

**STATEMENT OF WORK  
FOR CONSTRUCTION SOLICITATION**

**DATE: 5/1/2016**

**PROJECT TITLE: THERMAL EFFICIENCY IMPROVEMENTS AT BOILER PLANTS A6 NHCNE, 27A NAVAL WAR COLLEGE, 7CC MAIN BOILER PLANT FOR NAVSTA  
PROJECT LOCATION: Bldg. 27A Naval War College, A6 NHCNE Naval Station Newport, and 7CC Newport, RI**

**PART I - PROJECT SCOPE AND GENERAL INFORMATION:**

- 1.1 GENERAL INTENTION:** It is the declared and acknowledged intention and meaning to; 1) pipe and wire a 100 HP Cleaver Brooks boiler @ A6 Naval Health Care New England (NHCNE), 2) pipe and wire one 200 HP Cleaver Brooks boiler @ 27A Naval War College (NWC) and 3), pipe wire and commission heat recovery system 7CC. **The boilers at A6 and 27A will be relocated and set in place by the Government or separate contract PRIOR to the scope of work being performed under this contract – there is no requirement to move the boilers, they will already be in place by the time this contract is awarded.**
- 1.2 GENERAL DESCRIPTION:** Provide all labor, materials, transportation, equipment, supplies and supervision as required for each relocated boiler @ 27A and A6.
- a) Pipe in relocated boiler's steam supply to existing steam header.
  - b) Pipe in relocated boiler's feedwater supply to feedwater supply header
  - c) Pipe in relocated boiler's bottom blowdown system to existing bottom blowdown header.
  - d) Pipe in relocated boiler's surface blow system to second isolation valve.
  - e) Pipe in relocated boiler's gas train to existing gas supply pipe
  - f) Wire in relocated boiler's boiler/burner/blower/VFD power supply (A6 and 27A) and control wiring (27A) where indicated. Wire in feedwater control valve, conductivity sensor, and surface blowdown valve
  - g) Pipe in relocated boiler's Safety valve discharge piping.
  - h) Connect stack from boiler breaching to existing stack/vent connector.
  - i) Insulate all mechanical systems equal to adjacent original construction
  - j) Wire in control system for bldg. 27A and make boiler 100 % operational (27A only)
  - k) Provide all labor, materials, transportation, equipment, supplies and supervision as required for piping in Heat Exchanger and Heater Coil located in the boiler 4 area, 7CC
- 1.3 LOCATION:** The work shall be located at bldg.'s A6 NHCNE and 27A NWC and 7CC.
- 1.4 COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK:** The contractor shall commence work under the contract within 7 Calendar days after the date of contract award. The contractor shall complete the entire work, ready for use, prior to **October 31, 2016**. The time stated for completion shall include final clean-up of the premises. The contractor shall set up a meeting with the contracting officer or representative prior to the start of work. The Contractor shall schedule his work no less than 48 hours in advance with the Contracting Officer.
- 1.5 PARTIAL PAYMENT:** Partial payment for work accomplished under this contract will not be made. Payment will only be made when work is 100 percent complete and accepted by the Government.

1.6 OSHA/EPA REGULATIONS: During performance of all work under this contract, the Contractor shall strictly adhere to regulations of the Environmental Protection Agency (EPA) and the Occupational Safety and Health Agency (OSHA NFPA 70), as well as all applicable State and Local requirements, Newport NAVSTA regulations, and the Army Corps of Engineers Safety and Health Requirements Manual EM-385.

1.7 SKETCHES ACCOMPANYING SPECIFICATIONS:

- a. Sketches
  - 1) A6 100 HP Install
  - 2) 27A 200 HP Install
  - 3) 27A 200 HP Feedwater
  - 4) System Details
  - 5) 7CC Heat Recovery Route
  - 6) Heat Recovery 7CC one line
- b. Drawings
  - 1) BOILER INSTALLATION, B27A\_4-22-16
  - 2) BOILER INSTALLATION, BA6\_4-28-16
- c. Attachments – referenced documentation
  - 1) Shebler PA exhaust systems
  - 2) 27A stack original installation drawing
  - 3) State Tune Up Requirements
  - 4) Bill of Material 27A
  - 5) Bill of Material A6

1.8 EXAMINATION OF THE PREMISES: Bidders are expected to visit the site of work to make a survey of the conditions to be encountered which may affect the cost of the performance of the work. Failure to familiarize with the conditions shall not relieve the contractor from the responsibility for full completion of the work. The contractor is required to contact the FEAD Office at 401-841-7624 prior to commencement and upon completion of work. Work shall be performed during normal hours Monday through Friday 0700-1530 excluding federal holidays. Work performed outside of normal hours requires the approval of the contracting officer's representative. Submit requests for approval a minimum of 5 working days in advance. Utility outages shall be performed during off hours unless directed otherwise.

**PART II - TECHNICAL REQUIREMENTS:**

2.1 DETAILED REQUIREMENTS:

Provide all labor, materials, transportation, equipment, supplies and supervision as required for a pipe and wire two boilers complete and usable, per drawings and specifications, for the purpose of making boilers operational in these new locations. Install government provided material for the control system of B3 @ 27A and make 27A B3 fully operational.

2.2 MATERIALS

2.2.1 Piping Systems

2.2.1.1 Pipe

Provide steel pipe, sch 40 for steam and natural gas, sched 80 for drains, feedwater, and steam pipe that is threaded. Pipe shall ASTM A106 Gr B or ASTM A53 Gr B and seamless for sizes up

to 2.5” and ERW for sizes 2.5” and over. All mandatory 31.1 Power Piping systems requiring R1 or PP stamping and associated P4 A/B forms shall have associated Material Test Reports and traceable heat numbers.

#### 2.2.1.1.a Copper Tube

Provide copper tubing where indicated, hard type “L”

#### 2.2.1.2 Welded Fittings

Provide steel fittings with butt weld ends or socket weld ends where indicated. ASTM A 234 Gr B for butt weld and ASTM A105, A182, or A350 for socket weld. Schedule to match service as specified in 2.2.1. All mandatory 31.1 Power Piping systems requiring R1 or PP stamping and associated P4 A/B forms shall have associated Material Test Reports and traceable heat numbers.

#### 2.2.1.3 Threaded Fittings-Feedwater System or Bottom Blow System

Provide 300 psi malleable iron fittings (tees ells unions) for the boiler feedwater systems where threaded is indicated on drawings

Provide forged steel fittings for steam trap lines, steam vent or blowoff piping and surface blow piping. All mandatory 31.1 Power Piping systems requiring R1 or PP stamping and associated P4 A/B forms shall have associated Material Test Reports and traceable heat numbers.

#### 2.2.1.3.a Copper fittings

Provide copper wrought fittings for pressure pipe where indicated, cast for drains

#### 2.2.1.4 Drip Pan Ells – Safety Valve

Provide ASTM A126 CL B Cast Iron, threaded inlet and be of the same size as the Safety valve outlet or larger (S)

#### 2.2.1.4.1 Safety Valve Discharge

Provide 150# threaded unions and fittings downstream of safety valves, threaded nipples to be sched 80 (S)

#### 2.2.1.5 Feedwater Valves

Provide 300# isolation valves for feedwater system. All valves within the boundaries of mandatory 31.1 to be in accordance with 31.1. All mandatory 31.1 Power Piping systems requiring R1 or PP stamping and associated P4 A/B forms shall have associated Material Test Reports and traceable heat numbers. (S)

#### 2.2.1.6 Trap stations and header blowoffs

Provide 800# forged steel threaded ells, tees, couplings, unions, and valves up to and including downstream trap isolation valves or second iso valve for header drain. (S)

#### 2.2.1.7 Gaskets:

Provide spiral wound, non-asbestos gasket with centering ring per ASME B16.20. [ASME B16.21, composition ring 1.60 mm 0.0625 inch thick. Provide one piece factory cut ring gaskets for raised-face flanged joints, and full-face gaskets for flat-face flanged joints.]

#### 2.2.1.8 Bolts:

ASTM A 193/A 193M, Grade B7. Extend a minimum of two full threads beyond the nut with the bolts tightened to the required torque.

#### 2.2.1.9 Nuts:

ASTM A 194/A 194M, Grade 7.

#### 2.2.1.10 Washers:

Provide steel flat circular washers under bolt heads and nuts.

#### 2.2.1.11 Chainwheels

Provide Chainwheels with safety cap kit (to prevent chainwheel from falling) for all valves 2" and over. Provide Hammer blow chainwheels for line stop valves (4"). Provide lock out tag out tube for all chainwheels/chains provided.

#### 2.2.1.11 Stacks

##### 2.2.1.11.1 27A Schebler

Existing stack components @ 27A are manufactured by Schebler, provide new parts and sections as need to make boiler exhaust complete maintaining UL listing, new sections shall equal to original manufacturer, see Schebler, model PA 24" installation drawing for 27A. Provide OEM stack sections to create offset (not to exceed 30 deg) to new boiler breeching orientation as well as adapting new 16" breeching to 24" stack. Original stack was supported by boiler breeching though drawing indicates otherwise. Provide support plate as per drawing and secure to beams above. Original stack sections have been stored within 27A (or left in place). Provide new OEM vent termination – rain cap style. Do not dispose of original tapered nozzle. If replacing entire stack provide a double walled positive pressure system for use with boilers, max temp rating @ 1,000 deg F, pressure rating 60" wc. Inner layer to be 304 SS @ .035" and outer also 304 SS .018 thickness (S)

##### 2.2.1.11.2 A6 vent connector

A6 stack is currently fabricated from 10 gauge steel and of welded construction. Contractor may use similar materials and thickness to accomplish transition from relocated 200 hp boiler with 12" breeching to existing 16' stack or may use prefabricated systems equal to 2.2.6.1. Provide a double walled positive pressure system for use with boilers, max temp rating @ 1,000 deg F, pressure rating 60" wc. Inner layer to be 304 SS @ .035" and outer also 304 SS .018 thickness. (S)

##### 2.2.2.1 Insulation

Provide mineral fiber or glass fiber insulation, ASTM C 547 type IV Grade A, ASTM C 585 and ASTM C 795. Service temperature rating 1000 deg F. Flame spread rating of 25 w/smoke rating less than 50. Formaldehyde free insulation with 60% recycled glass content/non petroleum binders. K value .51 btu in/hr\*ft^2Deg F @ 500 deg F.

Outer layer of insulation to have a vapor retarding white all service jacket that is water resistant, comprised of aluminum foil reinforced with glass scrim bonded to kraft paper leaving no paper exposed allowing for cleaning up/wiping down with wet cloth. Intermittent exposure to water will not deteriorate jacket. Sealed with self sealing longitudinal laps and matching butt strips.

Insulation shall match adjacent insulation in thickness, covering equal to above, 2" copper tube insulation for 7CC shall have 1.5" of fiberglass insulation.

##### 2.2.2.1 Fittings

Provide pre-formed molded fiber glass where tees, long radius, or short radius ells are found. There are some elbows that may not be dimensionally equal to standard long or short radius ells- for these ell(s) a system of covering must be submitted for approval to the Contracting Officer using materials consistent with new adjacent insulation and covering.

#### 2.2.2.2 Fitting Covers

Provide pre-molded high impact PVC indoor/outdoor PVC covers-white, UV resistant, secured with SS tacks and, or matching PVC tape, or PVC adhesive.

#### 2.2.2.3 Fibrous Glass Cloth and Glass Tape

Fibrous glass cloth, with 20X20 maximum mesh size, and glass tape shall have maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84, Cloth shall be 14.5 #’s/Sq yard, .035” thick, made of silica yarn. Tape shall be 100 mm 4 inch wide rolls. Class 3 tape shall be 14.5 ounces/square yard. Finish cloth w/sealant, white, rate @ 1-1.25 gal’s/100 sqft, equal to Chil-Seal CP 50A.

#### 2.2.2.4 Finishing Cement

ASTM C 449/C 449M: Mineral fiber hydraulic-setting thermal insulating and finishing cement. All cements that may come in contact with Austenitic stainless steel must comply with ASTM C 795.

#### 2.2.2.5 Contact Adhesive

Adhesives may be any of, but not limited to, the neoprane based, rubber based, or elastomeric type that have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84. The adhesive shall not adversely affect, initially or in service, the insulation to which it is applied, nor shall it cause any corrosive effect on meta to which it is applied. Any solvent dispersing medium or volatile component of the adhesive shall have no objectionable odor and shall not contain any benzene or carbon tetrachloride. The dried adhesive shall not emit nauseous, irritating, or toxic volatile matters or aerosols when the adhesive is heated to any temperature up to 100 degrees C 212 degrees F. The dried adhesive shall be nonflammable and fire resistant. Natural cross-ventilation, local (mechanical) pickup, and/or general area (mechanical) ventilation shall be used to prevent an accumulation of solvent vapors, keeping in mind the ventilation pattern must remove any heavier-than-air solvent vapors from lower levels of the workspaces. Gloves and spectacle-type safety glasses are recommended in accordance with safe installation practices.

#### 2.2.2.6 Lagging Adhesive

Lagging is the material used for thermal insulation, especially around a cylindrical object. This may include the insulation as well as the cloth/material covering the insulation. Lagging adhesives shall be nonflammable and fire-resistant and shall have a maximum flame spread index of 25 and a maximum smoke developed index of 50 when tested in accordance with ASTM E 84. Adhesive shall be MIL-A-3316, Class 1, pigmented [white] and be suitable for bonding fibrous glass cloth to faced and unfaced fibrous glass insulation board; for bonding cotton brattice cloth to faced and unfaced fibrous glass insulation board; for sealing edges of and bonding fibrous glass tape to joints of fibrous glass board; for bonding lagging cloth to thermal insulation; or Class 2 for attaching fibrous glass insulation to metal surfaces. Lagging adhesives shall be applied in strict accordance with the manufacturer's recommendations for pipe and duct insulation. Insulation Cement shall be in accordance with ASTM C 195.

#### 2.2.2.7 Blankets (removable)

Provide 2 inch blanket fill for all blankets, Inner layer to be SS knitted mesh, outer layer heavy fiberglass cloth 14.5oz, min K factor no less than .26. Fastening to be all SS hardware.

Provide blankets for the following:

Non Return and line stop valves A6 & 27A

Trap assemblies – between the two unions

First Feedwater isolation valve, check valve and level control valve

#### Electrical Equipment

Provide the standard cataloged materials and equipment of manufacturers regularly engaged in the manufacture of the products. For material, equipment, and fixture lists submittals, show manufacturer's style or catalog numbers, specification and drawing reference numbers, warranty information, and fabrication site.

### 2.2.3 Electrical

#### 2.2.3.1 Conduits And Raceways

##### 2.2.3.2 Rigid Steel Conduit

Ensure rigid steel conduit complies with UL 6 and is galvanized by the hot-dip process. Use polyvinylchloride (PVC) coated rigid steel conduit in accordance with NEMA RN 1, where underground and in corrosive areas, or painted with bitumastic.

Use threaded fittings for rigid steel conduit.

Use solid gaskets. Ensure conduit fittings with blank covers have gaskets, except in clean, dry areas or at the lowest point of a conduit run where drainage is required.

Ensure covers have captive screws and are accessible after the work has been completed.

##### 2.2.3.3 Electrical Metallic Tubing (EMT)

Ensure EMT is in accordance with UL 797 and is zinc coated steel. Provide zinc-coated couplings and connectors that are raintight, gland compression with insulation throat. Crimp, spring, or setscrew type fittings are not acceptable.

##### 2.2.3.4 Flexible Metallic Conduit

Ensure flexible metallic conduit is galvanized steel and complies with UL 1.

Ensure fittings for flexible metallic conduit are specifically designed for such conduit.

Provide liquidtight flexible metallic conduit with a protective jacket of PVC extruded over a flexible interlocked galvanized steel core to protect wiring against moisture, oil, chemicals, and corrosive fumes.

Specifically design fittings for liquidtight flexible metallic conduit for such conduit.

##### 2.2.3.5 Intermediate Metal Conduit

Ensure intermediate metal conduit is galvanized steel and complies with UL 1242.

#### 2.2.3.6 Rigid Nonmetallic Conduit

Ensure rigid nonmetallic conduit complies with NEMA TC 2 and NEMA TC 3 with wall thickness not less than Schedule 40.

#### 2.2.3.7 Wireways and Auxiliary Gutters

Ensure wireways and auxiliary gutters are a minimum 4 by 4-inch trade size conforming to UL 870.

#### 2.2.3.8 Surface Raceways and Assemblies

Ensure surface metal raceways and multi-outlet assemblies conform to NFPA 70. Receptacles conform to NEMA WD 1, Type 5-20R.

#### 2.2.3.9 Cable Trays

Provide ladder type cable trays conforming to NEMA VE 1.

#### 2.2.3.10 Wire and Cable

Use copper 600-volt type THWN for conductors installed in conduit. Ensure all conductors AWG No. 8 and larger, are stranded. All conductors smaller than AWG No. 8 are solid.

Ensure flexible cable is Type SO and contain a grounding conductor with green insulation.

Ensure conductors installed in plenums are marked plenum rated.

#### 2.2.3.11 Switches

#### 2.2.3.12 Safety Switches

Ensure safety switches comply with NEMA KS 1, and are the heavy-duty type with enclosure, voltage, current rating, number of poles, and fusing as indicated. Switch construction is such that, when the switch handle in the "ON" position, the cover or door cannot be opened. Cover release device is coinproof and so constructed that an external tool is used to open the cover. Make provisions to lock the handle in the "OFF" position. Ensure the switch is not capable of being locked in the "ON" position. Provide switches of the quick-make, quick-break type. Approve terminal lugs for use with copper conductors.

Ensure safety color coding for identification of safety switches conforms to ANSI Z535.1.

#### 2.2.3.13 Toggle Switches

Ensure toggle switches comply with EIA 480, control incandescent, mercury, and fluorescent lighting fixtures and are the heavy duty, general purpose, noninterchangeable flush-type.

Provide commercial grade toggle switches, two-position devices rated 20 amperes at required voltage, 60 hertz alternating current (ac) only.

Ensure all toggle switches are products of the same manufacturer.

#### 2.2.3.14 Receptacles

Provide commercial grade receptacles, 20A, 125 VAC, 2-pole, 3-wire duplex conforming to NEMA WD 6, NEMA 5-20R.

#### 2.2.3.15 Outlets, Outlet Boxes, and Pull Boxes

Ensure outlet boxes for use with conduit systems are in accordance with NEMA FB 1 and are not less than 1-1/2 inches deep. Furnish all pull and junction boxes with screw-fastened covers.

#### 2.2.3.16 Panelboards

Provide circuit breaker type lighting and appliance branch circuit panelboards in accordance with NEMA PB 1. Bolt circuit breakers to the bus. Plug-in circuit breakers are not acceptable. Provide copper buses of the rating indicated, with main lugs or main circuit breaker as indicated. Provide all panelboards for use on grounded ac systems with a full-capacity isolated neutral bus and a separate grounding bus bonded to the panelboard enclosure. Ensure panelboard enclosures are NEMA 250, Type 1, in accordance with NEMA PB 1. Provide enclosure fronts with latchable hinged doors.

#### 2.2.3.17 Circuit Breakers

Ensure circuit-breaker interrupting rating is not less than those indicated and in no event less than 10,000 amperes root-mean-square (rms) symmetrical at 208 volts, respectively. Multipole circuit breakers are the common-trip type with a single handle. Molded case circuit breakers are bolt-on type conforming to UL 489.

