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1/16-inch. Only stainless steel brushes shall be used to clean the welds, pipe and welding surfaces. Before any welding is performed, the D/B Company shall submit to the Engineer a copy of the D/B Company's welding procedure specification and welder's qualification record clearly showing that the welder has been tested and approved for welding per the D/B Company's submitted procedure.

#### D. Copper Tubing Joints

1. Annealed copper tubing shall be cut square, and ends reamed using suitable tools. Bending tools shall be used in making bends. Minimum bend radii shall be 1-inch for 1/4-inch O.D. tubing and 1-1/2-inches for 3/8-inch O.D. and larger. Compression fittings shall be installed in conformance with the manufacturer's instructions. Plastic coatings shall be cut back only far enough to permit installation of fittings. When a section of tubing is cut from a coil, the end of the unused portion shall be crimped closed.
2. Hard drawn copper tubing and fittings shall be assembled using silver brazing alloy and flux as recommended by the manufacturers. Tubing shall be properly cut square, ends reamed, and both fitting and tubing polished with steel wool before fluxing. Joints shall be properly heated, care being taken not to overheat. After the brazing alloy has been run in, the joint shall be wiped clean. Brazing wire shall be fluxed before using. Unless otherwise specified, copper tubing shall be installed in conformance with the manufacturer's instructions.
3. Where steel or stainless steel pipe is connected to copper tubing, insulating bushings or couplings shall be used to prevent galvanic corrosion.

### 3.04 Drilling and Tapping

- A. Wherever required steel and alloy steel pipe and fittings shall be drilled and tapped to receive drainage or any other piping. All holes shall be drilled accurately at right angles to the axis of any pipe or fitting. Where plugs are drilled, holes shall be at right angles to the face of the plug.

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- B. Unless shown otherwise, small diameter pipes, less than 2-inches, shall be connected to ductile iron pipe using one of the following methods:
1. Direct tap.
  2. Direct tap with service clamp.
  3. Direct tap boss.
- C. Threaded Joints: Pipe threads shall be concentric with the outside of the pipe and shall conform to ANSI B2.1. When threading stainless steel pipe, dies shall have 20 to 30 degree hook. Finished joints shall have no more than three threads exposed. Before assembly, pipe ends and threads shall be inspected and any defective pieces replaced. All joints shall be properly aligned before connection to prevent thread damage. Pipe dope shall be used on the male threads of all threaded connections. Teflon thread tape shall be applied two threads back from the end of the pipe or fitting to prevent shredding. Excess pipe dope shall be trimmed or cleaned off to provide adherence for paints or coatings.

### **3.05 Constructing Beneath and Beyond Structures**

- A. All pipe covered under this Section, installed under buildings or basins, shall be encased and backfilled.
- B. All pipe covered under this Section, entering buildings or basins, shall be adequately supported between the structure and undisturbed earth to prevent damage resulting from settlement of backfill around the structure.

### **3.06 Constructing Within Structures**

- A. All pipe and fittings shall be carefully examined by the D/B Company for defects just before installing and no pipe or fitting shall be installed if it is defective. If any defective pipe or fitting is discovered after having been installed, it shall be removed and replaced in a satisfactory manner with a sound pipe or fitting by the D/B Company at D/B Company's own expense.

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- B. All pipes and fittings shall be thoroughly cleaned before they are installed and shall be kept clean until they are used in the completed work. Open ends of pipe shall be kept plugged with a bulkhead during construction.
  - C. All elbows, tees, brackets, crosses, and reducers in pressure piping systems shall be adequately restrained against thrust.
  - D. Wall pipe and wall sleeves shall be accurately located and securely fastened in place before concrete is poured. All wall pipe and sleeves shall have wall collars properly located to be in the center of the wall where the respective pipes are to be installed. Pipe passing through the sleeve shall extend no more than three feet beyond the structure without a piping joint.
  - E. Wall pipe and wall sleeves shall be constructed when the wall or slab is constructed. Blocking out or breaking of the wall for later installation shall not be permitted.
  - F. Cutting or weakening of structural members to facilitate pipe installation shall not be permitted. All piping shall be installed in place without springing or forcing.
  - G. Unions shall be installed where required, at all piping connections to equipment, at all valves, and wherever necessary to facilitate the dismantling of the piping system. Flanges on equipment may be considered as unions.

### **3.07 Surface Preparation and Shop Painting**

All ferrous piping not specified to be galvanized or otherwise coated shall be cleaned and shop primed or coated in accordance with the requirements of the pipe manufacturer and these Specifications.

### **3.08 Field Painting**

Following installation and testing, all exposed or submerged steel piping shall be field primed and painted in accordance with the requirements of these Specifications. All exterior coatings on buried pipe damaged during installation shall be repaired using a coal tar epoxy as specified in this Section.

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### **3.09 Inspection and Testing**

- A. All testing shall be in accordance with the requirements of these Specifications.
- B. The Contractor shall take all precautions necessary to protect any equipment that might be damaged by the pressures used in the tests. Delicate equipment shall be valved off, removed or otherwise protected.
- C. All piping shall be securely anchored and restrained against movement prior to application of test procedures. Prior to the pressure test, pipe laid in trenches shall be partially backfilled adequately to secure the pipe during the test. All joints, fittings and valves will be left open where possible. All exposed pipe, fittings, valves and joints shall be carefully examined during the pressure test.

### **3.10 Disinfection**

Following installation and testing, potable water lines shall be disinfected in accordance with the requirements of these Specifications.

## **PLASTIC PIPING (PVC)**

### **1.01 General Design**

- A. Polyvinyl chloride pipe and appurtenances covered under this Section shall include all pipe and accessories inside and under buildings and structures to the outside face of structures and buildings, except where there is no joint at the outside face. Where there is no joint at the exterior face, this Section shall include all polyvinyl chloride pipe and accessories within two feet of the exterior face of the structure or building.
- B. This Section includes piping and fittings in utility vaults and manholes.

## 2.01 Polyvinyl Chloride (PVC) Gravity Sewer Pipe

A. Acceptability of PVC pipe for gravity sewers is indicated in the following table:

Standard Min Thick Type PVC1	Wall	Acceptable Manufacturer	Size					
			≤ 6	8 to 15	18	21	24	30 to 48
ASTM D 3034 SDR 35 12454B	SW	Open Certainteed J-M Pipe	Yes	Yes	No	No	No	No
ASTM F 789 T-3 12164B	SW	Carlton	Yes	Yes	Yes	No	No	No
ASTM F 679 T-1 12454C	SW	Open Sceptor Certainteed	No	No	Yes	Yes	Yes	Yes
ASTM F 794 Series 46 12454C	OP	Ultra-Rib Perma-Loc	No	Yes <sup>2</sup>	Yes	Yes	Yes	Yes <sup>3</sup>
ASTM F 794 Series 46 12454C	CP	Vylon	Yes <sup>4</sup>	Yes <sup>4</sup>	Yes <sup>4</sup>	Yes	Yes	Yes
The following pipe materials are available but not typically used								
ASTM D 2680 Standard 12454B	CP	PVC Truss Pipe	No	Yes	No	No	No	No
ASTM F 949 Standard 12454B	OP	A-2000	Yes	Yes	Yes	No	No	No

1 As specified in ASTM D 1784.

2 Included in Standard, but not manufactured by Perma-Loc less than 18-

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inches in diameter.

3 Included in Standard, but not manufactured by Ultra-Rib greater than 30-inches in diameter.

4 Included in Standard, but not manufactured by Vylon less than 21-inches in diameter.

SW Solid Wall

OP Open Profile

CP Closed Profile

B. All pipe shall have a minimum pipe stiffness of 46 psi at five percent deflection as determined by ASTM D 2412.

C. PVC gravity sewer pipe shall be supplied in lengths not longer than 13 feet.

D. Fittings

1. Fittings 15 inches in diameter and less shall be manufactured in accordance with ASTM D 3034. PVC compound shall be 12454B or 12454C as specified in ASTM D 1784.

a. For sizes 8-inches and less in diameter, fittings shall be molded in one-piece with no solvent welded joints. Minimum socket depths shall be as specified in ASTM D 3034, Table 2.

b. For sizes 10-inches and larger in diameter, fittings shall be fabricated from pipe conforming to ASTM D 3034 using solvent welding. No field fabrication of fittings will be allowed. All such fabrication shall be performed at the factory and the fittings shall be delivered ready for use.

2. Fittings 18 inches in diameter and larger shall be fabricated from pipe conforming to ASTM F 679 using solvent welding. No field fabrication of fittings will be allowed. All such fabrication shall be performed at the factory and the fittings shall be delivered ready for use.

E. Joints: Joints for pipe and fittings shall be of the integral bell and spigot type with a confined elastomeric gasket having the capability of absorbing expansion and contraction without leakage, when tested in accordance with ASTM D 3212. Gaskets shall meet the requirements of ASTM F 477. The joint system shall be subject to the approval of the Engineer and shall be identical for pipe and fittings.

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F. Manhole Connections

1. Solid Wall and Closed Profile Wall Pipe: The sewer shall be connected to manholes utilizing a standard pipe section.
  2. Open Profile Wall Pipe: The sewer shall be connected to manholes with an adapter piece. The adapter piece shall have an open profile pipe bell and a solid wall pipe spigot for penetrating the manhole wall.
- G. Acceptance: Acceptance will be on the basis of the Engineer's inspection and the manufacturer's written certification that the pipe and fittings were manufactured and tested in accordance with the applicable standards.

**2.02 Polyvinyl Chloride (PVC) Pressure Pipe**

A. Polyvinyl Chloride Pipe (AWWA C900)

1. All buried PVC pipe shall have belled ends for push-on type jointing and shall conform to ANSI/AWWA C900, ductile iron pipe equivalent outside diameters. All exposed pipe shall use solvent-weld couplings in accordance with ANSI/AWWA C900. Flanged joints using flange adapters shall be provided where shown on the Drawings. The pipe shall have a Dimension Ratio (DR) of 18 and shall be capable of withstanding a working pressure of 150 psi. Pipe shall be supplied in minimum lengths of 20 feet.
2. All fittings shall be of cast or ductile iron meeting the requirements of AWWA C110/ANSI A21.10 or AWWA C153/ANSI A21.53 with a minimum rated working pressure of 150 psi. Fittings shall be cement lined in accordance with AWWA C104/ANSI A21.4. Fittings shall be furnished with a bituminous outside coating.
3. Acceptance will be on the basis of the Engineer's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards, including the National Sanitation Foundation. Additionally, each piece of pipe shall be stamped "NSF Approved".

B. Polyvinyl Chloride Pipe (AWWA C905)

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1. All PVC pipe shall have belled ends for push-on type jointing and shall conform to ANSI/AWWA C905, ductile iron pipe equivalent outside diameters. The pipe shall have a Dimension Ratio (DR) of 25 and shall be capable of withstanding a working pressure of 165 psi. Pipe shall be supplied in minimum lengths of 20 feet.
  2. All fittings shall be of cast or ductile iron meeting the requirements of AWWA C110/ANSI A21.10 or AWWA C153/ANSI A21.53 with a minimum rated working pressure of 150 psi. Fittings shall be cement lined in accordance with AWWA C104/ANSI A21.4. Fittings shall be furnished with a bituminous outside coating.
  3. Acceptance will be on the basis of the Engineer's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.

C. Polyvinyl Chloride Pressure Pipe (SDR Pipe)

1. Pipe: PVC pipe shall conform to ASTM D 2241. The pipe shall have a Standard Dimensional Rating (SDR) of 26 and shall be capable of withstanding a working pressure of 160 psi.
2. Fittings: Fittings for pipe 8-inches and less in diameter shall be one-piece with no solvent-welded joints. Fittings for pipe 10-inches and larger may be fabricated using solvent welding; however, no field fabrication of fittings will be allowed. All such fabrication shall be performed at the factory and the fittings delivered ready for use.
3. All fittings shall be of cast or ductile iron meeting the requirements of AWWA C110/ANSI A21.10 or AWWA C153/ANSI A 21.53 with a minimum rated working pressure of 150 psi. Fittings shall be cement lined in accordance with AWWA C104/ANSI A21.4. Fittings shall be furnished with a bituminous outside coating. Special adapters shall be provided, as recommended by the manufacturer, to adapt the PVC pipe to mechanical jointing with cast or ductile iron pipe, fittings or valves.
4. PVC pressure pipe shall be supplied in 20 foot nominal lengths.
5. Joints: Pipe and fittings shall have integral bell and spigot type joints with elastomeric gaskets having the capability of absorbing expansion and

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contraction without leakage. Joints shall meet the requirements of ASTM D 3139; gaskets shall meet the requirements of ASTM F 477. Joint system shall be subject to the approval of the Engineer.

6. Acceptance: Acceptance will be on the basis of the Engineer's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.

#### D. Schedule Pipe

1. Unless specified otherwise, use schedule polyvinyl chloride pipe for all interior polyvinyl chloride pipe and for all chemical and chlorination system piping.
2. Piping: PVC
  - a. Schedule 80 in accordance with ASTM D 1785.
  - b. Fittings: Solvent weld socket type, same schedule as piping, ASTM D 2466 or D 2467.
  - c. Solvent Cement: ASTM D 2564.

### 2.03 Wall Sleeves and Wall Pipes

#### A. Wall Sleeves

1. For pipe sizes smaller than 3-inches, wall sleeves shall be steel oversize sleeves furnished with a full circle, integral, or continuously welded waterstop collar. The sleeve seal shall be the mechanically expanded, synthetic rubber type. Provide all associated bolts, seals and seal fittings, pressure clamps, or plates necessary to achieve a watertight installation. Sleeves shall extend the full thickness of the concrete. Sleeves and seal shall be Link Seal. Bolts shall be stainless steel.
2. For larger pipe sizes, wall sleeves shall be ductile iron mechanical joint wall sleeves. Unless specified otherwise for a specific situation, wall sleeves shall be mechanical joint bell-plain end type with waterstop/thrust collar. The waterstop collar shall be capable of withstanding a thrust force caused by a 250 psi dead end load from either direction on that size pipe. Sleeves

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shall be constructed with studs and mechanical joint [retainer] gland on the air side of the concrete structure. Provide retainer gland where required. Where the concrete structure is exposed to dirt on one side and is wet on the other side, construct with studs and glands on the dirt side. Wall sleeves shall be equal to ACIPCO A-10771.

**B. Wall Pipes**

1. Wall pipes shall be either statically ductile iron with integral waterstop collar or centrifugally cast ductile iron with a continuously welded waterstop/ thrust collar. The welded-on collar shall be attached to the pipe by the manufacturer. The collar shall be capable of withstanding a thrust force caused by a 250 psi dead end load from either direction on that size pipe. Wall pipes shall be furnished uncoated on the outside and cement lined on the inside. Unless specified otherwise, wall pipes shall be flange end type.
2. Wall pipes shall be cast and/or fabricated and lined in one manufacturer's facilities and delivered to the job site ready for use.

**2.04 Flange Adapters**

- A. The flange adaptor shall permit the connection of unthreaded, ungrooved, open-ended polyvinyl chloride pipe to ANSI/ASME B16.1, Class 125 flanges. The flange adaptor shall meet the test requirements of ANSI/ASME B16.1 for Class 125 flanges. The adaptor shall be a ductile iron casting incorporating a flange with a serrated edge, clamping bolts, and gasket. The gasket shall provide a compression seal between the adaptor, the pipe and the adjacent flange. Flange adaptors are to be used only in locations specifically at the direction of the Engineer, and in accordance with the manufacturer's recommendations. The flange adaptor shall be Mega-Flange.

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**B. Bolts and Nuts**

1. All bolts and nuts shall be made in the U.S.A. Bolts and nuts shall be threaded in accordance with ANSI/ASME B1.1, Coarse Thread Series, Class 2A external and Class 2B internal fit.
2. Bolts for exposed service shall be zinc plated, cold pressed, steel machine bolts conforming to ASTM A 307, Grade B. Nuts for exposed service shall be zinc plated, heavy hex conforming to ASTM A 563. Zinc plating shall conform to ASTM B 633, Type II.
3. Bolts for submerged service shall be stainless steel machine bolts conforming to ASTM A 193, Grade B8. Nuts shall be heavy hex, stainless steel conforming to ASTM A 194, Grade 8.

**2.05 Retainer Glands**

Retainer glands shall be ductile iron and shall be equal to EBAA Iron 1100 PV or Uni-Flange Model 1300.

**3.0 Installation**

**3.01 Cutting**

- A. When new or existing pipe is required to be cut, the pipe shall be cut in such a manner as to leave a smooth end normal to the axis of the pipe.
- B. All cutting of polyvinyl chloride pipe shall be performed with a cutting saw. All burrs shall be removed from the inside and outside edges of all cut pipe. All damaged linings and coatings shall be repaired.

**3.02 Joint Assembly**

- A. Push-On Joints: The inside of the bell and the outside of the pipe from the plain end to the guide stripe shall be wiped clean immediately before assembling the pipe joint. Then the rubber gasket shall be inserted into a groove or shaped recess in the bell. Both the bell and spigot ends to be joined shall be wiped again to ensure they are thoroughly clean. A liberal coating of special lubricant furnished by the pipe manufacturer shall be applied to the outside of the pipe. The plain end

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shall be centered in the bell and the spigot pushed home.

B. Mechanical Joints

1. The surfaces with which the rubber gasket comes in contact shall be brushed thoroughly with a wire brush just prior to assembly to remove all dirt or foreign material which may be present and to provide clean surfaces which shall be brushed with a liberal amount of soapy water or other approved lubricant just prior to slipping the gasket over the spigot end and into the bell. Lubricant shall be brushed over the gasket prior to installation to remove loose dirt and lubricate the gasket as it is forced into its retaining space.
2. Joint bolts shall be tightened by the use of wrenches and to a tension recommended by the pipe manufacturer. When tightening bolts, the gland shall be brought up toward the pipe bell. If effective sealing is not attained at the maximum torque indicated above, the joint shall be disassembled and reassembled after thorough cleaning. Overstressing of bolts to compensate for poor installation shall not be permitted.

C. Flanged Joints

1. All flange adapters shall be installed true and perpendicular to the axis of the pipe. Flanged joints shall be installed so as to ensure uniform gasket compression. All bolting shall be pulled up to the specified torque by crossover sequence. The finished pipe edge shall not extend beyond the face of the flange.
2. Connections to equipment shall be made in such a way that no torque is placed on the equipment flanges. Connecting flanges must be in proper position and alignment and no external force may be used to bring them together properly.

- D. Solvent-Welded Joints: All solvent-welded joints shall be in accordance with ASTM 2855.

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### **3.03 Constructing Beneath and Beyond Structures**

- A. All polyvinyl chloride pipe installed under buildings or basins shall be encased and backfilled.
- C. All polyvinyl chloride pipe entering buildings or basins shall be adequately supported between the structure and undisturbed earth to prevent damage resulting from settlement of backfill around the structure.

### **3.04 Constructing Within Structures**

- A. Proper and suitable tools and appliances for safe and convenient handling and lying of pipe and fittings shall be used.
- B. All pipe and fittings shall be carefully examined by the D/B Company for defects just before installing and no pipe or fitting shall be installed if it is defective. If any defective pipe or fitting is discovered after having been installed, it shall be removed and replaced in a satisfactory manner with a sound pipe or fitting by the D/B Company at D/B Company's own expense.
- C. All pipes and fittings shall be thoroughly cleaned before they are installed and shall be kept clean until they are used in the completed work. Open ends of pipe shall be kept plugged with a bulkhead during construction.
- D. All elbows, tees, brackets, crosses, and reducers in pressure piping systems shall be adequately restrained against thrust.
- E. Wall pipe and wall sleeves shall be accurately located and securely fastened in place before concrete is poured. All wall pipe and sleeves shall have wall collars properly located to be in the center of the wall where the respective pipes are to be installed. Pipe passing through the sleeve shall extend no more than three feet beyond the structure with a piping joint.
- F. Wall pipe and wall sleeves shall be constructed when the wall or slab is constructed. Blocking out or breaking of the wall for later installation shall not be permitted.

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- G. Cutting or weakening of structural members to facilitate pipe installation shall not be permitted. All piping shall be installed in place without springing or forcing.

**3.05 Inspection and Testing**

All testing shall be in accordance with the requirements of these Specifications.

**3.06 Disinfection**

Following installation and testing, potable water lines shall be disinfected in accordance with the requirements of these Specifications.

**PIPE HANGERS AND SUPPORTS**

- A. Contractor shall design and furnish all pipe supports required to support the various piping systems in accordance with the pipe manufacturer's requirements and requirements specified herein.
- B. Pipe hangers, brackets, saddles, clamps, and other supports shall be adjustable type conforming to the requirements of ANSI B31.1, Section 6; shall have ample strength and rigidity to resist the hydraulic thrusts at changes in direction and at dead ends as well as the dead weight loads and the load carried; and shall be hot-dip galvanized, including all bolts, nuts, and threaded parts.
- C. Hangers and supports shall include all hanging and supporting devices shown, specified, or required for pipe lines, apparatus, and equipment other than electrical equipment. Hangers and supports shall be painted the same as required for the supported piping.
1. Where specified or shown, bolts, stud bolts, rods, yokes, and nuts of hangers and supports shall be of steel. Bolts shall not be less than 1/2-inch diameter.
  2. Except where otherwise shown, specified, or required, hangers, supports, anchors and concrete inserts shall be the standard types as manufactured by Grinnell Co., B-Line, Elcen Co., Fec and Mason

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Manufacturing Co. or equal, meeting the requirements specified herein. Non-metallic supports shall be standard types as manufactured by Aickinstrut, Inc. or equal.

D. Hangers and supports shall be adequate to support the pipe lines, apparatus, and equipment in proper position and alignment under all operating conditions. On pipes 3-inch in diameter and larger which are covered with insulation, hangers and supports shall include proper pipe protection saddles. Design and select hangers and supports in accordance with MSS Standard Practices: SP-58, Pipe Hangers and Supports - Materials and Design; and SP-69, Pipe Hangers and Supports - Selection and Application.

1. Provide saddle stand or stanchion where appropriate to piping configuration. Fabricate adjustable type saddle stands using a length of wrought pipe fitted at the base with a standard threaded flange and at the top with an adjustable saddle or roll. Bolt and grout the base flange to the floor or foundation. Stanchions shall be of similar construction to the saddle stand, except that they shall be fitted at the top with cast iron pipe saddle supports or with pipe stanchion saddles with yokes and nuts.
2. Provide anchors where specified, shown, or required for holding the pipelines and equipment in position or alignment. Design anchors for rigid fastening to the structures, either directly or through brackets.

Provide galvanized inserts in concrete structures where required for fastening supporting devices. Design inserts to permit the rods to be adjusted horizontally in one plane and to lock the rod nut or head automatically. Provide nail slots in the exposed flanges of the insert.

Where specified or shown, bolts, stud bolts, rods, yokes and nuts of hangers and supports shall be of silicon bronze or stainless steel with dimensions, threads and sizes equivalent to those specified in steel.

Where submerged in process fluids or where located in covered manholes, bolts, stud bolts, rods, yokes and nuts of hangers and supports shall be of silicon bronze, unless otherwise noted.

E. Fabricate brackets for support of piping from walls and columns using welded wrought steel design for maximum loads consistent with manufacturer recommendations for light, medium and heavy duty support

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service. When medium or heavy brackets are bolted to walls, provide back plates of adequate size and thickness to distribute the load against the wall. When used on concrete walls the back plates shall be cast in the concrete. Where the use of back plates is not practicable, the brackets shall be fastened to the wall in such a manner that the safe bearing strength of the wall will not be exceeded. Pipe rolls or chairs shall be of the cast iron type. Pipe rolls shall be provided with threaded rods.

- F. Spacing pipe hangers and supports as recommended by the pipe Manufacturer, but in no case shall the spacing of hangers exceed the spacing noted on the Drawings.
1. Where concentrations of valves, fittings, and equipment occur, closer spacing of supports will be required. In no case shall any total hanger load (weight of piping, insulation, and contents) exceed the load carrying capacities for hot rolled steel rod ASTM A36.
  2. Where vertical pipe runs exceed 15 feet, provide carbon steel riser clamps for support and steadying of the pipe unless otherwise indicated. Where possible, riser clamps shall be fitted and bolted below a coupling, flange, or hub. Maximum spacing of clamps shall be 15 feet.

G. Reference Standards:

1. Structural steel ASTM A36 and A283
2. Steel bars (grade 1022) ASTM A575
3. Steel castings (grade N-1) ASTM A27
4. Iron castings (grade 35) ASTM A48
5. Cast iron pipe fittings (class 125) ANSI B16.1
6. Malleable iron castings ASTM A47

7. Bolting materials

	Steel	Silicon Bronze	Stainless Steel
Bolts, yokes & studs	ASTM A307	ASTM B98 (Alloy A)	ASTM A276 (Type 316)
Nuts	ASTM A563		
Tensile Strength	60,000 – 72,000 psi	> 70,000 psi	> 75,000 psi
Yield Strength	38,000 – 50,000 psi	> 38,000 psi	> 30,000 psi
Elongation	27% maximum	17% maximum	< 35%
Reduction of Area	35 – 55%	----	< 45%

H. Cable Trays. Cable tray systems shall be composed of straight sections, fittings, and accessories as defined in the latest NEC Article 392 and the latest NEMA Standards publication VE-1. The cable tray and fittings shall be galvanized steel. Provide ladder type cable trays with 9-inch spacing, a minimum loading depth of 4 inches and a nominal width as shown.

1. Loading capacities shall meet NEMA classification with a safety factor of 1.5.
2. Install cable trays per the latest NEMA VE-2.

Cable trays and fittings shall be as manufactured by Husky, B-Line, T.J. Cope, or

**Coatings**

**COATING SCHEDULE**

Exposures	Surfaces	System Schedule	
		Non-Ferrous Metals Substrate	Ferrous Metals Substrate
Interior	Piping	157	144
Exterior	Piping	257	247
Exterior Below Grade	Piping	257	247

Submerged Water	Piping	-	344W
Submerged Wastewater	Piping	-	544

### Schedule Numbering Guide

First Number - Exposure		Second Number - Substrate		Third Number - Coating Type		Final Letter	
1	Interior and Weather Protected	1	Non-Ferrous Metals	1	Alkyd	S	Sewage
2	Exterior Weather Exposure	2	Wood	2	Asphaltic	W	Potable Water
3	Submerged in Potable Water but Protected from Sunlight	3	Concrete, Concrete Block, Masonry	4	Epoxy	F	Floors
4	Submerged in Potable Water and Exposed to Sunlight	4	Ferrous Metals	5	Vinyl	C	Severe Chemical Exposure
5	Submerged in Wastewater	5	Galvanized Ferrous Metals	6	Coal Tar		
		6	Drywall	7	Polyurethane		
		7	PVC Pipe	8	Acrylic		
				9	Zinc		
				0	Latex		

## Material Schedules

Surface Preparation: SP-10					
System: 144					
Type: Epoxy					
Use: Interior Ferrous Metal					
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Thiamec	Induron	Amercon
1st	3.0 - 5.0	Carboguard 893	Series 66-1211 Epoxoline Primer	Armorguard P-14 Primer	Amercoat 370 or 385
2nd	4.0 - 6.0	Carboguard 890	Series 69-Color Hi-Build Epoxoline II	Armorguard Epoxy	Amercoat 370 or 385
3rd	4.0 - 6.0	Carboguard 890	Series 69-Color Hi-Build Epoxoline II	Armorguard Epoxy	Amerlock 2
System	12.0				

Surface Preparation: SP-10					
System: 247					
Type: Polyurethane					
Use: Exterior Ferrous Metal					
Coat	Minimum Dry Film Thickness (Mils)	Carboline	Thiamec	Induron	Amercon
1st	3.0	Carboguard 892	Series 66-1211 Epoxoline	Armorguard P-14 Primer	Amercoat 370 or 385
2nd	4.0 - 6.0	Carboguard 890	Series 66-Color Epoxoline	Armorguard Epoxy	Amercoat 370 or 385
3rd	2.0 - 3.0	Carboline 133 HB	Series 74 Endura-Shield IV	Inductane 5500 Enamel	Amercoat 450 Series
System	11.0				

System: 257 Type: Polyurethane Use: Exterior Non-Ferrous Metals			Surface Preparation: SP-1		
Coat	Minimum Dry Film Thickness (Mils)	CarboLine	Thiamec	Incluron	Ameron
1st	4.0 - 6.0	Penetrating Sealer	Series 66-Color Ft-Build Epoxoline	Amerguard Epoxy	Amercoat 370 or 385
2nd	2.0 - 3.0	Carbothane 133 11B	Series 74-Color Endura-Shield IV	Indurethane 5500 Enamel	Amercoat 450 Series
System	8.0				

System: 34W Type: Epoxy Use: Submerged Ferrous Metal-Potable Water			Surface Preparation: SP-10 All coatings provided under this system shall be NSF: 61 approved		
Coat	Minimum Dry Film Thickness (Mils)	CarboLine	Thiamec	Incluron	Ameron
1st	3.0	Carboguard 891	Series 20-1211 Pota-Pox Rec	PE-54 Epoxy	Amercoat 370
2nd	4.0 - 6.0	Carboguard 891 - 898	Series 20-1255 Pota-Pox Boige	PE-54 Epoxy	Amercoat 370
3rd	4.0 - 6.0	Carboguard 891 - 8800	Series 20-WH02 Pota-Pox Tank White	PE-54 Epoxy	Amercoat 370
System	12.0				

## Pipe Identification and Color Coding

Pipe System	Paint Colors		Stencil Text
	Pipe	Letters and Arrows	
Air (Compressed)	Light Green	Black	Air
Air (Process)	Light Green w/Black Bands	Black	Air Process
Air, Instrument	Light Purple	Black	Air Instrument
Alum	Dark Blue/w Light Brown Bands	Light Brown	Alum
Ammonia Gas	Yellow w/Dark Green Bands	Dark Green	Ammonia Gas
Ammonia Solution	Yellow w/Light Blue Bands	Light Blue	Ammoniation Solution
Backwash Water	Light Grey w/Light Green Bands	Light Green	Backwash Water
Chlorine Gas	Yellow w/Red Bands	Red	Chlorine Gas
Chlorine Solution	Yellow	Black	Chlorine Solution
Dewatering	Black w/Orange Bands	Orange	Dewatering
Digested Sludge	Dark Brown w/Red Bands	Red	Digested Sludge
Drains (Plant)	Black w/White Bands	White	Drain
Effluent, Secondary	Light Grey w/Black & White Bands	Black	Secondary Effluent
Filter Effluent	Light Grey w/White Bands	White	Filter Effluent
Filtrate	Black w/Yellow Bands	Yellow	Filtrate
Foam Spray Water	Dark Green	White	Foam Spray Water
Gasoline	Orange	White	Gasoline
Hydraulic Fluid	Purple	White	Hydraulic Fluid
Injector Water	Light Grey w/Purple Bands	Light Purple	-
Lubricating Oil/Grease	Dark Blue w/Red Bands	Red	Lubricant Oil/Grease
Mixed Liquor (Aeration Tank Effluent)	Light Grey w/Pink Bands	Pink	Mixed Liquor
Polymer	Pink w/Dark Green Bands	Dark Green	Polymer
Potable Water	Light Blue	White	Potable Water (Cold) (Hot)

Pipe System	Paint Colors		Stencil Text
	Pipe	Letters and Arrows	
Raw Sewage (Wastewater)	Dark Grey	Orange	Sewage
Return Activated Sludge	Light Brown	White	Return Sludge
Scrubber Water	Light Green w/Dark Brown Bands	Dark Brown	-
Scum	Light Brown w/Pink Bands	Pink	Scum
Scum Decant	Light Brown w/Red Bands	Red	Scum Decant
Sump Drains (Plant)	Light Grey w/Orange Bands	Orange	Sump
Thickener Filtrate (Supernatant)	Light Grey w/Dark Brown & Light Brown Bands	Light Brown	Thickener Filtrate (Supernatant)
Thickened Sludge	Light Brown w/Light Green Bands	Light Green	Thickened Sludge
Utility Water	Dark Green w/Yellow Bands	Yellow	Utility Water (Non-Potable)
Vents (Plant)	Black	White	Vent (Plant)
Waste Activated Sludge	Light Brown w/Black Bands	Black	Waste Sludge

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### Color Coding General Notes

1. All banding to be 2-inches wide and four feet on center.
2. Sample, drain, vent, metering, blowoff, decant, and hot lines shall be painted the same color combination as the piping system from which the line originates unless specified otherwise above. The additional pertinent text shall be applied to the pipe.
3. Insulated pipe, jacketed with canvas, shall be painted with the color combination specified above.
4. Insulated pipe, jacketed with aluminum and/or stainless steel shall have the jacket unpainted. When valves and fittings for such lines are not insulated, the valves and fittings shall be color coded.
5. Building service lines such as plumbing lines, HVAC lines, and electrical conduit, shall not be color coded but shall be painted the same color as the background construction.
6. All sludge lines not otherwise specified above shall be painted dark brown and stenciled.
7. All polymer lines not otherwise specified above shall be painted pink and stenciled.
8. All lettering shall be done in capital letters of approved size and type.
9. Legend symbols shall be applied on piping on every run and spaced not greater than 8 feet apart.
10. Text shall be applied on piping in the middle of pipe runs for runs under 50 feet or in one room, whichever is the least distance. On runs greater than 50 feet, text shall be applied at third points in the run and no more than 35 feet apart.
11. Pumps, chemical tanks and other items of equipment to be painted shall be painted a color corresponding to their service, in accordance with the above schedule.

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## **PIPING TESTING AND ACCEPTANCE**

### **1.01 Test Mediums**

The County will provide the necessary water required for testing the Work. The D/B Company shall furnish all other test mediums. The D/B Company shall furnish all equipment, necessary piping and required labor to transport water from its source to the test location for use in testing.

### **2.01 Test Equipment**

The D/B Company shall furnish all labor and equipment, including required pumps with regulated bypass meters and gauges, for conducting of the piping tests.

### **3.01 Testing**

- A. The entire length of all pressurized piping and gravity lines shall be field tested for tightness by a test as described in this Section.
- B. The timing and sequence of testing shall be scheduled by the Contractor, subject to the approval of the County. The D/B Company shall provide the County with a minimum of 24 hours notice prior to the start of any test. All tests must be observed by the County.
- C. The D/B Company shall repair any leaks discovered during the initial filling of the piping and during the testing sequence. All known and visible leaks shall be repaired, whether or not the leakage rate is within allowable limits.

### **3.02 Major Piping**

- A. All piping shall be tested in accordance with this section. This shall include gravity and pressure pipelines. Storm drains shall be exempted from testing required by this Section.
- B. Clean and test lines before requesting final acceptance. Where any obstruction is met, clean the lines by means of rods, swabs, or other instruments. Flush out lines and manholes before final inspection.

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### C. Gravity Pipelines

1. Pipe lines shall be straight and show a uniform grade between manholes. Correct any discrepancies discovered during inspection.
2. Pipe joints for pipelines 30-inches] in diameter and larger shall be air tested individually. The joint tester assembly shall be placed over the joint and shall pressurize the joint area to 4 psi. The pressure shall not drop more than 2 psi in 10 seconds. The joint tester assembly shall be equal to that as supplied by Cheme Industries, Inc.
3. Infiltration Tests: Use only when groundwater is two feet above the top of the pipe.
  - a. Install suitable weirs in manholes to determine the leakage of ground water into the sewer. Measure leakage only when all visible leaks have been repaired and the ground water is two feet above the top of the pipe. If leakage in any section of the pipeline exceeds 100 gpd/inch/diameter/mile, locate and repair leaks. After repairs are completed, re-test for leakage.
  - b. Furnish, install and remove the necessary weirs, plugs and bulkheads required to perform the leakage tests. Where continuous monitoring of low level is required, the D/B Company shall provide and operate monitoring equipment.
4. Exfiltration Tests: Choose one of the following when groundwater is not two feet above the top of the pipe.
  - a. Hydrostatic Test
    - (1) Test pipe between manholes or structures with a minimum of 10 feet hydrostatic pressure, measured at the center of the pipe at the upstream manhole or structure.
    - (2) The ends of the pipe in the test section shall be closed with suitable watertight bulkheads. Inserted into the top of each bulkhead shall be a 2-inch pipe nipple with an elbow. At the upper end of the test section, a 12-inch riser pipe shall be connected to the 2-inch nipple. The test section of pipe shall be filled through the pipe connection in the lower bulkhead which

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shall be fitted with a valve, until all air is exhausted and until water overflows the riser pipe at the upper end. Water may be introduced into the pipe 24 hours prior to the test period to allow complete saturation. House service lines, if installed, shall also be fitted with suitable bulkheads having provisions for the release of air while the test section is being filled with water.

- (3) During the test period, which shall extend over a period of 2 hours, water shall be introduced into the riser pipe from measured containers at such intervals as are necessary to maintain the water level at the top of the riser pipe. The total volume of water added during the test period shall not exceed that specified for infiltration.

b. Low-Pressure Air Test

- (1) Prior to air testing, the section of pipeline between manholes or structures shall be thoroughly cleaned and wetted. Immediately after cleaning or while the pipe is water soaked, the sewer shall be tested with low-pressure air. At the D/B Company's option, pipelines may be tested in lengths between manholes or in short sections (25 feet or less) using Air-Lock balls pulled through the line from manhole to manhole. Air shall be slowly supplied to the plugged sewer section until internal air pressure reaches approximately 4.0 psi. After this pressure is reached and the pressure allowed to stabilize (approximately two to five minutes), the pressure may be reduced to 3.5 psi before starting the test. If a 1.0 psi drop does not occur within the test time, then the line has passed the test. If the pressure drops more than 1.0 psi during the test time, the line is presumed to have failed the test, and the Contractor will be required to locate the failure, make necessary repairs and retest the line. Minimum test time for various pipe sizes, in accordance with ASTM C 828 is as follows:

Nominal Pipe Size, inches	T (time) Min/100 Feet
8	1.2
10	1.5

Nominal Pipe Size, inches	T (time) Min/100 Feet
12	1.8
14	2.0
15 & 16	2.1
18	2.4
21	3.0
24	3.6
27	4.2
30	4.8
36	6.0
39	6.6
42	7.3
48	8.6

- (2) Required test equipment, including Air-Lock balls, braces, air hose, air source, timer, rotometer as applicable, cut-off valves, pressure reducing valve, 0-15 psi pressure gauge, 0-5 psi pressure gauge with gradations in 0.1 psi and accuracy of  $\pm$  two percent, shall be provided by the D/B Company.
- (3) The D/B Company shall keep records of all tests made. Such records shall show date, line number and stations, operator and such other pertinent information.
- (4) The D/B Company is cautioned to observe proper safety precautions in performance of the air testing. It is imperative that plugs be properly secured and that care be exercised in their removal. Every precaution shall be taken to avoid the possibility of over-pressurizing the line.

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5. PVC Deflection Test: Test PVC gravity pipelines for excessive deflection by passing a "pig" through the line with a diameter equal to 95 percent of the nominal inside diameter of the pipe. Excavate and install properly any section of pipe not passing this test. Re-test until results are satisfactory. This test shall be performed within the first 30 days of installation or during final inspection.

D. Pressure Pipelines

1. All sections of pipeline subject to internal pressure shall be pressure tested in accordance with AWWA C600. A section of line will be considered ready for testing after completion of all thrust restraint and backfilling.
2. Each segment of pipeline between line valves shall be tested individually.
3. Test Preparation
  - a. For pipelines less than 24-inches in diameter, flush pipeline section thoroughly at flow velocities greater than 2.5 feet per second, adequate to remove debris from pipe and valve seats. For pipelines 24-inches in diameter and larger, the main shall be carefully swept clean and mopped. Partially operate valves and hydrants to clean out seats. Provide correctly sized temporary outlets in number adequate to achieve flushing velocities.
  - b. Provide temporary blocking, bulkheads, flanges and plugs as necessary, to assure all new pipe, valves and appurtenances will be pressure tested.
  - c. Before applying test pressure, air shall be completely expelled from the pipeline and all appurtenances. Unless permanent air vents are in place, insert temporary corporation stops at highpoints to expel air as line is filled with water.
  - d. Fill pipeline slowly with water. Provide a suitable pump with an accurate water meter to pump the line to the specified pressure. Differential pressure at valves and hydrants shall equal the maximum possible, but shall not exceed manufacturer's pressure rating. Where necessary, provide temporary back pressure to meet the differential pressure restrictions.

- e. Valves and hydrants shall not be operated in either the opening or closing direction at differential pressures above their rated pressure.
4. The test pressure shall be measured at the lowest point in the test segment and shall be maintained for a minimum of two hours. Test piping in accordance with the minimum test pressures shown in Table 5A-1:
5. The test pressure shall not vary by more than 5 psi for the test duration. Should the pressure drop more than 5 psi at any time during the test period, the pressure shall be restored to the specified test pressure. Provide an accurate pressure gage with graduation not less than 5 psi.
6. Leakage: Leakage shall be defined as the quantity of water that must be pumped into the test section equal to the sum of the water, to maintain pressure within 5 psi of the specified test pressure for the test duration plus water required to return line to test pressure at the end of the test. Leakage shall be the total cumulative amount measured on a water meter.
7. Test Results: No test section shall be accepted if the leakage exceeds the limits determined under Section 4 of AWWA C600. The leakage test shall be repeated until the test section is accepted. All visible leaks shall be repaired regardless of leakage test results.
8. Completion: After a pipeline section has been accepted, relieve test pressure. Record type, size and location of all outlets on record drawings.

