General Notes and Standard Construction Drawings for the City of Twinsburg

Located in SUMMIT COUNTY

Department of Engineering
10075 Ravenna Road, Twinsburg, Ohio 44087

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Table of Contents

Note: These specifications are in addition to 2019 ODOT Construction and Material Specifications, COT codified Ordinances and COT Development Regulations. If a conflict exists the City Engineer will make the final ruling as to which applies. For bidding purposes the contractor shall assume the most stringent criteria in preparing their bid.

STORM PIPE SPECIFICATIONS

General Requirements:
The following pipe requirements apply to all pipes placed within the Municipality. All pipe installation shall conform to ODOT Specification Section 611 if not specified herein.

Pipe Requirements:
Reinforced concrete pipe material shall conform to ODOT Specification Section 706.02, with resilient and flexible gasket conforming to ASTM C443, Polyvinyl chloride pipe shall conform to ODOT Section 707.45, and Polyethylene pipe shall conform to ODOT Section 707.33. The gasket joint shall be of the integral bell design formed as a continuous, homogeneous entity with the pipe. The gasket shall be factory assembled and securely locked into place to prevent displacement during assembly. A joint lubricant supplied by the manufacturer shall be used on the gasket and bell during assembly. The gasket shall meet the requirements of ASTM F477 and the joint shall meet the requirements of ASTM D3212. Joint deflection shall not exceed the maximum allowable as recommended by the manufacturer.

Type A Conduits – Culverts

a. Material shall be concrete or HDPE for sewers up to 24 inch.
b. Material shall be concrete for sewers greater than 24 inch.
c. Material shall be concrete for conduits with cover less than twenty-four (24) inches from subgrade to top of pipe.
d. Minimum cover shall be nine (9) inches from subgrade to top of pipe. If minimum cover cannot be maintained, the pipe shall be concrete encased.

Type B Conduits – Storm sewer under pavement

a. Material shall be concrete or HDPE for conduit sizes up to and including Thirty six (36) inch diameter with minimum cover of twenty-four (24) inches from subgrade to top of pipe.
b. Material shall be concrete for conduit sizes greater than Thirty six (36) inch.
c. Material shall be concrete for conduits with cover less than twenty-four (24) inches from subgrade to top of pipe.

Type C Conduits – Storm sewer or sanitary not under pavement

a. Material shall be concrete, HDPE, or plastic for sizes up to twelve (12) inch.
a. Material shall be concrete or HDPE for conduit sizes from twelve (12) inch up to and including forty-eight (48) inch diameter with minimum cover of twelve (12) inches from subgrade to top of pipe.
b. Material shall be concrete for conduit sizes greater than forty-eight (48) inch.
c. Material shall be concrete for conduits with cover less than twelve (12) inches from subgrade to top of pipe.

Type D Conduits – Drive pipes and bikeways

a. Material shall be concrete or plastic for conduit sizes up to and including twenty-four (24) inch diameter with minimum cover of twelve (12) inches from subgrade to top of pipe.

b. Material shall be concrete for conduit sizes greater than twenty-four (24) inch.
c. Minimum size shall be twelve (12) inch.
d. All commercial drive culverts shall be concrete.

Type E Conduit – Miscellaneous small drain connections and headers shall be per ODOT Specifications.

Type F Conduit – Conduits on steep slopes: underdrain outlets shall be per ODOT Specifications.

Air Tight Plug and Staking:
The end of each connection shall be sealed with an air tight plug and the end of each connection shall be marked 2" x 2" hardwood stake, extending vertically from the end of the connection to a point approximately three (3) feet above the surface of the ground. Markers shall be color-coded: STORM – GREEN. Saw cut top of curb to mark location of utilities with the following symbols STORM – X.

Storm Laterals:
Storm laterals shall be PVC SDR 35. Pipe shall have preformed wyes for house lateral connections of six (6) inches diameter. A 6"x 6" straight tee or double tee shall be installed at one (1) foot outside the right-of-way with a riser of six (6) inch PVC, three (3) foot above grade and an extension of six (6) inch PVC to end of utility easement. A cap with a stainless steel trap cover, fastened to a stainless steel nut and bolt shall be furnished at riser. Ninety degree (90) bends are **prohibited. The curb shall be appropriately marked opposite. Positive fall should be field verified by Contractor.**

Dimensions:
Reinforced Concrete - Unless otherwise shown, the minimum thickness for reinforced concrete shall be Class IV with the Class value increasing as per design.

Home Mark:
All pipe spigots shall have a "home" mark to facilitate joint closure.

Fittings:
Reinforced Concrete – Fittings shall be factory made and provided with premium joints meeting ASTM C443 with resilient and flexible gasket joints.

HDPE - Fittings shall be factory made and provided with watertight joints and polyisoprene gaskets meeting ASTM D 2321 with an integral bell and spigot. Connection to structure shall be made with ADS C923 connection or equal.

Connection to Structures:
Concrete pipe shall use red sewer brick and non-shrink grout to seal the pipe to the structure. Plastic pipe shall use core–n-seal boots to make the connection to a structure. HDPE Pipe shall use ADS C923 connection to the structure, or equal.

Certification:
A manufactures certificate that the reinforced concrete and/or HDPE pipe and fittings were tested in accordance with the appropriate ASTM specifications shall be furnished to the Municipality prior to installation.

Straightness:
Pipe intended to be straight shall have a maximum deviation from straightness of 1/16 in per lineal foot when measured in accordance with ASTM D2122.

Line and Grade Control:
The line and grade of sewer mains shall be controlled during the sewer construction by use of an approved laser device. The line and grade shall be "checked" from line and grade stakes at a maximum of fifty foot (50) intervals. A minimum of 1% slope shall be maintained with a minimum cover of three (3) foot depth from final grade.

Inspection:
The Engineer or his authorized representative immediately prior to installation will inspect all pipe and fittings and all rejected pieces must be completely removed from the project. No repairs of pipe or fittings will be allowed; undamaged lengths of straight pipe may be salvaged by neatly sawing off the damaged portion of that pipe.

Video Inspection:
All storm pipes shall be cleaned and videotaped according to General Requirements herein.

Six (6) inch Underdrain:
Underdrain shall be installed in accordance with ODOT Item 605. Underdrain conduit shall meet one of the following ODOT Item Specifications:

1) ODOT Item 707.41 - Six (6) inch polyvinyl chloride (PVC) pipe conforming to ASTM F758, Type PS46 with a minimum of four (4) rows of perforations.
2) ODOT Item 707.42 - Six (6) inch (PVC) corrugated, doubled walled smooth interior pipe conforming to ASTM F949 with perforations.

   Bedding shall be No. 57 washed limestone. Underdrain shall be fabric wrapped as directed by the Engineer. The gasket joint shall be of the integral bell design formed as a continuous, homogeneous entity with the pipe. The gasket shall be factory assembled and securely locked into place to prevent displacement during assembly. A joint lubricant supplied by the manufacturer shall be used on the gasket and bell during assembly. The gasket shall meet the requirements of ASTM F477 and the joint shall meet the requirements of ASTM D3212. Joint deflection shall not exceed the maximum allowable as recommended by the manufacturer.

All storm sewers including underdrain entering a structure shall have a 6" x 6" class C concrete collar poured around the pipe on the outside of the structure to seal the voids between the conduit and structure. Hydraulic cement maybe substituted.

SANITARY PIPE SPECIFICATIONS

General Requirements:
Sanitary sewer construction shall conform to ODOT Item 611 and as modified herein. All sanitary pipes shall conform to ODOT Section 707.45; polyvinyl chloride wall pipe, ASTM 3034, SDR 35; having a bell and spigot, ASTM 3212 and gaskets in accordance with ASTM F477.

Sanitary Laterals:
Shall be PVC SDR 35 with gasket material conforming to ASTM F-477 and joints per ASTM D-3212. Pipe shall have preformed wyes for house lateral connections of six (6) inches diameter. A 6"x 6" straight tee or double tee shall be installed at one (1) foot outside the right-of-way with a riser of six (6) inch PVC, three (3) foot above grade and an extension of six (6) inch PVC to end of utility easement. Positive fall shall be verified through the use of as-builts performed by a Ohio Professional Survey.

All roof drains, foundation drains and other clean water connections to the sanitary system are prohibited.