### **3.0 EXECUTION**

#### **3.1 Welding**

##### 3.1.1 Welding Procedure Specifications

Develop and qualify procedures for welding metals included in the work. Do not start welding until welding procedures, welders, and welding operators have been qualified. Perform qualification testing by an approved testing laboratory, or by the Contractor if approved by the Contracting Officer in accordance with the qualified procedures. Notify the Contracting Officer at least 24 hours in advance of the time and place of the tests. When practicable, perform the qualification tests at or near the work site. Maintain current records of the test results obtained in welding procedure, welding operator/welder performance qualifications, and nondestructive examination (NDE) procedures. These records shall be readily available at the site for examination by the Contracting Officer. Qualify the procedures for making transition welds between different materials or between plates or pipes of different wall thicknesses. ASME 31.1 power piping requirements for branch connections may be used in lieu of detailed designs. Unless otherwise specified, the choice of welding process shall be the responsibility of the Contractor.

### 3.1.2 Previous Qualifications

Welding procedures, welders, and welding operators previously qualified by test may be accepted for the work without requalification provided that the following conditions are fulfilled:

- a. Copies of welding procedures, procedure qualification test records, and welder and welding operator performance qualification test records are submitted and approved in accordance with the paragraph entitled "Submittals."
- b. Testing was performed by an approved testing laboratory or technical consultant or by the Contractor's approved quality control organization.
- c. The welding procedures, welders, and welding operators were qualified in accordance with ASME BPVC SEC IX or AWS B2.1, AR-2 level; and base materials, filler materials, electrodes, equipment, and processes conformed to the applicable requirements of this specification.
- d. The requirements of paragraph entitled "Welder and Welding Operator Performance Qualification" for renewal of qualification were met, and records showing name of employer and period of employment using the process for which qualified are submitted as evidence of conformance.

### 3.1.3 Performance

The Contractor shall be responsible for the quality of joint preparation, welding, and examination. Clearly identify and record materials used in the welding operations. The examination and testing defined in this specification are minimum requirements. Provide additional examination and testing as necessary to achieve the quality required.

### 3.1.4 Welding Procedures Qualification

Qualification of the welding procedures for each group of materials to be welded is required as indicated in ASME BPVC SEC IX. Record in detail and qualify the "Welding Procedure Specifications" for every welding procedure proposed. Qualification for each welding procedure shall conform to the requirements of ANSI Standards and to this specification. The welding procedures shall specify end preparation for welds, including cleaning, alignments, and root openings. Preheat, interpass temperature control, and postheat treatment of welds shall be as required by ANSI Piping documents, unless otherwise indicated or specified. Describe the type of backing rings or consumable inserts, if used, and, if they are to be removed, the removal process. Welding procedure qualifications shall be identified individually and referenced on the shop drawings or suitably keyed to the contract drawings.

### 3.1.5 Welder and Welding Operator Performance Qualification

Qualify each welder and welding operator assigned to work covered by this specification by performance tests using equipment, positions, procedures, base metals, and electrodes or bare filler wires from the same specification, classification, or group number that will be encountered on his assignment. Welders or welding operators who make acceptable procedure qualification tests will be considered performance-qualified for the welding procedure used. Determine performance qualification in accordance with ASME BPVC SEC IX, B31.1 as specified.

### 3.1.6 Renewal of Qualification

Requalification of a welder or welding operator shall be required under one or any combination of the following conditions:

- a. When a welder or welding operator has not used the specific welding process for a period of 3 months. The period may be extended to 6 months if the welder has been employed on another welding process.
- b. There is specific reason to question the welder's ability to make welds that will meet the requirements of the specifications.

c. The welder or welding operator was qualified by an employer other than those firms performing work under this contract and a qualification test has not been taken within the preceding 12 months. Renewal of qualification under this condition need be made on only a single test joint or pipe of any thickness, position, or material to reestablish qualification for any thickness, position, or material for which the welder or welding operator had qualified previously. Contractor shall acknowledge that work location will remain open and operational during the duration of this project. Tools and materials shall not be left in the paths of exit/entry at any time, and the work area shall be cleaned at the end of each work day.

Submit all required materials to Officer in Charge prior to commencement of work for approval. Contractor shall adhere to the guidelines of attached soil management plan.

Test to ensure proper operation.

Restore excavated areas to original condition.

Installation shall meet or exceed the requirements of the National Electrical Code.

### **3.2 Piping**

3.2.1 Piping Joints between sections of pipe and between pipe and fittings shall be threaded, flanged, or welded as specified. Except as otherwise specified, fittings 1-1/2 inches and smaller shall be either threaded or socket welded, and fittings 2 inches and larger shall be either flanged or butt welded. Pipe and fittings 1-1/4 inches and larger installed in inaccessible conduits or trenches under concrete floor slabs shall be welded. Unless otherwise specified or indicated, connections to equipment shall be made with black malleable iron unions for pipe 1-1/2 inches or smaller in diameter, and with flanges for pipe 2 inches or larger in diameter Unless otherwise specified, pipe and fittings shall conform to requirements of ASME B31.1. Pipe shall be cut to measurements established at the jobsite and worked into place without springing or forcing, completely clearing windows, doors, and other openings.

3.2.2 Pipes shall be minimum 8 feet above walkway elevations.

3.2.3 Cutting or other weakening of the building structure to facilitate piping installation will not be permitted without written approval.

3.2.4 Pipes shall have burrs removed by reaming and shall be so installed to permit free expansion and contraction without causing damage to building structure, pipe, joints, or hangers. Filings, dust, or dirt shall be wiped from interior of pipe or tubing before connections are made

3.2.5 Changes in direction shall be made with fittings

3.2.6 Bottom Blow Piping – 27A

Provide piping per sketch. The location of the boiler bushing for bottom blow with respect to the new steel support skid may make access to bottom blow piping difficult. The contractor is permitted to temporarily remove sections of support steel to facilitate installation of bottom blow piping- all steel removed shall be returned to original position, temporary support of the boiler/boiler support steel members while steel sections are removed is the responsibility of contractor.

There are many drains that must be piped to the blowdown piping such as water column blowoffs, conductivity control drains, as well as safety valve drains, provide later-o-lets when tying into blowdown piping as per sketch

3.2.7 Bottom Blow Piping A6

Bottom blowdown piping for A6 requires only connection from downstream of bottom blowdown valves to existing bottom blow system. Fabricate/replace existing drain funnel (west side of boiler) with materials equal in construction to existing

### 3.2.8 7CC Heat Recovery

Provide copper tube piping system to and from heat exchanger, circulator, air separator, injection tank and heating coil. Route prop

### 3.3 Wiring

Electrical installations shall conform to IEEE C2, NFPA 70, ASME CSD\_1 and requirements specified herein. It is the intent of this contract to provide 3 phase power for boiler forced draft fan from existing motor control center to safety switch required by ASME CSD-1 to forced draft fan VFDs.

27A- Provide 3 phase wiring to and mount new VFD via disconnect. Provide all 120V control and burner management wiring, all low voltage control and communications wiring and associated equipment such as feedwater valves and blowdown valves. Boiler shall be complete and ready to use.

A6 Provide 3 phase wiring to boiler – provide single phase wiring to feedwater valve and blowdown valve. Control Wiring and single phase burner management by others.

#### 3.3.1 Conduits, Raceways and Fittings

Conduit runs between outlet and outlet, between fitting and fitting, or between outlet and fitting cannot contain more than the equivalent of three 90-degree bends, including those bends located immediately at the outlet or fitting.

Do not install crushed or deformed conduit. Avoid trapped conduit runs where possible. Take care to prevent the lodgment of foreign material in the conduit, boxes, fittings, and equipment during the course of construction. Clear any clogged conduit of obstructions or be replaced.

Conduit and raceway runs concealed in or behind walls, above ceilings, or exposed on walls and ceilings 5 feet or more above finished floors and not subject to mechanical damage may be electrical metallic tubing (EMT)

#### 3.3.2 Rigid Steel Conduit

Make field-made bends and offsets with approved hickey or conduit bending machine. Use long radius conduit for elbows larger than 2-1/2 inches

Provide all conduit stubbed-up through concrete floors for connections to free-standing equipment with the exception of motor-control centers, cubicles, and other such items of equipment, with a flush coupling when the floor slab is of sufficient thickness. Otherwise, provide a floor box set flush with the finished floor. For conduits installed for future use, terminate with a coupling and plug set flush with the floor

#### 3.3.3 Electrical Metallic Tubing (EMT)

Ground EMT in accordance with NFPA 70, using pressure grounding connectors especially designed for EMT

#### 3.3.4 Flexible Metallic Conduit

Use liquidtight flexible metallic conduit in wet and oily locations and to complete the connection to motor-driven equipment.

### 3.3.5 Rigid Nonmetallic Conduit

Ensure rigid PVC conduit is direct buried.

Install a green insulated copper grounding conductor in conduit with conductors and solidly connect to ground at each end. Size grounding wires in accordance with NFPA 70.

### 3.3.6 Wireway and Auxiliary Gutter

Bolt together straight sections and fittings to provide a rigid, mechanical connection and electrical continuity. Close dead ends of wireways and auxiliary gutters. Plug all unused conduit openings.

Support wireways for overhead distribution and control circuits at maximum 5-foot intervals.

Ensure auxiliary gutters used to supplement wiring spaces for equipment not contained in a single enclosure contains no switches, overcurrent devices, appliances, or apparatus and is not more than 30 feet long.

### 3.3.7 Surface Raceways and Assemblies

Mount surface raceways plumb and level, with the base and cover secured. Minimum circuit run is three-wire, with one wire designated as ground.

### 3.3.8 Cable Trays

Support cable trays from ceiling hangers, equipment bays, or floor or wall supports. Cable trays may be mounted on equipment racks. Provide support when the free end extends beyond 3 feet. Maximum support spacing is 6 feet. Support trays 10-inches wide or less by one hanger. Support trays greater than 10-inches wide by two hangers. Bond cable trays at splices.

### 3.3.9 Splices and Connectors

Make all splices in AWG No. 8 and smaller with approved insulated electrical type.

Make all splices in AWG No. 6 and larger with indentor crimp-type connectors and compression tools. Wrap joints with an insulating tape that has an insulation and temperature rating equivalent to that of the conductor.

### 3.3.10 Wiring

Color code feeder and branch circuit conductors as follows:

CONDUCTOR	COLOR AC
Phase A	BLACK
Phase B	RED

Phase C	BLUE
Neutral	White
Equipment Grounds	Green

Use conductors up to and including AWG No. 2 that are manufactured with colored insulating materials. For conductors larger than AWG No. 2, have ends identified with color plastic tape in outlet, pull, or junction boxes.

Splice in accordance with the **NFPA 70**. Provide conductor identification within each enclosure where a tap, splice, or termination is made and at the equipment terminal of each conductor. Match terminal and conductor identification as indicated.

Where several feeders pass through a common pullbox, tag the feeders to clearly indicate the electrical characteristics, circuit number, and panel designation.

### 3.4 Stacks

3.4.1 A6 - Make each stack/vent connector complete from boiler breeching to existing stack/vent connector and ready to use. Bldg A6 requires some adjustment of existing vent connector supports as existing supports appear to not be supporting common vent connector as piped – adjust threaded rod system as needed to distribute vent connector weight evenly throughout its length. Remove B1’s temporary stack support system when complete.

3.4.2 27A – Provide stack with offset as needed complete and ready to use. It will not be necessary to provide smoke monitoring connections @ this time. Make all connections for transition from 12” to 18 sections, boiler breeching to stack, and vent termination with UL listed system. Provide support system for stack with listed equipment. The overall height of stack (not considering tapered vent nozzles or rain cap) shall be equal to adjacent stacks.

### 3.5 Controls

3.5.1 27A Government provided material

The Government is providing the following parallel positioning combustion control system (loose) for the contractor to install and make boiler 100% useable.

- Control Panel Enclosure NEMA 4/12 Standard (24 x 30 x 10”)
- VSD/O2 Trim analog Input Card (Control Panel)
- Revised Wiring Diagram based on latest CB Revision
- Manual Fuel Selector Switch (Control Panel)
- Entrance Panel 24 x 24 x 8 NEMA 4 12 Sized for 10 HP Blower Motor (60.4 A)
- CCT (Entrance Panel)
- NEMA 1 Packaged VFD with bypass Includes; Nema 1 enclosure, 15 HP Drive, (460/3/60)Bypass Hardware, Line Reactor, HIM, and Ethernet connection
- Blower Motor; 10 HP, 208-230/460/3/60- 3600 FR213TDZODP Premium eff, 74-144, double shaft, SPEC 630-1002213TTDW7018, Part # 894-04483-000
- SPDT fuel pressure switches; 2 fuel high low gas pressure low oil pressure
- PSDT steam controls: HLC, OLC
- Low gas pressure switch range 3” – 21” wc (.1-.75 psig)

- High gas pressure switch range 41” – 193” wc (1.5 – 7 psig)
- Burner management control: CB 120E IR scan (Control Panel)
- Steam Pressure transmitter 150 psi ST
- Water temp transmitter 150 psig
- Stack temp transmitter
- 4” alarm bell
- Hawk 4” touchscreen color
- Parallel positioning actuators: Air Damper (15 ftlbs), Gas Valve actuator (3 ft lbs), Oil actuator(3 ft lbs)
- Parallel Positioning actuator mounting hardware
- O2 Trim
- Combustion or ambient air sensor  
Expanded annunciation package

### 3.5.2 27A Operations

Gas only (oil future use) - when the boiler has been completely piped and wired as specified, the boiler shall be subject to a complete operational test of all electrical and mechanical safety devices performed by the boiler manufacturer’s representative and witnessed by the government, this test shall include but not be limited to flame failure test, immunity to spark or hot refractory, Hi low gas pressure tests, make up air system including remote operation of make-up air louvers and associated limit switch, operation of wall switch to de-energize boiler, low water cut-outs (2), high water (if applicable), high steam pressure, excess steam pressure, and low water temperature activation of lag boiler setpoint. Boiler shall be capable of functioning as lead boiler – incorporate unit into existing lead lag configuration. The boiler controls shall be wired to display “First out Annunciation” which shall include not only the boiler proper safety devices such as low water/gas pressure/ steam pressure switches but also the external devices such as make up air dampers. The boiler shall be remotely monitored equal to adjacent boilers 1 and 2 – provide all communication interfaces for Modicon PLC. Should additional licensing @ 7CC be required provide such licensing @ 7CC. Modify screens @ 7CC to incorporate new controls on B3.

Tune up boiler for all firing rates incorporating @ least 15 combustion test points recording O2, CO2, CO, NOx, stack temp, particulates.

O2 shall be less than 4% for all firing rates above 20%.

The boiler shall be tuned and configured to deliver 7 to 1 turndown minimum.

In addition to standard tune up provide tune up in accordance with State required tune up attached to this specification (assume 50% as normal operating rate).

### 3.5.3 A6 Government provided material

The Government is providing the following single point positioning combustion control system (loose) for the contractor to install – wiring by others.

- Natural Gas Train Kit, 2 in NPT, IVT style includes main gas train, pilot train, main high and low gas pressure switches, mounting brackets, mounting hardware, main gas plugged leak test cocks, gauges, motorized main gas valves with one POC FM GE & CSD compliant.
- Gas through head pipe nipple, clamp ring and gasket retainer
- Revised boiler Manufacturers boiler rating plate
- Fireside gasket kit
- Gas cam linkage assembly
- ¾” jackshaft kit

- Electrical kit – Fuel selector switch, relay, ignition and transformer w/cable and revised wiring diagram.

#### 3.5.4 A6 Operations

Operation of this boiler will be via another contract. The contractor shall wire 3 phase power supply to boiler for operation as well as pipe gas train, feedwater train and steam header to boiler to facilitate operation

The actual wiring of the boiler's control system will be accomplished via NUTMEG on an existing contract. The wiring of auxiliary systems on the boiler such as surface blow and feedwater valves and conductivity sensor shall be via this contract. Main feed 208 Volt power supply shall be via this contract.

#### 3.5.5 7CC Heat Recovery Operations

Install, pipe wire and commission all copper tubing to and from gov't provided heat exchanger, circulator pumps, and heater coil. The temperature transmitters (gov't provided), flow meter (gov't provided), and pump speed shall all be commissioned as new points within Delta V. New screen shall be added for this system with links to all existing B4 screens.

Circulator shall revert to min speed when boiler 4 is energized (flame present) and shall ramp to 100% based on conductivity control valve position. There shall be a hand off auto selector switch local to the circulator pump.

Provided licensing for new screens and new commissioned points

### **PART III – SUPPLEMENTAL REQUIREMENTS:**

#### 3.1 REFERENCES:

All work shall comply with Unified Facilities Criteria (UFC) 1-200-01, GENERAL BUILDING REQUIREMENTS. (2013) International Plumbing Code. ASME international code. American society of sanitary engineering (ASSE). AWWA 10084 (2005) Standard methods for the examination of water and waste water.

#### 3.2 SECURITY AND IDENTIFICATION BADGING:

All contractor employees and sub-contractors on the job site must be U.S. citizens. A list of individuals requiring access to the job site will be provided to NAVSTA Newport, RI. prior to the start of the installation.

Obtain access to the installation by participating in the Navy Commercial Access Control System (NCACS) or by obtaining passes each day from the Base Pass and Identification Office. Costs for obtaining passes through the NCACS are the responsibility of the Contractor. One-day passes, issued through the Base Pass and Identification Office will be furnished without charge. Furnish a completed EMPLOYMENT ELIGIBILITY VERIFICATION (DHS FORM I-9) form for all personnel requesting badges. This form is available at <http://www.uscis.gov/portal/site/uscis> by

searching or selecting Employment Verification (Form I-9). Contractor shall immediately report instances of lost or stolen badges to the Contracting Officer.

- a. NCACS Program: NCACS is a voluntary program in which Contractor personnel who enroll, and are approved, are subsequently granted access to the installation for a period up to one year, or the length of the SECTION 01 14 00 contract, whichever is less, and are not required to obtain a new pass from the Base Pass and Identification Office for each visit. The Government performs background screening and credentialing. Throughout the year the Contractor employee must continue to meet background screening standards. Periodic background screenings are conducted to verify continued NCACS participation and installation access privileges. Under the NCACS program, no commercial vehicle inspection is required, other than for Random Anti-Terrorism Measures (RAM) or in the case of an elevation of Force Protection Conditions (FPCON). Information on costs and requirements to participate and enroll in NCACS is available at <http://www.rapidgate.com/vendors/how-to-enroll> or by calling 1-877-727-4342. Contractors should be aware that the costs incurred to obtain NCACS credentials, or costs related to any means of access to a Navy Installation, are not reimbursable. Any time invested, or price(s) paid, for obtaining NCACS credentials will not be compensated in any way or approved as a direct cost of any contract with the Department of the Navy.
- b. One-Day Passes: Participation in the NCACS is not mandatory, and if the Contractor chooses to not participate, the Contractor's personnel will have to obtain daily passes, be subject to daily mandatory vehicle inspection, and will have limited access to the installation. The Government will not be responsible for any cost or lost time associated with obtaining daily passes or added vehicle inspections incurred by non-participants in the NCACS.

### 3.3 SHOP DRAWING AND SUBMITTAL:

- a. Prior to starting work, the contractor shall provide a minimum of 2 copies of all submittals for approval purposes for all materials to be used on this project (project specifications may require the provision of additional submittal copies). Partial submittals will not be acceptable and will be returned without review. Submittals shall be from the manufacturer and complete with manufacturers name, catalog number, specifications, and any other information necessary to approve the materials. Material Safety Data Sheets (MSDS) shall be submitted along with product data for any potentially hazardous materials such as paints, adhesives, sealants, cleaners, gypsum board compound, flux materials, etc. Use low VOC materials wherever possible. No hazardous materials shall be brought on to government property without approved MSDS. The contractor shall maintain a copy of all MSDS at the job site at all times.
- b. Submit shop drawings and calculations for review and approval. Submittals shall include the following:
  - Shop\_Drawing
  - Any\_other\_requirement.
- c. Accident Prevention Plan (APP) at least 10 days in advance of starting work, following Appendix A of EM-385-1-1. The plan shall incorporate all aspects of the project and

additionally include the items mentioned below, as appropriate. Work may not begin until approval of the APP.