### 3.03 Miscellaneous Piping

- A. Upon completion of each piping system or sub-system, blow the lines free of dirt and debris and test. Wherever possible, test before the trench is backfilled. Drain piping shall be tested prior to encasement in concrete. The minimum test duration shall be one hour. The pipeline shall fail the test if a measurable pressure drop is observed. Test in accordance with the following requirements:

System	Test Medium	Test Pressure	Material
Low Pressure Air Lines (less than 4")	Air	15 psi	Stl
Chemical Feed Lines (Gases) [Chlorine]	Nitrogen Gas	150 psi 30 psi	BSP PVC

System	Test Medium	Test Pressure	Material
Chemical Feed Lines (Liquids) [Ferric Chloride] [Chlorine]	Water Water	50 psi 50 psi	PVC PVC
Hydraulic Tubing	Service Fluid	50 psi above operating	All
Pneumatic Tubing	Air	50 psi	All
Drain Piping (less than 6")	Water	5 psi	All

- B. Repair and retest any piping system found to be leaking.

### 3.04 Major Air Piping

- A. All air piping, 4-inches and larger, subject to internal pressure not listed under miscellaneous piping of this Section shall be tested in accordance with this Article.
- B. Each segment of pipeline between line valves shall be tested individually.
- C. Test Preparation
1. For pipelines less than 24-inches, the pipeline shall be cleaned using a pig or swab to remove all dirt and debris. For pipelines 24-inches in diameter and larger, the pipeline shall be carefully swept. Partially operate valves to clean out seats.
  2. Provide temporary blocking, bulkheads, flanges, and plugs as necessary to assure all new pipe, valves, and appurtenances will be pressure tested. Provide an air tap as required for filling the pipeline.
  3. Test equipment to be provided by the D/B Company shall include Air-Lock balls, braccs, air hoses, air source, timer, cut-off valves, 30 psi pressure gauge with minimum graduations of 0.2 psi and an accuracy of  $\pm 2$  percent.
  4. Fill the pipeline slowly with air until the test pressure has been reached. Allow the pressure to stabilize for 15 minutes.
- D. Test the pipeline at a test pressure of 25 psi for one hour. If a measurable pressure drop is observed by the end of the test period, the pipeline has failed the test. All

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leaks shall be located and repaired and the system retested until no measurable pressure drop is observed.

- E. Completion: After a pipeline has been accepted, relieve the test pressure.

### **3.05 Manholes**

- A. Prior to testing manholes for watertightness, all liftholes shall be plugged with a non-shrink grout, all joints between precast sections shall be properly sealed and all pipe openings shall be temporarily plugged and properly braced. Each manhole shall pass one of the following tests:

1. Exfiltration Tests: The manhole, after proper preparation as noted above, shall be filled with water. The maximum allowable leakage shall be 0.1 gallon per hour per foot of diameter per foot of depth. Tests shall last a minimum of eight hours. The manholes may be backfilled prior to testing.
2. Vacuum Tests: The manhole, after proper preparation as noted above, shall be vacuum tested prior to backfilling. The test head shall be placed at the inside of the top of the cone section and the compression head inflated to 40 psi to affect a seal between the vacuum base and the manhole structure. Connect the vacuum pump to the outlet port with the valve open. A vacuum of 10-inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to 9-inches. The manhole shall pass if the time is greater than 60 seconds for 48-inch diameter manholes. If the manhole fails the initial test, necessary repairs shall be made with non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained. Vacuum testing equipment shall be equal to that as manufactured by P.A. Glazier, Inc.

### **3.06 Repairs**

If the leakage exceeds the specified allowable limits, the point or points of leakage shall be sought out and remedied by the D/B Company at no additional cost to the County. Repair methods must be approved by the County.

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**3.07 Flushing and Cleaning**

The systems shall not be used, except for chemical cleaning, until the cleaning has been accomplished.

**3.08 Final Acceptance**

- A. No pipeline installation shall be accepted until all known and visible leaks have been repaired, whether or not the leakage is within the maximum allowable limits.
- B. The D/B Company will certify that all required tests have been successfully completed before the Work is accepted.

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## VALVES

### 1.01 Valves

This Section does not include valves for combustible or flammable liquids or gases. The equipment shall include, but is not limited to, the following:

1. Gate Valves
2. Knife Gate Valves
3. Butterfly Valves
4. Plug Valves
5. Resilient Seat Ball Valves
6. Bronze Ball Valves
7. Stainless Steel Ball Valves
8. Check Valves
9. Air Valves
10. Surge Relief Valves
11. Pinch Valves
12. Diaphragm Valves
13. Needle Valves
14. Flap Valves
15. PVC Ball Valves
16. PVC Check Valves
17. Pressure Relief Valves
18. Pressure Regulators

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19. Mud Valves
  20. Fire Hydrants
  21. Yard Hydrants
  22. Backflow Preventers
  23. Decanting Column
  24. Valve Operator Accessories
  25. Motorized Actuators

**2.01 General**

- A. Provide valves of same manufacturer throughout where possible.
- B. Provide valves with manufacturer's name and pressure rating clearly marked on the outside of the valve body.
- C. All exposed bolts, nuts, and washers for buried or submerged valves shall be stainless steel. All exposed nuts, bolts, springs, washers, and miscellaneous hardware shall be zinc plated in accordance with ASTM B 633, Type II unless specified otherwise.

**2.02 Shop Painting**

- A. All exterior ferrous metal surfaces of exposed or submerged valves and appurtenances shall receive a coating of rust-inhibitive primer compatible with the finish paint specified by the valve manufacturer. The exterior of all buried valves shall have a factory applied, two coat coal tar epoxy coating system. The coal tar epoxy shall be Tnemcc -Tar 46-413, Indurall Ruffstuff 2100 Coal Tar Epoxy or KopCoat Bitumastic No. 300-M. Each coating shall have a dry film thickness of 8-10 mils.
- B. All interior ferrous metal surfaces of valves, except for finished or bearing surfaces, and appurtenances shall be provided with two coats, interior epoxy coating conforming to the requirements of AWWA C550 and NSF 61. The

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coating shall be equal to Tnemec Series 20 Pota Pox, Valspar Series 78 Hi-Build Epoxy, or KopCoat Hi-Gard Epoxy. The coating system shall have a dry film thickness of 4 - 6 mils. Valves for air and gas service shall be

### **2.03 Gate Valves (GV)**

- A. Valves 3-Inches in Diameter and Smaller: Gate valves shall be bronze, heavy duty, rising stem, wedge type with screwed or union bonnet. Valve ends shall be threaded or solder type as appropriate. Valves shall have a minimum 200 psi working pressure for water. Valves shall be made in the U.S.A. Gate valves shall be equal to Crane No. 428 (threaded) or Crane No. 1334 (solder end).
- B. Valves 4-Inches through 12-Inches in Diameter: Gate valves 4 through 12-inches shall be resilient wedge type conforming to the requirements of AWWA C509 rated for 200 psi working pressure.
1. Valves shall be provided with two O-ring stem seals with one O-ring located above and one O-ring below the stem collar. The area between the O-rings shall be filled with lubricant to provide lubrication to the thrust collar bearing surfaces each time the valve is operated. At least one anti-friction washer shall be utilized to further minimize operating torque. All seals between valve parts, such as body and bonnet, bonnet and bonnet cover, shall be flat gaskets or O-rings.
  2. The valve gate shall be made of cast iron having a vulcanized, synthetic rubber coating, or a seat ring attached to the disc with retaining screws. Sliding of the rubber on the seating surfaces to compress the rubber will not be allowed. The design shall be such that compression-set of the rubber shall not affect the ability of the valve to seal when pressure is applied to either side of the gate. The sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either direction.
  3. All internal ferrous surfaces shall be coated with epoxy to a minimum thickness of 4 mils. The epoxy shall be non-toxic, impart no taste to the water and shall conform to AWWA C550, latest revision.
  4. Gate valves 4 through 12-inches shall be manufactured by American-Flow Control, Mueller or M & H Valve or approved equal.
- C. Valves 16-Inches in Diameter and Larger: Valves shall be double-disc type

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conforming to the requirements of AWWA C500. Valves shall be designed for horizontal installation with tracks and rollers, bypass valves, and bevel gear type actuator. Valves shall be rated for 150 psi working pressure.

- D. Valve ends shall be mechanical joint type except where flanged or restrained joint ends are required. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.
- E. Operators
  - 1. Manually operated valves, including geared valves, shall be non-rising stem type having O-ring seals.
  - 2. Valves for buried service shall have a nut type operator and shall be equipped with a valve box and extension stem as specified in this Section unless access to the operator is provided by a manhole.
  - 3. Valves for non-buried service shall be equipped with a handwheel operator. Valves six feet or more above the operating floor shall be equipped with a chainwheel operator and chain for operation from floor level.
- F. Gate Valves 16 inches in diameter and larger shall be manufactured by American-Flow Control, Mueller or M&H Valve or approved equal.

## **2.05 Butterfly Valves**

- A. Butterfly Valves for Liquid Service (BV)
  - 1. Butterfly valves shall be resilient seated, short body design, and shall be designed, manufactured, and tested in accordance with all requirements of AWWA C504 for Class 150B.
  - 2. Valve bodies shall be ductile iron conforming to ASTM A 536, Grade 65-45-12 or ASTM A 126, Grade B cast iron. Shafts shall be ASTM A 276, Type 304 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A 536, Grade 65-45-12 or ASTM A 126, Grade B cast iron. The resilient valve seat shall be located either on the valve disc or in the valve body and shall be fully field adjustable and field replaceable.
  - 3. Actuators

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- a. Valves for non-buried service, 3 through 8-inches in diameter, shall be lever operated. Hand levers shall be steel with a non-metallic grip. The lever shall be capable of being locked in any position.
  - b. Valves for buried service or non-buried service, 10-inches or greater in diameter shall be equipped with traveling nut, self-locking type geared manual actuators designed, manufactured and tested in accordance with AWWA C504. Actuators shall be capable of holding the disc in any position between full open and full closed without any movement or fluttering of the disc. Actuators shall be furnished with fully adjustable mechanical stop-limiting devices. Actuators that utilize the sides of the actuator housing to limit disc travel are unacceptable. Valve actuators shall be capable of withstanding a minimum of 450 foot pounds of input torque in either the open or closed position without damage.
  - c. Actuators for buried valves larger than 10-inches shall be mounted above ground using an extended bonnet except when the valve is located in paving or has 8 feet or less cover.
  - d. Valves shall be equipped with motorized actuators as specified in this Section.
4. Operators
- a. Valves for non-buried service, six feet or more above the operating floor shall be furnished with a chainwheel operator and chain for operation from floor level. All other valves shall be equipped with a handwheel operator.
  - b. Valves for buried service 8-inches and smaller shall have a nut type operator and shall be equipped with a valve box and stem extension required to bring the operation nut within 6-inches of finished grade. Valve boxes and extension stems shall be as specified in this Section.
  - c. Valves shall be equipped with pedestal type operators where required for operation and as specified in this Section.
5. Valves shall be installed with disc shaft horizontal [ ], except where extended bonnets are used. Valves and actuators shall have seals on all shafts and gaskets on valve actuator covers to prevent the entry of water. Actuator mounting brackets shall be totally enclosed and shall have
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6. Valve ends shall be mechanical joint type, except where flanged or restrained joint ends are shown. Flange joints shall meet the requirements of ANSI B16.1, Class 125, or Class 250, but drilled and faced to Class 125 dimensions.
  7. Butterfly valves shall be manufactured by Mueller, M & H Valve, DeZurik, or Pratt or approved equal.

B. Butterfly Valves for Air Service (BVA)

1. Butterfly valves shall be resilient seated, short body design, and shall be designed, manufactured, and tested in accordance with all requirements of AWWA C504. Valves shall be designed for a rated working pressure of 25 psi and a minimum service temperature of 250 degrees F.
2. Valve bodies shall be ductile iron conforming to ASTM A 536, Grade 65-45-12 or ASTM A 126, grade B cast iron. Shafts shall be 304 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A 536 Grade 65-45-12. The resilient valve seat shall be located either on the valve disc or in the valve body and shall be fully field adjustable and field replaceable.
3. Actuators
  - a. Valves for non-buried service, 3 through 8-inches in diameter, shall be lever operated. Hand levers shall be steel with a non-metallic grip. The lever shall be a universal locking type capable of being locked in any position.
  - b. Valves for buried service or non-buried service, 10-inches or greater in diameter shall be equipped with self-locking type, geared manual actuators designed, manufactured and tested in accordance with AWWA C504. Actuators shall be capable of holding the disc in any position between full open and full closed without any movement or fluttering of the disc. Actuators shall be furnished with fully adjustable mechanical stop-limiting devices. Actuators that utilize the sides of the actuator housing to limit disc travel are unacceptable. Valve actuators shall be capable of withstanding a minimum of 450 foot pounds of input torque in either the open or closed position without damage.

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- c. Actuators for buried valves larger than 10-inches shall be mounted above ground using an extended bonnet except when the valve is located in paving or has 8 feet or less cover.
  - d. Valves shall be equipped with motorized actuators required for operation and as specified in this Section.

4. Operators

- a. Valves for non-buried service, six feet or more above the operating floor shall be furnished with a chainwheel operator and chain for operation from floor level. All other valves shall be equipped with a handwheel operator.
- b. Valves for buried service shall have a nut type operator and shall be equipped with a valve box and stem extension required to bring the operation nut within 6-inches of finished grade. Valve boxes and extension stems shall be as specified in this Section.
- c. Valves shall be equipped with pedestal type operators where required for operation and as specified in this Section.

- 5. Valves shall be installed with disc shaft horizontal, except where extended bonnets are used. Valves and actuators shall have seals on all shafts and gaskets on valve actuator covers to prevent the entry of water. Actuator mounting brackets shall be totally enclosed and shall have gasket seals.
- 6. Valve ends shall be mechanical joint type, except where flanged or restrained joint ends are shown. Flange joints shall meet the requirements of ANSI B16.1, Class125.
- 7. Butterfly valves shall be manufactured by Keystone or Val Matic or approved equal.

**2.06 Plug Valves (PV)**

- A. Valves shall be 90 degree turn, non-lubricated, eccentric type with resilient faced plugs. Design of the valve shall provide that contact between the seat and the plug shall only occur in the final degrees of plug movement. Valves shall be suitable for throttling service and service where valve operation is infrequent.

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- B. Valves shall provide drip-tight shut-off up to the full pressure rating with pressure in either direction. Pressure ratings shall be established by hydrostatic tests conducted in accordance with ANSI B16.1. Valves shall be rated at a minimum of 150 psi.
  - C. Valves shall have a port area equal to at least 80 percent of the full pipe area.
  - D. Bodies shall be cast-iron, conforming to ASTM A 126, Class B (carbon steel for 2-inch valves).
  - E. Valve ends shall be a mechanical joint type, except where flanged or restrained joint ends are used. Mechanical joint valves shall have bell ends conforming to applicable requirements of AWWA C111/ANSI A21.11. Flanged joints shall meet the requirements of ANSI B16.1, Class 125. Flanged valves with flange-to-MJ adapters shall not be acceptable in lieu of MJ valves.
  - F. Valve seats shall be a raised, welded-in overlay of not less than 90 percent pure nickel, machined to mate with the resilient faced plug. Overlay shall be a minimum of 1/8-inch thick.
  - G. The plug shall be of semi-steel, conforming to ASTM A 126, Class B. The plug facing shall be a synthetic rubber compound of approximately 70 durometer hardness bonded to the plug. Facing material shall be abrasion resistant and suitable for service in sewage and sludge applications.
  - H. Valves shall be furnished with replaceable, sleeve-type bearings in the upper and lower journals. Bearings shall comply with applicable requirements of AWWA C507. Bearing materials shall have a proven record of service of not less than five years.
  - I. The valve body shall be fitted with a bolted bonnet incorporating a stuffing box and pull-down packing gland. Packing shall be the split chevron type. Design of exposed valves shall allow visible inspection of the shaft seal, adjustment of the packing, and replacement of the packing, all without disturbing the bonnet or valve operator. The shaft seal shall comply with the requirements of AWWA C504.
  - J. Actuators
    - 1. Valves for exposed service, 3 through 8-inches in diameter, shall be lever operated. Hand levers shall be steel with a non-metallic grip.

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2. Actuators for buried service and valves 10-inches and larger, shall be equipped with manual operated geared actuators. Geared actuators shall be totally enclosed, oil lubricated, worm and gear type. Shaft seals shall be provided to prevent entry of dirt and water into the actuator. All shaft bearings shall be permanently lubricated bronze bushings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque. Construction of actuator housing shall be semi-steel. Gear actuators shall comply with requirements of AWWA C504.
  3. Gear actuators for buried valves 10-inches and larger shall be mounted above ground on an extended bonnet except when the valve is located in paving or has 8 feet or less cover.
  4. Valves and operators for submerged or buried service shall have seals on all shafts and gaskets on valve operator covers to prevent the entry of water. Operator mounting brackets for submerged service shall be totally enclosed and shall have gasket seals.

**K. Operators**

1. Valves for non-buried service, six feet or more above the operating floor shall be furnished with a chainwheel operator and chain for operation from floor level. All other valves shall be equipped with a handwheel operator.
  2. Valves, 3 through 8-inches, for buried service shall have a nut type operator and shall be equipped with a valve box and stem extension required to bring the operation nut within 6-inches of finished grade. Valve boxes and extension stems shall be as specified in this Section.
  3. Valves shall be equipped with pedestal type operators where required for operation and as specified in this Section.
- L. Butterfly valves shall be manufactured by DeZurik, or Pratt or approved equal.

**2.07 Resilient Seat Ball Valves (BLV-RS)**

- A. All ball valves shall be of the tight-closing, shaft-mounted type that fully comply with AWWA C507. The rated pressure of the ball valves shall be 150 psi and the valves shall be designed to effect tight shutoff against flow in both directions. Design of valve shall be such that with the valve in the open position, the full and

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unobstructed circular inlet and outlet port diameter shall be as specified in AWWA C507. With the valve in the closed position, the valve shall be drop-tight at the rated pressure.

- B. The valve body shall have integral support legs or pads and shall consist of two body end pieces and a center body piece through-bolted and O-ring sealed against leakage. The center body piece shall be of cast iron ASTM A 126, Class B. End pieces for valves shall be either ductile iron ASTM A 536 or cast iron ASTM A 126, Class B. Minimum body thickness shall be as specified in AWWA C507. Flanges shall be flat-faced and flange drilling shall be in accordance with ANSI B16.1, Class 125.
- C. The valve plug shall be constructed of cast iron ASTM A 48 or ductile iron and shall be taper-pinned to an upper and lower fitted shaft of 304 stainless steel.
- D. The center section shall be fitted with sleeve-type bearings contained in the body hubs. Bearings shall be corrosion resistant and self-lubricating. Maximum bearing stress shall not exceed 2,000 psi at full rated pressure differentials across the valve. Bearing surfaces shall be isolated from flow by an O-ring type cartridge seal fitted into a recess in the center body section. The plug assembly shall be supported by a thrust bearing assembly consisting of a stainless steel screw and retainer plate with permanently lubricated, oil impregnated thrust plates.
- E. Valve seats shall be retained mechanically within the body and shall be field adjustable without removing the valve from the line. The valve shall be double single seated to provide drip-tight shut off in one both directions.
- F. Actuators
  - 1. Valves for non-buried service, 3 through 8-inches in diameter, shall be lever operated. Hand levers shall be steel with a non-metallic grip. The lever shall be capable of being locked in any position.
  - 2. Valves for buried service or non-buried service, 10-inches or greater in diameter shall be equipped with traveling nut, self-locking type geared manual actuators designed, manufactured and tested in accordance with AWWA C507. Actuators shall be capable of holding the plug in any position between full open and full closed without any movement or fluttering of the plug. Actuators shall be furnished with fully adjustable mechanical stop-limiting devices. Actuators that utilize the sides of the actuator housing to disc travel are unacceptable. Valve actuators shall be

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capable of withstanding a minimum of 300 foot pounds of input torque in either the open or closed position without damage.

3. Actuators for valves larger than 10-inches and submerged valves shall be mounted above groundwater using an extended bonnet.
4. Valves shall be equipped with motorized actuators where required for operation and as specified in this Section.

G. Operators

1. Valves for non-buried service, six feet or more above the operating floor shall be furnished with a chainwheel operator and chain for operation from floor level. All other valves shall be equipped with a handwheel operator.
2. Valves for buried service shall have a nut type operator and shall be equipped with a valve box and stem extension required to bring the operation nut within 6-inches of finished grade. Valve boxes and extension stems shall be as specified in this Section.
3. Valves shall be equipped with pedestal type operators where required for operation and as specified in this Section.

H. All ball valves shall be subjected to hydrostatic, shop leakage and performance tests as specified in AWWA C507.

I. The manufacturer shall be prepared to show proof that the valves proposed to meet the design requirements of AWWA C507, Section 17.2.

J. Ball valves shall be manufactured by Pratt, GA Industries, or APCO (Willamette) or approved equal.

**2.08 Bronze Ball Valves (3-Inches and Smaller) (BLV-BZ)**

A. Ball valves shall have a single piece, bronze body construction. Valves shall have threaded ends and lever operator. Ball shall be 316 stainless steel with TFE seats and packing. Valves shall be pressure rated for 400 psi at 68 degrees F.

B. Valves shall be Apollo Series 70-100, Neles-Jamesbury Series 300, Watts No. B-6400, or Nibco T580 or approved equal.

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## **2.09 Stainless Steel Ball Valves (3-Inches and Smaller) (BLV-SS)**

- A. Ball valves 2-inches in diameter and smaller shall be 3-piece, full port and stainless steel body construction. Ball valves 2-1/2-inches in diameter shall have reduced port with 3-piece stainless steel body construction. Valve shall have threaded ends and a lever operator or motorized operator. Ball valves shall be 316 stainless steel with TFE seats and packing. Valve shall be pressure rated for 1,000 psi.
- B. Ball valves shall be manufactured by Watts Series S, Apollo Series 85 and 86, or Neles-Jamesbury Series 4000.

## **2.10 Check Valves (CV)**

- A. Swing Disc Type, Cushioned
  - 1. Check valves shall be hinged disc type with cast iron body and bronze or bronze-fitted disc. Valves shall be designed for the operating head indicated and shall not slam shut on pump shutdown. The valve shall be set to close at a differential operating pressure determined during detailed design by the D/B Company. Valves shall be equipped with a 1/2-inch stop cock at the high point of the valve for bleeding air from the line.
  - 2. Valves shall be outside weight and lever cushioned type. The cushion chamber shall be attached to the side of the valve body externally and constructed with a piston operating in a chamber that will effectively prevent water hammer at the pump discharge heads specified. The cushioning shall be by air, and the cushion chamber shall be so arranged that the closing speed will be adjustable to meet the service requirements.
  - 3. Valve ends shall be flanged, meeting the requirements of ANSI B16.1, Class 125.
  - 4. Valves shall be manufactured by APCO or GA Industries or approved equal.

## **2.11 Air Valves for Water Service**

- A. Air Release Valves: Air release valves shall be one of the following types:
  - 1. The air release valve shall automatically release air accumulations from the pipeline due to the action of the float. When the air valve body fills with air,

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the float falls freely from the orifice to allow the air to escape to the atmosphere. When all the air has been exhausted from the valve body, the float will be buoyed up to seat against the orifice and prevent water from being exhausted from the valve. The valve body and cover shall be constructed of cast iron conforming to ASTM A 126, Class B. A synthetic orifice button shall be affixed to the valve cover to provide a non-corrosive seat for the float. The float shall be constructed of stainless steel. A resilient, Buna-N seat shall be attached to the float for drop-tight closure. The float shall be free floating within the valve body.

2. The air release valve shall automatically release air accumulations from the pipeline due to the action of the float and lever mechanism. When the air valve body fills with air, the float falls. Through the leverage mechanism, this causes the resilient seat to open the orifice and allow the air to escape to the atmosphere. When all the air has been exhausted from the valve body, the float will be buoyed up. Through the leverage mechanism, this will cause the resilient seat to close the orifice, preventing water from being exhausted from the valve. The valve body and cover shall be constructed of cast iron conforming to ASTM A 126, Class B. The float shall be constructed of stainless steel and attached to a stainless steel lever mechanism. A resilient, Buna-N seat shall be attached to the lever mechanism for drop-tight closure.

B. **Air/Vacuum Valve:** The air/vacuum valve shall discharge large amounts of air as the pipeline fills and allow air to enter the pipeline as it drains or in the event of vacuum conditions. The valve shall operate by means of a non-collapsible stainless steel float which seals an orifice. As air enters the valve the float shall drop from the orifice and allow the air to escape. As water rises in the valve, the float will again seal the orifice. The valve will be of such design that the float cannot blow shut at any air velocity. All working parts shall be of stainless steel. The inside of the valve body shall be epoxy coated.

C. **Combination Air Valves:** Combination air valves shall combine the features of an air release valve and an air/vacuum valve and shall be of one of the following types:

1. Valve shall consist of an air/vacuum valve described in paragraph B. above, with an air release valve described in A. above tapped into its body. The valve shall be of two-piece body design with an isolation gate valve separating the two valves.

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2. Valve shall be single body, double orifice, allowing large volumes of air to escape out the larger diameter air and vacuum orifice when filling a pipeline and closes watertight when the liquid enters the valve. During large orifice closure, the smaller diameter air release orifice will open to allow small pockets of air to escape automatically and independently of the large orifice. The large air/vacuum orifice shall also allow large volumes of air to enter through the orifice during pipeline drainage to break the vacuum. The Buna-N seats must be fastened to the valve, without distortion, for drop-tight shut-off. The float shall be stainless steel. Valve inlet and orifice sizes shall be

- D. Surge Check Valve: Where shown on the Drawings or specified, provide a surge check valve on the inlet of the air/vacuum valve. The surge check valve shall be normally open, spring loaded valve consisting of a body, seat and plug bolted to the inlet of the air/vacuum valve. The surge check shall operate on the interphase between the kinetic energy and relative velocity flows of air and water, allowing air to pass through but water shall close the surge check, reducing the rate of water flow by means of throttling orifices in the plug to prevent shock closure of the air/vacuum valve. The surge check orifices must be an adjustable type to suit operating conditions in the field.
- E. All air valves and accessories shall be supplied by a single manufacturer and shall be GA Industries, APCO Valve Corporation or Val-Matic or approved equal.

## **2.12 Air Valves for Sewage Service**

- A. Air Release Valves: The air release valve shall automatically release air accumulations from the pipeline due to the action of the float and lever mechanism. When the air valve body fills with air, the float falls. Through the leverage mechanism, this causes the resilient seat to open the orifice and allow the air to escape to the atmosphere. When all the air has been exhausted from the valve body, the float will be buoyed up. Through the leverage mechanism, this will cause the resilient seat to close the orifice, preventing water from being exhausted from the valve. The valve body and cover shall be constructed of cast iron conforming to ASTM A 126, Class B. The float shall be constructed of stainless steel and attached to a stainless steel lever mechanism. A resilient, Buna-N seat shall be attached to the lever mechanism for drop-tight closure. The valve shall be equipped with the necessary attachments, including valves, quick disconnect couplings and hose, to permit back flushing after installation without diverting the valve.

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- B. **Air/Vacuum Valve:** The air/vacuum valve shall discharge large amounts of air as the pipeline fills and allow air to enter the pipeline as it drains or in the event of vacuum conditions. The valve shall operate by means of a non-collapsible stainless steel float which seals an orifice. As air enters the valve the float shall drop from the orifice and allow the air to escape. As water rises in the valve, the float will again seal the orifice. The valve will be of such design that the float cannot blow shut at any air velocity. All working parts shall be of stainless steel. The inside of the valve body shall be epoxy coated. The valve shall be equipped with the necessary attachments, including valves, quick disconnect couplings and hose, to permit back flushing after installation without diverting the valve. All air/vacuum valves and accessories shall be supplied by a single manufacturer and shall be by Val-O-Mat.
- C. **Combination Air Valves:** Combination air valves shall combine the features of an air release valve and an air/vacuum valve and shall be of one of the following types:
1. Valve shall consist of an air/vacuum valve described in B. above, with an air release valve described in A. above tapped into its body. The valve shall be of two-piece body design with an isolation gate valve separating the two valves.
  2. Valve shall be single body, double orifice, allowing large volumes of air to escape out the larger diameter air and vacuum orifice when filling a pipeline and closes watertight when the liquid enters the valve. During large orifice closure, the smaller diameter air release orifice will open to allow small pockets of air to escape automatically and independently of the large orifice. The large air/vacuum orifice shall also allow large volumes of air to enter through the orifice during pipeline drainage to break the vacuum. The Buna-N seats must be fastened to the valve, without distortion, for drop-tight shut-off. The float shall be stainless steel. The valve shall be equipped with the necessary attachments, including valves, quick disconnect couplings and hose, to permit back flushing after installation without diverting the valve.
- D. All air valves and accessories shall be supplied by a single manufacturer and shall be GA Industries, APCO Valve Corporation or Val-Matic or approved equal.

### **2.13 Surge Relief Valves**

- A. Surge relief valves shall be angle type, APCO Series 3000 or GA Figure 624-D or 625-D.

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- B. Flanges shall be in accordance with ANSI/ASME B16.1, Class 125.
  - C. Valves shall be set to open at 100 psi. The opening set point shall be adjustable to 175 psi.

#### **2.14 Pinch Valves**

- A. Valves are to be of the full metal body, mechanical pinch type with flanged joint ends on both body and rubber sleeve. Port areas shall be 100 percent of the full pipe area through the entire valve length.
- B. All internal valve metal parts are to be completely protected by the flexible elastomer pinch tube. The elastomer pinch tube shall be one-piece construction with integral flanges. The pinch tube shall be ANSI B16.1, Class 125, pure gum rubber, Buna-N, nylon reinforced with an exterior wrapping of 1/8-inch thick neoprene.
- C. Closing mechanism shall be double-acting and pinch the sleeve equally from two sides.
- D. Valves for buried service shall have non-rising stems equipped with standard 2-inch square operating nut. Valves for non-buried service shall have a non-rising stem and handwheel operator.
- E. The valves shall have face to face dimensions of standard gate valves, according to specification ANSI B16.10 to 6-inch size and no longer in length than twice the diameter in sizes larger than 6-inches. There shall be no cast parts in the operating mechanisms.
- F. Valves shall be manufactured by Red Valve or DeZurik or approved equal.

#### **2.15 Diaphragm Valves**

- A. Valves shall be of the straight-through, full flow design. Valves shall have a natural rubber lined cast iron body with flanged connections conforming to ANSI/ASME B16.1, Class 125. The diaphragm shall be natural rubber.
- B. Valve actuators shall be manual or pneumatic. Manual valves shall be handwheel operated rising-stem type. Pneumatic operators shall be close coupled, double acting sized to close against maximum line pressure determined during detailed

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design by the D/B Company. Actuators shall be provided by the valve manufacturer, mounted on the valve and ready for connection of air piping.

- C. Valves with pneumatic actuators shall be furnished with a pressure gauge, regulator and filter.
- D. Valves shall have a localized mechanical position indication of open and closed. Valve shall include limit switches to signal open and closed positions to a control panel.
- E. Valves shall be ITT Grinnell Dia-Flo 2800 Series or Red Valve or approved equal.

## **2.16 Needle Valves**

### **A. PVC Needle Valves**

- 1. Chemical feed needle valves shall be non-shock, thermoplastic type of Type 1, Grade 1 PVC with O-ring stem seal and teflon stem seat. Valve shall withstand 150 psi pressure and shall incorporate a positive stop for safe operation. All parts shall be corrosion resistant materials, specifically suited for process chemical.
- 2. PVC needle valves shall be manufactured by Hayward or Chemtrol or approved equal.

### **B. Stainless Steel Needle Valves**

- 1. Needle valves shall be integral bonnet design with forged stainless steel body and stem and adjustable TFE packing. Valves shall have a minimum 0.375 orifice and regulating type stem. End connections shall be 1/2-inch NPT.
- 2. Valves shall be manufactured by Whitey, No. SS-18VF8 or approved equal.

## **2.17 Flap Valves**

- A. Provide resilient seat flap valves. Valve body and flap shall be cast iron in accordance with ASTM A 126, Class B. The flange shall be drilled for anchor bolt mounting to ASME/ANSI B16.1, Class 125 flange Type F wall thimble.
- B. The valve shall operate without leakage with seating and unseating heads.

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- C. Resilient seat shall be wide seating Buna-N or neoprene, bonded in a groove machined into the valve body.
  - D. Hinge links shall be high tensile bronze conforming to ASTM B 584, Class A-865 or 304 stainless steel. Each hinge arm shall have two pivot points. A lubrication fitting shall be provided for each pivot.
  - E. The valve manufacturer shall provide expansion type anchor with a minimum embedment of 6-inches. All anchor bolts shall be 304 stainless steel.
  - F. The valve manufacturer shall provide a cast iron, Type "F" wall thimble conforming to ASTM A 126, Class B. The manufacturer shall include all necessary mounting hardware for mounting the valve to the wall thimble. All mounting hardware shall be 304 stainless steel.
  - G. Valves shall be manufactured by Rodney Hunt, Waterman or Hydro Gate or approved equal.

#### **2.18 PVC Ball Valves (PBLV)**

Ball valves shall be non-shock thermoplastic of Type 1, Grade 1 PVC with O-ring stem seal and teflon ball seat. Valves shall withstand 150 psi pressure. Valves shall have union connections at each end. Valves shall be Hayward "Safe Block", or Chemtrol TU Series, or Spears (True Union) or approved equal.

#### **2.19 PVC Ball Check Valves (PBCV)**

Ball check valves shall be non-shock thermoplastic type of Type 1, Grade 1 PVC with O-ring ball seal. The valve shall have a true union connection for easy removal. The valve shall operate in the vertical or horizontal position. Valve shall be Hayward "True Check" or Chemtrol BC Series, or Spears (Ballcheck) or approved equal.

#### **2.20 Pressure Relief Valves**

- A. Floor Type
  - 1. Floor type pressure relief valves shall be installed in the bottom of concrete tanks.

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2. The valve shall include a cast iron wall casting with integral waterstop collar, removable strainer, and resilient seat cover. The valve shall be designed so the cover and strainer are locked in the body so they cannot be separated. The valve shall have a minimum inside diameter of 4-inches.
  3. The valve shall be Clow Model F-1492, American-Flow Control TPRV-Floor Type or Troy Model A2550-RS or approved equal.

**B. Wall Type**

1. The valve shall have a cast iron body and resilient seat disc. The valve shall have a removable cast iron strainer that is retained within the valve. The valve shall be flanged in accordance with ANSI/ASME B16.1, Class 125.
2. The valve shall include a compatible wall pipe tapped to an ANSI/ASME B16.1, Class 125 template. The valve shall include stainless steel hardware required for connecting the valve to the wall pipe.
3. The valve shall be 6 -inches in diameter with the wall pipe length equal to the wall thickness.
4. The valve shall be Clow F-1494/F-1496, American-Darling TPRV-Wall Type, or Troy Model A2580 with 19200 Series wall pipe or approved equal.

**2.21 Pressure Regulators (Seal Water Piping)**

- A. Regulators shall be of a cast bronze body, stainless steel seat ring with 1/2 to 2-inch NPT threaded connections.
- B. Provide regulator with separate "Y" type strainer with 20 mesh stainless steel screen and removable plug. Attach strainer at the inlet end of regulator with bronze nipple.
- C. Unless otherwise noted, pressure regulator shall be factory set at 45 psi and have an adjustable range of 25 to 84 psi using an external adjusting screw. Valve shall be rated for 125 psig minimum inlet water pressure.
- D. Valves shall be manufactured by Watts No. 25AUB or Mueller H-9300 Series or approved equal.

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## **2.22 Mud Valves**

- A. Mud valves shall be heavy duty flange type with rising stem. Valve frame, plug, yoke and extension stem connector shall be cast iron conforming to ASTM B 126, Class 30. Valve operating stem, lift nut, and seat shall be bronze.
- B. The valve flange shall conform to ANSI/ASME B16.1, Class 125.
- C. The valve shall be Clow F-3075 or Troy A-25600 or approved equal.

## **2.23 Fire Hydrants (FH)**

- A. All fire hydrants shall conform to the requirements of AWWA C502 for 150 psi working pressure. Hydrants shall be the compression type, closing with line pressure. The valve opening shall not be less than 4-1/2-inches.
- B. In the event of a traffic accident, the hydrant barrel shall break away from the standpipe at a point above grade and in a manner which will prevent damage to the barrel and stem, preclude opening of the valve, and permit rapid and inexpensive restoration without digging or cutting off the water.
- C. The means for attaching the barrel to the standpipe shall permit facing the hydrant a minimum of eight different directions.
- D. Hydrants shall be fully bronze mounted with all working parts of bronze. Valve seat ring shall be bronze and shall screw into a bronze retainer.
- E. All working parts, including the seat ring shall be removable through the top without disturbing the barrel of the hydrant.
- F. The operating nut and direction of operation shall match the current Owner standard. The operating threads shall be totally enclosed in an operating chamber, separated from the hydrant barrel by a rubber O-ring stem seal and lubricated by a grease or an oil reservoir.
- G. Hydrant shall be a non-freezing design and be provided with a simple, positive, and automatic drain which shall be fully closed whenever the main valve is opened.
- H. Hose and pumper connections shall be breech-locked, pinned, or threaded and pinned to seal them into the hydrant barrel. Each hydrant shall have two 2-1/2-inch hose connections and one 4-1/2-inch pumper connection, all with

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National Standard threads and each equipped with cap and non-kinking chain.

- I. Hydrants shall be furnished with a mechanical joint connection to the spigot of the 6-inch hydrant lead.
- J. Minimum depth of bury shall be 4.5 feet. Provide extension section where necessary for proper vertical installation and in accordance with manufacturer's recommendations.
- K. All outside surfaces of the barrel above grade shall be painted with enamel equal to Koppers Glamortex 501 in a color to be selected by the Owner.
- L. Hydrants shall be traffic model and shall be American- Darling B-84-B, Mueller Super Centurion or M & H Valve 929 or approved equal.

#### **2.24 Yard Hydrants**

- A. Hydrants shall have a 2-inch barrel and inlet with 10-inch handwheel operator. Hydrants shall be designed for a minimum working pressure of 150 psi and shall be self-draining to prevent freezing. Valve body shall be made of bronze with a cold-rolled steel stem and packed with double O-rings. Working parts shall be removable from the top of the valve for ease of maintenance. Provide a 1-inch threaded hose connection.
- B. Yard hydrants shall be manufactured by American-Flow Control or approved equal.

#### **2.25 Backflow Preventer, Reduced Pressure Type (BFP) (3/4 to 2-Inch Size)**

- A. Packaged bronze body backflow preventer shall be provided with bronze gate valves, bronze strainer and bronze ball valve test cocks.
- B. Backflow preventers shall be rated for 175 psig maximum inlet pressure and 140 degrees F water temperature.
- C. Provide with clecon check seats, stainless steel relief valve seats, shaft and flange bolts and rubber relief and check valves.
- D. Provide with air-gap drain connected to backflow preventer body.
- E. Backflow preventers shall comply with ASSE Standard 1013.

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- F. Backflow preventers shall be manufactured by Watts 909-S, Conbraco, or Hershey or approved equal.

#### **2.26 Backflow Preventers, Reduced Pressure Type (BFP) (3/4 to 2-Inch Size)**

- A. Packaged backflow preventers shall be complete with resilient wedge OS&Y gate valves, strainer, bronze body ball valve test cocks and flanged end connections.
- B. Backflow preventers shall be rated for 175 psig maximum inlet pressure and 110 degrees F water temperature.
- C. Body Construction
  - 1. 2-1/2 and 3-Inch Sizes: Bronze.
  - 2. 4 to 10-Inch Sizes: Epoxy-coated cast iron with bronze seats.
- D. Provide epoxy coated cast iron relief valves with stainless steel trim.
- E. Provide with air-gap drain connected to the backflow preventer body.
- F. Backflow preventers shall comply with ASSF Standard 1013.
- G. Backflow preventers shall be manufactured by Watts, 909-S-OSY-RW.

#### **2.27 Decanting Column**

- A. General: The sludge decanting column shall be specifically designed for the removal of supernatant from sludge drying beds. Adjustment of the decanting columns shall be manual and provide for full vertical travel in any position for the full range. All materials shall be non-corrosive and be provided with ultraviolet protection from sunlight.
- B. Column: The decanting column shall be 6-inches nominal diameter and constructed of polyethylene. The decanting column shall be adequately attached to the plastic decanting pipe bridge through a minimum of four threaded posts. The vertical travel of the column shall be 15-inches. [Add 1-1/2-inches for overall height of the decanting column]. The decanting pipe bridge shall include a minimum of 10 vertical plastic weir pegs.
- C. Base: The decanter base shall be constructed of polyethylene with four brass studs

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imbedded in place for the support columns. The opening for the column shall be a close tolerance fit.

- D. Stem: The 5/8-inch diameter threaded stem shall be constructed of brass and furnished with two threads per inch for rapid adjustment. The stem shall terminate in a solid brass T-bar handle and shall be secured in place at the support column bridge by two brass cotter pins and shall be threaded through the decanting pipe bridge.
- E. Support Columns: The four support columns shall be constructed of 1/2-inch diameter brass rods which shall connect the support column bridge to the decanter base.
- F. Coupling: A Fernco or DFW Plastics PVC coupling shall be furnished to connect the column decanter base to the sludge drying bed underdrain riser. The coupling shall be furnished with two stainless steel hose clamps and adjusting screws.
- G. Options: 316 stainless steel shall be provided for the stem, support column, and cotter pins.
- H. Decanting columns shall be manufactured by Naylor or approved equal.

## **2.28 Valve Operator Accessories**

- A. Pedestal Operators for Valves (PO)
  - 1. Non-g geared pedestal type operators shall be provided and installed as required. Operators shall be high strength cast iron. Non-g geared operators shall be equipped with indicators to show valve position and shall have handwheel operator. Operators shall be non-rising stem or rising stem valves. The operator shall be sized by the valve manufacturer to provide a minimum of two times the force and torque required to operate the valve with a maximum 40 pound force applied to the handwheel. Operators shall be manufactured by Clow, Troy, or shall be an accessory product of the valve manufacturer.
  - 2. Geared pedestal operators shall be provided and installed as required. Geared operators shall have ball thrust bearings sized by the valve manufacturer and shall be equipped with valve position indicators and crank type handle. The operator shall be sized by the valve manufacturer to provide two times the maximum load or torque required to operate the valve

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with a maximum 40 pound force applied to the crank. The operators shall be manufactured by Clow or shall be a product of the valve manufacturer.

