STERIS
Life Sciences

AMSCO® CENTURY® MEDIUM STEAM STERILIZER 26 x 37.5" (SCIENTIFIC)

APPLICATION

The sterilizer is offered in a prevacuum configuration and designed for fast, efficient sterilization of heat- and moisture-stable materials in scientific applications. The prevacuum configuration sterilizer is equipped with prevacuum, gravity, liquid, leak test, and daily air removal (Bowie-Dick) test cycles. ~~48" (1219 mm) and 60" (1524 mm) configurations include choice of single or double door~~; 36" (914 mm) configuration is single door only.

DESCRIPTION

The sterilizer is equipped with the latest features in both state of the art technology and ease of use.

Interior Chamber Dimensions

- 26 x 37.5 x 36" (660 x 953 x 914 mm)
- ~~26 x 37.5 x 48" (660 x 953 x 1219 mm)~~
- ~~26 x 37.5 x 60" (660 x 953 x 1524 mm)~~

Hinged ~~or Sliding~~ Door Configuration

- Hinged door with fast operating, low-effort door lock mechanism. Manual door handle lock lever requires a single 30° handle movement to lock or unlock.
- ~~Sliding door is controlled from touch screen. Quiet motor-driven cable and pulley mechanism opens and shuts door. As viewed from operating-end, door slides horizontally left when opening~~.

Century Control System with enhanced functionality and user-friendly color interface screen. System features include:

- Touch-sensitive 30-line x 40-character color display with both a wide viewing angle and high-visibility backlighting.

Hinged Door Model

Qty.2
E-2B 219 Buffer Room
E-2C 219 Buffer Room

Units E-2B & E-2C are recessed behind ST. STL. enclosure panel & do not require cabinet enclosures. Refer to floor plans.

(Typical - details may vary.)

- Ink-on-paper impact printer.
- Help screens for programming and troubleshooting alarm conditions.
- Standard communication interface with most PC-compatible peripheral devices (e.g., disk drives, printers).
- Automatic check of control program and cycle data maintains process integrity.
- Vacuum pump supplied on all units to effectively pull chamber to specified vacuum levels and reduce water consumption.

Selections Checked Below Apply To This Equipment

SIZE

- ☑ 26 x 37.5 x 36" (660 x 953 x 914 mm)[1]
- ☐ ~~26 x 37.5 x 48" (660 x 953 x 1219 mm)~~
- ☐ ~~26 x 37.5 x 60" (660 x 953 x 1524 mm)~~

- ☑ **SINGLE-DOOR CONFIGURATION**
  - ☑ **Hinged Door**[2] (☐ Left ☑ Right)
  - ☐ ~~**Horizontal-Sliding Door**[3]~~

  MOUNTING (2 options)
  - ☑ Cabinet Enclosed/Freestanding
  - ☐ ~~Recessed~~

- ☐ **DOUBLE-DOOR CONFIGURATION**[1]
  - ☐ **Hinged Door**[4]
    - ☐ Right/Left ☐ Right/Right
    - ☐ Left/Right ☐ Left/Left
  - ☐ **Horizontal-Sliding Door**[5]

  MOUNTING (2 options)
  - ☐ Recessed through One Wall
  - ☐ Recessed through Two Walls

STEAM SOURCE

- ☐ Building Steam
- ☐ Stand Alone SA Electric Steam Generator (Provided by STERIS)
- ☐ Stand Alone SA Electric Steam Generator (Customer Provided)
- ☐ Integral Indirect Clean Steam Generator
  - ☐ ~~Single Tube[11]~~ ☐ ~~Double Tube[11]~~
- ☑ Electric Steam Generator, Carbon Steel[6,11]
- ☐ ~~Electric Steam Generator, Stainless Steel~~[6,11]

ELECTRIC SERVICE
(for Vacuum Pump & Electric Steam Heat)

- ☐ ~~208/240 VAC, 60 Hz, 3-Phase~~
- ☑ 480 VAC, 60 Hz, 3-Phase
- ☐ ~~400 VAC, 50 Hz, 3-Phase (International)~~
- ☐ ~~600 VAC, 60 Hz, 3-Phase (Canada Only)~~

OPTIONS

- ☐ ~~Liquid Air Cooling (with Vacuum)~~
- ☐ Decontamination (with Vacuum)
- ☐ Pure Steam Piping to Chamber
  - ☐ ~~with Pressure Reducing Valve~~
- ☑ RTD Load Probe and F_0 Sterilization
  - ☑ One ☐ Two
- ☐ ~~Visible Press. Gauges (Std. on Sliding Door Units)~~
- ☐ ~~Bioseal (double door units only)~~[11]
  - ☐ ~~Sterile Side~~ ☐ ~~Non-Sterile Side~~
- ☐ ~~Air Differential Seal (double door units only)~~[11]
  - ☐ ~~Sterile Side~~ ☐ ~~Non-Sterile Side~~
- ☑ Eighteen-Cycle Capability
- ☐ TRI-CLAMP® Chamber Penetration(s)*[7]
  - ☐ 1" (25 mm) TRI-CLAMP Fitting (Qty. 1)
  - ☐ 3" (75 mm) TRI-CLAMP Fitting (Qty. 1)
- ☐ Printer on Both Ends
- ☐ Reference Recorder (3 Pen)
- ☐ Right Hand Piping
- ☐ ~~Backflow Preventer~~
- ☑ Auto Flush for Steam Generator
- ☐ ~~AMSCO™ Stand Alone Water Conservation System~~
- ☐ Closed Loop Chilled Water System (Drain Only)
  - ☐ Drain Only ☐ Vacuum & Drain
- ☐ 0.2 Micron Bacterial Retentive Filter
- ☐ Drain Line Reference Probe
- ☐ Air Detector System
- ☐ Allen-Bradley MicroLogix™ Control System

REMOTE MONITORING

- ☐ ~~ProConnect® Technical Support Services (Remote Monitoring, Priority Technical Support, Customer Care Center Access, Equipment Performance Reports). Available in U.S. and Canada only.~~

TRI-CLAMP® is a registered trademark of ALFA LAVAL INC.

ACCESSORIES

- ☐ ~~Loading Car~~ ☐ ~~Transfer Carriage~~
- ☑ Loading Car, Transfer Carriage & Track Assembly
  - ☑ Single Door ☐ Double Door
- ☐ ~~Chamber Rack and Shelf 36" (914 mm)~~[8]
- ☐ ~~Chamber Rack and Shelf 48" (1219 mm)~~[9]
- ☑ Seismic Tie-Down Kit[10]
- ☐ ~~Air Compressor, Portable, 115 Vac~~

Notes:

1. Double-Door configuration ~~*not available* for 26 x 37.5 x 36" (660 x 953 x 914 mm) sterilizers~~.
2. Door direction of swing is as viewed from OE.
3. ~~Configuration for Single-Door, Horizontal Sliding Door – door slides left to open~~.
4. ~~Double-Door configuration – First hinge position applies to operating-end (OE); second position applies to non-operating end (NOE).~~
5. ~~Configuration for Double-Door, Horizontal Sliding Door – door slides left to open at OE; door slides right to open at NOE.~~
6. ~~Double door cabinet enclosed units with integral steam generators require SSQ~~.
7. ~~Both 1" and 3" TRI-CLAMP options can be selected as part of the same order~~.
8. Chamber Length: 36" (914 mm) units only.
9. ~~Chamber Length: 48" (1219 mm) units only~~.
10. Based on CA requirements.
11. ~~Compressed air required for Single Door and Double Door sterilizers with integral electric steam generator, units with air differential or bioseal, or single tube column, integral indirect steam generator units.~~

Item SF2110111C20017011

Location(s)_____

_____

STANDARDS

Each sterilizer meets applicable requirements of the following listings and standards, and carries the appropriate symbols:

- **EMC Directive:** 2004/108/EC, 93/68/EEC, 92/31/EEC, 89/336/EEC.
- **Low Voltage Directive:** 2006/95/EC, 93/68/EEC, 72/23/EEC.
- **Machinery Directive (MD):** 2006/42/EC, 98/37/EEC, 93/68/EEC, 91/368/EEC, 89/392/EEC.
- **Pressure Equipment Directive (PED):** 97/23/EC.
- **Canadian Standards Association (CSA) Standard C22.2, No. 1010.**
- **Underwriters Laboratory (UL) Standard 61010-1** as certified by ETL Testing Laboratories, Inc.
- **ASME Code, Section VIII, Division 1** for unfired pressure vessels. The pressure vessel is so stamped; ASME Form U-1 is furnished. The shell and door are constructed to withstand a working pressure of 45 psig (3.1 bar).

FEATURES

26 x 37.5" (660 x 950 mm) chamber cross-section is sized to allow for efficient, high-volume processing.

Fast-operating, low-effort manual door lock mechanism (hinged-door models) allows the door to be locked or unlocked, using a single 30° handle motion.

Power horizontal-sliding door. Control panel operated horizontal-sliding door is available in left-hand (door slides left to open), single- or double-door models.

Resistance Temperature Detectors (RTDs) are installed for sterilizer temperature control. The chamber drain line RTD senses and controls temperature variations within the sterilizer chamber. A jacket RTD provides temperature control within the jacket space. These RTD signals, converted into electrical impulses, provide accurate control inputs and readouts throughout the entire cycle.

Electronic water saving control includes an RTD to control amount of water used in condensing exhausted chamber steam. See *Automatic Drain Effluent Cooling* on page 3.

Software calibration is performed in the service mode, accessible through the touch screen displays, and accomplished using external or internal temperature and pressure sources. The control system provides printed record of all calibration data for verification to current readings.

Automatic utilities startup/shutdown permits slow cooling of entire vessel and load. Shutdown may be programmed to activate at end of any designated cycle or time of day. When activated, control system automatically shuts off all utility valves, conserving steam and water usage. Sterilizer utilities can be restarted either by programmed time or manual operation. A different shutdown and restart time can be programmed for each day.

Steam purge feature is provided to assist in air removal and to preheat the load.

Insulation, one-inch thick, asbestos-free spin-glass (rated at 500 °F [260 °C] continuous) encompasses the exterior of the sterilizer vessel and is sealed in an oil and water resistant outer jacket.

Lighted DIN connectors are installed on all steam, water and exhaust valves for reliability and ease of maintenance.

ProConnect® Technical Support Services - Maximize operational efficiencies with secure, internet-based, real-time equipment monitoring. Data from your equipment is used by STERIS to provide pro-active Customer alert notifications, technical support, and predictive maintenance. Online parts ordering, equipment performance dashboards, and online service scheduling at steris.com is also available. (ProConnect Technical Support Services is available in U.S. and Canada only.) Refer to Tech Data sheet *SD983, ProConnect Technical Support Services*, for details.

PROCESSING CYCLES

This scientific sterilizer is factory programmed with the following cycles:

- **Prevacuum Cycle:** for efficient, high-volume sterilization of porous, heat- and moisture-stable materials in the temperature range of 121°C to 137°C. The prevacuum cycle uses a mechanical air evacuation system.
- **Gravity Cycle:** for the sterilization of heat- and moisture-stable goods in the range of 100°C to 137°C), and decontamination of bagged basic laboratory wastes. The gravity cycle uses the gravity air-displacement principle.
- **Liquid Cycle:** for sterilization of liquids and media in vented borosilicate glass or metal containers in the range of 100°C to 123°C. Liquid cycle uses the optimal solution cooling feature during the exhaust (cooling) phase to control the exhaust rate.

TEST CYCLES

- **Vacuum Leak Test:** used for testing the vacuum integrity of sterilizer piping. Sterilizer chamber must be empty while running this test cycle. All temperatures and timing are preprogrammed and cannot be adjusted.
- **Daily Air Removal Test Cycle:** used to conduct a Bowie-Dick test on the sterilizer. Recommended load is a Dart® Testing Apparatus to Determine the Effectiveness of Removing Air from a Chamber, or a properly prepared Bowie-Dick test pack. Sterilize exposure temperature: 132°C; sterilize exposure time: 3-1/2 minutes; dry time: 1 minute.

OPTIONAL CYCLE

Liquid Air Cool Cycle: provides water to the jacket, and air pressure to the chamber to improve exhaust time for liquid loads, and to reduce boil over.

Effluent Decontamination Cycle: processes contaminated laboratory waste (BL-3 and BL-4). The condensate produced during processing cycle is decontaminated before discharge to floor drain. Steam is admitted through bottom of sterilizer chamber, and chamber is exhausted out top side of vessel. During purge and vacuum pulses, all purge and exhaust gases are vented through a 0.2 micron bacterial retentive filter. Filter housing is steam jacketed to prevent wetting of filter membrane.

CONTROL SYSTEM

Design Features

The Century control system monitors and controls all sterilizer operations and functions. The control system is factory-programmed with standard sterilizing cycles. Each cycle is adjustable to meet specific processing requirements. All control configuring is performed using the touch screen displays.

IMPORTANT: If factory-programmed cycle values are changed, it is necessary for the operator to validate the efficacy of the changed cycle.

Cycle values and operating features may be adjusted and verified prior to cycle operation. Once a cycle is started, cycles and cycle values cannot be changed until the cycle is complete. On completion of the cycle, timers reset to the previously selected values, eliminating the need to reset values between repeated cycles. If the chamber temperature drops below the set point during the exposure phase, the timer is set to stop. Timer will automatically reset once normal operating temperature is reached.

Critical control system components are housed within a sealed compartment to protect the components from moisture and heat generated during the sterilization process. A cooling fan with filter is installed in the housing compartment to maintain positive pressure within the compartment, keeping components cool and dust-free.

Operator interface control panel, consisting of a touch screen and impact printer, is located on the operating (load or nonsterile) end of the sterilizer. If the sterilizer is equipped with double doors, an additional touch screen is provided on the sterilizer's non-operating (unload or sterile) end.

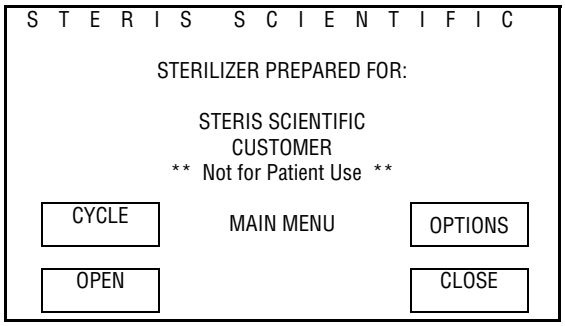
- **Touch-sensitive screen** features a 30-line x 40-character color graphics display. The control's touch screen color display features a wide viewing angle and high-visibility backlighting. All sterilizer functions, including cycle initiation and cycle configuration, are operated by pressing the touch-sensitive areas on the display, referred to as "touch pads." Display indicates appropriate control buttons, operator prompts, and status messages necessary to assist in sterilizer operation. All displayed messages are complete phases with no codes to be cross-referenced. Display also indicates any abnormal conditions that may exist either in or out of a cycle.
- **Ink-on-paper impact printer,** located above the touch screen, provides an easy-to-read printed record of all pertinent cycle data on 2-1/4" (57 mm) wide paper. Data is automatically printed at the beginning and end of each cycle and at transition points during the cycle. Printer take-up spool stores an entire roll of paper, providing cycle records which can be saved for future reference. Three paper tape rolls and two printer ribbons are furnished with each unit.

Non-operating end (NOE) control panel, equipped on double-door sterilizers only, includes a touch-sensitive screen similar to the operating end screen. Preprogrammed cycles can be started from the NOE control panel. The display concurrently shows the same information as the operating end screen display.