- d. Traffic control plan when any operation may interrupt or interfere with normal traffic in the area. Plan shall meet the requirements of EM-385-1-1.
- e. Safety plan
- f. Environmental Protection Plan
- g. Product information for all material to be used.
- h. Schedule
- i. Schedule of Values
- j. Warranties

#### 3.4 SAFETY REQUIREMENTS:

- a. The contractor shall be required to follow all federal occupational safety and health regulations (OSHA), EM 385-1-1, as well as all applicable state and local requirement.

#### 3.5 GENERAL REQUIREMENTS:

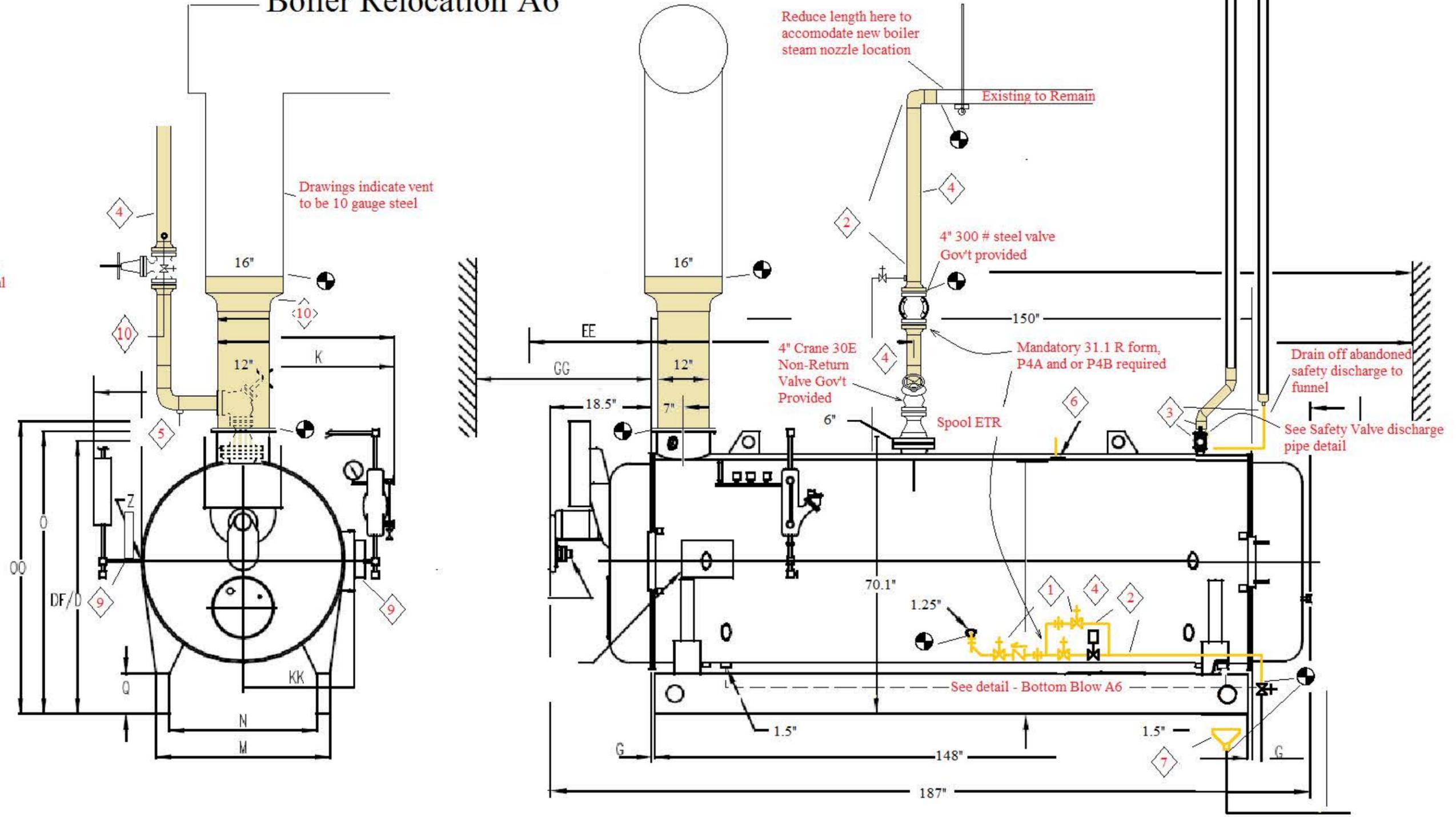
- a. Before beginning any excavation, contractor will follow National and Navy Dig Safe requirements. Navy Dig Safe POC, Fran Furtado (401) 841-1355.
- b. Extreme care shall be exercised to avoid damaging government or personal property, damaged or destroyed objects will be repaired or replaced, at the contracting officers' approval at no expense to the government.
- c. Any road closures will be coordinated through the Navy road closure process set forth by the NAVFAC Newport Facilities Engineering and Acquisition Division.
- d. In accordance with the EM-385-1-1, contractor will be responsible for submitting an Accident Prevention Plan (APP) to the contracting officer or representative before the start of work.
- e. The contractor shall be responsible for proper disposal of all items to be removed from government property, and clean up all dust and debris generated at the construction sites on a daily basis. For specific direction, contact Naval Station Newport's environmental division at (401) 841-7561. The contractor shall comply with NAVSTA waste recycling and green procurement policies.
- f. During the performance of this contract, contractor shall strictly adhere to environmental protection agency regulations (EPA), the federal occupational safety and health regulations (OSHA), EM 385-1-1, as well as all applicable state and local requirements.
- g. Contractor parking is available on site.
- h. Contractor to provide preferred space for lay down area for Government approval.

- i. Soil and sediment erosion controls are necessary unless excess soil is to be piled.
- j. For exterior work, or work which involves closing a building's entrance, the contractor shall install and maintain temporary chain link construction fencing set into moveable concrete blocks, meeting the requirements of EM-385-1-1, around the entire work area unless otherwise indicated. Fencing shall be installed to prevent unauthorized personnel from entering the work zone or any unsafe area. The fence shall be equipped with signage as required by EM-385-1-1. Provide gates where necessary for access by emergency personnel or to allow personnel to escape during an emergency. Temporary chain link fencing shall remain in place and maintained for the duration of the project.
- k. The contractor shall take necessary precautions to ensure any roof or other building opening exposed to the weather are monitored and protected. Take immediate actions necessary to seal off such openings when rain or other detrimental weather is imminent, and at the end of each workday. Ensure that the openings are completely sealed off to protect materials and equipment in the building from damage.
- l. When a warning of gale force winds is issued, take precautions to minimize danger to persons, and protect the work and nearby Government property. Precautions shall include, but are not limited to, closing openings; removing or securing loose materials, tools and equipment from exposed locations; and removing or securing scaffolding and other temporary work. Close openings in the work when storms of lesser intensity pose a threat to the work or any nearby Government property. During severe weather the contractor will be required to take any additional actions as required by the contracting officer or representative. Any work required to protect against inclement weather or high winds shall be at the contractor's expense.
- m. Hazardous Substances. When any hazardous substances are procured, used, stored or disposed, a hazard communication program must be in effect and MSDSs shall be available at the worksite. Employees shall have received training in hazardous substances being used. When the eyes or body of any person may be exposed to corrosives, irritants or toxic chemicals, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within 10 seconds of the worksite.
- n. Traffic control shall be accomplished in accordance with DOT's MUTCD.
- o. Control of Hazardous Energy (Lockout/Tagout). Before an employee performs any servicing or maintenance on any equipment where the unexpected energizing or startup of the equipment could occur, procedures must be in place to ensure adequate control of this energy.
- p. Driving, working on (i.e., working with equipment/mowers) while on slopes, working from/in boats/skiffs, etc shall also be considered and dealt with accordingly.
- q. Fall Protection – full text as required by the EM385-1-1.

Notes

- 1) All feedwater valves, except level control valve, provided by contractor.
- 2) All pipe and fittings provided by contractor.
- 3) All safety valve inlet piping (if needed) and discharge piping provided by contractor.
- 4) Insulation equal in thickness, type and jacketing to adjacent insulation.
- 5) Pipe in trap equal to other boilers, create mudleg per detail and pipe drain to funnel
- Trap assembly provided by government
- 6) Pipe in surface blow equal to other boilers
- 7) Replace funnel
- 8) Spool reduction piece
- 9) Mechanical contractor responsible for providing brackets as needed for electrical panels and for mounting various controls such as but not limited to conductivity, water level or support brackets for feedwater header.
- 10) Drain connection from above line stop to be piped to a second forged steel valve @ funnel

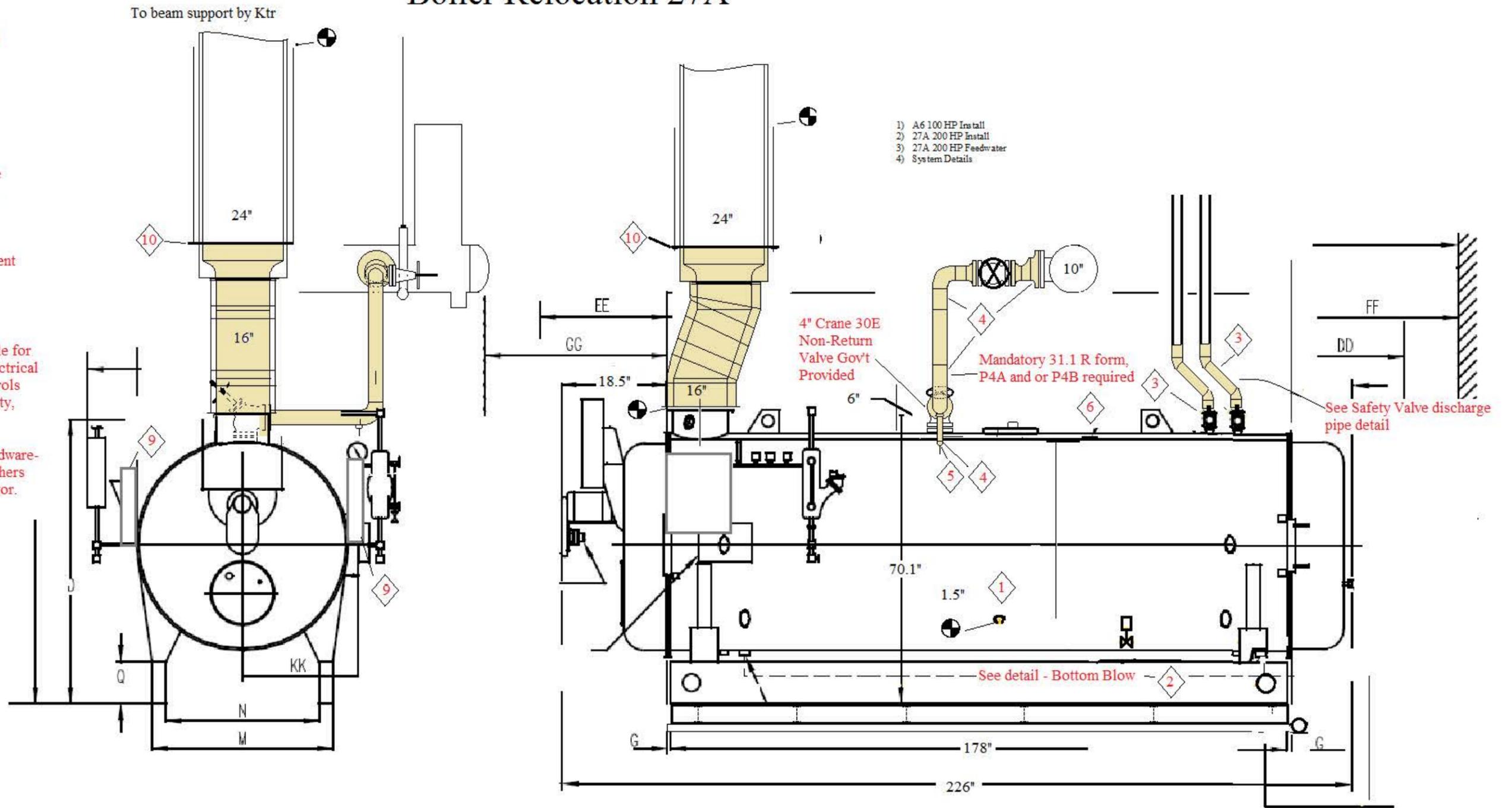
# Naval Station Newport RI Boiler Relocation A6



**100 HP Boiler Installation @ A6 NHCNE**

# Naval Station Newport RI Boiler Relocation 27A

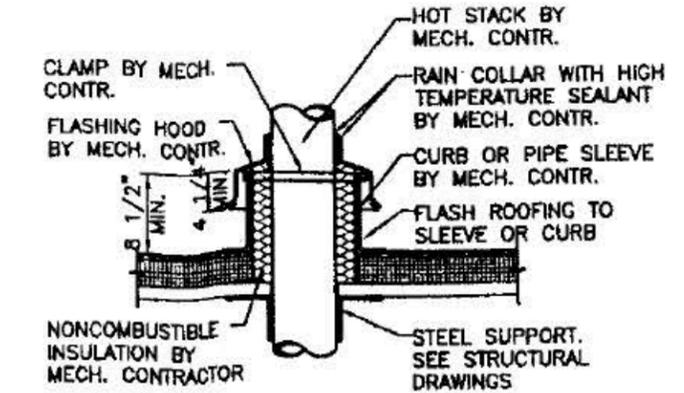
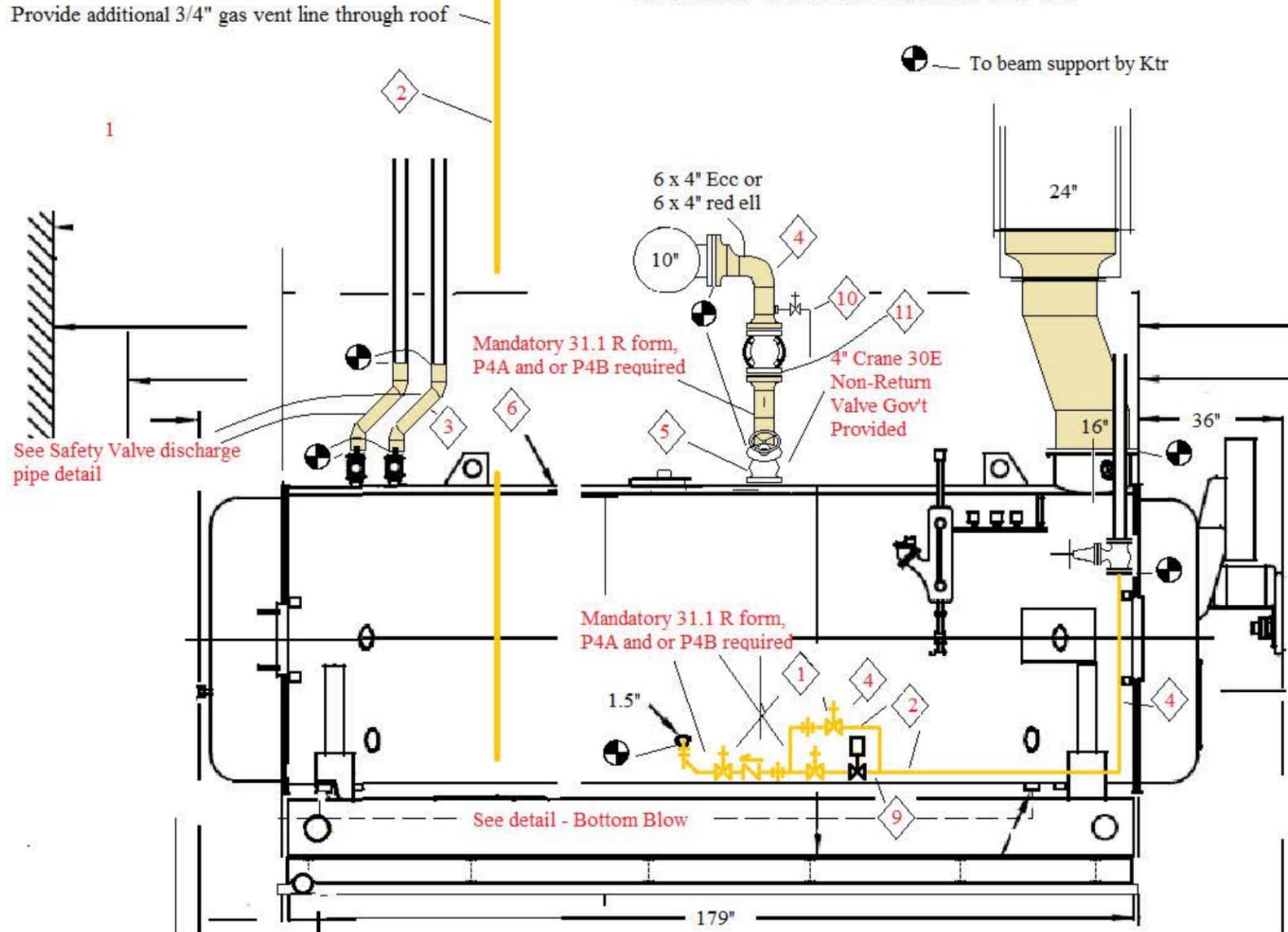
- Notes
- 1) All feedwater valves, except level control valve, provided by contractor.
  - 2) All pipe and fittings provided by contractor.
  - 3) All safety valve inlet piping (if needed) and discharge piping provided by contractor.
  - 4) Insulation equal in thickness, type and jacketing to adjacent insulation.
  - 5) Pipe in trap equal to other boilers, create mudleg per detail and pipe drain to funnel
  - Trap assembly provided by government
  - 6) Pipe in surface blow equal to other boilers
  - 7) Replace funnel
  - 8) Spool reduction piece
  - 9) Mechanical contractor responsible for providing brackets as needed for electrical panels and for mounting various controls such as but not limited to conductivity, water level or support brackets for feedwater header.
  - 10) Support plate and associated hardware-beam clamps, threaded rod, nuts washers provided by and installed by contractor.



