PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Laboratory Sterilizers (Autoclaves): Small

B. Laboratory Sterilizers (Autoclaves): Medium

1.2 RELATED SECTIONS

A. General and Supplementary Conditions and Division 1

B. Division 23: Mechanical

C. Division 22: Plumbing

D. Division 26: Electrical

1.3 REFERENCES

A. Comply with requirements of general and supplementary conditions and Division 1 as part of this specification.

1.4 DESCRIPTION

A. Furnish and install all laboratory equipment with necessary components and accessories required to ensure a complete installation and ready for intended use as specified herein and shown on the Laboratory Furnishings Drawings.

B. Provide side panels to cover all exposed sides of cabinet-type equipment designed for under-counter installation.

C. Work of this section requires close coordination with work of Division 22, 23 and 26 as well as installation of Owner furnished components and work specified in other Sections. Sequence all work to assure an orderly progress in the project without removal of previously installed work and so as to prevent damage to finishes and products.

1.5 SUBMITTALS

A. Refer to General Conditions and Division 1 “Submittal Procedures” for submittal requirements. In addition to these requirements, provide submittal requirements specified herein.

B. Submittal requirements:

1. Submittal shall be prepared individually for this specification section. Arrange product data, drawings and information for submission in a complete set for this specification section.

2. Submittal shall contain complete data for all items of this specification section. Periodic or partial submittals of individual components within this specification section will be returned as incomplete and rejected.

3. Submittals shall be organized by specification sequence with section and paragraph number identified.

4. Equipment and components being proposed shall be clearly labeled with all options and accessories indicated and shall be for this specific project.

C. Shop Drawings: Submit complete shop fabrication and installation drawings, including plans, elevations, sections, details and schedules. Show relationship to adjoining materials and construction. Shop Drawings shall be in the form of reproducibles or photocopies, not to exceed 11 inches x 17 inches (A3) in size. Blueline prints are not acceptable.

D. Submit detailed anchorage and attachment drawings and calculations provided by a licensed Structural Engineer to show compliance with the applicable Building Code seismic restraint requirements.

E. Samples: Submit for Architect's approval two (2) samples of each type of specified finish and color range available.

F. Certifications: As a condition of acceptance, submit certification stating that equipment is complete and ready for intended function.

G. Operations/Maintenance Manuals: Accompanying certification, submit for Architect's review and Owner's use, complete operating and maintenance manuals that describe proper operating procedures, maintenance and replacement schedules, components parts list, and closest factory representative for components and service.

1.6 QUALIFICATIONS

A. Contractor for work in this section shall have an established organization and production facilities including all tools, equipment and special machinery necessary for specializing in the fabrication and installation of the type of equipment specified, with skilled personnel, factory trained workmen and an experienced engineering department. Each shall have the demonstrated knowledge, ability and the proven capability to produce the specified equipment of the required quality and the proven capacity to complete an installation of this size and type within the required time limits.

1.7 COORDINATION

A. Work of this Section requires close coordination with Work of Divisions 22, 23 and 26 and Work specified in other Sections. Sequence all Work to ensure an orderly progress in the project without removal of previously installed Work and so as to prevent damage to finishes and products.

1.8 SUBSTITUTIONS

A. Approved Substitution/Approved Equal: In addition to the items required in Division 1, all substitution requests shall include item-by-item comparison of the proposed substitution to this project specification. A copy of the project specification shall be submitted, with each item and subsection of the project specification marked as “Comply” or “Not Comply.” In any cases where “Not Comply” is indicated, an explanation of the relative advantages of the proposed design shall be provided.

B. Substitution shall not affect dimensions shown on Drawings.

C. The Contractor shall pay for changes to the building design, including engineering design, detailing, utility and service requirements, and construction costs caused by the requested substitution.

D. Substitutions shall have no adverse effect on other trades, the construction schedule, or specified warranty requirements.

E. Maintenance and service parts shall be locally available for the proposed substitution.

F. Regulatory: Specified products, materials, or systems for Project may include engineering or on file standards required by the Regulatory Agency. Contractor’s substitution of products, materials or systems may require additional engineering, testing, reviews,

approvals, assurances, or other information for compliance with Regulatory Agency requirements or both. Contractor shall provide all Agency approvals or other additional information required and pay additional costs for required Architect's services made necessary by the substitution at no increase in Contract Sum or schedule time, and as a part of substitution proposal

1.9 PRODUCT HANDLING

A. Protection: Use all means necessary to protect work of this section before, during and after installation including installed work and materials of other trades.

