BOILER RETROFITS & CUSTOM AFTERMARKET SOLUTIONS

SUPERIOR BOILER

Our Presenters

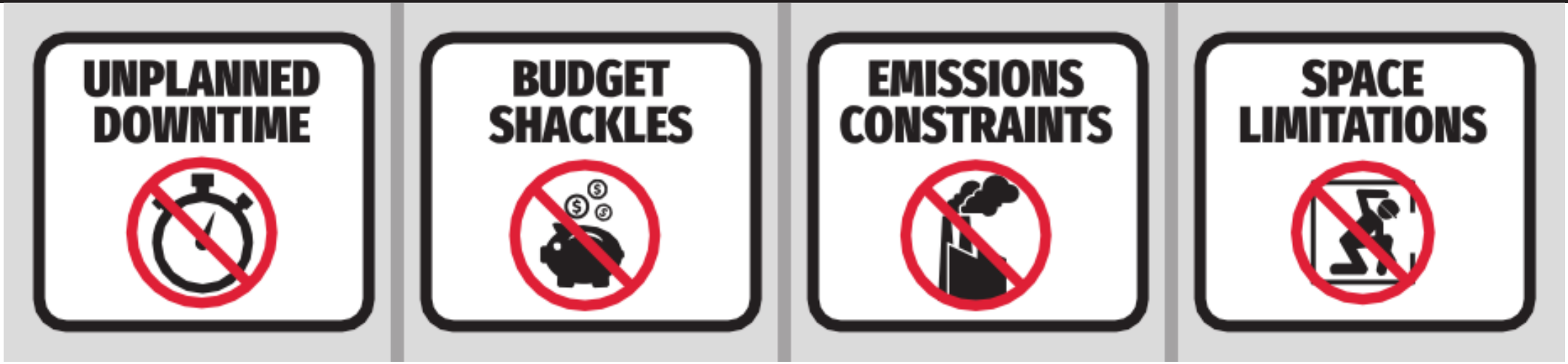
Matt Steele
VP of Sales & Marketing

Mick Jones
Aftermarket Parts & Services Manager

PARTNERS IN PROBLEM SOLVING

Superior Boiler helps you

outwit your challenges



SUPERIOR BOILER

Agenda

01 Superior Boiler Overview

Who are the Superior Problem Solvers? What do we offer?

02 Why Boiler Retrofit?

What would require a boiler retrofit? What issues could you come across?

03 Boiler Retrofit Options

Our team of Superior Problem Solvers will cover what to consider when designing your retrofit and Superior Boiler's options to fulfill your needs.

04 Parts & Equipment

Superior Boiler carries parts and equipment. What do we offer? What are the lead times? What can we offer you to get you back up and running?

05 Superior Boiler's Custom Aftermarket Solutions

Our team of Superior Problem Solvers can custom design parts specific to your project, available for ANY boiler on the market.

06 Q&A

Anything we didn't answer? Need clarification on something we talked about? Here's a chance to talk with our Superior Problem Solvers LIVE!

SUPERIOR BOILER

For over 100 years, we've been finding **solutions to the world's greatest boiler challenges.**

BACKGROUND
THE SUPERIOR BOILER STORY

1917

Hugh C. Gass founds Superior Welding Shop in Hutchinson.

WORLD WAR II

Superior Welding Shop transforms into a training facility, preparing around 200 welders for the war effort.

1945

Superior Boiler Works moves into a 5,000 sq. ft. facility with 10 employees.

1960'S

Equipment sizes increase, addition of the 3-pass dry back firetube boiler and the new firebox boiler requires more manufacturing space, expanding to 83,000 sq. ft.

1970'S

Added 3-pass wetback, horizontal return tube boilers and waste heat recovery boilers. Now producing fire tube boilers up to 600hp and fireboxes up to 350hp.

SUPERIOR BOILER

1984

Superior Boiler produces its first (of many) 1000hp gas and oil-fired boiler.

2002

Superior builds the largest single furnace firetube boiler in the industry, a 2200hp dry back.

2014

Superior Boiler purchases Triad Boiler. Product line expands to include both hot water and steam vertical firetube boilers commonly used in commercial heating applications.

2016

Superior purchases English Boiler, adding watertube boilers to its product offerings.

2021

Added another facility in Hutchinson, bringing the company to 300,000 sq.ft of manufacturing space.

SUPERIOR BOILER

SCOTCH MARINE BOILERS

DRYBACK & WETBACK (10-2,500 BoHP)

- Firebox/Modified Firebox Boilers (7-447 BoHP)
- Waste Heat Boilers - engineered & customized for each project
- Horizontal Return Tubular (HRT) Boilers

WATERTUBE BOILERS

Up to 300,000 LB/HR

- Industrial package watertube boilers
- Heat recovery steam generators (HRSG)
- Forced circulation hot water boilers
- Solid fuel boilers
- Modular boiler systems

BOILER ROOM ACCESSORIES

- Spray & Tray Deaerators; 3,500 LB/HR – 300,000 LB/HR
- Boiler Feed Tanks
- Economizers
- Blow Down & Flash Tank Separators
- Modular water treatment systems

VERTICAL FIRETUBE BOILERS

7-150 BoHP

CONDENSING BOILERS

4,000,000 – 12,000,000 BTU/HR

SUPERIOR BOILER

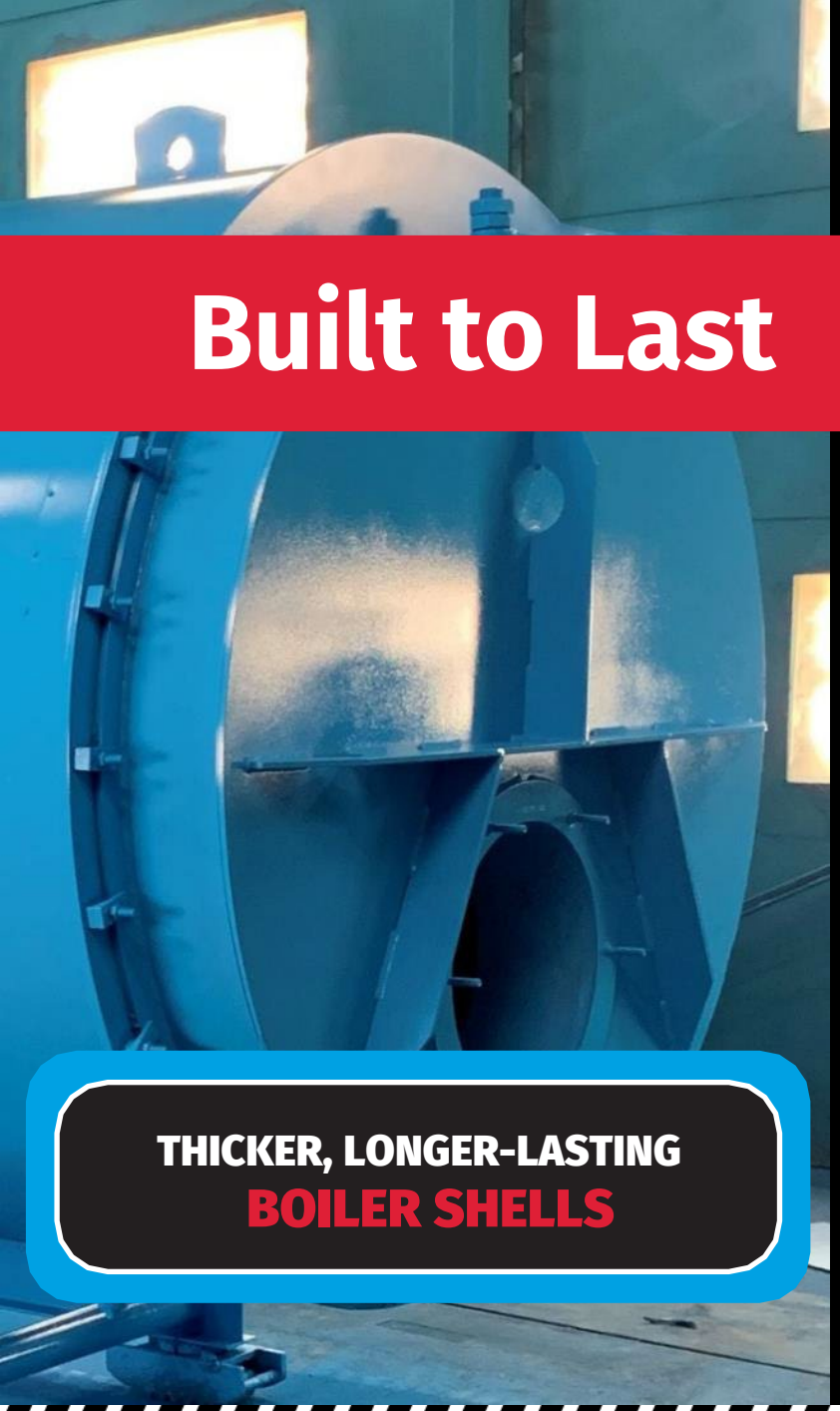
Superior Quality

ISO 9001:2015

American Systems Registrar

ANAB
ANSI National Accreditation Board
ACCREDITED
ISO/IEC 17021-1
MANAGEMENT SYSTEMS
CERTIFICATION BODY