## 27A 200 HP Boiler Installation

Not to scale

# Naval Station Newport RI Boiler Relocation 27A

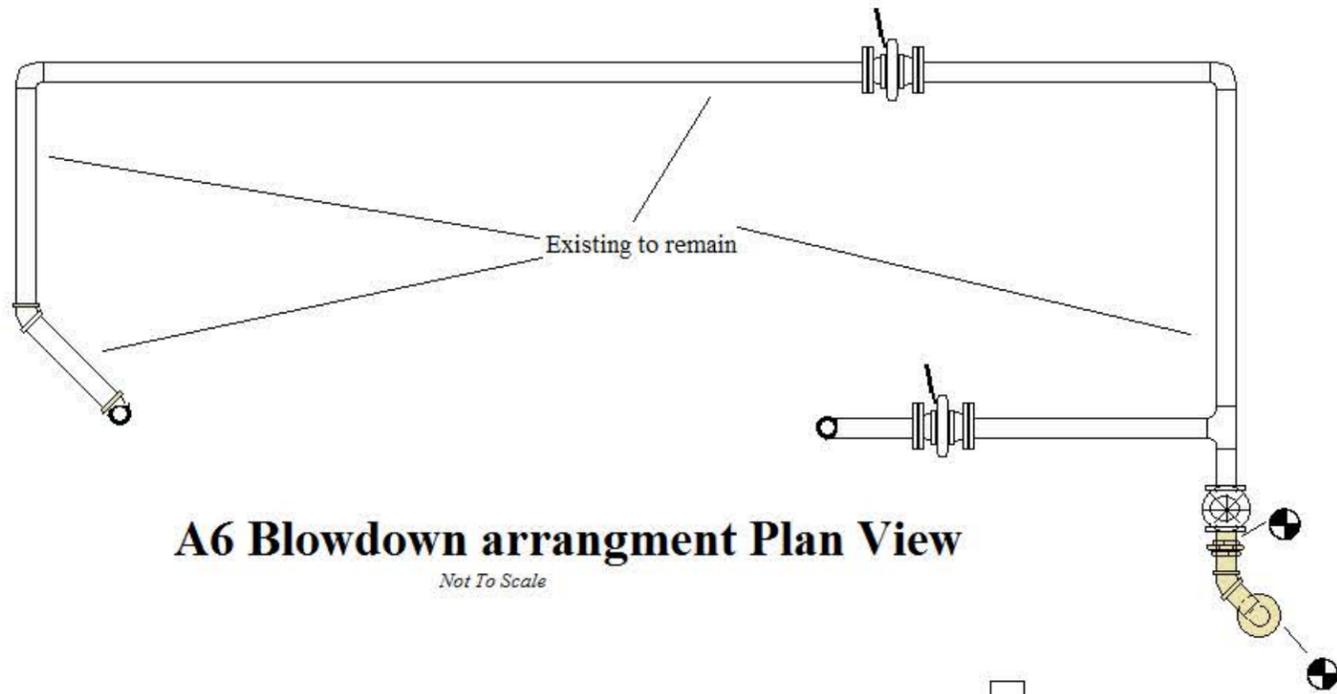


**3** ROOF HOT STACK DETAIL  
A-4 SCALE: 3/4" = 1'-0"

- Notes
- 1) All feedwater valves, except level control valve, provided by contractor.
  - 2) All pipe and fittings provided by contractor.
  - 3) All safety valve inlet piping (if needed) and discharge piping provided by contractor.
  - 4) Insulation equal in thickness, type and jacketing to adjacent insulation.
  - 5) Pipe in trap equal to other boilers, create mudleg per detail and pipe drain to floor drain  
Trap assembly provided by government
  - 6) Pipe in surface blow per detail sheet
  - 9) Mechanical contractor responsible for providing brackets as needed for electrical panels and for mounting various controls such as but not limited to conductivity, water level or support brackets for feedwater header.
  - 10) Drain connection from above line stop to be piped to a second forged steel valve then to floor drain
  - 11) Alternate location for line stop valve, valve is preferred to be on horizontal as per other sketches

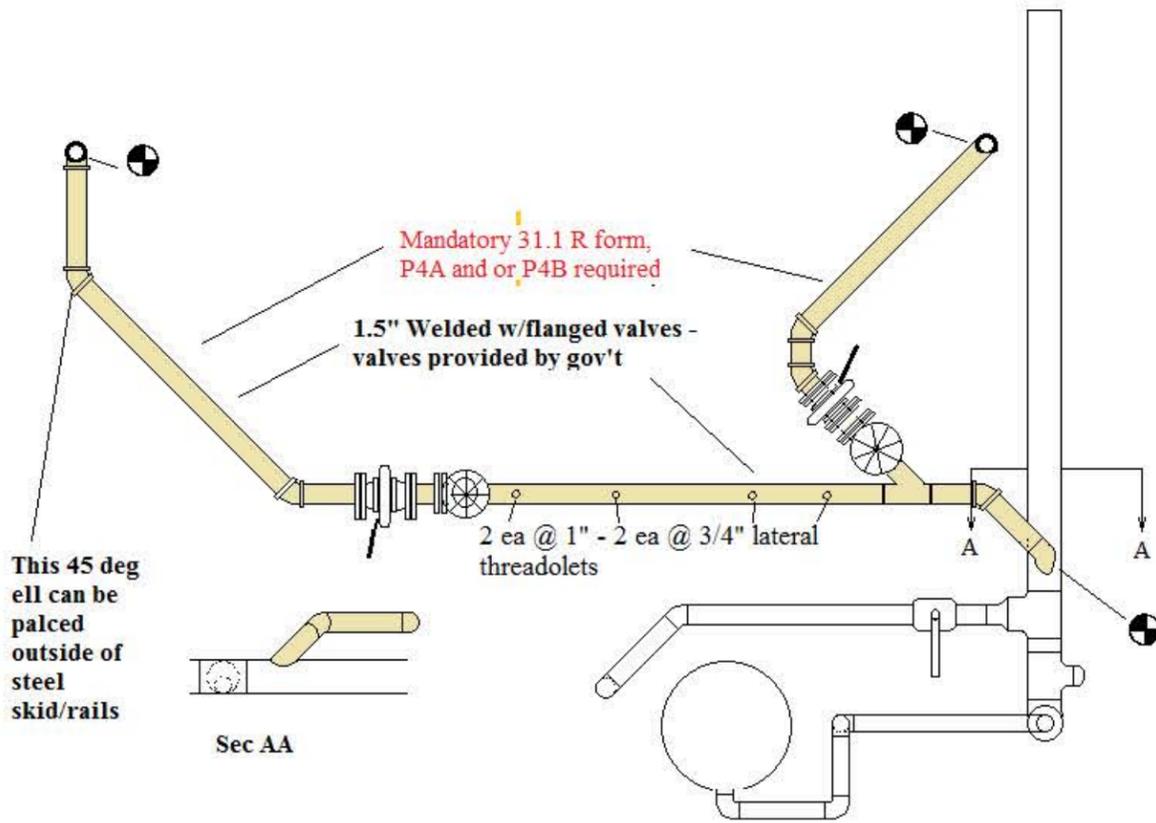
**27A 200 HP Boiler Feedwater Side**

# Boiler Relocation Naval Station Newport System Details



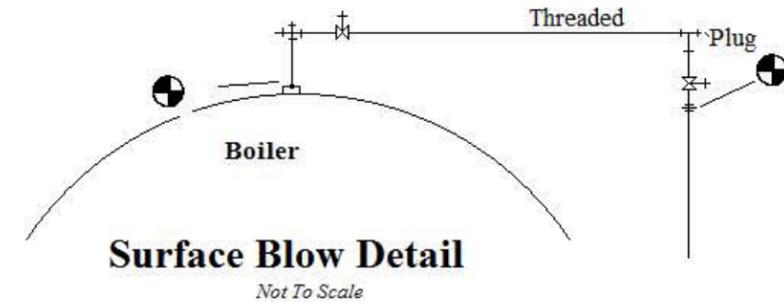
**A6 Blowdown arrangement Plan View**

*Not To Scale*



**27A Bottom Blow Plan View**

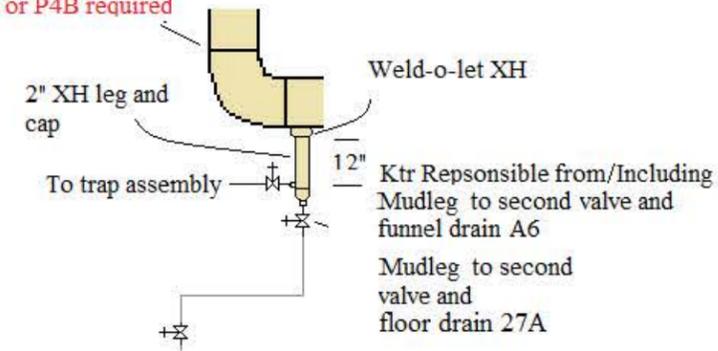
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**Surface Blow Detail**

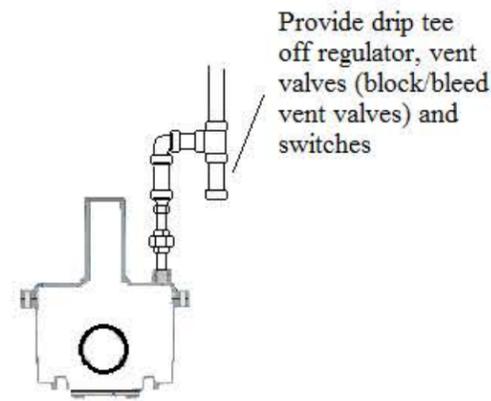
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Mandatory 31.1 R form, P4A and or P4B required

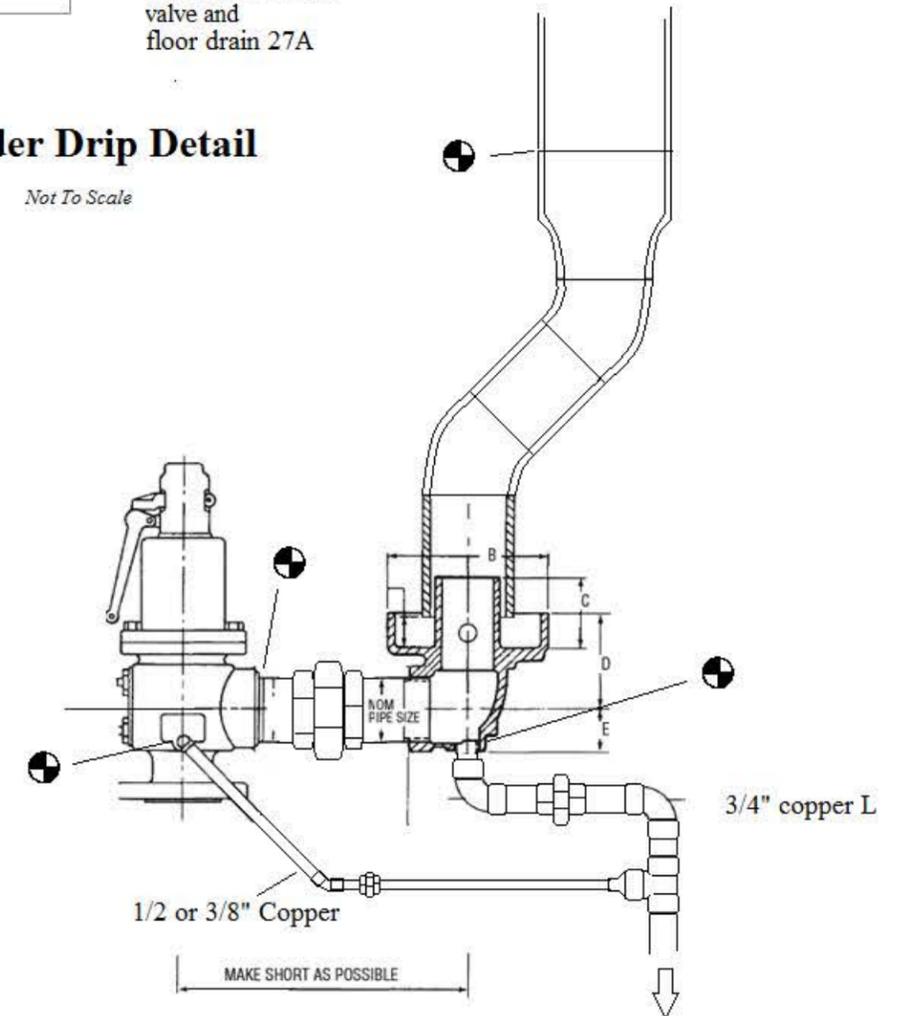


**Header Drip Detail**

*Not To Scale*



Typical Gas vent connection detail

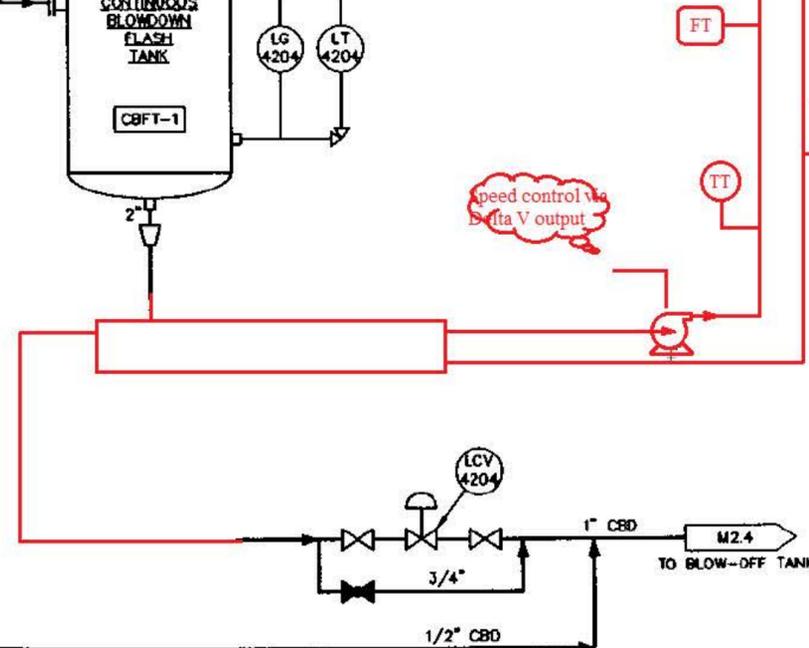
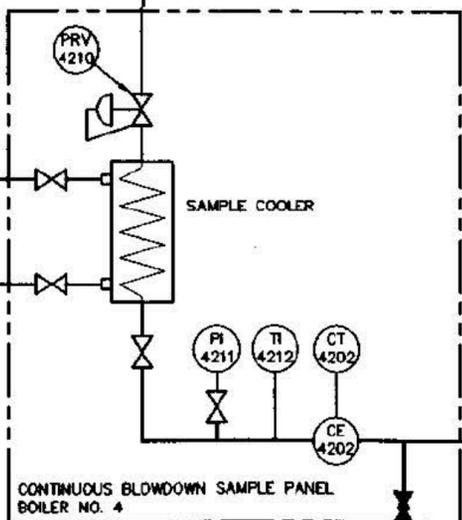
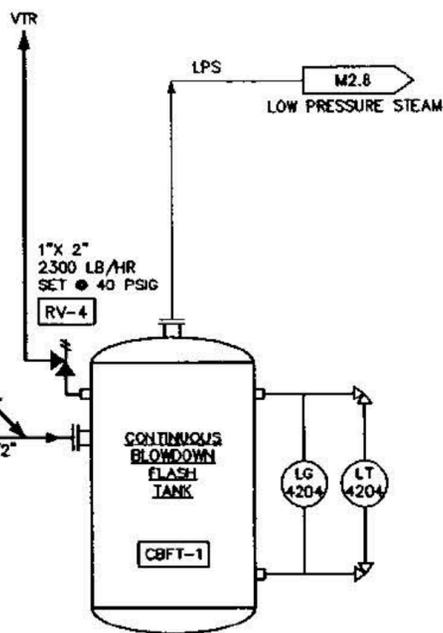
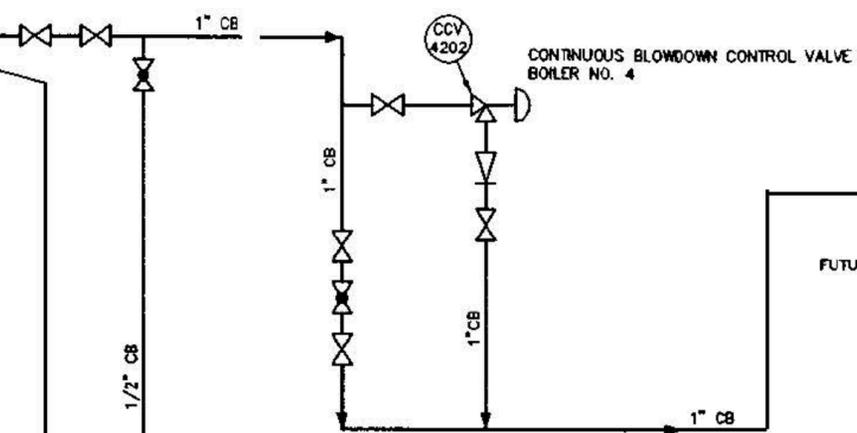
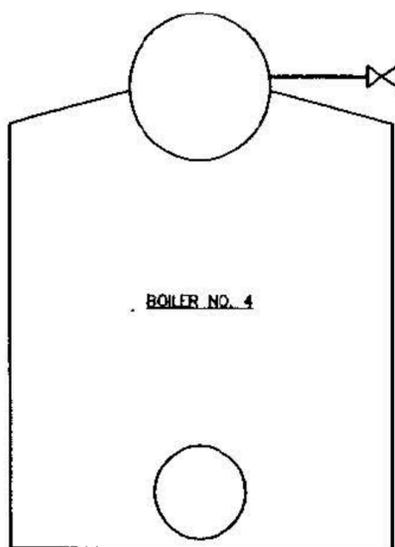


**Safety Valve Detail**

*Not To Scale*

Ktr responsible to funnel (A6) or blowdown header (27A)

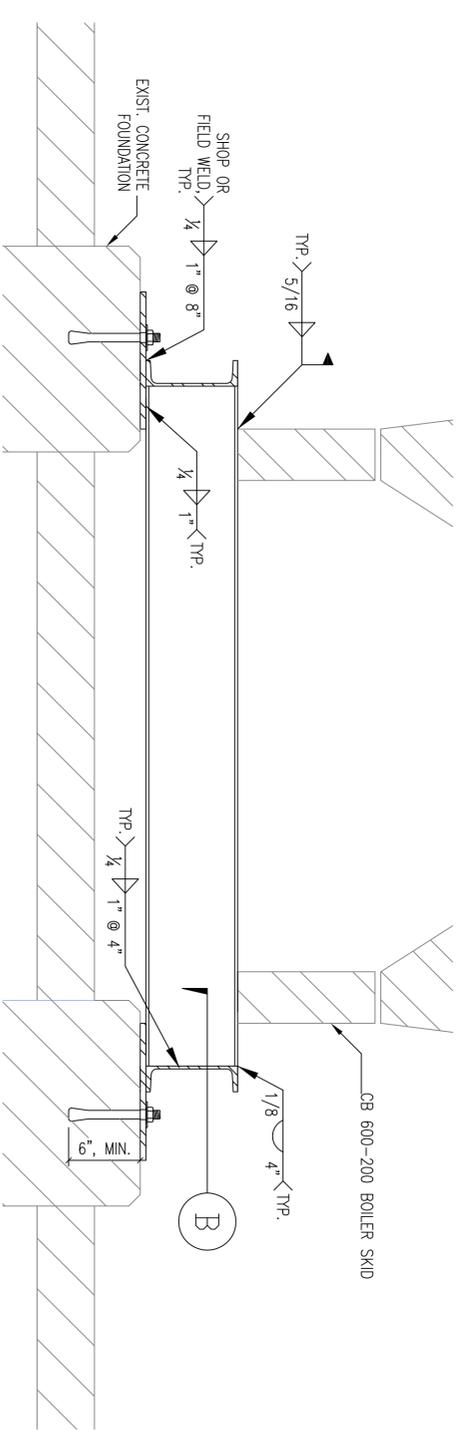




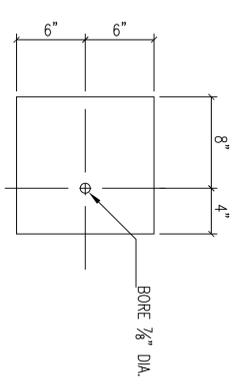
speed control via Delta V output

FINAL SUBMITTAL  
7/16/98

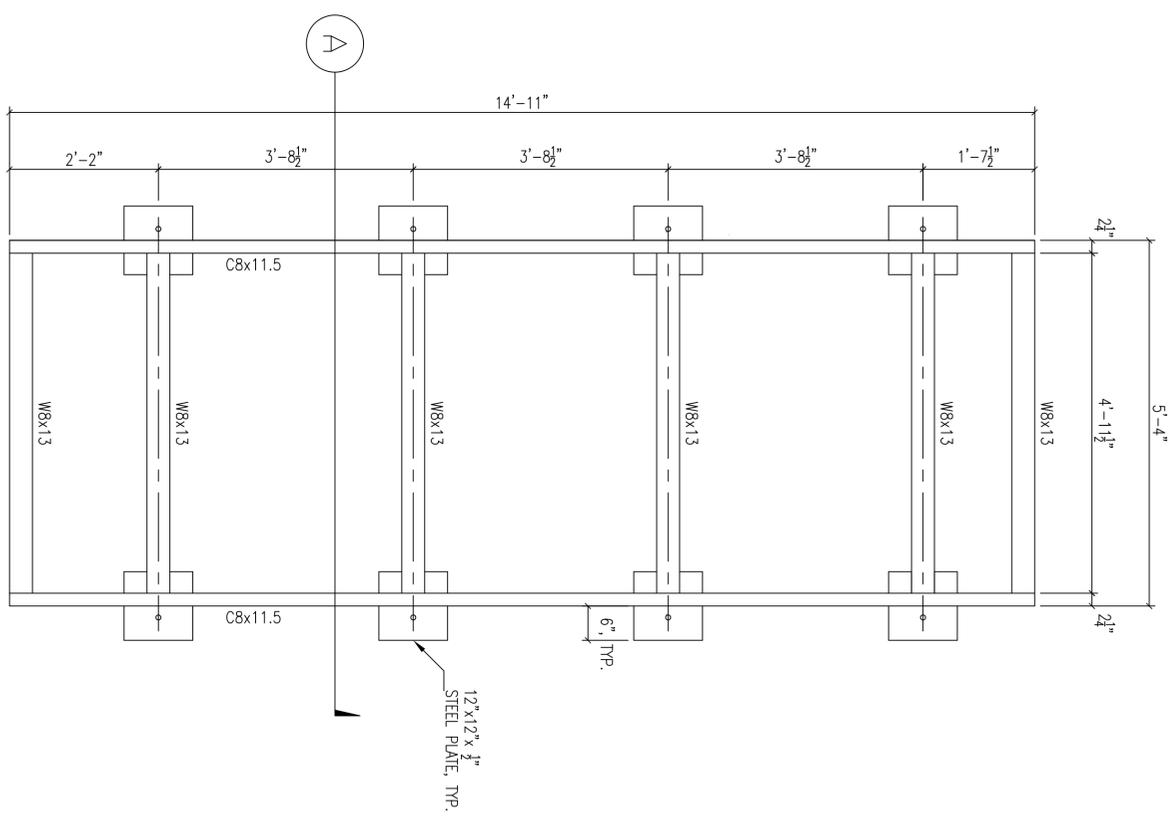
Pennsylvania State University  
 Department of Engineering  
 Northern Division  
 Leister  
 Final Submittal  
 7/16/98  
 SHEET  
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**A** SUPPORT FRAME - DETAIL  
SCALE: 1 1/2" = 1'-0"



