



Certification Test Report

Morsø Jernstøberi A/S

Insert Wood Stove

Model: 5660

Report Number: 192-S-14-3

OMNI-Test Laboratories Inc.
Product Testing & Certification

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Certification Test Report

Morsø Jernstøberi A/S

Insert Wood Stove

Model: 5660

Prepared for: Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark

Prepared by: OMNI-Test Laboratories, Inc.
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Beaverton, Oregon 97005
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Test Period: February 8, 2007 through February 16, 2007

Report Date: March 2007

Report Number: 192-S-14-3

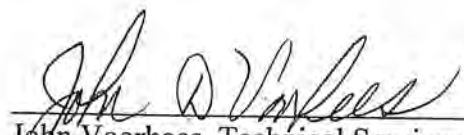
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Model: 5660
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark

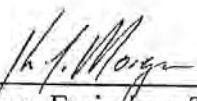
AUTHORIZED SIGNATORIES

This report has been reviewed and approved by the following authorized signatories:

Alana Smith, Senior Manager
OMNI-Test Laboratories, Inc.



John Voorhees, Technical Services Director
OMNI-Test Laboratories, Inc.



Ken Morgan, Emissions Testing Technician
OMNI-Test Laboratories, Inc.

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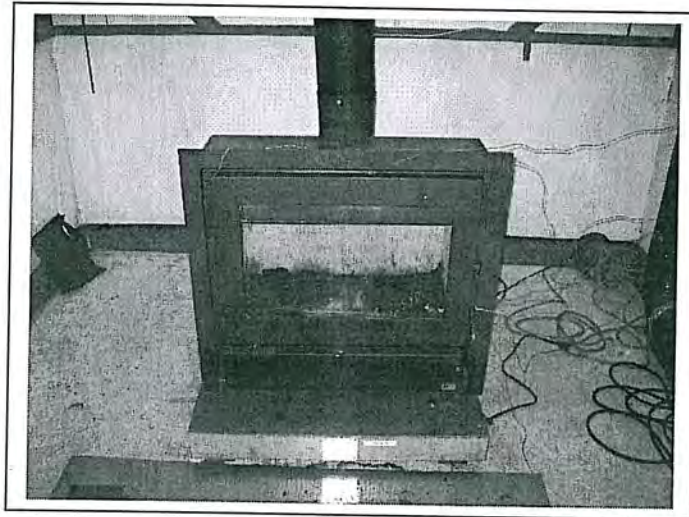
Section 1

Fuel Photographs/Appliance Description/Drawings

Model: 5660
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark

Morsø Jernstøberi A/S
5660

Test Dates: February 8, 2007 through February 16, 2007



Model: 5660
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark

Morsø Jernstøberi A/S 5660

Run 1 – Fuel



Run 1 - Newly Loaded Stove



Run 2 – Fuel



Run 2 - Newly Loaded Stove



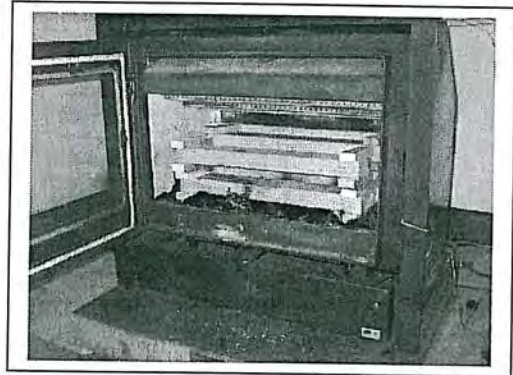
Model: 5660
Morsø Jernstøberi A/S
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Denmark

Morsø Jernstøberi A/S 5660

Run 3 – Fuel



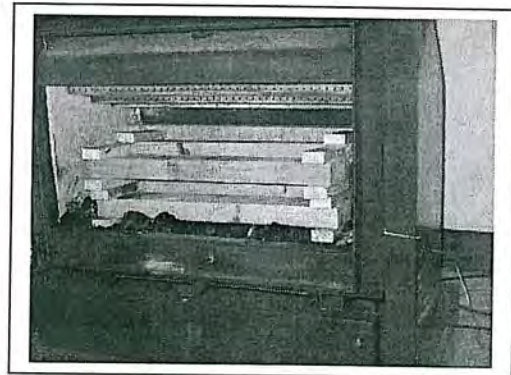
Run 3 - Newly Loaded Stove



Run 4 – Fuel



Run 4 - Newly Loaded Stove

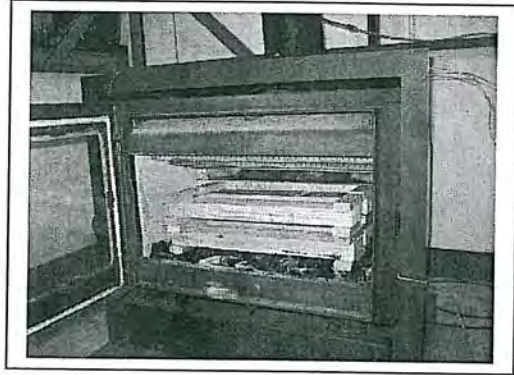


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Run 5 – Fuel



Run 5 - Newly Loaded Stove



Run 6 – Fuel



Run 6 - Newly Loaded Stove



Model: 5660
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Denmark

WOOD HEATER DESCRIPTION

Appliance Manufacturer: Morsø Jernstøberi A/S

Wood Stove Model: 5660

Type: Insert, radiant-type room heater

WOOD HEATER INFORMATION

Materials of Construction: The unit is constructed primarily of cast iron. The firebox is lined with vermiculite.

Air Introduction System: Air enters the firebox through an opening located in the rear of the appliance and is channeled to a manifold above the firebox door. Secondary air enters the appliance through the back and is channeled internally to a hollow, tiered baffle.

Combustion Control Mechanisms: The combustion air inlet is controlled by a handle located below the fuel-loading door in the center of the appliance.

Combustor: N/A.

Internal Baffles: A hollow, tiered steel baffle is mounted in the upper portion of the firebox. The flame path is forced to the front of the firebox where it travels up through the opening between the baffle and primary air manifold.

Other Features: Optional fan accessory.

Flue Outlet: The 6-inch diameter flue outlet is located in the top of the unit.

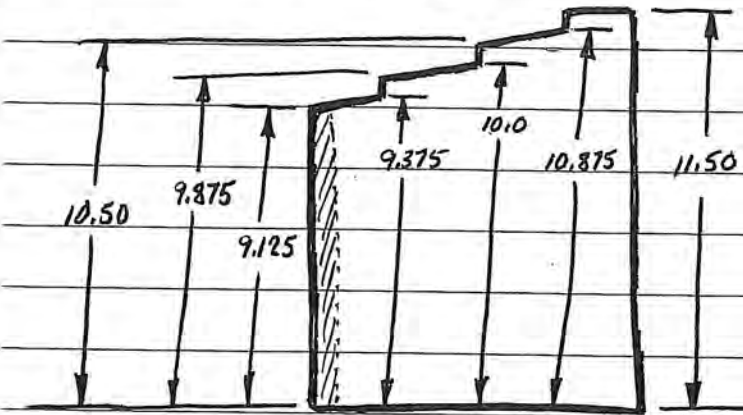
WOOD HEATER OPERATING INSTRUCTIONS

Specific written instructions: See Section 3 of this report. All markings and instruction materials were reviewed for content prior to printing.

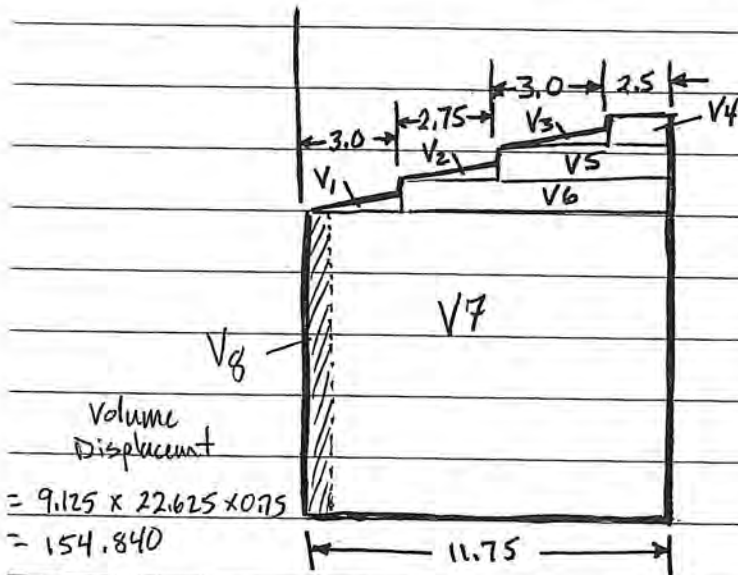
*Model: 5660
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Engineering Drawings/Blueprints (K List)

FIREBOX VOLUME CALCULATION



SIDE VIEW - VERTICAL DIMENSIONS



FIREBOX WIDTH IS
CONSTANT = 22.625

Volume Displacement
 $= 9.125 \times 22.625 \times 0.75$
 $= 154.840$

SIDE VIEW - HORIZONTAL DIMENSIONS

$V_1 = \frac{1}{2} ((3.0 \times (9.375 - 9.125))) \times 22.625 = 8.484$		$V_T = 2733.737 \text{ IN}^3$ $= 1.58 \text{ ft}^3$ $2733.737 - 154.840$ $= 2578.897$ $= 1.492 \text{ ft}^3$
$V_2 = \frac{1}{2} ((2.75 \times (10.0 - 9.875))) \times 22.625 = 3.889$		
$V_3 = \frac{1}{2} ((3.0 \times (10.875 - 10.50))) \times 22.625 = 12.727$		
$V_4 = 2.5 \times (11.5 - 10.5) \times 22.625 = 56.563 \text{ IN}^3$		
$V_5 = (10.50 - 9.875) \times (3.0 + 2.5) \times 22.625 = 77.773$		
$V_6 = (9.875 - 9.125) \times (11.75 - 3.0) \times 22.625 = 148.477$		
$V_7 = 9.125 \times 11.75 \times 22.625 = 2425.824$		

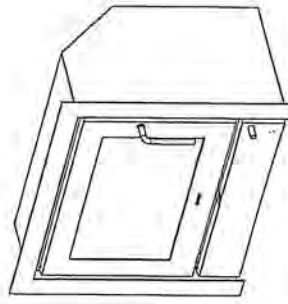
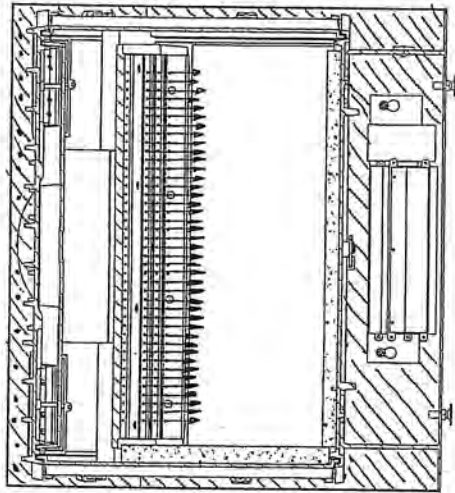
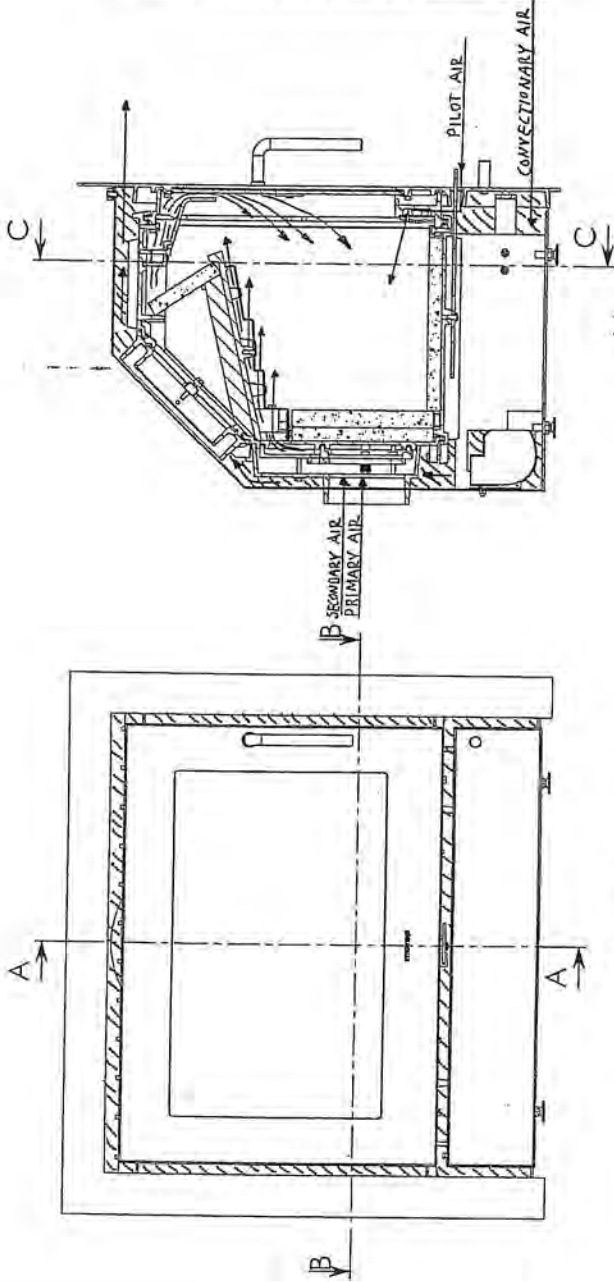
Project Number: 192-S-14-3

Technician Initialed: 16.f. [Signature]

Date: 1-11-07

10.444

OMNI ID: 946



C-C

A-A

PRIMARY AIR

SECONDARY AIR

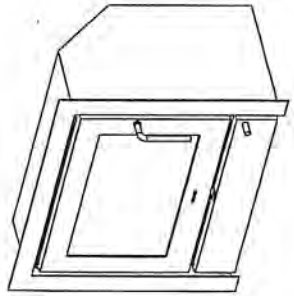
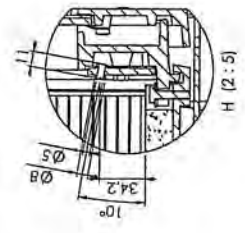
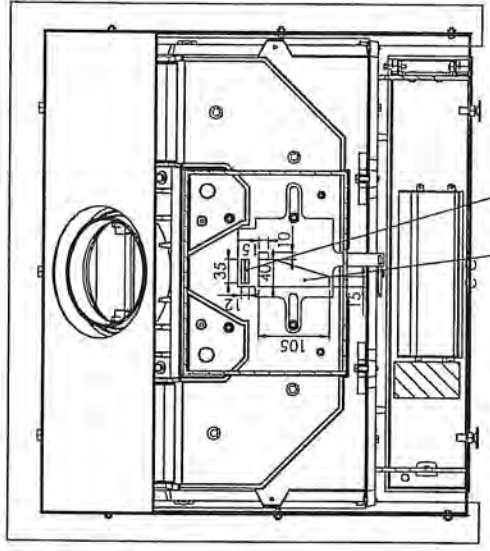
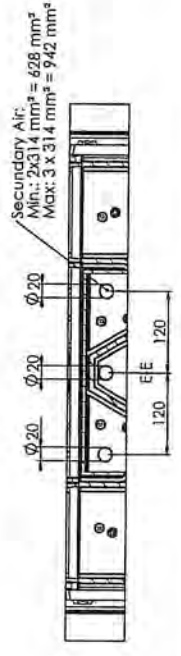
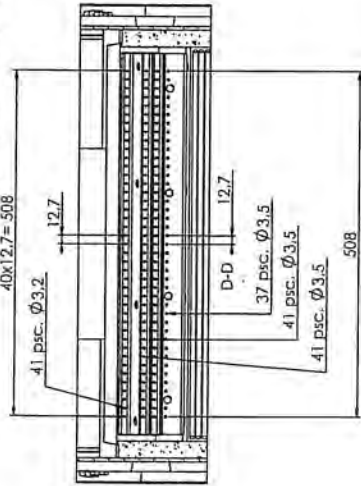
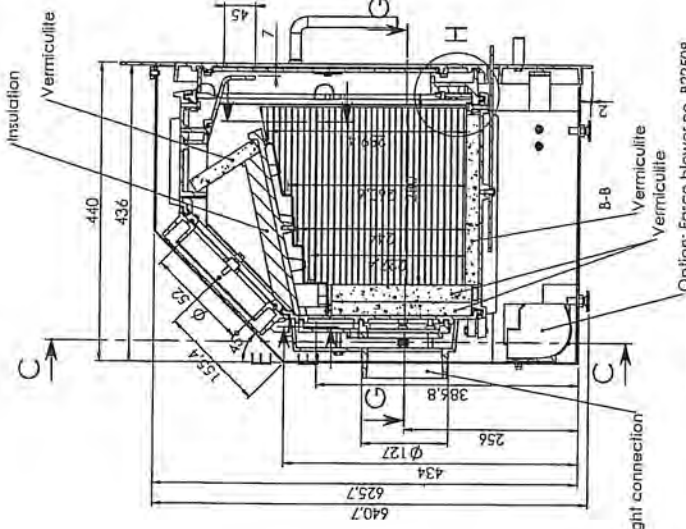
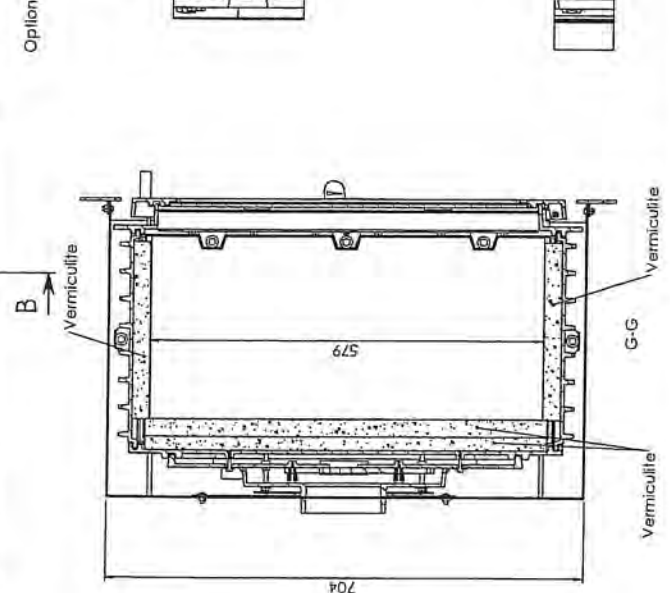
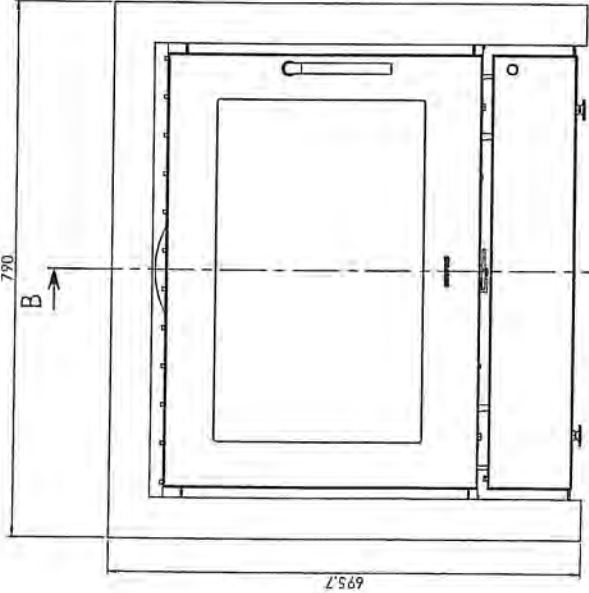
PILOT AIR

B-B

PILOT AIR

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Model no.		Scale:	1:5
Drawing no.		Item no.:	
Drawing no.		Drawing no.:	5600-77 a
morsø			

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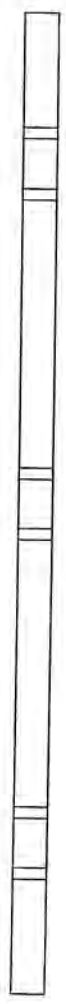
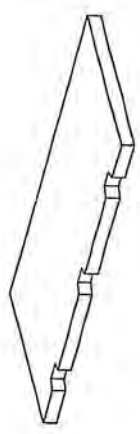
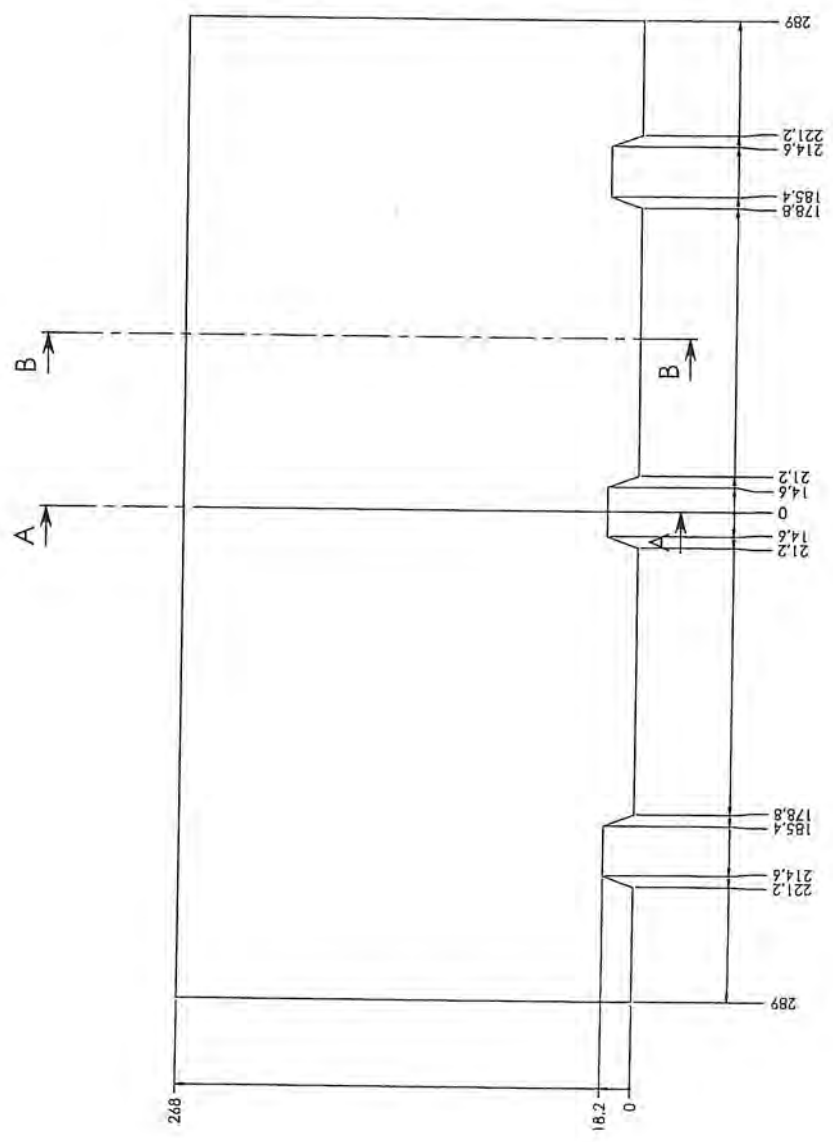
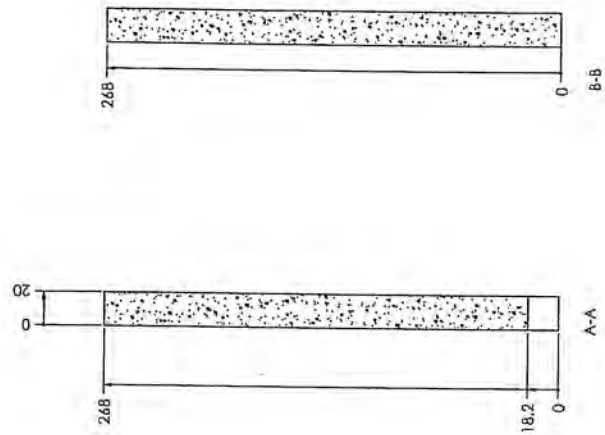
Rev. / Revision		Signat.	Date
1	001	GD	27.02.07
Approval drawing 5660 NA		Prepared:	A2
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Morse 5600		Skala:	1:5
		Drømt:	
		Drømt no.:	5600-68 a
		morse	
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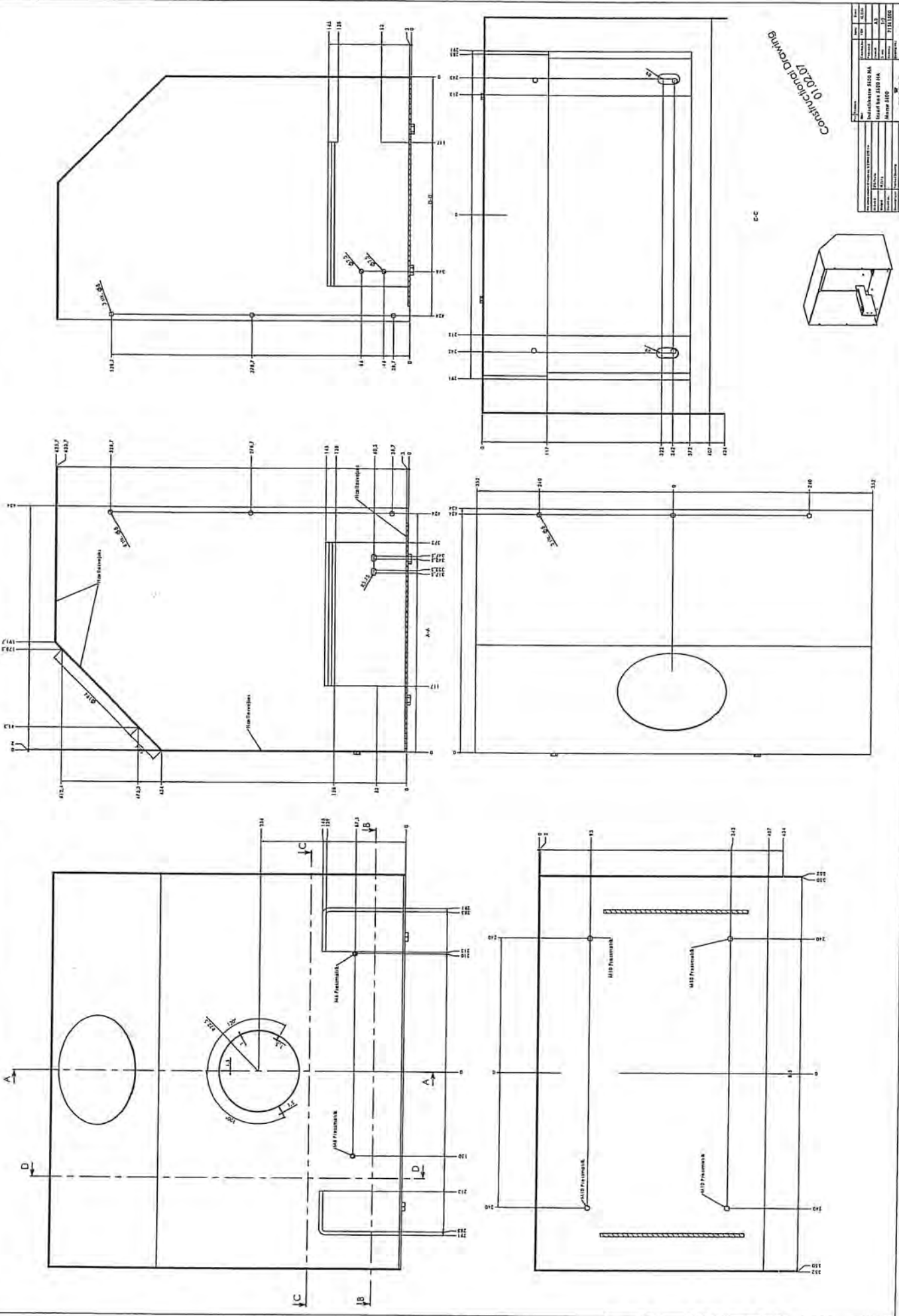
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Rev Drawing Material: Vummula v-100 m.2 Weight: 1,54 kg Material: - Drawing type: Product Drawing Location: -			
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Constructional Drawing
09.02.07

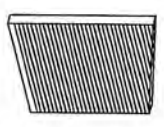
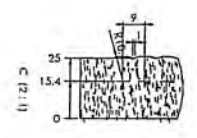
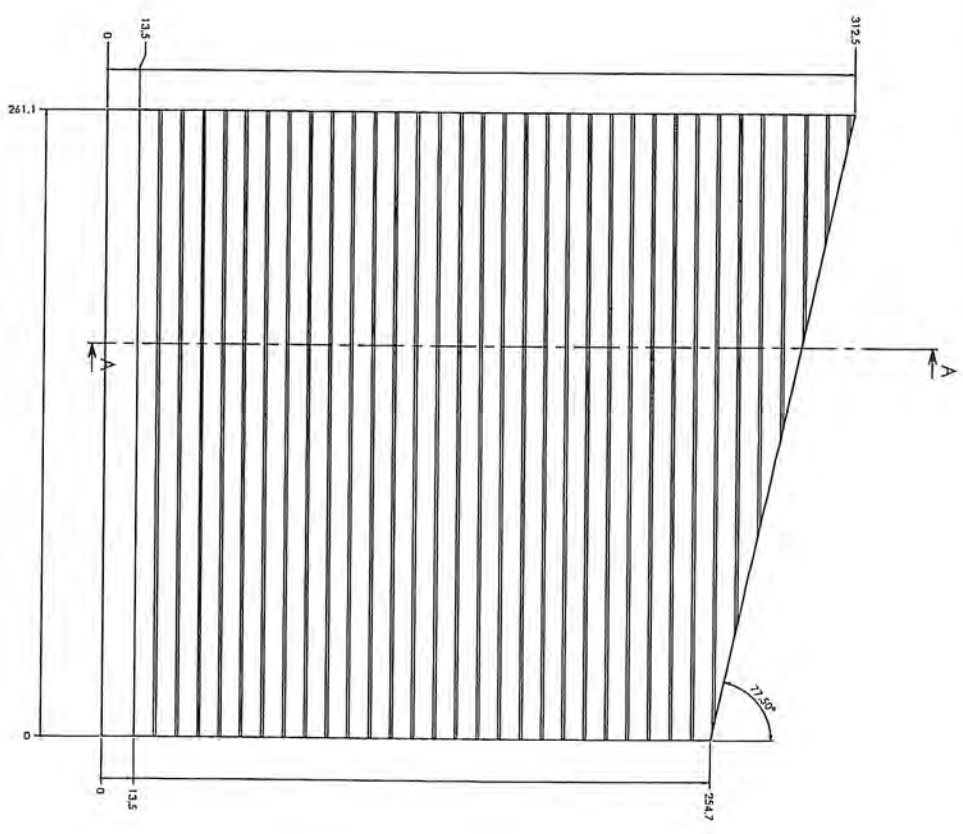
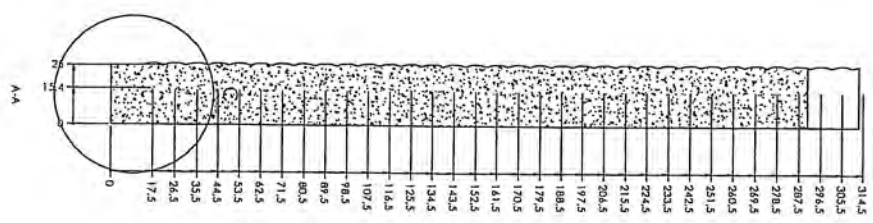




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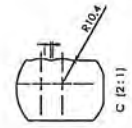
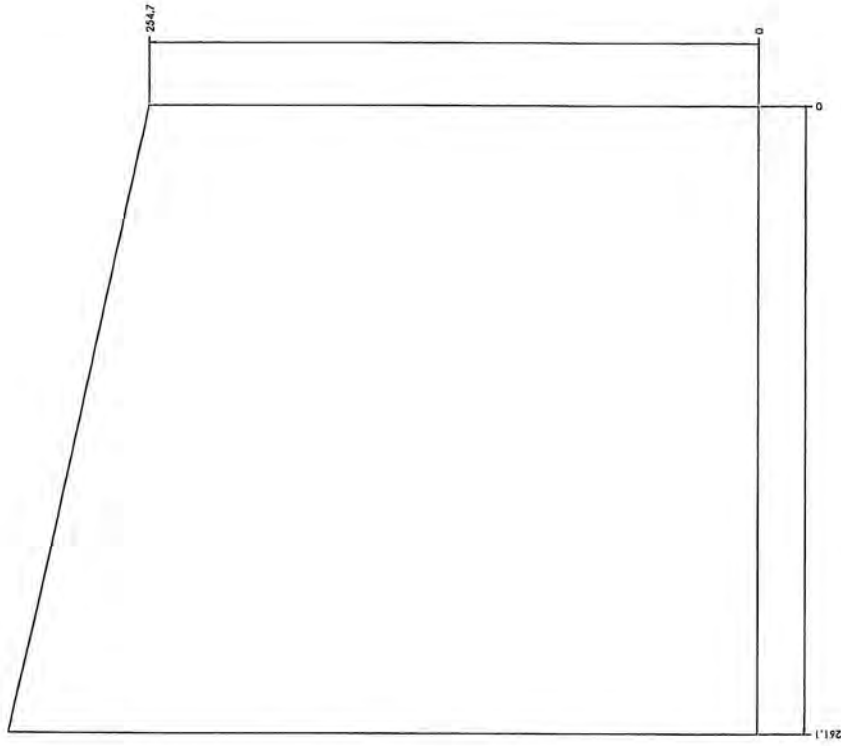
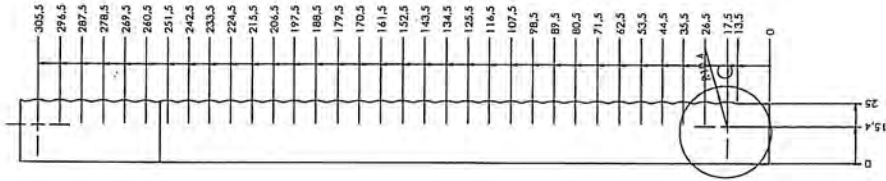
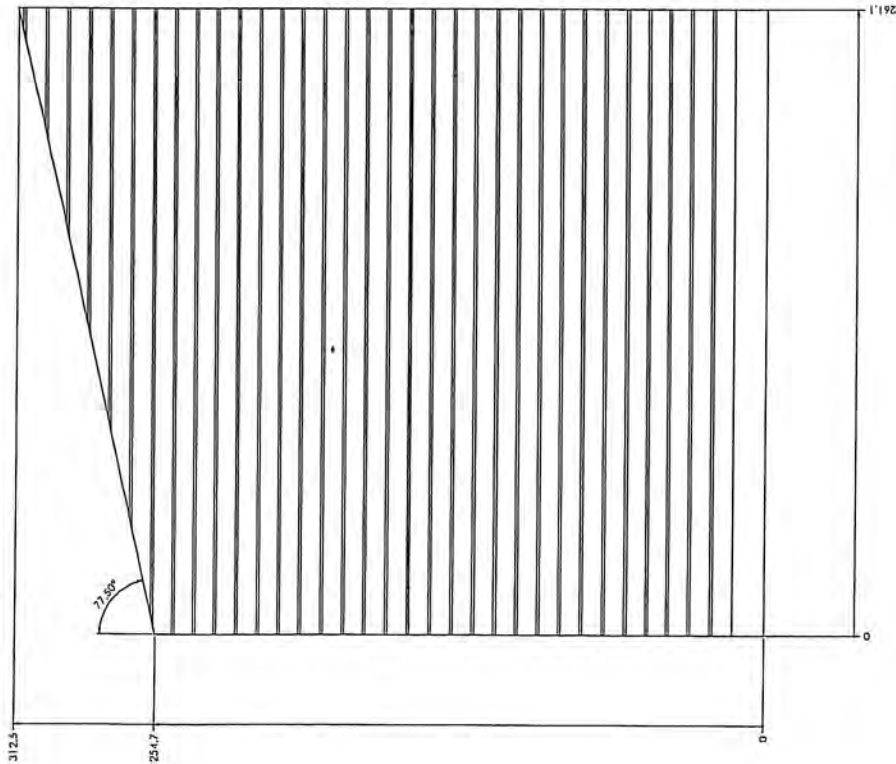
CONSTRUCTION DRAWING
 01/20/07





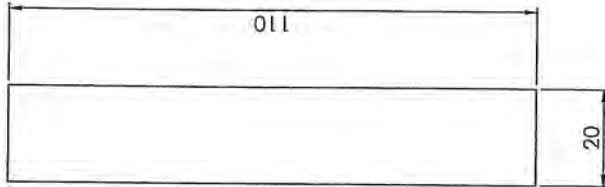
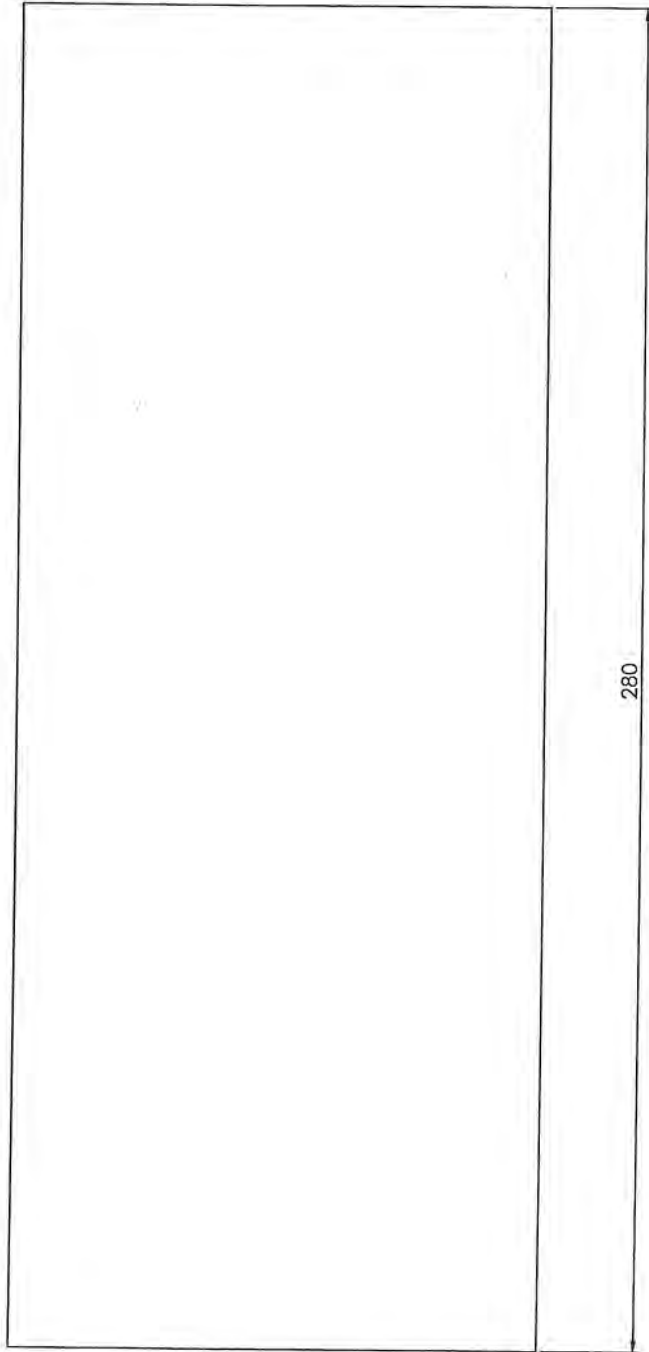
Construction Drawing
09.02.07

Project Information		Client Information	
Project Name	Stone side veranda N/A	Client Name	MORSP
Project Address	Stone side left N/A	Client Address	5400-34
Project No.	13116	Client Phone	7281000
Contract No.		Client Email	
Contract Date		Client Website	
Contract Status		Client Logo	

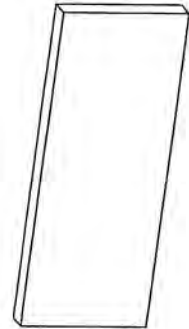


Construction Drawing
09.02.00

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Ime:	Sten side hije - NA	Imao:	AI		
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Ime:		Imao:	7/50/000		
Projekat: morso			Datum: 5.600-35		