Built to Last



THICKER, LONGER-LASTING
BOILER SHELLS

THICKER, STANDARD-SPACED
TUBESHEETS

THICKER
BOILER TUBES AND FURNACE

THICKER, LONGER-LASTING BOILER SHELLS

- ✓ Shells are at least 8% thicker than minimum ASME requirements
- ✓ Shell is 12% larger in diameter, allowing for enhanced steam release performance

THICKER, STANDARD-SPACED TUBESHEETS

- ✓ Tubesheets are an average of 40% thicker than minimum ASME requirements
- ✓ Provides additional strength and corrosion protection
- ✓ Additional handholes in the front tubesheet to assist with maintenance

THICKER BOILER TUBES AND FURNACE

- ✓ Heavy wall tubes are nearly 10% thicker than those used by other manufacturers
- ✓ Furnace is an average of 21% larger than other boilers
- ✓ Optimized heat release reduces thermal stress

PRE-SHIPMENT TESTING

Before it leaves our facilities, each boiler receives a thorough electrical test. Customers can also choose a complete factory fire test—and witness it in person or virtually!

Investment in research & development

Watertube DFW Patented Design

- A smaller overall footprint while maintaining overall capacity throughput
- Utilization of a lower fan horsepower to create the same steam flow as a conventional boiler design
- Lower overall operating emissions, resulting in cleaner overall boiler operating systems that are more environmentally friendly
- Reduced requirements for purchased materials and subcomponents, providing end customers a more cost-competitive offering

At Your Service

Global Network of Problem Solvers

52 companies represent territories across the U.S. and around the world. 23 of these companies are full line watertube/firetube/condensing reps.

SUPERIOR BOILER

Why Retrofit?

A boiler retrofit may be required because:

- ✓ Emission Standard Changes
- ✓ Maintenance Flags
- ✓ Preventative Maintenance vs. Emergency Maintenance
- ✓ Age of the Boilers
- ✓ Performance Issues (ex. Water Quality)
- ✓ Steam/Demand Requirement Changes

Considerations for Retrofits

Efficiency Requirements

Installation Space Limitations

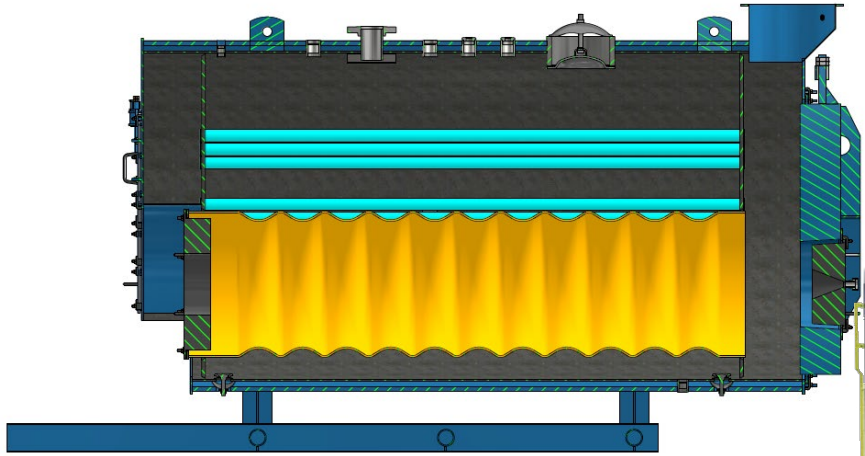
Access Point Dimensions

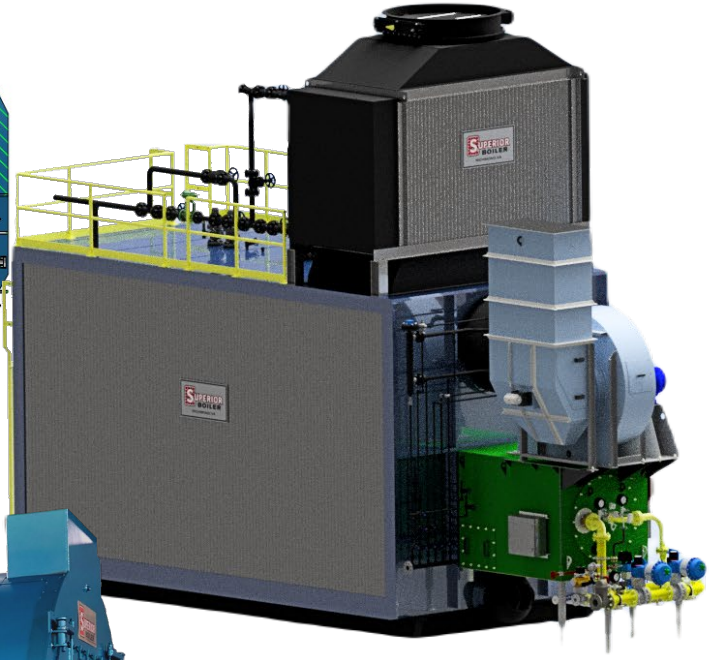
Existing Equipment and Layout

SUPERIOR BOILER

Efficiency Considerations

- ✓ Boiler Passes
  - ✓ More Passes = Better Heat Transfer
- ✓ Heating Surface
- ✓ Burners
  - ✓ NOx levels
- ✓ Economizers