**B** BEARING PLATE DETAIL  
SCALE: 1 1/2" = 1'-0"

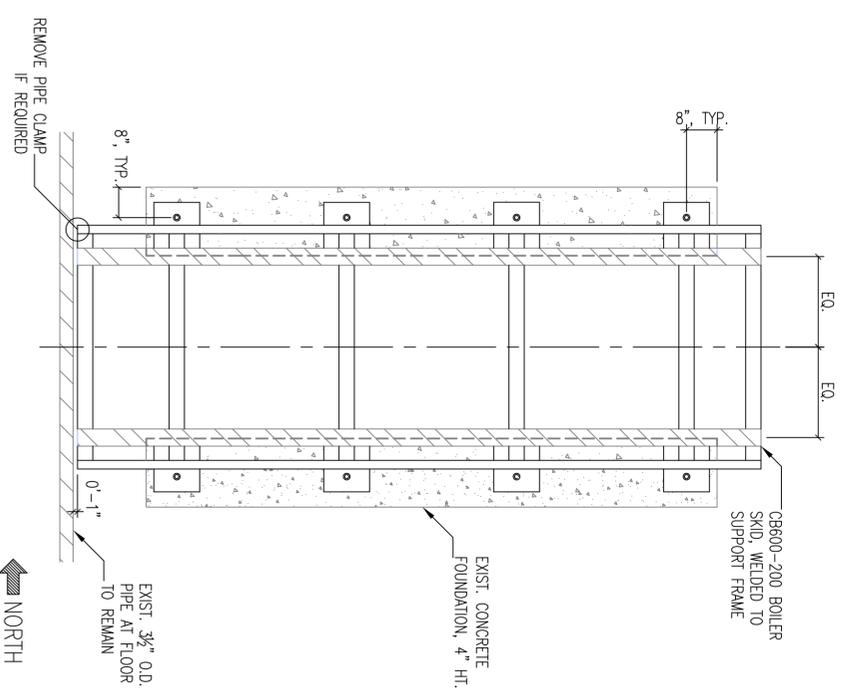


**1** SUPPORT FRAME - PLAN VIEW  
SCALE: 3/4" = 1'-0"

SECTION	LENGTH	QUANTITY	WEIGHT EACH	WEIGHT TOTAL
C8x11.5	14'-11"	2	171.5 LBS.	343.0 LBS.
W8x13	4'-1 1/2"	6	64.5 LBS.	387.0 LBS.
STEEL PLATE 1/2" x 12	1'-0"	8	20.4 LBS.	163.2 LBS.
ASSEMBLED FRAME				893.2 LBS.

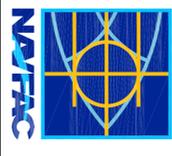
**NOTES:**

- 1) POST INSTALLED ANCHOR BOLTS TO BE HILTI 3/4" x 8" STAINLESS STEEL (SS304) EXPANSION ANCHORS OR APPROVED EQUAL. EMBEDMENT DEPTH 6", MIN.
- 2) STEEL CONNECTIONS NOT DETAILED ON PLANS TO BE FABRICATOR'S STANDARD AND IN ACCORDANCE WITH AISC SPECIFICATIONS.
- 3) WELDING TO BE BY CERTIFIED WELDERS AND IN CONFORMANCE WITH AWS STANDARDS. ALL WELDS NOT OTHERWISE IDENTIFIED SHALL BE CONTINUOUS.
- 4) SHOP APPLY RUST-INHIBITIVE PRIME COAT TO OBTAIN DRY FILM THICKNESS OF NOT LESS THAN 2 MILS. FINISH COAT TO BE SHOP OR FIELD APPLIED.
- 5) GRIND EXISTING FOUNDATION CURBS AS REQUIRED FOR FLUSH SURFACE AT BEARING PLATE LOCATIONS.



LOCATION KEY  
SCALE: ND SCALE

SYM	DESCRIPTION	DATE
	CONSTRUCTION	4-22-16



APPROVED	M/A INFO
FOR CHAIRMAN WAFAC	
ACTIVITY	
SUBMITTED TO	
DES. RSS	CHK.
PK.	

NEWPORT, RHODE ISLAND  
**BOILER INSTALLATION**  
 BUILDING 27A, NAVAL WAR COLLEGE

SCALE: AS NOTED  
 PROJECT NO.: 1551414  
 CONSTR. CONTR. NO.  
 CONST. CONTRACT NO.  
 NAFAC DRAWING NO.

SHEET 1 OF 1





MODEL PA

CHIMNEY AND  
EXHAUST SYSTEMS



## LISTINGS

The Schebler Model PA chimney and exhaust system is listed by Underwriters Laboratories Inc. (UL) under file number MH17739 for use as a 1400°F chimney, a 1000°F Building Heating Appliance Chimney for positive pressures to 60"WC (**UL 103**) and for Grease Duct (**UL 1978**). It also has the Underwriters Laboratories mark for Canada (cUL).

The system is also approved by the New York City Department of Buildings for use in New York City. MEA # 227-94-M.

## SYSTEM CONCEPT

The Model PA is a modular double wall prefabricated exhaust system with 1" air gap for use in venting appliances that require a positive, neutral or negative draft exhaust system. Sections are provided in lightweight, easy-to-handle lengths. Connections are sealed with pressure tight drawbands and high temperature sealant. Straight sections, expansion joints, tees, elbows and support devices are offered, allowing a complete exhaust system to be assembled from standard components.

## SURROUNDINGS

The Model PA chimneys are suitable for use with Building Heating Appliances and other low heat appliances as described in the Chimney Selection chart of the National Fire Protection Association Standard Number 211 which produce flue exhaust gases not exceeding 1400°F under continuous operation or 1800°F intermittent operation. These chimneys are to be installed as required for metal chimneys. They are not to be enclosed within combustible construction. An unenclosed chimney may be placed adjacent to walls of combustible construction at the clearances specified.

## COMPLETE LINE OF FITTINGS AND SIZES AVAILABLE

The Model PA chimney system is available in even and odd diameters ranging from 5" to 48". A complete line of straight sections, expansion joints, tees, elbows, rain caps, roof penetration components and support members are offered. In addition to the standard components virtually any conceivable fitting is available as a special order item.

## MATERIAL AVAILABLE

The Model PA is available in a variety of materials allowing the proper material selection for your specific application. The standard product features a 304 stainless steel liner and an aluminized steel outer shell. For greater corrosion resistance 316 stainless steel is available for the liner and 304 or 316 stainless steel for the outer shell.

For most applications the standard 304SS inner, aluminized outer material selection is sufficient. Under the following conditions you may consider the use of alternate materials:

- Boilers firing oils heavier than #2 use 316SS for the inner shell.
- Exterior installations which are not easily accessible for periodic painting you should consider a 304SS outer shell which will require no maintenance.

## MATERIAL THICKNESS

The standard material thickness for liners is 20 ga. (.036"); for shells it is 22 ga. (.034"). Fittings larger than 24" diameter utilize 18 ga. (.048") on the shell. Pipe diameters 38" and larger utilize 18 ga. (.048") on the liners and the shells.

## SUPPORT LIMITS

Support plates and wall supports are utilized to support the weight of the chimney and to provide a fixed point to allow proper operation of expansion joints. In horizontal runs supports should be placed adjacent to fittings that are not otherwise supported. See the individual part description for allowable support charts.

## TESTS PERFORMED

The Model PA has endured rigorous tests by Underwriters Laboratories. Just a few of the tests performed are:

- **Structural Tests** The support plates and wall supports have been physically tested to carry a load 4 times that allowed by our listing.
- **Wind Load Tests** Loads equivalent to 110 mph wind have been applied to the chimney with acceptable results.
- **Skin Temperature Rise Tests** The chimney has been subjected to a series of burn tests at temperatures up to 1800°F. The purpose of these tests is to determine safe clearances from the chimney wall to combustible materials.
- **Rain Tests** The rain caps have been tested to ensure that an unsatisfactory amount of water does not enter the rain cap.

## SCHEBLER VALUE

- **Fast Project Completion**
  - 2-week lead time (vs. industry standard 3-6 weeks)
  - Trouble-free installation / detailed instructions
  - No on-site welding
- **Maximum Strength / Long Life**
  - Unmatched dimensional accuracy for secure joint connections
  - Fully welded liners and shells
  - Unequaled support limits
- **Complete System Design**
  - CAD drawings
  - 3D design solutions
  - Complete BOM
  - System sizing
- **Special Fittings**

## OPERATING TEMPERATURES AND CLEARANCES CHART

The Model PA has been tested and listed for continuous use at both 1000°F and 1400°F as well as for use as grease duct at the following clearances to combustible materials. The clearances shown are from the shell to combustibles.

PA Clearance to Combustibles		
Section Inside Diameter	1000°F (560°C)	1400°F (760°C)
	Chimney*	Chimney
5"-6"	6" (152mm)	7" (178mm)
7"-12"	7" (178mm)	8" (203mm)
13"-16"	8" (203mm)	9" (229mm)
17"-20"	9" (229mm)	10" (254mm)
21"-24"	10" (254mm)	11" (279mm)
25"-28"	11" (279mm)	12" (305mm)
29"-32"	12" (305mm)	13" (330mm)
33"-36"	13" (330mm)	14" (356mm)
37"-40"	14" (356mm)	15" (381mm)
41"-44"	15" (381mm)	16" (406mm)
45"-48"	18" (457mm)	20" (518mm)

\*Building Heating Appliance Chimney

Section Inside Diameter	Grease Duct
5"-6"	6" (152mm)
7"-12"	8" (203mm)
13"-16"	10" (254mm)
17"-20"	11" (279mm)
21"-24"	12" (305mm)
25"-28"	14" (356mm)
29"-32"	16" (406mm)
33"-48"	18" (457mm)

Clearance to non-combustible materials for all diameters and applications is 1" (25mm).

## PART NUMBERS

All standard parts manufactured by Schebler are identified by a part number which describes their make up and function.

The part numbers are made up as follows:

1. The first series is the model designation, PA, P1, P2, P2A, P4 or SW.
2. This is followed by the part name. For example 47S, 90T and CC.
3. Next is the part's internal diameter in inches, such as 06, 12, 24.
4. Last is the liner/shell material designation.

For example the part number for an 8" ID, Model PA, 47" long straight section with a 304 stainless steel liner and aluminized steel shell is: PA47S08A.

Code	Liner / Shell Material
A	304 / Aluminized
B	316 / Aluminized
C	304 / 304 or all 304
D	304 / 316
E	316 / 316 or all 316
F	Galvanized
G	Aluminized
H	Painted Carbon Steel
N	304 / 430
P	316 / 430
Q	430
S	316 / 304

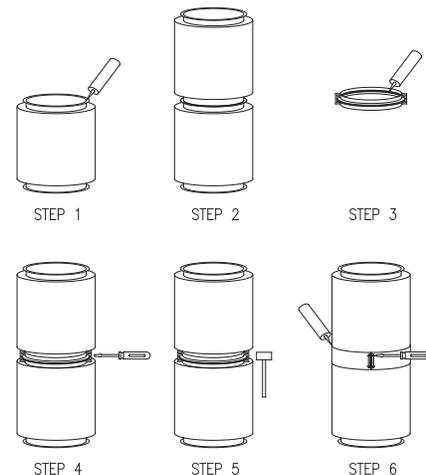
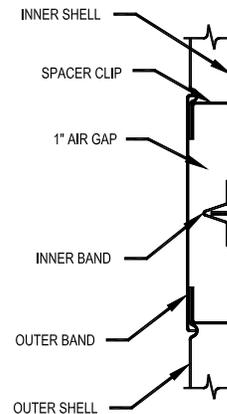
## JOINT ASSEMBLY

Note: Wipe inner bands and flanges clean prior to assembly.

1. Apply continuous bead of proper sealant covering one of the ½" flange of the two parts being joined.
2. Join the flanged ends of the two sections together.
3. Fully fill the vee groove of the inner band with proper sealant.
4. Install the inner band around the flanges and tighten the screws.
5. Tap around the inner band with a rawhide mallet and retighten the screws to ensure a tight joint.
6. Place the outer band over the space between the outer shells of the adjoining sections and tighten the screws. For outdoor installations, apply a bead of S600 sealant in the groove at the upper end of the outer band.

## SEALANT

Schebler offers three types of sealant, S600, S2000, and S2001. The S600 is used for applications with flue gas temperatures up to 600°F (315°C). This includes most boilers and water heaters. The S2000 is used for grease duct systems. S2001 is used for installations operating under positive pressure, such as generator exhaust.



# SYSTEM COMPONENTS

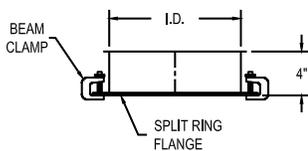
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## ADAPTER KIT (FLANGED)

### Part No. BKF

The Adapter Kit (Flanged) is used for securing pipe to a flanged appliance outlet. Beam clamps are provided for connection of the flanges, or the flange can be drilled in the field to match the appliance.

Includes 1 inner band and 1 seal ring to cover the gap between the inner and outer shells.

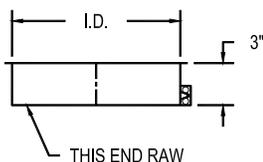


## ADAPTER KIT (RAW)

### Part No. BKR

The Adapter Kit (Raw) is used for securing pipe to an unflanged appliance outlet.

Includes 1 inner band and 1 seal ring to cover the gap between the inner and outer shells.



## STRAIGHT SECTION

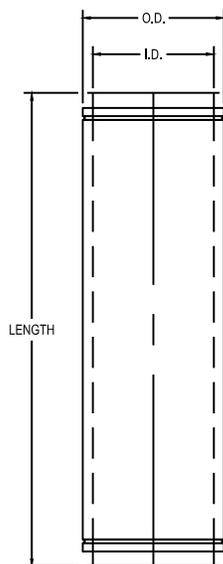
### Part No. 18S, 29S, 47S and 59S

Standard lengths are as follows:

- Diameter 5" - 7"** is 18", 29" and 47"
- Diameter 8" - 24"** is 18", 29", 47" and 59"
- Diameter 25" - 48"** is 18", 29" and 47"

Custom parts can be manufactured to any length over 8".

Includes 1 inner and 1 outer band.



## ADJUSTABLE LENGTH

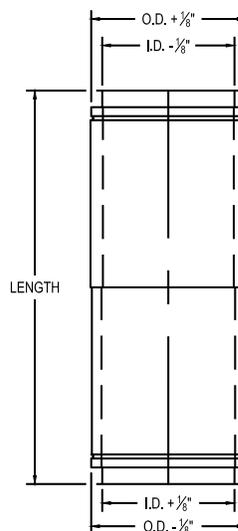
### Part No. 18AL, 22AL, 30AL and 45AL

The Adjustable Length is used to provide adjustment during installation as well as compensate for thermal expansion between fixed points.

The adjustment in length available for each part is as follows:

- 18AL** = 14" to 17"
- 22AL** = 16" to 21"
- 30AL** = 20" to 29"
- 45AL** = 27 1/2" to 44"

Includes 1 inner and 1 outer band.

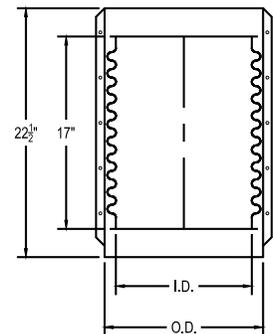


## BELLOWS SECTION

### Part No. BS

The Bellows Section is designed to compensate for thermal expansion, up to 3". This part is recommended for diesel engine and turbine exhaust systems.

Includes liner, shell, and 1 inner band.

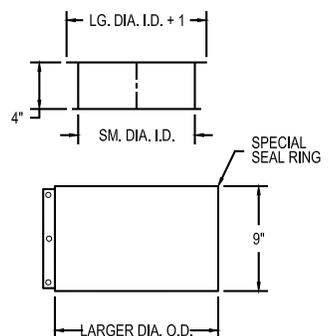


## ABRUPT INCREASER

### Part No. AI

The Abrupt Increaser is used to connect two sections of different diameters in a shorter space than a tapered increaser.

Includes 1 inner band of larger and smaller sizes and 1 seal ring.

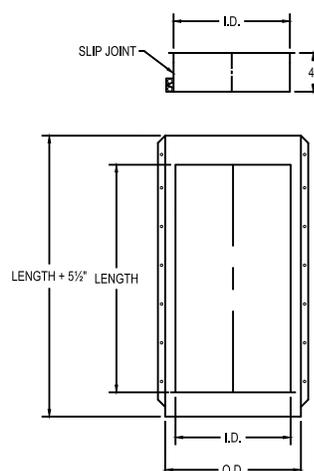


## VARIABLE LENGTH SECTION

### Part No. 18VS, 29VS and VS

The Variable Section adjusts to provide a fixed odd length between two sections. The minimum length is 5", the maximum is 18", 29" or 40". This part does not provide for thermal expansion.

Includes liner, shell, slip joint, and 1 inner band.