- B. Stem Guides (SG): Fully adjustable stem guides with bronze bushings, shall be furnished by the manufacturer of the associated valve and shall be installed to prevent unsupported stem lengths of 10 feet or more conform to the extension stem guide spacing requirements of AWWA C501.
- C. Extension Stems: Extension stem shall be stainless steel and shall be furnished by the manufacturer of the associated valve to bring the operating nut to within 6-inches of finished grade. Extension stems shall be sized by the valve manufacturer to withstand the maximum valve operator output.
- D. Valve Boxes (VB)
  - 1. All valves shall be equipped with valve boxes. The valve boxes shall be cast iron two-piece screw type with drop covers. Valve boxes shall have a 5.25-inch inside diameter. Valve box covers shall weigh a minimum of 13 pounds. The valve boxes shall be adjustable to 6-inches up or down from the nominal required cover over the pipe. Valve boxes shall be of sufficient length that bottom flange of the lower belled portion of the box is below the valve operating nut. Ductile or cast iron extensions shall be provided as necessary. Covers shall have "WATER VALVE", "SEWER", "AIR", or "WATER" cast into them. Valve boxes shall be manufactured in the United States.
  - 2. Valve boxes shall be manufactured by Tyler or Opelika or approved equal.
- E. Floor Boxes: Valve floor boxes shall be provided where shown on the Drawings. Floor boxes shall be manufactured by Vulcan Industries, Troy, Clow F-5695, U.S. Foundry, American-Darling, Nccnah, or M & H Valve.

## **2.29 Motorized Actuators**

- A. Type I, Open-Close or Modulating, Heavy Duty
  - 1. Actuator shall be an electric motor driven gear reducer with integral controls for motorized and manual operation or rising and non-rising stem valves. The actuator shall be provided and sized by the valve manufacturer to meet the maximum torque requirements of the valve. The actuating unit shall be mounted on and assembled to the valve. The actuator shall provide

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quarter-turn operation for plug, butterfly and ball valves and multi-turn operation for gate and globe valves.

2. Each motor shall be high torque, totally enclosed in a NEMA rated housing. The motor starting torque shall be equal to 2-1/2 times the running torque. The motor shall have AIEE standard Class F insulation. The grease tight operation shall be assured by the use of dual motor shaft seals.
3. The gearing shall be combined helical/spur and worm gear type, accurately machined. Helical gears shall be alloy steel, hardened and ground. Gearing shall be grease lubricated, with high speed parts on anti-friction bearings. An inspection plate on the housing shall be provided to allow inspection of the handwheel declutching mechanism, the motor gears, and for relubrication.
4. Each unit shall include a handwheel for manual operation of the valve drive sleeve through direct gearing. The handwheel shall not rotate during electrical operation. The motor shall not rotate during hand operation. In no case will the handwheel ever be connected with the motor. When the unit is being operated manually, it shall be automatically returned to the electric operation when the handwheel is released.
5. The transfer from electric to manual operation shall be accomplished by a declutching lever arm which will disengage the motor mechanically but not electrically. The unit shall be capable of being clutched or declutched when operated electrically with no damage to the clutch or gear mechanism.
6. The actuator shall operate the valve from full open to full closed in 60 seconds.
7. The controls shall provide a reversing actuator, mechanical and electrical interlock, and thermal overload relays. The D/B Company shall break all lines to the motor.
8. The actuator shall operate on a 480 volt three phase power supply. All controls shall operate on 115 volt AC power and a control power transformer shall be provided within the unit as required. Actuators to be located outdoors shall have a control enclosure heater to prevent condensation.
9. Position limit switches shall be provided for both open and close positions

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of travel and shall be connected directly to the valve through continuous gearing, and follow its position at all times. Mechanisms employing intermittent tooth gearing and rotary drive switches are not acceptable.

10. A double acting, adjustable torque limit switch shall be provided, capable of deleting excessive torque caused during seating, unseating, or obstructions. Torque control accuracy shall be within  $\pm$  five percent.
11. The controls shall provide for local and remote. The pushbutton control shall be provided with open, close and stop pushbuttons, open and close indicator lights, and local/remote selector switch. The controls shall include a transmitter for remote indication of valve position.
12. The actuator and controls shall be rated for Class I, Group D, Division 1.
13. Actuators for modulating service shall contain all the design and control features as required for the open/close actuators. In addition, they shall contain the following controls:
  - a. Actuators shall respond to a 4-20 mA input signal.
  - b. Actuators shall be capable of a maximum pulse rate of 100 starts per hour with an accuracy of  $\pm$  two percent.
  - c. Actuators shall have a system adjustment span of zero - deadband.
  - d. Actuators shall have a plug in circuit card and capabilities of either "lock in last position" or "fail to close position".
  - e. Actuators shall be capable of transmitting a 4-20 mA signal for remote indication of valve position. This signal shall be generated by a resistance to current (R/I) converter.
  - f. All controls and terminal blocks shall be contained in the same compartment which is integral to the actuator.
14. Motorized actuators shall be Limitorque L120 Series (multi-turn), Limitorque LY Series (1/4 turn), EIM M/MG Series, EIM 2000 Series (multi-turn), or EIM Q or R Series (1/4 turn) or approved equal.

B. Type II, Medium Duty, Open/Close or Modulating

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1. Actuator shall be a reversible electric motor driven gear reducer with integral controls for motorized operation of small diameter, non-rising stem, quarter-turn operated PVC ball valves and butterfly valves. The actuator shall be provided and sized by the valve manufacturer to meet the maximum torque and control requirements of the valve.
  2. The actuator shall operate the valve from full open to full closed in 2-1/2 seconds.
  3. The actuator shall operate on a 120 VAC power supply
  4. The actuators and controls shall be rated for weatherproof Class I, Group D, Division 1 service.
  5. The actuator shall have the following options:
    - a. Two limit switches
    - b. Feedback potentiometer
    - c. Heater and thermostat
    - d. Manual override
    - e. Adjustable 5 second - 14 minute cycle length control
    - f. Mechanical brake
    - g. 4-20 mA positioner for modulating control
  6. The actuators shall be Hayward Industries Products B Series, Limatorque LQ Series or FIM P Series or approved equal.

### 3.0 Installation

- A. All valves and appurtenances shall be installed and true to alignment and properly supported.
- B. Install all floor boxes, brackets, extension rods, guides, the various types of operators and appurtenances that are in masonry floors or walls, and install concrete inserts for hangers and supports as soon as forms are erected and before

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concrete is poured. Before setting these items, the D/B Company shall check all plans and figures which have a direct bearing on their location and he shall be responsible for the proper location of these valves and appurtenances during the construction of the structure.

### **3.01 Inspection and Testing**

Following installation, operating tests will be performed to demonstrate to the Engineer that all equipment and accessories will function in a satisfactory manner. The D/B Company shall make, at Contractor's own expense, all necessary changes, modifications and/or adjustments required to ensure satisfactory operation.

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The D/B Company shall make, at Contractor's own expense, all necessary changes, modifications and/or adjustments required to ensure satisfactory operation.

**APPENDIX 6**  
**APPROVED SUBCONTRACTORS**

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**[To be supplied following contract award, supplied by the D/B Company]**

**APPENDIX 7  
GUARANTY AGREEMENT**

WASTEWATER D/BS  
GUARANTY AGREEMENT

from

[GUARANTOR]  
to  
FULTON COUNTY

Dated

\_\_\_\_\_, 200\_\_

## GUARANTY AGREEMENT

THIS GUARANTY AGREEMENT is made and dated as of \_\_\_\_\_, 200\_\_, between [GUARANTOR], a corporation organized and existing under the laws of \_\_\_\_\_ (together with any permitted successors and assigns hereunder, the "Guarantor"), and Fulton County, Georgia, (the "County").

### RECITALS

The County and the [PROJECT COMPANY] (the "D/B Company"), a \_\_\_\_\_ corporation, have entered into a D/B Contract for the Design and Construction of the Johns Creek Environmental Campus, dated \_\_\_\_\_, 200\_\_, as amended from time to time (the "D/B Contract"), whereby the D/B Company has agreed to provide permitting, design, construction, start-up and testing of the JCEC; compliance with all applicable permits, licenses, approvals and other Applicable Law, and the performance of the other related and ancillary responsibilities, as more particularly described in the D/B Contract.

The D/B Company is a direct or indirect subsidiary of the Guarantor.

The County will enter into the D/B Contract only if the Guarantor guarantees the performance by the D/B Company of all of the D/B Company's responsibilities and obligations under the D/B Contract as set forth in this Guaranty Agreement (the "Guaranty").

In order to induce the execution and delivery of the D/B Contract by the County and in consideration thereof, the Guarantor agrees as follows:

## ARTICLE I

### DEFINITIONS AND INTERPRETATION

SECTION 1. DEFINITIONS: For the purposes of this Guaranty, the following words and terms shall have the respective meanings set forth as follows. Any capitalized word or term used but not defined herein is used as defined in the D/B Contract.

"Obligations" means the amounts payable by, and the covenants and agreements of, the D/B Company pursuant to the terms of the D/B Contract.

"Transaction Agreement" means any agreement entered into by the D/B Company or the County in connection with the transactions contemplated by the D/B Contract, including, but not limited to, the D/B Contract, and any supplements thereto.

#### SECTION 1: INTERPRETATION.

In this Guaranty, unless the context otherwise requires:

(A) References Hereto: The terms "hereby", "hereof", "herein", "hereunder" and any similar terms refer to this Guaranty, and the term "hereafter" means after, and the term "heretofore" means before, the date of execution and delivery of this Guaranty.

(B) Gender and Plurality: Words of the masculine gender mean and include correlative words of the feminine and neuter genders and words importing the singular number mean and include the plural number and vice versa.

(C) Persons: Words importing persons include firms, companies, associations, general partnerships, limited partnerships, trusts, business trusts, corporations and other legal entities, including public bodies, as well as individuals.

(D) Headings: The table of contents and any headings preceding the text of the Articles, Sections and subsections of this Guaranty shall be solely for convenience of reference and shall not constitute a part of this Guaranty, nor shall they affect its meaning, construction or effect.

(E) Entire Agreement; Authority: This Guaranty constitutes the entire agreement between the parties hereto with respect to the transactions contemplated by this Guaranty. Nothing in this Guaranty is intended to confer on any person other than the Guarantor, the County and their permitted successors and assigns hereunder any rights or remedies under or by reason of this Guaranty.

(F) Counterparts. This Guaranty may be executed in any number of original counterparts. All such counterparts shall constitute but one and the same Guaranty.

(G) Applicable Law: This Guaranty shall be governed by and construed in accordance with the Applicable Laws of the State of Georgia.

(H) Severability: If any clause, provision, subsection, Section or Article of this Guaranty shall be ruled invalid by any court of competent jurisdiction, the invalidity of any such clause, provision, subsection, Section or Article shall not affect any of the remaining provisions hereof, and this Guaranty shall be construed and enforced as if such invalid portion did not exist provided that such construction and enforcement shall not increase the Guarantor's liability beyond that expressly set forth herein.

(I) Approvals: All approvals, consents and acceptances required to be given or made by any party hereto shall be at the sole discretion of the party whose approval, consent or acceptance is required.

(J) Payments: All payments required to be made by the Guarantor hereunder shall be made in lawful money of the United States of America.

**ARTICLE II**  
**REPRESENTATIONS AND WARRANTIES OF THE GUARANTOR**

**SECTION 2.1 REPRESENTATIONS AND WARRANTIES OF THE GUARANTOR.**  
The Guarantor hereby represents and warrants that:

(1) **Existence and Powers.** The Guarantor is duly organized and validly existing as a corporation under the laws of \_\_\_\_\_, with full legal right, power and authority to enter into and perform its obligations under this Guaranty.

(2) **Due Authorization and Binding Obligation.** The Guarantor has duly authorized the execution and delivery of this Guaranty, and this Guaranty has been duly executed and delivered by the Guarantor and constitutes the legal, valid and binding obligation of the Guarantor, enforceable against the Guarantor in accordance with its terms except insofar as such enforcement may be affected by bankruptcy, insolvency, or moratorium or by general equity principals of reorganization and other similar laws affecting creditors' rights generally and general principals of equity.

(3) **No Conflict.** Neither the execution or delivery by the Guarantor of this Guaranty nor the performance by the Guarantor of its obligations hereunder (a) to the Guarantor's knowledge conflicts with, violates or results in a breach of any law or governmental regulation applicable to the Guarantor, (b) conflicts with, violates or results in a material breach of any term or condition of the Guarantor's corporate charter or by-laws or any judgment, decree, agreement or instrument to which the Guarantor is a party or by which the Guarantor or any of its properties or assets are bound, or constitutes a default under any such judgment, decree, agreement or instrument, or (c) to the Guarantor's knowledge will result in the creation or imposition of any material encumbrance of any nature whatsoever upon any of the properties or assets of the Guarantor except as permitted hereby or by any Transaction Agreement.

(3) **No Governmental Approval Required.** No approval, authorization, order or consent of, or declaration, registration or filing with, any governmental authority is required of the Guarantor for the valid execution and delivery by the Guarantor of this Guaranty, except such as shall have been duly obtained or made.

(4) **No Litigation.** Except as disclosed in the Guarantor's filings with the Securities and Exchange County pursuant to the requirements of the Securities Exchange Act of 1934, as amended, there is no action, suit or other proceeding, at law or in equity, before or by any court or governmental authority, pending or, to the Guarantor's knowledge, threatened against the Guarantor which has a likelihood of an unfavorable decision, ruling or finding that would materially and adversely affect the validity or enforceability of this Guaranty.

(6) **No Legal Prohibition.** The Guarantor has no knowledge of any Applicable Law in effect on the date as of which this representation is being made which would prohibit the

performance by the Guarantor of this Guaranty and the transactions contemplated by this Guaranty.

(7) Consent to Agreements. The Guarantor is fully aware of the terms and conditions of the D/B Contract.

(8) Consideration. This Guaranty is made in furtherance of the purposes for which the Guarantor has been organized, and the assumption by the Guarantor of its obligations hereunder will result in a material benefit to the Guarantor.

## ARTICLE III

### GUARANTY COVENANTS

SECTION 3.1 GUARANTY TO THE COUNTY. The Guarantor hereby absolutely, presently, irrevocably and unconditionally guarantees to the County for the benefit of the County (1) the full and prompt payment when due of each and all of the payments required to be credited or made by the D/B Company under the D/B Contract (including all amendments and supplements thereto) to, or for the account of, the County, when the same shall become due and payable pursuant to this Guaranty, and (2) the full and prompt performance and observance of each and all of the Obligations. Notwithstanding the unconditional nature of the Guarantor's obligations as set forth herein, the Guarantor shall have the right to assert the defenses provided in Section 3.4 hereof against claims made under this Guaranty.

SECTION 3.2 RIGHT OF COUNTY TO PROCEED AGAINST GUARANTOR. This Guaranty shall constitute a guaranty of payment and of performance and not of collection, and the Guarantor specifically agrees that in the event of a failure by the D/B Company to pay or perform any Obligation guaranteed hereunder, the County shall have the right to proceed first and directly against the Guarantor under this Guaranty and without proceeding against the D/B Company or exhausting any other remedies against the D/B Company which the County may have. Without limiting the foregoing, the Guarantor agrees that it shall not be necessary, and that the Guarantor shall not be entitled to require, as a condition of enforcing the liability of the Guarantor hereunder, that the County (1) file suit or proceed to obtain a personal judgment against the D/B Company or any other person that may be liable for the Obligations or any part of the Obligations, (2) make any other effort to obtain payment or performance of the Obligations from the D/B Company other than providing the D/B Company with any notice of such payment or performance as may be required by the terms of the D/B Contract or required to be given to the D/B Company under Applicable Law, (3) foreclose against or seek to realize upon any security for the Obligations, or (4) exercise any other right or remedy to which the County is or may be entitled in connection with the Obligations or any security therefore or any other guarantee thereof, except to the extent that any such exercise of such other right or remedy may be a condition to the Obligations of the D/B Company or to the enforcement of remedies under the D/B Contract. Upon any unexcused failure by the D/B Company in the payment or performance of any Obligation and the giving of such notice or demand, if any, to the D/B Company and Guarantor as may be required in connection with such Obligation and this Guaranty, the liability of the Guarantor shall be effective and shall immediately be paid or performed. Notwithstanding the County's right to proceed directly against the Guarantor, the County (or any successor) shall not be entitled to more than a single full performance of the obligations in regard to any breach or non-performance thereof.

SECTION 3.3 GUARANTY ABSOLUTE AND UNCONDITIONAL: The obligations of the Guarantor hereunder are absolute, present, irrevocable and unconditional and shall remain in full force and effect until the D/B Company shall have fully discharged the

Obligations in accordance with their respective terms, and except as provided in Section 3.4 hereof, shall not be subject to any counterclaim, set-off, deduction or defense (other than full and strict compliance with, or release, discharge or satisfaction of, such Obligations) based on any claim that the Guarantor may have against the D/B Company, the County or any other person. Without limiting the foregoing, the obligations of the Guarantor hereunder shall not be released, discharged or in any way modified by reason of any of the following (whether with or without notice to, knowledge by or further consent of the Guarantor):

(1) the extension or renewal of this Guaranty or the D/B Contract up to the specified Terms of each agreement;

(2) any exercise or failure, omission or delay by the County in the exercise of any right, power or remedy conferred on the County with respect to this Guaranty or the D/B Contract except to the extent such failure, omission or delay gives rise to an applicable statute of limitations defense with respect to a specific claim;

(3) any permitted transfer or assignment of rights or obligations under the D/B Contract or under any other Transaction Agreement by any party thereto (other than a permitted assignment to a replacement operator in the event of a termination of the D/B Company pursuant to applicable provisions of the D/B Contract), or any permitted assignment, conveyance or other transfer of any of their respective interests in the Managed Assets or in, to or under any of the Transaction Agreements;

(4) any permitted assignment for the purpose of creating a security interest or mortgage of all or any part of the respective interests of the County or any other person in any Transaction Agreement or in the Managed Assets;

(5) any renewal, amendment, change or modification in respect of any of the Obligations or terms or conditions of any Transaction Agreement;

(6) any failure of title with respect to all or any part of the respective interests of any person in the Managed Assets Realty or the Managed Assets;

(7) the voluntary or involuntary liquidation, dissolution, sale or other disposition of all or substantially all the assets, marshalling of assets and liabilities, receivership, insolvency, bankruptcy, assignment for the benefit of creditors, reorganization, moratorium, arrangement, composition with creditors or readjustment of, or other similar proceedings against, the D/B Company or the Guarantor, or any of the property of either of them, or any allegation or contest of the validity of this Guaranty or any other Transaction Agreement in any such proceeding (it is specifically understood, consented and agreed to that, to the extent permitted by law, this Guaranty shall remain and continue in full force and effect and shall be enforceable against the Guarantor to the same extent and with the same force and effect as if any such proceeding had not been instituted and as if no rejection, stay, termination, assumption or modification had occurred as a result thereof, it being the intent and purpose of this Guaranty that the Guarantor shall and does hereby waive all rights and benefits which might accrue to it by reason of any such proceeding);

(8) except as permitted by Sections 4.1 or 4.2 hereof, any sale or other transfer by the Guarantor or any Affiliate of any of the capital stock or other interest of the Guarantor or any Affiliate in the D/B Company now or hereafter owned, directly or indirectly, by the Guarantor or any Affiliate, or any change in composition of the interests in the D/B Company;

(9) any failure on the part of the D/B Company for any reason to perform or comply with any agreement with the Guarantor;

(10) the failure on the part of the County to provide any notice to the Guarantor which is not required to be given to the Guarantor pursuant to this Guaranty and to the D/B Company as a condition to the enforcement of Obligations pursuant to the D/B Contract;

(11) any failure of any party to the Transaction Agreements to mitigate damages resulting from any default by the D/B Company or the Guarantor under any Transaction Agreement;

(12) the merger or consolidation of any party to the Transaction Agreements into or with any other person, or any sale, lease, transfer, abandonment or other disposition of any or all of the property of any of the foregoing to any person;

(13) any legal disability or incapacity of any party to the Transaction Agreements;  
or

(14) the fact that entering into any Transaction Agreement by the D/B Company or the Guarantor was invalid or in excess of the powers of such party.

Should any money due or owing under this Guaranty not be recoverable from the Guarantor due to any of the matters specified in subparagraphs (1) through (14) above, then, in any such case, such money, together with all additional sums due hereunder, shall nevertheless be recoverable from the Guarantor as though the Guarantor were principal obligor in place of the D/B Company pursuant to the terms of the D/B Contract and not merely a guarantor and shall be paid by the Guarantor forthwith subject to the terms of this Guaranty. Notwithstanding anything to the contrary expressed in this Guaranty, nothing in this Guaranty shall be deemed to amend, modify, clarify, expand or reduce the D/B Company's rights, benefits, duties or obligations under the D/B Contract. To the extent that any of the matters specified in subparagraphs (1) through (6) and (8) through (14) would provide a defense to, release, discharge or otherwise affect the D/B Company's Obligations, the Guarantor's obligations under this Guaranty shall be treated the same.

**SECTION 3.4 DEFENSES, SET-OFFS AND COUNTERCLAIMS.** Notwithstanding any provision contained herein to the contrary, the Guarantor shall be entitled to exercise or assert any and all legal or equitable rights or defenses which the D/B Company may have under the D/B Contract or under Applicable Law (other than bankruptcy or insolvency of the D/B Company and other than any defense which the D/B Company has expressly waived in the D/B Contract or the Guarantor has expressly waived in Section 3.5 hereof or elsewhere

hereunder), and the obligations of the Guarantor hereunder are subject to such counterclaims, set-offs or deductions which the D/B Company is permitted to assert pursuant to the D/B Contract if any.

SECTION 3.5 WAIVERS BY THE GUARANTOR. The Guarantor hereby unconditionally and irrevocably waives:

- (1) notice from the County of its acceptance of this Guaranty;
- (2) notice of any of the events referred to in Section 3.3 hereof except to the extent that notice is required to be given as a condition to the enforcement of Obligations;
- (3) to the fullest extent lawfully possible, all notices which may be required by statute, rule of law or otherwise to preserve intact any rights against the Guarantor, except any notice to the D/B Company required pursuant to the D/B Contract or Applicable Law as a condition to the performance of any Obligation;
- (4) to the fullest extent lawfully possible, any statute of limitations defense based on a statute of limitations period which may be applicable to guarantors (or parties in similar relationships) which would be shorter than the applicable statute of limitations period for the underlying claim;
- (5) any right to require a proceeding first against the D/B Company;
- (6) any right to require a proceeding first against any person or the security provided by or under any Transaction Agreement except to the extent such Transaction Agreement specifically requires a proceeding first against any person (except the D/B Company) or security;
- (7) any requirement that the D/B Company be joined as a party to any proceeding for the enforcement of any term of any Transaction Agreement;
- (8) the requirement of, or the notice of, the filing of claims by the County in the event of the receivership or bankruptcy of the D/B Company; and
- (9) all demands upon the D/B Company or any other person and all other formalities the omission of any of which, or delay in performance of which, might, but for the provisions of this Section 3.5, by rule of law or otherwise, constitute grounds for relieving or discharging the Guarantor in whole or in part from its absolute, present, irrevocable, unconditional and continuing obligations hereunder.

SECTION 3.6 PAYMENT OF COSTS AND EXPENSES. The Guarantor agrees to pay the County on demand all reasonable costs and expenses, legal or otherwise (including counsel fees), incurred by or on behalf of the County in successfully enforcing by Legal Proceeding observance of the covenants, agreements and obligations contained in this Guaranty against the Guarantor, other than the costs and expenses that the County incurs in

performing any of its obligations under the D/B Contract, or other applicable Transaction Agreement, where such obligations are a condition to performance by the D/B Company of its Obligations.

**SECTION 3.7 SUBORDINATION OF RIGHTS.** The Guarantor agrees that any right of subrogation or contribution which it may have against the D/B Company as a result of any payment or performance hereunder is hereby fully subordinated to the rights of the County hereunder and under the Transaction Agreements and that the Guarantor shall not recover or seek to recover any payment made by it hereunder from the D/B Company until the D/B Company and the Guarantor shall have fully and satisfactorily paid or performed and discharged the Obligations giving rise to a claim under this Guaranty.

**SECTION 3.8 SEPARATE OBLIGATIONS; REINSTATEMENT.** The obligations of the Guarantor to make any payment or to perform and discharge any other duties, agreements, covenants, undertakings or obligations hereunder shall (1) to the extent permitted by Applicable Law, constitute separate and independent obligations of the Guarantor from its other obligations under this Guaranty, (2) give rise to separate and independent causes of action against the Guarantor and (3) apply irrespective of any indulgence granted from time to time by the County. The Guarantor agrees that this Guaranty shall be automatically reinstated if and to the extent that for any reason any payment or performance by or on behalf of the D/B Company is rescinded or must be otherwise restored by the County, whether as a result of any proceedings in bankruptcy, reorganization or similar proceeding, unless such rescission or restoration is pursuant to the terms of the D/B Contract, or any applicable Transaction Agreement, or the D/B Company's enforcement of such terms under Applicable Law.

**SECTION 3.9 TERM.** This Guaranty shall remain in full force and effect from the date of execution and delivery hereof until all of the Obligations of the D/B Company have been fully paid and performed.

## ARTICLE IV

### GENERAL COVENANTS

**SECTION 4.1 MAINTENANCE OF CORPORATE EXISTENCE.** Consolidation, Merger, Sale or Transfer. The Guarantor covenants that during the term of this Guaranty it will maintain its corporate existence, will not dissolve or otherwise dispose of all or substantially all of its assets and will not consolidate with or merge into another entity or permit one or more other entities to consolidate with or merge into it unless the successor is the Guarantor; provided, however, that the Guarantor may consolidate with or merge into another entity, or permit one or more other entities to consolidate with or merge into it, or sell or otherwise transfer to another entity all or substantially all of its assets as an entirety and thereafter dissolve if the successor entity (if other than the Guarantor) (a) assumes in writing all the obligations of the Guarantor hereunder and, if required by law, is duly qualified to do business in the State of Georgia, and (b) delivers to the County an opinion of counsel to the effect that its obligations under this Guaranty are legal, valid, binding and enforceable subject to applicable bankruptcy and similar insolvency or moratorium laws.

**Continuance of Obligations:** If a consolidation, merger or sale or other transfer is made as permitted by this Section 4.1, the provisions of this Section 4.1 shall continue in full force and effect and no further consolidation, merger or sale or other transfer shall be made except in compliance with the provisions of this Section 4.1. No such consolidation, merger or sale or other transfer shall have the effect of releasing the initial Guarantor from its liability hereunder unless a successor entity has assumed responsibility for this Guaranty as provided in this Section 4.1.

**SECTION 4 ASSIGNMENT.** Without the prior written consent of the County, this Guaranty may not be assigned by the Guarantor, except pursuant to Section 4.1 hereof.

**SECTION 4 QUALIFICATION IN GEORGIA.** The Guarantor agrees that, so long as this Guaranty is in effect, if required by law, the Guarantor will be duly qualified to do business in the State of Georgia.

**SECTION 4 CONSENT TO JURISDICTION.** The Guarantor irrevocably: (1) agrees that any Legal Proceeding arising out of this Guaranty shall be brought in the Georgia or federal courts in Fulton County, Georgia having appropriate jurisdiction; (2) consents to the jurisdiction of such court in any such Legal Proceeding; (3) waives any objection which it may have to the laying of the jurisdiction of any such Legal Proceeding in any of such courts; and (4) waives its right to a trial by jury in any Legal Proceeding in any of such courts.

**SECTION 4 BINDING EFFECT.** This Guaranty shall inure to the benefit of the County and its permitted successors and assigns and shall be binding upon the Guarantor and its successors and assigns.

SECTION 4 AMENDMENTS, CHANGES AND MODIFICATIONS. This Guaranty may not be amended, changed or modified or terminated and none of its provisions may be waived, except with the prior written consent of the County and of the Guarantor.

SECTION 4 LIABILITY. It is understood and agreed to by the County that nothing contained herein shall create any obligation of or right to look to any director, officer, employee or stockholder of the Guarantor (or any Affiliate thereof) for the satisfaction of any obligations hereunder, and no judgment, order or execution with respect to or in connection with this Guaranty shall be taken against any such director, officer, employee or stockholder.

SECTION 4 NOTICES. All notices, demands, requests and other communications hereunder shall be deemed sufficient and properly given if in writing and delivered in person to the following addresses or sent by first class mail and facsimile, to such addresses:

(a) If to the Guarantor:

(b) If to the County:

Either party may, by like notice, designate further or different addresses to which subsequent notices shall be sent. Any notice hereunder signed on behalf of the notifying party by a duly authorized attorney at law shall be valid and effective to the same extent as if signed on behalf of such party by a duly authorized officer or employee. Notices and communications given by mail hereunder shall be deemed to have been given 5 days after the date of dispatch; all other notices shall be deemed to have been given upon receipt.

IN WITNESS WHEREOF, the Guarantor has caused this Guaranty to be executed in its name and on its behalf by its duly authorized officer as of the date first above written.

[GUARANTOR]  
as Guarantor

By \_\_\_\_\_  
Printed Name:  
Title:

SEAL  
(IMPRESSED ON  
EXECUTION COPIES)

Accepted and Agreed to by:

FULTON COUNTY, GEORGIA

By: \_\_\_\_\_  
Printed Name:  
Title:

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## APPENDIX 8 ESCALATION INDICES

### 8.1 Fixed Membrane System Price Adjustment Factor

The Fixed Membrane System Price shall be adjusted in the event the Design/Build Date does not occur within 15 months after the Technology Proposal Submission Date. The Fixed Membrane System Price Adjustment Factor (FMSPAF) shall be based on the Construction Cost Index (CCI) as published by the Engineering News Record (ENR). The following formula illustrates the calculation of the FMSPAF to be applied to the Fixed Membrane System Price to adjust the price from a time 15 months after the Technology Proposal Submission Date to the month of the Design/Build Date:

$$FMSPAF = \left[ n_{db} \left( \frac{CCI_{\text{month of the Design/Build Date}}}{CCI_{\text{15th month after the Technology Proposal Submission Date}}} - 1 \right) \right] + 1$$

(where  $n_{db}$  = Percentage proposed on Price Proposal Form A)

Once the Fixed Membrane System Price is escalated from the 15 months after the Technology Proposal Submission Date to the Design/Build Date, no further escalation of the Fixed Membrane System Price shall occur.

In the event that the CCI is not available, the FMSPAF is to be calculated using a comparable index or price to be mutually agreed upon by the County and the Supplier. If the base used in any such index or price is altered, the FMSPAF shall be calculated to reflect the actual percentage change in such index or price from the 15th month after the Technology Proposal Submission Date to the Design/Build Date. Any increase in the Fixed Membrane System Price shall result in the Design/Build Price being increased the same amount, with no mark up.

### 8.2 Fixed Design/Build Price Adjustment Factor

The Fixed Design/Build Price shall be adjusted in the event the Design/Build Date does not occur within 12 months after the Design/Build Proposal Submission Date. The Fixed Design/Build Price Adjustment Factor (FDBPAF) shall be based on the Construction Cost Index (CCI) as published by the Engineering News Record (ENR). The following formula illustrates the calculation of the FDBPAF to be applied to the Fixed Design/Build Price to adjust the price from the 12 months after the Design/Build Proposal Submission Date to the month of the Design/Build Date:

$$FDBPAF = \left[ n_{db} \left( \frac{CCI_{\text{month of the Design/Build Date}}}{CCI_{\text{12th month after the Proposal Submission Date}}} - 1 \right) \right] + 1$$

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*(where  $n_{ab}$  = Percentage proposed on Price Proposal Form 1)*

The allowance for the Fixed Membrane System Price shall be escalated as described in article 8.1.1 above and shall be deducted from the Fixed Design/Build Price prior to escalation of the Fixed Design/Build Price. Only that portion of the Fixed Design/Build Price in excess of the allowance representing the Fixed Membrane System Price will be escalated under article 8.1.2.

Once the Fixed Design/Build Price is escalated from the 12 months after the Proposal Submission Date to the Design/Build Date, no further escalation of the Fixed Design/Build Price shall occur.

In the event that the CCI is not available, the FDBPAF is to be calculated using a comparable index or price to be mutually agreed upon by the County and the D/B Company. If the base used in any such index or price is altered, the FDBPAF shall be calculated to reflect the actual percentage change in such index or price from the 12th month after the Proposal Submission Date to the Design/Build Date.

## APPENDIX 9A INSURANCE REQUIREMENTS

### INSURANCE

#### 9.1 OWNER-CONTROLLED INSURANCE PROGRAM

##### 9.1.1 INTRODUCTION

Fulton County has implemented an Owner-Controlled Insurance Program ("OCIP") that covers this Project. Certain relevant provisions of the County's OCIP are outlined below. This OCIP does not affect Fulton County Government's statutory immunity. Under the OCIP, the County shall furnish certain portions of the Workers' Compensation, General Liability, and Builder's Risk insurance associated with the County's construction projects. Insurance furnished under the OCIP covers the County, the D/B Company and its Sub-Contractors of all tiers (with some exceptions, as described below), and other persons or interests as the County may designate in connection with the performance of the Work. As detailed below, the D/B Company still provides certain other portions of insurance coverage not included in the OCIP.

##### 9.1.2 DEFINITIONS SPECIFIC TO THIS Appendix 9A

9.1.2.1 "Owner-Controlled Insurance Program" (OCIP) means an insurance delivery method that assures the D/B Company, and its Sub-Contractors of all tiers, and other persons or interests as the County may designate in connection with the performance of the work are insured for certain prescribed Statutory Workers' Compensation, Employers Liability and Commercial General Liability, and such other coverage as the County may in writing specifically add or delete for the Project.

9.1.2.2 "OCIP Administrator" means the administrator retained by the County to implement and administer the OCIP. The OCIP Administrator is Resurgens Risk Management/Willis.

9.1.2.3 The term "enrolled" applies to the entities covered under the OCIP. The D/B Company is enrolled in the OCIP. The D/B Company's Sub-Contractors of all tiers shall be enrolled in the OCIP, provided in general that they are performing construction work at the Project site and that the work being performed is not temporary to the project and is an elemental component of the completed project. The D/B Company shall assure that all enrolled Sub-Contractors of all tiers satisfy all safety program obligations, claim management and applicable insurance requirements relative to the OCIP. The D/B Company understands that all D/B Company obligations set forth in the County's OCIP, whether performed directly by the D/B Company obligations set forth in the County's OCIP, whether performed directly by the D/B Company or indirectly by its enrolled Sub-Contractors, are the responsibility of the D/B Company. Whenever this Agreement

establishes obligations for D/B Company with respect to the OCIP, it shall also be deemed to establish obligations for enrolled Sub-Contractors. Certain exceptions apply to enrolled entities, as described below.

9.1.2.4 The term “non-enrolled” applies to the entities not covered under the OCIP. In general vendors, suppliers, fabricators, material dealers, drivers and others who merely transport, pick up, deliver or carry materials, personnel, parts or equipment or any other items or persons to or from the Project site shall be considered non-enrolled entities for the purpose of insurance coverage under the County’s OCIP. This non-enrolled OCIP Contractor status also applies to those contractors whose only work is temporary to the site and are not involved in any project construction that is part of the work on the finished project. The D/B Company shall assure that all non-enrolled Sub-Contractors of all tiers satisfy all safety program obligations, claim management and applicable insurance requirements relative to the OCIP.

9.1.2.5 “Agent” means the Fulton County’s designated Representative, as defined within this Agreement. For purposes of the OCIP, the County’s designated Representative shall serve as the County’s primary contact for communication with the Contractor related to the OCIP.

### 9.1.3 **INSURANCE OBLIGATIONS OF THE COUNTY AND D/B COMPANY**

#### 9.1.3.1 **INSURANCE PROVIDED BY THE COUNTY UNDER ITS OCIP.**

(a) *The County shall secure and thereafter maintain, except as otherwise provided herein, the insurance coverages described in Subparagraphs 9.1.3.2, 9.1.3.3, and 9.1.3.4 below, covering as insured parties the County, the D/B Company and its Sub-Contractors of all tiers (except as detailed below), and such other persons or interests as the County may designate in connection with the performance of the Work, and with limits not less than those specified for each coverage (“OCIP insurance coverage”).*

(b) No insurance coverage provided by the County’s OCIP shall extend to the activities or products of the following:

(i) Any person and/or organization that fabricates and/or manufactures products, materials, and/or supplies away from the Project site(s).

(ii) Any non-enrolled architect, engineer or surveyor and their consultants except where required by the Contract Documents.

(iii) Truckers, material-delivery, vendors, suppliers, and operators (as independent contractors), whose operation(s) and/or employee(s) is/are engaged solely in the loading, hauling and/or unloading of material, supplies and/or equipment to or from the Project site(s).

(iv) Any employee(s) of the D/B Company or an enrolled or non-enrolled Sub-Contractor of any tier, including employee(s) of truckers, material-delivery, vendors, suppliers, and operators (as independent contractors), which is/are engaged solely in the loading, hauling and/or unloading of material, supplies and/or equipment to or from the Project site(s).

(v) Any employee(s) of the D/B Company or an enrolled Sub-Contractor of any tier that does not work and/or generate payroll at the Project site(s).

(vi) Any employee(s) of the D/B Company or an enrolled Sub-Contractor of any tier, not specifically required to perform Work at the Project site(s), that occasionally visits the Project site(s) to make deliveries, pick up supplies and/or personnel, to perform supervisory and/or progress inspections, or for any other reason.

(vii) Any other entity specifically to be determined by the County to be excluded.

(viii) Any leased or temporary laborers.

(c) Unless herein otherwise specifically indicated, the policies set forth in Subparagraphs 9.1.3.2, 9.1.3.3 and 9.1.3.4 below shall cover only those operations of the insured parties performed at the Project site or sites incidental to the Work called for in this Owner-D/B Company Agreement.

(d) The County assumes no obligation to provide insurance other than that evidenced by the policies referred to in Subparagraphs 9.1.3.2, 9.1.3.3 and 9.1.3.4. Furthermore, any obligation of the County to provide insurance under its OCIP is expressly limited to the insurance referred to in Subparagraphs 9.1.3.2, 9.1.3.3 and 9.1.3.4. The County, however, reserves the right to furnish insurance coverage of various types and limits, provided that such coverage shall not be less than that specified below (so long as such insurance and limits are reasonably available in the insurance market) and provided that the costs of such insurance shall be borne by the County.

### **9.1.3.2 WORKERS' COMPENSATION INSURANCE**

Workers' Compensation insurance in statutory limits of the Workers' Compensation laws of the State of Georgia, with Coverage B - Employer's Liability, to limits of not less than one million dollars (\$1,000,000) covering operations of the insured parties at the Project site. Coverage under the Broad Form All States extension is also included. This insurance is primary for all occurrences at the Project site.

### **9.1.3.3 LIABILITY INSURANCE (EXCLUDING MOTOR VEHICLE LIABILITY)**

(a) Liability insurance (excluding Motor Vehicle Liability) under a Commercial General Liability insurance policy and covering the insured parties in connection

with the performance of the Work at the Project site, including hazards of operations (explosion, collapse and underground exposures), independent contractors, employees as additional insured, completed operations (for 5 years after final completion of the Work), contractual liability coverage (for contracts related to the Work), personal injury liability coverage, and excess Employer's Liability coverage for claims arising out of the Work hereunder, for personal injury, bodily injury, and property damage, in policies of insurance such that the total available limits to all insureds combined will not be less than twenty-five million dollars (\$25,000,000) combined single limits for each occurrence and aggregates, as applicable.

- (b) Notwithstanding the actual policy deductible, the D/B Company shall be liable for a deductible not to exceed five thousand dollars (\$5,000) each occurrence, to the extent losses payable are attributable to, involve, or relate to the performance, actions, errors, omissions, or negligence of the D/B Company or its Sub-Contractors, uninsured parties, or any other entity or person for whom it may be responsible. The D/B Company's deductible shall include the costs of defense, including court costs and attorneys' fees of a covered OCIP claim and shall not be construed to affect the D/B Company rights to indemnify the County under the contract. All such deductibles shall be collected as part of the Contract close-out process and final payment.
- (c) The insurance provided under the OCIP will not extend coverage for products liability to any insured party or uninsured party. However, Products/Completed Operations liability arising from manufacturing or assembly of items manufactured or assembled at the Project site, as required by the contract, is covered.

#### 9.1.3.4 ALL RISK BUILDER'S RISK, INCLUDING TRANSIT

- (a) All Risk Builder's Risk, including transit and installation risks, insuring the interest of the County, the D/B Company and its Sub-Contractors, providing coverage on an All Risk basis, including, but not limited to, coverage against flood, fire, lightning, wind damage, hail, explosion, riot or civil commotion, aircraft and other vehicles, and collapse.
- (b) The policies for such insurance will be secured and maintained by the County in a form and amount as determined by Fulton County. The amount may be amended depending on the amount of a specific project.
- (c) Coverage will include materials, supplies and equipment that are intended for specific installation in the Work while such materials, supplies and equipment are located at the Project site, in transit or while temporarily located away from the Project site for the purpose of repair, adjustment or storage at the risk of one of the insured parties.

