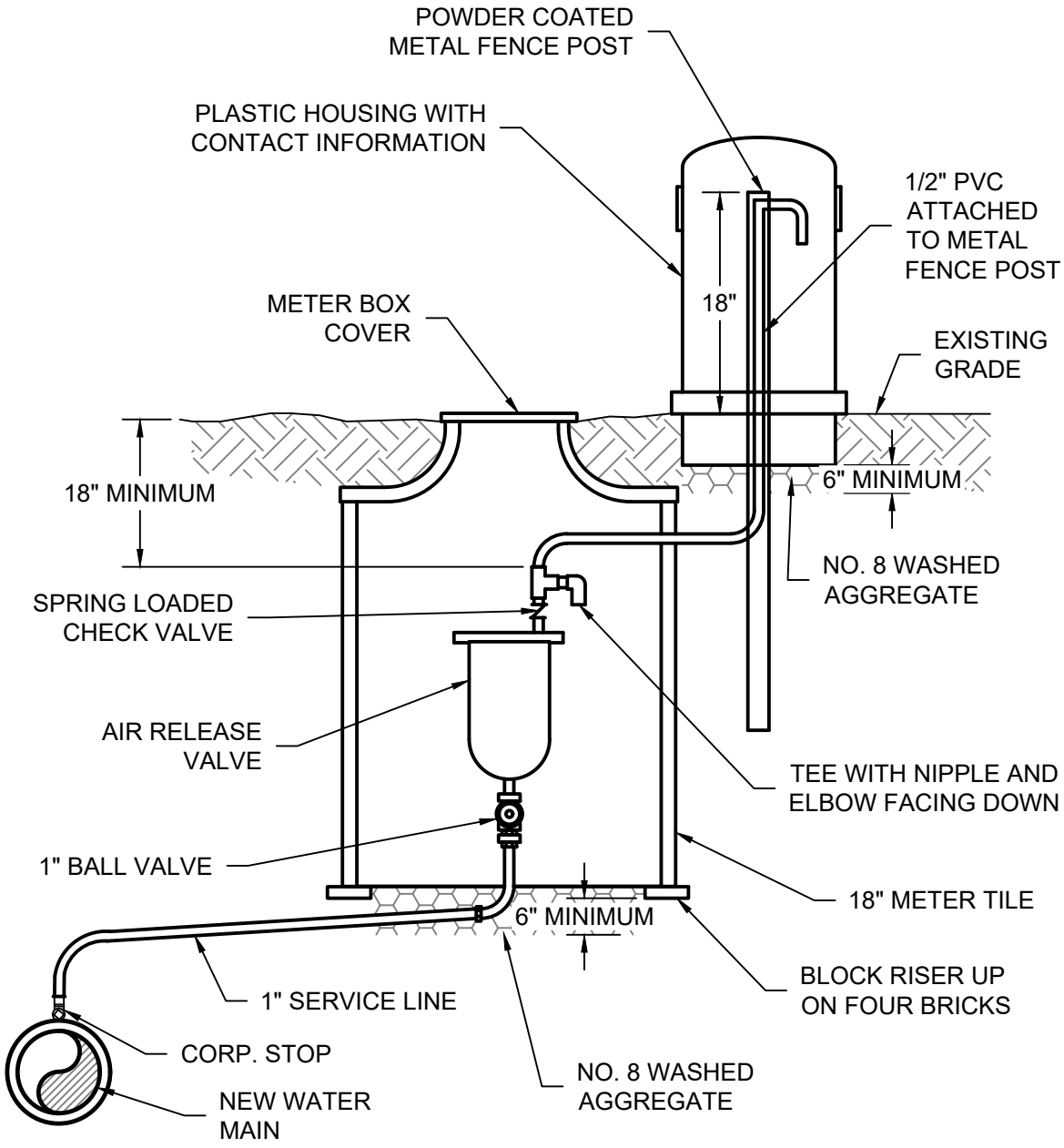


GATE VALVE

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. DW-01
DATE: SEP 2023

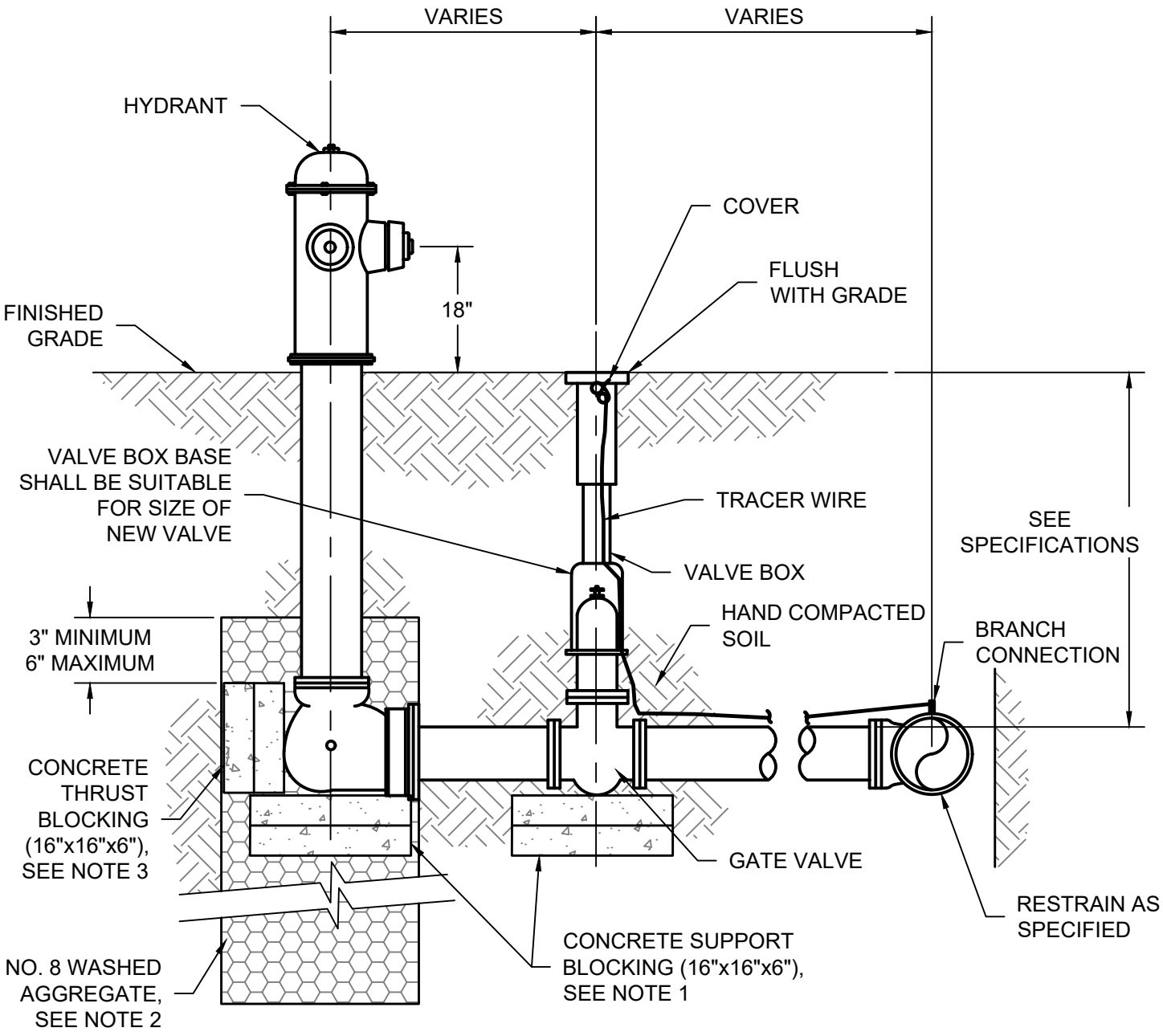


WATER MAIN AIR RELEASE VALVE

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. DW-02
DATE: SEP 2023



NOTES:

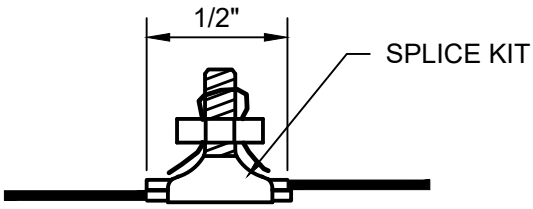
1. SET HYDRANT AND VALVE ON CONCRETE SUPPORT BLOCKING.
2. PLACE 2'x3' DEEP DRAINAGE PIT. EXTEND A MINIMUM OF 3", AND MAXIMUM OF 6", ABOVE HYDRANT BOOT.
3. RESTRAINED FITTINGS SHALL BE USED IN ADDITION TO CONCRETE THRUST BLOCKING. RESTRAINTS MUST BE USED FROM THE DISTRIBUTION MAIN TO THE HYDRANT. PLACE CONCRETE BLOCKS BEHIND HYDRANT TO UNDISTURBED EARTH.
4. VALVE BOX SHALL BE CENTERED AND PLUMB OVER VALVE OPERATING NUT.

HYDRANT ASSEMBLY

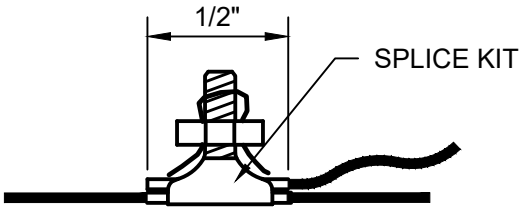
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. DW-03
DATE: SEP 2023



EXISTING CONNECTION



BRANCH CONNECTION

TRACER WIRE
BOLTED CONNECTION

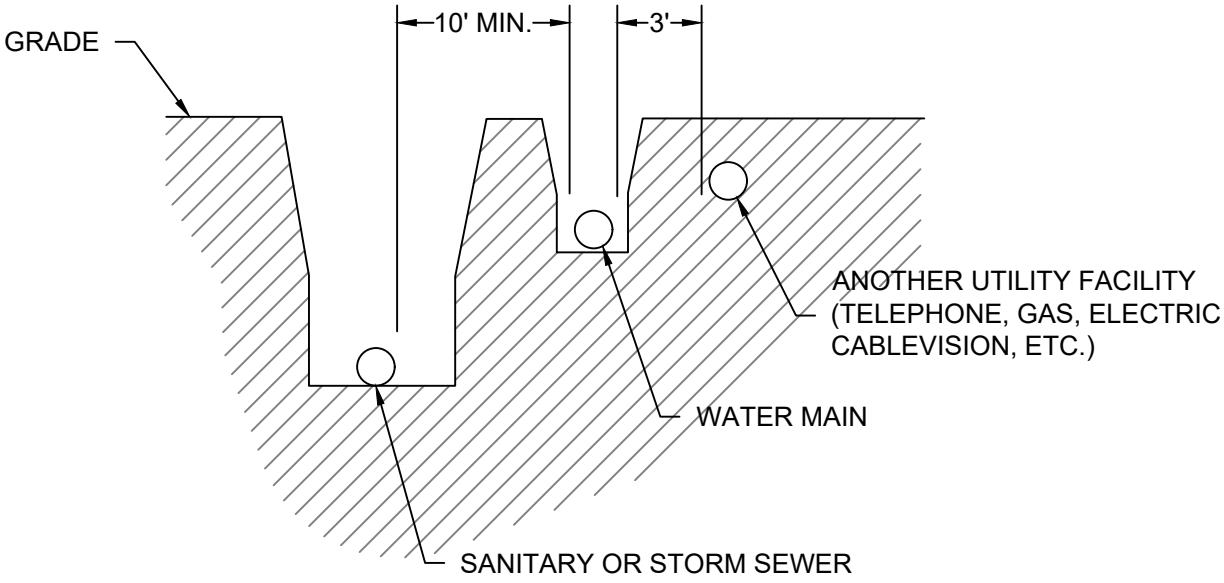
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. DW-04
DATE: SEP 2023

WATER MAIN SHALL NOT BE LOCATED IN THE SAME TRENCH AS SANITARY SEWERS.

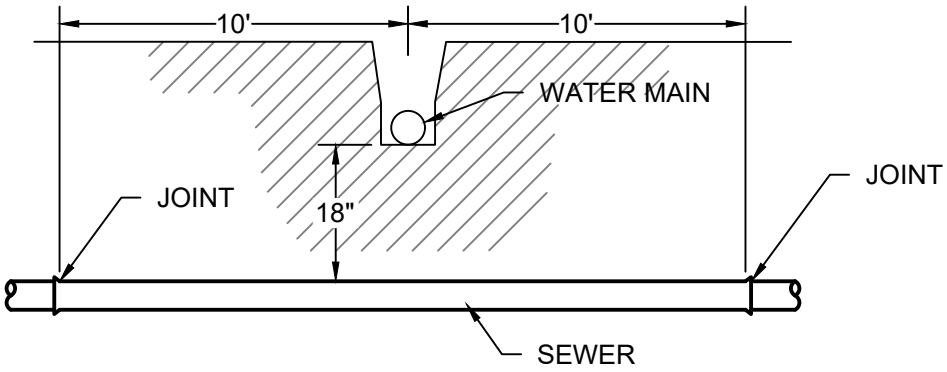
WATER MAIN LAYING PARALLEL TO SEWER



TYPICAL DEPTH OF WATER MAIN SHOULD HAVE 48" OF COVER.

NOTE:
SEPARATION OF 3 FT WITH ANY UTILITY REQUIRED.

WATER MAIN CROSSING SEWER

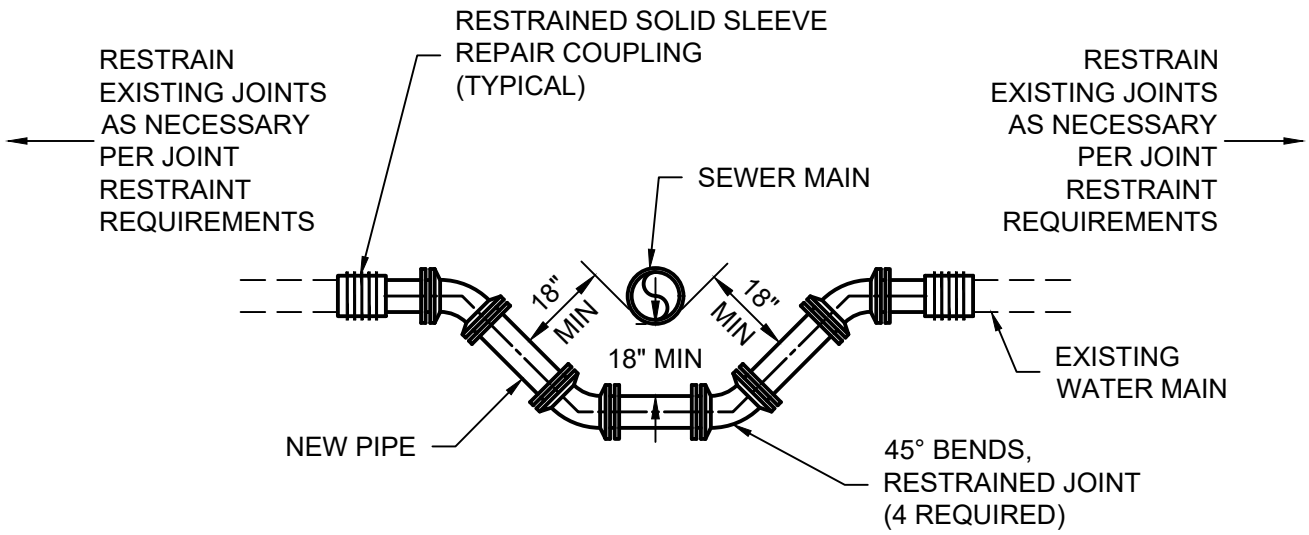


WATER MAIN AND SEWER SEPARATION

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. DW-05
DATE: SEP 2023



SPOT LOWERING

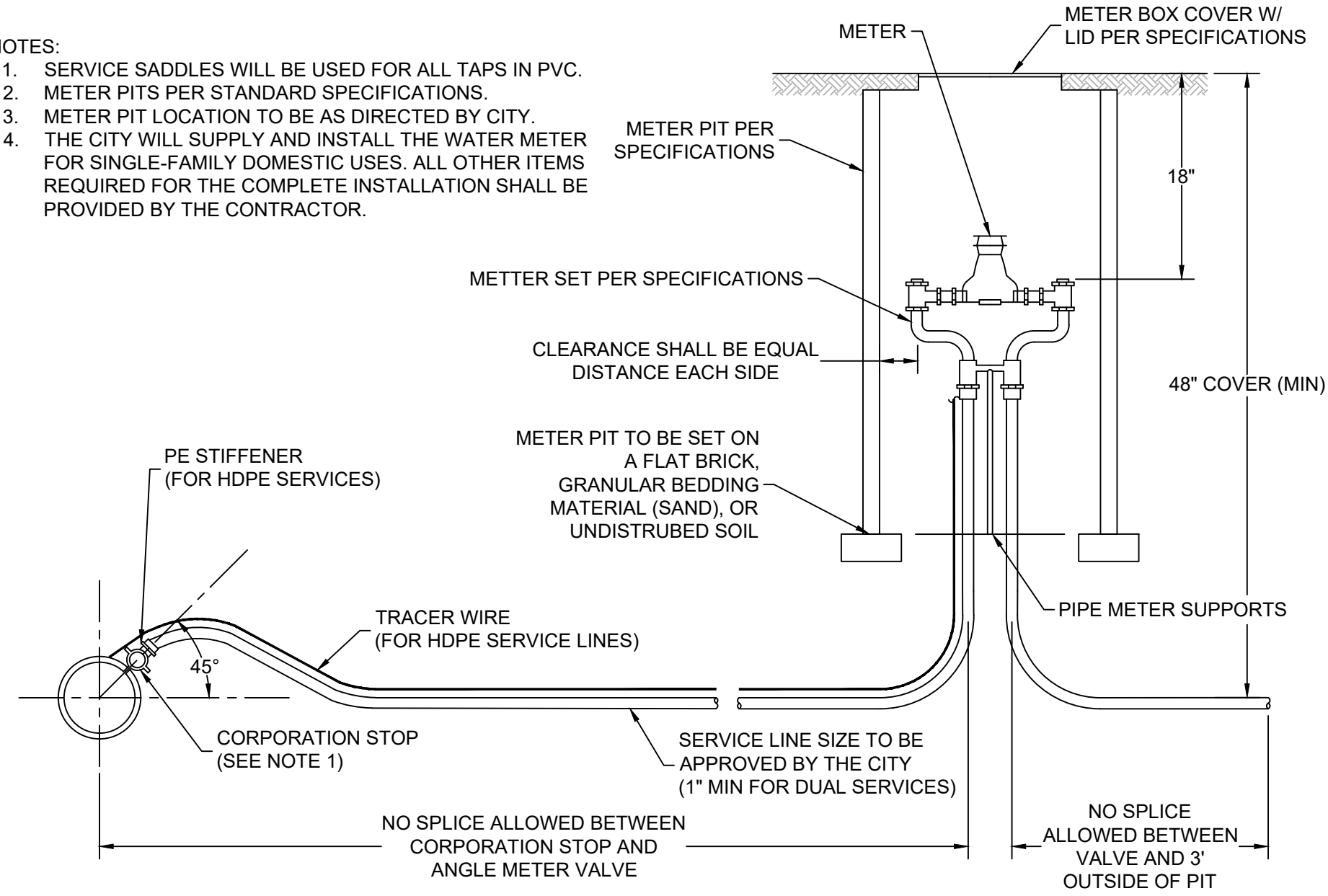
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. DW-06
DATE: SEP 2023

NOTES:

1. SERVICE SADDLES WILL BE USED FOR ALL TAPS IN PVC.
2. METER PITS PER STANDARD SPECIFICATIONS.
3. METER PIT LOCATION TO BE AS DIRECTED BY CITY.
4. THE CITY WILL SUPPLY AND INSTALL THE WATER METER FOR SINGLE-FAMILY DOMESTIC USES. ALL OTHER ITEMS REQUIRED FOR THE COMPLETE INSTALLATION SHALL BE PROVIDED BY THE CONTRACTOR.

