TurboChef Technologies, Inc.

Single Batch Ventless (HHS) Submittal Information

DOC-1639 / Rev B / October 2017

Project _____

Item No. _____

Quantity _____

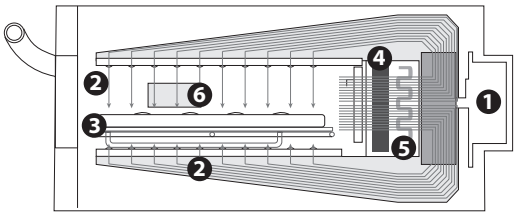
THE Single Batch™

PERFORMANCE

The TurboChef® Single Batch™ oven circulates impinged air at speeds of up to 50 mph to create high heat transfer rates and reduce cook time. The oven utilizes a variable speed blower, oscillating rack, and catalytic converter, resulting in minimal energy input, high food quality, and ventless operation.

VENTILATION

- UL (KNLZ) listed for ventless operation†
- EPA 202 test (8 hr):
  - Product: Pepperoni Pizzas
  - Results: 0.52 mg/m^3
  - Ventless Requirement: <5.00 mg/m^3
- Internal catalytic filtration to limit smoke, grease, and odor emissions



1. Blower Motor
2. Impinged Air
3. Oscillating Rack
4. Catalytic Converter
5. Impingement Heater
6. Light

EXTERIOR CONSTRUCTION

- Stainless steel front, top and sides
- 4" (102 mm) legs

INTERIOR CONSTRUCTION

- 304 stainless steel
- Fully insulated cook chamber
- Top and bottom jetplates

STANDARD FEATURES

- Simple and intuitive touch controls
- Multi-language user interface
- Integral recirculating catalytic converter for UL (KNLZ) listed ventless operation
- Variable-speed High h recirculating air impingement system
- Oscillating rack for high heat transfer without spotting
- Half-sheet pan/16-inch pizza capacity
- Stackable design (requires stacking kit)
- Smart menu system capable of storing up to 400 recipes
- Built-in self diagnostics for monitoring oven components and performance
- USB compatible
- Wi-Fi compatible
- Free one-year subscription to TurboChef Connect menu management web portal
- Smart Voltage Sensor Technology* (N.A. only)
- Includes plug and cord (6 ft. nominal)
- Warranty – 1 year parts and labor

STANDARD ACCESSORIES

- 1 Aluminum Paddle (NGC-1478)
- 1 Bottle Oven Cleaner (103180)
- 1 Bottle Oven Guard (103181)
- 2 Trigger Sprayers (103182)

c UL US

ANSI/NSF #4
81Y5

This product conforms to the ventilation recommendations set forth by NFPA96 using EPA202 test method.

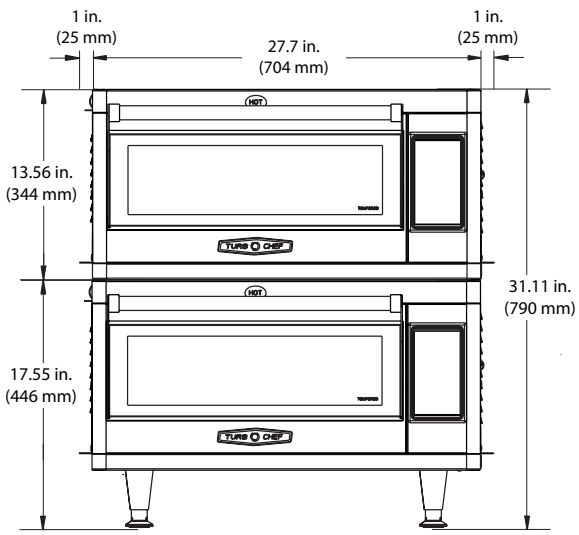
* Smart Voltage Sensor Technology does not compensate for lack of or over voltage situations. It is the responsibility of the owner to supply voltage to the unit according to the specifications on the back of this sheet.

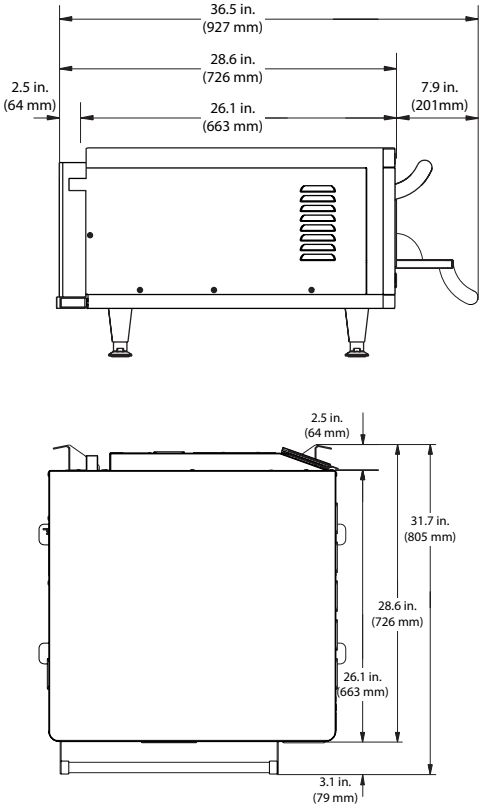
† Ventless certification is for all food items except for foods classified as "fatty raw proteins." Such foods include bone-in, skin-on chicken, raw hamburger meat, raw bacon, raw sausage, steaks, etc. If cooking these types of foods, consult local HVAC codes and authorities to ensure compliance with ventilation requirements.

Ultimate ventless allowance is dependent upon AHJ approval, as some jurisdictions may not recognize the UL certification or application. If you have questions regarding ventless certifications or local codes please email ventless.help@turbochef.com

TurboChef reserves the right to make substitutions of components or change specifications without prior notice.

