

Introduction

1.0 Introduction

Alliance Source Testing, LLC (AST) was retained by HarbisonWalker International Inc. (HarbisonWalker) to compliance testing at the White Cloud, Michigan facility. The facility operates under Michigan Department of Environment, Great Lakes, and Energy (EGLE) Permit No. 24-10A. Permanent total enclosure (PTE) evaluations were performed on three (3) oven enclosures.

1.1 Process/Control System Descriptions

The HWI facility in White Cloud manufactures refractory. After the bricks are made, they go into one of three natural gas ovens for curing. The ovens are referred to as Oven 1, Oven 2 and the Dryer and are permitted as EUBrickOvens. VOC emissions are collected from the ovens and routed through a catalytic thermal oxidizer and then exhausted to atmosphere. The oxidizer operates at a minimum inlet temperate of 700 degrees Fahrenheit.

1.2 Project Team

Personnel involved in this project are identified in the following table.

**Table 1-1
Project Team**

Facility Personnel	George Monasky – HarbisonWalker
AST Personnel	John Wilson

1.3 Test Protocol & Notification

Testing was conducted in accordance with the test protocol submitted to the EGLE on July 29, 2021.

Summary of Results

2.0 Summary of Results

AST conducted compliance testing at the HarbisonWalker facility in White Cloud, Michigan on September 2, 2021. Testing consisted of completing a Permanent Total Enclosure (PTE) evaluation on three (3) oven enclosures.

Table 2-1 provides a summary of the evaluation. Any difference between the summary results listed in the following table and the detailed results contained in appendices is due to rounding for presentation.

**Table 2-1
Summary of PTE Evaluation**

PTE	# of NDOs	Geometrical Requirements Satisfied	NEAR (<0.05)	Inward Flow Satisfied	Minimum Static Pressure (-0.007" WC)
Oven 1	2	No	0.024	Yes	-0.0100
Oven 2	2	No	0.024	Yes	-0.0090
Oven C	2	No	0.053	Yes	-0.0090

The distance of the source from the NDOs did not meet the geometrical requirements of Method 204 due to the large size of the NDOs and location of the refractory brick on the conveying lines. The operating cycles for the process are setup to mitigate this issue and to ensure that all emissions are captured and controlled. All other Method 204 criteria were met for the enclosures.

Ovens 1 & 2 - The outlet NDO opens for approximately 44 seconds at the beginning of the cycle for the refractory brick to exit to the cooling section. The outlet NDO then closes, and then the inlet NDO opens for approximately 43 seconds at the end of the cycle to allow the refractory brick to enter the oven. Only one of the NDOs is open at a time, per oven. When the oven door is open, the Inlet NDO has 83-113 cfm of air flow inward toward the oven.

Oven C - Oven C has 330-363 cfm of inward flow with the doors shut. When the doors open, the oven has 315-325 cfm of inward flow. Only one door is open at a time.

Each of the three ovens have permanently installed digital manometers to continually monitor the differential pressure inside the ovens. Historical data indicates the ovens continuously maintain -0.20 to -0.5 inches of H₂O at all times. The induced draft fans increase negative pressure in response to the fall in pressure detected when an NDO opens, thus ensuring all possible emissions are 100% captured and routed to the control device.

Testing Methodology

3.0 Testing Methodology

The emission testing program was conducted in accordance with the test methods listed in Table 3-1. Method descriptions are provided in this section.

**Table 3-1
Source Testing Methodology**

Parameter	U.S. EPA Reference Test Methods	Notes/Remarks
Permanent Total Enclosure	204	---

3.1 U.S. EPA Reference Test Method 204 – Temporary Total Enclosures

The following procedures were used to verify 100% of Total Volatile Hydrocarbon emissions are captured at all times.

The equivalent diameters of the natural draft openings (NDOs) and the distances from each TVH emitting point to all (NDOs) were determined. NDO's must be 4 equivalent diameters (ED) from TVH emissions source.

The total surface area (A_T) of the enclosure and the total area (A_N) of all NDO's in the enclosure were measured. The NDO to enclosure area ratio (NEAR) was calculated as follows: $NEAR = A_N/A_T$, the NEAR must be less than or equal to 0.05.

