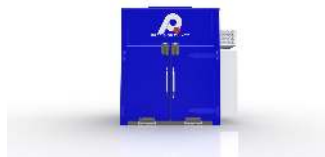
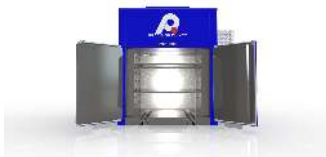




CASE STUDY

Electric Class B Cabinet Oven for Pre-Heating and Stress Relief of Aluminum and Steel Parts

Precision Quincy engineered this oven as a 40B-550 electric Class B cabinet oven for repeatable shelf-loaded batch processing of aluminum and steel parts. The project combined 250°F to 550°F operation, full horizontal airflow, 18 kW electric heat, gravity exhaust, and NEMA 1 controls in a compact cabinet format.



OVERVIEW

The project was developed as a 40B-550 electric cabinet oven for the customer. The process was pre-heating and stress relief for aluminum and steel parts. The oven was built around a 48 in W × 30 in D × 48 in H work chamber with a 250°F to 550°F operating range, 550°F maximum temperature, ±10°F uniformity, and a full horizontal airflow pattern.

The oven was configured as an electric Class B unit with 18 kW installed heat, a recirculation fan delivering 1500 CFM at 2 in. W.c., a 1.5 HP recirculation motor, gravity exhaust, and an SSI 804 temperature controller with a Geffran 650L excess-temperature controller in a NEMA 1 UL508A open industrial control panel. The package also included two swing doors, two 100 lb shelves, a 4-inch insulated floor, and a compact cabinet footprint.

This project was a compact batch oven package for controlled shelf-loaded processing of metal parts requiring repeatable heating, horizontal airflow, and a no-VOC Class B operating basis.



CUSTOMER PROCESS REQUIREMENTS

The project required a shelf-loaded batch oven sized for controlled thermal processing of aluminum and steel parts. The process was pre-heating and stress relief, requiring repeatable temperature control in a compact cabinet format.

Application requirement

- The project required a batch process oven for aluminum and steel parts.
- The oven had to support pre-heating and stress-relief processing.
- The oven had to support shelf-loaded product or fixtures in a cabinet chamber.

Work chamber / loading requirement

- Required work chamber: 48 in W × 30 in D × 48 in H.
- The loading package included two 100 lb shelves.
- Shelf adjustment: 3-inch centers.

- The loading arrangement had to support multiple part and fixture positions within the cabinet chamber.

Operator / access requirement

- The oven had to allow front loading and unloading through two swing doors.
- Trays, product positioning, and fixturing had to be arranged to minimize airflow restriction through the oven.
- The oven had to fit a standard industrial shipping and receiving environment based on 12 ft W × 16 ft H dock-door access.

Quality / control requirement

- The customer needed repeatable thermal processing within the stated work-zone uniformity.
- The process required controlled temperature measurement at the work area.
- The oven had to provide an independent excess-temperature safety limit.

Safety / environmental requirement

- The process was Class B.
- VOC loading was not permitted.
- The process used gravity exhaust rather than powered Class A exhaust architecture.

Site / utility requirement

- Required electrical service: 460V / 3PH / 60Hz.
- Design elevation: less than 1000 ft.

THERMAL / PHYSICAL PROCESS REQUIREMENTS

The project required a controlled moderate-temperature batch heating process based on horizontal forced convection, electric resistance heat, and Class B operation.

Temperature requirement

- Operating temperature: 250°F to 550°F.
- Maximum temperature: 550°F.
- Required work-zone uniformity: ±10°F.

Airflow / heat-transfer requirement

- Airflow direction: full horizontal airflow.
- The process required forced-convection heating across the work chamber.
- Chamber air velocity was 150 FPM, which provided the heat transfer rate required for the process.

Heat-input requirement

- Heat source: electric resistance heat.
- Installed heat: 18 kW total.

- Heating arrangement: eighteen 1000 W elements.
- The process required controlled heater operation through the temperature-control system.

Ventilation requirement

- Exhaust arrangement: gravity exhaust.
- The process was Class B with no VOCs allowed.
- The oven includes a 6-inch square exhaust opening and a fresh-air damper.

Control / measurement requirement

- Primary temperature control: SSI 804 temperature controller.
- Independent excess-temperature protection: Geffran 650L.
- The control system uses Type J thermocouples to monitor the work area and excess-temperature condition.

Cooldown requirement

- Fans are not to be shut down while oven temperature is above 250°F.
- The controller can be configured to shut down fans and reset once oven temperature falls below 250°F.



EQUIPMENT CONCEPT & ARCHITECTURE

To satisfy those requirements, Precision Quincy configured the project as a 40B-550 electric Class B cabinet oven with horizontal airflow, electric heat, insulated cabinet construction, and interlocked controls.

Pages 6–8 — Technical Specifications

Overall concept

- One electric Class B cabinet oven.
- Compact front-loading batch configuration.
- Shelf-loaded work chamber sized for flexible metal-parts loading.

