PRECISION QUINCY

CASE STUDY

Steam-Heated Batch Preheat Ovens for Defense-Industry Steel Components

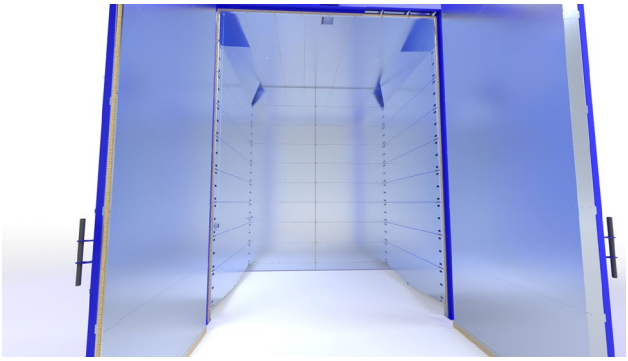
Matched pair of large steam-heated batch ovens engineered for preheating heavy defense-industry steel components—each delivering 200,000 BTU/hr via steam coil, 15,000 CFM full-horizontal recirculation, Class A explosion-proof-rated construction with internal sprinklers, knockdown flat-packed panel shipment for on-site assembly, and remote-mounted Allen-Bradley MicroLogix controls.

OVERVIEW

Precision Quincy engineered this project as two steam-heated batch ovens positioned side by side to process heavy steel parts used in a defense-industry manufacturing application. The equipment was developed to preheat steel components before later downstream operations. We have intentionally kept the product description generalized due to customer and application sensitivities. Each oven was designed as a single-zone, Class A batch oven with critical explosion-proof-rated components, even though the application itself did not rely on a defined VOC load in the same way as a conventional solvent process.

Each oven was built around a large internal work chamber of 120 in W × 96 in D × 168 in H and a load capacity of 6,000 lb per batch. The ovens were designed for a normal operating temperature of approximately 140°F, a maximum operating temperature of 165°F, and a required workroom uniformity of ±15°F. To deliver that performance, Precision Quincy used a steam coil heating system rated at 200,000 BTU/hr, a full-horizontal recirculation airflow pattern, and a recirculation system delivering 15,000 CFM at 2 in. w.c.

Because the equipment had to be installed in a customer environment with stringent safety constraints, the design incorporated explosion-proof fan motors and steam valve hardware, a remote-mounted controls package, a pull-cord emergency stop located inside the oven, and an internally sprinklered chamber. The shell system uses a 6-inch mineral-wool-insulated tubing-panel wall construction with RTV-sealed seams to withstand annual sprinkler testing without damaging the equipment. Due to the extreme chamber height, both ovens were designed to ship knocked down as flat-packed panel systems for field assembly and on-site finish work. Together, the two ovens occupy an overall side-by-side installed width of approximately 330 inches with a 4.5-inch gap between units.



CUSTOMER PROCESS REQUIREMENTS

This project was developed for a defense-industry application requiring the batch preheating of large steel components prior to downstream manufacturing steps. Because portions of the customer's process details are proprietary or sensitive, this case study summarizes the requirement at a high level while focusing on the equipment performance and architecture delivered by Precision Quincy.

Application requirement

- The equipment had to preheat steel parts used in a defense-industry application prior to later downstream processing.
- The system description is intentionally generalized to avoid disclosing customer-sensitive manufacturing details.
- The equipment had to provide consistent, repeatable low-temperature preheating for large heavy steel product.

System configuration requirement

- The project required two separate ovens installed side by side.
- The side-by-side configuration supports the customer's throughput and handling requirements.

Work chamber / load requirement

- Required internal work chamber per oven: 120 in W × 96 in D × 168 in H.
- Product height cannot exceed approximately 154 in at the corners.
- Required batch loading capacity: 6,000 lb per batch per oven.

Safety requirement

- The ovens were required to be designed as Class A units with explosion-proof-rated critical components.
- Each oven includes an interior pull-cord emergency stop located on the left-side wall.
- The work chamber includes sprinklers inside the oven with sealed construction to withstand annual testing.

Utility / customer-limitation requirement

- Required electrical service: 460V / 3PH / 60Hz.
- Customer-limited inlet steam pressure: 15 PSI max; maximum steam inlet temperature: 250°F max.