Single Batch™





DIMENSIONS		
Single Units		
Height	13.56″	344 mm
with legs	17.55″	446 mm
Width	27.70″	704 mm
Depth (Door Open/ Closed)	36.5″ / 31.7″	927 mm / 805 mm
Weight	153 lb.	69 kg
Stacked Units		
Height	31.11″	790 mm
Width	27.70″	704 mm
Depth (Door Open/ Closed)	36.5″ / 31.7″	927 mm / 805 mm
Weight	306 lb.	138.8 kg
Cook Chamber		
Height / Usable Height	5.5″ / 4.35″	140 mm / 110 mm
Width	18.5″	470 mm
Depth / Usable Depth	16.7″ / 16.25″	424 mm / 413 mm
Volume	0.99 cu.ft.	28 liters
Wall Clearance (Oven not intended for built-in installation)		
Top	2″	51 mm
Sides	2.5″	63.5 mm

ELECTRICAL SPECIFICATIONS-SINGLE PHASE		
Single Batch US Model (HHS-9500-1) - United States		 NEMA 6-30P
Voltage	208/240 VAC	
Frequency	50/60 Hz	
Current (Max Circuit Requirement)	27 amp (30 amp)	
Max Input	5,616 watts	

SHIPPING INFORMATION
U.S.: All ovens shipped within the U.S. are packaged in a double-wall corrugated box banded to a wooden skid. International: All International ovens shipped via Air or Less than Container Loads are packaged in wooden crates.
Box size: 35.25″ x 33.88″ x 19.50″ (895 mm x 861 mm x 495 mm) Crate size: 36″ x 37.25″ x 26.38″ (914 mm x 946 mm x 670 mm) Item class: 110 NMFC #26710 HS code 8419.81
Appx. boxed weight: 193.2 lb. (87.6 kg) Appx. crated weight: 226 lb. (102.5 kg)
Minimum entry clearance required for box: 35.5″ (902 mm) Minimum entry clearance required for crate: 39.5″ (1003 mm)

TurboChef recommends installing a type D circuit breaker for European installations.

TurboChef reserves the right to substitute components or change specifications without notice.

TurboChef Global Operations
2801 Trade Center Drive / Carrollton, Texas 75007 USA
US: 800.90TURBO (800.908.8726) / International: +1 214.379.6000
Fax: +1 214.379.6073 / turbochef.com

c UL us LISTED 81Y5

Convection Oven with Integral Systems for Limiting the Emissions of Grease Laden Air

This Product Conforms to the Ventilation Recommendations Set Forth by NFPA96 Using EPA202 Test Method

NOTICE OF COMPLETION
AND
AUTHORIZATION TO APPLY THE UL MARK

2017-07-13

Mr. David Castillo
Turbochef Technologies Inc
2801 Trade Center Drive
Carrollton, TX, 75007, US

Our Reference:	File E319600, Vol. 2	Order:	11723724
		Project:	4787938926
Your Reference:	David Castillo 13 April 2017		
Project Scope:	E319600: USL-CNL, KNGT/KNGT7/KNLZ/KNLZ7 evaluation of new HHS “Single Batch” Oven		

Dear Mr. David Castillo:

Congratulations! UL's investigation of your product(s) has been completed under the above Reference Number and the product was determined to comply with the applicable requirements. This letter temporarily supplements the UL Follow-Up Services Procedure and serves as authorization to apply the UL Mark at authorized factories under UL's Follow-Up Service Program. To provide your manufacturer(s) with the intended authorization to use the UL Mark, you must send a copy of this notice to each manufacturing location currently authorized under File E319600, Vol 2.

Records in the Follow-Up Services Procedure covering the product are now being prepared and will be sent in the near future. Until then, this letter authorizes application of the UL Mark for 90 days from the date indicated above.

Additional requirements related to your responsibilities as the Applicant can be found in the document “Applicant responsibilities related to Early Authorizations” that can be found at the following web-site: http://www.ul.com/EAResponsibilities

Any information and documentation provided to you involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL.

We are excited you are now able to apply the UL Mark to your products and appreciate your business. Feel free to contact me or any of our Customer Service representatives if you have any questions.

Very truly yours,

R. Rynkiewicz
Senior Staff Engineer
Richard.P.Rynkiewicz@ul.com

Reviewed by:

Bruce A. Mahrenholz
CPO Director
Bruce.A.Mahrenholz@ul.com

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ONLINE CERTIFICATIONS DIRECTORY

TSQT.E151488
Commercial Cooking, Rethermalization and Powered Hot-food-holding and -Transport Equipment

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Commercial Cooking, Rethermalization and Powered Hot-food-holding and -Transport Equipment

See General Information for Commercial Cooking, Rethermalization and Powered Hot-food-holding and -Transport Equipment

TURBOCHEF TECHNOLOGIES INC E151488
2801 Trade Center Drive
Carrollton, TX 75007 USA

Commercial Convention Microwave Oven, Model(s) NGC, NGCD6

Commercial Cooking, Rethermalization, and Hot Food Holding and Transport Equipment, Model(s) Oven, Model "Fire", may have prefixes and/or suffixes.

Commercial microwave/convection ovens, Model(s) Encore, Encore 2, G5, i3, i5, NGC, NGO

Commercial Oven, Model(s) HHB, HHB2, HHD, HHS

Conveyor ovens, Model(s) HHC1618, HHC2020, HHC2620

Gas-fired conveyor ovens, Model(s) HHC3240

Some models may also have Safety Certification.

Trademark and/or Tradename: "BULLET"

Last Updated on 2017-07-05

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ONLINE CERTIFICATIONS DIRECTORY

TSQT.GuideInfo
Commercial Cooking, Rethermalization and Powered Hot-food-holding and -Transport Equipment

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[Sanitation, Food Service Equipment] Commercial Cooking, Rethermalization and Powered Hot-food-holding and -Transport Equipment

See General Information for Sanitation, Food Service Equipment

USE

This category covers cooking and hot-food-holding equipment, including brewers, steam tables, griddles, broilers, ovens, fryers, food warmers, and similar equipment intended for commercial use.

PRODUCT MARKINGS

Equipment may be marked with use limitations or may provide guidance on intended application.

Rethermalization equipment is provided with a marking that specifies the maximum capacity of the unit.

Equipment provided with a security package for installation in areas where security may be a concern is marked "Intended for use only in environments where security is a concern, such as correctional facilities, mental health facilities, or some schools."