Cycle configuration is performed by accessing the change values menu through the operating end touch screen. The change values menu can be used to adjust cycle values and the following operating parameters:

- **Time display and printout units** in AM/PM or 24-hour (MIL).
- **Access code** requires entry of a four-digit access code to operate the sterilizer and/or change the cycle values. Operator is prompted to enter an access code when initiating a cycle or accessing the change values menu. If the access code is not properly entered, the display returns to the standby or main menu screen, denying user access to the sterilizer or programming.
- **Audible signals** are adjustable. **Touch pad** and **end-of-cycle signals** can be adjusted to one of four sound levels (off, low, medium, or high) as required for the operating environment. **Alarm signal** can be adjusted to low, medium, or high (it cannot be turned off).
- **Print format** allows selection of either a full or condensed printout of the cycle information during processing.
- **Temperature display and printout units** appear in Celsius (°C). Temperature is set, displayed, controlled, and printed to the nearest 1°. Recalibration is not required when changing temperature units to Fahrenheit (°F).
- **Pressure/vacuum display and printout units** appear in psig/InHg or bar. Recalibration is not required when changing pressure units.

Technical Data



Control system consists of microcomputer control boards and peripheral function circuit boards, located within the control PC board housing.

Internal battery backs up all cycle memory for up to 10 years. If power failure occurs during cycle, battery backup system assures cycle memory will be retained and proper cycle completion will occur once power is restored. When power is lost, cycle is held in phase until power is restored. Once power returns, the event is recorded on printout and cycle automatically resumes or restarts, depending on what phase cycle was in at time of power loss. Operator can choose to manually abort the cycle.

SAFETY FEATURES

Control lockout switch, located on chamber door, senses when door-seal is energized and tight against door. The control prevents cycle from starting until limit switch signal is received. If the control loses the appropriate signal during cycle, alarm activates, cycle aborts, and chamber safely vents with a controlled exhaust.

Chamber float switch activates alarm, aborts cycle, and safely vents chamber with a controlled exhaust if excessive condensate is detected in vessel chamber.

Pressure relief valve limits amount of pressure buildup so rated pressure in vessel is not exceeded.

CONSTRUCTION

Shell Assembly

Two fabricated Type 316L stainless-steel shells, welded one within the other, form the sterilizer vessel. Type 316L stainless-steel end frame(s) is welded to the door end. On a single door unit, the back of chamber is fitted with a welded 316L stainless-steel dished head.

Insulated sterilizer vessel is ASME and PED rated at 45 psig (3.1 bar) and includes one 1"-NPT access port for Customer use.

Steam-supply opening inside chamber is shielded by a stainless-steel baffle.

Chamber Door(s)

Chamber door is constructed of Type 316L stainless steel.

During cycle operation, door is sealed by a steam-activated door seal. Door seal is constructed of special long-life rubber compound. When sterilizer cycle is complete, door seal retracts under vacuum into a machined groove in sterilizer end frame.

A proximity switch senses when the door is closed. An additional seal pressure switch prevents inadvertent cycle initiation if the door is not sealed.

The door assembly is equipped with a mechanical locking mechanism that prevents the door from opening, as long as the seal is intact and energized and more than 2 psi (0.14 bar) pressure is in the chamber. Door interlocks on double door sterilizers can be programmed to prevent inadvertent opening of door(s). Access code is required to override door interlocks.

Sterilizer door is fitted with a stainless-steel panel that insulates operator from chamber end ring, lessening chance of accidental contact with hot metal surface.

Chamber Drain System

Drain system is designed to prevent pollutants from entering the sterilizer. An optional backflow preventer is available. An automatic condensing system, consisting of a stainless-steel plate-type condenser, converts chamber steam to condensate, and disposes condensate to waste. Cooling water flow is regulated by waste line RTD to minimize water usage. Water supply shutoff valve is located in recessed area of unit.

Automatic Drain Effluent Cooling

The piping system to the drain provides automatic condensing of chamber steam and disposal of condensate to waste. Cooling water is added to ensure discharge temperature is discharged at or below 60°C (140°F). A separate resistance temperature detector (RTD) is included to limit the volume of water to only the amount required to achieve target temperature, thus conserving water.

Vacuum System

Vacuum pump reduces chamber pressure during prevacuum and post-drying phases. Air is drawn from chamber through vacuum system. Following dry phase, chamber vacuum is relieved to atmospheric pressure by admitting air through a bacteria-retentive filter.

Steam Source

Sterilizer is piped, valved, and trapped to receive building-supplied steam delivered at 50 to 80 psig (3.5 to 5.6 bar) dynamic. Steam piping is constructed of brass and includes a shutoff valve, steam strainer, and a brass pressure regulator.

Steam feeds from jacket to chamber. A check valve is added between jacket and chamber on sterilizers with decontamination cycle option.

Integral Electric Steam Generator

45 kW generator is available for this sterilizer. Generator is manufactured of either carbon steel or stainless steel. Additional floor space either at rear of sterilizer (single door chamber) or at the side (double door chamber) is required. Additional utility requirements are also needed. Refer to appropriate equipment drawings if an integral steam generator is required.

Integral Indirect Clean Steam Generator

Utilizes Customer's plant steam (minimum 75 psig [517 kPa]) and high quality water (minimum specific resistivity of 1.0 MΩ·cm) to supply pure steam to sterilizer. Generator system is integrally mounted to sterilizer framework and automatically operated by sterilizer electronic control system. Clean steam-to-chamber piping option must be selected. Available with single or double tube sheet constructions. (See tech data SD589 for details.)

Piping

All piping connections terminate within confines of sterilizer, and are accessible from front and left side of the unit.

- **Solenoid valves** with DIN connectors simplify sterilizer piping and can be serviced individually.
- **Manual shutoff valves** are pressure rated at 125 psig (8.62 bar) for saturated steam. Valve handles are low-heat conducting. Valves are provided for steam, water, and emergency drain line exhaust.

MOUNTING ARRANGEMENT

The sterilizer is designed for either freestanding or recessed installation, as specified. (For double-door mounting, the recessed installation can be through one or two walls.) Each sterilizer is height-adjustable. Sterilizer subframe is equipped with a synthetic rubber gasket to provide a tight fit between the cabinet panels on freestanding systems, or between the front cabinet panel and wall partition on recessed systems.

Stainless-steel side panels enclose the sterilizer body and piping on freestanding systems.

ACCESSORIES

Seismic tie-down kit conforms to Title 24 California Code of Regulations, 1993 Amendment Section 2336(B).

Material handling accessories include stainless-steel chamber tracks and stainless-steel loading cars with painted-steel carriages. Stainless-steel chamber rack and shelf are available for 39" (991 mm) sterilizers. See separate literature for details.

Air compressor, portable (115 Vac), is intended for pneumatic valves on sterilizers when an air utility is not provided by the facility. It is also used for back-up pressure source for the door seal in bioseal applications and for sterilizers utilizing an electric steam generator.

The unit's 1.5 gallon compressor tank delivers pressurized air at 59.5 LPM @ 345 KPa (1.7 CFM @ 100 PSI). Refer to STERIS drawing no. 755718-038 for complete specifications.

OPTIONS

Pure steam piping delivers steam (generated from Customer purified water source) to chamber and its contents. All steam-to-chamber piping components are constructed of 300 series stainless steel. Available with Pressure Reducing Valve.

RTD load probe and F_0 sterilization automatically sense load temperature during cycle operation. A single thermal load probe is sealed through sterilizer vessel and manually placed in product container within chamber prior to cycle operation.

In conjunction with the load probe option, individual cycles can be set to start the exposure phase according to chamber drain temperature or according to load temperature. F_0 set points are also available for each cycle, allowing for exposure phase termination based on the calculated F_0 value. Note that a maximum of two probes can be used.

Visible pressure gauges (chamber and jacket pressure gauges) are mounted in the fascia panel and are visible to the operator; 4-1/2" (114 mm) diameter gauges are in psig/in Hg (chamber), or psig (jacket). The pressure gauges are standard on sliding door units; and optional for hinged door units.

Bioseal (double door units only) consists of a 1/4" stainless-steel plate welded to chamber and a 1/4" thick silicone gasket that extends between the plate and a carbon steel wall frame, which is welded to wall imbeds.The bioseal option is available for both the operating and non-operating ends of the sterilizer. The seal is designed to prevent the passage of airborne microorganisms from the space between the vessel body and the structural wall opening. Steam is the primary source of pressure behind the door seal. All sterilizers with bioseals have air back-up to maintain seal pressure when out of cycle or if the steam source is not available.

If bioseal option is selected, an increased wall opening is needed. (A compressed air supply is also required as a back-up means to operate the door seals). Refer to STERIS equipment drawing for bioseal specifications.

Air differential seal (double door units only) is available for both operating and non-operating ends of the sterilizer. The seal minimizes passage of air from non-sterile area to sterile area. (A compressed air supply is also required as a back-up means to operate the door seals).

Eighteen-cycle capability provides an additional 12 cycles to the control system memory for a total of 18 cycles.

1" (25 mm) TRI-CLAMP chamber penetration permits insertion of temperature probes, such as thermocouples or resistance temperature detectors (RTDs), into the chamber.

3" (76 mm) TRI-CLAMP chamber penetration permits insertion of temperature probes, such as thermocouples or resistance temperature detectors (RTDs), into the chamber.

Backflow preventer option can be installed on sterilizer piping to prevent the unwanted reverse flow of water or other substances into the potable water supply.

Auto flush for steam generator provides automatic flush of steam generator upon startup of sterilizer. Operator can bypass auto-flush by pressing <Cancel> on touch screen. This option is not required for stainless-steel steam generators.

Closed loop chilled water system (with drain only). Closed loop cooling source is used to cool the steam effluent from the jacket and chamber. This greatly reduces the amount of water sent to the drain. Plate heat exchanger is included. See equipment drawings for closed loop utility requirements.

Closed loop chilled water system (with vacuum pump & drain). Closed loop cooling source is used to cool the vacuum pump seal water to <15°C and sterilizer effluent to <60°C. This greatly reduces the amount of vacuum pump seal water and eliminates the need for water mixing with the effluent that is sent to drain. Plate heat exchangers and recirculation tank are included. See equipment drawings for closed loop utility requirements.

AMSCO Stand Alone Water Conservation System is designed to re-circulate and cool sterilizer process water to reduce water consumption. System includes collection tank, heat exchanger with integral cooling fan, recirculation pump and temperature and pressure switches.

During system operation, sterilizer water effluent passes through a fan-cooled heat exchanger. The fan cools the water before it returns to the collection tank. Additional cooling water is added only when a maximum temperature set-point is reached. Refer to tech data sheet SD929 for more detail.

Right hand piping. Piping is located on right side of sterilizer.

Reference recorder is integrally mounted to the sterilizer fascia paneling. The option is an independent recorder provided to record chamber drainline temperature and chamber pressure.

0.2 micron bacterial retentive filter provides sterile air during airbreak at end of cycle.

Printer on both ends provides an additional printer at the sterilizer's non-operating end.

Air detector (integral factory piping option) is used to determine whether any air or non-condensible gas present in the chamber is sufficient to impair the sterilizing process.

Drain line reference probe automatically senses temperature of drain during cycle operation. Individual cycles can be set to start exposure phase according to either the chamber drain temperature, or the load temperature.

Allen-Bradley MicroLogix™ Control System with enhanced functionality and user-friendly Allen-Bradley PanelView™ Plus 6 600 interface screen.[1]

- Touch-sensitive screen with 18-bit color graphic display
- Display features 320 x 240 resolution color-active matrix
- Display is designed with emphasis on human factors and user recognizable symbols

Preventive Maintenance

A global network of skilled service specialists can provide periodic inspections and adjustments to help assure low-cost peak performance. STERIS representatives can provide information regarding annual maintenance agreements.

NOTES

1. The sterilizer is not supplied with a backflow preventer and, where required by local codes, installation of a backflow preventer in the water line is not provided by STERIS.
2. Pipe sizes shown indicate terminal outlets only. Building service lines, not provided by STERIS, must supply the specified pressures and flow rates.
3. Disconnect switches (with OFF position lockout only, by third parties) should be installed in electric supply lines near the equipment.
4. Access to recess area from control end of the sterilizer is recommended.
5. Clearances shown are minimal for equipment installation and servicing.
6. Depending on the loading equipment used, additional clearance is required:
   - If shelves are used, length of sterilizer plus 24" (610 mm) at each door.
   - If loading car and carriage will be used, twice the length of the sterilizer at each door
   - Floor drain should be provided within the confines of the sterilizer framework.

1.Allen-Bradley MicroLogix™ and Allen-Bradley PaneView™ Plus are registered trademarks of Rockwell Automation, Inc.

UTILITY REQUIREMENTS

The following utility requirements information is general. Refer to equipment drawings for detailed information.

Drain

2" ODT drain terminal (floor drain capacity must handle peak water consumption)

Electric Control Domestic

120 V, 1-Phase, 60 Hz, 2 Amps

Electric Control International

230 V, 50 Hz, 1-Phase, 1.5 Amps

Electric Control, Vacuum Pump Domestic

480 V, 60 Hz, 3-Phase, 3 Amps per phase, or
208/240 V, 60 Hz, 3-Phase, 6 Amps per phase, or
600 VAC, 60 Hz, 3-Phase, 3 Amps per phase

Electric Control, Vacuum Pump International

400 V, 50 Hz, 3-Phase, 4 Amps per phase

Steam

Pressure: 50 to 80 psig (3.45 to 5.52 bar, dynamic), condensate free, and 97% to 100% vapor quality

Average Consumption (60" units): 185 lbs/hr (84 kg/hour)

Peak Flow (60" units): 335 lbs/hr (152 kg/hour)

Size: 1" NPT

Additional utilities are required for units with the following options:

- Double Door Units w/Interlocks & Air Differential Seal (Compressed Air)
- Liquid Air Cool (Compressed Air)
- Decontamination Cycle (Compressed Air)
- Bioseal (Optional Compressed Air Backup)
- Stainless-Steel Piping (Treated Water)
- Indirect Steam Generator (minimum 75 psig steam)

Consult Customer Service for specially configured equipment drawings.

Sterilizer Feedwater Pressure: 20 to 50 psig (1.38 to 3.45 bar), dynamic, Size: 1" NPT

NOTE: Backflow prevention is not standard on the unit, but a backflow preventer option can be ordered.

Requirements for ProConnect Technical Support Services

Requirements for ProConnect Technical Support Services
Refer to Tech Data sheet *SD983, ProConnect Technical Support Services.* (Available in U.S. and Canada only.)

ENGINEERING DATA

Drain	2" ODT drain terminal — floor drain capacity must handle peak water consumption.	
Electric • **USA**	**Control:**	120 Volt, 1-Phase, 60 Hz, 2 Amps.
	Vacuum Pump:	~~208/240 Volt, 3-Phase, 60 Hz, 6 Amps per phase, or~~ 480 Volt, 3-Phase, 60 Hz, 3 Amps per phase.
• **UK**	**Control:**	~~230 Volt, 1-Phase, 50 Hz, 1.5 Amps.~~
	Vacuum Pump:	~~400 Volt, 3-Phase, 50 Hz, 6 Amps per phase~~.
• **International (Outside UK)**	**Control:**	~~230 Volt, 1 Phase, 50 Hz, 1.5 Amps~~
	Vacuum Pump:	~~400 Volt, 3-Phase, 50 Hz, 4 Amps per phase.~~
~~**Steam**[1]~~	**Pressure:**	50 to 80 psig (3.45 to 5.52 bar, dynamic), condensate free, and 97% to 100% vapor quality
	Consumption:	26 x 37.5 x 36" (660 x 950 x 914 mm): **Peak:** 190 lb/hr (86 kg/hr **Avg.** 112 lb/hr (51 kg/hr) 26 x 37.5 x 48" (660 x 950 x 1219 mm): **Peak:** 255 lb/hr (116 kg/hr **Avg.** 148 lb/hr (67 kg/hr) 26 x 37.5 x 60" (660 x 950 x 1524 mm): **Peak:** 335 lb/hr (152 kg/hr **Avg.** 185 lb/hr (84 kg/hr)
	Peak Flow: (60" unit)	~~335 lb/hr~~ (152 kg/hr)
	Size:	1" NPT
Water	**Pressure:**	20 to 50 psig (1.38 to 3.45 bar), dynamic
	Consumption:	130 gal/hr (495L/hr)
	Peak Flow:	15 gal/min (57 L/min)
	Size:	1" NPT
Operating Weight	26 x 37.5 x 36" (660 x 950 x 914 mm)	3800 lb (1720 kg)
	~~26 x 37.5 x 48" (660 x 950 x 1219 mm)~~	~~4200 lb (1900 kg)~~
	~~26 x 37.5 x 60" (660 x 950 x 1524 mm)~~	~~4700 lb (2125 kg)~~

[1] *75-90 PSI dynamic steam pressure is required when operated with steam-to-steam generators.*

Notes:
- Operating weight includes a full load in the chamber.
- Water consumption data based on running one fully loaded prevac cycle per hour and the machine idling for remainder of the hour.

