

NORTHWIND™ 500UR BLAST CHILLERS **THE COMPACT BLAST CHILLER FOR ADVANCED FOOD PREPARATION**

Bally's Northwind 500UR gives you the power of world-class Northwind blast-chilling technology in a compact unit that fits any size kitchen. It accommodates any upright kitchen racks, so you can roll in any rack you use in your ovens or walk-in refrigerators. Outside dimensions are 6' 9-1/2" x 3' 11" x 8' 2". Interior clearance envelope (cart area) is 36" x 78" high. Operating orientation program by a registered dietitian is an optional extra.

VITAL STATISTICS

Modular Panel Construction – 4" – thick walls and ceilings of poured, foamed-in-place HCFC urethane insulation which meets international standards for CFC reduction.

Finish - Stainless Steel interior and exterior standard for durability and easy cleaning.

Product Volume - one processing cart supporting 20 12" x 20" x 2- 1/2" steam table pans. Product passes through the "danger zone" (140°F to 45°F) in approximately 75 to 120 minutes, depending on composition and containerization of food. Approximate product load capacity is 250-lbs.of food.

Processing Cart - One extruded aluminum food rack, 69" x 25 3/4" x 26 3/4", with 5" hard rubber wheels is included with the chiller.

Automatic Processing Cycle - Food probe control monitors food temperature pull-down and controls air temperature, automatically activating deep chill and storage cycles.

Refrigeration Systems – Bally's exclusive laminar airflow system which uses a 3 hp. R22 air-or water-cooled preassembled remote system offers a net capacity of 22,600 Btu/hr in quick-chill cycle; 7,730 Btu/hr in deep-chill cycle. Food is safely chilled without freezing, thanks to dual-cycle operating temperatures and a draw-through air-flow design. Refrigeration system operates at 5°F deep-chill temperature during chill-down of hot foods and converts to a 37°F storage mode when the product is safely cooled.

Electronic Controller - This controller provides continuous monitoring as required under HACCP. Options include remote or local control from a PC and diagnostic capabilities.

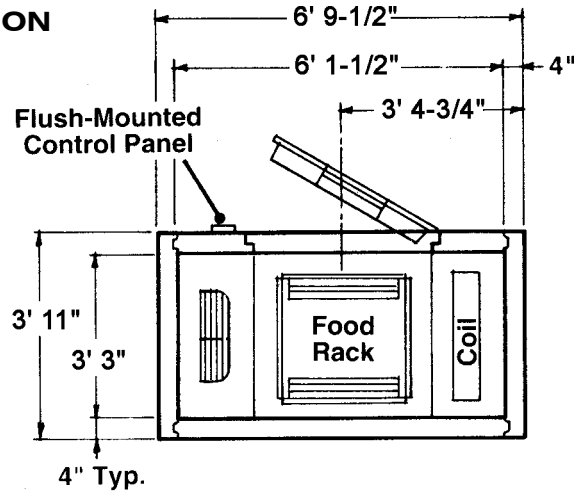
Optional Multi-probe Package – This option includes removable probes with quick-disconnect cables for ease of cleaning. Probes are monitored by exterior-mounted digital temperature readouts, and audible and visual alarms for each of the probe positions.

Optional Security package for Correctional Facilities – Includes keylock control switches, fixed probes with stainless steel armorflex sheathing, and tamperproof hardware screws.