Boiler Retrofit Options for Space Requirements

Field Erect Boilers

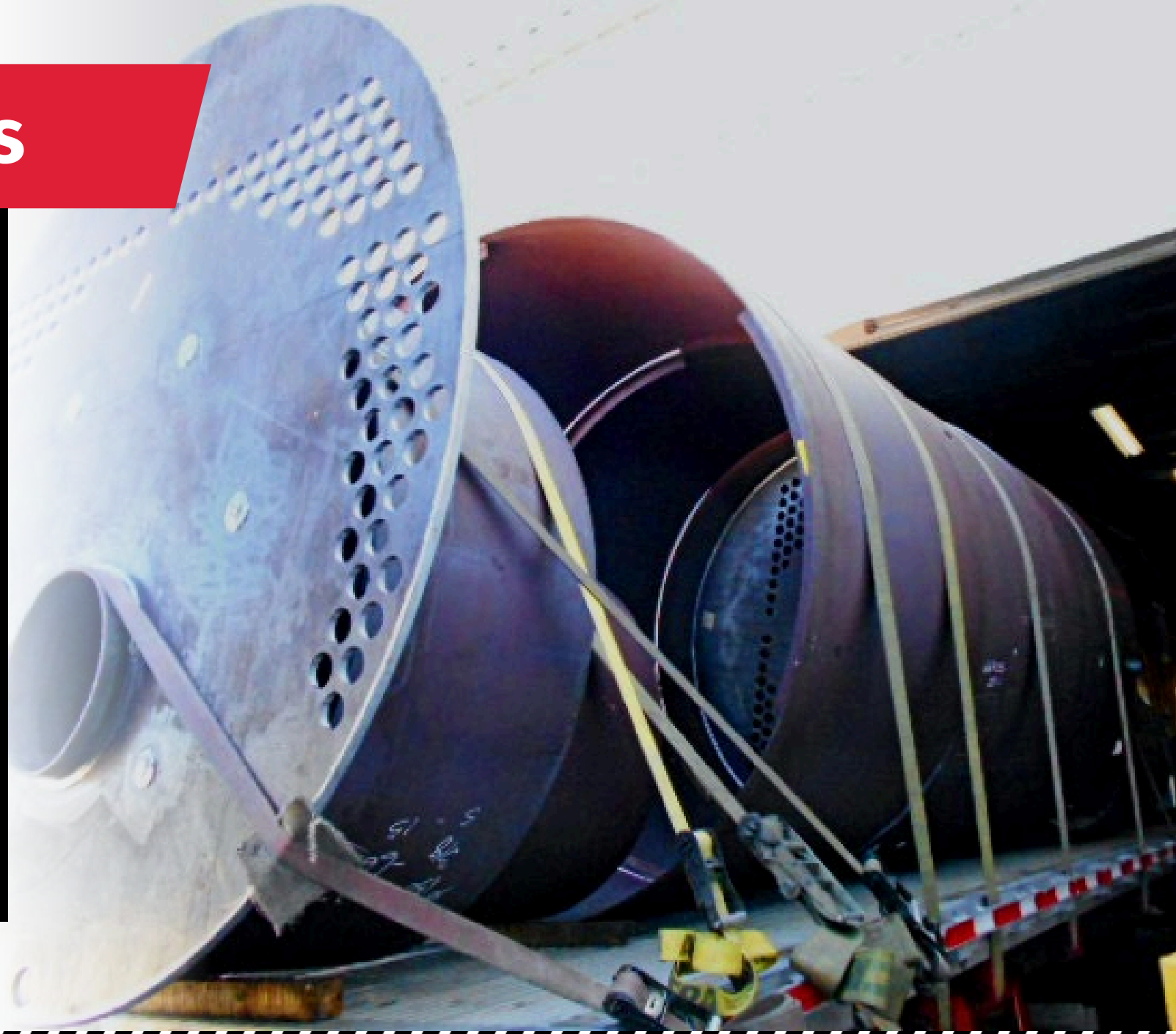
Space Saving Models

Custom-Engineered Designs

Field-Erect Boilers

Available for firetube and watertube boilers

- ✓ For firetube boilers:
  - ✓ Typically Section IV boilers
- ✓ Boilers that are built partially or fully in the field
- ✓ Custom-engineered kits to fit through limited access points and into constrained areas
- ✓ Easier to fit through entryways
- ✓ Extra reinforcement to support the metal during shipping and installation to maintain high-quality



SUPERIOR BOILER

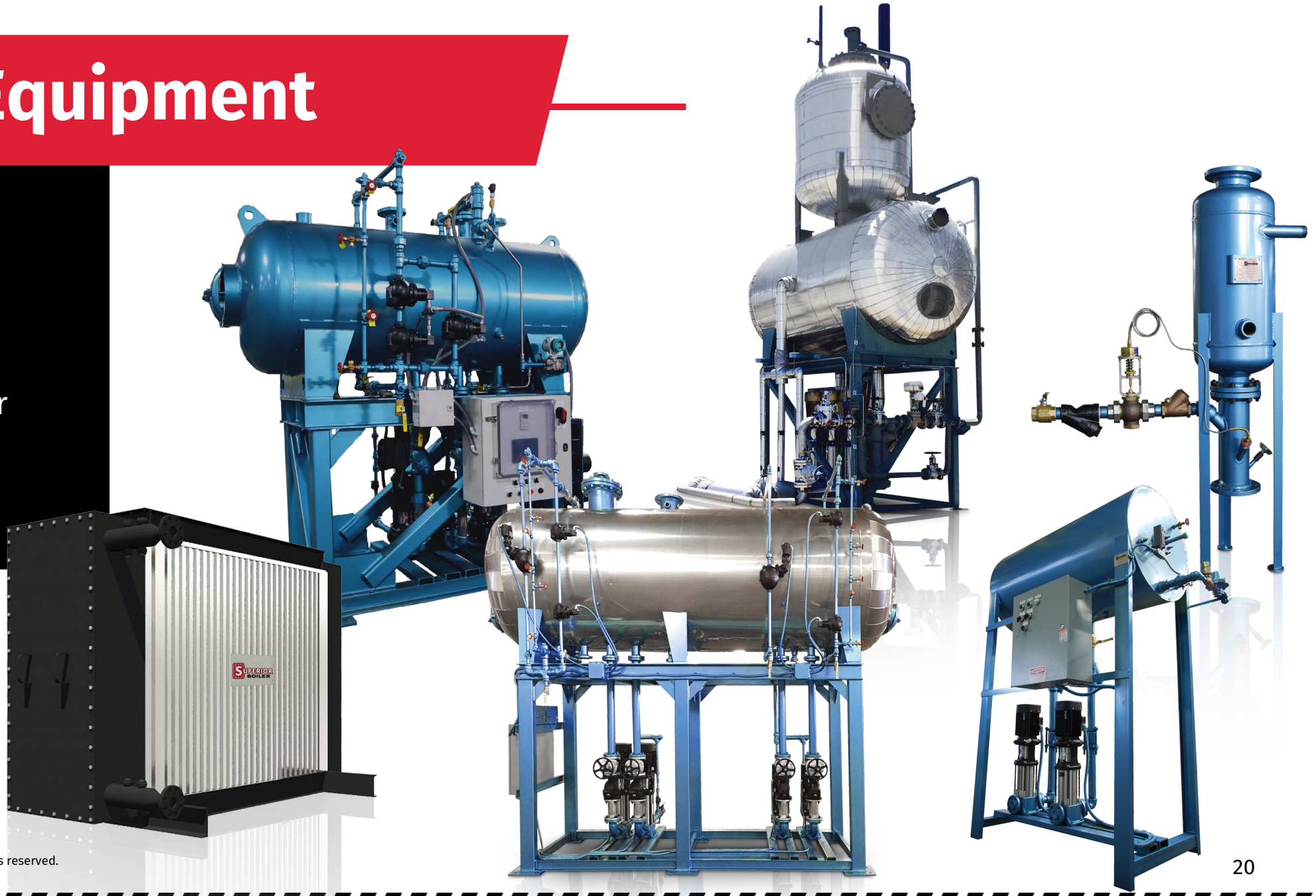
Space-Saving Models

- ✓ Vertical firetube boilers
  - ✓ Triads
  - ✓ Utes
- ✓ Skid Packages
  - ✓ Single-point power distribution
- ✓ Removable Skids
- ✓ Cheyenne Condensing Boiler
- ✓ Integral Economizer
- ✓ 3.5 ft² vs 5 ft² of heating surface
- ✓ Wetback vs. Dryback operational footprint
- ✓ 2-pass, 3-pass, or 4-pass stack location

SUPERIOR BOILER

Auxiliary Equipment

- ✓ Deaerator Systems
  - ✓ Spray Scrubber
  - ✓ Tray Type
  - ✓ Dual Tank
- ✓ Blowdown Separator
- ✓ Feedwater Tanks
- ✓ Economizers