Installation / maintenance requirement

- Due to extreme assembled height, the ovens were designed to ship knocked down as flat-packed panel systems for on-site assembly.
- Steam coils are arranged so they can be serviced from a man lift positioned in front of the ovens.
- The tall doors incorporate truck latches to aid door closing due to enclosure size. Final paint finishing is completed on site.

THERMAL PROCESS REQUIREMENTS

These thermal process requirements were established from the customer's need to preheat large steel defense-industry components in a tightly controlled, low-temperature, safety-focused batch environment.

Temperature capability

- Normal operating temperature: approximately 140°F.
- Maximum operating temperature: 165°F.
- Required workroom temperature uniformity: ±15°F.

Process basis

- The thermal process basis is batch preheating of large steel components prior to downstream manufacturing operations.
- The application requires repeatable low-temperature heating rather than high-temperature heat treatment.

Heat input requirement

- Heat source: steam. Installed heat input per oven: 200,000 BTU/hr steam coil.
- Steam supply limited by customer conditions to 15 PSI maximum inlet pressure and 250°F maximum inlet temperature.

Airflow delivery requirements

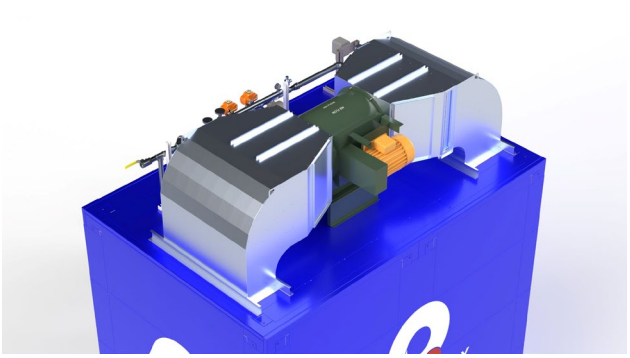
- Required airflow style: full horizontal recirculation airflow.
- Recirculation airflow basis: 15,000 CFM @ 2 in. w.c.

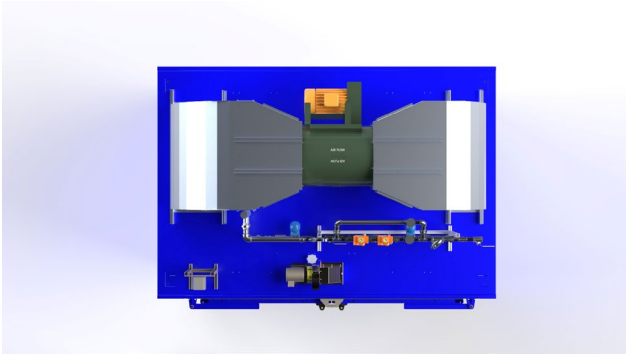
Exhaust / ventilation basis

- Exhaust fan: PQ1 exhauster delivering 500 CFM @ 1 in. w.c.; 0.75 HP explosion-proof-rated motor.

Safety / classification basis

- Oven classification basis: Class A.
- Explosion-proof-rated hardware required for critical in-oven components including fan motors and steam control valve.





EQUIPMENT CONCEPT & ARCHITECTURE

To deliver the customer and thermal process requirements for Project 5615, Precision Quincy developed the following equipment concept and architecture.

Overall concept

- Two side-by-side steam-heated single-zone batch ovens for preheating heavy steel defense-industry components.
- Each oven is an independent unit. Combined installed side-by-side width is approximately 330 inches with a 4.5-inch gap between units.

Heating architecture

- Heat source: steam — 200,000 BTU/hr steam coil per oven.
- Steam inlet pressure limited to 15 PSI max; steam inlet temperature limited to 250°F max (customer-site constraints).
- Steam control uses an explosion-proof 4–20 mA steam control valve.

Airflow / recirculation architecture

- Airflow pattern: full horizontal airflow.
- Recirculation fan: New York Blower tube axial FP27 fan, A22 size — 15,000 CFM @ 2 in. w.c., 15 HP explosion-proof-rated motor.
- Exhaust fan: PQ1 exhaust fan — 500 CFM @ 1 in. w.c., 0.75 HP explosion-proof-rated motor.

