ITEMIZED SPECIFICATION NUMBER THREE

MANHOLES

3.1 **SCOPE** - This item shall include the furnishing of all materials and construction of manholes and the furnishing and installation of all cast iron frames and covers for the manholes of the types as herein specified and as shown on the Drawings. All work, including excavation and backfill, shall be in accordance with all applicable requirements previously specified in the GENERAL SPECIFICATIONS.

3.2 **CONCRETE AND CONCRETE WORK** - Concrete and concrete work shall be as previously specified in GENERAL SPECIFICATION NUMBER ONE.

3.3 **MANHOLE TYPES** - All manholes shall be precast concrete O-Ring types as shown on the Drawings and as hereinafter specified.

3.4 **MANHOLE BASES** - Bases for manholes shall be of the precast reinforced concrete type with the bottom integrally cast with the walls, and shall meet all applicable requirements of ASTM C478, except the walls shall not be less than the thickness shown on the Drawings. Bottom reinforcement shall be adequately tied to wall reinforcement. Bases shall incorporate provisions for making a flexible joint between the pipe and the manhole. Joints shall be shock absorbent and shear resistant; shall be designed to prevent any direct contact between the pipe and manhole and shall provide a tight, infiltration proof sewer connection with the pipe deflected up to 12 degrees in any direction. The flexible joints shall be A-Lok; Kor-N-Seal; or Press Wedge II. Bases shall be set plumb and at the proper elevation on a cushion of granular material as approved by the ENGINEER. All joints between sections shall incorporate rubber "O" ring gaskets. If not integrally cast with the base, after installation of the pipes, the CONTRACTOR shall provide a Class II concrete invert through the manhole. The invert shall have a depth through the manhole equal to the radius of the sewer pipe and shall slope upward toward the manhole walls from the centerline of the sewer pipe approximately 3-inches. Concrete shall be troweled smooth.

3.5 **SLAB TRANSITION** - All type MH 3-5 and larger manholes shall be furnished with O-ring type slab transition sections. The slab transition sections shall be of precast reinforced concrete and shall meet all applicable requirements of ASTM C478.

3.6 **PRECAST RISER SECTIONS** - Riser sections shall have interior diameters of 4-feet. Walls shall be set plumb and the joint between the base slab and riser sections shall incorporate a rubber "O" ring gasket meeting the requirements of ASTM C443. Riser Sections shall be reinforced with steel wire mesh and shall meet the requirements of ASTM C478, except they shall not be less than 5-inches thick. Adjoining riser sections shall be firmly keyed together by means of tongue and

groove joints with rubber "O" ring gaskets meeting the requirements of ASTM C443. Precast riser sections shall be appropriately marked for purposes of identification and shall be subject to inspection and rejection at the factory, trench or other point of delivery.

3.7 **TOP SLABS** - Top slabs, shall be of precast reinforced concrete with o-ring type joints and shall meet all applicable requirements of ASTM C478. Top slabs will be used in lieu of eccentric transitions and shall have 24-inch openings so as to accommodate the cast iron frame and cover. Slab tops shall be 8-inches thick.

3.8 **ADJUSTING RINGS** - The cast iron manhole frame shall be set at the proper elevation by use of precast concrete adjusting rings placed on the top slabs. The rings shall be held in place with mortar composed of 1 part, by volume, Portland cement and 2 parts clean, hard sand. **The adjusting rings shall be a minimum of 4-inches in height and shall not exceed 16-inches in height.**

HDPE grade adjustment rings meeting ASTM 1248 may be used as an approved equal to concrete rings. Butyl rubber sealant shall be used between rings per the manufacturer's specifications to prevent infiltrations and inflow.

3.9 **MANHOLE FRAMES AND COVERS** - All manhole frames and covers shall be gray iron castings conforming to ASTM A48, and shall be Neenah Foundry Company R-1772-B or approved equal. Both the underside of the lid and the upper surface of the ledge upon which the lid rests shall be machined so as to prevent rocking of the lid on its supporting surface. Castings shall be cleaned and dipped in coal tar pitch varnish at the factory.