The direction of air flow through all NDO's inward was verified. If FV was less than 9,000 m/hr (500 fpm), the continuous inward flow or air shall be verified using streamers, smoke tubes, tracer gases, or delta P across the enclosure. The direction of air flow was monitored for at least one (1) hour, with checks made no more than 10 minutes apart.

Appendix A



Rectangular Permanent Total Enclosure Analysis

Facility Name: HarbisonWalker - White Cloud, MI

Source: Oven 1

Date: 9/2/21

NDO	Length (in)	Width (in)	Area (ft ²)	Equivalent Diameter (ft)	Equivalent Diameter x4 (ft)	Distance to Nearest Source (ft)	Geometrical Requirements Satisfied?	Velocity of Flow (fpm)	Direction of Flow?	1-hour Observation Required?	Flow Requirements Satisfied?
A	72.0	60.0	30.0	6.2	24.7	2.5	No	113	In	✓	✓
B	72.0	60.0	30.0	6.2	24.7	2.5	No	115	In	✓	✓

**If NDO is not rectangular, then Height and Width are dimensions of the largest area of the NDO.

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Parameter	Enclosure Dimensions										
	1	2	3	4	5	6	7	8	9	10	11
Width, ft	6.50	6.50	86.25	86.25	86.25	86.25	--	--	--	--	--
Height, ft	7.50	7.50	6.50	6.50	7.50	7.50	--	--	--	--	--
Area, ft ²	48.8	48.8	560.6	560.6	646.9	646.9	--	--	--	--	--
Total Area of Enclosure, ft²						2512.5					

Calculations	
Total NDO Area, ft ²	60.0
NEAR (must be less than 0.05)	0.024
Enclosure Static Pressure (< -0.007 in. WC)	-0.0100

**If 500 fpm is met, 1-hour observation is not required.



Rectangular Permanent Total Enclosure Analysis

Facility Name: HarbisonWalker - White Cloud, MI

Source: Oven 2

Date: 9/2/21

NDO	Length (in)	Width (in)	Area (ft ²)	Equivalent Diameter (ft)	Equivalent Diameter x4 (ft)	Distance to Nearest Source (ft)	Geometrical Requirements Satisfied?	Velocity of Flow (fpm)	Direction of Flow?	1-hour Observation Required?	Flow Requirements Satisfied?
A	72.0	60.0	30.0	6.2	24.7	2.5	No	122	In	✓	✓
B	72.0	60.0	30.0	6.2	24.7	2.5	No	96	In	✓	✓

**If NDO is not rectangular, then Height and Width are dimensions of the largest area of the NDO.

Parameter	Enclosure Dimensions										
	1	2	3	4	5	6	7	8	9	10	11
Width, ft	6.50	6.50	86.25	86.25	86.25	86.25	--	--	--	--	--
Height, ft	7.50	7.50	6.50	6.50	7.50	7.50	--	--	--	--	--
Area, ft ²	48.8	48.8	560.6	560.6	646.9	646.9	--	--	--	--	--
Total Area of Enclosure, ft²						2512.5					

Calculations	
Total NDO Area, ft ²	60.0
NEAR (must be less than 0.05)	0.024
Enclosure Static Pressure (< -0.007 in. WC)	-0.0090

**If 500 fpm is met, 1-hour observation is not required.



Rectangular Permanent Total Enclosure Analysis

Facility Name: HarbisonWalker - White Cloud, MI

Source: Oven C

Date: 9/2/21

NDO	Length (in)	Width (in)	Area (ft ²)	Equivalent Diameter (ft)	Equivalent Diameter x4 (ft)	Distance to Nearest Source (ft)	Geometrical Requirements Satisfied?	Velocity of Flow (fpm)	Direction of Flow?	1-hour Observation Required?	Flow Requirements Satisfied?
A	72.00	81.96	41.0	7.2	28.9	2.5	No	350	In	✓	✓
B	72.00	81.96	41.0	7.2	28.9	2.5	No	383	In	✓	✓