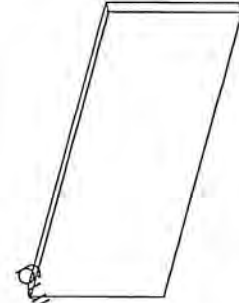
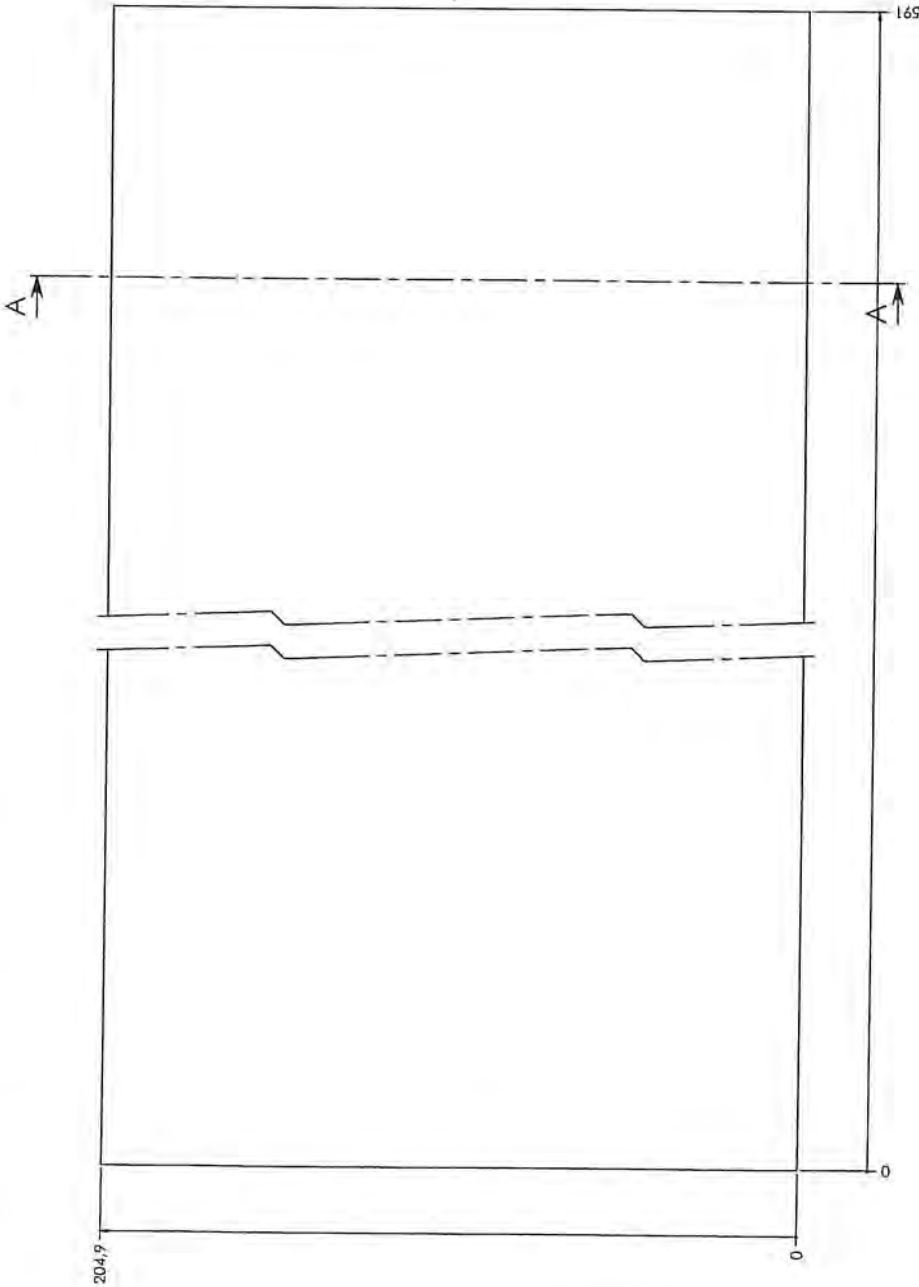
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09.02.07



Rev. / Revisions		Sign.:	Date:
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Model no.:		A3	
Drawing type:		Scale: 1:1	
Location of file:		Item no.: 79560700	
Drawing no.:		5600-33	



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Construction Drawing
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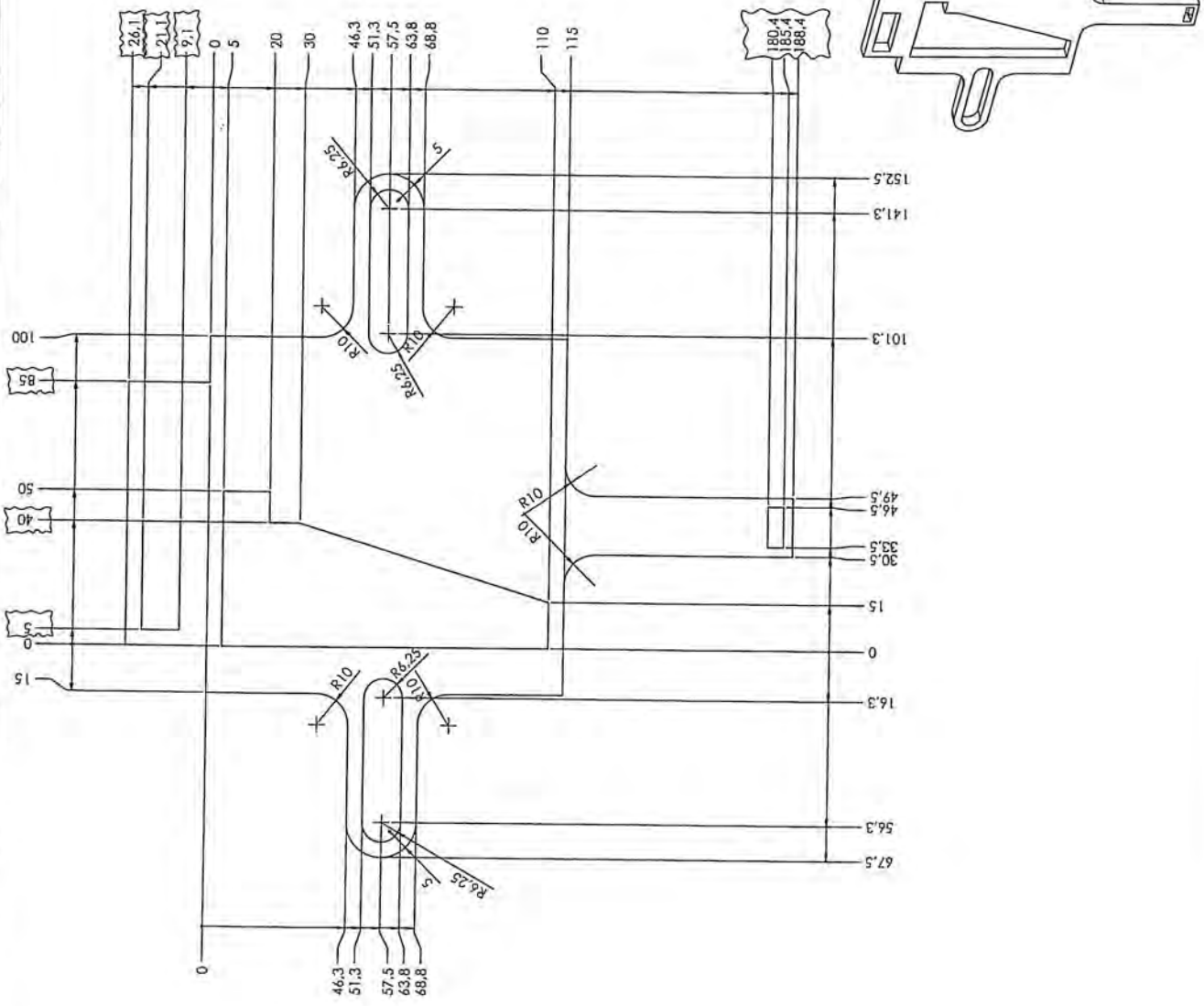
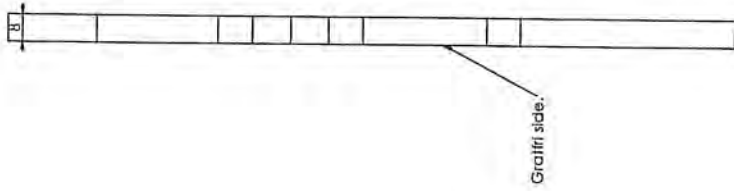
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Sten bag 5600 NA		Released:	A2
Stone back 5600 NA		Formed:	1:1
Morse 5600		Series:	79560800
Drawing no.:		5600-34	

See Drawing	
Material	Ventilator 1100/162
Weight	1,45 kg
Head no.	-
Drawing type	Product Drawing
Author/Title	Product Development

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Construction Drawing
27.02.07

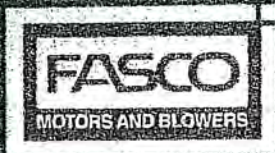


Rev	Revision	Sign.	Date
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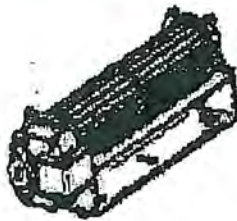
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Manufacturer:	Morsø
Material:	A2
Form:	A2
Scale:	1:1
Series:	71560500
Drawing no.:	5600-31

Code:	GRAETER FJERNES IIIII
Code:	Sekundær sprøyd 5600
Material:	SPD
Weight:	0.99 kg
Series no.:	Morsø 5600
Drawing title:	Product Drawing
Author:	
Checked:	
Released:	

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FASCO INDUSTRIES INC.
FASCO MOTORS GROUP
FASCO DISTRIBUTING CO.
CHESTERFIELD, MO. 63017



**MODEL NO
B22508**

SHADED POLE

C.F.M. 100

AMPS .70

115 V. 60 HZ

1500 RMP 1 SPEED

ORTATION - CWSE

THERMALLY PROTECTED

VENTILATION-OPEN

SLEEVE BEARING

WHEEL 9-1/2 X 2-1/2

CG04



61224379-1

1 B22508

REPLACEMENT MOTOR AND BLOWER SPECIALIST

GLASFIBERPRODUKTER TEKNISKE DATA

Basismaterialelet i STEFFCA glasfiberprodukter består af 6 - 8 mikron "E" glasfibertråde som kan volumineres, tekstureres, tvindes, forstærkes med ståltråde osv.
Produktene er uorganiske, sterile, ildfaste, hell asbestfri, indeholder ingen giftstoffer eller tungmetaller, og forårsager ikke hudirritation.

"E" GLASFIBER - SAMMENSÆTNING

SiO ₂	53-55 %
Al ₂ O ₃	14-15,5 %
CaO - MgO	20-24 %
B ₂ O ₃	6,5-8 %
Fe ₂ O ₃ - TiO ₂	< 1 %
Na ₂ O-H ₂ O	< 1 %

"E" GLASFIBER - GENERELLE EGENSKABER

Farve:	HVID
Max. temperatur	550 °C
Smeltepunkt	1200 °C
Fiberdiameter	6-8 mikron
Trækstyrke - nyt filament	3400 MPa
Young's modul	74000 MPa
Varmeledningsevne	1,0 W/m °K
Reaktion på ild	Ildfast
Glødetab	< 1,5%
Dielektrisk stivhed	60-100 kV/mm
Opløsningsmiddelægtighed	god
Basefasthed	god
Syrefasthed	god - bortset fra fluorbrintesyre

"E" GLASFIBERPRODUKTER - GENERELLE EGENSKABER

- stor mekanisk styrke
- gode elektriske egenskaber
- ildfast
- lav varmeledningsevne
- god modstandsevne over for kemiske stoffer
- høj termisk modstand
- god fleksibilitet

MAX TEMPERATUR 550 °C

STEFFCA GLASFIBERPRODUKTER - SORTIMENT

Snoede pakning - omfløttede pakning - isolerende bånd - fløttede pakninger i runde, firkantede og rektangulære dimensioner - vævet bændl - selyklæbende bændl - bånd - selvklæbende bånd - stigebånd - dielektrisk tape - lodde puder - rå, silikonecoatede, HT-behandlede, aluminiserede, grafilerede, karamelliserede, teflonbelagte, - glasklæder - afdækninger

VETRO-REF: GLASFIBERPRODUKTER MED SPECIEL HT-IMPRÆGNERING

Glasfiberprodukter kan imprægneres med speciel ildfast vermicullit for at øge deres resistens over for høje temperaturer og alle slags termisk chok op til 1000°C og for at reducere spild af glasfiber og pulver under håndteringen.
STEFFCA's "VETRO-REF" produkter er meget fleksible og modstandsdygtige over for gnister, svejsesprøjt og smeltet metal.

VETRO-REF produkternes farve	gul
Imprægneringens max termiske fasthed ved kontinuerlig anvendelse	700 °C
Imprægneringens max termiske fasthed ved kortvarige påvirkninger	1000 °C

www.kompass.net/c/steffcadk

STEFFCA A/S · FALSTERVEJ 10 H · DK-5800 NYBORG · A/S REG.NR. 24 44 93 · SE.NR. 20 76 85 09
TELEFON +45 6531 3102 · TELEFAX +45 6531 8502 · E-MAIL: info@steffca.dk · GIRO 2 45 16 46

Karsten Aagaard

Fra: Martin Steffensen [Martin@steffca.dk]

Sendt: 25. marts 2004 13:04

Til: kaa@morsoe.com

Emne: Data E-glas Eng.

Hermed data som aftalt.

GLASS FIBER TEXTILE PRODUCTS

The base material of STEFFCA Glass Fiber Textile Products consists of 6 - 9 microns "E" Glass Fiber Filament Yarns that can be voluminized, texturized, plyed, reinforced with steel wire etc.

They are inorganic, steril, incombustible, totally Asbestos-Free, do not contain any toxic matter nor heavy metals and do not cause skin irritations.

BASIC COMPOSITIONS OF "E" GLASS FIBER

- SiO₂ 53-55 %
- Al₂O₃ 14-15,5 %
- CaO + MgO 20-24 %
- B₂O₃ 6,5-9 %
- Fe₂O₃-TiO₂ < 1%
- Na₂O-K₂O < 1%

GENERAL PROPERTIES OF "E" GLASS FIBER

- Max. Temperature 550°C
- Melting Point 1200 °C
- Diameter-*filaments* 6-9 micron
- Tensile strength-*virgin filament* 3400 MPa
- Young's modulus 74000 MPa
- Thermal conductivity 1,0 W/m °K
- Fire reaction incombustible
- Loss on ignition < 1,5 %
- Dielectric rigidity-*glass in bulk* 60-100 KV/mm
- Solvent resistance good

- Bases resistance good
- Acid resistance good - except fluoridric acid

GENERAL PROPERTIES OF "E" GLASS FIBER TEXTILE PRODUCTS

- - high mechanical strength - good electrical properties
- - incombustible - good dimensional stability
- - low thermal conductivity - good resistance to chemical agents
- - high thermal resistences - - good flexibilty
- - max temperature 550°C

V-1100 (600) Vermiculite insulating boards

for hot-face and back-up insulation - up to 1100°C (2012°F)



Maximum service temperature	°C	1100
	°F	2012
Bulk density, dry	kg/m ³	600
	lbs/cu.ft.	37.5
Compressive strength (EN 1094-5: 1995)		
@ room temperature	MPa	4.2
	lbs/sq.in.	609
Modulus of rupture (EN 993-6: 1995)		
	MPa	1.6
	lbs/sq.in.	232
Total porosity (EN 1094-4: 1995)		
	%	76
Specific heat		
	kJ/(kg×K)	0.94
	BTU/(lb×°F)	0.224
Coefficient of reversible thermal expansion (BS 1902: section 5.3: 1990)		
@ 20°C-750°C (68°F-1382°F)	K ⁻¹	11×10 ⁻⁶
	°F ⁻¹	6.1×10 ⁻⁶
Resistance to thermal shock (EN 993-11: 1998)		
heating to 950°C (1742°F)	cycles	>10
Linear reheat shrinkage (EN 1094-5: 1999)		
@ 1000°C	%	1.0
@ 1100°C	%	
Pyrometric cone equivalent (ASTM C24-89 ORTON cones)		
	°C	1300
	°F	2372
Thermal conductivity (ASTM C-182)		
mean temp. @ 200°C	W/(m×K)	0.15
mean temp. @ 400°C	W/(m×K)	0.16
mean temp. @ 600°C	W/(m×K)	0.19
mean temp. @ 800°C	W/(m×K)	-
mean temp. @ 392°F	BTU/(sq.ft.×h×°F/in.)	1.04
mean temp. @ 752°F	BTU/(sq.ft.×h×°F/in.)	1.11
mean temp. @ 1112°F	BTU/(sq.ft.×h×°F/in.)	1.32
mean temp. @ 1472°F	BTU/(sq.ft.×h×°F/in.)	-
Chemical analysis, typical	%	
Silica	SiO ₂	47
Titanium dioxide	TiO ₂	0.5
Ferric oxide	Fe ₂ O ₃	4
Alumina	Al ₂ O ₃	7
Magnesium oxide	MgO	21
Calcium oxide	CaO	2
Sodium oxide	Na ₂ O	0.5
Potassium oxide	K ₂ O	11
Loss on ignition 1025°C (1877°F)	LOI	7
Colour		sand

* Vermiculite boards VIP-12 HS are tested according to EN 993-15:1998 Hot Wire.

Data are average results of tests conducted under standard procedures and are subject to variation. Data contained in this data sheet are supplied in good faith as a technical service and are subject to change without notice. Misprint and errors excepted.

Skamol A/S
Østergade 58-60
DK-7800 Nykøbing Mors
Denmark
Tel: 45 9772 1533
Fax: 45 9772 4975
insulation@skamol.dk

Sales offices

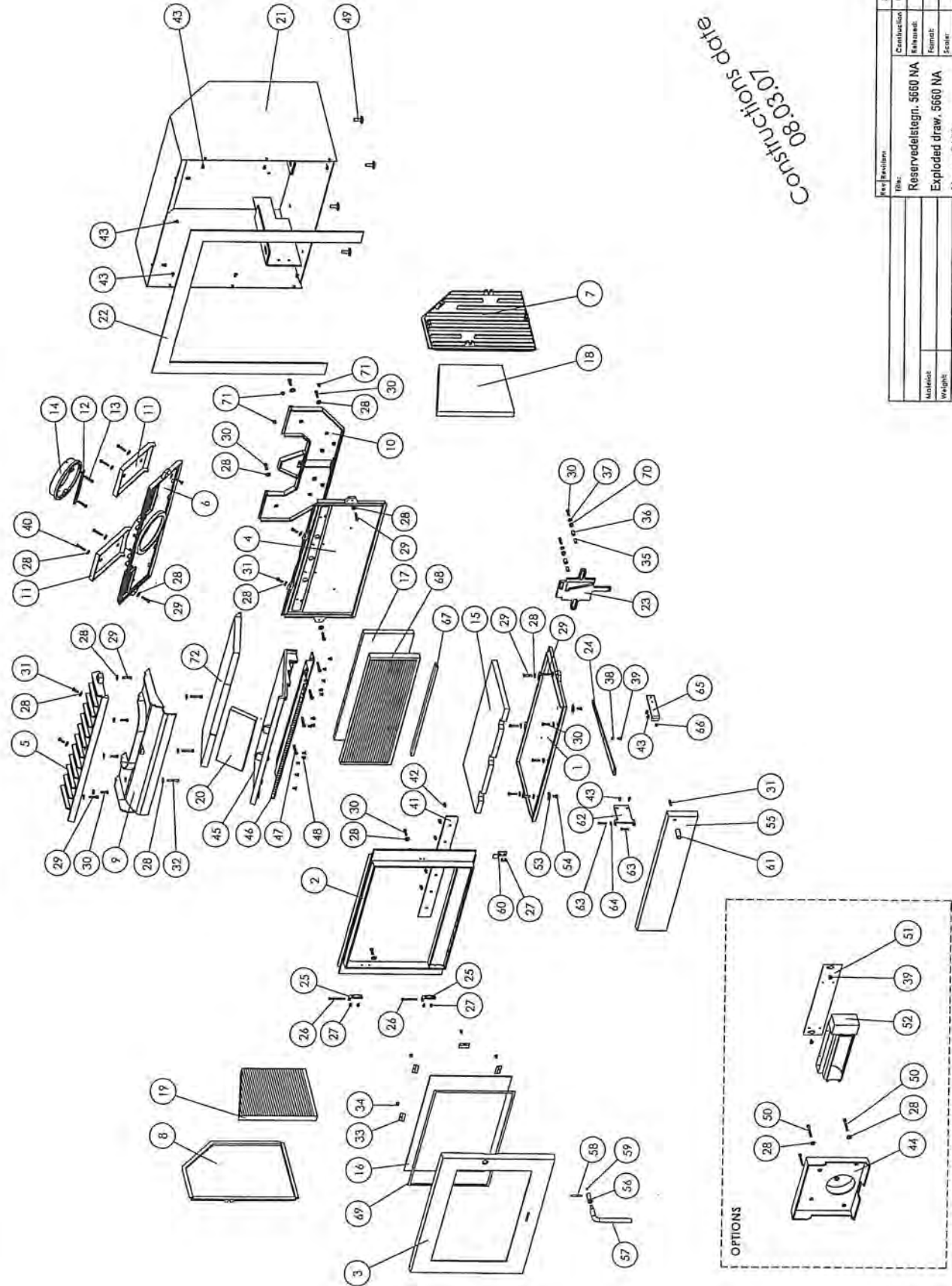
Skamol Europe GmbH
Promenadenstrasse 1
D-41460 Neuss
Germany
Postfach 10 14 37
D-41414 Neuss
Tel: +49 (0) 2131-10640
Fax: +49 (0) 2131-10646

Skamol Americas, Inc.
8318 Pineville-Matthews Road
Suite 267
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Fax: +1 (704) 544-1239

www.skamol.com

Skamol A/S is DS/EN ISO 9001 certified.

March 2004



Constructions date
 08.03.07

File / Revision:	Sign: / Date:
File: / Revision:	CDU / 07.03.07
Construction: / Release:	Reservdelstegn. 5600 NA / A2
Material: / Form:	Exploded draw. 5600 NA / 1:10
Weight: / Scale:	Morso 5600 /
Model no. / Release:	/
Dimensions: / Drawing no.:	/ 5600-501
Location of file: /	/

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*Model: 5660
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark*

Engineering Drawings/Blueprints (Remainder)

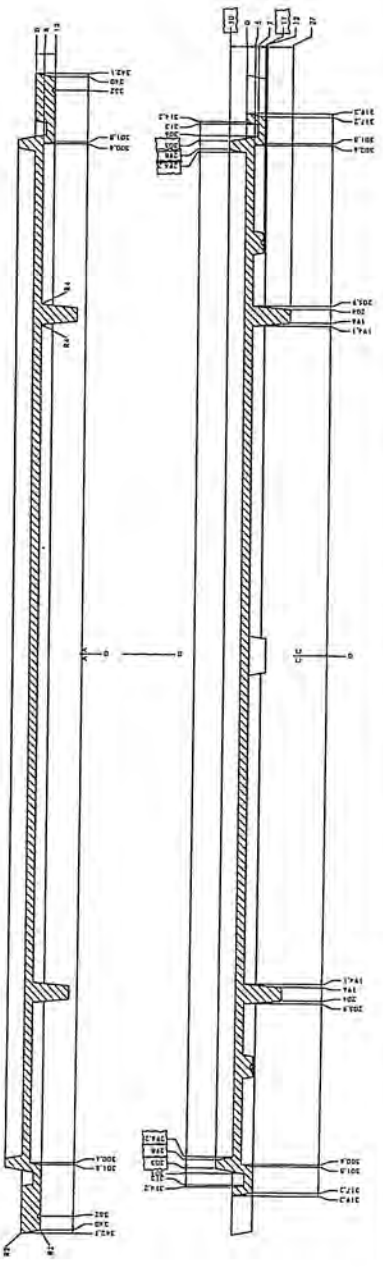
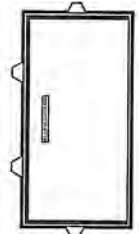
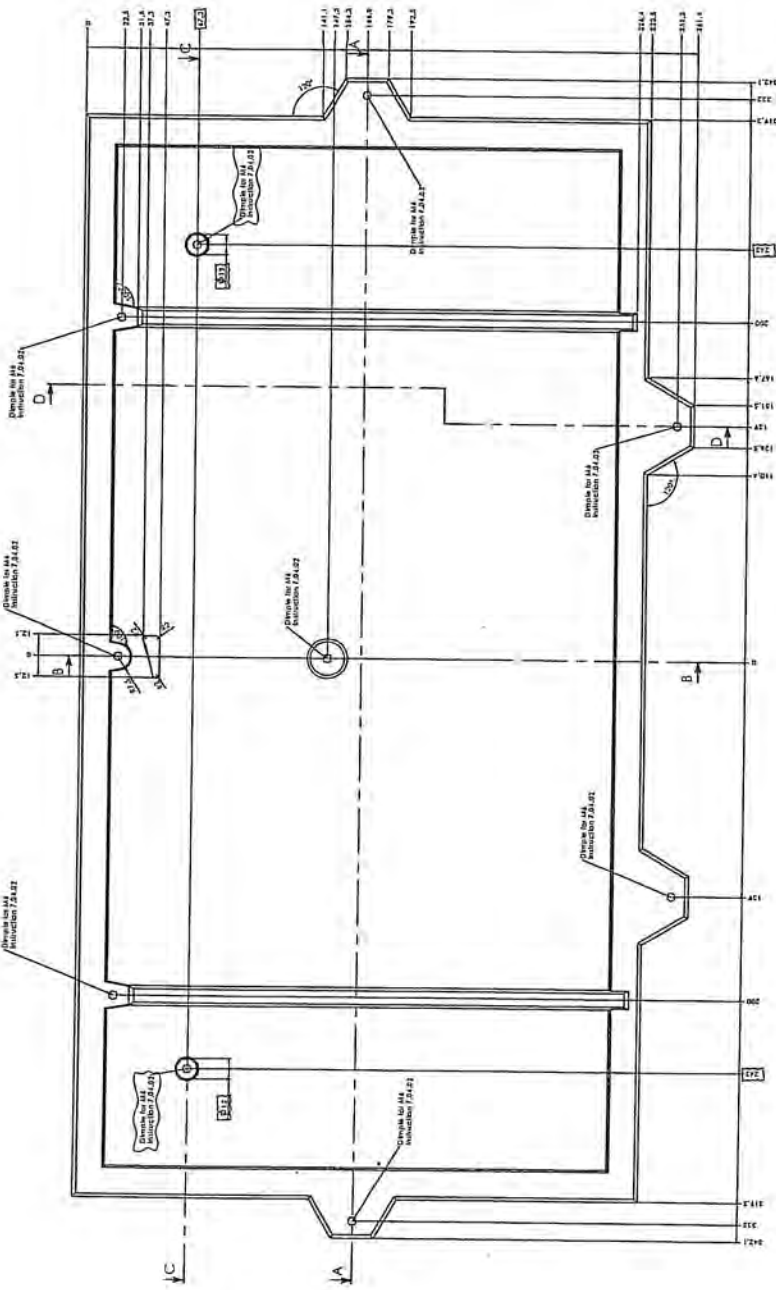
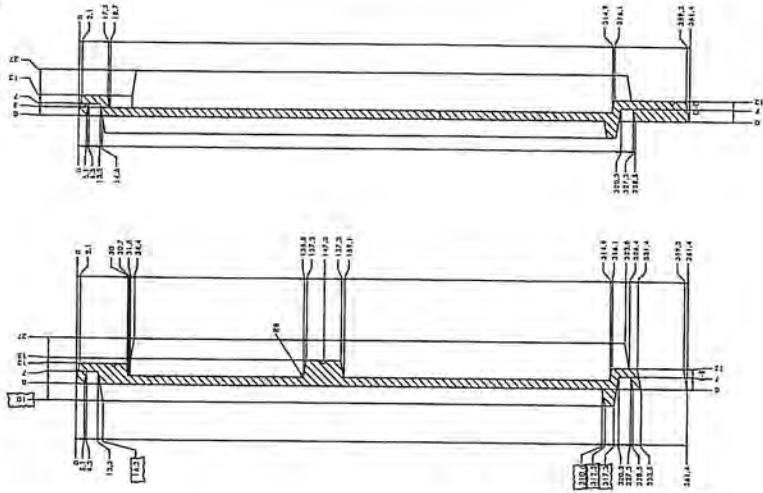
Morsø 5660 NA - Drawings and data

Nykøbing Mors d. 12.03.2007

PARTS:	DRAWINGS:	DATE:
Buttom plate	5600-01	08.02.2007
Front frame	5600-02	08.02.2007
Door	5600-03	21.12.2006
Rear plate	5600-04	27.02.2007
Top plate	5600-05	09.02.2007
Side Plate right	5600-06	21.12.2006
Side plate left	5600-07	21.12.2006
Top Plate Inclined	5600-08	04.09.2006
Air Canal Top inside	5600-09	22.09.2006
Air Canal Rear	5600-10	27.02.2007
Air Canal Inclined	5600-11	04.09.2006
Airtight Canal	5600-12	02.03.2007
Front cover 5600 NA	5600-13	31.01.2007
Baffle plate 5600	5600-14	08.02.2007
Ceramic glass	5600-20	31.08.2006
Stone back 5600 EN + NA	5600-21	09.02.2007
Secondary draught control	5600-31	27.02.2007
Handle sek. draught control	5600-32	08.02.2007
Vertical baffle plate	5600-33	09.02.2007
Stone back 5600 NA	5600-34	09.02.2007
Stone side right - NA	5600-35	09.02.2007
Stone side left NA	5600-36	09.02.2007
Adjustment base 5600	5600-38	07.02.2007
Cover f. Pilot air 5600	5600-41	08.02.2007
Insert box 5600 NA	5600-46	01.02.2007
Insert Frame 5600 NA	5600-47	01.02.2007
Baffle plate, stainless	5600-48	07.02.2007
Mounting plate Blower	5600-54	15.12.2006
Axis for handle	5600-58	20.12.2006
Door handle, stainless steel	5600-59	20.12.2006
Closing plate	5600-60	10.01.2007
Knob front cover	5600-62	01.02.2007
Front Cover fitting	5600-63	01.02.2007
Magnet fitting	5600-64	01.02.2007
Stone Buttom 5600 NA	5600-66	09.02.2007
App. drawing	5600-68	27.02.2007
Distance tube	5600-73	08.03.2007
Distance tube	5600-74	08.03.2007
Insulation	5600-75	08.03.2007
Tightening tape	5600-76	09.03.2007
Air flow	5600-77	12.03.2007
Parts drawing	5600-501	08.03.2007
Hinge pin	1126-38	20.12.1996
Hollow Section	1400-191	24.04.1998
Glass fitting	1400-206	14.03.2001
Distance tube	2000-185	30.04.2003
Flue collar	3400-97	21.08.2001
Magnet	4600-108	09.03.2004
Hinge pin fitting	8100-30	29.09.2005

DATA:

V-1100 (600) Vermiculite insulating slabs- Technical datas
Glas fiber products – Technical datas
Glass ceramics - Technical datas
Installation and Operating Instructions
Ventilator type – Data
Parts list



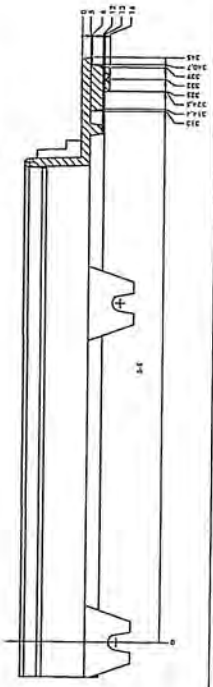
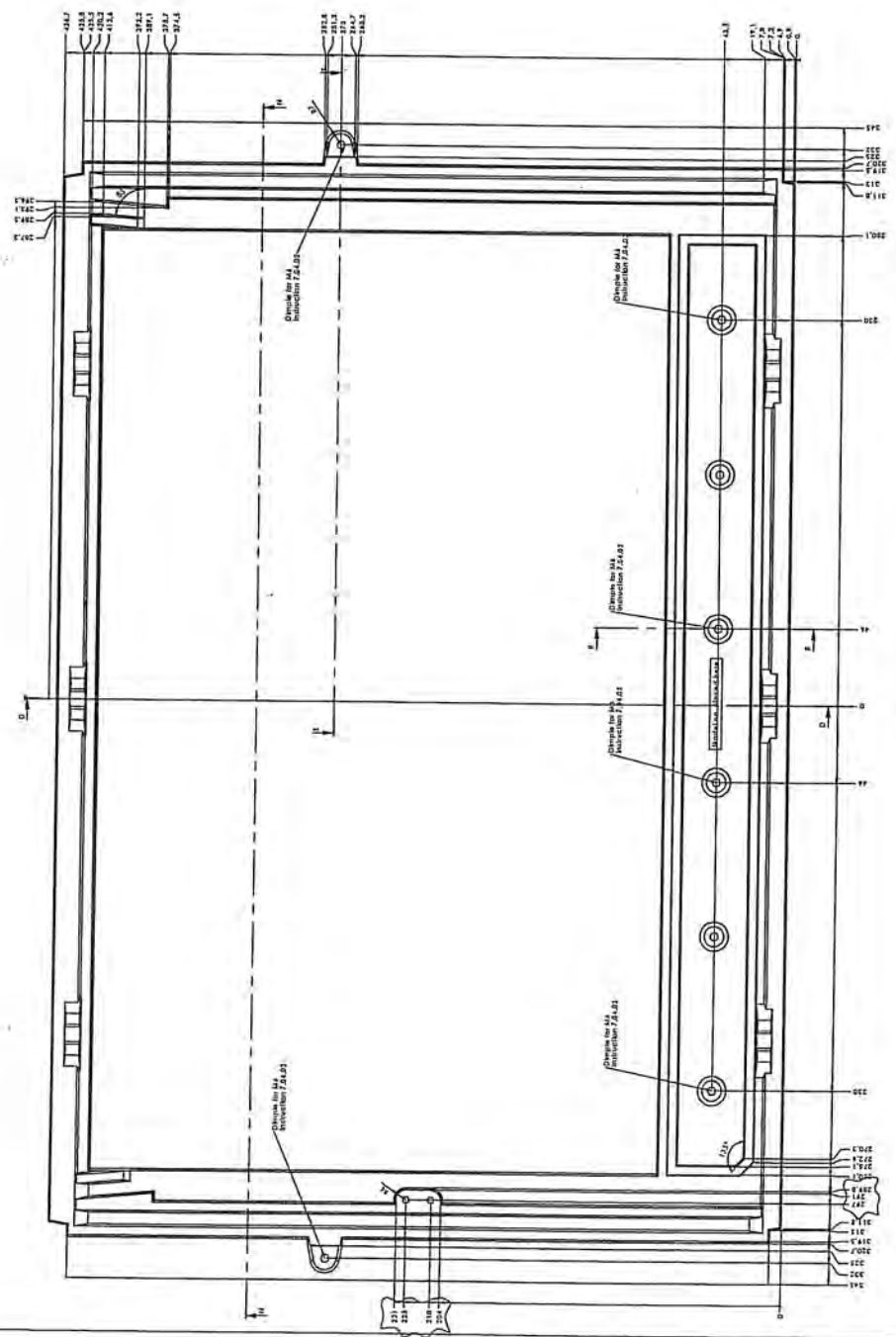
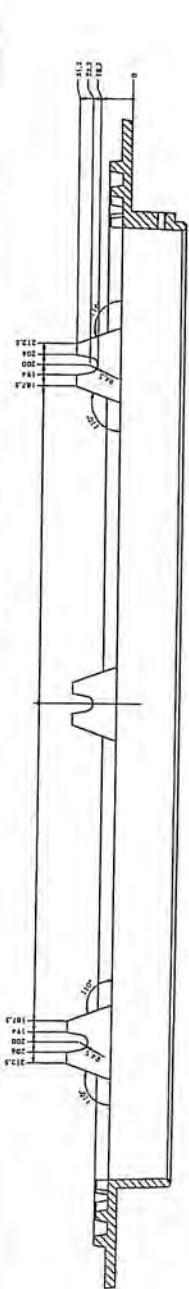
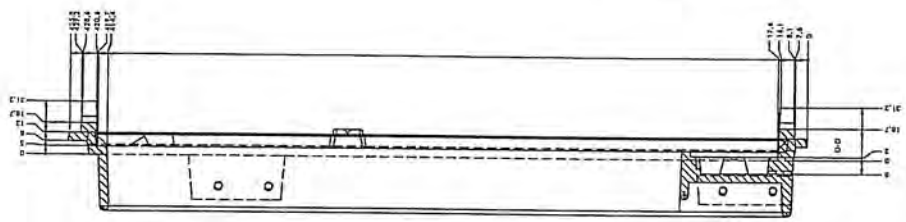
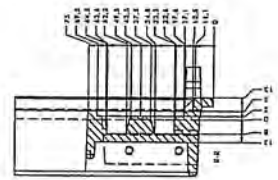
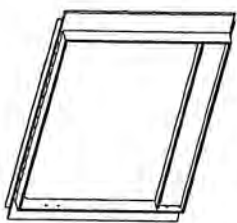
Conventional Drawing
 08.02.01

This window is installed in a wall.
 The window is shown in the open position.
 The window is shown in the closed position.