Table 1. Recommended Feed Water Quality for Sterilizers

Condition	Nominal	Maximum
Temperature	4°-16°C (40°-60°F)	21°C (70°F)
Total Hardness as $CaCO_3$[(a)]	50-120 mg/L	171 mg/L
Total Dissolved Solids	100-200 mg/L	500 mg/L
Total Alkalinity as $CaCO_3$	70-120 mg/L	180 mg/L
pH	6.8-7.5	6.5-8.5
Total Silica	0.1 - 1.0 mg/L	2.5 mg/L

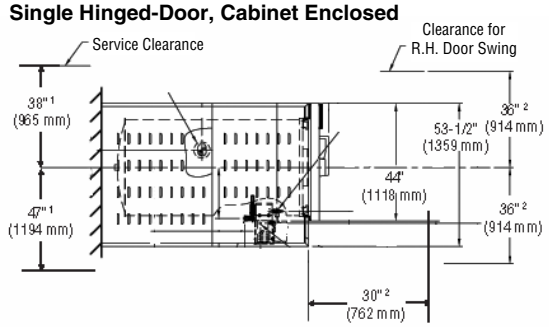
(a) 17.1 mg/L = 1.0 grain hardness

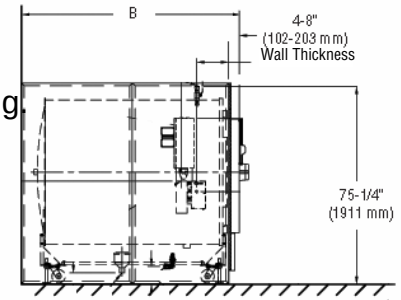
CUSTOMER IS RESPONSIBLE FOR COMPLIANCE WITH APPLICABLE LOCAL AND NATIONAL CODES AND REGULATIONS.

The base language of this document is ENGLISH.
Any translations must be made from the base language document.

Refer to the Following Equipment Drawings for Installation Details	
Equipment Drawing Number	**Equipment Drawing Title**
65435-775	26 X 37.5 AMSCO Century Ster. Prevac Or Sfpp Single (Hinge) Door Recessed Steam Heat
65435-776	26 X 37.5 AMSCO Century Ster. Prevac Or Sfpp Single (Hinge) Door Cabinet Steam Heat
65435-777	26 X 37.5 AMSCO Century Ster. Prevac Or Sfpp Double (Hinge) Door Recessed One Wall Steam Heat
65435-778	26 X 37.5 AMSCO Century Ster. Prevac Or Sfpp Double (Hinge) Door Recessed Two Walls Steam Heat

Single Hinged-Door, Cabinet Enclosed

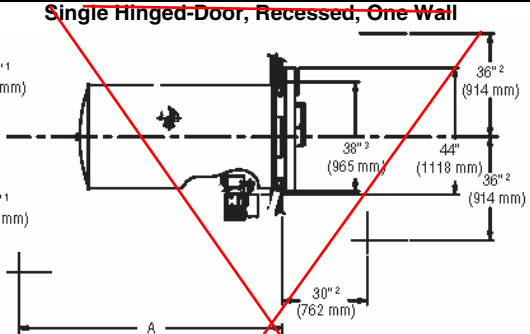


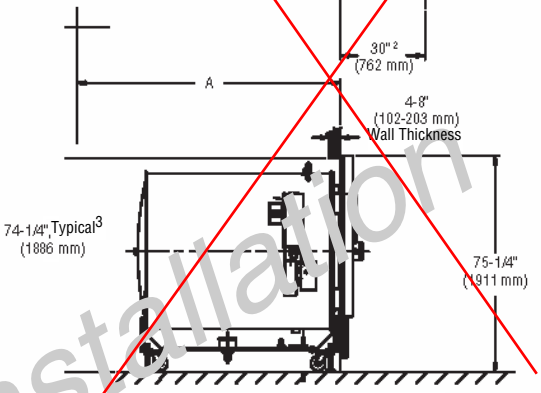


Steam generator shown on equip drawing.

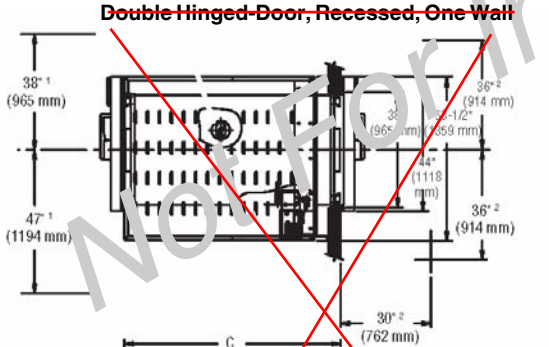
Refer to comments on previous sheets re: no cabinet enclosure, units are recessed.

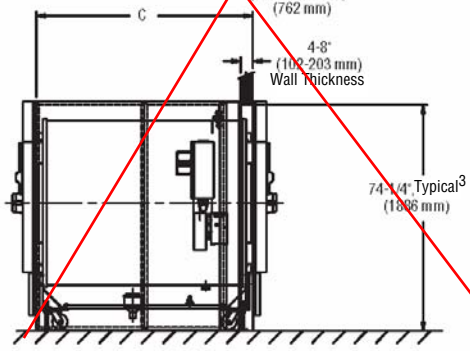
Single Hinged-Door, Recessed, One Wall



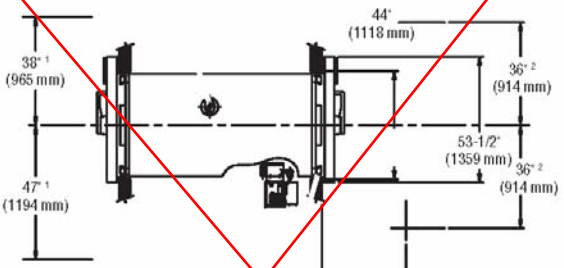


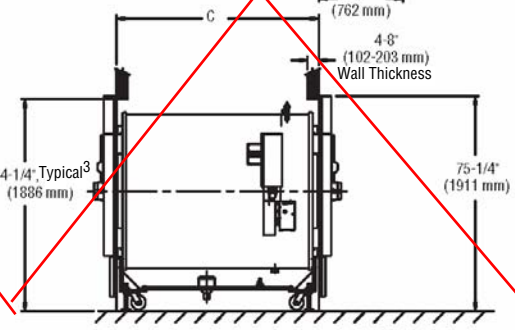
Double Hinged-Door, Recessed, One Wall





Double Hinged-Door, Recessed, Two Walls





[1] Service Clearance - new construction only. Unit may be installed in existing Eagle 3000 space without facility modification.
[2] Door Swing (left hand swing shown)
[3] Wall Opening

OVERALL INSTALLED LENGTH

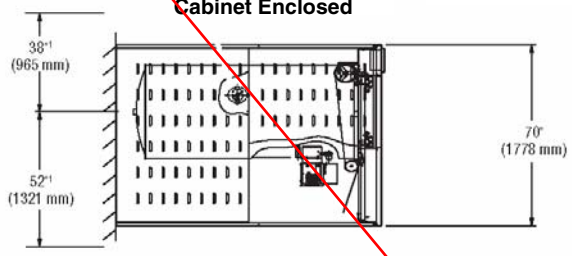
Refer To Illustrations

	Chamber Length		
	36" (914 mm)	**48" (1219 mm)**	**60" (1524 mm)**
A	69" (1753 mm)	81" (2057 mm)	93" (2362 mm)
B	58" (1473 mm)	70" (1778 mm)	82" (2082 mm)
C	48" (1219 mm)	60" (1524 mm)	72" (1829 mm)
D	59" (1499 mm)	71" (1803 mm)	83" (2108 mm)
E	71-1/2" (1816 mm)	83-1/2" (2121 mm)	95-1/2" (2425 mm)
F	53-1/4" (1352 mm)	65-1/4" (1657 mm)	77-1/4" (1962 mm)

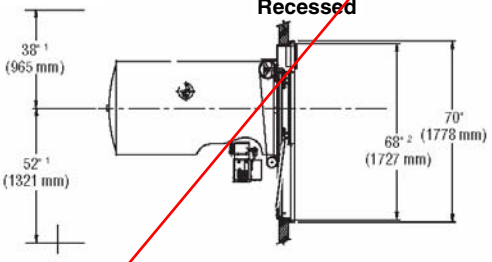
Refer to the Following Equipment Drawings for Installation Details	
Equipment Drawing Number	**Equipment Drawing Title**
65435-779	26 X 37.5 AMSCO Century Ster. Prevac Or Sfpp Single (Sliding) Door Cabinet Steam Heat
65435-780	26 X 37.5 AMSCO Century Ster. Prevac Or Sfpp Single (Sliding) Door Recessed Steam Heat
65435-781	26 X 37.5 AMSCO Century Ster. Prevac Or Sfpp Double (Sliding) Door Recessed One Wall Steam Heat
65435-782	26 X 37.5 AMSCO Century Ster. Prevac Or Sfpp Double (Sliding) Door Recessed Two Walls Steam Heat

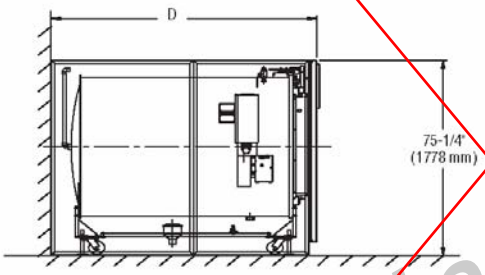
Single Horizontal-Sliding Door

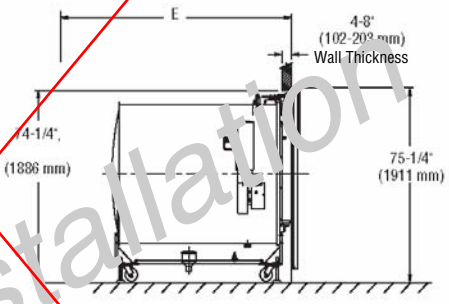
Cabinet Enclosed



Recessed

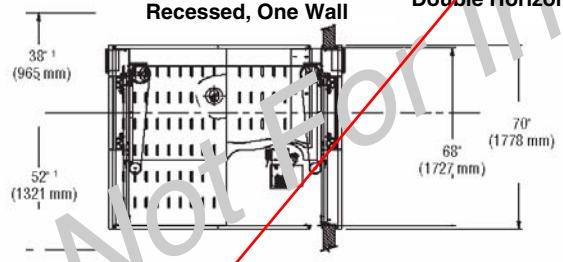




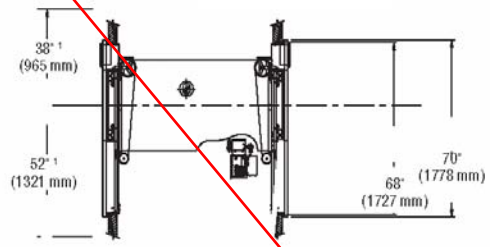


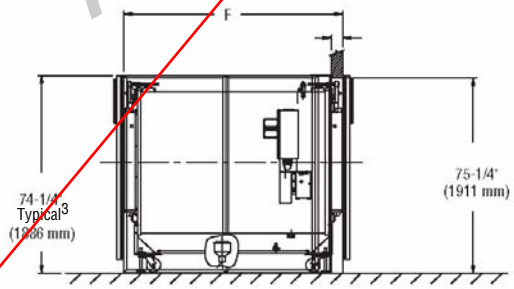
Double Horizontal-Sliding Door

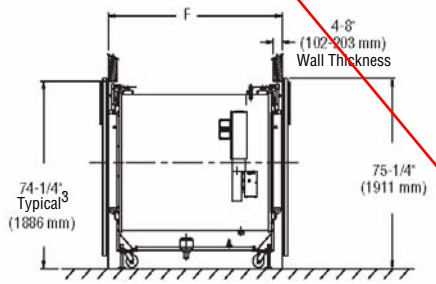
Recessed, One Wall



Recessed, Two Walls







[1] Service Clearance - new construction only. Unit may be installed in existing Eagle 3000 space without facility modification.
[2] Door Swing (left hand swing shown)
[3] Wall Opening

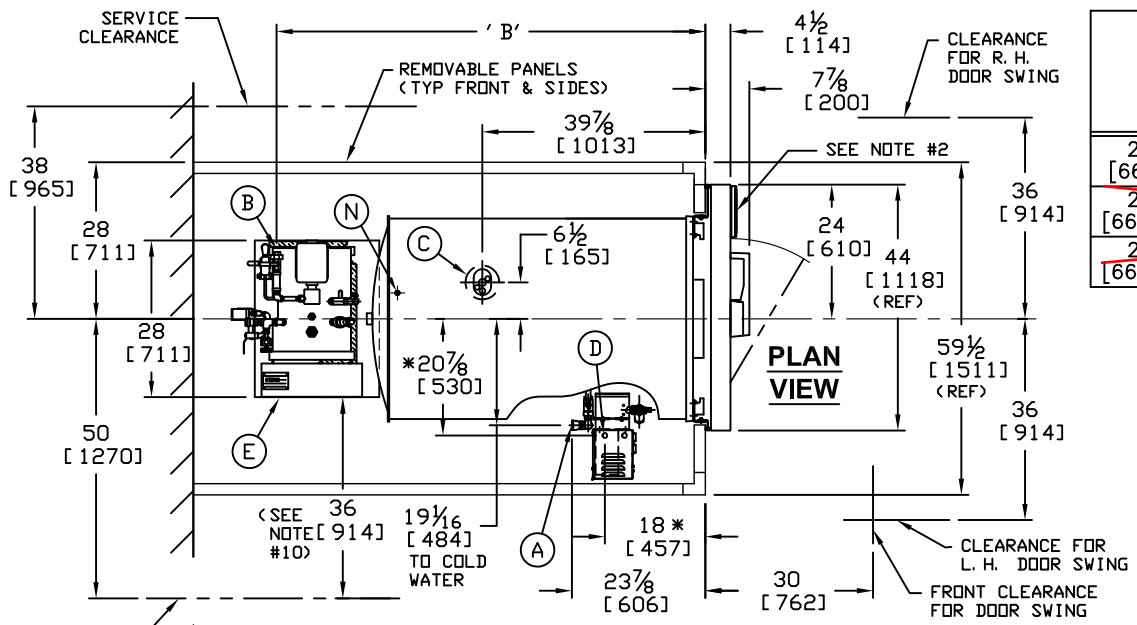
For further information, contact:

STERIS Life Sciences

STERIS Corporation
5960 Heisley Road
Mentor, OH 44060-1834 • USA
440-354-2600 • 800-548-4873
www.STERISLifeSciences.com

