City of Portland, Maine - Building or Use Permit Application

389 Congress Street, 04101 Tel: (207) 874-8703, Fax: (207) 874-8716

PERMIT ISSUED JAN 20 2002 CITY OF PORTLAND

	2-0020		CBL: 013 I043001
Location of Construction: 59 Washington Ave	Owner Name: A & M Partners Llc	Owner Address: 120 Exchange St	Phone: 207-772-1333
Business Name: n/a	Contractor Name: Coombs, Ben	Contractor Address: 17 Freeman Street Portland	Phone: 2077744547
Lessee/Buyer's Name: n/a	Phone: n/a	Permit Type: Change of Use - Commercial	Zone: B-1

Past Use:	Proposed Use:	Permit Fee:	Cost of Work:	CEO District:
Commercial / Vacant	Commercial / Change of Use; Prior use was a boiler room in old J.J. Nissen Bakery Building. Change to Glassblowing studio and small retail space.	$93.00	$10,000.00	1

FIRE DEPT: ☑ Approved ☐ Denied

Signature:

INSPECTION: Use Group: F-2 Type: 3B5 BOCA 99

Signature:

Proposed Project Description:
Change of Use

Studios for Artists & Crafts People

PEDESTRIAN ACTIVITIES DISTRICT (P.A.D.)

Action: ☐ Approved ☐ Approved w/Conditions ☐ Denied

Signature: Date:

Permit Taken By:	Date Applied For:
gg	01/09/2002

1. This permit application does not preclude the Applicant(s) from meeting applicable State and Federal Rules.
2. Building permits do not include plumbing, septic or electrical work.
3. Building permits are void if work is not started within six (6) months of the date of issuance. False information may invalidate a building permit and stop all work..

Zoning Approval

Special Zone or Reviews	Zoning Appeal	Historic Preservation
☐ Shoreland N/A	☐ Variance	☑ Not in District or Landmark
☐ Wetland	☐ Miscellaneous	☐ Does Not Require Review
☐ Flood Zone	☐ Conditional Use	☐ Requires Review
☐ Subdivision	☐ Interpretation	☐ Approved
☐ Site Plan N/A - wetland 5,000	☐ Approved	☐ Approved w/Conditions
Maj ☐ Minor ☐ MM ☐	☐ Denied	☐ Denied
Date: 1/11/02	Date:	Date:

CERTIFICATION

I hereby certify that I am the owner of record of the named property, or that the proposed work is authorized by the owner of record and that I have been authorized by the owner to make this application as his authorized agent and I agree to conform to all applicable laws of this jurisdiction. In addition, if a permit for work described in the application is issued, I certify that the code official's authorized representative shall have the authority to enter all areas covered by such permit at any reasonable hour to enforce the provision of the code(s) applicable to such permit.

SIGNATURE OF APPLICANT ADDRESS DATE PHONE

RESPONSIBLE PERSON IN CHARGE OF WORK, TITLE DATE PHONE

BUILDING PERMIT INSPECTION PROCEDURES

Please call 874-8703 or 874-8693 to schedule your inspections as agreed upon

Permits expire in 6 months, if the project is not started or ceases for 6 months.

The Owner or their designee is required to notify the inspections office for the following inspections and provide adequate notice. Notice must be called in 48-72 hours in advance in order to schedule an inspection:

By initializing at each inspection time, you are agreeing that you understand the inspection procedure and additional fees from a "Stop Work Order" and "Stop Work Order Release" will be incurred if the procedure is not followed as stated below.

BC **Pre-construction Meeting:** Must be scheduled with your inspection team upon receipt of this permit. Jay Reynolds, Development Review Coordinator at 874-8632 must also be contacted at this time, before **any** site work begins on any project other than single family additions or alterations.

N/A **Footing/Building Location Inspection:** Prior to pouring concrete

N/A **Re-Bar Schedule Inspection:** Prior to pouring concrete

N/A **Foundation Inspection:** Prior to placing ANY backfill

N/A **Framing/Rough Plumbing/Electrical:** Prior to any insulating or drywalling

BC **Final/Certificate of Occupancy:** Prior to any occupancy of the structure or use. NOTE: There is a $75.00 fee per inspection at this point.

Certificate of Occupancy is not required for certain projects. Your inspector can advise you if your project requires a Certificate of Occupancy. All projects DO require a final inspection

BC **If any of the inspections do not occur, the project cannot go on to the next phase, REGARDLESS OF THE NOTICE OR CIRCUMSTANCES.**

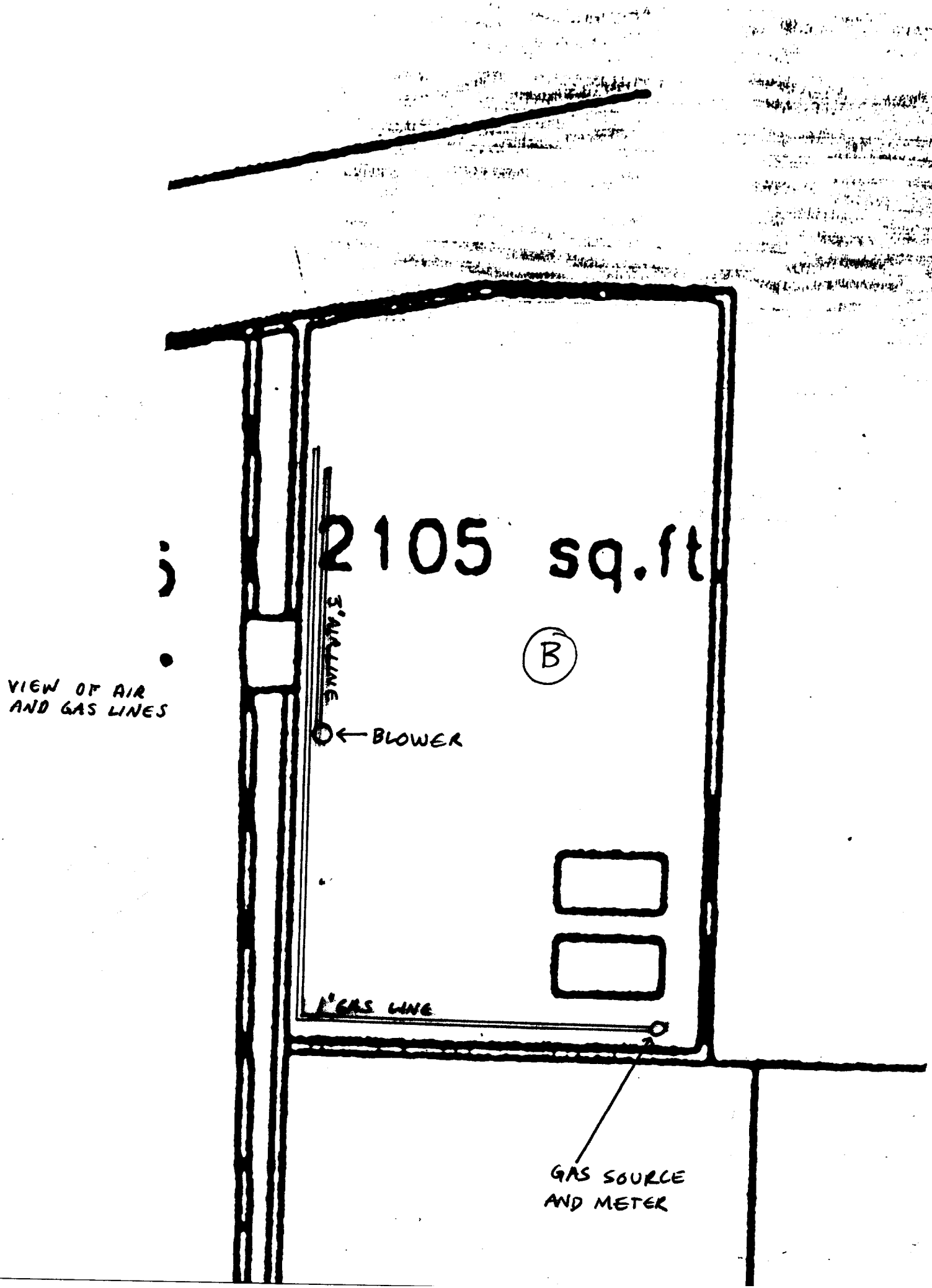
BC **CERIFICATE OF OCCUPANICES MUST BE ISSUED AN PAID FOR, BEFORE THE SPACE MAY BE OCCUPIED**

Bug Cooler — 1/29/02

Signature of applicant/designee — Date

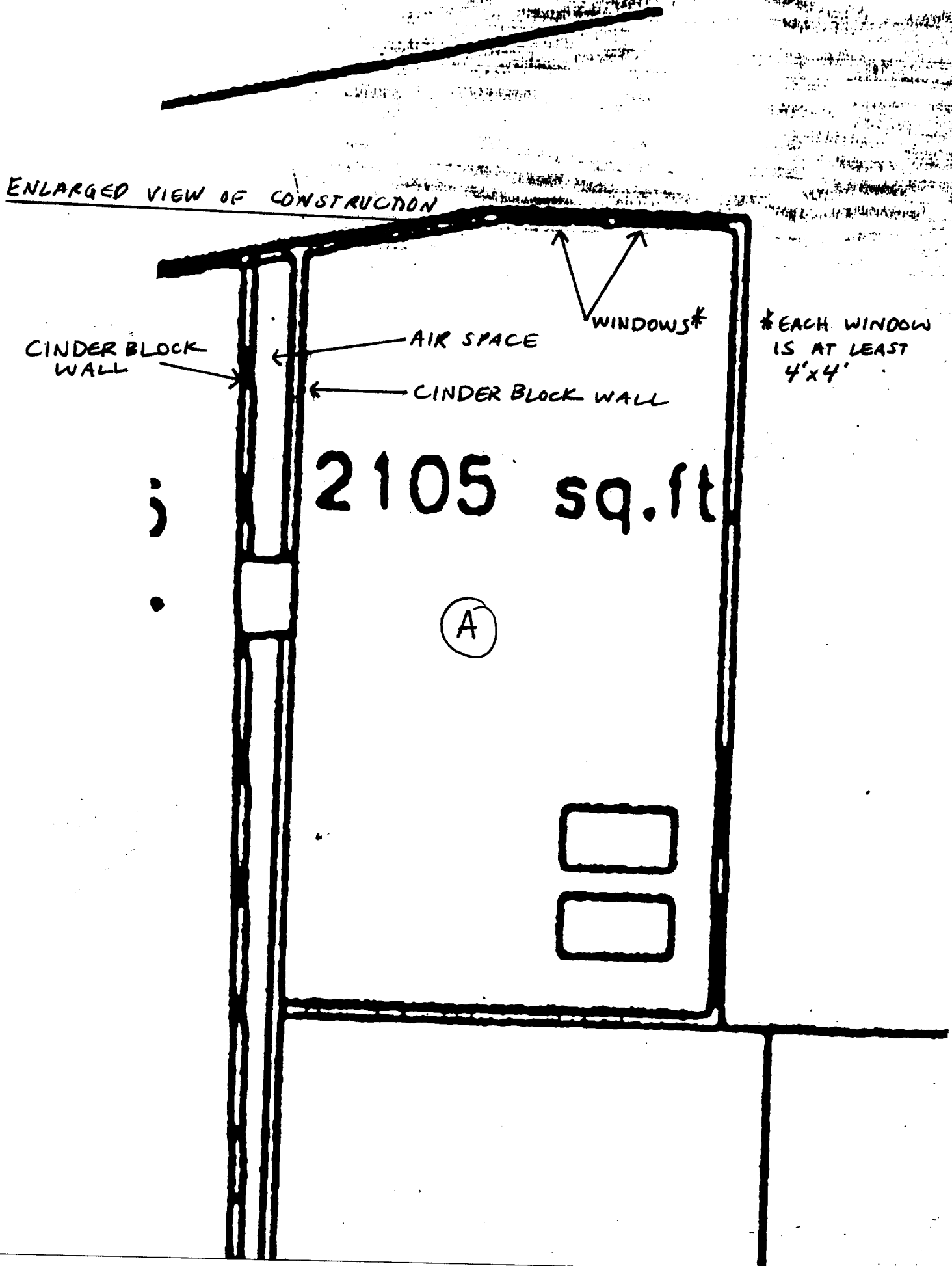
Signature of Inspections Official — 1/29/02 Date

CBL: 13-I-43 Building Permit #: 02-0020



VIEW OF AIR
AND GAS LINES

ENLARGED VIEW OF CONSTRUCTION



Application ID Number: 2-0020

Department: Zoning Status: Approved with Conditions Reviewer: Marge Schmuckal

Comments: 59 Washington Ave Approval Date: 01/11/2002

Sign Out Date: 01/11/2002

☑ OK to Issue Permit Name: Marge Schmuckal Date: 01/11/2002 Date 2:

Conditions Section:

This permit is being approved on the basis of plans submitted. Any deviations shall require a separate approval before starting that work.

Separate permits shall be required for any new signage.

Create Date: 01/10/2002 By: gg Update Date: 01/11/2002 By: mes

DEPT. OF BUILDING INSPECTION
CITY OF PORTLAND, ME
JAN - 9 2002

All Purpose Building Permit Application

If you or the property owner owes real estate or personal property taxes or user charges on any property within the City, payment arrangements must be made before permits of any kind are accepted.

Location/Address of Construction: 59 WASHINGTON AVE, PORTLAND		
Total Square Footage of Proposed Structure	Square Footage of Lot	
Tax Assessor's Chart, Block & Lot Chart# 013 Block# I Lot# 043	Owner: CB BOULOS CO. A & M PARTNERS, LLC	Telephone: CB BOULOS 772-1333
Lessee/Buyer's Name (If Applicable)	Applicant name, address & telephone: BEN COOMBS 17 FREEMAN ST (207 774 4547) PORTLAND, ME 04103	Cost Of Work: $10,000 Fee: $93.00

Current use: VACANT

If the location is currently vacant, what was prior use: BOILER ROOM IN OLD J.J. NISSEN BAKERY BUILDING

Approximately how long has it been vacant: 3 YEARS

Proposed use: GLASSBLOWING FACILITY

Project description: CHANGE OF USE
CONSTRUCT AND INSTALL A GLASSBLOWING STUDIO AND SMALL RETAL SPACE

Contractor's name, address & telephone: BEN COOMBS
17 FREEMAN ST., PORTLAND, ME 04103 (774.4547)

Who should we contact when the permit is ready: BEN COOMBS

Mailing address: 17 FREEMAN ST.
PORTLAND, ME 04103

Phone: 774 4547

IF THE REQUIRED INFORMATION IS NOT INCLUDED IN THE SUBMISSIONS THE PERMIT WILL BE AUTOMATICALLY DENIED AT THE DISCRETION OF THE BUILDING/PLANNING DEPARTMENT, WE MAY REQUIRE ADDITIONAL INFORMATION IN ORDER TO APROVE THIS PERMIT.

JAN - 9

I hereby certify that I am the Owner of record of the named property, or that the owner of record authorizes the proposed work and that I have been authorized by the owner to make this application as his/her authorized agent. I agree to conform to all applicable laws of this jurisdiction. In addition, if a permit for work described in this application is issued, I certify that the Code Official's authorized representative shall have the authority to enter all areas covered by this permit at any reasonable hour to enforce the provisions of the codes applicable to this permit.

Signature of applicant: Benjamin R. Coombs	Date: 1.09.02

This is not a permit, you may not commence ANY work until the permit is issued

Portland Glassblowing Studio 17 Freeman Street Portland, ME 04103

To Whom It May Concern:

This letter is in regards to the attached Change of Use Permit. I would like to explain what function the pieces of equipment drawn out in the following pages perform. I would also like to touch on my experience with glass equipment fabrication.

The glass furnace is basically a gas-fired kiln that melts the raw material for glass, then holds the glass at a working temperature. Although I did the design for this furnace, it is a standard composition for such a piece of equipment. The kiln runs on natural gas and forced air. Abell Combustion in Pennsylvania is designing the safety system on this furnace. Steven Abell is the owner of this company and has worked with other glassblowers around the Northeast to help them with their needs. This system is to be installed to his specifications by licensed gas technicians and electricians in the Portland area (I think it's important to have local support that can be called in when needed). This system is U.L. and FM approved.

The Glory Hole is just like a blacksmith's forge, only with a slightly different configuration. Unlike the furnace, this piece is turned on and off each day. It uses the same safety system as the furnace, except for the flame-sensor. The flame sensor on the furnace watches the burner head to make sure there is a flame at all times. If the flame goes out, it turns the system down. The sensor acts as my eyes when I am not in the shop. Since I monitor the Glory Hole throughout the day, it doesn't require this sensor. The burner head for both the furnace and the glory hole are manufactured by Joppa Glassworks in New Hampshire and are U.L. approved.

The Annealer is essentially a ceramics kiln that performs a different function. A ceramic kiln "fires" the pots to a certain temperature and then shuts off. An Annealer is a kiln that is bought up to around 1000°F (a ceramic kilns low-fire temp. is 1600°F) and the finished vase made of glass is loaded into this kiln and than cooled down slowly over about 12 hours. This process of "annealing" relieves stresses within the glass. If you were to make a vase and set it on the floor, the outside would cool faster than the inside and cause the piece to break. This oven is to be controlled by a computer (U.L. Approved) that is made here in Portland by a company called Digitry.

The ventilation hood is just a means to let some of the heat escape the room. There are no odors caused by the equipment underneath, and the air escaping through the ceiling vent is not more that a couple hundred degrees Fahrenheit. Simply leaving the door to the building ajar supplies the replacement air to the room. I would like to note that all the measurements are approximate. Standard refractory bricks are 4.5x9x2.5 inches, but they do vary slightly so some things may come out slightly larger or smaller.

