SECTION 235613 - HEATING SOLAR COLLECTORS

Manufacturers found in SpecAgent for this Section were identified as representative and not as an endorsement for meeting the requirements of this specification.

This Section includes performance, proprietary, and descriptive type specifications. Edit to avoid conflicting requirements.

This Section includes the term Architect/Engineer. "Architect" is used in AIA contract documents; "Engineer" is used in EJCDC contract documents. Retain appropriate term.

See the Drawing Coordination Considerations for information needed to coordinate this specification Section with the Drawings.

1. GENERAL
	* + 1. SUMMARY
				1. Section includes solar collectors, controls, pipe and fittings, valves, tanks, pumps, cabinet fans, cleaning and chemical treatment of systems.
				2. Related Sections:

Section 083113 - Access Doors and Frames: Product requirements for access doors for placement by this section.

Section 230513 - Common Motor Requirements for HVAC Equipment: Product requirements for pump motors for placement by this section.

Section 233100 - HVAC Ducts and Casings: Product requirements for collector connection to ductwork for placement by this section.

Section 260503 - Equipment Wiring Connections: Execution requirements for electric connections specified by this section.

* + - 1. REFERENCES

List reference standards included within text of this section. Edit the following for Project conditions.

* + - * 1. American Society of Mechanical Engineers:

ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.

* + - * 1. ASTM International:

ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

ASTM B88 - Standard Specification for Seamless Copper Water Tube.

ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric).

ASTM D635 - Standard Test Method for Rate of Burning [**and**] [**or**] Extent and Time of Burning of Plastics in a Horizontal Position.

ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics.

ASTM D2241 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.

ASTM D2310 - Standard Classification for Machine-Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.

ASTM D2843 - Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.

ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

* + - * 1. American Water Works Association:

AWWA C105 - American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.

* + - 1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

Only request submittals needed to verify compliance with Project requirements.

* + - * 1. Section 013300 - Submittal Procedures: Submittal procedures.
				2. Shop Drawings: Indicate manufactured assembly's system and control schematics, solar collector installation, layout, weights, mounting and support details, and piping connections.
				3. Product Data: Submit data on specialties, including manufacturers catalog information. Indicate chemical treatment materials, chemicals, and equipment. Submit certified pump performance and NPSH curve. Submit performance ratings and rough-in details for solar collectors.
				4. Manufacturer's Installation Instructions: Submit mounting and other structural requirements.
				5. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
				6. Manufacturer's Field-Reports: Indicate start-up of treatment systems and include analysis of system water after cleaning and treatment.
				7. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				8. Manufacturer's installation instructions shall be provided along with product data.
				9. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
			1. CLOSEOUT SUBMITTALS
				1. Section 017000 - Execution and Closeout Requirements: Closeout procedures.
				2. Operation and Maintenance Data: Spare parts lists, procedures, and treatment programs.
			2. QUALITY ASSURANCE

Select class required for application based on fire separation, percent opening, and size of individual panels. Refer to applicable code for class requirements.

* + - * 1. Light Transmitting Plastics: [**Class CC1**] [**Class CC2**] defined by [**applicable**] <**\_\_\_\_\_\_\_\_**> code when tested in accordance with ASTM D635 “Standard Test Method for Rate of Burning [**and**] [**or**] Extent and Time of Burning of Plastics in a Horizontal Position” in thickness for intended use.

Self Ignition Temperature: Minimum 650 degrees F (343 degrees C) when tested in accordance with ASTM D1929 “Standard Test Method for Determining Ignition Temperature of Plastics”.

Smoke Developed Index: Maximum 450 when tested in accordance with ASTM E84 “Standard Test Method for Surface Burning Characteristics of Building Materials” or maximum 75 when tested in accordance with ASTM D2843 “Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics” in thickness for intended use.

* + - * 1. Surface Burning Characteristics:

Foam Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84 “Standard Test Method for Surface Burning Characteristics of Building Materials”.

* + - * 1. Apply label from agency approved by authority having jurisdiction to identify each foam plastic insulation board.
				2. Perform Work in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Include the following paragraph only when cost of acquiring specified standards is justified.

* + - * 1. Maintain [**one copy**] [**<\_\_\_\_\_\_\_\_> copies**] of [**each**] document on site.
			1. QUALIFICATIONS
				1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years' [**documented**] experience [**, and with service facilities within [100] <\_\_\_\_\_\_\_\_> miles of Project**].
				2. Installer: Company specializing in performing Work of this section with minimum three years' [**documented**] experience [**approved by manufacturer**].
			2. PRE-INSTALLATION MEETINGS
				1. Section 013000 - Administrative Requirements: Pre-installation meeting.
				2. Convene minimum [**one**] <**\_\_\_\_\_\_\_\_**> week prior to commencing work of this section.
			3. DELIVERY, STORAGE, AND HANDLING
				1. Accept and store solar collectors and valves in shipping containers and maintain in place until installation.
				2. Protect piping from debris and other foreign matter by using caps on piping connections.
			4. FIELD MEASUREMENTS
				1. Verify field measurements prior to fabrication.
			5. MAINTENANCE SERVICE
				1. Section 017000 - Execution and Closeout Requirements: Maintenance service.
				2. Furnish [**monthly**] <**\_\_\_\_\_\_\_\_**> technical service visits for [**one**] <**\_\_\_\_\_\_\_\_**> years starting with date of substantial completion to perform field inspections and make water analysis on site. Detail findings in writing. Submit two copies of report after each visit.
			6. EXTRA MATERIALS
				1. Section 017000 - Execution and Closeout Requirements: Spare parts and maintenance products.
				2. Furnish supply of chemicals for treatment and testing during warranty period.
				3. Furnish one extra set of mechanical seals for pumps.
				4. Furnish [**<\_\_\_\_\_\_\_\_> month**] [**<\_\_\_\_\_\_\_\_>year**] supply of chemicals for treatment.
1. PRODUCTS
	* + 1. SOLAR COLLECTORS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=5885) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Alternate Energy Technologies, LLC](http://www.specagent.com/Lookup?uid=123456946498).

