OWNER'S MANUAL

MODEL:	**9K9-117C91-9NCHS**
SERIAL NUMBER:	**7604**
MANUFACTURED FOR:	**United Supertek**
SHIP DATE:	**July 2000**

SIERRATHERM

SIERRATHERM

PRODUCTION FURNACES INC.

200 Westridge Drive
Watsonville, CA 95076

PROCUREMENT SPECIFICATION

SIERRATHERM SERIES 9500

MODEL 9K9-117C91-9NCHS

CONTROLLED ATMOSPHERE CONVEYOR FURNACE

1. General Description

This specification describes a multiple zone, electrically heated, conveyor furnace capable of operating to 1050 degrees centigrade. The furnace includes a controlled nitrogen and hydrogen atmosphere system for the primary application of processing copper thick film materials and alloy brazing.

2. General Specification Overview

		Inch
A.	Belt Width:	9
B.	Heated Length:	117
C.	Cooling Length:	91
D.	Product Clearance Above Belt:	1.0
E.	Dimensions:	
	Entry/Exit Tables:	24
	Overall Length:	292
	Height:	50
	Width:	44
	Conveyor Height:	36
	Leveling Range:	± 1
F.	Belt Speed Range:	
	Minimum	1.0/min
	Maximum	10.0/min
G.	Number Of Heated Zones:	9
H.	Atmosphere:	Nitrogen or Hydrogen*
I.	Input Power:	200/240 VAC 3 Phase, 3 Wire 50/60 Hz 46 KVA Max
J.	Approximate Weight:	4000 lbs

* with exchange of exhaust extractor system

3. Furnace Muffle Assembly

A. **Muffle material:** The process muffle is fabricated from Inconel 601 alloy and extends throughout the entrance, heated length and insulated cooling. Channel shaped hearth plates fitted into the floor of the muffle provide the support for the conveyor belt.

B. **Exhaust Extractor assembly:** A variable flow, air amplifier (3 each) powered, exhaust extractor is located at the entrance end of the furnace. The exhaust amplifiers are connected to the burnout atmosphere extractor/gas inlet manifold that is removable from the entrance end of the muffle. The burnout atmosphere extractor/gas inlet manifold injects nitrogen gas and removes exhaust/binder products at multiple points throughout the burnout section (zones 1 through 4).

Note: The removable extractor can be replaced with the curtain assembly provided when the furnace is to be used for brazing applications.

C. **Atmosphere burn-off assemblies:** Atmosphere burn-off ports are located at the entry and exit ends of the heated section. Each assembly consists of dual filament hot wire ignitors. These burn-off ports can be closed during copper firing processes (when the exhaust extractor from B. is in use).

D. **Baffle door/Gas curtain assembly:** Removable, stainless steel, baffle doors and gas curtain assemblies are located at the entry and exit ends of the furnace.

E. **Water cooling module:** The cooling module is fabricated from stainless steel and incorporates removable, aluminum, water cooled plates on the top and bottom of the cooling muffle.

4. Heated Section

A. **Nominal operating temperature**: Ambient to 1050
degrees centigrade.

B. **Heating method**: Kanthal A-1 (or equivalent) wire coils embedded and fully enclosed in highly responsive, low mass ceramic fiber element modules located above and below the conveyor belt.

C. **Insulation**: Multi-Layered, thermally optimized, graded, insulation provides efficient thermal stability, cool external panel surfaces and minimal heat loss. Low mass refractory materials are utilized throughout the heated chamber resulting in maximum thermal responsiveness.

5. Furnace Layout		**Inch**	**kVA**	
A.	Entrance, including gas curtain and baffle door assembly.	36		
B.	Zone 1	13	4.8	
	Zone 2		13	4.8
	Zone 3		13	4.8
	Zone 4		13	4.8
	Zone 5		13	4.8
	Zone 6		13	4.8
	Zone 7		13	4.8
	Zone 8		13	4.8
	Zone 9		13	4.8
C.	Insulated Cooling	18		
D.	Water Cooling Module, including exit Gas Curtain and baffle door assembly		73	

Note:
The standard cooling method for the Graduated Cooling Module is facility water, @ 60 GPH/60 PSI. The water cooling system includes temperature readout and High/Low process alarms through the MicroTherm controller,
and a flow switch which activates an audible and visual alarm in the event of low flow conditions.