Air Tight Plug and Staking:
The end of each connection shall be sealed with an air tight plug and the end of each connection shall be marked 2" x 2" hardwood stake, extending vertically from the end of the connection to a point approximately three (3) feet above the surface of the ground. Markers shall be color-coded: SANITARY – RED. A cap with a stainless steel trap cover, fastened to a stainless steel nut and bolt shall be furnished at riser. Ninety degree (90) bends are prohibited. Saw cut top of curb to mark location of utilities with the following symbols SANITARY-triangle.

Dimensions:
Unless otherwise shown, the minimum thickness of the barrel of the pipe shall be Dimension Ratio SDR 35.

Home Mark:
All pipe spigots shall have a "home" mark to facilitate joint closure.

Fittings:
PVC fittings shall be factory made and provided with joints meeting ASTM D 3212 for bell and spigot and ASTM F477 for gaskets. Adapters shall be provided for connection to pipes of different materials, the City Engineer shall approve in writing the proposed adapter. All joints and fittings shall be formed to provide a leak-free connection.

Certification:
A manufactures certificate that the PVC material and pipe was tested in accordance with the appropriate ASTM specifications shall be furnished to the Municipality prior to installation.

Straightness:
Pipe intended to be straight shall have a maximum deviation from straightness of 1/16 in per lineal foot when measured in accordance with ASTM D2122.

Line and Grade Control:
The line and grade of sewer mains shall be controlled during the sewer construction by use of an approved laser device. The line and grade of the laser shall be "checked" from line and grade stakes at a maximum of one fifty foot (50) feet intervals. A minimum of 1% slope shall be maintained with a minimum cover of three (3) foot depth from final grade.

Prohibited Connections:
Clean water connections such as connections to roof drains and/or foundation drains and other clear water connections to the sanitary pipe are prohibited.

Clearance:
Sewers shall be at least ten (10) feet horizontally from existing or proposed water main. Sewers crossing water mains shall be laid to provide a minimum vertical distance of eighteen (18) inches between the outside of the water main and the outside of the sewer. Contractor shall use SDR 23 when clearances cannot be met inside the 10' rule.

At all storm sewer main and sanitary main intersections, having less than eighteen (18) inch vertical separation, encase the lower and monolithically cradle the upper pipe in 2500 PSI concrete for the width of the trench.

Inspection:
The Engineer or his authorized representative immediately prior to installation will inspect all pipe and fittings and all rejected pieces must be completely removed from the project. No repairs of pipe or fittings will be allowed; undamaged lengths of straight pipe may be salvaged by neatly sawing off the damaged portion of that pipe.

Video Inspection:
All sanitary pipes shall be cleaned and videotaped according to General Requirements herein.

Vacuum Testing:
All sanitary sewer pipe and manholes shall be tested to meet the current air pressure test requirements as proposed by the Ohio Environmental Protection Agency after completion of the pavement base construction.

Deflection Testing:
All sanitary sewers shall have a diametric deflection test not to exceed five (5) percent. This test shall be performed no sooner than thirty (30) days after completion but prior to issuance of building permits. The Municipality's mandrel shall be used, contact Waste Water (330) 963-6260. All sanitary pipes shall be flushed prior to deflection testing.

GENERAL MANHOLES & INLETS REQUIREMENTS

General Requirements:
The following requirements apply to all manholes and inlets within the municipality. All manhole and inlet installation shall conform to ODOT Item 611 if not specified herein.

Cold Weather:
If the work is carried out in cold weather, below 40 degree F, the Contractor shall, at his own expense, provide the necessary means for heating concrete and mortar and for complying with all the requirements of the specifications herein.

Manhole and Inlet Requirements:
All manholes and inlets shall be precast sections to conform to ASTM C-478 with a resilient gasket joint conforming to ASTM C-433 for Sanitary Manholes and bitumastic type joint for Storm Manhole, cylindrical section of manhole to be extended vertically from invert shelf a minimum of four (4) feet. Manholes shall have a minimum diameter of 48" for pipe sizes less than or equal to 30", 60" for pipe sizes more than 30" but less than or equal to 36" and for pipes of larger size increase the manhole of diameter accordingly to maintain a minimum of 6" between adjacent holes measured along the inside perimeter.

Catch Basins:
Catch basins and/or curb inlet basins shall be 24"x 36" (single) or 24"x 72" (double) rectangular structure installed in accordance with ODOT Item 611. Catch basins shall have a 30" minimum sump. Catch or inlet basins shall have compacted ODOT Item 304 limestone sub-base material backfill on all four sides to plan grade. Two (2) forty-five (45) Degree six (6) inch bends shall be installed on the curbside of structure for connection of underdrains. Catch basins shall be placed in the system prior to storm sewer.

All "lift hooks" shall be removed from all structures including risers and all resultant holes filled with non-shrink mortar.

Foundation:
The manhole shall be placed on crushed limestone ODOT No. 67 or 57, six (6) inches thick, thoroughly compacted, installed per ASTM D-2321, no slag allowed.

Connections:
All holes for pipe to manhole connections are to be cored or formed at the time of precast manufacturing. All devices or molds shall be used to aid in the forming of holes in precast structures shall be removed prior to installing any conduit. All holes in structures shall be formed or completely cored through structure wall. No knockouts will be accepted. These cored holes shall be measured along the inside perimeter of the manhole a minimum distance of six (6) inches between adjacent holes. Manhole to pipe shall be a watertight connection providing a flexing and lateral movement without shearing of the sewer pipe installed per ASTM C-923. The sewer pipe at the opening shall not extend

beyond the inside face of manhole. For HDPE pipe an ADS C923 connection or equal is required to connect to structures.

Maintenance of Existing Sewer Systems: Prior to any connection into an existing sewer manhole or conduit the contractor shall take such measures as necessary, "as approved by the Engineer", (i.e. temporary rubber plugs, bypass pumping) during the course of the construction of the proposed sewers, to guard against any drainage from entering the existing system and possibly contaminating such system with silt or stone, and to provide construction workers with a sewage free trench. The discharging of untreated sewage on the ground or into a storm sewer is prohibited and will be strictly enforced.

Inverts:
Where there are changes in the direction of the sewer or entering branches to the manhole, the centerline of the invert shall have a true curve of a radius, as the size of the manhole will permit.

Catch basins and inlet basins shall have poured and finished concrete paved invert floors unless a sump is required per plans.

Flow Prevention:
Where there is the ability of flow into an existing sewer system or flow outside of sewer system, the pipe shall be caped watertight, either temporary or permanent as directed the Municipality until improvement is accepted by City Engineer.

Manhole Steps:
Manhole steps shall conform to the requirements of ASTM C478. The distance between the top of the casting and the first step shall not exceed twenty-four (24) inches.

Exterior Manhole Joint Sealed With Gator Wrap:
All new sanitary & storm manholes installed shall be sealed with an external rubber sleeve (Gator Wrap – 9" Width) on all exterior pre-cast joints. Infi-Shield Gator Wrap is manufactured by Sealing Systems, Inc. Loretto MN, 763-478-2057 or approved other by the City Engineer shall be used. The concrete surface area adjoining the joint must be wire brushed and thoroughly cleaned. All rough surfaces must be ground down with a rotary drill attachment having an abrasive pad. The entire area must be smooth, dry and free of any dirt. Installation will take place before backfill is placed around the manhole and in accordance to manufacturer's requirements and above 40 degrees F.

Grade Adjustment:
Precast reinforced concrete adjusting collars, four (4) inches minimum and 6" maximum thickness, shall be set on bed of bitumastic strips. Only the outside of the grade adjustment shall be purged with mortar. No mortar shall be placed on the inside of the structures. Grade adjustment shall be twelve (12) inch maximum for manholes and six (6) inch maximum for catch & inlet basins. Mortar shall be non-shrinking and conform to ODOT Section 705.22. No red sewer brick shall be used as replacement for precast grade rings. Final height adjustment shall consist of ½" minimum rubber grade ring set between manufactures adhesive in pavement areas. Riser ring equal to East Jordan infra-riser. Waterproofing tar shall be used on outside of all grade rings.

Offset:
Offset shall be set to avoid sidewalks, curbs and/or underdrains.