NORTHWIND™ 500UR BLAST CHILLERS - CONTINUED

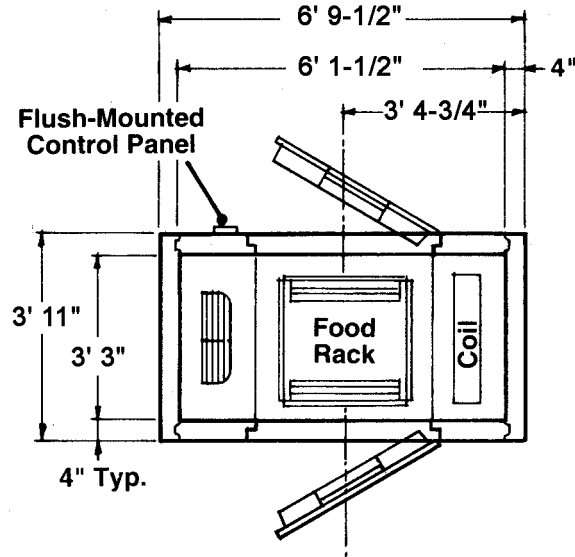
STANDARD CONFIGURATION

Plan view

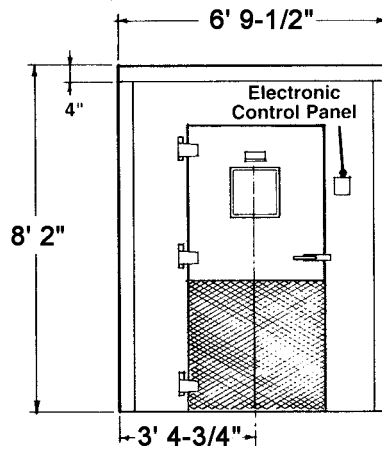


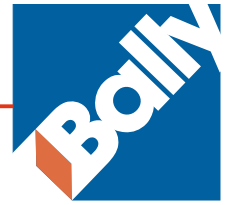
PASS-THRU TYPE

Plan view



Elevation - both types





NORTHWIND™ 500UR BLAST CHILLERS - CONTINUED

SPECIFICATIONS

1. **Scope** – these specifications cover Northwind 500UR blast chiller and storage rooms, mechanical refrigeration systems, and related equipment and accessories.
2. **Manufacturer's Installation Instructions** – Contractor shall furnish to owner instructions detailing assembly of the blast chiller, installation of refrigeration equipment, wiring diagrams, operating and maintenance instructions, and other data pertaining to the proper upkeep and operation of the chiller. Installation, start-up, and testing shall be carried out with approval of the architect, in accordance with equipment manufacturers published instructions.
3. **Regulations and Codes** – All work and materials shall be in full accordance with local and/or state ordinances, and with any other prevailing rules and regulations regarding potentially hazardous equipment or locations. Bally Refrigerated Boxes, Inc. is not responsible for furnishing items required by the regulations but not specified or shown on the drawings or contained in the specifications.
4. **10-year Warranty** – The manufacturer shall warrant that any part of the structure manufactured by Bally except the refrigeration system and its related accessories is free from defects in materials and workmanship under normal use and service. The manufacturer shall be obligated to repair or replace any part

of this equipment covered by the warranty, which proves to be defective within the period of 10 years from the date of original installation. The warranty shall not apply to equipment which has been subjected to any accident alteration, abuse, misuse or improper installation, and shall not include any labor charges for the placement and repair of defective parts or refrigeration. Refrigeration equipment is warranted for five years, electronic controls for one year.

5. **General** – Sectional blast chillers complete with hinged entrance doors shall be manufactured by Bally Refrigerated Boxes, Inc. Panels used to assemble these structures shall be listed by Factory Mutual and Underwriters Laboratories and shall carry labels indicating all such listings or approvals. Enclosure shall measure 6'9-1/2" w x 3'11" d x 8 '2" high. Inside floor of chiller shall be building floor, not manufacturer's panelized construction. Production capacity of the chiller shall be 250 pounds of product through the temperatures between 140°F and 45°F in 75 to 125 minutes. (Speed of chilling depends on several variable, including food product's density, moisture content, specific heat and containerization.) Net capacity at 90°F ambient temperature shall be 22,600 Btu/hr in the quick chill cycle and 7,730 Btu/hr in the deep-chill cycle.

6. Modular Panels

- A. Individual panels shall be certified by Underwriters Laboratories as having flame spread of 25 or lower and smoke generation of 450 or lower when tested in accordance with ASTM E-84-76. They shall also be approved by Factory Mutual as a Class I building type.
- B. Panels shall consist of interior and exterior metal skins precisely formed with steel dies and roll-form equipment and thoroughly checked with gauges for accuracy. The metal skins shall be placed into steel molds and liquid urethane injected between them. HCFC urethane cores meeting international standards for CFC reduction shall be foamed-in-place (poured, not frothed) and shall be completely heat cured to bind tenaciously to the metal skins, forming a rigid 4" thick insulated panel. Panels shall be insulated with 100 percent urethane and have no internal metal structural members between the skins. To ensure tight joints, panel edges must have foamed-in-place tongues and grooves with a flexible vinyl gasket also foamed in-place on the interior and exterior of all tongue edges. Gaskets shall be resistant to damage from oil, fats, water, detergents and sunlight, and must be NSF-approved.

NORTHWIND™ 500UR BLAST CHILLERS - CONTINUED

C. Panels shall be equipped with Bally Speed-Lok joining devices. Each locking device shall consist of a cam-action locking arm of a replaceable type placed in one panel, and a steel rod precisely positioned in the adjoining panel, so that when the locking arm is rotated, the hook engages over the rod and draws the panels tightly together. Press-fit caps shall be provided to close wrench holes. The required locking wrench shall be supplied with the chiller enclosure.

D. Plenum – A sheet metal plenum with necessary fasteners shall be furnished by the manufacturer. The ceiling plenum shall include an incandescent light fixture.

7. Finish – Stainless steel exterior and interior

8. Doors – The hinged walk-in door shall be infitting, flush mounted type measuring 36" X 78", meeting the requirements of the 1922 Americans with Disabilities Act. It shall be a right-hand or left-hand swinging Bally Super Door with observation window, three hinges, and deck-plate protection on lower part of door. Doorframe shall include interior steel support and door shall also include an inside safety release handle to prevent any person from being locked inside. Construction of both panel and door is generally as stated above.

9. Mechanical Refrigeration (General) – The refrigeration system shall be supplied by Bally Refrigerated Boxes, Inc. (the standard product of a single

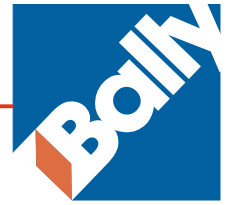
manufacturer) and shall be catalogued as a system complete with system capacities. All components, including controls and accessories, shall be furnished by the system manufacturer. The components shall include a fully piped, air-cooled or water-cooled condensing unit (as described below) and evaporator (as described below). Refrigeration system capacity and horsepower rating shall be as described in the refrigeration schedule on the plan.