PRODUCT IDENTITY

One of the following product identities appears on the product:

Cooking Equipment

Hot-food-storage Equipment

Other product identities may be used as shown in the individual certifications.

RELATED PRODUCTS

Electric equipment and warming and serving equipment intended for commercial use and investigated to UL Safety Standards is covered under Commercial Cooking Appliances (KNGT) and Custom-built Food-service Equipment (KNNS).

Gas-fired food service equipment is covered under Gas-fired Food Service Equipment (LGQX).

See Lead Content Verification of Products in Contact with Potable Water (QNVB).

ADDITIONAL INFORMATION

For additional information, see Food Safety and Quality, Products and Equipment (AAFS).

REQUIREMENTS

The basic standard used to investigate products in this category is NSF/ANSI 4, "Commercial Cooking, Rethermalization and Hot Food Holding and Transport Equipment."

UL MARK

The Certification Mark of UL on the product is the only method provided by UL to identify products manufactured under its Certification and Follow-Up Service. The Certification Mark for these products includes the UL symbol, the words "CERTIFIED" and "SANITATION," and a file number.

Additional Certification Markings

Products covered under this category are additionally marked with the following information:

NSF/ANSI 4

For those products which are also certified by UL under another category, the statement "NSF/ANSI 4" is included on the product.

Alternate UL Mark

The Classification Mark of UL on the product is the only method provided by UL to identify products manufactured under its Classification and Follow-Up Service. The Classification Mark for these products includes the EPH Mark (as illustrated in the Introduction of this Directory) and the following additional information:

[PRODUCT IDENTITY*]
NSF/ANSI 4
Control No.

* **COOKING EQUIPMENT** or **HOT FOOD STORAGE EQUIPMENT**, or other appropriate product name as shown in the individual Classifications

For those products which are also Listed or Classified by UL under another category, the marking includes the appropriate Listing or Classification Mark, the EPH Mark, and the text "NSF/ANSI 4" below the EPH Mark.

* *

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Last Updated on 2016-07-13

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2016-04-28

Mr. David Castillo
Turbochef Technologies Inc
Carrollton, TX, 75007

Reference: Project 4787924175

Product: EPA 202 TEST METHOD: USING COMMERCIAL COOKING APPLIANCE OVEN MODEL X1HHS

Dear Mr. Castillo,

Per your request, project 4787924175 was opened for the evaluation of grease-laden vapors produced from cooking below listed produce using the commercial oven Model X1HHS with power input as described in Appendix A.

The scope of this project was to determine the total grease emissions from cooking the specified food load as noted in Appendix A. Testing was conducted in accordance with EPA Method 202 test guidelines to determine ultimate results. Results are used to determine compliance with Section 59 of UL710B, the Standard for Recirculating Systems, formerly Section 14 of UL 197, Eighth Edition, Supplement SB, and paragraph 4.1.1.2 of NFPA96, the Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations. The test was conducted at our facility in Northbrook, IL on April 25th, 2017. This letter will report the results of the EPA 202 Emission test.

The cook cycles and settings were as shown in Appendix A. The results are considered to comply with UL710B, Section 59, formerly Section 14 of UL 197, Eighth Edition, Supplement SB, and NFPA96, paragraph 4.1.1.2.

The total amount of grease-laden effluents collected was 1.46 mg/m^3, which is less than 5 mg/m^3 limit.

No evaluation was conducted in regards to fire protection. In addition, no evaluation of the cooking equipment itself was conducted.

The total test time for each test was eight hours. The unit was energized as shown in Appendix A.

UL LLC did not select the samples, determine whether the samples were representative of production samples or witness the production of the test samples, nor were we provided with information relative to the formulation or identification of component materials used in the test samples. The test results apply only to the actual samples tested.

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This letter will serve to report that all tests on the subject product have been completed. All information generated will be retained for future use. This concludes all work associated with project 4787924175 and we are therefore closing this project. Our Accounting Department has been instructed to bill you for all charges incurred.

Thank you for the opportunity to provide your company with these services. Please do not hesitate to contact us if you should have any questions or comments.

Very truly yours,

Sean Drobinski

Sean P. Drobinski
Sr. Project Engineer

Tel: 847-664-1926
E-mail: Sean.Drobinski@ul.com

Reviewed by:

Brandon Gray

Brandon Gray
Sr. Staff Engineer

CLIENT INFORMATION	
Company Name	Turbochef
Address	2801 Trade Center Drive Carrollton, TX, 75007

AUDIT INFORMATION:				
Description of Tests	Per Standard No.	UL 197	Edition/ Revision Date	10th 9/17/2014
		CSA C22.2 No. 109-M1981		2nd 4/1989 (R2013)
		UL 710B		2nd 8/14/2014
[X] Tests Conducted by[1] Leo Carrillo				
[] UL Staff supervising UL Staff in training				

TESTS TO BE CONDUCTED:				
Test No.	Start	Done	Test Name	**[ ]** Comments/Parameters **[ ]** Tests Conducted by[2] **[ ]** Link to separate data files[4]
1	2017-04-24	2017-04-24	POWER INPUT TEST (SINGLE PHASE RATED OVER 120V): RATING (CSA 22.2 109-M1981):	
2	2017-04-24	2017-04-28	CAPTURE TEST:	
3	2017-04-25	2017-04-28	EMISSION TEST:	

Instructions -
1 - When all tests are conducted by one person, name can be inserted here instead of including name on each page containing data.
2 - When test conducted by more than one person, name of person conducting the test can be inserted next to the test name instead of including name on each page containing data. Test dates may be recorded here instead of entering test dates on the individual datasheet pages.
3 - Use of this field is optional and may be employed differently. If used to include a date instead of entering the testing date on the individual datasheet pages, the date shall be the date the test was conducted.

4 - Link to separate data files for a test can be inserted here. The link must be to a server that is accessible to UL staff, that provides for backup, required retention periods and a path, including file name, that does not change and result in a broken link. Not applicable

TEST LOCATION: (To be completed by Staff Conducting the Testing)					
[X]UL or Affiliate	**[]**WTDP	**[]**CTDP	**[]**TPTDP	**[]**TCP	**[]**PPP
	[]WMT	**[]**TMP	**[]**SMT		
Company Name: UL LLC					
Address: 333 Pfingsten Rd. Northbrook, IL, 60062					

TEST EQUIPMENT INFORMATION

[X] UL test equipment information is recorded on Meter Use.