B. Replacement: Any damage as a result of this contractors work will be replaced, repaired and restored to original condition to the approval of the Architect at no additional cost or inconvenience to the Owner.

1.10 WARRANTY

A. Refer to the General Conditions and Division 1 "Product Requirements" for warranty requirements. In addition to these requirements, all products will be warranted to be free from defects in materials and workmanship for a minimum period of one year following substantial completion. The manufacturer/ dealer/ subcontractor shall repair or replace any products (or parts thereof) that are found to be defective. Replacement will include any parts, labor, shipping, and travel expenses involved.

B. Autoclave chambers shall be warranted to be free from defects in materials and workmanship for a minimum period of 15 years following substantial completion.

PART 2 - PRODUCTS

2.1 LABORATORY STERILIZER (AUTOCLAVE): SMALL

A. Manufacturers: Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

1. Beta Star Life Science Equipment of R-V Industries, Inc., http://www.rvii.com.

2. Consolidated Sterilizer Systems, http://www.consteril.com.

3. Getinge USA, Inc., http://www.getingeusa.com.

4. Steris Corporation, http://www.steris.com.

5. Approved equal.

B. Description: Small size steam-jacketed sterilizer designed for use in Laboratory and industrial applications.

C. Chamber Size:

1. 20 inches x 20 inches x 38 inches (508 x 508 x 965 mm) nominal.

D. Door/Mounting Configuration:

1. Single door, cabinet enclosed unit.

E. Process Cycle Configuration:

1. Prevacuum: Prevacuum process shall be designed for fast, efficient sterilization of porous, heat- and moisture-stable materials, sterilization of liquids and media in borosilicate glass containers with vented closures, and decontamination of supplies after laboratory procedures. Prevacuum sterilizer shall be equipped with prevacuum, gravity, liquid, leak test and daily air removal test cycles.

2. Gravity: Gravity process shall be designed for sterilization of non-porous heat- and moisture-stable materials, sterilization of liquids and media in borosilicate glass containers with vented closures, and decontamination of supplies after laboratory procedures. Gravity sterilizer shall be equipped with gravity and liquid cycles.

F. Steam Source:

1. Integral electric carbon steel steam generator supplied with industrial water.

G. Product Characteristics:

1. Construction:

a. Shell Assembly: Double wall, jacketed and insulated. Type 316L stainless steel welded sterilizer pressure vessel and type 304L or 316L stainless steel jacket. ASME rated at design operating pressure with allowance to relief valve setpoint - minimum 45 psig (310 kPa). Polished and passivated internal surfaces. Steam supply opening inside chamber to be shielded by a Type

316L stainless steel baffle. Chamber designed for positive sloped drainage with screen drain inlet to prevent debris for entering drain piping.

b. Door Assembly: Vertical sliding door. Type 316L stainless steel, insulated with jacket. Door suspended by cable/pulley or chain/sprocket supports attached to counterweight or dual-spring assembly. Steam or compressed air activated recessed door gasket seal. Equipped with mechanical safety locking mechanism to prevent door opening when chamber pressure exceeds 2 psi (14 kPa). Provide door safety switch to prevent addition of steam to chamber unless door is closed and locked.

c. Front Cabinet Panel: Type 304 or 316L stainless steel with No. 4 finish. Hinged or removable for full access to sterilizer piping and control systems.

d. Side Panels: Sterilizer to be enclosed by Type 304 or 316L stainless steel removable side panels with No. 4 finish. Sterilizer sub-frame to be equipped with a synthetic rubber gasket to ensure tight fit between cabinet panels.

e. Vacuum System: Water ejector to reduce chamber pressure during prevacuum and post-drying phases.

f. Plumbing: All valves, fittings, and other plumbing components shall be non-proprietary. Custom manifolds or distribution systems shall not be installed. The piping system shall be designed such that all valve types used are from the same manufacturer for ease of maintenance. All utility piping connections shall terminate within the confines of the sterilizer and to be accessible from the front or access side of the unit. Provide ASME approved pressure relief valves rated for pressure vessels.

g. Electrical: Electrical components such as switches, relays, and wiring systems shall be non-proprietary. Electrical design and installation shall conform to CEC requirements. Provide appropriate enclosure for components to protect against wet and moist environments.

h. Floor Stand: Sterilizer to be equipped with a leveling height-adjustable floor stand manufactured of extruded aluminum structural members or welded stainless steel, or welded carbon steel with corrosion protective finish.