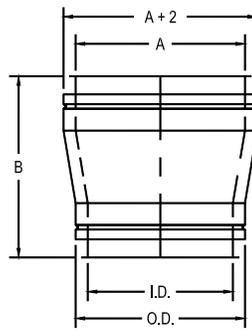


## TAPERED INCREASER

### Part No. TI

The Tapered Increaser is used when a change in pipe diameter is required.

Includes 1 inner and 1 outer band of both smaller and larger size.



Part No. TI								
I.D.	A	B	A	B	A	B	A	B
6"	8"	15"	10"	18"	12"	21"	14"	24"
8"	10"	15"	12"	18"	14"	21"	16"	24"
10"	12"	15"	14"	18"	16"	21"	18"	24"
12"	14"	15"	16"	18"	18"	21"	20"	24"
14"	16"	15"	18"	18"	20"	21"	22"	24"
16"	18"	15"	20"	18"	22"	21"	24"	24"
18"	20"	15"	22"	18"	24"	21"	26"	24"
20"	22"	15"	24"	18"	26"	21"	28"	24"
22"	24"	15"	26"	18"	28"	21"	30"	24"
24"	26"	15"	28"	18"	30"	21"	32"	24"
26"	28"	15"	30"	18"	32"	21"	34"	24"
28"	30"	15"	32"	18"	34"	21"	36"	24"
30"	32"	15"	34"	18"	36"	21"	38"	24"
32"	34"	15"	36"	18"	38"	21"	40"	24"
34"	36"	15"	38"	18"	40"	21"	42"	24"
36"	38"	15"	40"	18"	42"	21"	44"	24"
38"	40"	15"	42"	18"	44"	21"	46"	24"
40"	42"	15"	44"	18"	46"	21"	48"	24"
42"	44"	15"	46"	18"	48"	21"	~	~
44"	46"	15"	48"	18"	~	~	~	~
46"	48"	15"	~	~	~	~	~	~
48"	~	~	~	~	~	~	~	~

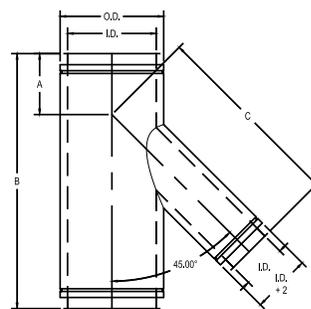
Available in odd sizes.  
Call for odd diameter taper increaser information.

## REDUCING 45° LATERAL TEE

### Part No. R45LT

The Reducing 45° Lateral Tee is used for low flow resistance entry into a stack or breeching when the stack or breeching is a larger size. Specify size of branch required.

Includes 1 each inner band and outer band for larger and smaller opening.



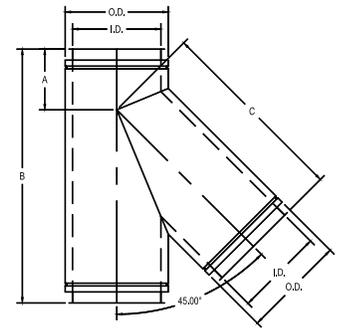
## 45° LATERAL TEE

### Part No. 45LT

The 45° Lateral Tee is used for low flow resistance entry into a stack or breeching.

Includes 2 inner bands and 2 outer bands.

Note: Grease tees available  
1 1/2" containment dam located at one opening.



Part No. 45LT / R45LT			
I.D.	A	B	C
5-6"	7"	26"	19"
7-8"	7 3/8"	28 3/4"	21 3/8"
9-10"	7 3/4"	31 1/2"	23 3/4"
11-12"	8 1/4"	34 1/2"	26 1/4"
13-14"	8 5/8"	37 1/4"	28 5/8"
15-16"	9 1/16"	40 1/8"	31 1/16"
17-18"	9 1/2"	43"	33 1/2"
19-20"	9 7/8"	45 3/4"	35 7/8"
21-22"	10 5/16"	48 5/8"	38 5/16"
23-24"	10 3/4"	51 1/2"	40 3/4"
25-26"	11 1/8"	54 1/4"	43 1/8"
27-28"	11 9/16"	57 1/8"	45 9/16"
29-30"	12"	60"	48"
31-32"	12 3/8"	62 3/4"	50 3/8"
33-34"	12 3/4"	65 1/2"	52 3/4"
35-36"	13 3/16"	68 3/8"	55 3/16"
37-38"	13 5/8"	71 1/4"	57 5/8"
39-40"	14"	74"	60"
41-42"	14 7/16"	76 7/8"	62 7/16"
43-44"	14 7/8"	79 3/4"	64 7/8"
45-46"	15 1/4"	82 1/2"	67 1/4"
47-48"	15 11/16"	85 3/8"	69 11/16"

# SYSTEM COMPONENTS

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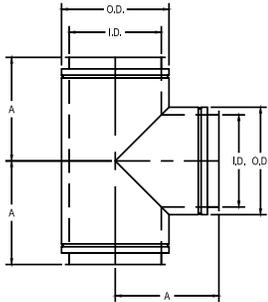
## 90° TEE

### Part No. 90T

The 90° Tee is used to join horizontal and vertical sections, as well as to provide for connection of drain or inspection fittings. Use either the drain tee cap or the end cap for closure of the unused opening.

Includes 2 inner bands and 2 outer bands.

Note: Grease tees available 1 1/2" containment dam located at one opening.

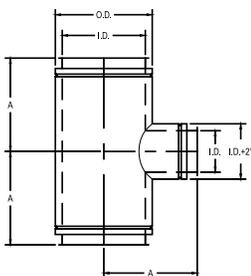


## REDUCING 90° TEE

### Part No. R90T

The Reducing 90° Tee is used to join horizontal and vertical sections of different sizes, as well as provide for connection to drain or inspection fittings. Use either the drain tee cap or the end cap for closure of the unused opening. Specify size of branch required.

Includes 1 each inner band and outer band for larger and smaller opening.

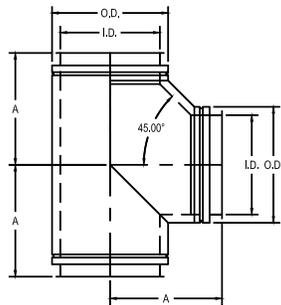


## 90° BOOT TEE

### Part No. BT

The 90° Boot Tee is used to join horizontal and vertical sections with lower resistance as well as to provide for connection of drain or inspection fittings. Use either the drain tee cap or the end cap for closure of the unused opening.

Includes 2 inner bands and 2 outer bands.



Part No. 90T / R90T / BT	
I.D.	A
5-6"	10 1/2"
7-8"	11 1/2"
9-10"	12 1/2"
11-12"	13 1/2"
13-14"	14 1/2"
15-16"	15 1/2"
17-18"	16 1/2"
19-20"	17 1/2"
21-22"	18 1/2"
23-24"	19 1/2"
25-26"	20 1/2"
27-28"	21 1/2"
29-30"	22 1/2"
31-32"	23 1/2"
33-34"	24 1/2"
35-36"	25 1/2"
37-38"	26 1/2"
39-40"	27 1/2"
41-42"	28 1/2"
43-44"	29 1/2"
45-46"	30 1/2"
47-48"	31 1/2"

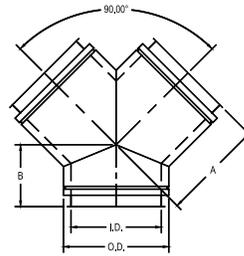
## 90° WYE

### Part No. 90Y

The 90° Wye is used for joining runs where low flow resistance is desired. All openings must be the same size. For connection to smaller diameter sections use the tapered or abrupt increasers.

Includes 2 inner bands and 2 outer bands.

Note: Grease wye available 1 1/2" containment dam located at one opening.



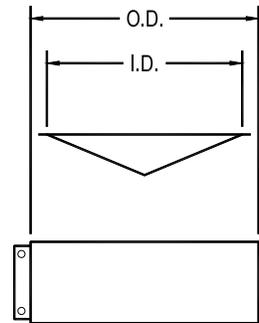
Part No. 90Y		
I.D.	A	B
5-6"	10 1/2"	7"
7-8"	11 1/2"	7 13/32"
9-10"	12 1/2"	7 13/16"
11-12"	13 1/2"	8 7/32"
13-14"	14 1/2"	8 5/8"
15-16"	15 1/2"	9 1/16"
17-18"	16 1/2"	9 7/16"
19-20"	17 1/2"	9 7/8"
21-22"	18 1/2"	10 9/32"
23-24"	19 1/2"	10 23/32"
25-26"	20 1/2"	11 1/8"
27-28"	21 1/2"	11 17/32"
29-30"	22 1/2"	11 31/32"
31-32"	23 1/2"	12 3/8"
33-34"	24 1/2"	12 25/32"
35-36"	25 1/2"	13 3/16"
37-38"	26 1/2"	13 11/16"
39-40"	27 1/2"	14 1/32"
41-42"	28 1/2"	14 15/32"
43-44"	29 1/2"	14 27/32"
45-46"	30 1/2"	15 1/4"
47-48"	31 1/2"	15 11/16"

## END CAP

### Part No. EC

The End Cap is used to close an unused tee opening and to provide a means of accessing the interior of the system for inspection and cleaning.

Includes 1 inner band.

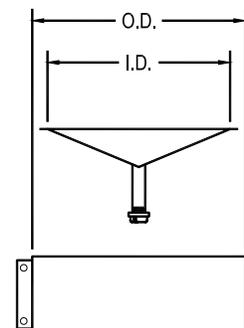


## DRAIN TEE CAP

### Part No. DTC

The Drain Tee Cap is used to close an unused tee opening and to provide a drain at the base of a vertical chimney.

Includes 1 inner band.

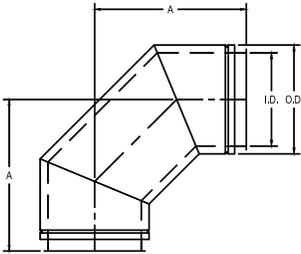


## 90° ELBOW

### Part No. 90L

The 90° Elbow is used when making a 90° directional change. The 90° elbow is available in sizes 5" through 24". For a 90° directional change in diameters from 25" through 48" use two 45° elbows.

Includes 1 inner and 1 outer band.

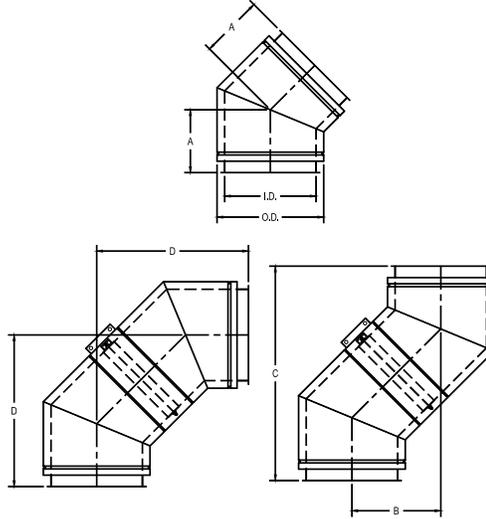


## 45° ELBOW

### Part No. 45L

The 45° Elbow is used when a vertical or horizontal direction change of 45° is desired.

Includes 1 inner and 1 outer band.

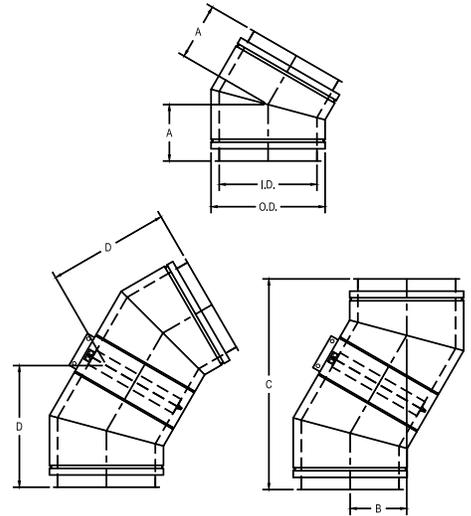


## 30° ELBOW

### Part No. 30L

The 30° Elbow is used when a vertical or horizontal direction change of 30° is desired.

Includes 1 inner and 1 outer band.



Part No. 90L	
I.D.	A
5-6"	13 1/2"
7-8"	15 1/2"
9-10"	17 1/2"
11-12"	19 1/2"
13-14"	21 1/2"
15-16"	23 1/2"
17-18"	25 1/2"
19-20"	27 1/2"
21-22"	29 1/2"
23-24"	31 1/2"

Part No. 45L				
I.D.	A	B	C	D
5-6"	7"	9 29/32"	23 29/32"	16 29/32"
7-8"	7 3/8"	10 7/16"	25 3/16"	17 13/16"
9-10"	7 3/16"	11 3/64"	26 43/64"	18 55/64"
11-12"	8 1/4"	11 43/64"	28 11/64"	19 59/64"
13-14"	8 5/8"	12 13/64"	29 29/64"	20 53/64"
15-16"	9 1/16"	12 13/16"	30 15/16"	21 7/8"
17-18"	9 1/2"	13 7/16"	32 7/16"	22 15/16"
19-20"	9 7/8"	13 31/32"	33 23/32"	23 27/32"
21-22"	10 5/16"	14 37/64"	35 13/64"	24 57/64"
23-24"	10 3/4"	15 13/64"	36 45/64"	25 61/64"
25-26"	11 1/8"	15 47/64"	37 63/64"	26 55/64"
27-28"	11 9/16"	16 23/64"	39 31/64"	27 59/64"
29-30"	11 15/16"	16 7/8"	40 3/4"	28 13/16"
31-32"	12 3/8"	17 1/2"	42 1/4"	29 7/8"
33-34"	12 3/4"	18 1/32"	43 17/32"	30 25/32"
35-36"	13 3/16"	18 21/32"	45 1/32"	31 27/32"
37-38"	13 5/8"	19 17/64"	46 33/64"	32 57/64"
39-40"	14"	19 51/64"	47 51/64"	33 51/64"
41-42"	14 7/16"	20 27/64"	49 19/64"	34 55/64"
43-44"	14 7/8"	21 1/32"	50 25/32"	35 29/64"
45-46"	15 1/4"	21 9/16"	52 1/16"	36 13/16"
47-48"	15 11/16"	22 3/16"	53 9/16"	37 7/8"

Part No. 30L				
I.D.	A	B	C	D
5-6"	6 1/8"	6 1/8"	22 55/64"	13 13/64"
7-8"	6 3/8"	6 3/8"	23 51/64"	13 47/64"
9-10"	6 5/8"	6 5/8"	24 23/32"	14 9/32"
11-12"	6 15/16"	6 15/16"	25 57/64"	14 61/64"
13-14"	7 3/16"	7 3/16"	26 53/64"	15 31/64"
15-16"	7 7/16"	7 7/16"	27 3/4"	16 1/32"
17-18"	7 3/4"	7 3/4"	28 59/64"	16 45/64"
19-20"	8"	8"	29 55/64"	17 15/64"
21-22"	8 1/4"	8 1/4"	30 51/64"	17 23/32"
23-24"	8 1/2"	8 1/2"	31 23/32"	18 5/16"
25-26"	8 3/4"	8 3/4"	32 21/32"	18 55/64"
27-28"	9 1/16"	9 1/16"	33 53/64"	19 17/32"
29-30"	9 5/16"	9 5/16"	34 3/4"	20 1/16"
31-32"	9 9/16"	9 9/16"	35 11/16"	20 39/64"
33-34"	9 7/8"	9 7/8"	36 55/64"	21 9/32"
35-36"	10 1/8"	10 1/8"	37 25/32"	21 13/16"
37-38"	10 3/8"	10 3/8"	38 23/32"	22 23/64"
39-40"	10 5/8"	10 5/8"	39 21/32"	22 57/64"
41-42"	10 15/16"	10 15/16"	40 13/16"	23 9/16"
43-44"	11 3/16"	11 3/16"	41 3/4"	24 7/64"
45-46"	11 1/2"	11 1/2"	42 59/64"	24 25/32"
47-48"	11 3/4"	11 3/4"	43 55/64"	25 5/16"

# SYSTEM COMPONENTS

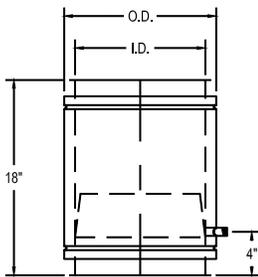
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## DRAIN SECTION

### Part No. DS

The Drain Section is used to drain rain water and condensation from within the stack. The NPT nipple should be connected to a suitable drain.

Includes 1 inner and 1 outer band.

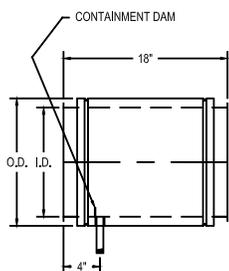


## HORIZONTAL DRAIN

### Part No. HD

The Horizontal Drain is used to drain rain water and condensation from within the stack. The NPT nipple should be connected to a suitable drain.

Includes 1 inner and 1 outer band.

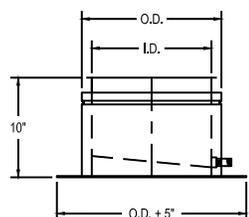


## BASE DRAIN SECTION

### Part No. BD

The Base Drain Section provides a bottom closure and drain attachment for base supported chimneys.

Includes 1 inner and 1 outer band.

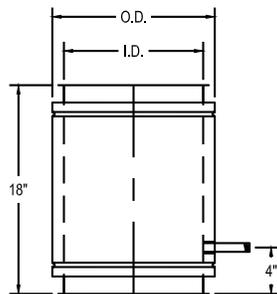


## NOZZLE SECTION

### Part No. NS

The Nozzle Section includes a 1" NPT connection to be used as a test port.

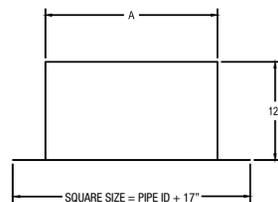
Includes 1 inner and 1 outer band.



## FLASHING

### Part No. FL

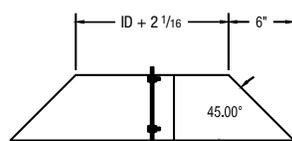
The Flashing is used in conjunction with the rain collar to seal roof penetrations. This part is designed for flat roofs. Custom pitched flashings are available upon request.



## RAIN COLLAR

### Part No. RC

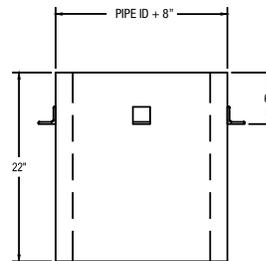
The Rain Collar is used in conjunction with the Flashing to seal roof penetrations.



## INSULATED THIMBLE

### Part No. IT

The Insulated Thimble is used when penetrating a combustible wall or roof. This part is designed for flat roofs. Custom Pitched Thimbles are available upon request.

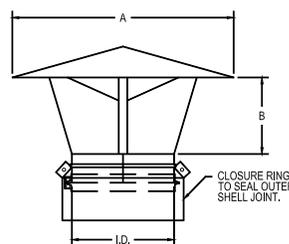


## RAIN CAP

### Part No. CC

The Rain Cap is used at stack terminations to prevent water from entering the flue. A drain should be used at the base of stacks to drain off water that may be blown into the flue.

Includes 1 inner band and 1 closure ring to seal outer shell joint.



## FLIP TOP CAP

### Part No. FTC

The Flip Top Cap is used in generator systems when the cap remains closed until pressure opens the cap.

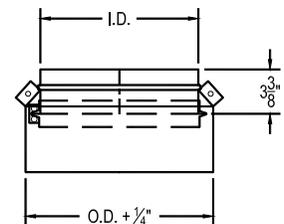
Includes 1 inner band and 1 closure ring to seal outer shell joint.