TEST SAMPLE IDENTIFICATION:

The table below is provided to establish correlation of sample numbers to specific product related information. Refer to this table when a test identifies a test sample by "Sample No." only.

Sample Card No.	Date Received	**[]** Test No.+	Sample No.	Manufacturer, Product Identification and Ratings
896908	4/7/17	ALL	1	Tubrochef, Model X1HHS, rated 208/240V, 30 A.

+ - If Test Number is used, the Test Number or Numbers the sample was used in must be identified on the data sheet pages or on the Data Sheet Package cover page.

[ ] Sampling Procedure -

[ ] This document contains data or information using color and if printed, should be printed in color to retain legibility and the information represented by the color.

METHOD

The supply voltage was adjusted to voltage and frequency as noted in "General Test Considerations", **240 V, 60 Hz.**

The supply voltage was adjusted to the rated voltage.

The power input was measured with the appliance at the intended operating temperature under full-load conditions.

[x] (c-UL) To determine the proper test voltage for the Temperature (Normal) and Temperature (Abnormal) tests, the supply voltage was adjusted to the increased test voltage as noted below. Following the test at increased test voltage, the supply voltage was adjusted to the value necessary to cause the appliance to draw the increased test current, calculated as specified below.

Increased Test Voltage (V_t): 216V for appliances rated 208V.
250V for appliances rated between 220V-250V.

7200 W (250/240)^2 = 7812.5 W

Where V_r, I_r, and W_r, are the rated voltage, current, and power of the appliance, respectively. Note: when the appliance is rated for a range of voltages, the mean of the range is to be used as V_r.

PARAMETERS

Appliance Ratings:

Volts: 240; Current: 30A

RESULTS

Operating Conditions	Specified				Measured		
	Volts, L1-L2	Amps L1	Amps L2	Power, (W) (kW)	Volts, L1-L2	Amps L1 & L2	Power, (W) ~~(kW)~~
Full power operation, rated voltage	240	---	---	---	240.4	28.4	6807
c-UL Test Conditions							
Full power operation, increased test voltage	250	---	---	---	250.3	29.7	7422
[x] Full power operation, increased power current	---			---	257.1	30.5	7814.0

[X] The input power **[was]** ~~[was not]~~ between 90% and 105% of the rated input current when the appliance was energized at rated voltage.

CAPTURE TEST:

UL 710B Sec. 58
UL 710 Sec. 31

METHOD

The model X1HHS convection_cooking appliance was placed under a hood operating at 500 CFM. Food product as specified below was then used for testing, see Emission Testing for specific details. The cooking area is to be observed for the presence of visible smoke and grease-laden air, and the hood assembly shall completely capture all of the emission as determined by observation.

COOKING PRODUCT

[x] Convection Oven – 12 in. pepperoni pizza (Tombstone, with 19 pepperonis per pizza), each cooked for 3:30 minutes with 0 seconds between loads for 8 hours (total of 131 pizzas cooked). Oven was set to maintain 500˚F. Unit holds 1 pizza at the time.

RESULTS

There ~~[was]~~ **[was not]** any presence of visible smoke and grease-laden air from the appliance during testing.

The sample **[did]** ~~[did not]~~ capture all of the emissions from the cooking appliance.

EMISSION TEST: UL 710B Sec. 59

METHOD

TEST FOR EVOLUTION OF SMOKE OR GREASE-LADEN AIR (500°F):

The model X1HHS cooking appliance was placed under a hood operating at 500 CFM, and was tested using a method derived from EPA Method 202. The Underwriters Laboratories also provided Pepperoni Pizza for the test.

A 12 in. by 6 in. rectangular, 108 in. tall sheet metal stack was constructed on top of the hood. A sampling port was located approximately 80 in. downstream from the hood exhaust, at which point it was determined there was laminar flow. The sampler was assembled and an out of stack filter was used. A pre-leak check was conducted and determined to be < 0.02 ft/min. Sampling was determined to be done at 8 traverse points.

The oven was operated normally by cooking the following foods:

Temp	Event #	% Time.	% Top Fan
500°F	1	3:30	100

The cooking cycle was repeated for 8 hours of continuous cooking.

During the cooking operation, it was noted whether or not visible effluents evolved from the air exhaust of the hood. Gauge, meter and temperature readings were taken and recorded every 10 min. After cooking, the condition of the duct was noted and a post-leak check was conducted and determined to be < 0.02 ft^3/min.

After being allowed to cool, the sampling equipment was disassembled. The glass-filter is to be removed using a pair of forceps and placed in a clean petri dish. The dish is to be sealed and labeled "SAMPLE 1".

A sample of the acetone of the same volume that will be used to rinse-out the nozzle and probe is to be placed into a clean sample bottle, sealed, and labeled "SAMPLE 2". The level of the liquid in the sample bottle is to be recorded.

The inside of the nozzle and probe is to be rinsed with acetone taking care to collect all the rinse material in a clean sample bottle. The sample bottle is to be sealed, labeled "SAMPLE 3", and the level of the liquid in the bottle is to be recorded.

The liquid in the first three impingers is to be measured and the total volume is to be recorded which will be compared to the original volume. The liquid is to be quantitatively transferred to a clean sample bottle. Each impinger and the connecting glassware including the probe extension are to be rinsed twice with water. The rinse water is to be collected and added to the same sample bottle. The sample bottle is to be sealed, labeled "SAMPLE 4" and the level of the liquid in the bottle is to be recorded.

This rinse process is to be repeated with two rinses of methylene chloride ($MeCl_2$). The rinses are to be recovered in a clean sample bottle. The sample bottle is to be sealed, labeled "SAMPLE 5" and the level of the liquid in the bottle is to be recorded.

A volume of water approximately equivalent to the volume of water used to rinse and a volume of $MeCl_2$ approximately equivalent to the volume of $MeCl_2$ used to rinse is to be placed in two clean sample bottles. The sample bottles are to be sealed, labeled "SAMPLE 6" and "SAMPLE 7" respectively, and the level of the liquid in the bottles is to be recorded.