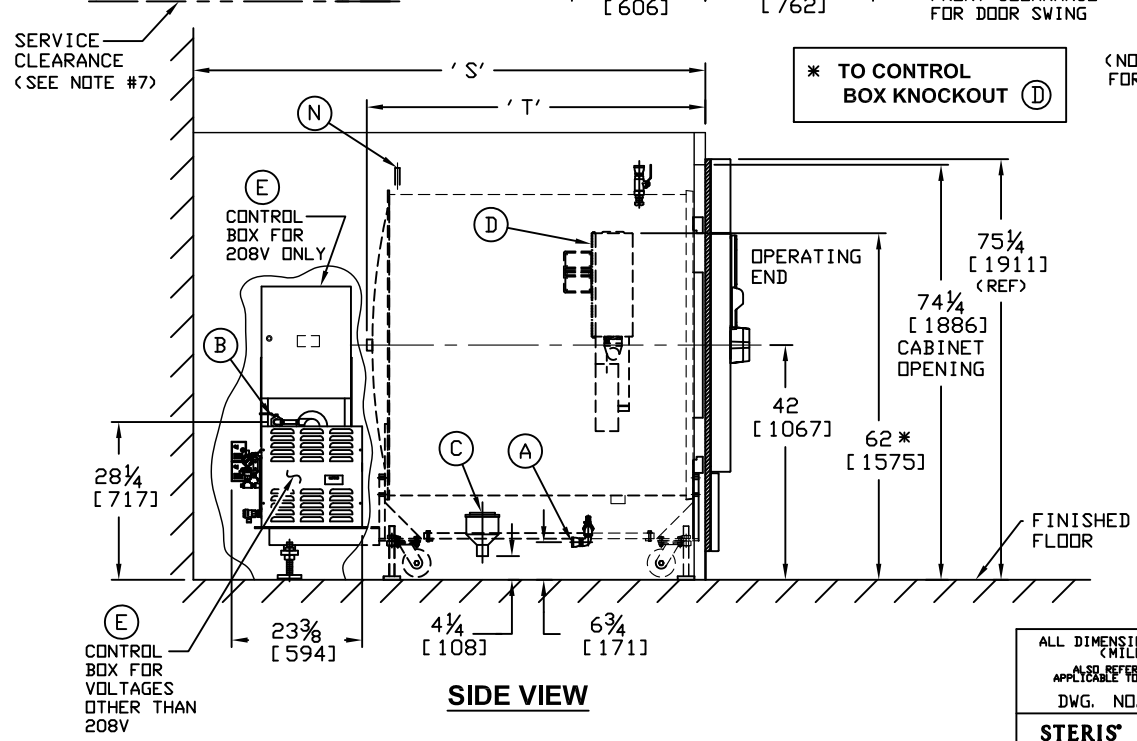
DATE: 09-20-17 DRAWN BY: HJR CHECKED BY: MAR

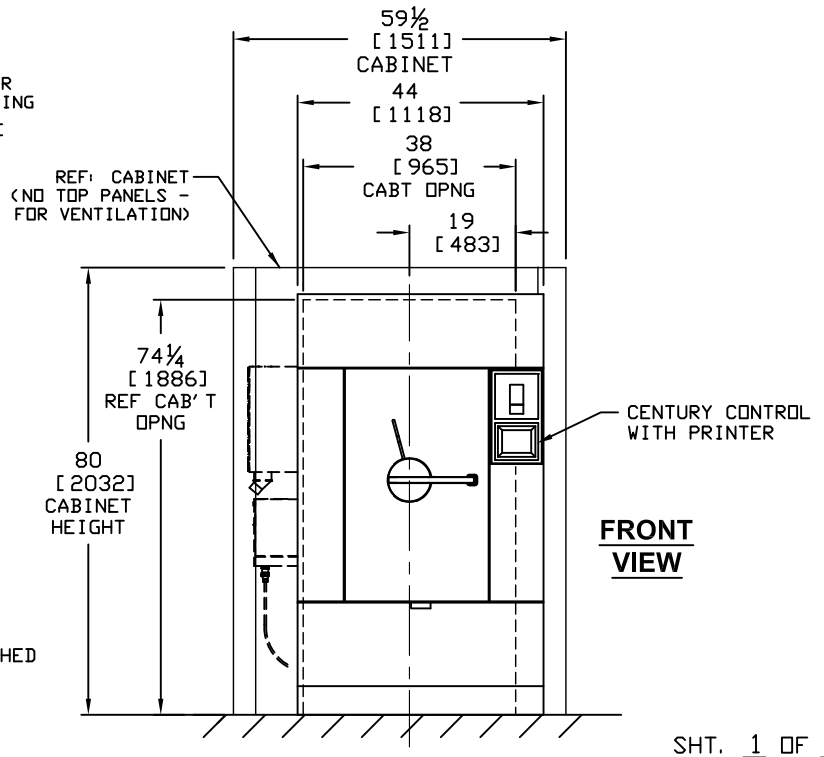
E. C. A. NO. _____ DATE 09-20-17 REV. 0 DWG. NO. 387363-970



STERILIZER SIZE	FRONT OF CAB'T TO REAR SERVICE CLEARANCE 'S' ±1/4 [±6]	FRONT OF CAB'T TO END OF STERILIZER (REF) 'T' ±1/4 [±6]	FRONT OF CAB'T TO Ⓑ UTILITY (HOT WATER) 'B'
26 X 37.5 X 36 [660 X 953 X 914]	79 1/2 (2019)	48 1/2 [1232]	64 3/4 [1645]
26 X 37.5 X 48 [660 X 953 X 1219]	91 1/2 (2324)	60 1/2 [1537]	76 3/4 [1948]
26 X 37.5 X 60 [660 X 953 X 1524]	103 1/2 (2629)	72 1/2 [1842]	88 3/4 [2254]

NOTES: 1. 48" LH HINGE STERILIZER SHOWN.
2. FOR SEISMIC INFO, SEE NOTE 11 ON SHEET 2.





SHT. 1 OF 3

ALL DIMENSIONS ARE IN INCHES (MILLIMETERS) ALSO REFER TO GENERAL NOTES APPLICABLE TO EQUIPMENT DRAWINGS DWG. NO. 62941-091		26x37.5 AMSCO CENTURY STER. VAC, SINGLE (HINGE) DOOR, CENTRY CONTROL, CABINET (MOD.) 45kW CS ELECTRIC STEAM GEN. REAR MOUNTED, COMP. AIR, SEISMIC	EQUIPMENT DRAWING NO. 387363-970
STERIS®	STERIS Corporation Mentor, OH		ITEM _____ LOCATION(S) _____ _____

AUTOCAD. DWG.

OPERATING REQUIREMENTS - DOMESTIC

Ⓐ COLD WATER: SUPPLY TEMPERATURE REQUIREMENT IS 70°F (21°C) MAX.. VACUUM EFFICIENCY IS REDUCED AT WATER TEMPERATURES ABOVE 70°F (21°C).

1" NPT
20-50 PSIG DYNAMIC (1.38-3.45 bar)

CONSUMPTION:
PEAK- 15 GPM (57 lpm)
AVERAGE-26 X 37.5 X 36 130 GPH (8.3 lpm)
26 X 37.5 X 48 130 GPH (8.3 lpm)
26 X 37.5 X 60 130 GPH (8.3 lpm)

Ⓑ HOT WATER: SUPPLY TEMPERATURE REQUIREMENTS ARE =<140°F (60°C). WATER RESITIVITY NOT TO EXEED 26000 OHMS/CM AND TOTAL HARDNESS NOT TO EXCEED 60 PPM (APPROX 3.5 GRAINS). PH MAINTAINED BETWEEN 6.8 AND 7.5 TOTAL DISSOLVED SOLIDS SHOULD NOT EXCEED 500 PPM AND ALKALINITY (BICARBONATE ONLY) SHOULD NOT EXCEED 250 PPM AS CALCIUM CARBONATE.

1/2" NPT: 20-50 DYNAMIC PSIG (137.9-344.7 KPA)
CONSUMPTION: PEAK 5 GPM, AVERAGE 0.5 GPM

Ⓒ DRAIN TERMINAL: 2" ODT (FLOOR DRAIN CAPACITY MUST HANDLE PEAK WATER CONSUMPTION).

Ⓓ CONTROL 1 PHASE POWER:
DOMESTIC: 120V, 50/60HZ, 15A, SINGLE PHASE ELECTRIC SERVICE.

Ⓔ VACUUM PUMP & GENERATOR HEATER 3 PHASE POWER:
~~208V, 50/60HZ, 132 AMPS/PH~~
~~(REF. SPECIAL CONTROL BOX, SHEET 1)~~
~~230/240V, 50/60HZ, 120 AMPS/PH~~
~~380/415V, 50/60HZ, 72 AMPS/PH~~
460/480V, 50/60HZ, 60 AMPS/PH
~~575/600V, 50/60HZ, 50 AMPS/PH~~

Ⓝ COMPRESSED AIR: 1/2"NPT DEHUMIDIFIED OIL FREE, 80-125 PSIG, 2 CFM.

G.C., Div. 22, 23 & 26 to coordinate all service connections.

GENERAL DOMESTIC NOTES:

1. DISASSEMBLED UNIT WIDTH IS 37 1/2". DOOR OPENINGS IN FACILITY MUST BE 38" WIDE OR LARGER TO ACCOMMODATE STERILIZER.
2. DISPLAY THIS SIDE FOR LH DOOR SWING AND OPPOSITE SIDE FOR RH DOOR SWING.
3. FOR GENERAL INSTALLATION INFORMATION SEE STERIS DRAWING NO. 62941-091. (THIS DWG. SHOULD ALWAYS ACCOMPANY THE EQUIPMENT DWGS.) IF DWG. IS NOT ATTACHED, CONTACT STERIS SERVICE ENGINEERING AT 1-800-333-8848 TO OBTAIN A COPY.
4. MAX. OPERATING WEIGHT BASED ON CHAMBER FULLY LOADED WITH WATER FLASKS:
   26 X 37.5 X 36 - 3800LBS (1720KG)
   ~~26 X 37.5 X 48 - 4200LBS (1901KG)~~
   ~~26 X 37.5 X 60 - 4700LBS (2127KG)~~
   ELEC. STEAM GEN. WEIGHT: 153 LBS (69KG) (SHIPPING)
   185 LBS (84KG) (OPERATING)
5. HEAT LOSS BTU/HR AT 70°F (21°C):
   26 X 37.5 X 36 - TO ROOM: 15150 BTU/HR
   ~~26 X 37.5 X 48 - TO ROOM: 17250 BTU/HR~~
   ~~26 X 37.5 X 60 - TO ROOM: 19400 BTU/HR~~
6. ALL DIMENSIONS IN INCHES AND (MM).
7. THIS SERVICE CLEARANCE MUST BE MAINTAINED TO ALLOW ACCESS TO STERILIZER FOR SERVICE ABILITY.
8. LEVELING FEET ARE PROVIDED FOR PROPER INSTALLATION.
9. IF LOADING CAR AND CARRIAGE ARE TO BE USED, FRONT CLEARANCE SHOULD EQUAL TWICE THE LENGTH OF THE STERILIZER.
10. MINIMUM CLEARANCE (36") TO MEET N. E. C. STANDARDS.
11. UNITS WITH SEISMIC MOUNTING MUST USE SEISMIC INSTALLATION KIT NO. 129373-573.

SHT. 2 OF 3

ALL DIMENSIONS ARE IN INCHES (MILLIMETERS) ALSO REFER TO GENERAL NOTES APPLICABLE TO EQUIPMENT DRAWINGS DWG. NO. 62941-091		26x37.5 AMSCO CENTURY STER. VAC, SINGLE (HINGE) DOOR, CENTRY CONTROL, CABINET (MOD.) 45kW CS ELECTRIC STEAM GEN. REAR MOUNTED, COMP. AIR, SEISMIC	EQUIPMENT DRAWING NO. 387363-970
STERIS®	STERIS Corporation Mentor, OH		ITEM _____ LOCATION(S) _____ _____

AUTOCAD. DWG.

DATE: 09-20-17 DRAWN BY: HJR CHECKED BY: MAR

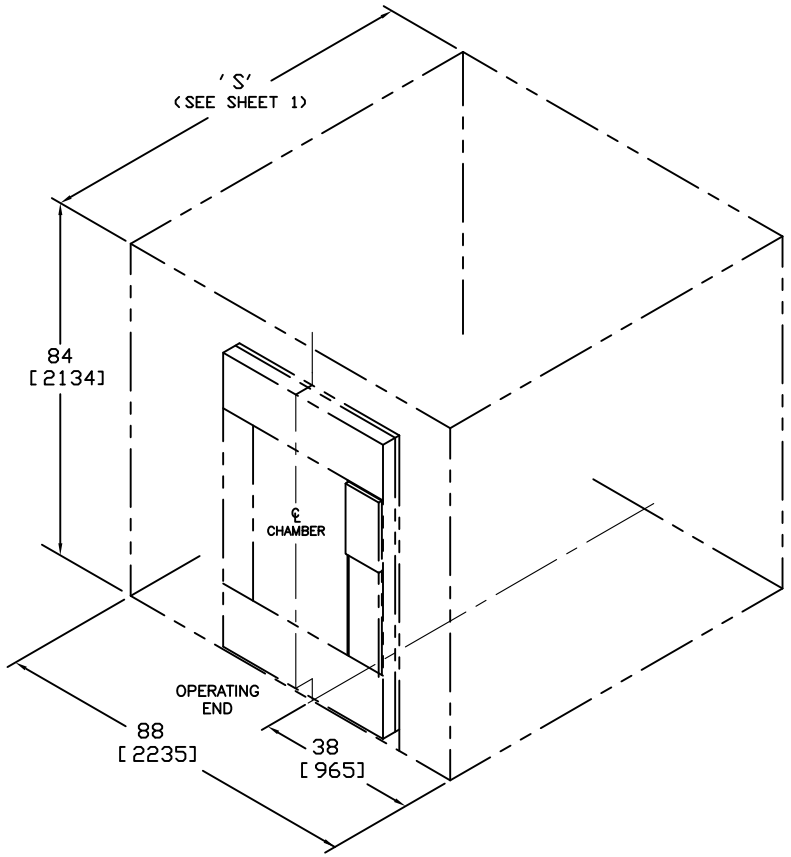
E. C. A. NO. _____ DATE 09-20-17 REV. 0 DWG. NO. 387363-970

INSTALLATION SPECIFICATIONS:

THE INSTALLATION OF THE AMSCO CENTURY STERILIZER MUST MEET ALL FEDERAL, STATE AND LOCAL REGULATIONS.

INSTALLATION SPECIFICATION IS LISTED AS ENGINEERING AND INSTALLATION GUIDES. REFERENCED COMPONENTS AND SERVICE CONNECTIONS ARE NOT FURNISHED AS PART OF EQUIPMENT UNLESS UNDER WRITTEN AGREEMENT WITH STERIS.

1. PIPE SIZES LISTED UNDER **OPERATING REQUIREMENTS** INDICATE THE EQUIPMENT TERMINATION SIZES ONLY. SIZE PIPING TO EQUIPMENT DEPENDING ON LENGTH OF PIPE RUN FROM PRESSURE REGULATING STATION FOR STEAM LINE AND MAIN WATER HEADERS. TO SUPPLY THE SPECIFIED SERVICE PRESSURE AND FLOW RATE AT EQUIPMENT TERMINALS, INCLUDE EFFECT OF COINCIDENT DRAW OF MULTIPLE UNIT INSTALLATIONS.
2. PROVIDE PIPING, SHUT-OFF VALVE, PIPE PLUGGED TEE, AND UNION IN STEAM & WATER SUPPLY CONNECTION BETWEEN EQUIPMENT AND STUB OUTS. PLUGGED TEE CAN LATER BE USED FOR TEST PRESSURE GAUGE CONNECTION. ARRANGE CONNECTION PIPING TO ALLOW ACCESS TO MACHINE COMPONENTS AND ELECTRICAL CONTROL PANEL.
3. RECOMMEND PROVISION OF BLOW DOWN VALVE AT EACH STEAM AND WATER STRAINER TO ENABLE STRAINER CLEAN OUT.
4. FOR RECOMMENDED FEED WATER QUALITY FOR STERILIZERS SEE STERIS DWG. NO. 62941-091.
5. BLOW DOWN BUILDING STEAM & WATER SUPPLY LINES BEFORE FINAL CONNECTION TO EQUIPMENT.
6. PROVIDE GROUPED OR GANGED CIRCUIT PROTECTION AND DISCONNECT FOR CONTROL POWER -D- AND VACUUM PUMP POWER -E- AS REQUIRED BY NEC AND LOCAL CODES. INDIVIDUAL POWER SHUTOFFS RECOMMENDED NEAR EACH MACHINE FOR SERVICING.
7. PROVIDE GROUNDED METAL CONDUIT AND WIRING BETWEEN EQUIPMENT TERMINALS AND STUB OUTS OR DISCONNECTS. 14 AWG. MINIMUM SIZE RECOMMENDED.
8. THE STERILIZER IS NOT SUPPLIED WITH A VACUUM BREAKER OR BACKFLOW PREVENTER AND WHERE REQUIRED BY LOCAL CODES, INSTALLATION OF SUCH A DEVICE IN WATER LINE IS BY OTHERS.
9. STERIS ASSUMES NO RESPONSIBILITY FOR CHANGES MADE NECESSARY THROUGH FAILURE TO OBSERVE THE SPECIFICATIONS ON EQUIPMENT DRAWING AND NOTE PAGES. SPECIFICATIONS AND DESCRIPTIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.