- (d) Except as otherwise provided in Subparagraph 9.1.3.4(c), this insurance will not include coverage for tools or clothing of workers, or tools, equipment, protective fencing, scaffolding, temporary structures, coffer damming, pipe stalling or bracing, or forms owned, rented or used by the D/B Company, its Sub-Contractors, or uninsured parties and used in the performance of the Work, unless such items are specifically identified in this Agreement and their values declared under the Builder's Risk insurance policy.
- (e) The County, its officers, agents, employees and consultants rendering services at the Project site, and the OCIP Administrator will not be liable or responsible for loss or damage to the items excluded in Subparagraph 9.1.3.4(d), and the D/B Company shall indemnify and hold harmless the County, its officers, agents, employees, its consultants rendering services at the Project site, the OCIP Administrator, and other Project contractors and their Sub-Contractors from claims or causes of action brought by any person or parties as a result of loss or damage to such excluded items.
- (f) The Builder's Risk policy will be endorsed waiving the carrier's rights of recovery under subrogation against the County, its officers, agents, employees and consultants rendering services at the Project site, the OCIP Administrator, and the D/B Company and its Sub-Contractors, whose respective interests are insured under such policy.
- (g) Notwithstanding the actual policy deductible, the D/B Company shall be liable for a deductible not to exceed five thousand dollars (\$5,000) each occurrence for all perils excluding theft and mysterious disappearance, and twenty-five thousand dollars (\$25,000) each occurrence for theft and mysterious disappearance. All such deductibles shall be collected as part of the Contract close-out process and final payment.

#### **9.1.3.5 D/B COMPANY RETAINS VARIOUS OBLIGATIONS**

Nothing contained herein, or in any document referenced herein, shall relieve, limit or be construed to relieve or limit the D/B Company, its Sub-Contractors or uninsured parties of responsibility or obligations otherwise imposed by the Contract. The OCIP shall not be construed as limiting, among other things:

- (a) The extent to which the D/B Company may be held legally responsible for damages to persons or property.
- (b) The D/B Company's indemnity obligations under this Agreement.

#### **9.1.3.6 D/B COMPANY RESPONSIBILITY TO REPAIR DEFECTIVE OR DAMAGED WORK**

- (a) Notwithstanding the provisions of this Agreement, and until final acceptance of the Work by the County, the D/B Company shall have full and complete charge

and care of the Work or any portion thereof (including the Owner-furnished supplies, material, equipment or other items to be utilized or incorporated in the Work).

- (b) The D/B Company shall rebuild, repair, restore and make good losses of, and injuries or damages to, the Work or any portion thereof (including the Owner-furnished supplies, material, equipment or other items to be utilized with, or incorporated in, the Work and which are in the Project site) before final acceptance of the Work. Such rebuilding, repair or restoration shall be at the D/B Company's sole cost and expense provided, however, the County will make available applicable proceeds from the Builder's Risk policy provided by the County, as specified in Section 11.1.3.4.

#### 9.1.3.7 **ADDITIONAL INSURED**

The Additional Insured on the County's OCIP policies shall include Fulton County; the County's officers, agents, employees, and consultants; the OCIP Administrator; and Contractors, including their Sub-Contractors of any tier (but excluding suppliers, vendors, material-delivery, truckers or haulers) whom Fulton County has contracted with and for whom the County has agreed to furnish coverage under the OCIP.

#### 9.1.3.8 **OWNER'S RIGHT TO AUDIT**

- (a) The D/B Company hereby warrants to the County the accuracy of the information provided on the OCIP Insurance Information Form submitted with its bid, and agrees that the County, its officers, agents, insurance carriers and the OCIP Administrator may audit the records of the D/B Company and its Sub-Contractors to confirm the accuracy of the information provided, including, but not limited to, the accuracy of all estimated payrolls, and to ascertain any effect on insurance resulting from changes in the Work. The audit will be held during the D/B Company's normal business hours at the office of the D/B Company or at another mutually agreeable location.
- (b) The County shall be entitled to credits in OCIP insurance premiums that may accrue as a result of the audit.
- (c) The D/B Company shall maintain or cause to be maintained sufficient records as may be necessary to audit its compliance and its Sub-Contractors' compliance with the requirements of the OCIP.

#### 9.1.3.9 **ASSIGNMENT**

The D/B Company and each of its Sub-Contractors of any tier shall assign to the County all return premiums, premium refunds, dividends and other monies due or to become due in connection with the insurance provided by the County. The D/B Company and its Sub-Contractors of any tier shall execute such other further documentation as may be required by the County to effectuate this assignment.

#### 9.1.1.3.10 OCIP CLAIMS

The D/B Company, its Sub-Contractors and uninsured parties shall assist the County, its agents, and the OCIP Administrator and provide the utmost cooperation in the adjustment of claims arising out of the operations conducted under, or in connection with, the Work and shall cooperate with the County's insurance carriers in claims and demands that arise out of the Work and that the insurance carriers are called upon to adjust or resist.

#### 9.1.3.11 LIMITATIONS ON OCIP COVERAGES

Although the scope of coverage afforded under this program may provide coverage beyond the scope required by the Owner-D/B Company Agreement in the absence of an OCIP, the County makes no warranty or representation that such broad coverage will remain in effect throughout the duration of the Work. The County further does not warrant or represent that the OCIP coverage constitute an insurance portfolio, which adequately addresses all the risk faced by the D/B Company or its Sub-Contractor(s). The D/B Company and Sub-Contractors of every tier shall satisfy themselves as to the existence, extent and adequacy of the OCIP coverage prior to the commencement of the Work. The cost to obtain any "extra" coverage shall be the responsibility of the D/B Company. The County shall not assume any responsibility for the premium cost of any "extra" insurance. The County shall issue Certificates of Insurance and make available copies of specimen insurance policies at the time of the Notice to Proceed.

#### 9.1.3.12 ALTERNATIVE INSURANCE

In the event the County, after commencement of the Work, is unable to furnish, or elects not to furnish or to continue to furnish, the insurance coverage herein described, and upon 30 days written notice from the County, the following shall be required:

- (a) The D/B Company shall secure and maintain all, or as much of the insurance herein described, as the County designates, at the County's expense, and the County will thereafter no longer be obligated to furnish such insurance.
- (b) All insurance secured by the D/B Company or its Sub-Contractors pursuant to this subparagraph shall be in policies subject to the prior written approval of the County as to form, content, limits of liability, cost and issuing company as outlined in the "Base Bid" version of this Appendix 9A, i.e., as if the OCIP had not been implemented for the Project.

#### 9.1.3.13 PROCEDURES AND SERVICES

The D/B Company shall fully comply with, and shall require its Sub-Contractors of any tier to fully comply with, all of said plans, procedures and services, including but

not limited to, completion of all necessary applications for coverage, prompt and full compliance with all audit requests and claim reporting procedures, and full compliance with the safety, loss prevention and loss control programs implemented by, or at the request of the County.

**9.1.3.14 INSURANCE NECESSARY FOR THE WORK, BUT COVERING OPERATIONS OUTSIDE THE OCIP**

- (a) The D/B Company shall, for the duration of this Agreement, provide and maintain insurance and shall require each Sub-Contractor to provide and maintain insurance of the type and in the limits as described in Paragraph 9.2, which is intended to cover employee injury, personal injury, bodily injury and property damage liability for ongoing operations work performed away from the Project site.
- (b) The insurance described in Subparagraphs 9.2.1.2.B (Motor Vehicle Liability) and 9.2.1.2.D (Professional Liability) shall apply to Work performed by both enrolled and non-enrolled entities both at and away from the Project site, and shall be provided and maintained for the duration of this Agreement. Such insurance shall name the parties required to secure same as insured and shall be in a form and through issuing companies acceptable to the County. Such insurance shall contain a defense of suits provision.
- (c) The D/B Company shall assure that all non-enrolled entities provide and maintain, for the duration of this Agreement, insurance of the type and in the limits as described in Paragraph 9.2, which shall cover those entities for employee injury, personal injury, bodily injury, and property damage liability for any Work performed at the Project site.

**9.1.3.15 D/B COMPANY OCIP OBLIGATIONS**

- (a) The D/B Company and each of its Sub-Contractors shall:
  - (i) Furnish to Fulton County's designated Representative all information and documentation that the County may require from time to time, in connection with the issuance of policies under this Agreement, in such form and substance as the OCIP Administrator may prescribe.
  - (ii) Furnish to the County's designated Representative monthly certified payroll and accident summary reports on forms provided by the OCIP Administrator, and payroll records, as required.
  - (iii) Segregate their respective reports relating to the Work for which OCIP coverage is herein provided, from their records relating to other work for which such coverage is not provided.

- (iv) Promptly comply with the recommendations of the OCIP insurance carriers, as submitted through the County's designated Representative.
- (b) The D/B Company shall not violate or knowingly permit to be violated any conditions of the policies of insurance provided by the County under the terms of this Agreement, and shall at all times satisfy the requirements of the issuing insurance companies.
- (c) The D/B Company shall assure that all OCIP requirements imposed upon and to be performed by the D/B Company shall likewise be imposed upon, assumed and performed by each of its Sub-Contractors and uninsured parties with whom it or its Sub-Contractors have a contractual relationship and are performing work under the Contract.
- (d) The D/B Company shall furnish each bidding and negotiating Sub-Contractor, vendor, supplier, material dealer or other person or business entity that may provide goods or services in connection with the Work, a copy of this document describing the insurance requirements for the D/B Company, and its Sub-Contractors shall require each to impose the same requirement in their subcontracting and procurement procedures.
- (e) If the D/B Company or any of its Sub-Contractors should fail to comply with the requirements of this document, the County may withhold payments due to the D/B Company or suspend the Work until such time as the D/B Company and its Sub-Contractors have performed such obligations to the reasonable satisfaction of the County.
- (f) The D/B Company agrees that the Contract Sum includes all costs of complying with the OCIP, as herein described.

#### 9.1.3.16 NOTICES, COSTS AND LOSSES

- (a) All policies of insurance that either the D/B Company, its Sub-Contractors, or the County is required to secure and maintain, shall be endorsed to provide that the insurance company shall notify the County, the D/B Company, and each Named Insured at least thirty (30) days prior to the effective date of any cancellation or modification of such policies.
- (b) The Contractor shall furnish to the County's designated Representative certificates of insurance for insurance required to be maintained by the Contractor and its Sub-Contractors, as provided herein. Prior to the issuance of the Notice to Proceed, the Contractor shall not be permitted on the Project site.
- (c) The County will pay the cost of the premiums for the insurance described above as being provided by the County, and the County will receive and pay, as the case may be, all adjustments in such costs, whether by way of dividends or otherwise. The D/B Company shall execute such instruments of assignment as

may be necessary to permit the County's receipt of such adjustments and shall cause all Sub-Contractors covered by such insurance to do the same.

- (d) The D/B Company shall be responsible for the payment of the deductible amounts indicated in Subparagraphs 9.1.3.3 and 9.1.3.4. If the actual County-provided OCIP policies have deductible amounts greater than those indicated in Subparagraphs 9.1.3.3 and 9.1.3.4, such excess amounts will be paid by the D/B Company.
- (e) The D/B Company shall be responsible for all losses greater than OCIP policy limits.
- (f) Payments by the insurer for all losses covered under the All Risk Builder's Risk policy, as specified in Section 9.1.3.4, will be made to the County. The County will make proceeds from the Builder's Risk policy available to the D/B Company for rebuilding work damaged by covered perils.

#### **9.1.3.17 SUBROGATION AND WAIVER**

- (a) The D/B Company shall require all policies of insurance that are related to the Work and that are secured and maintained by the D/B Company and its Sub-Contractors to include clauses providing that each underwriter and carrier shall waive all of their respective rights of recovery, under subrogation or otherwise, against the County, its officers, agents, employees and consultants rendering services at the Project site, the OCIP Administrator, the D/B Company and its Sub-Contractors, regardless of tier, and all other Project contractors and their Sub-Contractors, regardless of tier.
- (b) The D/B Company waives all rights of recovery against its Sub-Contractors, the County, its officers, agents, employees and consultants rendering services at the Project site, the OCIP Administrator, and other Project contractors and their Sub-Contractors, regardless of tier, that the D/B Company may have or acquire because of deductible clauses in or inadequacy of limits of policies of insurance that are in any way related to the Work and that are secured and maintained by the D/B Company.
- (c) The D/B Company shall require its Sub-Contractors of every tier to waive the rights of recovery in the same manner (as waived in the preceding paragraph by the D/B Company) against the County, its officers, agents, employees and consultants rendering services at the Project site, the OCIP Administrator, the D/B Company, and other Project contractors and their Sub-Contractors, regardless of tier.

### 9.1.3.18 **COVERAGE DETERMINED BY POLICY**

The coverage referred to above are set forth in full in the respective policy forms, and the foregoing descriptions of such policies are not intended to be complete, or to alter or amend any provision of the actual policies, and in matters, if any, in which the said description may be conflicting with such instruments, the provisions of the policies of the insurance shall govern.

## 9.2 **D/B COMPANY'S LIABILITY INSURANCE**

9.2.1 Pursuant to the exclusions of the Owner-Controlled Insurance Program (OCIP) described in Paragraph 11.1 above, the D/B Company shall purchase and maintain during the life of this Agreement, from a company or companies licensed to do business in its agents and acceptable to the County, such insurance as shall fully protect him, the County, any other Professional Consultant or Architect or Engineer hired by the County, and any parties, consultants, or Sub-Contractors performing work covered by this Agreement from any and all claims, including those resulting from bodily injury (including accidental death), professional liability of the property damage (other than to the work itself) or personal injury which may arise or result from the D/B Company's operations under this Agreement which are not covered under the OCIP, whether such operations be by himself or by any Sub-Contractor, or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.

(a) Said insurance shall specifically provide coverage during the life of this Agreement to the County, its agents, any Professional Consultant or Architect or Engineer hired by the County, and any Sub-Contractor performing work covered by this Agreement for claims made by any persons, including the employees and parties in privity of the contract with the D/B Company, claiming injury as a result of the performance of the Project.

(b) At a minimum, such insurance must include but not necessarily be limited to:

- (i) Worker's Compensation and Employer's Liability insurance (for all operations away from the Project site);
- (ii) Motor Vehicle Liability insurance, covering all motor vehicles, whether owned, non-owned, or hired (for all operations both at and away from the Project site);
- (iii) Comprehensive (or Commercial) General Liability insurance, with Broad Form Liability endorsement. Comprehensive (or Commercial) General Liability policy with Broad Form Liability endorsement shall be further endorsed naming County, Program Manager, Construction Manager, and County's Professional Consultants as additional insured (for all operations away from the Project site).

- (iv) Professional Liability insurance, specifying that the D/B Company shall be responsible to the County for acts, errors and omissions of the D/B Company's directors, officers, employees and parties in privity of the contract with the D/B Company to perform a portion of the work, including their agents and employees (for all operations both at and away from the Project site). The D/B Company shall require the architects and the engineers that are responsible for the design and engineering to purchase and maintain liability insurance with no less coverage than \$1,000,000.00 or 10% of the construction value of the Work, whichever is greater, throughout the duration of the project and for two years following the Date of Substantial Completion.

9.2.2 The insurance required by Subparagraph 9.2.1 above shall be written for not less than the following liability limits, or greater if required by law. Evidence of such insurance shall be provided PRIOR to the day of actual work being performed (refer to OCIP Enrollment procedures provided by the OCIP Administrator for more assistance, or contact Fulton County's designated Representative.)

(a) Worker's Compensation

Each Accident	GA Statutory Limits
Disease – Policy Limit	\$500,000
Disease - Each Employee	\$100,000
Employers Liability	\$1,000,000

General Liability

Bodily Injury/Property Damage	\$1,000,000
Personal Injury	\$1,000,000
General Aggregate	\$2,000,000

Automobile Liability

Bodily Injury	\$1,000,000 CLS
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Excess/Umbrella

As specified and required in the Contract

Professional Liability (if required by the specific Contract and Project)

Limit of \$1,000,000 or 10% of Contract value, whichever is greater.

Note: The Contractor shall provide and shall require all Sub-Contractors performing work under this Agreement to obtain an insurance certificate showing proof of insurance coverage conforming to the above limits, and showing FULTON COUNTY GOVERNMENT as the "Certificate Holder" and "Additional Insured"

without such certificate, the Contractor and any Sub-contractor are considered NON-ENROLLED in OCIP, and cannot commence work.

**APPENDIX 9B**  
**SAFETY POLICY STATEMENT**

**SAFETY POLICY STATEMENT**

It is the policy of Fulton County to establish a comprehensive accident and loss prevention process for all Capital Projects implemented by Fulton County or its agents.

The goals of this comprehensive accident and loss prevention process are as follows:

- To prevent personal injury, property damage, and injury to the public.
- To implement safety and loss prevention processes as critical elements in the complete design and build process.
- To establish a proactive safety and health process that complies with all laws, regulations, consensus standards, and good management practices.
- To have the D/B Company partner with Fulton County in the implementation of a Safety and Loss Prevention Process and Owner Controlled Insurance Program to minimize loss potential and to minimize risk.

Fulton County requires safety, health and loss prevention requirements and expectations to be included in project design, in the invitation to bid, in bid award and project meetings, and in the post job evaluations. The D/B Company is required to develop and submit a project safety and health program for acceptance by Fulton County prior to Notice to Proceed. The D/B Company is required to implement these requirements, and develop a management system to ensure compliance following the safety and health process outlined in this document and the bid documents.

The D/B Company and other entities placed under contract with Fulton County will be obligated to implement, adhere to and enforce this Policy. The safety and health of the D/B Company's employees, Sub-contractors, and the public are the sole responsibility of the D/B Company. The County may use and direct designated Representatives to implement and enforce this policy. **Failure of the D/B Company to comply with this policy or any Safety related obligations may be grounds for contract termination.**

Safety Professionals, Fulton County's designated Representative and Insurance Carrier will periodically inspect all Fulton County construction projects to identify safety hazards and make recommendations to resolve the issues. D/B Company will be responsible for abating the identified issues in a timely manner, and submitting written description of corrective action within 48 hours to Fulton County designated Representatives. Failure to bring timely resolution to the issues may result in work stoppage at D/B Company's expense.

Prior to commencing work under this contract, D/B Company's Project Manager and Project Superintendent shall attend a Pre-Construction Meeting and Safety Pre-Planning meeting to address insurance and safety issues/requirements.

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## **D/B COMPANY SAFETY AND HEALTH MANAGEMENT PROCESS**

### **1.0 NOT USED**

### **2.0 REFERENCES**

- 1.1 Occupational Safety and Health Regulations (OSHA) 29CFR1910 and 29CFR1926
- 1.2 Environmental Protection Agency Regulations (EPA) 40CFR
- 1.3 Fulton County Safety and Health and Requirements
- 1.4 Georgia Department of Transportation Regulations and Requirements
- 1.5 US Department of Transportation Requirements
- 1.6 Manual of Uniform Traffic Control Devices for Streets and Highways (ANSI D6.1)
- 1.7 Georgia Department of Natural Resources Environmental Protection Division Regulations

Safety rules and regulations will be followed using federal, state or local regulations in force. Should a D/B Company's rule be in use which is more effective, the most stringent rule or regulation will be enforced by the D/B Company, Sub-Contractors and the Construction Manager.

### **3.0 RESPONSIBILITY**

The D/B Company awarded the D/B Contract has the ultimate responsibility for the safety and health of all Sub-contractors, all employees on the project, and the general public and complying with all governmental regulations and requirements (OSHA, EPA, DOT, state, local). Nothing contained herein shall relieve the D/B Company or any Sub-contractor of such responsibility or liability.

### **4.0 PROCEDURE**

- 4.1 The D/B Company and each Sub-contractor must implement a written safety and health prevention process and program following the guidelines contained in this document and in any other relevant portion of the Contract Documents. This program must be accepted by the Construction Manager prior to Notice to Proceed.
- 4.2 The D/B Company and each Sub-contractor must implement a drug and alcohol policy following the guidelines contained in this document and in the bid specific actions. This program must be accepted by the Construction Manager prior to Notice to Proceed.
- 4.3 The D/B Company must designate a person responsible for site safety. Each Sub-contractor must designate a person responsible for site safety.
- 4.4 Not Used.

- 4.5 D/B Company is responsible for providing all necessary safety supplies and personal protective equipment required to protect its employees, Sub-contractor, and the general public.
- 4.6 D/B Company shall make available certified First-aid services, First-aid supplies, and provisions for medical care for all employees at the construction site prior to beginning work on site.
- 4.7 D/B Company shall maintain a competent person at the construction site at all times with an OSHA 10-hour certification. Said person shall have the knowledge to recognize hazards or potential hazards and has the authority to correct such hazards.
- 4.8 The status of project safety shall be included in the D/B Company's agenda, which is required in Progress Meetings.

## 5.0 DRUG AND ALCOHOL POLICY

The D/B Company and each Sub-contractor must implement a drug and alcohol policy in order to maintain a safe and efficient work environment. This policy must include the following elements.

1. Written policy that prohibits the use, transportation, sale and possession of these materials.
2. Disciplinary action plan for violations
3. Any treatment or reinstatement/reemployment options
4. Drug and alcohol testing schedule that includes pre-employment, periodic for safety sensitive or critical jobs, and for cause

Note: AGC, ABC and/or Fulton County programs may be used as guidance documents.

## 6.0 OTHER CONTROLLED ITEMS

The D/B Company and each Sub-Contractor is required to include in the Project Safety Program a prohibition against the use, possession, concealment, transportation, promotion or sale of the following controlled items

1. Firearms, weapons, and ammunition.
2. Switchblades
3. Unauthorized explosives including fireworks
4. Stolen property or contraband
5. Controlled chemicals or chemicals recognized as being able to be used for improper purposes.

## 7.0 EMERGENCY PROCEDURES/GUIDELINES

- 7.1 The D/B Company is required to establish site specific emergency procedures in the Project Safety Program to manage emergencies that may occur at any time in the following categories:

1. Fire
2. Employee injury
3. Pedestrian injury due to work activity of any kind
4. Property damage and damage to various utilities (i.e., electrical, gas, sewerage, water, telephone or public roadways)
5. Public demonstrations
6. Bomb threats
7. Flood, Wind, Lightening, Hail
8. Terrorists Threats
9. Work place violence

7.2 These Emergency Procedures will be made part of the D/B Company's Project Safety Program submittal and shall include but not be limited to the following elements:

1. A list of emergency phone numbers posted at the job site, along with information to be transmitted in such emergencies.
2. An incident command structure defining duties and responsibilities
3. A system to train supervisors and employees on this emergency plan
4. Procedures on how to handle emergencies including access to the site by emergency responders, accounting for workers, and securing the area.
5. Procedures for media releases. These releases must be coordinated through the Fulton County Information and Public Affairs Office in coordination with the County's designated Representative.
6. A plan that addresses serious incidents that includes notification to Fulton County, Fulton County's designated Representative, the OCIP Administrator, and the Insurance Carrier immediately after the incident.
7. A review and updating frequency that includes forwarding a copy to Fulton County and the County's designated Representative.

## 8.0 ACCIDENT AND INCIDENT INVESTIGATION AND REPORTING

8.1 The D/B Company is responsible for reporting all accidents and incidents on the project site to the County's designated Representative within (1) business day. Accidents or incidents resulting in a fatality, property loss in excess of \$5,000, or involvement with the general public must be reported immediately to Fulton County's designated Representative and the investigation of the accident or incident coordinated with Fulton County Safety staff and Insurance Carrier.

8.2 The D/B Company will maintain a log of all injuries that occur on the job site. This log will be current and available for review.

8.3 For any incidents such as fires, explosions, fatalities, etc., the D/B Company must notify the Construction Manager immediately and must coordinate any releases to

the news media through the Construction Manager and the County's Information and Public Affairs Office.

- 8.4 If a work-related injury should occur on this project, D/B Company shall perform a thorough investigation of the incident and document the information on a worker's compensation 1<sup>st</sup> Report of Injury. This report shall be submitted to the Insurance Carrier within 24 hours of the incident.
- 8.5 A written accident investigation report containing the following information as a minimum must be forwarded to the Construction Manager and OCIP Administrator within 24 hours of incident.
1. Company Name
  2. Location
  3. Date and Time of incident
  4. Description of incident
  5. Names of all parties involved and all witnesses
  6. Corrective action(s) taken to prevent recurrence
  7. If the incident involves injury or illness, the following information must be provided:
    - a) A medical description of the injury or illness
    - b) OSHA recordability status i.e. first aid, medical treatment, lost time, days of restricted work.
    - c) If the public is involved, information about treatment and treatment location.
  8. Any pictures, site drawings, etc. if they assist in describing the incident.

If the investigation cannot be completed in 24 hours, a preliminary report marked as such shall be forwarded and the report completed and forwarded as soon as possible.

## 9.0 JOB SAFETY ANALYSIS

- 9.1 The D/B Company and each Sub-Contractor must implement a procedure to conduct a written job safety analysis or job hazard analysis for all project work tasks prior to beginning each task. Reference Appendix A.
- 9.2 The job safety analysis should follow National Safety Council, AGC, or other recognized guidelines and address all safety and health hazards for the work,

identify personal protective and other safety equipment required, identify potential hazards to the general public if applicable, and identify any safety equipment, training, or controls that must be implemented prior to starting the work.

- 9.3 The D/B Company must maintain a file for all job safety analysis forms, which is accessible for review.

## 10.0 SAFETY AND HEALTH COMPLIANCE AUDITING

### 10.1 Self Auditing Requirements

10.1.1 The D/B Company and each Sub-Contractor must implement a procedure to assure that written safety and health audits or inspections are conducted at least biweekly (every 2 weeks). Safety checklists used by Fulton County's designated Representative may be used. The D/B Company may use this checklist or an equivalent approved by Fulton County's designated Representative.

10.1.2 Each written safety audit must be filed on the site and a copy forwarded to the Construction Manager. This audit will be routed to Fulton County's Insurance Carrier for review and comment and then filed in the Construction Project files.

### 10.2 NOT USED

### 10.3 INSPECTIONS BY REGULATORY AGENCIES

10.3.1 The D/B Company must notify the Construction Manager whenever an OSHA compliance officer, health inspector, or EPA or Georgia Environmental Protection Division Representative arrives at the project site to conduct an inspection.

10.3.2 The D/B Company is required to forward a copy of all regulatory citations, notice of violations, or similar for this project to the Construction Manager. Copies must be forwarded to the Insurance Carrier.

10.3.3 These records will be reviewed with the Construction Manager and included in the Construction Project files.

### 10.4 SAFETY INSPECTION AND AUDIT FOLLOW UP

10.4.1 Every safety audit or regulatory inspection conducted per the requirements above may be reviewed by the Construction Manager and/or Insurance Carrier loss control staff. This review may identify

- serious and repeat safety items, look at trends, identify risks and potential losses, and site safety and loss prevention activities.
- 10.4.2 After this review the findings may identify areas needing improvement.
  - 10.4.3 A copy of the audit and any areas identified, as needing improvement will be forwarded to the D/B Company's senior management.
  - 10.4.4 For findings that indicate major loss potential or serious concerns about site safety, the areas identified as needing improvement and the overall performance may be reviewed in a meeting with the OCIP Administrator, Construction Manager, and the Insurance Carrier loss control staff. A written action plan to address the D/B Company's performance issues may be developed.
  - 10.4.5 The Construction Manager may meet the D/B Company's senior management to discuss the findings, contract requirements, and their plans to address the findings.
  - 10.4.6 The number and frequency of safety audits and site visits may be increased until improvements are noted.

## 11.0 SAFETY MEETINGS

- 11.1 The D/B Company will conduct weekly safety meetings with all D/B Company and Sub-Contractor employees on the site.
- 11.2 The D/B Company will keep safety-meeting records that include meeting topic(s), outline of items discussed, and attendance and sign in sheet. At this meeting any accidents or audit findings and corrective actions from the previous week will be discussed.
- 11.3 The D/B Company will maintain a job site file that contains copies of the safety meeting records.

## 12.0 TRAINING, INSPECTION AND CERTIFICATION

### 12.1 Employee Training

- 12.1.1 The D/B Company must be able to show when requested the required safety training for all D/B Company and Sub-Contractors employees and competent persons working on the site including any required craft training.
- 12.1.2 The D/B Company must be able to show when requested that all employees operating mobile equipment or cranes have met or exceeded training and licensing requirements.
- 12.1.3 The D/B Company must be able to show when requested that all scaffolds are erected under the direction of a competent scaffold builder, that all users are properly trained, and that the scaffold is inspected daily.

- 12.1.4 The D/B Company shall ensure that each employee is properly trained in the recognition and avoidance of unsafe conditions and the regulations applicable to his or her work environment to control or eliminate any hazards or other exposure to illness or injury.
- 12.1.5 If D/B Company or Sub-contractors employs anyone who cannot effectively communicate using the English language, a translator must be maintained on site who can relay instructions, questions, or concerns in a manner that the non-English and English-speaking employees will understand. The identification of this translator shall be provided to the Construction Manager.
- 12.1.6 D/B Company shall orient all supervision and employees concerning safety requirements before working on the project site.

## 12.2 Equipment Certification and Inspection

- 12.2.1 The D/B Company must be able to document that all cranes and mobile equipment used on the job site have current inspections and certifications.
- 12.2.2 The D/B Company must assure that required daily and weekly equipment inspections are performed and documented in writing per governmental regulations and the requirements of this policy.
- 12.2.3 The D/B Company must maintain a job site file for these required inspections and certifications.
- 12.2.4 Equipment identified as having safety problems or not meeting standards or codes shall be tagged as defective and shall not be used until those identified items have been corrected.
- 12.2.5 D/B Company shall maintain, and have available for viewing, safety inspection reports for ladder, electrical cords, scaffolds, and trenches/excavations.

## 13.0 SAFETY AND HEALTH PROGRAM ELEMENTS

Note: Based on the project work activities and scope of work, some program elements may be not applicable to the project work and therefore do not have to be implemented. Elements marked with an asterisk are applicable to all Projects.

### 13.1 Return to Work Policy\*

The D/B Company and each Sub-contractor will be required to establish a transitional work program for employees injured at work, which provides modified duty within the employee's physical limitations.

### 13.2 Fire Prevention Program\*

The D/B Company and each Sub-contractor will be required to submit a

temporary fire protection plan to be in effect for the duration of the contract. This plan must be submitted as part of the D/B Company's Safety Program submittal. It must include provisions for fire protection systems and equipment, as identified in OSHA Safety and Health for Construction 1926, Sub-Part F, Fire Protection and Prevention.

### 13.3 Hazard Communication (HAZCOM)\*

The D/B Company and each Sub-contractor shall have a written HAZCOM Program. The program shall meet OSHA 1926 Requirements and provide for training so that all employees will be able to:

- Understand the program and identify hazardous chemicals with which they work.
- Understand product-warning labels.
- Have MSDSs for all potentially hazardous materials brought onto, used on, or stored at the job site.
- Know the physical location of the Material Safety Data Sheets (MSDS).

### 13.4 Personal Protective Equipment(PPE)\*

All D/B Company and Sub-contractor employees and other site visitors will be required to wear the PPE necessary to accomplish the work in a safe manner. PPE required will vary from job to job and must be based on a written hazard assessment. A list of PPE that is required is identified below:

- Hard Hats shall be worn at all times on all projects
- Hearing Protection for operations that create noise in excess of 85 dBA is required.
- D/B Company shall provide eye or face protection equipment when machines or operations present potential eye or face injury from physical, chemical, or radiation agents.
- Work boots or work shoes made of leather shall be required. No open toed shoes or canvas shoes are allowed
- Shirts with sleeves at least 4 inches long are required. Tank tops and mesh shirt are not allowed.
- Full Body Safety Harnesses with shock absorbing lanyards for fall protection are required.
- Full body and chemical splash protection is required when handling hazardous chemicals.
- Respirators are required when employees maybe exposed to dust and/or chemicals in excess of the OSHA permissible exposure limits.
- Long pants are required.

### 13.5 Confined Space Entry

If the project work involves permit required confined spaces, a permit required confined space entry program that meets OSHA requirements must be established. This program must include but is not limited to the following elements.

- Confined Space Identification
- Environmental Testing
- Rescue
- Communication with employees in the confined space
- Employee Training
- Permit System for entry

### 13.6 Excavations

If the D/B Company or Sub-contractor must make a cut, cavity, trench or depression in an earth surface formed by earth removal, the work must comply with the OSHA Regulations on trenching and excavations. A competent person must be assigned for each excavation. Requirements include but are not limited to

- Employee Training
- Daily inspections
- Soil testing
- Protective or support systems.

### 13.7 Electrical Tools, Equipment, and Systems\*

- The D/B Company and each Sub-contractor must implement Assured Grounding Program or use Ground Fault Circuit Interrupter (GFCI) devices on all electrical tools and extension cords.
- All electrical work must be performed in accordance with the National Electrical Code (NEC) and OSHA.
- All electrical tools and extension cords must be in good repair and the D/B Company must establish a written inspection program for all electrical tools. The frequency of inspection shall be at least monthly.

### 13.8 Lockout/Tagout Procedure

The D/B Company and each Sub-Contractor will be required to implement a

written Lockout/Tag procedure that meets OSHA requirements if their work requires energy isolation. Program elements include but are not limited to the following:

- Energy isolation lists for each piece of equipment
- Employee training
- Individually keyed locks and danger tags
- Written Procedure that assigns responsibilities

### 13.9 Fall Protection\*

D/B Company shall provide an approved fall protection system for all employees working at an elevation of 6 feet or higher on this project, including scaffolding work and steel erection. Employees will be responsible for utilizing the fall protection 100% of the time. Sub-contractors will be responsible for ascertaining their employees' compliance with this requirement. The plan must address the following items:

- Only full body harnesses with shock absorbing lanyards and double locking hooks shall be use.
- Falls should be limited to less than 6 feet such than employee can neither fall more than 6 feet nor contact any lower level.
- Fall protection systems must be planned into the job and must be designed to handle loads and forces expected. The project goal is 100% fall protection.
- Employee training and enforcement of these requirements are mandatory to assure an effective program.

### 13.10 Scaffolding\*

All scaffolds and work platforms shall be constructed to meet the requirements of OSHA 1926.451 and ANSI A10.8. Some program elements include but are not limited to

- User training for all employees who may use scaffolds
- Scaffolding is to be designed and erected by competent person(s) following manufacturer's guidelines. Employees must use fall protection when erecting scaffolding.
- Daily inspection by competent person. Must implement daily tag system to document inspection.

- Must have engineering approval for scaffolds above 100 feet in height.
- Must be able to document competent person credentials.
- Scaffolds must have proper egress (ladder/stairs) and should have guardrails, complete deck, toe boards and netting if anything can fall on people below. If guardrails or decking is not complete, fall protection must be used.

### 13.11 Cranes And Other Lifting Devices

- Trained and experienced operators shall operate Cranes in accordance with the applicable OSHA and ANSI/ASME.
- The D/B Company is responsible for ensuring that the crane is properly sized for the job and that all required inspections and maintenance required by OSHA and ANSI/ASME standards have been conducted.
- All cranes should have anti-two block devices installed and operational. Cranes lifting employees in personnel baskets must have an anti-two block device to stop the crane if this condition occurs (positive acting).
- Tag lines are required to secure materials while being moved or handled by cranes.
- All cranes working in the vicinity of overhead power lines shall be grounded and be equipped with proximity guards.
- A lift plan must be submitted for all lifts that exceed 20,000 pounds or 75% of the crane's lift capacity. This plan must be reviewed and approved by the D/B Company.
- Slings, hooks, and other lifting devices must be inspected on regular basis and stored properly.

### 13.12 Use Of Personnel Baskets

- Personnel baskets should only be used as the last practical means after documenting that all other means are unacceptable.
- The personnel basket must be manufactured, tested, and used in accordance with OSHA 1926.550. The crane lifting the basket must also meet OSHA requirements.

### 13.13 Personal Lifts With Articulating Booms (Jlg) And Scissors Lifts

- Operators must be trained in the safe operation of the lift including daily inspection procedures prior to use.
- Operators of JLG lifts must wear a full body harness with shock absorbing lanyard and be tied off while the lift is operation. Operators in a scissors lift must use fall protection anytime the guardrail system removed or altered.

#### 13.14 Ladders\*

- Ladders are acceptable means of access when used in compliance with OSHA 1926.1053.
- Ladders must be in good repair, have safety feet and be inspected.
- Extension ladders must be either held by an employee on the ground or tied off at the top.
- Homemade ladders not meeting OSHA requirements should not be used.
- Non-conducting ladders are required for electrical work.
- Fall protection is encouraged for employees working on ladders especially if they will be leaning and turning in their work activities.

#### 13.15 Tools And Equipment\*

All tools and equipment used on the project must be in a safe operating condition, with all guards in place, and must meet or exceed all governmental regulations (OSHA, EPA, DOT, etc.). Tools and equipment must be maintained, inspected, tested, and used in accordance with OSHA regulations.

#### 13.16 Compressed Gas Cylinders\*

- Compressed gas cylinders must be used, stored, and transported in accordance with OSHA requirements, DOT requirements, and Compressed Gas Association standards.
- Fuel and oxygen cylinders must be store separately or separated by a ½ hour rated firewall.
- Compressed gas cylinders are not allowed inside confined spaces.

#### 13.17 Welding, Burning, And Cutting\*

- The D/B Company's program must meet or exceed OSHA and NFPA requirements.
- All flammables must be removed from work area and a fire watch posted in area until 30 minutes after the job is completed.
- At a minimum a 10 LB ABC rated fire extinguisher must be available in the immediate work area.
- Regulators must be in good working order and must have anti-flash back and check valves.
- Welding shields and burning goggles must be used.

#### 13.18 Sanitation And Housekeeping\*

- The project site shall have an adequate number of portable toilets and hand washing facilities.
- The project site must establish a housekeeping plan that includes daily site clean up and trash and debris removal.

### 13.19 Hearing Conservation\*

The D/B Company and each Sub-contractor who has employees exposed to noise levels exceeding 85 dBA must establish a hearing conservation program that meets or exceeds OSHA requirements. Minimum program elements include audiometric testing, noise monitoring, use of hearing protectors, and employee training.

### 13.20 Respiratory Protection

The D/B Company and each Sub-contractor who has employees who wear respiratory protection must implement a respiratory protection program that meets or exceeds OSHA requirements. Minimum program elements include risk based respirator selection, medical surveillance, employee training, respirator fit testing, and written operating procedures.

## 14.0 SPECIALIZED SAFETY PROGRAM ELEMENTS

If required by the project scope of work and specific work site or activities, specialized programs listed below shall be included in the D/B Company's Safety Program submittal. The D/B Company is required to implement the required programs and assure that they meet or exceed all contractual, regulatory and Fulton County's requirements applicable. Details for specific program elements may be included in the contract documents.

14.1 Asbestos Removal

14.2 Lead Based Paint Removal

14.3 Exposure Assessment and Employee Monitoring (Industrial Hygiene)

14.4 Hazardous Waste Operations and Training

14.5 Overhead Power Lines

14.6 Locating underground utilities

14.7 Dust Control

14.8 Guarding for floor holes and roof openings

14.9 Heavy Equipment, Truck and Earth Moving Equipment requirements

14.10 Environmental Requirements

## 15.0 ROAD AND TRANSPORTATION SAFETY REQUIREMENTS

The D/B Company shall implement the following into its safety program whether required by the contract or any other authority having jurisdiction if required to perform the work and maintain vehicular and pedestrian traffic safety:

15.1 Barricades and Cones

- 15.2 Traffic and Warning Signs
- 15.3 Traffic control devices
- 15.4 Equipment and materials storage
- 15.5 Reflective Clothing and other personal protective equipment
- 15.6 Excavation and road hole protection
- 15.7 Erosion protection
- 15.8 Trained flaggers

## 16.0 ADDITIONAL REQUIREMENTS TO PROTECT THE GENERAL PUBLIC

Based on the D/B Company's scope of work and specific work activities or location the D/B Company may be required to implement the following into its safety program to protect the general public:

- 16.1 Fencing and other measures for site security
- 16.2 Warning, direction and no trespassing signs
- 16.3 Alternate public walk ways
- 16.4 Protection of the public from over head and other construction hazards
- 16.5 Site Traffic Control
- 16.6 Barricading off hazardous areas and open pits and holes

Attachment A Job Safety Analysis Worksheet Example and Information

**Job Safety Analysis/ Job Pre-Planning Worksheet**

<b>Job Name and #:</b>		<b>Completed By:</b>	
<b>Date:</b>		<b>Phase/Operation:</b>	
<b>Task</b>	<b>Hazard</b>	<b>Control</b>	

**PRE-OPERATIONAL PLANNING**  
**FACT FINDING GUIDE - GL**

**I. Evaluate present conditions at job site to determine items that could lead to liability claims during work and after completion of the project.**

**A. PRESENT OCCUPANCY OR USE OF THE SITE**

- Demolition to be done?
- Structures will remain (condition)?

**B. HISTORY OF THE SITE**

- For what was the site used before?
- Underground tanks?
- Underground utilities?

**C. GEOLOGY OF THE SITE**

- Rock to be blasted?
- Water to be removed/diverted?
- Fill needed? (where and how obtained?)
- Excavation needed? (where and how disposed of?)

**II. Evaluate controls needed in reference to site security and public protection.**

**A. FENCING NEEDED?**

**B. ACCESS/GATES**

- Can traffic be routed past office or checkpoint?
- "Non-Vendor" visitors escorted?
- Gate lockable after hours?
- "Hard Hat" signs at entrance?
- Dirt removal/tarping area at exit?
- Ready Mix chute wash area?

**C. PEDESTRIANS**

- Sidewalk maintained outside fence?
- Covered sidewalk needed?
- Special access requirements for neighboring occupants?
- Special after-hours considerations?

**D. ENVIRONMENTAL**

- Dust control?
- Silt control?
- Mud control on streets?
- Vibration control?

**E. UTILITIES**

- Underground utilities located?
- Overhead power lines in work area relocated, removed, or deenergized?
- Temporary power service away from high traffic areas?

**F. SUB-CONTRACTORS**

- Method to secure proof of adequate insurance coverage in place?
- List of hazardous materials obtained?
- List of hazardous materials provided?
- Responsibilities established
  - Job site safety meetings
  - Materials delivery
  - Debris removal
  - Access to site
  - Weekly Sub-contractors' meetings
  - Schedule of safety inspections
  - Emergency Procedures

**G. MATERIALS HANDLING**

- Crane selection criteria established
  - Maximum weight to be handled
  - Maximum lifting height
  - Maximum horizontal reach needed
  - Amount of travel needed
  - Swing radius available
  - Set-up area available
  - Ground bearing capacity
  - Approximate frequency of lifts
- Crane operations responsibilities established
  - Triangle or leasing company crane to be used?
  - Operator trained and experienced on specific machine?
  - Operator can accurately read and interpret machine load chart?
  - Critical lift identified (75% of net capacity)?
  - Machine fully inspected by a qualified outside agency?