Windows Fixed Partially Open

Personally I have been in the Glass business for about nine years now. I studied it in college where I earned a BFA in Sculpture (mainly fabricated steel sculpture) and Glass. In school I was responsible for the upkeep of the studio equipment and studied under, Doug Ohm, who is an excellent glass equipment designer/builder who is now the head tech at the Creative Glass Center of America in Millville, N.J. I also worked for eight summers at the Pilchuck Glass School. Pilchuck is the premier glass school in the country. It attracts faculty and students from dozens of different states and countries. At Pilchuck I was a technician for their glass equipment. I built several pieces of glassblowing equipment for them, including the design, and fabrication. I also participated in a workshop at Pilchuck to build a "continuous melt furnace" that holds 2000 pounds of glass. A continuous melt furnace allows you to work the glass from one end, and add more raw materials in the other. Aside from maintaining studio equipment at Pilchuck, I also was responsible for monitoring the students and keeping them safe. Aside from my experiences at Pilchuck, I worked at Benjamin Moore, inc. (BMI). BMI is a private glass studio in Seattle, WA. Some of the best glassblowers in the world make their work at BMI, including Dale Chihuly, Dante Marioni, and Richard Royal. I was also responsible for studio maintenance at this location. Equipment at BMI had to be maintained to exacting standards to meet the needs of these artists.

Thank you,

Ben Coombs

Ben Coombs

Ben Coombs
17 Freeman St.
Portland, Maine 04103
(207)774-4547

professional experience:

Sept. 1997-Oct. 2001	Benjamin Moore, Inc., Seattle, Wa.: Coldworker Provided quality work grinding and polishing glass pieces as needed, and maintained the equipment in the studio.
May/June 2000	Pilchuck Glass School staff: Hot Shop Technician Coordinated repair and building of new equipment. Including plumbing in of propane equipment, designing and rebuilding open flame equipment, and troubleshooting kilns and other electrical equipment. Facilitated and oversaw use of the studio equipment.
May/June 1999	Pilchuck Glass School staff: Cold Shop Coordinator Coordinated use of the studio. Maintained and installed equipment, including maintenance on electric motors, sweated in water lines with copper pipe
May-July 1998	Pilchuck Glass School staff: Cold Shop Coordinator
1996-97	Independent contractor working for glass studios in the Seattle area. Helping with production of items, and studio maintenance.
Fall 1995	Production Manager, studio assistant: Davlin Crystal, Boston, Ma. Oversaw production of work, quality control, taking orders, and packaging and shipping of work.

education:

1991-1995	BFA Hartwick College, Oneonta, New York
1996	Furnace Building Workshop Pilchuck Glass School—workshop led by Marc Gibeau

hysical Properties	**K-20**	**K-23**	**K-25**
ecommended Hot Face temperature,°F *(°C)*	2000 *(1093)*	2300 *(1260)*	2500 *(1371)*
lelting temperature,°F *(°C)*	2750 *(1510)*	2750 *(1510)*	2800 *(1538)*
ensity, avg (ASTM C 134)			
b/9" straight, *(kg)*	1.8 *(0.81)*	1.8 *(0.82)*	2.2 *(1)*
ocf *(kg/m³)*	30 *(481)*	31 *(497)*	38 *(609)*
lodulus of rupture, (ASTM C 133)			
osi *(kg/cm²)*	110 *(7.74)*	120 *(8.44)*	140 *(9.85)*
old crushing strength, (ASTM C 133)			
osi *(kg/cm²)*	125 *(8.79)*	145 *(10.19)*	220 *(15.47)*
ermanent linear change, % (per ASTM C 120)			
@1950°F *(1066°C)*	0	–	–
@2250°F *(1232°C)*	–	0	–
@2350°F *(1288°C)*	–	–	–
@2450°F *(1343°C)*	–	–	-0.5
eformation under hot load, % @ 10psi (ASTM C 16)			
½ hr @ 1950°F *(1066°C)*	0	0	–
½ hr @ 2200°F *(1204°C)*	–	0.2	0.1
oefficient of reversible thermal expansion			
n/in°F	3.0 x 10^{-6}	3.0 x 10^{-6}	3.1 x 10^{-6}

hemical Analysis			
lumina, Al_2O_3	39	39	45
ilica, SiO_2	44	44	38
erric oxide, Fe_2O_3	0.4	0.4	0.2
itanium oxide, TiO_2	1.5	1.5	1.4
alcium oxide, CaO	16	16	14.5
lagnesium oxide, MgO	0.1	0.1	0.1
lkalies, as, Na_2O	0.4	0.4	0.5

hermal Conductivity			
lean temperature			
@ 500°F *(260°C)*	0.93	0.95	1.12
@ 1000°F *(538°C)*	1.16	1.18	1.28
@ 1500°F *(815°C)*	1.44	1.45	1.46
@ 2000°F *(1093°C)*	–	1.74	1.65

ata are average results of tests conducted under standard pro-
dures and are subject to variation.

Data contained in this brochure are intended as a guide only. For specifications and estimating purposes, contact your nearest Thermal Ceramics representative.

Thermal Ceramics Marketing Offices

ıermal Ceramics Americas
02 Old Savannah Road
ıgusta, Georgia 30903
706 796 4200
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mail: tceramics@thermalceramics.com

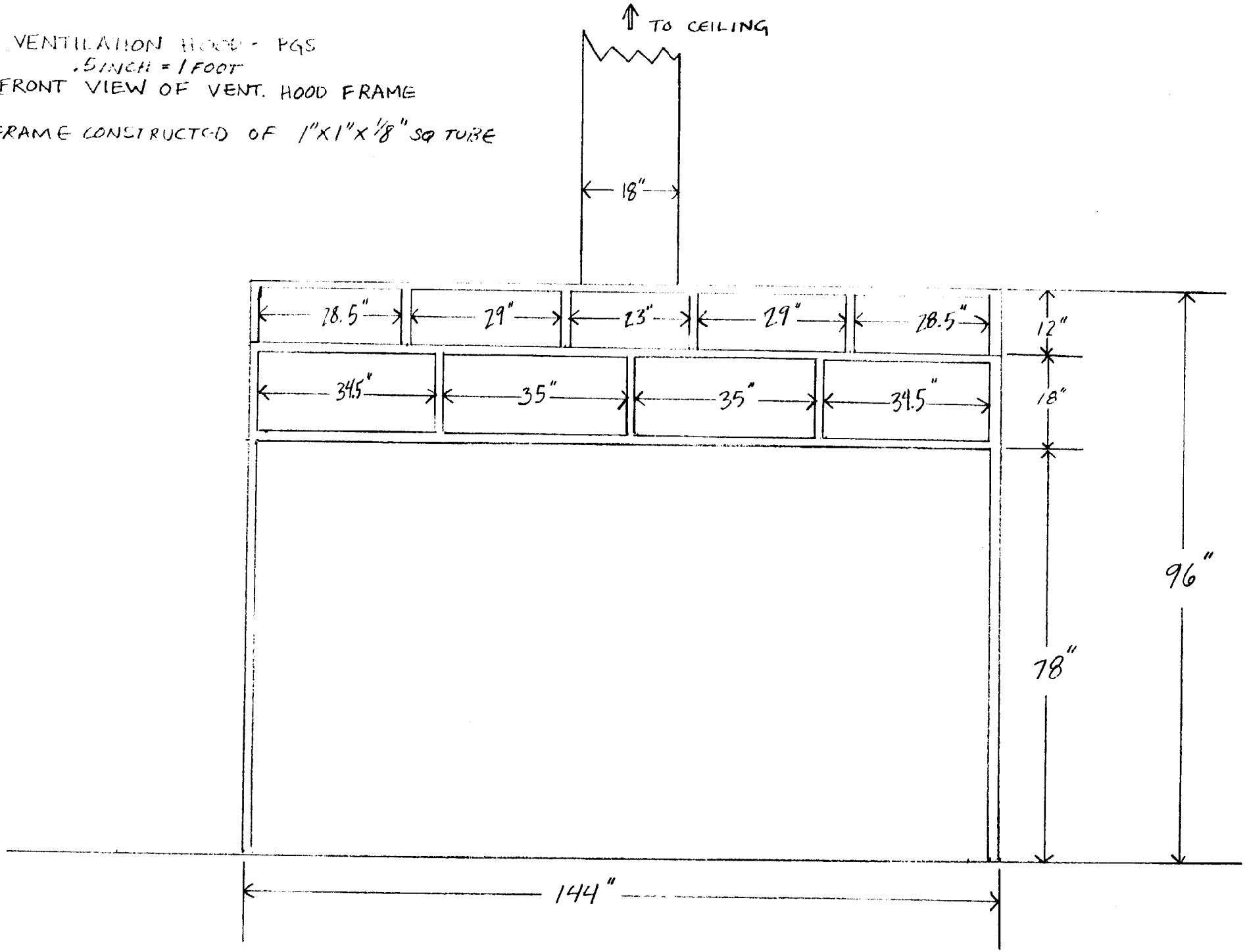
Thermal Ceramics Asia Pacific
28 Jalan Kilang Barat
Kewalram House
Singapore 159362
T: 65 273 1351 F: 65 273 0165
E-mail: thermalceramics@tcasia.com.sg

Thermal Ceramics Europe
Tebay Road
Bromborough Wirral
CH62 3PH England
T: 44 0 151 334 4030 F: 44 0 151 334 1684
E-mail: marketing@thermalceramics.co.uk

Website: www.thermalceramics.com

VENTILATION HOOD - PGS
.5 INCH = 1 FOOT
FRONT VIEW OF VENT. HOOD FRAME

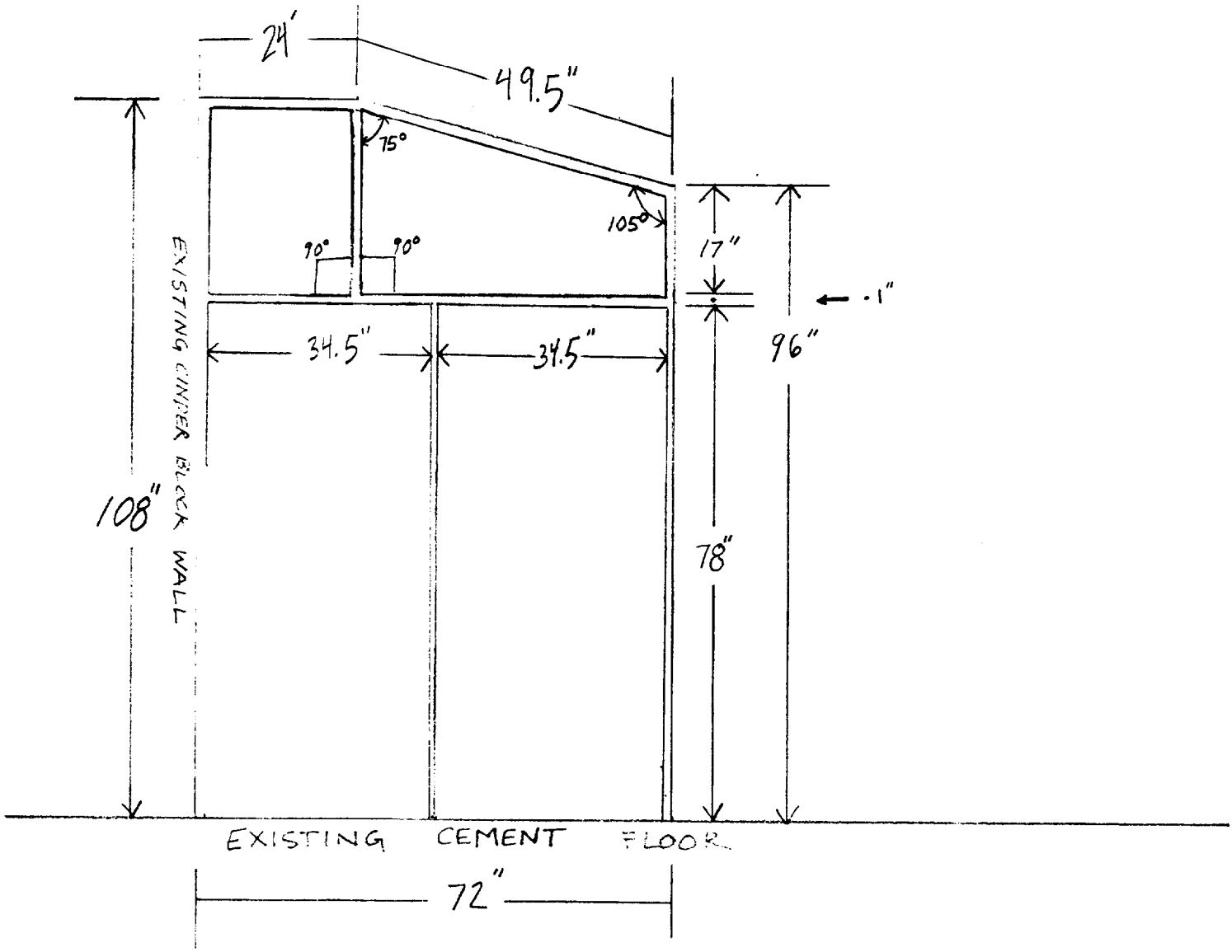
FRAME CONSTRUCTED OF 1"X1"X 1/8" SQ TUBE



