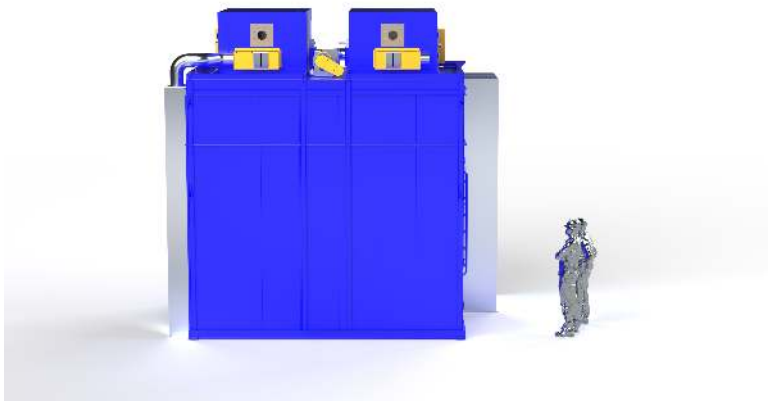
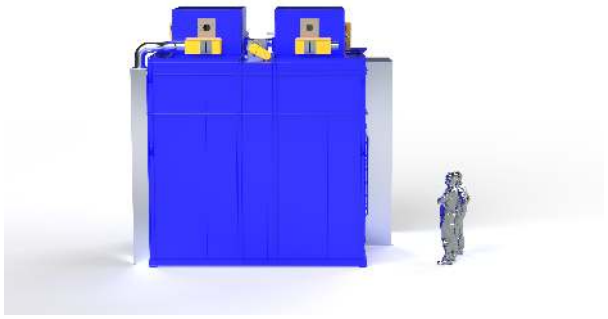


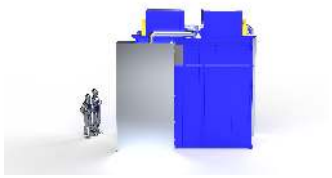
PRECISION QUINCY

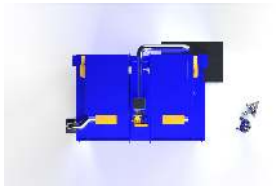
CASE STUDY

Natural Gas Heated Conveyor Drying Oven for Continuous Drying of Flow-Line Kick Plates

Precision Quincy engineered this oven as a natural-gas-heated conveyor drying oven for continuous drying of hanging kick plates in a flow-line manufacturing environment. The system was developed as a high-capacity NFPA 86 Class A oven with a tall vertical work chamber, full vertical airflow, inlet and outlet vestibules, and a dual-burner architecture designed to support stable drying performance on a continuously moving overhead conveyor.







OVERVIEW

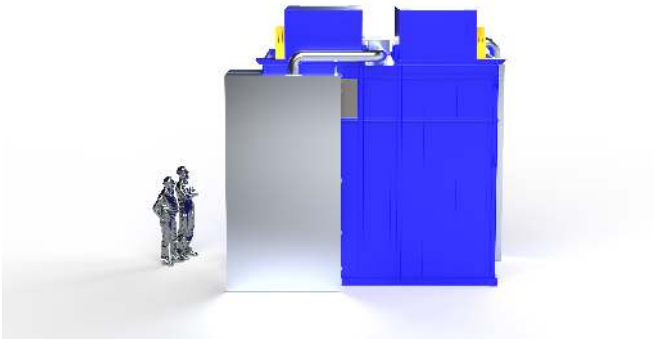
Precision Quincy engineered this oven as a natural-gas-heated conveyor drying oven for continuous drying of kick plates moving through the system on a customer-supplied overhead conveyor. The oven was designed for a high-throughput flow-line application requiring repeatable drying performance, strong airflow management, and robust Class A safety architecture.