- Rigging hardware properly selected?
- Inspecting and maintaining the crane per owner/manufacture specifications?

### **III. Start Up.**

#### **A. ELECTRICAL**

- Temporary Power
  - Underground service possible?
  - Maintenance responsibilities established?
  - Main circuit panel barricaded?
  - Lighting planned?
- Circuit Protection
  - Ground fault circuit interrupt protection?
  - Assured grounding conductor program?
  - Responsibilities established?

#### **B. FIRE PROTECTION**

- ABC extinguishers adequately distributed?
- Properly sized?
- Maintenance of fire extinguishers?
- Stand pipe/hydrant available? Adequate?
- Housekeeping checks/inspections?

#### **C. FALL PROTECTION**

- Critical Job Phases Identified?
  - Critical exposures identified by phase? (e.g. "Worker falls into basement excavation")
  - Scheduled start dates for critical phases?
- General Fall Protection Procedures
  - Perimeters
  - Floor openings
  - Working deck
  - Work area access
  - Ladders
  - Elevator hatchways

#### **D. PERSONAL PROTECTIVE EQUIPMENT**

- General
- Hard hats

- Work shoes
- Specific by Task

**E. HAZARD COMMUNICATION PROGRAM ESTABLISHED AND EMPLOYEES TRAINED**

**F. CONFINED SPACE ENTRY**

- Procedures established and task(s) identified requiring use of procedures?

**G. TRENCHING**

- Procedures established and task(s) requiring procedures identified?

**H. PHASE PRE-PLANNING**

- Job schedules established?
- Agreed upon target dates for meeting?
- Follow up system

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**APPENDIX 10**

**PERIODIC REPORTS/MEETINGS & DESIGN SUBMITTALS**

**10.1 Introduction**

This Appendix sets forth the requirements during the design and construction period for meetings and reports, and for design submittals. All documents or submittals described in this Appendix shall be submitted as complete organized reports (including tables of contents), bound in durable 3-ring binders. The D/B Company shall submit ten copies of all documents and submittals, except where noted.

**10.2 Monthly Project Design and Construction Progress Report**

On a monthly basis, following the Contract Date (during the design and construction periods), the D/B Company shall furnish the Construction Manager with a monthly project progress report, in accordance with the Design/Build Contract that summarizes all aspects of the completed month's work progress.

The Construction Manager will provide timely review and comment on all submittals in accordance with the Design/Build Contract. Failure of the Construction Manager to provide timely comments shall not relieve the D/B Company of any of its performance obligations contained in the Owner/Design Builder.

The monthly report shall contain as a minimum, the following:

- Executive Summary. A written narrative of the work completed this period, a description of work to be completed next period, and a description of any critical items, which require immediate resolution.
- Actual cost completed and percent completed. A financial breakdown of the status of the job to date.
- Budgeted Value versus Earned Value of the job to date.
- Project Schedule Updated and annotated
- Submittal Status Log
- Design Drawing Log
- Change Order Log
- Deficiency Log
- Photos
- Engineers/Architects Field Visit Reports

**10.2.1 Videos and Photographs**

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The use of photographs and videos to document the progress of the D/B Project and the history of the JCEC is a part of the D/B Company's responsibility. During the course of the D/B Project the use of photos may well be the only means of verification of the completion of satisfactory work. Also at the completion of this project the County and the D/B Company would both utilize a photographic history of the project. The D/B Company is encouraged to take as many digital pictures of the project as possible. The requirements of the RFP for pictures are outline below. All pictures taken on the project whether to fulfill the requirement of the specification or for other reason shall become the property of the County. Access to the picture database will not reasonably be denied the D/B Company.

#### **10.2.1.1.1 Videos**

Prior to the beginning of any site work, the D/B Company shall take a pre-construction video of the work area to record existing conditions. The video shall show all conditions which might later be subject to disagreement and shall be shown in sufficient detail to provide a basis for decisions. The Construction Manager shall be notified of the day and time of when the video is to be made and given an opportunity to be present during the making of the video. Video shall be submitted on CD-ROM with a log of the items tapped within 10 calendar days of the Notice to Proceed. No request for payments will be processed until the pre-construction video has been submitted and approved by the Construction Manager.

Following substantial completion, another recording shall be made showing the same area and features as in the pre-construction video. The Construction Manager shall be notified of the day and time of when the video is to be made and given an opportunity to be present during the making of the video. Post-Construction video shall be made prior to final acceptance and before submitting a request for final payment. Video shall be submitted on CD-ROM with a log of the items tapped.

During the project, the use of video to document significant events in the construction of the plant may be requested by the Construction Manager. The D/B Company shall provide all material and personnel necessary to make the video recording.

#### **10.2.1.2 Photographs**

All photography (Pre-construction, post-construction, progress) for this project shall be in digital format. The D/B Company shall provide the digital camera, the personnel to take the photographs, the labor and computer to transfer the photographs, the CD-ROM burner to transfer the prints to a CD-ROM and an appropriate color printer and photo quality paper to print the selected photographs for submission. All photographs shall be submitted in digital format on a CD-ROM with pertinent information provided for each image, including: project

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name, Contractor's name, description of subject, orientation, and date and time of exposure. The Construction Manager may request that of prints of some of the pictures in color on 8 by 10 photo paper. Photographs submitted shall be enclosed back to back in a double face plastic sleeve punched to fit a standard three-ring binder

Prior to the beginning of any work, the D/B Company shall take project photographs of the work area to record existing conditions. The Pre-construction Photos shall show all conditions which might later be subject to disagreement shall be shown in sufficient detail to provide a basis for decisions. The pre-construction photographs shall be submitted to the Construction Manager on a CD-ROM within 15 calendar days after the date of the Notice to Proceed. The Construction Manager may request that two (2) sets of prints of up to ten (10) pictures be print in color on 8 by 10 photo paper.

Post-construction photographs shall be taken after substantial completion and provided prior to acceptance of the project. The post-construction photographs shall be submitted to the Construction Manager on a CD-ROM prior to acceptance and final payment. The Construction Manager may request that two (2) sets of prints of up to twenty-five (25) pictures be print in color on 8 by 10 photo paper.

As the work progresses, the D/B Company shall provide record photographs of all major components of the construction. The photographs shall be taken at least monthly, or more frequently as necessary to provide an appropriate record of the work. A minimum of two (2) sets of 8" x 10" color prints of ten (10) photographic shot shall be submitted with the monthly report. The photographs shall be representative of the primary work being claimed for during the period under consideration. The print selection will be agreed to with the Construction Manager prior to submission. All digital pictures taken shall be submitted monthly on a CD-ROM with the monthly report.

Additionally, the D/B Company shall contract to have Aerial photographs taken of the construction site on a bi-monthly basis from the start of construction until final completion. All aerial photographs shall be submitted with the monthly report and shall become the property of the County.

### **10.3 Design Submittals and Review Process**

In accordance with the terms and conditions of the Design/Build Contract, the Construction Manager will review each design package for consistency in the Minimum Technical Requirements and the design information submitted with the D/B Company's Proposal and to provide input on selected issues such as selection of finishes, architectural concept, landscaping, and environmental mitigation. The Construction Manager's input to the design process shall be solicited by the D/B

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Company on a regular basis, including during design progress meetings and at the key stages in the design preparation using the design submittal packages specified below. The Construction Manager may also provide input on constructibility, operability, and maintainability issues.

All submittals are expected to comply with the Minimum Technical Requirements and with the Proposal design information. Any requested exception to the specifications or Design/Build Contract (regardless of prior discussion) must be clearly identified by the D/B Company in its cover letter, which transmits the submittal and must be fully documented with compelling justification for the exception. The D/B Company shall assume all risks associated with assuming that any such requests for exemption will be granted.

### **10.3.1 Concurrent Design and Construction Progress**

It is recognized that the design/build process requires that the D/B Company and the Construction Manager to work cooperatively to assure design review. At a minimum, design reviews meetings shall be held for the purpose of design review as follows:

- Confirmation of the conceptual design as proposed, and as modified during negotiations representing a 30% detailed design.
- 30 days prior to the Preliminary Design Submittal
- Post Regulatory Review Design Submittal
- 30 days prior to the Pre-Final Design Submittal
- Design Development Progress Submittals: Various Design and Equipment Packages Prepared by the D/B Company for the Final System Specific Designs.
- Prior to construction and procurement of any major component of the Design/Build Project; and
- At least 30 days prior to design submittals by the D/B Company to any regulatory agencies.

### **10.3.2 Design Changes Requested by The County**

The procedures to be followed for incorporating design changes requested by the County are specified in the Design/Build Contract.

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### **10.3.3 Design Submittals**

The minimum components of submittal packages that are precedent to key construction and testing activities are listed below. All drawings shall clearly indicate the status of new and existing equipment. The preliminary submittal Protocol envisions that the D/B Company will submit the following three design packages. These packages will be reviewed in accordance with sections 10.3.4 and 10.3.5.

#### **10.3.3.1 Conceptual Design Submittal**

- a. The D/B Company shall prepare a conceptual design submittal based on the information submitted in response to the proposal. The submittal shall include any modifications that may have occurred during negotiations and shall confirm that the technical requirements as outlined in the D/B RFP. This submittal should represent a 30% design with any and all changes made from the original design submitted with the D/B Company's Proposal clearly identified. The D/B Company shall review and confirm the requirements of the D/B Project in preparing this submittal.
- b. In preparing this submittal the D/B Company may meet with the Construction Manager to review any recommendations it may have, after the notice to proceed and prior to the Preliminary Design Submittal. The D/B Company may identify, document and submit for review a value-engineering proposal detailing topics and associated cost adjustments to the D/B Project for review by the Construction Manager.
- c. The D/B Company shall identify and document all permits, building, architectural, landscaping and major equipment requirements in this submittal. It shall also include the Design and Construction Schedule.
- d. The D/B Company shall submit this to the Construction Manager for review prior to submitting the Preliminary Design Submittal.

#### **10.3.3.2 Preliminary Design Submittal**

- a. The D/B Company shall make a Preliminary Design Submittal documenting the design concept as proposed, as modified during

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negotiations and addressing conceptual design submittal review comments. This submittal should represent a design with any and all changes made from the original 30% design submitted with the D/B Company's Proposal clearly identified. This submittal shall also be provided in a report format that will serve as a basis for the Georgia EPD Design Development Report. The submittal should include but not be limited to the following:

- Detailed design and construction Schedule (see Appendix 12).
- Basis of Design Memorandum Outline for each Design/Build task.
- Design influent and effluent wastewater characteristics.
- Design Flows at Average Day and Peak Day.
  
- Key parameter removal of BOD5, Total Suspended Solids, Total Nitrogen, NH3-N, Nitrites, Nitrates, Phosphorus, Dissolved Oxygen, pH, Temperature, Fecal Coliform, Total Residual Chlorine and any industrial waste.
- Description of the selected wastewater treatment processes.
- Mass balance for liquid, solids and sludge.
- Description of each unit process and the operating conditions.
- Unit processes and mechanical equipment sizes and dimensions, design criteria-design points and design range.
- System redundancy.
- Discussion of process control parameters (F/M, MCRT, MLSS, MLVSS, and SVI).
- Discussion of operational flexibility.
- Discussion of manual bypassing.
- Discussion of emergency power.
- Discussion of plant wide freeze protection.
- Discussion of thermal/ heat protection for all mechanical equipment
- Sludge treatment and disposal methods.
- Geotechnical Investigation Reports.
- Design Drawing List.
- Specification List.
- Preliminary Site Work Plans (Survey, Grading and Drainage Plans if applicable).
- Preliminary Architectural Plans.
- Sound and Light Abatement Plan.
- Sustainable Design Report: The Proposer shall substantiate the measures used to design and build the facilities using

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sustainable design principles including: energy efficient equipment and systems, low-embodied energy materials, renewable energy sources, recycled content materials and resources, enhanced indoor environmental quality, water conservation, stormwater impact minimization, spill minimization and handling, and life cycle cost analysis.

- Process and Support Facility General Arrangement Plans.
  - Process Flow Schematic and Piping and Instrumentation Diagrams (P&IDs) for all Design/Build requirements.
  - Preliminary Mechanical Plans.
  - Preliminary Plumbing/HVAC plans.
  - Preliminary Electrical Site Plan.
  - Electrical One-Line Drawings.
  - Emergency Response Plan Outline.
  - Safety & Security Plan Outline.
  - Summary
- b. Preliminary Design Documents shall be provided to depict all system equipment and components and their proposed locations.
- c. The D/B Company shall provide the Construction Manager with a minimum of ten sets of drawings and specifications for review in accordance with sections .
- d. The D/B Company shall review the document review comments from the Construction Manager and attend a coordination meeting with the Construction Manager. The D/B Company shall incorporate the Construction Manager's final review comments into the drawings and respond to Construction Manager document review comments in writing following the coordination meeting indicating the final resolution of each comment.
- e. If the Construction Manager accepts the Preliminary Design, the Construction Manager shall issue the Notice of Acceptance in writing to the D/B Company.
- f. The D/B Company shall develop and recommend a plan for final design and construction activities. The Schedule shall reflect this approach.

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- g. The D/B Company shall not commence with the work described below without written approval from the Construction Manager.

### **10.3.3.3 Post Regulatory Review Design**

- a. A post regulatory review design drawings and specifications shall be prepared to a level of detail sufficient for permitting and construction to begin. It shall reflect all comments from the review of the Preliminary Design Review, Georgia EPD and any other regulatory or governmental review. Documents shall set forth, in detail, the requirements for construction of the work and shall:
  - 1) Develop the intent of the D/B Company's preliminary design documents in greater detail.
  - 2) Provide information necessary for the use of those in the building trades who shall be constructing the work.
  - 3) Develop documents of sufficient detail as necessary to obtain all required regulatory and permitting agency approvals.
  - 4) Include all information to exhibit compliance with previously issued Construction Manager design review comments or written explanation of non-compliance.
  - 5) Include all information to exhibit compliance with Construction Manager design standards.
- b. The D/B Company shall issue interpretations of the plans and specifications to the Construction Manager, as requested for clarification of documents.
- c. The D/B Company shall submit ten sets of Construction Documents to the Construction Manager. Each drawing and cover page of the specifications shall be stamped by professional engineers and/or architects registered in the State of Georgia. The D/B Company may commence construction after submittal of the final design plans and specifications to the Construction Manager and the authority having jurisdiction and approval by the same.
- d. The D/B Company shall be responsible to apply for, pay for, and secure all permits, inspections, and review of the Project required

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by all authorities having jurisdiction prior to and during construction. Permits required include, but are not limited to, land disturbance and building permits. The D/B Company shall contact any public authority including Fulton County having jurisdiction for application requirements, scheduling, cost, and a checklist of minimum requirements. Deliver one set of approved permit drawings to the Construction Manager.

#### **10.3.3.4 Design Development Progress Submittal**

The Company shall make a Design Development Progress Submittal for each design package at approximately the 90 percent complete state. At a minimum, this submittal shall include the following:

- Final Basis of Design Memorandum;
- Preliminary Architectural Door, Window, Finish, and Hardware Schedules and Details;
- Preliminary Landscape Details and Planting Materials Lists;
- Updated Drawing and Specification Lists;
- Preliminary Piping and Valve Lists;
- Updated Site Work, Grading, Drainage, Landscaping, and Electrical Site Plans;
- Updated Process and Support Facility General Arrangement Plans;
- Preliminary Site Sections and Details;
- Updated Electrical One-Line Drawings;
- Updated Process Flow Piping and Instrumentation Diagrams (P&IDs) for all processes;
- Preliminary Building and Structure Foundation Plans, Floor Plans, and Sections;
- Updated Architectural Plans and Elevations (Including Landscape Plans and Details, at least one Full Building Section, and a representative Wall and Plan, and noise level calculations);
- Updated Mechanical Systems Plans, Sections, and Details; and
- Preliminary Process, Mechanical, Electrical, I&C, and Support Systems Equipment Lists.

#### **10.3.3.5 Pre-Final Design Submittal**

The Company shall make a Pre-Final Design Submittal for the Design/Build Improvement design package 30 days prior to substantially complete. At a minimum, this submittal shall include the following:

- Final Piping, Valve, Equipment, Landscaping, and Planting Lists;

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- Final Civil, Architectural, Landscaping, Structural, Mechanical, Electrical, and I&C Plans, Sections, and Details;
  - Final Process Flow Piping and Instrumentation Diagrams (P&IDs) for all processes, with loop drawings illustrating the functional elements in the path of each sensor to each control system Input/Output (ISA S5.4);
  - Architectural Door, Window, Finish, and Hardware Schedules and Details;
  - Final Electrical One-Line Drawings;
  - Process, Civil, Structural, Mechanical, and Electrical Design Calculations;

#### **10.3.4 Design Submittal Approvals and Consents.**

Any D/B Company submittal, request, or report, other than submittals that are in accordance with section 11.1.3, for any approval or consent by the County shall be submitted to the Construction Manager with transmittal. The receipt date shall be the date the Construction Manager signs and dates the submittal. All responses, approval or consent shall be given by the Construction Manager in writing and shall be conclusive evidence of such approval or consent, subject only to compliance by the County with the Applicable Law that generally governs its affairs. If the County does not find a request, report or submittal acceptable, the Construction Manager shall provide written response to the D/B Company describing the objections and the reasons for rejection within 30 days of the Construction Managers receipt of the submittal. If no response is received within 20 day time, the D/B Company shall request in writing from the Construction Manager and the Program Manager a response. If after the 30 day time the request, report or submittal has not be answered it shall be deemed rejected and the D/B Company may resubmit the same, with or without modification.

#### **10.3.5 Procedure for County Review of Design Submittals**

The following protocol applies for submission of design documents to the County for review and comment which must then be submitted to appropriate Governmental Bodies for approval prior to continued progress in accordance with the published project schedule. All submissions shall be to the Construction Manager with transmittal. The receipt date of the submittal shall be the date the Construction Manager signs and dates the transmittal. The County shall use good faith effort to complete a review of each submittal within 30 days of receipt. The D/B Company shall be notified of any concerns, problems, or non-compliance of such submittal within that time period. However, if the County does not comment on any aspect of a design

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submittal this lack of comment shall in no way be deemed to be an approval or consent or in any way relieve the D/B Company of full responsibility for the design, construction and performance of the Design/Build work. After 20 days from the date of submittal, the D/B Company shall in writing to the Construction Manager and Program Manager request a response to the submittal. If the County has not responded within that 30-day time period the D/B Company shall not be prohibited from submitting such design packages to the appropriate Governmental Body for review and approval. The D/B Company shall submit in writing to the Construction Manager and Program Manager at the 30 day point that in accordance with this protocol the submittal is deemed to have been reviewed by the County without comment and that the D/B Company is proceeding in accordance with the published schedule.

#### **10.4 Design Progress Meetings**

The Construction Manager shall have the right but not obligation to attend and participate in the D/B Company's design progress meetings. These meetings will be conducted at the D/B Company's on site construction office, or at an alternative agreed upon location. The D/B Company shall provide the Construction Manager with at least 72 hours notice of the meetings.

The D/B Company shall provide the Construction Manager with a meeting agenda no less than three (3) days prior to the meeting. Meeting minutes shall be prepared by the D/B Company in draft form within five (5) business days following each meeting for Construction Manager review and comment. The Construction Manager's comments shall be incorporated and final meeting minutes distributed by the D/B Company. The D/B Company shall also provide to the Construction Manager copies of other documentation produced as a result of the meetings.

#### **10.5 Project Meetings and Reports**

The Program Manager will schedule and administer the Pre-construction Kick-off Meeting. This meeting will transfer responsibility for the project from the Program Manager to the Construction Manager.

During the construction period the Construction Manager shall schedule and administer periodic progress meetings and specially called progress meetings throughout the progress of the work. The Construction Manager shall prepare agenda for these meetings, distribute written notice of each meeting three days in advance of the meeting date, and make physical arrangements for the meetings. The Construction Manager shall preside at the progress meetings, record the minutes, including all significant proceedings and decisions. The Construction Manager shall reproduce and distribute copies of minutes within three days after each meeting to all participants and to all parties affected by decisions made at the meeting.

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Representatives of D/B Company, sub-contractors and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents. The Program Manager shall attend progress meetings to ascertain that work is expedited consistent with the Contract Documents.

### **10.5.1 Pre-construction Meeting**

The Program Manager will designate the location and schedule the kick-off meeting within 15 days after contract execution.

The following parties shall attend the meeting:

1. Public Works Representative.
2. Program and Construction Manager.
3. D/B Company's Project Manager.
4. Major sub-contractors.
5. Major Suppliers.
6. Construction Manager and PM/CM safety managers
7. OCIP Representative

Suggested Agenda:

1. Introduction of key players (attendees)
2. Designation of responsible personnel
3. Steps to Issuing a Notice to Proceed
4. Safety Issues
5. List of major sub-contractors and suppliers.
6. Major equipment deliveries and priorities.
7. Project Coordination, Critical Work Sequencing.
8. Review of Procedures for:
  - a. Field decisions.
  - b. Proposal requests.
  - c. Submittals.
  - d. Change Orders.
  - e. Applications for Payment.
  - f. Adequacy of distribution of Contract Documents.
  - g. Procedures for maintaining Record Documents.
  - h. Use of premises:
    - i. Office work and storage areas.
9. Temporary utilities.
10. Security procedures.

### **10.5.2 Progress Meetings**

During the construction period the Construction Manager shall schedule regular periodic meetings and shall hold called meetings as required by progress of the

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work.. The meetings shall be held at the field office of the D/B Company or at other locations made available by the Construction Manager.

The following parties shall attend the meetings:

1. Construction Manager and Program Manager.
2. sub-contractor as appropriate to the agenda.
3. Suppliers as appropriate to the agenda.
4. Others as required

Suggested Agenda:

1. Review and approval of minutes of previous meeting.
2. Safety
3. Review of work progress/schedule updates since previous meeting.
4. Field observations, problems, and/or conflicts.
5. Problems which impede Construction.
6. Review of off-site fabrication, delivery schedules.
7. Corrective measures and procedures to regain projected schedule.
8. Planned progress, schedule, during succeeding work period. Look ahead  
Schedule
9. Review submittal schedules; expedite as required.
10. Review proposed changes orders
11. Unresolved Request for Information
12. Other

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## **APPENDIX 11**

### **CONSTRUCTION CONTROLS AND FACILITIES**

#### **11.1 HOURS OF WORK/CONTROL OF NOISE DURING CONSTRUCTION**

The D/B Company shall work between the hours of 7:00 AM and 7:00 PM, Monday through Friday (work hours) but so as to not violate Fulton County Noise Ordinance. Work that must be performed outside of these work hours or an increase in work hours to comply with the project schedule before 7:00 AM or after 7:00 PM or on weekends (Saturday or Sunday) must be requested in writing from the Construction Manager. This includes delivery of material or equipment to the site outside of the normal work hours. It is the policy that when there is work in progress that a member of the Construction Management team will be present or available within short notice. If work outside of the work hours is required and either a member of the construction managers team must be present or is required for work inspection the D/B Company shall pay for those hours that the individual works.

#### **11.2 CONSTRUCTION**

In accordance with the terms and conditions of the Design/Build Contract, the Construction Manager shall review construction activities and participate in the construction decision-making process and construction progress meetings, as needed, to verify compliance with the intent of the Design/Build Contract. In addition, the Construction Manager will review the progress of construction to verify payment. The monthly design and construction program reports, together with the detailed design and construction Schedule, the schedule of values, and the draw down Schedule, as presented in Appendix 12 of the Design/Build Contract will be reviewed.

##### **11.2.1 Construction Manager Oversight during Construction**

The County, the Construction Manager and Program Manager shall have complete access to the site at all times, 24 hours per day, 365 days per year.. It is expected that the Construction Manager will have full-time representation at the Site throughout construction, start-up, and Acceptance Testing. The Construction Manager and his designated representatives shall have the right to attend the D/B Company's construction progress meetings which shall be held at the D/B Company's on site construction office, the Johns Creek WPCP or another agreed upon location.

The Construction Manager may issue a Work Deficiency Notice in the event of unsatisfactory work or performance. The D/B Company shall implement the approved Corrective Action Plan or means acceptable to the Construction Manager to achieve compliance.

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The D/B Company shall solicit the Construction Manager's input to the process on a regular basis. The D/B Company shall provide the Construction Manager with copies of documentation produced as a result of all construction progress meetings.

All personnel accessing the site shall comply with the D/B Company's reasonable operating and safety procedures and rules, and shall not interfere with the D/B Company's work. The parties agree that the County and the Construction Manager/Program Manager shall have immediate access to the site and D/B Work, and no Company rule or procedure shall impede, impair or delay such access.

### **11.3 REQUEST FOR INFORMATION (RFIs)**

The D/B Company can request clarification on any issue associated with the project. This request can be in the form of a written memo or email. The format of this request will be provided to the D/B Company at the pre-construction meeting. Verbal request for information are not allowed and will not be honored. A request for information is an official document of the project and a file of RFIs will be maintained. RFIs will be answered by the Construction Manager as rapidly as possible.. All RFIs will be answered within 48 hours of receipt or the D/B company informed of the reason that resolution was not determinable. If the answer to an RFI cannot be determined within the 48-hour time limit, the RFI will become an unresolved issue and placed on the agenda of the next Design Review Meeting or Project Progress Meeting for resolution or clarification. In the Monthly Project Design and Construction Progress Report all unanswered or unresolved RFIs must be listed.

### **11.4 SITE CLEANLINESS**

This Section covers the general cleaning which the D/B Company shall be required to perform both during Construction and before final acceptance of the Project.

#### **11.4.1 Hazardous Materials and Waste**

The D/B Company shall handle hazardous waste and materials in accordance with applicable local, state, and federal regulations. Waste shall also be disposed of in WFLA approved landfills as applicable. The D/B Company shall prevent accumulation of wastes which create hazardous conditions. Burning or burying rubbish and waste materials on the site shall not be allowed. Disposal of hazardous wastes or materials into sanitary or storm sewers shall not be allowed.

#### **11.4.2 Disposal of Surplus Material**

The D/B Company shall legally dispose off the site all surplus materials and equipment from demolition and shall provide suitable off-site disposal site.

#### **11.4.3 Cleaning Materials And Equipment**

Provide all required personnel, equipment and materials needed to maintain the specified standard of cleanliness.

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#### **11.4.4 Compatibility**

Use only the cleaning materials, methods and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material or as approved by the Engineer.

#### **11.4.5 Progress Cleaning**

Do not allow the accumulation of scrap, debris, waste material and other items not required for construction of this Work. At least each week, and more often if necessary, completely remove all scrap, debris and waste material from the job site. Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the environment.

##### **11.4.5.1 Site**

Daily and more often if necessary, inspect the site and pick up all scrap, debris and waste material. Remove all such items to the place designated for their storage. Restack materials stored on site weekly. At all times maintain the site in a neat and orderly condition which meets the approval of the Construction Manager.

##### **11.4.5.2 Structures**

Weekly and more often if necessary, inspect the structures and pick up all scrap, debris and waste material. Remove all such items to the place designated for their storage. Weekly and more often if necessary, sweep all interior spaces clean. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by using a hand-held broom.

As required preparatory to installation of successive materials, clean the structures or pertinent portions as recommended by the manufacturer of the successive material. Following the installation of finish floor materials, clean the finish floor daily. "Clean", for the purpose of this paragraph, shall be interpreted as meaning free from all foreign material which, in the opinion of the Engineer, may be injurious to the finish floor material. Schedule cleaning operation so that dust and other contaminants resulting from cleaning operations will not fall on wet, recently painted surfaces.

#### **11.4.6 Final Cleaning**

Unless otherwise specifically specified, "clean" for the purpose of this section shall be interpreted as the level of cleanliness generally provided by commercial building maintenance sub-contractors using commercial quality building maintenance equipment and materials. General: Prior to completion of the Work, remove from the job site all tools, surplus materials, equipment, scrap, debris and waste.

##### **11.4.6.1 Site**

Unless otherwise specifically directed by the Construction Manager, hose down all paved areas on the site and all sidewalks; rake clean other surfaces of the grounds. Completely remove all resultant debris.

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#### **11.4.6.2 Structures**

Remove all traces of soil, waste material, splashed material, and other foreign matter to provide a uniform degree of exterior cleanliness. Visually inspect all exterior surfaces and remove all traces of soil, waste material, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. If necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior of the structure. In the event of stubborn stains not removable with water, the Construction Manager may require light sandblasting or other cleaning at no additional cost to the Owner. Visually inspect all interior surfaces and remove all traces of soil, waste material, smudges and other foreign matter. Remove all paint droppings, spots, stains and dirt from finished surfaces. Clean all glass inside and outside. Polish all surfaces requiring the routine application of buffed polish. Provide and apply polish as recommended by the manufacturer of the material being polished.

#### **11.4.7 Post-Construction Cleanup:**

All evidence of temporary construction facilities, haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other evidence of construction, as directed by the Engineer. Schedule final cleaning as approved by the Construction Manager to enable the Owner to accept the Project

#### **11.4.8 Restoration of Landscape Damage:**

Any landscape feature damaged by the D/B Company shall be restored as nearly as possible to its original condition at the D/B Company's expense. The Construction Manager will decide what method of restoration shall be used.

#### **11.4.9 Cleaning During Owner's Occupancy**

Should the Owner occupy the Work or any portion thereof prior to its completion by the D/B Company and acceptance by the Owner, responsibilities for interim and final cleaning of the occupied spaces shall be as determined by the Construction Manager in accordance with the conditions of the contract documents.

### **11.5 DUST CONTROL**

Limit blowing dust caused by construction by applying water or employing other appropriate means or methods to maintain dust control subject to the approval of the Construction Manager.

#### **11.5.1 Protection Of Adjacent Property**

The D/B Company shall make adequate provision to fully protect the surrounding area and will be held fully responsible for all damages resulting from D/B Company's operations. Protect all existing facilities (indoors and out) from damage by dust, spray or spills (indoors or out). Protect motors, bearings, electrical gear, instrumentation and building or other surfaces from dirt, dust, welding fumes, paint spray, spills or droppings causing wear, corrosion, malfunction, failure or defacement by enclosure, sprinkling or other dust palliatives, masking and covering, exhausting or containment.

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## **11.6 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS**

### **11.6.1 Work Includes**

The work covered includes furnishing all labor, equipment, and materials required for temporary control of construction operations.

### **11.6.2 D/B Company's Office**

The D/B Company shall maintain an office convenient to the site of the work during the period of construction, at which project manager shall be while work is in progress. The size of the office shall be as required for general use and to provide space for project meetings. Furnishings shall be provided as necessary. The office shall be provided with telephone service. Copies of the Contract, Drawings and Specifications and approved shop drawings shall be kept on file at this office for reference at any time. Project Record Documents of these Specifications. Notices, instructions, orders, directions or other communications from the Construction Manager, left at this office, shall be considered as received by the D/B Company.

### **11.6.3 Construction Managers Field Office/Trailer**

The D/B Company shall furnish proper and adequate office space with furniture and facilities for the use of the Construction Manager and Inspectors. A separate office with a closable door shall be provided at least 12'x14' either in connection with the D/B Company's office or in a separate structure. The office shall have access within the same structure to suitable bathrooms. The office shall be supplied with: three desks, copier, telephone lines (two) , fax machine (separate telephone line) and dedicated HP laser printer. Computer hook-up to provide internet and VPN access to Fulton County's network is to be provided. Construction Managers and inspectors will provide their own computers. The D/B Company is to provide a dedicated administrative assistance to the Construction Manager and Inspectors office for 40 hours per week from the start of construction to substantially completion.

### **11.6.4 Temporary Facilities**

The D/B Company shall provide all temporary facilities for water, heat, electric light, and power as required for the work during the entire period of operations. D/B Company shall be responsible for payment of utilities costs for the duration of construction. The D/B Company shall provide temporary toilets as required and shall maintain them in a sanitary condition for the duration of the work and remove them at completion. On or before the completion of the work, the D/B Company shall remove all temporary facilities, together with all rubbish and trash, as directed by the Construction Manager.

### **11.6.5 Storage**

The D/B Company shall secure adequate storage to accommodate the required equipment, vehicles, and materials for the period of performance of the Contract.

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#### **11.6.6 Construction Utilities**

The D/B Company shall pay all power company installation and use charges for the electrical energy utilized for the construction related power and light. The D/B Company shall make his own arrangements at his own expenses for obtaining the water supply necessary for construction purposes, and he shall pay for all water consumed during construction.

#### **11.6.7 Temporary Buildings/Trailers**

The D/B Company may build temporary buildings or other structures for housing personnel, tools, machinery and supplies at approved sites, and shall maintain their surroundings in a sanitary and satisfactory manner at all times. On or before the completion of the work, all such structures shall be removed, together with all rubbish and trash, at the expense of the D/B Company.

#### **11.6.8 Temporary Facility Removal**

The D/B Company shall remove temporary facilities from the site of the work when so notified by the Construction Manager. All Temporary Facilities have to be removed from the site area for the project to be "complete". Adequate retainage will be held back after the project is "substantially complete" to insure that all temporary facilities are removed.

#### **11.6.9 Maintenance During Construction**

The D/B Company shall maintain, at his expense, the work during construction and until final acceptance of all work under the Contract.. In the event the D/B Company fails to remedy any unsatisfactory situation, within twenty-four hours after receipt of written notice from the Construction Manager describing the unsatisfactory conditions, the Construction Manager may be immediately proceed with adequate forces and equipment to maintain the project, and the entire cost of this maintenance will be deducted from the monies otherwise due the D/B Company under the Contract. As an alternative to the above specified maintenance, the cost of all of the items which are not properly maintained may be deducted at the Contract Prices from the current partial payment request even if such items have been paid for in previous estimates.

#### **11.6.10 Traffic Controls**

The D/B Company shall provide all signs, barriers, markers, and flagmen as required to maintain traffic. The D/B Company shall maintain traffic at all times, as practicable. No road shall be closed to traffic without the approval of the Construction Manager. Open trenches adjacent to traveled rights-of-way shall be properly barricaded, bridged, or otherwise maintained safe for traffic.

#### **11.6.11 Access Roads and Construction Entrance**

Streets, road and drives used by the D/B Company for access to and from the site of the work shall be protected from damage caused by the normal traffic of vehicles used for or in connection with construction work. Any such damage done shall be repaired immediately and left in good condition at the end of the construction period. Any new

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access road construction shall be all weather and have drainage structures placed as shown or as required.

#### **11.6.12 Pumping**

The D/B Company shall furnish and operate pumping and appurtenant piping for dewatering, flow rerouting, or any similar purposes. Pumping equipment which could disturb the public shall be operated only during a standard work day or as approved by the Construction Manager. No discharge of raw sewage will be permitted to area water courses under any circumstances.

#### **11.6.13 Pavement Restoration**

The D/B Company shall restore in a neat and acceptable manner all streets, roadways, or other areas where trenches have been opened. Bituminous concrete, and prime and seal paving shall be restored so that the wearing surface and base course shall each be one and one-half times the original thickness. Gravel surfacing shall be restored to its original thickness with a size gravel to match the existing, but in no case shall restored surfacing be less than 4 inches.

The D/B Company shall restore concrete curbs, gutters, and walks to the size and shape as were existing. Damaged sections shall be replaced with complete new sections. Patching of damaged sections will not be permitted.

#### **11.6.14 Tree and Plant Protection**

The D/B Company shall preserve and protect existing trees and plants at the site which are designated to remain and those adjacent to the site. Temporary barriers to a height of six feet shall be provided around each tree, or around each group of trees, or around plants to be protected. The D/B Company shall carefully supervise excavating, grading and filling, and subsequent construction operations to prevent damage. The D/B Company shall consult with the Construction Manager, and remove those roots and branches which interfere with construction. The D/B Company shall replace, or suitably repair, trees and plants designated to remain, which have been damaged or destroyed due to construction operation. Reasonable care shall be taken during construction to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.

#### **11.6.15 Soil Erosion**

The D/B Company shall be required to take the necessary steps to minimize siltation and soil erosion during construction. The D/B Company shall be required to obtain and comply with all the requirements of a **Land Disturbance Permit (LDP)**. This work shall consist of furnishing all labor, equipment, and materials and performing all operations in connections with the construction, installation, and maintenance of all erosion and pollution controls through the use of berms, sediment basins, mulches, hay erosion checks, ditches, debris filters, and other devices. Temporary pollution control

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shall be coordinated with the permanent landscape program to assure economical, effective and continuous erosion control throughout the construction period.

## **11.7 JOB SITE SECURITY**

### **11.7.1 Site Security**

The D/B Company shall submit a Security Plan prior to the Notice to Proceed in accordance with Appendix 13. The D/B company shall be responsible for all site security both for construction equipment and D/B Work until operational control is turned over to the County. The D/B Company shall guard against and be responsible for all damage or injury to such properties caused by trespass, negligence, vandalism or malicious mischief of third parties, and shall provide for safe and orderly vehicular movement. The D/B Company shall also be liable for any injury to any personnel on site. The D/B Company shall insure that only authorized personnel have access to the site and that all personnel follow the safety requirements as outline in the Safety Manual.

The D/B Company shall furnish and erect such barricades, fences, lights and danger signals and shall provide such other precautionary measures for the protection of persons or property and of the D/B Work as necessary. The D/B Company shall be responsible for the security of the site, and shall maintain suitable fences, gates and locks at the site.

From sunset to sunrise, the D/B Company shall furnish and maintain at least one light at each barricade and sufficient numbers of barricades shall be erected to keep vehicles from being driven on or into any D/B Work under construction.

The D/B Company will be held responsible for all damages to the D/B Work due to failure of barricades, signs and lights and whenever evidence is found of such damage, the D/B Company shall immediately remove the damaged portion and replace it at the D/B Company's cost and expense. The D/B Company's responsibility for the maintenance of barricades, signs and lights shall not cease until the Project has been accepted by the Owner.

The D/B Company shall employ, when necessary, watchmen on the work and shall, when necessary, erect and maintain such strong and suitable barriers and such light as will effectively prevent the happening of any accident to health and/or property. Lights shall be maintained for the hours between sunset to sunrise. Installation of lighting shall be by an approved plan submitted to the Construction Manager as part of the Security Plan required in Appendix 13.

### **11.7.2 Safety**

The D/B Company shall maintain the safety of the site per the Project Safety and Health Program (Appendix 13) and as detailed in Appendix 9B at a level consistent with the Contract Standards. Without limiting the foregoing, the D/B Company shall: (1) take all reasonable precautions for the safety of, and provide all reasonable protection to prevent damage, injury or loss by reason of or related to the operation of the Managed Assets to, (a) all employees working at the Managed Assets and all other

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persons who may be involved with the operation, construction, maintenance, repair and replacement of the Managed Assets, (b) all visitors to the site, (c) all materials and equipment under the care, custody or control of the D/B Company on the Site, (d) other property constituting part of the site or D/B Work, and (e) County Property; (2) establish and enforce all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards and promulgating safety regulations; (3) give all notices and comply with all Applicable Law relating to the safety of persons or property or their protection from damage, injury or loss; (4) designate a qualified and responsible employee at the site whose duty shall be the supervision of plant safety, the prevention of fires and accidents and the coordination of such activities as shall be necessary with federal, State and County officials; (5) operate all equipment in a manner consistent with the manufacturer's safety recommendations; (6) provide for safe and orderly vehicular movements; and (7) develop and carry out a Site-specific safety program,(appendix 9B) including employee training and periodic inspections.

### **11.7.3 OSHA.**

The D/B Company shall make all modifications to the site and D/B Work and take all other actions which may be required in order to insure that the site and D/B Work are in compliance with the Occupational Safety and Health Act as in effect on the Contract Date at the cost and expense of the D/B Company. Any amendments to the Occupational Safety and Health Act which take effect after the Contract Date shall constitute a Change in Law.

## **11.8 RECORD DRAWINGS, SHOP DRAWINGS,**

The D/B Company shall maintain at the site and provide the Construction Manager with record design and construction documents including calculations, engineering analyses, modeling results, design reports, drawings, specifications, addenda, approved shop drawings, samples, photographs, change orders, other modifications of contract documents, test records, survey data, field orders and all other documents pertinent to the project. Record documents shall be available at the site at all times for inspection by the Construction Manager and its representatives. Drawings shall note all changes made during construction including, but not limited to:

- The Drawings shall be electronically updated with Record Drawings.
- Depth of various elements of foundation in relation to datum.
- Horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements.
- Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
- Dimensions and details of field changes.
- Changes made by change order or field order.
- Details not on original drawings and other elements not originally specified.

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Upon completion of all construction work, the D/B Company shall submit to the Construction Manager ten (10) sets of record design drawings (as-builds), including a set of design notebooks. The notebooks shall include calculations, engineering analyses, modeling results and design reports. The D/B Company shall provide a CD-ROM, in the AutoCAD Release requested by the Construction Manager, a set of design drawings and specifications for each Design/Build requirement, modified to clearly and accurately show all changes made during the construction. These drawings shall be designated in the revision block as "construction record" drawings and shall be checked by the design engineer(s) responsible for the original design verifying that the field changes shown are accurate and consistent with the design intent. Construction record drawings shall be submitted to the Construction Manager no later than 30 days prior to final Acceptance Test.

## **11.9 REFERENCE STANDARDS**

### **11.9.1 Applicability Of Standards**

Where reference is made to standards or specifications published by various organizations ("standards"), the Work shall conform to latest edition of such standards as amended and revised in effect at the date of Contract, unless a specific date is indicated.

Where material is designated for certain applications, material shall conform to standards designated in the applicable building code governing the Work. Similarly, unless otherwise specified, installation methods and standards of workmanship shall also conform to standards required by such code. Where no particular material is specified for a certain use, the Design/Builder shall select from choices offered in the governing code.

