



## CASE STUDY

# Electric Horizontal Airflow Cabinet Oven for Laboratory Pre-Heating and Test Preparation

*Precision Quincy engineered this oven as a 40B-550 electric Class B cabinet oven for repeatable batch pre-heating in a laboratory and testing-support environment. The delivered machine combined 550°F maximum capability, full horizontal airflow, multi-shelf batch loading, and a side-mounted NEMA 1 control package in a compact floor-standing cabinet format.*



## OVERVIEW

The project was developed for the customer, a family-owned laboratory products business whose offering covered laboratory testing equipment, supplies, chemicals, and material-testing product lines. The project centered on a controlled pre-heating application in a compact cabinet format suited to batch laboratory support work.

The oven was built around a 48 in W × 30 in D × 48 in H work chamber and processed within a 250°F to 350°F operating range with a 550°F maximum temperature rating and ±10°F uniformity. The final package used full horizontal airflow with a 1.5 HP recirculation fan delivering 1,500 CFM at 2 in. W.c. Through the chamber.

Heat was supplied by eighteen nominal 1 kW electric elements. With the final 208V / 3PH / 60Hz electrical service, the installed heating package delivered 14.7 kW. The ventilation package used a Class B, non-solvent heating basis with a fresh-air damper and gravity exhaust opening.

The controls package used an SSI-804 temperature controller, a Gefran 650L excess-temperature controller, and a side-mounted NEMA 1 UL508A open industrial control panel. The mechanical package also included two swing doors, five 100 lb capacity shelves, 4-inch insulated walls and floor, an aluminized steel interior, and a PQ Blue exterior.



## CUSTOMER PROCESS REQUIREMENTS

The project required a compact batch oven for controlled pre-heating in a laboratory and testing-support environment. The customer operated in laboratory products and testing equipment, so the project fit a workflow where repeatable batch heating, flexible shelf loading, and dependable temperature control supported preparation work ahead of downstream handling, staging, or evaluation.

### Application requirement

- The project required a batch pre-heating oven for laboratory support work.
- The oven had to support controlled heating of samples, fixtures, containers, tools, or related work items handled in a lab or test-preparation setting.

- The process emphasized repeatability and flexible batch loading across multiple batch arrangements.

**Work chamber / loading requirement**

- Required work chamber: 48 in W × 30 in D × 48 in H.
- The chamber had to support multi-level shelf loading for different batch arrangements.
- The final shelf package included five 100 lb capacity shelves.
- Product loading and fixturing had to preserve clear airflow paths through the chamber.

**Operator / access requirement**

- The oven had to allow front loading and unloading through two swing doors.
- Operators needed a layout that supported straightforward shelf access and practical batch changeover.
- The cabinet format had to fit a compact laboratory or support-area footprint.

**Quality / control requirement**

- The process required repeatable pre-heating performance across the operating range.
- Required work-zone uniformity was  $\pm 10^{\circ}\text{F}$ .
- The oven needed adjustable temperature control with an independent excess-temperature safety layer.

**Utility / site requirement**

- Required electrical service: 208V / 3PH / 60Hz.

**THERMAL / PHYSICAL PROCESS REQUIREMENTS**

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The project required a moderate-temperature forced-convection pre-heating process built around horizontal airflow, multi-shelf loading, and stable electric heat delivery.

**Temperature requirement**

- Operating temperature range: 250°F to 350°F.
- Maximum temperature capability: 550°F.
- Required work-zone uniformity:  $\pm 10^{\circ}\text{F}$ .

**Airflow / heat-transfer requirement**

- Airflow direction: full horizontal airflow.
- The chamber air velocity was approximately 150 FPM.
- The process relied on forced-convection heating across the shelf-loaded work zone.

**Heat-input requirement**

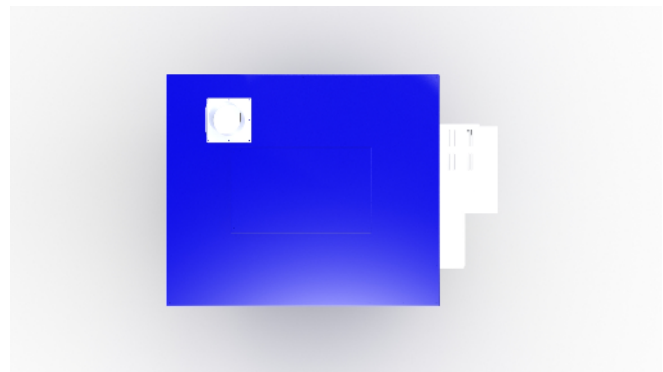
- Heat source: electric resistance heating.
- Final delivered heat on the installed electrical service: 14.7 kW.

**Atmosphere / ventilation requirement**

- The process used a Class B non-solvent heating basis.
- Fresh air entered through a fresh-air damper and exited through a gravity exhaust opening.
- The heating process centered on clean heated-air circulation for controlled pre-heating duty.

**Control / cooldown requirement**

- The process used setpoint-based temperature control with an independent excess-temperature limit.
- Fan operation remained active through cooldown and could be ended automatically when oven temperature fell below 150°F if that function was enabled.
- The recirculation fan remained in operation until oven temperature dropped 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, a single electric heat bank, multi-shelf loading, and side-mounted controls.