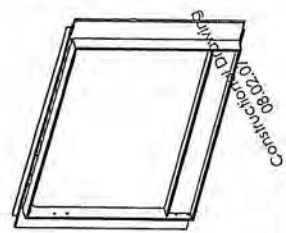
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Project Mat.	08.02.01	Project Con.	08.02.01
Project Sta.	08.02.01	Project Fin.	08.02.01
Project Tot.	08.02.01	Project Val.	08.02.01
Project Ave.	08.02.01	Project Est.	08.02.01
Project Bid.	08.02.01	Project Act.	08.02.01
Project Win.	08.02.01	Project Los.	08.02.01
Project Tie.	08.02.01	Project Abn.	08.02.01
Project Wtd.	08.02.01	Project Wtl.	08.02.01
Project Wlo.	08.02.01	Project Wli.	08.02.01
Project Wle.	08.02.01	Project Wlf.	08.02.01
Project Wll.	08.02.01	Project Wlm.	08.02.01
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Project Wlp.	08.02.01	Project Wll.	08.02.01
Project Wlr.	08.02.01	Project Wln.	08.02.01
Project Wls.	08.02.01	Project Wlo.	08.02.01
Project Wlt.	08.02.01	Project Wlp.	08.02.01
Project Wlv.	08.02.01	Project Wlr.	08.02.01
Project Wlw.	08.02.01	Project Wls.	08.02.01
Project Wlw.	08.02.01	Project Wlt.	08.02.01
Project Wlw.	08.02.01	Project Wlv.	08.02.01
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08.02.07
 08.02.07
 08.02.07

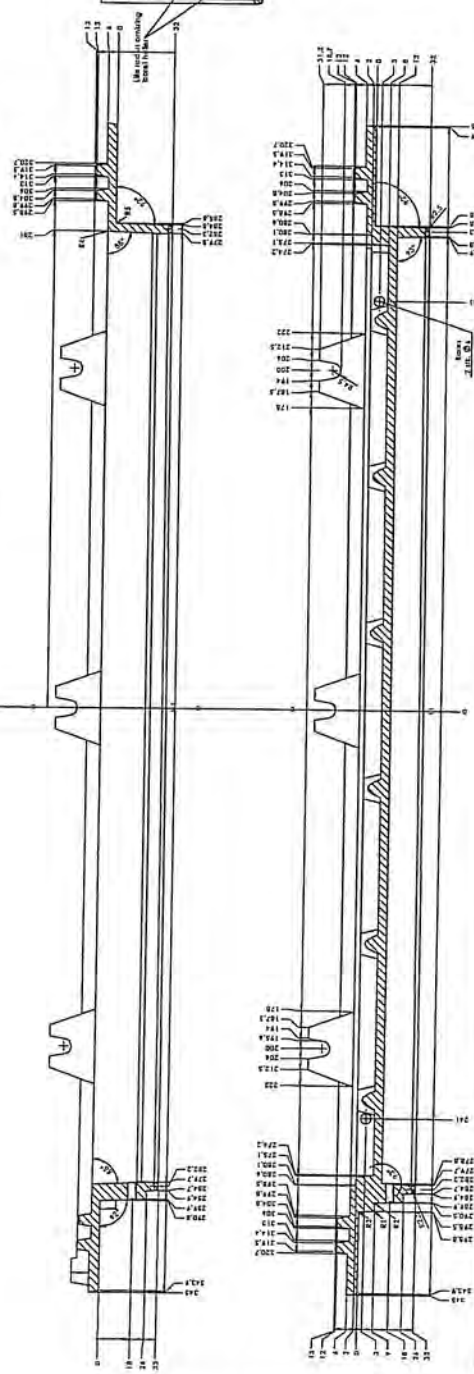
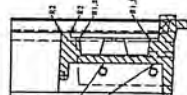
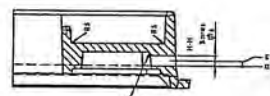
ITWISSO Institut für Technische Wissenschaften am Bauhaus-Universität 10000 Berlin	
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Auftraggeber:	Auftraggeber:
Datum:	Datum:
Zeichner:	Zeichner:
Prüfer:	Prüfer:
Blatt:	Blatt:
Blattzahl:	Blattzahl:



OS-0011 OS-0011-00	
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Part Number	OS-0011-00
Revision	001
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Unit	OS-0011-00
Weight	OS-0011-00
Volume	OS-0011-00
Value	OS-0011-00
Notes	OS-0011-00

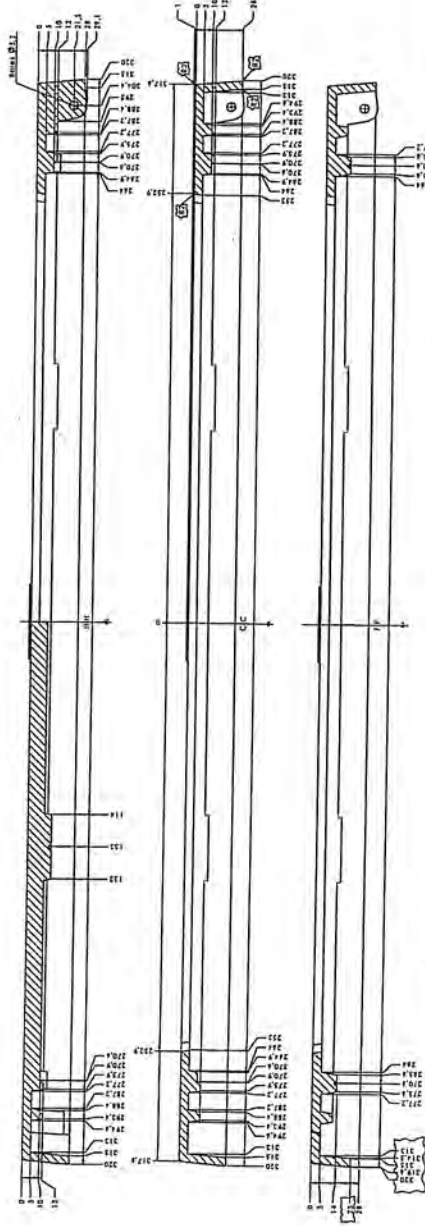
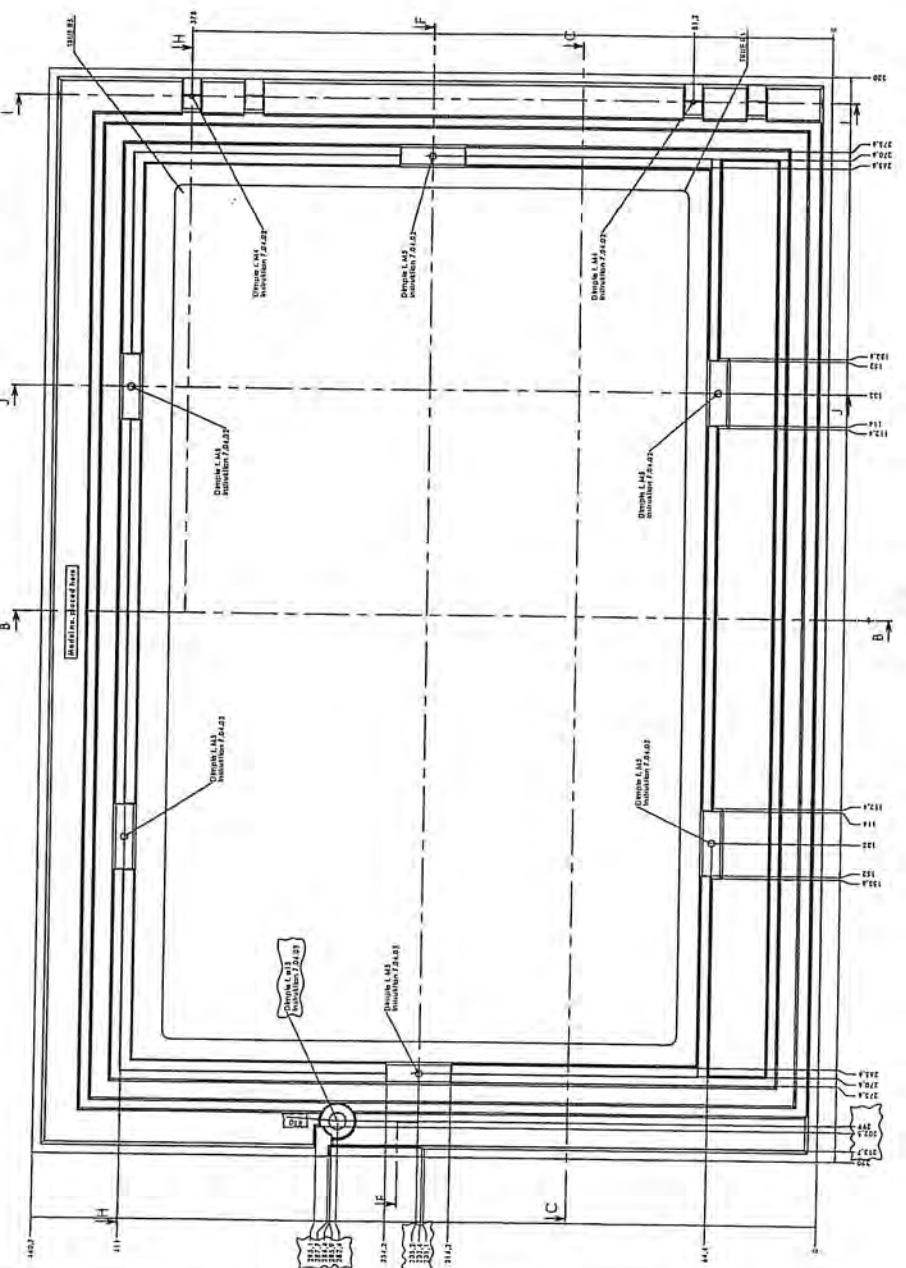
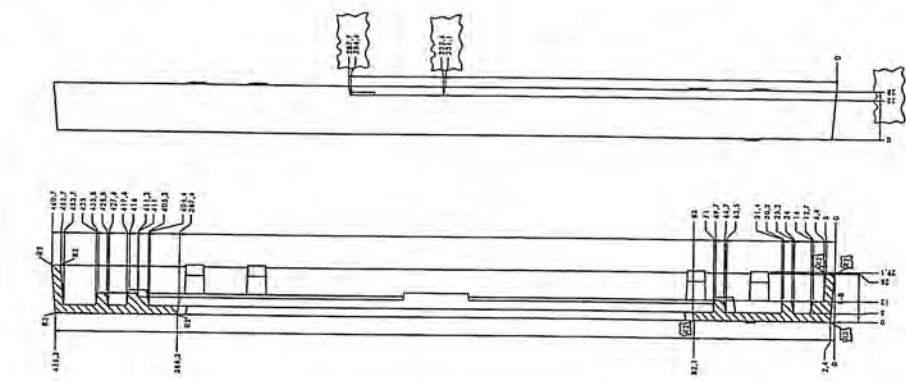
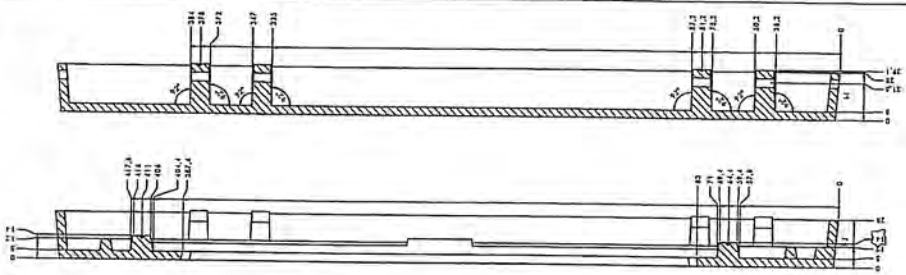
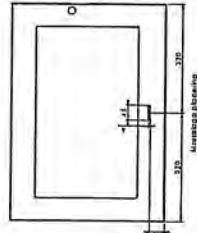
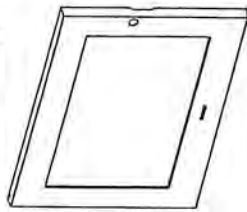


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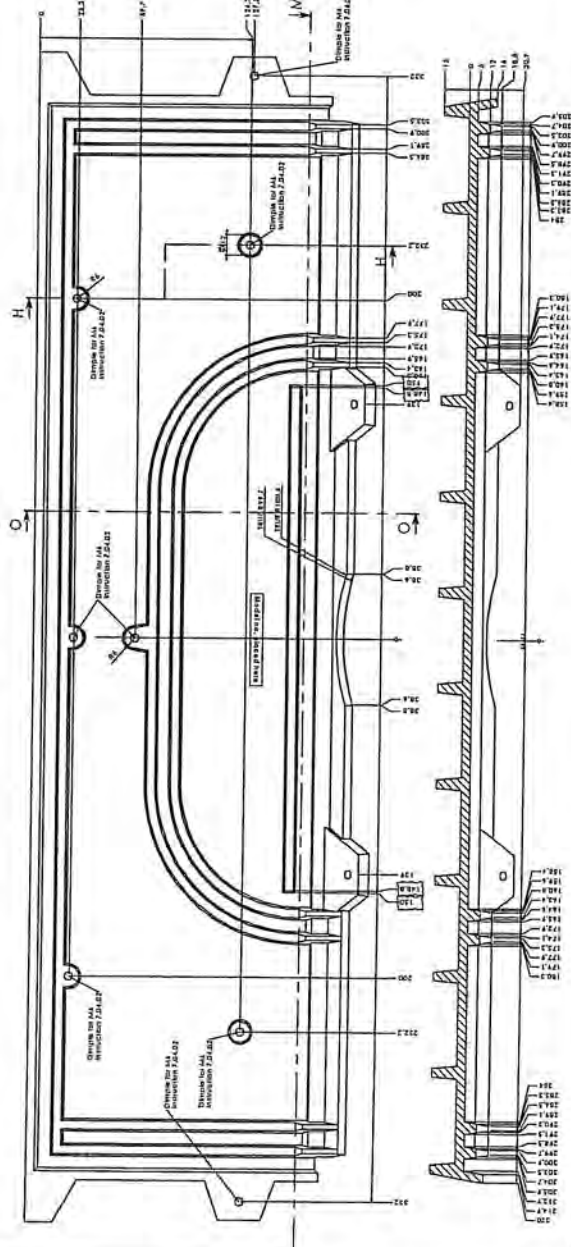
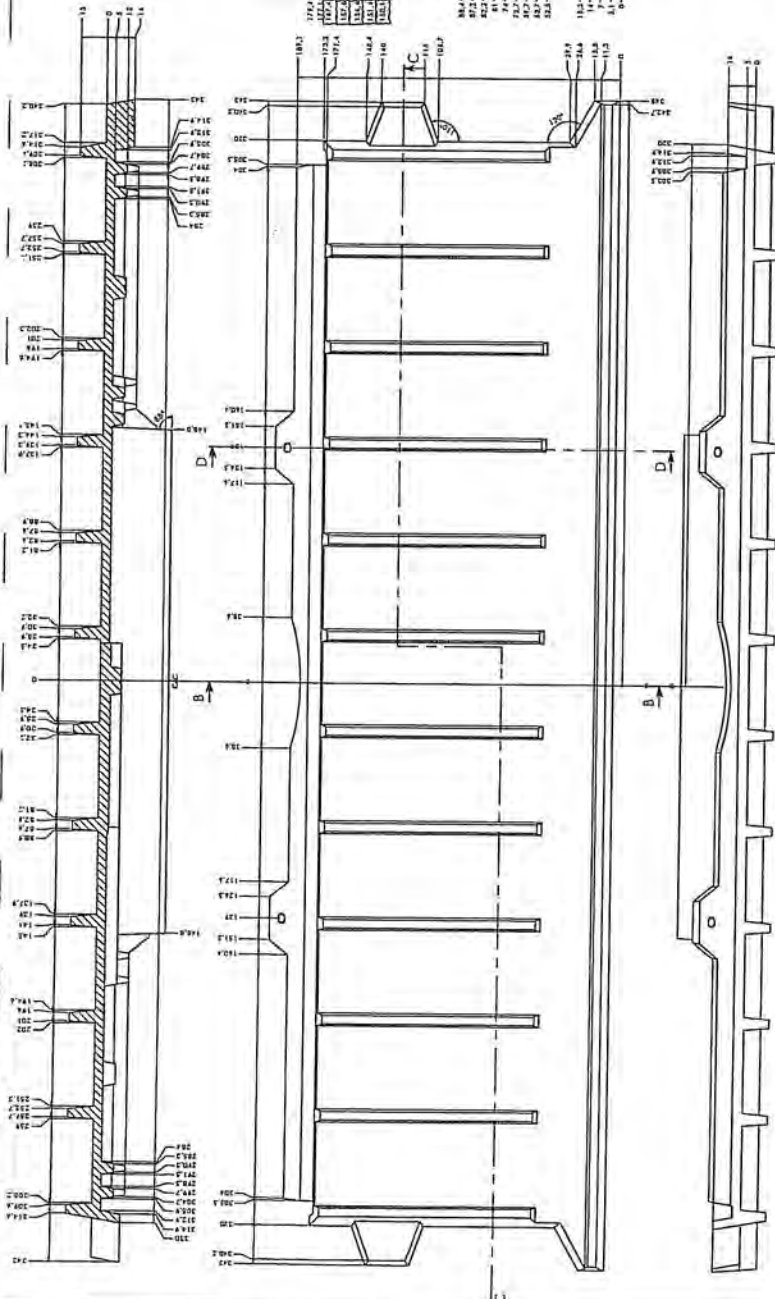
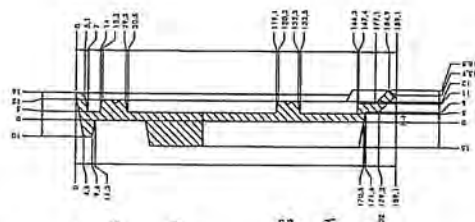
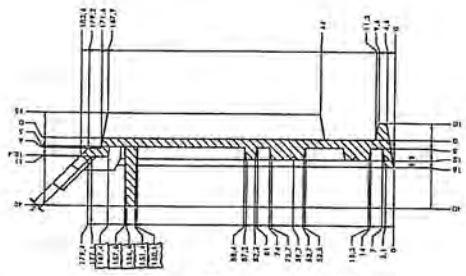
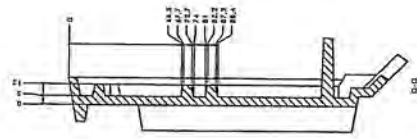
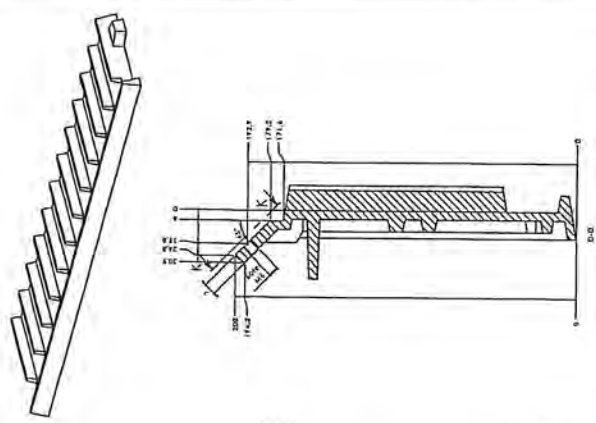
MOORE Mechanical Engineering 1000 North 10th Street Phoenix, Arizona 85016 Phone: (602) 254-1100 Fax: (602) 254-1101 E-Mail: moore@moore-eng.com	
Project No.: 1000 Drawing No.: 1000-1000 Date: 10/10/10 Scale: 1/8" = 1'-0"	Revision: 1.0 Description: 1000-1000

CONSTRUCTION DRAWING
 21.1208



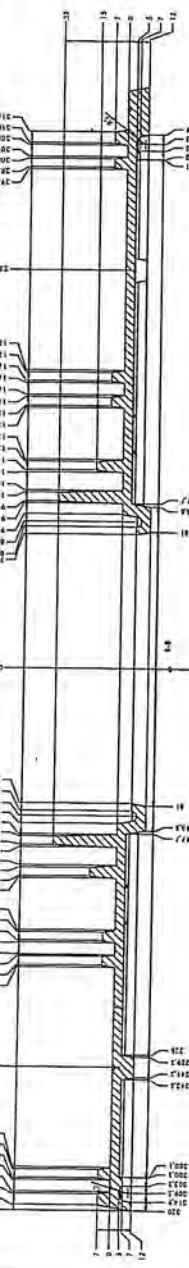
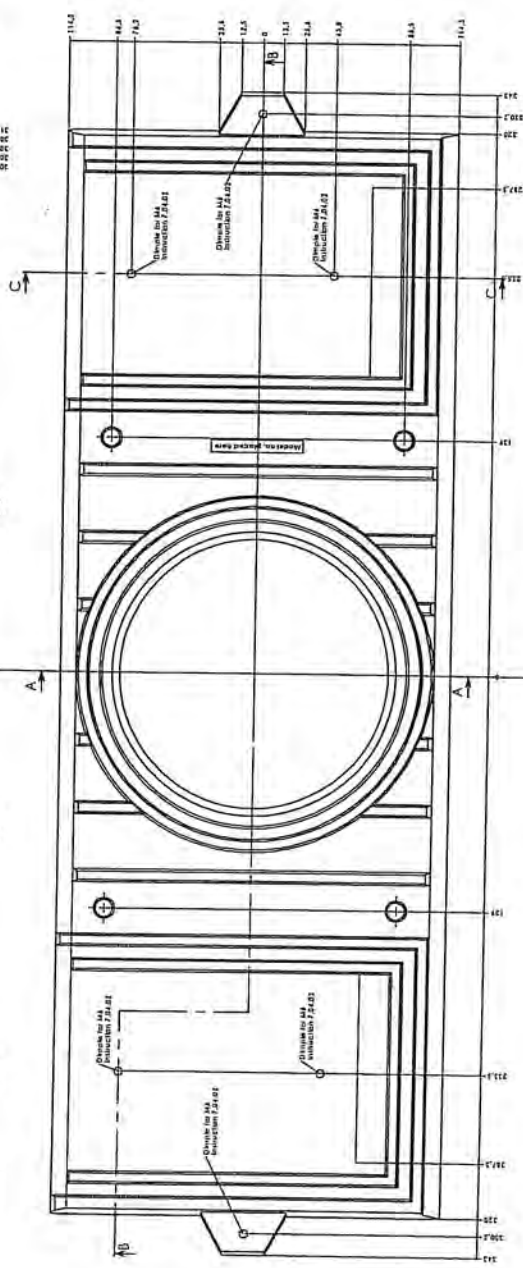
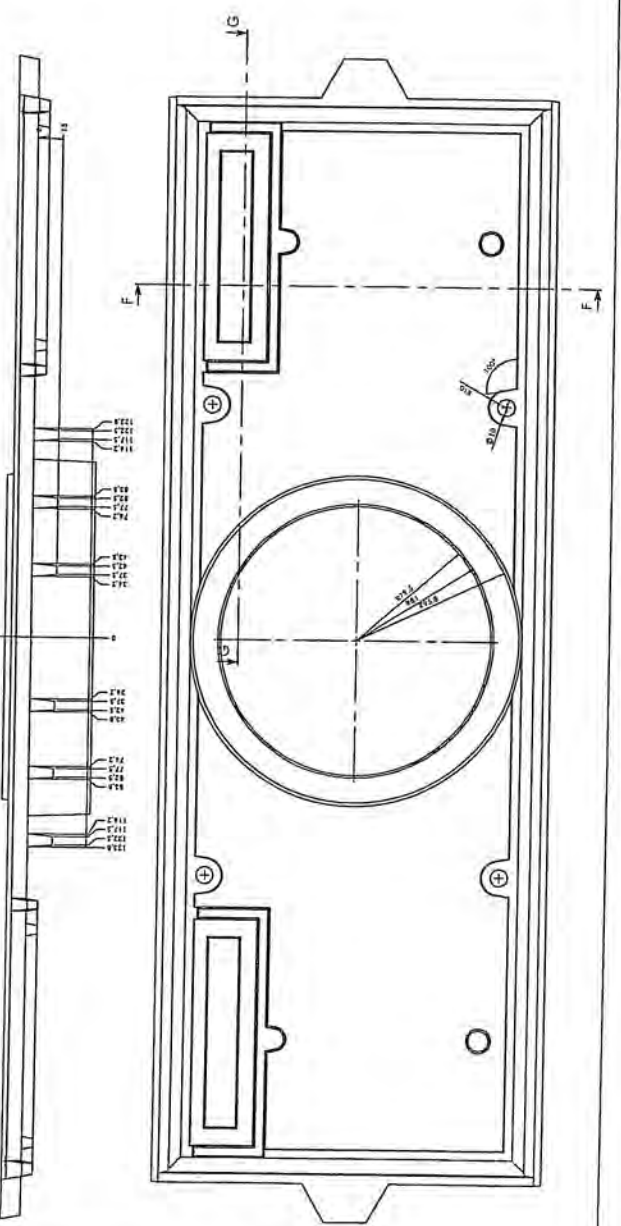
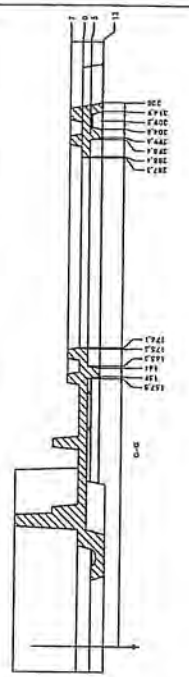
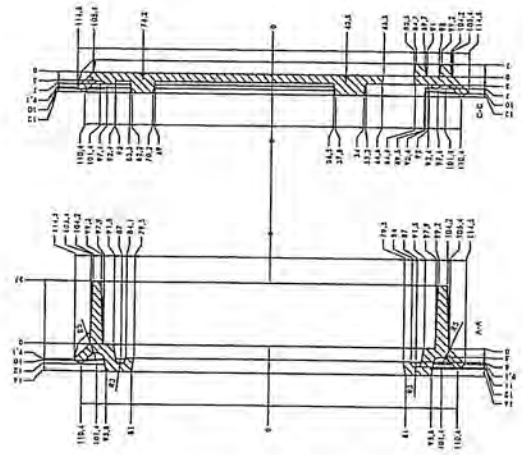
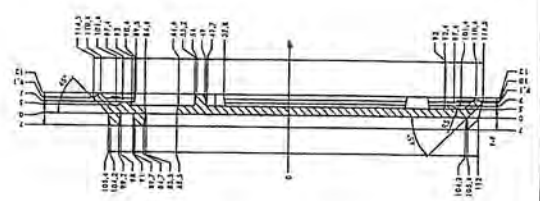
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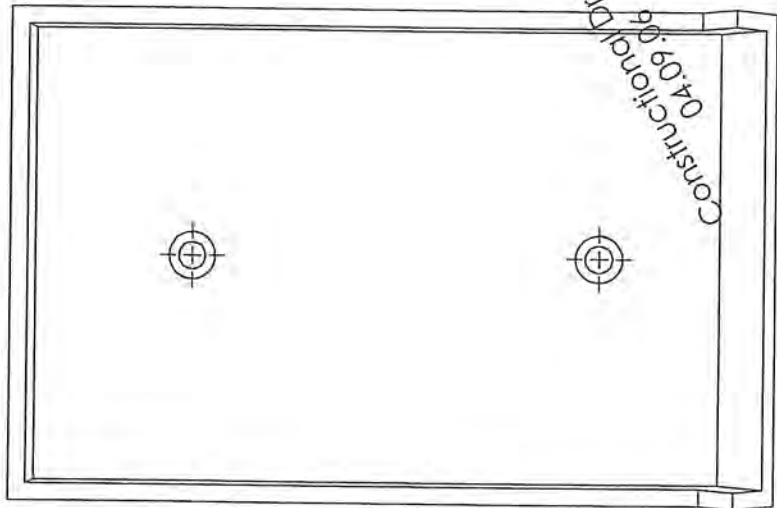
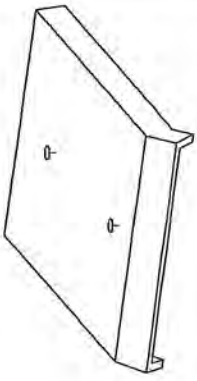
Conventional Drawing
 00.0201



MOSES Mechanical Engineering 10000 15th Avenue, Suite 100 Denver, CO 80202 Phone: 303.751.1000 Fax: 303.751.1001 E-Mail: info@moses.com	
Project No.: Drawing No.: Revision: Date:	Title: Scale: Author: Checker: Date:

Conditional Drawing
04.09.08

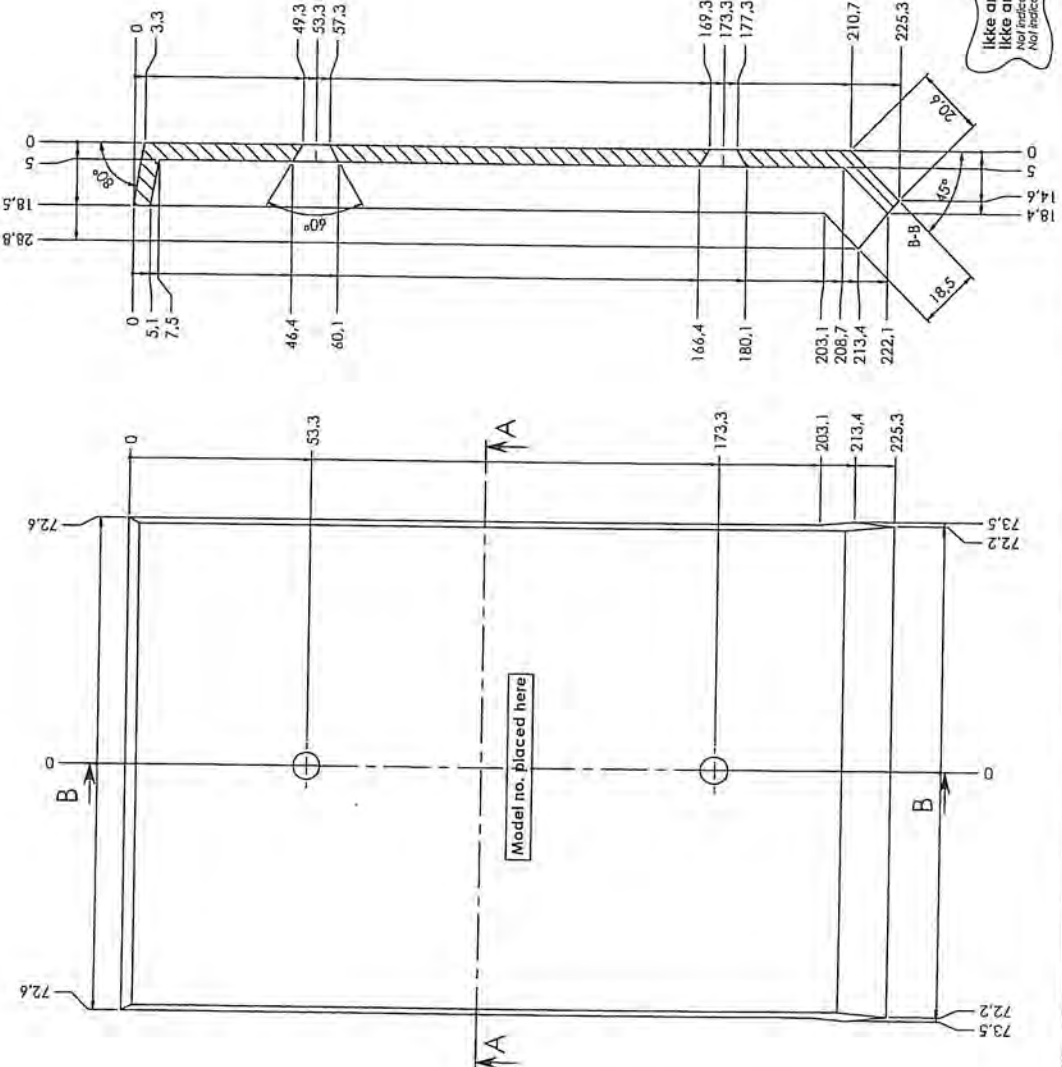
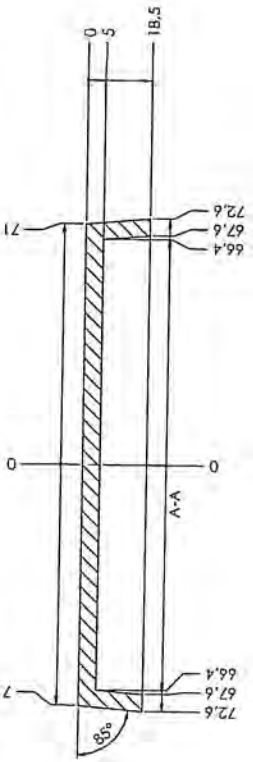




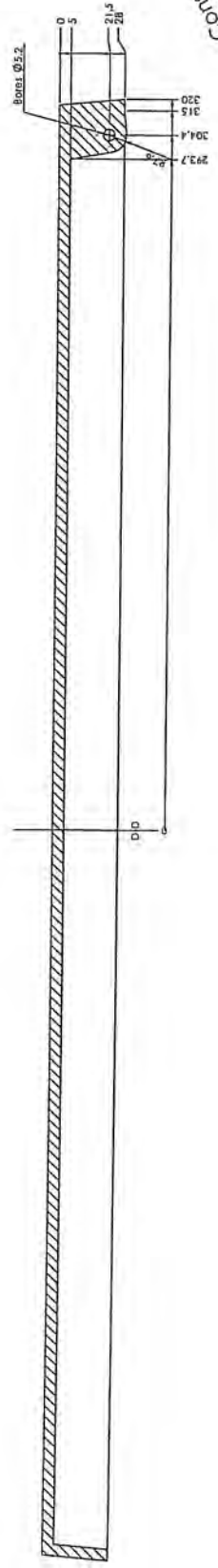
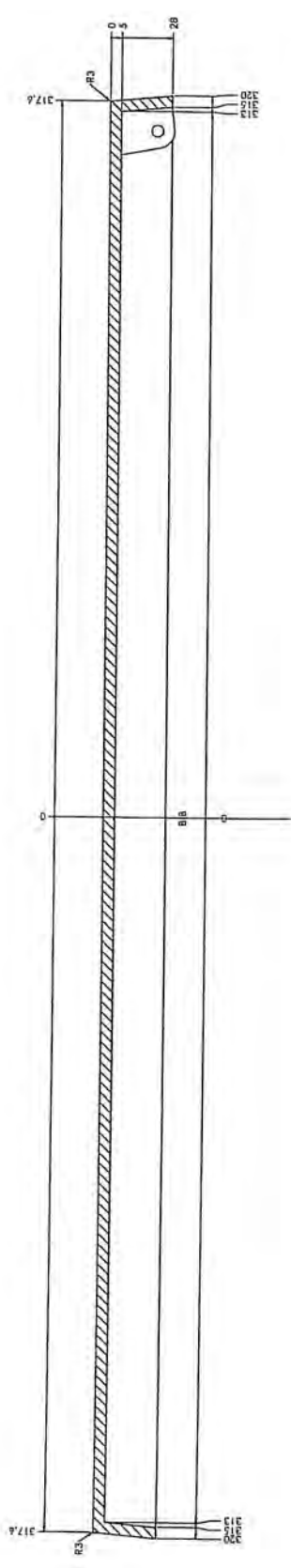
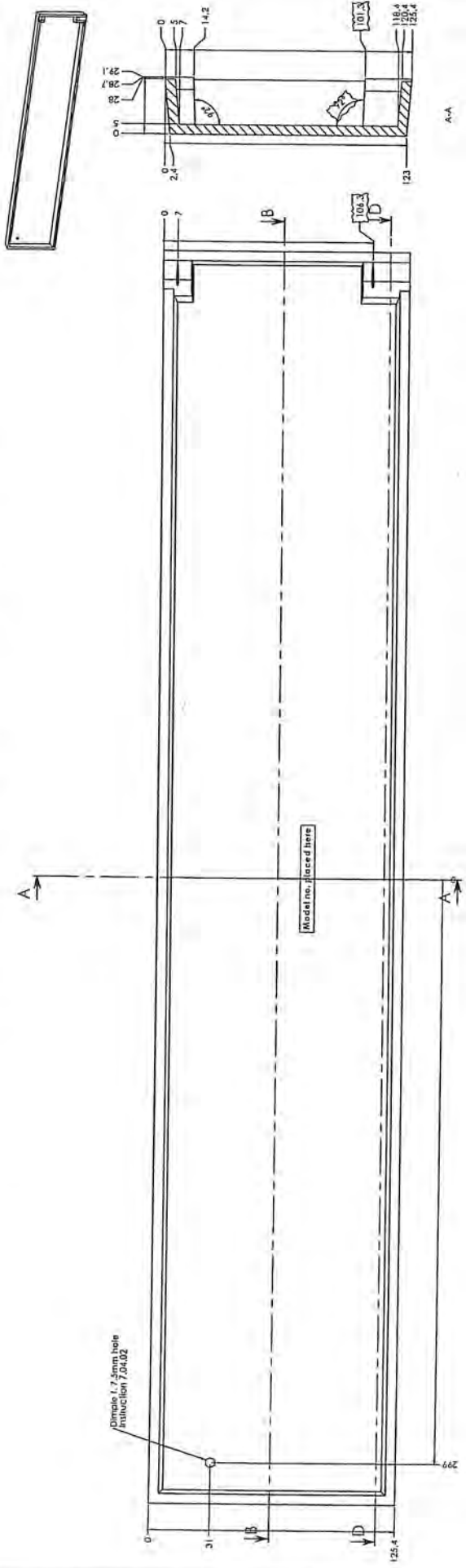
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ikke angivne kantradier = R1,5
ikke angivne fillet = R4
Not indicated edge radii = R1,5
Not indicated fillet = R4



Model no. placed here



31.01.07 - nr. 2
Construction Drawing

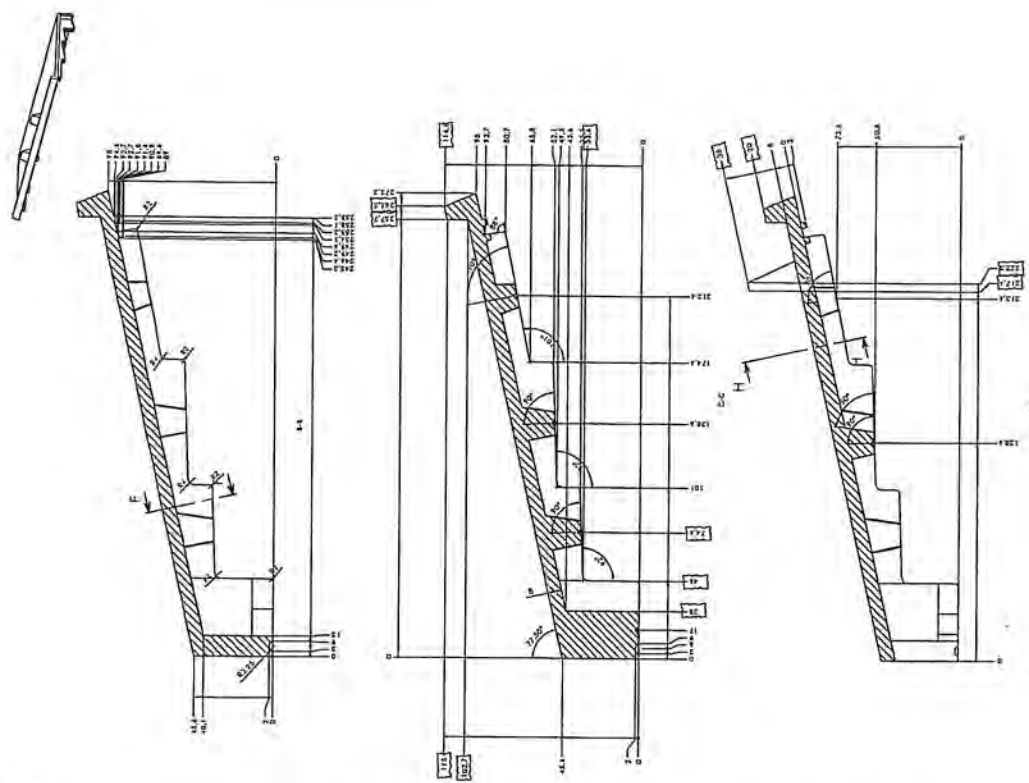
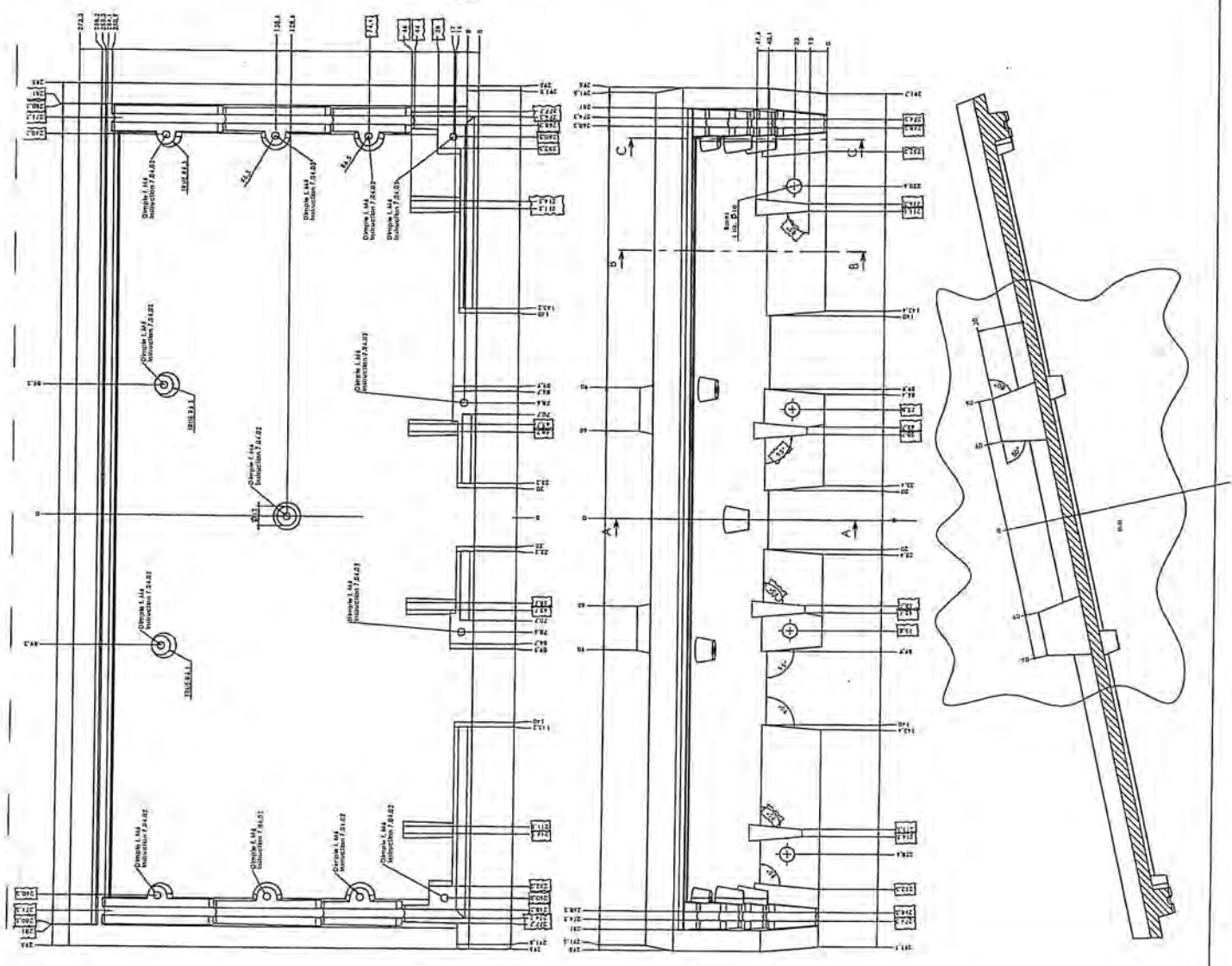
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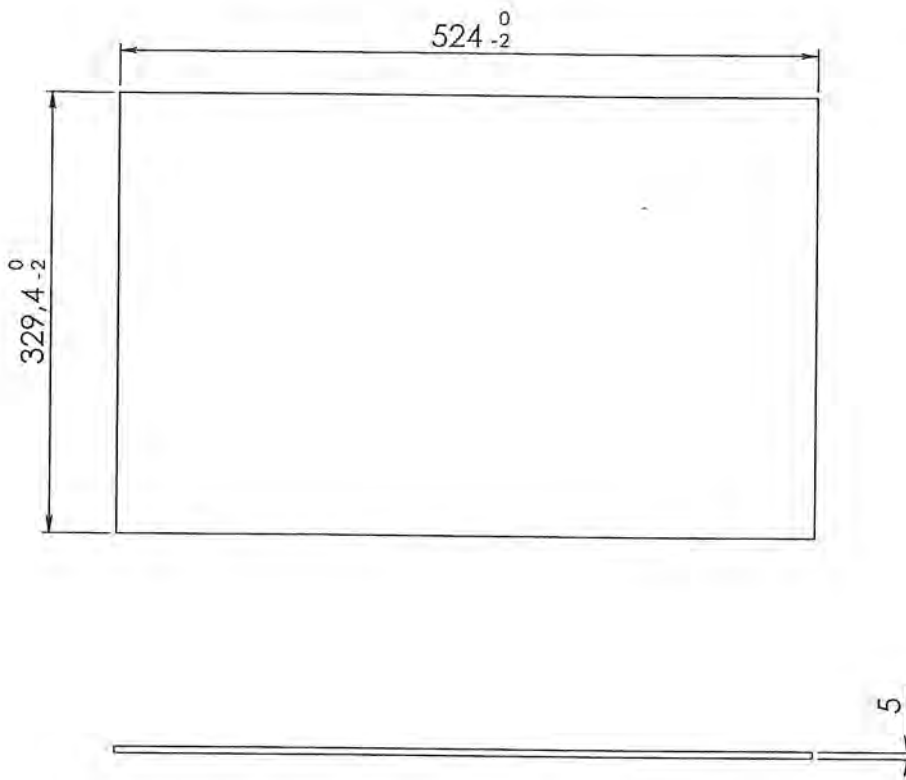
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Like implies knicker = 1,5
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Like implies knicker = 1,5

Conventional Drawing
08.0201

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Sheet Total	1
Revision	0
Drawn by	...
Checked by	...
Approved by	...
Date	...