[Heliodyne, Inc](http://www.specagent.com/Lookup?uid=123456946506).

[Hydronic Specialties Co](http://www.specagent.com/Lookup?uid=123456946502).

[Integrated Solar, LLC](http://www.specagent.com/Lookup?uid=123456946507).

[Oventrop Corporation](http://www.specagent.com/Lookup?uid=123456946504).

[Sun Earth Inc](http://www.specagent.com/Lookup?uid=123456946508).

[Thermo Dynamics Ltd](http://www.specagent.com/Lookup?uid=123456946499).

[Viessmann Manufacturing Co. (US) Inc](http://www.specagent.com/Lookup?uid=123456946500).

Approved equivalent.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8325&mf=04&src=wd):

Substitutions: [**Section 016000 - Product Requirements**] [**Not Permitted**].

\*\*\*\*\*\* [OR \*\*\*\*\*\*

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Construction: Unit consisting of [**manufacturers standard**] [**custom**] assembly of frame, cover, back cover with insulation, absorber plate assembly, and accessories.
				2. Frame:

Aluminum: Extrusion shapes including I-beam, top battens, double battens, strips, channels, or angles, assembled with [**stainless steel**] [**cadmium plated steel**] screws with self sealing neoprene washers.

Steel: Galvanized, formed into appropriate shapes and assembled with [**stainless steel**] [**cadmium plated steel**] screws with self sealing neoprene washers.

Wood: Frame [**as indicated on Drawings**] with aluminum extrusions and assembled with [**stainless steel**] [**cadmium plated steel**] screws [**and galvanized nails**] with self sealing neoprene washers.

* + - * 1. Cover: Fiberglass reinforced polymer sheet.

Solar energy transmittance: [**86**] <**\_\_\_\_\_\_\_\_**> percent at 0-degree angle of incidence.

Heat transmittance: (<**\_\_\_\_\_\_\_\_**>Btu/hr x sq ft x degrees F) (<**\_\_\_\_\_\_\_\_**> W/sq m x K).

Index of refraction: [**1.55**] <**\_\_\_\_\_\_\_\_**>.

Tensile strength: [**10,000**] <**\_\_\_\_\_\_\_\_**>psi ([**68,950**] <**\_\_\_\_\_\_\_\_**> kPa).

Flexural strength: [**17,150**] <**\_\_\_\_\_\_\_\_**>psi ([**118,250**] <**\_\_\_\_\_\_\_\_**> kPa).

Flexural modulus: [**1,000,000**] <**\_\_\_\_\_\_\_\_**>psi ([**689,500**] <**\_\_\_\_\_\_\_\_**> kPa).

Shear strength: [**12,800**] <**\_\_\_\_\_\_\_\_**> psi ([**88,250**] <**\_\_\_\_\_\_\_\_**> kPa).

Water absorption: [**0.6**] <**\_\_\_\_\_\_\_\_**> percent by weight.

Thermal expansion: [**1.36**] <**\_\_\_\_\_\_\_\_**>in/in/degree F (<**\_\_\_\_\_\_\_\_**> <**\_\_\_\_\_\_\_\_**> mm/mm/degree C).

Thermal conductivity: [**0.713**] <**\_\_\_\_\_\_\_\_**>Btu/hr sq ft degree F/in (<**\_\_\_\_\_\_\_\_**> <**\_\_\_\_\_\_\_\_**> W/sq meter).

Weight: [**2.8**] [**3.8**] [**4.7**] <**\_\_\_\_\_\_\_\_**> oz/sq ft ([**855**] [**1160**] [**1435**] <**\_\_\_\_\_\_\_\_**> kg/sq meter).

Thickness: [**0.025**] [**0.040**] [**0.060**] <**\_\_\_\_\_\_\_\_**> inches ([**0.06**] [**0.10**] [**0.15**] <**\_\_\_\_\_\_\_\_**> mm).

Nominal size: <**\_\_\_\_\_\_\_\_**> x <**\_\_\_\_\_\_\_\_**> inches (<**\_\_\_\_\_\_\_\_**> x <**\_\_\_\_\_\_\_\_**> mm).

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

The following panel is factory assembled using multiple layers of sheet material.

* + - * 1. Cover: Fiberglass reinforced polymer sheet panel.