Frames and covers:
Manhole frames and covers shall be dipped gray iron castings. All frames shall be set on bitumastic strips. The cover and seat shall have machined bearing surfaces to prevent rocking. All castings shall conform to one of the following requirements:

Alternate (1) – Sanitary Manhole w/ word "SANITARY"
Solid Lid, EJ No. 1020 AGS cover & 1022Z1 frame

Alternate (2) – Storm Manhole w/ word "STORM"
Vented Lid, EJ No. 1020 cover & 1022Z1 frame

Alternate (3A) – Storm Curb Catch/Inlet Basin (6" curb)
Frame, EJ No. 7035 with Type M6 grate and type T4 back & EJ 7030 M6 grate.

Alternate (3B) – Storm Curb Catch/Inlet Basin (roll curb)
Frame, EJ No. 7390 with Type 7390M3 grate.

Alternate (4) – Yard Basin 2-2-B
Vented lid, EJ No. 5110 M3 grate

Inspection:
The Engineer or his authorized representative immediately prior to installation will inspect all manholes and all rejected pieces must be completely removed from the project. No repairs will be allowed.

Manhole Vacuum Testing:
All sanitary manholes shall be tested to meet the current air pressure test requirements as proposed by the Ohio Environmental Protection Agency and standard industry practices as per ASTM. All sanitary/storm manholes will be tested for water tightness and air tested according to ASTM C1244 & Table 1 of ASTM C1244. A minimum of 60 seconds is required unless depth of manhole exceeds time value of 60 seconds in table 1.

REQUIREMENTS FOR SEWER PIPE VIDEOTAPING:

General Requirements:

All inspection and testing shall be done by an experienced and qualified firm engaged in this type of work, as approved by the City of Twinsburg. Written reports for all inspection and testing shall be submitted to the owner and the City for approval. All final testing and inspection shall be preformed after completion of pavement construction but prior to installation of the surface course and prior to issuance of building permit. All sanitary & storm sewer pipe shall be videotaped according to specifications herein.

Inspection Requirements:

a. The intent is to video tape pipes not easily accessible for visual inspection. All sanitary and storm sewer piping, up to and including thirty (30) inches in diameter shall be videotaped. Beyond thirty (30) inches a visual inspection will be required.

b. The Contractor shall inspect and record the condition of all pipe runs that meet the criteria stated above. All pipes shall be flushed clean of debris. The contractor will be responsible for all costs associated with videotaping. Major cleaning will be done before video inspection.

c. The inspection rate should be suitable for pipe size to allow detection of discrepant areas, but should not exceed fifty (50) feet per minute.

d. Additional video tape or still photo coverage of suspect discrepant areas shall be provided through the use of rotating head camera or still camera. Discrepancies include, but are not limited to: pipe joint separations, cracks or breaks in the wall of the pipe, deformation of the pipe wall, penetration of the wall by vegetation or foreign objects or excessive debris.

e. The location of discrepant areas shall be established by measurement from nearest known established feature such as a catch basin, manhole or headwall. Accuracy of such locations shall be within plus or minus one (1) foot.

Inspection Report:

a. The Contractor shall provide color video of all areas inspected. Subtitles on the tape shall include the following:

Subdivision Name
Date & Time
Paper Size
Name of City Inspector Present
Reference to end points of pipe inspected, as identified on a sketch, noting the direction of inspection.
Continuous play of distance from a known reference point.

b. The Contractor shall provide a written report identifying location, length and size of all pipe inspected. The report shall identify all areas where the integrity of the pipe system is suspect. Recommendations for repairs shall be provided and then corrected.

Defects Found:
Any defects found shall be corrected and reinspected prior to final approval.

New Subdivisions:
All storm and sanitary sewers in new subdivisions shall have a second cleaning and color VCR television inspection prior to expiration of the maintenance bond.

WATER LINE SPECIFIACTIONS

General Requirements:
All water work shall be in accordance with the standard construction and material specifications of the City of Cleveland, Department of Public Utilities, Division of Water and the City of Twinsburg's specifications herein.

Inspection & Testing:
The Cleveland Water Department (CWD) will inspect all pipe and fittings. All rejected pieces must be completely removed from the project. For the purpose of chlorination and bacteriological testing, the contractor shall provide and install, at each chlorination pit, flushing/sampling taps of sizes to be determined by CWD. Chlorination pits shall be six (6) foot square meeting OSHA standards. The Contractor in the presence of a CWD inspector shall do a hydrostatic pressure test. The Contractor shall meet the current requirements as per CWD at the contractor's expense.

Materials:
All water boxes, bends, tees, crosses, wyes and other fittings shall be manufactured by Tyler, Biddy, Lifco, Clow, US Pipe Foundry or approved equal by the City in writing. These manufactures have been chosen above other manufactures for the quality and durability of parts.

Hydrant – All hydrants shall be Mueller "Albertville" Type A-463 or EJIW 5CD250. Hydrants shall be supplied with National Standard Threads, with one streamer nozzle (5") and two hose nozzles per hydrant (2.5"). A six (6) inch hydrant assembly shall include the tee or reducer as applicable, valve, valve box and pipe. A minimum of twenty (20) inches and maximum of twenty-two (22) inches of clearance from center of steamer nozzle to finished grade is required. The contractor shall furnish, with each project, two (2) bottles of hydrant oil for future maintenance.

Fire Department connection to be equipped with a 5" STORZ connection. A 30 degree drop will be required if clearance from center of steamer nozzle to finish ground is greater than 24".

Water Main Pipe – All water main pipe shall be AWWA C151/ANSI A21.51 Class 52 cement lined ductile iron pipe with a rubber ring gasket, compression type joint, unless otherwise noted. All fittings shall be ductile iron, Class 350, cement lined. All fittings and pipe connected to fittings shall be restrained using a "Retained" mechanical joint in accordance with ANSI/AWWA C-110/A21.10 and ANSI/AWWA C-111/A21.11. Except for anchor tees. Reducers or other special circumstances when directed by CWD, all fittings are to have bell ends.

Bolts and Nuts – All bolts and nuts on all "Retained" mechanical joints shall have field applied one (1) coat of bitumastic painting followed by an encasement of polyethylene wrapping in accordance with ANSI/AWWA C-105/A21.5-88, Class "C", method "B".

Push-On Joints – Where shown on the plans, or when otherwise called for, pipe and fittings shall have an approved "Type I" or "Type II" boltless restrained push-on joints to the limits shown on the drawings.

Copper Service Line – Copper service line shall meet the requirements of ASTM specification B-88, "Type K". The tubing shall be round, seamless, cold drawn to size and furnished with proper bending temper. Water service shall be buried between four (4) to five (5) feet in depth below final grade.

Valves – The contractor shall furnish and install the valves and accessories where shown on the plans or where directed by the Engineer.

Hydrant Painting:
New hydrants and refurbished hydrants shall be shop coated as specified herein.

Exterior above traffic flange (Including bolts & nuts) shall have surface preparation to be in accordance with SSPC-SP 10 (NACE 2) near white blast cleaned surface. Coat with two (2) applications of Sherwin Williams system for Sher-kem paint as follows:

KEM 400 PRIMER (CC-B32) - Prime Coat, enamel primer to be in conformance with SSPC paint specifications.

SHER-KEM (F75RC7) – Finish Coat, high gloss metal finishing enamel to be in conformance with SSPC paint specifications.

Colors – Entire hydrant, top & bottom portions shall be painted one color Sher Williams INTERNATIONAL RED.

Copper Service Line Placement:
The copper service line shall be placed a minimum of five (5) feet from any utility and carried to easement line. The end of each connection shall be sealed with an air tight plug and the end of each connection shall be marked 2" x 2" hardwood stake, extending vertically from the end of the connection to a point approximately three (3) feet above the surface of the ground. Markers shall be color-coded: WATER – BLUE. Saw cut top of curb to mark location of utilities with the following symbol: WATER-W.

Coordination of tap-in:
The Contractor shall coordinate tap-in with the CWD for inspection schedule. The contractor shall provide all labor, tools, materials and equipment required to complete connection to main in service as shown on the plans. Water taps are to be installed with premium backfill, ODOT Item # 304 aggregate. Curb stops and boxes shall be placed on red sewer brick. All fittings and valve boxes shall be of Tyler, Biddy, Lifco, US Pipe Foundry, Clow or approved equal.