VENTILATION HOOD - PGS

.5 INCH = 1 FOOT

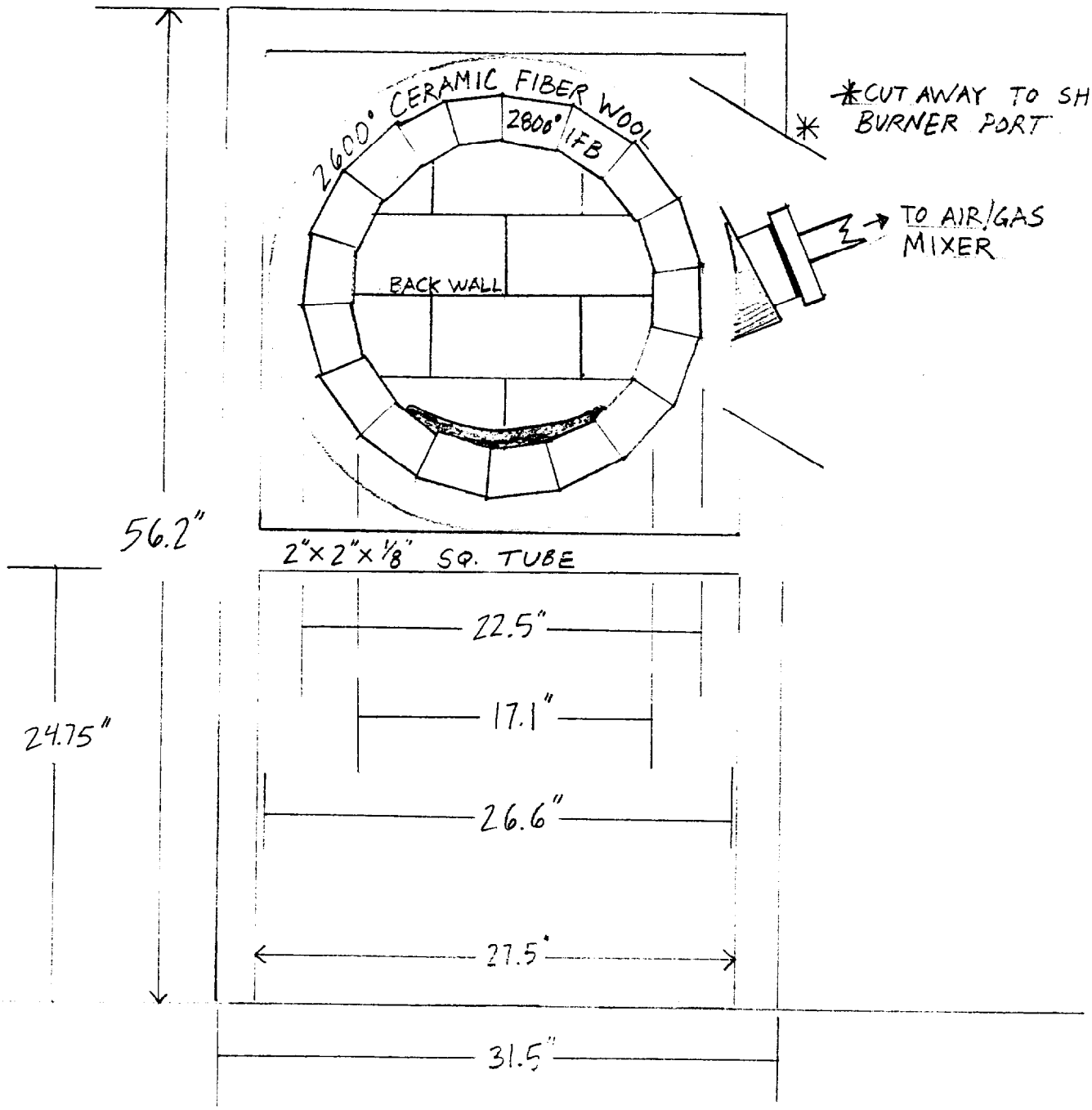
END VIEW OF VENT. HOOD FRAME



GLORY HOLE · PGS 2001

1 INCH = 9 INCHES

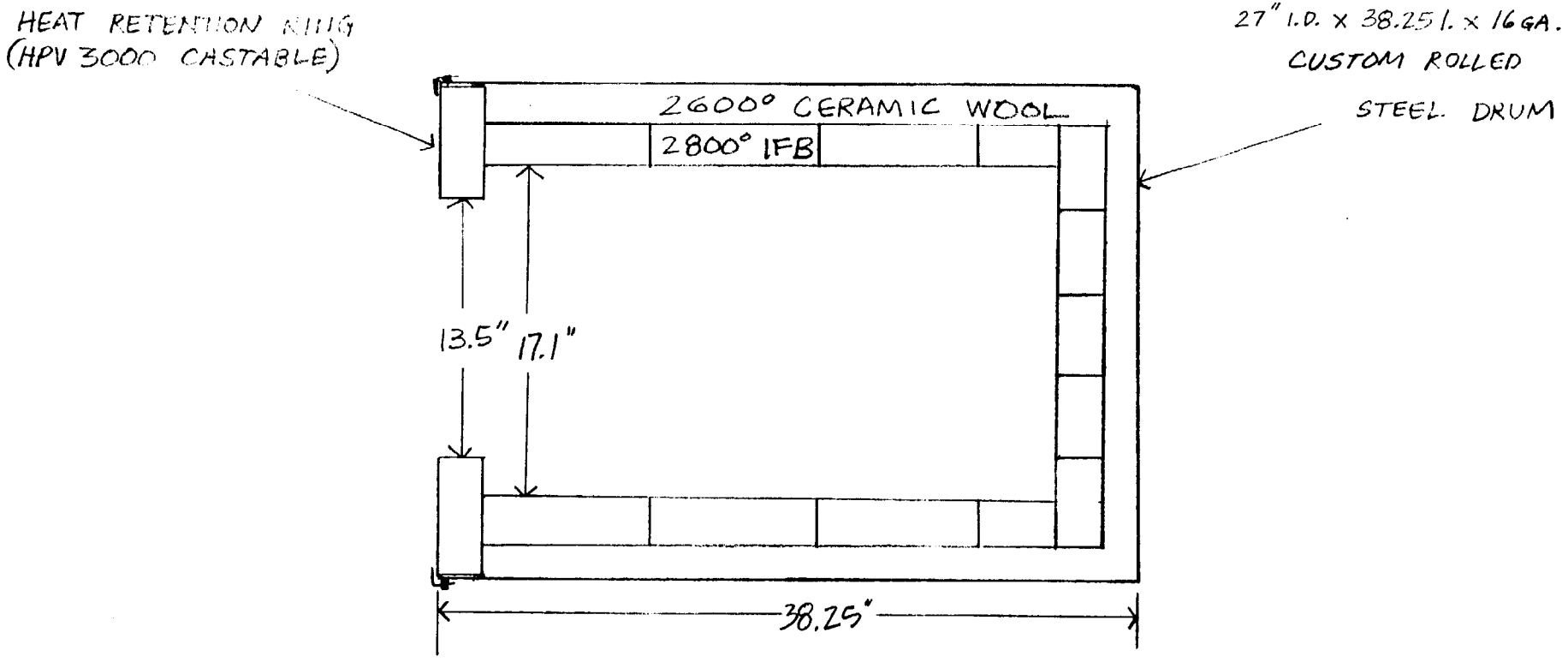
FRONT VIEW W/O RETAINER AND DOORS



GLORY HOLE - IGS 2001

1 INCH = 9 INCHES

CUTAWAY PROFILE VIEW OF DRUM AND INSULATION

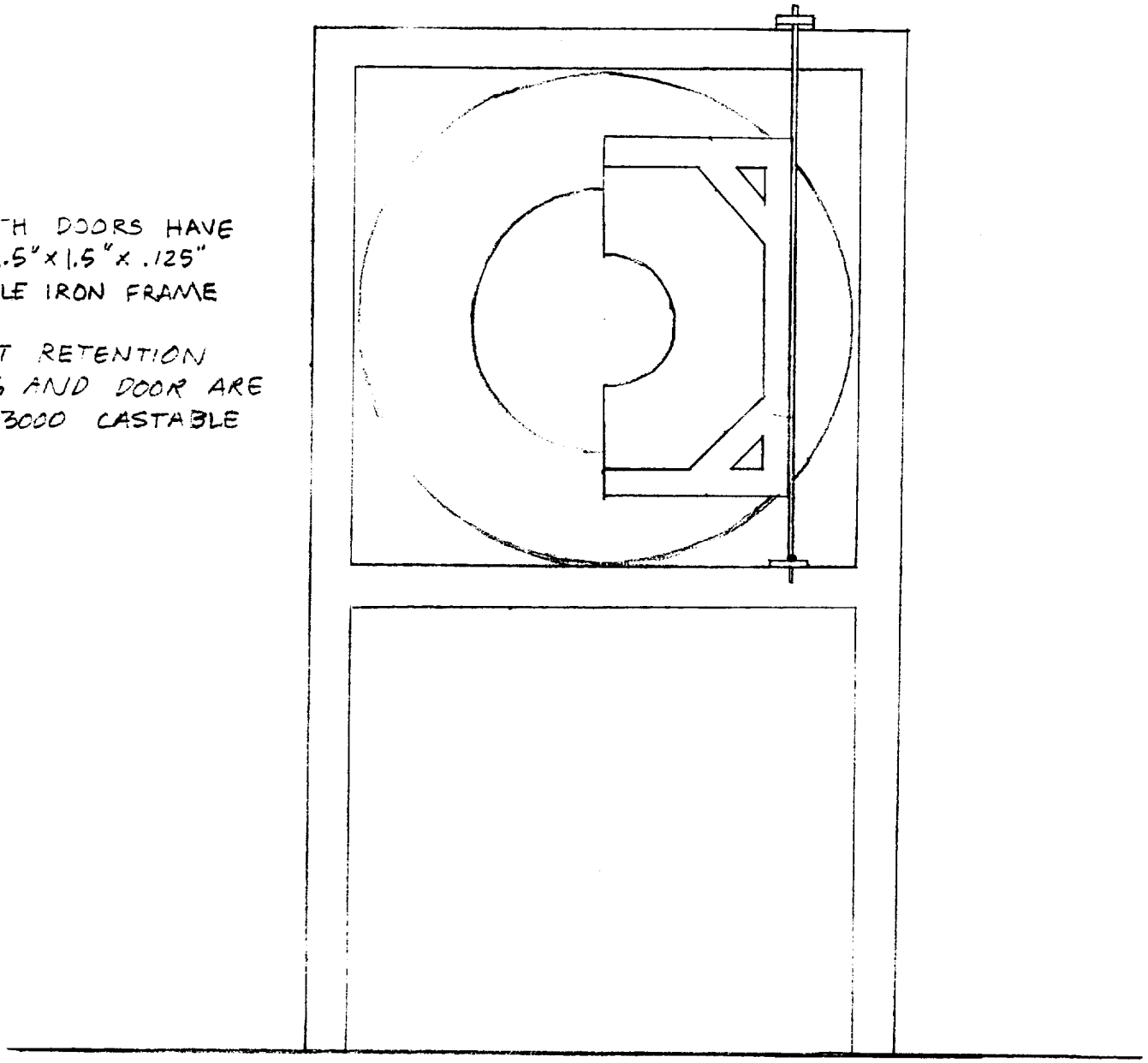


GLORY HOLE - PGS 2001

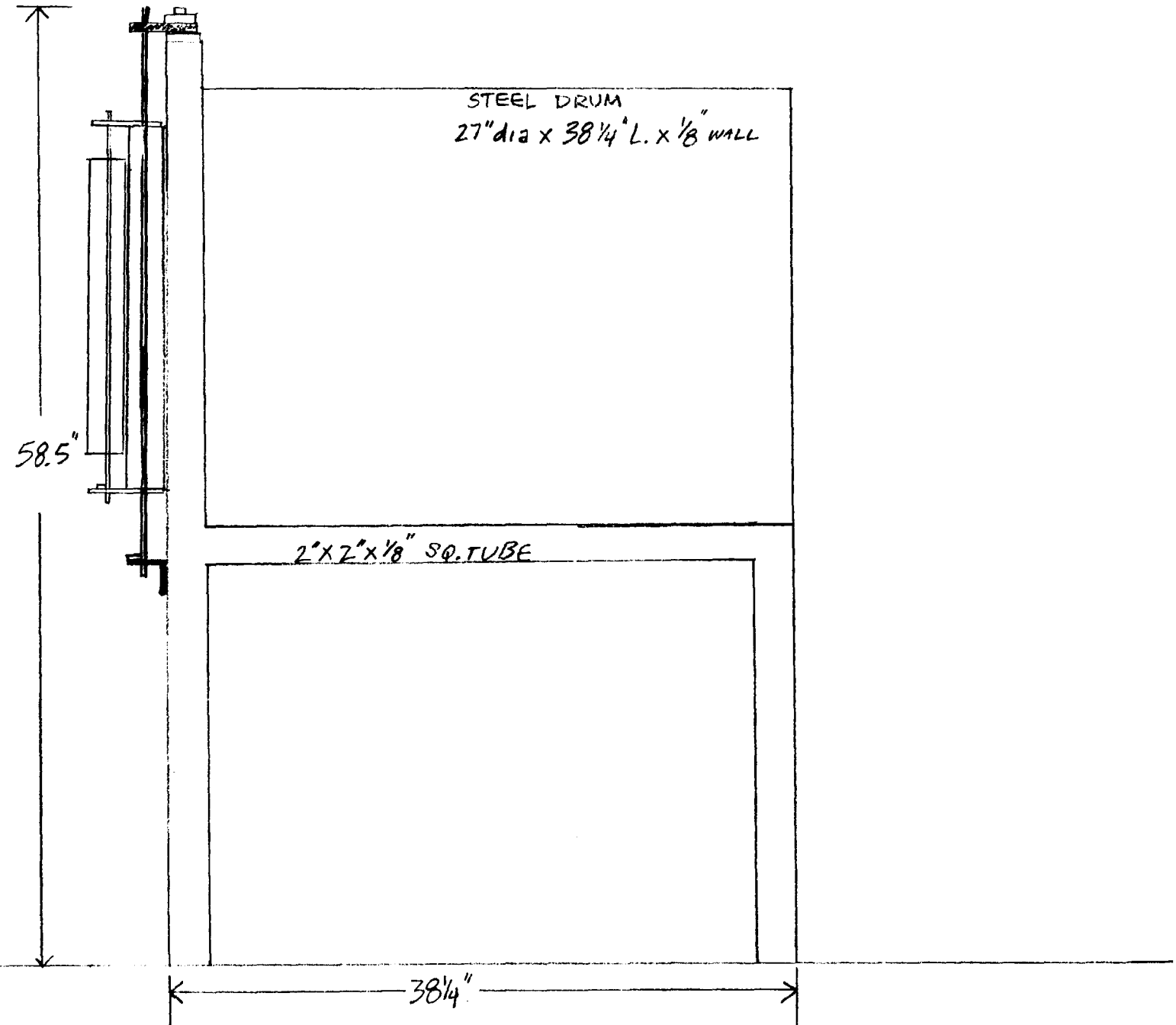
FRONT VIEW SHOWING ONE OF TWO DOORS AND HEAT RETENTION RING

BOTH DOORS HAVE A 1.5" x 1.5" x .125" ANGLE IRON FRAME

HEAT RETENTION RING AND DOOR ARE HP! 3000 CASTABLE



GLORY HOLE - PGS
1 INCH = 9 INCHES
SIDE VIEW WITH DOORS



RHI Refractories AMERICA

EXPERIMENTAL DATA

10/00: na

HPV 3000 CASTABLE

Classification: Alumina-Silica Lightweight Castable

Physical Properties: (Typical)	English Units		SI Units
Maximum Service Temperature	3000°F		1650°C
	lb/ft^3		g/cm^3
Material Required	120		1.92
Water Required to Cast - Weight - %		15.0 - 19.0%	
Bulk Density	lb/ft^3		g/cm^3
After 230°F (110°C)	120		1.92
After 1500°F (816°C)	115		1.84
After 2000°F (1093°C)	115		1.84
After 2500°F (1371°C)	115		1.84
After 2910°F (1599°C)	126		2.02
Modulus of Rupture	lb/in^2		MPa
After 230°F (110°C)	1000		6.9
After 2910°F (1599°C)	3300		22.8
Hot Modulus of Rupture			
At 1500°F (816°C)	2100		14.5
At 2000°F (1093°C)	3500		24.1
At 2500°F (1371°C)	700		4.8
Crushing Strength			
After 230°F (110°C)	3600		24.8
After 1500°F (816°C)	5700		39.3
After 2000°F (1093°C)	11,800		81.3
After 2500°F (1371°C)	13,600		93.8
After 2910°F (1599°C)	14,800		102.0
Permanent Linear Change - %			
After 1500°F (816°C)		-0.3%	
After 2000°F (1093°C)		-0.4%	
After 2500°F (1371°C)		+0.3%	
After 2910°F (1599°C)		-3.5%	
Apparent Porosity - %			
After 230°F (110°C)		34.0%	
After 1500°F (816°C)		39.0%	
After 2000°F (1093°C)		39.0%	
After 2500°F (1371°C)		39.0%	

(Continued)

RHI Refractories AMERICA

HPV 3000 CASTABLE (Continued)

Thermal Conductivity At a Mean Temperature of	Btu·in/hr·ft^2·°F	W/m·°C
392°F (200°C)	7.1	1.02
752°F (400°C)	7.0	1.01
1112°F (600°C)	6.8	0.98
1472°F (800°C)	7.3	1.05

Chemical Analysis: (Approximate)
(Calcined Basis)

Alumina	(Al_2O_3)	57.6%
Silica	(SiO_2)	37.0
Iron Oxide	(Fe_2O_3)	0.5
Lime	(CaO)	3.4
Titania	(TiO_2)	1.0
Alkali	(Na_2O)	0.4

The test data shown are based on average results on production samples and are subject to normal variation on individual tests. Accordingly, test data cannot be taken as establishing maximum or minimum specifications. ASTM test procedures used when applicable.

6/99 Dev.

INSWOOL®-HTZ BULK

2700°F Alumina-Silica-Zirconia Ceramic Fiber Bulk

INSWOOL-HTZ BULK is an alumina-silica-zirconia bulk ceramic spun fiber which can be used at temperatures to 2700°F. INSWOOL-HTZ BULK demonstrates excellent high temperature resistance, thermal stability and resistance to vibration, as well as outstanding low thermal conductivity and low heat storage. It is resistant to attack under reducing atmospheres. It is attacked by acids and concentrated alkalies. The thermal and physical properties of INSWOOL-HTZ BULK are completely restored upon drying if it becomes wet by water, steam, or oil.

INSWOOL-HTZ BULK has a density of approximately 6 lb/ft^3 as it comes from the carton. The packed density ranges between 6 and 12 lb/ft^3 by hand packing. thus the installed density will vary depending upon the force used when packing.

CHEMICAL ANALYSIS - Calcined Basis

Zirconia - ZrO_2	15.4%
Silica - SiO_2	37.6%
Alumina - Al_2O_3	46.4%
Iron Oxide - Fe_2O_3	0.1%
Lime - CaO	0.1%
Magnesia - MgO	0.1%
Titania - TiO_2	0.1%
Alkalies - $Na_2O + K_2O$	0.2%

A. P. Green is a supplier of high duty and super duty brick, insulating firebrick, high alumina brick, basic brick, silica brick, mortars, plastics, castables, and precast shapes as well as mineral wool block insulation and a complete ceramic fiber line. Stocks of these products are maintained in more than 90 locations throughout North America. And, having been in the refractories business for more than 80 years, A. P. Green can also provide the expertise and thorough technical assistance that you might require.

INSWOOL®-HTZ BULK

Technical Data

MAXIMUM RECOMMENDED TEMPERATURE

For Intermittent Use	2700°F	1480°C
For Continuous Use	2450°F	1345°C
COLOR	White/Yellow	
FIBER LENGTH	2-4 in. avg.	5-10 cm. avg.

THERMAL CONDUCTIVITY - 8 lb/ft³ (128 kg/m³)

At Mean Temperature of:	Btu·in/hr·ft²·°F	W/m·°C
600°F (315°C)	0.4	0.06
1000°F (540°C)	0.6	0.09
1400°F (760°C)	0.8	0.12
1600°F (870°C)	1.0	0.14

The test data shown are based on average results on production samples and are subject to normal variation on individual tests. Accordingly, test data cannot be taken as establishing maximum or minimum specifications.

February 8, 1996

GREENLITE®-28

Technical Data

MAXIMUM TEMPERATURE	2800°F	1540°C
REHEAT (Permanent Linear Change) - ASTM C210		
After 2750°F (1510°C)	1.0% exp.	
HOT LOAD TEST		
Deformation after 2200°F (1205°C) at 10 lb/in² (0.07 MPa) Load for 1 1/2 Hours	0.2%	
	lb/ft³	**g/cm³**
BULK DENSITY - ASTM C134	56	0.90
	lb/in²	**MPa**
MODULUS OF RUPTURE - ASTM C133	300	2.07
COLD CRUSHING STRENGTH - ASTM C133	800	5.52
THERMAL CONDUCTIVITY		
At a Mean Temperature of	**Btu·in/hr·ft²·°F**	**W/m·°C**
400°F (205°C)	2.2	0.32
800°F (425°C)	2.4	0.35
1200°F (650°C)	2.5	0.36
1600°F (870°C)	2.7	0.39
2000°F (1095°C)	2.9	0.42

Manufacturing Location: Mexico, MO

The test data shown are based on average results on production samples and are subject to normal variation on individual tests. Accordingly, test data cannot be taken as establishing maximum or minimum specifications.