6. Loading/Unloading Tables		**Inch**
A.	Loading Table	
	Width:	43
	Length:	24
B.	Unloading Table	
	Width:	43
	Length:	24

7. Conveyor System

A. Belt Type: Columbium Stabilized, Nichrome V, 9 inches wide.
B. Belt Mesh: Balanced Spiral 42-27-16
C. Belt Loading: 1 pound per square foot
D. Belt Speed: 1-10 inches/min,
E. Speed Control: Microprocessor controlled, closed loop, digital feedback, ± 0.1% accuracy

Note :1

The belt speed range specified above refers to adjustability of belt speed only and does not imply compliance with load and temperature requirements over the entire range of belt speed adjustability.

8. Temperature Control System

The furnace is controlled with a **Micro**Therm temperature control system. The **Micro**Therm is a high performance, single board computer with full PID and control for up to 16 furnace channels. Each furnace zone is monitored and controlled using a type 'K' thermocouple in the center of each heated zone. The **Micro**Therm incorporates closed loop conveyor speed control accurate to ± 0.1%.

(See separate **Micro**Therm specification for a comprehensive list of temperature control system features.)

9. User Interface System

A Pentium based PC with a VGA Color Monitor is provided for user interface. The User Interface Computer communicates with the Temperature Controller on a high speed serial link. A complete description of the User Interface features is described in a separate specification.

10. Over Temperature Safety Protection

The furnace is supplied with a redundant over temperature safety protection system which incorporates an additional type K thermocouple in the center of each controlled zone.

11A. Atmosphere Control System for Copper Thick Film Firing Configuration

A. The following flow meters supply atmosphere to the process chamber:

		SCFH
1.	Entry Curtain N2	0-600
2.	Burnout Atmosphere Distributor #1 N2	0-400
3.	Burnout Atmosphere Distributor #1 Air	0-.5
4.	Burnout Atmosphere Distributor #2 N2	0-400
5.	Burnout Atmosphere Distributor #2 Air	0-.5
6.	Burnout Atmosphere Distributor #3 N2	0-400
7.	Burnout Atmosphere Distributor #3 Air	0-.5
8.	Firing Atmosphere Distributor N2	0-600
9.	Firing Atmosphere Distributor Air	0-5
10.	Exit Curtain N2	0-600
B.	Exhaust Extractor (3 each Air Amplifier)	0-80 PSIG

Note 1:

The furnace is supplied with a removable, variable flow, air amplifier powered (3 each), exhaust burnout extractor located at the end of the furnace. Four panel mounted exhaust condition monitors and flow regulators are provided for the extractor.

Note 2:

An audible alarm and visual indicator is provided, and will activate in the event of low pressure in the gas supply line.