A. Condensing Unit – The condensing unit shall include a 3 hp motor compressor, condenser, receiver, and electrical panel components assembled, piped and wired by the manufacturer. Motor-compressor shall be of the accessible hermetic type, with inherent overload protection (three-leg on three-phase) for Bally systems. Coil shall be similar in construction to that described in section (B). Fan motors shall have inherent overload protectors. Fan blades must be guarded to prevent injury. Accessories include a moisture-liquid indicator and suction and discharge vibration eliminators. Electrical controls, installed by the system manufacturer, shall include a high-low pressure control switch and a magnetic contactor. A fan cycle control and crankcase heater shall be installed on the condensing unit to maintain desired condensing pressure and protect the compressor from liquid migration when ambient temperatures are

below 55°F. A weatherproof hood shall be factory fabricated and installed (air cooled only).

B. Evaporator – The coil shall have copper tubes expanded into aluminum fins. The housing shall be of aluminum. Electric defrost shall be used. Coil shall be electrically heated. Selection and wiring of all defrost controls shall be the sole responsibility of the system manufacturer. Coil shall include thermostatic expansion valve, filter-drier, and liquid-line solenoid valve.

C. Control Panel – Manufacturer shall provide a factory-installed and wired controller to permit selection of functions by the operator. The automatic chill mode shall rely on a sensor probe suitable for insertion into the product to automatically select the proper chill cycle (quick chill, 37°; deep chill, 5°F). Chill temperatures shall be automatically controlled by electronic controllers. Upon completion of the deep-chill cycle, the controller shall automatically revert to the holding mode (37°F). A manual chill mode shall be provided as an alternate means of chilling product when probe insertion is not practical.



NORTHWIND™ 500UR BLAST CHILLERS - CONTINUED

The manual chill mode shall rely on an electronic built-in timer with a user-selectable setting range. The timer shall enable the user to select the duration of the deep-chill cycle (5°F). Upon completion of the manually set deep-chill cycle, the timer shall automatically cause the chiller to return to the quick-chill/hold mode.

10. Installation.

A. Interconnecting accessories shall be installed in accordance with the manufacturers' recommendations and shall be located for ease of servicing. Piping shall be placed in accordance with good engineering practice. Particular attention shall be given to oil return, gas velocities, refrigerant pressure drops and neatness.

B. Copper tubing for use in refrigerant piping shall conform to applicable ASTM standard specifications (serial designation B.88). All tubing shall be type "L" hard-drawn copper.

C. Each system shall be triple evacuated prior to charging. 1,500 and 500 microns of vacuum shall be drawn successively, and broken with dry refrigerant. After the third evacuation, the system shall be charged.

D. Suction line insulation shall be sized and installed according to the insulation manufacturer's recommendations to prevent suction line condensation.

E. Penetrations shall be sealed with non-hardening caulking compound. Exposed ends of the penetration must be trimmed.

F. Placement of all exposed pipes shall be approved by the architect before installation.

11. Preassembled Remote Refrigeration Equipment -

Refrigeration equipment shall be a Bally system designed for remote installation, for use with R-22 refrigerant. Manufacturer shall provide equipment including all necessary components factory installed on both evaporator and condensing unit assemblies. All components shall be prewired, so that job site work is limited to making electrical and tubing connections between the assemblies and supplying electrical power. All necessary electrical wire, conduit and fittings, and all refrigeration tubing, fittings and insulation shall be furnished by the refrigeration and electrical contractors. Equipment shall be fully automatic in operation, and shall conform to the following minimal requirements:

A. Condensing Unit – The condensing unit shall be provided complete with motor/compressor, air-cooled (or water-cooled) condenser, receiver and all other necessary components mounted on a common base. The compressor shall be of the accessible hermetic type. The unit shall be designed for chill operation at the specified temperature, in a 90°F (32.2°C) ambient temperature.

B. Evaporator – The evaporator shall be of the forced convection type, designed specifically for blast chiller operation, instead of the unit cooler type. Air circulating motors, multi-fin and tube-type coil, and fan guards

shall be assembled within protective housing. The liquid-line solenoid valve, thermostatic expansion valve, and inlet and outlet connections shall also be contained in this housing. The entire evaporator assembly shall be readily accessible for cleaning. A drip pan and drain connection shall be provided. Removable air inlet filters shall be provided. A manual system for defrosting the evaporator, including heaters and safety thermostats, shall be supplied.

12. Materials Supplied by Others -

Because requirements vary with individual site locations and local regulations, review and approval of all plans must be the responsibility of an engineer familiar with the installation.

13. Specify by Name – To ensure that specifications prepared from this guide will be complied with fully, include the following paragraph:

The blast chiller shall be as manufactured by Bally Refrigerated Boxes, Inc. To protect the client's interests, no substitutions will be accepted unless by specific approval.

In line with our program of constantly striving for improvement in design, we reserve the right to change specifications without notice.

NORTHWIND™ 1000UR-2 BLAST CHILLERS

THE IDEAL BLAST CHILLER FOR HIGH-VOLUME ADVANCED FOOD PREPARATION

Bally's Northwind 1000UR-2 gives you the power of world-class Northwind blast-chilling technology in a big, high-volume package. It accommodates any upright kitchen racks, so you can roll in any rack you use in your ovens or walk-in refrigerators. Outside dimensions are 6' 9-1/2" x 7' 9" x 8' 2". Interior clearance envelope (cart area) is 36" x 78" high. Operating orientation program by a registered dietitian is an optional extra.

VITAL STATISTICS

Modular Panel Construction – 4" -thick walls and ceilings of poured, foamed-in-place urethane insulation meet international CFC reduction standards.

Finish – Stainless steel interior and exterior standard for durability and easy cleaning.