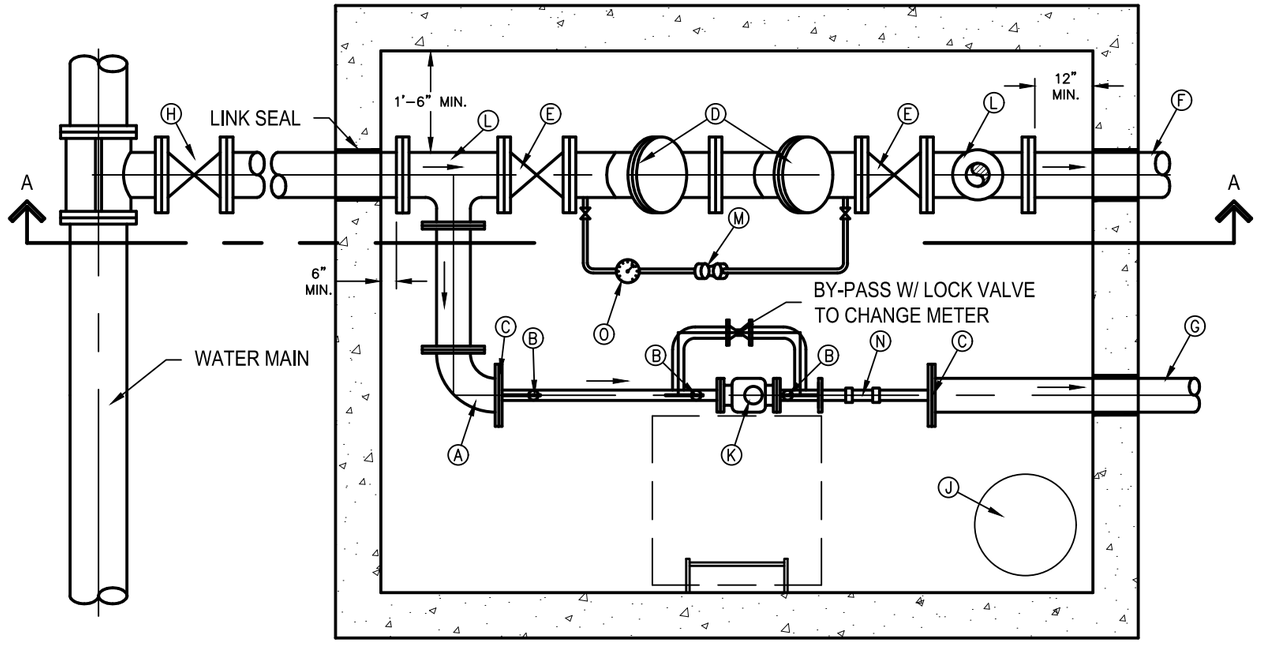


TYPICAL METER SETTING
(5/8"X3/4" & 1" METERS

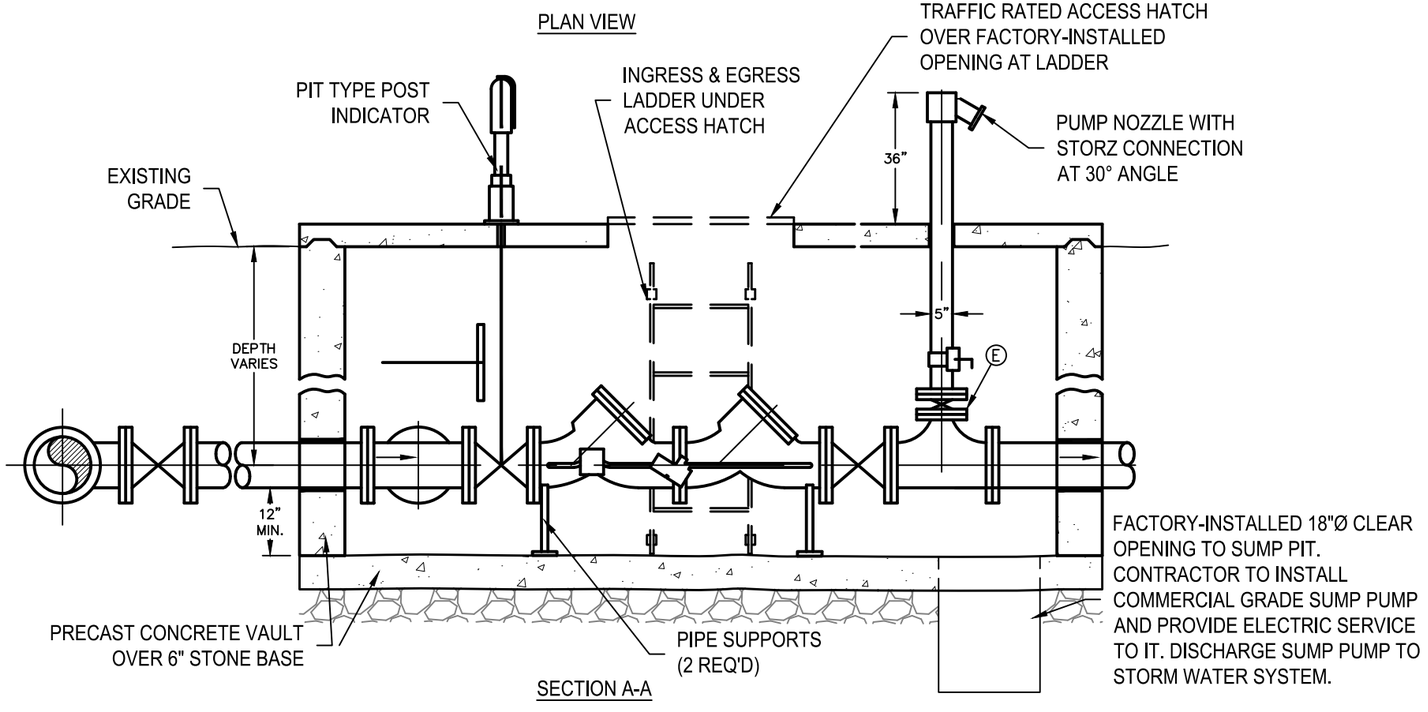
FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

SCALE: NONE

DETAIL NO. DW-07
DATE: SEP 2023



PLAN VIEW



SECTION A-A

KEYED NOTES:

- (A) 90° FLANGED BEND w/ PIPE SUPPORT
- (B) BALL VALVE
- (C) REDUCING FLANGE
- (D) DOUBLE DETECTOR CHECK VALVE ASS'Y
- (E) FLANGED OS & Y VALVE
- (F) FIRE LINE
- (G) DOMESTIC SERVICE
- (H) MECHANICAL JOINT GATE VALVE & BOX
- (I) TAPPING SLEEVE w/ TAPPING VALVE & BOX
- (J) SUMP
- (K) METER - (BY UTILITY)
- (L) FLANGED TEE
- (M) DOUBLE CHECK VALVE
- (N) LOK-PAK
- (O) PRIVATE METER

NOTES:

1. CONTRACTOR SHALL CONSTRUCT METER VAULT.
2. CONSTRUCTION MATERIALS: PRECAST CONCRETE.
3. INSIDE DIMENSIONS PER DRAWING NOTES. VAULT TO BE SET LENGTHWISE WITH SERVICE.
4. TOP OF VAULT TO BE PRE-CAST CONCRETE, AT LEAST 4" THICK WITH REINFORCING TO SUPPORT AASHTO HS20 TRAFFIC LOAD. TOP OF VAULT SHALL CORRESPOND WITH FINISHED GRADE LEVEL OF SURROUNDING AREA, LEVEL WITH PAVEMENT IF CONSTRUCTED IN PAVED AREA.
5. BOTTOM OF VAULT TO BE PRE-CAST 6" CONCRETE, WITH MINIMUM CLEARANCE OF 12" BELOW BOTTOM OF FIRE/SERVICE LINE.
6. CUSTOMER SHALL FURNISH 2" BALL VALVES ON OUTLET SIDE OF THE 2" METER SETTING.
7. CUSTOMER SHALL FURNISH DOUBLE DETECTOR CHECK VALVE. METER IS FURNISHED BY UTILITY.
8. CUSTOMER SHALL FURNISH VAULT FRAME AND LID TO BE INSTALLED IN TOP OF VAULT BY CUSTOMER (BILCO J-2AL OR 30"x30" ALUMINUM PCM)
9. UTILITY WILL INSTALL DOMESTIC SERVICE METER INTO THE VAULT. COMBINATION SERVICES CAN BE USED AT THE DISCRETION OF THE UTILITY.
10. CUSTOMER SHALL INSTALL A LADDER IN PIT FOR INGRESS AND EGRESS.
11. A 2" TEST PLUG SHALL BE INSTALLED AT LEAST 2 PIPE DIAMETERS DOWNSTREAM OF 2" OR LARGER METERS.

COMBINED FIRE SERVICE & METER VAULT

SCALE: NONE

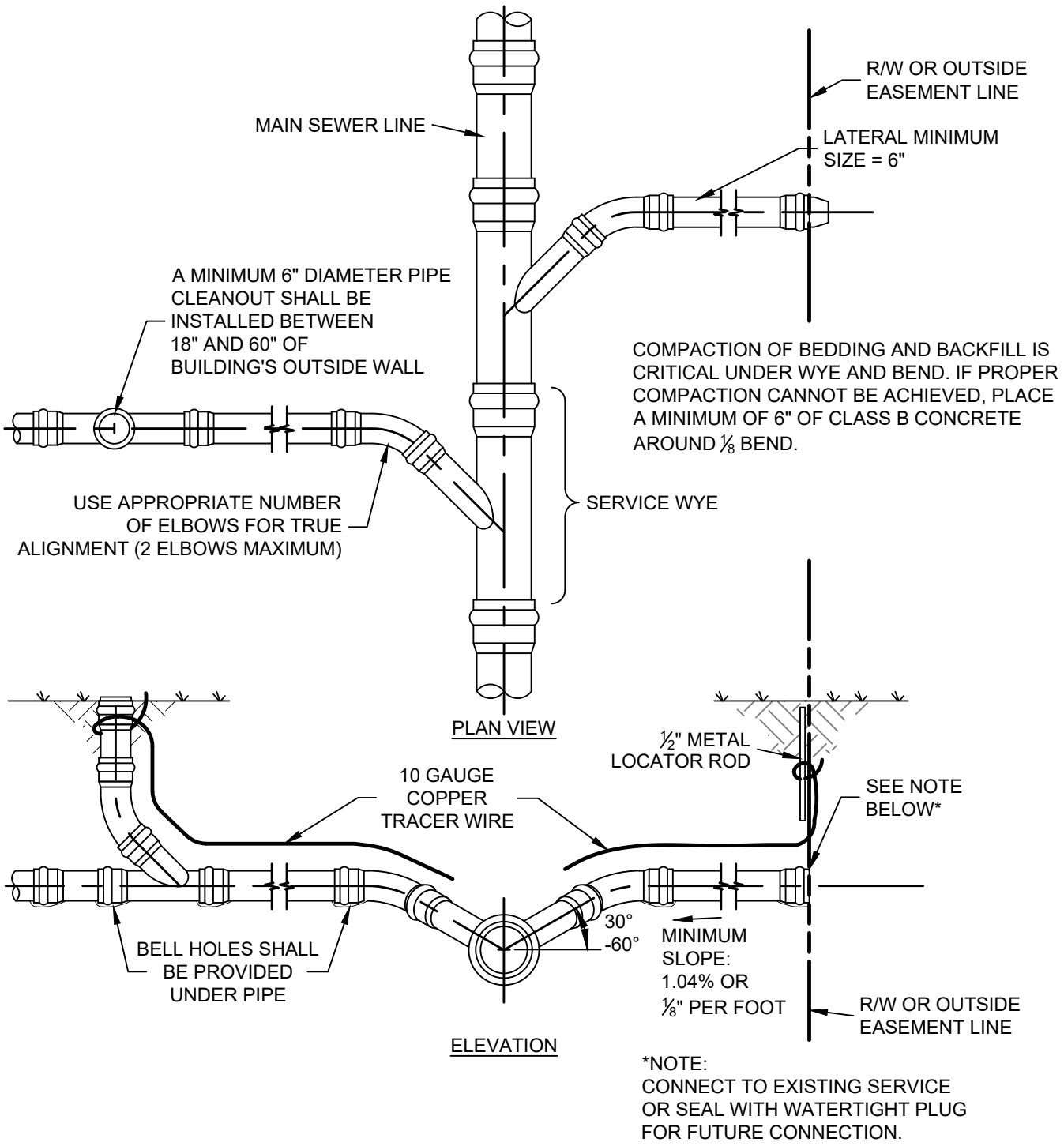
FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. DW-08
DATE: SEP 2023

STANDARD DETAILS

SS - SANITARY SEWER SYSTEMS

TABLE OF CONTENTS



NOTES:

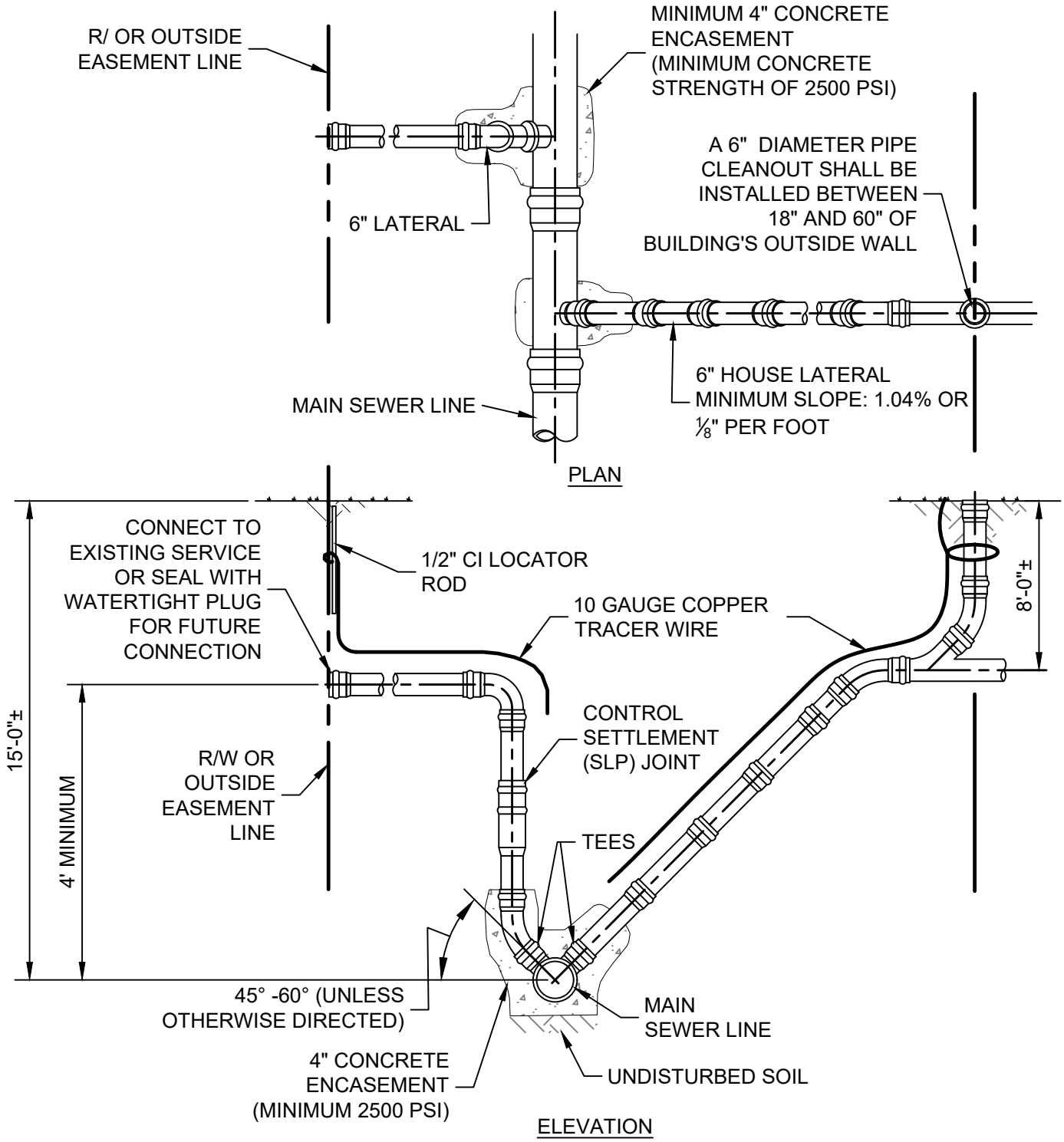
1. WYE BRANCHES SHALL BE INSTALLED WHERE INDICATED. THEY SHALL BE EXTENDED TO THE RIGHT-OF-WAY, THE OUTSIDE EASEMENT LINE, OR TO DISTANCES AS SHOWN ON THE DRAWINGS, AND SHALL BE OF 6" PIPE UNLESS OTHERWISE SHOWN.
2. THE DEPTH OF THE LATERAL AT THE PROPERTY LINE SHALL BE APPROXIMATELY 8'-0" UNLESS SEWER DEPTH IS LESS, IN WHICH EVENT A MINIMUM SLOPE OF 1/8" PER 1'-0" SHALL BE USED. THE DEPTH OF THE LATERAL SHALL BE NO LESS THAN 4'-0"

SANITARY LATERAL FOR SHALLOW SEWERS (LESS THAN 15' DEEP)

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SS-01
DATE: SEP 2023



NOTES:

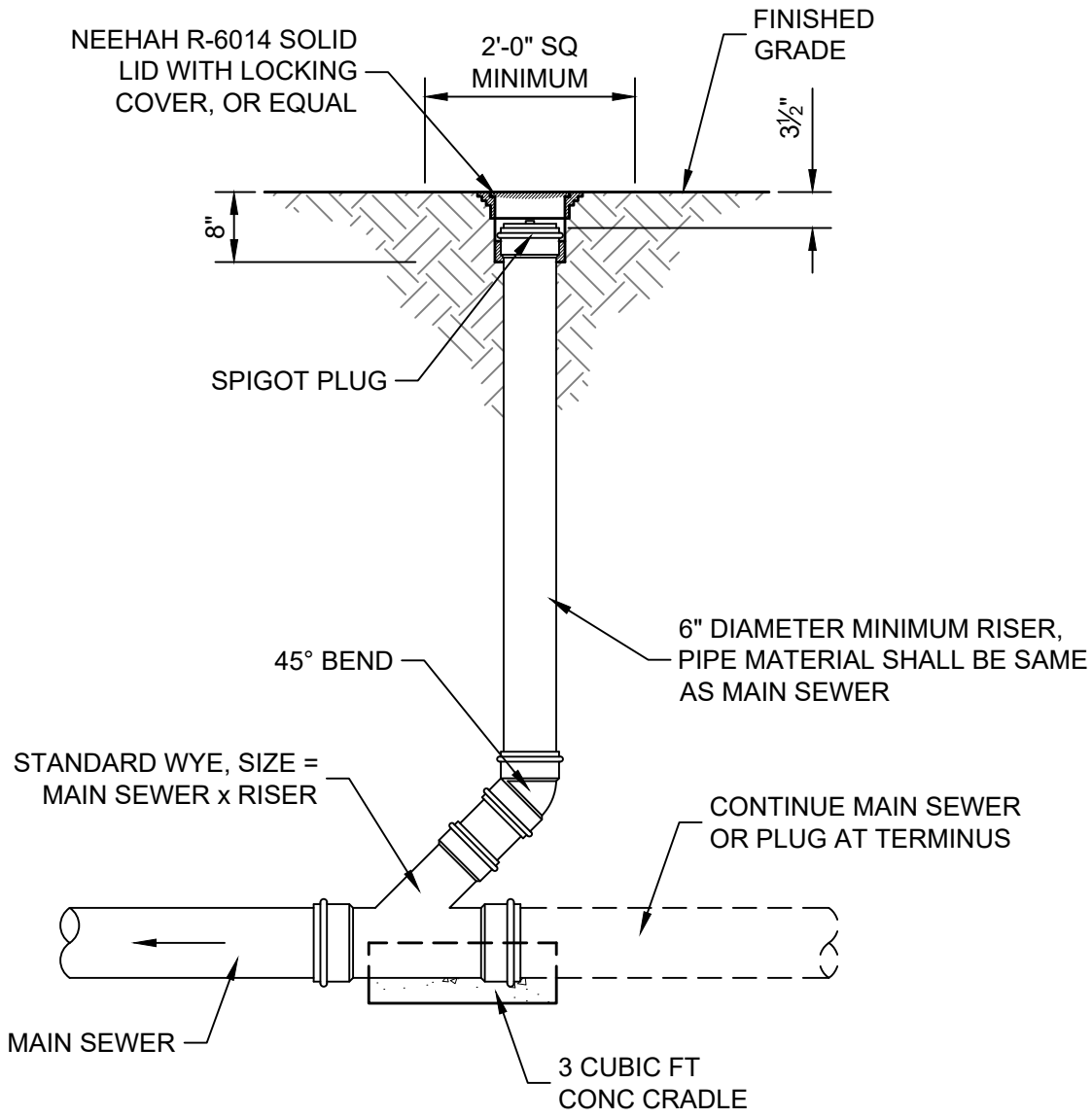
1. SANITARY LATERALS SHALL BE INSTALLED WHERE INDICATED. THEY SHALL BE EXTENDED TO THE RIGHT-OF-WAY, THE OUTSIDE EASEMENT LINE, OR TO DISTANCES AS SHOWN ON THE DRAWINGS, AND SHALL BE 6" PIPE UNLESS OTHERWISE SHOWN.
2. THE DEPTH OF THE LATERAL AT THE EASEMENT LINE SHALL BE APPROXIMATELY 8'-0" UNLESS SEWER DEPTH IS LESS, A MINIMUM SLOPE OF 1/8" PER 1'-0" SHALL BE USED. THE DEPTH OF THE LATERAL SHALL BE NO LESS THAN 4'-0".

SANITARY LATERAL FOR DEEP SEWERS (15' DEEP AND OVER)