Manhole frames and covers shall weigh not less than 360 pounds. The frames shall have a clear opening of not less than 24-inches in diameter and a height of 7-inches. Covers shall have strengthening ribs on the underside and shall have the words **"SANITARY SEWER"** cast into the top of the castings used on all sanitary manholes; **"STORM SEWER"** cast into the top of castings used on all storm manholes; and **"SEWER"** cast into the top of castings used on combined sewer manholes. The Contractor shall verify which cover is required for each manhole on this project.

After installation, the frames and covers shall be painted with one coat of asphaltum paint.

The manhole frames shall be firmly set on top of the adjusting rings with a full leveling bed of 1:1 cement mortar. HDPE rings do not require cement mortar. Where manholes are located in paved areas, the surface of the cover shall be made flush with the pavement surface. In unpaved areas, the cover shall be set not to exceed 1-inch above the ground surface, or as directed by the ENGINEER.

3.10 **STEPS** - Steps shall be provided in all manholes. All steps shall be Model PS2-PF Manhole Step as manufactured by M.A. Industries, Inc. or approved equal. The vertical spacing of steps shall be not more than 16-inches. Care must be used when setting riser sections with steps so that the steps are properly aligned.

3.11 **MANHOLE SEALING SYSTEM** - All sanitary sewer manholes shall be provided with an external sealing system between the casting and the dome/top slab section. The adjusting rings and castings of each manhole shall be sealed with an external rubber sealing sleeve as manufactured by Infi-Shield, Inc. or an approved equivalent. The seal shall be made of neoprene and/or EPDM rubber and have a minimum thickness of 60 mils. The sleeve shall be sealed to the top of the dome/top slab of the manhole and over the top of the casting flange with a non-hardening butyl rubber mastic. Manholes may be sealed using an alternate material as approved by the City of Bowling Green and the Ohio Environmental Protection Agency, Northwest District Office.

3.12 **SANITARY MANHOLE LEAKAGE TESTING** – Air testing for sanitary sewer manholes shall conform to the test procedures described in ASTM C-1244. The CONTRACTOR shall include in his bid all costs necessary to perform the air tests. If leakage exceeds the specified amount, the CONTRACTOR shall locate and remedy the defect at his own expense. The air tests shall be conducted in the presence of a representative of the City. Repairs shall be performed in accordance with ASTM C-478.

3.13 **MANHOLE REMOVED** – Manholes shown to be removed on the plans, shall be removed in accordance with ODOT Item 202.11.

3.14 **MANHOLE ABANDONED** - Manholes to be abandoned shall be abandoned in accordance with all applicable sections of ODOT Item 202.09.

3.15 **MAINTENANCE OF EXISTING FLOW** – Where existing sewers are encountered or interfered with, flow shall be maintained . Sewage or other liquid must be handled by the Contractor either by connection to other sewers or as approved by the Owner and Engineer. Sewage or other liquid shall not be pumped, boiled or flumed over the pavement.

3.16 **MINOR DETAILS** - Minor details not specifically mentioned in these Specifications nor shown on the Drawings, but necessary to secure a workmanlike job and proper operation, shall be provided by the CONTRACTOR without extra cost.

3.17 **PRICE BID** - The price bid for manhole work shall include all necessary materials, labor, tools, and equipment to construct and/or to abandon manholes as described in these Specifications and shown on the Drawings and shall be the price bid per each, installed complete.

ITEM	ODOT	DESCRIPTION	UNIT
3a	604	Sanitary Sewer Manhole CBG, Type MH3-4	EA

Sanitary Manhole Vacuum Testing

The minimum time for the vacuum reading to drop from ten (10) inches to nine inches (9) inches of mercury is as follows:

Minimum Test Times			
Manhole Depth, feet	Manhole Diameter, in		
	48	60	72
	Time, seconds		
8	20	26	33
10	25	33	41
12	30	39	49
14	35	46	57
16	40	52	67
18	45	59	73
20	50	65	81
22	55	72	89
24	59	78	97
26	64	85	105
28	69	91	113
30	74	98	121