SPACE AVAILABILITY

THIS DRAWING SHOWS THE OVERALL SPACE NEEDED (INCLUDING SERVICE CLEARANCES), TO BE FREE OF BUILDING OBSTRUCTIONS FOR THIS INSTALLATION.

SHT. 3 OF 3

ALL DIMENSIONS ARE IN INCHES (MILLIMETERS) ALSO REFER TO GENERAL NOTES APPLICABLE TO EQUIPMENT DRAWINGS DWG. NO. 62941-091		26x37.5 AMSCO CENTURY STER. VAC, SINGLE (HINGE) DOOR, CENTRY CONTROL, CABINET (MOD.) 45kW CS ELECTRIC STEAM GEN. REAR MOUNTED, COMP. AIR, SEISMIC	EQUIPMENT DRAWING NO. 387363-970
STERIS®	STERIS Corporation Mentor, OH		ITEM _____ LOCATION(S) _____ _____

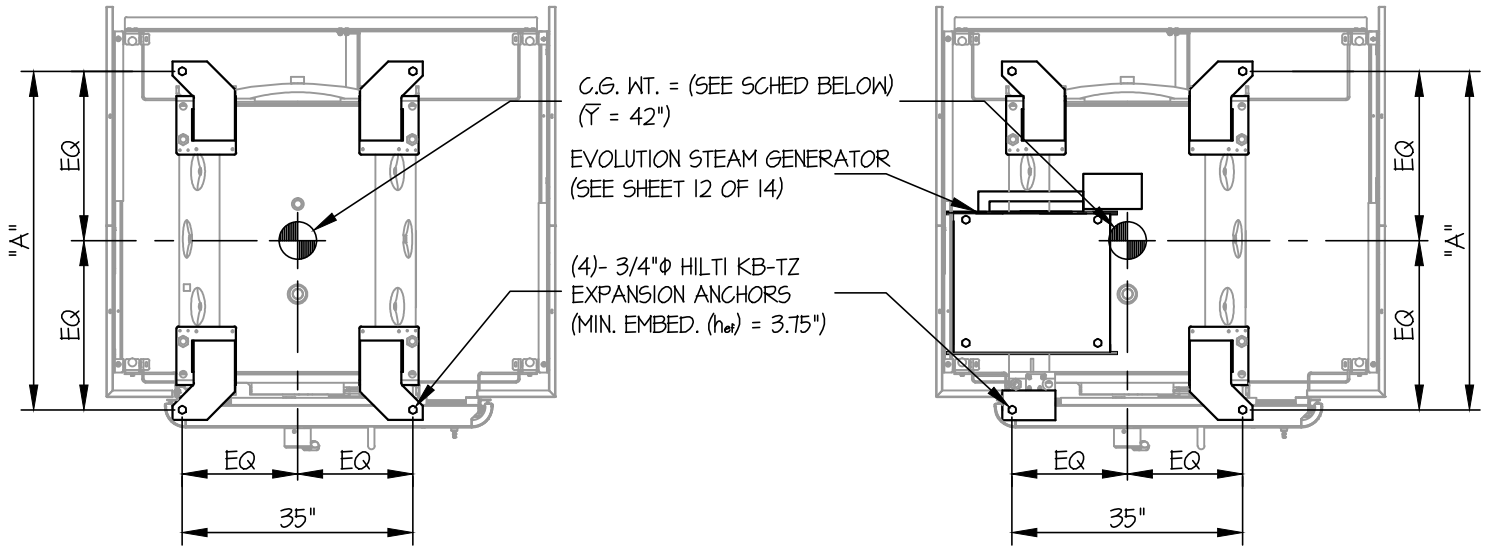
AUTOCAD DWG.

STERIS CORPORATION

AMSCO, EVOLUTION & CENTURY STEAM STERILIZERS 26 X 37.5

DES. J. ROBERSON
JOB NO. 14-1702
DATE 1/30/17
SHEET 2 OF 14 SHEETS

SEISMIC ANCHORAGE — $S_{DS} \leq 1.70$, z/h = 0 — SLAB ON GRADE



PLAN AT BASE
(STANDARD SEISMIC BASE)

PLAN AT BASE
(STEAM GENERATOR SEISMIC BASE)

	MODEL	UNIT SIZE	WEIGHT (LB)	DIM. "A" (IN.)	T_U (LB/BOLT)	V_U (LB/BOLT)
	EVOLUTION 42 SD	65 X 91.25 X 77.25	3800	51.375	2626	1093
	EVOLUTION 54 SD	77 X 91.25 X 77.25	4200	63.375	2790	1208
*	EVOLUTION 66 SD	89 X 91.25 X 77.25	4700	75.375	3037	1351
	EVOLUTION 42 DD	62.25 X 91.25 X 77.25	3800	51.875	2621	1093
	EVOLUTION 54 DD	65.25 X 91.25 X 77.25	4200	63.875	2786	1208
	EVOLUTION 66 DD	77.25 X 91.25 X 77.25	4700	75.875	3034	1351

* THIS UNIT USED IN CALCULATION BELOW.

LOADS: PER 2016 CALIFORNIA BUILDING CODE AND ASCE 7-10.
STRENGTH DESIGN IS USED (S_{DS} = 1.70, a_p = 1.0, I_p = 1.5, R_p = 1.5, Ω_0 = 1.5, z/h = 0)
WEIGHT = 4700 LB
HORIZONTAL FORCE (E_{mh}) = 1.15 W_p = 5405 LB
VERTICAL FORCE (E_v) = 0.34 W_p = 1598 LB

BOLT SPEC: 3/4"ϕ HILTI KB-TZ (h_{ef} = 4.75")
ϕT=0.75ϕNn = 3296 LB/BOLT (TENSION
ϕV= ϕVn = 7634 LB/BOLT (SHEAR)

BOLT FORCES:

TENSION (T)

$$T_{U\ MAXIMUM} = \left[\frac{5405\#(42'')}{2\ BOLTS\ (75.38'')} \times (0.3)\right] + \frac{5405\#(42'')}{2\ BOLTS\ (35'')} - \frac{4700\#(0.9) - 1598\#}{4\ BOLTS} = 3037\ LB/BOLT\ (MAX)$$

(HORIZ. - FRONT TO BACK) (HORIZ - SIDE TO SIDE) (WEIGHT (0.9) - E_v)

SHEAR (V)

$$V_{U\ MAXIMUM} = \frac{5405}{4\ BOLTS} = 1351\ LB/BOLT\ (MAX)$$

UNITY CHECK:

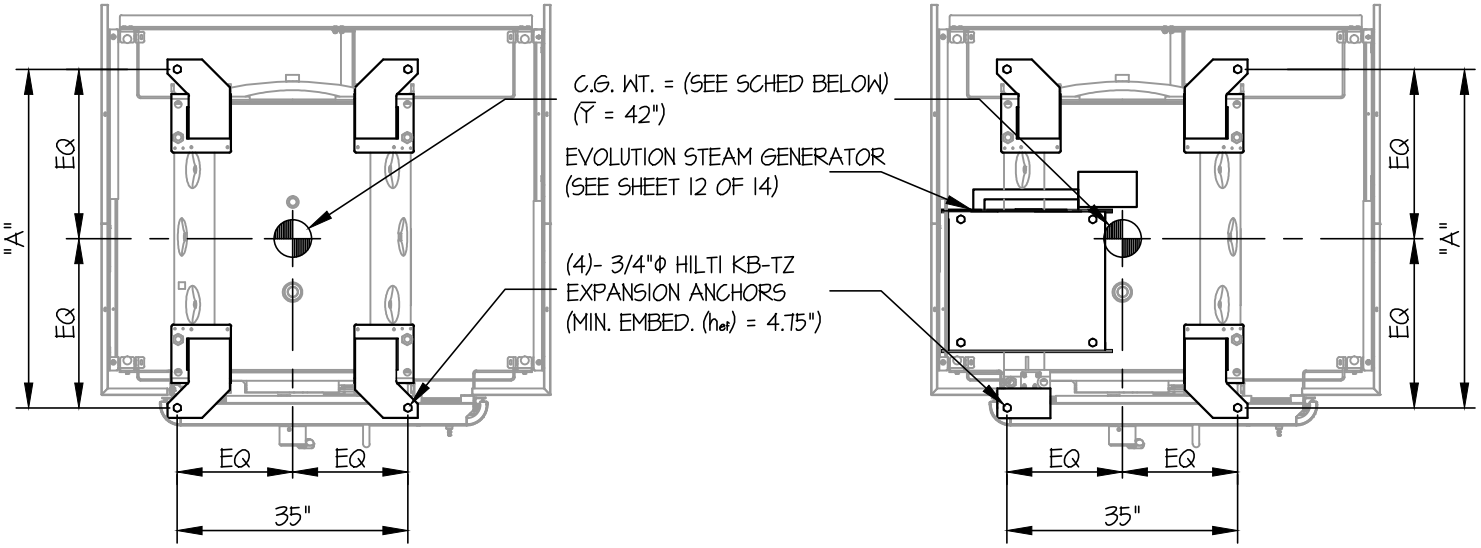
$$\left(\frac{T_U}{\phi T}\right) + \left(\frac{V_U}{\phi V}\right) \leq 1.2 \quad \left(\frac{3037}{3296}\right) + \left(\frac{1351}{7634}\right) = 1.10 \leq 1.2 \ \therefore \ \underline{O.K.}$$

STERIS CORPORATION

AMSCO, EVOLUTION & CENTURY STEAM STERILIZERS 26 X 37.5

DES. J. ROBERSON | JOB NO. 14-1702 | DATE 1/30/17 | SHEET 3 OF 14 SHEETS

SEISMIC ANCHORAGE — $S_{DS} \leq 2.2$, z/h = 0 — SLAB ON GRADE



PLAN AT BASE
(STANDARD SEISMIC BASE)

PLAN AT BASE
(STEAM GENERATOR SEISMIC BASE)

	MODEL	UNIT SIZE	WEIGHT (LB)	DIM. "A" (IN.)	T_U (LB/BOLT)	V_U (LB/BOLT)
	EVOLUTION 42 SD	65 X 91.25 X 77.25	3800	51.375	3655	1416
	EVOLUTION 54 SD	77 X 91.25 X 77.25	4200	63.375	3894	1565
*	EVOLUTION 66 SD	89 X 91.25 X 77.25	4700	75.375	4247	1751
	EVOLUTION 42 DD	62.25 X 91.25 X 77.25	3800	51.875	3648	1416
	EVOLUTION 54 DD	65.25 X 91.25 X 77.25	4200	63.875	3889	1565
	EVOLUTION 66 DD	77.25 X 91.25 X 77.25	4700	75.875	4243	1751

* THIS UNIT USED IN CALCULATION BELOW.

LOADS: PER 2016 CALIFORNIA BUILDING CODE AND ASCE 7-10.
STRENGTH DESIGN IS USED (S_{DS} = 2.20, a_p = 1.0, I_p = 1.5, R_p = 1.5, Ω_0 = 1.5, z/h = 0)

WEIGHT = 4700 LB

HORIZONTAL FORCE (E_{mh}) = 1.49 W_p = 7003 LB

VERTICAL FORCE (E_v) = 0.44 W_p = 2068 LB

BOLT SPEC: 3/4"ø HILTI KB-TZ (h_{ef} = 4.75")
$\phi T = 0.75\phi N_n$ = 4699 LB/BOLT (TENSION
$\phi V = \phi V_n$ = 7634 LB/BOLT (SHEAR)

BOLT FORCES:

TENSION (T)

$$T_{U\ MAXIMUM} = \left[\frac{7003\#(42'')}{2\ BOLTS\ (75.38'')} \times (0.3)\right] + \frac{7003\#(42'')}{2\ BOLTS\ (35'')} - \frac{4700\#(0.9) - 2068\#}{4\ BOLTS} = 4247\ LB/BOLT\ (MAX)$$

(HORIZ. - FRONT TO BACK) (HORIZ. - SIDE TO SIDE) (WEIGHT (0.9) - E_v)

SHEAR (V)

$$V_{U\ MAXIMUM} = \frac{7003\#}{4\ BOLTS} = 1751\ LB/BOLT\ (MAX)$$

UNITY CHECK:

$$\left(\frac{T_U}{\phi T}\right) + \left(\frac{V_U}{\phi V}\right) \leq 1.2 \quad \left(\frac{4247}{4699}\right) + \left(\frac{1751}{7634}\right) = 1.14 \leq 1.2 \ \therefore\ \underline{O.K.}$$

STERIS CORPORATION

AMSCO, EVOLUTION & CENTURY STEAM STERILIZERS 26 X 37.5

DES. J. ROBERSON
JOB NO. 14-1702
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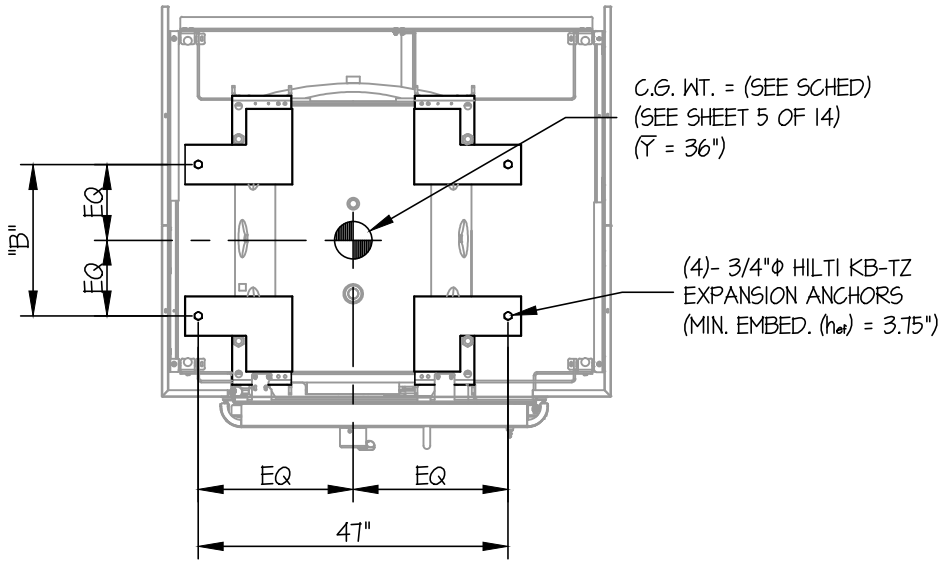
SHEET 4 OF 14 SHEETS