Solar energy transmittance: [**77**] <**\_\_\_\_\_\_\_\_**> percent at 0 degree angle of incidence.

Heat transmittance: (<**\_\_\_\_\_\_\_\_**>Btu/hr x sq ft x degrees F) (<**\_\_\_\_\_\_\_\_**> W/sq m x K).

Light transmittance: [**84**] <**\_\_\_\_\_\_\_\_**> percent.

Thermal expansion: [**0.0000136**] <**\_\_\_\_\_\_\_\_**>in/in/degree F (<**\_\_\_\_\_\_\_\_**> <**\_\_\_\_\_\_\_\_**> mm/mm/degree C).

Thickness: [**0.5**] [**1.5**] <**\_\_\_\_\_\_\_\_**> inches ([**13**] [**38**] <**\_\_\_\_\_\_\_\_**> mm).

Service temperature limit: [**200**] <**\_\_\_\_\_\_\_\_**>degrees F ([**93**] <**\_\_\_\_\_\_\_\_**> degrees C).

Nominal size: <**\_\_\_\_\_\_\_\_**> x <**\_\_\_\_\_\_\_\_**> inches (<**\_\_\_\_\_\_\_\_**> x <**\_\_\_\_\_\_\_\_**> mm).

* + - * 1. Back Cover: [**Galvanized steel**] [**Plywood**] [**with 2 inch (50 mm) thick rigid fiberglass insulation**].
				2. Plate and Tube Assembly: EPDM extruded mat with integral water passages on 0.75 inch (19 mm) centers, in 4.4 inch (112 mm) widths, in continuous lengths to 600 feet (183 meters).

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

The following assembly is typical for hydronic solar collectors.

* + - * 1. Plate and Tube Assembly: Copper sheet bonded to copper tubes.

Tubes: 0.375 diameter, 0.013 inch ([**0.016 mm**]) wall, copper.

Sheet: 0.0032 to 0.0035 inch ([**0.081 to 0.089**] mm) thick copper alloy sheet.

Working pressure: 150 psig (1034 kPa).

Paint: Selective-absorptivity 0.94, emissivity 0.47.

Construction: Tubes brazed to header, sheet soldered to tubes.

Headers: [**0.75 inch (20 mm)**] [**1.0 inch (25 mm)**] Type M copper tube.

Sheet width: [**22**] [**34**] [**44**] inches ([**560**] [**860**] [**1120**] mm).

Sheet length: [**94**] <**\_\_\_\_\_\_\_\_**> inches ([**2390**] <**\_\_\_\_\_\_\_\_**> mm).

Area: [**14.4**] [**22.2**] [**28.7**] sq ft ([**1.34**] [**2.06**] [**2.67**] sq meters).

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

The following assembly is typical for Air to Air solar collectors.

* + - * 1. Plate Assembly: [**Copper**] [**Aluminum**] sheet with [**textured**] [**corrugations**].

Sheet: [**0.0032 to 0.0035**] [**0.005**] <**\_\_\_\_\_\_\_\_**>inch ([**0.081 to 0.089**] [**0.127**] <**\_\_\_\_\_\_\_\_**> mm) thick [**copper alloy**] [**aluminum**] sheet.

Paint: [**Selective-absorptivity 0.95 emissivity 0.86**] [**Black chrome absorptivity - 0.95, emissivity - 0.11**].

Sheet width: [**22**] [**24**] <**\_\_\_\_\_\_\_\_**> inches ([**560**] [**610**] <**\_\_\_\_\_\_\_\_**> mm).

Sheet length: [**36**] [**48**] [**120**] <**\_\_\_\_\_\_\_\_**>inches ([**915**] [**1220**] [**3050**] <**\_\_\_\_\_\_\_\_**> mm).

* + - 1. DIFFERENTIAL CONTROLLERS

In this article, list manufacturers acceptable for this Project.

* + - * 1. Manufacturers:

Substitutions: [**Section 016000 - Product Requirements**] [**Not Permitted**].

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9748) Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Honeywell

Johnson Controls

Approved equivalent.

\*\*\*\*\*\* [OR] \*\*\*\*\*

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Description: Solid-state differential temperature thermostat with two low resistance thermistors and SPDT relay contactor, and field adjustable differential.
				2. Functions:

Standard: When collector [**outlet**] temperature exceeds storage temperature, close contacts.

Ambient Override: When collector temperature is less than 80 degrees F (26 degrees C), open contacts.

Freeze prevention circulation: When collector temperature drops below 42 degrees F (5.5 degrees C), close contacts and open at 52 degrees F (11 degrees C).

High Limit Off: When storage temperature rises above 160 degrees F (71 degrees C), open contacts.

* + - 1. THERMOSTATS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8131&mf=04&src=wd):

Substitutions: [**Section 016000 - Product Requirements**] [**Not Permitted**].

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9748) Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Carrier

Emerson Electric Co.

Johnson Controls

Approved equivalent.