The equipment was built around a tall work chamber sized at approximately 169 in W × 91.5 in D × 145 in H, with an interior volume of approximately 1,298 cubic feet. The overall oven assembly is approximately 225 in W × 158.21 in D × 214.5 in H and includes inlet and outlet vestibules, defined conveyor openings, and an internal arrangement configured for full vertical airflow to support consistent heat transfer across continuously moving hanging product.

The thermal process basis is drying at an operating range of approximately 230°F to 300°F, with a maximum temperature of 300°F and required work-area uniformity of ±10°F. Unlike the curing oven architecture used on related the customer projects, this design basis documents no VOCs allowed for the drying application.

To deliver that performance, Precision Quincy used two Selas PC1-B burners rated at 750,000 BTU/hr each, two NYB Dual AK12 recirculation air kits rated at a combined 20,250 CFM at 2 in. W.c., and a PQ15 exhauster rated at 1,200 CFM at 1 in. W.c.. The system uses a WATLOW F4T temperature controller, dedicated high-limit protection for both combustion chambers and both work-area zones, and a UL 508A open industrial control panel inside a 46 in × 46 in × 12 in NEMA 1 enclosure.

Because the oven had to combine a tall hanging-part process envelope, a conveyorized drying application, and Class A safety requirements, the final architecture uses a top-mounted dual heat-chamber arrangement, large recirculation capacity, controlled fresh-air handling through the vestibules, dedicated burner gas trains, and a split shipping configuration using lower body, upper body, and heat-chamber sections with lifting provisions.



CUSTOMER PROCESS REQUIREMENTS

This oven was developed for a continuous finishing line requiring the drying of hanging kick plates conveyed through the oven on an overhead transport system.

Application requirement

- The equipment had to support a continuous flow-line drying process rather than batch processing.
- The product basis identified in the proposal is kick plates.
- The process basis is drying.
- The conveyor system is customer supplied, with the oven designed to interface with the conveyor openings and mounting locations.

Throughput / conveyance requirement

- The process basis is 720 lb/hr at 6 ft/min, assuming 2 parts per hook.
- The oven had to support continuous passage of suspended product through a tall vertical work envelope.
- Conveyor inlet and outlet interface points are built into the oven design.
- The GA includes defined 6 in × 6 in conveyor mounting point openings for customer conveyor integration.

Work chamber / load requirement

- Internal work area: 169 in W × 91.5 in D × 145 in H.
- Interior volume: approximately 1,298 cubic feet.
- The oven had to provide enough internal height and width to process hanging parts while preserving adequate airflow passage through the chamber.
- Product positioning and fixturing had to avoid restricting airflow through the oven.

Process requirement

- The system had to provide controlled drying performance for continuously moving product.
- Maximum VOC basis: no VOCs allowed.
- Operating temperature range: 230°F to 300°F.
- Maximum temperature: 300°F.
- Required work-area uniformity: ±10°F.

Safety requirement

- The oven was required to be designed as an NFPA 86 Class A unit.
- The design required exhaust, purge, combustion, flame safeguard, gas-pressure-proving, proof-of-closure, airflow-proving, and high-limit architecture suitable for a conveyorized gas-fired drying oven.
- The GA includes an explosion relief panel, with surrounding clearance required.

Utility / site requirement

- Required electrical service: 460V / 3PH / 60Hz.
- Full load amps: 44.4 A.
- Required fuel: natural gas.
- Gas inlet pressure basis: 1 PSI.
- Gas flow basis: 1,500 CFH.

- Design elevation: less than 1,000 ft above sea level.
- Installation access basis: 12 ft W × 16 ft H dock / door size.

Installation / shipment requirement

- Approximate shipping weight: 20,000 lb.
- The oven was designed to ship in multiple major sections.
- The GA shows separate lower body, upper body, and heat chamber lifting points.
- Customer installation scope includes unloading, move-in, utility connections, exhaust stack installation, and reassembly of any items removed for shipping.