The weight of the fourth impinger containing the silica gel is to be recorded and then the silica gel can be discarded.

The analysis phase was done in accordance with EPA Method 202, using the out of stack filter.

RESULTS

The results **[are]** ~~[are not]~~ considered acceptable because there ~~[was]~~ **[was no]** visible smoke emitted from the exhaust of the hood during the normal cooking operation. There ~~[was]~~ **[was no]** noticeable amounts of smoke accumulated in the test room after 8 hours of continuous cooking.

The total amount of grease-laden effluents collected by the sampling equipment was found to be 1.46 mg/m^3, which is [less] [~~more~~] than 5 mg/m^3.

The total grease emissions (per clause 78.2 of 710B) in pounds per hour per linear food of hood was 0.000838 lb/hr/ft.

CONDENSIBLE MATTER
(Lab Analysis)

Sample Bottle No.	Description	Volume, ml	Final Wt, mg
2	Acetone (Blank)	50.0	0.0
3	Acetone (Wash)	48.0	0.5
4&5	Solvent Phase(Wash)	450.0	5.7
4&5	Water Phase (Wash)	540.0	3.8
6&7	Solvent Phase (Blank)	460.0	0.0
6&7	Water Phase (Blank)	550.0	0.4

Filter paper weight before test - 596.6 mg
Filter paper weight after test- 599.9 mg

Analysis

1. The liquid level of all the sample bottles is to be measured.
2. The filter from sample ONE is to be removed and dried to constant weight by means of a desiccator or an oven. The weight of the filter is to be recorded.
3. The volume of sample TWO is to be determined. The liquid is then to be transferred to a beaker and evaporated to dryness. The volume of the liquid and the final weight of the condensable matter are to be recorded.
4. The volume of sample THREE is to be determined. The liquid is then to be transferred to a beaker and evaporated to dryness. The volume of the liquid and the final weight of the condensable matter are to be recorded.
5. The volumes of sample FOUR and FIVE are to be measured.
6. Samples FOUR and FIVE are to be combined. The solvent phase is to be mixed, separated, and then repeated with two $MeCl_2$ washes.
7. The solvent extracts obtained from the procedure in 6 are to be placed in a beaker and evaporated to a constant weight. The final weight is to be recorded.
8. The water phase is to be placed in a beaker and evaporated to dryness. The final weight is to be recorded.
9. The volumes of samples SIX and SEVEN are to be determined. Sample bottles SIX and SEVEN are to be analyzed according to procedures 8 and 7 respectively.

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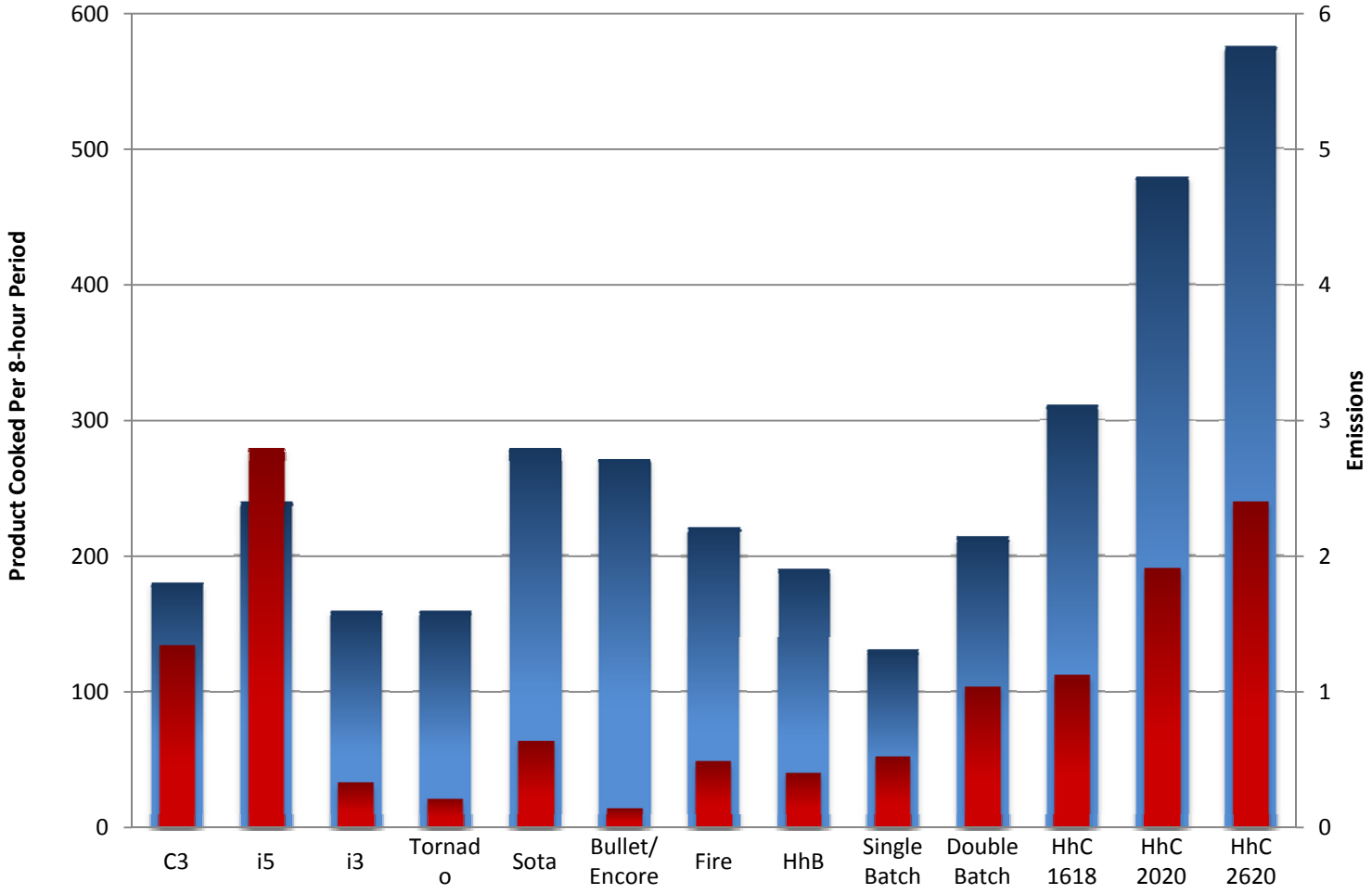
UL® (KNLZ)
Emissions by Product
Ventless Requirement: <5.00 mg/m³