2. Control System:

a. General: The sterilizer control system shall monitor, control, display, and record all process parameters. The control system shall include a PLC controller, touch-screen operator interface control panel, printer, audible alert, and emergency manual off (EMO) safety switch.

b. Programmable Logic Controller (PLC) Controller: Non-proprietary controller to display, monitor, and control all sterilizer operations and functions. Allen-Bradley® MicroLogix™ control system or equal.

c. Touch Screen Operator Interface Control Panel: Color active matrix (TFT) touch sensitive color interface screen. Allen-Bradley® PanelViewPlus™ or equal. Provide one screen on each side of pass-through units.

d. Printer: Alphanumeric ink-on-paper dot-matrix impact or permanent thermal paper printer with take-up spool.

e. Programming: All programming to be stored in non-volatile memory to retain programming during a power outage. Provide help menus/screens for programming and troubleshooting alarm conditions. Provide security features to prevent inadvertent or unauthorized process changes. Provide user programmable time-of-day utility startup/shutdown schedules for energy savings.

f. RS-232 or equivalent communication protocol for downloading cycle information.

g. USB or compact flash memory card slot for memory backup/restore and downloading cycle information.

H. Utilities:

1. Electric Steam Generator Unit:

a. Drain: 1½ inch (38 mm) ODT.

b. Generator drain: ½ inch (12.7 mm) ODT.

c. Electrical Controls: 120V, 60 Hz.

d. Electric Steam Generator: 208 V, 60 Hz, 3-phase.

e. Sterilizer feed water: Industrial cold water, 1 inch (25.4 mm) NPT, 30-50 psig (207-345 kPa) dynamic.

f. Compressed Air: ½ inch (38 mm) NPT, 80-100 psig (552-690 kPa).

g. Steam generator feed water: Industrial softened hot water, ½ inch (12.7 mm) NPT, 20-50 psig (138-345 kPa) dynamic.

I. Standards: Units shall conform to the applicable requirements of the following:

1. Underwriters Laboratories (UL).

2. California Plumbing Code.

3. CEC.

4. ASME Code, Section VIII, Division 1 for unfired pressure vessels.

5. ASME Code, Section I, Part PMB for power boilers.

J. Options Required:

1. Drain discharge cool down to limit discharge temperature into waste systems below 140°F.

2. Minimum 12-cycle capacity.

3. Seismic tie-down kit required to conform to local building codes.

4. Auto flush cycle for carbon steel steam generator with programmable timer/controls.

5. Boiler Control and Safety Device (CSD-1) for secondary low water cut-off as required by local jurisdiction.

6. Water Savings Package: System that incorporates water ejector with a pump and water reservoir to recirculate the water that creates the vacuum necessary for part of the sterilization cycle.

K. Accessories Required:

1. Rack and shelves.

2.2 LABORATORY STERILIZER (AUTOCLAVE): MEDIUM

A. Manufacturers: Products, which comply with this specification section as judged and approved by the Architect, may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.

1. Beta Star Life Science Equipment of R-V Industries, Inc., http://www.rvii.com.

2. Consolidated Sterilizer Systems, http://www.consteril.com.

3. Getinge USA, Inc., http://www.getingeusa.com.

4. Steris Corporation, http://www.steris.com.

5. Approved equal.

B. Description: Medium size steam-jacketed sterilizer designed for use in Laboratory and industrial applications.

C. Chamber Size:

1. 24 inches x 36 inches x 36 inches (610mm x 914mm x 914mm) nominal.

D. Door/Mounting Configuration:

1. Doors / mounting: Single door, cabinet enclosed unit.

E. Process Cycle Configuration:

1. Prevacuum and gravity processes are to be designed for fast, efficient sterilization of porous, heat and moisture-stable materials, sterilization of liquids and media in borosilicate glass containers with vented closures and decontamination of supplies after laboratory procedures. Sterilizer shall be equipped with prevacuum, gravity, liquid, leak test and daily air removal test cycles.