\*\*\*\*\*\* [OR] \*\*\*\*\*

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Electric Thermostat: Low voltage type [**with setback/setup temperature control**] for [**heating only.**] [**cooling and heating.**]
				2. Line Voltage Thermostats: Integral manual On/Off/Auto selector switch, maximum dead band of 2 degrees F (one degree C) concealed temperature adjustment, and locking cover, rated for [**motor**] load, single or two pole as required.
			1. PIPING
				1. Steel Pipe: ASTM A53/A53M “Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless”, Grade B, Schedule 40, black.

Fittings: Malleable iron or forged steel.

Joints: Screwed or welded.

* + - * 1. Steel Pipe (Buried): ASTM A53/A53M “Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless”, Grade B, Schedule 40, black.

Fittings: Malleable iron or forged steel.

Joints: Screwed or welded.

Jacket: AWWA C105 “American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems” polyethylene, or double layer, half-lapped 10 mil (0.25 mm) polyethylene tape.

Insulation: <**\_\_\_\_\_\_\_\_**>inch (<**\_\_\_\_\_\_\_\_**> mm) thick Polyurethane insulation with high-density polyethylene jacket and heat shrink sleeves.

* + - * 1. Copper Tubing: ASTM B88 “Standard Specification for Seamless Copper Water Tube” (ASTM B88M), Type [**M,**] [**L,**] drawn.

Fittings: Cast brass or wrought copper.

Joints: Grade 95TA solder joint.

* + - * 1. Copper Tubing (Buried): ASTM B88 “Standard Specification for Seamless Copper Water Tube” (ASTM B88M), Type [**K,**] [**L,**] [**M,**] [**drawn**] [**annealed**].

Fittings: Cast brass or wrought copper.

Joints: Flared compression or Grade 95TA solder.

Insulation: <**\_\_\_\_\_\_\_\_**> inch (<**\_\_\_\_\_\_\_\_**> mm) thick polyurethane insulation with high-density polyethylene jacket and heat shrink sleeves.

* + - * 1. PVC Pipe: ASTM D1785 “Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120”, Schedule 40 or ASTM D2241 “Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter”, SDR 21 or 26, solvent weld joints.
				2. RTR Pipe: ASTM D2310 “Standard Classification for Machine-Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe”, fiberglass reinforced thermosetting resin plastic.

Fittings: Fiberglass reinforced epoxy.

Joints: Hub-and-spigot with rubber gaskets, or union or flanged couplings.

* + - 1. GATE VALVES

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9748) Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

[American Valve, Inc](http://www.specagent.com/Lookup?uid=123457199087).

[Apollo Valves; a part of Aalberts Integrated Piping Systems](http://www.specagent.com/Lookup?uid=123457199099).

[Crane Fluid Systems; Crane Co](http://www.specagent.com/Lookup?uid=123457199250).

[Jenkins Valves; a Crane Co. brand](http://www.specagent.com/Lookup?uid=123457199088).

[KITZ Corporation](http://www.specagent.com/Lookup?uid=123457199092).

[Lance Valves](http://www.specagent.com/Lookup?uid=123457199251).

[Milwaukee Valve Company](http://www.specagent.com/Lookup?uid=123457199094).

[Powell Valves](http://www.specagent.com/Lookup?uid=123457199096).

[Red-White Valve Corp](http://www.specagent.com/Lookup?uid=123457199097).

[Stockham; a Crane Co. brand](http://www.specagent.com/Lookup?uid=123457199090).

[WATTS; A Watts Water Technologies Company](http://www.specagent.com/Lookup?uid=123457199098).

Approved equivalent.

* + - * 1. Furnish materials in accordance with [State] [Municipality] [Manufacturers](http://www.specagent.com/LookUp/?ulid=7944&mf=04&src=wd):

Substitutions: [**Section 016000 - Product Requirements**] [**Not Permitted**].

\*\*\*\*\*\* [OR] \*\*\*\*\*

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Up to 2 inches (50 mm): Bronze body, bronze trim, non- rising stem, hand wheel, inside screw, single wedge or disc, [**solder or**] threaded ends.
				2. Over 2 inches (50 mm): Iron body, bronze trim, rising stem, hand wheel, OS&Y, single wedge, flanged or grooved ends.
			1. GLOBE VALVES

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9678) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[American Valve, Inc](http://www.specagent.com/Lookup?uid=123457207446).

[Crane Fluid Systems; Crane Co](http://www.specagent.com/Lookup?uid=123457207465).

[Hammond Valve](http://www.specagent.com/Lookup?uid=123457207447).

[Milwaukee Valve Company](http://www.specagent.com/Lookup?uid=123457207448).

[NIBCO INC](http://www.specagent.com/Lookup?uid=123457207449).

[WATTS; A Watts Water Technologies Company](http://www.specagent.com/Lookup?uid=123457207466).

Approved equivalent.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8006&mf=04&src=wd):

Substitutions: [**Section 016000 - Product Requirements**] [**Not Permitted**].

\*\*\*\*\*\* [OR] \*\*\*\*\*

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Up to 2 inches (50 mm): Bronze body, bronze trim, rising stem and hand wheel, inside screw, renewable composition disc, [**solder or**] screwed ends, with back-seating capacity.
				2. Over 2 inches (50 mm): Iron body, bronze trim, rising stem, hand wheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.
			1. BALL VALVES

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9691) Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

NIBCO INC.