## TOP SECTION

### Part No. TS

The Top Section is used to protect the insulating space between the inner and outer shells when an open termination is required. A drain should be used at the base of stacks to drain off water that enters the system.

Includes 1 inner band and shell joint.



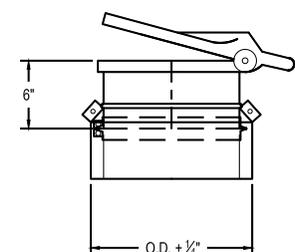
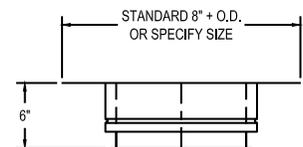
## FAN ADAPTER

### Part No. FA

The Fan Adapter is used to attach grease duct to an exhaust fan or kitchen hood.

Includes 1 inner and 1 outer band.

Note: Plenum boxes available for multiple fan systems.

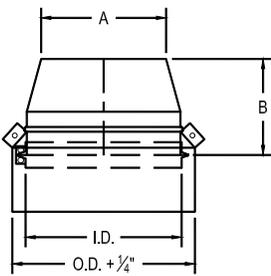


## EXIT CONE

### Part No. EXC

The Exit Cone is used to increase the flue gas velocity exiting the stack. A drain should be used at the base of stacks to remove any water that enters the stack.

Includes 1 inner band and 1 closure ring to seal outer shell joint.

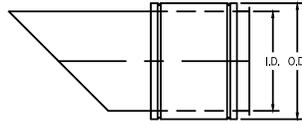


## HORIZONTAL TERMINATION

### Part No. HT

The Horizontal Termination is used when the stack terminates in a horizontal position. Birdscreen covers the opening to prevent any birds or rodents from entering.

Includes 1 inner and 1 outer band.



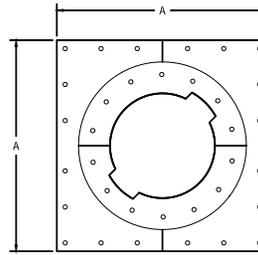
## SUPPORT PLATE

### Part No. SP

The Support Plate is the primary load carrying member of the chimney assembly. This part is designed to support (B) (See Chart below) feet of vertical chimney section as well as provide fixed points in breaching runs.

Includes 1 inner band and 2 half outer bands.

Note: This part must be placed at the connection of two flue sections.



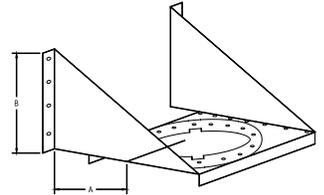
## WALL SUPPORT

### Part No. WS

The Wall Support is used to provide chimney support along a wall. The wall support will maintain the required clearance to combustible structures when properly installed and can support (C) (See Chart Below) feet of vertical chimney.

Includes 1 inner band and 2 half outer bands.

Note: This part must be placed at the connection of two flue sections.



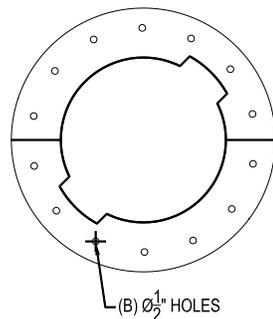
## GUY SECTION

### Part No. GS

The Guy Section is to be used when the chimney extends beyond the vertical limits above the roof line. The guy section should be connected to guy wires or a rigid guying structure.

Includes 1 inner band and 2 half outer bands.

Note: This part must be placed at the connection of two flue sections.



### Part No. EXC

I.D.	A	B
6"	4 7/8"	5 3/8"
8"	6 1/2"	6 1/8"
10"	8 1/8"	6 3/4"
12"	9 3/4"	7 1/2"
14"	11 3/8"	8 1/8"
16"	13 1/8"	8 7/8"
18"	14 3/4"	9 1/2"
20"	16 3/8"	10 1/4"
22"	18"	10 7/8"
24"	19 5/8"	11 5/8"
26"	21 1/4"	12 1/4"
28"	22 7/8"	13"
30"	24 1/2"	13 5/8"
32"	26 1/8"	14 3/8"
34"	27 3/4"	15"
36"	29 3/8"	15 3/4"
38"	31"	16 3/8"
40"	32 5/8"	17 1/8"
42"	34 1/4"	17 3/4"
44"	35 7/8"	18 1/2"
46"	37 1/2"	19 1/8"
48"	39 1/4"	19 3/4"

### Part No. SP

I.D.	A	B(FT)
5-6"	19 3/16"	306'
7-8"	21 3/16"	269'
9-10"	23 3/16"	255'
11-12"	25 3/16"	237'
13-14"	27 3/16"	227'
15-16"	29 3/16"	213'
17-18"	31 3/16"	201'
19-20"	34 3/16"	192'
21-22"	36 3/16"	180'
23-24"	38 3/16"	172'
25-26"	40 3/16"	161'
27-28"	42 3/16"	151'
29-30"	44 3/16"	142'
31-32"	46 3/16"	161'
33-34"	48 3/16"	151'
35-36"	50 3/16"	113'
37-38"	52 3/16"	101'
39-40"	54 3/16"	93'
41-42"	56 3/16"	85'
43-44"	58 3/16"	76'
45-46"	60 3/16"	68'
47-48"	62 3/16"	60'

### Part No. WS

I.D.	A	B	C(FT)
5-6"	11"	12 3/8"	193'
7-8"	13"	14 3/8"	171'
9-10"	14"	15 3/4"	164'
11-12"	15"	17 1/16"	153'
13-14"	17"	19 1/16"	148'
15-16"	18"	20 7/16"	140'
17-18"	20"	22 1/2"	134'
19-20"	21"	24 1/8"	129'
21-22"	23"	26 3/16"	123'
23-24"	24"	27 1/2"	119'
25-26"	26"	29 1/2"	113'
27-28"	27"	30 7/8"	108'
29-30"	29"	32 7/8"	103'
31-32"	30"	34 1/4"	120'
33-34"	32"	36 1/4"	114'
35-36"	33"	37 5/8"	88'
37-38"	35"	39 9/16"	81'
39-40"	36"	40 15/16"	77'
41-42"	38"	42 15/16"	73'
43-44"	39"	44 5/16"	68'
45-46"	44"	47"	64'
47-48"	45"	49 11/16"	60'

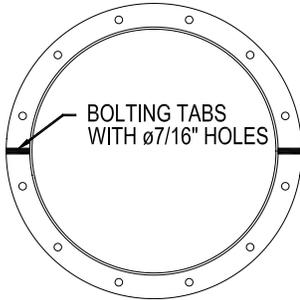
# SYSTEM COMPONENTS

CUSTOM DIMENSIONS ARE AVAILABLE TO SUIT YOUR NEEDS IN EVEN AND ODD SIZES

## FULL RING

### Part No. FR

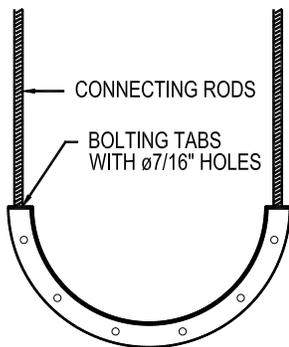
The Full Ring is used to guide horizontal and vertical runs. The part is simply bolted around the outer shell then rigidly connected to the building structure.



## HALF RING

### Part No. HR

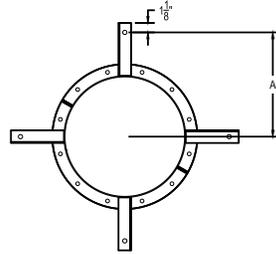
The Half Ring is used to support long horizontal runs, placed under the flue and then supported by rods connecting to the building structure.



## FLOOR/ROOF GUIDE

### Part No. FRG

The Floor/Roof Guide is used at the penetration of floors and roofs to guide the chimney. This part is designed to absorb lateral loads only. It will not support vertical chimney sections.

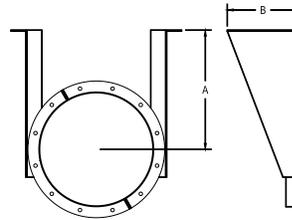


Part No. FRG	
I.D.	A
5-6"	9 3/8"
7-8"	10 3/8"
9-10"	11 3/8"
11-12"	12 3/8"
13-14"	13 3/8"
15-16"	14 3/8"
17-18"	15 3/8"
19-20"	16 3/8"
21-22"	17 3/8"
23-24"	18 3/8"
25-26"	19 3/8"
27-28"	20 3/8"
29-30"	21 3/8"
31-32"	22 3/8"
33-34"	23 3/8"
35-36"	24 3/8"
37-38"	25 3/8"
39-40"	26 3/8"
41-42"	27 3/8"
43-44"	28 3/8"
45-46"	29 3/8"
47-48"	30 3/8"

## WALL GUIDE

### Part No. WG

The Wall Guide is used to guide long vertical runs that are placed adjacent to walls. This part will maintain proper clearance to combustibles when properly installed.



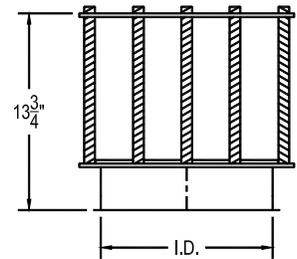
Part No. WG		
I.D.	A	B
5-6"	11"	7 13/16"
7-8"	13"	8 1/2"
9-10"	14"	8 5/8"
11-12"	15"	9"
13-14"	17"	9 7/16"
15-16"	18"	9 3/4"
17-18"	20"	10 1/4"
19-20"	21"	10 9/16"
21-22"	23"	11 1/8"
23-24"	24"	11 5/16"
25-26"	26"	11 7/8"
27-28"	27"	12 1/8"
29-30"	29"	12 11/16"
31-32"	30"	12 15/16"
33-34"	32"	13 1/2"
35-36"	33"	13 11/16"
37-38"	35"	14 5/16"
39-40"	36"	14 1/2"
41-42"	38"	15 1/16"
43-44"	39"	15 5/16"
45-46"	44"	16 11/16"
47-48"	45"	16 7/8"

## PRESSURE RELIEF VALVE

### Part No. PRV

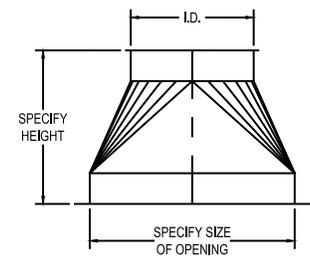
The Pressure Relief Valve is used in generator exhaust systems to prevent damage resulting in the ignition of unburned fuel. This component complies with NFPA 37.

Valves are set to 1 PSI.

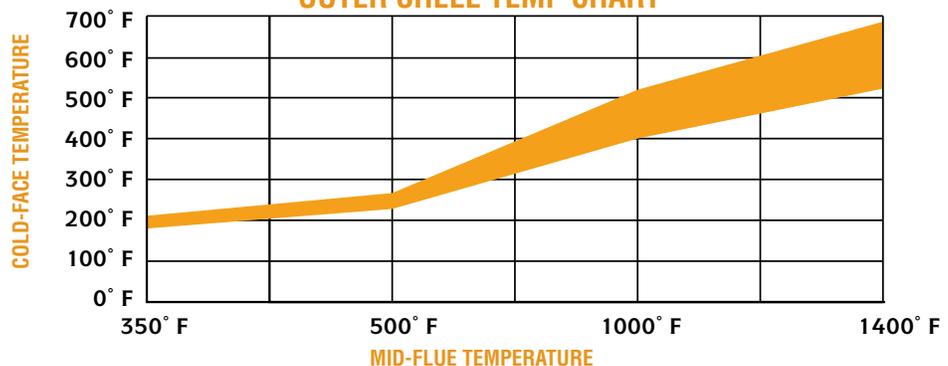


## SQUARE-TO-ROUND TRANSITIONS

The Square-to-Round Transitions are used when connecting to appliances with square or rectangular outlets. The base can be raw for field welding or flanged for field drilling and bolting.



## OUTER SHELL TEMP CHART



## PA WEIGHT CHART

Part Description	Part No.	Inside Diameter (Inches)																					
		6"	8"	10"	12"	14"	16"	18"	20"	22"	24"	26"	28"	30"	32"	34"	36"	38"	40"	42"	44"	46"	48"
14" to 17" Adjustable	18AL	12 lbs.	15	18	21	24	27	30	33	36	39	42	45	48	51	54	69	86	90	95	99	104	108
16" to 21" Adjustable	22AL	13 lbs.	17	20	24	28	31	35	38	42	45	49	52	56	59	63	81	100	105	110	115	120	126
20" to 29" Adjustable	30AL	17 lbs.	21	26	30	35	40	44	49	53	58	62	67	71	76	80	104	128	135	141	148	154	161
27½" to 44" Adjustable	45AL	23 lbs.	30	36	43	49	56	62	68	75	81	88	94	101	107	113	148	181	190	199	209	218	227
29" Straight Section	29S	16 lbs.	20	24	28	32	36	41	45	49	53	57	61	66	70	74	95	118	124	130	136	142	148
30 Degree Elbow	30L	8 lbs.	10	12	15	18	20	23	26	30	33	36	40	44	47	51	67	85	91	98	105	112	119
45 Degree Elbow	45L	9 lbs.	11	14	17	20	24	27	31	35	40	44	49	54	59	64	85	108	116	125	135	144	154
45 Degree Tee	45LT	18 lbs.	26	34	43	53	64	76	88	102	117	133	150	168	186	205	283	356	388	422	457	493	531
47" Straight Section	47S	23 lbs.	30	36	43	49	56	62	68	75	81	88	94	101	107	113	148	181	190	199	209	218	227
59" Straight Section	59S	-	38	47	54	61	70	77	85	94	101	-	-	-	-	-	-	-	-	-	-	-	
90 Degree Elbow	90L	12 lbs.	17	23	30	38	46	55	65	76	88	-	-	-	-	-	-	-	-	-	-	-	
90 Degree Grease Tee	90GT	16 lbs.	20	26	32	38	45	53	62	70	79	89	100	110	121	133	181	226	246	266	287	309	330
90 Degree Tee	90T	15 lbs.	19	25	31	37	44	52	60	68	77	87	97	107	118	130	176	221	240	259	280	301	322
Abrupt Increaser	AI	7 lbs.	8	10	11	13	15	16	18	20	21	23	24	26	28	29	31	39	41	43	45	47	49
Base Drain	BD	12 lbs.	15	17	20	23	26	28	31	34	37	39	42	45	48	51	59	72	76	79	83	87	90
Bellows Section	BS	13 lbs.	16	19	22	26	29	32	35	39	42	45	49	52	55	59	75	93	98	103	107	112	117
Boiler Kit Flanged	BKF	7 lbs.	8	10	11	13	15	16	18	20	21	23	24	26	28	29	31	39	41	43	45	47	49
Boiler Kit Raw	BKR	4 lbs.	5	6	7	8	8	9	10	11	12	13	14	15	15	16	17	25	26	27	29	30	31
Drain Section	DS	11 lbs.	14	17	20	23	26	29	32	35	37	40	43	46	49	52	66	83	87	91	95	99	103
Drain Tee Cap	DTC	5 lbs.	6	7	8	9	11	12	14	16	18	20	22	25	27	30	39	51	55	59	64	69	74
End Cap	EC	4 lbs.	5	6	7	8	10	11	13	15	17	19	21	24	26	29	38	50	54	58	63	68	73
Fan Adapter	FA	7 lbs.	8	10	11	13	15	16	18	20	21	23	24	26	28	29	31	39	41	43	45	47	49
Flashing	FL	11 lbs.	12	13	15	16	18	19	21	22	24	25	27	29	30	32	34	35	37	39	40	42	44
Floor/Roof Guide	FRG	10 lbs.	10	11	12	15	16	17	18	19	24	25	27	27	30	30	32	33	34	35	36	38	39
Full Ring	FR	3 lbs.	4	5	6	9	10	11	12	13	18	19	21	21	24	24	26	27	28	29	30	32	33
Guy Section	GS	9 lbs.	11	13	14	16	18	20	22	23	25	27	29	31	32	34	36	42	44	46	48	50	52
Half Ring	HR	2 lbs.	2	3	3	5	5	6	6	7	9	10	11	11	12	12	13	14	14	15	15	16	17
Horizontal Drain	HD	11 lbs.	14	17	20	23	26	29	32	35	37	40	43	46	49	52	66	83	87	91	95	99	103
Insulated Thimble	IT	20 lbs.	22	25	28	31	33	36	39	42	44	47	50	52	55	58	61	63	66	69	72	74	77
Nozzle Section	NS	11 lbs.	14	17	20	23	26	29	32	35	37	40	43	46	49	52	66	83	87	91	95	99	103
Rain Cap	CC	9 lbs.	11	13	16	18	21	24	27	31	34	37	41	45	52	57	65	73	79	86	92	99	105
Rain Collar	RC	4 lbs.	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15
Support Plate	SP	31 lbs.	36	42	47	53	58	64	70	76	99	107	114	122	130	138	146	186	196	206	217	227	238
Tapered Increaser	TI	13 lbs.	16	20	23	27	30	33	37	40	44	47	50	54	57	61	78	97	102	106	111	116	121
Top Section	TS	3 lbs.	4	5	5	6	7	8	9	9	10	11	12	12	13	14	17	21	22	23	24	25	26
Variable Section	VS	23 lbs.	30	36	43	49	56	62	68	75	81	88	94	101	107	113	148	181	190	199	209	218	227
Wall Guide	WG	14 lbs.	17	19	21	26	28	31	34	37	44	48	50	53	57	60	62	66	69	73	75	85	87
Wall Support	WS	51 lbs.	61	73	84	97	108	124	138	156	186	206	222	244	262	285	304	360	381	416	439	477	501

All weights shown above are actual weights, for shipping weights multiply by 1.25

### SAMPLE SPECIFICATION - MODEL PA

The factory built modular chimney shall be laboratory tested and listed in accordance with Underwriters Laboratories Standard UL 103 for use with building heating equipment burning gas, solid or liquid fuels with flue gases not exceeding 1400°F continuous operations and 1800°F intermittent operation. It shall also be tested and listed for use as a grease duct in accordance with UL 1978. Sections shall bear the UL listing mark and the cUL listing mark for Canada. Sections shall be sealed with banded flanges utilizing joint sealant supplied by the manufacturer for the specific application.

Inner shell material shall be type 304 stainless steel for natural gas and number 2 oil fired appliances, type 316 stainless steel for coal, number 4 and number 6 oil fired appliances. Inner shell thickness shall be .036" for 5" to 36" diameter systems and .048" for 37" to 48" diameter systems. All inner shell seams shall be full penetration welded the entire length of the pipe section. Riveted, tack or spot welded seams are not permitted.

Outer shell material shall be aluminized steel with a thickness of .034" for 5" to 36" diameter systems and .052" for 37" to 48" systems.

(Outer shell thickness of optional type 304 or 316 stainless steel shall be .030" for 5" to 36" diameter systems and .048" for 37" to 48" diameter systems). All outer shell seams shall be full penetration welded the entire length of the pipe section. Riveted, tack or spot welded seams are not permitted.

Between the inner and outer shells there shall be a minimum 1" of 1600°F rated low conductivity ceramic fiber insulation. The insulation is to be securely attached to the inner shell with steel straps and insulating pins welded to the inner shell. Stainless steel centering clips shall be welded to the outer shell to maintain the 1" spacing and ensure concentricity of the shells.

Breeching and chimney sections, when installed according to manufacturer's instructions, shall comply with national safety standards and building codes. Stacks terminating above a roof must terminate as required by code or NFPA 211.

Chimney sections exposed to atmospheric conditions shall be protected by a minimum of one base coat and one finish coat of heat resistant paint after installation. Outer shells of type 304 or 316 stainless steel need not be painted.

