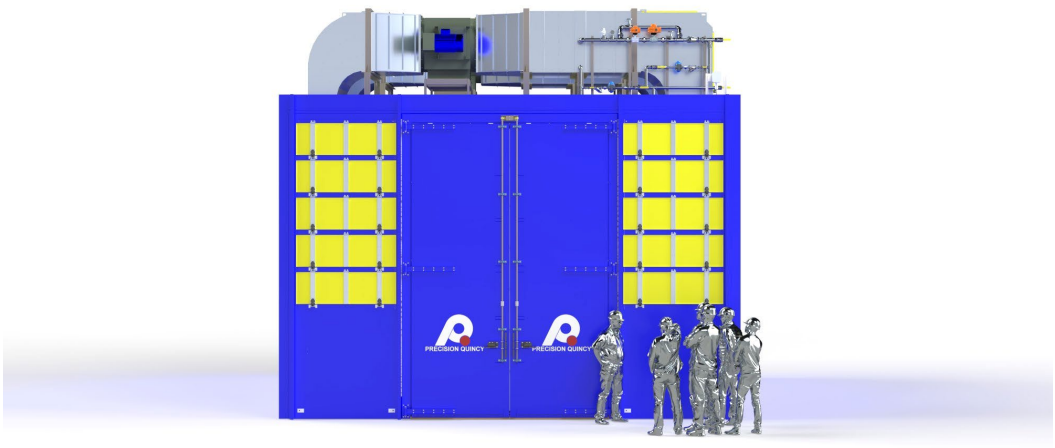
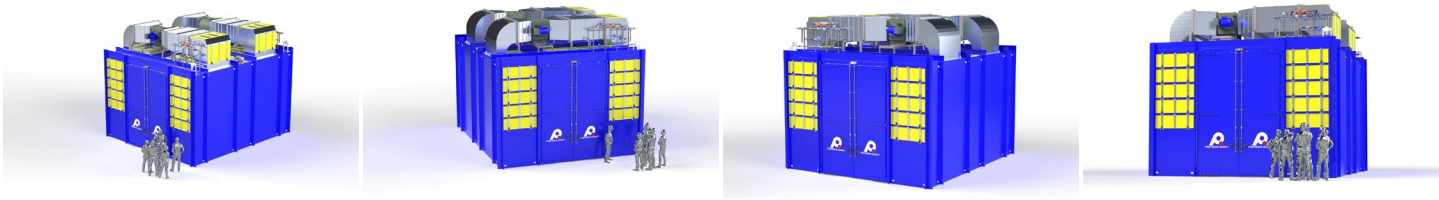


PRECISION QUINCY

CASE STUDY

Outdoor Steam-Heated Batch Curing Oven for Defense-Industry Confidential Materials

Large outdoor single-zone steam-heated batch curing oven installed beneath a lean-to—delivering 1,000,000 BTU/hr via two ST58 steam coils, 50,000 CFM full-horizontal recirculation via two New York Blower FP36 fans, explosion-proof-rated critical hardware, dual pull-cord E-stops, internal sprinkler compatibility, and Watlow F4T controls with encrypted data acquisition in a flat-packed field-assembled panel shell.

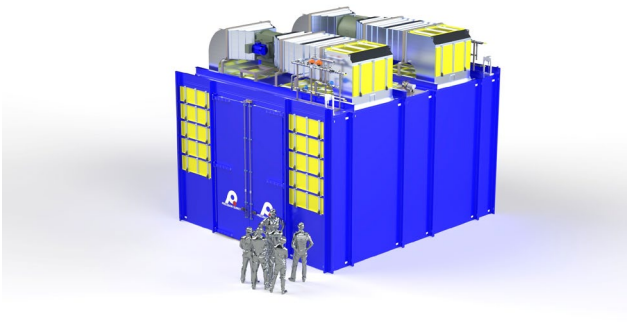


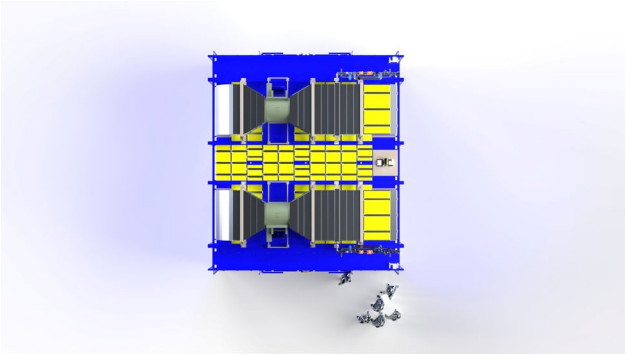
OVERVIEW

Precision Quincy engineered this project as an outdoor steam-heated batch curing oven for processing confidential materials used in a defense-industry application. The case study intentionally describes the product and downstream process only at a generalized level, but the equipment was designed to provide repeatable low-temperature curing performance while minimizing ignition risks through the use of explosion-proof-rated critical hardware, remote-mounted controls, sealed construction, and safety-focused airflow and heating architecture.