March 25, 1998

GREENLITE®-28

Insulating Firebrick

GREENLITE®-28 is a 2800°F maximum service temperature insulating firebrick. It exhibits low iron oxide, high strengths, and a low density. Typical applications are: controlled atmosphere furnaces, carbon baking furnace dense brick backup, high temperature backup linings, sulphur reactor furnace lining backup, and iron rotary channel induction furnace upper sidewall backup linings.

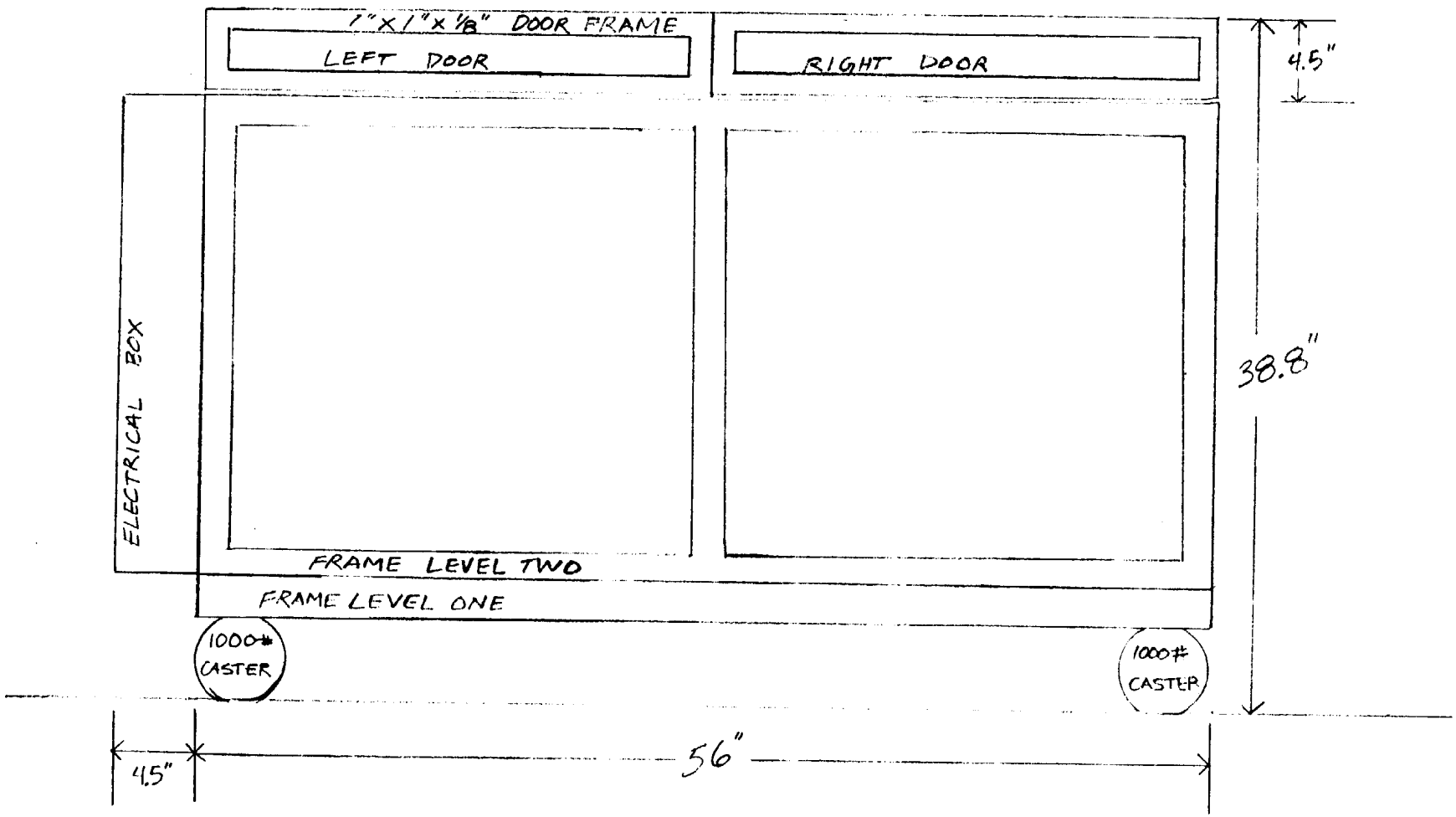
CHEMICAL ANALYSIS - Calcined Basis

Silica - SiO_2	33.5%
Alumina - Al_2O_3	61.0%
Iron Oxide - Fe_2O_3	1.0%
Lime - CaO	1.1%
Magnesia - MgO	0.3%
Titania - TiO_2	1.1%
Alkalies - $Na_2O + K_2O$	1.5%

A. P. Green is a supplier of high duty and super duty brick, insulating firebrick, high alumina brick, basic brick, silica brick, mortars, plastics, castables, and precast shapes as well as mineral wool block insulation and a complete ceramic fiber line. Stocks of these products are maintained in more than 90 locations throughout North America. And, having been in the refractories business for more than 80 years, A. P. Green can also provide the expertise and thorough technical assistance that you might require.

TOP LOADING ANNEALER - PGS
1 INCH = 9 INCHES

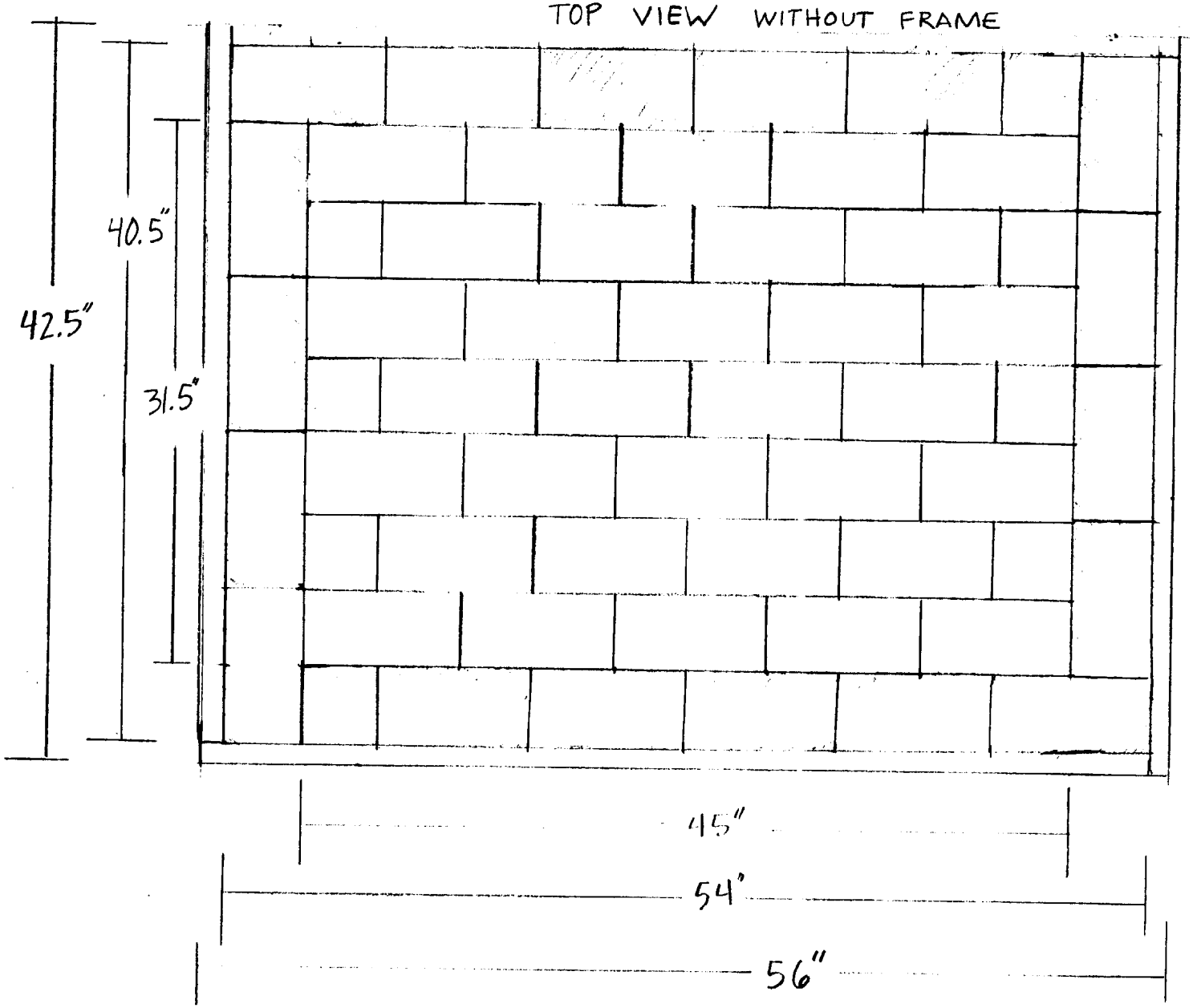
FRONT VIEW



TOP LOADING ANNEALER · PGS
DEC 18, 2001

1 INCH = 9 INCHES

TOP VIEW WITHOUT FRAME



= 2000° IFB

= 1900° CERAMIC FIBER BOARD (1" THICK)

= WALL BRICKS

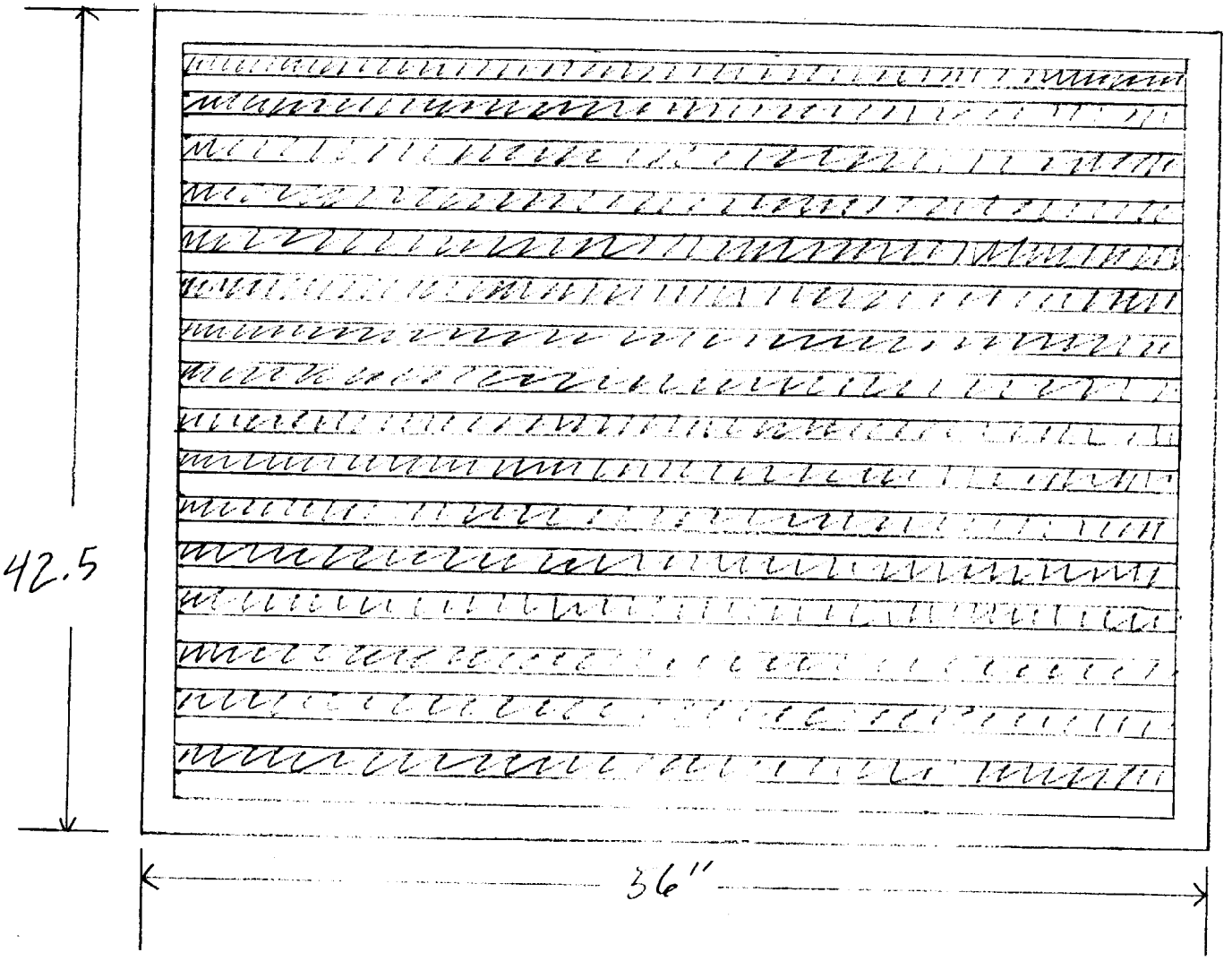
for LOWING ANNEALER - PGS

1 INCH = 9 INCHES

TOP VIEW OF STEEL FRAME (LEVEL TWO)

1.5 x 1.5 x 1/4" ANGLE IRON PERIMETER

1" x 1/4" FLAT STOCK (SPACED 1" APART)



= 1 INCH FLAT STOCK

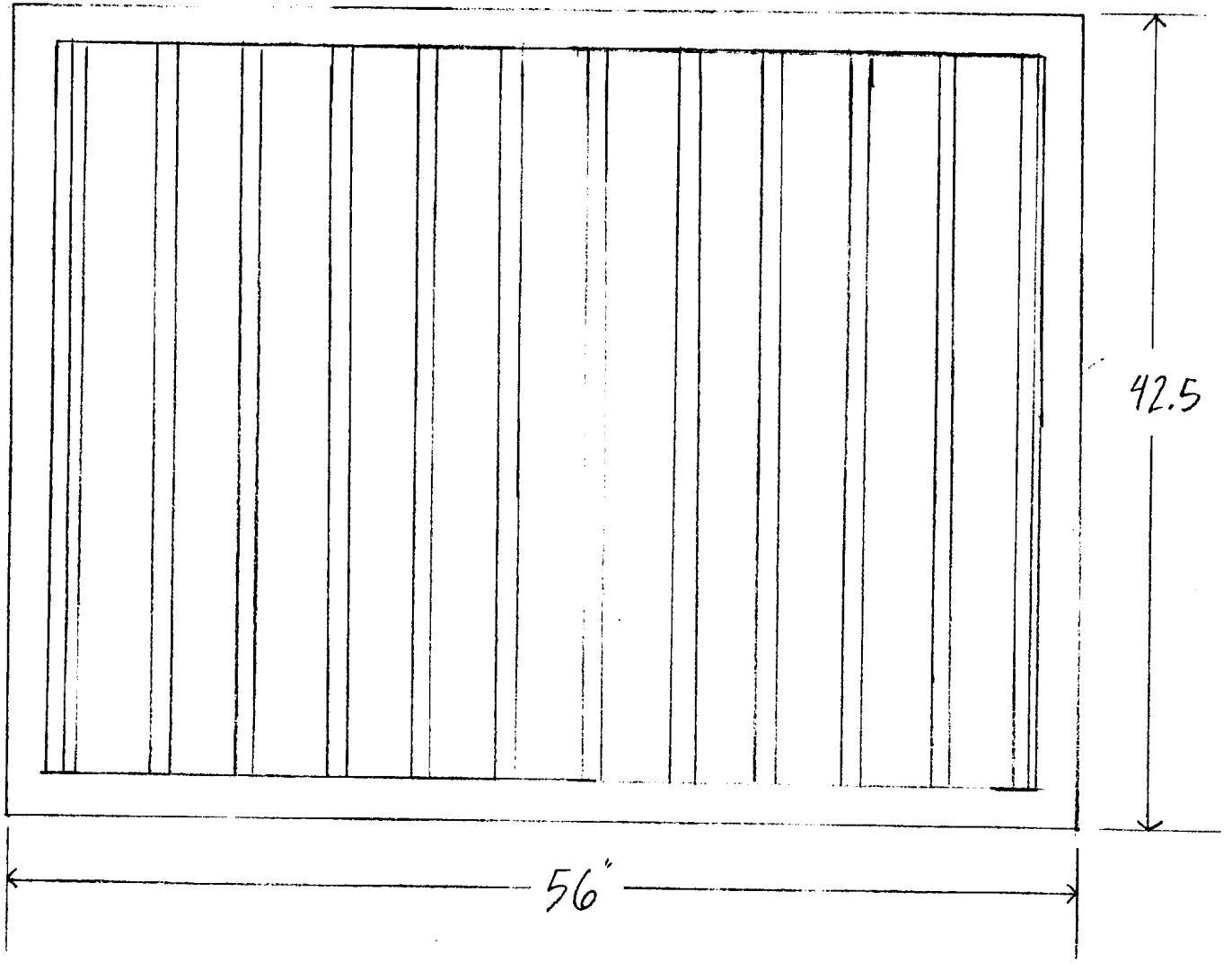
TOP LOADING ANNEALER - PGS 2001

1 INCH = 9 INCHES

TOP VIEW OF STEEL FRAME (LEVEL ONE)