Testing & Permits:
All permits and fees associated with the water improvements shall be included in the unit price and shall be the responsibility of the Contractor. The Contractor shall supply proof to the City Engineer of having made application and payment to the CWD for all testing, chlorination and tapping into the water main and appurtenances. The City Engineer shall be notified 24 hours prior to testing for observation of testing. Any of the aforementioned not complied with will not be accepted and shall be retested at the Contractor's expense.

UNDERGROUND UTILITY CONSTRUCTION REQUIREMENTS

Underground Utilities:
Utilities including gas pipes, telephone cables and electrical power and street lighting circuits are recommended to be underground. When electrical power cables are installed underground in a subdivision, electrical street lighting cables may also be installed, whether for present or future use. Unused wires and cables shall be de-energized and protected against physical damage. All trench backfill in pavement areas shall be ODOT Item #304 aggregate base compacted by vibratory or mechanical tamping in eight (8) inch layers. All wiring and cables not contained within conduit and direct buried, shall have their locations marked with tecto-tape or facsimile twelve (12) inch above such direct buried wiring or cable. Refer to Trench Excavation, Bottom Preparation and Backfilling section herein.

All construction of utility pipe, conduit, cable, wires, vaults and pertinent equipment shall comply with the current regulations of the Public Utilities Commission of Ohio and with the requirements of the utilities involved. All location and detail drawings of the utilities prepared by the developer and/or the utilities companies shall be submitted to the City Engineer for approval.

The location of the underground utilities shown on the plans has been obtained by diligent field check and searches of available records. It is believed that they are essentially correct, but the design engineer does not guarantee their accuracy or completeness and the contractor is therefore urged to proceed with caution. Existing appurtenances such as utility poles, valve boxes, etc. are to be safeguarded by the contractor during construction.

The contractor shall contact the utilities protection service, 1-800-362-2764 at least forty-eight (48) hours before any underground work is commenced in existing streets.

TRENCH EXCAVATION, BOTTOM PREPARATION AND BACKFILLING

General Requirements:
All requirements for trench excavation, bottom preparation and backfilling shall be in accordance with ODOT Item 611.05 & 611.06 or the specifications herein. No backfill material shall be frozen.

Testing and Inspection:
All backfill of excavations (for trenches and structures) under berm, pavement areas, walk, and drive areas, or within a 45° influence line from the edge of pavement, shall be virgin limestone or City approved as "equal" and shall conform to ODOT Item 611.06 Type B, item 304 sub-base material. Slag material, sand or slacker aggregates shall not be used.

All backfill of excavations outside of berm, pavement, walk or drive areas shall conform to ODOT 611.06 Type C suitable for intended purpose and as approved by the City.

If material other than ODOT Item 304 material is proposed for use as fill within the right-of-way or premium fill areas, a written request must be submitted for approval by the City Engineer. The material is subject to the following requirements:

Proctors must be conducted on all fill materials and planned compaction methods submitted to this office prior to any filling operations being permitted. New proctors must be obtained as often as the soil material changes. No proctor's from previous year's construction will be accepted. Slag is not permitted.

Regardless of the type of backfill used on the development, the developer or his agents must provide the testing services necessary to verify that proper compaction of each lift placed. The developer shall provide written daily reports for each day that fill is placed, a copy of which is to be provided to the City Engineer. These reports shall include observations made during the workday, the location where backfill was placed, and the results of compaction and moisture content tests for each lift or backfill placed in that given day. The developer will be responsible for payment for the testing services. Any materials that cannot be compacted to the required density will need to be removed and replaced with materials that can achieve the required compaction.

All conduits shall be installed on a firm bed for its full length in accordance with ODOT Item 611 unless otherwise specified.

Trench Backfilling:
Where backfilling is being performed, the following shall conform to the following limits:

Installation under pavement and/or within 45° influence line of pavement edge shall be installed in accordance with ODOT Item 304 backfill. The entire trench shall be filled in layers not to exceed eight (8) inches in thickness and compacted with mechanical tampers

at the specified moisture content until dry density is not less than 98% of the Standard Proctor.

Within the right-of-way (R/W) but not under pavement or not within 45° influence line of pavement edge, suitable backfill material shall be compacted to at least 95% of the Standard Proctor, at the specified moisture content. The entire trench shall be filled in layers not to exceed eight (8) inches with a mechanical tamper.

If any conflicting compaction percentages are found to exist between those indicated above and ODOT Specifications, the higher compaction percentage shall govern. Slag material is not acceptable.

These requirements pertain to installation of all utilities.

Trench Width:
Widths of trenches shall be held to a minimum to accommodate the pipe and appurtenances. Compacted stone aggregate, ODOT Item 67, shall be installed per ASTM D-2321. No slag is acceptable. The trench width shall be measured at the top of the pipe barrel and shall conform to the following limits:

All pipe having a diameter less than twenty-four (24) inches shall have a minimum width of nine (9) inches measured from outside of pipe barrel to trench wall. All pipe having a diameter greater than twenty-four (24) but less than sixty-six (66) inches shall have a minimum width of twelve (12) inches measured from outside of pipe barrel to trench wall. All pipe having a diameter greater than sixty-six (66) inches shall have a minimum width of fifteen (15) inches measured from outside of pipe barrel to trench wall

Trench Protection:
The Contractor shall take all precautions to prevent any caving or settling of excavation or trench walls which could endanger the safety of any person engaged in the work or in any way damage the underground installations of adjacent utilities or property; or diminish the trench width necessary for the proper construction of the underground installation or otherwise injure or delay the work. The type and amount of such protection, such as trench boxes, sheeting, shoring, or bracing shall be consistent with the depth and width of excavation, the composition and water content of the soil, the proximity of structures or other utilities, the vibration from equipment and the spoil placement, and shall be in accordance with the latest OSHA regulations. ***The contractor is required to obtain a trenching permit from the City of Twinsburg Building Department.***

Dewatering:
In order to reduce ground water seepage and provide a stable trench bottom it may be necessary to dewater prior to excavation of the sewer trench and/or provide temporary sumps.

Foundation Bottom:
Foundation material below the pipe and six (6) inches of sub-bedding shall be suitable material that prevents pipe from deflection due to settlement. If, in the Engineer's opinion, the material forming the trench bottom is not suitable for a solid foundation,

further depth shall be excavated and the same filled with material and thickness specified by the Engineer.

Sub-bedding Material:
After preparation of the trench bottom, bedding material shall be placed below pipe. Bedding material shall be ODOT No. 57 stone with a minimum thickness of six (6) inches and spread the full width of the trench bottom. Bedding material shall not have standing water and be free of debris. All conduits shall be installed on a firm bed for its full length in accordance with ODOT Item 603.03 unless otherwise specified.

Pipe Protection:
All trench excavation shall be backfilled immediately after pipe is placed. Aggregate material, ODOT Item 57 stone, thoroughly compacted and installed per ASTM D-2321 shall protect pipe according to specifications herein. Flexible pipe shall have a minimum coverage of twelve (12) inches over outside pipe barrel. Ridge pipe shall have a minimum coverage of six (6) inches over outside pipe barrel.

MAINTENANCE OF TRAFFIC

Interference with Traffic:
The contractor shall maintain safe traffic conditions in accordance with the Manual of Traffic Control Devices per ODOT 614.

Traffic Diversion:
Whenever it is necessary to divert traffic from its normal channel into another channel, such diversion shall be clearly marked by cones, drums, barricades or temporary guardrail. If the markers are left in place at night, suitable lights shall be provide and maintained.

One Way Traffic:
Whenever one-way traffic is established, at least two full time flagman shall be used.

Street Closing: (Requires authorization from Mayor)
The contractor may close the street to through traffic for minimum periods of time with 24-hour notice to local occupants of all premises, police and fire protection authorities and other public authorities as applicable. The Contractor shall so schedule his work that this time is a minimum and shall, whenever possible, make suitable provision for access by local residents, school buses and mail delivery vehicles. The contractor shall provide access for police, fire and emergency vehicles at all times. Fire hydrants and other public utility valves shall be accessible at all times.

Detours:
When it is required that the street or road be closed to traffic, the contractor shall furnish, erect and maintain advance warning signs and barricades at the limits of the project, where side streets intersect and at other points of public access to the project. The contractor shall furnish, erect and maintain advance warning signs and barricades on side streets at the first street intersection beyond the one closed by construction indicating "Street Closed, One Block Ahead." The Contractor shall furnish, erect and maintain marking signs on temporary routes. Contractor shall first submit detour plan to City for acceptance prior to construction of detour.