[WATTS; A Watts Water Technologies Company](http://www.specagent.com/Lookup?uid=123457188359).

Approved equivalent.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=7945&mf=04&src=wd):

Substitutions: [**Section 016000 - Product Requirements**] [**Not Permitted**].

\*\*\*\*\*\* [OR] \*\*\*\*\*

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Up to 2 inches (50 mm): Bronze or stainless steel one piece body, stainless steel ball, teflon seats and stuffing box ring, lever handle, [**solder or**] threaded ends.
				2. Over 2 inches (50 mm): Cast-steel body, chrome plated steel ball, Teflon seat and stuffing box seals, lever handle, flanged.
			1. BUTTERFLY VALVES

In this article, list manufacturers acceptable for this Project.

* + - * 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Milwaukee

Nibco

Watts

Approved equivalent.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=7947&mf=04&src=wd):

Substitutions: [**Section 016000 - Product Requirements**] [**Not Permitted**].

\*\*\*\*\*\* [OR] \*\*\*\*\*

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Iron body, bronze or stainless steel disc, resilient replaceable seat for service temperature, wafer or lug ends, extended neck, 10 position lever handle.
			1. SWING CHECK VALVES

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8327&mf=04&src=wd):

Substitutions: [**Section 016000 - Product Requirements**] [**Not Permitted**].

* + - * 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Milwaukee

Nibco

Watts

Approved equivalent.

\*\*\*\*\*\* [OR] \*\*\*\*\*

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Up to 2 inches (50 mm): Bronze swing disc, solder or screwed ends.
				2. Over 2 inches (50 mm): Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.
			1. RELIEF VALVES

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8021&mf=04&src=wd):

Substitutions: [**Section 016000 - Product Requirements**] [**Not Permitted**].

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9748) Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Hayward Flow Control

Metraflex Co.

Approved equivalent.

\*\*\*\*\*\* [OR] \*\*\*\*\*

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated capacities ASME certified and labeled.
			1. DIAPHRAGM TYPE COMPRESSION TANKS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8011&mf=04&src=wd):

Substitutions: [**Section 016000 - Product Requirements**] [**Not Permitted**].

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9748) Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Bell & Gossett

Burcam

Dayton

Taco, Inc.

Approved equivalent.

\*\*\*\*\*\* [OR] \*\*\*\*\*

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Construction: Welded steel, tested and stamped in accordance with ASME Section VIII “Boiler and Pressure Vessel Code - Pressure Vessels”; rated for working pressure of 125 psig (860 kPa), with flexible diaphragm sealed into tank, and steel legs or saddles.
				2. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure double check back flow preventer, test cocks, strainer, vacuum breaker, and by-pass with valves.
				3. Pressure Relief Valve: <**\_\_\_\_\_\_\_\_**> psi (<**\_\_\_\_\_\_\_\_**> kPa).
				4. Pressure Reducing Valve: <**\_\_\_\_\_\_\_\_**> psi (<**\_\_\_\_\_\_\_\_**> kPa).
				5. Accessories: Pressure gage and air charging fitting.
				6. Size: <**\_\_\_\_\_\_\_\_**> diameter, <**\_\_\_\_\_\_\_\_**> overall length, <**\_\_\_\_\_\_\_\_**> capacity.
			1. AIR VENTS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8165&mf=04&src=wd):

Substitutions: [**Section 016000 - Product Requirements**] [**Not Permitted**].

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9748) Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Bell & Gossett

Hayward Flow Control

Metraflex Co.

Approved equivalent.

\*\*\*\*\*\* [OR] \*\*\*\*\*

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Manual Type: Short vertical sections of 2 inch (50 mm) diameter pipe to form air chamber, with 1/8 inch (3 mm) brass needle valve at top of chamber.
				2. Float Type: Brass or semi-steel body, copper float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
			1. STRAINERS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8023&mf=04&src=wd):

Substitutions: [**Section 016000 - Product Requirements**] [**Not Permitted**].

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9748) Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Dayton

Mueller

Hayward Flow Control

Approved equivalent.

\*\*\*\*\*\* [OR] \*\*\*\*\*

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Size 2 inch (50 mm) and Under: Screwed brass or iron body for 175 psig (1200 kPa) working pressure, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
				2. Size 2-1/2 inch (65 mm) to 4 inch (100 mm): Flanged iron body for 175 psig (1200 kPa) working pressure, Y pattern with 3/64 inch (1.2 mm) stainless steel perforated screen.
				3. Size 5 inch (125 mm) and Larger: Flanged iron body for 175 psig (1200 kPa) working pressure, basket pattern with 1/8 inch (3.2 mm) stainless steel perforated screen.
			1. CONTROL VALVES

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8136&mf=04&src=wd):

Substitutions: [**Section 016000 - Product Requirements**] [**Not Permitted**].

* + - * 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Keystone; Emerson Electric Co.

Siemens Industry, Inc., Building Technologies Division.

Approved equivalent.

\*\*\*\*\*\* [OR] \*\*\*\*\*

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Angle or straight pattern, rising stem, globe valve for 125 psig (860 kPa) working pressure, with bronze body and integral union for screwed connections, renewable composition disc, general purpose solenoid enclosure with continuous duty coil.
			1. PUMPS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8328&mf=04&src=wd):

Substitutions: [**Section 016000 - Product Requirements**] [**Not Permitted**].