Product Volume – Two processing carts supporting 40 12" x 20" x 2-1/2" steam table pans. Product passes through the "danger zone" (140°F to 45°F) in approximately 75 to 125 minutes, depending on composition and containerization of food. Approximate product load capacity is 500 lbs. of food.

Processing Cart – Two extruded aluminum food racks, 69" x 25 3/4" x 26 3/4", with 5" hard rubber wheels are included with the chiller.

Automatic Processing Cycle – Food probe control monitors food temperature pull-down and controls air temperature, automatically activating deep chill and storage cycles.

Refrigeration Systems – Bally's exclusive system uses a specially designed evaporator coil providing high velocity laminar airflow and a remote condensing unit (air or water-cooled) with 3 hp two compressors yielding net capacities of 49,400 (air) BTUH in quick-chill; or 18,540 (air) BTUH in deep-chill. Food is safely chilled without freezing thanks to dual-cycle operating temperatures and draw-through airflow design. Refrigeration system operates at 5°F deep-chill temperature during chill-down of hot foods and converts

to a 37°F storage mode when product is safely cooled.

Electronic Controller – This controller provides continuous monitoring as required under HACCP. Options include remote or local control from a PC and diagnostic capabilities.

Optional Multi-probe Package – This option includes removable probes with quick-disconnect cables for ease of cleaning. Probes are monitored by exterior-mounted digital temperature readouts and audible and visual alarms for each of the two probe positions.

Optional security package for correctional facilities – includes clear, lockable cover for controls, fixed probes with stainless steel armor flex sheathing, and tamperproof hardware screws.