	C3	i5	i3	Tornado	Sota	Bullet/ Encore	Fire	HhB	Single Batch	Double Batch	HhC 1618	HhC 2020	HhC 2620
Product Cooked Per 8-hour Period	180	240	160	160	280	272	222	190	131	214	311	480	576
Emissions	1.35	2.8	0.32	0.21	0.64	0.13	0.48	0.4	0.52	1.04	1.12	1.91	2.4

Single Batch ENERGY ESTIMATE ASTM METHOD

Changeable Parameters		
Operating Time	12	Hours
Energy Costs	$0.11	kWHr
Snooze Mode	0.00	Hours
Cook Cycles / Day	100	Cooks/Day
Typical Cook Time	180	Seconds

Do Not Change the following values

	Time (min)	Power (Watts)	Cost / Day	Balance of Time (hrs)
Warm up	10	4900	$0.09	11.83
Cooking	300	4150	$2.28	6.83
Snooze Idle	0	0	$0.00	6.83
Idle	410	1360	$1.02	0
Total / Day			$3.39	**Yearly**
Total / Month			$101.84	**$1,222.06**

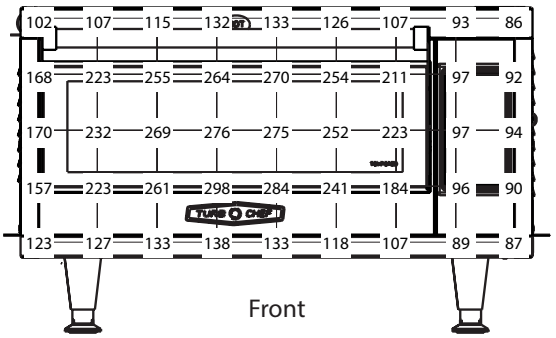
HVAC Requirements Per Operating Time -- Note: Approximations Only					
Average Energy Cooking And Idle (J)	**Warmup Energy (J)**	**Total Energy (J)**	**Total average Power (W)**	**Total Environmental Load kBtu / hr**	**Average Cooling Requirement (ton of AC)**
108,156,000	2,940,000	111,096,000	2,572	8.775355	0.731

TURBOCHEF TECHNOLOGIES, INC.

Single Batch Oven Surface Temperatures

The illustrations in this document represent the surface testing data reported for the TurboChef oven model HhS during idle and during cooking after two and a half hours of idle at 500ºF (260ºC), simulating the highest temperature condition.

Fahrenheit Measurements (Idle/Cooking)



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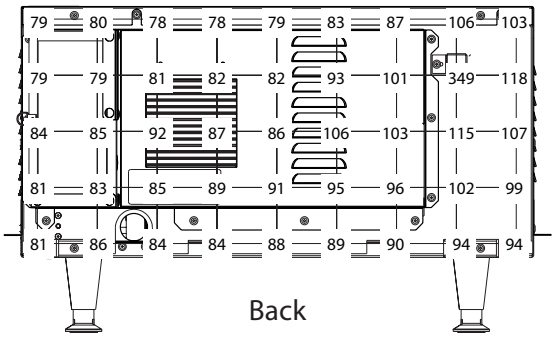

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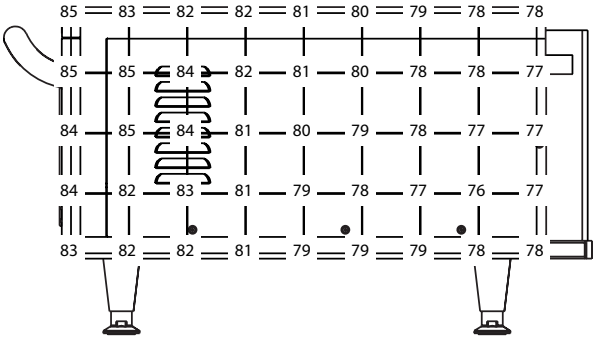

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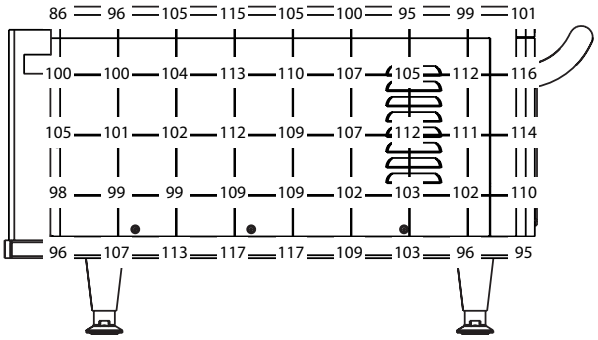

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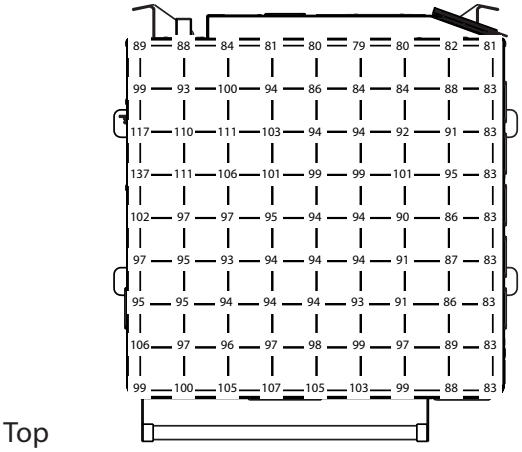

