

TRANSPORTATION BULLETIN



Illinois Department of Transportation

ADDENDUM NO. 1

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Item No. 16A

Rehabilitate Taxiway J and L

Chicago Rockford International Airport
Rockford, Illinois
Winnebago County
IL Project No.: RFD-4008
AIP Project No.: 3-17-0088-XX
Contract No.: RO018

REASON FOR ADDENDUM:

1. Sanitary Sewer Pipe specifications were inadvertently omitted from the Special Provisions.
2. The quantity for Item AR705524 "4" Perforated Underdrain w/Sock is shown incorrectly in the Summary of Quantities on Sheet 2 of the plans and the Schedule of Prices. The Correct Quantity is 4,200 L.F.

TO ALL PLAN HOLDERS:

Replace the Schedule of Prices with the revised Schedule of Prices. Return with bid. Note: the C-Bid has not been updated to reflect the quantity change.

Replace Sheet 2 of the Plans with the revised Plan Sheet 2.
Delete Page 84 and 85 of the Special Provisions and replace with the following:

ITEM 770 - SANITARY SEWER PIPE

DESCRIPTION

770-1.1

Under this item, the Contractor shall provide all labor, equipment and materials necessary to construct the sanitary sewer as shown on the plans. Testing of all sanitary sewer shall be done by the Contractor and witnessed by the Engineer.

Pipe bedding and trench backfill will be incidental to this item and shall not be measured for separate payment under Item Sanitary Sewer.

In addition, the pipe, fittings and pipe installation shall conform to the following specifications: *Standard Specifications for Water and Sewer Main Construction in Illinois*, 5th Edition; May, 1996, Division IV, Sections 41-2.01 A through C, Protection of Water Mains, and Rock River Water Reclamation District *General Provisions and Technical Specifications for Sanitary Sewer Construction*. In case of apparent contradictions between the Detailed Specifications and the *General Provisions and Technical Specifications for Sanitary Sewer Construction*, these Detailed Specifications shall govern.

The Contractor shall notify the Rock River Water Reclamation District (hereinafter District) forty-eight (48) hours prior to beginning any work to have an inspector present during all construction. The Contractor shall notify the District 24 hours prior to working on a weekend or a District Holiday. The Contractor will not be permitted to work on the following District holidays: Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day and New Years Day. The Contractor shall comply with all provisions of permits secured for this project. Copies of all Contractor-secured permits shall be provided to the District Engineer prior to the start of construction. Any construction not supervised by a District inspector shall not be accepted.

The Contractor shall be responsible for all tests of materials and final installation required by the District. All deficiencies noted by the inspectors shall be corrected by the Contractor without cost to the District and prior to final payment.

MATERIALS

770-2.1

All material shall conform to the Rock River Water Reclamation Districts Requirements. PVC pipe shall be solid wall SDR 26 (PS115) meeting the requirements of ASTM F-679 (18"-30" diameter), as shown on the plans. For a detailed scope of pipe materials, reference Appendix A section 15260. Miscellaneous concrete shall meet the requirements of section 610.

770-2.2

Bedding - The material for bedding shall meet the IDOT gradation CA-11.

770-2.3

Backfill - The material used for trench backfill shall be aggregate meeting the requirements section 701 of the special provisions.

CONSTRUCTION METHODS

770-3.1

For a detailed scope of pipe construction methods, reference Appendix A section 15265.

770-3.2

Pipe Installation - Pipe shall be installed to the line and grades shown on the plans.

Care shall be taken to properly align the pipe before the joints are entirely forced home. During insertion of the tongue or spigot, the pipe shall be partially supported by hand, sling or crane to minimize unequal lateral pressure on the gasket and to maintain concentricity until the gasket is properly positioned.

Sufficient pressure shall be applied in making the joint to assure that it is home, as described in the installation instructions provided by the pipe manufacturer. Sufficient restraint shall be applied to the line to assure that joints once home are held so, until fill material under and alongside the pipe has been sufficiently compacted. At the end of the work day, the last pipe laid shall be blocked in an effective way to prevent creep "down time."

770-3.3

Survey Line and Grade - Survey line and grade control hubs at a fifty (50) foot maximum spacing and at a change in line and grade will be provided by the Contractor, except a greater interval may be used in conjunction with the use of a laser in maintaining line and grade.

The Contractor shall constantly check line and grade of the laser beam and the pipe and in the event they do not meet specified limits described hereinafter, the work shall be immediately stopped, the Engineer notified, and the cause remedied before proceeding with the work.

770-3.4

Dewatering - Dewatering sufficient to maintain the water level 12 inches below the surface of the trench bottom or base of the bedding course, shall be accomplished prior to pipe laying and jointing, if not prior to excavation and placing of the bedding as called for in other sections of the specifications or Special Provisions. The dewatering operation, however accomplished, shall be carried out so that it does not destroy or weaken the strength of the soil under or alongside the trench. The normal water table shall be restored to its natural level in such a manner as to not disturb the pipe and its foundation. **Cost of any dewatering operations shall be incidental to the sanitary sewer.**

METHOD OF MEASUREMENT

770-4.1

Sanitary sewer will be measured by the lineal foot in place. Sanitary sewer shall be measured along the centerline of the pipe to the center of the wall of each manhole or connection.

BASIS OF PAYMENT

770-5.1

Payment for sanitary sewer shall be made at the contract unit price per lineal foot bid for 21" sanitary sewer of the appropriate material, application and depth. Payment shall be full compensation for excavation, connections to proposed/existing manholes, bedding, installation of sewer, compaction, testing and televising, and all labor, materials, equipment as shown on the plans and as specified herein to provide a complete and operational sanitary sewer.