THERMAL / PHYSICAL PROCESS REQUIREMENTS

These thermal process requirements were established from the customer's need to dry powder-coated hanging kick plates in a continuous conveyorized production environment.

Temperature capability

- Operating range: 230°F to 300°F.
- Maximum operating temperature: 300°F.
- Required work-area temperature uniformity: ±10°F.

Process basis

- The thermal process basis is continuous drying.
- Product basis: kick plates.
- Throughput basis: 720 lb/hr at 6 ft/min, assuming 2 parts per hook.
- VOC basis: no VOCs allowed.

Heat input requirement

- Heat source: natural gas.
- Burner arrangement: two Selas PC1-B burners.
- Burner output: 750,000 BTU/hr each.
- Total heat input: 1,500,000 BTU/hr.
- Burner-side regulated pressure basis: 7.0 in. W.c.
- Recommended gas-pressure switch settings: 4 in. W.c. Low and 9 in. W.c. High.
- Gas train design includes double safety shutoff with proof of closure, regulator, low- and high-gas-pressure switches, visual indication, test nipples, and Siemens SQM4 actuator-based modulation.

Airflow delivery requirements

- Required airflow style: full vertical airflow.
- Recirculation fan arrangement: two NYB Dual AK12 air kits.
- Total recirculation airflow basis: 20,250 CFM at 2 in. W.c.

- Recirculation fan motor basis: 10 HP each.
- Recirculation fans are controlled by Allen-Bradley PowerFlex 4M VFDs.

Exhaust / ventilation basis

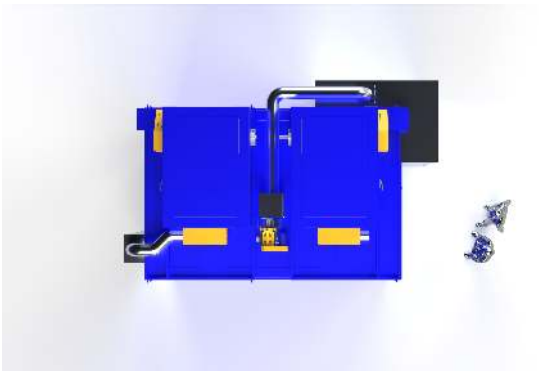
- Exhaust airflow basis: 1,200 CFM at 1 in. W.c.
- Exhaust fan basis: PQ15 exhauster with 1 HP motor.
- The outlet vestibule is exhausted at 100 CFM.
- The remaining 1,100 CFM is pulled from the heat zone.
- Fresh air is pulled from the inlet vestibule to help reduce heat loss at the process openings.
- Burner and fresh-air inlets include MERV 1 or greater filtration.
- The exhaust system supports Class A purge and ventilation requirements for the process.

Thermal instrumentation / control basis

- Primary temperature controller: WATLOW F4T.
- Thermocouple type: Type J.
- Separate high-limit protection is provided for:
- Combustion chamber #1
- Work area #1
- Combustion chamber #2
- Work area #2
- The F4T configuration includes:
- Two work-area temperature inputs
- Two 4–20 mA heat outputs
- Fan shutdown output
- Disable-burners output
- Combustion blower alarm / post-run output when a burner is off and oven temperature is above 150°F

Safety / classification basis

- Oven classification basis: NFPA 86 Class A.
- Dual-burner safety architecture includes Dungs flame safeguard controls, airflow switches, gas pressure switches, proof-of-closure logic, purge sequencing, and high-limit protection.
- The sequence of operation starts the exhaust fan first, then the recirculation fans, then enables burner purge and lightoff.
- If any safe operating condition is not met, the burners are disabled.
- The wiring package instructs that fans are not to be shut down when the oven is above 250°F.



EQUIPMENT CONCEPT & ARCHITECTURE

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

Overall concept

- One natural-gas-heated conveyor drying oven.
- Designed for continuous flow-line drying of hanging kick plates.
- The oven interfaces with a customer-supplied overhead conveyor.
- Conveyor inlet and outlet openings, vestibules, and mounting-point provisions are built into the oven design.
- The architecture combines a tall work chamber, vertical airflow, Class A safety hardware, and a shipping-friendly sectional structure for field installation.