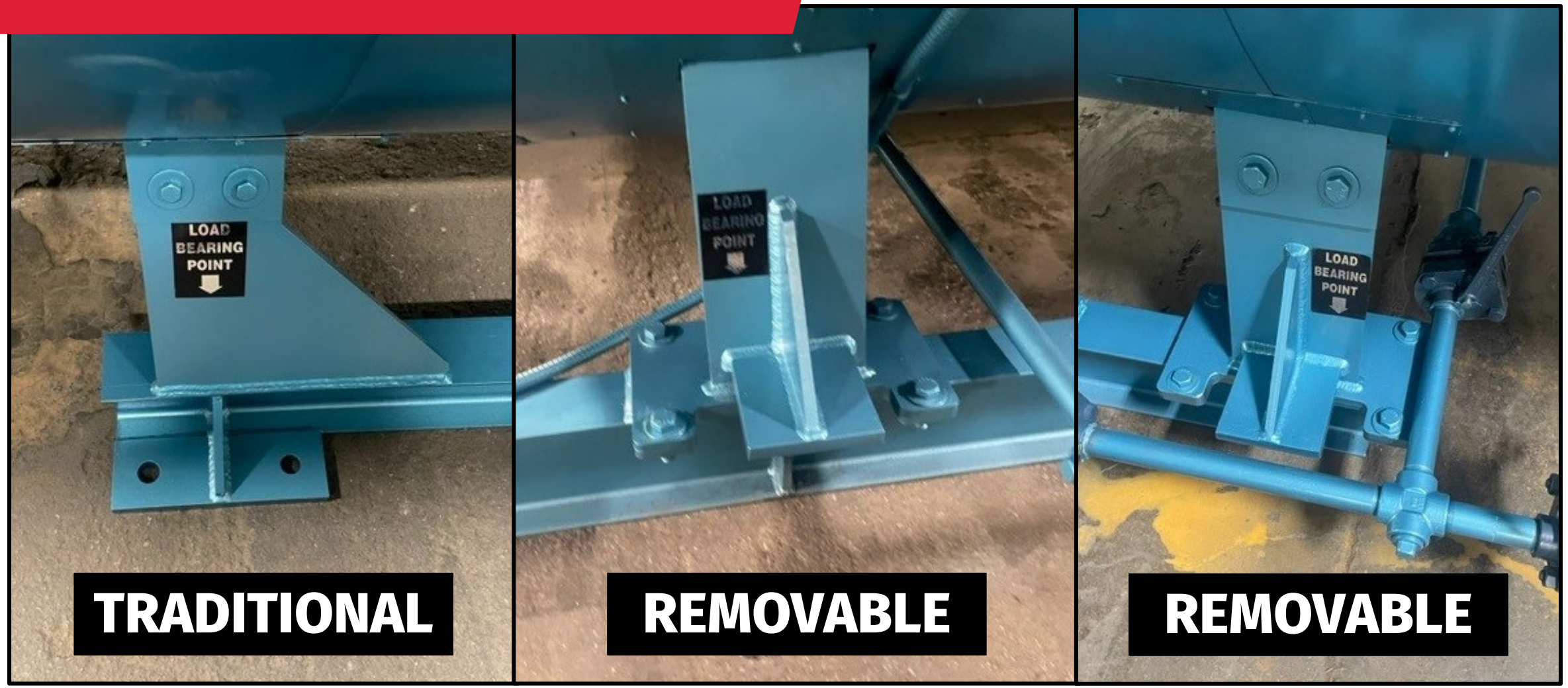


SUPERIOR BOILER

Removable Skids

- ✓ For additional flexibility with limited sized access points, boilers can be built with removable skids.
- ✓ Removable skids must be decided from the beginning of the manufacturing process—they are built differently to guarantee the integrity and quality.

Removable Skids



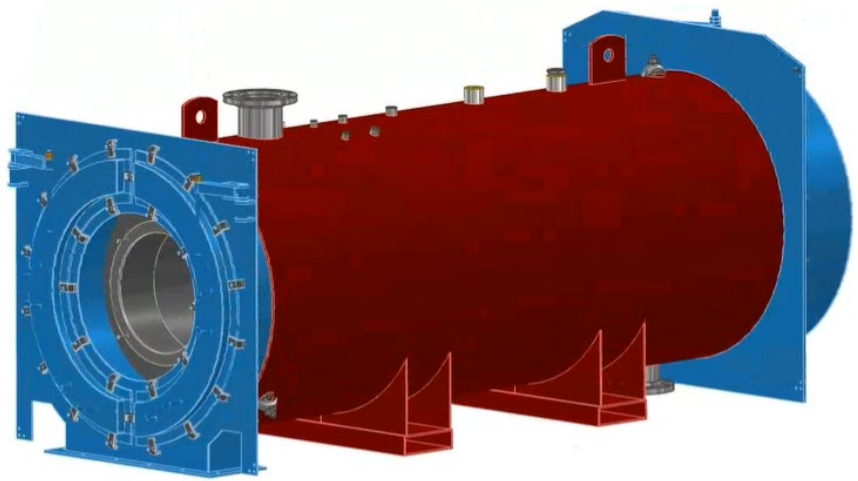
Cheyenne Condensing Line

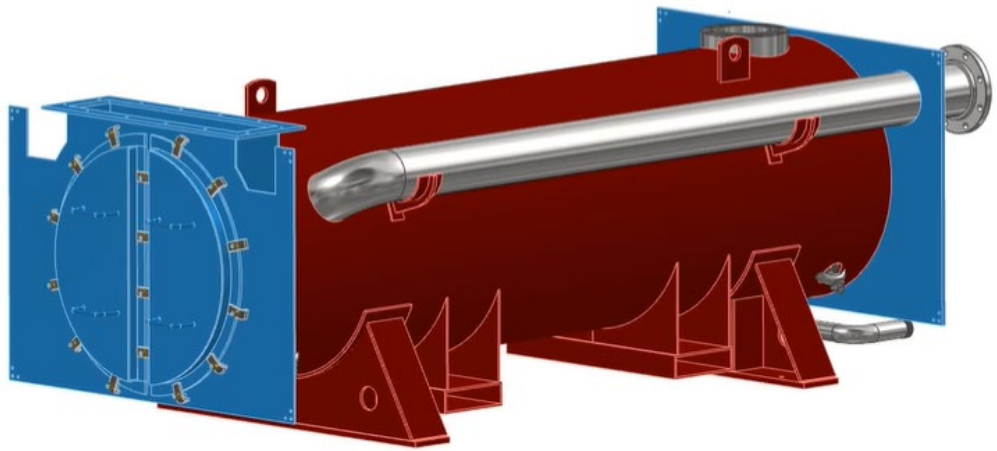
- ✓ Choice of UL listed burner packages
- ✓ Proven efficiency
- ✓ NOx Emissions of 30 PPM or less available on all firing rates (ultra low NOx 9PPM available)
- ✓ True dual fuel capabilities with natural gas/oil
- ✓ Full penetration tube welds
- ✓ All 316 Stainless Steel construction in Condensing Pass
- ✓ 12GA rifled tubes in the 2nd pass

SUPERIOR BOILER

Cheyenne Condensing Boiler

Ability to decouple creates less restrictions when transported through limited access points.



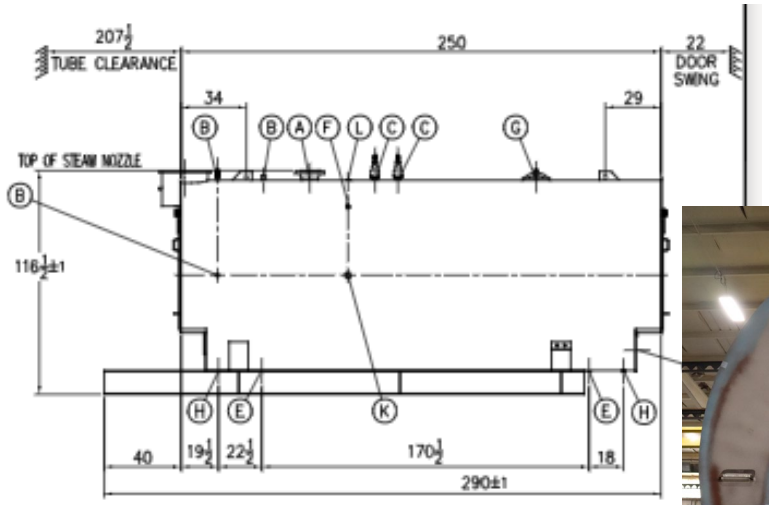


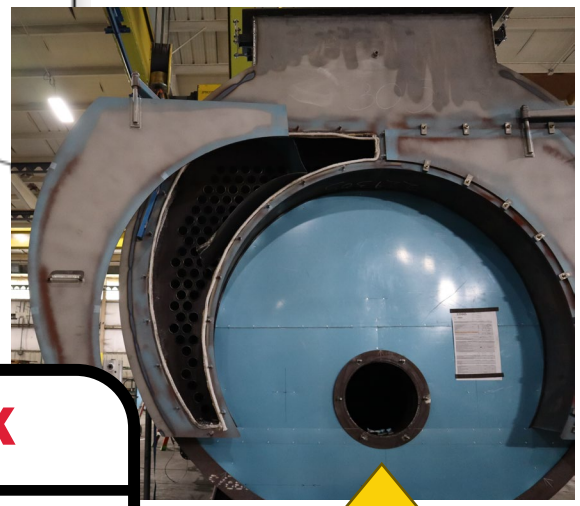
Wetback vs. Dryback

Wetback		Dryback
↑	**Initial Cost**	↓
↓	**Fuel Costs**	↑
Two Split/Hinge	**Doors**	Single Large and Heavy
Small	**Inspection Space**	Wide
None	**Refractory**	Costly to Maintain
Little to None	**Cool-Down Period**	Long
Complex Internals	**Design**	Simple
Water-backed	**Rear Turnaround**	Refractory-backed
Can expand, less stress	**Tube Sheet**	Subject to add'l stress
Frontside access only	**Tube Access**	Front & Rear Access
Turnaround & furnace	**Cleanout Plug Access**	Furnace access only