Bedding and trench backfill will be incidental to the respective item and shall not be measured for payment.

If, upon delivery and incorporation of any materials, the Contractor has failed to provide the necessary submittals as required by Sections 30-18, 40-01, 40-03 and 40-11 of the Standard and Special Provisions, the pay item shall not be included on the Construction Progress Payment report until such submittals have been furnished.

Payment will be made under:

ITEM AR800826 21" SANITARY SEWER

PER LINEAL FOOT

APENDIX A

DIVISION 15 - MECHANICAL
Section 15260 – Plant Pipes and Fittings

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe and pipe fittings.

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION (RESERVED)

1.03 RELATED SECTIONS

- A. Section 09900 - Painting.
- B. Section 15265 - Piping Installation.
- C. Section 15270 - Valves

1.04 REFERENCE TO STANDARDS

- A. ASTM - American Society of Testing Materials.
- B. AWWA - American Waterworks Association.
- C. ANSI - American National Standards Institute.

1.05 SYSTEM DESCRIPTION (RESERVED)

1.06 SUBMITTALS

- A. Submit under the provisions of Special Condition - Section 01300.
- B. Shop Drawings:

At least 60 days prior to installation of piping systems covered in these specifications, the Contractor is required to submit to the Engineer complete drawings of each piping system to be installed showing locations, dimensions, and details of all runs of piping, including piping sizes, pipe materials, fittings, valves, hangers, supports, and other equipment. Detailed drawings of any proposed departure due to actual field conditions or other causes shall be included with the foregoing submittal. The manufacturer's catalog description of all valves, hangers, supports, equipment, and other items shall also be submitted for review to show conformance with the requirements of these specifications and the contract drawings. The piping shop drawings shall be new drawings prepared by the Contractor, not a mark-up of contract drawings, and the shop drawings shall have a bill of material on each drawing defining all items mentioned above. All catalog and descriptive data shall note where the specific item is to be installed and a cross

reference made on the piping shop drawings.

1.07 QUALIFICATIONS

- A. Manufacturer shall certify to a minimum 3 years experience specializing in manufacturing of products specified herein.

1.08 QUALITY ASSURANCE

- A. The Contractor shall establish and maintain quality control of all equipment and construction operations involved under this item. To assure compliance with contract requirements, the contractor shall maintain records of his quality control for all items listed below.

1. Check for damage to and defects in materials.
2. Check for proper storage of materials and provide a systematic listing of these items and their location.
3. Check to see that shop drawings on all piping systems have been submitted and are reviewed.
4. Check to see that all piping materials conform to reviewed shop drawings.
5. Review requirements of plans and specifications and check layouts.

A copy of these records shall be kept at the jobsite and shall be available at all times for the Engineer's review.

- B. All manufactured items shall be standard commercial products of reputable manufacturers. Where materials are shown on the drawings or listed but not specifically covered by a standard or specification, the Contractor shall furnish best commercial grades of material or articles subject to the review of the Engineer. When two or more articles of the same material or equipment are required, similar articles of the same size shall be products of a single manufacturer.
- C. The Contractor shall furnish the Engineer with sufficient copies of the manufacturer's sworn certificates and test results from a reputable testing laboratory showing the results of tests made on all pipe delivered to the project in accordance with the ASTM, AWWA, or ANSI Specifications for the various types of pipe to be furnished. All expenses incidental to the pipe testing shall be considered as included in the prices bid for pipe furnished and installed, and no additional payment will be allowed therefore.
- D. The Contractor shall furnish the Engineer with lists, in duplicate, of all pieces of pipe and fittings in each shipment received, and these lists shall give the serial or mark number, weight, class, size and description of each item received at the jobsite.

1.09 REGULATORY REQUIREMENTS (RESERVED)

1.10 COORDINATION (RESERVED)

1.11 MAINTENANCE SERVICE (WARRANTY)

- A. The Contractor shall warrant the equipment and materials to be free of material or workmanship defects for a period of one year from the date of acceptance by the Owner.

1.12 EXTRA MATERIALS (SPARE PARTS) (RESERVED)

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. U.S. - DIP.
- B. American - DIP.
- C. Mueller Co. - Cast iron cut-in or tapping sleeve.
- D. Indurall - DIP linings for high temperature applications.
- E. Tnemec - Painting.
- F. Tyler Pipe Co. - Cast iron soil pipe (CISP).
- G. Fernco - Couplings.
- H. Johns-Manville - PVC.
- I. Certain Teed - PVC.
- J. Chemtrol - PVC.
- K. Cabot - PVC.

2.02 DUCTILE IRON PIPE

A. Buried

TABLE 1							
Size in.	Pressure Class psi	Nominal Thickness in.	Type 4 Trench Maximum Cover – ft.	Size in.	Pressure Class psi	Nominal Thickness in.	Type 4 Trench Maximum Cover – ft.
3	350	0.25	100	20	250	0.33	22
	350	0.25	85		300	0.36	26
	350	0.25	47		350	0.38	28
8	350	0.25	34	24	200	0.33	17
10	350	0.26	28		250	0.37	20
12	350	0.28	28		300	0.40	24
14	250	0.28	23	30	350	0.43	28
	300	0.30	26		150	0.34	14
	350	0.31	27		200	0.38	16
16	350	0.30	24	30	250	0.42	19
	300	0.32	26		300	0.45	21
	350	0.34	28		350	0.49	25
18	250	0.31	22	36	150	0.38	14
		0.34	26		200	0.42	15
		0.36	28		250	0.47	18
	300	0.36	28	36	300	0.51	20
					350	0.56	24
					42	150	0.41
	200	0.47	15				
	250	0.52	17				
	300	0.57	20	42	300	0.57	20
350					0.63	23	
350					0.63	23	

1. Joints

- a. Push-On: ANSI A21.11 or AWWA C111, American Fastite Joint or U.S. Pipe Tyton Joint, gaskets and lubricant included for 20” diameter and larger pipe.
- b. Mechanical Joint: ANSI A21.11 or AWWA C111 for 16” diameter and smaller.
- c. Bolts, nuts, and glands shall be Alloy Steel (Corten or US alloy type) and be cathodic to ductile iron and cast iron.