* + - * 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

Armstrong Pumps, Inc.

Bell & Gossett, ITT.

Taco, Inc

Approved equivalent.

\*\*\*\*\*\* [OR] \*\*\*\*\*

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. General Construction Requirements:

Balance: Rotating parts, statically and dynamically.

Construction: To permit servicing without breaking piping or motor connections.

Motors: Operate at 1750 rpm unless specified otherwise.

Connections: Flanged.

* + - * 1. In-Line Circulators:

Type: Horizontal shaft, single stage, direct connected to [**multiple speed**] motor for in-line mounting, [**oil**] [**water**] lubricated, for [**125**] <**\_\_\_\_\_\_\_\_**> psig ([**860**] <**\_\_\_\_\_\_\_\_**> kPa) maximum working pressure.

Construction: [**[Cast iron] [Bronze] casing, [cadmium plated steel] [bronze] impeller keyed to alloy steel shaft, oil lubricated bronze sleeve bearings**] [**Stainless steel housing impeller and shaft**] [**Bronze body, thermoplastic impeller**] [**Thermoplastic body and impeller**].

* + - * 1. Close Coupled Pumps:

Type: [**Horizontal**] [**Vertical**] shaft, single stage, close coupled, radial split casing, for [**125 psig (860 kPa)**] [**175 psig (1200 kPa)**] maximum working pressure.

Construction: Cast iron casing with suction and discharge gage ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge, bronze, fully enclosed impeller keyed to motor shaft extension, [**mechanical**] [**packed**] seal.

* + - * 1. Performance:

Flow Capacity <**\_\_\_\_\_\_\_\_**> gal/min (<**\_\_\_\_\_\_\_\_**> L/sec) at <**\_\_\_\_\_\_\_\_**>feet (<**\_\_\_\_\_\_\_\_**> kPa) head.

Motor: <**\_\_\_\_\_\_\_\_**> hp, <**\_\_\_\_\_\_\_\_**> volt, [**single**] [**three**] phase 60 Hz.

* + - 1. TANKS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8329&mf=04&src=wd):

Substitutions: [**Section 016000 - Product Requirements**] [**Not Permitted**].

\*\*\*\*\*\* [OR] \*\*\*\*\*

* + - * 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Belco

Granby Composites

Approved equivalent.

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Tank: 0.188 inch (4.8 mm) thick steel internally lined with epoxy lining 0.01 inch (0.025 mm) thick, and painting on exterior with primer. Continuous weld and grind joints smooth. Brace externally around perimeter. Slope floor towards drain nozzle. Support floor with flat bars spaced as required. Flange external connections larger than 2 inches (50 mm).
				2. Tank: Reinforced fiberglass for 50 psi (345 kPa) working pressure, cover with gasket, fittings, and trappings for accessories, <**\_\_\_\_\_\_\_\_**> inches (<**\_\_\_\_\_\_\_\_**> mm) diameter, <**\_\_\_\_\_\_\_\_**> inches (<**\_\_\_\_\_\_\_\_**> mm) high, <**\_\_\_\_\_\_\_\_**> gallon (<**\_\_\_\_\_\_\_\_**> L) volume.
			1. CHEMICAL TREATMENT

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. System Cleaner: Liquid alkaline compound with emulsifying agents and detergents.
				2. Closed System Treatment (Water):

Sequestering agent to reduce deposits and adjust pH.

Corrosion inhibitors.

Conductivity enhancers.

* + - * 1. Open System Treatment:

Sequestering agent to inhibit scaling and corrosion inhibitor.

Algaecide.

* + - * 1. By-pass (Pot) Feeder: [**2 quart**] [**6.0 gal**] ([**1.9**] [**22.7**] L) with quick opening cap.
				2. Drip Feeder: Plastic reservoir with coil of capillary tubing with probe, weight, charging syringe, and clip.
			1. CABINET FANS

In this article, list manufacturers acceptable for this Project.

* + - * 1. [Manufacturers](http://www.specagent.com/LookUp/?ulid=8331&mf=04&src=wd):

Substitutions: [**Section 016000 - Product Requirements**] [**Not Permitted**].

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=9748) Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

AMETEK

Dayton

Noren Thermal Solutions

Approved equivalent.

\*\*\*\*\*\* [OR] \*\*\*\*\*

* + - * 1. Furnish materials in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.

Edit the following descriptive specifications to identify Project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Fan Unit: Direct driven, centrifugal with forward curved wheel in galvanized steel housing [**resilient mounted motor**] [**gravity back-draft damper in discharge**].
				2. Performance:

Air Flow: <**\_\_\_\_\_\_\_\_**> cfm (<**\_\_\_\_\_\_\_\_**> L/sec) at <**\_\_\_\_\_\_\_\_**> in wg (<**\_\_\_\_\_\_\_\_**> Pa).

Motor: <**\_\_\_\_\_\_\_\_**> hp, <**\_\_\_\_\_\_\_\_**> volt, [**single**] [**three**] phase 60 Hz.