SUPERIOR BOILER

Wetback vs. Dryback—Door Clearance



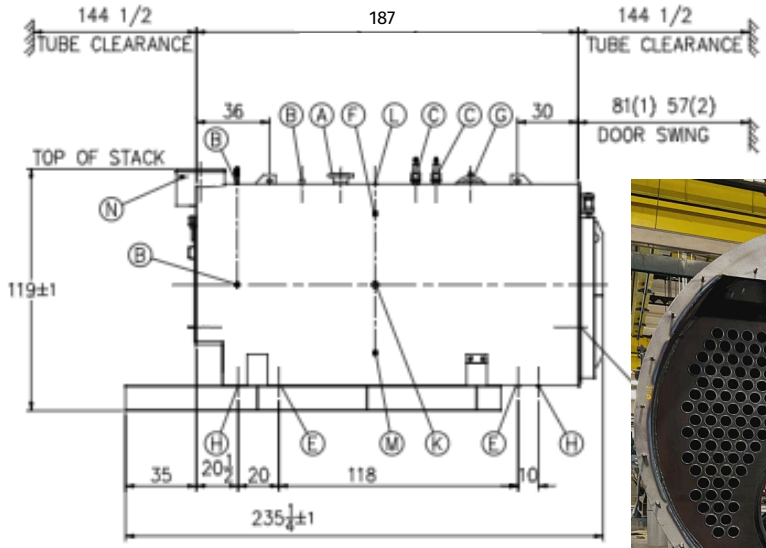


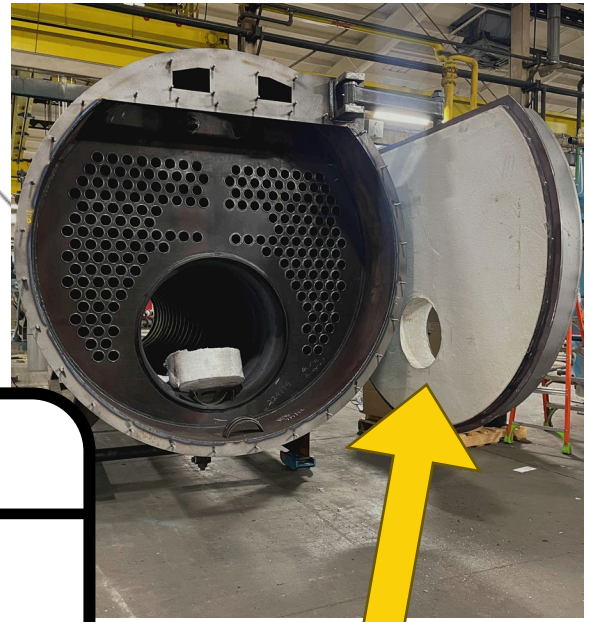
MOHICAN WETBACK

500 HP

- Initial door swing of 22”
- Tube clearance 207” front side only

Cleanout Plug





APACHE DRYBACK

500 HP

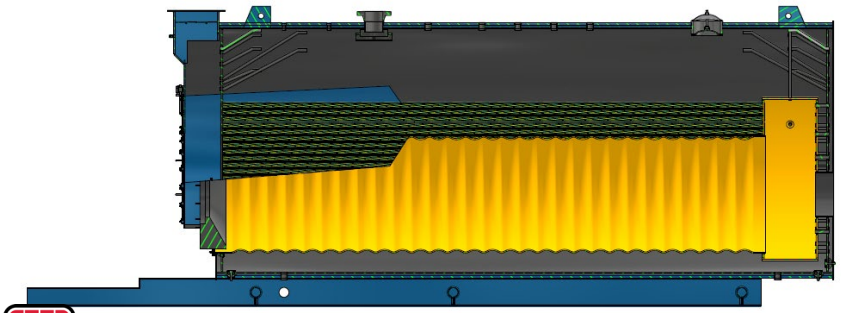
- Initial door swing of 51”-81”
- Tube clearance 144” either side