1/4" = 1'-0" (Vertical)
1/4" = 1'-0" (Horizontal)



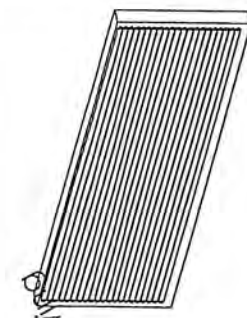
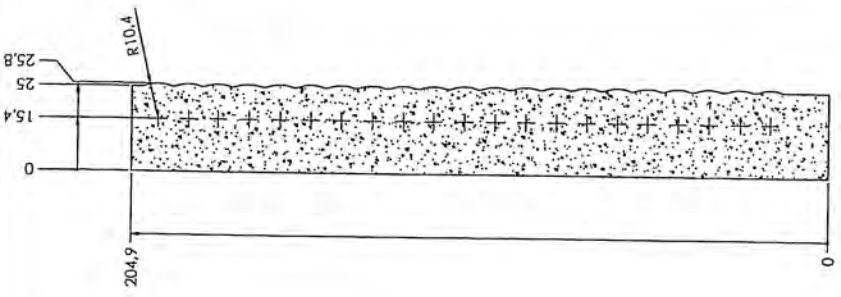


Constructional Drawing
31.08.06

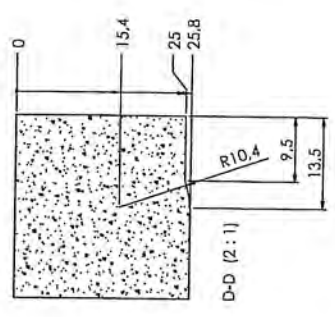
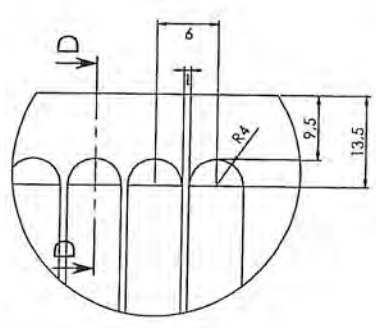
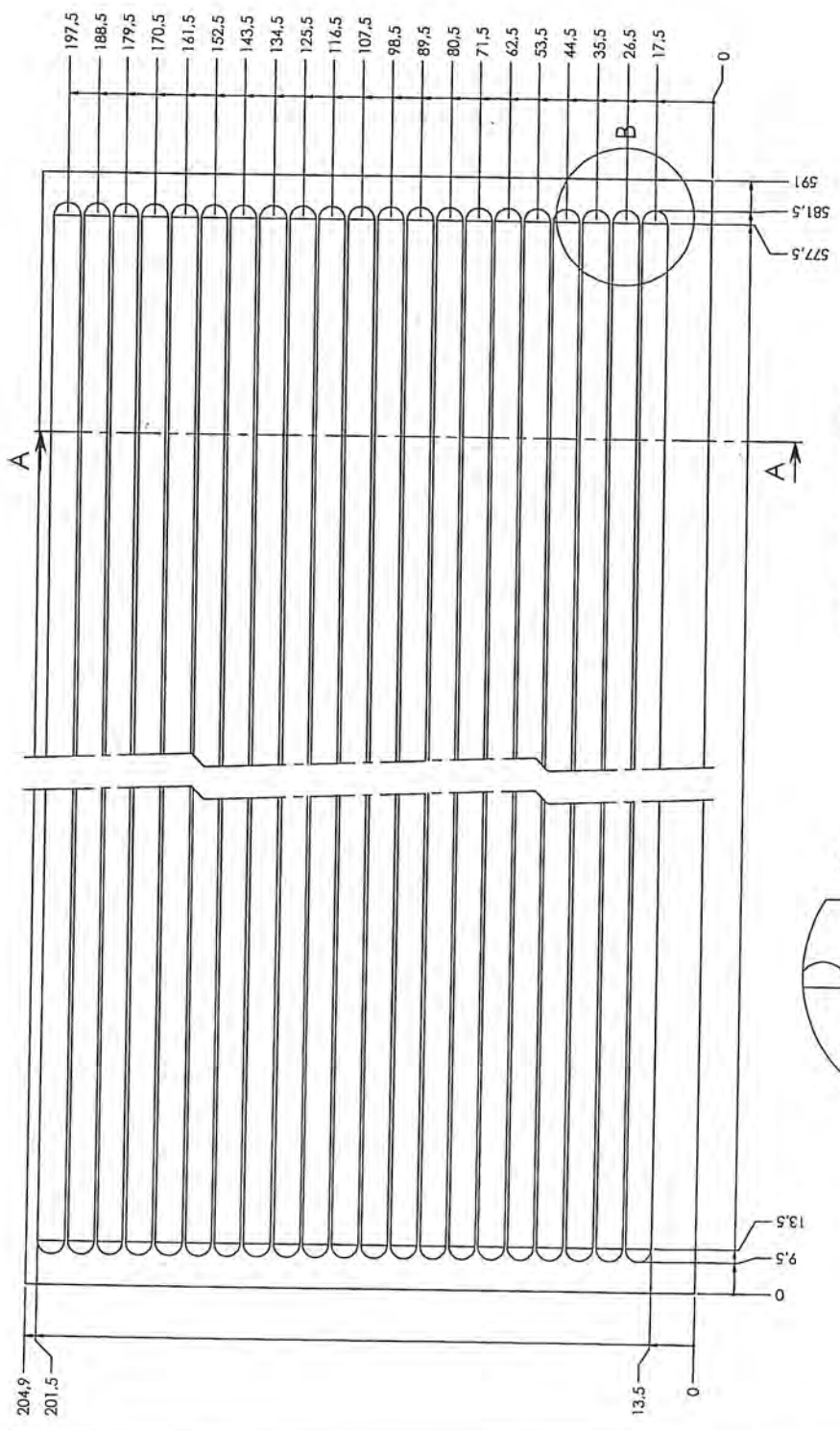
Date of print: 09-03-2007

Rev.		Revisions		Sign.:	Date:
See Drawing		Title:		Construction:	KDU 09.03.06
Material:	Keramisk glas	Glass 5600		Released:	
Weight:	2.16 kg	Glas 5600		Format:	A4
Model no.:	-	Morsø 5600		Scale:	1:5
Drawingtype:	Product Drawing			Itemno.:	79560100
Location of file:	U:\MDV\Verdinger\5600\5600-20 Glass.DWG			Drawing no.:	5600-20

This drawing is Morsø Jernstøberi A/S' property and must not be sold, lent or copied without any written authorization from the company.

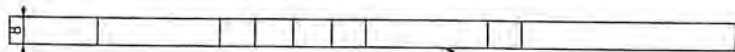


Construction Drawing
09.02.07

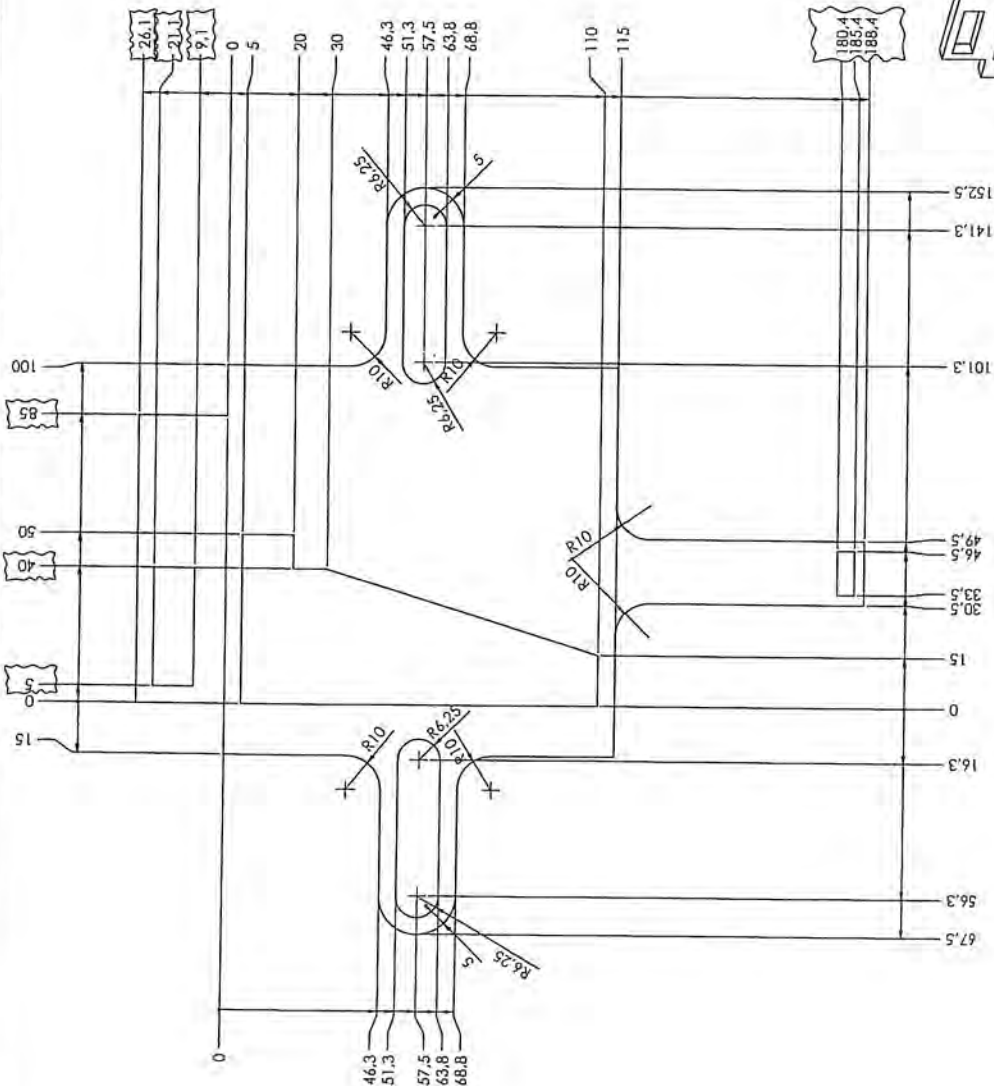


Rev	Revision	Sign.	Date
1		ZDU	28.04.06
Title		Certification	
Sten bag 5600 EN + NA		Formal	A2
Stone back 5600 EN		Scale	1:1
Morsb 5600		Formal	79560200
Drawing no.:		5600-21	
Morsb logo			
This drawing is the property of Morsb and must not be sold, rented or copied without any written authorization from the company.			

Constructional Drawing
27.02.07

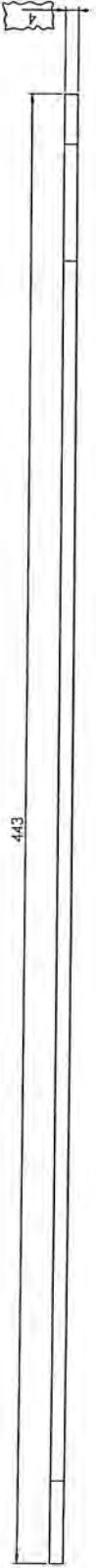
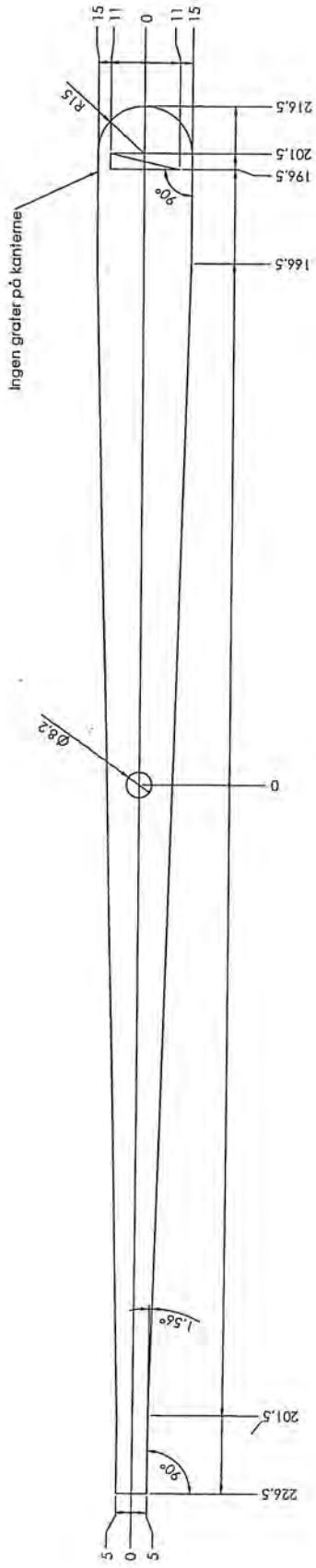


Grafitt side.



Rev / Revision	Signa	Dato
1	RDU	07.03.04
GRATER JERNES IIIII		
Dim. without indication of margin: see. in DIM 27.04.10		
Titel	Construction	Referens
Sekundær spjæld 5600		A2
Materiæl	Form	Skala
SPD		1:1
Vægt	Item no.	Drawing no.
0.07 kg	71560500	5600-31
Head no.	Drawing no.	
	5600-31	
Drømtegnelse	Product Drawing	
Customer ref.	morsø	
	www.morsoe.com	

This drawing is Morse dimension A2. Property and material be used, modified or copied without any written authorization from the company.



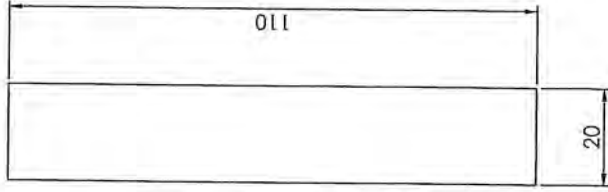
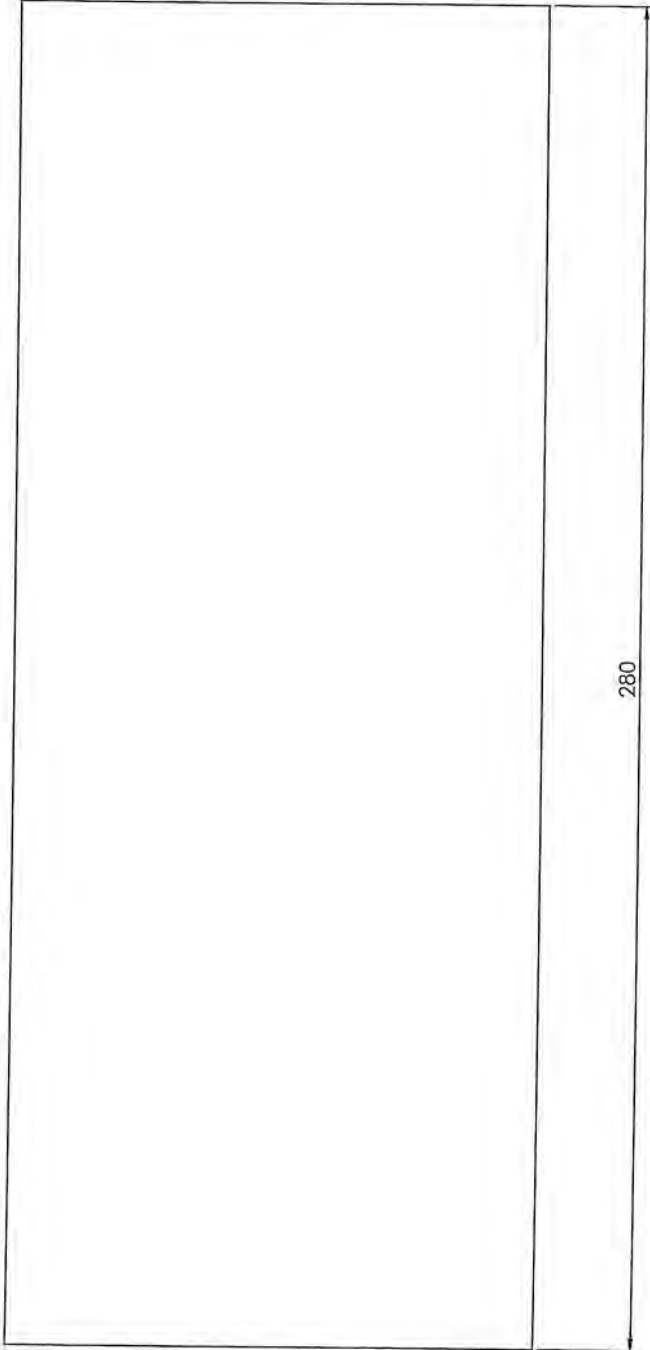
Constructional Drawing
08.02.07



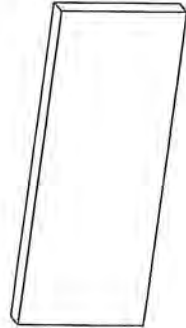
Rev./Revision		Sign.	Date
Titel		Construction	01.09.04
Dim. without indication of module acc. to ISO 2768-1 m			
Material		Sekundær greb 5600	
Weight		Handle sek. draught control	A2
Manufacture		Morse 5600	1:1
Drawing type		Part	71560400
Drawing no.			5600-32

Location of file: www.morse.dk

The drawing is Morse Jernindustri A/S property and must not be sold, imitated or copied without any written authorization from the company.



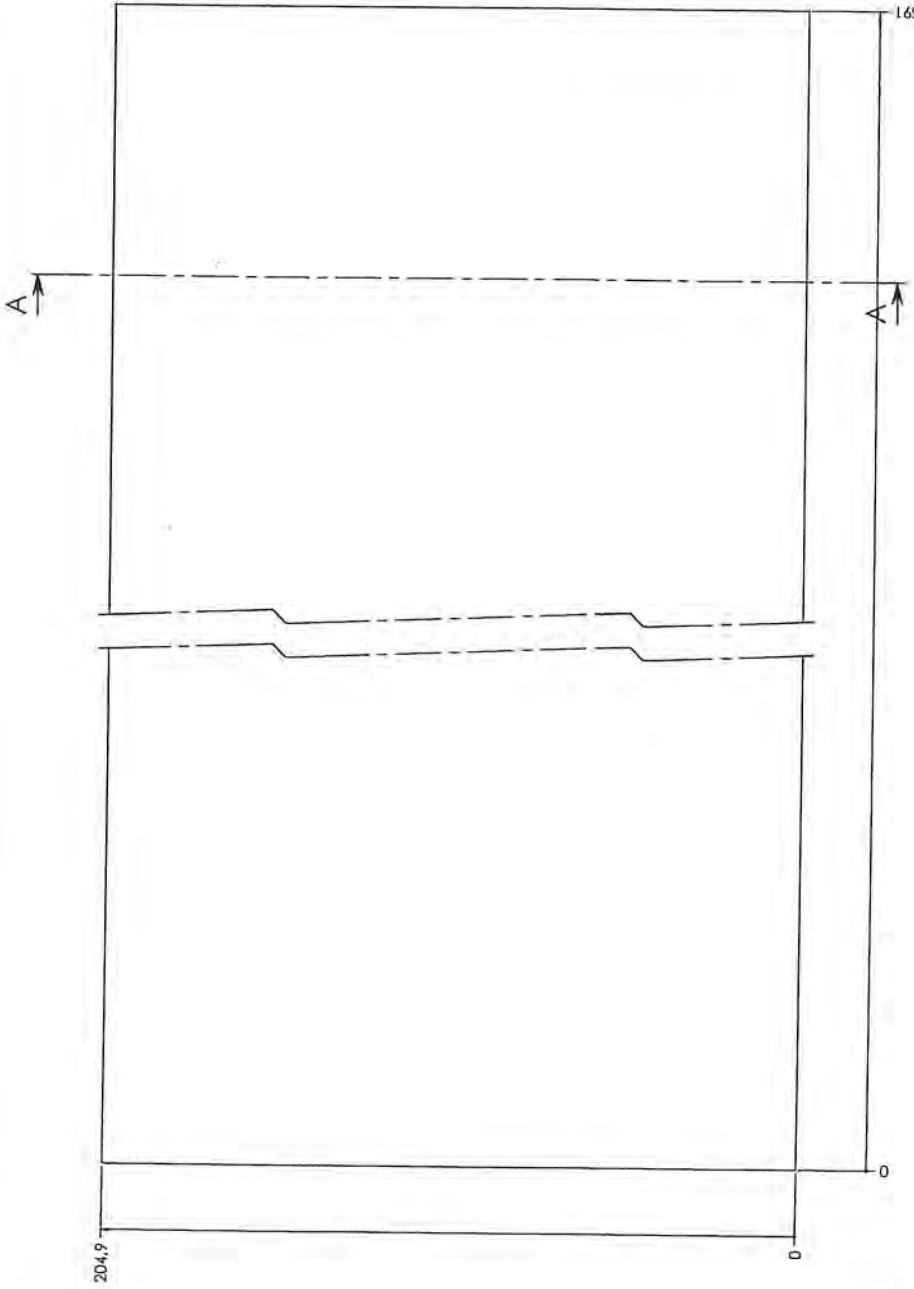
Constructional Drawing
09.02.07



Rev		Revisions		Sign:	Date:
See Drawing		Title:		KDU	28.06.06
Material:		Constitution:			
Vermiculite v-100 Mk.2		Røgledeplade øverst 5600			
Weight:		Format:		A3	
0.37 kg.		Scale:		1:1	
Model no.:		Item no.:		79560700	
Drawing type:		Drawing no.:		5600-33	
Product Drawing		Drawing no.:		5600-33	
Location of file:		Drawing no.:		5600-33	
Product Drawing		Drawing no.:		5600-33	
Location of file:		Drawing no.:		5600-33	



This drawing is Morsø Jernstøbeeri A/S' property and must not be sold, lent or copied without any written authorization from the company.

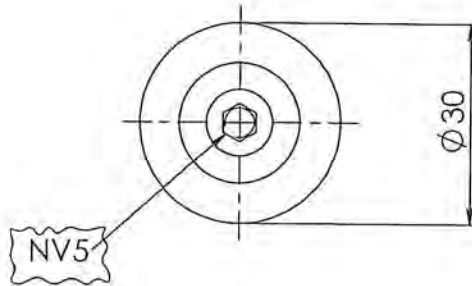
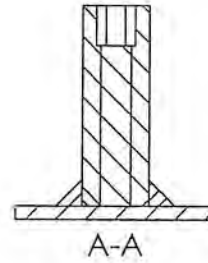
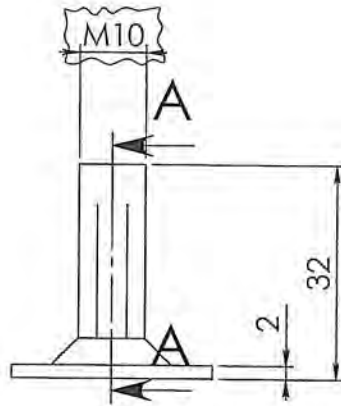


Construction Drawing
09.02.07

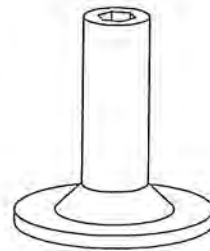
Rev. / Revision		Sgnl. / Date	
Rev.	Revision	Sgnl.	Date
1	09.02.07		09.02.07
Title		Contributor	Format
Sten bag 5600 NA		APU	A2
Material		Formal	Scale
Volumen = 1100 l/2			1:1
Weight: 1-45 kg		Items	79560000
Modif. no.		Drawing no.	5600-34
Drawing type		Drawing no.	
Location of file		5600-34	




This drawing is a Morse Jernskæret AP property and must not be used, printed or copied without any written authorization from the company.



Constructional Drawing
07.02.07

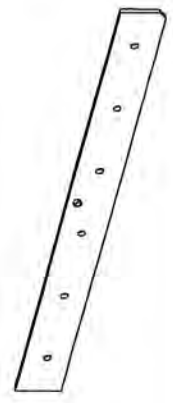
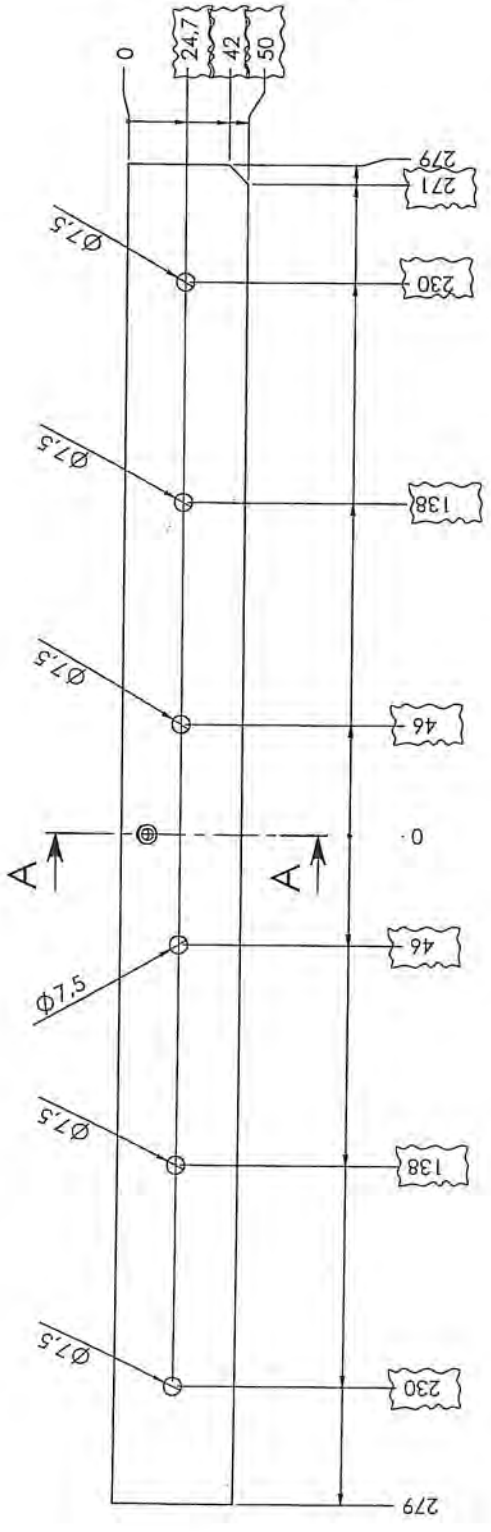
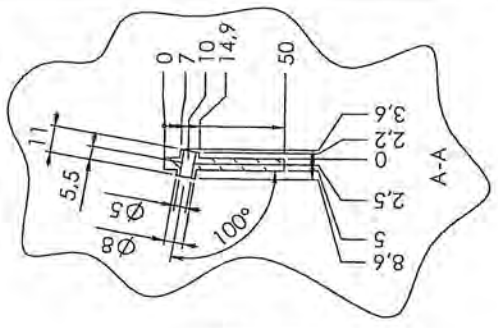


Date of print: 09-03-2007

Rev. Revisions		Sign.:	Date:
Title:		Construction:	KDU 30.06.06
Justeringsfod 5600		Released:	
Adjustment base 5600		Format:	A4
Morsø 5600		Scale:	1:1
Material: SPD Plade		Itemno.:	71560700
Weight: 0.03 kg		Drawing no.:	
Model no. -		5600-38	
Drawingtype: Product Drawing			
Location of file: D:\MDV\Engineering\5600\5600-38 Justeringsfod.SIDPRE			

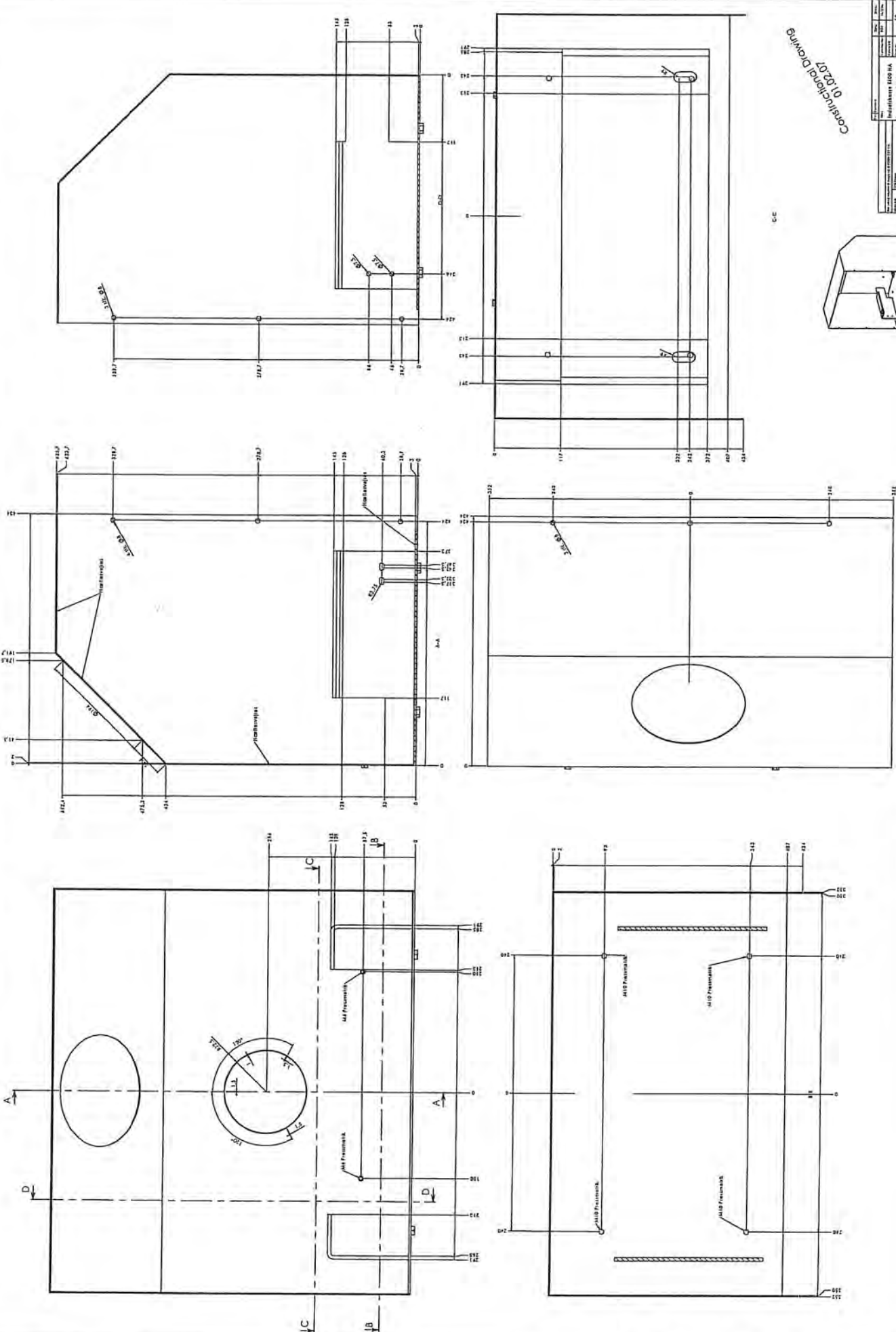
This drawing is Morsø Jernstøberi A/S' property and must not be sold, lent or copied without any written authorization from the company.

Constructional Drawing
08.02.07



Rev./Revisions	Sign.: KDU	Date: 06.09.06
Title: Dækplade pilotluft 5600		
Released: Cover f. Pilot air 5600		
Formel: A3		
Scale: 1:2		
Item no.: 71561000		
Drawing no.: 5600-41		
Dim., without indication of margin acc. to DS/ISO 2768-1 m Material: Rustfri stål/stainless steel Weight: 1.00 kg Model no.: Drawing type: Product Drawing Location of file:		

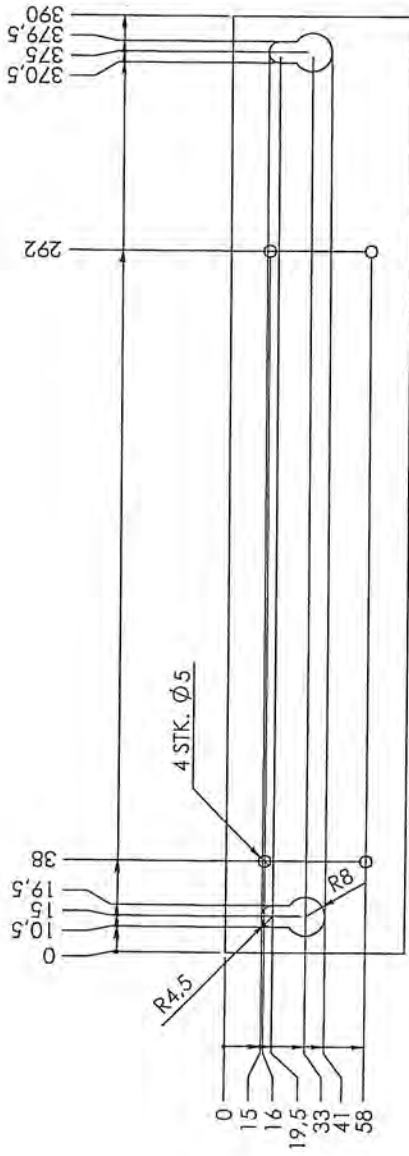
This drawing is Morsø Jernstøberi A/S' property and must not be sold, lent, or copied without any written authorization from the company.



Conventional Drawing
 0.1207



Project No.	5100-48
Sheet No.	1
Scale	1/4" = 1'-0"
Date	7/11/52
Author	
Checker	
Engineer	
Contractor	
Client	
Project Name	INDUSTRIAL BLDG. NO. 1
Location	INDUSTRIAL PARK, WASHINGTON, D.C.
Contract No.	
Drawn By	
Checked By	
Approved By	
Project Manager	
Company	MPF&P

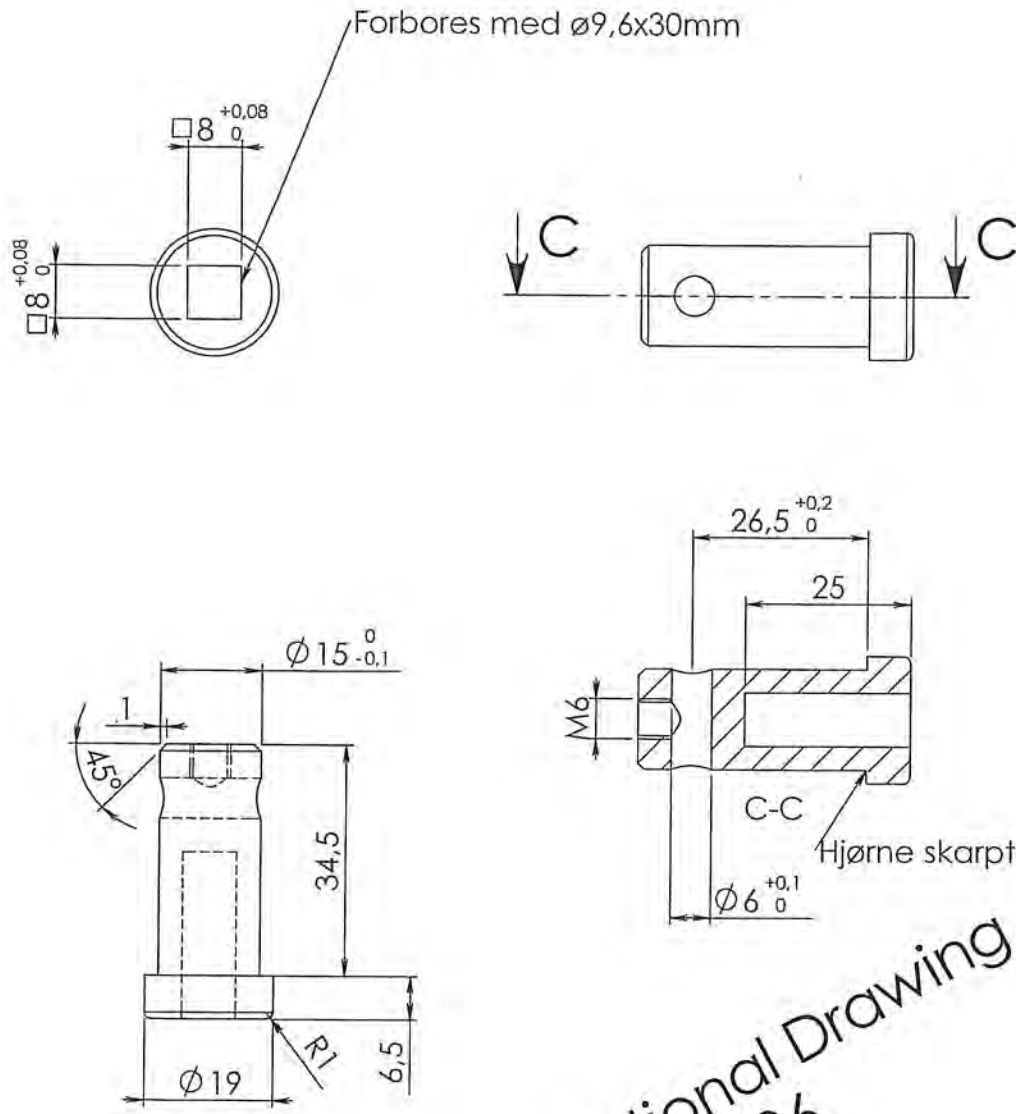


Constructional Drawing
 15.12.06

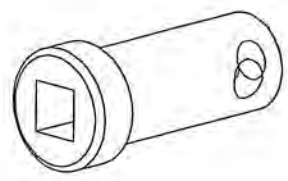


Rev		Revisions		Sign.:	Date:
Title:		Construction:		KDU	15.12.06
Mounting plate Blower		Released:			
Monteringsplade blæser		Format:		A3	
Morsø 5600		Scale:		1:2	
		Item no.:		71561700	
		Drawing no.:		5600-54	
Drawing type: Product Drawing		morsø			
Location of file:					
Dim. without indication of margin acc. to DS/ISO 2768-1 m					
Material: SFD Plade					
Weight: 0.44 kg					
Model no.:					


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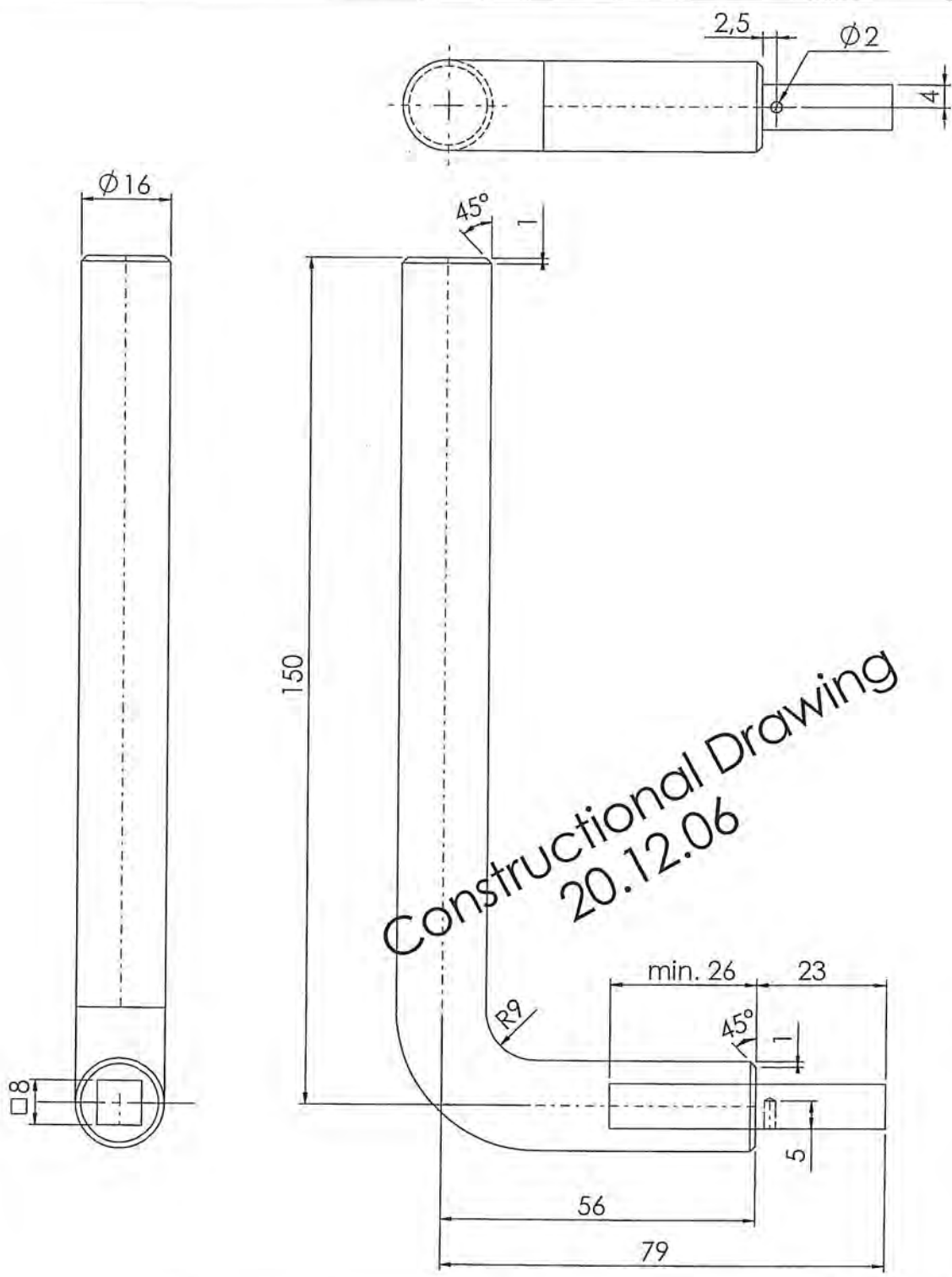
Constructional Drawing
20.12.06



Date of print: 09-03-2007

Rev. Revisions		Sign.:	Date:
Title:		Construction:	KDU 20.12.06
Døraksel 5600		Released:	
Morsø 5600		Format:	A4
		Scale:	1:1
Location of file:		Itemno.:	71562061
<p><small>D:\MORV\1\prøinger\5600\5600-58 Døraksel 5600 58.DWG</small></p>		Drawing no.:	5600-58

This drawing is Morsø Jernstøberi A/S' property and must not be sold, lended or copied without any written authorization from the company.