The gaskets for mechanical joints in the activated sludge storage

tank aeration piping systems shall be an EPDM material suitable for service in applications conveying 225°F air. All other gaskets shall be plain rubber styrene-butadiene, unless a particular application requires otherwise.

- d. The Contractor shall have the option of using mechanical joints with retainer glands or restrained joints for all 16" diameter and smaller pipe except for air piping.

2. Fittings

- a. Mechanical Joints: Shall conform to ANSI A21.11 (AWWA C111). Mechanical joint fittings shall be standard body with ductile iron retainer glands unless noted otherwise. Shall be of class or pressure rating not less than that of connecting pipe.
- b. Push-On Joints: Shall conform to ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 American Fastite Joint or U.S. Pipe Tyton Joint, gaskets and lubricant included for 20" diameter and larger pipe.
- c. Restrained Joints: Shall conform to ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 American Flex-Ring or U.S. Pipe TR Flex for 16" diameter and smaller pipe, except air piping.
- d. All fittings shall be of the class or pressure rating not less than that of the connecting pipe.
- e. The Contractor shall have the option of using mechanical joints with retainer glands or restrained joints for all 16" diameter and smaller pipe except for air piping.

3. Linings

- a. Cement Linings: ANSI A21.4 or AWWA C104 unless otherwise indicated, all ductile iron pipe and fittings shall be cement lined and coated within an asphalt seal coat. Pipe used for air service shall not be cement-lined.

- 4. Coatings: Tar coated in accordance with ANSI A21.51.

- B. Non-Buried: ANSI A21.51, pressure class 250.

1. Joints

- a. Flanged: ANSI A21.15 or AWWA C115, Class 125 drilled and faced per ANSI B16.1.

Required nuts, bolts, and studs shall be cadmium plated. Gaskets shall be plain rubber styrene-butadiene. Gaskets for flanged joints in the aeration piping systems shall be an EPDM material suitable for service in 225°F air applications. Uni-flanges shall be permitted when specifically shown on the drawings or approved by the Engineer.

2. Fittings

ANSI A21.10 (AWWA C110) All fittings shall be standard body of class or pressure rating not less than that of connecting pipe. Flange fittings requiring bases shall have the base flange machined and drilled in accordance with ANSI A21.10.

3. Linings

a. Cement Linings: ANSI A21.4 or AWWA C104 unless otherwise indicated, all ductile iron pipe and fittings shall be cement lined and coated within an asphalt seal coat. Pipe used for air service shall not be cement lined.

4. Coatings

Contractors and pipe suppliers shall note that ductile iron pipe and fittings which are to be exposed (not buried) shall not be tar coated, but shall receive a coat of rust inhibitive primer (66-1211 Epoxoline Primer) by Tnemec Company, or equal. Contractor shall notify the Engineer and suppliers of the paint system he proposes to use. Primers for ductile iron pipe shall be compatible with that paint. In the event that piping, which is to be for exposed use, is shipped to the job with a tar coat, the contractor shall remove the tar coat by sandblasting and apply prime coat with Tnemec 66-1211 Epoxoline Primer, or equal, at his own expense.

The exposed piping shall be finish coated in accordance with Section 09900 - Painting.

2.03 PVC SANITARY SEWER PIPE

A. SDR 26 PVC Sewer Pipe

PVC gravity sewer pipe shall be SDR 26 solid wall PVC sewer pipe. Pipe up to 21" in diameter shall conform to ASTM Specification ASTM F679 (latest revision). Joints shall be the rubber-gasketed slip-on type meeting ASTM F479. Either Class I, II or III granular cradle shall be permitted for embedment. Delivery, storage, handling and installation of pipe shall be in strict accordance with the manufacturer's instructions. Pipe bedding and compaction shall be in accordance with manufacturer

requirements in order to provide warranty for the pipe.

B. AWWA C900 and C905, D.R. 18 Forcemain

1. Joints: Push-on type with rubber gaskets.
PVC pipe shall have rubber gasketed joints, shall be Dimension Ratio 18 (Pressure Class 150) and shall conform to AWWA Specification C900 and C905 (latest revision). PVC pipe shall have outside diameter equal to ductile iron pipe. Rubber gaskets shall meet ASTM Specification F477.

For all PVC pipe, additives and fillers, including but not limited to stabilizers, antioxidants, lubricants, colorants, etc. shall not exceed ten (10) parts by weight per one hundred (100) parts of the resin in the compound. Manufacturers will be required to certify that their pipe compound meets this requirement as well as cell classification.

All pipes shall be furnished with a painted ring or other acceptable marking suitable for determining whether or not the pipe has been properly inserted into the coupling. Each pipe shall be clearly marked with the nominal diameter, manufacturer's name, class pressure rating and identification code.

All buried PVC forcemains shall be installed with a parallel 12 gauge copper wire alongside the pipe. The wire shall be electrically continuous. Only waterproof splices shall be permitted such as 3M, or equal. Wire shall terminate at manholes, valve boxes, air release valves or other structures along the forcemain.