Dust Control:
The Contractor shall provide all labor, material and equipment necessary, such as calcium chloride, water or a motorized dust free sweeping device, as directed by Engineer to maintain all roadways being used for access to the construction site.

Maintenance:
If proper maintenance of traffic facilities and/or proper provision for traffic control is not being provided, the Municipality may take necessary steps to correct traffic maintenance. The cost of such service will be deducted from payment to contractor.

ROADWAY CONSTRUCTION REQUIREMENTS

General Requirements:
The following requirements apply to all roadway pavement improvements placed in the Municipality.

Cold Weather:
Asphalt - No asphaltic pavement course and/or concrete pavement or curbing shall be laid on frozen pavement, base or sub-base.

Surface temperatures for asphalt pavement placement shall be 40 degrees F and rising for thickness greater than 1.5 inches and 50 degrees F and rising for surface courses less than 1.5 inches. The air temperature should not be less than 40 degrees F for asphalt placement. ODOT 401.06 shall be referenced.

Concrete - Ambient temperature shall be 35 degree F and rising per ODOT 451.07 for concrete placement. Winter protection shall be in effect when temperatures fall below 40 degrees for a period of 3 successive days or the City Engineer institutes winter rules from November 15th to Mar 15th. Protection consists of visqueen **and** blankets. Addition cement may be added to accelerate strength gain and increase the temperature of the concrete. (700 lbs cement for 1 cubic yard of concrete ready mix cured at 40 degrees F will reach 3000 psi in seven days. 100 lbs additional cement, the temperature of concrete increases 10 degrees F.)

Inspection:
All inspection and testing shall be done by an experienced and qualified firm engaged in this type of work, as approved by the City of Twinsburg. Written reports for all inspection and testing shall be submitted to the owner and the City for approval. All final testing and inspection shall be preformed prior to issuance of building permit. Any materials or methods of construction not meeting requirements shall be replaced at Contractor's expense.

Earthwork:
All filled areas, excluding trenches within right-of-way areas, shall be compacted in accordance with ODOT Item 203. In addition, for any fill in excess of two (2) feet, an approved testing company in accordance with ODOT Item 203 shall perform nuclear compaction tests. The City Engineer shall approve these tests before any pavement construction commences.

Before acceptance of the sub-grade by the City Engineer, a thirty (30) ton proof roll shall be required on all areas to be paved in accordance with ODOT Item 204 and 204.06. Granular soils may require 50 ton proof roll. Zero deflection using gross weight 60,000 lb tandem truck with ticket shall be required. Cement stabilization shall be required where the subgrade CBR value is less than 6 or as per plan.

Asphalt Pavement:
For all roadway materials the Contractor shall provide the City Engineer with a job mix formula for review and approval prior to paving the road. All material must be obtained from a source approved by the Ohio Department of Transportation.

Slope:
Asphalt paved street shall slope away from the centerline and have a center crown. Cross slope shall be 5/16 inch per foot unless otherwise directed in writing by the Municipal Engineer.

Cross-slopes shall be verified @ 100' intervals after leveling course is installed with a smart level. (0.026' min. slope)

Materials:
Aggregate Base – Aggregate Base shall be the required thickness as shown in Table 2 and in accordance to ODOT Item 304. Aggregate base shall be compacted to 98% maximum density per ODOT 304.05.

Prime Coat – Prime Coat shall conform to ODOT Item 408 using 702.02 cutback asphalt, MC30 or MC70 and/or 702.03 cutback asphalt emulsion primer 20. Prime Coat shall be applied at a rate of 0.40 gallons per SY.

Tack Coat – Tack Coat shall conform to ODOT Item 407 using 702.02 cutback asphalt RC-250 or 702.04 emulsified asphalt RS-1, SS-1 or SS-1H. Tack Coat shall be applied at a rate of 0.40 gallons per SY.

Surface Asphalt Concrete – Surface Asphalt Concrete shall be 1 ½ inch thick, virgin, asphalt with limestone aggregate, constructed in accordance with ODOT Item 441 Type 1 (448), PG 64-22. For subdivision work, the surface course is to be constructed no sooner than one (1) year after the intermediate course and not later than two (2) years. The surface course shall be finished ¼ inch above the gutter and all castings in roadway.

Intermediate Asphalt Concrete – Intermediate Asphalt Concrete shall be 1 ½ inch thick asphalt, constructed in accordance with ODOT Item 441 Type 2 (448) PG 64-22.

Bituminous Aggregate Base – Bituminous Aggregate Base shall be the required thickness as shown in Table 2 and in accordance to ODOT Item 301.

Stabilized Aggregate Shoulders – Stabilized Aggregate Shoulders shall conform to ODOT Item 411.

Seal Coat – Seal Coat shall conform to ODOT Item 409.

Joint Sealer – The joint between the concrete curb and asphalt surface shall be sealed with a four (4) inch wide application of rubberized joint sealer overlapping the curb 1" inch. The seal shall be lightly applied in a straight line, squeegee and lightly covered with sand.

Asphalt Placement:
In addition to and in variation with the standard specification this item shall include the following:
A minimum of two rollers shall be required for this project per asphalt paving machine. One roller of which shall be a 3 wheeled rubber tire having a minimum weight of 10 tons and the other shall be a 2 axle, 2 wheeled tandem steel type having a weight of 8 to 12 tons, both of which shall meet the requirements of the standard specifications. Surface course of asphalt to be ¼" above manhole castings, water valves, gas valves, and concrete gutter. Asphalt patches and minor asphalt pavement repairs shall require only one 8-ton roller.

Asphalt Pavement Repair:
Asphalt pavement repair shall conform to all ODOT requirements and specifications herein. In addition asphalt pavement repairs shall be in accordance with the City Pavement Opening Repair Detail, Flexible Pavement and the following:

Sub-base Repair shall include removal and disposal of damaged aggregate and replacement with compacted ODOT Item 304 limestone. Areas for repair shall be determined as directed by the Engineer.

Cold weather repairs: During adverse weather conditions low strength mortar (LSM) shall be used to fill the trench and a 6" MS concrete cap temporarily installed using a visqueen bond breaker.

Abutting Asphalt Contact:
At any point where the proposed pavement meets existing pavement, the existing pavement shall be full depth saw cut. This cut shall be perpendicular to centerline removing approximately one (1) foot or all damaged pavement as directed by the Engineer. An additional 18" of adjoining asphalt shall be milled 1 1/2" prior to applying the surface course. Asphalt concrete per ODOT Item 441 Type 1 (448), PG 64-22 shall be used to feather the transition and maintain positive drainage between the existing and proposed pavement.

Temporary Concrete Pavement:
When asphalt is not available at that time, the Contractor shall furnish, place and remove temporary pavement as shown on the plans or where directed by the Engineer and as specified herein. Temporary concrete pavement shall be a minimum of six (6) inches thick, fast set (FS) design and shall conform to the grade of the existing pavement, drive or walk. When asphalt is available the concrete cap shall be removed along with aggregate to elevation as per plan for asphalt installation. All street, drives and walks shall be maintained in a safe and usable condition for public use during the construction period.

Trench Excavation and Backfill:
Slurry Backfill Method:
At the option of the Contractor or per direction of City Engineer, slurry backfill consisting of low density mortar (LDM) may be used as structural backfill for pipe culverts, except that slurry backfill shall not be used as such for aluminum or aluminum coated pipe culverts. Slurry backfill may be used as a substitute for aggregate base with

the approval of the Engineer or Agency. Slurry backfill may be used as bedding for private utilities with approval of the utility company.

When slurry backfill is used as structural backfill, the width of the excavation shown on the plans may be reduced so that the clear distance between the outside of the pipe and the side of the excavation, on each side of the pipe, is a minimum of six inches for pipes up to and including 42 inches in diameter or span and one foot for pipe over 42 inches in diameter or span. Slurry backfill shall be placed only for the portion of the structural backfill below the original ground or the grading plane or the type of embankment placed prior to excavating for the culvert pipe. Where necessary, earth plugs shall be compacted as required by the project specifications at each end of the pipe prior to placing slurry backfill in a manner that will completely contain the slurry backfill in the pipe trench.