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SS-02
DATE: SEP 2023

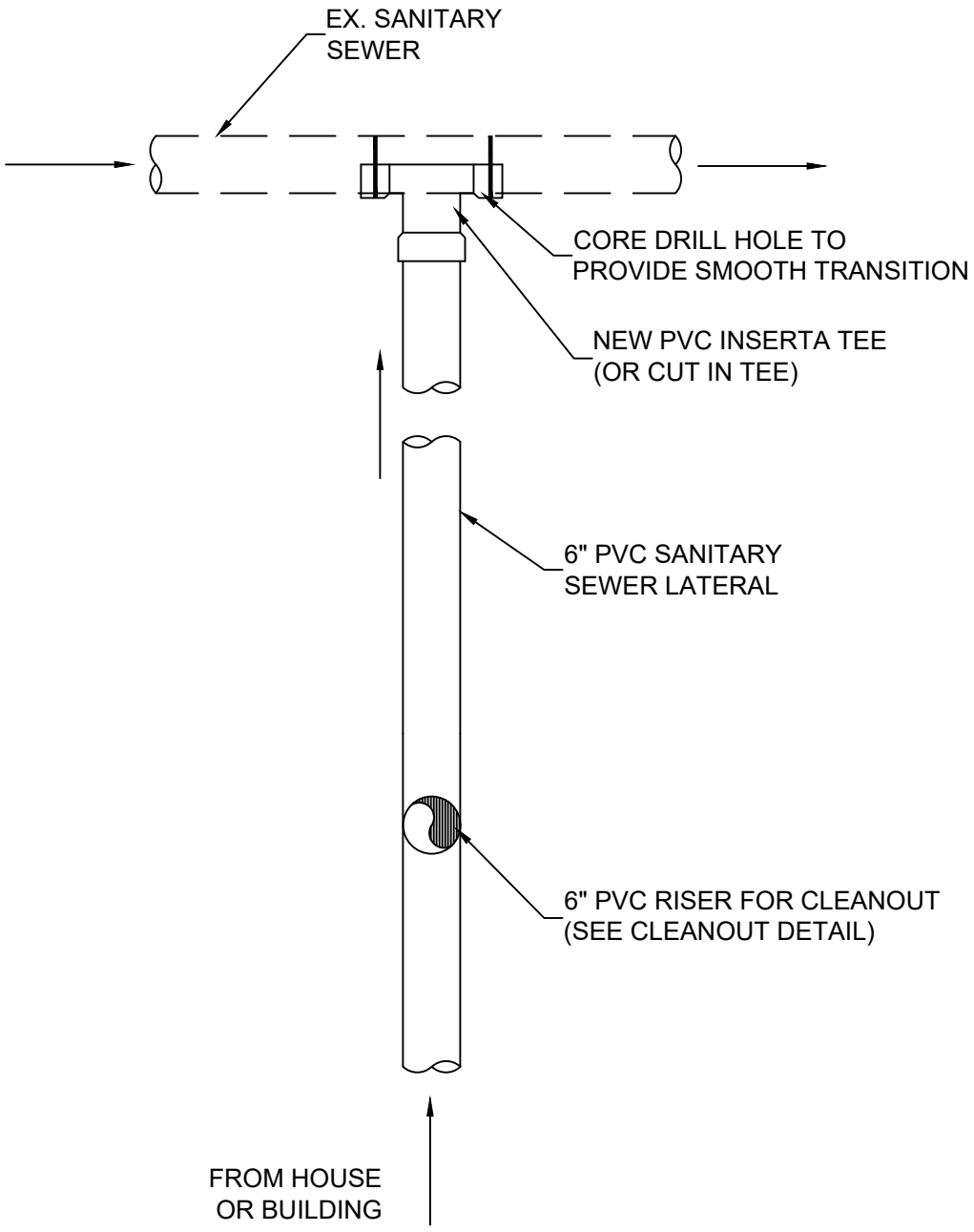


SANITARY SEWER CLEANOUT

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SS-03
DATE: SEP 2023

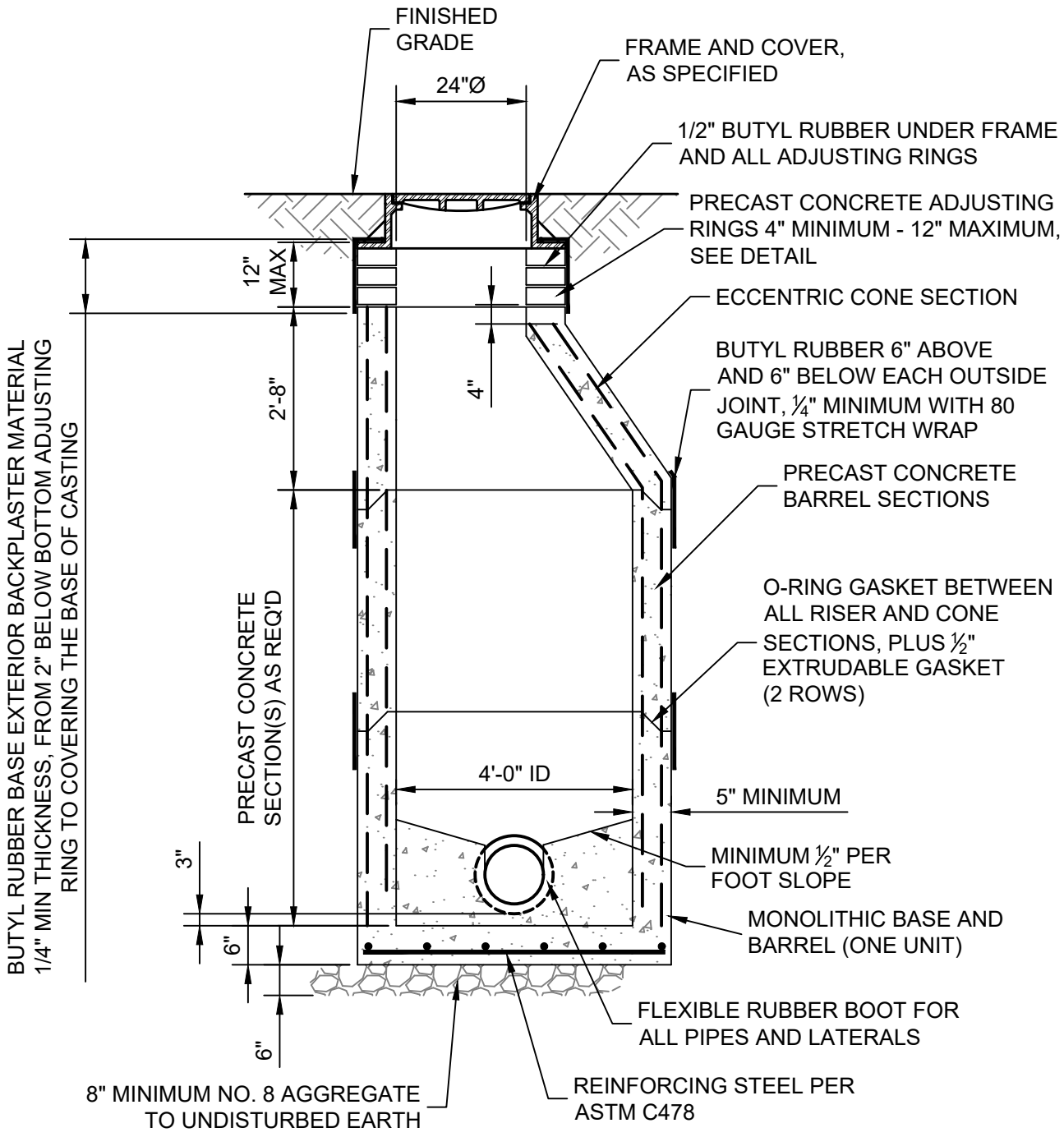


NEW SERVICE CONNECTION TO EXISTING SANITARY SEWER

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SS-04
DATE: SEP 2023



NOTES:

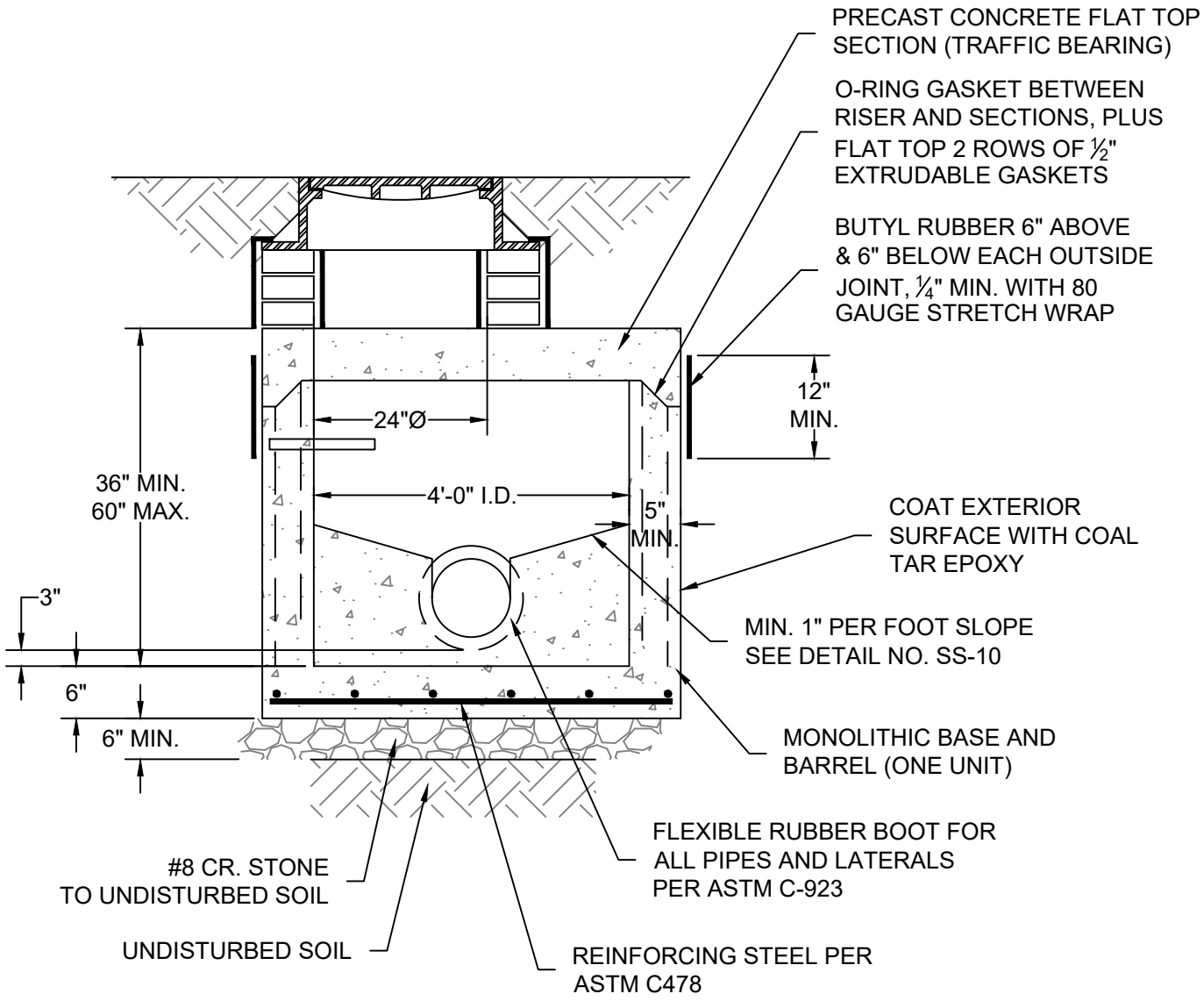
1. DROP MANHOLES SHALL BE USED WHENEVER THE DISTANCE FROM THE INVERT OF THE INCOMING LINE AND BOTTOM OF MANHOLE IS GREATER THAN TWO FEET.

STANDARD SANITARY MANHOLE

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SS-05
DATE: SEP 2023



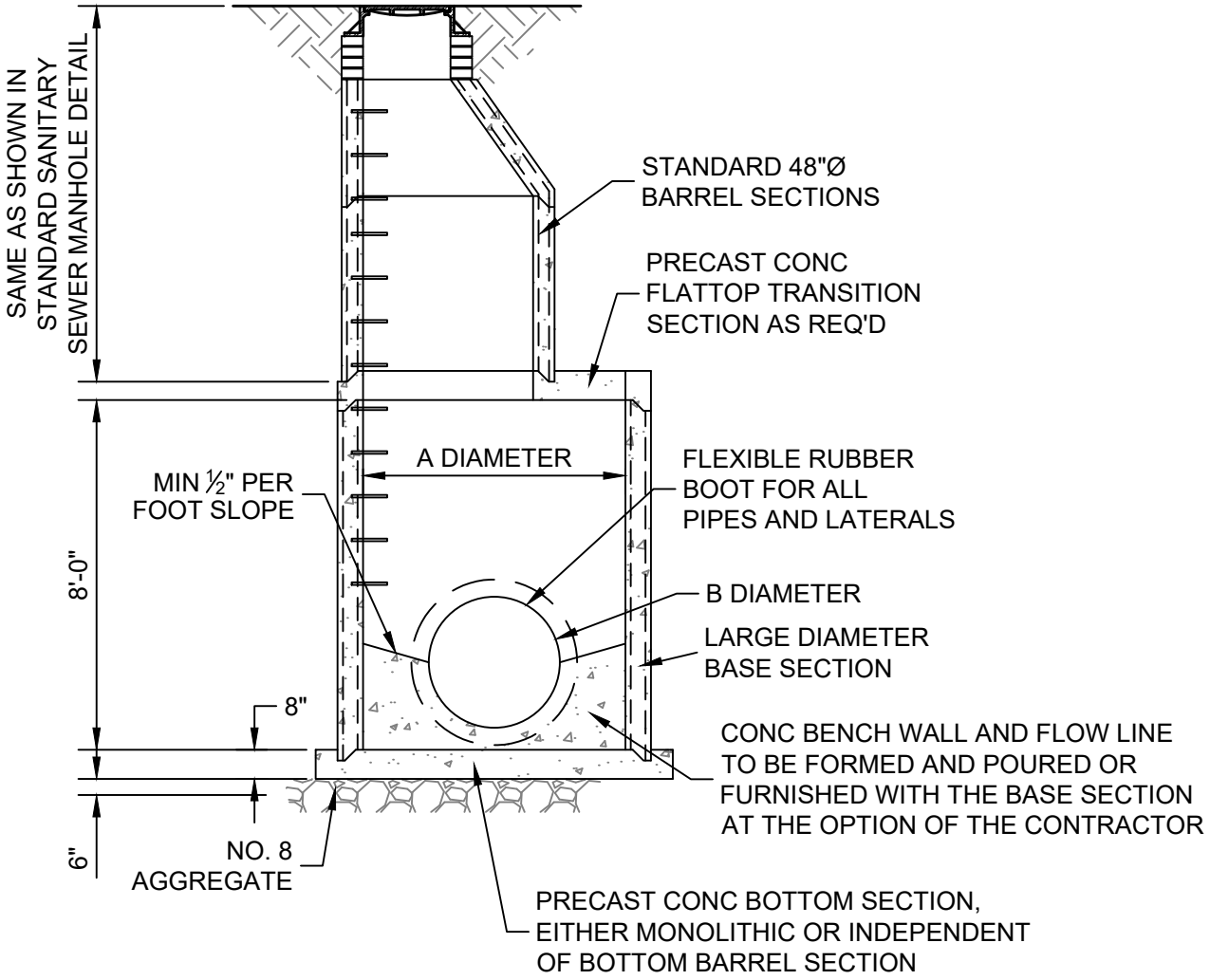
NOTES:
1. REQUIRES PRE-APPROVAL BY THE CITY.
2. NEW MANHOLE CONSTRUCTION AND ACCESSORIES SAME AS SHOWN FOR STANDARD SANITARY MANHOLE.

SHALLOW SANITARY MANHOLE

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SS-06
DATE: SEP 2023



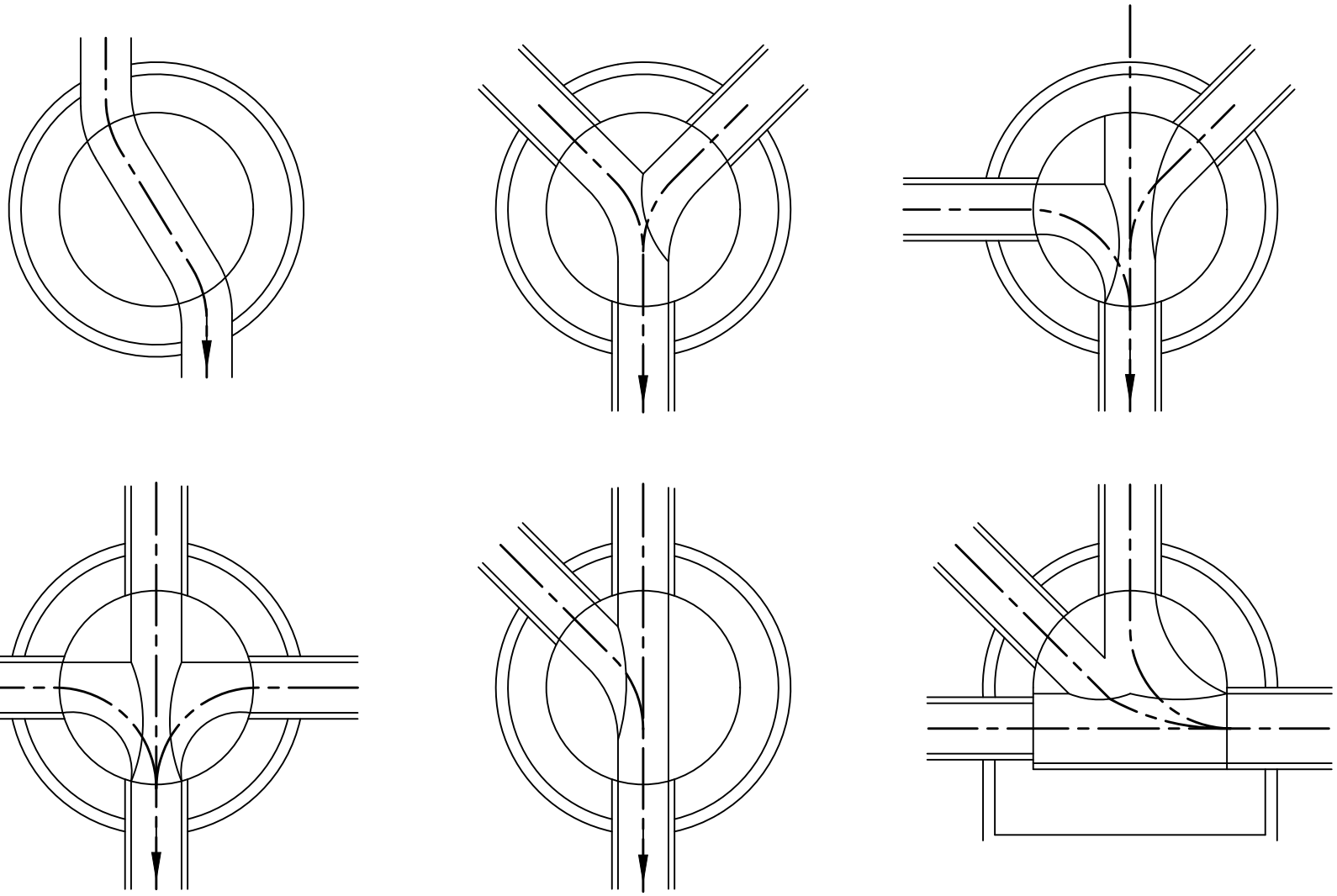
STRUCTURE DATA SCHEDULE		
A DIA	B DIA	APPLICATION
60"	24" TO 33"	HORIZ PIPE DEFLECTION GREATER THAN 45° UP TO 90°
60"	27" TO 36"	HORIZ PIPE DEFLECTION STRAIGHT THRU MANHOLE UP TO 45°
72"	36"	HORIZ PIPE DEFLECTION GREATER THAN 45° UP TO 90°
72"	42" TO 48"	HORIZ PIPE DEFLECTION STRAIGHT THRU MANHOLE UP TO 45°
84"	42"	HORIZ PIPE DEFLECTION GREATER THAN 45° UP TO 90°
96"	48"	HORIZ PIPE DEFLECTION GREATER THAN 45° UP TO 90°

LARGE SANITARY MANHOLE

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SS-07
DATE: SEP 2023



NOTES:

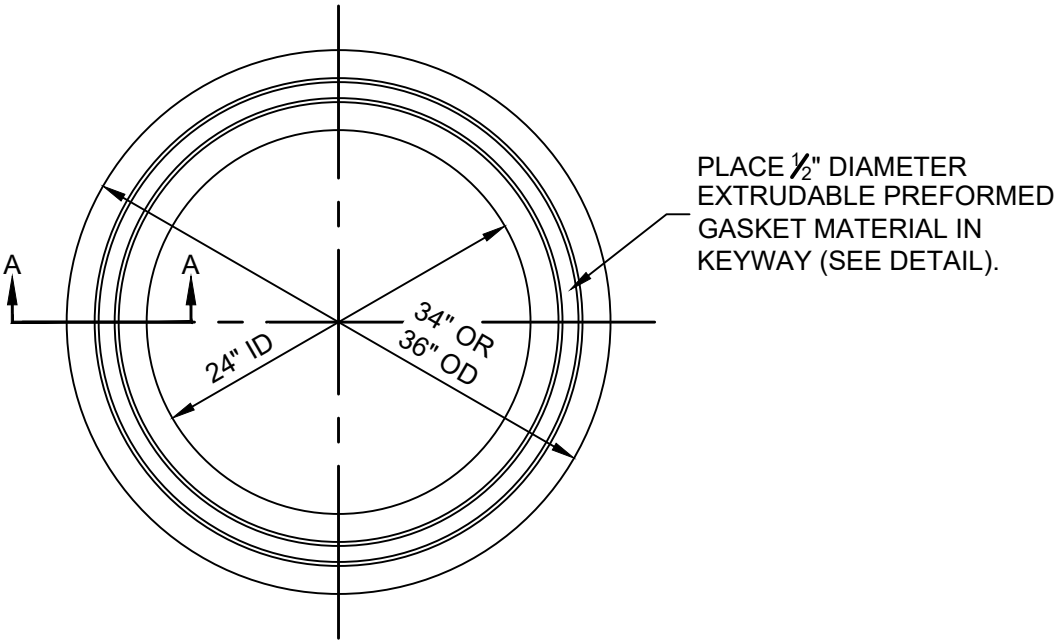
1. SANITARY SEWER BENCH SLOPE = ½" PER FOOT

STANDARD MANHOLE BENCHES

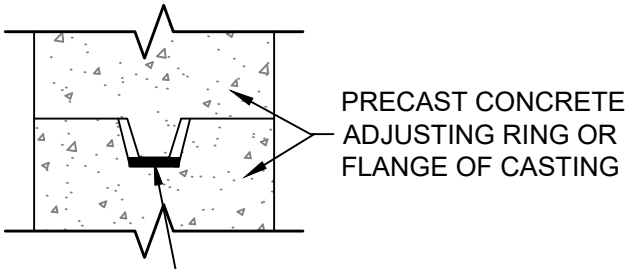
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

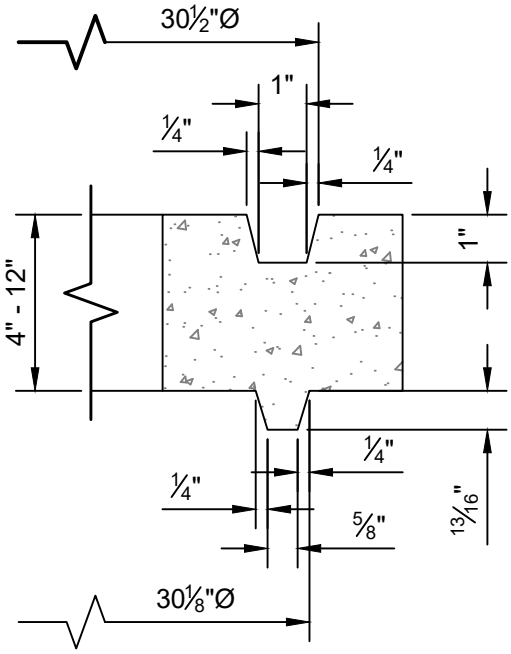
DETAIL NO. SS-08
DATE: SEP 2023



PLAN VIEW



GASKET



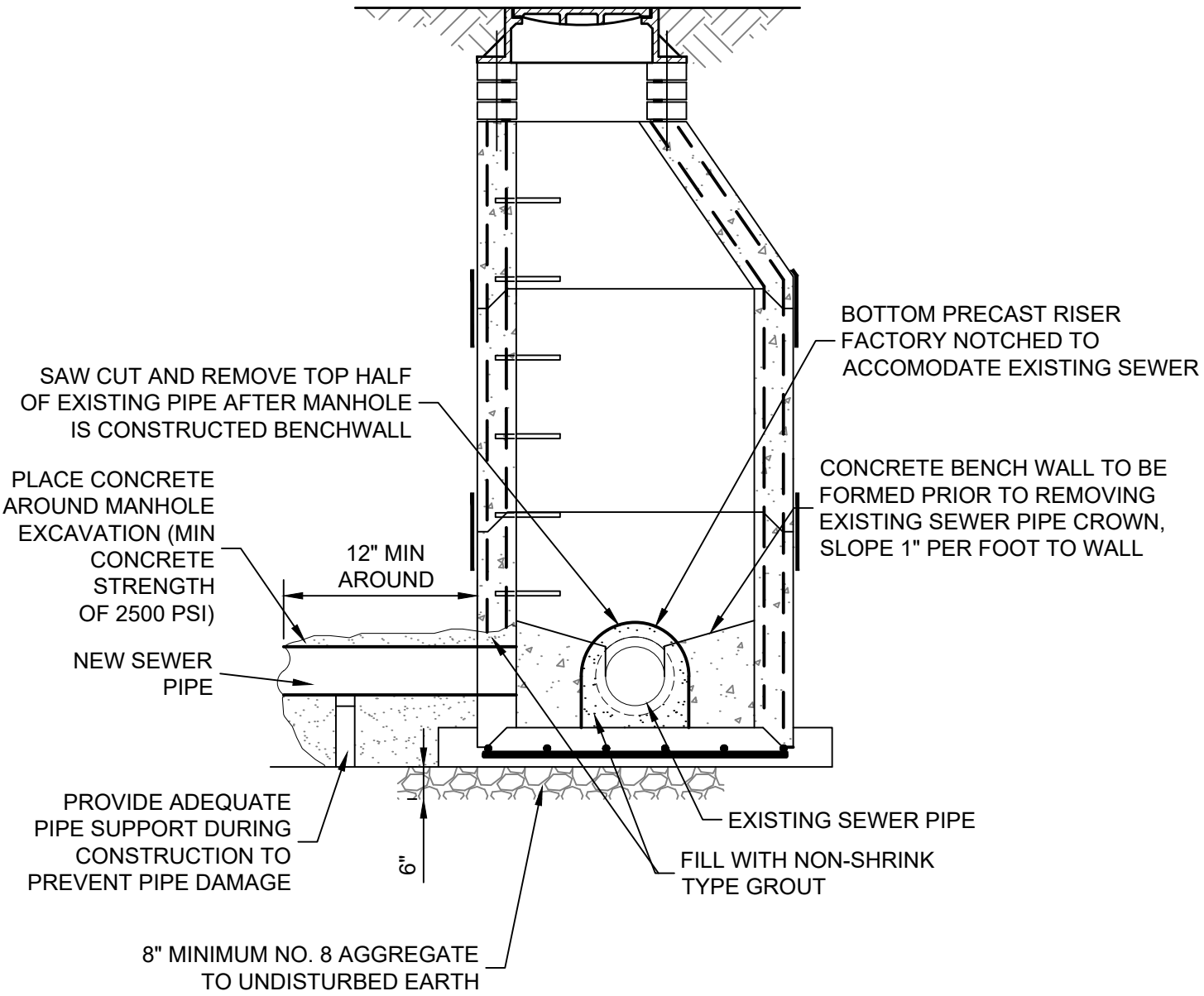
SECTION A-A

PRECAST ADJUSTING RING

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SS-09
DATE: SEP 2023



NOTE:

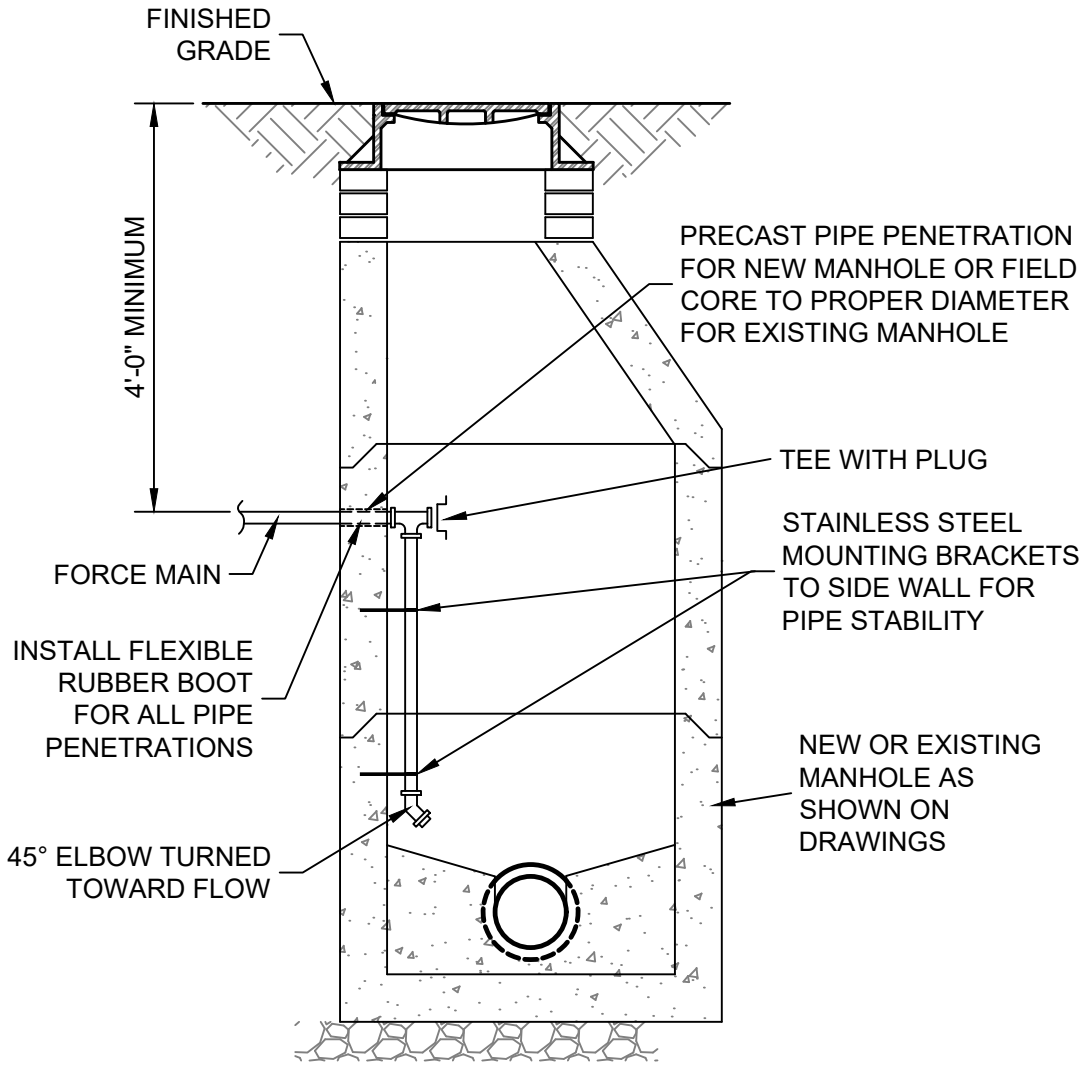
1. MANHOLE CONSTRUCTION AND ACCESSORIES SAME AS SHOWN FOR STANDARD MANHOLE.

SANITARY MANHOLE OVER EXISTING SANITARY SEWER

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SS-10
DATE: SEP 2023



NOTES:

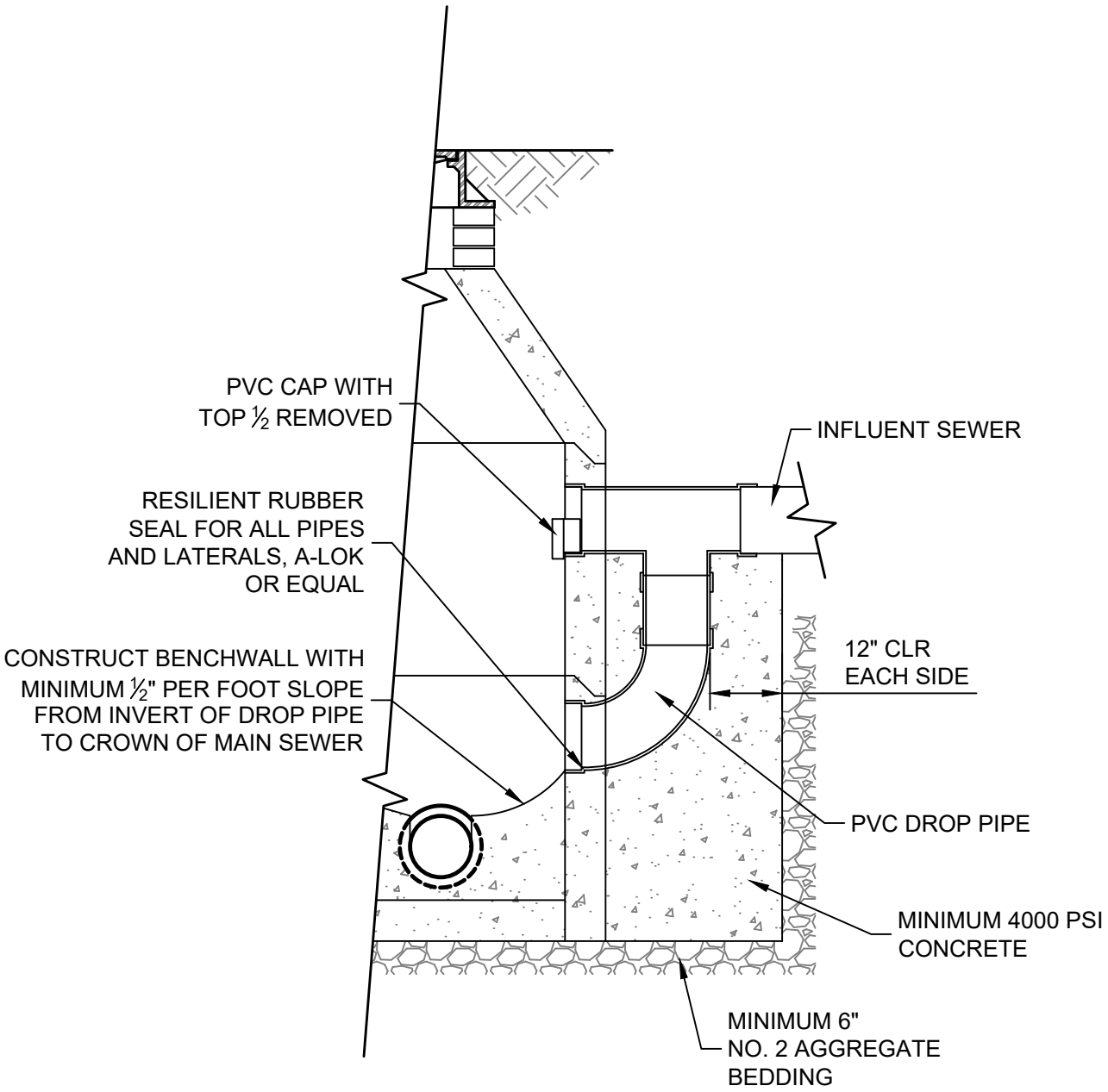
1. NEW MANHOLE CONSTRUCTION AND ACCESSORIES SAME AS SHOWN FOR STANDARD SANITARY SEWER MANHOLE.

FORCE MAIN CONNECTION AT NEW MANHOLE

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SS-11
DATE: SEP 2023



NOTES:

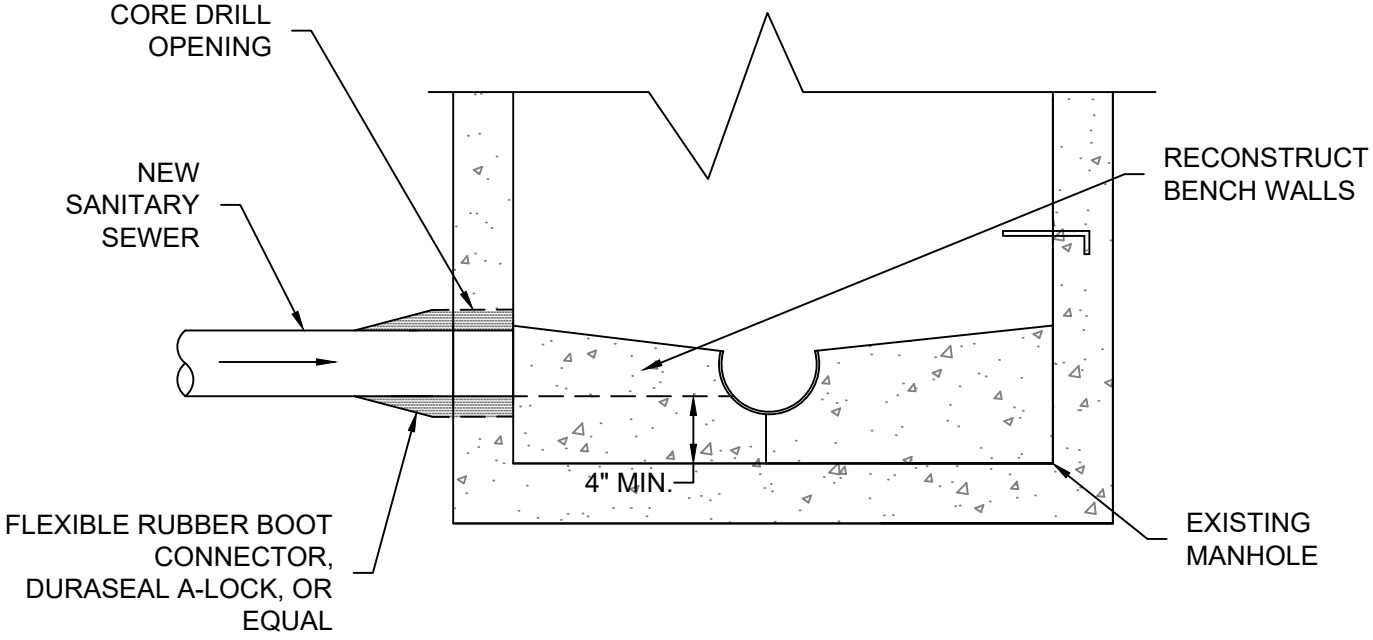
1. MANHOLE CONSTRUCTION AND ACCESSORIES SAME AS SHOWN FOR STANDARD SANITARY SEWER MANHOLE.

OUTSIDE DROP SANITARY MANHOLE

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SS-12
DATE: SEP 2023

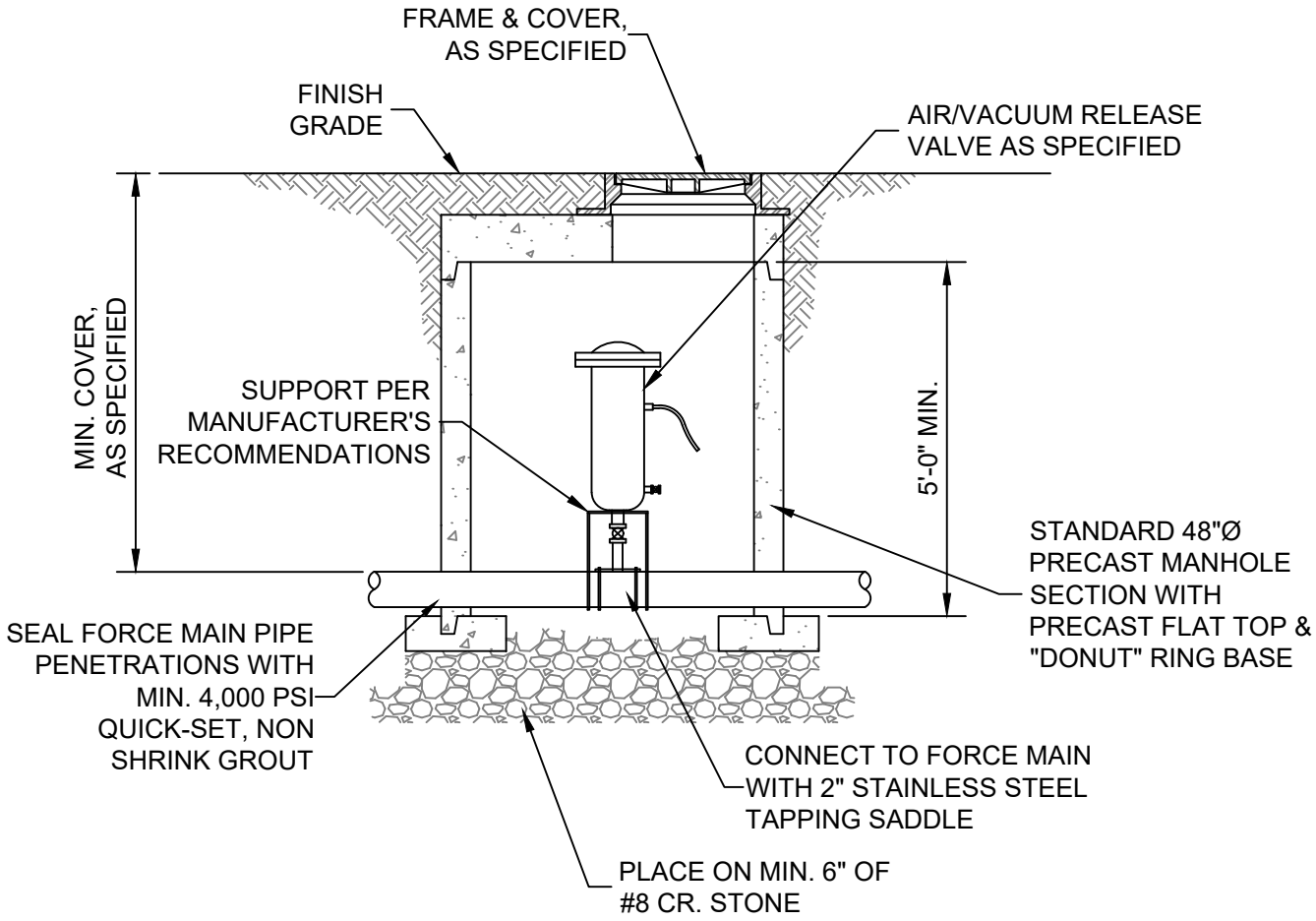


EXISTING MANHOLE CONNECTION

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SS-13
DATE: SEP 2023



NOTES:

1. THE CONTRACTOR SHALL DETERMINE THE REQUIRED FORCE MAIN DEPTH AT THE STRUCTURE TO ENSURE THAT THE VALVE VAULT STRUCTURE DOES NOT EXTEND ABOVE FINISHED GRADE.

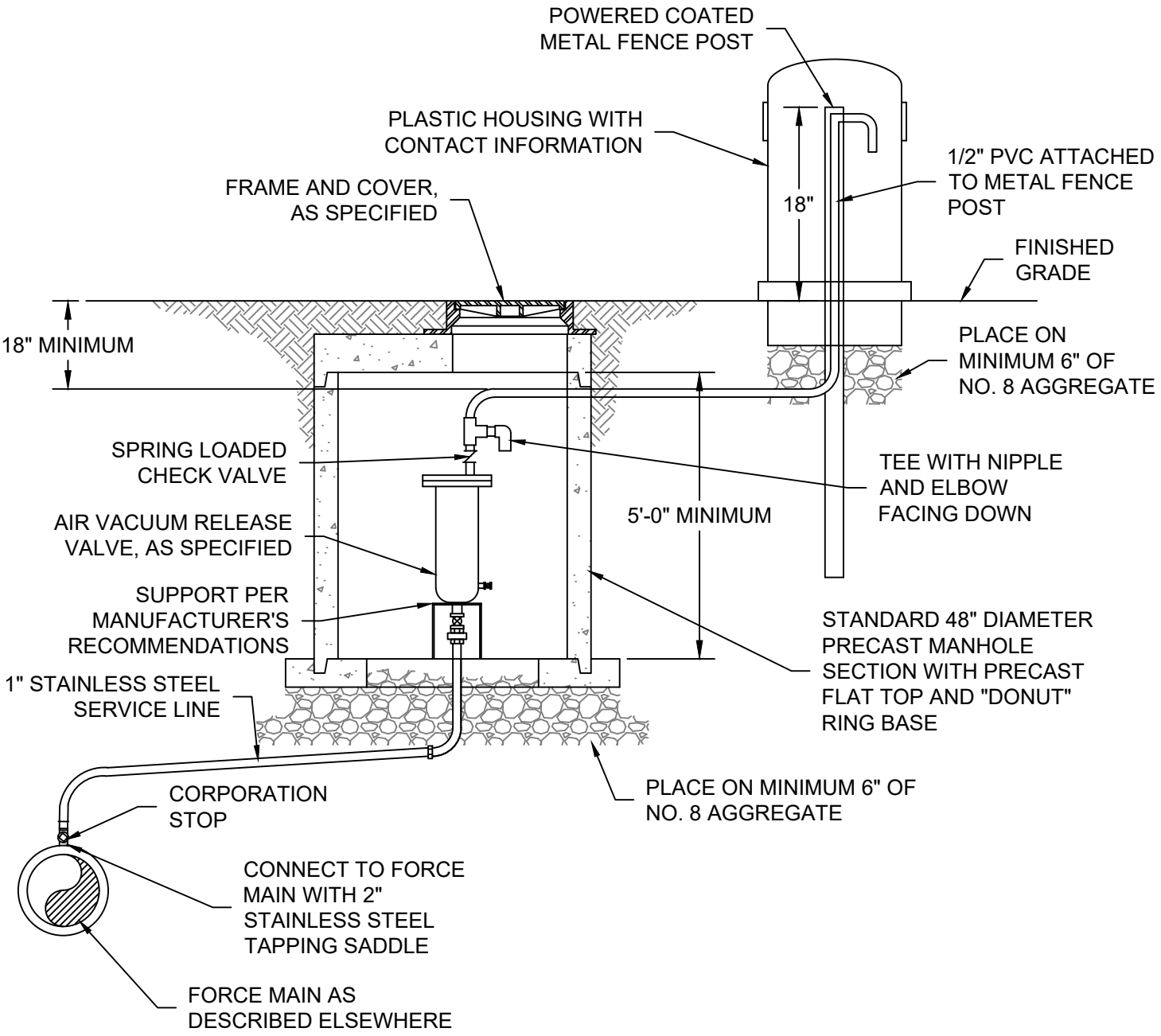
2. LOCATION OF AIR/VACUUM RELEASE STRUCTURES ARE APPROXIMATE. THE FINAL LOCATION TO BE DETERMINED IN THE FIELD BY THE CONTRACTOR AT THE HIGH ELEVATION POINT OF THE FORCE MAIN.