11B. Atmosphere Control System for Hydrogen Brazing Configuration

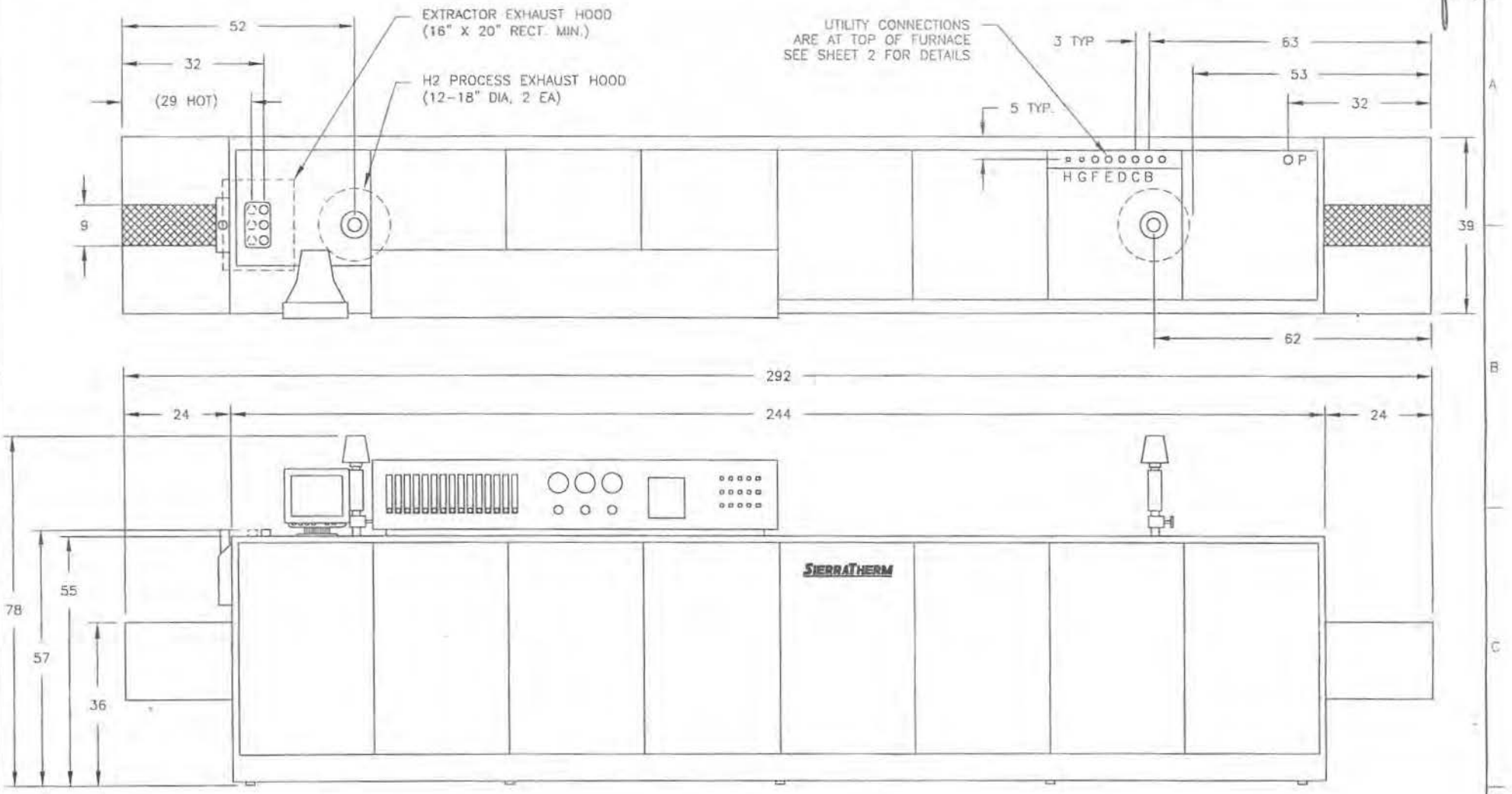
13. Operating Instruction Manuals

A. The furnace is supplied with two copies of instruction manuals covering all phases of installation, operation, and maintenance procedures.

14. Code Compliance

SierraTherm production equipment is manufactured in compliance with the National Electric Code (NEC). Any requirements for compliance with local codes or customer specifications must be supplied to SierraTherm and agreed to by SierraTherm prior to order acceptance. Costs for third party inspections or certifications of the equipment shall be the responsibility of the customer unless specifically stated.

DATE	REV	REVISION RECORD	DR	CH
5/10/00	A	PRODUCTION RELEASE	RG	



NOTES:

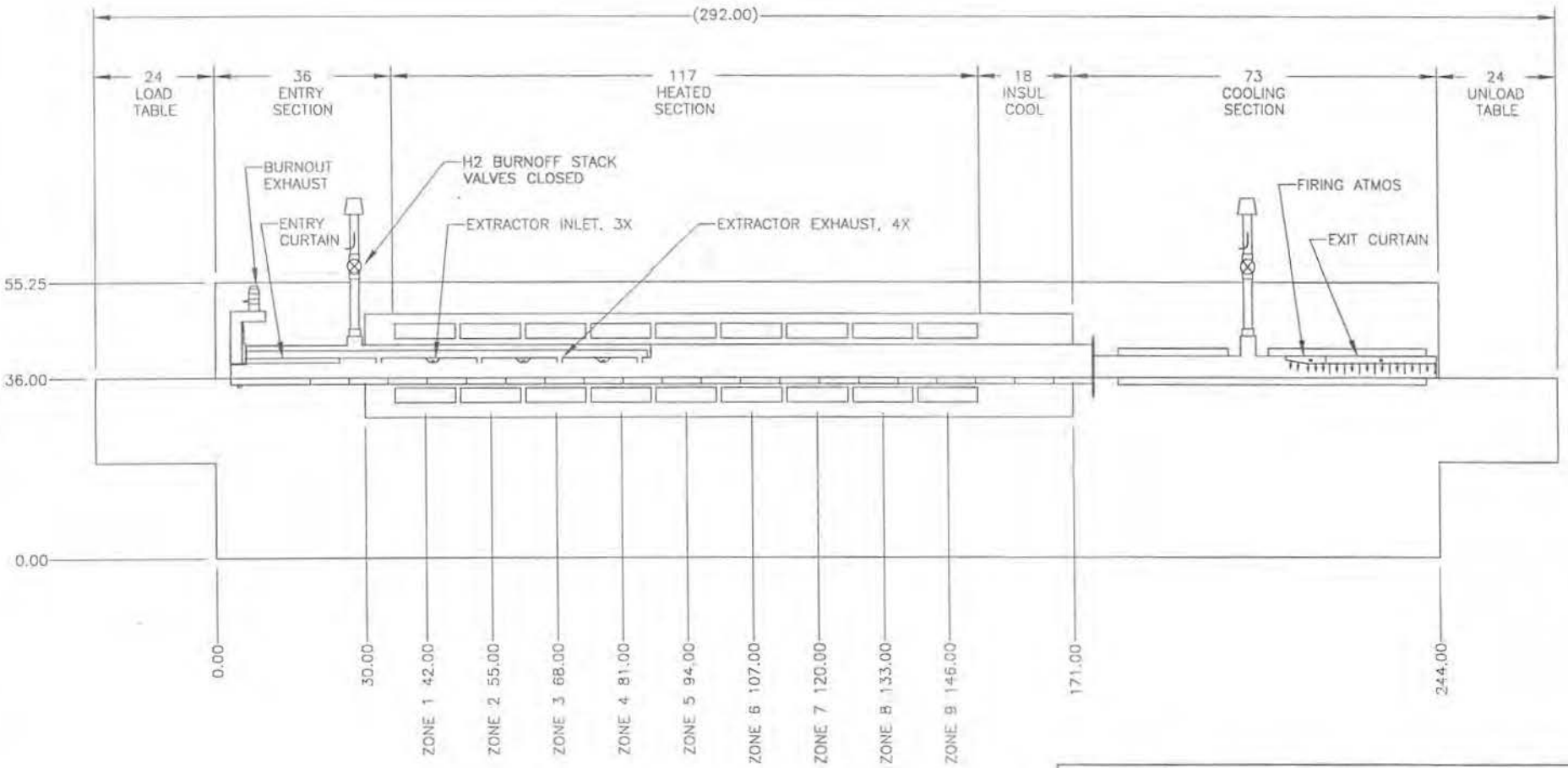
1. RAISE FURNACE UP ON TO THE LEVELING LEGS BEFORE MAKING THE UTILITY CONNECTIONS. THE LEVELING LEGS ARE INSTALLED IN THE FULLY RAISED POSITION AT THE FACTORY – IT WILL BE NECESSARY TO REMOVE THE OUTER PANELS TO REACH THEM.
2. CUSTOMER TO PROVIDE ALL SHUT-OFF VALVES, PRESSURE REGULATORS, FILTERS, AND ELECTRICAL DISCONNECT.
3. SEE SHEET 2 FOR UTILITIES REQUIREMENTS.

SIERRATHERM PRODUCTION FURNACES
200 WESTRIDGE DRIVE
WATSONVILLE, CA 95076
(408)763-0117

DATE: 5/10/00	TITLE: 9K9-117C91-9NCHS OUTLINE & UTILITY CONNECTIONS
SCALE: NONE	
DRAWN BY: RG	
APPR. BY:	
SHEETS: 1 OF 2	
TOLERANCE: .XX = ± .06, .XXX = ± .005, ANGLE = .5°	DRW NO: 6-90-95067 REV A