Where a standard does not provide all information necessary for the complete installation of an item, comply with manufacturer's instructions for installation and workmanship.

Where specific articles, sections, divisions or headings for standards are not given, such standards shall apply as appropriate. Standards when included in the Contract Documents by abbreviations or otherwise, shall form a part of Contract Documents. In the event of conflicts between cited standards and/or the Contract Documents, the more stringent shall govern.

### **11.9.2 Abbreviations And Acronyms**

Abbreviations and acronyms used throughout the Contract Documents refer to associations, institutes, societies and other public bodies who publish standards which are readily available to the public, and to the titles of the standards which they publish. Where such abbreviations or acronyms are used in the Contract Documents, they shall mean the recognized name of the trade

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association, standards-generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

Whenever initials representing such a body are shown, followed by a number or a combination of numerals and letters, reference is to a particular standard to which Design/Builder shall conform. The number or combination of numerals and letters following abbreviation designates the particular standard to be followed.

### **11.9.3 Design/Builder's Duties And Responsibilities**

The Design/Builder shall be responsible when required by Contract Documents, or upon written request from the Construction Manager, to deliver required proof that materials or workmanship, or both, meet or exceed the requirements of a reference standard.

### **11.9.4 Conflicting Standards**

Where compliance with two or more standards is specified and where the standards may establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different but apparently equal and other uncertainties to the Construction Manager for a decision before proceeding.

### **11.9.5 Copies Of Standards**

Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed to perform a required construction activity, the Design/Builder shall obtain copies directly from the publication source.

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## APPENDIX 12

# PROJECT SCHEDULING AND PAYMENT SUBMITTALS

### 12.1 INTRODUCTION

This Section describes the Design/Build Scheduling and progress reporting requirements of the Contract. The primary objectives of the requirements are:

1. To insure adequate planning and execution of the D/B Work by the D/B Company;
2. To assist the County and Construction Manager in evaluating the progress of the D/B Work;
3. To provide for optimum coordination by the D/B Company of its sub-contractors, trades, and suppliers, and of its D/B Work with the work or services provided by the County or any separate contractors; and
4. To permit the timely prediction or detection of events or occurrences which may affect the timely prosecution of the D/B Work.
5. To provide for a basis of progress of work for invoicing and payment to D/B Company.

#### Contract Term

The D/B Contract will have a Term that is contained in Article 2 of the contract. This term is the maximum time that the D/B Contract is in effect and constitutes the maximum period of time during which the D/B Work can be accomplished and completed without change order. The D/B Company shall prepare their detailed Design/Build Schedule to be less than or equal to the term of the D/B Contract.

### 12.2 GENERAL SCHEDULING REQUIREMENTS

A. The D/B Work of this Contract shall be planned, scheduled, executed, and reported using the critical path method (CPM). The D/B Company shall use one of the following software programs to develop its detailed Design/Build Schedule:

1. Microsoft Project, latest version
2. SureTrak Project Manager, latest version
3. Primavera Project Planner

B. The detailed Design/Build Schedule shall represent the D/B Company's commitment and intended plan for completion of the D/B Work in compliance

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with the D/B Contract completion date and interim milestone dates specified. The detailed Design/Build Schedule shall take into account all foreseeable activities to be accomplished by any separate Contractors or the County, and interface dates with utility companies, the County's operations, and others. The detailed Design/Build Schedule shall anticipate all necessary manpower and resources to complete the D/B Work within the dates set forth.

- C. Once approved by the Construction Manager, the detailed Design/Build Schedule will become the Baseline Schedule and Schedule of Record for coordinating the D/B Work, scheduling the D/B Work, monitoring the D/B Work, reviewing the progress payment requests, evaluating time extension requests, and all other objectives listed above.
- D. The D/B Company is responsible for determining the sequence of activities, the time estimates of the detailed construction activities and the means, methods, techniques and procedures to be employed. The detailed Design/Build Schedule shall represent the D/B Company's best judgment of how it will prosecute the Work in compliance with the Contract requirements. The D/B Company shall ensure that Detailed Design/Build Schedule is current and accurate and is properly and timely monitored, updated and revised as Project conditions and the Contract Documents may require.
- E. When there are separate contractors working concurrently on the Project whose work must interface or be coordinated with the D/B Work of the D/B Company, the D/B Company shall coordinate its activities with the activities of the separate contractors, and the Detailed Design/Build Schedule shall take into account and reflect such work by others.
- F. The D/B Company shall be solely responsible for expediting the delivery of all materials and equipment to be furnished by it so that the progress of construction shall be maintained according to the currently approved Design/Build Schedule for the D/B Work. The D/B Company shall notify the Construction Manager in writing, and in a timely and reasonable manner, whenever the D/B Company determines or anticipates that the delivery date of any material or equipment to be furnished by the D/B Company will be later than the delivery date indicated by the currently approved Design/Build Schedule, or required consistent with the completion requirements of this Contract, subject to schedule updates as herein provided.

### **12.3 DETAILED DESIGN/BUILD SCHEDULE**

- A. Initial D/B Schedule was submitted with the successful D/B Company's proposal in response to the D/B RFP. Within 14 days after the Notice to Proceed, the D/B Company shall submit a detailed Design/Build Schedule according to the requirements. The Construction Manager will review the Design/Build Schedule and will return the reviewed copy within the time-period specified for submittals. If required, the D/B Company shall resubmit

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schedule to the Construction Manager making any required revisions within ten (10) days following the return date, and then again similarly for all such partial approvals and the final approval.

B. The detailed Design/Build Schedule shall consist of a time-scaled, detailed network graphic representation of all activities that are part of the D/B Company's construction plan and an accompanying listing of activity's dependencies and interrelationships. The detailed Design/Build Schedule submission shall include, but not be limited to, the following information:

1. Project name
2. The D/B Work shall be divided into logical and identifiable subdivisions called activities. All activities will be assigned to a Milestone. The Milestones shall be the same milestones submitted in the Maximum Drawdown Schedule as submitted as Price Proposal Form 2 (PPF2) as part of the selected D/B Company's proposal. The total cost of the all the work represented by all the Milestones shall equal the Fixed Design/Build Price. Work shall be further subdivided into Activities as defined below. Activities cost will be subtotaled to a Milestones cost, with the total cost of all the activities under a specific Milestone being equal or less than the value for the Maximum Drawdown Amount as indicated on PPF2.
3. Activities for all aspects of the Work, with durations not exceeding fourteen (14) calendar days for all activities for which the Design/Builder will perform actual design or construction work. Material procurement, submittals, concrete curing and other similar activities may exceed fourteen (14) calendar days if approved by the Construction Manager. Related activities, each of duration of five (5) calendar days or less, may be shown as one activity together, if not on the critical path of timely job completion.
4. The Design/Build schedule shall indicate the Critical Path for the D/B Work. This can be accomplished on the Design/Build schedule, on a separate schedule.
5. Outage schedules for existing utility services, if any, that will be interrupted during the performance of the Work
6. Acquisition and installation of equipment and materials supplied and/or installed by the County or separate contractors
7. All start dates, milestones, float and completion dates
8. An accounting of the number of workdays anticipated to be lost due to weather. This accounting shall be in accordance with allowable days per month provided elsewhere in the Contract Documents.
9. A tabular report listing all predecessor and successor activities for each activity
10. A legible time scaled network diagram
11. A listing of the project calendar, indicating the anticipated days of work performance

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12. A CD-ROM in a form and format acceptable to the Construction Manager, of the detailed Design/Build Schedule including all required submission information resident in the computer system and containing all of the files associated with the schedule; or a legible spreadsheet report with activity number, description, duration and successor activities.
- C. All Milestones and Activities are to appear on the detailed Design/Build Schedule shall include, but not be limited to, preliminary construction activities, pre-construction meetings, site work, structure erection, roof close-in, exterior wall systems, paving, major material fabrication and delivery, shop drawings submittals, bi-weekly progress meetings, furniture delivery and installation, equipment delivery and installation, coordination requirements, mock-up installations and inspections, dates of Substantial and Final Completion, Certificate of Occupancy inspection, systems testing and instruction, and special County decision points that impact the Work.
- D. Schedule Reports: Schedule submissions will contain the following minimum information for each activity:
1. Activity number, description and estimated duration
  2. Anticipated start and finish dates
  3. Responsibility for activity
  4. The cost loading values for each activity.
- E. For all major equipment and materials to be fabricated or supplied for the Project, the Detailed Design/Build Schedule shall show a sequence of activities including:
1. Preparation of shop drawings and sample submissions
  2. A reasonable time for review of shop drawings and samples or such time as specified in the Contract Documents
  3. Shop fabrication, delivery and storage
  4. Erection or installation
  5. Testing of equipment and materials.
- F. The D/B Company shall submit, as a part of the data submitted to the Construction Manager, a narrative report indicating the anticipated allocation by the D/B Company of the following resources and work shifts for each activity which he proposes to be utilized on the Project:
1. Labor resources;
  2. Equipment resources; and
  3. Whether it proposes the Work to be performed on single, double or triple shifts, and whether it is to be done on a 5, 6 or 7 day work week basis. (see work hours)
- G The Construction Manager shall have the right to require the D/B Company to modify any portion of the D/B Company's Detailed Design/Build Schedule,

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or Recovery Schedule, including cost loading with the D/B Company bearing the expense thereof, which the Construction Manager reasonably determines to be:

1. Impractical;
2. Based upon erroneous calculations or estimates;
3. Unreasonable;
4. Not in compliance with other provisions of the Contract Documents;
5. Required in order to ensure proper coordination by the D/B Company of the D/B Work of its sub-contractors and with the work or services being provided by any separate contractor;
6. Necessary to avoid undue interference with the County's operations or those of any utility companies or adjoining property owners;
7. Necessary to ensure completion of the D/B Work by the milestone and completion dates set forth in the Contract Documents;
8. Required in order for the D/B Company to comply with the requirements of this Appendix or any other requirements of the Contract Documents; or
9. Not in accordance with the D/B Company's actual operations.

#### **12.4 BASELINE SCHEDULE**

A. Upon final approval, the detailed Design/Build Schedule shall be used as a Baseline Schedule. The Baseline Schedule will be change only under the following circumstances after review and approval of the Construction Manager.

1. An approved Change Order to the D/B Work, which constitutes an adjustment to the original scope of work and requires additional time to complete. The baseline schedule will be change to reflect the additional time of the change order.
2. Unavoidable delays, not the fault of the D/B Company, contained in a time-only approved Change Order. The baseline schedule will have the additional time added to the schedule.
3. A Change Order approved by the County that has an additional time extension.
4. A request by the D/B Company for a revision to the Detailed Design/Build Schedule that does not extend the Acceptance Date beyond the term of the Contract.

B. It should be noted that delays attributed to the D/B Company or failure of the D/B Company to make major milestones that require a subsequent recovery schedule does not change the baseline (original) schedule. Recovery schedules, when required, will be used until the project regains the baseline schedule or until the D/B Work is complete, the term of the contract reached or the contract terminated. The baseline schedule remains the baseline unless

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changed by an approved change order or is revised and equals the term of the contract..

## **12.5 SCHEDULE OF VALUES**

As part of the submission of the detailed Design/Build Schedule, the D/B Company shall submit a breakdown of the expected value of each of the schedule activities for which payment will be requested. Activities shall roll-up into Milestones. The Milestones shall be the same as the milestones presented in Price Proposal Form 2 (PPF2) in the D/B Company's proposal in response to the D/B RFP. The total cost for each Milestone shall not exceed the Maximum Drawdown Amount as presented on PPF2 in the D/B Company's proposal and the total cost of all Milestones will be equal to the Fixed Design/Build Price. The cost breakdown of the detailed Design/Build Schedule shall have a direct correlation to the Schedule of Values to be used as the basis for Applications for Payment.

## **12.6 UPDATING OF DESIGN/BUILD SCHEDULE--DESIGN AND CONSTRUCTION PROGRESS REPORTS**

- A. As detailed in appendix 10, the D/B Company shall submit for the monthly progress report and for all payment requests an update of the D/B Schedule. The Construction Manager will review the D/B Schedule contained in the Design and Construction Progress Report or payment request to determine the D/B Company's actual progress. Prepared by the D/B Company, said schedule updates shall set forth current and accurate progress data and shall be based upon the D/B Company's best judgment. Said schedule updates shall be prepared by the D/B Company in consultation with all principal sub-contractor and suppliers.
- B. The updated Schedule shall show the activities, or portions of activities, completed during the reporting period, the actual start and finish dates for these activities, remaining duration and/or estimated completion dates for activities currently in progress, and quantities of material installed during the reporting period. The Construction Manager will produce a computerized update worksheet for the D/B Company to complete as a part of this process.
- C At the monthly progress meeting held in accordance with Appendix 10, a total review of the Project will take place including but not limited to, the following:
  - 1. Current update of the Detailed Design/Build Schedule
  - 2. Anticipated detailed construction activities for the subsequent report period
  - 3. Critical items pending
  - 4. D/B Company's requested changes to the detailed Design/Build Schedule. These changes shall be accompanied by a change order to

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the scope of work and term or a change order to the term only.

- D. The D/B Company shall submit a narrative with the progress report which shall include, but not be limited to, a description of problem areas, current and anticipated delaying factors and their impact, explanations of corrective actions taken or planned, any proposed newly planned activities or changes in sequence, and proposed logic for a Recovery Schedule, if required, as further described herein. The report shall also include:
1. A narrative describing actual D/B Work accomplished during the reporting period
  2. A list of major construction equipment used on the Project during the reporting period
  3. The total number of men by craft actually engaged in the Work during the reporting period, with such total stated separately as to office, supervisory, and field personnel
  4. A manpower and equipment forecast for the succeeding thirty (30) days, stating the total number of men by craft, and separately stating such total as to office, supervisory and field personnel
  5. A list of D/B Company supplied materials and equipment, indicating current availability and anticipated job site delivery dates
  6. Anticipated changes or additions to D/B Company's supervisory personnel.
- E. As part of the updating process, the Construction Manager will calculate, based upon progress data provided by the D/B Company and agreed to by the Construction Manager, the value of Work completed based on the sum of the cost loading amounts for all activities, including activities specifically defined for stored materials, less the amount previously paid. Summation of all values of each activity less the appropriate percent of retainage shall be the maximum amount payable to the D/B Company, provided that the D/B Company has complied with all requirements of the Contract Documents.

## **12.7 RECOVERY SCHEDULE**

- A. Should the updated detailed Design/Build Schedule, at any time during the D/B Company's performance, show, in the sole opinion of the Construction Manager, that the D/B Company is fourteen (14) or more days behind schedule for any milestone or completion date for any location or category of work, the D/B Company, at the request of the Construction Manager, shall prepare a Recovery Schedule within 5 days, at no additional cost to the County (unless the County is solely responsible for the event or occurrence which has caused the schedule slippage), explaining and displaying how the D/B Company intends to reschedule its D/B Work in order to regain compliance with the detailed Design/Build Schedule.

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- B. The D/B Company in preparing a recover schedule shall prepare and submit to the Construction Manager a Recovery Schedule, incorporating the best available information from sub-contractors and others that will permit a return to the Detailed Construction (baseline) Schedule at the earliest possible time. The D/B Company shall prepare a Recovery Schedule to the same level of detail as the detailed Design/Build Schedule. The Recovery Schedule shall be prepared in coordination with other separate contractors on the Project.
- C. Within two (2) days after submission of the Recovery Schedule to the Construction Manager, the D/B Company and any of the necessary sub-contractors, suppliers, vendors, manufacturers, etc. shall participate in a conference with the Construction Manager to review and evaluate the Recovery Schedule. Each of the participants will give a written commitment to comply with the Recovery Schedule. Within two (2) days of the conference, the D/B Company shall submit the revisions necessitated by the review for the Construction Manager's review and approval. The D/B Company shall use the approved Recovery Schedule as its plan for returning to the detailed Design/Build Schedule.
- D. The D/B Company shall confer continuously with the Construction Manager to assess the effectiveness of the Recovery Schedule. As a result of these conferences, the Construction Manager will direct the D/B Company as follows:
1. If the Construction Manager determines the D/B Company continues behind schedule, the Construction Manager will direct the D/B Company to prepare a Schedule Revision. If the submitted Schedule Revisions will exceed the term of the D/B Contract then the D/B Company must also submit and change order request. This change order request will be for the amount of time the project has been delayed. All conditions effecting the requested change order and liquidated damages or construction claims that might arise from the delay, or from the change order must be included in the Change Order request.
  2. If the Construction Manager determines the D/B Company has successfully complied with provisions of the Recovery Schedule, the Construction Manager will direct the D/B Company to return to the use of the approved detailed Design/Build Schedule.

## 12.8 SCHEDULE REVISIONS

- A. If the D/B Company cannot recover the detailed Design/Build Schedule via the Recovery Schedule then the D/B Company must prepare a Schedule Revision and if this revision extends the detailed Design/Build Schedule

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beyond the term of the D/B contract, a request for a Change Order must be submitted. If the Schedule does not exceed the term of the contract the Construction Manager can approve the revision that now becomes the new Detailed Design/Build Schedule and Baseline. If the Term of the Contract is exceeded then a Change Order request must be submitted and the schedule revision with reasons for the delay. If the delay is the fault of the D/B Company then only the detailed Design/Build Schedule is revised with the Baseline remaining unchanged. If the delay is County's fault or request or an uncontrollable circumstance then the detailed Design/Build Schedule and baseline will be revised following approval of the Change Order. Change Orders within Fulton County can take several months. The requests for a Change Order must be well thought out and analyzed to insure that all delays are requested and documented.

- B. Requests for revision will be accompanied by evidence acceptable to the Construction Manager that the D/B Company's suppliers, and sub-contractor are in agreement with the proposed revisions. If there are separate contractors on the Project, the approval of the separate contractors shall be obtained to make the proposed schedule revisions. If accepted by the Construction Manager and County, the revisions shall be binding upon the D/B Company and all separate contractors on the Project.

## **12.9 FLOAT TIME**

- A. Float or slack time associated with one chain of activities is defined as the amount of time between earliest start date and latest start date or between earliest finish date and latest finish date for such activities, as calculated as part of the currently approved Design/Build Schedule. Float or slack time shown on the currently approved Design/Build Schedule is not for exclusive use or benefit of either the County or the D/B Company and is available for use by either of them according to whichever first needs the benefit of the float to facilitate the effective use of available resources and to minimize the impact of Project problems, delays, impact, acceleration or changes in the Work which may arise during performance. The D/B Company specifically agrees that the County or Construction Manager in conjunction with their review activities or to resolve Project problems may use float time. The D/B Company agrees that there will be no basis for any modification of the milestone or completion dates or an extension of the Contract Time, or a claim for additional compensation as a result of any Project problem, delay, impact, acceleration, or change order which only results in the loss of available float on the currently approved Design/Build Schedule.
- B. Float time shown on any Design/Build Schedule shall not be used arbitrarily by the D/B Company in a manner, which, in the opinion of the Construction Manager, unnecessarily delays separate contractors from proceeding with their work in a way which is detrimental to the interests of the County

## 12.10 PAYMENT

- A. The invoicing process is defined in Section 6.6 of the D/B Contract and nothing in this Appendix is meant to be in conflict with the D/B Contract. Any inconsistencies between this appendix and the D/B Contract, the D/B Contract shall prevail.
- B. **There shall be no payment to the D/B Company prior to the Design/Build Date.** All monthly payments invoiced by the D/B Company to the County shall be based on Completion of the Design/Build Work in accordance with the cost Loaded Design and Design/Build Schedule, Schedule of Values and the Maximum Draw Down Schedule (PPF2).
- C. For a payment submittal to be accepted by the Construction Manager all the conditions as defined in Section 6.6 of the D/B Contract must be met by the D/B Company. Failure to meet these requirements constitutes not-submittal of the payment request.
- D. With each payment submittal the D/B Company must include:
1. a reasonably detailed description of all D/B Work actually completed during the period of the payment submittal
  2. an up-to-date and annotated Design/Build Schedule which shall reflect the status of the D/B Company's design and Design/Build Schedule since the date of the last payment submittal
  3. an up-to-date and annotated Schedule of Values indicating the percentage of Work completed by activity and milestone for the project.
  4. revisions to the critical path schedule which shall reflect changes in the critical path schedule since the date of the last payment submittal.
  5. notice of any liens or "Encumbrances which have been filed, together with evidence that the D/B Company has bonded or discharged such liens or encumbrances
  6. a complete and filled-out Exhibit G, Technical Proposal Form 8
  7. construction Progress Photos as required by Appendix 10
  8. any other documents or information relating to the Design/Build Work or this Design/Build Contract requested by the Construction Manager as may be required by Applicable Law or this Design/Build Contract
- E. **Schedule Of Values Utilization**
1. Applications for Payment: The Schedule of Values, that is acceptable to the County, shall be the basis for the D/B Company's applications for payment.
  2. Draw Down Schedule: Upon acceptance, by the County of the

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Schedule of Values, the D/B Company shall prepare and submit to the County a schedule of draw down payments, referred to as Draw Down Schedule, totaling the Fixed Design/Build Price. This Draw Down Schedule will be used by the County to anticipate the cash flow needed to meet its financial obligations under the Design/Build Contract. Any change in the Schedule of Values, as specified below, will require that the Draw Down Schedule be revised and resubmitted.

3. Changes to the Schedule of Values: The County shall have the right to require the D/B Company to alter the value or add/delete categories listed on the Schedule of Values at any time for the following reasons:
  - a) The Schedule of Values appears to be incorrect or unbalanced.
  - b) A revision to the segregation of values is required due to the D/B Company revising the sequence of construction or assembly of building components, which in turn invalidates the Schedule of Values.
  - c) Change Orders are issued to the D/B Company and require incorporation into the Schedule of Values.
4. Stored Materials: The D/B Company is required to correlate the documentation for payment of stored materials requested in the Application for Payment against the agreed upon breakdown of the Schedule of Values. The County reserves the right to not process the application for payment if this correlation has not been submitted in conjunction with the application for payment.

#### **12.11 RETAINAGE**

The County shall withhold a retainage amount of each monthly payment otherwise due and payable to the D/B Company in the amount of 10 percent. Such holdbacks shall continue until the D/B Company satisfactorily completes 50 percent of the value of the Design/Build Work performed is satisfactory to the County, at which time further payments will not be subject to retainer holdbacks. The County may, however, withhold additional retainage after 50 percent of the work is complete pursuant to the Design/Build Contract. The retained amount shall be released upon Acceptance except for amounts equal to 200 percent of the value of any outstanding Design/Build Work.

#### **12.12 FINAL PAYMENT/CLOSE-OUT OF PROJECT**

Following acceptance and the project milestone “**Complete**” has been achieved the project must be closed-out for the D/B Company to receive the Final Payment. The D/B Company shall provide as part of the project submittals the following

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documents which are also provided in Appendix 13:

- a. An affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the work have been paid otherwise satisfied; each subcontractor must also provide an affidavit.
- b. The surety's and guarantor's consent to final payment
- c. Certificate of Occupancy for all facilities constructed as part of the Design/Build Work
- d. Contractor Statement of Completion of all Work
- e. OCIP Signoff – Exhibit B
- f. A Final Exhibit G – Prime Contractor and Sub-contractor Utilization Report (TPP8)
- g. Notification of Warranty Period for all major pieces of equipment
- h. Transmittals signed by Construction Manager for all deliverables
- i. A final invoice for the D/B Work

**APPENDIX 13**  
**PROJECT PLANS & MANUALS--OTHER PROJECT**  
**DELIVERABLES**

**13.1 General Requirements**

The D/B Company shall be required to prepare several comprehensive Project Plans and Manuals, which satisfy the County's objectives for Plant performance. Cost of completion of the work required for Appendix 13 shall be included in the Fixed Design/Build Price. The D/B Company shall develop each of the required plans in sufficient detail to cover activities during the construction, start-up and transition periods with the understanding that the future contract operator will further develop each of the plans as necessary after the D/B Company's responsibilities end.

Additionally, other Project Deliverables are required. These deliverables are also defined in this appendix.

The D/B Company shall develop the following plans:

Plans required to achieve Design/Build date:

- Public Communications Plan

Construction Control Plans—these plans are due to the Construction Manager 60 days prior to a scheduled Notice to Proceed, Construction date and must be approved by the Construction Manager to achieve NTP, Construction.

- Quality Controls/Quality Assurance
- Corrective Action
- Project Safety and Health Program
- Security Plan
- Emergency Response Plan

Operational Plans/Manuals—these plans/manuals are due in accordance with this Appendix and the D/B Contract

- Equipment and Start-Up Testing Plan
- Transition Plan
  - Acceptance Testing Plan
  - Staffing Requirements
  - Training Plan
- Operations and Maintenance Manuals

**13.1.1 Format for all Plans/Manuals**

All plans and manuals required by this appendix shall be submitted on 8 ½ by 11 white paper in three ring binders. 5 copies of draft plans and manuals shall be provided, 10 copies of final plans and manuals shall be provided. All documents (draft or final) shall also be provided in electronic form on CD-ROM in Microsoft Office format and

PDF format. All plans and manuals shall be linked to the O&M Manual and text searchable. The Construction Manager must approve any exception to the format requirement.

## **13.2 Plans/Manuals**

The D/B Company shall submit the following specific Plans of Actions to the Construction Manager.

### **13.2.1 Public Communications Plan**

The D/B Company shall prepare and secure approval of a Public Communications Plan prior to Notice to Proceed in accordance with Appendix 19..

### **13.2.2 Quality Assurance /Quality Control Plan**

The Quality Assurance/Quality Control Plan is required to be submitted and approved prior to Notice to Proceed.

The D/B Company is responsible for providing a Quality Assurance/Quality Control Plan (QA/QC Plan) as a part of meeting the contract requirements. The QA/QC Plan shall establish a protocol to be used to maintain an effective construction quality control system. The QA/QC Plan shall identify the personnel, their qualifications; inspection procedures, sampling and test procedures, frequency and number of tests, laboratory and field test standards, and materials requiring testing that will be used to ensure a final product that complies with the approved design and specifications. The QA/QC Plan shall address all construction and manufacturing operations, both on-Site and off-Site, and shall be keyed to the proposed construction sequence. The QA/QC Plan shall be submitted for review and the D/B Company shall modify the QA/QC Plan as necessary to address the comments and requests of the Construction Manager. The Construction Manager will provide comments on the QA/QC Plan to the D/B Company within 30 days. At the discretion of the Construction Manager, subsequent updates to the QA/QC Plan may be required to meet the needs of the Project. The Construction Manager shall be notified of the testing schedule in advance of all testing and reserves the right to attend and request shop testing and/or other tests related to the construction elements.

The D/B Company shall further be responsible for certifying that all design submittals are in compliance with Appendix 10 and the Design/Build Contract, and that the completed Design/Build Project has been constructed in accordance with the approved design submittals.

### **13.2.3 Corrective Action Plan**

The Corrective Action Plan is required to be submitted and approved prior to Notice to Proceed.

The D/B Company is required to submit a Corrective Action Plan, which will provide guidelines for the adjustment, rectification, or improvement of work or work progress that may be deemed unsatisfactory by the Construction Manager. This plan shall contain the forms and/or logs that will be used to document such work, the status of work, and course of action taken. Each instance of unsatisfactory work will then require the following of this plan as a guideline for corrective action.

#### **13.2.4 Project Safety and Health Program**

The Project Safety and Health Program is required in accordance with Appendix 9B to be submitted and approved by the Construction Manager prior to Notice to Proceed.

The D/B Company shall provide for and maintain the security and safety of all individuals near or on-Site during the Construction Period. The D/B Company shall develop and submit to the Construction Manager for review a Project Safety and Health Program designed to minimize the likelihood of construction related accidents and provide all safety measures required by Applicable Law in accordance with Appendix 9B.

#### **13.2.5 Security Plan**

The D/B Company shall prepare and secure approval of a Security Plan prior to Notice to Proceed.

The plan shall describe the responsibilities for maintaining the security and safety of all equipment and structures contained within the facilities. Any and all persons entering the facilities shall be identified and provide appropriate documentation of authorization to have access to the facilities. A log of any and all persons accessing the facilities shall be kept.

The Security Plan shall address the following minimum physical security requirements:

- The structural integrity of the fences shall be maintained and kept in neat order.
- Gates access points, and doors to the facilities and structures in the facilities shall be kept locked.
- Entrance to such facilities and structures shall be protected against unauthorized entry.
- Security alarms and surveillance systems shall be maintained in working order.

All security issues are to be coordinated and approved by the Construction Manager.

### **13.2.6 Emergency Response Plan**

The D/B Company shall prepare and submit an Emergency Response Plan. The initial submittal of this plan shall cover the construction period and potential emergencies that could arise during this period. This plan shall supplement the Safety and Health Plans and the Security Plan with specific actions. The Emergency Response Plan shall be updated and resubmitted as part of the Transition Plan to include those emergencies related to JCEC operations. The plan shall serve as a guide to the D/B Company and the County in responding to emergency situations. The goal shall be to tabulate procedures and information needed to ensure prompt and reasonable response to all customer problems and emergencies pertaining to the facilities.

Standard operating procedures, including on-call backup capability to be utilized during an emergency event shall be developed by the D/B Company. At a minimum, the emergency operations procedures shall address:

- Chemical spills
- Personal emergencies
- Fires and explosions
- Pipe, valve or pump failure
- Equipment and process failure
- Power failure
- Acts of God (i.e., hurricane, wind storms and floods)
- Wastewater bypass discharges
- Emergency telephone numbers
- Emergency equipment inventory
- Homeland Security Procedure Implementation
- Records preservation
- Coordinating instructions with public safety agencies
- Consent Agreement(s) operational requirements.

### **13.2.6 Equipment and Start-Up Testing Plan**

The Equipment and Start-Up Testing Plan shall be submitted to the Construction Manager for review and concurrence in accordance with Appendix 14 prior to the first equipment and Start-up testing event.

The Equipment and Start-up Testing Plan must address the personnel, resources and precautions required to accomplish the start-up and testing of the equipment. Additionally it shall address all issues in accordance with Appendix 14

### 13.2.7 Transition Plan

The D/B Company shall submit to the Construction Manager for review and concurrence the Transition Plan 90 days prior to the anticipated start of Acceptance Testing.

The D/B Company shall develop a plan describing events to occur during the period between formal Substantial Completion of work and County having Operational Responsibility for the JCEC. The selected D/B Company will be expected to provide a plan, which allows for a smooth transition from the D/B Company's personnel to the operations contractor personnel. The objective will be a most cost effective approach, which ensures continual effective operation of the facilities during the changeover. The comprehensive plan will satisfy all requirements for startup, operation, and turnover of all process equipment and facilities in proper working order. All costs for transition activities shall be included in the Fixed Design/Build Price.

The Transition Plan contains the Acceptance Test Plan, the Training Plan, the Staffing Requirements and the updated Emergency Response Plan. The Transition Plan shall address how the transition activities will eventually lead into Acceptance Testing and how the Plant will be operated if any down time will exists between the transition period and the commencement of the Acceptance Test Period. Acceptance Testing requirements are defined in Appendix 15.

Decommissioning activities at the existing Johns Creek WPCP are to be performed under a separate contract. Coordination with the activities of a separate contract for decommissioning the existing Johns Creek WPCP may be required. Where necessary the sequence for decommissioning existing treatment components at the Johns Creek WPCP and phasing-in components at the new JCEC must be clearly identified.

A time frame and milestones for implementation along with the responsibilities of all parties to be involved must be clearly identified and reflected in the project schedule.

The Transition Plan shall describe, at a minimum, the approach with respect to:

- Appropriate safety and security measures implemented during the transition period.
- The procedure for diversion of sewage to the JCEC and how effluent from the JCEC will be discharged to comply with the NPDES permit requirements
- Coordination to allow continuing operations at the existing Johns Creek WPCP during the transition period.

- Procedures for start-up and shut-down of new equipment and systems.
- Address how successful completion of all installation activities and supporting documentation will be provided prior to proceeding with the Acceptance Testing.
- The timing and duration of scheduled testing procedures for equipment and unit processes.

Start-up and commissioning of major equipment and systems to be addressed in the Transition Plan shall include as a minimum the following:

- Electrical equipment (e.g., switchgear, starter panels, protection and control circuits, etc.);
- Pipelines (e.g. pressure testing);
- Storage tanks and basins;
- Filtration systems;
- Chemical feed systems including tanks and metering pumps;
- Biological treatment systems,
- All pumping systems including, influent, effluent, recycle sludge, waste sludge, and all other support pumping systems,
- Instrumentation and metering;
- Disinfection systems,
- All other ancillary systems.

### **13.7.8 Acceptance Test Plans**

The D/B Company shall develop as part of the Transition Plan and an Acceptance Test Plan for the facility as a whole. The Acceptance Test Plan must satisfy the requirements of Appendix 15.

### **13.2.9 Staffing Plan**

The labor force required to manage, operate and maintain the proposed facilities must be determined in order to assess the life cycle cost of a particular proposal. The D/B Company will assume any future operations contractor shall provide a staff that meet minimum qualifications for the operation, maintenance, and management of wastewater treatment systems in the State of Georgia. The D/B Company's input will be utilized for the terms and conditions to be defined in a future operations agreement separate from the Design/Build Project.

The D/B Company is responsible for identifying the required number of staff and third party contractors as deemed appropriate to operate, maintain and manage the facilities as proposed. The Plan shall include, at a minimum, job classifications, minimum qualifications to perform assignment and the number of staff required for both transition phase and long-term operations

Permanent Staffing categories shall include;

- Management, Supervisory, Technical, Operations, and Maintenance personnel;
- Technical support to provide on-call backup and process expertise for process control, management, maintenance, and facilities repair, as necessary, to support operations and management staff;
- Specialists, as necessary, for process control, instrumentation, troubleshooting, emergency management, and other similar activities;
- Office and clerical support staff.

### **13.2.10 Training Plan/Training Program**

The D/B Company shall submit an Operator Training Plan (Training Plan). The Training Plan shall clearly define the classroom and hands-on training curriculum for each operator position and classification. A training schedule shall be submitted in the Training Plan.

The Construction Manager will review the draft Training Plan and return one copy with comments and reasonable and acceptable corrections during the negotiations phase. The D/B Company shall submit a final version of the Training Plan incorporating requested changes and comments prior to issue of the final Design/Build Contract.

The D/B Company shall provide a training program for all anticipated personnel to be employed in plant operations. Such training shall include, but not be limited to, modern wastewater process control for all newly installed unit processes, equipment operations, repair, and maintenance, sampling and analytical procedures, regulatory requirements, supervisory skills, and safety and occupational health procedures.

The D/B Company will provide initial facility specific training opportunities for the operations contractor employees during the transition phase. These training activities must be coordinated such that hands on training can be provided by the equipment manufacturers. These training opportunities must be offered on a minimum of two separate occasions to allow some flexibility for coordination with the start-up schedule and schedule of the contract operator personnel. The D/B Company shall provide documentation of all training completed during start-up and transition phases to the participants. Video taping will be provided for all vendor training.

### **13.2.11 Operations and Maintenance Manual**

The D/B Company shall prepare and submit an Operations and Maintenance Manual (O&M Manual) The O&M Manual shall specify all maintenance and

testing to be conducted specific to and inclusive of all facilities and equipment. The O&M Plan shall be incorporated into a comprehensive manual organized into separate sections addressing each of the unit processes involved, the overall facilities operation and control, auxiliary facilities equipment, and grounds and building maintenance.

The O&M Manual for the JCEC shall be developed in a manner that is fully consistent with the Design/Build Contract. The D/B Company shall submit a Draft O&M Manual 45 days prior to the anticipated date for the beginning of Acceptance Testing. The Construction Manager will review the draft O&M Manual and return comments and corrections within 30 days. D/B Company's exceptions to the comments and corrections must be resolved prior to the start of Acceptance Testing. The D/B Company shall submit a final version of the O&M Plan incorporating any requested changes, comments and lessons learned during Acceptance Testing prior to the County Assumption of Operational Responsibility.

The O& M manuals shall be in an electronic format compatible for use with the County's IAS network. At a minimum, the O&M manuals shall include the following:

- Routine maintenance schedule for all major systems and schedule of expected shutdowns;
- Equipment manufacturers/suppliers operation and maintenance manuals in electronic form;
- Forms and checklists to be used to monitor equipment, execute all operations and track predictive, preventative, and corrective maintenance;
- Any and all addenda or updates for Design/Build Work efforts;
- Operator logs to be used to monitor the equipment/processes; and
- Pictures of equipment and structures.

Each separate unit process and grounds/building shall have a designated process description section in the manuals and shall include a detailed written explanation of the following (as applicable):

- The process, or grounds/building, including its key components;
- The function of the equipment/process installed, including its purpose and normal operating parameters;
- Equipment summary, including nameplate data, supplier/local representative, and manufacturer;
- Description of instrumentation and control systems, including alarm conditions and responses;
- Description of normal operations, including: startup and shutdown, adjustment of variable functions and settings, interface with other equipment/processes, routine monitoring checklists, normal operating parameters, and record keeping forms;

- Description of alternate and emergency operations modes;
- Maintenance, including predictive, preventative and corrective maintenance for process functions, mechanical functions, electrical functions, instrumentation and control functions, and structural maintenance.
- Troubleshooting malfunctions of any of the equipment/processes.

### **13.3 OTHER DELIVERABLES & NON-PERIODIC REPORTS**

#### **13.3.1 Record Drawings**

After Substantial Completion the D/B Company shall deliver to the Construction Manager Ten (10) sets of Record Drawings for the D/B Project prior to, or with the final invoice. The final invoice will not be paid until the Record Drawings are reviewed and accepted by the County. The Record Drawings shall also be delivered to the Construction Manager in electronic format on a CD-ROM.

#### **13.3.2 Asset Management Data**

As part of the CMMS implementation the D/B Company shall provide to the County Asset Management Data on all major components that were installed during the D/B Work. This data shall be in electronic form, a Microsoft Access Database and also two printed copies of database tables. The database shall contain as a minimum the following data fields: acquisition date, acquisition cost, name plate data, expected life, location and fields for maintenance cost.

#### **13.3.3 Equipment And Start-Up Test Report**

Following individual equipment and process start-up and prior to acceptance testing the D/B Company shall submit a report to the Construction Manager as to the results of the equipment and process start-up.

#### **13.3.4 Acceptance Testing Report**

At least 90 days prior to the Scheduled Acceptance Date, the D/B Company shall submit to the County a detailed Acceptance Testing Plan. The results of Acceptance Testing shall be submitted to the Construction Manager in an Acceptance Testing Report prior to the Final Payment. The report will be reviewed by the Construction Manager and returned with comments within 30 days. The D/B Company shall make all changes associated with the Construction Manager's comments and submit a Final Report.

#### **13.3.5 Close-Out Deliverables**

Per the D/B Contract the following documentation is required to process the final Pay application:

- a. An affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the work have been paid otherwise satisfied; each subcontractor must also provide an affidavit.
- b. The surety's and guarantor's consent to final payment
- c. Certificate of Occupancy for all facilities constructed as part of the Design/Build Work
- d. Contractor Statement of Completion of all Work
- e. OCIP Signoff – Exhibit B
- f. A Final Exhibit G – Prime Contractor and Sub-contractor Utilization Report (TPP8)
- g. Notification of Warranty Period for all major pieces of equipment
- h. Transmittals signed by Construction Manager for all deliverables
- i. A final invoice for the D/B Work

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## APPENDIX 14 EQUIPMENT AND START-UP TESTING

### 14.1 General

The purpose of Equipment and Start-Up Testing is to confirm, prior to Acceptance Testing that the process equipment meets the Minimum Technical Requirements set forth in Appendices 5A and 5B. Due to hydraulic and solids loading limitations, all the Equipment and Start-Up Tests outlined in this Appendix may not be feasible prior to Acceptance Testing. If needed, design rated flow capacities can be simulated by operating individual units or parts of the Plant. Those specific Equipment and Start-Up Tests are partially identified in this Appendix. Equipment and Start-Up Testing shall be performed by the D/B Company pursuant to the provisions described in this Appendix and the Design/Build Contract. The County reserves the right to require the D/B Company to perform an Equipment or Start-Up Test of any individual process or any combination of related processes during the Acceptance Test should loading conditions not be available.

The D/B Company shall prepare an Equipment and Start-up Testing Plan prior to testing any equipment. The plan shall be submitted a minimum of 90 days prior to the anticipated test starting date and must be approved by the Construction Manager. The plan shall outline all resources required including, but not limited to, key personnel, power, water, length of time required, and chemicals required for a complete test. All test results shall be recorded and included in the final Equipment and Start-Up Test Report described in section 14.6 of this Appendix.

All labor, materials, equipment, chemicals, fuels, sampling, laboratory testing, and other services required to perform the Equipment and Start-Up Test shall be supplied by the D/B Company at no additional cost to the County. During the test, the D/B Company will operate and maintain all systems under normal operating conditions, including, but not limited to, routine equipment operation, maintenance services, chemicals, and electric usage. Under no circumstances shall the equipment be operated under conditions that are more severe than the maximum allowable operating conditions for which the equipment was designed.

The equipment will be deemed to have passed the Equipment and Start-Up Test if the performance standards established in this Appendix and the Minimum Technical Requirements of Appendices 5A and 5B are satisfied. At a minimum, testing shall be performed on the systems listed in Section 14.3

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## 14.2 Definitions

### 14.2.1 Pre-Operational Checkout (Step 1)

Are those documented physical checks (tests) that must occur to insure that an item of equipment or equipment system is ready for functional testing? Example components of pre-operational checkout include but are not limited to the following:

- Pressure and/or leakage tests, water-tightness of concrete structures, and pipe testing. Electrical testing, resistance testing in accordance with NETA - Section 16.
- Phase/motor rotation checks.
- Instrument calibration and loop tests.
- Pre-operational checkout of instrumentation system controls.
- Pre-operational checkout of mechanical and HVAC equipment to include alignment, lubrication, and other checks as recommended by the manufacturer.