2. Fittings: ANSI A21.11 (AWWA C111), ductile iron standard body mechanical joint type.

2.04 STEEL PIPE AND FITTINGS (RESERVED)

2.05 CONCRETE PIPE (RESERVED)

2.06 WALL SLEEVES

- A. The wall sleeves and wall pipes shown on the drawings for metallic piping 3" and larger shall be made of either cast iron or ductile iron. The wall sleeves and wall pipes shall have a water collar and the length shall be as required for wall thickness or as shown on the drawings.
- B. The wall sleeves and wall pipes shall have either mechanical joints or flanged joints as shown on the drawings and furnished complete with studs, glands and gaskets. Where ends are flush with a concrete wall, ends shall be tapped for studs. Refer to ductile iron pipe for gasket requirements.

- C. Contractor shall be required to furnish wall sleeves for all wall or floor penetrations in which the pipe passes from a wet well or tank of water into a dry pit area, or from a backfilled exterior into a wet well, tank of water or dry room area, unless shown otherwise on the drawings.

2.07 LINK SEALS

- A. The link seals used on this project shall be rated for corrosive service. The link seals shall be suitable for use over a range in temperature between -40°F and 250°F. The pressure plates shall be glass reinforced nylon plastic. The bolts and nuts shall be 18-8 stainless steel (type 304). The seating element shall consist of EPDM rubber. The link seals shall be Thunderline Corporation, LS model, or equal.

2.08 CUT-IN, TAPPING SLEEVE AND SPLIT SLEEVES (RESERVED)

2.09 COPPER PIPING AND TUBING (RESERVED)

2.10 FLANGE ADAPTERS

- A. Flange adapters shall be installed at locations shown on the drawings or at locations approved in writing by the Engineer. The flange and adapter shall be made from ductile iron ASTM A536 grade 65-45-12 and drilled in accordance with ANSI B16.1 and have a working pressure of 250 psi for 2 inch to 12 inch and 150 psi for 14 inch to 24 inch. The flange adapter shall be furnished with EPDM gaskets and have set screws for gripping the perimeter of plain end pipe. The flange adapter shall be a Uni-Flange Series 400, or equal.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that excavations are at the required grade, dry and not over-excavated.

3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt, on inside and outside, before assembly.

3.03 INSTALLATION

- A. See Section 15265 - PIPING INSTALLATION.

END OF SECTION 15260

DIVISION 15 – MECHANICAL
Section 15265 - Plant Piping Installation

PART 1 GENERAL

1.01 DESCRIPTION OF THE WORK

- A. The work included in this section is the installation of the various piping systems shown on the plans. Pipe materials and pipe fittings are specified elsewhere.

1.02 RELATED WORK

- A. Section 15260 - Plant Pipe and Pipe Fittings
- B. Section 15270 - Valves

1.03 QUALITY ASSURANCE

- A. Proper and suitable tools and appliances for the safe and convenient handling and placing of the pipes, specials and valves shall be used. All pieces shall be carefully examined for defects and no piece shall be laid which is known to be defective. If any defective piece should be discovered after having been laid, it shall be removed and replaced with a sound piece, in a satisfactory manner, by the Contractor at his own expense. The pipes, specials, and valves shall be thoroughly cleaned before they are placed, shall be kept clean until they are accepted in the completed work, and when laid shall conform accurately to the lines and elevations as specified.
- B. The drawings show the general arrangement for both underground and exposed piping systems. Whenever the Contractor deems it necessary to deviate from the arrangements shown, he shall submit to the Engineer in writing a request for the deviation, along with drawings showing the proposed new arrangement. Deviation shall not be made until approval of new arrangements is obtained. Wherever piping arrangements are shown or required to be modified to accommodate the equipment approved for installation, the Contractor shall prepare and submit for approval detailed shop drawings of the new arrangement. Only new and unused materials shall be installed in the work specified herein.
- C. The contract drawings are not intended to show every fitting, offset, or similar item. Piping systems shall include all unions, fittings, flanges, anchors, valves, gaskets, nipples, strainers, hangers, vents, gauges, or other equipment necessary for the proper installation of the various systems, but shall include not less than that shown in the contract drawings. Piping shall be arranged and installed approximately as indicated, straight, plumb, and as direct as possible, and in such manner that right angles or parallel lines are formed with building walls. All pipes shall be cut accurately to measurements established at the building and shall be installed without springing or forcing. All changes in direction of piping shall be made with fittings. Reduction in sizes of pipes shall be made with reducing fittings. Bushings will not be permitted unless specifically detailed on the drawings.

1.04 REFERENCES TO IDOT STANDARDS

- A. IDOT Standard Specifications (latest revision).
- B. ASTM D698 Standard Proctor Density Test.

1.05 SUBMITTALS

A. Piping Systems

At least 60 days prior to installation of piping systems covered in these specifications, the Contractor is required to submit to the Engineer complete drawings of each piping system to be installed showing locations, dimensions, and details of all runs of piping, including piping sizes, pipe materials, fittings, valves, hangers, supports, and other equipment. Detailed drawings of any proposed departure due to actual field conditions or other causes shall be included with the foregoing submittal. The manufacturer's catalog description of all valves, hangers, supports, equipment, and other items shall also be submitted for approval to show conformance with the requirements of these specifications and the contract drawings. The piping shop drawings shall be new drawings prepared by the Contractor, not a mark-up of contract drawings, and the shop drawings shall have a bill of material on each drawing defining all items mentioned above. All catalog and descriptive data shall note where the specific item is to be installed and a cross reference made on the piping shop drawings.

- B. Granular Cradle - Sieve Analysis and Sample
- C. Granular Backfill - Sieve Analysis and Sample
- D. Boring and Jacking Plan.
- E. Potable Water Distribution Line Disinfection.

PART 2 PRODUCTS

2.01 PIPING MATERIALS AND FITTINGS

- A. Piping materials and fittings shall be as specified in Section 15260 and as shown on the plans.