Heating architecture

- Heat source: electric resistance heat.

- Total installed heat: 18 kW.
- Heating built from eighteen 1000 W elements.
- Heater power controlled through solid-state relays with associated switching and protection hardware.

Airflow architecture

- Airflow pattern: full horizontal airflow.
- Recirculation system based on a 9.94 in × 6 in fan wheel delivering 1500 CFM at 2 in. W.c..
- Recirculation motor: 1.5 HP.
- Louver openings provide airflow setup adjustment.

Exhaust / ventilation architecture

- Exhaust arrangement: gravity exhaust.
- Exhaust opening: 6-inch square opening.
- A fresh-air damper is integrated into the oven body.

Chamber / shell architecture

- Internal work chamber: 48 in W × 30 in D × 48 in H.
- 4-inch insulated wall construction.
- Insulation: 4 in of 6 lb mineral wool.
- Interior: unpainted aluminized steel.
- Exterior finish: PQ Blue.
- Control enclosure finish: ANSI 61 gray.
- Approximate oven weight: 1250 lb.
- The oven includes a 4-inch insulated floor.

Door / loading architecture

- Two swing doors.
- Shelf package includes two 100 lb shelves.
- Shelf adjustment is based on 3-inch centers.
- The installation includes four floor anchors.

Controls architecture

- SSI 804 for primary temperature control.
- Geffran 650L for excess-temperature protection.
- NEMA 1 UL508A open industrial control panel.
- Control package includes disconnect, fusing, motor starter / protector, solid-state relays, control transformer, airflow switch input, and enclosure cooling fan.

Safety architecture

- Applicable standards: NFPA 79, NFPA 86, UL508A.

- Safety logic includes:
- Recirculation airflow proving
- Excess-temperature shutdown
- Heat shutdown if required safe operating conditions are not met
- Controlled fan shutdown below 250°F when enabled

Shipping / installation architecture

- The oven was shipped assembled on 4x4 lumber or larger as required on a flatbed truck.

TECHNICAL SPECIFICATIONS

Oven Configuration

Model	40B-550
Type	Electric Class B cabinet oven
Quantity	1 oven
Airflow Pattern	Full horizontal airflow
Work Chamber	48 in W × 30 in D × 48 in H
Chamber Volume	40.0 cu ft
Doors	2 swing doors
Floor	4 in insulated floor

Electrical System

Power Supply	460V / 3PH / 60Hz
Full Load Amps	26.4 A
Control Enclosure	NEMA 1
Enclosure Listing Basis	UL508A Open Industrial Control Panel
Enclosure Size	42 in × 30 in × 12 in
SCCR	5,000 amps
Main Disconnect	Non-fused 60A disconnect switch

Heating System

Operating Temperature	250°F to 550°F
Maximum Temperature	550°F
Uniformity	±10°F
Heat Source	Electric
Installed Heat	18 kW

Element Basis	18 total elements, 1000 W each
Heater Control	Solid-state relay switching

Recirculation / Airflow System

Airflow Pattern	Full horizontal airflow
Recirculation Fan Performance	1500 CFM at 2 in. W.c.
Recirculation Fan Wheel	9.94 in × 6 in
Recirculation Fan Motor	1.5 HP
Recirculation Motor FLA	3.0
Chamber Air Velocity	~150 FPM

Exhaust / Ventilation System

Exhaust Arrangement	Gravity exhaust
Exhaust Opening	6 in square
Fresh-Air Damper	Included
Oven Classification	Class B
VOC Basis	No VOCs allowed
Design Elevation	<1000 ft

Construction

Wall Thickness	4 in
Insulation	4 in of 6 lb mineral wool
Interior Material	Unpainted aluminized steel
Exterior Finish	PQ Blue
Control Enclosure Finish	ANSI 61 gray
Approximate Weight	1250 lb
Floor Anchoring	4 floor anchors

Shelving / Loading

Shelf Quantity	2 shelves
Shelf Capacity	100 lb each
Shelf Slotting	3 in centers
Loading Access	Front loading
Door Arrangement	Two swing doors

Controls & Safety

Main Temperature Controller	SSI 804
Excess Temperature Controller	Geffran 650L
Temperature Sensors	Type J thermocouples
Airflow Proving	Recirculation airflow switch
Control Transformer	350 VA
Enclosure Cooling	Enclosure cooling fan
Fan Shutdown Protection	Do not shut down fans above 250°F
Applicable Standards	NFPA 79, NFPA 86, UL508A

Equipment Dimensions

Overall Width	83.17 in
Overall Depth	43.99 in
Overall Height	78.07 in
Oven Body Width	69.00 in
Oven Body Depth	38.00 in
Oven Body Height	73.10 in
Height to Top of Control Enclosure	52.00 in

Shipping / Receiving Basis

Shipping Dock Door Size	12 ft W × 16 ft H
Receiving Dock Door Size	12 ft W × 16 ft H
Shipment Basis	Oven was shipped assembled on a flatbed truck



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