The oven was built around a large internal work chamber of 240 in W × 312 in D × 192 in H with an exterior envelope of approximately 190 in W × 343 in D × 267.5 in H. The equipment was designed for a normal operating temperature of approximately 140°F, a maximum operating temperature of 170°F, and a required workroom uniformity of ±15°F. Heating is provided by two ST58 steam coils delivering 500,000 BTU/hr each, for a total installed heat input of 1,000,000 BTU/hr. Air movement is provided by two New York Blower tube-backward inclined seal fans, model FP36, each delivering 25,000 CFM at 2,500 RPM, for a total recirculation airflow of 50,000 CFM.

Because the equipment is installed outdoors under a lean-to and must operate in a high-safety-duty customer environment, the design incorporates explosion-proof recirculation fan motors, explosion-proof exhaust fan hardware, explosion-proof steam control valves, and two pull-cord emergency stop stations located at opposite ends of the work chamber in explosion-proof switch assemblies. The shell system uses a 6-inch-thick structural steel tubing with interior panel cladding construction, 6 lb density mineral wool insulation, and interior and exterior seams sealed with exterior-grade sealants suitable for annual sprinkler testing. Due to its size, the oven ships flat-packed for on-site assembly, on-site wiring conduit installation, and on-site testing. All steam heating equipment is roof mounted and the control enclosure is mounted away from the oven in an area without explosion risk.





CUSTOMER PROCESS REQUIREMENTS

This project was developed for a defense-industry application requiring the batch curing of confidential materials associated with steel components used in downstream operations. 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, safety approach, and architecture delivered by Precision Quincy.

Application requirement

- The equipment had to process confidential materials used in a defense-industry application.
- The thermal process is described at a generalized level as a batch curing operation.
- The system description is intentionally generalized to avoid disclosing customer-sensitive manufacturing details.

- The equipment had to provide consistent, repeatable low-temperature curing performance in a high-safety-duty environment.

System configuration requirement

- The project required one large outdoor batch oven installed beneath a lean-to structure.
- The system operates as a single-zone batch unit suitable for field assembly, field conduit installation, and final on-site testing.

Work chamber / load requirement

- Required internal work chamber: 240 in W × 312 in D × 192 in H.
- Exterior oven size: 190 in W × 343 in D × 267.5 in H. Product entry opening: 120 in W × 192 in H.
- The work chamber is wider than the primary product opening, allowing product loading and positioning within a larger process envelope while limiting open access width.

Thermal / operating requirement

- Intended operating temperature: approximately 140°F. Maximum operating temperature: 170°F.
- Required workroom temperature uniformity: ±15°F.

Safety requirement

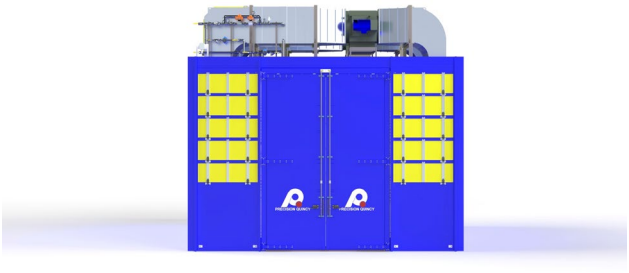
- Critical hardware at the oven required explosion-proof-rated components including recirculation fan motors, exhaust fan hardware, steam control valves, and pull-cord E-stop switch assemblies.
- The oven includes two interior pull-cord emergency stop stations, one at each end of the process chamber.
- Work chamber and shell construction must remain compatible with annual internal sprinkler testing.

Utility / customer-limitation requirement

- Required electrical service: 460V / 3PH / 60Hz; 56.4 A FLA.
- Customer-limited steam inlet: 15 PSI max pressure / 250°F max temperature. Design elevation basis: less than 1,000 ft above sea level.

Installation / maintenance requirement

- Oven designed to ship flat-packed for on-site assembly. Field wiring conduit and final testing completed on site.
- All steam heating equipment is roof mounted. Seams sealed with exterior-grade sealants for weather resistance and sprinkler test compatibility.



THERMAL PROCESS REQUIREMENTS

These thermal process requirements were established from the customer's need to cure confidential defense-industry materials in a tightly controlled, low-temperature, safety-focused outdoor batch environment.