2.02 GRANULAR CRADLE

- A. The granular cradle material shall as shown on the plans.

2.03 GRANULAR BACKFILL

- A. Granular backfill materials shall be as shown on the plans.

PART 3 EXECUTION

3.01 INSTALLATION

A. Buried Piping Systems

All buried piping shall have a compacted granular cradle as shown on the drawings. The granular backfill shall be used in locations where piping runs of any kind cross roadways, where one pipe crosses another and where piping spans from undisturbed earth to the wall of the structure. Where one pipe crosses another, or spans to a building wall, granular backfill shall be used to the midpoint of the highest pipe. The types of granular cradle and granular backfill materials shall be as shown on the plans.

B. Excavation and backfill shall include all excavation, backfilling, compacting, disposal of surplus material, and all other work incidental to the construction of trenches, including any additional excavation which may be required for manholes or other structures forming a part of the pipe line.

C. All buried PVC pipe shall be installed with a parallel 12-gauge copper wire within six inches above the pipe. The wire shall be continuous without splices. Wire shall terminate at structures or hydrants approximately 12 inches above grade.

1. Construction Methods

Depth of Pipe Cover: Unless otherwise shown or directed, all pipe shall be laid to minimum depth of three feet measured from the existing ground surface or established grade to the top of the barrels of the pipe. In areas subject to subsequent excavation or fill, the pipes shall be laid to grades provided by the Engineer.

Excavation: The trench shall be dug to the depth and alignment required and only so far in advance of pipe laying as the Engineer shall permit. The trench shall be so braced and drained that workmen may work therein safely and efficiently. The Contractor shall note that excavations shall conform to the latest OSHA requirements for excavations. It is essential that the discharge from pumps be led to natural drainage channels or to drains. The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures and piping, both known and unknown, may be determined, and he shall be held responsible for the repair of such structures and piping when broken or otherwise damaged by him.

Width: The trench width may vary with and depend upon the depth of the trench and the nature of the excavated material encountered, but in any case shall be of ample width to permit the pipe to be laid and jointed properly and the backfill to be placed and compacted properly. The minimum width of unsheeted trench shall be 2'-6".

Pipe Foundations: The trench, unless otherwise specified, shall have a curved bottom conforming to the pipe diameter and the grade to which the pipe is to be laid. The pipe shall be laid on compacted granular cradle so that the barrel of the pipe will have a bearing for its full length. Reliefs shall be excavated for joints.

Thrust Restraint: **RETAINER GLANDS SHALL BE USED ON ALL BURIED MECHANICAL JOINT VALVES AND FITTINGS. Use thrust blocks only where shown on the drawings, otherwise use retainer glands.** Poured concrete thrust blocks shall be used on all cast iron, ductile iron, and concrete fittings, 22-1/2° bends and greater, tees and plugs where the thrust block can be poured to bear on undisturbed earth. Thrust blocks shall be installed on all piping systems.

All PVC Forcemain bends, tees, wyes, plugs, fittings, or other significant changes in alignment shall be braced with poured concrete thrust blocks. For Forcemain, fittings connected to PVC pipe with retainer glands will not be allowed. See drawings for thrust block details.

Thrust blocks on all other piping systems shall be installed with thrust blocks as detailed on the drawings. The thrust blocking shall be sized with a bearing surface such that the soil pressure loads resulting from the pipe's maximum internal operating pressure times a 2.5 multiplier does not exceed 1500 psf unless noted otherwise.

2. Granular Cradle

All granular cradle materials shall be compacted to a minimum of 95% Standard Proctor Density in accordance with ASTM D698 and at not more than 2% below nor more than 3% above the optimum moisture content.

Overexcavation Backfill Requirement: In cases where the trench excavation is carried beyond or below the lines and grades given by the Engineer, the Contractor shall, at his own expense, backfill all such excavated space with granular cradle material in layers not to exceed eight (8) inches in thickness and compact each layer solidly in place. Where, in the opinion of the Engineer, the excavation has been carried excessively below the lines and grades given by the Engineer, the Contractor shall be required to have a minimum of one moisture density test, in accordance with ASTM D698 (Standard Proctor Test) made on the backfill material. The Contractor shall be responsible for all Standard Proctor Density Tests required for this backfill and costs for the tests shall be considered incidental to the work. Once the Standard Proctor Tests have been run, the Contractor shall, at his own expense, refill all such excessively excavated space. The backfill material shall be placed in 6 to 8 inch layers and then compacted to a minimum of 95% Standard Proctor density or that necessary to prevent settlement. Compaction of granular cradle materials within three feet of the walls of a structure shall be accomplished by the use of hand operated compaction

equipment. Use of heavy compaction equipment within three feet of the walls of a structure will not be allowed. Compaction of backfill by jetting shall not be permitted under any circumstances.

3. Granular Backfill

All granular backfill material shall be compacted in maximum 8" lifts to a minimum of 95% Standard Proctor Density in accordance with ASTM D698 and at not more than 2% below nor more than 3% above the optimum moisture content .

Care shall be taken during backfilling operations so that adjacent newly placed concrete will not be disturbed as a result of vibration due to compaction equipment.

No frozen materials shall be placed in pipe trenches as backfill materials.