FORCE MAIN AIR/VACUUM RELEASE VALVE & VAULT

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SS-14
DATE: SEP 2023



NOTES:

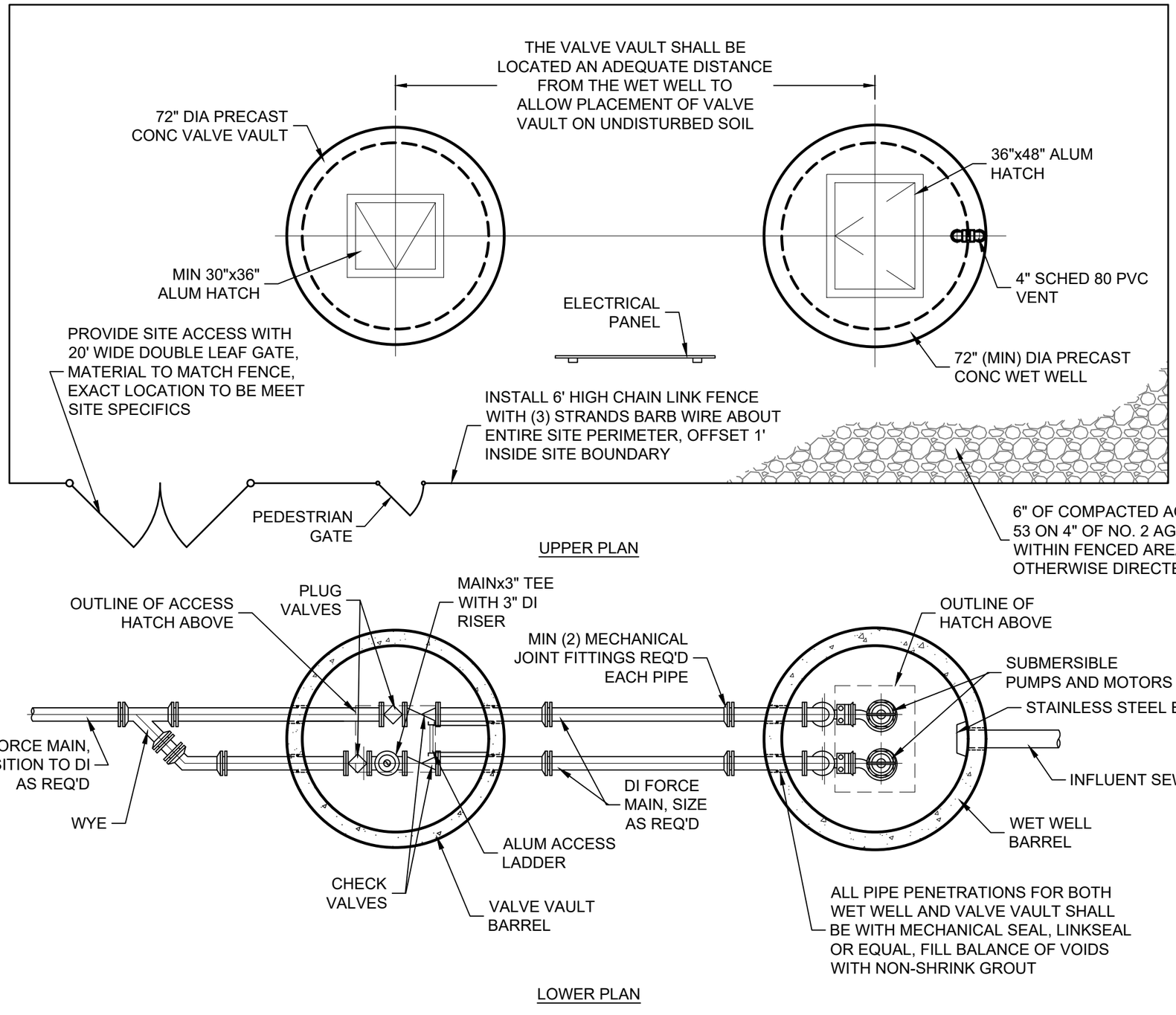
1. LOCATION OF AIR/VACUUM RELEASE STRUCTURES ARE APPROXIMATE. THE FINAL LOCATION TO BE DETERMINED IN THE FIELD BY THE CONTRACTOR AT THE HIGH ELEVATION POINT OF THE FORCE MAIN.

FORCE MAIN AIR/VACUUM RELEASE OFFSET VALVE & VAULT

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SS-15
DATE: SEP 2023



NOTES:

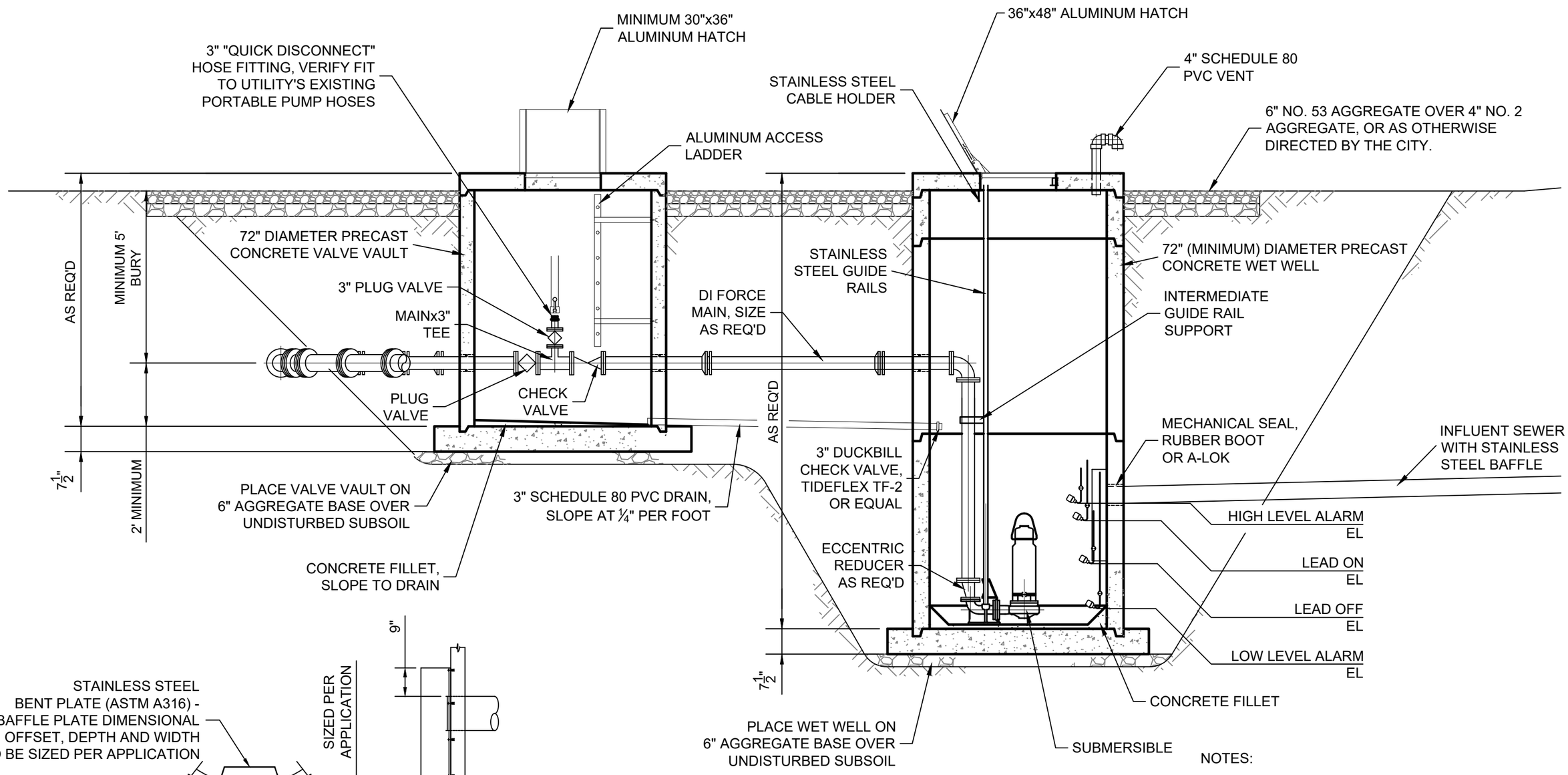
1. ACTUAL LIFT STATION DIMENSIONS, CONTROL SETTINGS, & PUMP SELECTION TO BE AS INDICATED BY THE DESIGN ENGINEER AND APPROVED BY THE CITY.
2. WHEN FLOW METER VAULT IS REQUIRED, LOCATE DOWNSTREAM OF VALVE VAULT, CONTINUE D.I. PIPING THOUGH FLOW METER VAULT BEFORE TRANSITIONING TO PVC FORCE MAIN. EXPAND AGGREGATE AND FENCING ACCORDINGLY TO ACCOMMODATE VAULT.
3. CONTRACTOR SHALL CONSTRUCT A 12 FOOT CONCRETE ACCESS DRIVE FROM EXISTING EDGE OF PAVEMENT TO PROPOSED EDGE OF STONE LOT. THE CONCRETE PAVEMENT SHALL BE 6" CONCRETE ON 6" COMPACTED NO. 53 AGGREGATE.

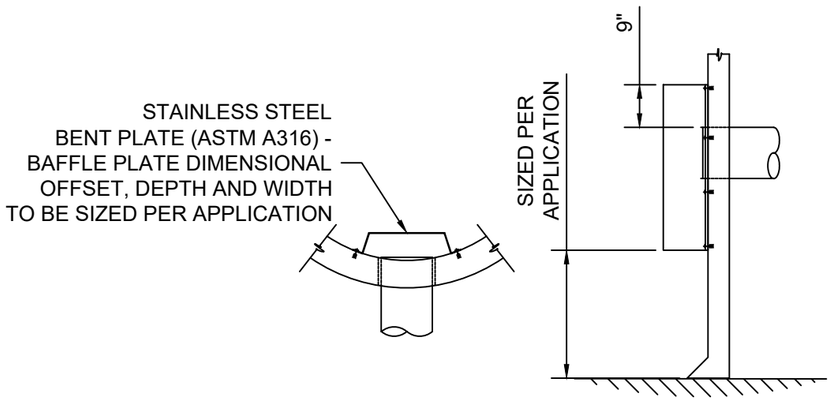
FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

TYPICAL LIFT STATION PLAN

SCALE: NONE

DETAIL NO. SS-16
DATE: SEP 2023





STAINLESS STEEL BAFFLE DETAIL

SCALE: NONE

NOTES:

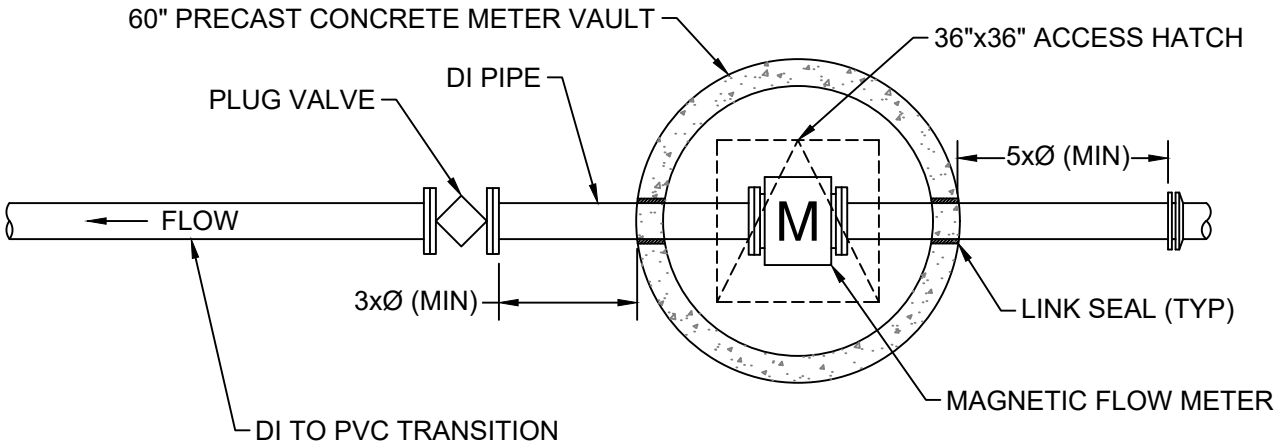
1. ACTUAL LIFT STATION DIMENSIONS, CONTROL SETTINGS, & PUMP SELECTION TO BE AS INDICATED BY THE DESIGN ENGINEER AND APPROVED BY THE CITY.
2. WHEN FLOW METER VAULT IS REQUIRED, LOCATE DOWNSTREAM OF VALVE VAULT, CONTINUE D.I. PIPING THOUGH FLOW METER VAULT BEFORE TRANSITIONING TO PVC FORCE MAIN.

TYPICAL LIFT STATION SECTION

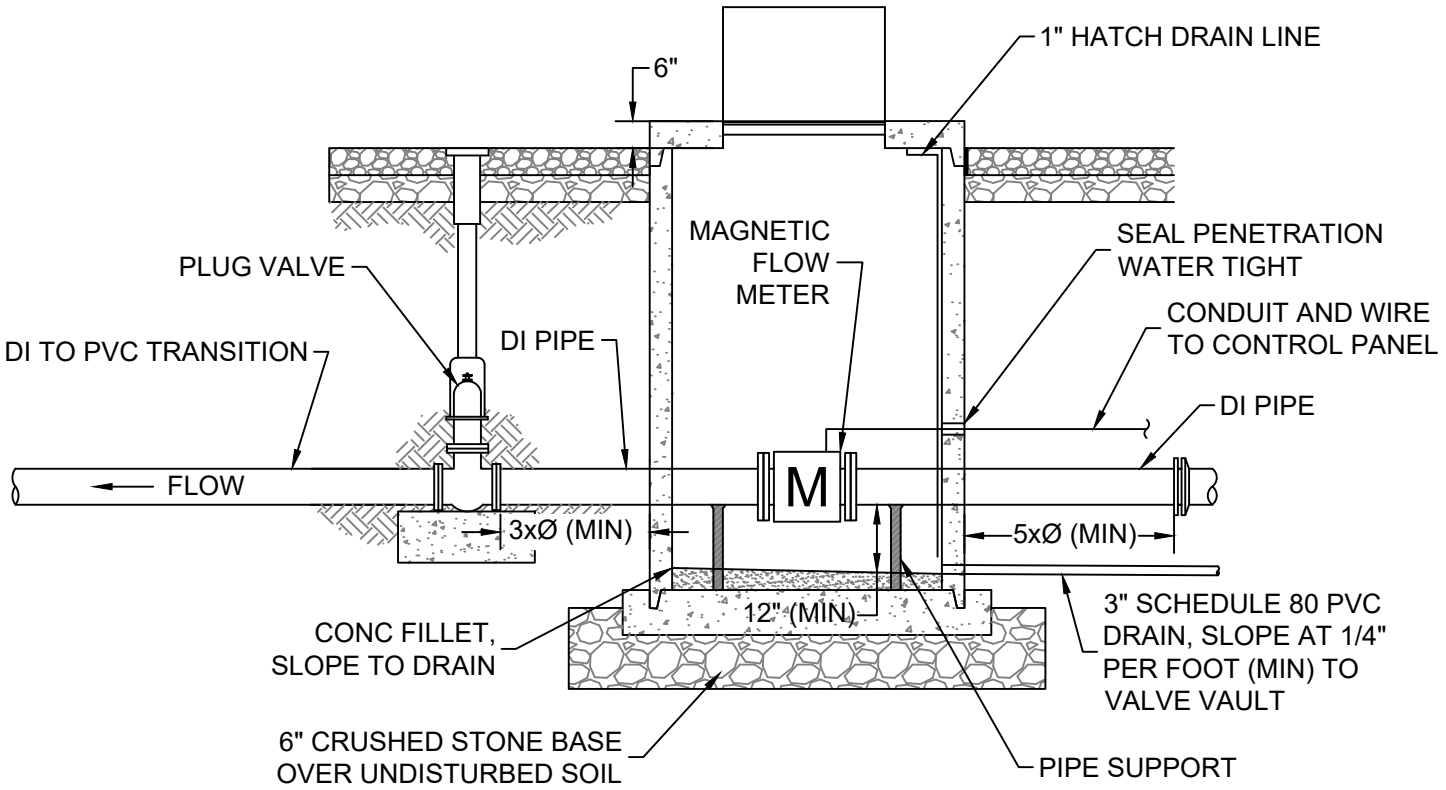
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SS-17
DATE: SEP 2023



PLAN



SECTION

NOTES:

1. METER VAULT HATCH SHALL BE SIZED AND LOCATED SO CLEAR OPENING IS DIRECTLY ABOVE MAG METER.

2. WHEN METER VAULT IS REQUIRED, LOCATE DOWNSTREAM OF VALVE VAULT. CONTINUE D.I. PIPING THROUGH METER VAULT BEFORE TRANSITIONING TO PVC FORCEMAIN.

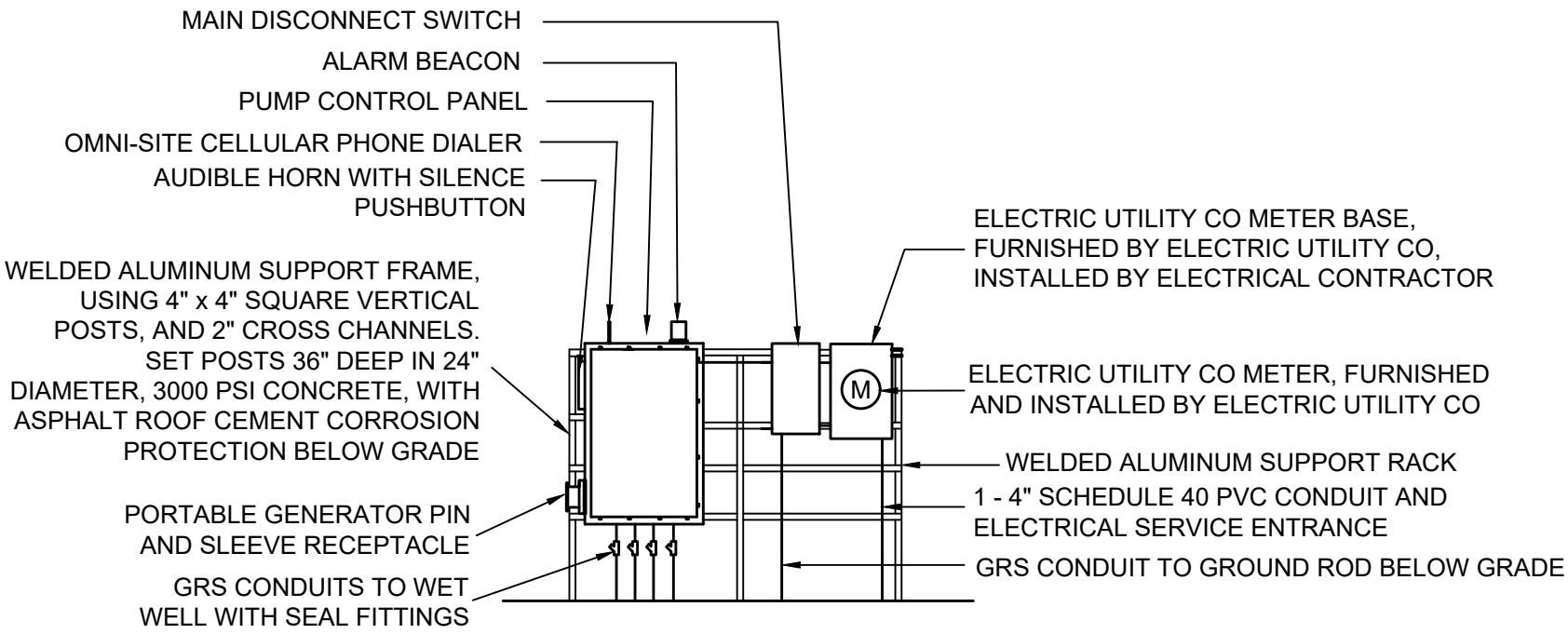
3. PROVIDE REPLACEMENT D.I. SPOOL PIECE TO REPLACE MAG METER AND SPOOL PIECES IF REMOVED.