Chamber / construction architecture

- Internal work chamber per oven: 120 in W × 96 in D × 168 in H. Exterior dimensions: 162 in W × 120 in D × 220 in H.
- Shell style: structural steel tubing with interior panel cladding. Wall thickness: 6 inches, mineral wool insulation.
- Interior and exterior seams sealed with RTV — supports annual internal sprinkler testing without equipment damage.
- Truck latches on tall doors to assist door closure; steam coils serviceable from a man lift positioned in front of the ovens.

Controls architecture

- Primary controls platform: Allen-Bradley MicroLogix PLC / HMI in NEMA 4 / IP65-rated enclosure.
- Controls are remote mounted so the main panel is outside the hazardous oven area; field devices at the oven use explosion-proof-rated hardware.

Safety / compliance architecture

- NFPA 86 Class A classification. Explosion-proof-rated: recirculation fan motor, exhaust fan motor, and steam control valve.
- Interior pull-cord E-stop on the left-side wall of each oven. Internal sprinkler coverage in each chamber.

Shipping / installation architecture

- Equipment is designed to ship knocked down as flat-packed panels due to the extreme overall height.
- Final assembly and paint finishing are completed on site.

TECHNICAL SPECIFICATIONS

Oven Configuration	
Project	5615
Type	Steam-heated single-zone batch preheat oven
Quantity	2 ovens
Application	Preheating steel defense-industry components prior to downstream processing
Configuration	Two side-by-side ovens
Internal Work Chamber (each oven)	120 in W × 96 in D × 168 in H
Exterior Dimensions (each oven)	162 in W × 120 in D × 220 in H
Side-by-Side Installed Width	Approx. 330 in

Gap Between Ovens	Approx. 4.5 in
Product Height Limit	Approx. 154 in at corners
Batch Capacity	6,000 lb per batch per oven
Shipment Style	Knockdown flat-packed panel shipment
Final Assembly	On-site assembly and painting

Thermal Heat Power System	
Normal Operating Temperature	140°F (approximate)
Maximum Operating Temperature	165°F
Temperature Uniformity	±15°F
Heat Source	Steam
Steam Coil Capacity (per oven)	200,000 BTU/hr
Steam Inlet Pressure Limit	15 PSI max
Steam Inlet Temperature Limit	250°F max
Heating Zone Quantity	1

Recirculation / Airflow System	
Airflow Pattern	Full horizontal airflow
Recirculation Fan	New York Blower tube axial FP27, A22 size
Recirculation Airflow	15,000 CFM
Recirculation Static Pressure	2 in. w.c.
Recirculation Fan Motor	15 HP
Recirculation Motor Type	Explosion-proof-rated

Exhaust System	
Exhaust Fan	PQ1 exhaust fan
Exhaust Airflow	500 CFM
Exhaust Static Pressure	1 in. w.c.
Exhaust Fan Motor	0.75 HP
Exhaust Motor Type	Explosion-proof-rated

Construction Materials / Shell System	
Shell Style	Structural steel tubing with interior panel cladding oven shell
Wall Thickness	6 in
Insulation	Mineral wool

Seam Sealing	RTV-sealed interior and exterior seams
Chamber Sprinklers	Included inside each oven
Service Access	Steam coils serviceable from man lift in front of oven
Door Hardware	Truck latches to assist closure

Safety & Compliance	
NFPA 86 Classification	Class A
Recirculation Fan Motor	Explosion-proof-rated
Exhaust Fan Motor	Explosion-proof-rated
Steam Control Valve	Explosion-proof 4–20 mA control valve
Interior Emergency Stop	Pull-cord E-stop on left-side wall (each oven)
Controls Location	Remote mounted outside hazardous area

Controls & Electrical	
PLC / HMI Platform	Allen-Bradley MicroLogix PLC / HMI
Control Enclosure	NEMA 4 / IP65-rated remote enclosure
Primary Power	460V / 3PH / 60Hz
Full Load Amperage	23.4 A FLA

Process Summary	
Product	Large steel components
Market / Application	Defense-industry preheat application
Process Type	Batch preheating prior to downstream processing
Batch Capacity	6,000 lb per batch per oven
Key Verification Concept	Repeatable control of temperature, airflow, and safe operating limits

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