SEISMIC ANCHORAGE — $S_{DS} \leq 1.50$, z/h = 0 — SLAB ON GRADE



PLAN AT BASE

LOADS: PER 2016 CALIFORNIA BUILDING CODE AND ASCE 7-10.
STRENGTH DESIGN IS USED (S_{DS} = 1.50, a_p = 1.0, I_p = 1.5, R_p = 1.5, Ω_0 = 1.5, z/h = 0)
WEIGHT = 3800 LB
HORIZONTAL FORCE (E_{mh}) = 1.01 W_p = 3838 LB
VERTICAL FORCE (E_v) = 0.30 W_p = 1140 LB

BOLT SPEC: 3/4"ø HILTI KB-TZ (h_{ef} = 3.75")
$\phi T = 0.75\phi N_n$ = 3296 LB/BOLT (TENSION
$\phi V = \phi V_n$ = 7634 LB/BOLT (SHEAR)

BOLT FORCES:

TENSION (T)

$$T_{u\ MAXIMUM} = \left[\frac{3838\#(36'')}{2\ BOLTS\ (47'')} \times (0.3)\right] + \frac{3838\#(36'')}{2\ BOLTS\ (23'')} - \frac{3800\#(0.9) - 1140\#}{4\ BOLTS} = 2875\ LB/BOLT\ (MAX)$$

(HORIZ - SIDE TO SIDE) (HORIZ - FRONT TO BACK) (WEIGHT (0.9) - E_v)

SHEAR (V)

$$V_{u\ MAXIMUM} = \frac{3838\#}{4\ BOLTS} = 960\ LB/BOLT\ (MAX)$$

UNITY CHECK:

$$\left(\frac{T_u}{\phi T}\right) + \left(\frac{V_u}{\phi V}\right) \leq 1.2 \qquad \left(\frac{2875}{3296}\right) + \left(\frac{960}{7634}\right) = 1.00 \leq 1.2 \ \therefore \ \text{O.K.}$$

STERIS CORPORATION

AMSCO, EVOLUTION & CENTURY STEAM STERILIZERS 26 X 37.5

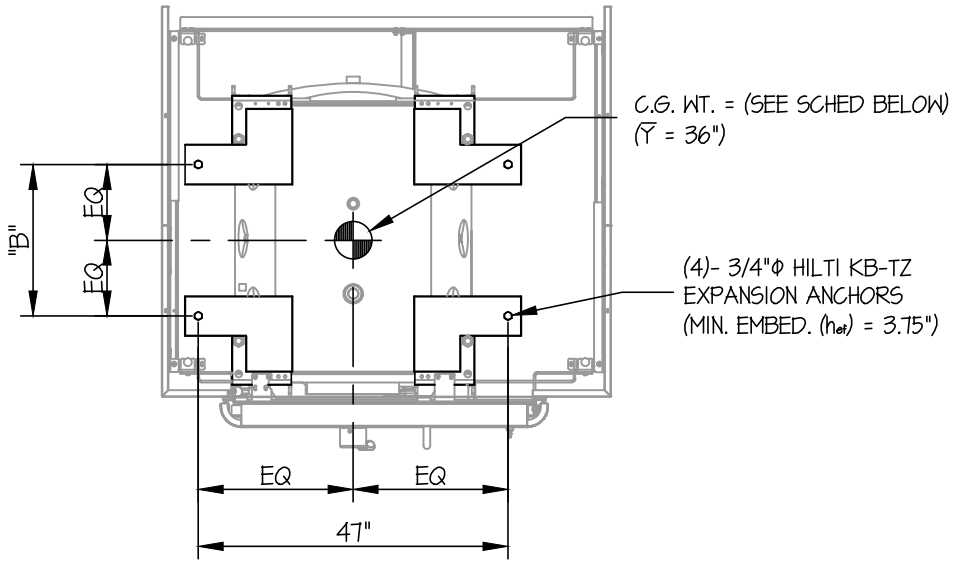
DES. J. ROBERSON
JOB NO. 14-1702
DATE 1/30/17

SHEET 5 OF 14 SHEETS

SEISMIC ANCHORAGE

$S_{DS} \leq 1.50$, $z/h = 0$

SLAB ON GRADE



PLAN AT BASE

	MODEL	UNIT SIZE	WEIGHT (LB)	DIM. "B" (IN.)	T_u (LB/BOLT)	V_u (LB/BOLT)
*	AMSCO 400 36 SD	63.5 X 70 X 75.25	3800	23	2875	960
	AMSCO 400 48 SD	75.5 X 70 X 75.25	4200	35	2039	1061
	AMSCO 400 60 SD	87.5 X 70 X 75.25	4700	47	1658	1187
	AMSCO 400 36 DD	62.25 X 70 X 75.25	3800	23.5	2811	960
	AMSCO 400 48 DD	74.25 X 70 X 75.25	4200	35.5	2008	1061
	AMSCO 400 60 DD	86.25 X 70 X 75.25	4700	47.5	1653	1187
	CENTURY 36 SD	59 X 70 X 75.25	3800	23	2875	960
	CENTURY 48 SD	71 X 70 X 75.25	4200	35	2039	1061
	CENTURY 60 SD	83 X 70 X 75.25	4700	47	1658	1187
	CENTURY 36 DD	58.25 X 70 X 75.25	3800	23.5	2811	960
	CENTURY 48 DD	70.25 X 70 X 75.25	4200	35.5	2008	1061
	CENTURY 60 DD	82.25 X 70 X 75.25	4700	47.5	1653	1187

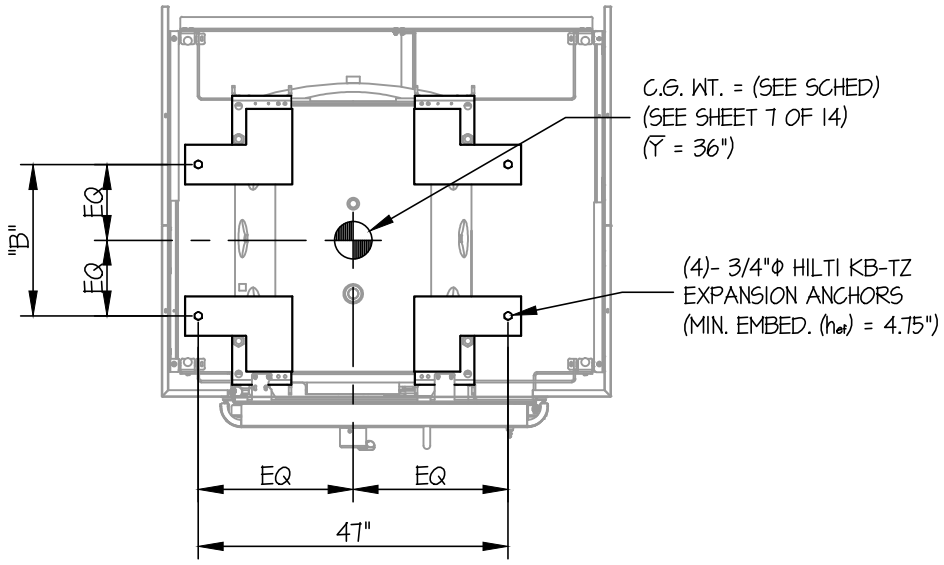
* THIS UNIT USED IN CALCULATION ON SHEET 4 OF 14.

STERIS CORPORATION

AMSCO, EVOLUTION & CENTURY STEAM STERILIZERS 26 X 37.5

DES. J. ROBERSON
JOB NO. 14-1702
DATE 1/30/17
SHEET 6 OF 14 SHEETS

SEISMIC ANCHORAGE | $S_{DS} \leq 2.00$, z/h = 0 | SLAB ON GRADE



PLAN AT BASE

LOADS: PER 2016 CALIFORNIA BUILDING CODE AND ASCE 7-10.
STRENGTH DESIGN IS USED (S_{DS} = 2.00, a_p = 1.0, I_p = 1.5, R_p = 1.5, Ω_0 = 1.5, z/h = 0)
WEIGHT = 3800 LB
HORIZONTAL FORCE (E_{mh}) = 1.35 W_p = 5130 LB
VERTICAL FORCE (E_v) = 0.40 W_p = 1520 LB

BOLT SPEC: 3/4"ø HILTI KB-TZ (h_{ef} = 4.75")
$\phi T = 0.75\phi N_n$ = 4699 LB/BOLT (TENSION
$\phi V = \phi V_n$ = 7634 LB/BOLT (SHEAR)

BOLT FORCES:

TENSION (T)

$$T_{u\ MAXIMUM} = \left[\frac{5130\#(36'')}{2\ BOLTS\ (47'')} \times (0.3)\right] + \frac{5130\#(36'')}{2\ BOLTS\ (23'')} - \frac{3800\#(0.9) - 1520\#}{4\ BOLTS} = 4129\ LB/BOLT\ (MAX)$$

(HORIZ - SIDE TO SIDE) (HORIZ - FRONT TO BACK) (WEIGHT (0.9) - E_v)

SHEAR (V)

$$V_{u\ MAXIMUM} = \frac{5130\#}{4\ BOLTS} = 1283\ LB/BOLT\ (MAX)$$

UNITY CHECK:

$$\left(\frac{T_u}{\phi T}\right) + \left(\frac{V_u}{\phi V}\right) \leq 1.2 \quad \left(\frac{4129}{4699}\right) + \left(\frac{1283}{7634}\right) = 1.05 \leq 1.2 \ \therefore \ \text{O.K.}$$

STERIS CORPORATION

AMSCO, EVOLUTION & CENTURY STEAM STERILIZERS 26 X 37.5

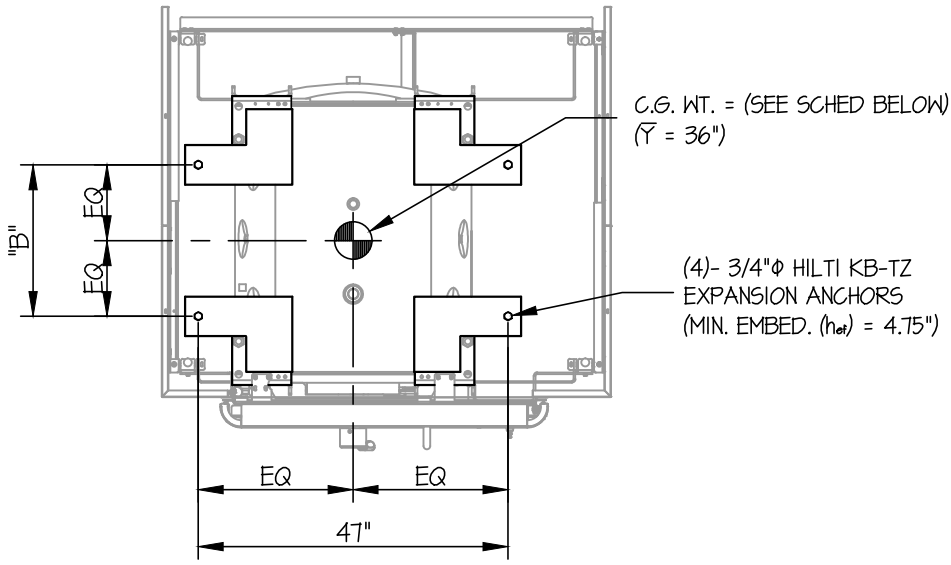
DES. J. ROBERSON
JOB NO. 14-1702
DATE 1/30/17

SHEET 7 OF 14 SHEETS

SEISMIC ANCHORAGE

$S_{DS} \leq 2.00$, z/h = 0

SLAB ON GRADE



PLAN AT BASE

	MODEL	UNIT SIZE	WEIGHT (LB)	DIM. "B" (IN.)	T u (LB/BOLT)	Vu (LB/BOLT)
*	AMSCO 400 36 SD	63.5 X 70 X 75.25	3800	23	4129	1283
	AMSCO 400 48 SD	75.5 X 70 X 75.25	4200	35	3042	1418
	AMSCO 400 60 SD	87.5 X 70 X 75.25	4700	47	2572	1586
	AMSCO 400 36 DD	62.25 X 70 X 75.25	3800	23.5	4044	1283
	AMSCO 400 48 DD	74.25 X 70 X 75.25	4200	35.5	3001	1418
	AMSCO 400 60 DD	86.25 X 70 X 75.25	4700	47.5	2564	1586
	CENTURY 36 SD	59 X 70 X 75.25	3800	23	4129	1283
	CENTURY 48 SD	71 X 70 X 75.25	4200	35	3042	1418
	CENTURY 60 SD	83 X 70 X 75.25	4700	47	2572	1586
	CENTURY 36 DD	58.25 X 70 X 75.25	3800	23.5	4044	1283
	CENTURY 48 DD	70.25 X 70 X 75.25	4200	35.5	3001	1418
	CENTURY 60 DD	82.25 X 70 X 75.25	4700	47.5	2564	1586

* THIS UNIT USED IN CALCULATION ON SHEET 6 OF 14.

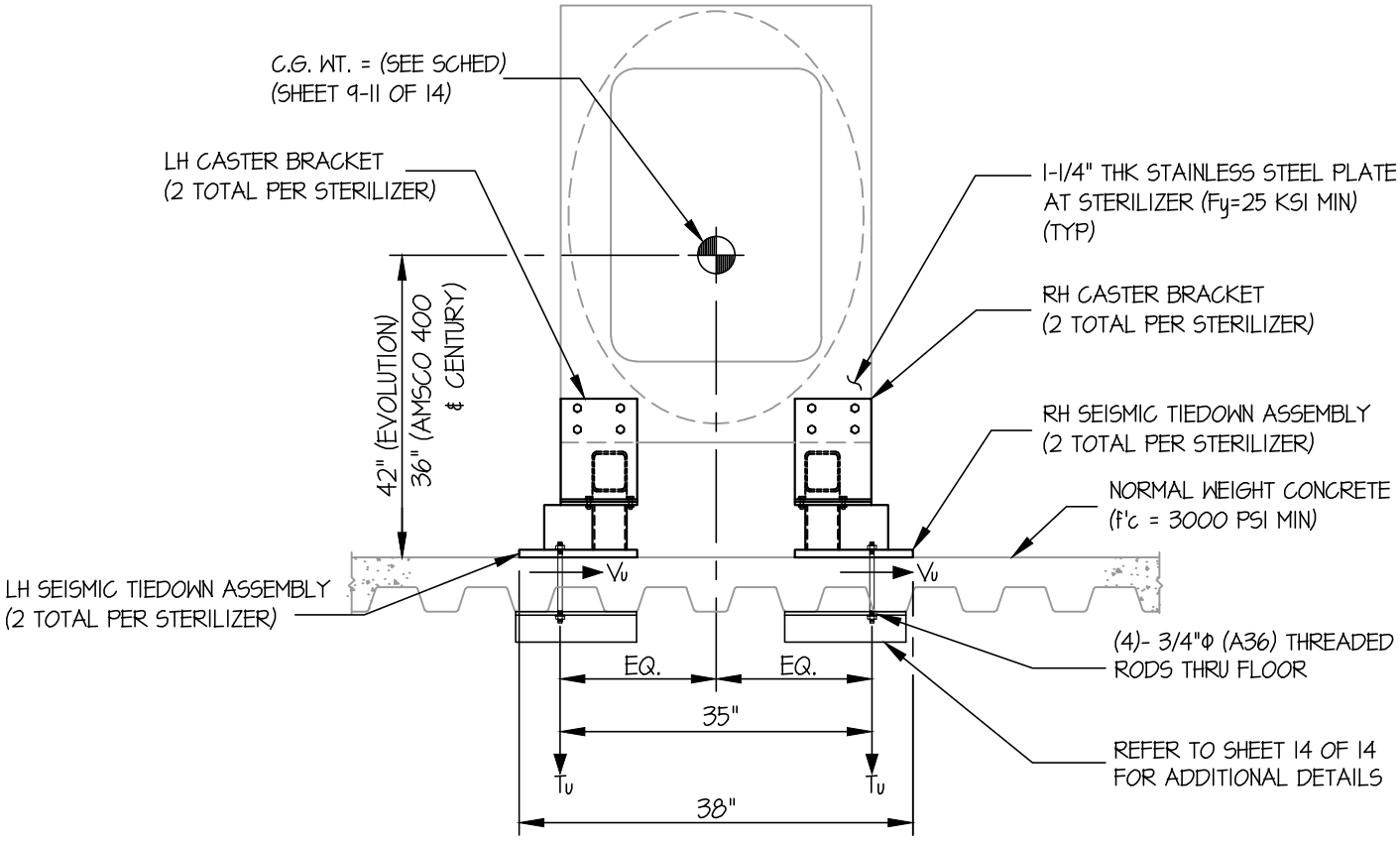
STERIS CORPORATION

AMSCO, EVOLUTION & CENTURY STEAM STERILIZERS 26 X 37.5

DES. J. ROBERSON
JOB NO. 14-1702
DATE 1/30/17
SHEET 8 OF 14 SHEETS

SEISMIC ANCHORAGE

UPPER FLOOR



FRONT ELEVATION

NOTES:

1. **FORCES ARE DETERMINED PER 2016 CALIFORNIA BUILDING CODE AND ASCE 7-10.**
   STRENGTH DESIGN IS USED. (S_{DS} = 2.00, a_p = 1.0, I_p = 1.5, R_p = 1.5, $z/h \leq 1$)

   HORIZONTAL FORCE (E_h) = 2.40 W_p
   VERTICAL FORCE (E_v) = 0.40 W_p

2. CENTER OF GRAVITY (C.G.) AND WEIGHT ARE THE GOVERNING PARAMETERS FOR DESIGN. THIS PREAPPROVAL ENCOMPASSES ALL WEIGHTS UP TO THE MAXIMUM WEIGHT SHOWN.