Cleanout Plug

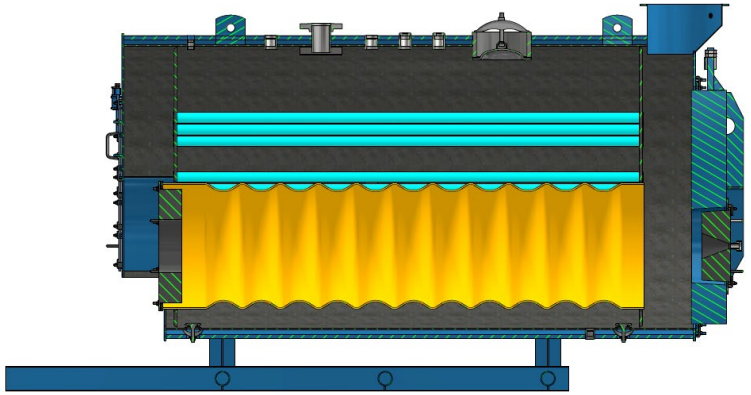
2, 3, and 4-Pass Stacks

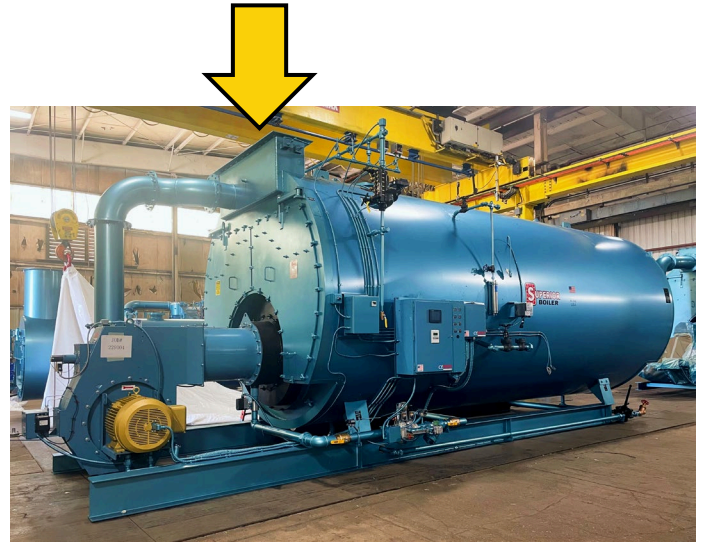
MORE PASSES=BETTER HEAT TRANSFER

2-PASS

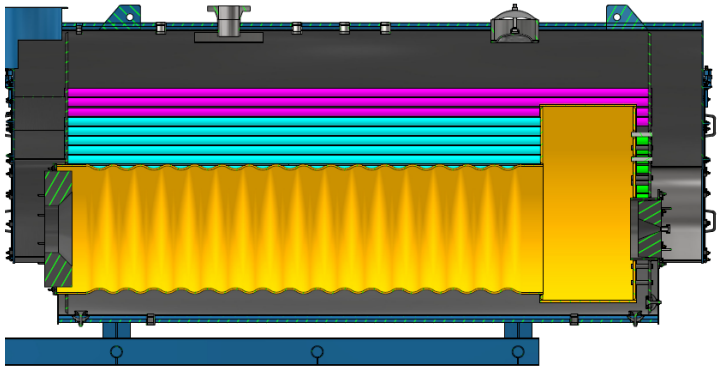


3-PASS





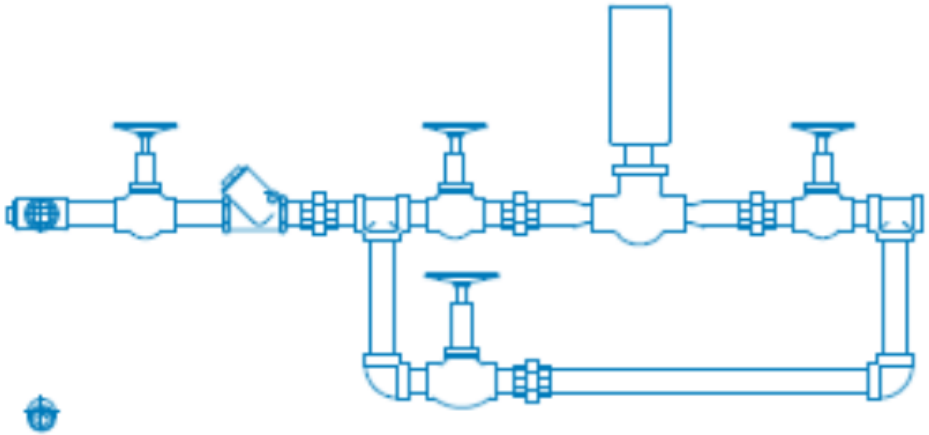
4-PASS



Engineered and Built to Order

Customized packages to meet your requirements

- ✓ Fluctuating load demands
- ✓ Emissions compliance
- ✓ Energy efficiency
- ✓ Fuel flexibility
- ✓ Redundancy
- ✓ Footprint challenges



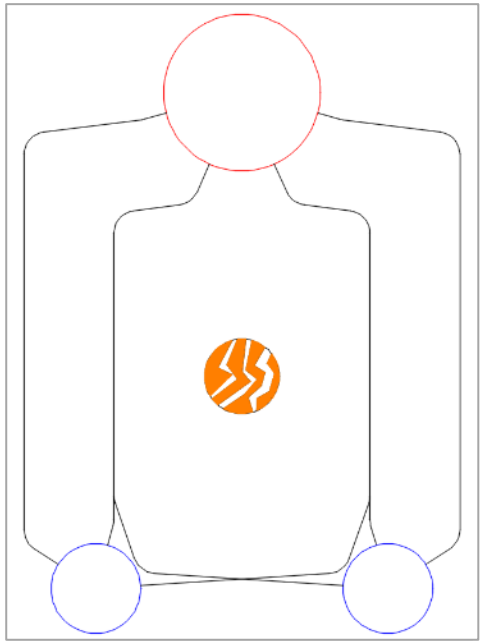
Modified Designs

Custom engineered to fit your space

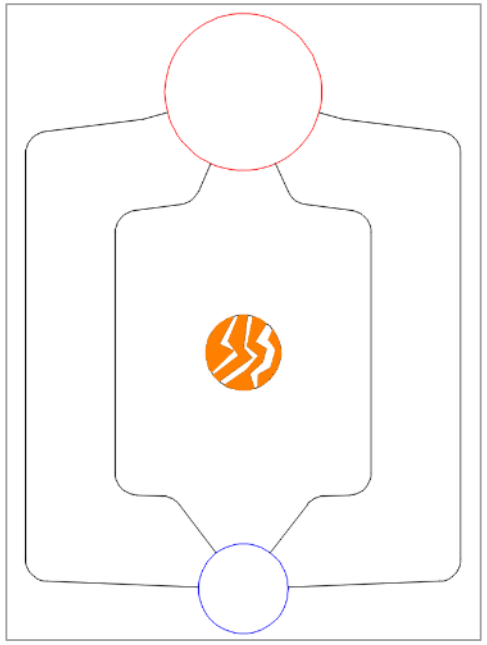
- ✓ Our engineering team will work with you to design a boiler for your space limitations (Mokhtar and Sundeep)
- ✓ DFW Patented Design
- ✓ Waste Heat/HRSG – FT and WT
- ✓ Examples:
  - ✓ Ds-Type boiler for pharmaceutical company
  - ✓ Super Seminole for a Midwest hospital