Heating architecture

- Heat source: natural gas.
- Burner arrangement: two Selas PC1-B burners.
- Individual burner output: 750,000 BTU/hr.
- Total heat input: 1,500,000 BTU/hr.
- Gas train components include double safety shutoff valves with proof of closure, regulator, high- and low-pressure switches, test nipples, visual valve position indication, and actuator-based modulation.
- Burner gas control valve actuators: Siemens SQM4.
- Burner flame safety controls: Dungs MPA4112 series.
- Separate combustion blowers are provided for each burner.

Airflow / recirculation architecture

- Airflow pattern: full vertical airflow.
- Recirculation fan concept:
- Two NYB Dual AK12 air kits
- 10,125 CFM at 2 in. W.c. Each

- 10 HP motor each
- Allen-Bradley PowerFlex 4M VFDs
- Exhaust fan concept:
- PQ15 exhauster
- 1,200 CFM at 1 in. W.c.
- 1 HP motor
- The exhaust system supports Class A ventilation and purge requirements.
- Vestibule-based fresh-air handling is used to help reduce heat loss at the conveyor openings.
- The internal airflow pattern is shown on the GA as full vertical airflow through the work chamber.

Chamber / construction architecture

- Internal work chamber: 169 in W × 91.5 in D × 145 in H.
- Interior volume: approximately 1,298 cubic feet.
- Construction style: tongue-and-groove interlocking insulated panel oven with structural steel reinforcement.
- Wall thickness: 6 inches.
- Insulation: 6-inch, 6 lb density mineral wool.
- Floor: 3-inch insulated floor.
- Interior material: unpainted aluminized steel.
- Exterior finish: RAL 9003 Signal White.
- Heat chamber location: top-mounted dual heat chamber arrangement.
- The GA shows a sectional design with upper body, lower body, and heat chamber lifting provisions for shipment and installation.

Door / access architecture

- Main access doors: two 42 in × 110 in access doors on the oven body.
- Heat chamber access doors: two 20 in × 24 in access doors.
- Conveyor openings: approximately 14 in W × 122 in H.
- Vestibule opening size: approximately 14 in W × 125.37 in H.
- Vestibule width: 22.5 in.
- Internal vestibule geometry extends down into the oven to help isolate the process openings from the main heated work area.

Controls architecture

- Primary temperature controller: WATLOW F4T.
- Thermocouple type: Type J.
- Independent excess-temperature controllers are provided for:
- Combustion chamber #1
- Work area #1

- Combustion chamber #2
- Work area #2
- Main control enclosure: 46 in × 46 in × 12 in NEMA 1 enclosure.
- Panel type: UL 508A open industrial control panel.
- Reserved remote-I/O space: 12 in × 12 in minimum.
- Spare panel space with DIN rail: 8 in × 10 in.
- Burner junction boxes: two 16 in × 16 in × 6 in NEMA 1 enclosures.
- The front panel includes operator controls and indication for exhaust fan, recirculation fans, burner #1, burner #2, purging, flame safety faults, and flame safety resets.

Safety / compliance architecture

- Oven classification: NFPA 86 Class A.
- Applicable standards shown on the electrical documents: NFPA 79, NFPA 86, UL 508A.
- Burner safety hardware includes flame safeguards, gas pressure switches, proof-of-closure devices, ignition transformers, and combustion-airflow proving.
- The GA includes an explosion relief panel with a required clear area.
- The wiring package lists an SCCR of 5,000 A.

Shipping / installation architecture

- Approximate shipping weight: 20,000 lb.
- Shipping access basis: 12 ft × 16 ft dock / door size.
- The oven was designed to ship partially assembled.
- Customer installation planning must account for vestibules, exhaust ducting, conveyor mounting, and point-of-use clearance.