### 14.2.2 Functional Testing (Step 2)

Is the testing of the individual items of equipment within a system under simulated conditions to determine contract compliance? This is done utilizing plant effluent, potable water, or another acceptable (approved in advance) substitute test media. The equipment will be operated long enough to gather information (data) on noise, temperature, vibration, performance characteristics, and to make initial adjustments of any applicable controls. Initial baseline data will be gathered on equipment with motors greater than one horsepower including amperage, bearing temperatures, and vibration.

The instrumentation and control field testing (loop checks from the field devices to PLC or distributed control systems as well as field calibrations) will be accomplished during the pre-operational checkout and functional testing stages as defined above.

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### **14.3.2 Start-up and Testing Schedule**

The D/B Company shall produce an overall testing schedule setting forth the sequence contemplated for performing the test work. The schedule shall be in bar chart form, plotted against calendar time, shall detail the equipment and systems to be tested, and shall be coordinated with the construction schedule. The testing schedule shall show the contemplated start date, duration of the test and completion of each test. The preliminary test schedule shall be submitted with the overall Equipment and Start-up Test Plan. The Construction Manager will not witness any testing work until the D/B Company has submitted a schedule to which the Construction Manager takes no exception. The test schedule shall be updated weekly, and presented at each start-up meeting, showing actual dates of test work, indicating systems and Equipment and Start-Up Testing completed satisfactorily and meeting the requirements of the Contract Standards, and also re-forecast the upcoming testing and reflect any schedule adjustments accompanied by written reason for the change. The D/B Company's baseline start-up and testing schedule is to be submitted with the overall test plan.

### **14.3.3 Documentation**

The D/B Company shall develop a record-keeping system to document all activities associated with Equipment and Start-up Testing and its prerequisites. Equipment and system documentation shall include date of test, equipment number or system name, nature of test, test objectives, test results, test instruments employed for the test and signature spaces for witness by the Construction Manager, the D/B Company's Start-Up Engineer, and the equipment manufacturer. At a minimum, the D/B Company shall utilize the attached forms to document such tests. A separate file shall be established for each system, organized by start-up phase (i.e., pre-operational, functional, start-up, and acceptance test phase), and will include sections for each item of equipment. These files shall include the following information and documentation as a minimum.

## **14.4 Test Plan Organization**

The Test Plan shall be organized as follows:

1. Index

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2. Overall Schedule
  3. Each type of equipment will have its own section within the system and include the following:
    - The detailed pre-operational test procedures.
    - The detailed functional test procedures.
    - Customized mechanical equipment, customized electrical, and customized instrumentation pre-operational and functional test forms as applicable.
    - Other pre-operational test documentation as required for piping and mechanical equipment.
  4. A separate section will be created for the system start-up testing and include the following:
    - The detailed 5-day start-up test procedure.
    - A detailed start-up system check/sign-off sheet (based on system tests, control checks, and interlock checks to be performed).
    - System start-up test completion sign-off form.
  5. Another section is to be designated for the Acceptance Testing and include the following:
    - Detailed work plans
    - Communications plan
    - Contingencies, as well as other requirements outlined under tie-ins and modifications to existing systems
    - The schedule shall reflect a 30-day test overview period and proposed spreadsheet forms to be utilized by the D/B Company's operations staff to record appropriate operational and performance data on a regular interval for the 30 days.

#### **14.5 Specific Start-Up Testing Requirements**

The D/B Company shall provide, at no expense to the County, all power, fuel, compressed air, supplies, water, and chemicals; as well as all labor, temporary piping, heating, ventilating, and air conditioning for any areas where the proposed facilities are not complete but operable at the time of Equipment and Start-up Testing and its prerequisites. The D/B Company shall provide all other items and work required to complete Acceptance Testing and its prerequisites as outlined in

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Appendix 15. Temporary facilities shall be maintained until permanent systems are in service.

The D/B Company shall also provide all necessary qualified operations personnel and manufacturer's field service personnel of the major equipment suppliers on an eight hour per day basis at the facilities and on a 24 hour per day basis locally during the Equipment and Start-Up Test period.

#### **14.5.1 Start-up Staffing**

The start-up efforts shall be staffed as described in the following sections unless otherwise approved by the Construction Manager in advance.

#### **14.5.2 Start-up Engineer**

The D/B Company shall appoint an operations engineer or equally qualified operations specialist to manage, coordinate, and supervise all aspects of the D/B Company's Start-Up and Testing Program including, but not limited to those components of the program as listed within this appendix. The designated representative shall have at least five (5) years of total experience, or experience on at least five separate projects, in managing the start-up commissioning of mechanical, electrical, instrumentation, HVAC, and piping systems.

#### **14.5.3 D/B Company's Testing Team**

The D/B Company's Testing Team shall include, at a minimum, staffing utilizing a like number of personnel anticipated to operate the facility complete with certifications and licenses as required by law, a qualified Mechanical/Equipment Foreman, a qualified Electrical Journeyman, and a qualified Instrument Technician.

The D/B Company is responsible to have the appropriate personnel, procedures, and test forms at the test site when performing a scheduled checkout/testing activity that is to be witnessed by the Construction Manager. At a minimum, the forms in Attachment 14A shall be utilized for this purpose and include with the final written Test Report described in this Appendix.

#### **14.5.4 Testing Equipment**

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All test equipment (gauges, meters, thermometers, analysis instruments, and other equipment) used for calibrating or verifying the performance of equipment installed under this contract shall be calibrated to within plus or minus two (2) percent of actual value at full scale. Pressure gauges shall be calibrated in accordance with ANSI/ASME B40.1. Thermometers shall be calibrated in accordance with ASTM E77 and shall be furnished with a certified calibration curve.

Test instruments shall be calibrated to references traceable to the National Bureau of Standards and shall have a current sticker showing date of calibration, deviation from standard, name of calibration laboratory and technician, and date recalibration is required.

Calibration equipment/test instruments utilized for Start-Up and Equipment Testing shall be documented to include identification (by make, manufacturer, model, and serial number) of the test equipment, date of original calibration, subsequent calibrations, calibration method, and test laboratory as well as documentation of current calibration.

All analysis instruments, sensors, gauges, and meters used for performance testing shall be subject to recalibration to confirm accuracy after the testing has been completed. All analysis instruments, sensors, gauges, and meters installed under this contract shall be subject to recalibration prior to acceptance.

Test equipment used to simulate inputs and read outputs shall have a rated accuracy at the point of measurement at least three times greater than the component under test. Buffer solutions and reference fluids shall be provided as necessary for tests of analytical equipment.

## **14.6 Test Plan Implementation**

This program will be implemented in four distinct steps (phases). These steps are the Pre-Operational Checkout, the Functional Testing, Start-up Testing, and the Acceptance Testing (Appendix 15).

### **14.6.1 Step 1 - Pre-Operational Checkout and Testing**

Pre-operational checkout includes multi-discipline work completion and physical checkout. The Pre-operational Completion Verification

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and Pre-operational test reports include the following required testing. Examples of these documented tests include, but are not limited to:

- Field pressure/leakage test reports for all pipe, valves, and appurtenances.
- Wire insulation megohm reports for all 600V wire.
- Phasing, ratio, polarity, ground resistance, current injection, insulation resistance, over potential test, and circuit breaker contact resistance reports for medium voltage switchgear.
- Insulation power factor and resistance test reports for surge arresters.
- Megger reports for Unit Substations, Three Winding Transformers, and 4160V motor control centers.
- Megger reports and ground connection tests.
- Loop Status Report and Component Calibration forms.
- Equipment installation checkout forms.

#### **14.6.2 Equipment Pre-Operational Checkout**

Equipment pre-operational checks and tests shall include, but are not limited to, the following:

- Check for proper installation, alignment, support, and anchorage per the applicable manufacturers operation and maintenance manual and in accordance with the contract documents.
- Check the equipment for proper adjustment, packing of seals, lubrication, drive connection, motor connection, and belt/chain tension per the applicable manufacturers operation and maintenance manual and in accordance with the contract documents.
- Check the associated process, seal water, drain, and vent pipe connections for proper routing and connection. Check to insure the pipe testing was performed and signed as completed for all the associated piping.
- Ensure that the equipment is clean and free of any construction debris that could potentially cause a malfunction.

Ensure that all safety guards, signage, and other safety measures such as hearing protection, etc., are in place.

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Manufacturer's representatives shall perform all pre-operational tests per the manufacturers' recommendations and review the equipment installation and sign the Manufacturer's Installation portion of the certification form. If the manufacturer's representative brings his own checklist, obtain a copy of the completed form and attach it to the D/B Company's completed forms. Note that the manufacturer must also fill out the contract approved checkout form (their own form will not serve as a substitute).

All gates and valves associated with the equipment system must be checked for proper installation, adjustment, and lubrication per the manufacturer's recommendations.

#### **14.6.3 Electrical Pre-Operational Checks/Tests**

Prior to energizing electrical circuits, use a 1,000-volt megohmmeter to measure insulation resistance on conductors and insulated parts of electrical equipment. All measurements shall meet or exceed the appropriate ICEA, NEMA, or ANSI standard. Any insulation resistance less than 10 megohms is unacceptable. Record results, as well as ambient temperature. See attached form for example.

Measure phase-to-ground insulation resistance for all circuits 120 volts and above, with the exception of lighting circuits. Measurements may be made with motors and other equipment connected, except that solid-state equipment shall be disconnected unless the equipment is normally tested by the manufacturer at voltages in excess of 1000 volts DC.

Complete Test Form for each installed motor. Measure the insulation resistance of all motors before connection. Measure the insulation resistance for all motors at the time of delivery as well as when connected. Insulation resistance values less than 10 megohms are not acceptable.

Adjust and make operative all protective devices. Perform a functional check of the control circuit prior to energization of the equipment.

Review all associated electrical terminations, switches, and breakers for satisfactory installation.

#### **14.6.4 Individual Component/Instrument Calibration Pre-Operational Check/Test**

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Each instrument and final element shall be field calibrated in accordance with the manufacturer's recommended procedure. Instruments shall then be tested in compliance with ISA S51.1 and the data entered on the applicable test report form. Alarm trips, control trips, and switches shall be set to initial values specified in the design at this time. Final elements shall be checked for range, dead band, and speed of response.

Calibration of analysis instruments, sensors, gauges, and meters installed under this contract shall proceed on a system-by-system basis. No equipment or system start-up, or acceptance tests shall be performed until instruments, gauges, and meters to be installed in that particular system have been calibrated and the calibration work has been witnessed by the Construction Manager.

Testing of instrument process piping/tubing, wiring and individual components shall be completed and documented on the approved test forms provided to the Construction Manager as part of the pre-operational testing phase and prior to commencement of individual loop testing conducted during the pre-operational functional test phase.

Any component which fails to meet the required tolerances shall be repaired by the manufacturer or replaced, and the above tests repeated until the component is within tolerance. System instrumentation equipment supplied and installed must also be reviewed for proper installation and termination as part of the pre-operational checkout.

#### **14.6.5 Pre-Operational Checkout Summary**

The pre-operational checkout and testing for each item shall be carried out in accordance with the D/B Company's submitted and approved procedures and documented on the D/B Company's approved pre-operational test forms.

The D/B Company shall complete the pre-operational testing requirements listed above, at a minimum, for each item of mechanical, electrical, instrumentation, and HVAC equipment prior to beginning any functional testing with regard to the equipment or the systems in which the equipment functions

#### **14.6.6 Step 2 - Functional Test**

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The second step in the program is the functional testing of the equipment. These tests begin for each item of equipment only after the Pre-operational Checks have been satisfactorily completed for all components for the particular equipment.

The functional testing for each item of equipment shall be carried out in accordance with the D/B Company's submitted and approved procedures and documented on the approved functional test forms.

Once 1) all affected equipment has been subjected to the required pre-operational testing procedures; and 2) the Construction Manager has witnessed and has not found deficiencies in that portion of the work, individual items of equipment and systems may be started and operated under simulated operating conditions to determine as nearly as possible whether the equipment and systems meet the Minimum Technical Requirements in Appendices 5A and 5B. If available, plant process media may be employed for the testing of all liquid systems except gaseous, oil, or chemical systems. If not available, potable water shall be employed as the test medium. Test media for these systems shall either be the intended fluid or a compatible substitute. The equipment shall be operated for a sufficient period of time to determine machine-operating characteristics, including noise, temperatures and vibration; to observe performance characteristics; and to permit initial adjustment of operating controls. When testing requires the availability of auxiliary systems such as looped piping, electrical power, compressed air, control air, or instrumentation which have not yet been placed in service, the D/B Company shall provide, and the Construction Manager shall approve in advance, acceptable substitute sources, capable of meeting the requirements of the machine, device, or system at no additional cost to the County. Disposal methods for test media shall be subject to review by the Construction Manager. During the functional test period, the D/B Company shall obtain baseline operating data on all equipment with motors greater than 1 horsepower to include amperage, bearing temperatures, and vibration.

Test results shall be within the tolerances set forth in this Appendix and Appendices 5A and 5B of the Contract Documents and as indicated in the D/B Company's functional test plan and the manufacturer's criteria. If no tolerances have been specified, test results shall conform to tolerances established by recognized industry practice. Where, in the case of an otherwise satisfactory functional test, any doubt, dispute, or difference should arise between the Construction Manager and the D/B Company regarding the test results or the methods or equipment used

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in the performance of such test, than the Construction Manager may order the test to be repeated at the D/B Company's expense. Where the results of any functional test fail to comply with the Minimum Technical Requirements found in Appendices 5A and 5B for such test, then such repeat tests as may be necessary to achieve the Contract Standards shall be made by the D/B Company at its expense.

The Functional Test reports (test documentation) include the required testing. Examples of these types of reports include, but are not limited to:

- The Functional Field Test of valves.
- The cycling/functions check of the sluice gates, slide gates, weir gates, stop logs, and stop plates.
- The leakage testing of sluice gates, slide gates, weir gates, stop logs, and stop plates in accordance with AWWA and applicable specifications.
- Vibration, noise, and capacity testing of Pumps.
- Air distribution and leakage test of any diffused air systems.
- Loop functional test for Instrumentation and Control

#### **14.6.7 Process/Mechanical/Equipment – (Functional Testing)**

During the functional verification check and testing process, the D/B Company and the various Manufacturers' Technical representatives shall examine and record the initial start-up performance of the components provided by their respective firms in accordance with the D/B Company's approved functional test procedure.

The initial operation, testing and adjustment shall be as required to prove that the equipment has been installed properly and operates under the conditions specified.

Upon completion of this work, the manufacturer's field service technician shall complete the D/B Company's approved functional test form as well as their own signed report to record the results of his/her inspection, operation, adjustments and tests. The report shall include detailed descriptions of the points inspected, tests and adjustments made, quantitative results if such are specified, and suggestions for precautions to be taken to ensure proper maintenance.

#### **14.6.8 Electrical - (Functional Testing)**

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The D/B Company's electrician shall be present during all testing to confirm the electrical, provide troubleshooting assistance, repair as needed, and assist in gathering baseline data such as motor amperages.

Energize each control circuit and operate each control, alarm or malfunction device and each interlock in turn to verify that the specified action occurs. The D/B Company shall submit a description of his proposed functional electrical test procedures as part of the testing plan.

Verify that motors are connected to rotate in the correct direction. Verification may be accomplished by momentarily energizing the motor, provided the D/B Company confirms that neither the motor nor the driven equipment will be damaged by reverse operation.

#### **14.6.9 Instrumentation and Control – (Functional Testing)**

The D/B Company's instrumentation representative shall be on site full time during the functional test phase to perform loop checks and to support the start-up team as needed. Any packaged equipment or manufacturer supplied control panels must be field tested to verify all control interlocks and control functions during this phase of testing by the equipment supplier. The D/B Company's functional test procedure for each piece of equipment shall define each interlock to be tested.

Each instrument loop shall be tested. This testing shall check operation from transmitter to readout components. Signals shall be generated utilizing the primary measuring elements where possible. Signals shall be injected only if primary element is unavailable.

If any output device fails to indicate properly, corrections to the loop shall be made as necessary and the test repeated until all instruments operate properly.

#### **14.6.10 Functional Testing Summary**

The functional testing for each item of equipment, electrical, and instrumentation shall be carried out in accordance with the D/B Company's submitted and approved procedures and documented on the D/B Company's approved functional test plans and forms. This information shall be accumulated for all equipment and will serve as the basis for the Equipment and Start-Up Test Reports.

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### **14.6.11 Step 3 - Start-up Testing**

Start up Testing begins after all Pre-operational checks and Functional tests have been satisfactorily completed. The D/B Company shall plan its activities to allow for Construction Manager witnessing of all tests and shall provide twenty-four (24) hours advance notice of all testing activities.

The D/B Company's start up test plan shall be a detailed procedure to confirm all System Automatic Mode functions, verify all system interlocks, and reconfirm all equipment functions and controls. All design and performance criteria will be demonstrated and documented during this period. The D/B Company, manufacturer, electrical, and instrumentation representatives will be on site on an 8 hour a day basis and locally on 24 hours a day basis during this period.

In the event of failure to demonstrate satisfactory performance of the system on the first or any subsequent attempt, all necessary alterations, adjustments, repairs and replacements shall be made. When the system is again ready for operation, it shall be brought on line and a new test shall be started. This procedure shall be repeated as often as necessary until the system has operated continuously to the satisfaction of the Construction Manager, for the specified duration at no additional cost to the County.

## **14.7 Minimum Testing Requirements**

### **14.7.1 Screening System Testing**

Screening System Testing shall consist of the ability of the continuously cleaned fine screen to separate a flow of 15 mgd with one unit in operation. Components of the testing shall include the ability of the screen to automatically sense the amount of debris 2mm and larger collected on the screen panels by measuring the differential pressure drop across the screen and to initiate the screen travel speed to increase to remove the accumulated debris and convey the debris to a centralized screenings collection area. The equipment shall also be tested to sense maximum differential pressure, shut down the system, and provide both local and remote alarms indicating equipment failure. Sufficient testing shall occur as to cause the screenings washer and compactor/bagger to operate in conjunction with the screens as a complete system. The compactor/bagger equipment shall be considered

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the UV disinfection system, the "worst case" operating conditions shall include a water temperature of 5 degrees Celsius, a total suspended solids level of 30 mg/l, the peak average daily flow condition (25.3 MGD), and a transmittance of less than 60%.

#### **14.7.5 Immersed Membrane Filtration System Testing**

Equipment and Start-Up Testing of the Immersed Membrane System shall consist of an evaluation of the membrane flux rate, fouling rate, membrane life cycle, and cleaning frequency (both recovery cleaning and "in tank" back pulse cleaning) under the design conditions shown in Appendix 5A. The membrane system shall be tested at the peak average daily flow for 24 hours with one membrane train off line. If the loading conditions are not achievable prior to Acceptance Testing as defined in Appendix 15, modeling shall be an acceptable demonstration. The Construction Manager shall at his discretion have the option of requiring said testing once the plant has successfully completed the Acceptance Testing and full loading conditions become available as described in Appendix 15.

#### **14.7.6 Pump System Testing**

Evaluation of all pumping systems to establish operating parameters as installed, including flow rate, total dynamic head, pump efficiency, motor efficiency, and capacity range. Pump system testing shall be conducted for a variety of conditions that represents the design operating range of the pump. This will include parallel operations where applicable. Influent, effluent, and reclaimed water pump stations shall be tested throughout the range of expected flows as shown in Appendix 5A. Pumping systems shall also be tested for excess vibration. Each pump shall be tested and monitored for vibration and shall not exceed the manufacturers recommended value for vibration.

#### **14.7.7 Variable Frequency Drive Control System Testing**

Evaluation of variable frequency drive control systems to ensure the system is capable of operating under the full range of conditions and continuous operation.

#### **14.7.8 Aeration/Mixing System Testing**

Evaluation of the aeration system, with the largest blower or mixing pump out of service to adequately aerate the contents of the process

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unit pursuant to design and construction specifications, including peak flow and peak loading conditions, and provide adequate mixing of the process unit contents, if applicable.

#### **14.7.9 Odor Control System Testing**

Evaluation of the ability of the odor control equipment and ancillary systems to sufficiently collect odorous air and provide mechanical odor control to treat the odorous air generated from the facility. The odor control system's Equipment Start-Up Test shall demonstrate the ability of the system to sufficiently collect odorous air and provide odor control to treat the odorous air generated within the Plant to meet the Performance Criteria in Appendix 2.

During the Odor Control Equipment Start-Up Test, the D/B Company shall perform the following test for each odor control system selected and installed by the D/B Company at the specified locations:

- Collect and treat odorous air to remove 99 percent of hydrogen sulfide (H<sub>2</sub>S), with performance to be determined by comparison of concentration of H<sub>2</sub>S in the inlet and outlet of the odor treatment equipment, as measured in parts per billion (ppb).
- Ventilate and treat odor for process areas where personnel perform operations and maintenance duties at a rate of 12 air changes per hour.

Odor control equipment treating air collected under anoxic zone covers, aeration basins, sludge holding tank headspace, interconnecting channels or other space may be tested during the Acceptance Test if the maximum solids loading rates are not achievable during Equipment and Start-Up Testing. Failure of any odor control system to remove a minimum of 99% hydrogen sulfide concentrations across the inlet and outlet of the odor control treatment equipment shall be sufficient cause for equipment and acceptance test failure. This test will also include:

- Ventilate and treat odor of tank headspace, channels and/or within equipment enclosures at a rate of 6 air changes per hour.

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- Continuously maintain a negative pressure under equipment covers averaging between 0.10 and 0.125 inches water column (not to exceed 0.25 inches).
  - Demonstrate a maximum H<sub>2</sub>S concentration of 10 parts per billion (ppb) measured at and/or beyond the structure outline as shown in Appendix 2 of the immediate facility and an odor detection by less than 50 % of an odor panel at the property line as determined by the Construction Manager. These standards shall apply to the discharge of all odor control treatment systems.

#### **14.7.10 Dewatering System Testing**

Determination of the ability of the dewatering units to reliably process sludge with one unit out of service and meet the dewatering Performance Guarantees during two 5-day (8 hour day) testing periods. The test will be comprised of three elements; solid content (percentage solids), chemical/polymer usage, and capture efficiency.

The dewatering system's Equipment and Start-Up Test shall demonstrate the ability of the dewatering units to reliably process sludge and meet the minimum technical requirements in Appendix 5A during two 5 day (8 hour days) periods. The test will be composed of three elements: solids content (a minimum of 20% percent cake solids), chemical/polymer usage and capture efficiency (95% minimum) as described in Appendix 5A.

During the dewatering system test, the sludge solids will be monitored to assess the raw feed rate, filtrate and dewatered solids content, in order to evaluate the performance of the system and the overall system capture efficiency. The consumption of chemicals and/or polymers shall also be monitored and recorded to determine specific consumption rates. Additionally, any other parameter or condition required by the GAEPD or the EPA will also be monitored. An outside laboratory agreed to by both the D/B Company and the Construction Manager, using laboratory analytical quality control standard procedures, shall analyze samples. The solid and wet streams shall be sampled at least four times per day for established parameters.

During the test, the dewatering system shall be operated at minimum and maximum design flow and loading rates, and at a range of feed conditions as have been established by the Dewatering Test Plan.

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Dewatering Test Plan shall be developed and will describe how the test will demonstrate the ability of the system to achieve the solids removal efficiencies required under the ranges of sludge loading that may be encountered during the useful life of the unit. During one 5-day period, each dewatering unit shall be operated at its maximum rate unless the Construction Manager agrees to a lower rate. During one 8-hour day, the dewatering equipment shall be operated at a rate that would be required when the sludge holding tank is at capacity and is being drawn down over two consecutive eight-hour days.

The D/B Company shall staff the dewatering system during the Equipment and Start-Up Test using the number of staff and with similar qualifications to the levels anticipated during normal operations.

#### **14.7.11 Plant Hydraulic Capacity Testing**

Determination of the ability of the New Plant to convey and treat maximum average daily flows, and instantaneous peak flows, and adjust and balance to parallel flow patterns under the entire range of expected flow conditions.

The D/B Company shall conduct Plant Capacity Testing of all parallel unit processes to demonstrate flow rates are split and balanced pursuant to the design and specifications while meeting all Performance Criteria and Minimum Technical Requirements as applicable. Hydraulic balancing testing shall be conducted at 11 MGD, 15 MGD, and 22 MGD. Where redundant units have been provided, the D/B Company shall demonstrate the ability to meet all Performance Criteria and the Minimum Technical Requirements with the applicable redundant unit out of service. During the Plant Hydraulic Capacity Test, the D/B Company shall demonstrate that the Plant is capable of complying with the NPDES Permit, Performance Criteria, and The Minimum Technical Requirements for effluent quality under peak design flow and loadings conditions and under a range of influent temperature conditions.

#### **14.7.12 Chemical Feed System Testing**

Equipment and Start-Up Testing for chemical feed systems shall include the ability of each system to deliver volumetric or mass flow rates of treatment chemicals through the range of dosages likely to be needed during the flow conditions shown in Appendix 5A.

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### **14.7.13 Pump Station SCADA System Testing**

The SCADA system for each pump station shall be subjected to Equipment and Start-Up Testing to demonstrate the system's ability to accurately sense all variables monitored and transmit operating conditions and status to remote locations. Each pump station shall be remotely controlled and shall be tested by running the pumps through the full range of anticipated flows as described in Appendix 5A.

### **14.7.14 Treatment Efficiency testing**

Testing shall be made of the ability of the Plant to meet the discharge limits of the NPDES Permit and the Performance Criteria under peak flow and loading conditions with all redundant process units and equipment out of service, including:

- One fine screen
- One grit collector
- One aeration train
- One membrane zone
- One UV disinfection train

The results of efficiency testing shall be annotated in the Equipment and Start-Up Testing Report. Minimum specific equipment and system testing parameters are outlined in Sections 15.2.1 through 15.2.13 of this appendix.

### **14.7.15 System Acceptance Test Completion/Sign-Off Form**

The forms attached to this Appendix are samples showing the format and minimum level of detail required for documentation. The D/B Company is advised that these are samples only and are not specific to this project or to any item of equipment or system to be installed under this contract. The D/B Company shall develop test documentation forms specific to each item of equipment and system installed under this contract. Acceptable example documentation forms for all systems and items of equipment shall be produced and submitted for review and approval by the Construction Manager. Once the Construction Manager has reviewed and taken no exception to the forms proposed by the D/B Company, the D/B Company shall produce customized forms for each item of equipment and system and include these individual forms in the overall test plan that will be submitted for approval.

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The complete test plan and all its sections are to be submitted (120 days prior to any testing) and approved prior to the start of any testing.

#### **14.7.16 Step 4 – Acceptance Testing**

The fourth step in the program is Acceptance Testing. The acceptance test period shall not begin until all new systems and equipment have successfully completed the start up test period. Acceptance Testing shall also comply with additional details found in Appendix 15

The Operations and Maintenance staff shall receive spare parts, safety equipment, tools and maintenance equipment, lubricants, approved operation and maintenance data and the specified operation and maintenance instruction prior to the startup with plant process media. All valve tagging shall also be complete prior to this startup.

As part of the Acceptance Test Plan the D/B Company shall submit detailed work plans, communications plan, contingencies plan, and other requirements as the Construction Manager may request. Also a 30-day test overview and proposed spreadsheet forms to be utilized by the D/B Company's operations staff to record appropriate operational and performance data on a regular interval for the 30 days.

#### **14.7.17 Prerequisites**

Acceptance Testing and the Acceptance Test Plan shall comprehensively cover all potential modes of operation, including failure scenarios, as well as the operation of ancillary systems, to demonstrate full functionality of the facilities. Any failures of process, equipment or systems shall result in re-starting the acceptance-testing period. Specific acceptance testing criteria is described in Appendix 15.

### **14.8 Equipment and Start-Up Test Report**

A comprehensive Equipment and Start-Up Test Report shall be prepared and ten (10) copies submitted by the D/B Company to the Construction Manager within 30 days after the completion of the Equipment and Start-Up Test. The Equipment and Start-Up Test Report shall include, but not be limited to, the following:

- 
- A certification that testing was conducted in accordance with the Equipment and Start-Up Test Plan.
  - A certification stating that the results of the Equipment and Start-Up Test, including a determination of the extent to which the equipment complies with the applicable unit, process design criteria, Minimum Technical Requirements in Appendix 5A and 5B, Performance Standards and Performance Criteria, and the requirements of this Appendix and the Design/Build Contract.
  - All required data measured and recorded during the test(s) including all laboratory analyses.
  - Record of equipment outages, failures, repairs and preventative maintenance;
  - Data and calculations demonstrating the ability of the equipment to meet the requirements of this Appendix;
  - Summary of test results and conclusive evidence of compliance with all test requirements; and
  - Any other data reasonably requested by the Construction Manager to be included in such reports.

The Equipment and Start-Up Test Report shall include copies of the original forms, data sheets, log sheets, and all calculations used to evaluate performance during testing, and copies of any laboratory reports conducted in conjunction with Equipment and Start-Up Testing.

Until results of Equipment and Start-Up Testing are acceptable to the Construction Manager, the D/B Company shall make all necessary changes, readjustments and replacements. Defects, which cannot be corrected by installation adjustments, will be sufficient grounds for rejection of any equipment.

**WIRE AND CABLE RESISTANCE TEST DATA FORM:**

Project \_\_\_\_\_

Date: \_\_\_\_\_

Site Conditions: \_\_\_\_\_

Time: \_\_\_\_\_

Circuits or Items being tested:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Wire or Cable No.: \_\_\_\_\_ Temperature, °F \_\_\_\_\_

<u>Location of Test</u>	From	To	Insulation Resistance, <u>megohms</u>
1.			
2.			
3.			
4.			
5.			
6.			
7.			

Comments:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

CERTIFIED

\_\_\_\_\_  
Company's Representative

\_\_\_\_\_  
Date

WITNESSED

\_\_\_\_\_  
County's Representative

\_\_\_\_\_  
Date

**INSTALLED MOTOR TEST FORM (PRE-OPERATIONAL CHECK/TEST):**

Motor Equipment Number \_\_\_\_\_ Date of test \_\_\_\_\_  
Equipment Driven \_\_\_\_\_ Ambient temp \_\_\_\_\_ °F  
MCC Location \_\_\_\_\_

Resistance:

Insulation resistance phase-to-ground megohms:

Phase A \_\_\_\_\_, Phase B \_\_\_\_\_, Phase C \_\_\_\_\_

Current at Full Load:

Phase \_\_\_\_\_ Current, amps \_\_\_\_\_

Phase \_\_\_\_\_ Current, amps \_\_\_\_\_

Phase \_\_\_\_\_ Current, amps \_\_\_\_\_

Thermal Overload Device: Manufacturer/catalog # \_\_\_\_\_ Amperes \_\_\_\_\_

Circuit breaker (MCP) setting: \_\_\_\_\_

Motor Nameplate Markings:

Mfr \_\_\_\_\_ Mfr type \_\_\_\_\_ Frame \_\_\_\_\_ HP \_\_\_\_\_

Volts \_\_\_\_\_ Phase \_\_\_\_\_ RPM \_\_\_\_\_ \*\*Service factor \_\_\_\_\_

Amps \_\_\_\_\_ Freq \_\_\_\_\_ Ambient temp rating \_\_\_\_\_ °C

Time rating \_\_\_\_\_ \*\*Design letter \_\_\_\_\_  
(NEMA I-10.35) (NEMA MG-1.16)

Code letter \_\_\_\_\_ insulation class \_\_\_\_\_

\*\*Required for 3-phase squirrel cage induction motors only.

CERTIFIED \_\_\_\_\_ Date \_\_\_\_\_  
Company's Representative

WITNESSED \_\_\_\_\_ Date \_\_\_\_\_  
County's Representative

**LOOP WIRING AND INSULATION RESISTANCE TEST DATA FORM (PRE-OPERATIONAL CHECK/TEST):**

Loop No.: \_\_\_\_\_

List all wiring associated with a loop in table below. Make applicable measurements as indicated after disconnecting wiring.

Wire No.	Panel Tie	Field <u>TB</u>	Continuity Resistance <sup>a</sup>		Shield/ <u>Gnd.</u>	Insulation Resistance <sup>b</sup>		
			Cond./ <u>Cond.</u>	Cond./ <u>Shield</u>		Shield/ <u>Cond.</u>	Cond./ <u>Gnd.</u>	Shield/ <u>Shield</u>
A			--	(A/SH)				
B			(A/B)	--				
C			(A/C)	--				
D			(A/D)	--				
etc.								

- a. Continuity Test. Connect ohmmeter leads between wires A and B and jumper opposite ends together. Record resistance in table. Repeat procedure between A and C, A and D, etc. Any deviation of  $\pm 2$  ohms between any reading and the average of a particular run indicates a poor conductor, and corrective action shall be taken before continuing with the loop test.
- b. Insulation Test. Connect one end of a 500 volt megger to the panel ground bus and the other sequentially to each completely disconnected wire and shield. Test the insulation resistance and record each reading.

CERTIFIED

\_\_\_\_\_  
Company's Representative

\_\_\_\_\_  
Date

WITNESSED

\_\_\_\_\_  
County's Representative

\_\_\_\_\_  
Date

# INSTRUMENT CALIBRATION SHEET

## Information

COMPONENT	MANUFACTURER	PROJECT
Tag No:	Name:	Number:
Description:	Model:	Name:
	Serial #:	

## Settings

ANALOG DEVICE	DISCRETE DEVICE
Units:	Units:
Inst. Range:	Inst. Range:
Calibration Range:	Setpoint(note rising or falling)
Suppression/Elevation:	Trip

## Calibration

Input / Output	Input Value	Desired Output	Actual Output						
0%									
25%									
50%									
75%									
100%									

Calibration in Shop:   
 Calibration in Field:

## Acceptance & Notes

#	NOTES:	Component Calibrated and Ready for Start-Up
		Contractor: _____ Date: _____
		Inspector: _____ Date: _____



# INSTRUMENTATION/FUNCTIONAL TEST / SIGN-OFF SHEET

<b>COMPONENT</b>	<b>MANUFACTURER</b>	<b>PROJECT</b>
Tag No:	Name:	Number: FC x
Description:	Model:	General Wastewater
	Serial #:	Pump Station Improvements

## FUNCTIONS

RANGE	VALUE	ENG. UNITS	COMPUTING FUNCTIONS
Indicate			Describe:  SWITCH Start Stop Status  Unit Range: Differential: Fixed / Adjustable Reset: Automatic / Manual
Record			
Alarm			

ANALOG CALIBRATIONS (5-point check)			
Device Calibration	WITNESSED CALIBRATION / CHECK		REQUIRED
	Input / Output	Field Instrument	AS CALIBRATED
	Input Value	Local Display / PLC Display / DCS Display	Trip Point / Reset Point / Display #1 / Display #2
0%	Output		(note rising or falling)
25%			
50%			
75%			
100%			

DISCRETE OUTPUT CALIBRATIONS			
Initial Calibration Complete:	SOURCE		Action
	Volt./ Dry	DCS	Monitored @ Device

Contractor /Mfg.	Date	P:	I:	D:
CONTROL MODE SETTINGS:				
#	NOTES:			
	<b>Component Calibrated and Ready for Start-Up</b>			
	Company's Representative:			Date:
	County's Representative:			Date:

**MISCELLANEOUS INSTRUMENT CALIBRATION TEST DATA FORM:**

(For instruments not covered by any of the preceding test forms, the Contractor shall create a form containing all necessary information and calibration procedures.)

CERTIFIED \_\_\_\_\_ Date  
Company's Representative

WITNESSED \_\_\_\_\_ Date  
County's Representative

# EQUIPMENT TEST REPORT

Equipment Name:  
 Equipment Number:  
 Specification Ref:  
 Location:

	Company's Representative Verified	County's Representative Verified
	Date	Date

## PREOPERATIONAL CHECKOUT/TEST (STEP 1)

### Mechanical

Lubrication	_____	_____	_____	_____
Alignment	_____	_____	_____	_____
Anchor bolts	_____	_____	_____	_____
Seal water system operational	_____	_____	_____	_____
Equipment rotates freely	_____	_____	_____	_____
Safety guards	_____	_____	_____	_____
Valves operational	_____	_____	_____	_____
O&M manual information complete	_____	_____	_____	_____
Manufacturer's installation certificate complete	_____	_____	_____	_____

### Electrical (Circuit ring-out and high-pot tests)

<u>Circuits:</u>				
Power to MCC 5	_____	_____	_____	_____
Control to HOA	_____	_____	_____	_____
<u>Indicators at MCC:</u>				
Red (running)	_____	_____	_____	_____
Green (power)	_____	_____	_____	_____
Amber (auto)	_____	_____	_____	_____
Indicators at local control panel	_____	_____	_____	_____
Wiring labels complete	_____	_____	_____	_____
<u>Nameplates:</u>				
MCC	_____	_____	_____	_____
Control station	_____	_____	_____	_____
Control panel	_____	_____	_____	_____
Equipment bumped for rotation	_____	_____	_____	_____

### Piping Systems

<u>Cleaned and flushed:</u>				
Suction	_____	_____	_____	_____
Discharge	_____	_____	_____	_____
Pressure tests	_____	_____	_____	_____

### Instrumentation and Controls

Flowmeter FE2502F calibration	_____	_____	_____	_____
Calibration Report No.	_____	_____	_____	_____

Flow recorder FR2502G calibrated  
 against transmitter \_\_\_\_\_  
 VFD speed indicator calibrated against  
 independent reference \_\_\_\_\_  
 Discharge overpressure shutdown  
 switch calibration \_\_\_\_\_  
 Simulate discharge overpressure  
 shutdown \_\_\_\_\_

**FUNCTIONAL TESTS (STEP 2)**

Mechanical

Motor operation temperature satisfactory \_\_\_\_\_  
 Pump operating temperature satisfactory \_\_\_\_\_  
 Unusual noise, etc? \_\_\_\_\_  
 Pump operation: 75 gpm/50 psig \_\_\_\_\_  
 Measurement:  
 Flow \_\_\_\_\_  
 Pressure \_\_\_\_\_ test gage number \_\_\_\_\_  
 Alignment \_\_\_\_\_  
 Dowelled in \_\_\_\_\_

Remarks:

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Electrical

Local switch function:  
 Runs in *HAND* \_\_\_\_\_  
 No control power in *OFF* \_\_\_\_\_  
 Timer control in *AUTO* \_\_\_\_\_  
 Overpressure protection switch PS2502C  
 functional in both *HAND* and *AUTO* \_\_\_\_\_  
 Overpressure protection switch PS2502C  
 set at 75 psig \_\_\_\_\_  
 PLC 2500 set at 24 hr cycle,  
 25 min *ON* \_\_\_\_\_

**PIPING TEST DATA FORM:**

Project \_\_\_\_\_

Date: \_\_\_\_\_

Building or Structure: \_\_\_\_\_

Inspection (description of pipe) \_\_\_\_\_  
\_\_\_\_\_

Description of Work to be Performed:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Specification Section.: \_\_\_\_\_

Comments:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Status of Test: (Circle One)

Passed

Passed with correction noted below  
\_\_\_\_\_  
\_\_\_\_\_

Not Acceptable:  
\_\_\_\_\_  
\_\_\_\_\_

CERTIFIED

\_\_\_\_\_  
Company's Representative

\_\_\_\_\_  
Date

WITNESSED

\_\_\_\_\_  
County's Engineer

\_\_\_\_\_  
Date

## SUMMARY EQUIPMENT ACCEPTANCE SHEET

Project Name: \_\_\_\_\_ Equipment Name: \_\_\_\_\_  
Project No.: \_\_\_\_\_ Shop Dwg. Approved Date: \_\_\_\_\_  
Manufacturer: \_\_\_\_\_ O&M Approved Date: \_\_\_\_\_  
Local Vendor: \_\_\_\_\_ O&M Del. to Owner Date: \_\_\_\_\_  
Vendor Phone: \_\_\_\_\_ Start 30-Day Test: \_\_\_\_\_  
Training Instructor's Name: \_\_\_\_\_ Complete 30-Day Test: \_\_\_\_\_  
\_\_\_\_\_

### Manufacturer's Approval of Calibration and Installation

We hereby certify that the above named equipment has been installed, calibrated, and adjusted per the manufacturer's instructions and is ready for full time operation. Witnessed by:

County Engineer.: \_\_\_\_\_ Company's Rep.: \_\_\_\_\_  
Mfg. Rep.: \_\_\_\_\_ Date: \_\_\_\_\_

### Manufacturer's Functional Test

We hereby certify that the required functional test has been satisfactorily completed in accordance with contract specifications and the equipment is fully operational and capable of meeting design requirements. Witnessed by:

County Engineer.: \_\_\_\_\_ Company's Rep.: \_\_\_\_\_  
Mfg. Rep.: \_\_\_\_\_ Date: \_\_\_\_\_

### Manufacturer's Instruction and Training

We hereby certify that the contract specified training services have been provided by a competent factory representative for the equipment listed above. The Owner's personnel have been properly instructed in the operation, maintenance, and repair of the equipment as outlined in the specifications. Witnessed by:

County Engineer.: \_\_\_\_\_ Company's Rep.: \_\_\_\_\_  
Mfg. Rep.: \_\_\_\_\_ Date: \_\_\_\_\_

### Owner's Acceptance of Equipment for Full Time Operation by Contractor's Operations Staff and Warranty

As a representative of the Owner for the above mentioned project, I hereby accept the above mentioned equipment. The 30-day operating test has been completed and the warranty period begins on \_\_\_\_\_. All O&M manuals have been received. Witnessed by:

County Engineer.: \_\_\_\_\_ Company's Rep.: \_\_\_\_\_  
Owner's Rep.: \_\_\_\_\_ Date: \_\_\_\_\_





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## **APPENDIX 15 ACCEPTANCE TESTING**

### **15.1 General**

After the D/B Work is in place, Equipment and Start-Up Testing have been performed, and prior to Acceptance of the JCEC, the D/B Company shall perform Acceptance Testing. The purpose of Acceptance Testing is to verify that the Plant has been designed and constructed such that while operating under Design Conditions (Appendices 2, 3, and 4), it will meet all Performance Criteria (Appendix 2), Minimum Technical Requirements (Appendices 5A and 5B), and requirements of the D/B Contract. Additionally, the Acceptance test period of 120 days will substantiate the D/B Company's Operational (electrical, chemical, sludge and odor control chemical) Guarantees.