Temperature capability

- Normal operating temperature: approximately 140°F.
- Maximum operating temperature: 170°F.
- Required workroom temperature uniformity: ±15°F.

Process basis

- The thermal process basis is batch curing of confidential materials used in a defense-industry application.
- The application requires repeatable low-temperature curing rather than high-temperature thermal processing.

Heat input requirement

- Heat source: steam. Total installed heat input: 1,000,000 BTU/hr (two ST58 steam coils at 500,000 BTU/hr each).
- Steam supply limited to 15 PSI maximum inlet pressure and 250°F maximum inlet temperature.

Airflow delivery requirements

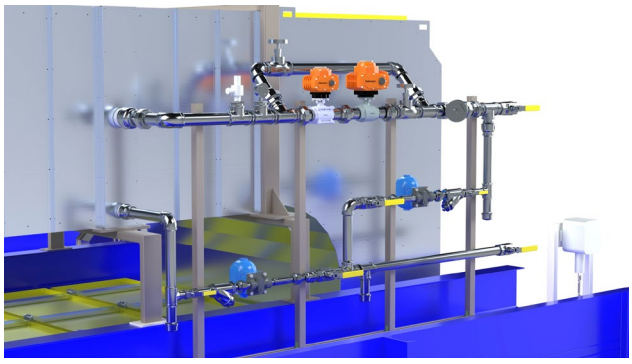
- Full horizontal recirculation airflow across the work area.
- Required total recirculation airflow: 50,000 CFM.

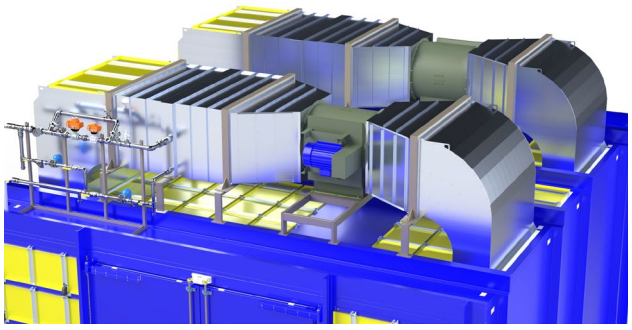
Exhaust / ventilation basis

- Required exhaust airflow: 300 CFM via PQ1 exhauster with explosion-proof-rated hardware.

Safety / processing basis

- Design approach minimizes potential ignition sources within the process environment.
- Control package is located outside the immediate explosion-risk area.
- Annual sprinkler testing compatibility is a construction and sealing requirement built into the design.





EQUIPMENT CONCEPT & ARCHITECTURE

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

Overall concept

- One outdoor steam-heated single-zone batch curing oven, installed beneath a lean-to structure.
- Designed for flat-pack shipment, on-site assembly, on-site conduit installation, and on-site testing.

Heating architecture

- Heat source: steam — two ST58 steam coils at 500,000 BTU/hr each; 1,000,000 BTU/hr total.
- Steam inlet limited to 15 PSI max / 250°F max (customer-site constraints). All steam heating equipment is roof mounted.
- Steam control uses explosion-proof-rated steam control valves.

Airflow / recirculation architecture

- Airflow pattern: full horizontal recirculation.
- Two New York Blower tube-backward inclined seal FP36 fans — 25,000 CFM each / 50,000 CFM total at 2,500 RPM; 20 HP explosion-proof-rated motor each (40 HP total).
- PQ1 exhaust fan — 300 CFM; explosion-proof-rated hardware.

Chamber / construction architecture

- Internal work chamber: 240 in W × 312 in D × 192 in H. Exterior: 190 in W × 343 in D × 267.5 in H. Product entry opening: 120 in W × 192 in H.
- Shell style: structural steel tubing with interior panel cladding. Wall thickness: 6 inches, 6 lb density mineral wool insulation.
- Interior and exterior seams sealed with exterior-grade sealants — supports annual sprinkler testing and outdoor installation weathering.

Controls architecture

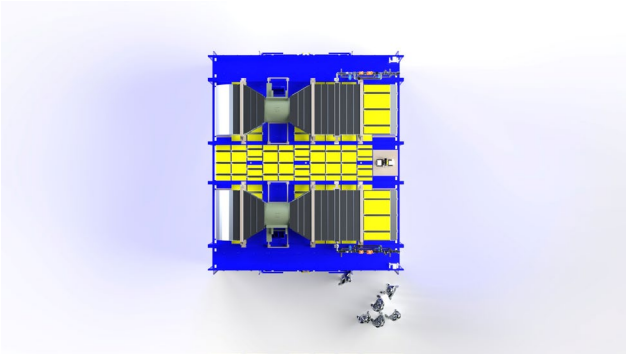
- Primary process controller: Watlow F4T ramp/soak controller with encrypted data acquisition.
- NEMA 4 control enclosure, remote mounted away from the oven in a non-explosion-risk area.