FLOW METER VAULT

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SS-18
DATE: SEP 2023



LEFT-HAND CONFIGURATION

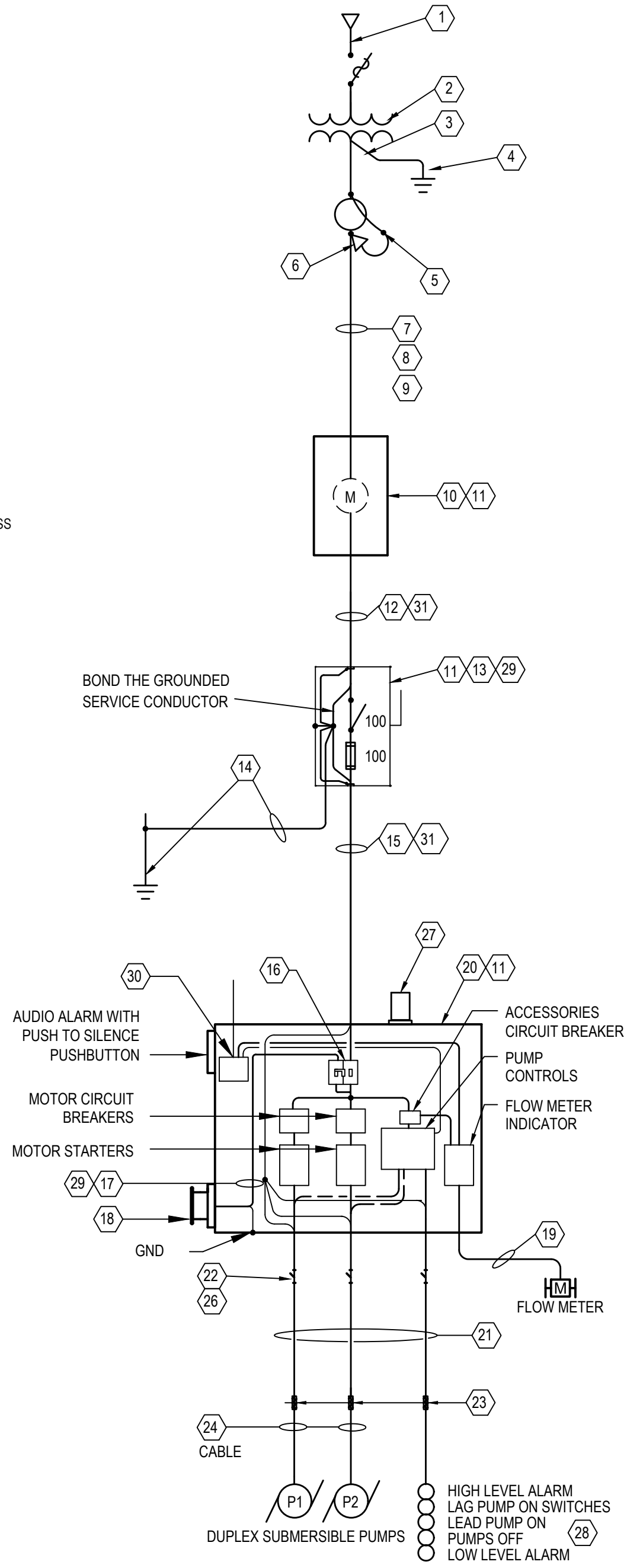
TYPICAL LIFT STATION
ELECTRICAL EQUIPMENT ELEVATION

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SS-19
DATE: SEP 2023

1. AERIAL MEDIUM VOLTAGE CONDUCTORS.
2. TRANSFORMER BANK ON ELEC. UTILITY CO. POLE.
3. UTILITY CO WOOD POLE.
4. GROUNDING AT ELECTRIC UTILITY POLE.
5. CONNECTION TO RISER CONDUCTORS.
6. WEATHERHEAD AND CONDUCTOR PIGTAILS.
7. 1 - 4" SCHEDULE 40 PVC CONDUIT RISER SPACED 9" AWAY FROM POLE.
8. SERVICE CONDUCTORS IN 1 - 4" SCHEDULE 40 PVC CONDUIT.
9. USE SCHEDULE 40 PVC CONDUIT ABOVE AND BELOW GROUND FOR ELECTRICAL SERVICE. USE GRS ELLS AND STUBS AT THE METER BASE.
10. METER AND BASE.
11. BOND BUSHINGS AND BONDING OF CONDUITS AND ENCLOSURES.
12. 3-#1, 1-#6 GROUND, 1 1/2" GRS C. MINIMUM SERVICE SIZE. CONFIRM SERVICE SIZE IF MOTORS ARE 3PH 7.5 HP OR LARGER.
13. GROUNDED FUSED MAIN DISCONNECT SWITCH, WITH NEMA 4X STAINLESS STEEL ENCLOSURE.
14. 5/8" X 8'-0" COPPER-CLAD GROUND ROD AND #6 GROUND, 3/4" C.
15. 3-#1, 1-#6 GROUND, 1 1/2" GRS C MINIMUM SERVICE SIZE. CONFIRM SERVICE SIZE IF MOTORS ARE 3PH 7.5 HP OR LARGER.
16. GENERATOR RECEPTACLE AND PUMP PANEL CIRCUIT BREAKER WITH MECHANICAL INTERLOCK (WALKING BEAM).
17. 3-#1, 1-#6 GROUND, MINIMUM SIZE. CONFIRM SIZE IF MOTORS ARE 3PH 7.5HP OR LARGER.
18. PIN AND SLEEVE NEMA 4X RECEPTACLE FOR CONNECTION OF PORTABLE GENERATOR. CONFIRM CONFIGURATION WITH COUNTY/CITY.
19. FLOW METER MANUFACTURER'S CABLE INSIDE 2"C. CONDUIT TO BE PVC WHERE UNDERGROUND AND GRS WHERE EXPOSED.
20. PUMP MOTOR CONTROL PANEL.
21. GALVANIZED RIGID STEEL CONDUITS, PUMP CABLES, FLOAT CABLES, AND LEVEL SENSOR CABLE.
22. GALVANIZED RIGID STEEL CONDUITS AND CONDUIT SEALS; APPROPRIATE FOR CLASS 1, DIVISION 1, GROUP D HAZARDOUS ENVIRONMENT.
23. STRAIN RELIEF CABLE GRIP AND HOOK FOR SUPPORT OF POWER AND CONTROL CABLES, ACCESSIBLE FROM WET WELL HATCH.
24. CABLES WITH PUMP POWER AND SENSOR CONDUCTORS.
25. WEIGHTED CABLE SET AND FLOAT SWITCHES.
26. HAZARDOUS ATMOSPHERE; ALL CONDUITS ENTERING WET WELL SHALL HAVE APPROVED CONDUIT SEALS INSTALLED.
27. ALARM BEACON.
28. FLOATS SHALL PROVIDE PRIMARY LEVEL CONTROL.
29. 100A MINIMUM SERVICE SIZE IS ONLY ALLOWED FOR MOTORS AT 240V 3PH UP TO 5HP AND MOTORS AT 480V 3PH UP TO 15 HP. CONFIRM SERVICE SIZE IF LARGER MOTORS ARE USED.
30. CELLULAR TELEPHONE ALARM DIALER. CONSULT WITH OWNER FOR THE CURRENT MODEL.



TYPICAL LIFT STATION ONE-LINE DIAGRAM (240V, 3PH, FOR 5 HP AND BELOW 480V, 3PH, FOR 7.5 HP AND ABOVE CONSULT WITH OWNER)

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

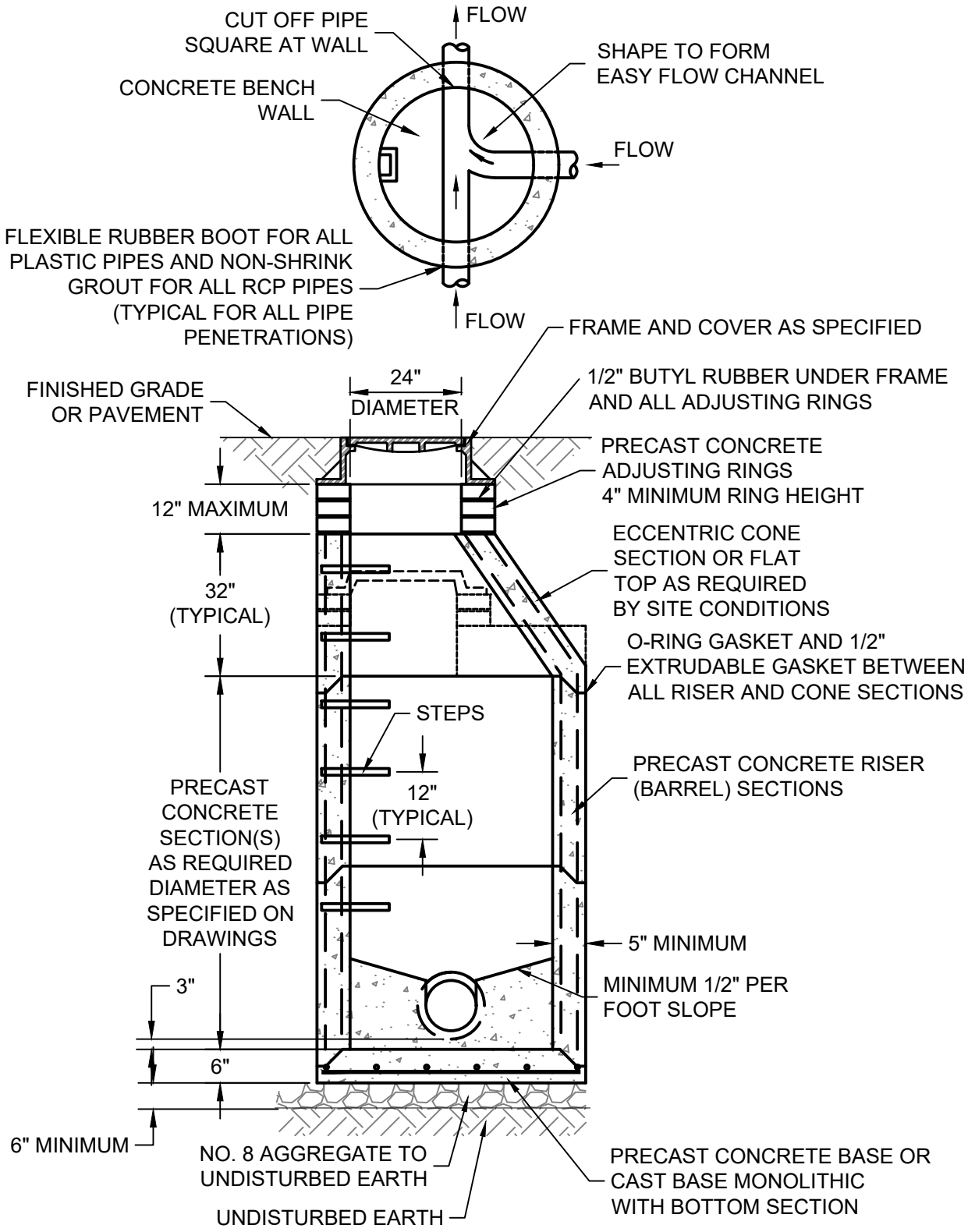
SCALE: NONE

DETAIL NO. SS-20
DATE: SEP 2023

STANDARD DETAILS

SW - STORM WATER SYSTEMS

TABLE OF CONTENTS

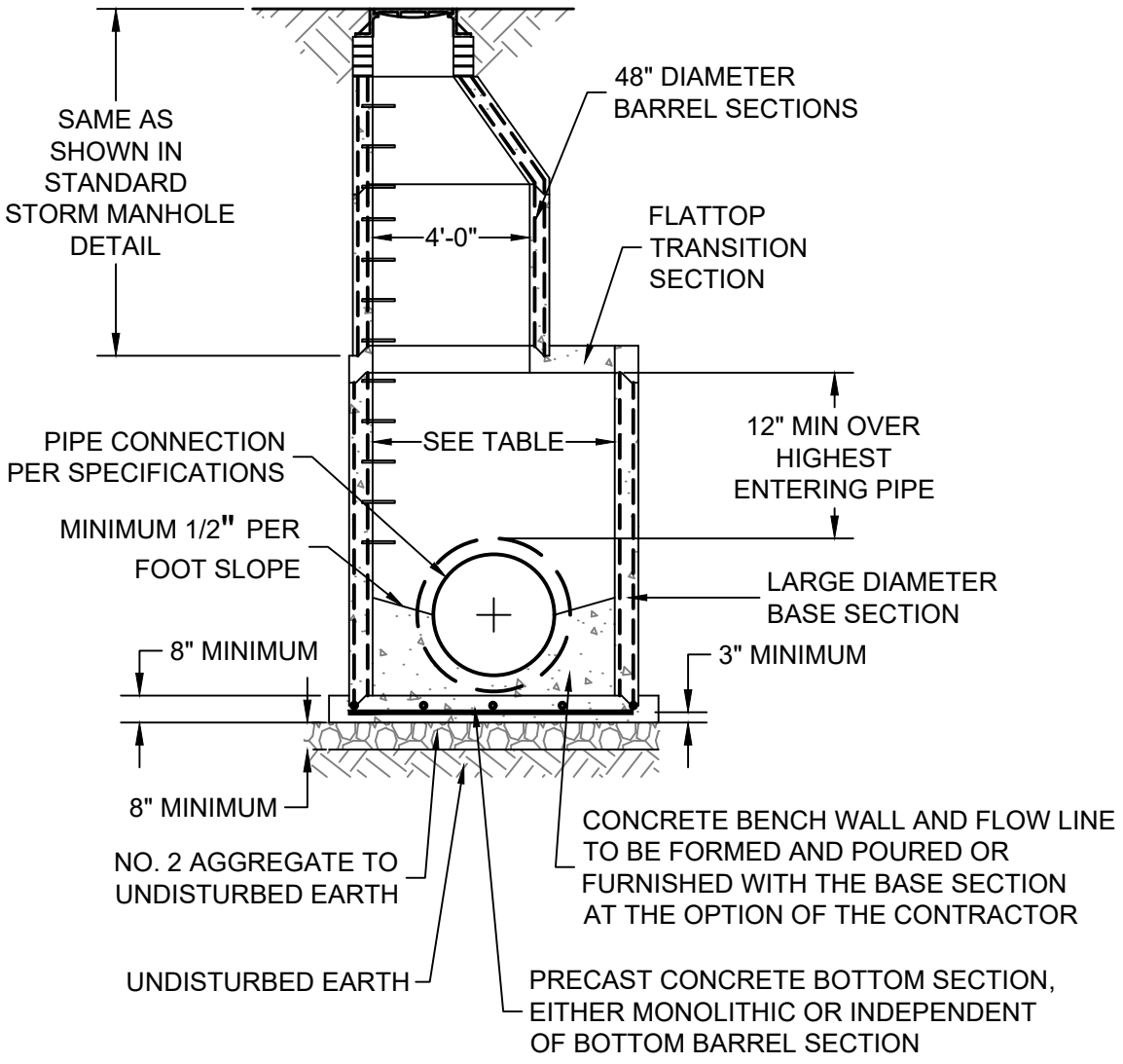


STANDARD STORM MANHOLE

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SW-01
DATE: SEP 2023



STRUCTURE DATA SCHEDULE

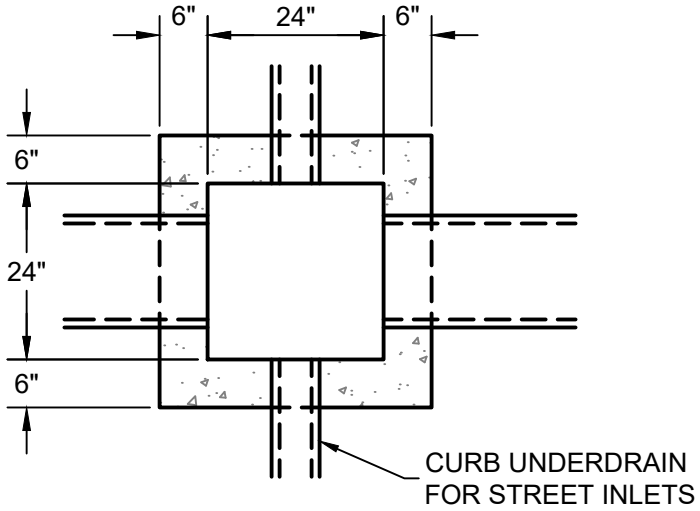
STR DIA	PIPE DIA	APPLICATION
60"	24" TO 33"	HORIZONTAL PIPE DEFLECTION GREATER THAN 45° UP TO 90°
60"	27" TO 36"	HORIZONTAL PIPE DEFLECTION STRAIGHT THRU MANHOLE UP TO 45°
72"	36"	HORIZONTAL PIPE DEFLECTION GREATER THAN 45° UP TO 90°
72"	42" TO 48"	HORIZONTAL PIPE DEFLECTION STRAIGHT THRU MANHOLE UP TO 45°
84"	42"	HORIZONTAL PIPE DEFLECTION GREATER THAN 45° UP TO 90°
96"	48"	HORIZONTAL PIPE DEFLECTION GREATER THAN 45° UP TO 90°

TYPE 1 STORM MANHOLE

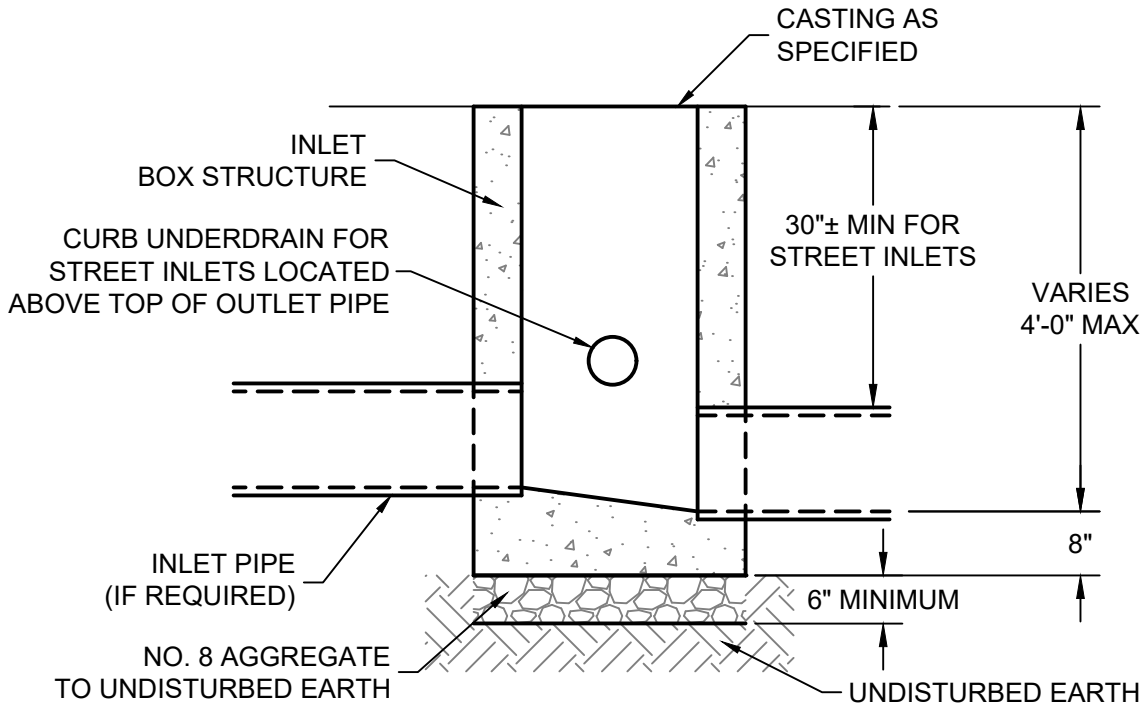
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SW-02
DATE: SEP 2023



PLAN VIEW



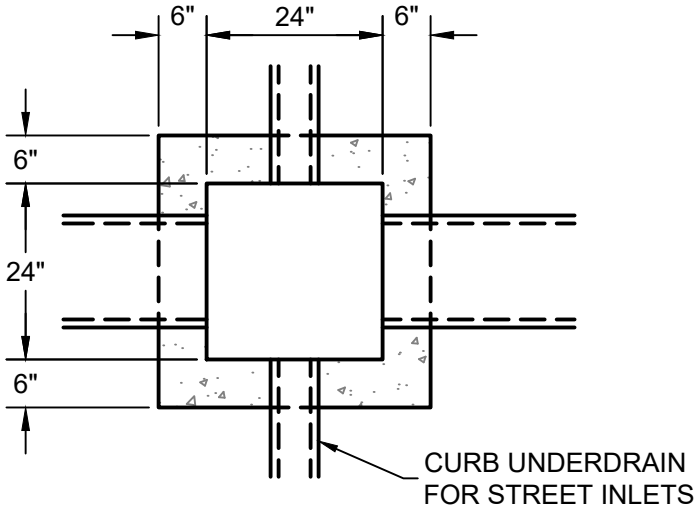
ELEVATION VIEW

INLET TYPE A

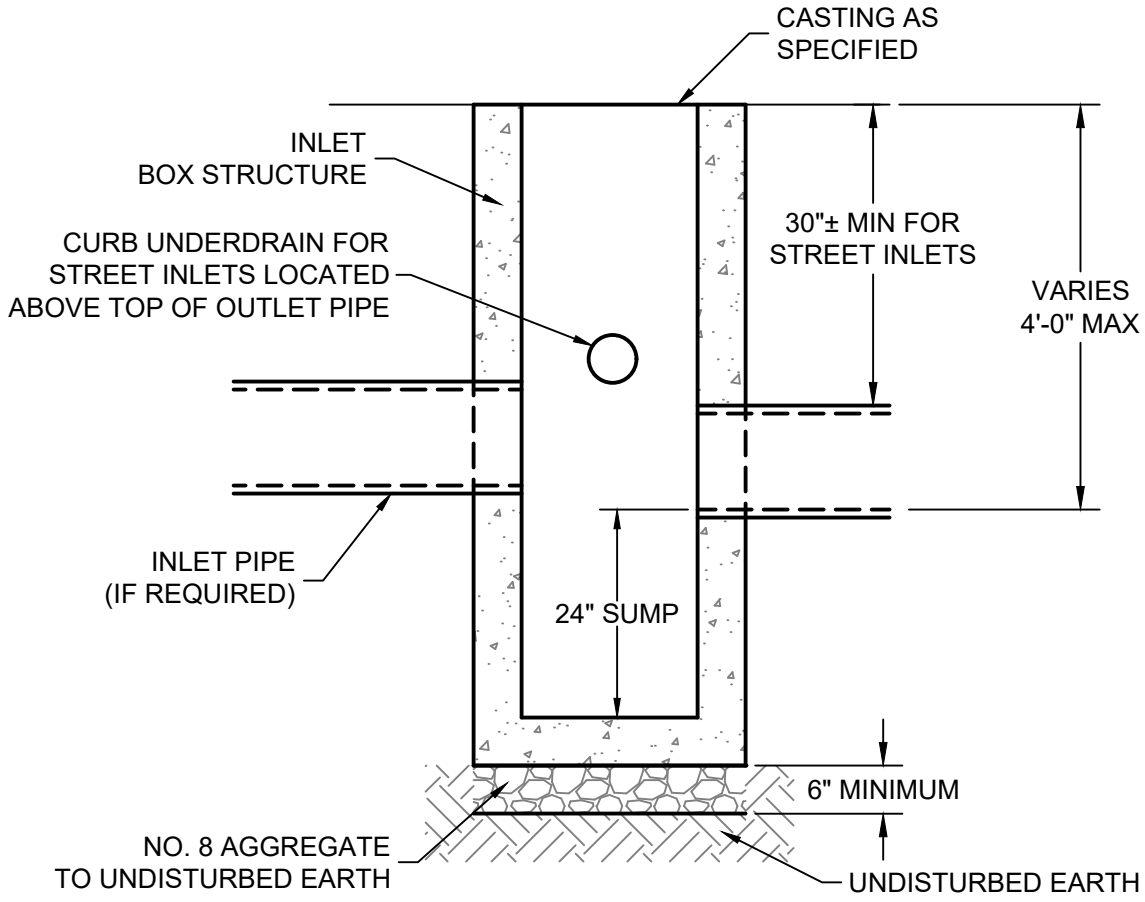
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SW-03
DATE: SEP 2023