3. STRUCTURAL ENGINEER OF RECORD FOR THE BUILDING SHALL PROVIDE SUPPORT STRUCTURE DESIGNED TO SUPPORT WEIGHTS AND FORCES SHOWN IN COMBINATION WITH ALL OTHER LOADS THAT MAY BE PRESENT.

REGISTERED PROFESSIONAL ENGINEER
JONATHAN ROBERSON
No. 4197
EXP. 6-30-2018
1/30/17
STRUCTURAL
STATE OF CALIFORNIA

STERIS CORPORATION

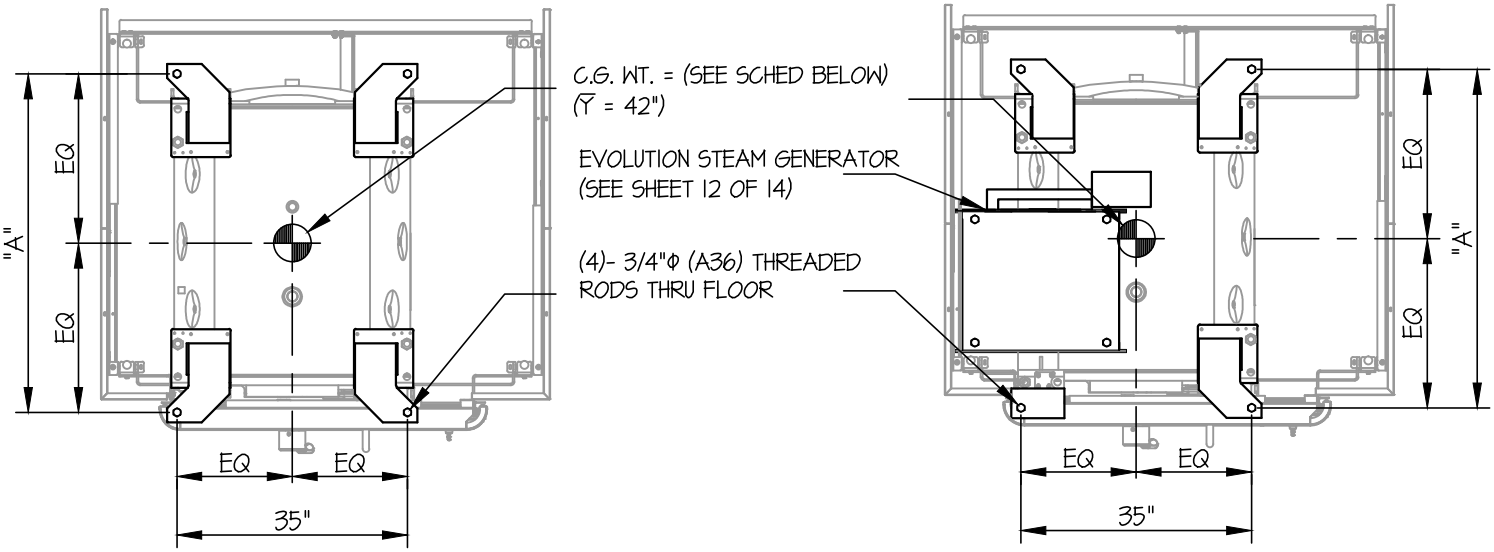
AMSCO, EVOLUTION & CENTURY STEAM STERILIZERS 26 X 37.5

DES. J. ROBERSON
JOB NO. 14-1702
DATE 1/30/17
SHEET 9 OF 14 SHEETS

SEISMIC ANCHORAGE

$S_{DS} \leq 2.00$, $z/h \leq 1$

UPPER FLOOR



PLAN AT BASE
(STANDARD SEISMIC BASE)

PLAN AT BASE
(STEAM GENERATOR SEISMIC BASE)

	MODEL	UNIT SIZE	WEIGHT (LB)	DIM. "A" (IN.)	T_u (LB/BOLT)	V_u (LB/BOLT)
	EVOLUTION 42 SD	65 X 91.25 X 77.25	3800	51.375	6115	2280
	EVOLUTION 54 SD	77 X 91.25 X 77.25	4200	63.375	6525	2520
*	EVOLUTION 66 SD	89 X 91.25 X 77.25	4700	75.375	7123	2820
	EVOLUTION 42 DD	62.25 X 91.25 X 77.25	3800	51.875	6105	2280
	EVOLUTION 54 DD	65.25 X 91.25 X 77.25	4200	63.875	6517	2520
	EVOLUTION 66 DD	77.25 X 91.25 X 77.25	4700	75.875	7117	2820

* THIS UNIT USED IN CALCULATION BELOW.

LOADS: PER 2016 CALIFORNIA BUILDING CODE AND ASCE 7-10.
STRENGTH DESIGN IS USED (S_{DS} = 2.00, a_p = 1.0, I_p = 1.5, R_p = 1.5, $z/h \leq 1$)
WEIGHT = 4700 LB
HORIZONTAL FORCE (E_h) = 2.40 W_p = 11,280 LB
VERTICAL FORCE (E_v) = 0.40 W_p = 1880 LB

BOLT SPEC: 3/4"ø (A36) THREADED ROD
ϕT = 14,420 LB/BOLT
ϕV = 7691 LB/BOLT

BOLT FORCES:

TENSION (T)

$$T_{u\ MAXIMUM} = \left[\frac{11280\#(42'')}{2\ BOLTS\ (75.38'')} \times (0.3)\right] + \frac{11280\#(42'')}{2\ BOLTS\ (35'')} - \frac{4700\#(0.9) - 1880\#}{4\ BOLTS} = 7123\ LB/BOLT\ (MAX)$$

(HORIZ. - SIDE TO SIDE) (HORIZ. - FRONT TO BACK) (WEIGHT (0.9) - E_v)

SHEAR (V)

$$V_{u\ MAXIMUM} = \frac{11280\#}{4\ BOLTS} = 2820\ LB/BOLT\ (MAX)$$

STERIS CORPORATION

AMSCO, EVOLUTION & CENTURY STEAM STERILIZERS 26 X 37.5

DES. J. ROBERSON
JOB NO. 14-1702
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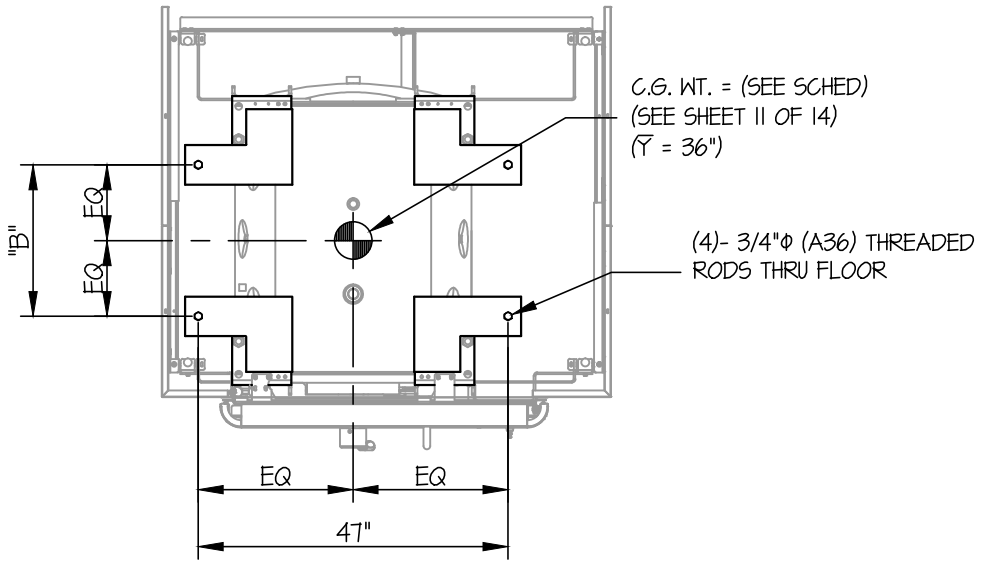
SHEET 10 OF 14 SHEETS

SEISMIC ANCHORAGE

$S_{DS} \leq 2.00$, $z/h \leq 1$

UPPER FLOOR



PLAN AT BASE

LOADS: PER 2016 CALIFORNIA BUILDING CODE AND ASCE 7-10.
STRENGTH DESIGN IS USED (S_{DS} = 2.00, a_p = 1.0, I_p = 1.5, R_p = 1.5, $z/h \leq 1$)
WEIGHT = 3800 LB (AMSCO 400 36 SD)
HORIZONTAL FORCE (E_h) = 2.40 W_p = 9120 LB
VERTICAL FORCE (E_v) = 0.40 W_p = 1520 LB

BOLT FORCES:

BOLT SPEC: 3/4"ø (A36) THREADED ROD
ϕT = 14,420 LB/BOLT
ϕV = 7691 LB/BOLT

TENSION (T)

$$T_{u\ MAXIMUM} = \left[\frac{9120\#(36'')}{2\ BOLTS\ (47'')} \times (0.3) \right] + \frac{9120\#(36'')}{2\ BOLTS\ (23'')} - \frac{3800\#(0.9) - 1520\#}{4\ BOLTS} = 7710\ LB/BOLT\ (MAX)$$

(HORIZ. - SIDE TO SIDE) (HORIZ. - FRONT TO BACK) (WEIGHT (0.9) - E_v)

SHEAR (V)

$$V_{u\ MAXIMUM} = \frac{9120\#}{4\ BOLTS} = 2280\ LB/BOLT\ (MAX)$$

STERIS CORPORATION

AMSCO, EVOLUTION & CENTURY STEAM STERILIZERS 26 X 37.5

DES. J. ROBERSON
JOB NO. 14-1702
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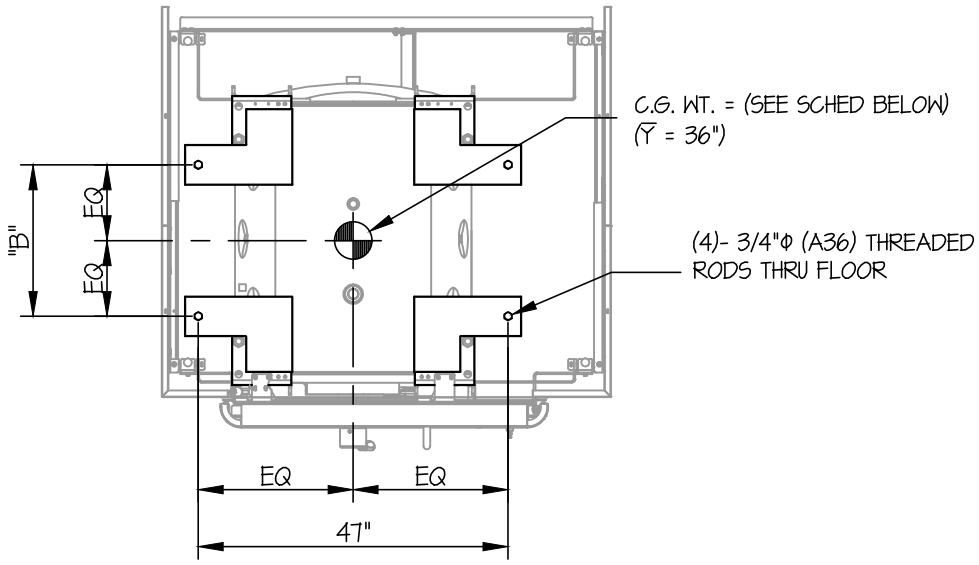
SHEET 11 OF 14 SHEETS

SEISMIC ANCHORAGE

$S_{DS} \leq 2.00$, $z/h \leq 1$

UPPER FLOOR



PLAN AT BASE

	MODEL	UNIT SIZE	WEIGHT (LB)	DIM. "B" (IN.)	T_u (LB/BOLT)	V_u (LB/BOLT)
*	AMSCO 400 36 SD	63.5 X 70 X 75.25	3800	23	7710	2280
	AMSCO 400 48 SD	75.5 X 70 X 75.25	4200	35	5817	2520
	AMSCO 400 60 SD	87.5 X 70 X 75.25	4700	47	5029	2820
	AMSCO 400 36 DD	62.25 X 70 X 75.25	3800	23.5	7558	2280
	AMSCO 400 48 DD	74.25 X 70 X 75.25	4200	35.5	5744	2520
	AMSCO 400 60 DD	86.25 X 70 X 75.25	4700	47.5	5015	2820
	CENTURY 36 SD	59 X 70 X 75.25	3800	23	7710	2280
	CENTURY 48 SD	71 X 70 X 75.25	4200	35	5817	2520
	CENTURY 60 SD	83 X 70 X 75.25	4700	47	5029	2820
	CENTURY 36 DD	58.25 X 70 X 75.25	3800	23.5	7558	2280
	CENTURY 48 DD	70.25 X 70 X 75.25	4200	35.5	5744	2520
	CENTURY 60 DD	82.25 X 70 X 75.25	4700	47.5	5015	2820

* THIS UNIT USED IN CALCULATION SEE SHEET 10 OF 14.