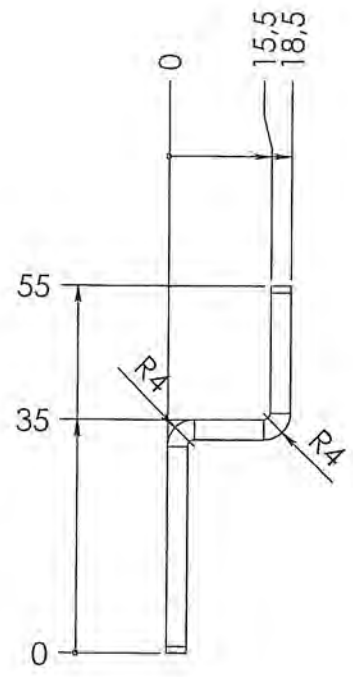
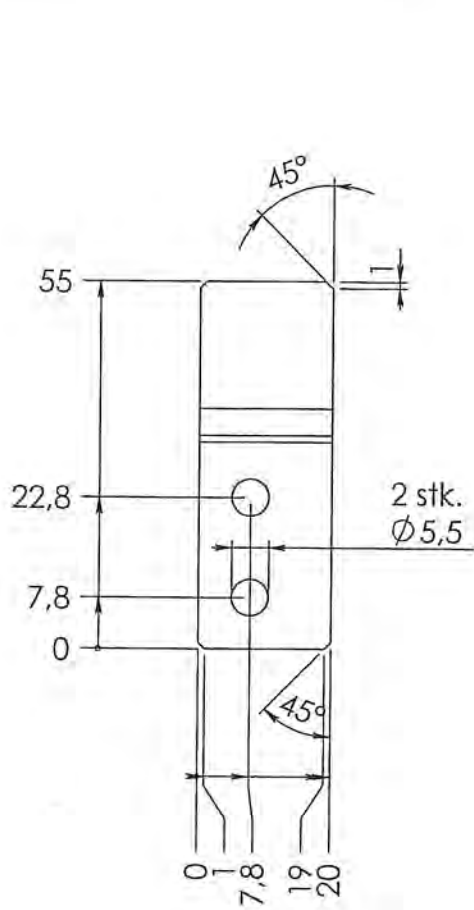
Rev.	Revisions	Sign.:	Date:
Title:		Construction:	KDU 20.12.06
Released:			
Format:		A4	
Scale:		1:1	
Itemno.:		75263600	
Drawing no.:		5600-59	

Overfladebehandling: Silkeslebet	
Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m	
Material:	Rustfri stål
Weight:	0,32 kg
Model no.:	-
Drawingtype:	Emnetegning
Location of file:	U:\NIDV\tegninge\5600\5600-59 Håndtag 1.boring.1.DPRT

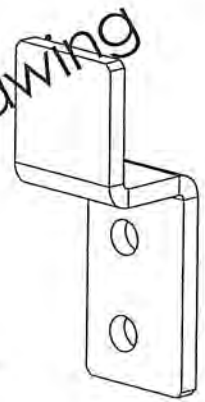
Date of print: 09-03-2007



This drawing is Morsø Jernstøberi A/S' property and must not be sold, lended or copied without any written authorization from the company.



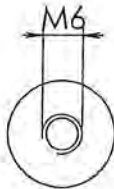
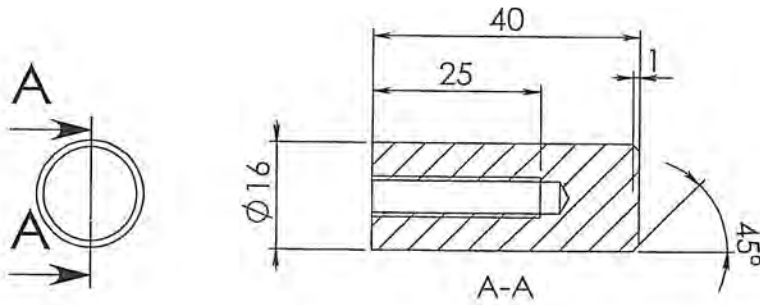
Constructional Drawing
10.01.07



Date of print: 09-03-2007

Dim. without indication of margin acc. to DS/ISO 2768-1 m		Rev. Revisions		Sign.:	Date:
Material:	SPD Plade	Title:		Construction:	KDU 10.01.07
Weight:	0,03 kg	Beslag f. lukkepal 5600		Released:	
Model no.:	-	Morsø 5600		Format:	A4
Drawingtype:	Product Drawing			Scale:	1:1
Location of file:	\\UDEV\tegninger\5600\5600-60 Beslag f. lukkepal\LDPRF			Itemno.:	71562100
				Drawing no.:	5600-60

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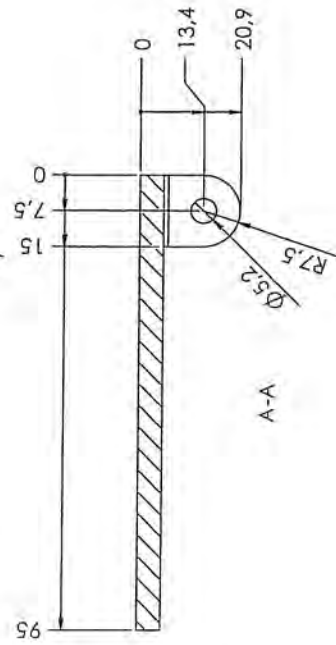
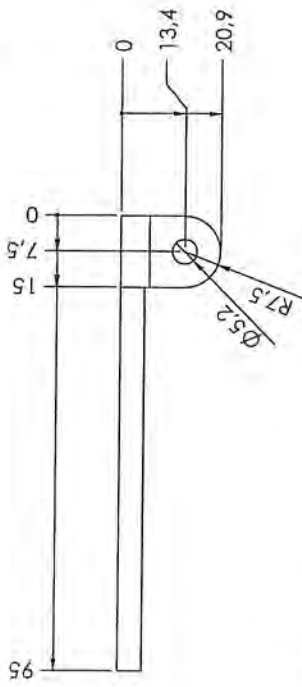
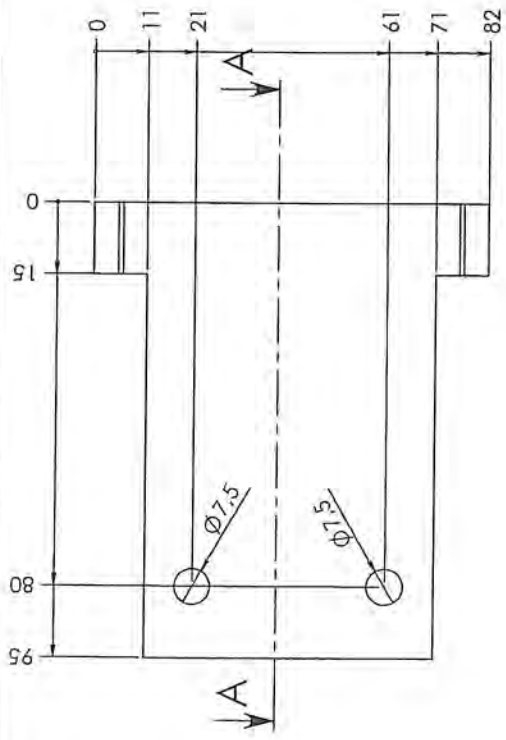
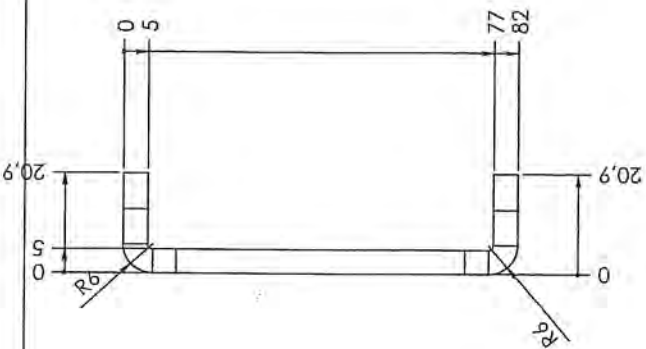
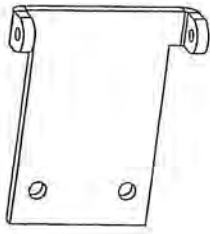
Constructional Drawing
01.02.07

Date of print: 09-03-2007

Rev. Revisions		Sign.:	Date:
Overfladebehandling: Silkelebet		Construction:	KDU 01.02.07
Dim. without indication of margin acc. to DS/ISO 2768-1 m		Released:	
Material:	Rustfri stål/Stainless steel	Format:	A4
Weight:	0,06 kg	Scale:	1:1
Model no.:	-	Itemno.:	71562200
Drawingtype:	Product Drawing	Drawing no.:	5600-62
Location of file:	U:\120V\tegnings\5600_62 knop f. dækplade 312PRT	 5600-62	

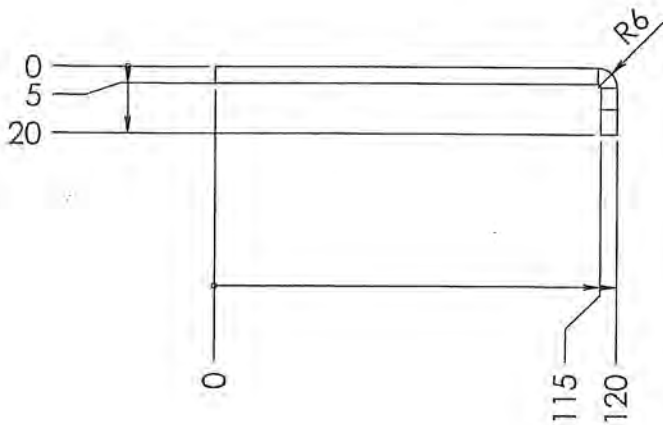
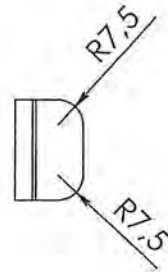
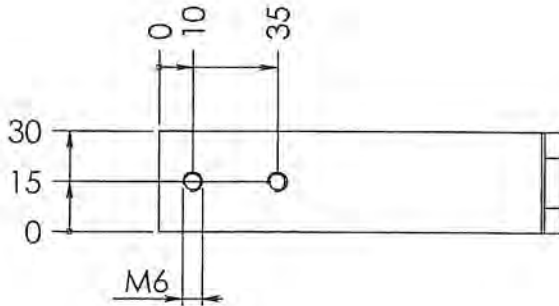
This drawing is Morsø Jernstøberi A/S' property and must not be sold, lent or copied without any written authorization from the company.

Constructional Drawing
01.02.07

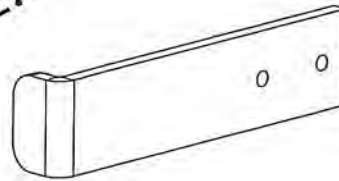


Rev. / Revisions		Title:		Constructions:		Sign.:		Date:	
		Hængselsbeslag dækplade		Released:		KDU		01.02.07	
		5600 NA		Format:		A3			
		Morsø 5600		Scale:		1:1			
				Item no.:		71562300			
		Drawing type: Product Drawing		Drawing no.:		5600-63			
		Location of file: <small>Product Development\Products\Accessories\Accessories</small>		Morsø					
		Dim. without indication of margin acc. to DS/ISO 2768-1 m							
		Material: SFD Plade							
		Weight: 0.25 kg							
		Model no.:							

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Constructional Drawing
01.02.07



Rev.	Revisions	Sign.:	Date:
	Title:	Construction:	KDU
	Magnetbeslag 5600 NA	Released:	
	Morsø 5600	Format:	A4
		Scale:	1:2
		Itemno.:	71562400
		Drawing no.:	5600-64

Date of print: 09-03-2007

Dim. without indication of margin acc. to DS/ISO 2768-1 m

Material: SPD Plade

Weight: 0,15 kg

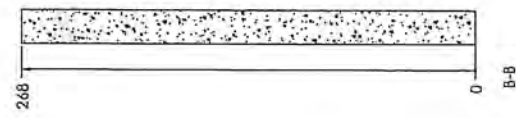
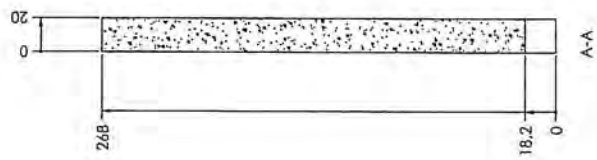
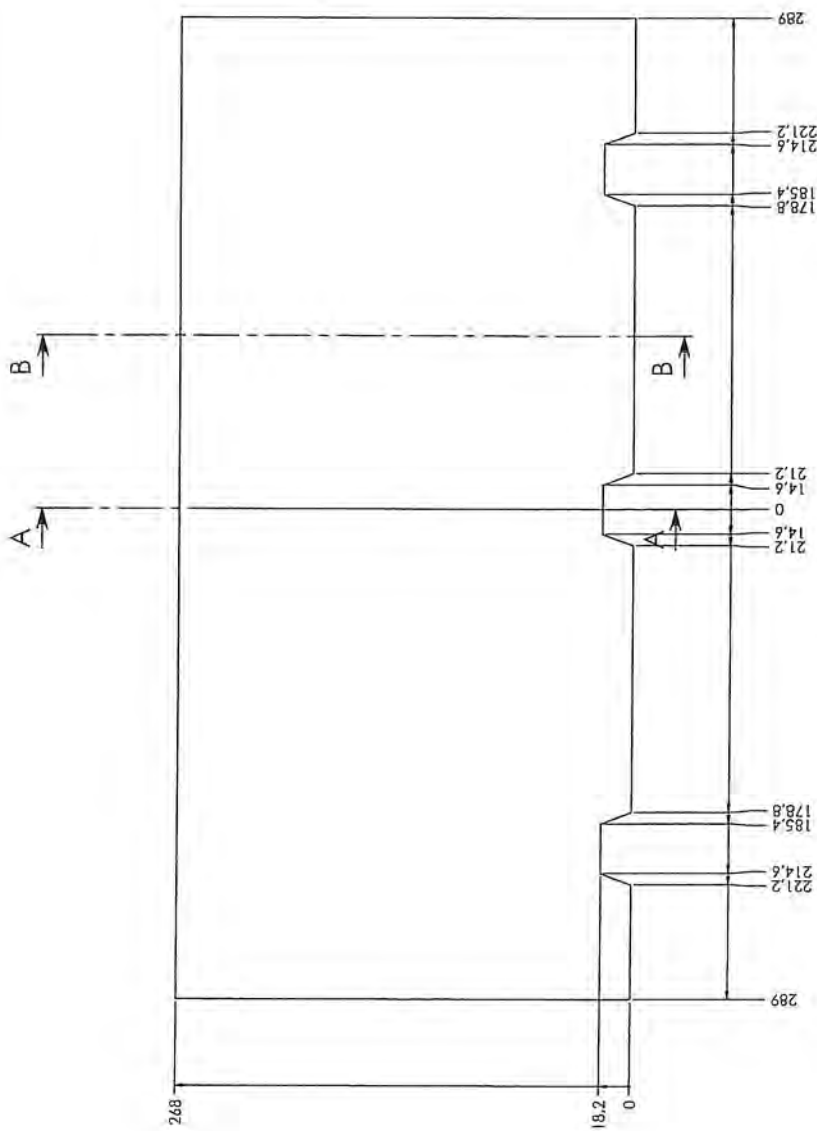
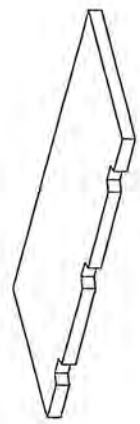
Model no. -

Drawingtype: Product Drawing

Location of file: U:\UD\W\tegringer\5600\5600-64\Magnetbeslag.DWG



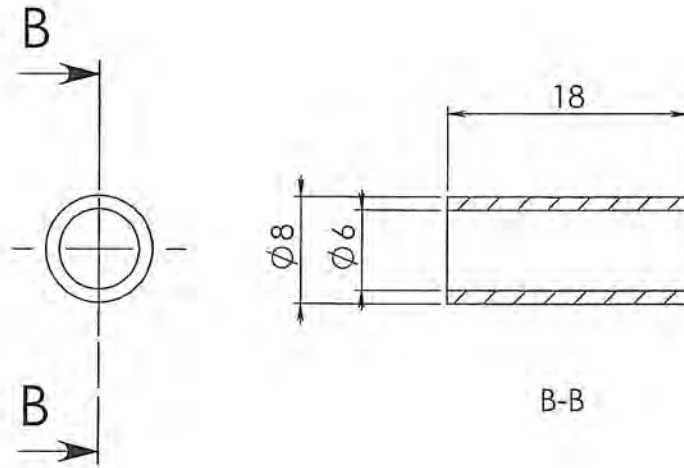
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Construction Drawing
09.02.07

Rev.	Revisions	Signa	Date
01	Stien bund 5600 NA	KCU	02.02.07
02	Stone Buftom 5600 NA		
03	Maise 5600		
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morsø
 Drawing No.: 5600-66



Constructional Drawing
08.03.07

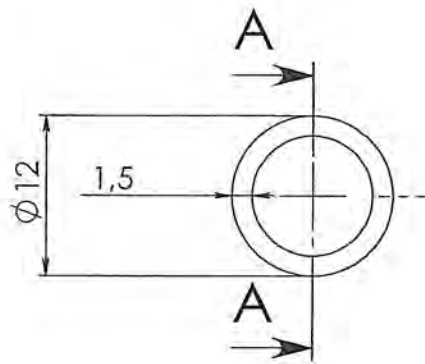
b	Ændret længde fra 9 mm til 10 mm	RSV	13.01.2006
Rev.	Revisions	Sign.:	Date:
Title:		Construction:	KDU 07.03.07
Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Released:	
Material:	Galv	Format:	A4
Weight:	0, kg	Scale:	2:1
Model no.		Itemno.:	71562600
Drawingtype:	Emnetegning	Drawing no.:	
Location of file:	U:\IDV\tegninger\10endogtblote\1\A1\ordrer\A1fordrer s&L\LDPE	5600-73	

Afst.stykke ø8x1 L=18mm
Hydraulikrør galv.
Morsø 5600



Date of print: 09-03-2007

This drawing is Morsø Jernstøberi A/S' property and must not be sold, lend or copied without any written authorization from the company.



Constructional Drawing
08.03.07

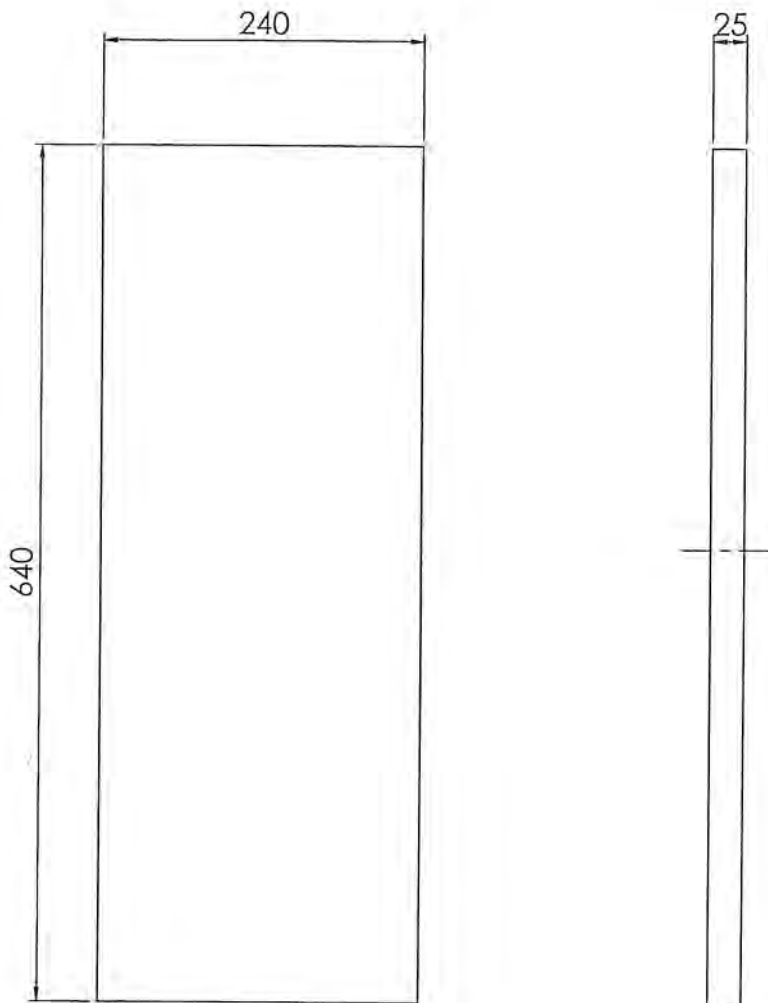
Rev.	Revisions	Sign.:	Date:
Title:		Construction:	KDU 07.03.07
Released:		Format:	A4
Scale:		Scale:	2:1
Itemno.:		Itemno.:	71562700
Drawing no.:		Drawing no.:	
5600-74		5600-74	

Date of print: 09-03-2007

Dim. without indication of margin acc. to DS/ISO 2768-1 m	
Material:	
Weight:	0,01 kg
Model no.:	-
Drawingtype:	Product Drawing
Location of file:	h:\VUB\1\egninger\1\konstruktions\afst.rør\afst.rør ø12x1,5\1.DWG



This drawing is Morsø Jernstøberi A/S' property and must not be sold, lent or copied without any written authorization from the company.

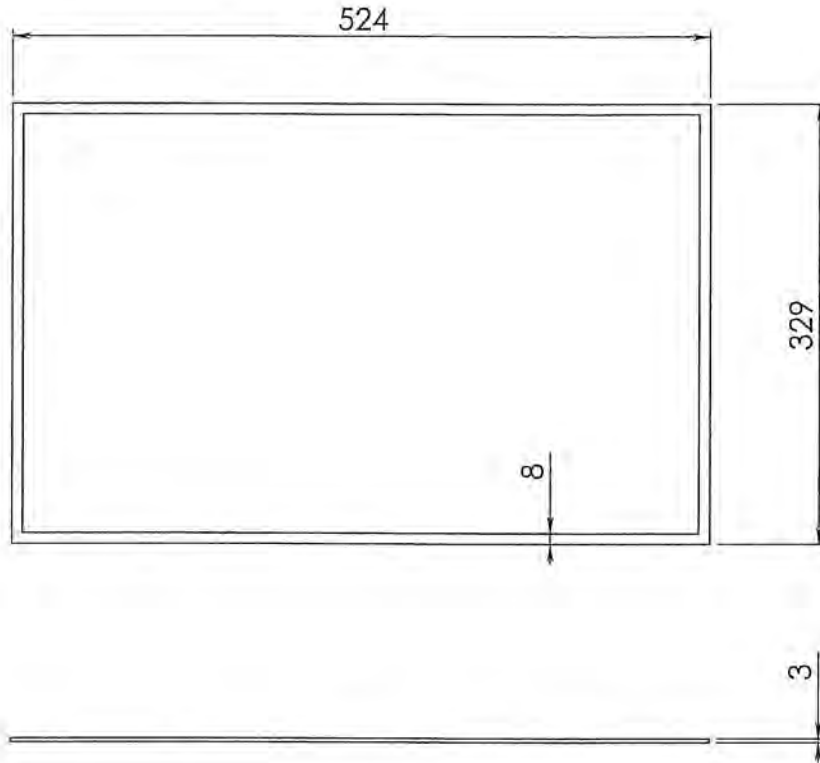


Constructional Drawing
08.03.07

Date of print: 09-03-2007

		Rev. Revisions	Sign.:	Date:
Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m		Title:	Construction: KDU	08.03.07
Material:	25mm iso-glas	Isoleringsmätte 5600 NA	Released:	
Weight:	26.17 kg	Morsø 5600	Format:	A4
Model no.:		morsø <small>Erhvervsfirmaet A/S</small>	Scale:	1:5
Drawingtype:	Emnetegning		Itemno.:	79561300
Location of file:	D:\UDV\tegninger\5600\5600-75 isoleringsmätte 31DPR1		Drawing no.:	5600-75

This drawing is Morsø Jernstøberi A/S' property and must not be sold, lendd or copied without any written authorization from the company.

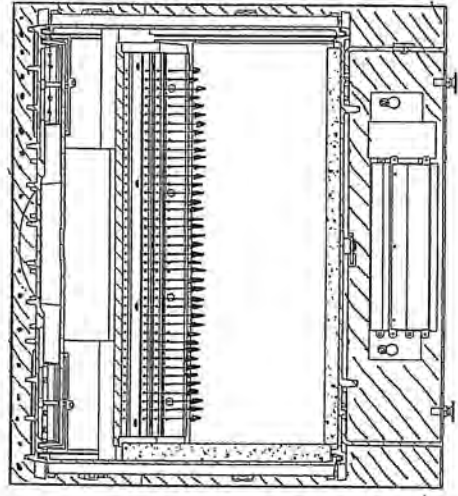
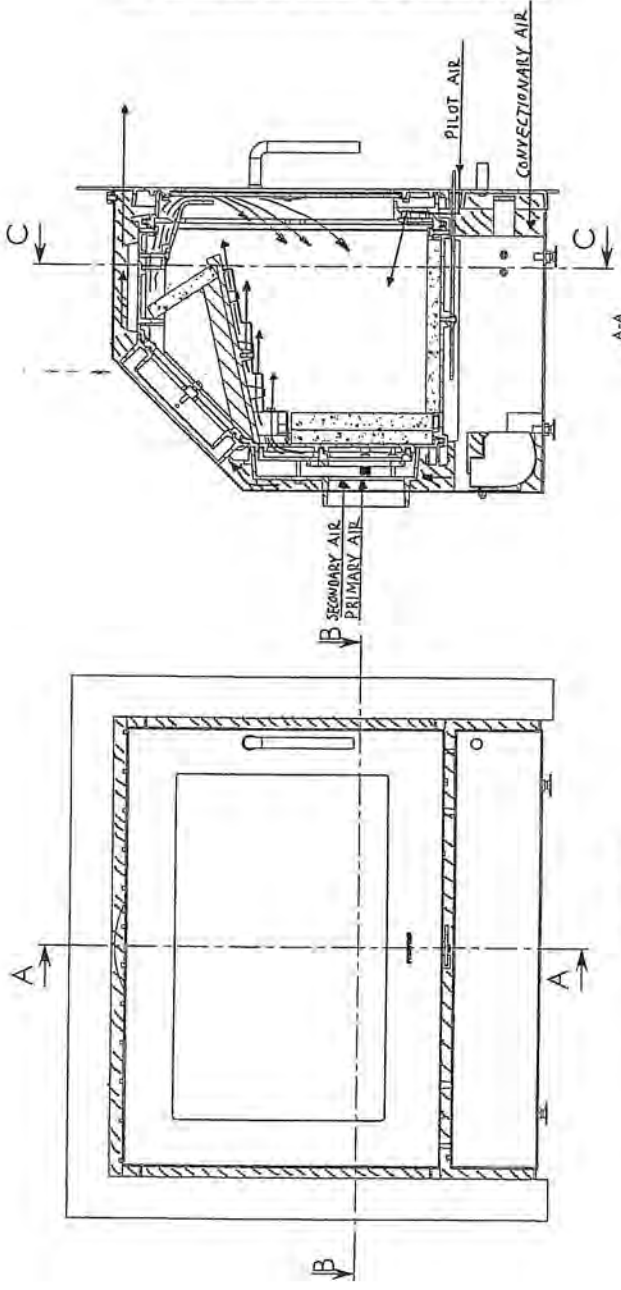


Constructional Drawing
09.03.07

Date of print: 09-03-2007

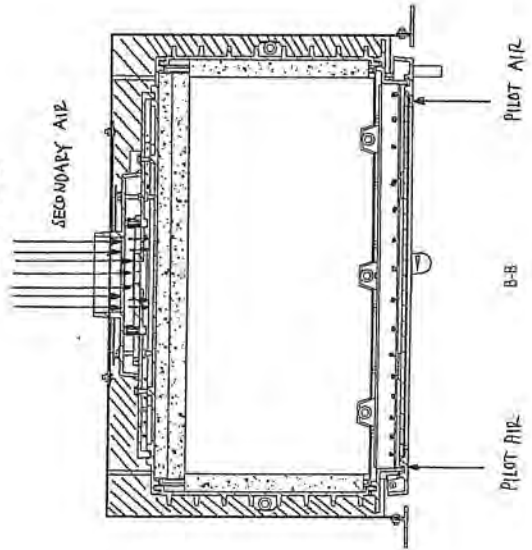
Rev.		Revisions		Sign.:	Date:
		Title:	Construction:	KDU	07.03.07
		Glasbånd 5600 fyrdør	Released:		
Material:	Bx3mm Glasbånd m. tape	Morsø 5600	Format:	A4	
Weight:			Scale:	1:5	
Model no.			Itemno.:	79074500	
Drawingtype:	Product Drawing			Drawing no.:	
Location of file:	U:\M2\1\regninger\5600_5600-76 Glasbånd.SLDPR1			5600-76	

This drawing is Morsø Jernstøberi A/S' property and must not be sold, lendet or copied without any written authorization from the company.

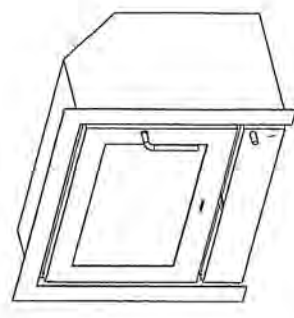


C-C

A-A

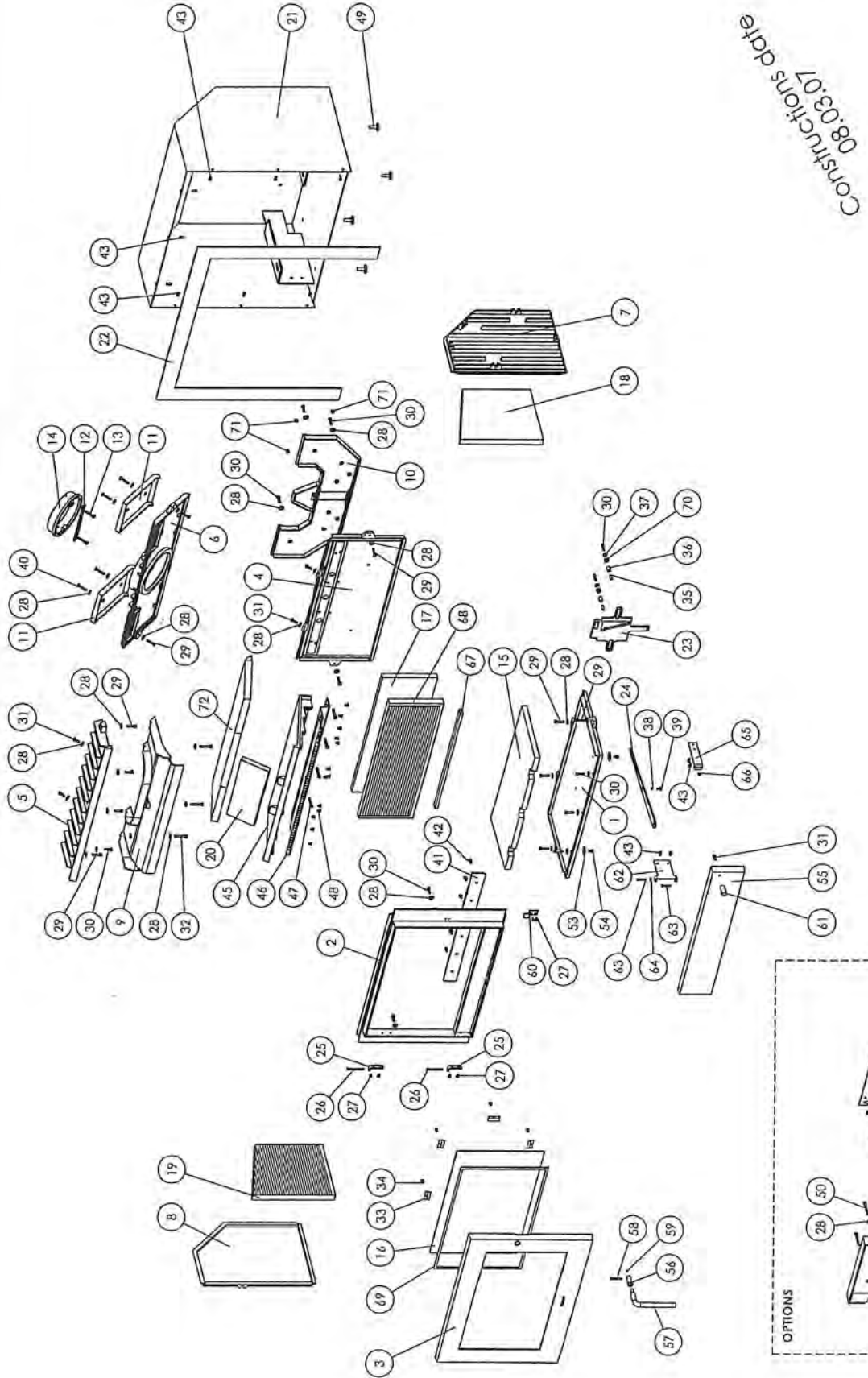


B-B

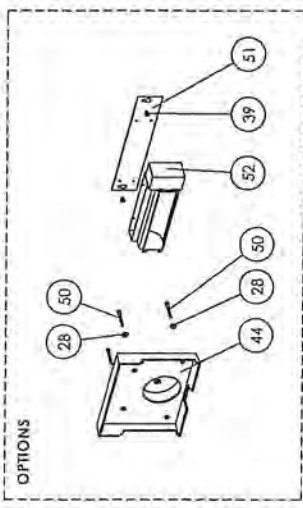


Rev		Revisions	Sign.	Date
1			BY	12.03.2007
TITLE		Construction		
		Release:		
		Format:	A2	
		Scale:	1:5	
		Items:		
Drawing no.:		5600-77 d		
Brand:		morsø		

This drawing is Morse Jernløstøbet A/S property and must not be used, printed or copied without any written authorization from the company.

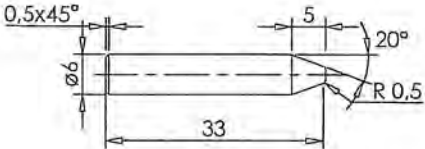
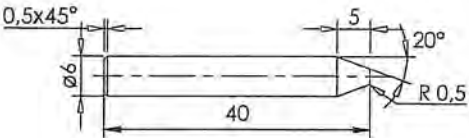
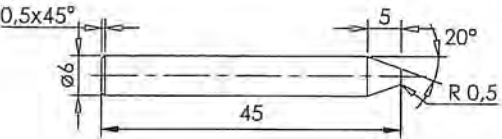


Construction date
 08.03.07




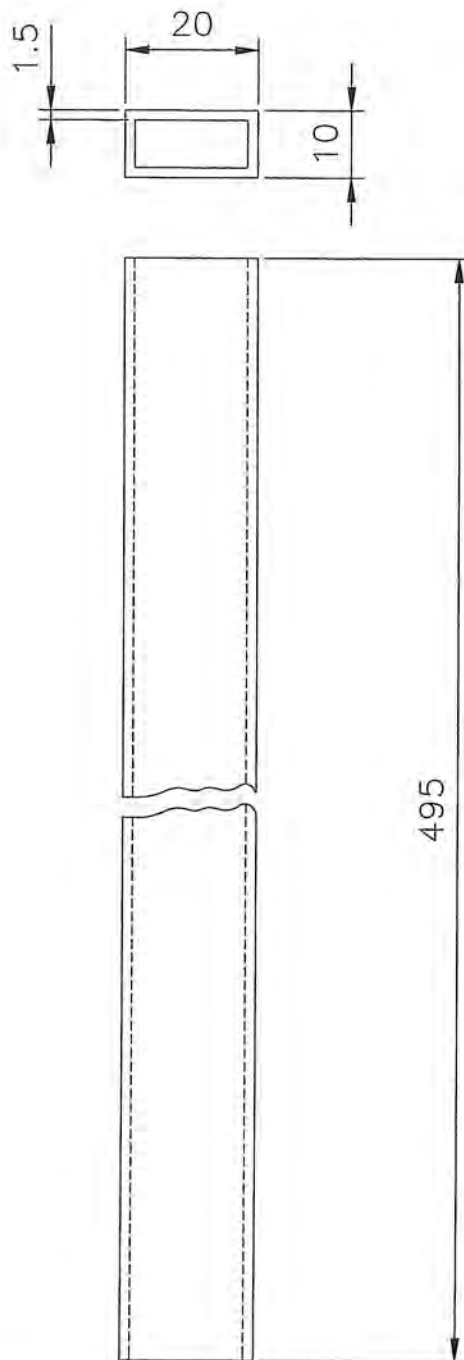
No. / Revision		Sign.	Date
Title:		Continuation (CD)	07.02.07
Reservdelstegn. 5660 NA		Revised:	
Exploded draw. 5660 NA		Form:	A2
Morsø 5600		Scale:	1:10
		Issue:	
Drawing no.:		5600-501	
Location:		morsø	
Drawing type:		Exploded view	
Drawing file:		morsbo_5600_501.dwg	

This drawing is Morsø's confidential information and must not be sold, lent or copied without any written authorization from the company.

	Anvendes til:
<p>EDB nr. 541403</p> 	1410
<p>EDB nr. 542056</p> 	1B 2B 1126
<p>EDB nr. 541082</p> 	1610 1710

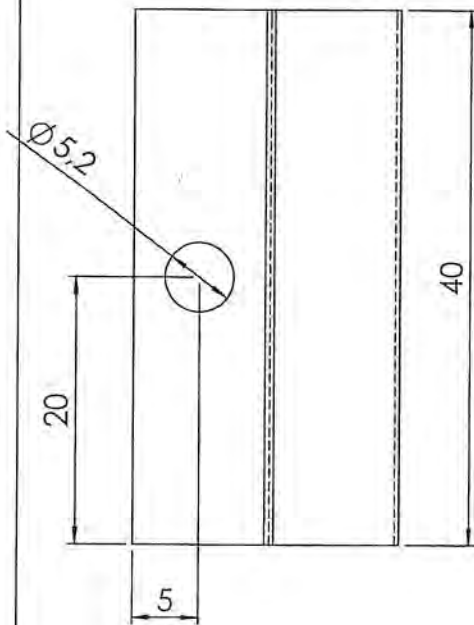
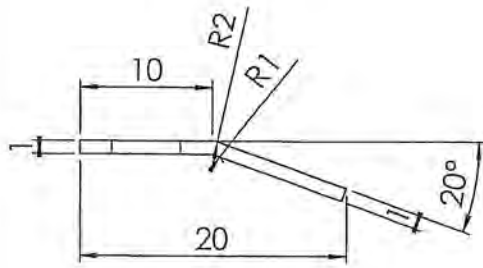
Mart.: $\varnothing 6$ Rf. automatstål
EDB nr. 714005

Titel: $\varnothing 6$ hængselstifter	Sign.: N.Aa.	Dato: 06.10.87	Revision	Sign.	Dato
	Tegn.form.: A4	Målforshold 1:1	Gamdrup TegneTeknik	HCH	April 96
			Tilføjet grader	KDU	20.12.96
Tegningsnummer: 1126-38-4	Varenummer: se teg.				
	Filnavn: 1126-38				



Materiale: 20x10x1,5 mm hulprofil (Varenr. 71362000)

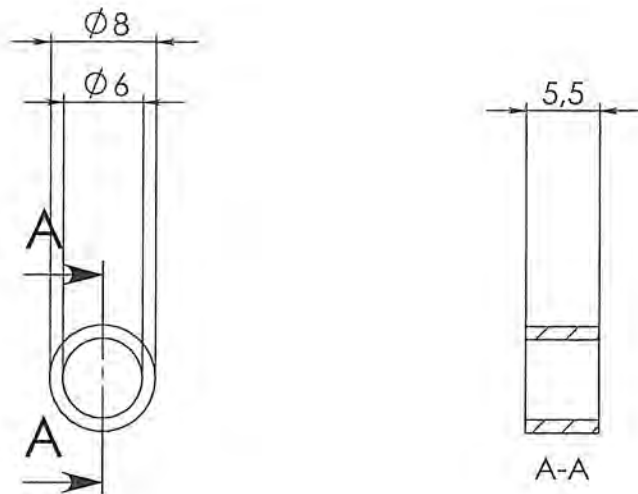
Rev.	Revision	Sign.	Dato	Titel: Løs hulprofil for fedtstenstop 1450	Sign.:	Dato:
b	Foreløbig tegn. fjernet	KDU	24.03.98		KDU	10.03.98
c	Varenr. ændret	KDU	24.04.98		Tegn.form.:	Målforshold
				Filnavn:	A4	1:1
				1400-191 løs hulprofil 1450	Varenummer:	
					54145621	
					Tegningsnummer:	
					1400-191 c	



c	Ændret varenummer	RSV	14.03.2001
b	Ændret mål	RSV	06.09.2000
Rev.	Revisionstekst:	Sign.:	Dato:
Materiale:	1 mm rustfri plade	Titel:	Konstr.:
Vægt:	0,006 kg. Bearbejdes:	Glasbeslag 2	RSV 07.03.2000
Overfladebeh.:	m ²	Morsø 1400	Frigivet: RSV 30.06.2000
Måltolerance:	Mål uden toleranceangivelse DS/ISO 2768-1 m	morsø	Tegn.format: A4
Ruhedstolerance:		<small>Byggeri og Værktøjsindustri</small>	Målforhold: 2:1
Værktøjsnr.:			Varenr.: 54146361
Tegningstype:	Emnetegning		Tegningsnr.: 1400-206 c

1400-206 glasbeslag 2 - Sheet1

Denne tegning tilhører Morsø Jernstøberi A/S og må ikke afhændes, udlånes eller kopieres uden firmaets skriftlige tilladelse

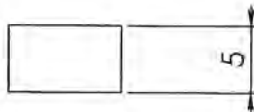
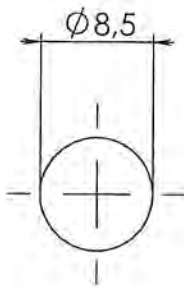


b	Længde ændret fra 3,5mm	KDU	30.04.03
Rev. Revisions		Sign.:	Date:
Title:		Construction:	RSV 06.03.03
Afstandsør ø8x1 L=5,5		Released:	RSV 06.03.03
		Format:	A4
		Scale:	2:1
		Itemno.:	54202500
			
		2000-185 b	

Material:	Ø8 x 1 mm hydraulikrør galv.
Weight:	0,7 g
Model no.	
Drawingtype:	Emnetegning
Location of file:	U:\UOV\tegninger\afstandsør\afstandsør ø8x1\51DPB

Date of print: 12-03-2007

This drawing is Morsø Jernstøberi A/S' property and must not be sold, lent or copied without any written authorization from the company.