PLAN VIEW



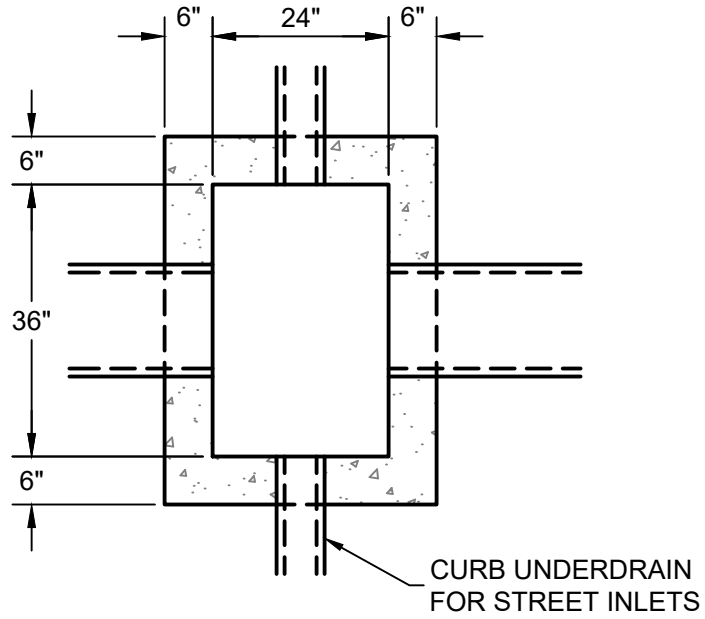
ELEVATION VIEW

CATCH BASIN TYPE A

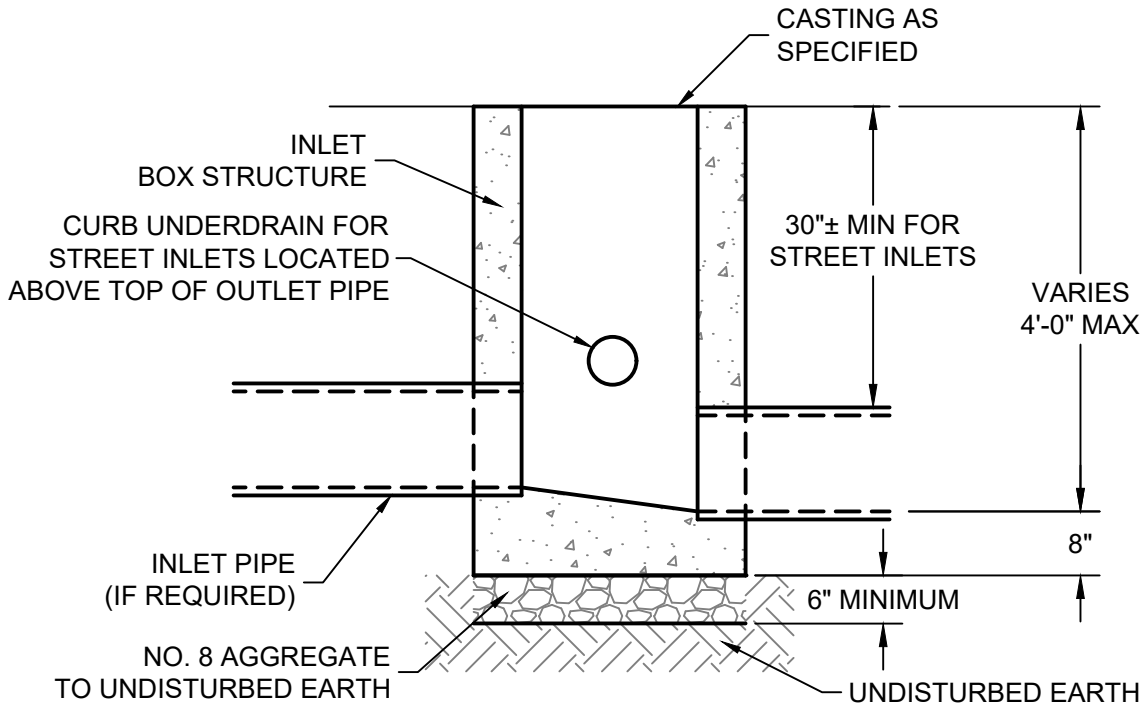
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SW-04
DATE: SEP 2023



PLAN VIEW



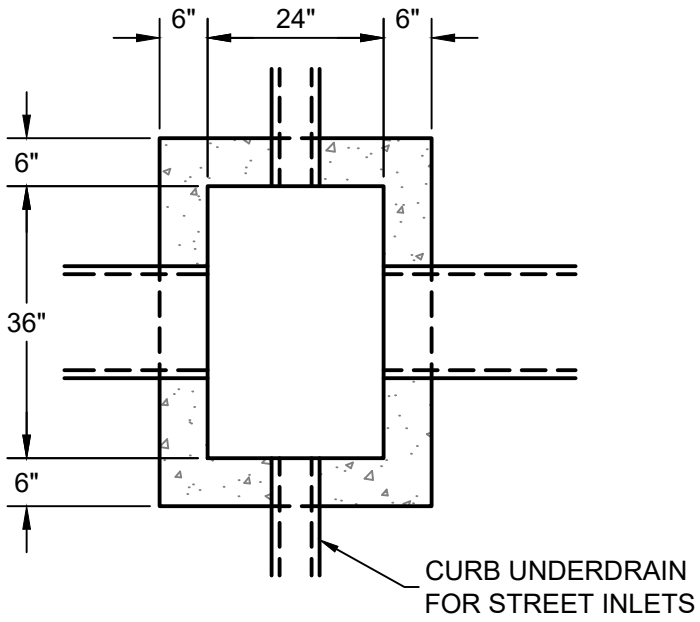
ELEVATION VIEW

INLET TYPE B

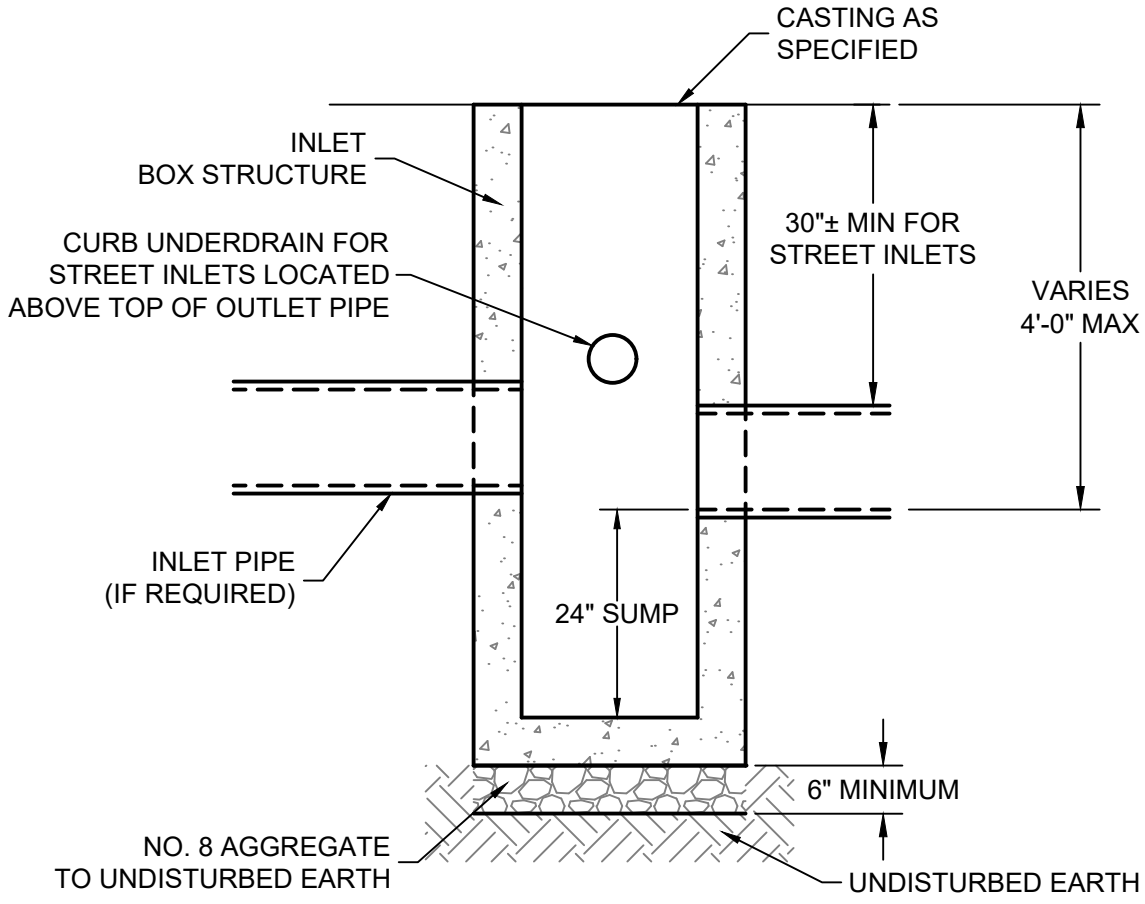
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SW-05
DATE: SEP 2023



PLAN VIEW



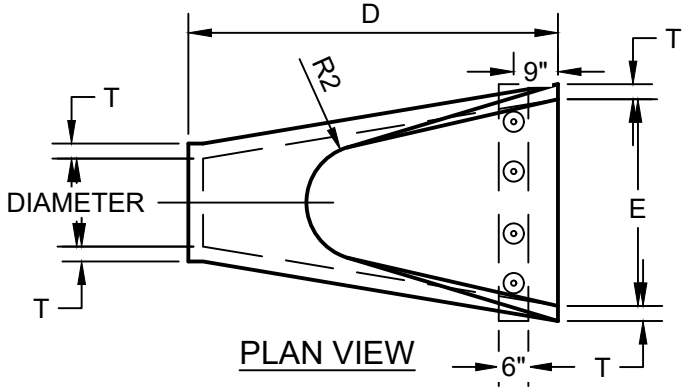
ELEVATION VIEW

CATCH BASIN TYPE B

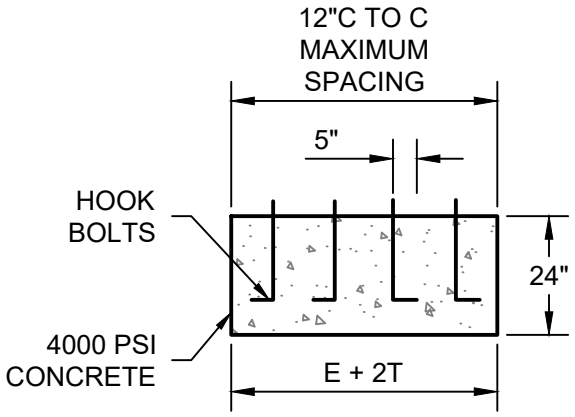
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

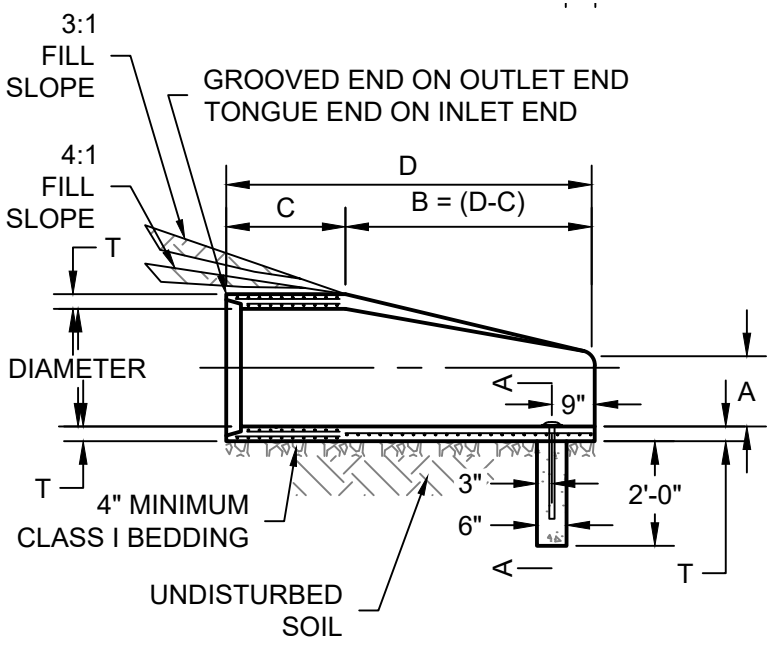
DETAIL NO. SW-06
DATE: SEP 2023



PLAN VIEW



SECTION A
CONCRETE PIPE TOE ANCHOR



LONGITUDINAL SECTION

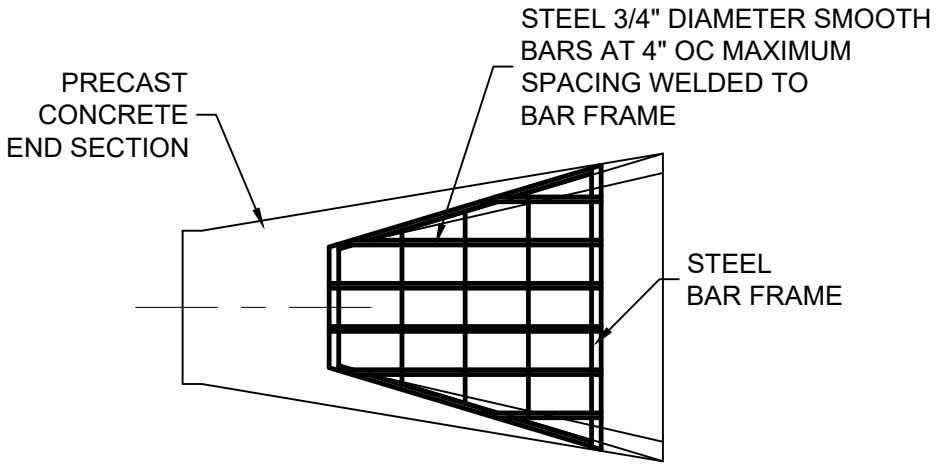
DIA	T (MIN)	A*	C*	D*	E*	R_1	R_2	APPROX WEIGHT
12"	2"	5"	51"	74"	24"	10.125"	9"	800
15"	2.25"	7"	48"	75"	30"	12.5"	11"	1100
18"	2.5"	11"	49"	74"	36"	15.5"	12"	1300
21"	2.75"	11"	42"	75"	42"	16.125"	13"	1500
24"	3"	12"	32"	75"	48"	16.375"	14"	1800
27"	3.25"	13"	29"	75"	54"	18.563"	14.5"	2100
30"	3.5"	14"	22"	75"	60"	18.5"	15"	2400
33"	3.75"	15"	42"	99"	66"	23.75"	17.5"	4100
36"	4"	17"	37"	99"	72"	24.625"	20"	4200
* TOLERANCE ±								

PRECAST CONCRETE END SECTION

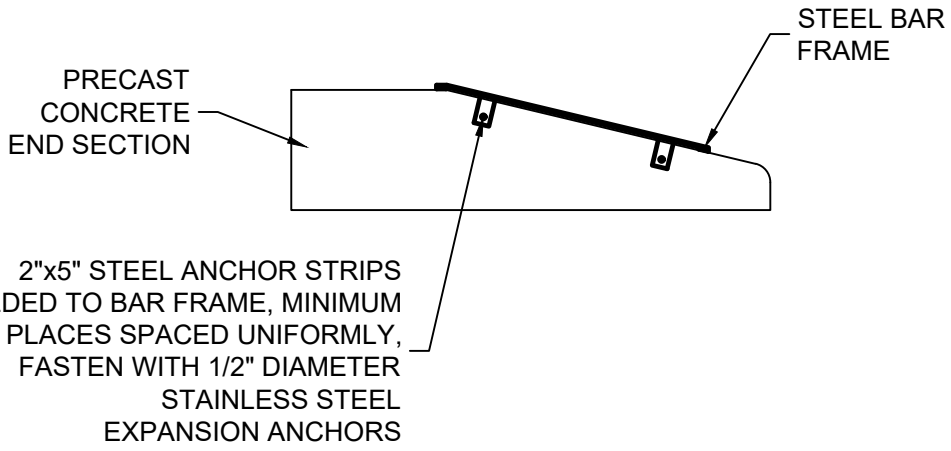
FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

SCALE: NONE

DETAIL NO. SW-07
DATE: SEP 2023



PLAN VIEW



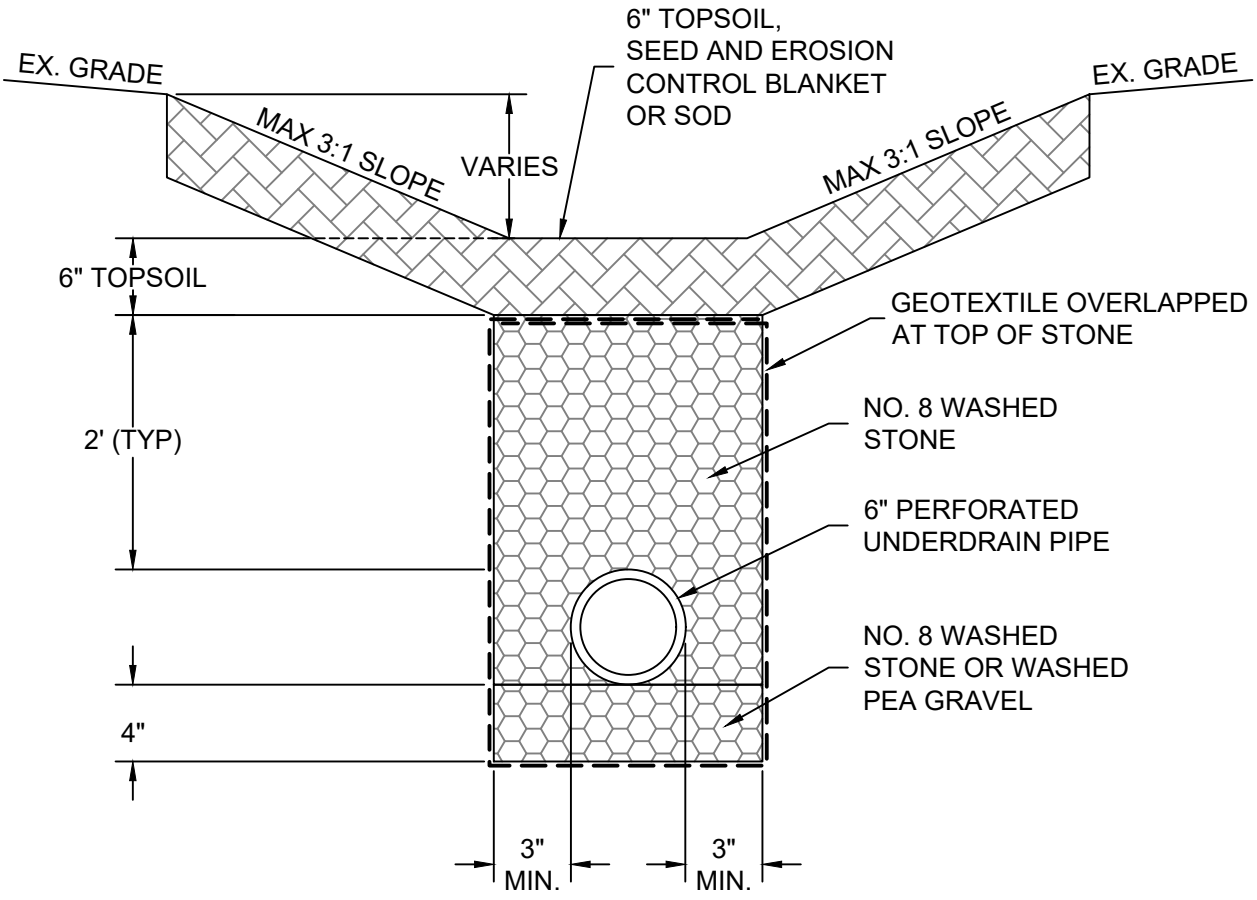
SIDE VIEW

TRASH GUARD

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SW-08
DATE: SEP 2023



NOTES:

1. PIPE MATERIAL SHALL BE PERFORATED CORRUGATED POLYETHYLENE, AS SPECIFIED.

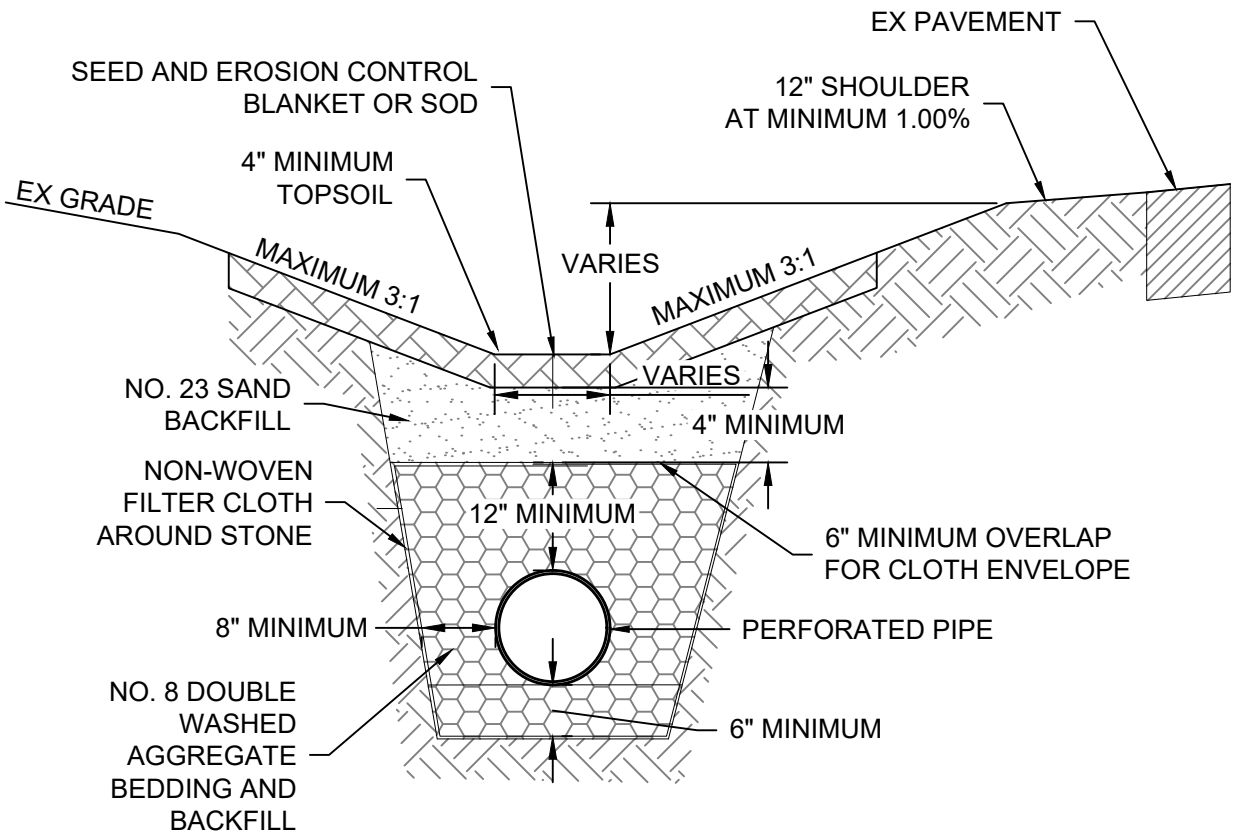
2. UNDERDRAIN CLEANOUT/RISERS REQUIRED EVERY 500 FEET.