**If NDO is not rectangular, then Height and Width are dimensions of the largest area of the NDO.

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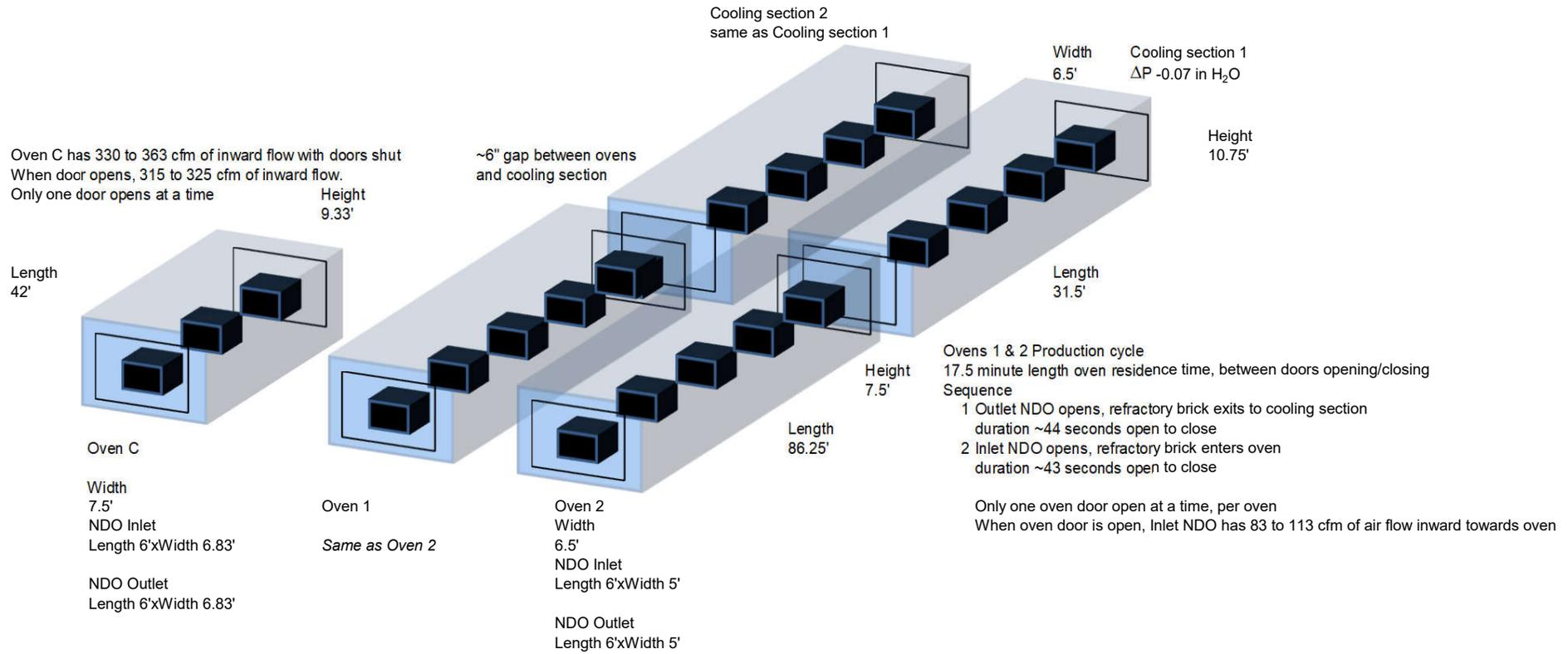
Parameter	Enclosure Dimensions										
	1	2	3	4	5	6	7	8	9	10	11
Width, ft	7.50	7.50	42.00	42.00	42.00	42.00	--	--	--	--	--
Height, ft	9.33	9.33	7.50	7.50	9.33	9.33	--	--	--	--	--
Area, ft ²	70.0	70.0	315.0	315.0	391.9	391.9	--	--	--	--	--
Total Area of Enclosure, ft²						1553.7					

Calculations	
Total NDO Area, ft ²	82.0
NEAR (must be less than 0.05)	0.053
Enclosure Static Pressure (< -0.007 in. WC)	-0.0090

**If 500 fpm is met, 1-hour observation is not required.

Appendix B

Both Cooling sections are under 722 to 836 cfm of inward flow at all times.



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