Pages 6–8 — Technical Specifications

**Overall concept**

- One electric Class B cabinet oven
- Floor-standing batch configuration
- Full horizontal airflow through a shelf-loaded work chamber

**Heating architecture**

- Heat source: electric resistance heat
- Heating package: 18 nominal 1 kW elements
- Final installed heat delivery: 14.7 kW at 208V
- Heater control architecture: solid-state relay with back-up contactor

**Airflow architecture**

- Airflow pattern: full horizontal

- Recirculation fan performance: 1,500 CFM at 2 in. W.c.
- Recirculation fan motor: 1.5 HP
- Fan wheel basis: 9.94 in × 6 in

**Ventilation architecture**

- Fresh-air damper integrated into the oven body
- 6 in square gravity exhaust opening
- Class B heated-air configuration sized for non-solvent pre-heating duty

**Chamber / shell architecture**

- Internal work chamber: 48 in W × 30 in D × 48 in H
- Wall system: 4 in thick insulated construction
- Floor system: 4 in insulated floor
- Insulation: 4 in of 6 lb mineral wool
- Interior material: unpainted aluminized steel
- Exterior finish: PQ Blue
- Control enclosure finish: ANSI 61 gray

**Door / loading architecture**

- Two swing doors
- Five 100 lb capacity shelves
- Shelf loading arranged for flexible multi-level batch placement

**Controls architecture**

- SSI-804 primary temperature controller
- Gefran 650L excess-temperature controller
- 42 in × 30 in × 12 in side-mounted NEMA 1 control enclosure
- 100A non-fused disconnect switch
- Control package included recirculation fan control, heater-bank control, airflow proving, and enclosure cooling

**Safety architecture**

- Applicable standards basis: NFPA 79, NFPA 86, UL508A
- The control enclosure was a UL508A open industrial control panel
- Safety logic included recirculation airflow proving, excess-temperature shutdown, and heat shutdown if required operating conditions were not met
- Cooldown protection kept the fan operating until safe shutdown temperature was reached

## TECHNICAL SPECIFICATIONS

### Oven Configuration

|                 |                                             |
|-----------------|---------------------------------------------|
| Model           | 40B-550                                     |
| Type            | Electric Class B cabinet oven               |
| Quantity        | 1 oven                                      |
| Application     | Batch pre-heating / laboratory support duty |
| Airflow Pattern | Full horizontal                             |
| Work Chamber    | 48 in W × 30 in D × 48 in H                 |
| Doors           | 2 swing doors                               |

### Electrical System

|                         |                                      |
|-------------------------|--------------------------------------|
| Power Supply            | 208V / 3PH / 60Hz                    |
| Full Load Amps          | 49.1 A                               |
| Main Disconnect         | 100A non-fused disconnect            |
| Control Enclosure       | NEMA 1                               |
| Enclosure Size          | 42 in × 30 in × 12 in                |
| SCCR                    | 5,000 amps                           |
| Enclosure Listing Basis | UL508A open industrial control panel |

### Heating System

|                                    |                                         |
|------------------------------------|-----------------------------------------|
| Operating Temperature Range        | 250°F to 350°F                          |
| Maximum Temperature                | 550°F                                   |
| Uniformity                         | ±10°F                                   |
| Heat Source                        | Electric resistance                     |
| Element Basis                      | 18 nominal elements, 1000 W each @ 230V |
| Delivered Heat @ Installed Voltage | 14.7 kW                                 |

|                |                                          |
|----------------|------------------------------------------|
| Heater Control | Solid-state relay with back-up contactor |
|----------------|------------------------------------------|

### Recirculation / Airflow System

|                               |                         |
|-------------------------------|-------------------------|
| Airflow Pattern               | Full horizontal airflow |
| Recirculation Fan Performance | 1,500 CFM at 2 in. W.c. |
| Recirculation Fan Motor       | 1.5 HP                  |
| Fan Wheel                     | 9.94 in × 6 in          |
| Chamber Air Velocity          | Approximately 150 FPM   |

### Ventilation System

|                        |                                       |
|------------------------|---------------------------------------|
| Heating Classification | Class B                               |
| Ventilation Basis      | Fresh-air damper with gravity exhaust |
| Exhaust Opening        | 6 in square                           |
| VOC Basis              | Non-solvent pre-heating duty          |

### Construction

|                          |                            |
|--------------------------|----------------------------|
| Wall Thickness           | 4 in                       |
| Floor Thickness          | 4 in insulated floor       |
| 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       | 1,250 lb                   |
| Design Elevation         | <1000 ft                   |

### Shelving / Loading

|                |             |
|----------------|-------------|
| Shelf Quantity | 5           |
| Shelf Capacity | 100 lb each |

|                      |                                         |
|----------------------|-----------------------------------------|
| <b>Loading Style</b> | Front-loaded, multi-shelf batch loading |
|----------------------|-----------------------------------------|

### Controls & Safety

|                                      |                                  |
|--------------------------------------|----------------------------------|
| <b>Main Temperature Controller</b>   | SSI-804                          |
| <b>Excess Temperature Controller</b> | Gefran 650L                      |
| <b>Thermocouples</b>                 | Type J                           |
| <b>Airflow Proving</b>               | Recirculation airflow switch     |
| <b>Fan Shutdown Function</b>         | Automatic below 150°F if enabled |
| <b>Cooldown Protection</b>           | Fan remained on above 250°F      |
| <b>Applicable Standards Basis</b>    | NFPA 79, NFPA 86, UL508A         |

### Equipment Dimensions

|                                           |          |
|-------------------------------------------|----------|
| <b>Overall Width</b>                      | 83.17 in |
| <b>Overall Depth</b>                      | 42.21 in |
| <b>Overall Height</b>                     | 78.10 in |
| <b>Oven Body Width</b>                    | 69.00 in |
| <b>Oven Body Depth</b>                    | 38.00 in |
| <b>Oven Body Height</b>                   | 73.10 in |
| <b>Height to Top of Control Enclosure</b> | 52.00 in |
| <b>Door Swing Clearance</b>               | 35.00 in |
| <b>Control Enclosure Door Clearance</b>   | 36.00 in |





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