F. Steam Source:

1. Integrated electric carbon steel steam generator supplied with industrial hot water.

G. Product Characteristics:

1. Construction:

a. Shell Assembly: Double wall, jacketed and insulated. Type 316L stainless steel welded sterilizer pressure vessel and type 304L or 316L stainless steel jacket. ASME rated at design operating pressure with allowance to relief valve setpoint - minimum 45 psig (310 kPa). Polished and passivated internal surfaces. Steam supply opening inside chamber to be shielded by a Type 316L stainless steel baffle. Chamber designed for positive sloped drainage with screen drain inlet to prevent debris for entering drain piping.

b. Door Assembly: Hinged Door with manual operation. Type 316L stainless steel, insulated with jacket. Supported by stainless steel hinge(s). Stainless steel locking pins/plates and rotating locking handle assembly. Door seal is activated by pressurized steam or air. Equipped with mechanical safety locking mechanism to prevent door opening when chamber pressure exceeds 2 psi (14 kPa). Provide door safety switch to prevent addition of steam to chamber unless door is closed and locked.

c. Front Cabinet Panel: Type 304 or 316L stainless steel with No. 4 finish. Hinged or removable for full access to sterilizer piping and control systems.

d. Side Panels: Sterilizer to be enclosed by Type 304 or 316L stainless steel removable side panels with No. 4 finish. Sterilizer sub-frame to be equipped with a synthetic rubber gasket to ensure tight fit between cabinet panels.

e. Vacuum System: Liquid-ring vacuum pump to reduce chamber pressure during prevacuum and post-drying phase.

f. Plumbing: All valves, fittings, and other plumbing components shall be non-proprietary. Custom manifolds or distribution systems shall not be installed. The piping system shall be designed such that all valve types used are from the same manufacturer for ease of maintenance. All utility piping connections shall terminate within the confines of the sterilizer and to be accessible from the front or access side of the unit. Provide ASME approved pressure relief valves rated for pressure vessels.

g. Electrical: Electrical components such as switches, relays, and wiring systems shall be non-proprietary. Electrical design and installation shall conform to NEC requirements. Provide appropriate enclosure for components to protect against wet and moist environments.

h. Floor Stand: Sterilizer to be equipped with a leveling height-adjustable floor stand. Structural members shall be manufactured of extruded aluminum, welded stainless steel, or welded carbon steel with corrosion protective finish.

2. Control System:

a. General: The sterilizer control system shall monitor, control, display, and record all process parameters. The control system shall include a PLC controller, touch-screen operator interface control panel, printer, audible alert, and emergency manual off (EMO) safety switch.

b. Programmable Logic Controller (PLC) Controller: Non-proprietary controller to display, monitor, and control all sterilizer operations and functions. Allen-Bradley® MicroLogix™ control system or equal.

c. Touch Screen Operator Interface Control Panel: Color active matrix (TFT) touch sensitive color interface screen. Allen-Bradley® PanelViewPlus™ or equal. Provide one screen on each side of pass-through units.

d. Printer: Alphanumeric ink-on-paper dot-matrix impact or permanent thermal paper printer with take-up spool.

e. Programming: All programming to be stored in non-volatile memory to retain programming during a power outage. Provide help menus/screens for programming and troubleshooting alarm conditions. Provide security features to prevent inadvertent or unauthorized process changes. Provide user programmable time-of-day utility startup/shutdown schedules for energy savings.

f. RS-232 or equivalent communication protocol for downloading cycle information.

g. USB or compact flash memory card slot for memory backup/restore and downloading cycle information.

H. Utilities:

1. Electric Steam Generator Unit:

a. Drain: 2 inch (51 mm) ODT.

b. Generator drain: ½ inch (12.7 mm) ODT.

c. Electrical Sterilizer Controls: 120V, 60 Hz.

d. Electrical Steam Generator Controls: 120 V, 60 Hz.

e. Electric Steam Generator: 480V, 60 Hz, 3-phase.

f. Electric Vacuum Pump: 208V, 60 Hz, 3-phase.

g. Sterilizer feed water: Industrial cold water, 1 inch (25.4 mm) NPT, 30-50 psig (207-345 kPa) dynamic.

h. Compressed Air: ½ inch (38 mm) NPT, 80-100 psig (552-690 kPa).

i. Steam generator feed water: Industrial softened hot water, ½ inch (12.7 mm) NPT, 20-50 psig (138-345 kPa) dynamic.