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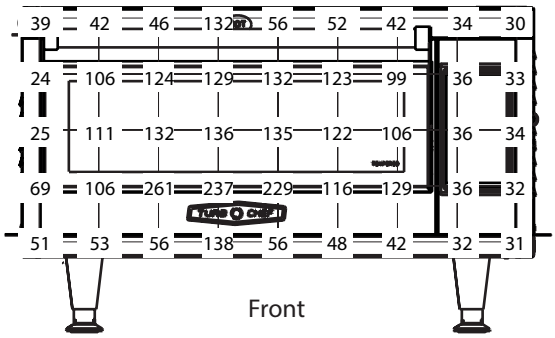
Celsius Measurements (Idle/Cooking)



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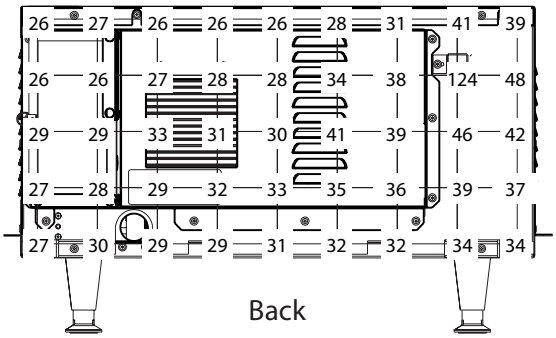

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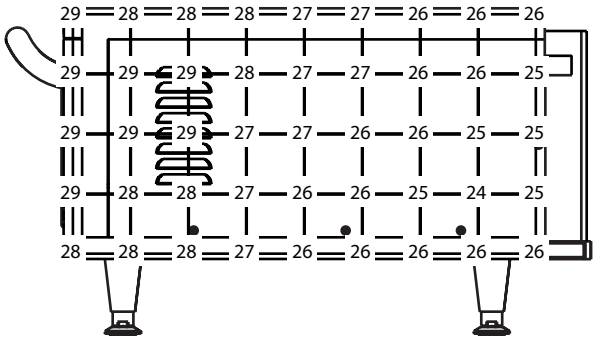

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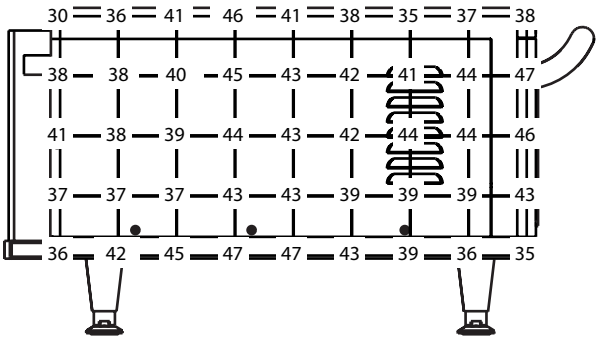

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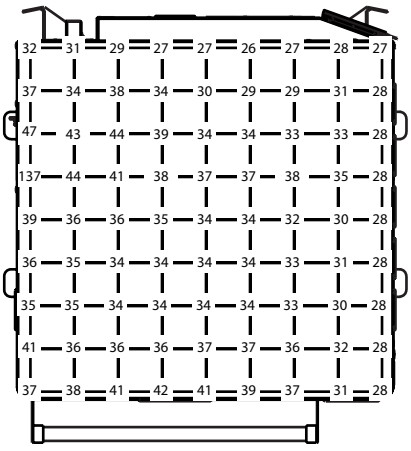


Top

TURBOCHEF TECHNOLOGIES, INC.

Installation Recommendations

TurboChef ventless ovens have internal systems for destroying grease laden vapor prior to the grease escaping the oven; therefore, the ovens are certified as non-grease emitting appliances. When following our recommendations, TurboChef ovens can be installed without the aid of a Type I or Type II hood per International Mechanical Code (2006, 2009, and 2012), NFPA 96, NFPA 101 (Life Safety Code), EPA 202, and Underwriter's Laboratory (UL KNLZ).

The following guide is intended to give relevant information for the ventless installation, operation, and maintenance of TurboChef ovens. It is important that these guidelines are followed and that the oven and surrounding areas be maintained regularly for optimal performance.

Certifications

Safety – cULus, TUV (CE)
Sanitation – NSF*, UL EPH*
Ventless – UL (KNLZ)

Electrical Requirements

TurboChef ovens must be installed on a circuit equal to the ratings listed below, per NEC sec 210.23, permissable loads.

Oven	Voltage	Current	Phase
Sōta (i1)	208/240 VAC	30 amp	1 Ph
Sōta Single Mag (i1)	208/240 VAC	20 amp	1 Ph
i3	208/240 VAC 208/240 VAC	40 amp 30 amp	1 Ph 3 Ph
i5	208/240 VAC 208/240 VAC	50 amp 30 amp	1 Ph 3 Ph
Encore/Encore 2	208/240 VAC	30 amp	1 Ph
Tornado	208/240 VAC	30 amp	1 Ph
C3	208/240 VAC	50 amp	1 Ph
HhC 2620	208/240 VAC	50 amp	3 Ph
HhC 2020	208/240 VAC	50 amp	3 Ph
HhC 1618	208/240 VAC 208/240 VAC	30 amp 50 amp	3 Ph 1 Ph
HhB 2	208/240 VAC	30 amp	1 Ph
Double Batch	208/240 VAC 208/240 VAC	50 amp 30 amp	1 Ph 3 Ph
Waterless Steamer (i1)	208/240 VAC	30 amp	1 Ph
Panini (i1)	208/240 VAC	30 amp	1 Ph
Fire	208/240 VAC	30 amp	1 Ph
Bullet	208/240 VAC	30 amp	1 Ph

* NSF certification applies to the Tornado, C3, and HhB 2 ovens only. UL EPH certification applies to all ovens except the C3.

Menu Requirements

TurboChef ovens have been approved by Underwriter's Laboratory for ventless operation (UL KNLZ listing) for all food items EXCEPT for foods classified as "fatty raw proteins." Such foods include bone-in, skin-on chicken, raw hamburger meat, raw bacon, raw sausage, steaks, etc.

The TurboChef certification includes precooked food items such as pizza toppings, sandwich meats, frozen appetizers, and cheeses. Additionally, raw, lean meats such as boneless, skinless chicken breasts and fish fall within the certification.