DRAINAGE SWALE WITH UNDERDRAIN

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SW-09
DATE: SEP 2023

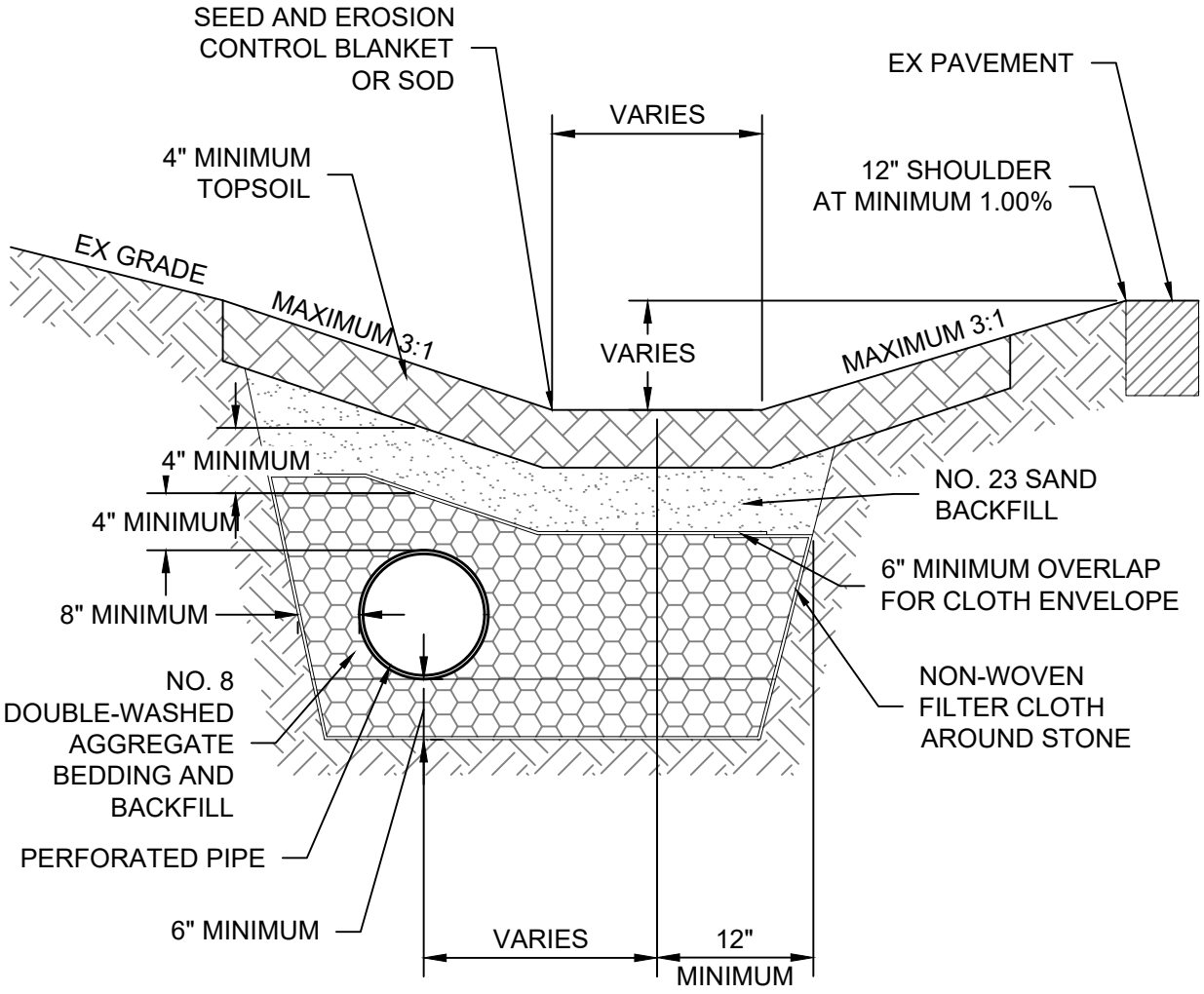


HYBRID DITCH TRENCH

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SW-10
DATE: SEP 2023

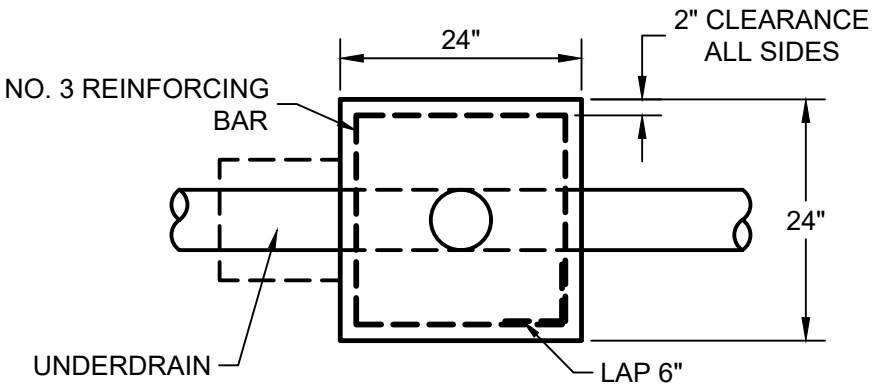


MODIFIED HYBRID DITCH TRENCH

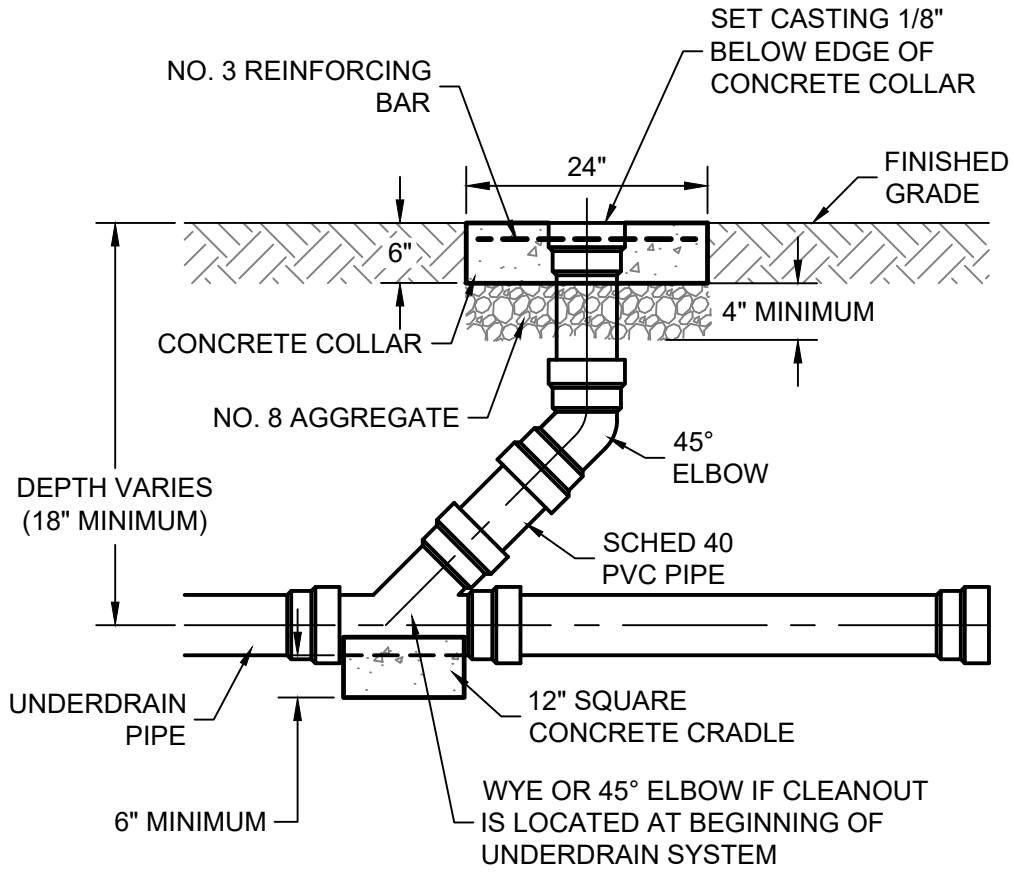
SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SW-11
DATE: SEP 2023



PLAN VIEW



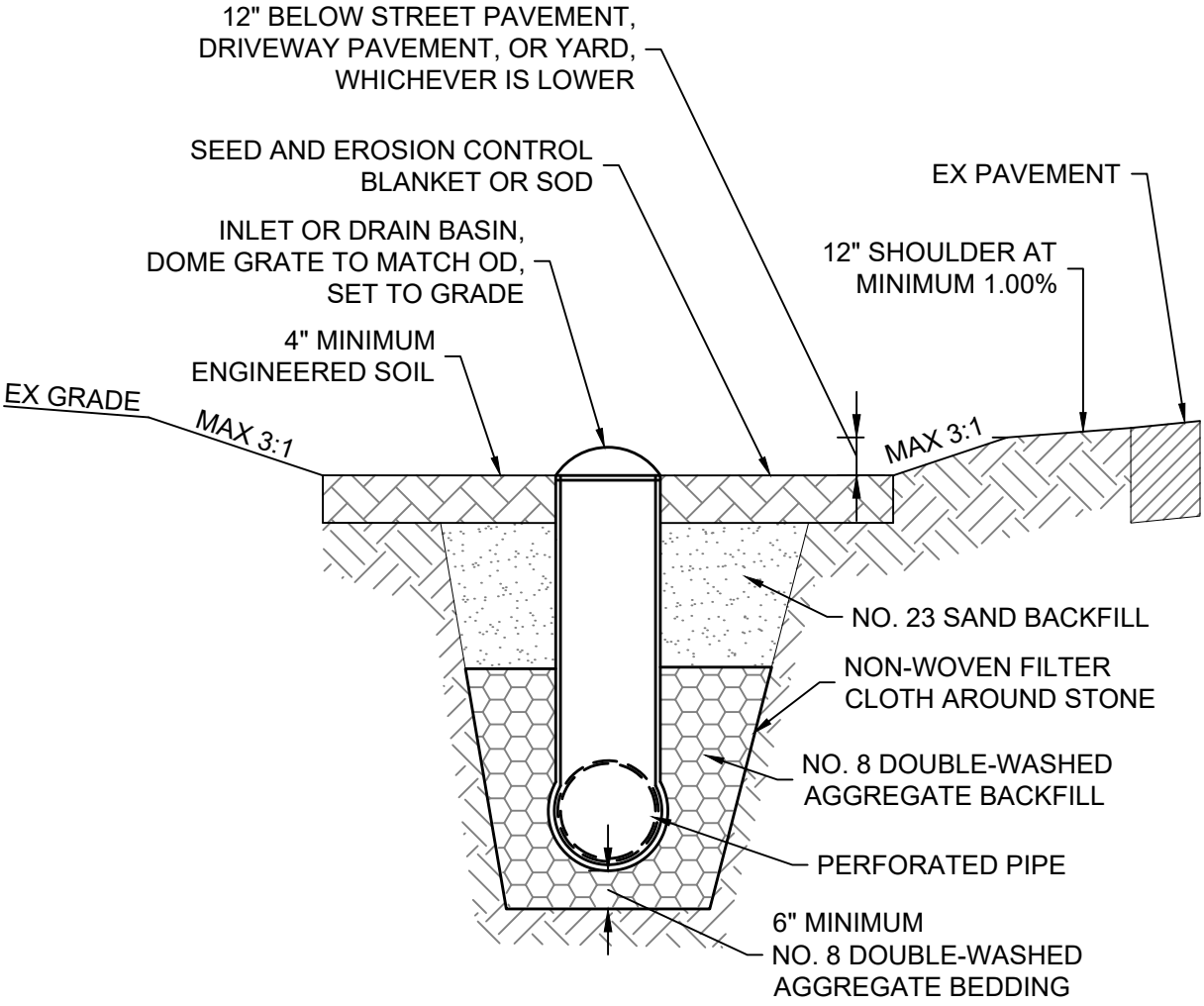
ELEVATION VIEW

UNDERDRAIN CLEANOUT

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SW-12
DATE: SEP 2023



ENGINEERED SOIL SPECIFICATION:

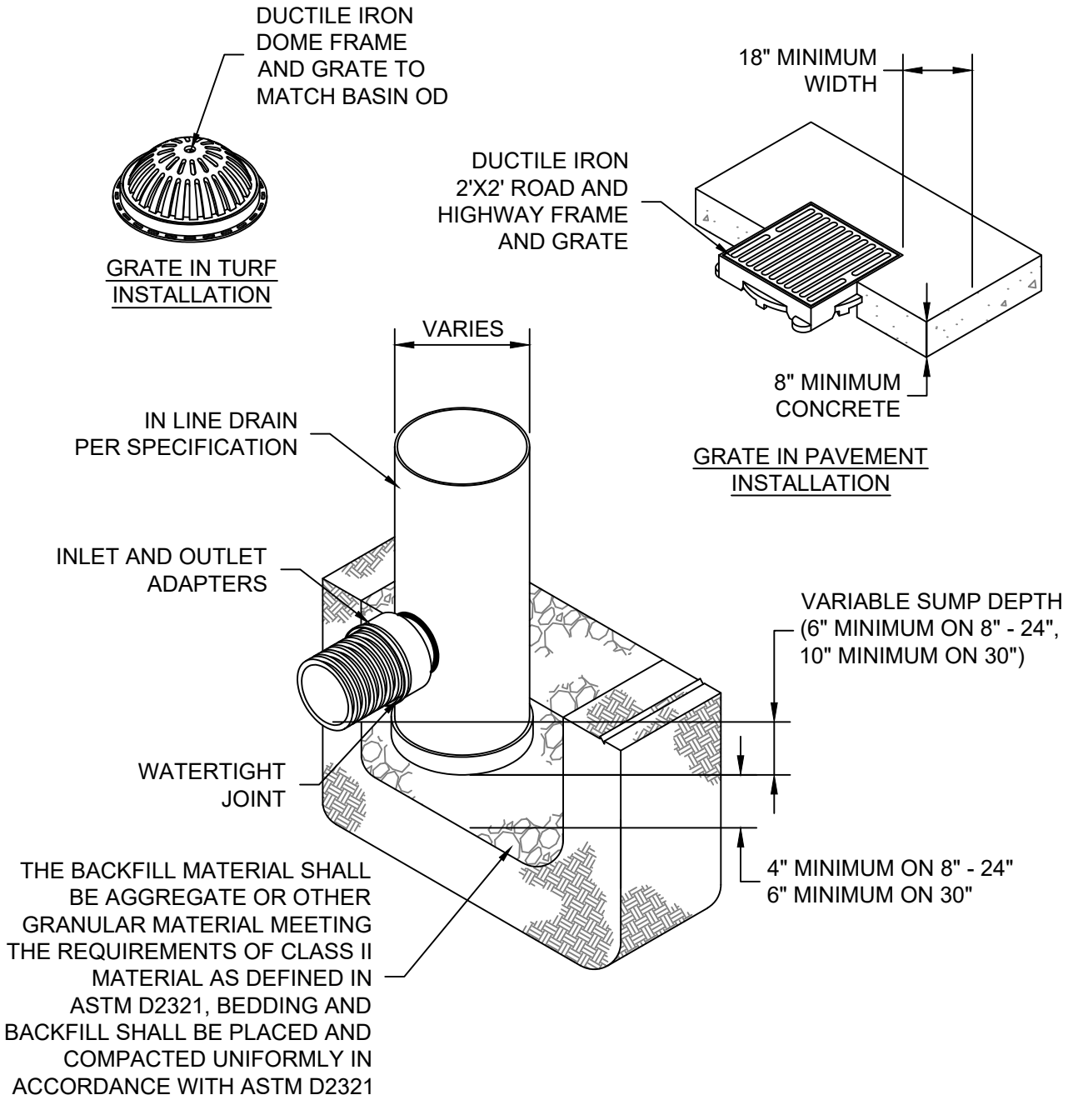
1. ENGINEERED SOIL MIX SHALL BE CONSISTENT WITH THE FOLLOWING:
   A. 60% WASHED INDOT NO. 23 SAND (INDOT 903.01), 20% TOPSOIL (INDOT 914.01), AND 20% COMPOST MULCH (INDOT 914.05) BY VOLUME.
   B. THE TEXTURE OF THE ENGINEERED SOIL IS LOAMY SAND OR SANDY LOAM ACCORDING TO THE USDA SOIL CLASSIFICATION SYSTEM.
   C. MINIMUM LONG-TERM INFILTRATION RATE OF 2.0 INCHES/HOUR PER ASTM D2434.
2. ENGINEERED SOIL MAY BE OBTAINED OFF SITE OR CREATED BY TESTING NATIVE SOILS AND MIXING WITH IMPORTED MATERIALS AS NEEDED TO ACHIEVE SPECIFICATIONS.
3. ENGINEERED SOIL SHOULD BE MIXED UNIFORMLY AND ITS CHARACTERISTICS SHALL BE VERIFIED BY MATERIALS TESTING PRIOR TO PLACEMENT.
4. TO PRESERVE INFILTRATION CAPACITY OF NATIVE SOIL, KEEP MACHINERY OUTSIDE OF THE EXCAVATED HYBRID DITCH AREA.
5. DO NOT PLACE SOIL IF SATURATED. OVERFILL THE AREA WITH ENGINEERED SOIL BY 5% TO ALLOW FOR SETTLEMENT.
6. RESTORE DISTURBED AREAS BEYOND THE TRENCH EXCAVATION WITH TOPSOIL AND SEEDING. MATCH GRADES AND PROVIDE POSITIVE SLOPE TO DITCH.
7. AVOID OVER COMPACTION BY ALLOWING TIME FOR NATURAL SETTLEMENT.

HYBRID DITCH TRENCH AT INLET

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SW-13
DATE: SEP 2023

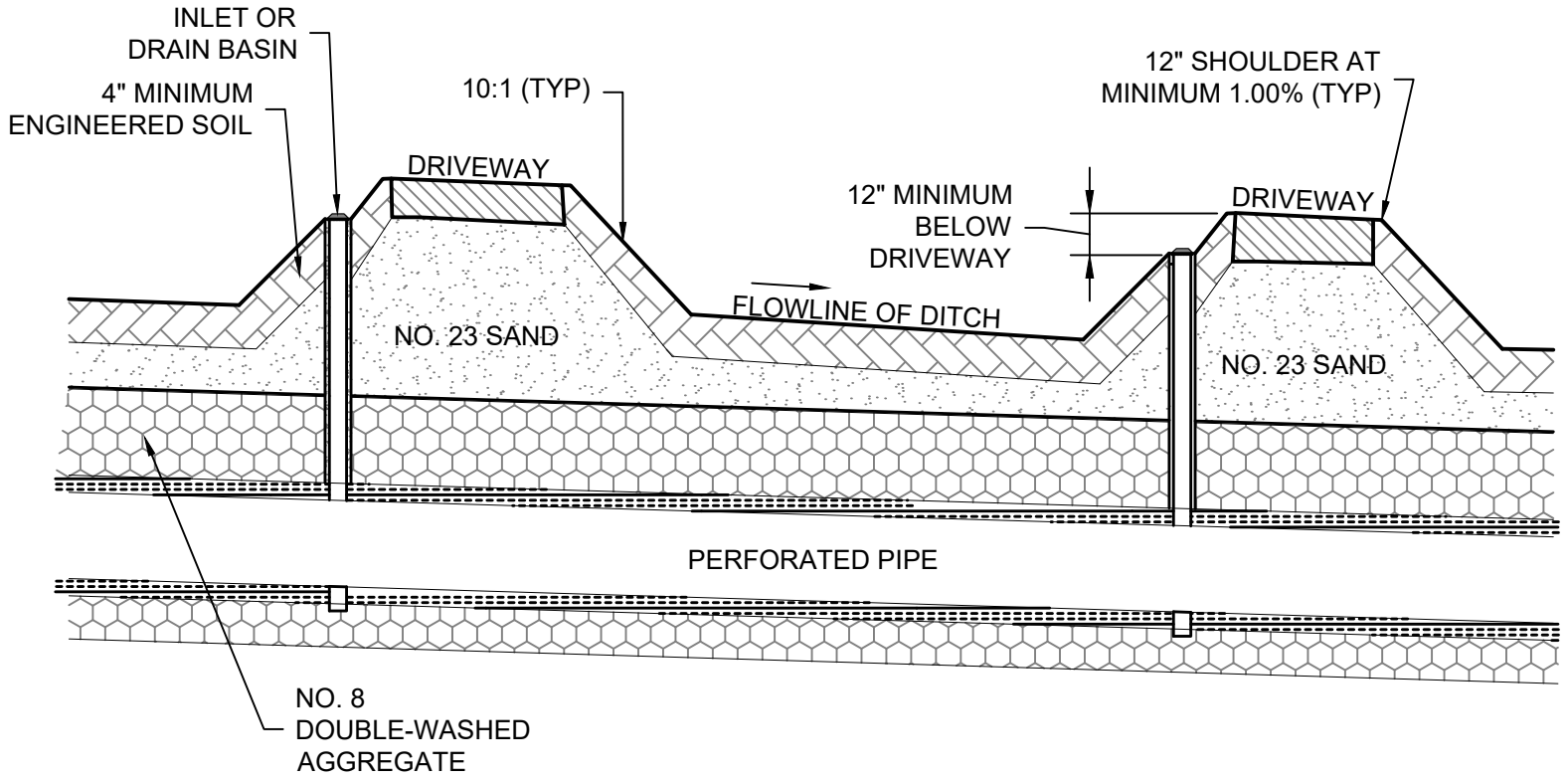


HYBRID DITCH DRAIN BASIN

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SW-14
DATE: SEP 2023



ENGINEERED SOIL SPECIFICATION:

1. ENGINEERED SOIL MIX SHALL BE CONSISTENT WITH THE FOLLOWING:
   A. 60% WASHED INDOT NO. 23 SAND (INDOT 903.01), 20% TOPSOIL (INDOT 914.01), AND 20% COMPOST MULCH (INDOT 914.05) BY VOLUME.
   B. THE TEXTURE OF THE ENGINEERED SOIL IS LOAMY SAND OR SANDY LOAM ACCORDING TO THE USDA SOIL CLASSIFICATION SYSTEM.
   C. MINIMUM LONG-TERM INFILTRATION RATE OF 2.0 INCHES/HOUR PER ASTM D2434.
2. ENGINEERED SOIL MAY BE OBTAINED OFF SITE OR CREATED BY TESTING NATIVE SOILS AND MIXING WITH IMPORTED MATERIALS AS NEEDED TO ACHIEVE SPECIFICATIONS.
3. ENGINEERED SOIL SHOULD BE MIXED UNIFORMLY AND ITS CHARACTERISTICS SHALL BE VERIFIED BY MATERIALS TESTING PRIOR TO PLACEMENT.
4. TO PRESERVE INFILTRATION CAPACITY OF NATIVE SOIL, KEEP MACHINERY OUTSIDE OF THE EXCAVATED HYBRID DITCH AREA.
5. DO NOT PLACE SOIL IF SATURATED. OVERFILL THE AREA WITH ENGINEERED SOIL BY 5% TO ALLOW FOR SETTLEMENT.
6. RESTORE DISTURBED AREAS BEYOND THE TRENCH EXCAVATION WITH TOPSOIL AND SEEDING. MATCH GRADES AND PROVIDE POSITIVE SLOPE TO DITCH.
7. AVOID OVER COMPACTION BY ALLOWING TIME FOR NATURAL SETTLEMENT.

HYBRID DITCH PROFILE

SCALE: NONE

FAYETTE COUNTY, INDIANA
THE CITY OF CONNERSVILLE, INDIANA

DETAIL NO. SW-15
DATE: SEP 2023