4. Pipe Laying

a. Laying of pipe shall be accomplished to line and grade in the trench only after it has been dewatered and the foundation and/or bedding has been prepared. Mud, silt, gravel and other foreign material shall be kept out of the pipe and off the jointing surface.

b. All pipe laid shall be retained in position so as to maintain alignment and joint closure until sufficient backfill has been completed to adequately hold the pipe in place. All pipe shall be laid to conform to the prescribed lines and grades shown on the plans, with the limits that follow. Laser equipment shall be used for laying gravity piping.

c. Variance from established line and grade shall not be greater than one thirty-second ($1/32$) of an inch per inch of pipe diameter and not to exceed one-half ($1/2$) inch, provided that any such variation does not result in a level or reverse sloping invert; provided also, that variation in the invert elevation between adjoining ends of pipe, due to non-concentricity of joining surface and pipe interior surfaces, does not exceed one sixty- fourth ($1/64$) per inch of pipe diameter, or one-half ($1/2$) inch maximum.

d. Gravity piping, unless otherwise approved by the Engineer, shall be laid up grade from point of connection to the existing piping or from a designated starting point. The pipe shall be installed with the bell end forward or upgrade, unless approved otherwise. When pipe laying is not in progress the forward end of the pipe shall be kept tightly closed with an approved temporary plug.

e. The Forcemain may, during construction, be deflected at its joints, but under NO circumstances shall the deflection at any joint exceed the recommended limits of the manufacturer. PVC pipe may be curved to accommodate small deflections in accordance with the

recommendations of the manufacturer.

3. Miscellaneous Pipe Construction Requirements

Braced and Sheeted Trenches: Whenever necessary to prevent caving, excavations in sand, gravel, sandy soil or other unstable materials shall be adequately sheeted and braced. Where sheeting and bracing are used, the trench width shall be increased accordingly. Trench sheeting shall remain in place until the pipe has been laid, tested for defects, and repaired if necessary, and the backfill around it compacted to a depth of two feet over the top of the pipe.

Trenching by Machine or by Hand: The use of trench digging machinery will be permitted except in places where operation of same will cause damage to trees, buildings or existing structures above or below ground, in which case hand methods shall be employed.

Flow of Drains and Sewers Maintained: Adequate provision shall be made for the flow of sewers, drains and water courses encountered during the construction and the structures which may have been disturbed shall be satisfactorily restored upon completion of the work.

Property Protection: Trees, fences, poles and all other property shall be protected unless the removal is authorized and any property damaged shall be satisfactorily restored by the Contractor.

Manner of Handling Pipe and Accessories in the Trench: Proper implements, tools and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient completion of the work. All pipe fittings, valves and hydrants shall be carefully lowered into the trench, piece by piece, by means of derrick, ropes or other suitable tools or equipment in such manner as to prevent damage to pipe or pipe coating. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.

Piling Excavated Material: All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing roadways. Fire hydrants under pressure, valve pit covers, valve boxes, manholes, electrical vaults, or other utility controls shall be left unobstructed and accessible until the work is completed. Natural watercourses shall not be obstructed. Surplus material and excavated material unsuitable for backfilling shall be transported and disposed of off the site in disposal areas obtained by the Contractor.

Removal of Water: The Contractor shall at all times during construction provide and maintain ample means and devices with which to promptly remove and properly dispose of all water entering the excavations or other parts of the work until all work to be performed therein has been completed. No water containing settleable solids shall be discharged into storm sewers. The proposed method for controls of groundwater shall be submitted to the

Engineer for approval.

Pipe Kept Clean: All foreign matter or dirt shall be removed from the inside of the pipe before it is lowered in its position in the trench, and it shall be kept clean by approved means during and after laying. If, in the opinion of the Engineer, the pipe contains dirt that will not be removed during the flushing operation, the interior of the pipe shall be cleaned and swabbed, as necessary, with a bactericidal solution made up with calcium hypochlorite, chlorinated lime or sodium hypochlorite.

Preventing Trench Water From Entering Pipe: At times when the pipe laying is not in progress, the open ends of the pipe shall be closed by approved means, and no trench water shall be permitted to enter the pipe.

Cutting Pipe: Cutting of pipe for inserting valves, fittings or closure pieces shall be done in a workmanlike manner without damage to the pipe.

Permissible Deflections of Joints: Whenever necessary to deflect pipe from a straight line either in a vertical or horizontal plane to avoid obstructions, to plumb stems, or where long radius curves are permitted, the degree of deflection shall be no greater than recommended by the pipe manufacturer and shall be approved by the Engineer.

Plugging Dead Ends: Plugs shall be inserted into the joints of all dead end pipes, tees or crosses.

Barricades, Guards and Safety Provisions: To protect persons from injury and to avoid property damage, adequate barricades, construction signs, lights and guards as required shall be placed and maintained by the Contractor at his expense during the progress of the construction work and until it is safe for traffic to use the roadways. All material piles, equipment and pipe which may serve as obstructions to traffic shall be enclosed by fences or barricades and shall be protected by proper lights when the visibility is poor. The rules and regulations of OSHA and the appropriate authorities respecting safety provisions shall be observed.

Structure Protection: Temporary support, adequate protection and maintenance of all underground and surface structures, drains, piping and other obstructions encountered in the progress of the work shall be furnished by the Contractor at his expense. The structures which may have been disturbed shall be restored upon completion of the work.

Disinfection of Completed Potable Water Pipe Lines:

- a. Before being placed in service, all new pipe lines which will carry potable water or any valved sections thereof shall be disinfected to guard against a contaminated water supply. Disinfection will not be required for sewage force mains.

- b. Disinfection shall be accomplished in accordance with the provisions of AWWA Specification C-601, latest revision.
- c. In the process of disinfecting newly laid pipe, valves and other appurtenances shall be operated while the pipe line is filled with the disinfection agent. Following disinfection, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its length shall, upon test, both chemically and bacteriologically, be proved equal to the water quality served the public from the existing water supply.
- d. Repetition of Procedure: Should the initial treatment fail to result in satisfactory results, as specified above, the original disinfection procedure will be repeated until satisfactory results are obtained. The results of laboratory examination by the State certified laboratory shall be conclusive in determining whether or not the water quality is acceptable.