STERIS CORPORATION

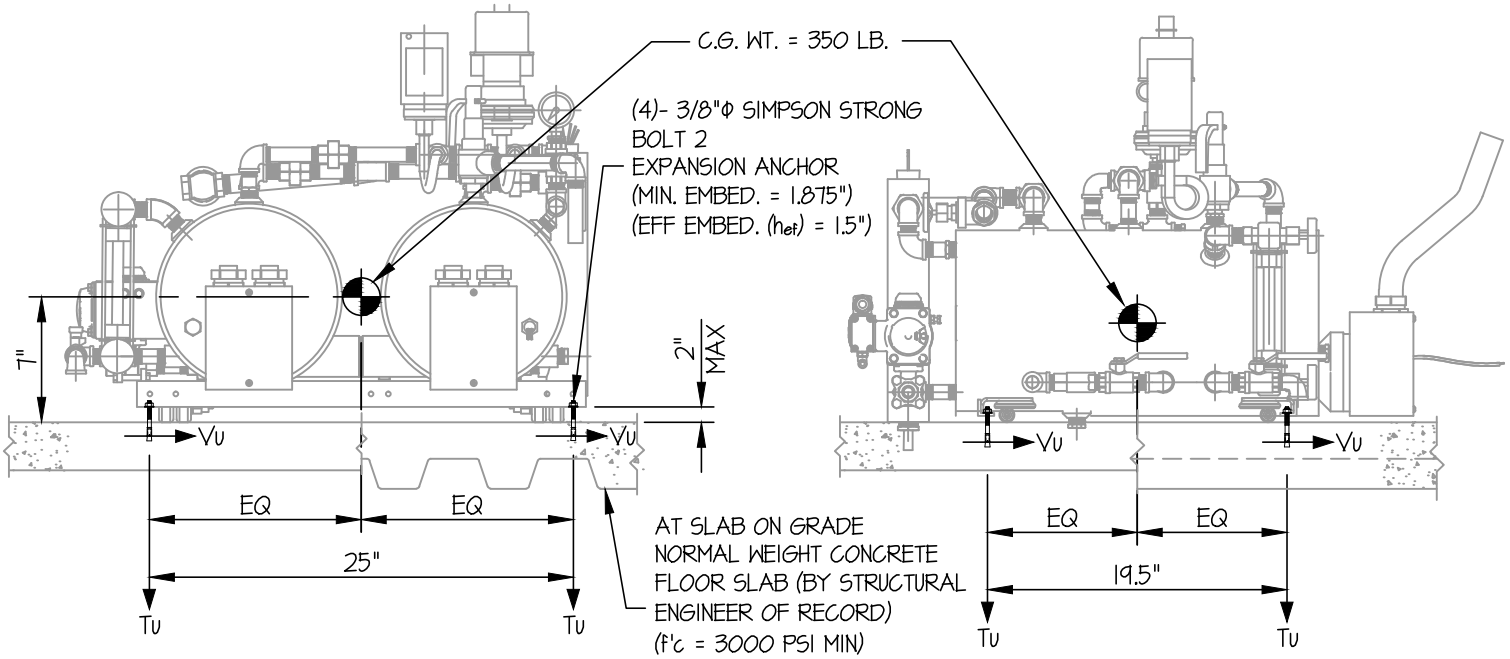
AMSCO, EVOLUTION & CENTURY STEAM STERILIZERS 26 X 37.5

DES.	J. ROBERSON
JOB NO.	14-1702
DATE	1/30/17

SHEET 12 OF 14 SHEETS

SEISMIC ANCHORAGE

UPPER FLOOR



FRONT ELEVATION
(EVOLUTION STEAM GENERATOR)

SIDE ELEVATION
(EVOLUTION STEAM GENERATOR)

NOTES:

1. **FORCES ARE DETERMINED PER 2016 CALIFORNIA BUILDING CODE AND ASCE 7-10.**
   STRENGTH DESIGN IS USED. (S_{DS} = 2.00, a_p = 1.0, I_p = 1.5, R_p = 1.5, Ω_o = 1.5, z/h = 0)

   HORIZONTAL FORCE (E_h) = 2.40 Wp
   HORIZONTAL FORCE (E_{mh}) = 3.60 Wp (FOR CONCRETE ANCHORAGE)
   VERTICAL FORCE (E_v) = 0.40 Wp

2. CENTER OF GRAVITY (C.G.) AND WEIGHT ARE THE GOVERNING PARAMETERS FOR DESIGN. THIS PREAPPROVAL ENCOMPASSES ALL WEIGHTS UP TO THE MAXIMUM WEIGHT SHOWN.

3. STRUCTURAL ENGINEER OF RECORD FOR THE BUILDING SHALL PROVIDE SUPPORT STRUCTURE DESIGNED TO SUPPORT WEIGHTS AND FORCES SHOWN IN COMBINATION WITH ALL OTHER LOADS THAT MAY BE PRESENT.

REGISTERED PROFESSIONAL ENGINEER
JONATHAN ROBERSON
No. 4197
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1/30/17
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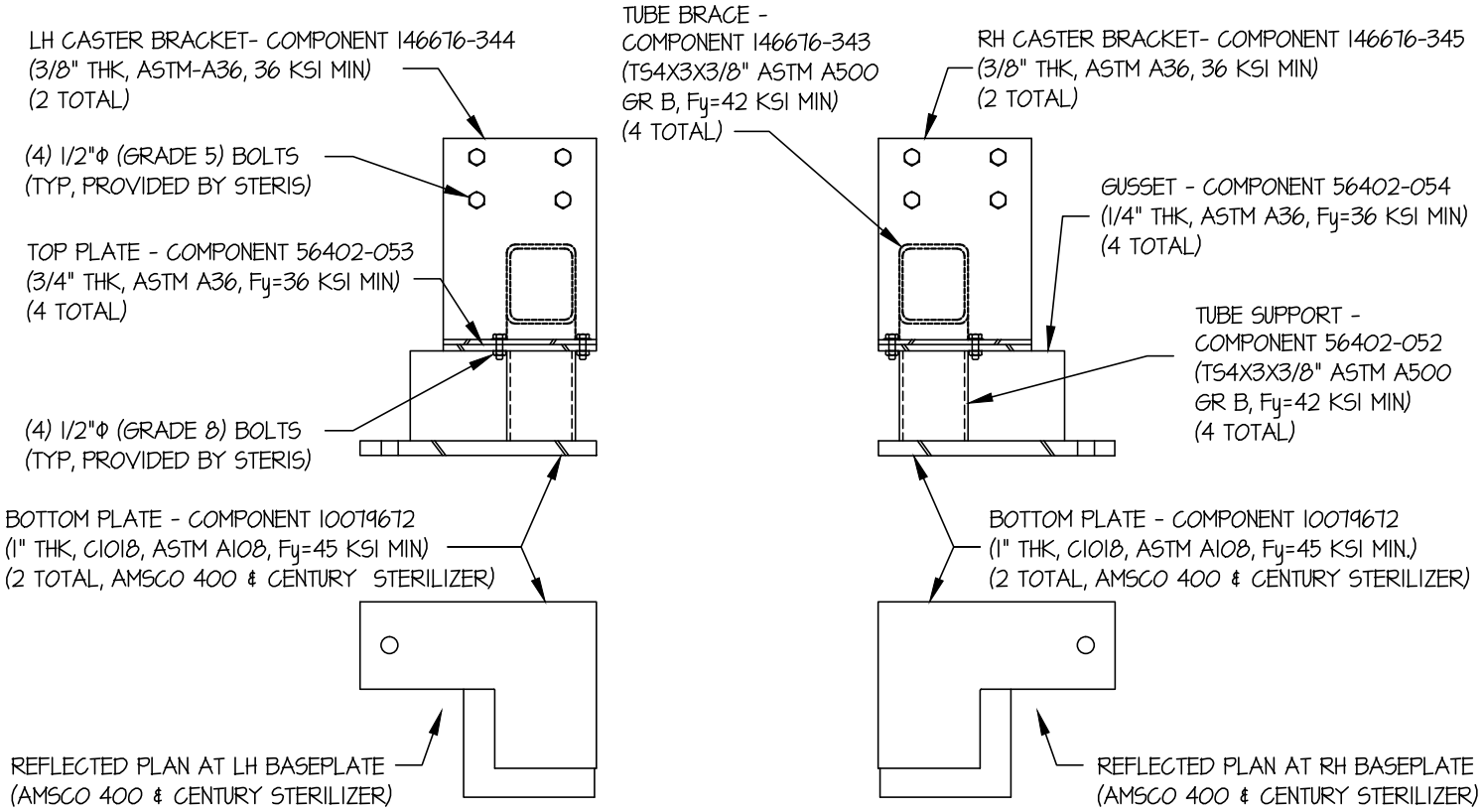
STATE OF CALIFORNIA

STERIS CORPORATION

AMSCO, EVOLUTION & CENTURY STEAM STERILIZERS 26 X 37.5

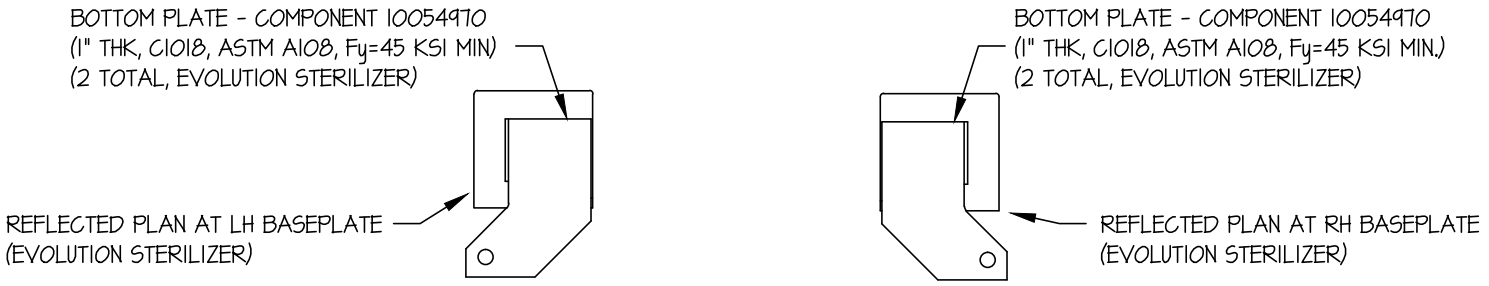
SEISMIC ANCHORAGE

DETAILS



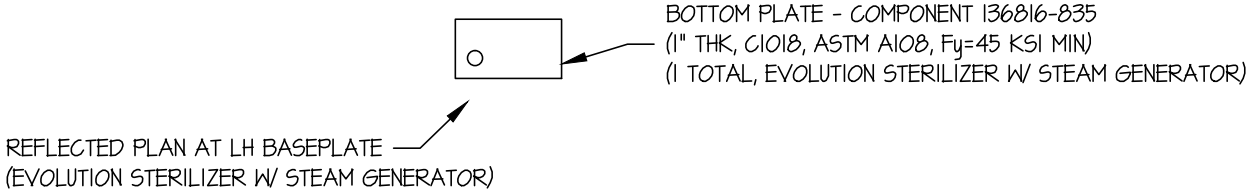
LH SEISMIC TIEDOWN ASSEMBLY- 10079671 (2 TOTAL)
(AMSCO 400 & CENTURY STERILIZER)

RH SEISMIC TIEDOWN ASSEMBLY- 10079670 (2 TOTAL)
(AMSCO 400 & CENTURY STERILIZER)



LH SEISMIC TIEDOWN ASSEMBLY- 10054968 (2 TOTAL)
(EVOLUTION STERILIZER)

RH SEISMIC TIEDOWN ASSEMBLY- 10054969 (2 TOTAL)
(EVOLUTION STERILIZER)



LH SEISMIC TIEDOWN ASSEMBLY- 136816-838 (1 TOTAL)
(EVOLUTION STERILIZER W/ STEAM GENERATOR)

NOTE: ALL COMPONENTS LISTED ON THIS SHEET ARE SUPPLIED BY STERIS

STERIS CORPORATION

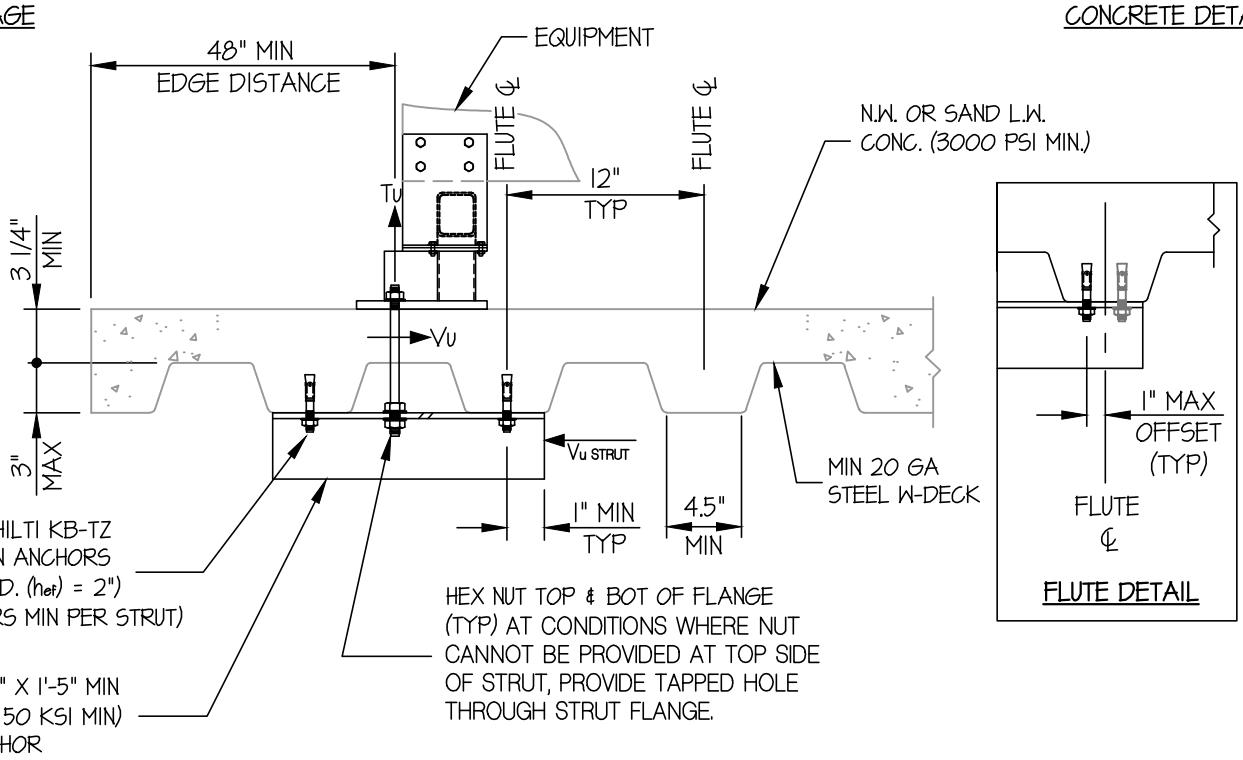
AMSCO, EVOLUTION & CENTURY STEAM STERILIZERS 26 X 37.5

DES. J. ROBERSON
JOB NO. 14-1702
DATE 1/30/17

SHEET 14 OF 14 SHEETS

SEISMIC ANCHORAGE

CONCRETE DETAILS



MIN STEEL DECK REQUIREMENTS AND STRUT DETAIL

DEMANDS: (BASED ON UPPER FLOOR)

T_u = 7710 LB/BOLT

V_u = 2820 LB/BOLT

$V_{u\ STRUT} = 0.7V_u = 0.7(2820\#) = 1974$ LB/STRUT

BOLT SPEC: 1/2"ϕ HILTI KB-TZ: (h_{ef} = 2" MIN)

ϕV= 2100 LB/BOLT

CONCRETE ANCHORS AT STRUT

$V'_{u\ STRUT} = \Omega_o V_{u\ STRUT} = 1.5(1974\#) = 2961$ LB/STRUT

USE 2 BOLTS MIN

$V'_{u\ BOLT} = 2961\#/(2\ BOLTS) = 1481$ LB/BOLT

STRUT DESIGN (L4 X 4 X 5/16" : S = 1.27 in^3, A572)

$$M_{u\ STRUT} = \frac{7710\#(14'')}{4} = 26{,}985''\#$$

$$\frac{b}{t} = \frac{4}{0.3125} = 12.8 \leq 0.54\sqrt{\frac{E}{Fy}} = 0.54\sqrt{\frac{29000}{50}} = 13.0$$

$\therefore M_n = 1.5\ Fy\ Sc$

$= 1.5(50000)(0.8 \times 1.27)$

$= 76{,}200''\#$

$\phi M_n = 0.9M_n = 0.9(76{,}200'') = 68{,}580''\# > 26{,}985''\#$ $\therefore$ OK

REGISTERED PROFESSIONAL ENGINEER
JONATHAN ROBERSON
No. 4197
EXP. 6-30-2018
1/30/17
STRUCTURAL
STATE OF CALIFORNIA