I. Standards: Units shall conform to the applicable requirements of the following:

1. Underwriters Laboratories (UL).

2. California Plumbing Code.

3. CEC.

4. ASME Code, Section VIII, Division 1 for unfired pressure vessels.

5. ASME Code, Section I, Part PMB for power boilers.

J. Options Required:

1. Drain discharge cool down to limit discharge temperature into waste systems below 140°F.

2. Minimum 18-cycle capacity.

3. Seismic tie-down kit required to conform to local building codes.

4. 1” NPT (25 mm) chamber port

5. Auto flush cycle for carbon steel steam generator upon startup of sterilizer.

6. Boiler Control and Safety Device (CSD-1) for secondary low water cut-off as required by local jurisdiction.

7. Water Savings Package: System that incorporates vacuum pump with a water conservation reservoir to reduce makeup water requirements for the vacuum pump necessary for part of the sterilization cycle.

K. Accessories Required:

1. Rack and shelves.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Inspection: Prior to installation of laboratory equipment, carefully inspect the installed work specified in other Sections and verify that all such work is complete to the point where this installation may properly commence.

B. Discrepancies: In the event of discrepancy, immediately notify the Architect.

3.2 EXAMINATION

A. Examine surfaces designated to receive work for conditions that would adversely affect the finished work. Repair or replace surfaces not meeting tolerances or quality requirements governing substrate construction prior to start of work.

B. Verify that surfaces, prepared openings, or support structures are ready to receive work.

C. Verify field measurements and opening dimensions are as instructed by manufacturer.

D. Inspect and verify that the required utilities are available, in proper locations, prior to equipment installation.

3.3 WORK REQUIRED OF OTHER SECTIONS PRIOR TO INSTALLATION

A. Install shutoff valves on service lines.

B. Install fused disconnect switches (with lockout in OFF position) in electric supply lines near the equipment.

C. Provide building service lines supplying specified pressures and flow rates.

D. Provide recommended feed water quality for carbon steel steam generators as follows: Total hardness as $CaCO_3$-max 130 mg/l; Total alkalinity as $CaCO_3$-max 180 mg/l; Total dissolved solids-max 250 mg/l; Total Silica-max 2.5 mg/l; pH-6.5 to 8.5.

E. Provide illumination of service area, with provision of convenience outlet for maintenance.

3.4 INSTALLATION

A. General:

1. Install all equipment per manufacturer's recommendations and reviewed submittals.

2. Properly align and position all equipment.

B. Connection to Building Systems: See Laboratory Plumbing and Electrical drawings and Divisions 22 & 23 and 26 for final connections.

3.5 START UP AND TESTING

A. Test, clean, and adjust equipment and apparatus installed to ensure performance meets specified requirements.

B. Operate each unit and test full range of cycles over a continuous period. Record test data.

C. Adjust and re-test any units not meeting requirements.

3.6 DEMONSTRATION AND INSTRUCTIONS

A. Engage services of factory-qualified instructor to instruct and train Owner's operating and maintenance personnel in operation, service, and maintenance of equipment.

B. Test equipment prior to demonstration. Ensure equipment, including specified accessories, is operational.

C. Provide demonstration of equipment operation and instruction of Owner's personnel.

D. Demonstrate operating capability of equipment and systems. Include control and safety features, and service and maintenance procedures.

3.7 CLEANING AND PROTECTION

A. All equipment shall be protected before, during and after installation. Damage to material due to improper protection shall be cause for rejection.

B. Packaging and debris and other waste resulting from installation of equipment will be removed.

C. Repair or remove and replace defective Work as directed by the Architect upon completion of installation.

D. Clean finished equipment, touch up as required and remove and refinish damaged or soiled areas.

E. Prior to final acceptance by the customer, equipment that has become damaged will be repaired or replaced according to the terms of the warranty and any external soiled surfaces will be cleaned.

END OF SECTION