Cleaning Up: Surplus pipe line materials, tools and temporary structures shall be removed by the Contractor; and all dirt, rubbish and excess earth from excavation shall be hauled to a landfill by the Contractor, and the construction site shall be left clean, to the satisfaction of the Construction Manager and the Owner.

Compaction Limits: All granular backfill and structural backfill materials shall be compacted with portable, hand operated type compactors when the backfilling is within 3 feet of a structure wall or up to 2 feet minimum above the top of the pipe in the trench. In other areas where accessible larger compaction equipment may be utilized.

Concrete Cradle: Where subgrade conditions, in the opinion of the Engineer, warrant extra precautions for the bedding of pipe, the Engineer may order the construction of a concrete cradle to be installed. The design requirements for a concrete cradle shall be furnished by the Design Consultant. Payment for the concrete cradle shall be by Change Order as extra work.

D. Above Ground Piping System

1. General

All pipe of 3-inch or larger diameter shall be accurately placed and installed in accordance with the plans and shop drawings. Pipe smaller than 3-inch diameter shall be placed and installed as shown or indicated on the plans and/or diagrams, as specified or as required to make a complete installation.

All prefabricated pipe shall be manufactured to accurate measurements in accordance with the plans and specifications. Measurements and dimensions shown on the plans for prefabricated pipe which is to meet or

join existing piping or the clearance of which is controlled by the Contractor, and the measurements and dimensions as used for fabrication of the pipe shall be his entire responsibility.

Piping and tubing which is to be fabricated in the field shall be cut accurately to measurements established at the structure by the Contractor and shall be worked into place without springing or forcing. Care shall be taken not to weaken the structural portions of the structure. Piping and tubing shall be run parallel with the lines of the structure unless otherwise shown or noted on the drawings. Pipe, valves, and fittings shall be kept a sufficient distance from other work to permit easy accessibility for installation and maintenance. The whole assemblage of pipe and tube work shall be neat, orderly, and performed in a thorough workmanlike manner. Where several lines of small piping extend parallel and adjacent to each other, they shall be nested and supported in suitable racks, which in turn, shall be properly supported. No pipe shall be buried in floors unless specifically indicated on the drawings or approved by the Engineer or Design Consultant. Changes in sizes shall be made by the use of reducing fittings. The use of nipples and bushings will not be permitted. Whether or not specifically indicated on the plans, each branch of plant water, city water, natural gas or air piping shall be independently valved. A sufficient number of unions shall be incorporated in all pipe and tubing work to permit removal of any portion of the piping work, without the forced removal of undue lengths of adjacent piping.

Flanged cast iron pipe, ductile cast iron pipe, and steel pipe systems shall be constructed of flanged pipe and fittings hereinbefore specified. Flanges shall be faced true. Full faced gaskets shall be used. Provisions for adjustments in dimensions at openings for equipment shall be provided by use of spool pieces, flange fillers, or shims, as required. When the bolts of the system are made up tight, strain or stress shall not be introduced into the flanges of the equipment connected to the system.

Stud bolting in piping shall be used only in locations where regular headed bolts cannot be removed for maintenance. Where used, the stud bolts and nuts shall be bronze or stainless steel.

2. Pipe Hangers, Inserts and Supports

The Contractor shall provide specified hangers and supports as required to support the piping system in a first class workmanlike manner. No attempt has been made to show all necessary pipe hangers and supports. Under no circumstances shall pumps and similar pieces of equipment carry the weight of connected piping. Provide all necessary concrete inserts required for the attachment of hangers and supports.

Inserts shall permit adjustment of the bolt in one horizontal direction and shall be installed before the concrete is poured, except where indicated on the plans. The insert shall be galvanized malleable iron, and shall be of a type to receive a machine bolt head or nut after installation. Self drilling

expansion anchors when used shall be adequate for the load supported. Hangers and supports shall be installed at dimensions not to exceed the maximum limits listed below and at intervals required to keep the pipe in alignment and to carry the weight of the pipe and contents.

All hangers and/or pipe support assemblies, including all structural shapes, saddles, clevis, and clamps, shall be hot dipped galvanized except for those items that are stainless steel or shown otherwise. All support rods, anchor bolts, nuts and washers shall be either Type 303 or 304 stainless steel.

All horizontal pipe requiring suspension from the ceiling shall be supported using galvanized adjustable clevis hangers Grinnell Fig. 260, or equal, unless shown otherwise. All horizontal pipe requiring support from a wall shall be a galvanized steel bracket either Grinnell Fig. 195 or Fig. 199, or equal, depending on the load support requirements.

The piping shall be secured to the wall brackets with galvanized steel pipe straps. Horizontal piping requiring floor support shall be supported by cast iron adjustable pipe saddle supports Grinnell Fig. 264, or equal, and galvanized schedule 40 steel pipe.

Vertical piping passing through floors shall be supported with galvanized steel riser clamps Grinnell Fig. 261, or equal. Vertical piping 4 inch and smaller shall be supported by galvanized Unistrut No. P2542 thru No. P2546, or equal, depending on the pipe size and length and clamped with galvanized steel pipe clamps.

Horizontal piping hangers and supports shall be installed as specified hereinafter, and at locations not more than 3 feet from the end of each run-out. Hangers shall be installed not over 1 foot from each change in direction of piping. Hangers and turnbuckles shall be of a type suitable for the particular installation and will be subject to the approval of the Engineer. Brackets of an approved design may be used for the support of piping at walls, in lieu of the brackets specified above.

Cast iron pipe or ductile iron pipe shall be supported at intervals not to exceed 10 feet, either horizontally or vertically.