TECHNICAL SPECIFICATIONS

Oven Configuration	
Type	Natural-gas-heated conveyor drying oven
Quantity	1 oven
Application	Continuous drying of hanging kick plates
Internal Work Chamber	169 in W × 91.5 in D × 145 in H
Interior Volume	Approx. 1,298 cu ft
Conveyor Integration	Customer-supplied overhead conveyor
Throughput Basis	720 lb/hr at 6 ft/min, assuming 2 parts per hook

Thermal Heat Power System	
Operating Temperature Range	230°F to 300°F
Maximum Operating Temperature	300°F
Temperature Uniformity	±10°F
Heat Source	Natural gas
Burner Quantity	2
Burner Type	Selas PC1-B
Burner Rating	750,000 BTU/hr each
Total Heat Input	1,500,000 BTU/hr
Utility Gas Inlet Pressure	1 PSI
Gas Flow Basis	1,500 CFH
Gas Train Design Max / Min	5 PSI max / 2 PSI min
Regulated Pressure at Gauge	7.0 in. W.c.
Design Elevation	<1,000 ft
Maximum VOC Load	No VOCs allowed

Recirculation / Airflow System	
Airflow Pattern	Full vertical airflow
Recirculation Fan Quantity	2
Recirculation Fan Type	NYB Dual AK12 air kits
Recirculation Airflow	10,125 CFM each / 20,250 CFM total
Recirculation Static Pressure	2 in. W.c.
Recirculation Fan Motor	10 HP each
VFDs	Allen-Bradley PowerFlex 4M

Exhaust System	
Exhaust Fan	PQ15 exhauster
Exhaust Airflow	1,200 CFM
Exhaust Static Pressure	1 in. W.c.
Exhaust Fan Motor	1 HP
Outlet Vestibule Exhaust	100 CFM
Heat-Zone Exhaust	1,100 CFM
Fresh Air Source	Pulled from inlet vestibule

Construction Materials / Shell System	
Shell Style	Tongue-and-groove insulated panel construction with structural steel reinforcement
Wall Thickness	6 in
Insulation	6-inch, 6 lb density mineral wool
Interior Material	Unpainted aluminized steel
Exterior Finish	RAL 9003 Signal White
Floor	3 in insulated floor
Main Access Doors	Two 42 in × 110 in access doors

Heat Chamber Access Doors	Two 20 in × 24 in access doors
Conveyor Openings	Approx. 14 in W × 122 in H
Vestibules	Included at inlet and outlet

Safety & Compliance

Classification	NFPA 86 Class A
Flame Safeguards	Dungs MPA4112 series
Applicable Standards	NFPA 79, NFPA 86, UL 508A
Explosion Relief	Included / shown on GA
Gas Safety Valves	Double blocking with proof of closure
Gas Pressure Switches	Low and high pressure switches provided
SCCR	5,000 A

Controls & Electrical

Temperature Controller	WATLOW F4T
Thermocouples	Type J
High-Limit Controllers	Partlow MIC 1161, two combustion chamber and two work-area high limits
Control Cabinet	NEMA 1 enclosure, 46 in × 46 in × 12 in
Panel Type	UL 508A open industrial control panel
Primary Power	460V / 3PH / 60Hz
Full Load Amperage	44.4 A
Reserved Remote I/O Space	12 in × 12 in
Spare Panel Space	8 in × 10 in with DIN rail
Burner Junction Boxes	Two NEMA 1, 16 in × 16 in × 6 in

Process Summary

Product Basis	Hanging kick plates on overhead conveyor

Process Type	Continuous conveyor drying
Throughput Basis	720 lb/hr at 6 ft/min, assuming 2 parts per hook
Airflow Style	Full vertical airflow
Key Verification Concept	Repeatable control of temperature, airflow, combustion, dwell exposure, and safe operating limits

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