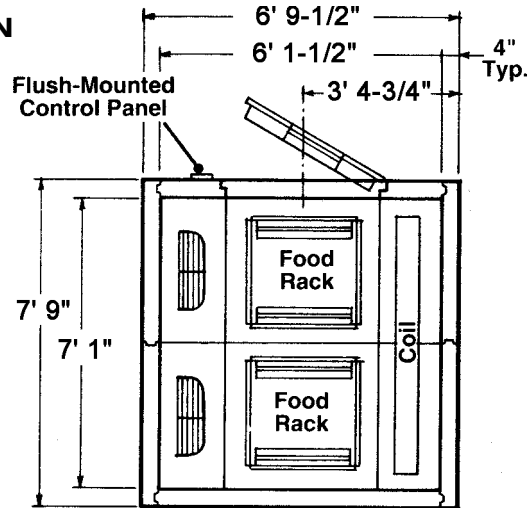
5 BLAST CHILLERS



NORTHWIND™ 1000UR-2 BLAST CHILLERS - CONTINUED

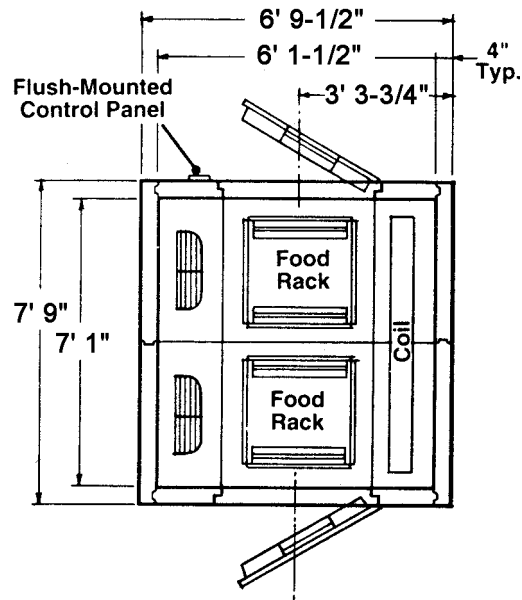
STANDARD CONFIGURATION

Plan view

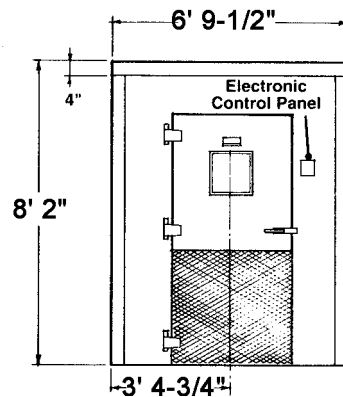


PASS-THRU TYPE

Plan view



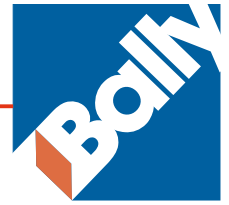
Elevation - both types



NORTHWIND™ 1000UR-2 BLAST CHILLERS - CONTINUED

SPECIFICATIONS

1. **Scope** – These specifications cover Northwind 1000UR-2 blast chiller and storage rooms, mechanical refrigeration systems, and related equipment and accessories.
2. **Manufacturer's Installation Instructions** – Contractor shall furnish to owner instructions detailing assembly of the blast chiller, installation of refrigeration equipment, wiring diagrams, operating and maintenance instructions, and other data pertaining to the proper upkeep and operation of the chiller. Installation, start-up and testing shall be carried out with the approval of the architect, in accordance with the equipment manufacturer's published instructions.
3. **Regulations and Codes** – All work and materials shall be in full accordance with local and/or state ordinances, and with any other prevailing rules and regulations regarding potentially hazardous equipment or locations. Bally Refrigerated Boxes Inc. is not responsible for furnishing items required by the regulations but not specified or shown on the drawings or contained in the specifications.
4. **10-year Warranty** – The manufacturer shall warrant that any part of the structure manufactured by Bally except the refrigeration system and its related accessories is free from defects in materials and workmanship under normal use and services. The manufacturer shall be obligated to repair or replace any part of this equipment covered by the warranty which proves to be defective within the period of ten years from the date of original installation. The warranty shall not apply to equipment which has been subjected to any accident, alteration, abuse, misuse or improper installation, and shall not include any labor charges for the placement and repair of defective parts or refrigeration. Refrigeration equipment is warranted for five years, electronic controls for one year.
5. **General** – Sectional blast chillers complete with hinged entrance doors shall be manufactured by Bally Refrigerated Boxes Inc. Panels used to assemble these structures shall be listed by Factory Mutual and Underwriters Laboratories and shall carry labels indicating all such listings or approvals. Enclosure shall measure 6' 9-1/2" w x 7' 9" d x 8" 2" high. Inside floor chiller shall be building floor, not manufacturer's panelized construction. Production capacity of the chiller shall be 500 pounds of product through the temperatures between 140°F and 45°F in 75 to 125 minutes. (Speed of chilling depends on several variables, including food product's density, moisture content, specific heat and containerization.) Net capacity at 90°F ambient temperature (105°F condensing temperature for water-cooled) shall be 49,40000 Btu/hr (air-cooled) in the quick-chill cycle and 18,540 Btu/hr (air-cooled) in the deep-chill cycle.
6. **Modular Panels**
 - A. Individual panels shall be certified by Underwriters Laboratories as having flame spread of 25 or lower and smoke generation of 450 or lower when tested in accordance with ASTM E-84-76. They shall also be approved by Factory Mutual as a Class I building type.
 - B. Panels shall consist of interior and exterior metal skins precisely formed with steel dies and roll-form equipment and thoroughly checked with gauges for accuracy. The metal skins shall be placed into steel molds and liquid urethane injected between them. CFC-free urethane cores shall be foamed-in-place (poured, not frothed) and shall be completely heat cured to bind tenaciously to the metal skins, forming a rigid 4" thick insulated panel. Panels shall be insulated with 100 percent urethane and have no internal metal structural members between the skins. To ensure tight joints, panel edges must have foamed-in-place tongues and grooves with a flexible vinyl gasket also foamed-in-place on interior and exterior of all tongue edges. Gaskets shall



NORTHWIND™ 1000UR-2 BLAST CHILLERS - CONTINUED

be resistant to damages from oil, fats, water, detergents and sunlight, and must be NSF approved.

- C. Panels shall be equipped with Bally Speed-Lok joining devices. Each locking device shall consist of a cam-action locking arm of a replaceable type placed in one panel, and a steel rod precisely positioned in the adjoining panel, so that when the locking arm is rotated, the hook engages over the rod and draws the panels tightly together. Press-fit caps shall be provided to close wrench holes. The required locking wrench shall be supplied with the chiller enclosure.
 - D. Plenum – A sheet metal plenum with necessary fasteners shall be furnished by the manufacturer. The ceiling plenum shall include a fluorescent light fixture.
- 7. Finish** – Stainless steel exterior and interior
- 8. Doors** – The hinged walk-in door shall be an infitting, flush-mounted type measuring 36" x 78", meeting the requirements of the 1992 Americans with Disabilities Act. It shall be a right-hand or left-hand swinging Bally door with observation window, three hinges, and deck plate protection on lower part of door. Doorframe shall include interior steel support and door shall also include an inside safety release handle to prevent any person from being locked inside. Construction of both panel and door is generally as stated above.

- 9. Mechanical Refrigeration (General)** – The refrigeration system shall be supplied by Bally Boxes, Inc. (the standard product of a single manufacturer) and shall be catalogued as a system complete with system capacities. All components, including controls and accessories, shall be furnished by the system manufacturer. The components shall include a fully piped, air-cooled or water-cooled condensing unit (as described below) and evaporator (as described below). Refrigeration system capacity and horsepower rating shall be as described in the refrigeration schedule on the plan.

- A. Condensing Unit – The condensing unit shall include two 3 hp motor compressor, 3-circuit condenser, three receivers, and electrical control panel components assembled, piped and wired by the manufacturer. Motor-compressors shall be of the accessible hermetic type, with inherent overload protection (three-leg on the three-phase) for Bally systems. Coil shall be similar in construction to that described in section (B). Fan motors shall have inherent overload protectors. Fan blades must be guarded to prevent injury. Accessories include moisture-liquid indicators and suction and discharge vibration eliminators. Electrical controls, installed by the system manufacturer, shall include high-low pressure control switches and magnetic contractors. Fan cycle controls

and crankcase heaters shall be installed on the condensing unit to maintain desired condensing pressure and protect the compressors from liquid migration when ambient temperatures are below 55°F. A weatherproof hood shall be factory fabricated and installed (air-cooled only).

- B. Evaporator – The coil shall have copper tubes expanded into aluminum fins. The housing shall be of aluminum. Electric defrost shall be used. Selection and wiring of all defrost controls shall be the sole responsibility of the system manufacturer. Coil shall include thermostatic expansion valves, filter-driers, and liquid-line solenoid valves.
- C. Control Panel – Manufacturer shall provide a factory-installed and wired controller to permit selection of functions by the operator. The automatic chill mode shall rely on a sensor probe suitable for insertion into the product to automatically select the proper chill cycle (quick chill, 37°F; deep chill, 5°F). Chill temperatures shall be automatically controlled by electronic controllers. Upon completion of the deep-chill cycle, the controller shall automatically revert to the hold mode (37°F). A manual chill mode shall be provided as an alternate means of chilling product when probe insertion is not practical.