DATE	REV	REVISION RECORD	DR	CK
7/26/00	A	PRODUCTION RELEASE	RG	

COPPER FIRING OPERATION



9 ZONES @ 13" EACH

SIERRATHERM

SIERRATHERM PRODUCTION FURNACES
200 WESTRIDGE DRIVE
WATSONVILLE, CA 95076
(831)763-0117

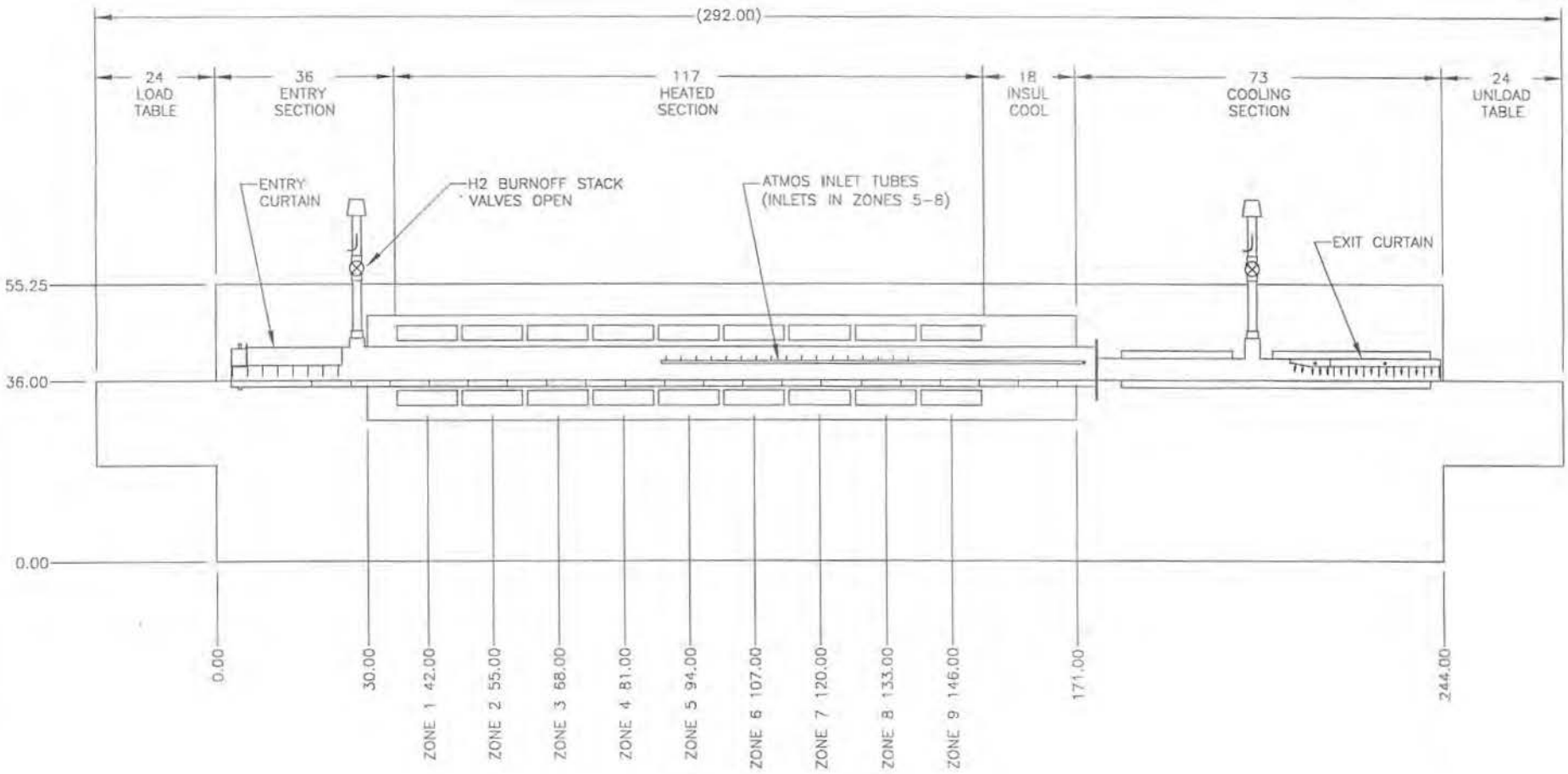
DATE: 7/26/00
SCALE: NONE
DRAWN BY: RG
APPR. BY:
SHEETS: 1 OF 2
TOLERANCE:
XX = ± .06
.XXX = ± .005
ANGLE = ± .5°

TITLE:

FURNACE LAYOUT
9K9-117C91-9NCHS

DRW NO: 6-90-95068 REV A

HYDROGEN OPERATION



9 ZONES @ 13" EACH

DO NOT SCALE DRAWING.

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DRW NO:	SHEETS:	REV
6-90-95068	2 OF 2	A