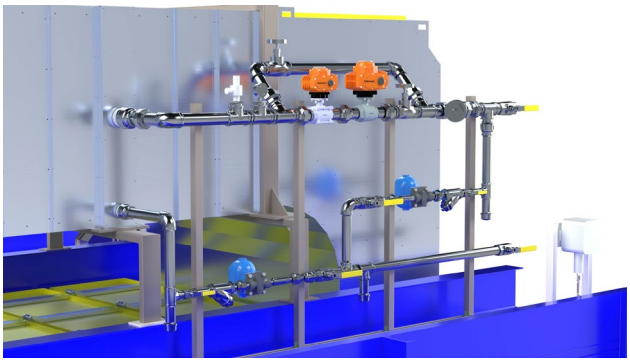
Safety / compliance architecture

- Explosion-proof-rated: recirculation fan motors, exhaust fan hardware, steam control valves, and pull-cord E-stop switch assemblies.
- Two pull-cord emergency stop stations — one at each end of the process chamber.

Shipping / installation architecture

- Ships flat-packed due to overall size. Final assembly, wiring conduit installation, and testing completed on site.





TECHNICAL SPECIFICATIONS

Oven Configuration	
Project	5616
Type	Outdoor steam-heated single-zone batch curing oven
Quantity	1 oven
Application	Curing confidential materials used in a defense-industry application
Installation	Outdoor, under lean-to
Internal Work Chamber	240 in W × 312 in D × 192 in H
Exterior Dimensions	190 in W × 343 in D × 267.5 in H
Product Entry Opening	120 in W × 192 in H
Shipment Style	Flat-packed panel shipment
Final Assembly	On-site assembly
Field Wiring	Conduit installed on site
Final Testing	Tested on site

Thermal Heat Power System	
Normal Operating Temperature	140°F (approximate)
Maximum Operating Temperature	170°F
Temperature Uniformity	±15°F
Heat Source	Steam
Steam Coil Quantity	2 ST58 steam coils
Steam Coil Capacity	500,000 BTU/hr each
Total Installed Heat Input	1,000,000 BTU/hr
Steam Inlet Pressure Limit	15 PSI max
Steam Inlet Temperature Limit	250°F max
Heating Zone Quantity	1
Steam Heating Location	Roof mounted

Recirculation / Airflow System	
Airflow Pattern	Full horizontal recirculation
Recirculation Fan Quantity	2
Recirculation Fan	New York Blower tube-backward inclined seal FP36
Recirculation Airflow	25,000 CFM each / 50,000 CFM total
Fan Speed	2,500 RPM
Recirculation Fan Motor	20 HP each / 40 HP total
Recirculation Motor Type	Explosion-proof-rated

Exhaust System	
Exhaust Fan	PQ1 exhauster
Exhaust Airflow	300 CFM
Exhaust Hardware	Explosion-proof-rated

Construction Materials / Shell System	
Shell Style	Structural steel tubing with interior panel cladding oven shell
Wall Thickness	6 in
Insulation	6 lb density mineral wool
Seam Sealing	Interior and exterior seams sealed with exterior-grade sealants
Sprinkler Compatibility	Designed for annual internal sprinkler testing
Installation Basis	Outdoor service under lean-to

Safety & Compliance	
VOC Basis	No VOC process basis
Recirculation Fan Motors	Explosion-proof-rated
Exhaust Fan	Explosion-proof-rated hardware
Steam Control Valves	Explosion-proof-rated
Interior Emergency Stops	Two pull-cord E-stops, one at each end of chamber
E-Stop Switch Type	Explosion-proof switch assemblies
Controls Location	Remote mounted away from explosion-risk area

Controls & Electrical	
Process Controller	Watlow F4T ramp/soak controller
Data Acquisition	Encrypted
Control Enclosure	NEMA 4 enclosure, remote mounted
Primary Power	460V / 3PH / 60Hz
Full Load Amperage	56.4 A FLA
Design Elevation	Less than 1,000 ft above sea level

Process Summary	
Product	Confidential defense-industry materials
Market / Application	Defense-industry batch curing application
Process Type	Low-temperature batch curing
Key Verification Concept	Repeatable control of temperature, airflow, steam heating delivery, and safe operating limits

PRECISION QUINCY

MAKE BADASS PRODUCTS

pqovens.com