Cleaning Requirements

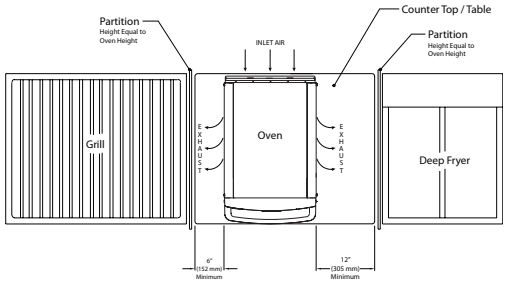
To ensure continued compliance with all health, building, and fire codes, users are required to:

- ☐ Use only TurboChef-approved cleaning chemicals.
- ☐ Follow monthly and quarterly cleaning instructions provided in the manual. Post cleaning instructions near the oven.
- ☐ Ventless installation requires that the areas around the oven (walls, ceilings, kitchen equipment, etc.) be cleaned as needed but no less than once every other month.

Installation Near Open Heat Source

When placing a TurboChef oven near an open heat source (see illustration below), strictly adhere to the following:

- If the oven is being placed near a grill or stove, a divider must exist between the oven and the open heat source, with a minimum of 6" (152 mm) between the oven and the divider.
- If the oven is being placed near a fryer, a divider must exist between the oven and fryer, with a minimum of 12" (305 mm) between the oven and the divider.
- The height of the divider must be greater than or equal to the height of the oven.



Oven Clearances

Verify the oven location has the following clearances on the top and each side. TurboChef ovens have built-in back bumpers that allow for the necessary spacing from the oven to the back wall.

Oven	Top	Sides
Sŏta / Sŏta Single Mag (i1)	5" (127 mm)	2" (51 mm)
i3	19" (483 mm)	2" (51 mm)
i5	19" (483 mm)	2" (51 mm)
Encore/Encore 2	5" (127 mm)	2" (51 mm)
Tornado	4" (102 mm)	2" (51 mm)
C3	4" (102 mm)	2" (51 mm)
HhC 2620	10" (254 mm)	0" (0 mm)
HhC 2020	10" (254 mm)	0" (0 mm)
HhC 1618	10" (254 mm)	0" (0 mm)
HhB 2	2" (51 mm)	2" (51 mm)
Double Batch	2" (51 mm)	2" (51 mm)
Waterless Steamer (i1)	5" (127 mm)	2" (51 mm)
Panini (i1)	5" (127 mm)	2" (51 mm)
Fire	2" (51 mm)	2" (51 mm)
Bullet	5" (127 mm)	2" (51 mm)

Ventilation

TurboChef ovens must be installed in a well-ventilated space. The space should have an exhaust rate of .70 cfm per square foot of kitchen space and an additional 100 sq. ft. (9.3 m^2) of virtual space per ventless cooking appliance (TurboChef or any other).

If the air inlet is for general exhaust, pursuant to requirements for 507.2.2, paragraph 2, locate the air inlet above the center point of each oven.

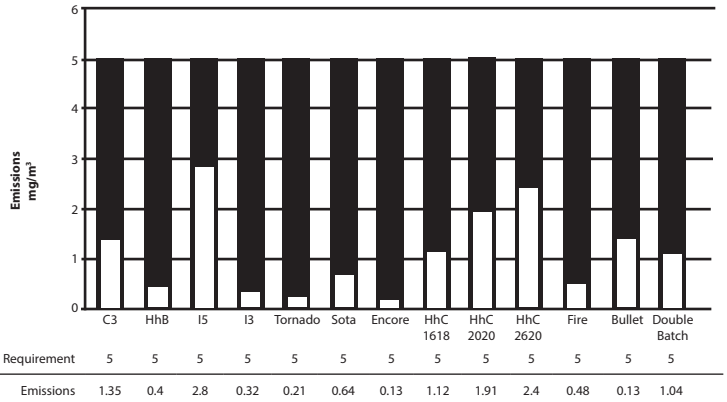
The heat load from TurboChef ovens is mostly sensible. The only latent heat present is due to evaporation during the cooking process. When installing a TurboChef oven, the space must have the following tons of AC per oven installed.

Oven	Tons of AC
Sŏta (i1)	0.29
Sŏta Single Mag (i1)	0.29
i3	0.94
i5	1.31
Encore/Encore 2	0.45
Tornado	0.58
C3	0.63
HhC 2620	1.82
HhC 2020	1.47
HhC 1618	1.00
HhB 2	0.84
Double Batch	1.04
Waterless Steamer (i1)	0.29
Panini (i1)	0.29
Fire	0.50
Bullet	0.13

How the Ovens are Tested

TurboChef ovens are evaluated according to UL. The evaluation entails placing the test oven in an environmental chamber built to capture all emissions escaping during idle, cooking, and door-open conditions. During the eight-hour test period, a typical worst-case food item is cooked continuously, and 100% of condensable and non-condensable emissions from the product are collected and analyzed according to the EPA 202 Test Method. At the conclusion of the test, the total concentration of particulate matter (emissions) must be less than 5.0 mg/m^3 for the oven to be certified for ventless operation. Cooking devices that measure above the 5.0 mg/m^3 threshold are considered to produce grease and must be installed under Type I ventilation, according to International Mechanical Code.

TurboChef ovens are well below the 5.0 mg/m^3 threshold as shown below.



	C3	HhB	I5	I3	Tornado	Sota	Encore	HhC 1618	HhC 2020	HhC 2620	Fire	Bullet	Double Batch
Ventless Requirement	5	5	5	5	5	5	5	5	5	5	5	5	5
Emissions	1.35	0.4	2.8	0.32	0.21	0.64	0.13	1.12	1.91	2.4	0.48	0.13	1.04

NOTE: Certain configurations of TurboChef ovens, such as a triple stacked HhC 2620, may cause emissions to be greater than 5.0 mg/m^3. In these situations, TurboChef recommends that the ovens be installed under a Type I or Type II hood.

Contact Information

For questions regarding a ventless installation, email ventless.help@turbochef.com. For questions or concerns regarding an existing installation, contact Customer Service at 1.800.908.8726, Option 1.