* + - 1. ELECTRICAL CHARACTERISTICS AND COMPONENTS

Select one or more of the following subparagraphs appropriate to equipment requirements.

* + - * 1. Electrical Characteristics: In accordance with Section 260503 and the following:

[**<\_\_\_\_\_\_\_\_>hp (<\_\_\_\_\_\_\_\_> W).**] [**<\_\_\_\_\_\_\_\_> rated load amperes.**]

<**\_\_\_\_\_\_\_\_**> volts, [**single**] [**three**] phase, 60 Hz.

<**\_\_\_\_\_\_\_\_**> amperes maximum [**fuse size**] [**circuit breaker size**] [**overcurrent protection**].

<**\_\_\_\_\_\_\_\_**> minimum circuit ampacity.

<**\_\_\_\_\_\_\_\_**> percent minimum power factor at rated load.

* + - * 1. Motors: In accordance with Section 230513.
				2. Disconnect Switch: Factory mount [**in control panel**] [**on equipment**].
1. EXECUTION
	* + 1. PREPARATION
				1. Ream pipe and tube ends. Remove burrs. [**Bevel plain end ferrous pipe.**]
				2. Remove scale and dirt on inside and outside before assembly.
				3. Prepare piping connections to equipment with flanges or unions.
				4. After completion, fill, clean, and treat systems.
			2. INSTALLATION

Include names of reference standards in the followings paragraph as guidance for installation.

* + - * 1. Install in accordance with <**\_\_\_\_\_\_\_\_**>.

\*\*\*\*\*\* [OR] \*\*\*\*\*

* + - * 1. Install Work in accordance with [**State**] [**Municipality**] of <**\_\_\_\_\_\_\_\_**> [**Highways**] [**Public Work's**] standards.
				2. Route piping in orderly manner, installing plumb and parallel to building structure, and maintain gradient.
				3. Install piping to conserve building space, and not interfere with use of space and other work. Group piping whenever practical at common elevations.
				4. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
				5. Maintain clearance for installation of insulation, and access to valves and fittings.
				6. Install access doors where valves and fittings are not exposed. [**Coordinate size and location of access doors with Section 083113.**]
				7. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
				8. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
				9. Prepare pipe, fittings, supports, and accessories for finish painting. Refer to Section 099000.
				10. Install valves with stems upright or horizontal.
				11. Support tanks inside building from building structure.
				12. Install drain with valve and hose connection on strainer blow down connection.
				13. Select system relief valve capacity greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment. Pipe relief valve outlet to nearest floor drain.
				14. Verify pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
				15. Make changes in piping size with reducing fittings. Support piping adjacent to pump so no weight is carried on pump casings.
				16. Install line sized shut-off valve and strainer on pump suction, and line sized check valve and balancing valve on pump discharge. Install air vent and drain connection on horizontal pump casings.
				17. Install unions downstream of valves and at equipment or apparatus connections.

Include the following paragraph when soldered valves are permitted.

* + - * 1. Install threaded brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
				2. Install [**gate**] [**ball**] [**butterfly**] valves for shut-off and to isolate equipment, part of systems, or vertical risers.
				3. Install [**globe**] [**ball**] [**butterfly**] valves for throttling, bypass, or manual flow control services.
				4. Install 3/4 inch (20 mm) [**gate**] [**ball**] drain valves at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. [**Pipe to nearest drain.**]
				5. Install [**manual**] [**automatic**] air vents at system high points. [**Install vent tubing to nearest drain.**]
				6. Install relief valves on system at expansion tanks.
				7. Connect air collectors and fans with flexible connectors and ductwork. Refer to Section 233100.
			1. CLEANING
				1. Section 017000 - Execution and Closeout Requirements: Final cleaning.
				2. After completion, fill, start, and vent prior to cleaning. Use water meter to record capacity in each system. Place terminal control valves in open position during cleaning.
				3. Add cleaner to closed systems at concentration as recommended by manufacturer.
				4. Circulate for 48 hours, then drain systems as quickly as possible. Refill with clean water, circulate for 24 hours, then drain. Refill with clean water and repeat until system cleaner is removed.
				5. Use neutralizer agents on recommendation of system cleaner supplier and acceptance of Director’s Representative.
				6. Flush open systems with clean water for one-hour minimum. Drain completely and refill.
				7. Remove, clean, and provide new strainer screens. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed.
				8. Closed System Treatment:

Install one bypass feeder on each system. Install isolating and drain valves and interconnecting piping. Install around globe valve downstream of circulating pumps [**as indicated on Drawings**].

Introduce closed system treatment through bypass feeder.

* + - * 1. Open System Treatment:

Install [**two**] <**\_\_\_\_\_\_\_\_**> glass mesh feeder bags for each unit, suspended in sump, filled with sequestering agent.

Install drip feeder to feed sequestering agent into sump. Interlock solenoid valve on drip system with circulating pump.

Install 1/2 inch (13 mm) bleed-off complete with globe valve piped to drain. Install bleed-off above flood line.

* + - 1. SCHEDULES

Include schedule when more than one size and different types of equipment are included in Project. Coordinate equipment tags and abbreviations with project specific requirements.

Consider the following examples when developing Project schedules.