## MODEL PA STANDARD 5-YEAR WARRANTY

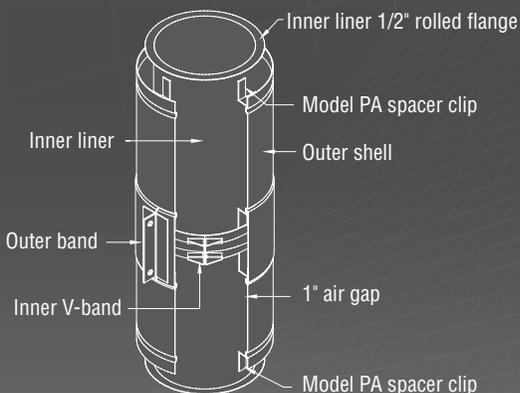
The Schebler Model PA Chimney, when installed according to manufacturer's installation instructions, is warranted by the Schebler Company for a period of five (5) years from date of system start-up, against defects in material and workmanship of the product for parts only. Any defective part in the product will, at Schebler's option, either be repaired or replaced. Should the part be returned, the owner must pay all transportation charges. The repaired or replacement part will, in turn, be shipped by Schebler to the owner, freight prepaid. The warranty on any repaired or replacement part shall be for a duration of time no longer than the remaining or unexpired term of the original warranty.

This warranty does not cover labor or other service charges incurred by the owner, nor any parts not manufactured by The Schebler Company, or any other components that are not part of the Model PA Chimney Systems.

This limited warranty is extended to the purchaser subject to the satisfaction of the following conditions:

1. Generally accepted engineering practices have been followed to determine that sizing and material specifications are suitable for the application and environment involved.
2. The undamaged components have been correctly installed in accordance with the installation instructions published by The Schebler Company at the time of shipment.

The Schebler Company assumes no liability for incidental or consequential damages of any kind or for any damages resulting in whole or part from misuse, improper installation, or inadequate maintenance of the system or component part thereof. This warranty is in lieu of all other express warranties or guarantees of any kind. All implied warranties, including merchantability and fitness, are limited to the duration of the express warranty contained herein. The Schebler Company neither assumes nor does it authorize any other person to assume on its behalf any other liability in connection with the sale of its products.



## MODEL PA EXTENDED 10-YEAR WARRANTY

The Schebler Company warrants owners of its Model PA Chimney against defects in material and workmanship in normal use for ten (10) years from the date of delivery to the construction site when installed, maintained and used as part of a Schebler Model PA Chimney System and in accordance with The Schebler Company specifications. The Schebler Company further warrants any portion of the chimney system repaired or replaced under this warranty for the remainder of the original warranty period.

This warranty is limited to repair or replacement of the product plus shipping cost to the failure location. This warranty does not cover any labor costs for removal or replacement of the defective product nor does this warranty cover any system components not furnished by The Schebler Company and installed as part of the system.

This limited warranty is extended to the purchaser subject to the satisfaction of the following conditions:

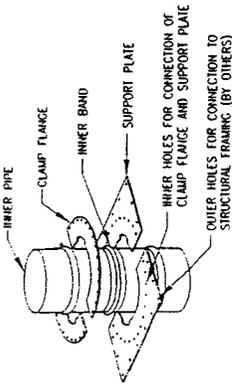
1. System sizing and design has been performed by Schebler personnel and design parameters provided to The Schebler Company by the responsible engineer were and are accurately representative of the operating conditions.
2. The undamaged components have been correctly installed in accordance with system design and sizing as performed by Schebler and installation instructions published by The Schebler Company at the time of shipment.
3. Proper precautions have been taken to insure that appliance air is free of solvent or refrigerant vapors or any halogenated compound which may cause acid condensate to form within the chimney.
4. The Schebler Company has supplied the entire chimney or exhaust system from the appliance outlet to the termination of the stack.
5. Prior to start-up and thereafter, exposed aluminized steel surfaces are protected with a minimum of one base coat of primer and one finish coat of heat resistant paint at all times.

The Schebler Company assumes no liability for incidental or consequential damages of any kind or for any damages resulting in whole or part from misuse, improper installation, or inadequate maintenance of the system or component part thereof. This warranty is in lieu of all other express warranties or guarantees of any kind. All implied warranties, including merchantability and fitness, are limited to the duration of the express warranty contained herein. The Schebler Company neither assumes nor does it authorize any other person to assume on its behalf any other liability in connection with the sale of its products.

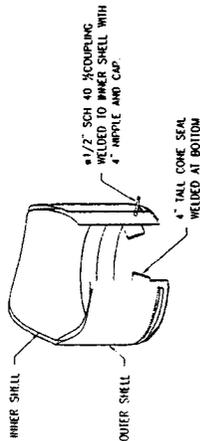


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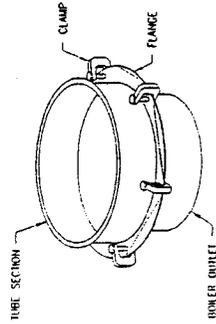
**TYP. 3 STACKS**  
 (KIND OF MATERIALS REFLECTS PARTS  
 REQUIRED FOR (3) STACKS.)



**SUPPORT PLATE DETAIL**  
 NOT TO SCALE

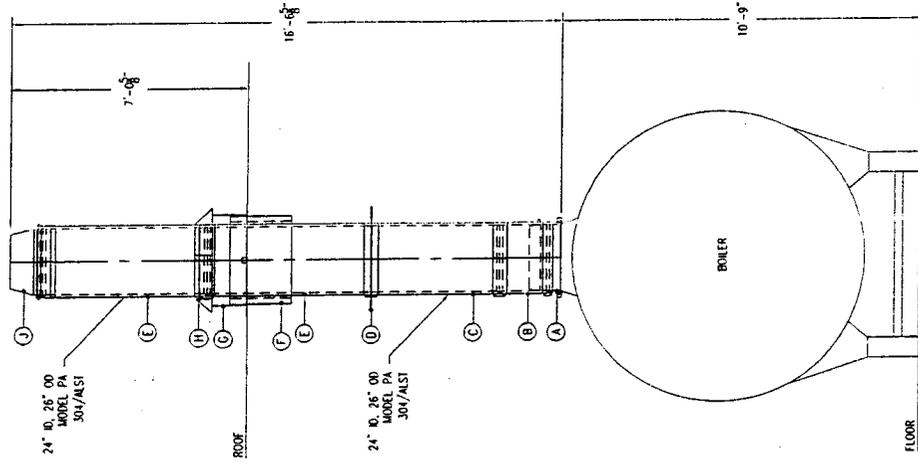


**DRAIN SECTION**  
 NOT TO SCALE



**BOILER KIT (FLANGED)**  
 NOT TO SCALE

NOTE: FACE KIT FLANGE TO BOILER FLANGE  
 AND DRAW TIGHT WITH CLAMPS OR  
 FIELD DRILL HOLES TO MATCH BOILER  
 OUTLET AND DRAW TIGHT WITH BOLTS.



**ELEVATION VIEW**  
 SCALE: 3/8"=1'-0"

HEAD	QTY	PART NUMBER	DESCRIPTION	MATERIAL
A	3	PA0724A	BOILER KIT (FLANGED)	304/ALST
B	3	PA0524A	DRAIN SECTION	304/ALST
C	3	PA4524A	47" STRAIGHT SECTION	304/ALST
D	3	PA0724H	SUPPORT PLATE	CBST
E	6	PA59524A	59" STRAIGHT SECTION	304/ALST
F	3	PA1724F	INSULATED INNER	CBST
G	3	PA1724F	FLASHING	CBST
H	3	PARC24C	RAIN COLLAR	ALST
J	3	PARC24C	EXIT CONE	304
K	15	IB24C	424" INNER BAND	304
L	6	OB26C	426" OUTER BAND	ALST
M	6	HB24G	424" HALF BAND	ALST
N	3	PASR24C	424" x 426" SEAL RING	ALST
P	8	S600	SILICONE JOINT SEALANT	
O	1	HARDWARE	BOX OF NUTS, BOLTS, ETC.	

**PA NOTES:**

1. ALL DIMENSIONS TO BE VERIFIED BY CONTRACTOR BEFORE RELEASING PROJECT FOR FABRICATION.
2. INNER SHELL MATERIAL TO BE 20 GA. 304 STAINLESS STEEL.
3. OUTER SHELL MATERIAL TO BE 22 GA. ALUMINUM STEEL.
4. DIAMETERS 3/8" AND LARGER ON STRAIGHT SECTIONS TO BE 18 GA. MATERIAL FOR FITTINGS. OUTER SHELL DIAMETERS 24" AND LARGER TO BE 18 GA. MATERIAL.
5. INNER SHELL AND OUTER SHELL TO BE SEPARATED BY 1" AIR SPACE.
6. REFER TO SCHEBLER GENERAL MANUAL FOR INSTALLATION INSTRUCTIONS FOR CORRECT INSTALLATION METHODS.

**SUBMITTAL**

DESIGNED BY: MODEL PA BOILER EVALUATED STACKS  
 AIR DISTRIBUTION CORPORATION  
 DRAWN BY: NEWPORT MANUFACTURING CO. #27  
 B. SPEITH  
 CHECKED BY: DATE: 08/17/04  
 SCALE: 3/8" = 1'-0"  
 NO. 01



REV	DATE	BY	DESCRIPTION



2.7

## APPENDIX A

### EQUIPMENT TUNING PROCEDURE<sup>1</sup>

Nothing in this Equipment Tuning Procedure shall be construed to require any act or omission that would result in unsafe conditions or would be in violation of any regulation or requirement established by Factory Mutual, National Fire Prevention Association, the Rhode Island Department of Labor (Division of Occupational Safety), the Federal Occupational Safety and Health Administration or other relevant regulations or requirements.

1. Operate the unit at the firing rate most typical of normal operation. If the unit experiences significant load variations during normal operation, operate it at its average firing rate.
2. At this firing rate, record stack gas temperature, oxygen concentration and CO concentration (for gaseous fuels) or smoke-spot number<sup>2</sup> (for liquid fuels) and observe flame conditions after the unit stabilizes at the firing rate selected. If the excess oxygen in the stack gas is at the lower end of the range of typical minimum values<sup>3</sup>, and if the CO emissions are low and there is no smoke, the unit is probably operating at near optimum efficiency - at this particular firing rate. However, complete the remaining portion of this procedure to determine whether still lower oxygen levels are practical.
3. Increase combustion air flow to the furnace until stack gas oxygen levels increase by one to two percent over the value measured in Step 2. As in Step 2, record the stack gas temperature, CO concentration (for gaseous fuels) or smoke-spot number (for liquid fuels) and observe flame conditions for these higher oxygen levels after boiler operation stabilizes.
4. Decrease combustion air flow until the stack gas oxygen concentration is at the level measured in Step 2. From this level gradually reduce the combustion air flow in small increments. After each increment, record the stack gas temperature, oxygen concentration, CO concentration (for gaseous fuels) and smoke-spot number (for liquid fuels). Also observe the flame and record any changes in its condition.
5. Continue to reduce combustion air flow stepwise until one of these limits is reached:
  - a. Unacceptable flame conditions - such as flame impingement on furnace walls or burner parts, excessive flame carryover or flame instability.

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- b. Stack gas CO concentration greater than 400 ppm.
  - c. Smoking at the stack.
  - d. Equipment related limitations - such as low windbox/furnace pressure differential, built in air flow limits, etc.
6. Develop an O<sub>2</sub>/CO curve (for gaseous fuels) or O<sub>2</sub>/smoke curve (for liquid fuels) similar to those in Figures 1 and 2 using the excess oxygen and CO or smoke-spot number data obtained at each combustion air flow setting.
  7. From the curves prepared in Step 6, find the stack gas oxygen levels where the CO emissions or smoke-spot number equal the following values:

Fuel Measurement Value

Gaseous CO emissions 400 ppm

#1 & #2 oils smoke-spot number number 1

#4 oil smoke-spot number number 2

#5 oil smoke-spot number number 3

#6 oil smoke-spot number number 4

The above conditions are referred to as CO or smoke threshold, or as the minimum excess oxygen level.

Compare this minimum value of excess oxygen to the expected value provided by the combustion unit manufacturer. If the minimum value found is substantially higher than the value provided by the combustion unit manufacturer, burner adjustments shall be made to improve fuel and air mixing, thereby allowing operation with less air.

8. Add 0.5 to 2.0 percent to the minimum excess oxygen level found in Step 7 and reset burner controls to operate automatically at this higher stack gas oxygen level. This margin above the level accounts for fuel variations, variations in atmospheric conditions, load changes and non repeatability or play in automatic controls.

9. If the load of the combustion unit varies significantly during normal operation, repeat Steps 1-8 for firing rates that represent the upper and lower limits of the range of the load. Because control adjustments at one firing rate may affect

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conditions at other firing rates, it may not be possible to establish the optimum excess oxygen level at all firing rates. If this is the case, choose the burner control settings that give the best performance over the range of firing rates. If one firing rate predominates, settings should optimize conditions at that rate.

10. Verify that the new settings can accommodate the sudden changes that may occur in daily operation without adverse affects. Do this by increasing and decreasing load rapidly while observing the flame and stack. If any of the conditions in Step 5 result, reset the combustion controls to provide a slightly higher level of excess oxygen at the affect firing rates. Next, verify these new settings in a similar fashion. Then make sure that the final control settings are recorded at steady state operating conditions for future reference.

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*1. This tuning procedure is based on a tune-up procedure developed by KVB Inc. for the USEPA.*

*2. The smoke-spot number can be determined with ASTM Test Method D-2156 or with the Bacharach method. ASTM Test Method D-2156 is included in a tune-up kit that can be purchased from the Bacharach Company.*

*3. Typical minimum oxygen levels for boilers at high firing rates are:*

*For natural gas: 0.5% - 3.0%*

*For liquid fuels: 2.0% - 4.0%*

Item #	Qty.	Description
# 1	1	<p><b>HAWK ICS: CONV-HAWK-1000-St(460/3/60)</b></p> <p><b>System Information:</b>  Boiler Design Type: Firetube  Boiler Manufacturer - Cleaver - Brooks (Boiler(s) Unit Number(s): L-74089)  Steam Boiler - 200 HP - Design Pressure: 150 PSI - Operating Pressure: 125 PSI - Fuel 1: Natural Gas - Fuel 2: #2 Oil - Number of Boilers for Shared Controls:  Burner: Integral  Emissions Level: Uncontrolled  Boiler Components: Blower Motor</p>
# 2	1	Product Pricing Basis: Apr14 Price Book in use based on 04/07/2016 effective date for this product configuration. Pricing valid for 60 days from date of this proposal.
# 3	2	Conversion Manuals (4):(Variable Speed Drive - Hawk ICS/Hawk ICS & O2 Trim/CB120/120E/Hawk 1000/)
# 4	1	Control Panel Enclosure: NEMA 4/12 Standard (24"Hx30"Wx10"D)
# 5	1	VSD/O2 Trim Analog Input Card (Control Panel)
# 6	1	Revised Wiring Diagram: Submittals Based on Latest C-B Revision on File
# 7	1	Manual Fuel Selector Switch (Control Panel)
# 8	1	Entrance Panel: 24x24x8 NEMA412: Sized For: 10 HP Blower Motor (60.4 Amps):
# 9	1	CCT (Entrance Panel)
# 10	1	NEMA 1 Packaged Drive with By-Pass Includes: NEMA 1 Enclosure, 15 HP Drive (460/3/60), By-Pass Hardware, Line Reactor, HIM, and Ethernet Communication Card
# 11	1	Blower Motor; 10 HP, 208-230/460/3/60-3600, FR213TDZ,ODP Premium Efficiency,74-144, Double Shaft, SPEC 630-1002213TTDW7018; Part # 894-04483-000 (Shipped Loose)

# 12	1	SPDT Fuel Pressure Switch(es): 2 Fuel: High/Low Gas Pressure Low Oil Pressure (Shipped Loose)
# 13	1	SPDT Steam Controls: HLC, OLC (Shipped Loose)
# 14	1	Low Gas Pressure Switch Range: 3" - 21" wc (.1 - .75 PSI)
# 15	1	High Gas Pressure Switch Range: 41" - 193" wc (1.5 - 7 PSI)
# 16	1	Burner Management Control: CB-120E, IR Scan (Control Panel)
# 17	1	Steam Pressure Transmitter: 150 lb ST: (Shipped Loose)
# 18	1	Water Temperature Transmitter: 150 lb ST: (Shipped Loose)
# 19	1	Stack Temperature Transmitter: (Shipped Loose)
# 20	1	Alarm: 4 inch Bell (Control Panel)
# 21	1	HAWK Touchscreen Standard: 4" Color Screen (Control Panel) with Integrated Webserver
# 22	1	Parallel Positioning Actuators: Air Damper Acuator (15ft/lbs), Gas Valve Actuator (3ft/lbs), Oil Actuator (3ft/lbs) (Actuators Include Connectors)(Actuator Assemblies Shipped Loose)
# 23	1	Parallel Positioning Actuators Mounting Hardware: Air Damper (Gear), Main Gas Valve (Honeywell V51), CB Fuel Oil Controller Air Damper Bore Size: 2.380 in Gas Valve Size: 2.5-3 in (Shipped Loose)
# 24	1	O2 Trim: CB Integrated - Air Trim
# 25	1	Combustion (Ambient) Air Temperature Sensor (Shipped Loose)
# 26	1	Expanded Annunciation with pre-wired interposing relays (Control Panel)

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Item #	Qty.	Description
# 1	1	<p><b>Fuel Conversion:</b>  CONV-FUEL-CB-101-100-150ST-TO-CB-700-100-150ST(460/3/60)-STD-CFG</p> <p><b>System Information:</b>  Project Market: United States</p> <p><b>Existing Boiler:</b>  CB-101-100-150ST (460/3/60)  Existing Burner TD: 4 to 1  Emissions Level: Uncontrolled  Existing Flame Safeguard: CB780 or Equivalent  Boiler Diameter: 48”  Boiler Unit Number: L-103665</p> <p><b>New Boiler:</b>  CB-700-100-150ST- (460/3/60)  New Burner Turndown: 4 to 1  Type of Pilot: Gas  Gas Train Type: Honeywell</p> <p><b><u>Required Fuel Specification</u></b>  <b>Natural Gas:</b>  Carbon,% (wt) = 69.98  Hydrogen,% (wt) = 22.31  Sulfur,% (wt) = 0.0  Heating Value, Btu/ib. = 21,830</p> <p><b>Minimum Required Gas Pressure at inlet to new 2 in. NPT I.V.T. Style Gas Train:</b></p>

		<b>11 (in. W.C.)</b> Configuration:
# 2	1	Product Pricing Basis: Apr14 Price Book in use based on 12/21/2015 effective date for this product configuration. Pricing valid for 60 days from the revised date of this proposal.
# 3	1	Gas Cam and Linkage Assembly
# 4	1	3/4" Jackshaft Kit
# 5	1	Electrical Kit. Includes: Fuel selector switch & relay, Ignition transformer w/ cable for use w/ natural gas and revised wiring diagram based on Latest C-B Revision wiring diagram on file
# 6	0	<b>Burner Housing for Natural Gas Firing is <u>Not Included</u> . Existing Burner Housing to be Re-Used.</b>
# 7	1	Fireside Gasket Kit
# 8	1	Gas Through Front Head Pipe Nipple, Clamp Ring, and Gasket Retainer
# 9	1	Natural Gas Train Kit: 2 in. NPT I.V.T. Style Includes : Main Gas Train, Starter Gas Train, Pilot Gas Train, Main Gas High & Low gas pressure switches, Mounting brackets, Mounting hardware, Main gas plugged leak test cocks & gauges, (2) motorized main gas valves, one w/ POC. FM, GE-GAP, & CSD-1 compliant
# 10	1	Revised Manufacturer Boiler Rating Plate