Schedule 40 PVC piping shall be supported at intervals not to exceed 4 feet either vertically or horizontally.

3.02 PIPE TESTING

A. General Notes:

1. Deep piping shall be tested prior to completing backfilling or covering with concrete.
2. All piping systems shall be tested. Engineer shall provide test pressures for all

pipng systems during construction.

B. Sanitary Sewer and Drain Line Testing

The Contractor shall be required to test all the sanitary sewers and drain lines installed on this project and all sections will be required to pass testing as outlined below. Testing shall be in accordance with the applicable provisions of Section 31-1.11 of the Standard Specifications for Water & Sewer Main Construction in Illinois (latest revision), except as modified herein.

Leakage tests shall be performed after the lines have been cleaned and the trench backfilled.

All gravity sanitary sewers and drain lines shall be tested by Method A, exfiltration of water or Method C, exfiltration of air. The appropriate method of leakage testing shall be determined by the Engineer based on field conditions. Along the section of sewer to be tested, the Contractor shall determine the groundwater level at each end manhole and at all intermediate manholes. The groundwater level outside each manhole shall be measured outside the manhole by excavation down to the sewer to be tested, or shall be measured in the manhole by the use of clear tubing and piping which extends through the manhole wall at or below the top of the sewer pipe to be tested. The hole through the manhole shall be sealed following successful completion of all leakage testing.

All manholes shall be included in the water exfiltration and infiltration test methods. If the exfiltration of air method is used, manholes shall be separately tested by water infiltration or exfiltration test. If the infiltration method is used, the ground around the manhole shall be soaked and water standing up to the top of the manhole. Manholes shall be bottle tight with no leakage.

The Contractor shall furnish the water to be used during the test when the exfiltration method of testing is used. If the City water system is used, all water shall be metered and the Contractor shall pay the City according to their current rates. All sewers shall be required to meet allowable leakage criteria as contained in the Standard Specifications. If any section fails to meet the test, the section shall be repaired or replaced at the Contractor's expense and retested until it meets the leakage limits. Pressure grout or concrete encasement will not be acceptable methods of repair of joints.

The Contractor shall be required to conduct deflection testing on each type of flexible sewer pipe or drain (ABS and PVC composite and PVC sewer pipe). Deflection testing shall be performed on all flexible sewer which is installed. Sections of sewer shall be tested no sooner than 30 days after the sewer has been installed. Where feasible, testing shall be initiated at the downstream sections of the sewer and be followed by the upstream sections. Testing shall be performed by pulling through the sewer by hand a rigid ball or mandrel having an outside diameter equal to 95% of the base inside diameter of the pipe as established in the ASTM Standard D3034. Base inside diameter shall be determined for truss pipe in a similar manner to that used for PVC pipe. Other instruments for measuring deflection may be used if they are approved by the Engineer.

Deflection of flexible pipe shall not exceed 5% of the base inside diameter. In the event that the deflection exceeds the 5% limit in 10% or more of the manhole intervals tested, the total sewer project shall be tested.

Where deflection is found to be in excess of 5% of the original pipe diameter, the Contractor shall excavate to the point of excess deflection and carefully compact around the point where excess deflection was found. The line shall then be retested for deflection. However, should after the initial testing the deflected pipe fail to return to the original size (inside diameter), the line shall be replaced.

D. Ductile Iron Piping and Polyvinyl Chloride Piping (PVC) Forcemain System

The sanitary forcemain on this project shall be tested as described here. After the forcemain has been laid and backfilled, it shall be subjected to a hydrostatic pressure water test of not less than one and one-half (1.5) times the normal operating pressure introduced at the lowest point of the forcemain. Duration of the pressure test shall be not less than two (2) hours and not greater than six (6) hours and the leakage during the test shall not be greater than the limit specified below.

Procedure for Test: Each valved section of pipe or forcemain shall be slowly filled with water. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made, if necessary, at points of highest elevation and afterwards tightly plugged. Temporary plugs shall be installed at the ends of the forcemain if there are no valves. Then the specified test pressure shall be applied by means of a pump connected to the pipe in a satisfactory manner. The pump pipe connection and all necessary apparatus including gages and meters shall be furnished by the Contractor. All joints showing visible leaks shall be repaired until tight. Any cracked or defective pipes, fittings, valves, or hydrants discovered in consequence of this pressure test shall be removed and replaced by the Contractor with sound material and the test shall be repeated until satisfactory to the Engineer.

Permissible Leakage: Suitable means shall be provided by the Contractor for determining the quantity of water lost by leakage under the specified test pressure. Leakage is defined as the quantity of water to be supplied in the newly laid pipe or any valved section of it necessary to maintain the specified leakage test pressure after pipe has been filled with water and the air expelled. During the test, the pressure shall be maintained between +/- 3 psi of the test pressure as described above.

The allowable leakage in gallons per hour shall not be greater than that determined by the following formula:

$$L = \frac{NDP^{0.5}}{3700}$$

Where, L = Allowable leakage in gallons per hour.

N = Number of joints in length of pipeline tested (push-on or mechanical joint).

D = Nominal diameter of pipe in inches.

P = Average test pressure during leakage test in pounds per square inch (psi) gauge.

Flanged pipe shall be "bottle tight."

The Contractor shall arrange for and make any necessary payment for water necessary for forcemain testing.

Repairs or Replacement: If the pipeline fails to meet the hydrostatic or leakage test requirements, the Contractor shall find the cause for the failure, make the necessary repairs or replacements, and repeat the test until satisfactory to the Engineer. The cost of testing the forcemain shall be included in the cost of installing the forcemain and no separate payment shall be made.

- E. Plant Water and Potable Water Service Lines (Reserved)

END OF SECTION 15265