2" x 2" x 3/16" SQUARE TUBE

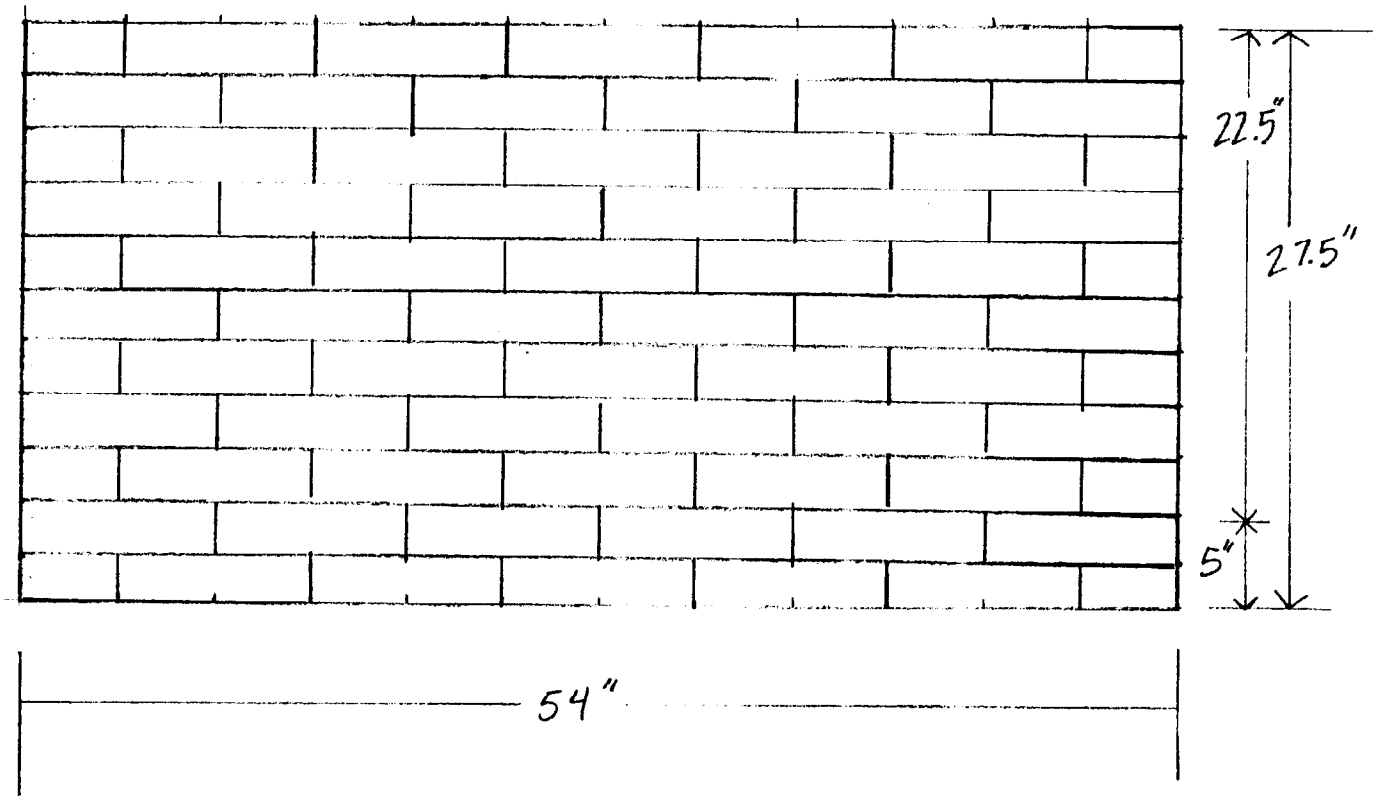
2" x 1" x 1/8" SQUARE TUBE



TOP LOADING ANNEALER- PGS
DEC 18, 2001

1 INCH = 9 INCHES

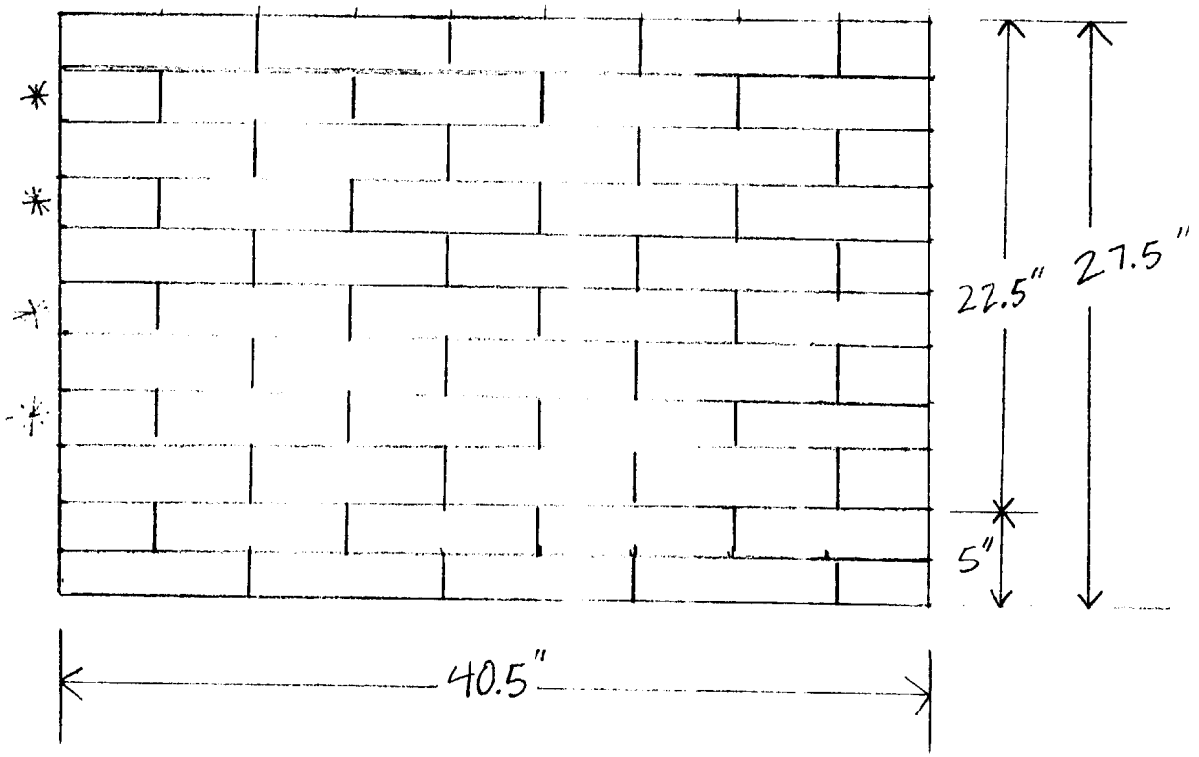
LONG SIDE BRICK VIEW



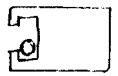
EACH LONG SIDE IS THE SAME

TOP LOAD ANNEALER - PGS
DEC 18, 2001

SHORT SIDE BRICK VIEW



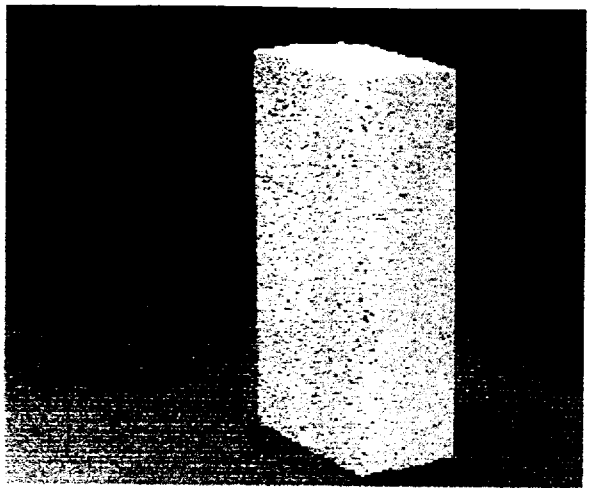
KILN ELEMENTS ARE INSTALLED IN "GROOVED BRICK" SEE EXAMPLE BELOW



O = ELEMENT

* MARKS LAYER WITH ELEMENT
EACH ELEMENT IS 240 VOLTS, 14 AMPS, AND 3360 WATTS FOR A KILN THAT RUNS ON 240V, AND USES 56 AMPS AND 13440 WATTS

→ ELEMENTS MADE BY JOHN GLASSWORKS, WARNER, N.H.



Thermal Ceramics was first to introduce insulating firebrick (IFB) to the industry in the 1930's. The IFB are manufactured with a unique slurry casting process which creates a network of microporosity which produces low thermal conductivity and good thermal shock characteristics. This process produces brick that are some of the most efficient insulators available in the market. The anorthite mineralogy ($CaO \cdot Al_2O_3 \cdot 2\ SiO_2$) of these low temperature IFB gives them excellent strength at operating temperatures and resistance to corrosive alkali environments.

Features

- Extremely low "K" factors
- Low densities
- Excellent strength at room and high temperatures
- Excellent resistance to alkali attack

Applications

- Backup insulation for carbon baking furnaces
- Backup insulation in aluminum electrolytic cel
- Electrical kilns for industrial and hobby use
- Backup insulation for blast furnace stove linin
- Linings for carbonizing furnaces
- Forge furnace linings
- Heat transfer linings

Physical Characteristics

Standard sizes* 9" x 4½" x 2½" and 9" x 4½" x 3

* Special sizes available upon request.

INSBOARD 2300

2300°F Ceramic Fiber Board

INSBOARD 2300 is a vacuum formed ceramic fiber board with excellent insulating characteristics, as well as thermal stability. It can be used as a hot face or back up insulation material. Applications include petro-chemical, ceramics, steel, aluminum, waste incineration, and the glass industry.

CHEMICAL ANALYSIS - Calcined Basis

Silica - SiO_2	55.0%
Alumina - Al_2O_3	45.0%

A. P. Green is a supplier of high duty and super duty brick, insulating firebrick, high alumina brick, basic brick, silica brick, mortars, plastics, castables, and precast shapes as well as mineral wool block insulation and a complete ceramic fiber line. Stocks of these products are maintained in more than 90 locations throughout North America. And, having been in the refractories business for more than 80 years, A. P. Green can also provide the expertise and thorough technical assistance that you might require.

INSBOARD 2300

Technical Data

MAXIMUM RECOMMENDED TEMPERATURE	2300°F	1260°C
COLOR	White With Non-Dusty Surface	
BULK DENSITY (+ OR - 15%)	18 lb/ft³	0.29 g/cm³
	lb/in²	**Mpa**
MODULUS OF RUPTURE	120	0.83
COMPRESSIVE STRENGTH		
10% Deformation	35	0.24
25% Deformation	65	0.45
HARDNESS (1" Dia. Indentor)	**lbs.**	**N**
10% Deformation	30	133
25% Deformation	70	311
PERMANENT LINEAR CHANGE		
Percent of Shrinkage		
24 hrs. at 2000°F (1095°C) soaking temp.	2.4%	
24 hrs. at 2200°F (1205°C) soaking temp.	3.1%	

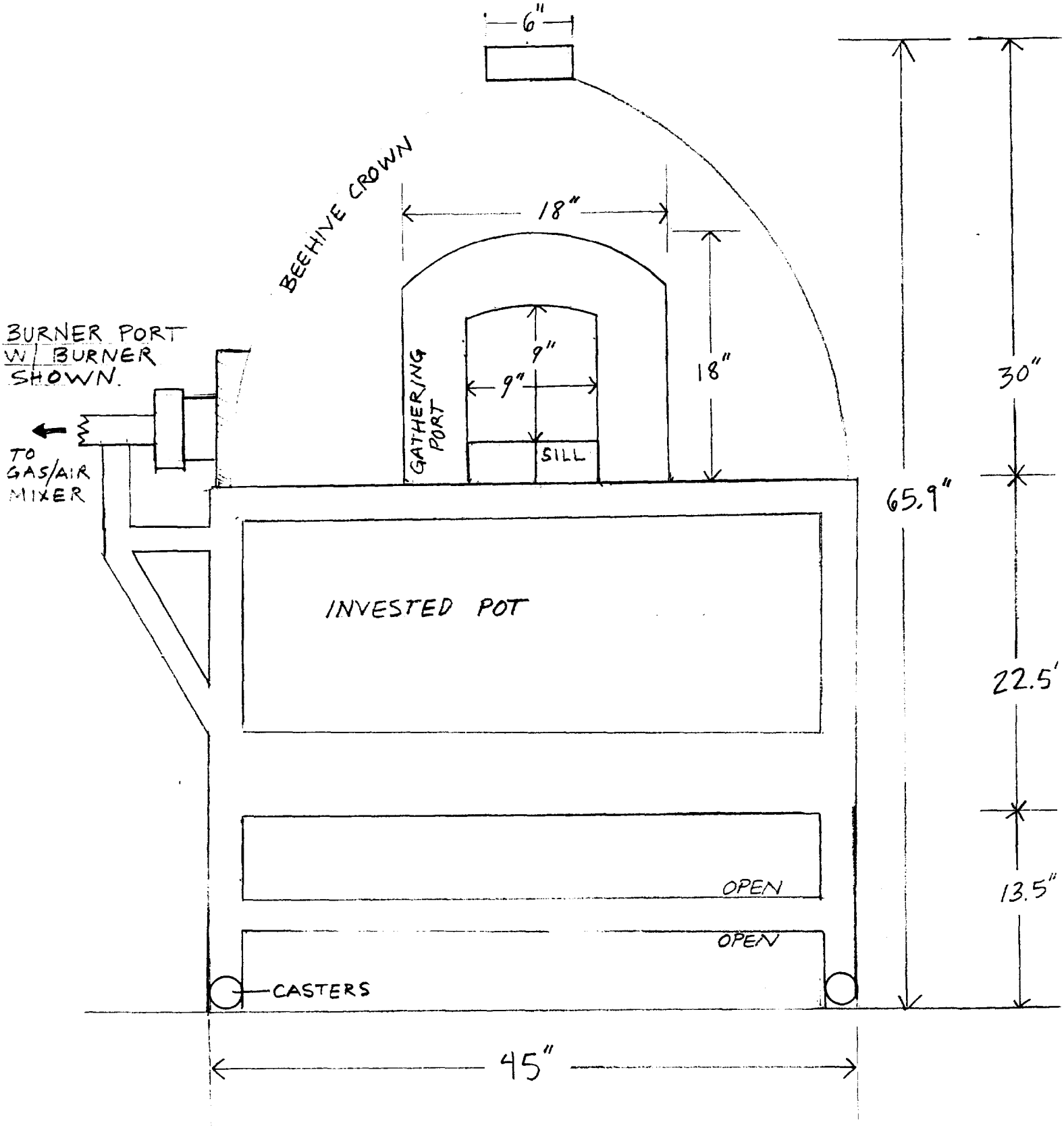
THERMAL CONDUCTIVITY		
At a Mean Temperature	**Btu·in/hr·ft²·°F**	**(W/m·°C)**
400°F (205°C)	0.4	0.05
800°F (425°C)	0.6	0.09
1200°F (650°C)	0.8	0.12
1600°F (870°C)	1.0	0.14
2000°F (1095°C)	1.2	0.18

Manufacturing Location: Ellisville, MS

The test data shown are based on average results on production samples and are subject to normal variation on individual tests. Accordingly, test data cannot be taken as establishing maximum or minimum specifications.