Watertube Boiler Designs

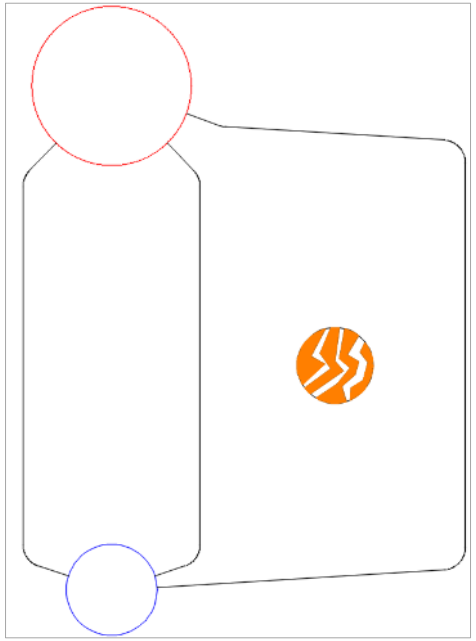
A



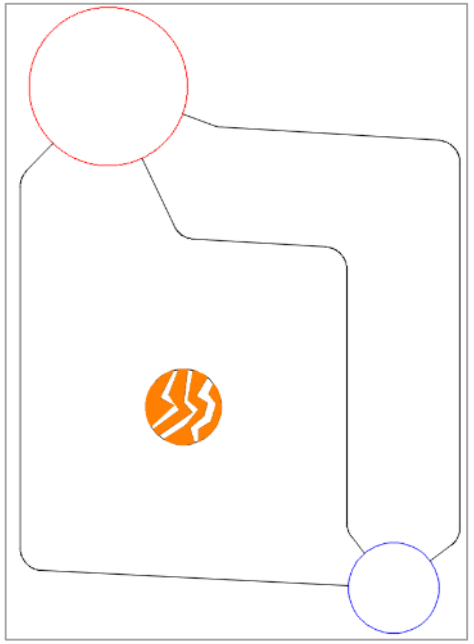
O



D

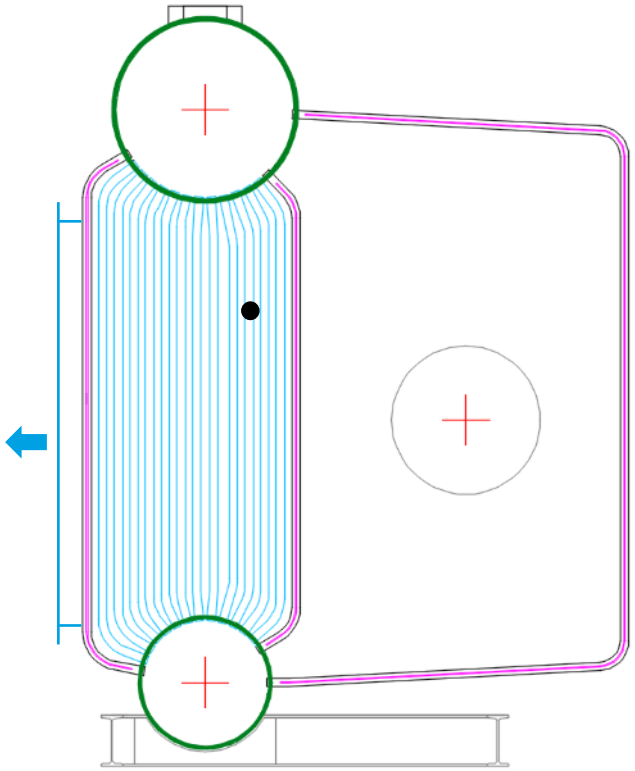


Ds

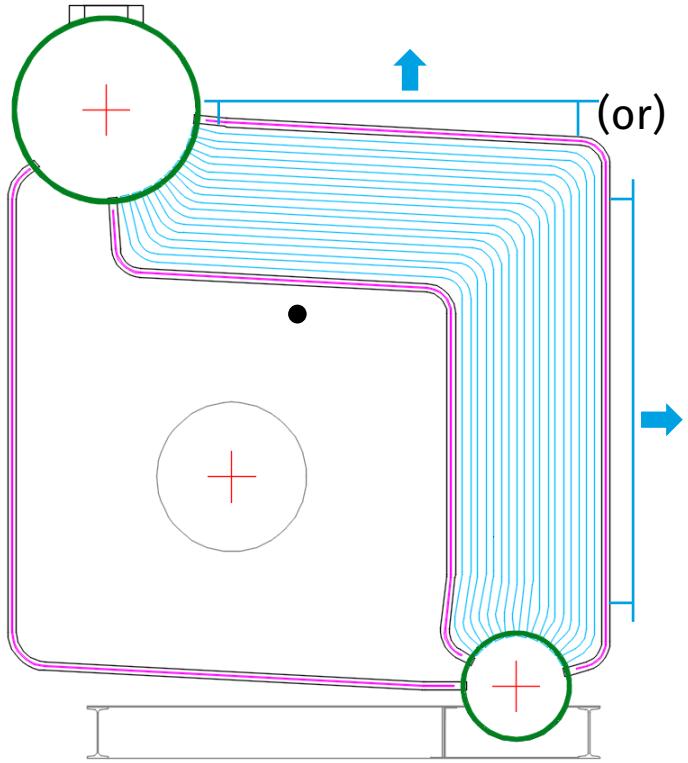


SUPERIOR PATENTED DESIGN

D-Type vs Ds-Type



D		Ds
Rectangle	**Furnace**	Square
Uneven	**Heat flux**	Uniform
Higher	**Burner location**	Lower to ground
—	**Draft losses**	↓ *
Side	**Gas Outlet**	Top (or) Side
In the Convection	**Center of Gravity**	Almost Center
Addl. For Econ.	**Footprint**	No Add'l
—	**Capital Cost**	↓ *
—	**Operational Cost**	↓ *
—	**Weight**	↓ *



*Contact Superior Boiler for data related to your boiler size and application.

DFW Design Benefits

AVAILABLE FOR USE WITH THE A, O, D, AND Ds-TYPE BOILERS

Decreased Footprint

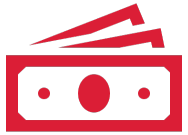
Offers a smaller overall footprint while maintaining boiler capacity throughput.

Increased Sustainability

Lower overall operating emissions, resulting in cleaner overall boiler operating systems that are more environmentally friendly.

Lower Fan HP

Utilization of a lower fan horsepower to create the same steam flow as a conventional boiler design, resulting in lower overall cost of operations to end users.



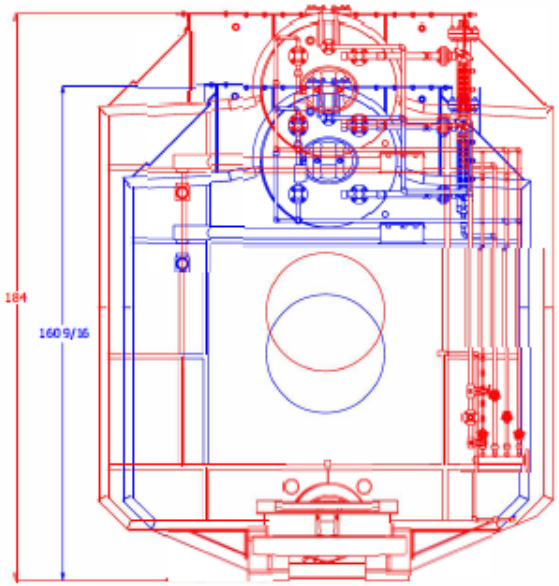
Cost Reduction

Reduced requirements for purchased materials and subcomponents, providing end users a more cost-competitive offering compared to existing systems.

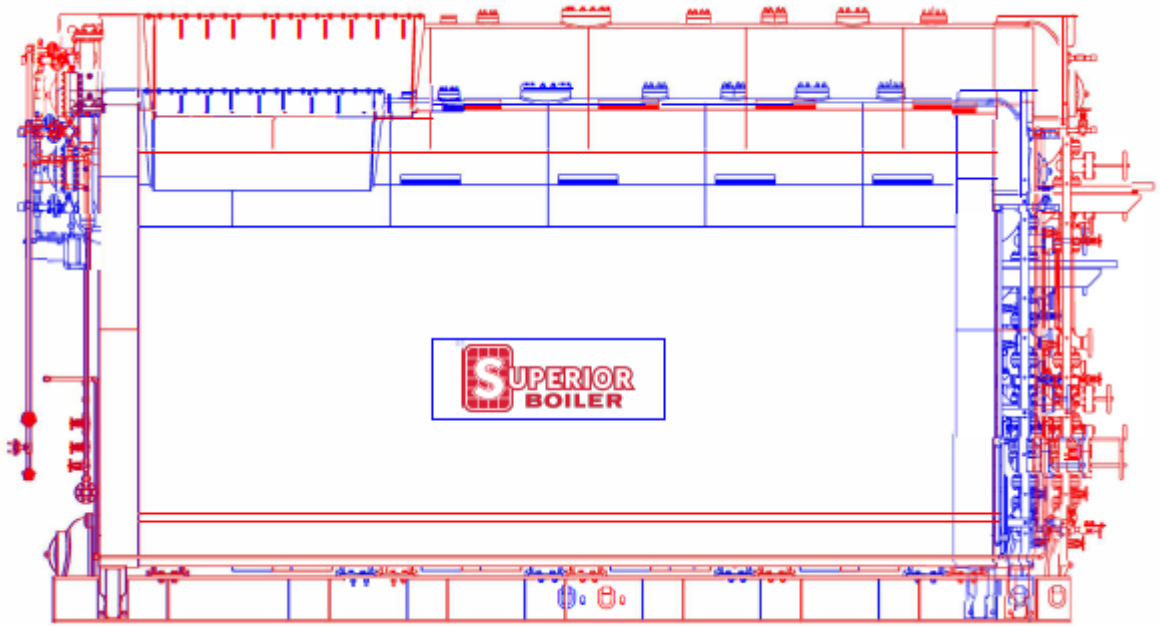
DFW Comparison (O-Type)

	O TYPE	O TYPE - DFW
STEAM CAPACITY	85,000 lb/hr	85,000 lb/hr
BOILER FOOTPRINT	26' 10" L x 12' 4" W x 14' 9" H	25' 1" L x 11' 0" W x 13' 6" H
FURNACE DIMENSIONS	24' 5" L x 8' 10" W x 6' 7" H	22' 6" L x 7' 6" W x 6' 4" H
FURNACE VOLUME	1,465 ft^3	1,086 ft^3
FURNACE HEATING SURFACE	781 ft^2	1,185 ft^2
AVERAGE FURNACE HEAT FLUX	158,052 btu/hr ft^2	103,274 btu/hr ft^2
TYPICAL FGR RATE	15%	0%
BOILER DRAFT LOSS	7.6 in. wc.	9 in. wc.
FAN HORSEPOWER	155 HP	131 HP
MAWP	750 psig	750 psig
SUPERHEAT STEAM	750° F	750° F
BOILER DRY WEIGHT	116,600 lbs	99,000 lbs
BOILER FLOODED WEIGHT	152,200 lbs	132,700 lbs

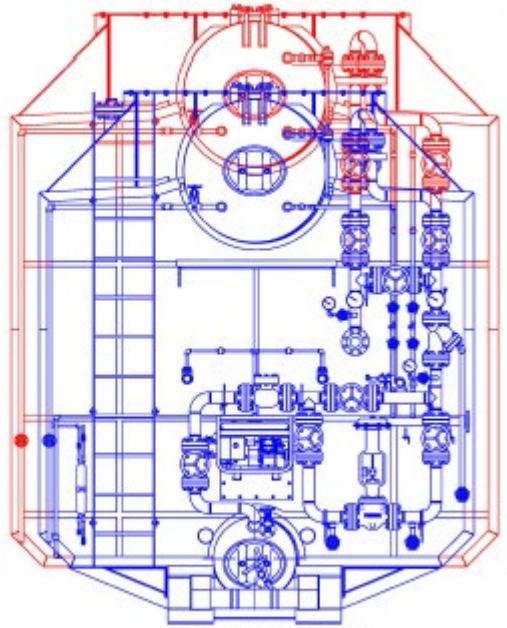
DFW Comparison (O-Type)