Slurry backfill shall be placed in a uniform manner that will prevent the development of voids in or segregation of the slurry backfill, and will not shift or float the pipe culvert. Foreign materials which fall into the trench prior to or during the placement of the slurry backfill shall be immediately removed. The placement of any material or traffic over the slurry backfill shall not commence until sufficient curing of LDM to support traffic has occurred. A temporary 6" concrete cap shall be applied at grade of roadway until asphalt placement can occurred.

Contractor shall provide a design mix that shall provide self-leveling and self-compacting cementitious material with an unconfined compressive strength of 1,200 psi or less including excavation material properties which relates to the ease at which the material may be remove without damage to adjacent pavement, culvert or other. Ohio Department of Transportation Item 613 shall apply.

All street, drives and walks shall be maintained in a safe and usable condition for public use during the construction period.

PAVEMENT DRIVE APRONS, SIDEWALK, CURBS AND CURB RAMP REQUIREMENTS

General Requirements:
The following requirements apply to all pavement drive aprons, sidewalks and curb ramps placed within the municipality. All pavement drives, sidewalks and/or curb ramps shall conform to ODOT Specifications if not specified herein. All pavement drives, sidewalks and curb ramp replacements shall conform to the grade of the existing pavement drive, sidewalk and/or curb ramp.

Material:
All concrete shall be Class "C" per ODOT 499 and properly consolidated. (No slag) Curing compound shall be liquid white curing compound meeting with the requirements of Section 705.07 of the standard specification and applied at the rate of 1 gallon per 200 square feet.

Drive aprons, sidewalks, curbs and curb ramps at locations that require access as determined by need and or as required per City Engineer shall require moderate set (MS) or fast set (FS) concrete.

Notification to Residents:
The scheduling for this work shall be discussed with each property owner affected prior to commencing the replacement operation. Excavation in traffic areas shall not be left open overnight. All drive apron construction shall follow a schedule that allows access to and from residence, business, etc. at all times. The disruption of access to driveways due to this work shall be kept to a minimum.

Signage:
The contractor must provide adequate signs, markers and barricades to protect pedestrian traffic, vehicular traffic and construction personnel during the progress of this work. Additional signs indicating entrances for businesses in a construction zone are required as directed by the City Engineer.

Pavement Drive Aprons:
All pavement drive aprons shall have a minimum thickness of six (6) inches for one or two family residential driveways and eight (8) inches for all other driveways. Aprons shall be fiber reinforced or use of wire mesh. Rubberized expansion joint material shall be used as per City construction drawings.

Sidewalk:
All sidewalks shall be a minimum thickness of four (4) inches except within the limits of the driveways, where the minimum thickness shall be six (6) inches for one or two family residential driveways and eight (8) inches for all other driveways.

One-half (1/2) inch rubber expansion joints shall be placed at intervals not to exceed one hundred (100) feet or as specified on construction drawings. Expansion joints shall ½" thick. Construction joints shall be a minimum of 15' spacing with the concrete scored every five feet. The width of the sidewalk per plan, four (4) feet in width minimum. All concrete sidewalk and/or curb shall be of monolithic construction. All sidewalks shall have a two (2) inch sub-base, ODOT Item 304, compacted to 95% compaction.

Curbs:
Curbs shall be constructed in accordance with ODOT 609, cast in place concrete curb and gutter. For structures located in curb and gutter sections a box out is required using an expansion joint with 1" preformed expansion joint filler Item 705.03 or rubberized expansion and 1" x 18" smooth dowel, greased and sleeve on one end with a 3" metal cap. When tying into existing curb and gutter two (2) anchor hook bolts are required. Saw cuts shall be performed at ten-foot intervals at a depth of ¼ the thickness minimum on the same day as placement.

Saw cut top of curb to mark location of utilities with the following symbols; X – storm, triangle – sanitary, and W - water.

Curb Ramps:
Curb ramps shall be placed at all intersection corners for access when crossing roadway pavement. All sidewalks shall connect to the pavement or curb at intersections with wheelchair ramps and one-half (1/2) inch expansion joints between the walk and curb. Expansion joints shall be sealed with ½" thick self-leveling urethane chalk, limestone gray in color. All curb ramps shall meet the current ADA requirements of red truncated domes.

Construction Saw Cutting:
Where it is necessary to disturb existing pavement drives, curb ramps or sidewalks the concrete shall be saw cut in neat straight lines as directed by Municipality. The depth of saw cut shall be full depth. Where it is necessary to disturb existing pavement drives, curbs and/or walks the asphalt concrete shall be line cut with straight vertical edges. All cut bituminous surfaces shall be sealed with a 4" wide rubberized joint sealer using a squeegee.

Compaction Requirements:
Refer to Trench Excavation, Bottom Preparation and Backfilling section herein.

Curing Compound:
An approved sealer shall seal all exposed concrete appropriate to application on surface of concrete. See ODOT specification 451.11 for application methods.

Structures Encountered:
The Contractor shall adjust any "surface structure" in the area of sidewalk and/or pavement drive to grade. The Contractor shall furnish necessary parts and repair all "surface structures" damaged by construction of improvement.

Testing:
Public improvements or projects within the right-of-way require testing. At least two concrete cylinders will be made in the morning and at least two concrete cylinders made

in the afternoon during each day concrete is placed. If the amount of concrete poured in either the morning or afternoon exceeds 30 cubic yards, an additional two cylinders shall be made. Slump and entrained air content must be maintained and tested and tested when more than 10 cu. yds. of concrete is placed. A minimum of one test beam will be taken in the morning and one in the afternoon on all Class MS concrete installed.

In each group of two cylinders, one will be broken at 7 days and one at 28 days after they are made. The cylinders must be taken and tested by an approved testing laboratory in accordance with ASTM methods. The contractor will be responsible for making all the arrangements for the testing unless otherwise specified. Written reports for all inspection and testing shall be submitted to the owner and the City for approval.

SANITARY PUMP STATION

Preferred Manufacturer: Smith & Lovelace
14040 Santa Fe Trail Drive
Lenexa, KS 66215-1284
P. 913-888-5201
F. 913-888-2173

Dry Well:
A City waterline shall be located near the ladder at pump level (Cleveland water will require a meter and backflow preventer pit). A Saf-T Climb system or approved fall protection system shall be installed. Run time meters for each pump shall be included.

Wet Well:
A 2' sump should be included for collection of debris

Stand-by Power:
Stand By power unit should be Kohler and run on natural gas. Power requirements should be verified. The transfer panel should include a small, thermostatically controlled heater.

Telemetry:
Alarms to be transmitted to the treatment plant via an Autocon System Representative is The Bergren Associates, Inc. 7055 Engle Road, Suite 104 Middleburg Heights, OH 44130 P. 440-239-9445 F. 440-239-9333

The following are the points of monitoring:

High wet well level
Flooded dry well
Power outage, generator running
Pump Failure
Communications failure

*This system is to include a battery back-up

Back-up Control System:
The station control system shall be backed up by an independent float system. A failure of the main pump control system will automatically switch to the float system and control both pumps.

Site:
A suitable enclosure should be provided. If enclosure is board-on-board fence the main entry should be a double wide gate with wheel supports. The enclosed area should be a concrete pad and concrete access drive to station to accommodate a 65,000 lb vehicle. Safety lighting shall be activated by a switch rather than a sensor inside fence area. Small lights (2) should be mounted on the outside of the enclosure on each side of the gate. A minimum of one, duplex outlet shall be provided inside the enclosure. Gas and Water meters are to be located on the outside of the enclosure.

Computerization:

Station to be monitored by computer for the following parameters:

Wet well level	Flow rate
Pump speed	Pump running indication
Pump run times	Compressor running indication
Power transfer	Stand-by power running

Dry well sump pump running

All monitored parameters to have alarm set points

* Treatment plant computer system to be adjusted with a graphic for display of the above information

Spare Parts:

A spare parts list will be developed according to the type of station provided. However, the following is a list of the parts generally required:

1 Pressure switch
1 Pressure transducer
2 Impellers
2 Volute gaskets
2 Mechanical seals
1 pump motor
1 generator block heater
1 sump pump
1 relay of each type used
2 fuses for each type and size used
1 Indicator lights
1 filter for each use

SURVEY REQUIREMENTS

- The centerline is to be stationed with nails at 100 feet intervals on tangents, and 50 feet intervals on curves. Show centerlines, giving length and bearings, (including reference or basis). Show record and/or deed distances with observed distances between record monuments. Give description of all monuments found, used and set performing this survey.