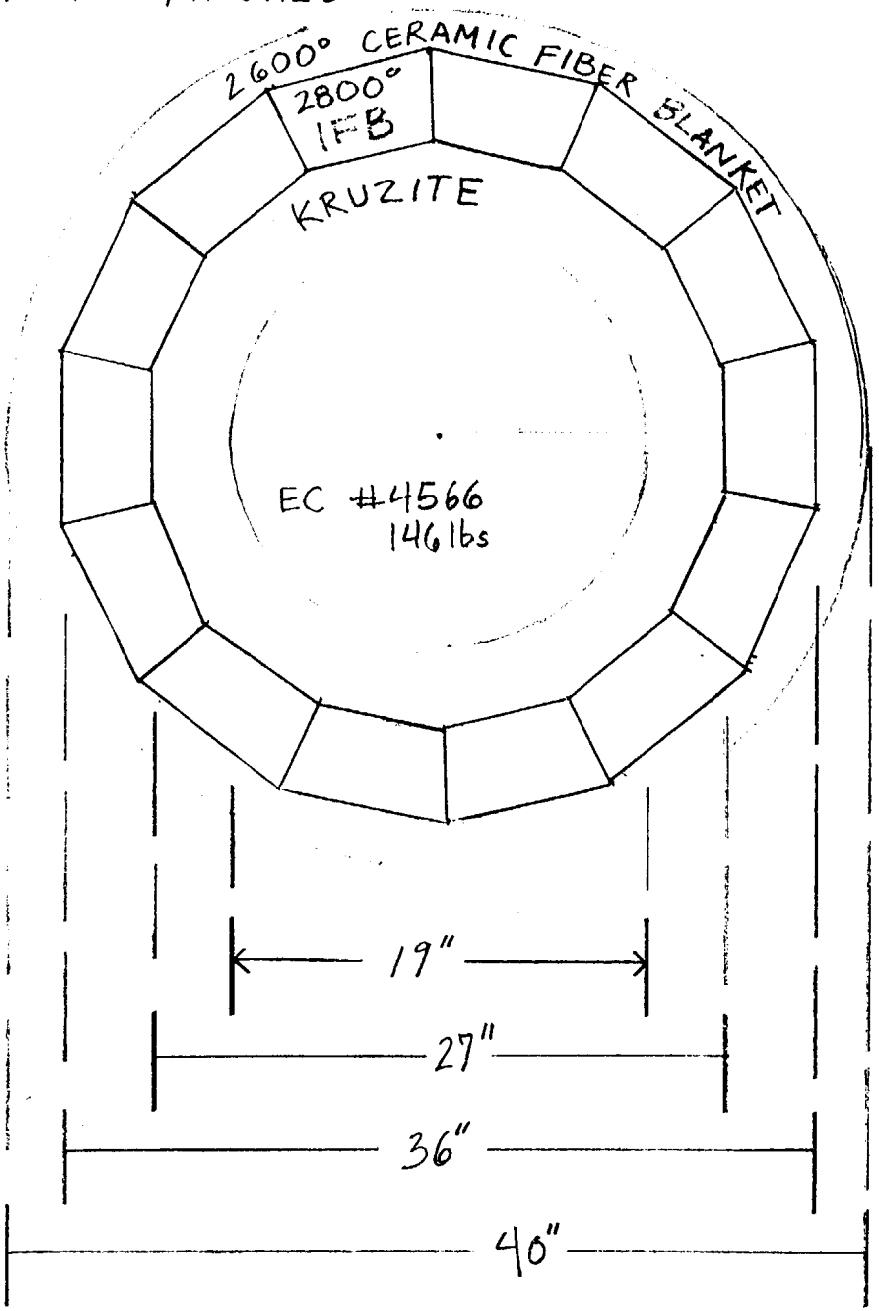
July 14, 1994

INVESTED POT FURNACE - PGS
FRONT VIEW W/O DOOR
1 INCH = 9 INCHES



INVESTED POT FURNACE - PGS 2001
146 # CAPACITY

1 INCH = 9 INCHES



LONG SIDE OF EACH BRICK IS 8.7 inches

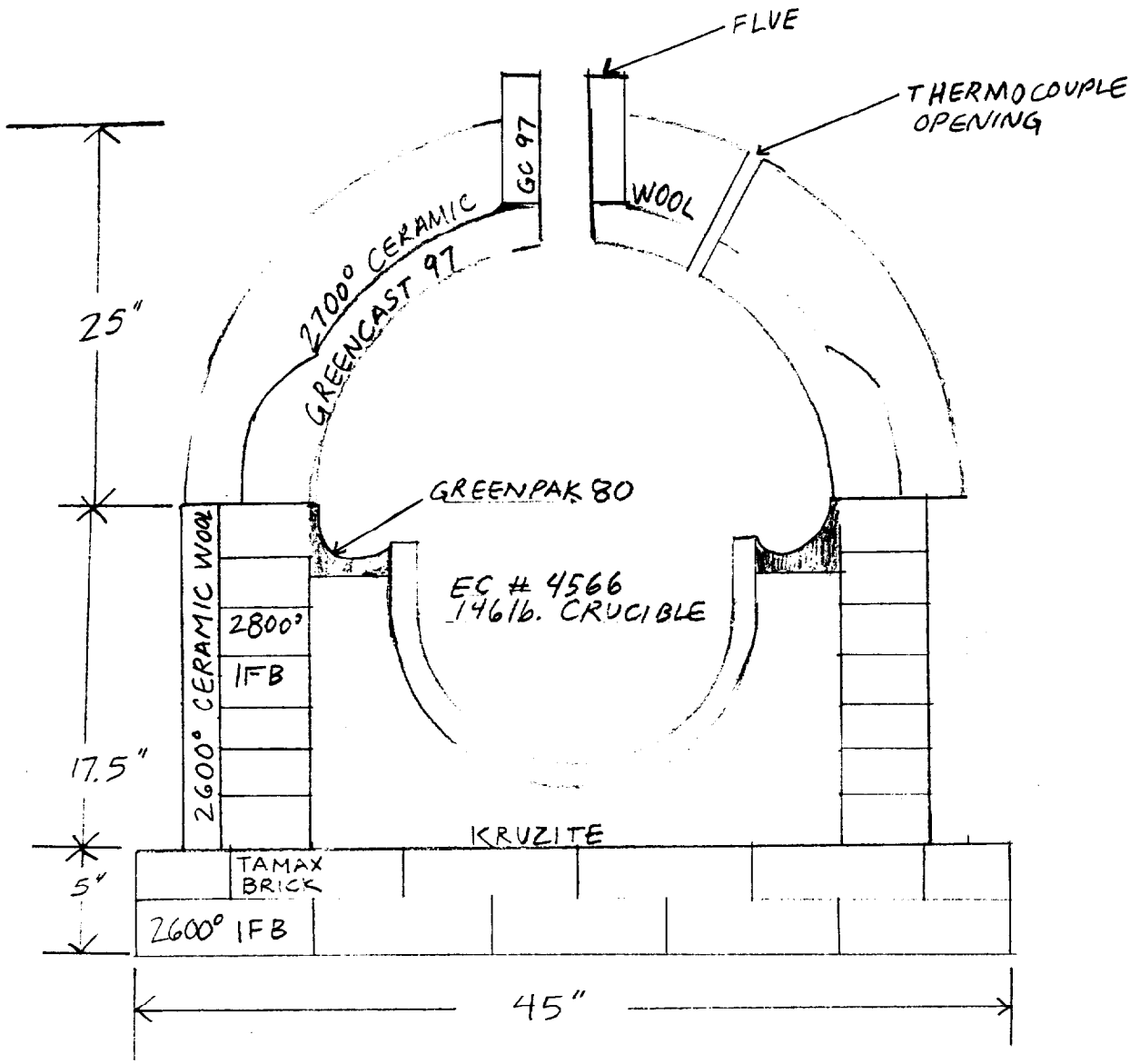
13 BRICKS PER COURSE WITH 7 COURSES = 91 BRICKS

TOP VIEW WITHOUT BEEHIVE CROWN

INVESTED POT FURNACE PGS

1 INCH = 9 INCHES

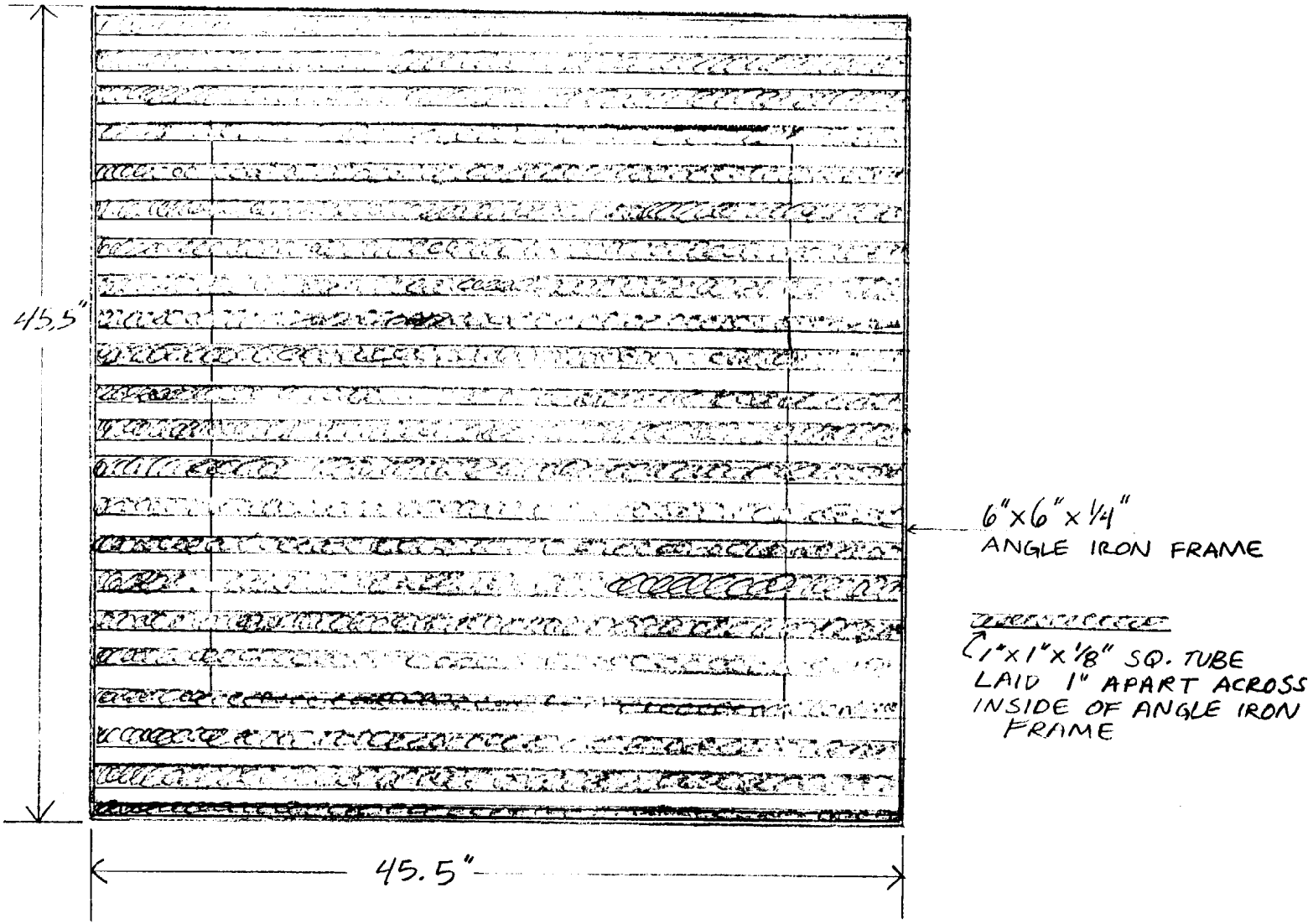
CROSS SECTION OF INSULATION

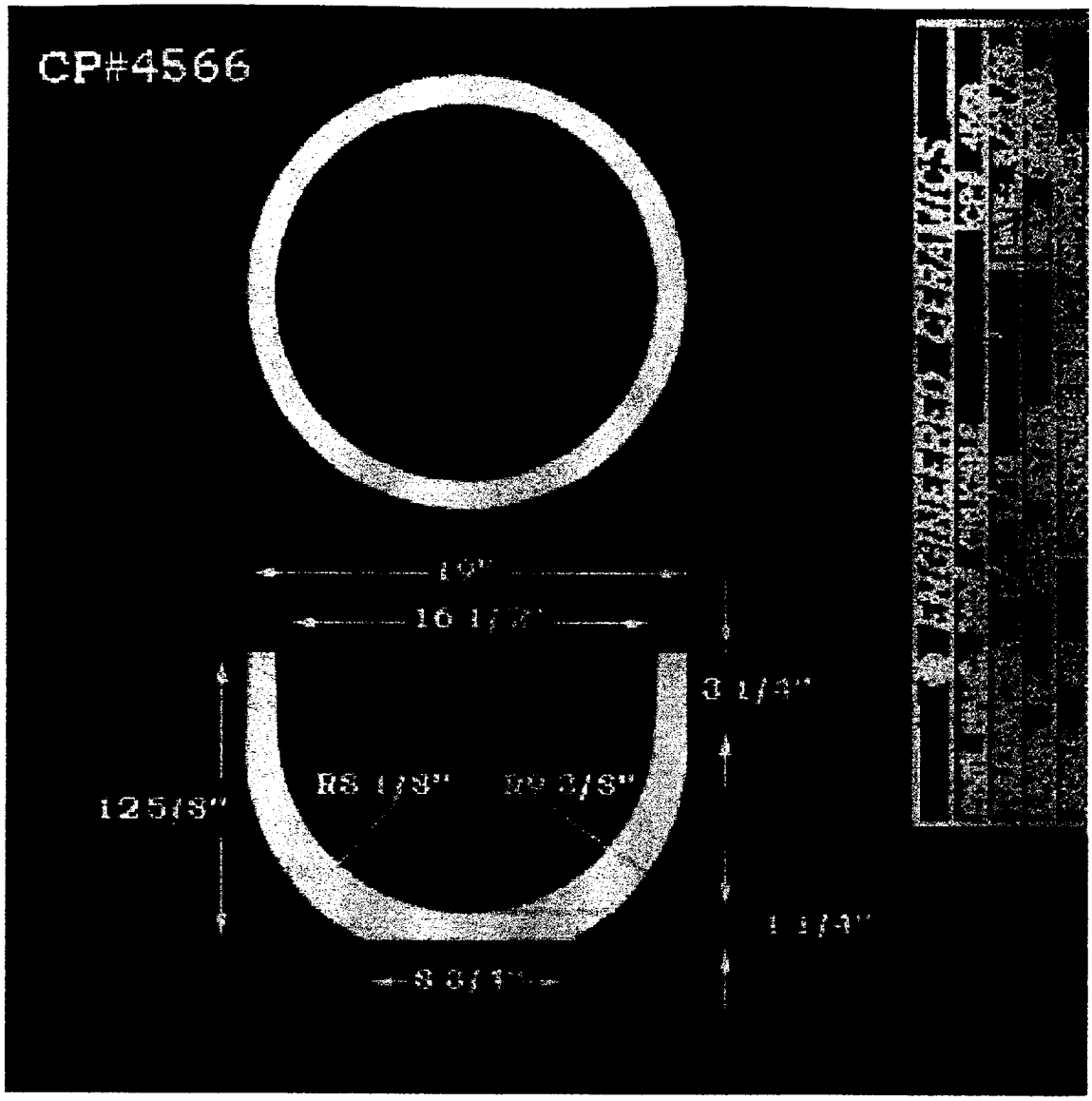


INVESTED POT FURNACE - PGS

1 INCH = 9 INCHES

TOP VIEW OF STEEL FRAME FOR BASE LAYERS OF BRICK




CP#4566
12"
10 1/2"
3 1/4"
12 5/8"
R5 1/8"
1 1/4"

GREENCAST®-97

Technical Data

MAXIMUM RECOMMENDED TEMPERATURE	3400°F		1870°C	
QUANTITY REQUIRED	164 lb/ft³		2.63 g/cm³	
QUANTITY IN PLACE	**lb/ft³**	**σ**	**g/cm³**	**σ**
Cured and Then Dried at 220°F (105°C)	170	1.8	2.72	0.029
Heated at 2500°F (815°C)	165		2.64	
WATER REQUIRED FOR MIXING		**Approximately**		
Weight % Dry Solids		9.5%		
Per 100 Pounds (45.4 kg)	1 1/4 gal (U.S.)			4.7 liters
MAXIMUM TIME FROM ADDING WATER TO PLACING MATERIAL		20 Minutes		
PERMANENT LINEAR CHANGE - ASTM C113				
Expansion or Shrinkage - Percent of Original Length				
Cured and Then Dried at 220°F (105°C)		Nil		
Heated at 1500°F (815°C) and Then Cooled		0.1% exp.		
Heated at 2000°F (1095°C) and Then Cooled		0.0%		
Heated at 2500°F (1370°C) and Then Cooled		0.1% exp		
Heated at 2900°F (1595°C) and Then Cooled		0.1% exp.		
Heated at 3200°F (1750°C) and Then Cooled		1.2% exp.		
MODULUS OF RUPTURE - ASTM C133	**lb/in²**	**σ**	**MPa**	**σ**
Cured and Then Dried at 220°F (105°C)	560	95	3.9	0.66
Heated at 1500°F (815°C) and Then Cooled	330		2.3	
Heated at 2000°F (1095°C) and Then Cooled	390		2.7	
Heated at 2500°F (1370°C) and Then Cooled	880		6.1	
COLD CRUSHING STRENGTH - ASTM C133				
Cured and Then Dried at 220°F (105°C)	2580		17.8	
Heated at 1500°F (815°C) and Then Cooled	1880		13.0	
Heated at 2000°F (1095°C) and Then Cooled	2880		19.9	
Heated at 2500°F (1370°C) and Then Cooled	3430		23.6	
PARTICLE SIZE - ASTM C92				
Retained on 4 Mesh Tyler Screen (4.70 mm opening)				
Dry Analysis		Less Than 2%		
THERMAL CONDUCTIVITY				
At a Mean Temperature of	**Btu·in/hr·ft²·°F**		**W/m·°C**	
400°F (205°C)	14.4		2.08	
800°F (425°C)	12.8		1.84	
1200°F (650°C)	11.5		1.66	
1600°F (870°C)	10.7		1.54	
2000°F (1095°C)	10.4		1.50	
2400°F (1315°C)	10.5		1.51	

Manufacturing Locations: Sproul, PA; Sulphur Springs, TX; Smithville, ON

* NOTE: GREENCAST®-97 Plus will typically show 1-3 lb/ft³ lower density and up to 15% lower strength values.

The test data shown are based on average results on production samples and are subject to normal variation on individual tests. Accordingly, test data cannot be taken as establishing maximum or minimum specifications.

Aprill 30, 1996

GREENCAST®-97

3400°F, Alumina Castable

GREENCAST®-97 is a 97% alumina dense castable for temperatures up to 3400°F. It exhibits very high purity ingredients, low in silica, iron oxide, and alkalies. Typical applications are petrochem waste heat boiler tube sheets, iron foundry ladles, upper case sections of iron and copper vertical channel induction units, high temperature burner blocks, copper tundishes, electric arc furnace delta sections, and thermal combustors.

GREENCAST®-97 Plus is the rapid fire-in version of GREENCAST®-97.

CHEMICAL ANALYSIS - Calcined Basis

Silica - SiO_2	0.3%
Alumina - Al_2O_3	96.8%
Iron Oxide - Fe_2O_3	0.1%
Lime - CaO	2.4%
Magnesia - MgO	0.2%
Titania - TiO_2	0.1%
Alkalies - $Na_2O + K_2O$	0.1%

A. P. Green is a supplier of high duty and super duty brick, insulating firebrick, high alumina brick, basic brick, silica brick, mortars, plastics, castables, and precast shapes as well as mineral wool block insulation and a complete ceramic fiber line. Stocks of these products are maintained in more than 90 locations throughout North America. And, having been in the refractories business for more than 80 years, A. P. Green can also provide the expertise and thorough technical assistance that you might require.