FRONT ELEVATION



SIDE ELEVATION


REAR ELEVATION

STANDARD 100,000 LB/HR O-TYPE

DFW 100,00 LB/HR O-TYPE

Our Aftermarket Team

MICK JONES

Aftermarket Parts & Service Manager

mjones@superiorboiler.com

CHRISTOPHER MICHAEL

Aftermarket Parts & Service Representative

cmichael@superiorboiler.com

SUPERIOR BOILER

620-662-6693

Parts & Equipment

- **Electrical, Heating, & Controls**
- **Valves, Gaskets, & More**
- **Burners, Burner Parts, & Boiler Controls**
- **Refractory & Burner Mounts**
- **Non-Proprietary Parts**
- **Boiler Vessel Replacement Equipment**

Electrical, Heating, & Controls

- ✓ Economizers (new and retrofit)
- ✓ Heat exchangers, tube bundles, & pre-heaters
- ✓ Superheater & reheater tube assemblies
- ✓ Electrical relays, starters, switches, & motors
- ✓ Warrick controls
- ✓ Water level controls
- ✓ Thermometers

SUPERIOR BOILER

Valves, Gaskets, Pumps & More

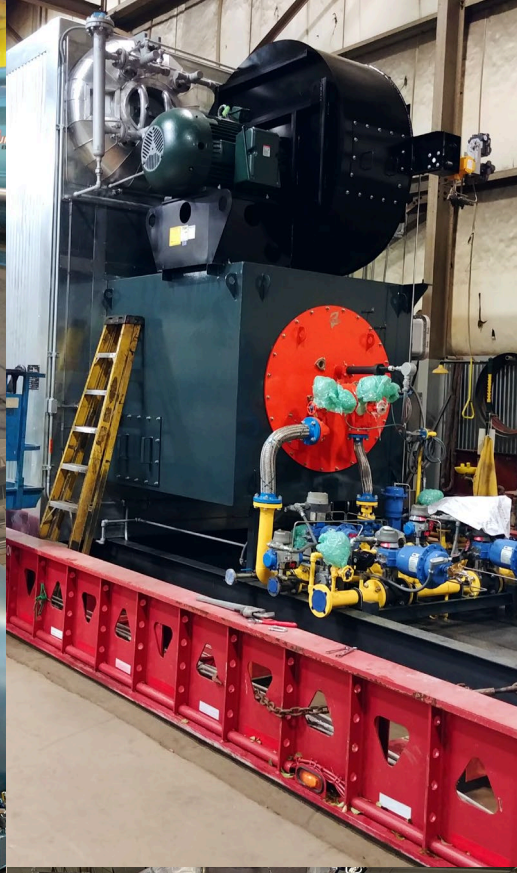
- ✓ Blowdown valves
- ✓ Gauges & pressure gauges
- ✓ Clean-out plugs
- ✓ Gaskets, insulation, & rope
- ✓ Pumps (including Grundfos pumps)
- ✓ Stack dampers
- ✓ Davit arms
- ✓ Spool pieces
- ✓ Handhole/manway plates

SUPERIOR BOILER

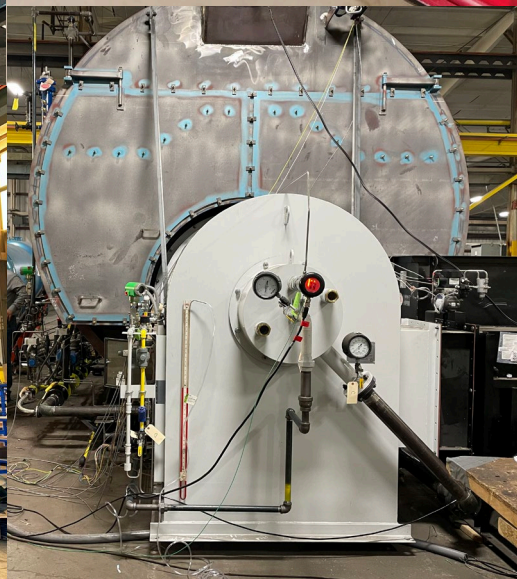
Burner & Controls

Superior Boiler is committed to remaining burner & controls neutral

- ✓ Superior boilers are burner neutral and work with any brand
- ✓ Driven by the specification, customer preference, or what the representative carries
- ✓ Easier and more cost-effective to maintain
- ✓ If the burner and/or controls need replaced or upgraded, the end user has their choice of burner manufacturers.
- ✓ Superior Boiler has access to a variety of burners, burner parts, and controls when it comes time for replacement!



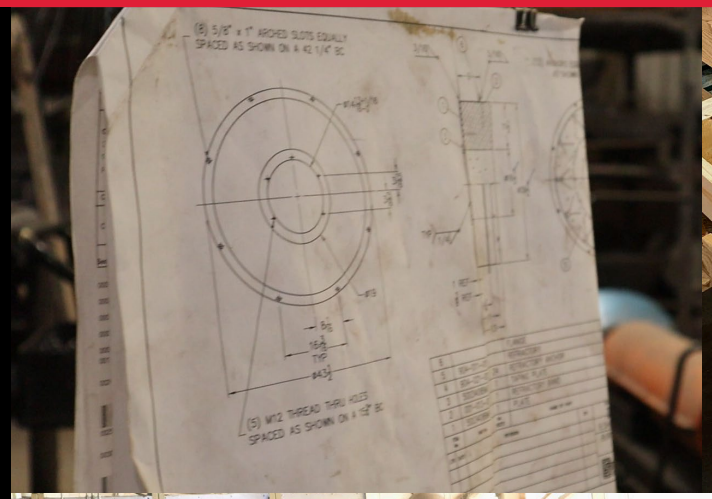
SUPERIOR BOILER

Burner Mounts & Refractory

Aftermarket Solutions designed for <u>ANY</u> boiler on the market

- ✓ Replacement Custom Refractory Bridge and Blocks
- ✓ Replacement Custom Burner Mounts

See curing procedure sheet in files section!



SUPERIOR BOILER

Non-Proprietary Parts

OEM and non-OEM parts for ALL Superior Boilers and all equipment on the market.

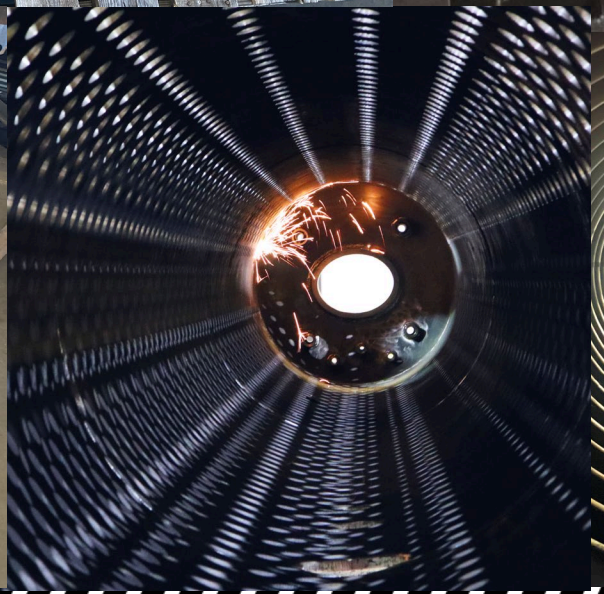
- ✓ Superior Boiler is a recognized distributor for many parts manufacturers.
- ✓ Parts can be found from a variety of distributors.
  - ✓ Quick to get you back up and running!
- ✓ Maintenance and repairs can be completed by the qualified boiler contractor of your choice.

SUPERIOR BOILER

Boiler Vessel Replacement Equipment

Aftermarket solutions available for EVERY boiler on the market

- ✓ Replacement Tube Sheets
- ✓ Corrugated/Plain Furnaces
- ✓ Membrane wall panels
- ✓ Header & Drums
- ✓ Complete Front & Rear Doors
- ✓ Repair Sections
- ✓ Warranty for Boilers & Parts



SUPERIOR BOILER

Boiler Tubes

- ✓ 2”, 2 ½”, and 3” in 11, 12, and 13 gauge for firetube boilers
  - ✓ Rifled tubing available on special application request
- ✓ Bent tubes for package watertube boilers
  - ✓ CNC tube bender for efficient supply of replacement tubes
  - ✓ Custom designed for ANY boiler on the market
- ✓ Spiral fin tubes for economizers and waste heat boilers.
- ✓ For Cheyenne – 316 stainless steel tubes

SUPERIOR BOILER

Q&A

Hit us with your challenges

SUPERIOR BOILER

THANK YOU

SUPERIOR BOILER