Rev.	Revisions	Sign.:	Date:
Title:		Construction:	RSV 09.03.04
Magnet		Released:	
		Format:	A4
		Scale:	10:1
		Itemno.:	79082003
		Drawing no.:	
			

Dim. without indication of margin acc. to DS/ISO 2768-1 m

Material:

Weight: 0, kg

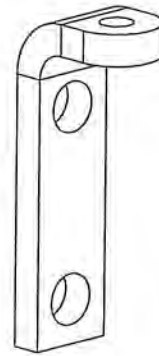
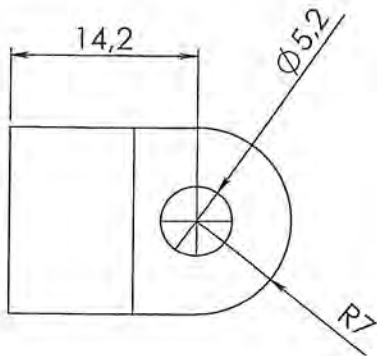
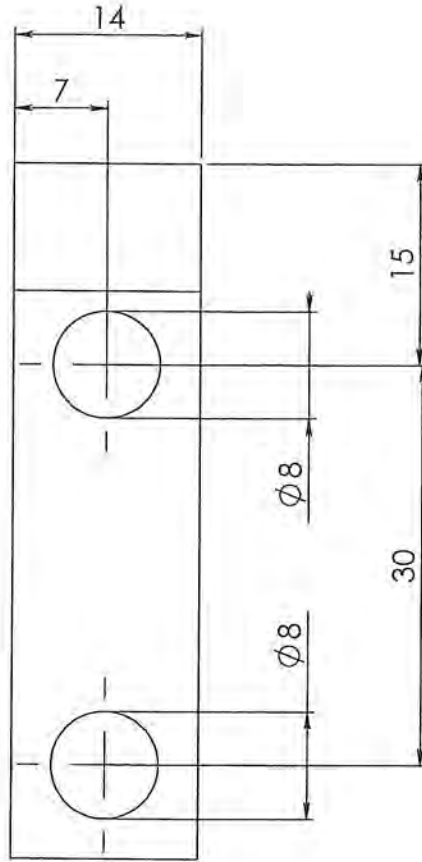
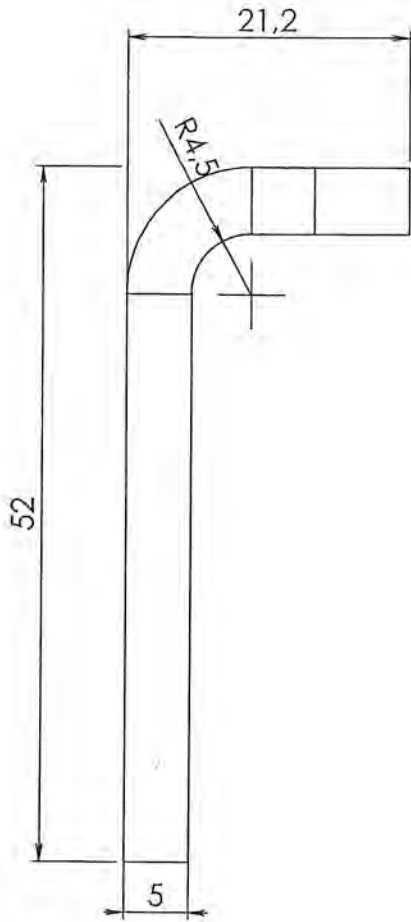
Model no.

Drawingtype: Product Drawing

Location of file: 0:\u2011\tegninger\4600\TEGNING\4600-108 magnet.1.DWG

Date of print: 12-03-2007

This drawing is Morsø Jernstøberi A/S' property and must not be sold, lended or copied without any written authorization from the company.



Rev.	Revisions	Sign.:	Date:
		KDU	13.01.05
		KDU	29.09.05
		A4	
		2:1	
		71810100	
Title: Hængselsbeslag Morsø 8100		Drawing no.: 8100-30 a	
morsø <small>Byggeri og Jernstøberi A/S</small>			

Mål uden toleranceangivelse i.h.t. DS/ISO 2768-1 m

Material: SPD Plade

Weight: 0,03 kg

Model no. -

Drawingtype: Emnetegning

Location of file: \\L:\UD\Tegninger\81\8100-30 Hængselsbeslag.DWG

Date of print: 12-03-2007

This drawing is Morsø Jernstøberi A/S' property and must not be sold, lended or copied without any written authorization from the company.

V-1100 (600) Vermiculite insulating boards

for hot-face and back-up insulation - up to 1100°C (2012°F)



Maximum service temperature	°C	1100
	°F	2012
Bulk density, dry	kg/m ³	600
	lbs/cu.ft.	37.5
Compressive strength (EN 1094-5:1995)	MPa	4.2
@ room temperature	lbs/sq.in.	609
Modulus of rupture (EN 993-6:1995)	MPa	1.6
	lbs/sq.in.	232
Total porosity (EN 1094-4:1995)	%	76
Specific heat	kJ/(kg×K)	0.94
	BTU/(lb×°F)	0.224
Coefficient of reversible thermal expansion (BS 1902: section 5.3: 1990)	K ⁻¹	11×10 ⁻⁶
@ 20°C-750°C (68°F-1382°F)	°F ⁻¹	6.1×10 ⁻⁶
Resistance to thermal shock (EN 993-1:1998)	cycles	>10
heating to 950°C (1742°F)		
Linear reheat shrinkage (EN 1094-6:1999)	%	1.0
@ 1000°C	%	
@ 1100°C	%	
Pyrometric cone equivalent (ASTM C24-89 ORTON cones)	°C	1300
	°F	2372
Thermal conductivity (ASTM C-182)	W/(m×K)	0.15
mean temp. @ 200°C	W/(m×K)	0.16
mean temp. @ 400°C	W/(m×K)	0.19
mean temp. @ 600°C	W/(m×K)	-
mean temp. @ 800°C	W/(m×K)	-
mean temp. @ 392°F	BTU/(sq.ft.×h×°F/in.)	1.04
mean temp. @ 752°F	BTU/(sq.ft.×h×°F/in.)	1.11
mean temp. @ 1112°F	BTU/(sq.ft.×h×°F/in.)	1.32
mean temp. @ 1472°F	BTU/(sq.ft.×h×°F/in.)	-
Chemical analysis, typical	%	
Silica	SiO ₂	47
Titanium dioxide	TiO ₂	0.5
Ferric oxide	Fe ₂ O ₃	4
Alumina	Al ₂ O ₃	7
Magnesium oxide	MgO	21
Calcium oxide	CaO	2
Sodium oxide	Na ₂ O	0.5
Potassium oxide	K ₂ O	11
Loss on ignition 1025°C (1877°F)	LOI	7
Colour		sand

* Vermiculite boards VIP-12 HS are tested according to EN 993-15:1998 Hot Wire.

Data are average results of tests conducted under standard procedures and are subject to variation. Data contained in this data sheet are supplied in good faith as a technical service and are subject to change without notice. Misprint and errors excepted.

Skamol A/S
Østergade 58-60
DK-7900 Nykøbing Mors
Denmark
Tel: 45 9772 1533
Fax: 45 9772 4975
insulation@skamol.dk

Sales offices

Skamol Europe GmbH
Promenadenstrasse 1
D-41460 Neuss
Germany
Postfach 10 14 37
D-41414 Neuss
Tel: +49 (0) 2131-10640
Fax: +49 (0) 2131-106464

Skamol Americas, Inc.
8318 Pineville-Matthews Road
Suite 267
Charlotte, NC 28226
USA
Tel: +1 (704) 544-1015
Fax: +1 (704) 544-1239

www.skamol.com

Skamol A/S is DS/EN ISO 9001 certified.

March 2004

Karsten Aagaard

Fra: Martin Steffensen [Martin@steffca.dk]

Sendt: 25. marts 2004 13:04

Til: kaa@morsoe.com

Emne: Data E-glas Eng.

Hermed data som aftalt.

GLASS FIBER TEXTILE PRODUCTS

The base material of STEFFCA Glass Fiber Textile Products consists of 6 - 9 microns "E" Glass Fiber Filament Yarns that can be voluminized, texturized, plied, reinforced with steel wire etc.

They are inorganic, steril, incombustible, totally Asbestos-Free, do not contain any toxic matter nor heavy metals and do not cause skin irritations.

BASIC COMPOSITIONS OF "E" GLASS FIBER

- SiO₂ 53-55 %
- Al₂O₃ 14-15,5 %
- CaO - MgO 20-24 %
- B₂O₃ 6,5-9 %
- Fe₂O₃-TiO₂ < 1%
- Na₂O-K₂O < 1%

GENERAL PROPERTIES OF "E" GLASS FIBER

- Max. Temperature 550°C
- Melting Point 1200 °C
- Diameter-*filaments* 6-9 micron
- Tensile strength-*virgin filament* 3400 MPa
- Young's modulus 74000 MPa
- Thermal conductivity 1,0 W/m °K
- Fire reaction incombustible
- Loss on ignition < 1,5 %
- Dielectric rigidity-*glass in bulk* 60-100 KV/mm
- Solvent resistance good

- Bases resistance good
- Acid resistance good - except fluoridric acid

GENERAL PROPERTIES OF "E" GLASS FIBER TEXTILE PRODUCTS

- - high mechanical strength - good electrical properties
- - incombustible - good dimensional stability
- - low thermal conductivity - good resistance to chemical agents
- - high thermal resistences - - good flexibility
- - max temperature 550°C

GLASFIBERPRODUKTER TEKNISKE DATA

Beslæmaterialet i STEFFCA glasfiberprodukter består af 6 - 9 mikron "E" glasfibertråde som kan volumineres, tekstureres, tvindes, forstærkes med ståltråde osv.
Produkterne er uorganiske, sterile, lldfaste, helt asbestfri, indeholder ingen giftstoffer eller tungmetaller, og forårsager ikke hudirritation.

"E" GLASFIBER - SAMMENSÆTNING

SiO ₂	53-55 %
Al ₂ O ₃	14-15,5 %
CaO - MgO	20-24 %
B ₂ O ₃	6,5-9 %
Fe ₂ O ₃ - TiO ₂	< 1 %
Na ₂ O-H ₂ O	< 1 %

"E" GLASFIBER - GENERELLE EGENSKABER

Farve:	HVID
Max. temperatur	550 °C
Smeltepunkt	1200 °C
Fiberdiameter	6-9 mikron
Trækstyrke - nyt filament	3400 MPa
Young's modul	74000 MPa
Varmeledningsevne	1,0 W/m °K
Reaktion på lld	lldfast
Glødetab	< 1,5%
Dielektrisk stivhed	60-100 kV/mm
Opløsningsmiddelægtighed	god
Basefasthed	god
Syrefasthed	god - bortset fra fluorbrintesyre

"E" GLASFIBERPRODUKTER - GENERELLE EGENSKABER

- stor mekanisk styrke
- gode elektriske egenskaber
- lldfaste
- lav varmeledningsevne
- god modstandsevne over for kemiske stoffer
- høj termisk modstand
- god fleksibilitet

MAX TEMPERATUR 550 °C

STEFFCA GLASFIBERPRODUKTER - SORTIMENT

Snoede pakning - omflettede pakning - isolerende bånd - flettede pakninger i runde, firkantede og rektangulære dimensioner - vævet bændel - selvklæbende bændel - bånd - selvklæbende bånd - stigebånd - dielektrisk tape - lodde puder - rå, silikonecoatede, HT-behandlede, aluminiserede, grafitiserede, karamelliserede, telefonbelagte, - glasklæder - afdækninger

VETRO-REF:

GLASFIBERPRODUKTER MED SPECIEL HT-IMPRÆGNERING

Glasfiberprodukter kan imprægneres med speciel lldfast vermicullit for at øge deres resistens over for høje temperaturer og alle slags termisk chok op til 1000°C og for at reducere spild af glasfiber og pulver under håndlæringen.
STEFFCA's "VETRO-REF" produkter er meget fleksible og modstandsdygtige over for gnister, svejseprøjt og smeltet metal.

VETRO-REF produkternes farve

Imprægneringens max termiske fasthed ved kontinuerlig anvendelse

Imprægneringens max termiske fasthed ved kortvarige påvirkninger

guldf
700 °C
1000 °C

www.kompass.net/d/steffcadk

STEFFCA A/S · FALSTERVEJ 10 H · DK-5800 NYBORG · A/S REG.NR. 24 44 93 · SE.NR. 20 76 85 09
TELEFON +45 6531 3102 · TELEFAX +45 6531 8502 · E-MAIL: info@steffca.dk · GIRO 2 45 16 46

Glass ceramics NEOCERAM N-0

Technical datas

Thermal expansion

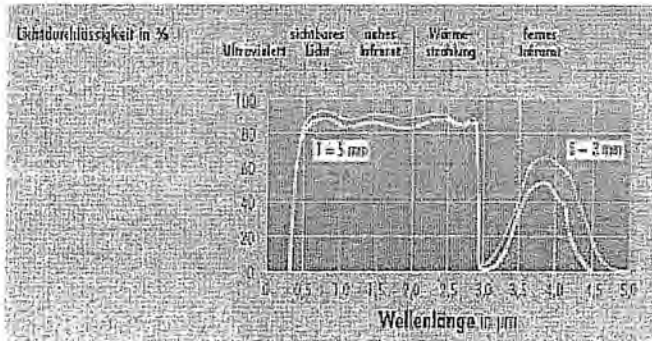
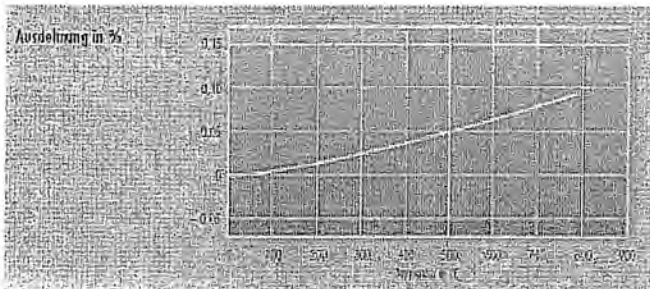
Light transmission

Surface character

Flat glasses/Coated glass ceramics/Installation instructions

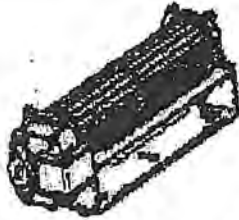
Technical datas

Expansion coefficient	· 10 ⁻⁷ /K	(30 - 380° C) – 6 (30 - 750° C) – 3
Thermal shock resistance	°C	800
Maximum service temperature	°C	long term 700 short term 800
Thermal conductivity	W/m · K (25° C)	1,51
Specific heat	J/kg · K	712
Density	g/cm ³	2,51
Bending and impact strength	correspondent to the datas of casting glass	





FASCO INDUSTRIES INC.
 FASCO MOTORS GROUP
 FASCO DISTRIBUTING CO.
 CHESTERFIELD, MO. 63017



**MODEL NO
 B22508**

SHADED POLE
C.F.M. 100
AMPS .70
115 V. 60 HZ
1500 RPM 1 SPEED
ORTATION - CWSE
THERMALLY PROTECTED
VENTILATION-OPEN
SLEEVE BEARING
WHEEL 9-1/2 X 2-1/2

CG04

61224379-1



1 B22508

REPLACEMENT MOTOR AND BLOWER SPECIALIST

*Model: 5660
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark*

Section 2

Quality Assurance/Quality Control

QUALITY ASSURANCE/QUALITY CONTROL

OMNI follows the guidelines of ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories," and the quality assurance/quality control (QA/QC) procedures found in OMNI's Quality Assurance Manual.

OMNI's scope of accreditation includes, but is not limited to, the following:

- ANSI (American National Standards Institute) for certification of product to safety standards.
- To perform product safety testing by the International Approval Service (formerly ICBO ES) under accreditation as a testing laboratory designated TL-130.
- To perform product safety testing as a "Certification Organization" by the Standards Council of Canada (SCC).
- Serving as a testing laboratory for the certification of wood heaters by the U.S. Environmental Protection Agency.

This report is issued within the scope of OMNI's accreditation. Accreditation certificates are available upon request.

Model: 5660
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark

Sample Analysis
Analysis Worksheets
Tared Filter and Beaker Data
Solvent Blank Data

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso Jernstoberi A/S

Model: 5660

Project #: 192-S-14-3 Tracking #: 946

Date: 2-08-07

Test Crew: K. Morgan

Run #: 1

Sample Train #: _____

Train assembled by: K. Morgan

Balance ID #: OMNI - 00023

Thermo/Hygro meter ID #: OMNI -

Audit weight ID #: OMNI - 00131

(Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter	2-12-07	08:00	.5366	.5001	23	71	K
Lab ID # _____							
ID # <u>N296</u>	2-13-07	08:00	.5364	.5001	24	70	K
Tare wt. <u>.4957</u>							
D/T in desiccator							
<u>2-07-08 16:15</u>							
<u>2-08-07</u>							
Preliminary wt.: <u>.5372</u>							
Rear Filter	2-12-07	08:00	.5035	.5001	23	71	K
Lab ID # _____							
ID # <u>N295</u>	2-13-07	08:00	.5033	.5001	24	70	K
Tare wt. <u>.5012</u>							
D/T in desiccator:							
<u>2-8-07 16:50</u>							
Preliminary wt.: <u>.5041</u>							
Acetone Rinse	2-13-07	08:00	112.3349	.5001	24	70	K
Lab ID # _____							
Beaker # <u>41</u>							
Tare wt. <u>112.3298</u>	2-14-07	08:00	112.3345	.5001	24	73	K
Volume <u>75</u> ml							
Cleaned by: <u>K</u>							
Solvent #: <u>SA07B</u>							
D/T in desiccator:							
<u>2-12-07 08:00</u>							
Preliminary wt.: <u>112.3362</u>							

Technician signature: K. Morgan

Date: 2-14-07

47.9

5.1

40.7

7.3

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso Jernstoberi A/S
 Model: 5660
 Project #: 192-S-14-3 Tracking #: 946
 Date: 2-12-07 Test Crew: H. Morgan Run #: 2
 Sample Train #: _____ Train assembled by: H. Morgan
 Balance ID #: OMNI - 00023 Thermo/Hygro meter ID #: OMNI -
 Audit weight ID #: OMNI - 00131 (Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter	2-13-07	16:20	.5225	.5001	23	72	K
Lab ID # _____							
ID # <u>N298</u>	2-14-07	08:00	.5220	.5001	24	73	K
Tare wt. <u>.5017</u>							
D/T in desiccator <u>2-12 2PM</u>							
Preliminary wt.: <u>.5227</u>							
Rear Filter	2-13-07	16:20	.4916	.5001	23	72	K
Lab ID # _____							
ID # <u>N297</u>	2-14-07	08:00	.4911	.5001	24	73	K
Tare wt. <u>.4895</u>							
D/T in desiccator: <u>2-12 2PM</u>							
Preliminary wt.: <u>.4929</u>							
Acetone Rinse	2-14-07	08:00	101.6974	.5001	24	73	K
Lab ID # _____							
Beaker # <u>829</u>							
Tare wt. <u>101.6901</u>	2-15-07	08:00	101.6990	.5001	12	72	K
Volume <u>75</u> ml							
Cleaned by: <u>K</u>							
Solvent #: <u>5A078</u>							
D/T in desiccator: <u>2-13-07 K+G 08:00</u>							
Preliminary wt.: <u>101.6993</u>							

Technician signature: H. Morgan Date: 2-15-07

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso Jernstoberi A/S

Model: 5660

Project #: 192-S-14-3 Tracking #: 946

Date: 2-13-07

Test Crew: K. Morgan

Run #: 3

Sample Train #: _____

Train assembled by: K. Morgan

Balance ID #: OMNI - 00023

Thermo/Hygro meter ID #: OMNI -

Audit weight ID #: OMNI - 00131

(Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter	2-15-07	08:00	.5246	.5001	12	72	K
Lab ID # _____							
✓ ID # <u>N302</u>	2-15-07	15:40	.5245	.5001	13	76	K
Tare wt. <u>.4955</u>							
D/T in desiccator <u>2-13-07 16:00</u>							
Preliminary wt.: <u>.5253</u>							
Rear Filter	2-15-07	08:00	.5024	.5001	12	72	K
Lab ID # _____							
✓ ID # <u>N301</u>	2-15-07	15:40	.5024	.5001	13	76	K
Tare wt. <u>.5011</u>							
D/T in desiccator: <u>2-13-07 16:00</u>							
Preliminary wt.: <u>.5027</u>							
Acetone Rinse	2-15-07	08:00	104.8846	.5001	12	72	K
Lab ID # _____							
Beaker # <u>2187</u>							
✓ Tare wt. <u>104.8819</u>	2-15-07	15:40	104.8843	.5001	13	76	K
Volume <u>75</u> ml							
Cleaned by: <u>K</u>							
Solvent #: <u>SA078</u>							
D/T in desiccator: <u>2-14-07 08:00</u>							
Preliminary wt.: <u>104.8893</u>							

Technician signature: K. Morgan

Date: 2-15-07

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso Jernstoberi A/S

Model: 5660

Project #: 192-S-14-3 Tracking #: 946

Date: 2-14-07

Test Crew: K. Morgan

Run #: 4

Sample Train #: _____

Train assembled by: K. Morgan

Balance ID #: OMNI - 00023

Thermo/Hygro meter ID #: OMNI -

Audit weight ID #: OMNI - 00131

(Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter	2-15-07	15:40	.5610	.5001	13	76	IK
Lab ID # _____	2-16-07	08:00	.5610	.5001	19	76	IK
ID # <u>N308</u>							
Tare wt. <u>.5501</u>							
D/T in desiccator							
<u>2-14-07 13:30</u>							
Preliminary wt.: <u>.5612</u>							
Rear Filter	2-15-07	15:40	.5546	.5001	13	76	IK
Lab ID # _____	2-16-07	08:00	.5545	.5001	19	76	IK
ID # <u>N307</u>							
Tare wt. <u>.5533</u>							
D/T in desiccator:							
<u>2-14-07 13:30</u>							
Preliminary wt.: <u>.5549</u>							
Acetone Rinse	2-16-07	08:00	.55 ^{IK} 110.1746	.5001	19	76	IK
Lab ID # _____	2-16-07	15:00	110.1745	.5001	21	75	IK
Beaker # <u>2351</u>							
Tare wt. <u>110.1696</u>							
Volume <u>75</u> ml							
Cleaned by: <u>IK</u>							
Solvent #: <u>SA078</u>							
D/T in desiccator:							
<u>2-15-07 08:00</u>							
Preliminary wt.: <u>110.1762</u>							

Technician signature: K. Morgan

Date: 2-16-07

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso Jernstoberi A/S

Model: 5660

Project #: 192-S-14-3 Tracking #: 946

Date: 2-15-07

Test Crew: K. MORGAN

Run #: 5

Sample Train #: _____

Train assembled by: K. MORGAN

Balance ID #: OMNI - 00023

Thermo/Hygro meter ID #: OMNI -

Audit weight ID #: OMNI - 00131

(Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter	<u>2-16-07</u>	<u>16:00</u>	<u>.5700</u>	<u>.5001</u>	<u>21</u>	<u>75</u>	<u>IK</u>
Lab ID # _____							
ID # <u>N312</u>	<u>2-19-07</u>	<u>08:00</u>	<u>.5696</u>	<u>.5001</u>	<u>17</u>	<u>67</u>	<u>IK</u>
Tare wt. <u>.5475</u>							
D/T in desiccator <u>2-15-07 15:30</u>							
Preliminary wt.: <u>.5707</u>							
Rear Filter	<u>2-16-07</u>	<u>16:00</u>	<u>.5543</u>	<u>.5001</u>	<u>21</u>	<u>75</u>	<u>IK</u>
Lab ID # _____							
ID # <u>N313</u>	<u>2-19-07</u>	<u>08:00</u>	<u>.5539</u>	<u>.5001</u>	<u>17</u>	<u>67</u>	<u>IK</u>
Tare wt. <u>.5534</u>							
D/T in desiccator: <u>2-15-07 15:30</u>							
Preliminary wt.: <u>.5546</u>							
Acetone Rinse	<u>2-19-07</u>	<u>08:00</u>	<u>102.4512</u>	<u>.5001</u>	<u>17</u>	<u>67</u>	<u>IK</u>
Lab ID # _____							
Beaker # <u>2175</u>							
Tare wt. <u>102.4449</u>	<u>2-20-07</u>	<u>08:00</u>	<u>102.4510</u>	<u>.5001</u>	<u>20</u>	<u>72</u>	<u>IK</u>
Volume <u>75</u> ml							
Cleaned by: <u>IK</u>							
Solvent #: <u>SA078</u>							
D/T in desiccator: <u>2-16-07 16:00</u>							
Preliminary wt.: <u>102.4536</u>							

Technician signature: IK Morgan

Date: 2-20-07

29.7
3194

Dilution Tunnel (Method 5G) Analysis Worksheet

Client: Morso Jernstoberi A/S

Model: 5660

Project #: 192-S-14-3 Tracking #: 946

Date: 2-16-07

Test Crew: K. Morgan

Run #: 6

Sample Train #: _____

Train assembled by: K. Morgan

Balance ID #: OMNI - 00023

Thermo/Hygro meter ID #: OMNI -

Audit weight ID #: OMNI - 00131

(Balance audit mfr. std: 500 ± 0.72 mg)

Train Part	Weighing Record						
	Date	Time	Weight (grams)	Audit (grams)	R/H %	Temp. (F)	Initials
Front Filter	<u>2-19-07</u>	<u>08:00</u>	<u>.5585</u>	<u>.5001</u>	<u>17</u>	<u>67</u>	<u>IK</u>
Lab ID # _____							
ID # <u>N315</u>	<u>2-20-07</u>	<u>08:00</u>	<u>.5583</u>	<u>.5001</u>	<u>20</u>	<u>72</u>	<u>IK</u>
Tare wt. <u>.5453</u>							
D/T in desiccator <u>2-16-07 15:00</u>							
Preliminary wt.: <u>.5575</u>							
Rear Filter	<u>2-19-07</u>	<u>08:00</u>	<u>.5584</u>	<u>.5001</u>	<u>17</u>	<u>67</u>	<u>IK</u>
Lab ID # _____							
ID # <u>N314</u>	<u>2-20-07</u>	<u>08:00</u>	<u>.5583</u>	<u>.5001</u>	<u>20</u>	<u>72</u>	<u>IK</u>
Tare wt. <u>.5567</u>							
D/T in desiccator: <u>2-16-07 15:00</u>							
Preliminary wt.: <u>.5592</u>							
Acetone Rinse	<u>2-20-07</u>	<u>08:00</u>	<u>102.1743</u>	<u>.5001</u>	<u>20</u>	<u>72</u>	<u>IK</u>
Lab ID # _____							
Beaker # <u>281</u>	<u>2-21-07</u>	<u>08:00</u>	<u>102.1740</u>	<u>.5001</u>	<u>19</u>	<u>69</u>	<u>IK</u>
Tare wt. <u>102.1650</u>							
Volume <u>75</u> ml							
Cleaned by: <u>IK</u>							
Solvent #: <u>SA07B</u>							
D/T in desiccator: <u>2-19-07 08:00</u>							
Preliminary wt.: <u>102.1752</u>							

Technician signature: K. Morgan

Date: 2-16-07

234

Date Placed in Desiccator

04-Feb-07

Balance ID Number

OMNI-00023

Time Placed in Desiccator

9:10 AM

Audit Weight ID Number

OMNI-00131

Technician

Davis

Thermometer/Hygrometer ID Number

AE Glass 102 mm Filter Tares

OMNI-Test Laboratories, Inc

Date: 2/5/2007
 Time: 1:15 PM
 RH %: 12
 T (F): 70
 Filters Tech.: Davis
 ID Number Audit: 0.5001

Appliance

Manufacturer

Project No.

Run

Train

ID Number	Date	Time	RH %	T (F)	Filters Tech.	Audit	Appliance	Manufacturer	Project No.	Run	Train
N295	2/5/2007	1:15 PM	12	70	Davis	0.5001	5660 Insert	Morso	192-S-14-3	1	
N296	2/6/2007	1:04 PM	11	71	Davis	0.5012	5660 Insert	Morso	192-S-14-3	1	
N297						0.4958	5660 Insert	Morso	192-S-14-3	1	
N298						0.4896	5660 Insert	Morso	192-S-14-3	2	
N301						0.5017	5660 Insert	Morso	192-S-14-3	2	
N302						0.5011	5660 Insert	Morso	192-S-14-3	3	
N307						0.4957	5660 Insert	Morso	192-S-14-3	3	
N308						0.5534	5660 Insert	Morso	192-S-14-3	3	
N312						0.5503	5660 Insert	Morso	192-S-14-3	4	
N313						0.5479	5660 Insert	Morso	192-S-14-3	4	
N314						0.5535	5660 Insert	Morso	192-S-14-3	5	
N315						0.557	5660 Insert	Morso	192-S-14-3	5	
						0.5452	5660 Insert	Morso	192-S-14-3	6	

Date Placed in Desiccator: 29-Jan-07
 Time Placed in Desiccator: 8:00 AM
 Technician: Morgan
 Balance ID Number: OMNI-00023
 Audit Weight ID Number: OMNI-00131
 Thermometer/Hygrometer ID Number:

250 ml Beaker Tares
OMNI-Test Laboratories, Inc

ID Number	Date	Time	RH %	T (F)	Tech.:	Audit	Manufacturer	Appliance	Project No.	Run	Train
2175	1/30/2007	8:00 AM	12	68	Morgan	0.5001	Moroso	5660 Insert	192-S-14-3	5	
41	1/31/2007	7:50 AM	12	66	Morgan	0.5001	Moroso	5660 Insert	192-S-14-3	1	
281	1/31/2007	7:50 AM	12	66	Morgan	0.5001	Moroso	5660 Insert	192-S-14-3	6	
829	1/31/2007	7:50 AM	12	66	Morgan	0.5001	Moroso	5660 Insert	192-S-14-3	2	
2187	1/31/2007	7:50 AM	12	66	Morgan	0.5001	Moroso	5660 Insert	192-S-14-3	3	
2351	1/31/2007	7:50 AM	12	66	Morgan	0.5001	Moroso	5660 Insert	192-S-14-3	4	

Acetone Solvent Blank Analysis Worksheet

Date: 3-1-06 By: B. Davis Balance ID #: OMNI - 00023
 Manuf. Lot #: C180103SP Solvent Bottle #: SA078 Audit Weight ID #: OMNI - 00131
 (Balance audit mfr. std.: 500 ± 0.72 mg)

Mls. Sample	ID No.	Tare Weight	Date & Time in Dessicator	Weighing Record			Initials	Calculations & Remarks
				Date	Time	Weight		
150	2195	104.4234	3-03-06 & 09:00	3-4-06	0920	102.8377 104.4239	BA	$\frac{0.7}{150}$.0047
				3-7-06	0107	104.4243	DK	
150	2000	102.8382	3-3-06 & 09:00	3-4-06	0910	102.1877	BA	$\frac{-0.4}{150}$ -.0027
				3-7-06	0807	102.8378	BA	
								$\frac{.0047}{2} = .0024$ mg/ml

Technician Signature: [Signature] Date: 6-30-06

Checked by: [Signature] Date: 6/30/06 Approved by: [Signature] Date: 6/30/06

Calibrations

Methods 28 and 5G

ID #	Lab Name/Purpose	Log Name	Attachment Type
21	Calibrator Dry Gas Meter	Control Module – Sierra Misco	Calibration Log
23	Scale/Analytical Balance	Analytical Balance – Mettler Instrument	Calibration Log
112	Thermometer	Temperature Controller Meter – Omega	Calibration Certificate
126	Draft Gauge	Magnehelic, 0-0.25" H ₂ O – Dwyer	Calibration Log
131	500 mg Weight	Standard Weight, 500 mg – Ohaus	Calibration Certificate
141	Dry Gas Meter	Dry Gas Meter – Singer	Calibration Certificate
156	Incline Manometer	Incline Manometer 0-10" – Dwyer	Calibration Log
185	Scale	Platform Scale – Weigh-Tronix	Calibration Log
209	Barometer	Barometer – Princo	Manual Cover
265	Vaneometer	Vaneometer/Air Velocity Meter – Dwyer	Calibration Log
274	10 lb Weight	Standard Weight, 10 lb.	Calibration Certificate
287	Manometer	Microtector – Dwyer	Calibration Log
340	Moisture Meter	Moisture Meter – Delmhorst	Manual Cover
342	Hygrometer	Digital Hygrometer – Omega	Calibration Certificate
364	Stopwatch	Stopwatch – Sportline	Calibration Log

Thermal Metering System Calibration

Y and dH@

Manufacturer: Sierr-Misco Inc.
 Model: 7200
 Serial Number: _____
 OMNI Tracking No.: 21

**Average Orifice
Meter dH@
1.674**

**Average Gas
Meter y Factor
0.987**

Calibration Date: 02/16/07
 Calibrated by: Ken Morgan
 Calibration Frequency: Post Series
 Next Calibration Due: 08/17/07
 Instrument Range: 1.000 cfm
 Standard Temp.: 68 oF
 Standard Press.: 29.92 "Hg
 Barometric Press.: 30.35 "Hg
 Signature/Date: *Ken Morgan* 2-16-07

Previous Calibration Comparison

Date	11/27/2006	Acceptable	
dH@ Value	1.598	Deviation (5%)	Deviation
y Factor	1.001	0.05005	0.014
Acceptance	Acceptable		

Current Calibration

Acceptable y Deviation	0.020
Maximum y Deviation	0.003
Acceptable dH@ Deviation	0.200
Maximum dH@ Deviation	0.018
Acceptance	Acceptable

Reference Standard *

Standard Calibrator	Model	Standard Test Meter
	S/N	00141
	Calib. Date	19-Jun-06
	Calib. Value	0.9980 y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Vacuum ("Hg)	1.00	1.00	1.00
dH ("H2O)	0.75	0.75	0.75
Initial Reference Meter	28.005	36.766	46.571
Final Reference Meter	36.766	46.571	51.436
Initial DGM	956.255	965.518	975.872
Final DGM	965.518	975.872	981.014
Temp. Ref. Meter (°F), Tr	70.0	70.0	70.0
Temperature DGM (°F), Td	93.0	95.0	96.0
Time (Minutes)	18.0	20.0	10.0
Net Volume Ref. Meter, Vr	8.761	9.805	4.865
Net Volume DGM, Vd	9.263	10.354	5.142
Gas Meter y Factor	0.983	0.988	0.989
Gas Meter y Factor Deviation (from avg.)	0.003	0.001	0.002
Orifice dH@	1.69	1.66	1.68
Orifice dH@ Deviation (from avg.)	0.013	0.018	0.005

where:

1. Deviation = |Average value for all runs - current run value|
2. $y = [Vr \times (y \text{ factor (ref)}) \times (Pb) \times (Td + 460)] / [Vd \times (Pb + (dH / 13.6)) \times (Tr + 460)]$
3. $dH@ = 0.0317 \times dH / (Pb (Td + 460)) \times [(Tr + 460) \times \text{time}] / Vr^2$

* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272

Thermal Metering System Calibration

Y and dH@

Manufacturer: Sierra-Misco
 Model: 7200
 Serial Number: _____
 OMNI Tracking No.: 21

**Average Orifice
Meter dH@**
1.598

**Average Gas
Meter y Factor**
1.001

Calibration Date: 11/27/06
 Calibrated by: Ken Morgan
 Calibration Frequency: Six Month
 Next Calibration Due: 05/28/07
 Instrument Range: 1.000 cfm
 Standard Temp.: 68 oF
 Standard Press.: 29.92 "Hg
 Barometric Press.: 29.64 "Hg
 Signature/Date: *K.J. Morgan* 11-27-06

Previous Calibration Comparison

Date	5/17/06	Acceptable	
dH@ Value	1.526	Deviation (5%)	Deviation
y Factor	0.991	0.04955	0.010
Acceptance	Acceptable		

Current Calibration

Acceptable y Deviation	0.020
Maximum y Deviation	0.010
Acceptable dH@ Deviation	0.200
Maximum dH@ Deviation	0.069
Acceptance	Acceptable

Reference Standard *

Standard	Model	Standard Test Meter
Calibrator	S/N	141
	Calib. Date	19-Jun-06
	Calib. Value	0.9980 y factor (ref)

Calibration Parameters	Run 1	Run 2	Run 3
Vacuum ("Hg)	1.00	1.00	1.00
dH ("H2O)	0.45	0.75	1.50
Initial Reference Meter	333.501	339.4	347.468
Final Reference Meter	338.871	346.833	352.489
Initial DGM	650.186	656.396	664.907
Final DGM	655.843	664.233	670.206
Temp. Ref. Meter (°F), Tr	64.0	64.0	64.0
Temperature DGM (°F), Td	89.0	95.0	102.0
Time (Minutes)	14.0	15.0	7.0
Net Volume Ref. Meter, Vr	5.370	7.433	5.021
Net Volume DGM, Vd	5.657	7.837	5.299
Gas Meter y Factor =	0.991	1.001	1.010
Gas Meter y Factor Deviation (from avg.)	0.009	0.000	0.010
Orifice dH@	1.64	1.62	1.53
Orifice dH@ Deviation (from avg.)	0.044	0.024	0.069

where:

1. Deviation = |Average value for all runs - current run value|
2. $y = [Vr \times (y \text{ factor (ref)}) \times (Pb) \times (Td + 460)] / [Vd \times (Pb + (dH / 13.6)) \times (Tr + 460)]$
3. $dH@ = 0.0317 \times dH / (Pb (Td + 460)) \times [(Tr + 460) \times \text{time}] / Vr]^2$

* Reference calibration is traceable to NIST through NIST Test # 40674, Kimble ASTM E1272

Certificate of Calibration

360456

Omni-Test Laboratories
5465 SW Western
Suite G
Beaverton, OR 97005

Cust ID: 56
OnSite

PO: OTL-06-127
Authorized By:



JJ Calibrations, Inc.

Make: Mettler
Model: AE200
Noun: SCALE
Serial #: 010644
Property #: OMNI-00023
Department: NO
User:
Procedure: CP 27
Accuracy: $\pm 0.01\%$ OF APPLIED WEIGHT

Order Date: 11/08/2006
Calibrated on: 11/08/2006
*Recommended Due: 05/08/2007
Environment: 17°C 49% RH
As Received: Within Tolerance
As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 92
ID Barcode: CVUH



Remarks
Refer to attachment for measurement results.

* Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
256A	Rice Lake	W0133K	WEIGHT SET	08/11/2008	326425
503A	Rice Lake	1mg-200g TYPE O	O CLASS WEIGHT SET	09/28/2007	353816

This instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual and is traceable to the National Institute of Standards and Technology (NIST). The quality system and this certificate are in compliance with ANSI/NC SL Z540-1-1994, ISO/IEC 17025-1999, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without written approval of JJ Calibrations.