The manual chill mode shall rely on an electronic built-in timer with a user-selectable

NORTHWIND™ 1000UR-2 BLAST CHILLERS - CONTINUED

setting range. The timer shall enable the user to select the duration of the deep chill cycle (5°F). Upon completion of the manually set deep-chill cycle, the timer shall automatically cause the chiller to return to the quick-chill/hold mode.

10. Installation

- A. Interconnecting accessories shall be installed in accordance with the manufacturers' recommendations and shall be located for ease of servicing. Piping shall be placed in accordance with good engineering practice. Particular attention shall be given to oil return, gas velocities, refrigerant pressure drops and neatness.
- B. Copper tubing for use in refrigerant piping shall conform to applicable ASTM standard specifications (serial designation B.88). All tubing shall be type "L" hard-drawn copper.
- C. Each system shall be triple-evacuated prior to charging. 1,500 and 500 microns of vacuum shall be drawn successively, and broken with dry refrigerant. After the third evacuation, the system shall be charged.
- D. Suction line insulation shall be sized and installed according to the insulation manufacturer's recommendations to prevent suction line condensation.
- E. Penetrations shall be sealed with non-hardening caulking compound. Exposed ends of the penetration must be trimmed.

F. Placement of all exposed pipes shall be approved by the architect before installation.

11. Preassembled Remote Refrigeration Equipment –

Refrigeration equipment shall be a Bally system designed for remote installation, for use with R-22 refrigerant. Manufacturer shall provide equipment including all necessary components factory installed on both evaporator and condensing unit assemblies. All components shall be prewired, so that job site work is limited to making electrical and tubing connections between the assemblies and supplying electrical power. All necessary electrical wire, conduit and fittings, and all refrigeration tubing, fittings and insulation shall be furnished by the refrigeration and electrical contractors. Equipment shall be fully automatic in operation, and shall conform to the following minimal requirements:

A. Condensing Unit – The condensing unit shall be provided complete with motor/compressors, air-cooled (or water-cooled) condenser, receivers and all other necessary components mounted on a common base. The compressors shall be of the accessible hermetic type. The unit shall be designed for chill operation at the specified temperature, in a 90°F (32.2°C) ambient temperature.

B. Evaporator – The evaporator shall be of the forced convection type, designed specifically for blast chiller operation, instead of the unit cooler type.

Air circulating motors, multi-fin and tube-type coil, and fan guards shall be assembled within a protective housing. The liquid-line solenoid valves, thermostatic expansion valves, and inlet and outlet connections, shall also be contained in this housing. The entire evaporator assembly shall be readily accessible for cleaning. A drip pan and drain connection shall be provided. Removable air inlet filters shall be provided. A manual system for defrosting the evaporator, including heaters and safety thermostats, shall be supplied.

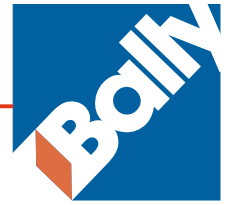
12. Materials Supplied by Others –

Because requirements vary with individual site locations and local regulations, review and approval of all plans must be the responsibility of an engineer familiar with the installation.

13. **Specify by Name** – To ensure that specifications prepared from this guide will be complied with fully, include the following paragraph:

The blast chiller shall be as manufactured by Bally Refrigerated Boxes, Inc. To protect the client's interests, no substitutions will be accepted unless by specific approval.

In line with our program of constantly striving for improvement in design, we reserve the right to change specifications without notice.



BLAST CHILLING: A CRITICAL CONTROL IN THE PREPARATION OF FOOD

Time and temperature relationships are critical to the growth and spread of contamination, contributing to sensory-quality and safety loss in foods. Every foodservice manager is aware of this fact, and of how difficult it can be to make all food service employees use safe food handling and storage practices in an attempt to prevent quality loss and possible foodborne illness.

With operator awareness and regulatory agency surveillance, why has there been a general increase in national incidence of foodborne illness – illness that could be controlled by use of proper food handling temperatures? Temperature control, especially cold storage, is an often misunderstood and neglected control point in the safe preparation and holding of food.

The standard recommendation for rapid cooling of prepared food is the use of a two inch product depth and a cumulative time of four hours or less in the 140°F-45°F “danger zone.” Ironically, the following chart illustrates how long it actually takes to properly cool prepared foods in 2”, 4” and 6” deep pans, stored in a 38°F standard storage refrigerator.

1. Cooling Times (In Hours) in Standard Walk-in

Food Product	2" Deep Steam Table Pan	4" Deep	6" Deep
Beef Stew	12 hrs.	16 hrs.	22 hrs.
Chicken and Turkey a la King	10 hrs.	14 hrs.	22 hrs.
Swiss Steak with Tomato Sauce	13 hrs.	17 hrs.	20 hrs.
Sliced Beef and Gravy	10 hrs.	13 hrs.	23 hrs.
Gravy	11 hrs.	14 hrs.	21 hrs.
Broth	5 hrs.	8 hrs.	12 hrs.
Cream of Pea Soup	10 hrs.	13-1/2 hrs.	18 hrs.
Mashed Potatoes	12 hrs.	16 hrs.	22 hrs.
Peas	6 hrs.	9 hrs.	13 hrs.
Broccoli	7 hrs.	9-1/2 hrs.	14 hrs.
Lasagna	11 hrs.	17 hrs.	21 hrs.