KRUZITE® CASTABLE

Technical Data

MAXIMUM TEMPERATURE	3200°F	1760°C
QUANTITY REQUIRED	155 lb/ft^3	2.48 g/cm^3
QUANTITY IN PLACE	**lb/ft^3**	**g/cm^3**
220°F (105°C)	155 - 160	2.48 - 2.56
1500°F (815°C)	153 - 157	2.45 - 2.51
WATER REQUIRED	**Approximately**	
Weight % Dry Solids	9.5%	
Per 100 Pounds (45.4 kg)	$1\frac{1}{8}$ Gal. (U.S.)	4.2 liters
WORKING TIME - Minutes	20	
PERMANENT LINEAR CHANGE - ASTM C113		
220°F (105°C)	Nil	
1500°F (815°C)	0 - 0.2% shr.	
2000°F (1095°C)	0 - 0.2% shr.	
2500°F (1370°C)	0.5 - 1.5% exp.	
2900°F (1595°C)	0.5 - 1.5% exp.	
3200°F (1760°C)	1.0 - 2.0% shr.	
MODULUS OF RUPTURE - ASTM C133	**lb/in^2**	**Mpa**
220°F (105°C)	400 - 700	2.8 - 4.8
1500°F (815°C)	300 - 500	2.1 - 3.4
2000°F (1095°C)	200 - 300	1.4 - 2.1
COLD CRUSHING STRENGTH - ASTM C133		
220°F (105°C)	3000 - 4000	20.7 - 27.6
1500°F (815°C)	2000 - 3000	13.8 - 20.7
2000°F (1095°C)	1000 - 2000	6.9 - 13.8
PARTICLE SIZE - ASTM C92		
Retained on 4 Mesh Screen	Less Than 2%	
THERMAL CONDUCTIVITY	**Btu·in/hr·ft^2·°F**	**W/m·°C**
400°F (205°C)	10.1	1.46
800°F (425°C)	9.4	1.35
1200°F (650°C)	8.9	1.28
1600°F (870°C)	8.6	1.24
2000°F (1095°C)	8.5	1.23
2400°F (1315°C)	8.5	1.23

* NOTE: KRUZITE CASTABLE Plus will typically show 1-3 lb/ft^3 lower density and up to 15% lower strength values.

The test data shown are based on average results on production samples and are subject to normal variation on individual tests. Accordingly, test data cannot be taken as establishing maximum or minimum specifications.

November 14, 1991

KRUZITE® CASTABLE

3200°F High Alumina Castable

KRUZITE® CASTABLE is a general purpose 3200°F pouring castable containing 74-79% alumina. KRUZITE CASTABLE displays high refractoriness and moderate strength. Applications are iron foundry ladles, burner blocks, aluminum furnace roofs and upper sidewalls, high temperature boilers, and induction furnace covers.

KRUZITE CASTABLE Plus is the fast fire version of KRUZITE CASTABLE.

CHEMICAL ANALYSIS - Calcined Basis

Silica - SiO_2	14.0 - 19.0%
Alumina - Al_2O_3	74.0 - 79.0%
Iron Oxide - Fe_2O_3	1.0 - 1.8%
Lime - CaO	1.2 - 2.2%
Magnesia - MgO	0.1 - 0.4%
Titania - TiO_2	2.3 - 3.3%
Alkalies - $Na_2O + K_2O$	0.3 - 0.8%

A. P. Green is a supplier of high duty and super duty brick, insulating firebrick, high alumina brick, basic brick, silica brick, mortars, plastics, castables, and precast shapes as well as mineral wool block insulation and a complete ceramic fiber line. Stocks of these products are maintained in more than 90 locations throughout North America. And, having been in the refractories business for more than 80 years, A. P. Green can also provide the expertise and thorough technical assistance that you might require.

RHI Refractories AMERICA

TECHNICAL DATA

3/01: na

TAMAX

Classification: High Alumina/High Purity Mullite

Physical Properties: (Typical)	English Units	SI Units
	lb/ft^3	g/cm^3
Bulk Density	155	2.49
	lb/in^2	MPa
Cold Crushing	9800	67.6
Modulus of Rupture At 70°F (21°C)	2500	17.2
Apparent Porosity	17.0%	
Apparent Specific Gravity	2.98	
Load Test - 25 lb/in^2 (0.17 MPa) % Subsidence at 2900°F (1593°C)	<2.0%	
Creep: 28.4 lb/in^2 (0.20 MPa) at 2732°F (1500°C) Deformation between 20^{th} and 50^{th} hour	0.74%	
Reheat Test – Linear Change After 5 hours at 3100°F (1704°C)	+0.11%	

Chemical Analysis: (Approximate)
(Calcined Basis)

Silica	(SiO_2)	28.0%
Alumina	(Al_2O_3)	69.0
Iron Oxide	(Fe_2O_3)	0.5
Titania	(TiO_2)	0.9
Lime	(CaO)	0.15
Magnesia	(MgO)	0.07
Alkalies	(K_2O+Na_2O)	0.24

The test data shown are based on average results on production samples and are subject to normal variation on individual tests. Accordingly, test data cannot be taken as establishing maximum or minimum specifications. ASTM test procedures used when applicable.

3/95 Dev.

INSWOOL®-HTZ BLANKET

2700°F Alumina-Silica-Zirconia Ceramic Fiber Blanket

INSWOOL-HTZ BLANKET is a 2700°F rated alumina-silica-zirconia ceramic fiber blanket. It displays very low thermal conductivity, excellent thermal shock resistance, low heat storage, and good sound absorption. Typical applications are glass furnace crown insulation, boiler seals and doors, low velocity stack linings, steam and gas turbine insulation, expansion joint seals, furnace doors, and shields.

CHEMICAL ANALYSIS - Calcined Basis

Zirconia - ZrO_2	15.4%
Silica - SiO_2	37.6%
Alumina - Al_2O_3	46.4%
Iron Oxide - Fe_2O_3	0.1%
Lime - CaO	0.1%
Magnesia - MgO	0.1%
Titania - TiO_2	0.1%
Alkalies - $Na_2O + K_2O$	0.2%

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INSWOOL®-HTZ BLANKET

Technical Data

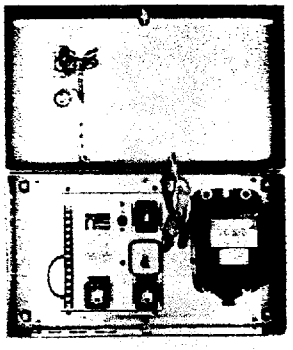
MAXIMUM RECOMMENDED TEMPERATURE			
For Intermittent Use	2700°F		1480°C
For Continuous Use	2450°F		1345°C
COLOR		White/Yellow	
FIBER LENGTH	3 in. avg.		7.6 cm. avg.
TENSILE STRENGTH - 8 lb/ft³, 1 in.	**lb/in²**		**MPa**
Machine Direction	10		.07
Cross Direction	6		.04
PERMANENT LINEAR CHANGE - ASTM 356			
Expansion or Shrinkage			
Heated for 24 hours at 2200°F (1205°C)		2.5% shr.	
Heated for 24 hours at 2400°F (1315°C)		3.5% shr.	
Heated for 24 hours at 2700°F (1480°C)		6.5% shr.	
THERMAL CONDUCTIVITY - 8 lb/ft³ (0.13 g/cm³)			
At a Mean Temperature of	**Btu·in/hr·ft²·°F**		**W/m·°C**
400°F (205°C)	0.4		0.06
600°F (315°C)	0.6		0.09
800°F (425C)	0.8		0.12
1200°F (650°C)	1.0		0.14

The test data shown are based on average results on production samples and are subject to normal variation on individual tests. Accordingly, test data cannot be taken as establishing maximum or minimum specifications.

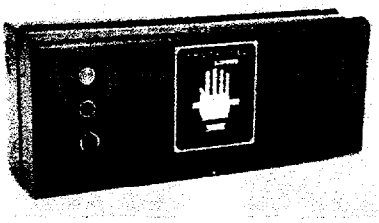
February 23, 1996

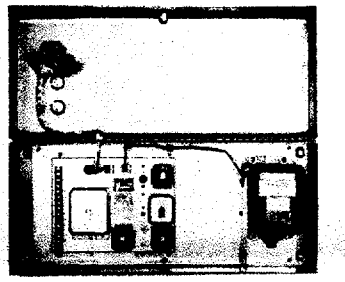
COMBUSTION CONTROL PANEL

COMBUSTION CONTROL PACKAGED.....READY TO INSTALL WITH NO ADDITIONAL COMPONENTS REQUIRED

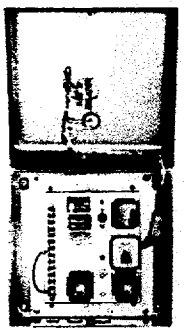


STANDARD MODEL 62019-1VA
(with ignition transformer)





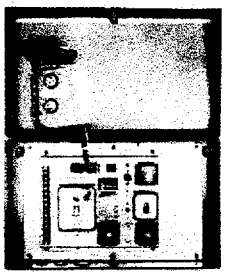
TIMOFIER MODEL 62021-1VT
(with ignition transformer)



STANDARD MODEL 62019A-1VA
(without ignition transformer)

IRI ACCEPTED

SEE UNIFIED PRICE BULLETIN

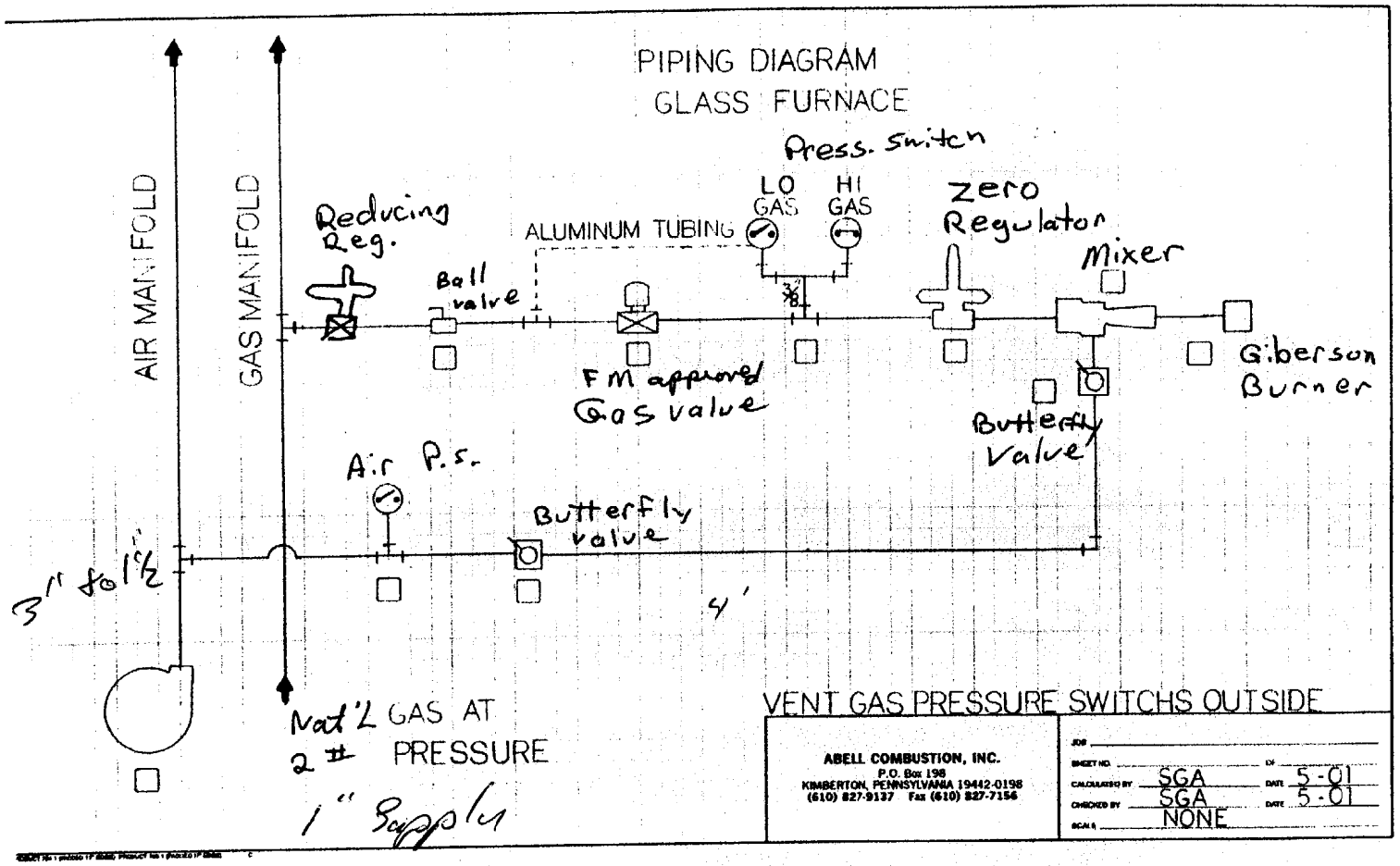


TIMOFIER MODEL 62021X-1VT
(without ignition transformer)

1. Form 6642VA PROTECTOFIER with plug-in solid state electronic FLAME-PAK and plug-in ACF relays
2. START Pushbutton
3. Signal light to indicate flame
4. Ignition transformer (optional)
5. Dust-tight steel enclosure

1. Form 6642VT PROTECTOFIER with plug-in TIMOFIER for purge and ignition trial, plug-in solid state electronic FLAME-PAK and plug-in ACF relays
2. Burner Off/Run/Ignition switch
3. Signal light to indicate flame
4. Signal light to indicate timer operation
5. Ignition transformer (optional)
6. Dust-tight steel enclosure

NOTE:
Shown are UNIFIED Control Panels for manual operation and supervision of one burner. For automatic operation the Form "B" PROTECTOFIER is supplied. The UNIFIED Combustion Control Panels are also available to supervise any number of burners and models are available to suit many safety requirements such as non-relight, low fire start, interrupted pilot, etc.

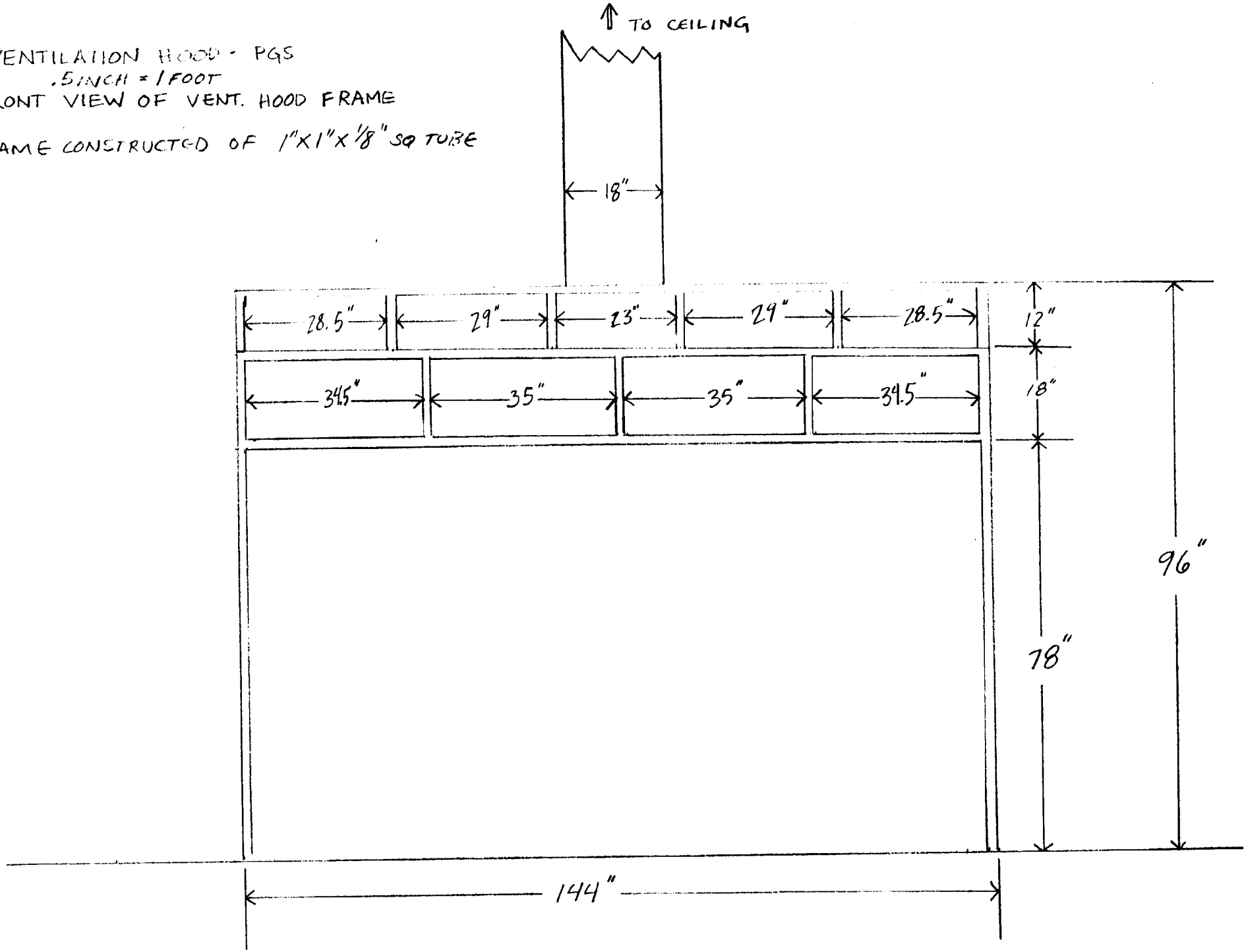

PIPING DIAGRAM
GLASS FURNACE
Press. switch
LO GAS
HI GAS
Zero Regulator
Mixer
Reducing Reg.
ALUMINUM TUBING
Ball valve
AIR MANIFOLD
GAS MANIFOLD
FM approved Gas value
Giberson Burner
Butterfly Valve
Air P.S.
Butterfly valve
3" to 1½"
4'
Nat'l GAS AT
2 # PRESSURE
1" Supply
VENT GAS PRESSURE SWITCHS OUTSIDE
ABELL COMBUSTION, INC.
P.O. Box 198
KIMBERTON, PENNSYLVANIA 19442-0198
(610) 827-9137 Fax (610) 827-7156
JOB
SHEET NO.
OF
CALCULATED BY SGA DATE 5-01
CHECKED BY SGA DATE 5-01
SCALE NONE