- Research of available records, plats, deeds and right of way maps to establish the existing centerline. Locate all existing property corners.

- Geodetic benchmarks will be used. State elevation and location on each drawing sheet. City benchmarks can be obtained from the Engineering Department.

- State Plane Coordinate System and elevations as used by the Summit County Engineers Office shall be used for mapping. Drawing files should not require manipulation to be incorporate into City database.

- 100 yr Floodway information shall be shown. FIRM Maps should be referenced in determining flood prone areas and benchmark system coordinated with Benchmarks provided on FIRM.

- Show existing contours at one-foot intervals and to extend 25 feet outside of right of way. At intersections: locations and elevations are to extend 75 feet beyond the centerline intersection.

- Spot elevations at fifty feet (50') intervals on centerline, curb & gutter or edge of pavement, center of ditch, top of bank, back of walk and 25 feet beyond right of way. Show existing centerline grade in profile. Elevations on hard surfaces shall have an accuracy of 0.02', and ground elevations within 0.1'. Horizontal accuracy of survey monuments found and/or used shall be 0.01'.

- Driveway elevations taken at top of curb or edge of asphalt, front of walk, back of walk and at existing concrete joints or at 10 foot intervals, up to 30 feet past right of way.

- Location, size and depth of water and gas mains and other utilities along the roadway. Coordinate with OUPS for marking of underground utility lines. Show approximate location of gas service connections for all residences by locating gas meter at house or existing shut-off. Show water connections by locating shutoff boxes that are exposed or uncover them using CWD records.

- Show all service cleanout connections, invert elevations, conduit sizes and horizontal stationing.

- Locate all fire hydrants, hydrant shut off valves and all line valves.

- Location of power, communication and cable TV systems above and below ground. Locate all utility poles and note their ID number on plan.

- Location, size, depth and direction of flow of all sanitary sewers, storm sewers and storm culverts, and service connection cleanouts within the project limit.

- Show all catch basins and manholes with inverts, pipe sizes and rim elevations and stationing. Show all sewers in profile.

- Location of all swales and drainage ditches along the roadway. Show centerline elevations at fifty feet intervals.

- Location of trees denoting species, diameters & canopy sizes, all shrubs, planters, mail boxes, etc. within the project limits set forth herein.

- Show sublots with their mailing address and record distance on plan & profile sheets

- Proof of Professional Liability Insurance must accompany your proposal.

- Final approved as-builts shall include the Ohio professional survey P.S. seal including signature provided for on first page of as-built document.

- All layering format, including line and text properties as included herein for AutoCAD drawings shall be approved by Engineering Department for acceptance. As-built AutoCAD drawings shall be submitted to the City within 60 days after improvements have been approved and accepted by City. Electronic AutoCAD 2007 or newer version and PDF format including professional survey P.S. stamp and signature on cover page shall be included. Contact Greg Harwell at Gharwell@twinsburg.oh.us for format requirements. Surveyor shall also provide a separate list all survey monuments found and/or used with their respective coordinates.

SITE PLAN REQUIREMENTS FOR SINGLE, TWO AND THREE FAMILY DWELLINGS

*** See Codified Ordinance of the City of Twinsburg 1195.05

SITE PLAN REQUIREMENTS FOR OTHER DEVELOPMENT

*** See Codified Ordinance of the City of Twinsburg 1195.07

APPENDIX A

(*To be used in concurrence with General Notes – Proposed Subdivision Plan*)

CITY OF TWINSBURG SUBDIVISION - GENERAL NOTES

1. ALL CONSTRUCTION AND MATERIALS INCLUDED ON THIS PROJECT SHALL BE IN ACCORDANCE WITH THE 2019 STATE OF OHIO DEPARTMENT OF TRANSPORTATION CONSTRUCTION AND MATERIAL SPECIFICATIONS (ODOT). THE ENGINEERING DESIGN AND CONSTRUCTION MANUAL OF THE CITY OF TWINSBURG, THE ORDINANCE OF THE CITY OF TWINSBURG AND FOR WATER DISTRIBUTION SYSTEMS, THE CONSTRUCTION AND MATERIAL SPECIFICATION OF THE CITY OF CLEVELAND. WHERE CONFLICTS OCCUR IN THE ABOVE, THE ENGINEER OF THE CITY OF TWINSBURG SHALL DETERMINE THE GOVERNING AUTHORITY.

2. ANY DEFECTS IN THE CONSTRUCTION INCLUDING MATERIALS OR WORKMANSHIP SHALL BE REPLACED OR CORRECTED BY REMOVAL AND REPLACEMENT OR OTHER APPROVED METHOD PRIOR TO ACCEPTANCE BY THE CITY.

3. THE CITY OF TWINSBURG AND ITS ENGINEER SHALL NOT BE HELD LIABLE FOR DAMAGES OF ANY TYPE WHICH MAY OCCUR AS A RESULT OF ERROR AND/OR OMISSIONS IN THE ENGINEERING DESIGN DATA PRESENTED BY THE DEVELOPER'S ENGINEER, NOR SHALL THE CITY AND ITS ENGINEER BE LIABLE FOR DAMAGES RESULTING FROM THE DEVELOPER'S CONTRACTOR NOT COMPLYING WITH THE APPROVED PLANS OR BY USING CONSTRUCTION METHODS OR MATERIALS NOT APPROVED.

4. THE DEVELOPERS ENGINEER CERTIFIES THAT ALL DESIGN DATA AND CALCULATIONS PERTAINING TO THESE IMPROVEMENT PLANS, WHERE APPLICABLE, ARE CORRECT AND CONFORM TO THE CURRENT DESIGN CRITERIA. THE CITY ENGINEER IN APPROVING THESE PLANS AND DEDICATION PLAT THEREOF, DOES NOT, IN ANY WAY RELIEVE THE DEVELOPER'S ENGINEER OF HIS RESPONSIBILITY FOR ACCURATE AND COMPLETE ENGINEERING DESIGN RELATIVE PLANS.

5. ALL ROAD SURFACES, EASEMENTS OR RIGHT OF WAYS DISTURBED BY CONSTRUCTION OF ANY PART OF THIS IMPROVEMENT ARE TO BE RESTORED COMPLETELY TO THE BEFORE CONSTRUCTION CONDITION OR BETTER WHEN ORDERED BY THE CITY ENGINEER.

6. THE LOCATION OF THE UNDERGROUND UTILITIES SHOWN ON THE PLANS HAVE BEEN OBTAINED BY DILIGENT FIELD CHECK AND SEARCHES OF AVAILABLE RECORDS. IT IS BELIEVED THAT THEY ARE ESSENTIALLY CORRECT, BUT THE DESIGN ENGINEER DOES NOT GUARANTEE THEIR ACCURACY OR COMPLETENESS AND THE CONTRACTOR IS THEREFORE URGED TO PROCEED WITH CAUTION. EXISTING APPURTENANCES SUCH AS UTILITY POLES, VALVE BOXES, ETC ARE TO BE SAFEGUARDED BY THE CONTRACTOR DURING CONSTRUCTION.

7. AT LEAST FIVE DAYS PRIOR TO START OF ANY CONSTRUCTION WORK, A PRE-CONSTRUCTION MEETING SHALL BE SCHEDULED WITH THE CITY ENGINEER. THE CONTRACTOR OR HIS SUPERINTENDENT SHALL BE PRESENT ALONG WITH ALL PRIVATE UTILITY COMPANY REPRESENTATIVES. THIS MEETING WILL BE FOR COORDINATION AND PROCEDURE REVIEW. CONTRACTOR IS REQUIRED TO HAVE A SCHEDULE FOR REVIEW.

8. CONTRACTOR SHALL NOT COMMENCE WITH ANY FORM OF CONSTRUCTION WITHOUT CONTACTING THE OFFICE OF THE CITY ENGINEER AT LEAST 48 HOURS PRIOR TO STARTING CONSTRUCTION AND TO ARRANGE FOR AN INSPECTOR (330-963-6247).