Reviewer

Inspector
4 Issued 11/09/2006 Rev # 12

Temperature Calibration EPA Method 28 and 5G						
BOOTH:	TEMPERATURE MONITOR TYPE:				IDENTIFICATION NUMBER:	
Emissions	OMEGA 115 KF				112	
REFERENCE TEMPERATURE MONITOR TYPE:				IDENTIFICATION NUMBER:		
OMEGA Calibrator Model CL300 00117				Serial Number 506		
CALIBRATION PERFORMED BY:		DATE:	AMBIENT TEMPERATURE:		BAROMETRIC PRESSURE:	
KEN MORRAN		11-27-06	63		29.68	
Reference Point Source	Temperature Monitor (°F)					
	Method 28 Room	Method 5G Dilution Tunnel				DB
Meter (Tm)		Filters (Tf)	Tunnel (Tt)	Dryer (Ts)		
OMEGA Thermocouple Simulator Serial #506						
0	1	1	1	1	1	1
100	98	98	98	98	98	98
300	301	301	301	301	301	301
500	500	500	500	500	500	500
700	699	699	699	699	699	699

Technician signature: Ken Moran Date: 11-27-06



DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET Magnehelic Gauge

Instrument to be calibrated: MAGNEHELIC

Range: 0 - 0.25 ID Number: 126

Calibration Instrument: Digital Manometer ID Number: 315

Date: 12-07-06 By: K. Morgan

Only two data points for a between calibration check

Digital Manometer (A) (inches of H ₂ O)	Magnehelic Gauge (B) (inches of H ₂ O)	Difference (A - B)	% Error of Full Span*
.251	.248	.003	1.2%
.173	.175	.002	0.8%
.117	.113	.004	1.6%
.030	.028	.002	0.8%

*Acceptable tolerance is 4%.

This calibration is traceable to NIST through the Dwyer Liquid Manometer, NIST Test #MAS 822/254143-94.

Technician signature: K. Morgan Date: 12-07-06

Certificate of Calibration

Certificate # 286629

Page # 1 of 1

Order Date: 13Nov2003

For: OMNI-TEST LABORATORIES

56

Department: NO

PO#: PAM BLACKBURN



JJ Calibrations, Inc.



Instrument Identification

Property #: OMNI-00131

Serial #: 27503

Make: OHAUS

User:

Model: 500mg

Noun: 500mg WEIGHT

Accuracy: CLASS F

Certification Information

As Found: Within Tolerance

Calibration Date: 19Nov2003

As Left: Within Tolerance

*Client Specified Due Date: 19Nov2004

Adjustments: None

Repairs: None

Seals: N/A

Environment: 20°C 33% RH

Procedure: CP 16

Technician: 34

Remarks

SEE DATA SHEET FOR MEASUREMENT RESULTS.

*Any number of factors may cause this item to drift out of calibration before the recommended due date has expired.

Standards Used

ID#	Manufacturer	Model#	Nomenclature	Due Date	Trace ID
432	SARTORIUS	C-44	MICROBALANCE 5.1g	19Nov2004	285515

JJ Calibrations, Inc., certifies that this instrument has been compared in accordance with the above referenced procedure using standards with accuracies traceable to the National Institute of Standards and Technology, derived from accepted values of physical constants, derived from ratio measurements, or compared to consensus standards. The results contained herein relate only to the item calibrated. This certificate is in compliance with the applicable requirements of; ISO 17025, ANSI/NCSL Z540-1, MIL-STD-45662A, ISO 10012-1, ISO-9002 and QS-9000.

A Test Accuracy Ratio (TAR) of at least 4:1, if achievable, is maintained unless otherwise stated.

This uncertainty expression is expanded at approximately the 95% confidence level, coverage factor (k=2).

Technical Reviewer

Quality Assurance

This certificate shall not be reproduced except in full, without the written approval of JJ Calibrations, Inc.

Issued 19Nov2003
Rev # 11

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DICK MUNNS COMPANY
Liquid and Gas - Flowmeter Calibration Service
 10572 Calle Lee - 138 • Los Alamitos, California 90720
 Telephone (714) 827-1215 • Telefax (714) 827-0823

CERTIFICATE OF CALIBRATION

Client Name:	OMNI-TEST LABS	Calibration Date:	06-19-2006
Reference Number:	PO# OTL-06-057	Calibration Due:	06-19-2007
Instrument Manufacturer:	AMERICAN METER CO.	Procedure:	NAVAIR-17-20MG-02
Instrument Description:	P.D. METER	Calibration Fluid:	Air @14.7PSIA 70F.
Model Number:	DTM-200A	Standard(s) Used:	A4 DUE 2-2007
Serial Number:	95W492393	NIST Traceability Per:	322ENW, 737/3096, 37720
Rated Uncertainty:	+/- .5% RD	Ambient Conditions:	761 mmHGA, 46% RH
Uncertainty Given:	As rec. Within Specs.	Certificate/File:	423862

	IND. SCFM	ACT. SCFM	C. FACTOR
1	0.250	0.250	1.00001
2	0.501	0.500	0.99801
3	0.751	0.750	0.99868
4	1.002	1.000	0.99801
5	1.503	1.500	0.99801
6	2.004	2.000	0.99801
7	2.507	2.500	0.99722
8	3.009	3.000	0.99702

** ID# 00141 **

All instruments used in the performance of the above calibration have direct traceability to the National Institute of Standards and Technology (NIST). The accuracy ratio between the calibration standards used and the unit under test is a minimum of 4:1, unless otherwise noted. Calibration has been performed per the above listed procedure number, in accordance with ISO 10012-1, 17025, ANSI/NCSL-Z-540-1, and/or MIL-STD-45662A. CONDITION AS: RECEIVED AS LEFT WITHIN SPECS. YES () NO.

Calibration Performed By:
 PABLO ACOSTA *PA*

Approved By:
 R.L. Munns
[Signature]

DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET Magnehelic Gauge

Instrument to be calibrated: Liquid INCLINE MANOMETER

Range: 0-10" w.c. ID Number: 156

Calibration Instrument: Digital Manometer ID Number: 315

Date: 12-07-06 By: K. Morgan

Only two data points for a between calibration check

Digital Manometer (A) (inches of H ₂ O)	Magnehelic Gauge (B) (inches of H ₂ O)	Difference (A - B)	% Error of Full Span
1.900	1.90	0	0
1.000	1.00	0	0
0.719	0.718 0.720	.001	0.1%
0.319	0.320	.001	0.1%

*Acceptable tolerance is 4%.

This calibration is traceable to NIST through the Dwyer Liquid Manometer, NIST Test #MAS 822/254143-94.

Technician signature: K. Morgan Date: 12-07-06

Weiigh-Tronix, Inc.
7933-SW Nimbus Ave. #28
Beaverton, OR 97005
503-626-3008
1-800-878-3008

WV: BRUCE DAVIS

WEIGH-TRONIX SERVICE WORK ORDER

SHIP TO	NAME	OMNI ENVIRONMENTAL SERVICES			JOB No. <u>111991</u>
	ADDRESS	5465 SW WESTERN AVE			
	CITY	BEAVERTON			
	PHONE	503 - 643-3788	STATE	OR	
	FAX		ZIP	97075	
	CONTACT	Bruce or Richard			CUSTOMER No. <u> / / </u>
					Order Date <u> / / </u>
					Start Date <u> / / </u>
					Complete Date <u>1/11/99</u>
BILL TO	NAME	PO BOX 743			P.O. No. <u>99-007</u>
	ADDRESS				
	CITY				
	ATTN:				
		STATE			

EQUIPMENT:

S/N	Location	Type	Cap.	Recommendations and Remarks
<u>5547</u>		<u>WI-127</u>	<u>1K</u>	<u>10,000 DIV</u>
<u>21676</u>		<u>3030</u>	<u>1K</u>	

COMMENTS:

Rental 1 Month

Set up calibrated 1000 x 0.1 LB pan. wden tested. good.

PARTS:

2.5

Qty.	Description	Price	Total

SERVICE SUMMARY

Reg.	Agree.	Pref.	Inst.
Hrs. @ _____			
Mileage _____			
Parts _____			
Shop Supplies _____			
Other _____			
TOTAL			

*ONE _____ VEHICLE
TECHNICIAN J.D.

THIS IS NOT AN INVOICE

I acknowledge all service has been performed satisfactorily, as stated above. All parts installed are warranted for thirty days from this date.

Authorized Signatures Bruce Davis

Print Name Bruce Davis

WEIGH-TRONIX
Rental / Sales / Service

DAMAGE TO RENTAL/DEMO EQUIPMENT IS SOLELY THE RESPONSIBILITY OF THE USER WHILE IN THEIR POSSESSION!

DISTRIBUTION: WHITE - OFFICE YELLOW - FILE PINK - CUSTOMER

OMNI 00209

Instruction Booklet

for use with

PRINCO

Fortin type mercurial

Barometers

Manufactured by

PRINCO INSTRUMENTS, INC.
1020 Industrial Blvd.
Southampton, Pa. 18966-4095
U.S.A.

Phone: 215 355-1500
Fax: 215 355-7766

453
National
Weather
Service
Type

469
NOVA™
Economy
Model

CALIBRATION RECORD

Vaneometer Air Velocity Meter – OMNI-00032 265 ak

CALIBRATION/SERVICE RECORD			
DATE	BY	RESULTS	DATE OF NEXT CALIBRATION
10-18-02	Jared S	Installed new vane from factory	4-18-03
4-15-03	K	Installed new vane from factory	10-15-03
10-26-03	BD	Installed new vane from factory	4-26-04
4-26-04	BD	Installed new vane from factory	10-26-04
11-4-04	BD	Installed new vane from factory	5-4-05
5-3-05	BD	Installed new vane from factory	11-3-05
11-3-05	BD	Installed new vane from factory	5-3-06
6-1-06	JTS	Installed new vane from factory ✓	12-1-06
11-28-06	BD	Installed new vane from factory	5-28-07
		Installed new vane from factory	5.28.07 (MD)
		Installed new vane from factory	
		Installed new vane from factory	
		Installed new vane from factory	
		Installed new vane from factory	
		Installed new vane from factory	
		Installed new vane from factory	
		Installed new vane from factory	
		Installed new vane from factory	

Certificate of Calibration

365615

Omni-Test Laboratories
5465 SW Western
Suite G
Beaverton, OR 97005

Cust ID: 56

PO: OTL-07-186
Authorized By:



JJ Calibrations, Inc.

Make: Rice Lake
Model: 10 1b.
Noun: WEIGHT
Serial #: OMNI-00274
Property #: OMNI-00274
Department:
User:
Procedure: CP 16
Accuracy: CLASS F

Order Date: 02/06/2007
Calibrated on: 02/08/2007
*Recommended Due: 02/08/2008
Environment: 19°C 39% RH
As Received: Within Tolerance
As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 34
ID Barcode: GRAI



Remarks
Refer to attachment for measurement results and uncertainties.

* Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
550A	And (A&D) Co.	HP-30K	BALANCE 30 Kg	03/21/2007	344001

This instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual and is traceable to the National Institute of Standards and Technology (NIST). The quality system and this certificate are in compliance with ANSI/NCCL Z540-1-1994, ISO/IEC 17025-1999, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without written approval of JJ Calibrations.

5 yrs.

Catalyn Johnson
Reviewer

Janice
Inspector

5 Issued 02/08/2007 Rev # 12

2 - 27 OF 2 - 43

DIFFERENTIAL PRESSURE GAUGE CALIBRATION DATA SHEET Liquid Manometer Gauge

Instrument to be calibrated: Dwyer Microtector

Range: 0-2"

ID Number: OMNI-00287

Calibration Instrument: ^{Digital} Liquid Manometer

ID Number: OMNI-00275

Date: 9-25-03

By: B. DAVIS

^{Digital} Liquid Manometer (A) REF. (inches of H ₂ O)	^{New liquid 9-25-03} Liquid Manometer (B) (inches of H ₂ O)	Difference (A - B)	% Error of Full Span
1.80	1.82	0.02	1.0
0.98	0.99	0.01	0.5
0.29	0.30	0.01	0.5
0.11	0.12	0.01	0.5

*Acceptable tolerance is 4%.

This calibration is traceable to NIST through the Dwyer Liquid Manometer, NIST Test #MAS 822/254143-94.

Technician signature: B. Davis Date: 9-25-03

J-2000

owners manual



DELMHORST
INSTRUMENT CO.

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www.delmhorst.com
e-mail - info@delmhorst.com

Certificate of Calibration 356168

Omni-Test Laboratories
5465 SW Western
Suite G
Beaverton, OR 97005

Cust ID: 56

PO: otl-06-104
Authorized By:



JJ Calibrations, Inc.



Make: Omega
Model: RH81
Noun: THERMO HYGOMETER
Serial #: 9480241
Property #: OMNI-00342
Department:
User:
Procedure: CP 1
Accuracy: RH +/-4% TEMP +/-1 DEGREE F

Order Date: 09/11/2006
Calibrated on: 09/15/2006
*Recommended Due: 09/15/2007
Environment: 25°C 38% RH
As Received: Within Tolerance
As Returned: Within Tolerance
Action Taken: Calibrated
Technician: 40
ID Barcode: GNNM



Remarks
Refer to attachment for measurement results.

* Any number of factors may cause the calibration item to drift out of calibration before the recommended interval has expired

Standards Used

Std ID	Manufacturer	Model	Nomenclature	Due Date	Trace ID
464A	General Eastern	M4-RH/D2	HUMIDITY STANDARD	12/21/2006	337300
497A	Hart Scientific	1502A	TWEENER THERMOMETER	09/23/2006	353815
601A	Burns Engineering	200G05B085	INDUSTRIAL PRT	01/24/2007	339794

This instrument has been calibrated in accordance with the JJ Calibrations Quality Assurance Manual and is traceable to the National Institute of Standards and Technology (NIST). The quality system and this certificate are in compliance with ANSI/NCSL Z540-1-1994, ISO/IEC 17025-1999, ISO 10012-1, the ISO 9000 family and QS 9000. The expanded uncertainties of measurements for this calibration are based upon 95% (2 sigma) confidence limits. The results reported herein apply only to the calibration of the item described above. This report may not be reproduced, except in full, without written approval of JJ Calibrations.

Reviewer

Inspector

Issued 09/18/2006 Rev # 12

NIST Stopwatch Calibration, Time Proficiency Testing Procedure and Data Sheet

Date: 2/1/07 User/Technician: Michelle Dolman Pass Fail

NIST traceable stop watch OMNI Tracking Number: 292 Last Cal: 2.7.06

Stopwatch to be tested for time proficiency OMNI Tracking Number: OMNI-00364

1. Start the NIST traceable stopwatch; at a predetermined time (i.e., 1.00 minutes), the technician shall start the watch being tested. When 15.00 seconds have passed (i.e., the NIST traceable stopwatch reads 1 minute, 15 seconds), the technician shall stop the watch being tested. Record the target time interval (i.e., 15.00 seconds). Repeat this step twice and record the data.
2. Repeat step #1 for each of the following target time intervals: 30.00 seconds, 10.00 minutes, and 30 minutes.
3. If the delta between the target time and measured time is less than 5% of the target time interval or 2.00 seconds (whichever is less), then the technician has demonstrated proficiency with the specific instrument utilized in the proficiency test. The proficiency is valid for a period of twelve months.
4. Archive the proficiency test data and information, including the effective date and expiration date of the proficiency, in the equipment record for the instrument involved.

Target time: 15.00 seconds #1 Measured time: 14.57 #2 Measured time: 14.76 #3 Measured time: 15.02
Target time: 30.00 seconds #1 Measured time: 29.77 #2 Measured time: 29.99 #3 Measured time: 29.86
Target time: 10.00 minutes #1 Measured time: 10:00.08 #2 Measured time: 9:00.91 #3 Measured time: 9:00.65
Target time: 30.00 minutes #1 Measured time: 29:00.58 #2 Measured time: 29:00.98 #3 Measured time: 29:00.72

Technician Signature: zzz. Dolman Date: 2.1.07

Example Calculations

Note: OMNI uses the Lotus 1-2-3 computer program for all Method 5G and 5H calculations. The program automatically carries 14 decimal points in all calculations. The numbers on the printouts have been rounded for display only.

Equations and Sample Calculations - Method 5G

Equations used to calculate the parameters listed below are described in this appendix. Sample calculations are provided for each equation. The raw data and printout results from a sample run are also provided for comparison to the sample calculations.

BR	Dry burn rate, kg/hr
m_n	Total particulate matter collected, mg
$V_{m(std)}$	Volume of gas sampled corrected to standard conditions, dscf
v_s	Average dilution tunnel gas velocity, ft/sec
C_s	Particulate concentration, g/dscf
Q_{sd}	Average dilution tunnel gas flow rate, dscf/min
E	Particulate emission rate, lbs/hr
PR	Proportional rate variation, %

Dry Burn Rate

Using equation 28-3:

$$BR = \frac{60 \times W_{wd}}{\theta} \times \frac{100 - \%M_w}{100}$$

Where,

- BR = Dry burn rate, lb/hr
- W_{wd} = Mass of wood burned (wet basis) during test run, lb
- θ = Total time of test run, minutes
- $\%M_w$ = Average moisture content of test fuel charge, wet basis percent

Sample Calculation:

Dry basis moisture of fuel = 20.03%

Using the equation 28-2 for converting dry basis moisture to wet basis moisture,

$$\%M_w = \frac{20.03 \times 100}{20.03 + 100}$$

$$\%M_w = 16.69\%$$

The wet weight of the fuel charge was 7.8 pounds. Converting pounds to kilograms yields a weight of 3.538 kg. The run time for this run was 180 minutes. Therefore, the burn rate equation appears thus:

$$BR = \frac{60 \times 3.538 \times (100 - 16.69)}{180 \times 100}$$

$$BR = 0.98 \text{ kg/hr} = 2.17 \text{ lb/hr}$$

Total Particulate Matter Collected

$$m_n = F_1 + F_2 + R - (V_a \times B_a)$$

Where:

- m_n = Total particulate matter collected, mg
- F_1 = Particulate matter collected on front filter, mg
- F_2 = Particulate matter collected on rear filter, mg
- R = Residue from evaporated probe and filter holder acetone rinse, mg
- V_a = Volume of acetone evaporated probe and filter holder acetone rinse, ml
- B_a = Acetone blank value, mg/ml

Sample Calculation:

$$m_n = 12.6 - 0.4 + 4.7 - (180 \times 0.0040)$$

$$m_n = 16.2 \text{ mg}$$

Volume of Gas Sampled Corrected to Dry Standard Conditions

Using equation 5-1:

$$V_{m(std)} = V_m \times Y \times \left(\frac{T_{std}}{P_{std}} \right) \times \frac{(P_b + \frac{\Delta H}{13.6})}{T_m}$$

Where:

- K = 17.64 °R/in. Hg
- T_{std} = 528 °R
- P_{std} = 29.92 in. Hg
- V_m = Volume of gas sample measured at the dry gas meter, dcf
- Y = Dry gas meter calibration factor, dimensionless
- P_b = Barometric pressure at the testing site, in. Hg
- ΔH = Average pressure differential across the orifice meter, in. H₂O
- T_m = Absolute average dry gas meter temperature, °R

Sample Calculation:

$$V_{m(std)} = 98.434 \times 1.01 \times \left(\frac{528}{29.92} \right) \times \frac{30.03 + \frac{0.7}{13.6}}{532.5}$$

$$V_{m(std)} = 99.116 \text{ ft}^3$$

Dilution Tunnel Gas Velocity

Using equations 2-7 and 2-6, calculated at each recorded interval:

$$v_s = k_p \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{T_{s(avg)}}{P_s \times M_s}}$$

$$M_s = M_d \times (1 - B_{ws}) + 18.0 \times B_{ws}$$

Where:

- v_s = Average dilution tunnel gas velocity, ft/sec
- k_p = Pitot tube constant: $85.49 \frac{ft}{sec} \left[\frac{(lb/lb-mole) \times (inches\ Hg)}{(^{\circ}R) \times (inches\ H_2O)} \right]^{\frac{1}{2}}$
- C_p = Pitot tube coefficient (0.99 for standard pitot tube; 0.84 may be used for S-type pitot tubes constructed according to Method 2 procedures), unitless
- ΔP = ΔP measured during the pre-test flow traverse of the dilution tunnel; the square root of the ΔP values are averaged for this calculation, in. H_2O
- P_b = Barometric pressure at test site, in. Hg
- P_g = Static Pressure of tunnel, in. Hg
- P_s = Absolute tunnel pressure, = $P_b + P_g$
- M_s = Molecular weight of tunnel gas; assume $M_d = 29$ lb/lb-mole (per method 5G)
- B_{ws} = Moisture content of dilution tunnel gas, ratio; assume 4% (per method 5G)
- T_s = Dilution tunnel temperature, $^{\circ}R$; ($^{\circ}R = ^{\circ}F + 460$)

Sample calculation:

$$M_s = 29 \times (1 - 0.04) + 18.0 \times 0.04 = 28.56$$

$$v_s = 85.49 \times 0.99 \times \sqrt{0.0351} \times \sqrt{\frac{(548)}{(30.03 + \frac{-0.45}{13.6}) \times (28.56)}}$$

$$v_s = 12.69 \frac{ft}{sec}$$

Particulate Concentration

Using equation 5G-2:

$$C_s = 0.001 \frac{g}{mg} \times \frac{m_n}{V_{m(std)}}$$

Where:

C_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, g/dscf

m_n = Total mass of particulate matter collected in the sampling train, mg

$V_{m(std)}$ = Volume of gas sampled corrected to dry standard conditions, dscf

Sample calculation:

$$C_s = \frac{0.001 \times 16.2}{99.116}$$

$$C_s = 0.000163 \text{ g/dscf}$$

Average Dilution Tunnel Gas Flow Rate

Using equation 2-8, calculated at each recorded interval:

$$Q_{sd} = 3600 \times (1 - B_{ws}) \times v_s \times A \times \frac{T_{std}}{T_{s(avg)}} \times \frac{P_s}{P_{std}}$$

Where:

- Q_{sd} = Gas flow rate corrected to dry, standard conditions, dscf/hr
- 3600 = Conversion from seconds to hours
- B_{ws} = Moisture content of dilution tunnel gas, ratio; assume 4% (per method 5G)
- v_s = Average dilution tunnel gas velocity, ft/sec
- A = Cross sectional area of dilution tunnel, ft²
- T_{std} = Standard absolute temperature, 538°R
- $T_{s(avg)}$ = Average absolute dilution tunnel temperature, °R, (°R = °F + 460)
- P_b = Barometric pressure at test site, in. Hg
- P_g = Dilution tunnel static pressure, in. Hg
- P_s = Absolute dilution tunnel gas pressure, in Hg, (Hg = $P_b + P_g$)
- P_{std} = Standard absolute pressure, 29.92 in Hg

Sample calculation:

$$Q_{sd} = 3600 \times (1 - 0.04) \times 12.69 \times \frac{(\pi \times 3^2)}{144} \times \frac{528}{548} \times \frac{30.03 + \frac{-0.45}{13.6}}{29.92}$$

$$Q_{sd} = 8313.36 \text{ dscf/hr} = 138.56 \text{ dscf/min}$$

Particulate Emission Rate

Using equation 5G-3 and 5G-4:

$$E = C_s \times Q_{sd}$$

$$E_{adj} = K_3 \times E^{0.83}$$

Where:

- E = Particulate emission rate, g/hr
- E_{adj} = Particulate emission rate, adjusted, g/hr
- C_s = Concentration of particulate matter in the stack, corrected to dry, standard conditions, g/dscf
- Q_{sd} = Average dilution tunnel gas flow rate, dscf/hr
- K_3 = Constant, 1.82 for metric units, 0.643 for English units

Sample calculation:

$$E = 0.000163 \times 8313.36 \times 60$$

$$E = 1.36 \text{ g/hr}$$

$$E_{adj} = 1.82 \times 1.36^{0.83}$$

$$E = 2.35 \text{ g/hr}$$

Proportional Rate Variation

Using equation 5H-9, calculated at each recorded interval:

$$PR = \frac{\theta \times (V_{mi} \times V_s \times T_m \times T_{si})}{10 \times (V_m \times V_{si} \times T_s \times T_{mi})} \times 100$$

Where:

- PR = Percent proportional rate
- θ = Time of test, min
- S_i = Measured tracer gas concentration for the “ith” interval, in this case, the inverse of the calculated flow in the stack based on CO₂ concentrations in the stack and in the dilution tunnel
- $V_{mi(\text{std})}$ = Volume of gas sample measured by the dry gas meter during the “ith” 10 minute interval, dscf
- V_m = Volume of gas sample as measured by dry gas meter, dscf
- V_{si} = Average gas velocity in the dilution tunnel during each 10 minute interval, i, of the test run, m/sec
- V_s = Average gas velocity in the dilution tunnel, m/sec
- T_{mi} = Absolute average dry gas meter temperature during each 10 minute interval, i, of the test run, °R
- T_m = Absolute average dry gas meter temperature, °R
- T_{si} = Absolute average gas temperature in the dilution tunnel during each 10 minute interval, i, of the test run, °R
- T_s = Absolute average gas temperature in the dilution tunnel, °R

Sample calculation (for the reading at 50 minutes into test run 1):

$$PR = \frac{180 \times 5.6 \times 12.69 \times 533 \times 552}{10 \times 98.434 \times 12.63 \times 548 \times 532} \times 100$$

$$PR = 103.8\%$$

*Model: 5660
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark*

Section 3

Owner's Manual



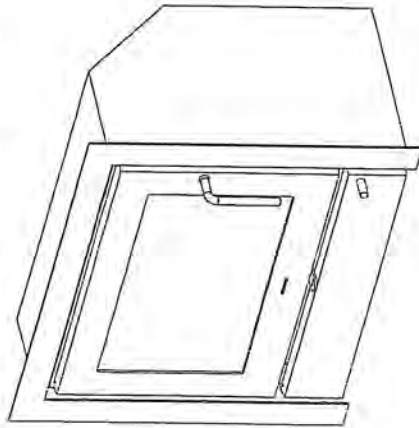
By appointment to The Royal Danish Court

morsø

Installation and Operating Instructions

5660 Insert

For use in North America



Read this entire manual before you install and use your new room heater. If this room heater is not properly installed, a house fire may result. To reduce the risk of fire, follow the installation instructions. Failure to follow instructions may result in property damage, bodily injury, or even death.

Contact local building officials about restrictions and installation/inspection-requirements in your area.

Save these instructions

MORSØ JERNSTØBERI A/S · DK-7900 NYKØBING MORS
E-Mail: stoves@morsoe.com · Website: www.morsoe.com

Distributed by: **MORSO US LLC**
1011 Highway 52 West - Portland TN - 37148 - USA
Website: www.morsoe.com

We congratulate you on your choice of a Morsø stove. Morsø has been producing some of the world's best stoves since 1853. If you follow this installation- and operating instruction carefully, we can assure you many years of warmth and pleasure.

Optional Accessories

A wide range of accessories (such as handling gloves, fireside tools, glass cleaner and heatproof paint) are available for use with your Morsø stove. They help with day-to-day running and maintenance. Contact your Morsø dealer for more information.

The Morsø 5660 Insert meets the U.S. Environmental Protection Agency's emission limits for wood heaters sold on or after July 1, 1990

The Morsø 5660 Insert have been tested by OMNI-Test Laboratories, Inc. The test standards are ANSI/UL-1482 for the United States and ULCS 5627 for Canada.

The stove is listed for burning wood only. Do not burn other fuels.

Under specific test conditions this heater has been shown to deliver heat at rates ranging from XXXX to XXXXX Btu/hr.

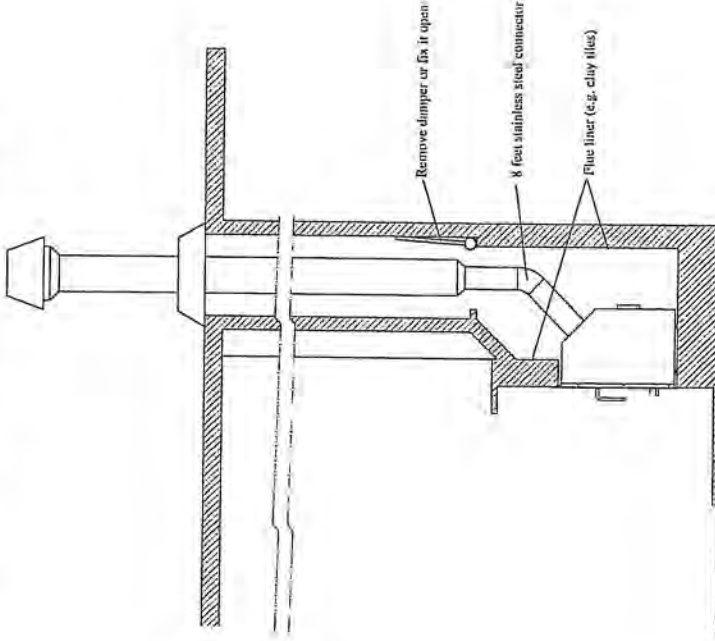
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MINIMUM MANSONRY FIREPLACE SIZE

Inches/mm.	Height (A) xxx/xxx	Depth (B) xxx/xxx	Width (C) xxx/xxx
	xxx/xxx	xxx/xxx	xxx/xxx

The stainless steel connector between the Morsø 5660 insert must be at least 6 feet. The chimney must have a clay liner or a stainless steel liner. Do not move bricks or mortar from the existing fireplace. Remove or lock existing fireplace dampers in the open position.



The stainless steel chimney liner (flexible or rigid) are available at most factory built chimney manufactures. The installation may be used with a factory built or masonry fireplace. Be sure to fulfill all requirements.

1.0 Installation of your Morsø stove

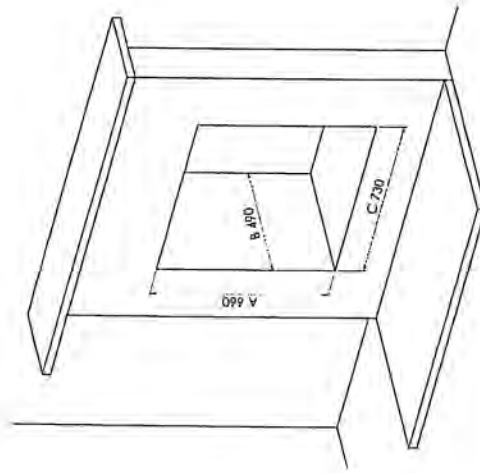
Installation of woodburning stoves must be safe and legal.

If your Morsø stove is not installed correctly, it may cause a house fire. To reduce the risk of fire, the installation instructions must be followed carefully. Contact the local building officials about restrictions and installation inspection in your area.

Before you start installing your stove, make sure that:

- The stove and chimney connection are placed far enough from combustible materials to meet all clearance requirements.
 - The floor protection must be adequate and must be made correctly according to the requirements.
- All necessary approvals are needed from the local building officials.

The data plate, which is located on the back of the stove, provides information regarding safety testing information, name of certified testing laboratory, and installation requirements. Installation requirements vary in different districts, and the local building officials have the final authorization to approve your installation. You should discuss the installation with them before beginning. Please ask your dealer for further information.



The figure above shows the required fireplace dimension for the Morsø 5660 insert. It is easier to make adjustments to the masonry surrounding the insert, when the heavy cast iron is not connected to the steel box. Use the steel box as a template for the masonry adjustments. Allow extra room for installation, especially above the insert.

1.1 The chimney / flue system

Note that the flue system must be independently secured and must not rely on the stove for support.

The stove must not be connected to a chimney flue serving any other appliance. (Several flues may run up a single chimney stack; use one flueway per appliance).

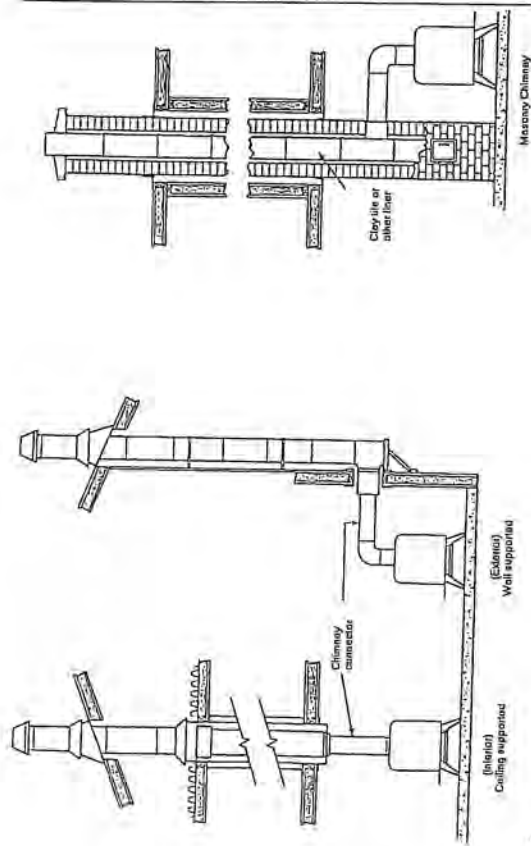
Use a residential type masonry or listed type HT factory-built chimney.

High Temperature (H.T.) Chimney Standard UL-103-1985 (2100° F.) for the USA, and High Temperature (650°C) Standard ULC S-629 for Canada.

The internal dimensions of the chimney connector and chimney must not be less than 6 inches diameter (or equivalent cross section), and should not be significantly larger than this. Too large a section will tend to allow the flue gases to cool excessively, causing sluggishness or unpredictability in the stove's performance.

We recommend the length of the chimney system should be at least 16 feet (not required) above the stove in normal domestic situations, measured from the flue collar to the top of the chimney. Local conditions like for example - roof constructions, large trees nearby and high altitude, may influence the chimney draft and height. Therefore, contact the local professional chimney sweep or your Morse dealer.

Typical Factory-Built or Masonry Chimney Installations



Do not connect to any air distribution duct or system.

Important: If the installation instructions are not followed carefully, it may cause dangerous situations like chimney - and house fires. Follow the instructions carefully and do not deviate from them as it may cause injuries to people or property.

1.2 Flue Connection

The stove is supplied from the factory with a flue collar fitted to the top plate.

The flue collar is from the factory prepared for fitting the enclosed 6 inch adapter. Use a 24 MSG black or blue chimney connector or listed double wall chimney connector. Refer to local codes and the chimney manufacturer's instructions for precautions required for passing a chimney through a combustible wall or ceiling. Remember to secure the chimney connector with a minimum of three screws to the product and to each adjoining section. Position the stove and connect to the flue system.

Wear gloves and protective eyewear when drilling, cutting or joining sections of chimney connector.

1.4 Connection to the existing chimney

A Chimney connector is the double-wall or single-wall pipe that connects the stove to the chimney. The chimney itself is the masonry or prefabricated structure that encloses the flue. Chimney connectors are used only to connect the stove to the chimney.

Double-wall connectors must be tested and listed for use with solid-fuel burning appliances. Single-wall connectors should be made of 24 gauge or heavier gauge steel. Do not use galvanized connector; it cannot withstand the high-temperatures that smoke and exhaust gases can reach, and may release toxic fumes under high heat. The connector must be 6 inches (150mm) in diameter.

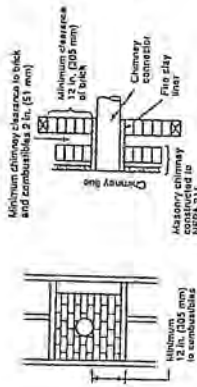
If possible, do not pass the chimney connector through a combustible wall or ceiling. If passage through a combustible wall is unavoidable, refer to the sections on Wall Pass- Throughs. Do not pass the connector through an attic, a closet or similar concealed space when installing the chimney connectors.

It is important to keep the flue gases moving smoothly in the right direction. Do not vent into a large void at this location; rather form one continuous section all the way up. Use mild bends (e.g. 45° vs. 90°) rather than sharp angles where a change of direction is required. All parts of the venting must be accessible for cleaning purposes. In horizontal runs of chimney, maintain a distance of 18 inches from the ceiling. Keep it as short and direct as possible, with no more than two 90 degree turns. Slope horizontal runs of connector upward 1/4 inch per foot (20 mm per metre) going from the stove toward the chimney. The recommended maximum length of a horizontal run is 3 feet (1 metre), and the total length should be no longer than 8 feet (2.5 metres).

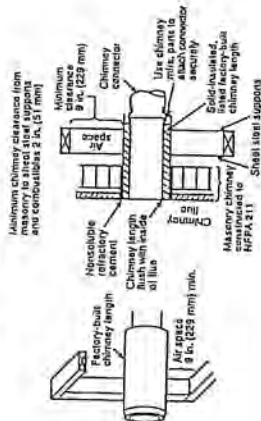
Information on assembling and installing connectors is provided by the manufacturer's instructions exactly as you assemble the connector and attach it to the stove and chimney.

Be sure the installed stove and chimney connector are correct distances from near by combustible materials. See the clearance paragraph page 10.

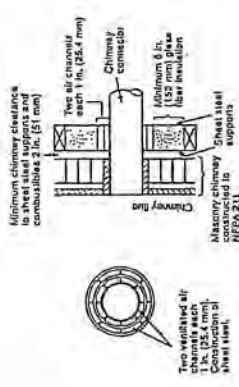
Chimney Connector-Systems and Clearances from Combustible Walls for Residential Heating Appliances



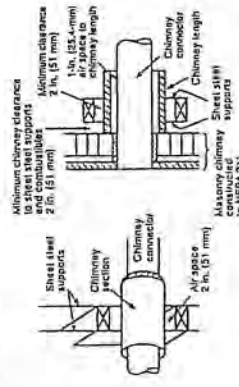
A Minimum 3.5-in thick brick masonry all finished into combustible wall with a minimum of 12-in brick separation from clay liner to combustibles. The fireclay liner shall run from outer surface of brick wall to, but not beyond, the inner surface of chimney flue liner and shall be firmly cemented in place.



B Solid-insulated, listed factory-built chimney length of the same inside diameter as the chimney connector and having 1-in. or more of insulation with a minimum 9-in. air space between the outer wall of the chimney length and combustibles.



C Sheet steel chimney connector, minimum 24 gauge in thickness, with a ventilated flume, minimum 24 gauge in thickness, having two 1-in. air channels, separated from combustibles by a minimum of 6-in. of glass fiber insulation. Opening shall be covered, and flume supported with a sheet steel support, minimum 24 gauge in thickness.



D Solid insulated, listed factory-built chimney length with an inside diameter 2-in. larger than the chimney connector and having 1-in. or more of insulation, serving as a pass-through for a single wall sheet steel chimney connector of minimum 24 gauge thickness, with a minimum 2-in. air space between the outer wall of chimney section and combustibles. Minimum length of chimney section shall be 12-in. chimney section spaced 1-in. away from connector using sheet steel support plates on both ends of chimney section. Opening shall be covered, and chimney section supported on both sides with sheet steel supports securely fastened to wall surfaces of minimum 24 gauge thickness. Fasteners used to secure chimney section shall not penetrate chimney flue liner.

1.3 Positioning the stove

IN CASE THE MORSØ 5660 INSERT, AS EXPECTED, IS NOT USED AS A INSERT IN AN NON-COMBUSTIBLE CHIMNEY FOLLOWING RULES APPLY

Distance to walls and lintel

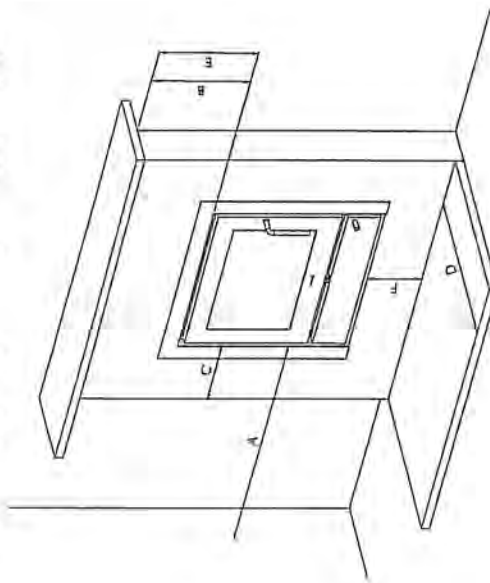
When the stove is positioned near combustible materials, observe all current local and national building regulations with regards to clearances. Whatever regulations apply to your area, do not in any case install the stove within 8 inches of combustible materials around the sides or 16 inches above the top of the stove (fireplace installations require greater clearances above the stove - see below in the clearance chart). These distances may need to be increased if the materials are sensitive to heat. Note also that wall paper and other decorative materials may become detached with the effects of heat and care should be taken to ensure that they do not fall towards the stove in such an event.

When the stove is positioned near non-combustible materials, a gap of 4 inches or more is recommended for cleaning purposes and to ensure that heat circulates around the stove and out into the room.

CLEARANCE TO COMBUSTIBLE SURFACES REQUIREMENTS:

The floor in front of the fireplace requires thermal projection of 1 inch (25 mm) thick mineral fiber millboard with a value of $k=0.84$ BYU/IN FT² HR °F when the floor is x inches or more below the bottom opening of the fireplace extending out xx inches (xxx mm.).

INSTALLATION	A	B	C	D	E	F
UNITED STATES	17"	26.5"	8"	20"	26.5"	9.25"
CANADA	17"	28.5"	8"	18"	28.5"	9.25"



A	Sidewall to insert
B	Combustible mantel to insert
C	Side facing
D	Hearth
E	Top facing
F	Floor protection to fireplace bottom

Do NOT install in a mobile home

Distance to furniture

The recommended minimum distance from stove to furniture is xx inches. Note that some furniture is more easily affected by heat and may need to be moved to a greater distance. This is your responsibility.

In addition other combustible materials, away from the stove. In general, a distance of xx inches must be maintained between the stove and moveable combustible item such as drying clothes, newspapers, firewood etc.

Note:

Acid Protection

If acid-washing the masonry around the stove, protect the stove surface with an acid-proof cover

Fresh Air Inlet

Unless there is deemed to be sufficient ambient leakage of air into the room via doorways, windows and the like, a dedicated fresh air inlet will be needed. This inlet should have 2 square inches (1250 square mm) of free air space. This is particularly important where the room is well sealed, or where an extractor hood or ventilation system disturbs the natural air pressure. Such an inlet should not be on a wall that is usually subject to negative pressure from normal wind pattern. Avoid placing the inlet directly across the room from the stove, thus causing a cold air draft.