Product cooled from 140°F to 45°F in a 38°F holding refrigerator

Consider the consequences if prepared foods are contaminated by the following organisms and are cooled as slowly as Chart 1. shows.

2. Bacteria Growth Rate Chart

Organisms	Temperature	Generation Time (Min.)
Escherichia coli	98.6°F	17 min. in broth 12.5 min. in milk
Salmonella typhi	98.6°F	23.5 min. in broth
Staphylococcus aureus	98.6°F	27-30 min. in broth
Streptococcus lactis	98.6°F	48 min. in broth 26 min. in milk

Data from Weiser, Mounthey, and Gould, "Practical Food Microbiology and Technology," Table 3B.

How can this potentially hazardous condition be controlled? Through use of the blast chiller.

CRITICAL CONTROL IN THE PREPARATION OF FOOD

THE BLAST CHILLER

The air blast chiller provides critical temperature control during conventional food preparation. The blast chiller is more efficient in cooling foods than the standard storage refrigerator.

To understand the basic principle of the blast chiller, let us review its conception. Initially, the blast chiller was designed to support cook/chill programs where foods were prepared or cooked, rapidly cooled through the 140°F-45°F "danger

zone," and held in refrigerated inventories to be reheated and served later. Rapid cooling prolonged the safe storage life of these foods.

Since the standard storage refrigerator is designed to hold foods that are already chilled, it is ill equipped to effectively remove heat from loads or prepared foods placed inside it. Hence the blast chiller was developed, offering greater heat removal capacity and utilizing high-velocity, convected air directed through the product zone

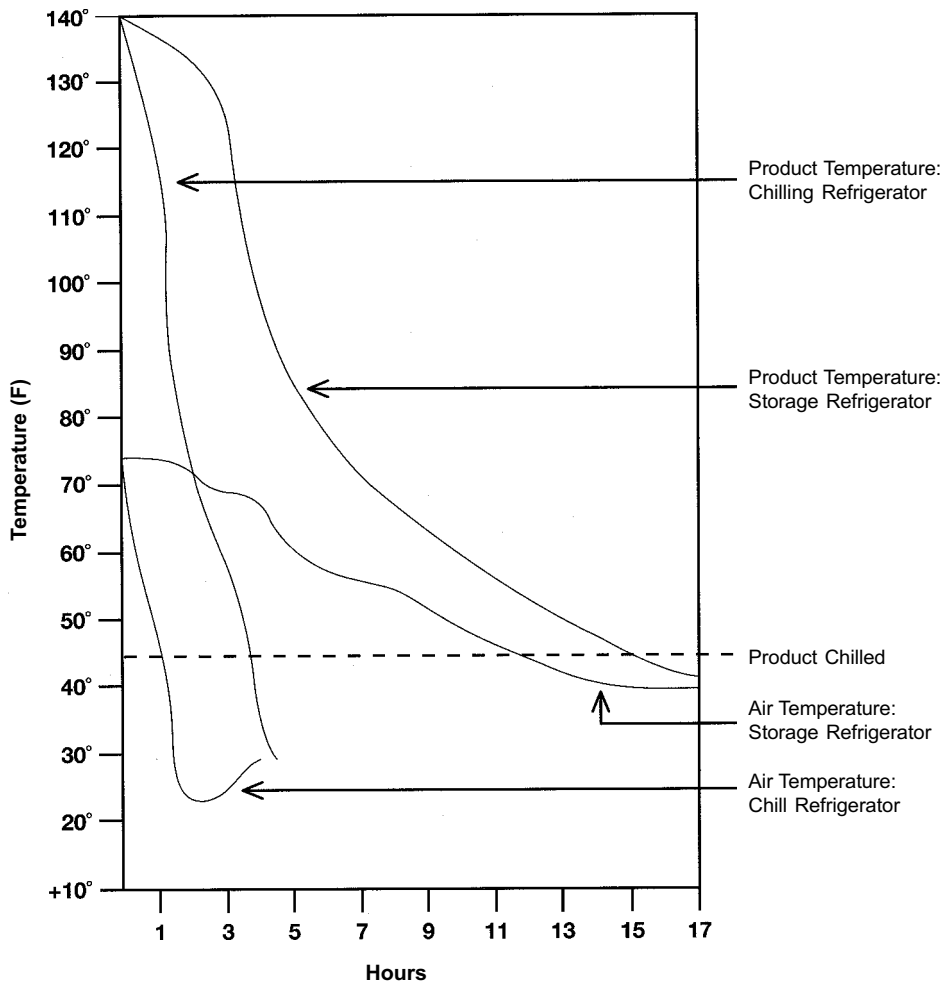
to promote fast, even cooling for foods. The rapid temperature pull-down accomplished by these systems proved to extend safe storage life and improved the quality of the food.

The following chart illustrates the cooling time of similar product loads; one placed in the blast chiller and the other in a standard storage refrigerator. Note the cooling curves for the center of the food mass and the air temperature recovery times.