9. IF ANY CHANGE IN THE WORK SCHEDULE BECOMES NECESSARY, IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO NOTIFY THE INSPECTOR TO AVOID UNNECESSARY INSPECTION COSTS. IF NO NOTIFICATION IS MADE IN REGARDS TO CANCELLATION OF WORK, THE CONTRACTOR WILL BE CHARGED $200 FOR EACH EVENT THE INSPECTION TIME OCCURRED.

10. THE CONTRACTOR SHALL CONTACT THE OHIO UTILITIES PROTECTION SERVICE, 1-800-362-2764, AT LEAST 48 HOURS BEFORE ANY UNDERGROUND WORK IS COMMENCED IN EXISTING STREETS.

11. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS. ALL CONTRACTORS ARE REQUIRED TO BE REGISTERED WITH THE CITY OF TWINSBURG BUILDING DEPARTMENT.

12. THE CONTRACTOR SHALL MAINTAIN LOCAL TRAFFIC AT ALL TIMES.

13. ALL DISTURBED SIGNS, GUARDRAIL, MAIL AND OR PAPER BOXES, DRIVES AND DRIVE CULVERTS, LAWNS SHALL BE REPAIRED AND OR REPLACED AS DIRECTED BY THE CITY ENGINEER.

14. ALL DISTURBED AND/OR DAMAGED STORM SEWER PIPES, STORM SEWER APPURTENANCES, WATER APPURTENANCES, PAVEMENTS, BERMS, AND DITCHES SHALL BE REPAIRED AND/OR REPLACED AS DIRECTED BY THE ENGINEER.

15. CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARY SOIL EROSION AND SEDIMENT CONTROL IN ACCORDANCE WITH THE LATEST ODOT REQUIREMENTS, SUMMIT COUNTY SOIL CONSERVATION SERVICE, OHIO EPA AND AS REQUIRED BY THE CITY ENGINEER. THE EROSION CONTROL MEASURES MUST BE IN PLACE BEFORE ANY OTHER CONSTRUCTION COMMENCES ON THIS SITE. CONTRACTOR SHALL, ON A DAILY BASIS, CLEAN ALL EXISTING STREETS OF MUD AND DIRT DURING THE CONSTRUCTION PHASE.

16. ALL CASTINGS LOCATED WITHIN THE RIGHT OF WAY ARE TO BE SET TO THE CORRECT GRADE (3/8 INCH PER FOOT FROM TOP OF CURB). BEFORE RELEASE FROM PERFORMANCE BOND THE CONTRACTOR SHALL PROVIDE AS-BUILTS INCLUDING TOP OF CASTING ELEVATIONS CERTIFIED BY AN OHIO REGISTERED SURVEYOR.

17. AT ALL STORM SEWER MAIN AND SANITARY MAIN INTERSECTIONS (CROSSINGS LESS THAN 18"), ENCASE THE LOWER AND MONOLITHICALLY CRADLE THE UPPER PIPE IN 2500 PSI CONCRETE FOR WIDTH OF THE TRENCH.

18. ALL SEWER CONSTRUCTION CONDUIT BEDDING, PIPE COVER AND BACKFILL SHALL BE AS NOTED ON THE TYPICAL TRENCH DETAIL.

19. ALL INSPECTION AND TESTING SHALL BE DONE BY AN EXPERIENCED AND QUALIFIED FIRM ENGAGED IN THIS TYPE OF WORK. VIDEOTAPES AND WRITTEN REPORTS OF ALL INSPECTION AND TESTING SHALL BE SUBMITTED TO THE CITY ENGINEER. ALL SANITARY SEWERS AND STORM SEWERS MUST BE FLUSHED AND HAVE A COLOR TELEVISION INSPECTION IN ACCORDANCE WITH CITY REQUIREMENTS AFTER COMPLETION OF THE PAVEMENT CONSTRUCTION AND SEEDING OF DISTURBED AREAS. ANY DEFECTS FOUND SHALL BE CORRECTED AND TESTED/INSPECTED PRIOR TO ISSUANCE OF BUILDING PERMITS AND/OR RELEASE OF THE PERFORMANCE BOND.

20. ASPHALT SURFACE COURSE TO BE CONSTRUCTED NOT SOONER THAN ONE (1) YEAR AFTER INTERMEDIATE ASPHALT IS PLACED OR AS DIRECTED BY CITY ENGINEER BUT NOT LATER THAN TWO (2) YEARS.

21. ALL LAWN AREAS REMOVED OR DISTURBED SHALL BE REPLACED BY SEEDING AND MULCHING IN ACCORDANCE WITH ITEM 659 OF ODOT SPECIFICATIONS AND SHALL BE RESEEDED AND MULCHED WHEN REQUESTED, IF SATISFACTORY RE-ESTABLISHMENT OF LAWN DOES NOT OCCUR. PAYMENT SHALL BE MADE UPON EVIDENCE OF SATISFACTORY RE-ESTABLISHMENT OF LAWN AREA.

22. THE CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE AT ALL TIMES AND SHALL BACKFILL AND GRADE EXCAVATED AREAS TO ELIMINATE PONDING ON THE SITE.

    AS-BUILT AUTOCAD DRAWINGS SHALL BE SUBMITTED TO THE CITY WITHIN 60 DAYS AFTER IMPROVEMENTS HAVE BEEN APPROVED AND ACCEPTED BY CITY. ELECTRONIC AUTOCAD 2007 OR NEWER VERSION AND PDF FORMAT INCLUDING PROFESSIONAL SURVEY P.S. STAMP AND SIGNATURE ON COVER PAGE SHALL BE INCLUDED. CONTACT Gharwell@twinsburg.oh.us FOR FORMAT REQUIREMENTS. SURVEYOR SHALL PROVIDE A SEPARATE LIST OF ALL SURVEY MONUMENTS FOUND AND/ OR USED WITH THEIR RESPECTIVE COORDINATES.

23. THE CONTRACTOR SHALL PROVIDE ALL MATERIAL SUBMITTIALS TO THE CITY FOR APPROVAL PRIOR TO INSTALLATION.

24. BEFORE ACCEPTANCE OF THE SUB-GRADE, A THIRTY (30) TON PROOF ROLL SHALL BE REQUIRED ON ALL AREAS TO BE PAVED IN ACCOURDANCE WITH ODOT ITEM 204 AND 204.06. ZERO DEFLECTION USING GROSS WEIGHT OF 60,000LB TANDEM TRUCK WITH TICKET SHALL BE REQUIRED. CEMENT STABILIZATION SHALL BE REQUIRED WHERE THE SUBGRADE CBR VALUE IS LESS THAN 6.

25. ALL VOIDS CREATED FROM THE BORING OF UTILITY LINES SHALL BE BACKFILLED WITH SAND OR GROUT TO THE SATISFACTION OF THE CITY ENGINEER.

26. PROPOSED ELEVATIONS SHOWN SHALL NOT BE CHANGED WITHOUT APPROVAL OF CITY ENGINEERING.

27. ALL AREAS WITHIN PROPOSED STREET RIGHT-OF-WAYS SHALL BE EXCAVATED OR FILLED TO WITHIN 3" + OF FINISHED GRADE PRIOR TO THE START OF UTILITY CONSTRUCTION.

28. CUT SHEETS FOR ALL UNDERGROUND UTILITIES MUST BE SUBMITTED A MINIMUM OF 24 HOURS PRIOR TO THE START OF CONSTRUCTION.

29. DEVELOPER MUST SUBMIT AN APPROVED SET OF CONSTRUCTION DRAWINGS FROM THE GAS COMPANY TO THE CITY ENGINEER FOR APPROVAL. IT WILL BE THE DEVELOPER'S RESPONSIBILITY TO PROVIDE COORDINATION OF GAS UTILITY BELOW LIMITS OF CEMENT STABILIZATION AND OR PAVEMENT DESIGN.

30. DEVELOPER MUST SUBMIT AN APPROVED SET OF CONSTRUCTION DRAWINGS FROM THE ELECTRIC, PHONE AND INTERNET PROVIDERS TO THE CITY ENGINEER FOR APPROVAL. IT WILL BE THE DEVELOPER'S RESPONSIBILITY TO PROVIDE EMPTY CONDUIT BELOW LIMITS OF CEMENT STABILIZATION AND OR PAVEMENT FOR SUCH UTILITIES.