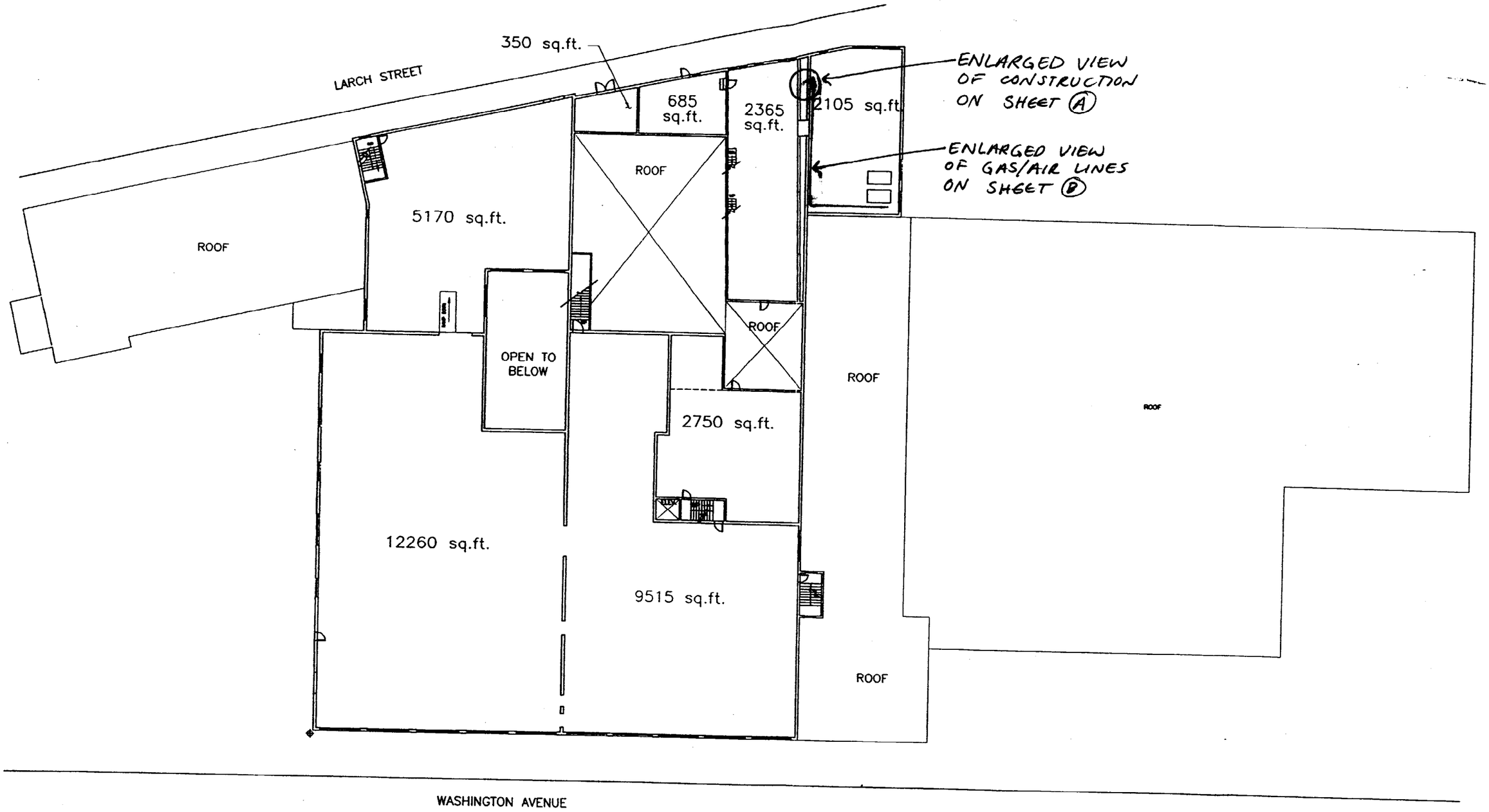
VENTILATION HOOD - PGS

.5 INCH = 1 FOOT

FRONT VIEW OF VENT. HOOD FRAME

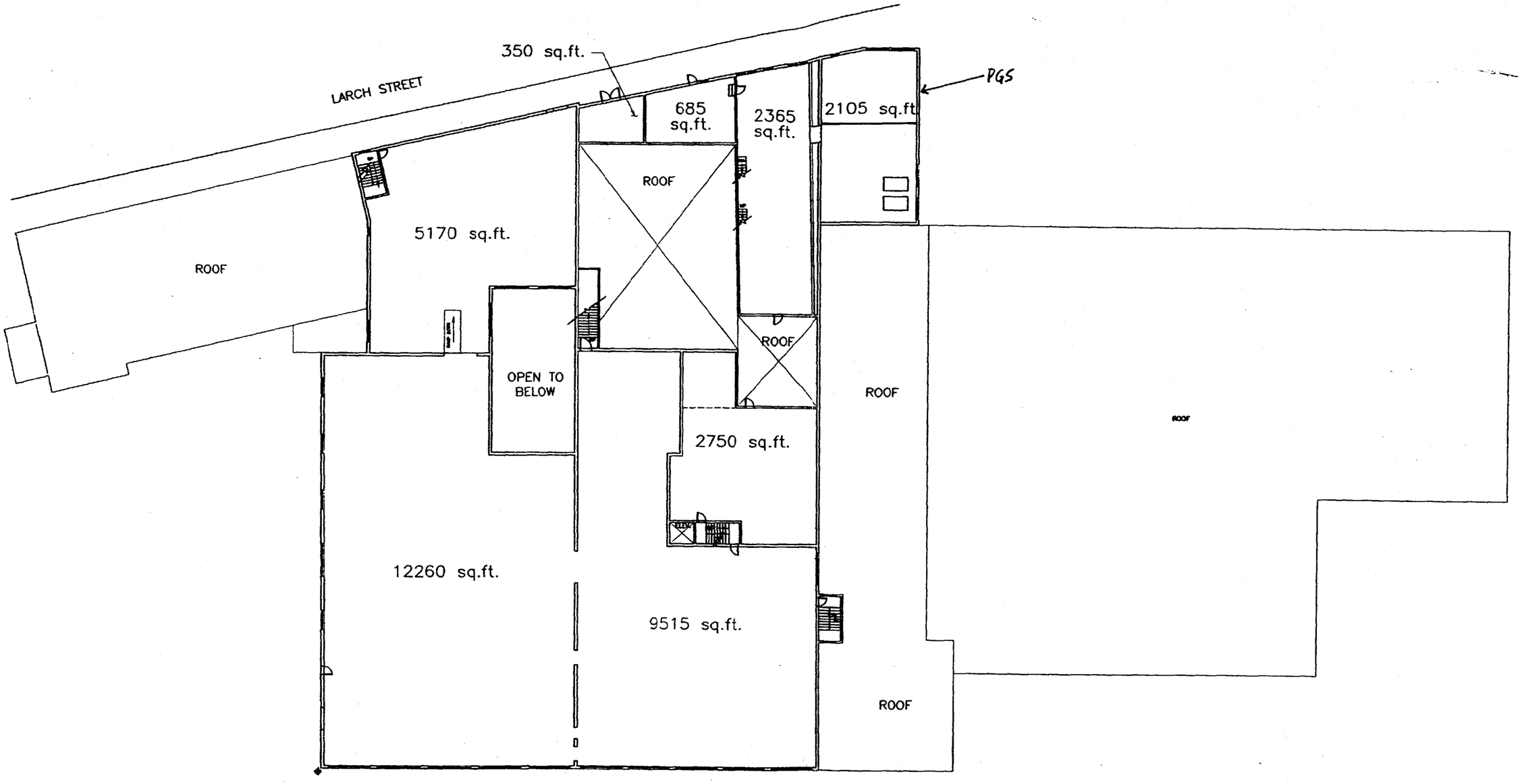
FRAME CONSTRUCTED OF 1"X1"X1/8" SQ TUBE





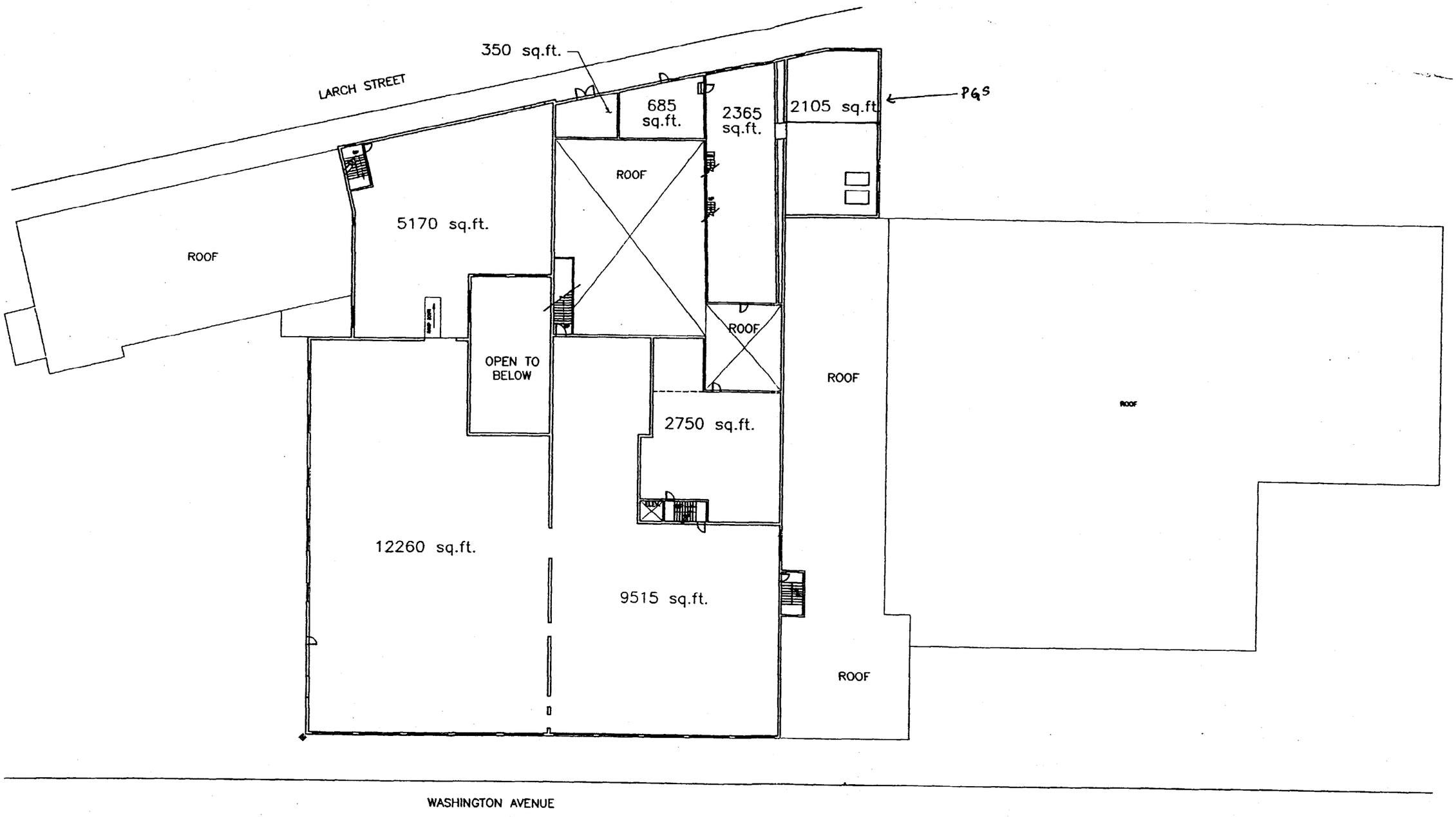
FLOOR PLAN – LEVEL 3

35,200 SqFt



FLOOR PLAN – LEVEL 3

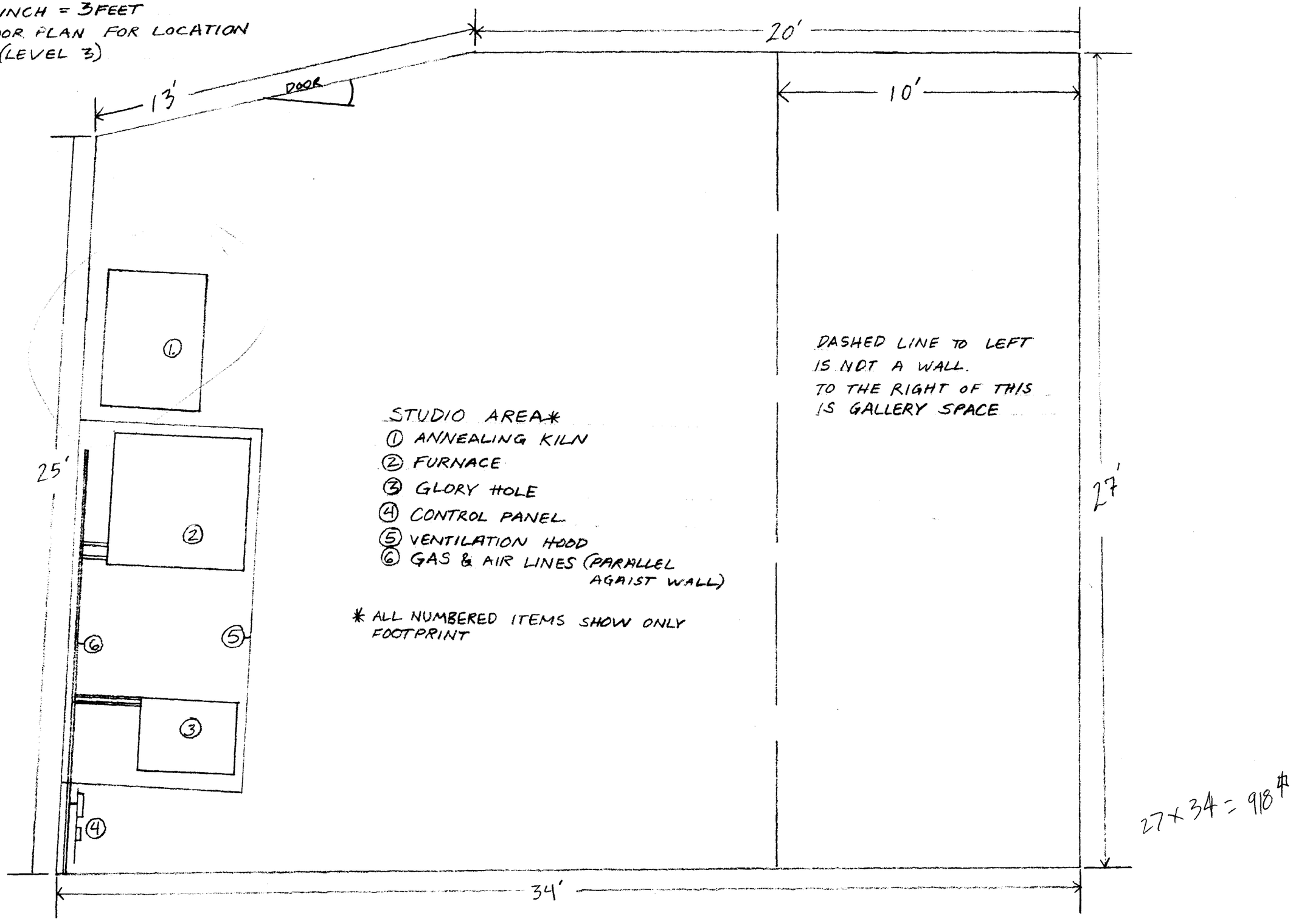
35,200 SqFt



FLOOR PLAN – LEVEL 3

35,200 SqFt

PORTLAND GLASSBLOWING STUDIO
FLOOR PLAN 1 INCH = 3 FEET
SEE BUILDING FLOOR PLAN FOR LOCATION OF THIS SPACE (LEVEL 3)



STUDIO AREA*
① ANNEALING KILN
② FURNACE
③ GLORY HOLE
④ CONTROL PANEL
⑤ VENTILATION HOOD
⑥ GAS & AIR LINES (PARALLEL AGAIST WALL)

* ALL NUMBERED ITEMS SHOW ONLY FOOTPRINT

DASHED LINE TO LEFT IS NOT A WALL.
TO THE RIGHT OF THIS IS GALLERY SPACE

27 × 34 = 918 #

PORTLAND GLASSBLOWING STUDIO
FLOOR PLAN 1 INCH = 3 FEET
SEE BUILDING FLOOR PLAN FOR LOCATION OF THIS SPACE (LEVEL 3)