* + - * 1. Solar Panel Schedule:

Equipment Tag: <SP-1>:

[**Manufacturer: <\_\_\_\_\_\_\_\_>.**]

[**Model: <\_\_\_\_\_\_\_\_>.**]

Location: <**\_\_\_\_\_\_\_\_**>.

Frame: <**\_\_\_\_\_\_\_\_**>.

Cover: <**\_\_\_\_\_\_\_\_**>.

Back Cover: <**\_\_\_\_\_\_\_\_**>.

Plate Assembly: <**\_\_\_\_\_\_\_\_**>.

Width: <**\_\_\_\_\_\_\_\_**>.

Height: <**\_\_\_\_\_\_\_\_**>.

Equipment Tag: <SP-2>:

[**Manufacturer: <\_\_\_\_\_\_\_\_>.**]

[**Model: <\_\_\_\_\_\_\_\_>.**]

Location: <**\_\_\_\_\_\_\_\_**>.

Frame: <**\_\_\_\_\_\_\_\_**>.

Cover: <**\_\_\_\_\_\_\_\_**>.

Back Cover: <**\_\_\_\_\_\_\_\_**>.

Plate Assembly: <**\_\_\_\_\_\_\_\_**>.

Width: <**\_\_\_\_\_\_\_\_**>.

Height: <**\_\_\_\_\_\_\_\_**>.

* + - * 1. Pump Schedule:

Equipment Tag: <P-1>:

[**Manufacturer: <\_\_\_\_\_\_\_\_>.**]

[**Model: <\_\_\_\_\_\_\_\_>.**]

Location: <**\_\_\_\_\_\_\_\_**>.

Service: <**\_\_\_\_\_\_\_\_**>.

Flow Capacity: <**\_\_\_\_\_\_\_\_**>.

Head: <**\_\_\_\_\_\_\_\_**>.

Minimum Efficiency: <**\_\_\_\_\_\_\_\_**>.

Seal Type: <**\_\_\_\_\_\_\_\_**>.

Motor Size: <**\_\_\_\_\_\_\_\_**>.

Motor Volt/Phase/Cycle: <**\_\_\_\_\_\_\_\_**>.

Equipment Tag: <P-2>:

[**Manufacturer: <\_\_\_\_\_\_\_\_>.**]

[**Model: <\_\_\_\_\_\_\_\_>.**]

Location: <**\_\_\_\_\_\_\_\_**>.

Service: <**\_\_\_\_\_\_\_\_**>.

Flow Capacity: <**\_\_\_\_\_\_\_\_**>.

Head: <**\_\_\_\_\_\_\_\_**>.

Minimum Efficiency: <**\_\_\_\_\_\_\_\_**>.

Seal Type: <**\_\_\_\_\_\_\_\_**>.

Motor Size: <**\_\_\_\_\_\_\_\_**>.

Motor Volt/Phase/Cycle: <**\_\_\_\_\_\_\_\_**>.

* + - * 1. Expansion Tank Schedule:

Equipment Tag: <ET-1>:

[**Manufacturer: <\_\_\_\_\_\_\_\_>.**]

[**Model: <\_\_\_\_\_\_\_\_>.**]

Location: <**\_\_\_\_\_\_\_\_**>.

Service: <**\_\_\_\_\_\_\_\_**>.

Capacity: <**\_\_\_\_\_\_\_\_**>.

Diameter: <**\_\_\_\_\_\_\_\_**>.

Length: <**\_\_\_\_\_\_\_\_**>.

Equipment Tag: <ET-2>:

[**Manufacturer: <\_\_\_\_\_\_\_\_>.**]

[**Model: <\_\_\_\_\_\_\_\_>.**]

Location: <**\_\_\_\_\_\_\_\_**>.

Service: <**\_\_\_\_\_\_\_\_**>.

Capacity: <**\_\_\_\_\_\_\_\_**>.

Diameter: <**\_\_\_\_\_\_\_\_**>.

Length: <**\_\_\_\_\_\_\_\_**>.

* + - * 1. Fan Schedule:

Equipment Tag: <F-1>:

[**Manufacturer: <\_\_\_\_\_\_\_\_>.**]

[**Model: <\_\_\_\_\_\_\_\_>.**]

Location: <**\_\_\_\_\_\_\_\_**>.

Capacity: <**\_\_\_\_\_\_\_\_**>.

Static Pressure: <**\_\_\_\_\_\_\_\_**>.

Motor Size: <**\_\_\_\_\_\_\_\_**>.

Motor Volt/Phase/Cycle: <**\_\_\_\_\_\_\_\_**>.

Equipment Tag: <F-2>:

[**Manufacturer: <\_\_\_\_\_\_\_\_>.**]

[**Model: <\_\_\_\_\_\_\_\_>.**]

Location: <**\_\_\_\_\_\_\_\_**>.

Capacity: <**\_\_\_\_\_\_\_\_**>.

Static Pressure: <**\_\_\_\_\_\_\_\_**>.

Motor Size: <**\_\_\_\_\_\_\_\_**>.

Motor Volt/Phase/Cycle: <**\_\_\_\_\_\_\_\_**>.

END OF SECTION 235613