This Appendix outlines the Acceptance Testing for equipment and the Whole Plant that the County considers relevant to verify the D/B Company's design and to substantiate the JCEC's Whole Plant operation. If the D/B Company's design of any process or piece of equipment, whether in Appendices 2 or 15 or not, is such that the design of the process or equipment allows other critical process or equipment to be designed at less capacity or capability than is anticipated by Appendices 2 or 15, then the D/B Company shall test that process or equipment to verify its design.

The D/B Company shall submit to the Construction Manager an Acceptance Testing Report, which describes in detail the testing conducted and the results of the testing.

### **15.2 Acceptance Testing Plan**

At least 90 days prior to the Scheduled Acceptance Date, the D/B Company shall submit to the Construction Manager a detailed Acceptance Testing Plan. The Acceptance Testing Plan shall include specific, detailed protocols describing the procedures to be used, measurements to be made, permanent and temporary instrumentation to be used, organization of the test team, testing schedule, and the operation and maintenance schedule that will be used when conducting Acceptance Testing. The Acceptance Testing Plan shall indicate how the Plant will be staffed and operated during Acceptance Testing, including certifications or licenses of each individual.

The Construction Manager shall comment on or approve the Acceptance Testing Plan within 30 days of receipt. The Acceptance Testing Plan is not complete and approved until all of the Construction Manager's comments are resolved. The Construction Manager's approval will not be unreasonably withheld if the D/B Company makes every effort to provide expeditious response to all comments.

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Acceptance Testing shall not begin until the Acceptance Testing Plan is approved, and the D/B Company has been authorized by the Construction Manager to proceed with Acceptance Testing. Preliminary testing may be conducted at the D/B Company's expense; however, the results of such testing shall not be made part of the Acceptance Testing Report.

### **15.3 Acceptance Testing**

Prior to beginning Acceptance Testing, the following conditions shall be met:

1. Construction of the Design/Build Work shall have achieved Substantial Completion.
2. The Equipment and Start-Up Testing Report shall have been completed, submitted, and accepted by the Construction Manager.
3. The Acceptance Testing Plan shall have been approved by the Construction Manager.

All labor, materials, equipment, chemicals, fuels, sampling, laboratory testing, and other services required to perform Acceptance Testing shall be supplied by the D/B Company. Except as indicated below, during Acceptance Testing, the D/B Company shall operate the plant normally, including routine equipment operation, maintenance services, chemical usage, and power usage.

Laboratory analyses shall be performed by an independent State-certified laboratory agreed to by both the D/B Company and the Construction Manager, using standard laboratory analytical quality control procedures. At its option, the Construction Manager may approve use of field methods for analyses that could be performed either by a laboratory or using field methods.

The D/B Company shall staff the Plant during the Acceptance Test using the staff indicated in the Acceptance Testing Plan. Should the performance of the Plant be deemed to be unsatisfactory at any time during the Acceptance Test, immediate action shall be taken by the D/B Company to ensure that the effluent does not exceed existing or interim limits, or pose a threat to human health and the environment. If remedial action is considered unlikely to satisfy this requirement, the equipment or applicable portion of the Plant that fails to satisfy Acceptance Testing requirements will be shut down and the test terminated until such time as the above requirement is satisfied.

The following subsections present requirements for the various parts of Acceptance Testing, divided by treatment process.

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*Requirements of what must be demonstrated by a given test are given in italics. A discussion of how the test is to be performed follows in normal text. The Acceptance Testing Plan shall comply with these requirements but shall provide more detail. Conditions for passing the test follow in underlined text.*

### **15.3.1 Raw Sewage Collection**

*The D/B Company shall demonstrate that the gravity line constructed from the diversion structure to the new JCEC has a minimum capacity 110 percent of design QPKHR.*

Sufficient water shall be added to the diversion structure such that the resulting flow through the new gravity line is a minimum of 110 percent of design QPKHR. This flow rate shall be maintained for no less than 60 minutes. The water level at the downstream end of the gravity line shall be maintained at the design high water level, plus or minus 1 foot.

The test shall pass if, at all times during the test, the water level in the diversion structure remains below its design high water level<sup>1</sup>.

*The D/B Company shall demonstrate that the modified Horseshoe Bend influent pump station and force main to the Plant has a minimum firm capacity of 6.0 MGD<sup>2</sup>.*

Water shall be added to the pump station wet at no less than 6.0 MGD. The pump station shall be operated for no less than 60 minutes with one pump out of service. Return this pump to service and repeat the above until the pump station has been tested with each pump having been out of service.

The test shall pass if, at all times during the test, the water level in the pump station wet well remains below its design high water level.

### **15.3.2 JCEC Influent Pumping**

*The D/B Company shall demonstrate that the minimum firm capacity of the influent pump station is 110 percent of design QPKIIR.*

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<sup>1</sup> Here and elsewhere in this Appendix, "high water level" refers to the level indicated on design drawings produced by the D/B Company.

<sup>2</sup> Million gallons per day

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Water shall be added to the pump station wet well at no less than 110 percent of design QPKHR. The pump station shall be operated for no less than 60 minutes with each pump out of service.

The test shall pass if, at all times during the test, the water level in the pump station wet well remains below its design high water level.

*The D/B Company shall demonstrate that the influent pump station has sufficient turndown to handle the minimum influent flow rates at startup.*

This requirement may be demonstrated on paper using pump curves and calculations.

### 15.3.3 Coarse Screening

*The D/B Company shall demonstrate that the firm capacity of the Coarse screening process is at least QPKHR. The D/B Company also shall demonstrate that the screens remove all particles larger 6 millimeters.*

The Coarse screening system shall be operated for no less than 60 minutes with one screen out of service. Return this screen to service and repeat the above until the fine screening system has been tested with each screen having been removed from service.

While the screens are being tested, collect grab samples of screened wastewater every 10 minutes. Combine all of the grab samples for a given screen. Filter the sample through a sieve having openings the same size as the requirement.

The test shall pass if: 1) at no time during the test are the primary effluent weirs submerged (i.e., downstream water surface higher than the bottom of the v-notch), and 2) no material larger than the requirement is retained on the sieve.

*The D/B Company shall demonstrate that the flow split to multiple Coarse screens is equal.*

With all fine screens online, operate the process at a constant flow rate at least 90 percent of design QPKHR. Three feet upstream (or downstream) of each screen, at the center of the channel, 0.6 of the distance from the water surface to the channel invert, measure the velocity of flow.

The test shall pass if the velocity measurements for each screen vary from one another by no more than 10 percent.

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#### 15.3.4 Equalization

*The D/B Company shall demonstrate that under Design Conditions, the peak flow rate leaving the equalization process (i.e., flowing to primary treatment) will never be greater than design QPKDY.*

This requirement may be demonstrated by calculations

*The D/B Company shall demonstrate that any influent flow exceeding design QPKDY will be automatically diverted to the equalization tank(s). The D/B Company also shall demonstrate that at a flow rate of QPKDY to the primary treatment process, the Parshall flume used for flow measurement will not be submerged.*

With the plant configured to bypass the equalization tanks and the primary treatment process (if in process) in service (i.e., no bypass), increase the plant flow rate from QPKDY to design QPKHR over several hours. Monitor the flow rate to primary treatment.

The test shall pass if during the test: 1) the flow rate to primary treatment does not exceed QPKDY, 2) excess flow begins to divert to equalization at QPKDY, and 3) the Parshall flume is never submerged.

#### 15.3.5 Vortex Grit Removal Process (pretreatment option A)

*The D/B Company shall demonstrate that flow split to multiple vortex grit units is equal and that the grit removal process can meet Performance Criteria for grit removal efficiency while operating at the design grit load and design QPKHR. The D/B Company also shall demonstrate that the grit cyclones/classifiers remove putrescible solids and thicken grit to minimum 75 percent solids.*

Sufficient water shall be added upstream of the grit removal process that the flow rate is between 90 and 100 percent of QPKHR at all times during the test.

In the first part of the test, with all grit units online, measure the velocity of flow in each grit unit the effluent channel before it combines with flow from other grit units. Measure the velocity as far downstream from an individual grit unit as practical, in the center of the channel, at 0.6 of the distance from the water surface to the channel invert.

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The first part of the test shall pass if the velocity measurements are within 10 percent of one another.

In the second part of the test, dewatered grit from another County wastewater treatment facility shall be added to the grit removal process feed such that the grit load is greater than or equal to the design grit load. Because the design grit load has been stated at QPKDY, the grit concentration at QPKHR will be lower than it would be at QPKDY.

Bypass the equalization tank(s) during the test, to allow any uncaptured grit to be captured in the primary clarifiers. Operate the grit removal process and downstream primary clarifiers for a minimum 24 hours. Each hour, collect a sample from the top of the grit pile and a sample of primary sludge. Prepare flow-weighted 24-hour composite samples of grit and primary sludge.

Analyze the composite samples for Total Solids (TS) and Total Volatile Solids (TVS). Measure the particle size distribution of the ignited samples through U.S. Standard Sieves (such as 6, 16, 30, 70, and 140 mesh) using a Standard Mechanical Sieve Shaker. Collect solids smaller than 140 mesh (or similar size) in a pan.

Record the total quantity of grit collected during the test period and the quantity of primary sludge collected during the test.

Calculate percent removal of inert material larger than 65 mesh as follows:

1. Calculate the mass of inert material (i.e., grit) removed by the grit removal process during the test:

$$X = Q_g \cdot (TS_g) \cdot (1 - TVS_g) \cdot r_l \cdot S_g$$

X = mass of grit removed during the test period (lb/d<sup>3</sup>)

Q<sub>g</sub> = quantity of grit removed during the test period (ft<sup>3</sup>/d<sup>4</sup>)

TS<sub>g</sub> = TS of grit sample (as a fraction of wet mass)

TVS<sub>g</sub> = TVS of grit sample (as a fraction of TS<sub>g</sub> mass)

r<sub>l</sub> = specific weight of water (62.4 lb/ft<sup>3</sup><sup>5</sup>)

S<sub>g</sub> = specific gravity of grit (assumed 2.65)

2. Calculate the mass of inert material collected in primary sludge during the test:

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3 Pounds per day

4 Cubic feet per day

5 Pounds per cubic foot

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$$Y = Q_s \cdot (TS_s) \cdot (1 - TVS_s) \cdot r_2 \cdot S_s$$

Y = mass of grit in primary sludge during the test period (lb/d)

Q<sub>s</sub> = quantity of primary sludge during the test period (gpd<sup>6</sup>)

TS<sub>s</sub> = TS of primary sludge sample (as a fraction of wet mass)

TVS<sub>s</sub> = TVS of primary sludge sample (as a fraction of TS<sub>s</sub> mass)

r<sub>2</sub> = specific weight of water (8.34 lb/gal.<sup>7</sup>)

S<sub>s</sub> = specific gravity of primary sludge inert material (assumed 1.4)

3. Calculate the quantity of inert material of each size of interest (i.e., greater than 65 mesh and between 65 and 100 mesh) in grit process influent:

$$A = P_g \cdot X + P_s \cdot Y$$

A = quantity of inert material larger than a given sieve size (lb/d)

P<sub>g</sub> = mass fraction of grit larger than the size of interest (in grit)

P<sub>s</sub> = mass fraction of grit larger than the size of interest in primary sludge

4. Calculate the removal of inert material of each size of interest:

$$PR = (P_g \cdot X/A) \cdot 100 \text{ percent}$$

PR = percent removal of inert material of the size of interest

The second part of the test shall pass if: 1) the removal of grit larger than 65 mesh exceeds 95 percent, 3) the removal of grit larger than 100 but smaller than 65 mesh exceeds 75 percent, 4) the TS fraction of the composite grit sample is greater than 75 percent, and 5) the TVS fraction of the composite grit sample is less than 5 percent.

*The D/B Company shall demonstrate the ability of the grit removal process to pass design QPKHR with any single grit unit offline.*

Sufficient water shall be added upstream of the grit removal process that the flow rate is minimum design QPKHR at all times during the test. The grit removal system shall be operated for no less than 60 minutes with one unit out of service. Return this unit to service and

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repeat the above until the grit removal system has been tested with each unit having been removed from service.

The test shall pass if, at all times during the test, the headloss across the grit removal process is less than the design headloss as shown in the design drawings.

### **15.3.6 Primary Treatment (pretreatment option A)**

*The D/B Company shall demonstrate that the flow split to multiple primary clarifiers is equal.*

With all clarifiers online and no bypass, operate the clarifiers at a constant flow rate at least 90 percent of design QPKDY. In each clarifier, 3 feet upstream of each side of the effluent drop box, at the center of the launder measure the velocity of flow.

The test shall pass if the average of the two velocity measurements made in each clarifier vary from one another by no more than 10 percent.

*The D/B Company shall measure and report TSS and cBOD<sub>5</sub> removals by primary treatment while the clarifiers are loaded as they would be at design QMAX30 flow rate.*

Operate one or more primary clarifiers such that the primary clarifier hydraulic loading rate (HLR) is the same as the HLR that would exist at QMAX30 plant influent flow rate with one primary clarifier out of service. Additional primary influent flow shall bypass primary treatment.

Operate at the test flow rate for no less than 30 days. Each day collect 24-hour flow weighted samples of primary influent and effluent (not including any untreated bypass). Calculate and report the 30-day average TSS, cBOD<sub>5</sub>, TKN, and TP removals by primary treatment.

This test is for information only and cannot be passed or failed, although the reported removals will be used to develop test conditions for the activated sludge process.

*The D/B Company shall demonstrate that the primary treatment process can pass design QPKHR with any single unit out service. The D/B Company also shall demonstrate that primary treatment can be completely bypassed at QPKDY.*

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The plant shall be operated at QPKDY. The primary treatment process shall be operated for no less than 120 minutes with each individual unit out of service and no bypass. The plant shall then be operated at QPKDY with all primary clarifiers offline and complete bypass of primary treatment.

The test shall pass if, at all times during the test, the upstream Parshall flume is unsubmerged and freeboard requirements are met.

### **15.3.7 Fine Screening (pretreatment option A)**

*The D/B Company shall demonstrate that the firm capacity of the fine screening process is at least QPKDY. The D/B Company also shall demonstrate that the screens remove all particles larger than the Membrane System Supplier's requirement or 2 millimeters, whichever is smaller.*

With the primary clarifiers online and no primary bypass, operate the plant at QPKDY. The fine screening system shall be operated for no less than 60 minutes with one screen out of service. Return this screen to service and repeat the above until the fine screening system has been tested with each screen having been removed from service.

While the screens are being tested, collect grab samples of screened wastewater every 10 minutes. Combine all of the grab samples for a given screen. Filter the sample through a sieve having openings the same size as the requirement.

The test shall pass if: 1) at no time during the test are the primary effluent weirs submerged (i.e., downstream water surface higher than the bottom of the v-notch), and 2) no material larger than the requirement is retained on the sieve.

*The D/B Company shall demonstrate that the flow split to multiple fine screens is equal.*

With all fine screens online, operate the process at a constant flow rate at least 90 percent of design QPKDY. Three feet upstream (or downstream) of each screen, at the center of the channel, 0.6 of the distance from the water surface to the channel invert, measure the velocity of flow.

The test shall pass if the velocity measurements for each screen vary from one another by no more than 10 percent.

### **15.3.8 Grit and Grease Removal (pretreatment option B)**

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*The D/B Company shall demonstrate that flow split to grit and grease removal units is equal and that the grit and grease removal process can meet Performance Criteria for grit and grease removal efficiency while operating at the design grit load and design QPKHR. The D/B Company also shall demonstrate that the grit cyclones/classifiers remove putrescible solids and thicken grit to minimum 75 percent solids.*

Sufficient water shall be added upstream of the grit removal process that the flow rate is between 90 and 100 percent of QPKHR at all times during the test.

In the first part of the test, with all grit units online, measure the velocity of flow in each grit unit the effluent channel before it combines with flow from other grit units. Measure the velocity as far downstream from an individual grit unit as practical, in the center of the channel, at 0.6 of the distance from the water surface to the channel invert.

The first part of the test shall pass if the velocity measurements are within 10 percent of one another.

In the second part of the test, dewatered grit from another County wastewater treatment facility shall be added to the grit removal process feed such that the grit load is greater than or equal to the design grit load. Because the design grit load has been stated at QPKDY, the grit concentration at QPKHR will be lower than it would be at QPKDY.

Bypass the equalization tank(s) during the test, to allow any uncaptured grit to be captured in the primary clarifiers. Operate the grit removal process and downstream primary clarifiers for a minimum 24 hours. Each hour, collect a sample from the top of the grit pile and a sample of primary sludge. Prepare flow-weighted 24-hour composite samples of grit and primary sludge.

Analyze the composite samples for Total Solids (TS) and Total Volatile Solids (TVS). Measure the particle size distribution of the ignited samples through U.S. Standard Sieves (such as 6, 16, 30, 70, and 140 mesh) using a Standard Mechanical Sieve Shaker. Collect solids smaller than 140 mesh (or similar size) in a pan.

Record the total quantity of grit collected during the test period and the quantity of primary sludge collected during the test.

Calculate percent removal of inert material larger than 65 mesh as follows:

1. Calculate the mass of inert material (i.e., grit) removed by the grit removal process during the test:

$$X = Qg \cdot (TSg) \cdot (1 - TVSg) \cdot r1 \cdot Sg$$

X = mass of grit removed during the test period (lb/d <sup>8</sup>)  
 Qg = quantity of grit removed during the test period (ft<sup>3</sup>/d <sup>9</sup>)  
 TSg = TS of grit sample (as a fraction of wet mass)  
 TVSg = TVS of grit sample (as a fraction of TSg mass)  
 r1 = specific weight of water (62.4 lb/ft<sup>3</sup> <sup>10</sup>)  
 Sg = specific gravity of grit (assumed 2.65)

2. Calculate the mass of inert material collected in primary sludge during the test:

$$Y = Qs \cdot (TSs) \cdot (1 - TVSs) \cdot r2 \cdot Ss$$

Y = mass of grit in primary sludge during the test period (lb/d)  
 Qs = quantity of primary sludge during the test period (gpd <sup>11</sup>)  
 TSs = TS of primary sludge sample (as a fraction of wet mass)  
 TVSs = TVS of primary sludge sample (as a fraction of TSs mass)  
 r2 = specific weight of water (8.34 lb/gal. <sup>12</sup>)  
 Ss = specific gravity of primary sludge inert material (assumed 1.4)

3. Calculate the quantity of inert material of each size of interest (i.e., greater than 65 mesh and between 65 and 100 mesh) in grit process influent:

$$A = Pg \cdot X + Ps \cdot Y$$

A = quantity of inert material larger than a given sieve size (lb/d)  
 Pg = mass fraction of grit larger than the size of interest (in grit)  
 Ps = mass fraction of grit larger than the size of interest in primary sludge

4. Calculate the removal of inert material of each size of interest:

$$PR = (Pg \cdot X/A) \cdot 100 \text{ percent}$$

PR = percent removal of inert material of the size of interest

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8 Pounds per day  
 9 Cubic feet per day  
 10 Pounds per cubic foot  
 11 Gallons per day  
 12 Pounds per gallons

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The second part of the test shall pass if: 1) the removal of grit larger than 65 mesh exceeds 95 percent, 3) the removal of grit larger than 100 but smaller than 65 mesh exceeds 75 percent, 4) the TS fraction of the composite grit sample is greater than 75 percent, and 5) the TVS fraction of the composite grit sample is less than 5 percent.

*The D/B Company shall demonstrate the ability of the grit removal process to pass design QPKHR with any single grit unit offline.*

Sufficient water shall be added upstream of the grit removal process that the flow rate is minimum design QPKHR at all times during the test. The grit removal system shall be operated for no less than 60 minutes with one unit out of service. Return this unit to service and repeat the above until the grit removal system has been tested with each unit having been removed from service.

The test shall pass if, at all times during the test, the headloss across the grit removal process is less than the design headloss as shown in the design drawings.

### **15.3.9 Fine (1mm) Drum Screens (pretreatment option B)**

*The D/B Company shall demonstrate that the firm capacity of the fine screening process is at least QPKDY. The D/B Company also shall demonstrate that the screens remove all particles larger than the Membrane System Supplier's requirement or 1 millimeters, whichever is smaller.*

With the primary clarifiers online and no primary bypass, operate the plant at QPKDY. The fine screening system shall be operated for no less than 60 minutes with one screen out of service. Return this screen to service and repeat the above until the fine screening system has been tested with each screen having been removed from service.

While the screens are being tested, collect grab samples of screened wastewater every 10 minutes. Combine all of the grab samples for a given screen. Filter the sample through a sieve having openings the same size as the requirement.

The test shall pass if: 1) at no time during the test are the primary effluent weirs submerged (i.e., downstream water surface higher than the bottom of the v-notch), and 2) no material larger than the requirement is retained on the sieve.

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*The D/B Company shall demonstrate that the flow split to multiple fine screens is equal.*

With all fine screens online, operate the process at a constant flow rate at least 90 percent of design QPKDY. Three feet upstream (or downstream) of each screen, at the center of the channel, 0.6 of the distance from the water surface to the channel invert, measure the velocity of flow.

The test shall pass if the velocity measurements for each screen vary from one another by no more than 10 percent.

### **15.3.10 Activated Sludge Process and Aeration System**

*The D/B Company shall demonstrate that under Design Conditions the activated sludge process and aeration system can achieve Performance Criteria for: 1) Membrane System effluent pH, cBOD<sub>5</sub>, NH<sub>3</sub>-N, ON, TP, and NO<sub>3</sub>-N concentrations, and 2) dissolved oxygen (DO) concentrations in aerated tankage.*

Use the design influent TSS, cBOD<sub>5</sub>, TKN, and TP loads (Table A2-2 in Appendix 2) and the primary treatment average TSS, cBOD<sub>5</sub>, TKN, and TP removal efficiencies demonstrated during primary treatment testing (see above) to calculate design activated sludge influent loads.

For example, if the demonstrated primary treatment cBOD<sub>5</sub> removal were 25 percent, the design activated sludge influent average annual cBOD<sub>5</sub> load would be:

$$18,300 \text{ lb/d} \cdot (1 - 0.25) = 13,725 \text{ lb/d}$$

Biological process efficiency is lowest in cold water, but aeration efficiency is lowest in warm water. In this case, demonstration of effluent quality is more important than demonstration of aeration performance. Therefore, activated sludge process testing shall be conducted when cold water is expected. Activated sludge process testing shall be conducted for a 90-day period entirely between January 1 and April 15.

In the test, the activated sludge process shall be operated for the 90-day period at activated sludge influent average annual influent loading conditions, for any 30-day period at activated sludge influent maximum 30-day average influent loading conditions, and for any single day at activated sludge influent peak day average influent loading conditions.

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During the test, operate all or fewer activated sludge train(s), as necessary to achieve activated sludge influent loads in proportion to design loads. For example, if 75 percent of the activated sludge trains were online during the test, the activated sludge influent *test* loads would be 75 percent of the activated sludge influent *design* loads. The number of trains shall not be changed during the test, nor shall an offline train be brought online in exchange for an online train being taken offline.

During the test, operate aeration equipment such that the air flow rate delivered to the activated sludge process is in proportion to the fraction of activated sludge tankage online.

Required activated sludge influent test loads shall be achieved through appropriate selection of the number of activated sludge train(s) to be online during the test, adjustment of the primary treatment process, primary treatment bypass, and by "spiking." The following materials and chemicals shall be used for such spiking:

- TSS – Municipal wastewater or municipal primary sludge (where metal salt has not been added upstream)
- cBOD<sub>5</sub> – Municipal wastewater or 50/50 blend (on a cBOD<sub>5</sub> basis) of municipal primary sludge (where metal salt has not been added upstream) and any soluble cBOD<sub>5</sub> (other than volatile fatty acids)
- TKN - Municipal wastewater, ammonium chloride, or other ammonium salt
- TP - Municipal wastewater, sodium phosphate, or other orthophosphate salt

During the test, mixed liquor suspended solids (MLSS) shall be wasted from the activated sludge process according to the design solids retention time (SRT). That is, each day, waste a mass of MLSS calculated as follows:

$$\text{Wasted MLSS} = \text{MLSS Inventory} / \text{Design SRT}$$

During the test, collect 24-hour composite samples of activated sludge influent and Membrane System permeate. Each day, record power consumption by activated sludge process aeration, recirculation, and mixing equipment. Every eight hours measure dissolved oxygen in each activated sludge train that is online. DO measurements shall be made at 12 locations per aerobic tank. One third of these measurements shall be taken in the lowest 3 feet of the tank. One third shall be taken at mid-depth, and one third shall be taken at the water

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surface. Where multiple DO measurements are made at the same depth, they shall be distributed horizontally such that they are representative of all areas of the tank.

The test shall pass if: 1) at no time during the test does the MLSS concentration in the activated sludge process greater than the design concentration, 2) at no time is the 30-day average Membrane System effluent cBOD<sub>5</sub>, NH<sub>3</sub>-N, ON, TP, or NO<sub>3</sub>-N concentration greater than Performance Criteria or pH outside the limits of the Performance Criteria, 3) at no time during the "maximum 30-day average" part of the test is the DO concentration in aerated tankage less 2.0 mg/L, 4) at no time during the "peak day" part of the test is the DO concentration in activated sludge tankage less than 0.5 mg/L, and 6) at no time during the "average," "maximum 30-day average," or "peak day" parts of the test is power consumption greater than the values indicated on Technical Proposal Form C of the D/B Proposal.

*The D/B Company shall demonstrate that hydraulically, the capacity of the activated sludge process is QPKDY with any single train out service.*

With any one activated sludge train online, operate the plant for a minimum of 6 hours such that the flow rate through the activated sludge process is between 90 and 100 percent of QPKDY.

The test shall pass if, at all times during the test, the water level downstream of the fine screens remains below its design high water level.

### 15.3.11 Membrane System

Membrane System Acceptance Testing will consist of two steps. The first step will be to operate the activated sludge process such that the mixed liquor closely matches the design characteristics. The second step will be to operate each of the Membrane System trains under design conditions to verify its ability to meet the Start-up Guaranteed Maximum Power Consumption and Chemical Usage indicated in the Price Proposal Forms of the Technology Proposal.

The same test procedure will be used at any time desired by the County in order to determine whether the membranes have reached end of life. In such a case, the County or its agent will conduct the test, and the results will be compared to the End of Membrane Life Guaranteed Maximum Power Consumption and Chemical Usage indicated in the Price Proposal Forms of the Technology Proposal. In this case, the permeate temperature need not be less than 20 degrees Celsius. If the membranes are found to have reached end of life, the Membrane System Supplier will bear the cost of the test. Otherwise,

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the County will bear the cost of the test.

### **Step 1 – Achieve Design Mixed Liquor Characteristics**

Operate the activated sludge process such that the mixed liquor closely matches the design characteristics, as indicated by the following conditions being met:

- The MLSS concentration is 90 to 95 percent of the maximum 30-day average value specified by the Membrane System Supplier on Technical Proposal Form C of the Technology Proposal. Operate at this MLSS concentration even if the design MLSS concentration selected by the D/B Company is lower.
- The 30-day average SRT is at least 5 percent more than the minimum value specified by the Membrane System Supplier on Technical Proposal Form C of the Technology Proposal. Calculate the 30-day average SRT by first determining the 30-day average mass of MLSS (in dry pounds) in the activated sludge process. Then divide by the 30-day total mass of MLSS (in dry pounds) removed from the activated sludge process. Then multiply by 30 days.

$$\text{SRT} = (\text{average mass of MLSS} / \text{total mass of MLSS removed}) * 30 \text{ days}$$

- Sufficient metal salt has been added to the activated sludge process that the 30-day average membrane permeate TP concentration meets the Plant Performance Criteria for effluent TP.

### **Step 2 - Verify Compliance with Guaranteed Maximum Power Consumption and Chemical Usage**

During Step 2, the activated sludge process shall be operated such that the conditions presented in Step 1 are met.

In this step, test the ability of each Membrane System train to meet the Guaranteed Maximum Power Consumption (Price Proposal Form B of the Technology Proposal) and Chemical Usage (Price Proposal Form C of the Technology Proposal) for Start-up. There are two test conditions: QMAX30 and QPKDY, as defined below.

The target permeate flow rate per train for the QMAX30 test condition is the Plant design QMAX30 flow rate divided by one less than the total number of membrane trains. For example, if the total number of membrane trains were 4,

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the target permeate flow rate per train would be QMAX30/3. During this test condition, the 30-day average membrane permeate temperature shall be less than 20°C.

The target permeate flow rate per train for the QPKDY test condition is the Plant design QPKDY flow rate divided by the total number of membrane trains. For example, if the total number of membrane trains were 4, the target permeate flow rate per train would be QPKDY/4.

One or more membrane trains may be tested together. Additional membrane trains may be operated at the same time, but they will not be considered part of the test. It may be necessary to conduct the following parts of Step 2 more than once to test all Membrane System trains.

For a continuous 30-day period, operate the train(s) being tested such that the 30-day average permeate flow rate of each train being tested is within 5 percent of the target for the QMAX30 test condition. On the 30<sup>th</sup> day of the test, make adjustments such that the permeate flow rate of each individual train is within 5 percent of the target for the QPKDY test condition at all times during the 24-hour period.

During the 30-day period, keep the following records, which will be used to compare the performance of each Membrane System train to the guaranteed performance requirements:

- Chemical usage associated with each train being tested
- Total power consumption by the Membrane System
- Power consumption associated with permeate production for each train in service, regardless of whether the train is being tested.
- Total Membrane System permeate flow.
- Permeate flow and temperature for each train being tested.

Following data collection, perform the following evaluation for each membrane train tested:

1. Verify that the train operated successfully under the QMAX30 and QPKDY test conditions defined above.
2. Verify compliance with Membrane System Guaranteed Maximum

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Power Consumption.

- Add the power consumptions associated with permeate production for each train in service.
- Subtract this result from the total power consumption by the Membrane System to obtain power consumption for all purposes other than permeate pumping. Total power consumption by the Membrane System is defined to be all uses associated with the Membrane System, including (but not limited to) mixed liquor transfer, mixed liquor screening (other than with the secondary influent fine screens), permeate production, and membrane air scour.
- Assign a portion of the total power consumption not associated with permeate pumping to each train in service, proportional to the volume of permeate produced by that train.
- Calculate a unitless temperature correction factor (TCF) as follows:

$$TCF = \exp[0.0246 \times (20^{\circ}\text{C}-T)]$$

where “exp” is the exponential function and “T” is the 30-day average permeate temperature in degrees Celsius. The TCF will be applied to the portion of power consumption associated with permeate pumping.

- Divide the power usage associated with permeate pumping (in kilowatt-hours [kW-hr]) for the train being tested by the calculated TCF
  - For the train being tested, add the power consumption not associated with permeate production to the temperature-corrected power consumption associated with permeate production. Divide this sum by the permeate volume produced by the train (in million gallons [MG]). Compare the result (in kW-hr/MG) to the guaranteed value.
3. Verify compliance with the Membrane System Guaranteed Maximum Chemical Usage.
- Use amounts of chemicals used specifically for the train being tested to calculate the chemical cost during the 30-day test. Use

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the unit chemical costs shown in the Technology RFP. If the unit cost of a chemical is not shown in the Technology RFP, use the unit cost indicated in the Membrane System Supplier's Proposal.

- Divide the chemical cost (in dollars) by the permeate volume produced (in MG) and compare to the result (in dollars/MG) to the guaranteed value.

### 15.3.12 Ultraviolet Disinfection System

*The D/B Contractor shall verify that the UV Disinfection System is able to deliver a minimum UV dose of 80 mJ/cm<sup>2</sup> (or the design UV dose, if higher) and that the delivered UV dose is sufficient to achieve Performance Criteria for effluent fecal coliform.*

Perform Acceptance Testing of the Ultraviolet Disinfection System in accordance with Chapter 3 of Ultraviolet Disinfection Guidelines for Drinking Water and Water Reuse, 2<sup>nd</sup> edition, except as indicated below.

- Testing must use the full-scale UV Disinfection System installed at the JCEC, not similar pilot- or full-scale reactors.
- Testing shall use Membrane System permeate as the water to be disinfected, without UV transmittance adjustment. These tests shall be conducted immediately following the testing of the activated sludge process and Membrane System. During this test, upstream processes shall be operated as they would under normal plant operation.
- Where "regulatory agency" is indicated, substitute "the County."
- Testing shall include the QPKDY flow rate.
- The D/B Company shall have selected whether redundancy requirements have been met using a standby reactor train or a standby reactor in each reactor train.

If a standby reactor train has been used, the test shall be conducted once per installed reactor train, with a different reactor train offline during each test. *At its option, the Construction Manager may reduce the scope of the test by requiring only one test, with the Construction Manager selecting which reactor train will be offline during the test.*

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If a standby reactor has been used in each reactor train, the test shall be conducted once per installed reactor train, with one reactor (Construction Manager choice) out of service in a different reactor train during each test. *At its option, the Construction Manager may reduce the scope of the test by requiring only one test, with the Construction Manager selecting which reactor will be offline during the test.*

The test shall pass if the UV Disinfection System is shown to: 1) achieve minimum 80 mJ/cm<sup>2</sup> UV dose at QPKDY flow rate (or the design UV dose, if higher), and 2) achieve an effluent fecal coliform concentration less than the Performance Criterion for monthly geometric mean.

### **15.3.13 Post-Aeration**

*The D/B Company shall demonstrate that the post-aeration process can achieve the effluent monthly average DO limit at design QPKDY, with all post-aeration tankage in service and one blower out of service.*

During this test, upstream processes shall be operated as they would under normal plant operation. The test shall be conducted between July 31 and August 31.

The Post-Aeration process shall be operated at design the QPKDY flow rate, with all tankage in service and one blower out of service (D/B Company choice). During the test, measure the post-aeration effluent DO concentration every 10 minutes. Conduct the test until three consecutive measurements are greater than the Performance Criterion for effluent DO concentration.

The test shall pass if the above condition can be achieved within six hours of commencing the test.

### **15.3.14 Effluent Pumping, Transmission, and Outfall**

*The D/B Company shall demonstrate that the minimum firm capacities of the effluent pump station, transmission line, and outfall are 110 percent of design 31.7 MGD..*

Prior to beginning the test, the effluent transmission line shall be filled with water.

Water shall be added to the pump station wet at no less than 110 percent of design 31.7 MGD. The pump station shall be operated for no less than 60 minutes with one pump out of service. The pumps station shall be operated at

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the design static head. Return this pump to service and repeat the above until the pump station has been tested with each pump having been out of service.

The test shall pass if, at all times during the test, the water level in the pump station wet well remains below its design high water level.

#### **15.3.15 Reuse Storage and Pumping**

*The D/B Company shall demonstrate that the minimum firm capacities of the reuse pump station is 10.9 MGD*

Prior to beginning the test, the re-use transmission line shall be filled with water.

Water shall be added to the pump station wet at no less than 10.9 MGD. The pump station shall be operated for no less than 60 minutes with one pump out of service. The pumps station shall be operated at the design static head. Return this pump to service and repeat the above until the pump station has been tested with each pump having been out of service.

The test shall pass if, at all times during the test, the water level in the pump station wet well remains below its design high water level.

#### **15.3.16 Centrifuge Dewatering**

*The D/B Company shall demonstrate that the centrifuges are able to dewater the amount of digested sludge corresponding to maximum 30-day average influent loads.*

Under these loading conditions, the centrifuges would operate 4 days per week, 12 hours per day. The D/B Company also shall demonstrate that the centrifuges operate with minimum 95 percent solids capture, and produce cake with minimum 20 percent solids and that meets, at a minimum, 40 CFR Part 503, Subparts C and D, Method 9095 Paint Filter Liquid Test as described in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (EPA Publication No. SW-846), as well as any Local or State regulations applicable to landfill disposal of sludge.

The centrifuge test shall be conducted at the same time as the digester test, described above. Digested sludge from the test digester will be the feed sludge for the centrifuge test.

The amount of digested sludge to be dewatered by the test centrifuge depends on the total number of digesters ("n") and the total number of centrifuges

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("m"). The fraction of the digested sludge from the test digester to be dewatered by each test centrifuge shall be  $n/m$ . For example, if there are two digesters ( $n=2$ ) and three centrifuges ( $m=3$ ), the test digester shall receive two-thirds of the digested sludge from the test digester. One or more centrifuges may be tested at a time, depending on the availability of digested sludge.

The test shall pass if: 1) each centrifuge is able to dewater the required amount of digested sludge in less than 48 hours per week, 2) dewatered sludge has minimum 20 percent solids, and 3) dewatered sludge passes the Paint Filter Liquid Test and any applicable Local or State regulations.

### **15.3.17 Chemical Storage and Metering**

The D/B Company shall demonstrate on paper that bulk storage tanks have sufficient capacity to store a 21-day supply of chemical at all times during the design year. The D/B Company also shall demonstrate on paper that "day" tanks have sufficient capacity to store a five-day supply of chemical at all times during the design year.

### **15.3.18 Whole Plant Acceptance Test**

*The D/B Company shall demonstrate that the plant, when operating under normal conditions, meets all effluent requirements, as well as the Guaranteed Operating Costs on Price Proposal Form 2.*

*The D/B Company shall demonstrate that the odor concentration at the property line does not exceed a dilution-to-threshold (D/T) of 5, as defined in ASTM E-679: Standard of Practice for Determination of Odor and Taste Thresholds by a Forced-Choice Ascending Concentration Series Method of Limits.*

*The D/B Company shall demonstrate that noise from operation of the permanent equipment installed at the Plant does not exceed benchmark background noise levels by more than 3 dB on a time weighted average (TWA) basis.*

Operate the plant for a 120-day period, collecting routine operating data, data required by the effluent permit, and any additional data necessary to demonstrate the "test passing" conditions, described below.

Collect one air sample each day, between 2 p.m. and 5 p.m., at the property line, on the downwind side of the plant. Analyze the air sample for D/T. The Construction Manager may, at its option, collect additional air samples.

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Continuously monitor the noise level at the two monitoring points defined in Appendix 2.

The test shall pass if: 1) all effluent permit limits are met, 2) for any 30-day period within the 120-day period, the plant operates within the "Guaranteed Operating Costs" as shown on Price Proposal Form 2 and described in Section 6, 3) no air sample collected at the property line exceeds 5 D/T, and 4) no noise level measurement made at either of the two monitoring points defined in Appendix 2 exceeds benchmark background noise levels by more than 3 dB on a 24-hour TWA basis.

### **15.3.19 Existing Influent Pumps Stations**

#### **15.3.20**

*The D/B Company shall demonstrate that the minimum firm capacity of the existing influent pump station is 6MGD and that it can pump all flows that gravity to the existing influent pump stations to the JCEC influent pump station..*

Water shall be added to the pump station wet well at no less than 6 MGD. The pump station shall be operated for no less than 60 minutes with each pump out of service.

The test shall pass if, at all times during the test, the water level in the pump station wet well remains below its design high water level.

*The D/B Company shall demonstrate that the existing influent pump station has sufficient turndown to handle the minimum influent flow rates.*

This requirement may be demonstrated on paper using pump curves and calculations.

#### **15.3.21 Other Equipment**

There is no specific acceptance for Anaerobic or Acrobic Digestion. The County desires, at present, to produce an un-classed sludge for disposal in an authorized landfill. The D/B Company shall not be required to demonstrate any specific Volatile Suspended Solids (VSS) destruction. However, the D/B Company will be required to run a Verification Test on any digestion system installed that documents the amount of VSS destruction when the digester is loaded with primary and/or waste activated sludge at rates corresponding to design maximum 30-day average influent TSS and cBOD5 loads.

This test shall be conducted while the plant is operating normally. Because initial plant influent loads will be less than the design loads, one digester shall be tested at a time.

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Where “n” is the number of digesters installed, the test digester shall receive 1/n of the primary and/or waste activated sludge loads corresponding to design maximum 30-day average influent TSS and cBOD5 loads. The test digester shall receive this load for 30 consecutive days. During the test, the other digester(s) shall handle any additional primary and/or waste activated sludge.

Digester feed and digested sludge shall be analyzed daily during the test for Total Suspended Solids (TSS) and VSS.

#### **15.4 Acceptance Test Report**

Within 45 days of the completion of each part of Acceptance Testing, the D/B Company shall submit to the Construction Manager ten copies of a chapter corresponding to this part of Acceptance Testing. When all Acceptance Testing is complete, the D/B Company shall prepare a comprehensive Acceptance Testing Report, which shall include each of the chapters previously submitted. The D/B Company shall submit to the Construction Manager ten copies of the Acceptance Testing Report within 45 days of the completion of all parts of Acceptance Testing.

The Acceptance Testing report shall include, but not be limited to, the following:

- A certification stating that each part of Acceptance Testing was conducted in accordance with the approved Acceptance Testing plan.
- A certification stating that the results of the Acceptance Testing comply with the applicable unit and process design criteria, Performance Criteria, and the requirements of this Appendix and the Design/Build Contract.
- Copies of the original data sheets, log sheets, and all calculations used to determine performance during Acceptance Testing.
- All required process parameters measured, recorded, or calculated during the tests including all laboratory analysis results.
- All necessary certifications relating to testing, evaluation, analyses, and performance.
- Record of equipment and system outages, failures, repairs, and preventative maintenance.
- Data and supporting calculations demonstrating the ability of the Plant to meet the requirements of this Appendix.

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- Summary of test results and conclusive evidence of compliance with all test requirements.
  - Any other data reasonably requested by the Construction Manager to be included in the Acceptance Testing Report.

In the event the Acceptance Test Report does not demonstrate that the Plant has met the applicable Performance Criteria, the D/B Company shall make the appropriate modifications and re-test in accordance with the D/B Contract, Appendix 14, and Appendix 15 as required.