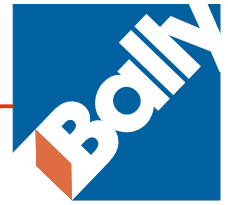
As these illustrate, the blast chiller provides the critical control necessary in properly cooling and holding prepared foods. Unfortunately, the blast chiller is seldom considered for its value in functioning as a much needed control point in conventional food preparation programs.

3. Product Chilling rate

Product Load: 200 pounds beef stew/40 12" x 10" x 2 1/2" pans



Conventional storage refrigerators are not engineered and equipped to remove the heat rapidly from a large load or hot food. Consequently, several hours are required to reduce product temperature through the temperature danger zone, a situation which could result in loss of product quality and sanitation.



WHAT IS A CONVENTIONAL FOODSERVICE PROGRAM?

This question is part of today's food safety problems. Historically, conventional food preparation meant preparing food for immediate service with brief hot and cold holding periods involved. In order to survive, today's foodservice operations are anything but conventional.

Common operational pressures include a limited supply of skilled labor, escalating overhead, insurance and construction expenses, competition forcing menu expansion in kitchens originally not designed for producing multiple menu items, and attempts to build profitability through satellite, banquet and catering functions. These are but a

few factors creating havoc in today's conventional foodservice kitchens.

Few operators are able to prepare foods for immediate service. Items are produced several hours before consumption, often allowed to cool at room temperature or placed into standard storage refrigerators – refrigeration systems that cannot cool foods safely.

The following microbiological data are the result of an unstructured test analyzing the effect of cooling time on the condition of sliced turkey and gravy prepared in a high school kitchen. Product was prepared conventionally, sliced, placed in sanitized 12" x 10" x 2 1/2" steam table pans and covered with aluminum foil.

Each pan was filled to a depth of two inches; total product weight was six pounds. Product compared was from the same production batch. The blast-chilled product load required 2 to 3 1/2 hours to cool from above 140°F to a central core temperature below 45°F; the product load cooled in the standard storage refrigerator required six to eight hours. Upon subsequent storage in a 38°F holding refrigerator, standard plate count tests illustrated an average of over 100,000 aerobic organisms per gram of product sampled by day three in the storage refrigerator cooled turkey and gravy.

4. Standard Plate Counts • Sliced Turkey and Gravy

Time Following Chilling	Chill Processing Refrigerator	Holding Refrigerator
Initial	3,000	4,000
Day 3	8,000	151,000
Day 7	400	5,700
Day 10	4,500	30,000
Day 14	13,000	40,000

Adding to public health concern is the fact that minimal heat treatment is applied when these foods are reheated in an attempt to maintain food quality after they have been improperly cooled and stored.

WHAT IS THE SOLUTION?

THE BALLY NORTHWIND BLAST CHILLER

Bally Northwind blast chillers are designed to provide that critical control necessary to maintain food quality and sanitation during the preparation of a wide range of foods in today's busy foodservice kitchens.

- Casseroles and extended or layered entrée preparations are dense and extremely difficult to cool. Most of these items are assembled ahead of time and heated as needed for service. Especially dangerous is the fact that common ingredients in these preparations include eggs, cream, cheese and ground meat. Holding in a storage refrigerator does not properly cool these preparations. Items include ziti; lasagna; eggplant; macaroni and cheese; rice, bean and other pasta-base dishes; stuffings; stews; a-la-king preparations and other ethnic style entrees.
- Generally, roasted or baked meats and poultry are prepared several hours ahead of service due to their lengthy cooking time and to the fact that these items must be cooled prior to slicing. Often these foods are left out in the kitchen to cool. Blast chilling not only provides a rapid cool-down, reducing preparation time, but also maintains product sanitation; items

include turkey breasts; roasting chickens; Cornish hens; various beef, veal, pork and lamb roasts; briskets; ribs; meat loaves; meatballs; taco fillings and sausage dishes.

- A third group of potentially hazardous food preparations requiring blast chilling is salad and sandwich fillings. Contamination levels are often high since the ingredients in these preparations include eggs, mayonnaise, and cream base dressings and protein and raw vegetable ingredients. The high density of these mixtures adds concern, since proper chilling requires several hours and seldom are prechilled ingredients used to prepare and assemble these items. Salad mixtures and sandwich fillings are ideal candidates for blast chilling; they include potato, macaroni, rice, pasta, fruit and cabbage salads; and tuna, salmon, crab, seafood, chicken, turkey, ham and egg salads and fillings.
- Even liquid or semi-viscous items such as gravies, broths, soups, chilies, sauces, cream fillings, custards, Jell-O, puddings and pie fillings maintain higher levels of quality and sanitation if blast chilled in lieu of standard storage refrigerator cooling.

The Bally Northwind blast chiller is a versatile, multi-use system that supplements the cooling demands being made on today's conventional food storage systems. It controls microbial contamination and food deterioration by rapid product cooling through the 140°F-45°F "danger zone" for food handling, effectively preparing foods for subsequent safe storage in holding refrigerators.

References:

Sandra J. Ley, R.D., Foodservice Refrigeration

CBI Publishing Co., Inc. (Boston: 1980)

Charts

1. "Cooling Times," Table 2.2, *ibid.*, p. 24
2. "Bacteria Growth Rate Chart," Table 2.1, *ibid.*, p. 24
3. "Product Chilling Rate," Table 3.1, *ibid.*, p. 50
4. "Standard Plate Counts-Sliced Turkey & Gray," Table 3.1 *ibid.*, p. 52.