2.0 Operation

2.1 Before you start firing

For Use with Solid Wood Fuel Only. Do Not Overfire, If Heater or Chimney Connector Glows You Are Overfiring. Inspect and Clean Chimney Frequently. Under Certain Conditions of use creosote buildup may occur rapidly. Because of risk of smoke and flame spillage, operate only with door fully closed.

Caution:

Hot while in operation. Keep children, clothing and furniture away. Contact may cause skin burns.

Do not use chemicals or fluids to start the fire.

Do not burn garbage or flammable fluids.

Do not use gasoline, gasoline-type lantern fuel, kerosene, charcoal lighter or fluid or similar liquids to start or freshen up a fire in this heater. Keep all such liquids away from the heater while it is in use.

Choosing your fuel

All types of natural wood can be burned on your stove, but they must be well-seasoned and dry. Once the wood is cut to length, it should be split down middle - to suit the dimensions given below - to allow moisture to evaporate.

Cut the wood to a length of 20 inches and approx. 3 to 3.5 inches (7-8 cm) in section. If you can weigh your wood, aim for around 6 lb..

The maximum moisture content of the wood should be around 20%.

Store the logs under cover in a location where fresh air can move through the stack. Some soft woods may take as little as one good summer to season, where some harder woods may take a couple of years or more. Well seasoned wood will be remarkably light to hold and will probably have radial cracking at the ends. If your wood spits or sizzles when burnt, and your stove's door glass persistently mists up, your wood is not properly seasoned.

Never use drift wood (from the sea), whose salt content may cause corrosion, nor construction wood that may have been impregnated with chemicals.

Starting the first fire

The initial fire should be small, so that the stove paint can cure and the main plates of the stove can settle into position. Some fumes will be given off by the paint. Ventilate the room during this phase.

The setting of the valve, lighting techniques and loading intervals will depend on chimney draft, the fuel used, the heat required and so on. Some basic techniques are outlined below.

In principle

Your stove has three air supplies:

Primary air is controlled by the air controller beneath the door. The air eventually washes at high speed down the back face of the door glass. This super-heated air helps with the combustion of volatile gases produced by the fire.

Secondary air is supplied to the top of the fire through holes in the tubes under the lower baffle. This effectively burns off other residual gases, making for very clean emissions. This air

supply is constant and cannot be varied.

Pilot air is supplied to the coalbed through a hole placed behind the front grate. This air will activate the embers. This air supply is constant and cannot be varied.

2.2 Lighting and loading intervals

When first lighting the stove, a large volume of air is needed. When the stove is cold, you should leave the door open an inch or two for the first few minutes and open the primary air supply completely. While the door is open, do not leave the stove unattended.

To form a reasonable bed of ash on the floor of the stove, you should use 5-6 inches thickness (4-6 pound) of dry kindling at the initial lighting. Always maintain a 1-1,5 inch (2-3 cm) layer of ash on the floor of the combustion chamber at all other times.

1. A layer of embers will form rapidly if the stove is lit with fire lighters or 7-10 rolled up sheets of newspaper, underneath roughly 4-5 lb. of dry kindling
2. Light the fire
3. Fully open the air controller so that the primary air supply can enter the firebox
4. After the paper/fire lighters have caught fire, leave the fire door ajar about 1 inch, so that the chimney draws well
5. After 5-10 minutes the chimney draft should be established, at this point close the fire door. If all the necessary conditions are met, a nice layer of embers will start to accumulate after another 15-20 minutes.
6. Refuelling of your stove should be done while there are still glowing embers in the bed. Spread the embers across the bottom, but concentrated mostly towards the front of the stove
7. Place 2-3 pieces of fuel weighing roughly 4-6 lb. across the embers in one layer, with spacing of roughly 1 inch between the pieces of wood.
8. When the primary air supply is open all the way and the door is closed, the new fuel will ignite in a few minutes
9. Once the new fuel has taken, adjust the primary air amount to the desired setting; optimal combustion will continue until glowing embers are produced.
10. A new charge of wood can be added by repeating steps 6 & 7.

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Do not for any reason attempt to increase the firing of your heater by altering the air control adjustment range outlined in these directions.

Warning: Fireplace stoves must never be left unattended with doors open.

If the door is left partly open, gas and flame may be drawn out of the fireplace stove opening, creating risks from both fire and smoke. We recommend you to fit a smoke detector in the room where the stove is installed.

DO NOT OVERFIRE THIS HEATER. Overfiring may cause a house fire, or can result in permanent damage to the stove. If any part of the stove glows, you are overfiring.

Draft conditions

If smoke or fumes come out of your stove when lightning up and reloading, or if the fire simply will not respond, a poor draft is almost certainly to blame. (In a very few cases, there may be insufficient fresh air getting into the room - see installation advice above). Take advice from your stove supplier on how best to upgrade your flue system to improve draft.

Rules of woodburning

If you want less heat, put fewer logs on the stove and reduce the amount of air. It is still important to maintain a good layer of embers.

Less heat - less wood - less air

Greater heat - more wood - more air

Soot deposits will settle on the glass if the stove is run too slowly or if your wood is not well seasoned.

3.0 MAINTENANCE

When performing maintenance on your stove, always protect yourself, using safety goggles and gloves.

3.1 Exterior Maintenance

The stove surface is painted with heat-resistant Senotherm paint. It is best kept clean by vacuuming with a soft brush attachment or by wiping with a lint-free cloth.

Over a period of time, the painted surface may become slightly grey. A can of Morsø touch-up spray paint should be available from your stove supplier. This can be applied - in accordance with the instructions - in just a few minutes. When first firing after touching up, the stove will give off a slight smell as the paint cures. Make sure to ventilate the room well during this phase.

3.2 Internal maintenance

Glass

If the stove is generally run at the correct temperatures, there should be little or no dirt on the glass. If dirt does settle during lighting, most will burn off as temperatures increase. For heavier deposits that will not burn off, use morsø glass cleaner, applied when the glass is cold, in accordance with the instructions. Never use abrasive cleaners on the glass surface.

15

Reasons for dirty glass

- Fuel too wet
- Logs too large or not split
- Combustion temperatures too low

Replace broken glass immediately.

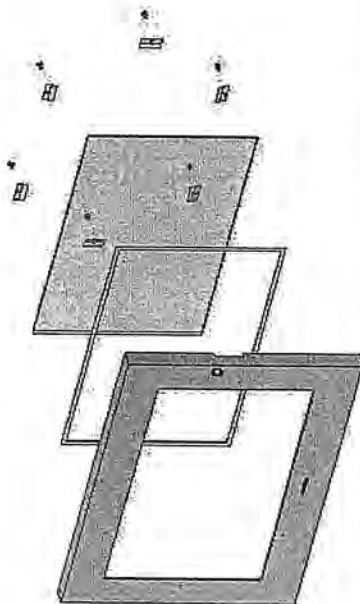
Do not operate your stove if the glass in the door is damaged.

If you need to replace the glass, it should be replaced with the high temperature ceramic glass supplied by Morsø, contact your Morsø dealer.

Installing the glass

Never install the glass when the stove is in function.

1. Lift the door off its hinges and place face-down on a sheet of cardboards or other non-abrasive fabric.



2. Unscrew the six bolts that secure the glass. (In the event that a bolt sheers off when being unscrewed, remove the remaining body of the bolt by drilling down its centre with 1/8 inch high speed steel drill bit. Smaller drill bits may be successful, but do not use a larger bit. Make sure the bit stays away from the edges of the bolt - this may damage the thread in the cast iron).

3. Remove the old ceramic gaskets and clean up the surface underneath with wire wool or emery paper to remove loose particles.

4. Place the new gasket material in position around the perimeter of the window area, making sure to pinch them to the length in such a way that they make a continuous seal. Leave no gaps.

5. Place the new glass in position on the strips and screw home the fresh bolts and fitting by hand.

6. Finally, give each of the bolts an extra half turn or so. The glass should held tight enough by that cleaning will not dislodge it. Do not over-tighten the bolts as this may put excessive pressure on the glass, resulting in cracking - important!

To reduce the risk of breaking the glass, avoid striking the glass or slamming the door.

Internal service parts

The flame-path equipment - consisting of firebricks, glass, baffle, pilot air assembly and flue collar - are subject to the extremes of heat produced by the fire. From time to time, one or other of these parts may need replacing as a matter of routine maintenance.

NOTE: The flame-path equipment, the ceramic rope and the paint finish are not covered by guarantee.

All of these service parts can be bought from your morsø dealer, and we recommend that damaged parts are replaced as soon as possible to avoid collateral damage.

Should the baffle be distorted by an overfire, the stove will still function, although its efficiency may be compromised. Replace it as soon as possible. Remove the baffle, scrape out the old fire furnace and replace with new to make an effective seal.

Reasons for fast internal wear and tear

Persistent heavy firing
Soot and ashes left to accumulate

Ceramic Gasket

The gasket around the perimeter of the door may harden over a period of time. It should be replaced if it becomes difficult to close the door or if air starts to leak in around the perimeter of the door, causing the fire to become a little less controllable. A morsø rope gasket kit is available from your stove supplier.

3.3 Cleaning the Stove and the Flue

Check for soot above the baffle plate and around the flue outlet every month or so to start with. If the stove suddenly becomes sluggish, check for a soot fall around the flue collar or in the flue/chimney. - at least once a year. inspect every month.

Clean the flue/chimney - all the way from the stove to the flue terminal point above the house.

A good routine is to clean the flue after each heating season in any case, and inspect prior to the season to ensure that bird's nests or other blockages have not occurred during the off season.

Ash disposal

Remove the ash from the stove bottom on a daily basis or as needed. Ash allowed to build up towards the underside of the grate will trap heat and could cause premature failure of the grate/pilot air assembly.

Caution:

Never empty a stove in operation. Never use your household or shop vacuum cleaner to remove ash from the stove; always remove and dispose of the ash properly.

Creosote - formation and need for removal

When wood is burned slowly, it produces tar and other organic vapors, which combine with expelled moisture to form creosote. The creosote vapors condense in the relatively cool chimney flue of a slow-burning fire. As a result, creosote residue accumulates on the flue lining. When ignited this creosote makes an extremely hot fire. When burning wood, inspect the chimney connector periodically to determine if a creosote buildup has occurred.

Chimney sweeping

Inspect the system regularly during the heating season as part of a regular maintenance schedule. To inspect the chimney, let the stove cool completely. Then, using a mirror, sight up through the flue collar into the chimney flue. If you cannot inspect the flue system in this fashion, the stove must be disconnected to provide better viewing access.

Clean the chimney using a brush the same size and shape as the flue liner. Run the brush up and down the liner, causing any deposits to fall to the bottom of the chimney where they can be removed through the clean-out door.

Clean the chimney connector disconnecting the sections, taking them outside, and removing any deposits with a stiff wire brush. Reinstall the connector sections after cleaning, being sure to secure the joints between individual sections with sheet metal screws. If you cannot inspect or clean the chimney yourself, contact your local Morsø Dealer or a professional chimney sweep.

If you do experience a chimney fire, act promptly and:
Close the air control.

Get everyone out of the house.

Call the Fire Department.

Annual maintenance

Before the heating season, perform a thorough cleaning, inspection and repair. Thoroughly clean the chimney and chimney connector.

Inspect the chimney for damage and deterioration. Replace weak sections of prefabricated chimney. Have a mason make repairs to a masonry chimney.

Inspect the chimney connector and replace any damaged sections.

Check gasketing for wear or compression, and replace if necessary.

Check the glass for cracking; replace if needed.

Check door and handles for tightness. Adjust if needed.

3.4 Leaving the stove for extended periods

Important:

If the stove is to be left unused for any period of time, clean it out thoroughly and leave the handle for primary air inlet slightly open to allow airflow. Make sure that the flue does not allow rainwater to come anywhere near the stove; install a chimney cap, but do not block off the flue completely.

These measures should ensure there is a slight movement of air through the stove, and that the body of the stove remains dry, right into the corners.

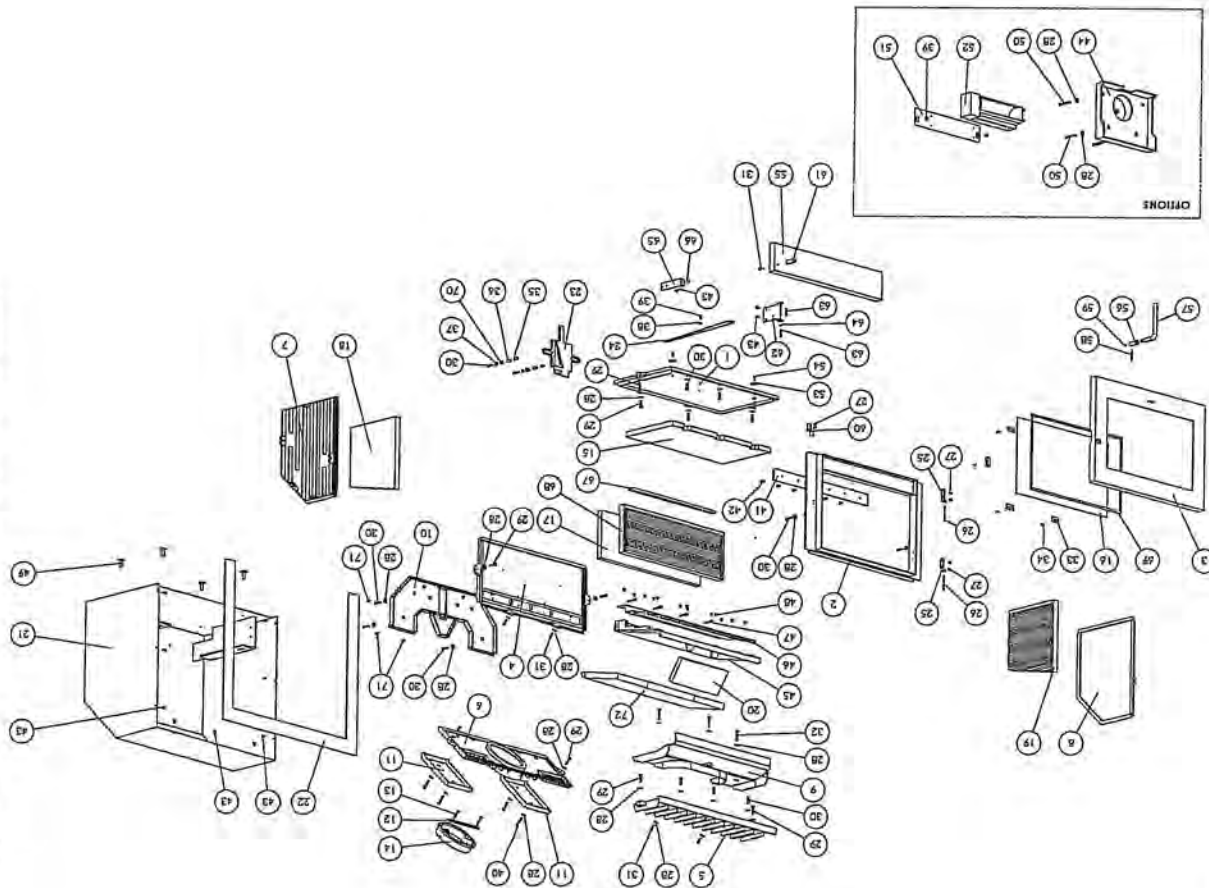
Any ash left within an unfired stove can attract moisture like blotting paper. If moisture is allowed to settle within the stove, rust will form. Rust expands as it takes a grip. This can lead to undue pressure on the stove joints, and this in turn may result in damage to the stove.

NOTE: It is best to thoroughly clean the stove after the heating season has concluded. Adding a desiccant, such as kitty litter, into the stove bottom helps absorb moisture during the summer months. Be sure to remove this prior to the heating season.

Thank you for buying a morsø stove.

We hope you have many years of carefree warmth in its company. Some initial experimentation with loading and running techniques will decide your normal routine. If you have any problems after this short learning phase, please refer to your stove dealer. Should they be unable to help

3.5 Parts diagram for the model Morsø 5660 Insert



3.6 Parts list for the model Morsø 5660 Insert

Pos. No.	Description	Itemno.
1	Buttom plate 5600	44560121
2	Front frame 5600	44560221
3	Door 5600	44560321
4	Rear plate 5600	44560400
5	Top plate 5600	44560521
6	Top plate Inclined 5600	44560800
7	Side plate right 5600	34560600
8	Side plate left 5600	34560700
9	Air Canal Top inside 5600	34560900
10	Air Canal Rear 5600	44561000
11	Air Canal Inclined 5600	34561100
12	Stop bar 5600	71561100
13	Screw	-
14	Flue collar	44344100
15	Stone Buttom 5600 NA	79561200
16	Glass 5600	79560100
17	Stone back 5600 NA	79560800
18	Stone side right - NA	79560900
19	Stone side left NA	79561000
20	Vertical baffle plate	79560700
21	Insert box 5600 NA	71561500
22	Insert Frame 5600 NA	71561600
23	Secondary draft control	71560500
24	Handle sek. draught control	71560600
25	Door fitting	71810100
26	Hinge pin	74701000
27	Screw	-
28	Washer	-
29	Screw	-
30	Screw	-
31	Screw	-
32	Screw	-
33	Glass fitting	54146361
34	Screw	-
35	Distance tube	71562600
36	Distance tube	71562700
37	Washer	-
38	Distance tube	54202500
39	Screw	-
40	Screw	-
41	Cover f. Pilot air 5600	71561000
42	Screw	-
43	Screw	-
44	Airtight Canal 5600	34561200
45	Baffle plate 5600	44561400
46	Baffle plate, stainless	71561300
47	Screw	-
48	Screw	-
49	Adjustment base 5600	71560700

3.6 Parts list for the model Morsø 5660 Insert

Pos. No.	Description	Itemno.
50	Screw	-
51	Mounting plate Blower	71561700
52	Blower	54560100
53	Washer	-
54	Screw	-
55	Front cover 5600 NA	34561300
56	Axis for handle	71562061
57	Door handle, stainless steel	75263600
58	Hinge pin	541082
59	Screw	-
60	Closing plate	71562100
61	Knob front cover	71562200
62	Front Cover Fitting	71562300
63	Hinge pin	74701200
64	Washer	-
65	Magnet fitting	71562400
66	Magnet	79082003
67	Hollow Section	54145621
68	Stone back 5600 EN + NA	79560200
69	Adhesive fibre for door glass	79074500
70	Spring	79049100
71	Screw	-
72	Insulation	79561300

Model: 5660
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark

Section 4

Test Data by Run

*Model: 5660
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark*

Run 1

Wood Heater Test Data - EPA Method 5G

Manufacturer: Morso Jernstoberi
 Model: 5660 Insert
 Project No.: 946
 Tracking No.: 192-S-14-3
 Run: 1
 Test Date: 02/08/07

Burn Rate	0.85 kg/hr dry
Particulate Concentration (dry-standard) Particulate Emission Rate Adjusted Emissions	0.00037 grams/dscf 2.98 grams/hour 4.50 grams/hour
Average Tunnel Temperature	85 degrees Fahrenheit
Average Delta p	0.034 inches H2O
Total Sample Volume - Vm Average Gas Meter Temperature Average Gas Velocity in Dilution Tunnel - vs Average Gas Flow Rate in Dilution Tunnel - Qsd Total Sample Volume (Standard Conditions) - Vms	137.48 cubic feet 103 degrees Fahrenheit 12.44 feet/second 8136.81 dscf/hour 129.16 dscf
Total Particulates - mn Average Delta H Total Time of Test	47.3 mg 0.72 inches H2O 260 minutes

Wood Heater Test Data - EPA Method 5G

Run:	I
Manufacturer:	Morso Jernstoberi
Model:	5660 Insert
Tracking No.:	946
Project No.:	192-S-14-3
Test Date:	08-Feb-07
Beginning Clock Time:	11:45
Recording Interval:	10 min.
Total Sampling Time:	260 min.

Velocity Traverse Data									
	Pl.1	Pl.2	Pl.3	Pl.4	Pl.5	Pl.6	Pl.7	Pl.8	
Initial dP	0.030	0.036	0.038	0.032	0.032	0.034	0.036	0.032	#H2O of
Initial Temp	92	92	92	92	92	92	92	92	

OMNI Equipment Numbers:

PM Control Module:	21
Dilution Tunnel MW(dry):	29.00 lb/lb-mole
Dilution Tunnel MW(wet):	28.56 lb/lb-mole
Dilution Tunnel H2O:	4.00 percent
Dilution Tunnel Static:	-0.520 "H2O
Pilot Tube Cp:	0.99
Meter Box Y Factor:	1.001
Barometric Pressure:	Begin Middle End Average
	29.92 29.89 29.88 29.90 "Hg

Signature/Date: *K.J. Meyer 4-4-07*

Tunnel Velocity:	12.44 ft/sec.
Initial Tunnel Flow:	134.7 scfm
Average Tunnel Flow:	135.6 scfm
Tunnel Area:	0.196 ft ²
Post-Test Leak Check:	0.04 @ 3 cfm@11g
Fuel Moisture (dry basis):	21.47 %
Total Particulate:	47.3 mg
Filter Holder No.:	

Elapsed Time	Particulate Sampling Data										Fuel Weight, lb										Wood Heater Temperature Data, °F										Stack Draft In. H2O	Catalyst Temp.
	Gas Meter Cubic Feet	Sample Rate, cfm	Orifice dH	Meter of	Meier Vac. In. Hg.	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Interior	Average Surface	Stack	Filter	Impinger exit	Ambient											
0	442.100		0.00	73	0	92	0.034		9.9		428	292	300	385	395	360.0	249	73	67	73												
10	447.315	0.52	0.75	85	1	87	0.034	103	9.1	-0.8	456	303	285	351	361	351.2	239	75	47	72	-0.048											
20	452.470	0.52	0.75	92	1	86	0.034	100	8.6	-0.5	423	299	273	326	336	331.4	224	75	45	71	-0.045											
30	457.660	0.52	0.75	98	1	88	0.034	100	7.8	-0.8	475	285	262	300	315	327.4	280	76	45	71	-0.058											
40	462.915	0.53	0.75	100	1	90	0.034	101	6.7	-1.1	558	268	255	299	325	341.0	317	76	45	72	-0.063											
50	468.200	0.53	0.75	103	1	95	0.034	102	5.5	-1.2	655	242	250	314	358	363.8	389	77	45	73	-0.073											
60	473.405	0.52	0.75	105	1	96	0.034	100	4.1	-1.4	740	227	259	350	401	395.4	439	78	45	70	-0.078											
70	478.720	0.53	0.75	105	1	98	0.034	102	3.1	-1	753	218	276	388	444	415.8	402	78	46	75	-0.070											
80	484.030	0.53	0.75	107	1	94	0.034	101	2.6	-0.5	713	214	288	422	460	419.4	343	79	47	75	-0.063											
90	489.315	0.53	0.75	108	1	92	0.034	100	2.3	-0.3	647	215	291	427	453	406.6	304	78	48	75	-0.058											
100	494.630	0.53	0.75	109	1	91	0.034	101	2.1	-0.2	587	218	291	420	441	391.4	277	78	48	76	-0.055											
110	499.985	0.54	0.75	110	1	87	0.034	101	2.0	-0.1	513	227	285	402	418	369.0	249	78	50	73	-0.050											
120	505.250	0.53	0.75	108	1	84	0.034	99	1.8	-0.2	466	234	275	386	398	351.8	232	76	50	70	-0.048											
130	510.600	0.54	0.75	108	1	84	0.034	101	1.7	-0.1	455	235	272	382	393	347.4	227	75	51	69	-0.048											
140	515.905	0.53	0.75	107	1	83	0.034	100	1.5	-0.2	441	236	267	376	346	341.2	222	75	50	69	-0.048											
150	521.220	0.53	0.75	107	1	83	0.034	100	1.4	-0.1	425	238	262	368	379	334.4	217	74	51	68	-0.045											
160	526.530	0.53	0.75	107	1	82	0.034	100	1.3	-0.1	412	240	256	359	370	327.4	212	73	51	68	-0.043											
170	531.850	0.53	0.75	106	1	81	0.034	100	1.2	-0.1	397	241	251	352	364	321.0	206	73	52	69	-0.043											
180	537.155	0.53	0.75	105	1	80	0.034	100	1.0	-0.2	389	239	247	347	358	316.0	203	73	52	67	-0.043											
190	542.460	0.53	0.75	106	1	80	0.034	100	0.9	-0.1	381	238	243	343	353	311.6	200	72	52	67	-0.043											
200	547.800	0.53	0.75	105	1	79	0.034	101	0.8	-0.1	372	237	239	338	347	306.6	197	72	53	66	-0.043											
210	553.060	0.53	0.75	105	1	79	0.034	99	0.7	-0.1	363	235	236	334	341	301.8	194	71	54	66	-0.040											
220	558.355	0.53	0.75	105	1	79	0.034	100	0.6	-0.1	359	231	232	328	334	296.8	192	71	55	67	-0.040											
230	563.655	0.53	0.75	105	1	80	0.034	100	0.4	-0.2	356	229	230	324	328	293.4	192	71	56	67	-0.040											
240	568.970	0.53	0.75	105	1	80	0.034	100	0.3	-0.1	352	227	228	318	323	289.6	190	71	57	66	-0.038											
250	574.275	0.53	0.75	105	1	79	0.034	100	0.2	-0.1	348	224	226	313	318	285.8	188	71	58	66	-0.038											
260	579.578	0.53	0.75	105	1	79	0.034	100	0.0	-0.2	345	222	222	307	311	281.4	191	71	59	66	-0.038											
Avg/Total	137.478	0.53	0.72	103.11		85.48	0.034	100.54								79	74.44	51.07			-0.050											

Final Laboratory Report - Method 5G Dilution Tunnel Particulate Calculations

Client Name: Morso Jernstoberi A/S Equipment Numbers: _____ Run #: 1
 Model: 5660 Insert _____ Date: 02/08/07
 Project No.: 192-S-14-3 _____
 Tracking No.: 946 _____

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N296	536.4	495.7		40.7
B. Rear filter catch	Filter	N295	503.3	501.2		2.1
C. Rinse of probe and filter assembly	Acetone	75	112334.5	112329.8	0.0024	4.5

Total Particulate, mg :	47.3
-------------------------	------

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Rinse of probe and filter assembly	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg

Analyst: *H. J. Merg* Date: 2-22-07

STOVE TEMPERATURE TEST DATA - METHOD 5G

Page ___ of ___

Client/Model: ¹²⁵⁶⁶⁰ Morso Jernstoberi A/S / 5600 Project # 192-S-14-3 Tracking # 946

Date: 2-09-07 Test Crew: K. Morgan

Run #:

OMNI Equipment ID #:

Preburn [X]		Coal Bed:										Actual:	
Test	[]	Data: 0 = 0										Coal Bed:	2.1
		Range: 2.0 - 2.4											
		TEMPERATURES (oF)										Not Used	
Time	Fuel Weight	Delta Weight	Stack Draft	Ambient	Top	Bottom	Back	Left	Right	Flue	Gatalyst		
0	6.6		-0.093	71	817	320	257	397	391	667			
10	5.7	0.9	-0.068	71	736	321	275	423	434	376			
20	4.7	1.0	-0.070	71	735	308	284	416	430	387			
30	3.7	1.0	-0.070	72	741	294	273	425	429	390			
40	3.0	0.7	-0.065	72	758	282	304	425	448	355			
50	2.6	0.4	-0.060	74	707	282	306	419	444	317			
60	2.4	0.2	-0.055	74	636	286	305	414	432	285			
70	2.2	0.2	-0.053	74	557	289	302	404	418	257			
80	2.1	0.1	-0.048	73	497	291	295	391	403	237			
90													
00													
10													
20													
30													
40													
50													
60													
70													
80													
90													
AVG													

PREBURN

Preliminary: 0.85 @ 4.40

Technician signature: K. Morgan

Date: 2-09-07

FUEL DATA

Client: Morso Jernstoberi A/S

Model: 5660

Project #: 192-S-14-3 Tracking #: 946

Date: 2-08-07 Test Crew: K. Morgan Run #: 1

OMNI Equipment ID #: _____

FUEL LOAD PREPARED BY: K. Morgan

FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.

PRE-BURN FUEL					
MOISTURE CONTENT (METER -- DRY BASIS)					
CALIBRATION:		Cal Value (1) = 12%	Actual Reading	<u>12.0</u>	
		Cal Value (2) = 22%	Actual Reading	<u>22.0</u>	
Piece	Length	Readings		Type	
1	<u>8</u> ft	<u>21.2</u>	<u>23.6</u>	<u>22.8</u>	<u>2x4</u>
2	<u>8</u> ft	<u>24.6</u>	<u>23.8</u>	<u>24.2</u>	<u>2x4</u>
3	<u>ft</u>				
Length of cut pieces: <u>2@10</u> <u>4@15</u> <u>4@5</u> inches		Pre-Burn Fuel Average Moisture: <u>23.37%</u>			
Time (clock): <u>09:30</u>		Room Temperature (F): <u>66</u>	Initials: <u>KL</u>		

TEST FUEL					
FUEL TYPE AND AMOUNT:		<u>2x4</u> <u>4</u>	<u>4x4</u> <u>0</u>		
CALCULATED LOAD WEIGHT:		<u>10.444</u>	ACTUAL LOAD WEIGHT:	<u>9.9</u> (2x4)	
FUEL PIECE LENGTH: <u>18.0"</u>				<u>8.4</u> (4x4)	
				<u>9.9</u> Total	
MOISTURE CONTENT (METER -- DRY BASIS)					
PIECE	READINGS			TYPE	
1	<u>18.9</u>	<u>19.9</u>	<u>21.5</u>	<u>2x4</u>	
2	<u>22.1</u>	<u>22.4</u>	<u>21.2</u>	<u>2x4</u>	
3	<u>21.8</u>	<u>22.3</u>	<u>21.1</u>	<u>2x4</u>	
4	<u>21.2</u>	<u>21.8</u>	<u>23.4</u>	<u>2x4</u>	
5	_____	_____	_____	_____	
6	_____	_____	_____	_____	
7	_____	_____	_____	_____	
8	_____	_____	_____	_____	
9	_____	_____	_____	_____	
10	_____	_____	_____	_____	
OVERALL TEST FUEL LOAD MOISTURE AVERAGE:				<u>21.47%</u>	
Time (clock): <u>07:50</u>		Room Temperature (F): <u>66</u>	Initials: <u>KL</u>		

Technician signature: K. J. Morgan Date: 2-08-07

Run Notes

Client/Model: Morso Jernstoberi A/S

Model: 5660

Project #: 192-S-14-3

Tracking Number: 946

Run #: 1 Date: 2-07-08

Test Crew: K. Morgan

OMNI Equipment ID Numbers: _____

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:

Fully Closed

SECONDARY: 1K
FIXED INlet

area = .8836 IN²

TERTIARY: NONE

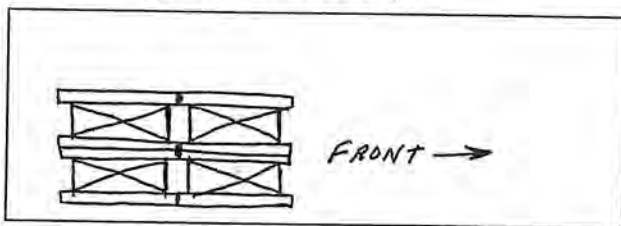
FAN: ON-LOW

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
0 80	TEST SETTING				X	Levelled

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: N/A

FUEL LOADING: Loaded by 55 sec.

DOOR: Closed at 1min

PRIMARY AIR: Fully Open 5.0 MIN.
ABRUPTLY Closed to test
setting at 5.0 MIN.

OTHER: NONE

DESCRIBE OR SKETCH TEST SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:

Fully Closed

SECONDARY: FIXED 1K
inlet area = .8836 IN²

TERTIARY: NONE

FAN: OFF 1st 30 min, ON -
Low Remainder of test.

Technician signature: K. Morgan

Date: 2-07-08 2-8-07

Supplemental Data EPA 5G/5H

Client: Morso Jernstoberi A/S

Model: 5660

Project No.: 192-S-14-3

Tracking No.: 946

Date: 2-08-07

Run No.: 1

Booth: 1

Test Crew: K. Morgan

Start Time: 11:45

Stop Time: 16:05

OMNI Equipment #'s: _____

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: N/A

Initial: N/A

Final: N/A

Final: N/A

Calibrations: Span Gas CO₂: N/A O₂: N/A CO: N/A CO₂(DT): N/A

Time	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span
O ₂							
CO ₂							
CO							
CO ₂ (DT)							

Stack Diameter (inches): 6.0

Air Velocity (ft/min): Initial: 450 Final: 450

Scale Audit (lbs.): Pretest: 10.0 Post Test: 10.0

Induced Draft: 0 %Smoke Capture: 100

Pitot Tube Leak Test: Pre: 0 @ 3.1" W.C. Post: 0 @ 3.2" W.C.

Flue Pipe Cleaned Prior to First Test in Series: Date: 2-06-07 Initials: K

	Initial	Middle	Ending
Pb (in. Hg)	<u>29.92</u>	<u>29.89</u>	<u>29.88</u>
Room Temp (°F)	<u>73</u>	<u>70</u>	<u>66</u>

Technician signature: K. Morgan Date: 2-08-07

Model: 5660
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark

Run 2

Wood Heater Test Data - EPA Method 5G

Manufacturer: Morso Jernstoberi
 Model: 5660 Insert
 Project No.: 946
 Tracking No.: 192-S-14-3
 Run: 2
 Test Date: 02/12/07

Burn Rate	2.99 kg/hr dry
Particulate Concentration (dry-standard) Particulate Emission Rate Adjusted Emissions	0.00071 grams/dscf 5.78 grams/hour 7.81 grams/hour
Average Tunnel Temperature	112 degrees Fahrenheit
Average Delta p	0.035 inches H2O
Total Sample Volume - Vm Average Gas Meter Temperature Average Gas Velocity in Dilution Tunnel - vs Average Gas Flow Rate in Dilution Tunnel - Qsd Total Sample Volume (Standard Conditions) - Vms	41.43 cubic feet 88 degrees Fahrenheit 12.96 feet/second 8098.49 dscf/hour 40.04 dscf
Total Particulates - mn Average Delta H Total Time of Test	28.6 mg 0.67 inches H2O 80 minutes

Wood Heater Test Data - EPA Method 5G

Run: 2
 Manufacturer: Masco-Jenstoberi
 Model: 5660 Insert
 Tracking No.: 946
 Project No.: 192-S-14-3
 Test Date: 12-Feb-07
 Beginning Clock Time: 10:37
 Recording Interval: 10 min.
 Total Sampling Time: 80 min.

Velocity Traverse Data								
	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
Initial dP	0.030	0.034	0.036	0.036	0.034	0.040	0.034	0.034
Initial Temp.	117	117	118	119	120	120	120	120

PM Control Modiale: 21
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole
 Dilution Tunnel MW(wet): 28.56 lb/lb-mole
 Dilution Tunnel H₂O: 4.00 percent
 Dilution Tunnel Static: -0.580 "H₂O
 Pitor Tube Cp: 0.99
 Meter Box Y Factor: 1.001
 Barometric Pressure: _____

Signature/Date: P. J. Morgan 4-11-07
 Tunnel Velocity: 12.96 ft/sec.
 Initial Tunnel Flow: 134.1 scfm
 Average Tunnel Flow: 135.0 scfm
 Tunnel Area: 0.196 ft²
 Post-Test Leak Check: 0.005 @ ± 3 cfm@"Hg
 Fuel Moisture (dry basis): 20.46 %
 Total Particulate: 28.6 mg
 Filter Holder No.: _____

OMNI Equipment Numbers:

Elapsed Time	Particulate Sampling Data										Fuel Weight, lb										Wood Heater Temperature Data, of										Stack Draft In H ₂ O	Ambient Temp.	Catalyst Temp.
	Gas Meter Cubic Feet	Sample Rate, cfm	Orifice dH	Meter dH	Meter In. Hg	Dilution Tunnel Temp.	Dilution Tunnel dP	Pro. Rate (10%)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Interior	Average Surface	Stack	Filter	Impinger exit	Stack Inlet H ₂ O	Stack Ambient	Stack Catalyst										
0	580.500	0.51	0.75	0.00	0	119	0.035	10.6	10.6	806	324	315	504	507	491	491.2	524	65	60	66	-0.080	66	66										
10	585.595	0.51	0.75	0.00	1	121	0.035	7.9	-2.7	805	339	304	505	491	491	488.8	670	73	45	66	-0.095	66	66										
20	590.700	0.51	0.75	0.00	1	134	0.035	4.6	-3.3	938	327	293	508	502	502	513.6	804	81	44	68	-0.098	68	68										
30	595.815	0.51	0.75	0.00	1	133	0.035	2.1	-2.5	968	318	308	540	541	541	535.0	794	79	44	69	-0.100	69	69										
40	600.970	0.52	0.75	0.00	1	106	0.035	1.1	-1	813	331	342	589	574	574	529.8	490	69	44	69	-0.080	69	69										
50	606.320	0.54	0.75	0.00	1	104	0.035	0.7	-0.4	768	335	338	585	569	569	519.0	467	70	44	69	-0.075	69	69										
60	611.450	0.51	0.75	0.00	1	98	0.035	0.4	-0.3	668	342	324	563	544	544	488.2	420	74	45	68	-0.072	68	68										
70	616.690	0.52	0.75	0.00	1	97	0.035	0.1	-0.3	611	344	315	546	520	520	467.2	398	75	45	70	-0.070	70	70										
80	621.932	0.52	0.75	0.00	1	96	0.035	0.0	-0.1	572	344	305	509	498	498	445.6	378	75	46	70	-0.068	70	70										
Avg/Total	41.432	0.52	0.67	88.33	111.99	0.035	100.19	46	73.44	46.33	73.44	46.33	46	46	46	46	46	73.44	46.33	46.33	-0.082	73.44	73.44	#DIV/0!									

Final Laboratory Report - Method 5G Dilution Tunnel Particulate Calculations

Client Name: Morso Jernstoberi A/S
 Model: 5660 Insert
 Project No.: 192-S-14-3
 Tracking No.: 946

Equipment Numbers: _____

Run #: 2
 Date: 02/12/07

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N298	522.0	501.7		20.3
B. Rear filter catch	Filter	N297	491.1	489.5		1.6
C. Rinse of probe and filter assembly	Acetone	75	101697.0	101690.1	0.0024	6.7

Total Particulate, mg :	28.6
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Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Rinse of probe and filter assembly	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg

Analyst: *V. J. Morgan*

Date: 2-22-07

STOVE TEMPERATURE TEST DATA - METHOD 5G

Page ___ of ___

Client/Model: Morso Jernstoberi A/S / 5600 Project # 192-S-14-3 Tracking # 946

Date: 2-12-07 Test Crew: K. Mergan

Run #: 2

OMNI Equipment ID #:

Preburn Test	Coal Bed:				TEMPERATURES (oF)				Actual:	
	Fuel Weight	Delta Weight	Stack Draft	0 = 0	Range: 2.2 - 2.6	Left	Right	Flue	Coal Bed: 2.3	Not Used Catalyst
0	13.9		-1.053		267	336	340	302		
10	13.3	0.6	-1.050	565	276	321	321	265		
20	12.2	1.1	-1.060	475	259	286	289	337		
30	10.0	2.2	-1.070	659	235	258	274	613		
40	7.5	2.5	-1.095	798	233	281	315	766		
50	5.0	2.5	-1.093	874	263	374	423	658		
60	3.4	1.6	-1.089	863	294	450	487	609		
70	2.3	1.1	-1.085	845	317	496	505	557		
80										
90										
00										
10										
20										
30										
40										
50										
60										
70										
80										
90										
AVG										

PRELIMINARY: 2.99 @ 6.75 g/hr

Technician signature: *K. Mergan*

Date: 2-12-07

FUEL DATA

Client: Morso Jernstoberi A/S

Model: 5660

Project #: 192-S-14-3 Tracking #: 946

Date: 2-12-07 Test Crew: K. Morgan Run #: 2

OMNI Equipment ID #: _____

FUEL LOAD PREPARED BY: K. Morgan

FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.

PRE-BURN FUEL					
MOISTURE CONTENT (METER -- DRY BASIS)					
CALIBRATION:	Cal Value (1) = 12%	Actual Reading	<u>12.0</u>		
	Cal Value (2) = 22%	Actual Reading	<u>22.0</u>		
Piece	Length	Readings			Type
1	<u>8</u> ft	<u>23.2</u>	<u>23.8</u>	<u>21.8</u>	<u>2x4</u>
2	<u>8</u> ft	<u>24.6</u>	<u>25.1</u>	<u>24.1</u>	<u>2x4</u>
3	ft				
Length of cut pieces: ⁵⁰¹⁵ <u>4010</u> inches		Pre-Burn Fuel Average Moisture: <u>23.77%</u>			
Time (clock): <u>09:10</u>		Room Temperature (F): <u>66</u>	Initials: <u>K</u>		

TEST FUEL				
FUEL TYPE AND AMOUNT:	2 x 4	<u>4</u>	4 x 4	<u>0</u>
CALCULATED LOAD WEIGHT:	<u>10.444</u>	ACTUAL LOAD WEIGHT:	<u>10.6</u>	(2 x 4)
			<u>0</u>	(4 x 4)
FUEL PIECE LENGTH:	<u>18.0"</u>		<u>10.6</u>	Total
MOISTURE CONTENT (METER -- DRY BASIS)				
PIECE	READINGS			TYPE
1	<u>20.6</u>	<u>21.3</u>	<u>20.3</u>	<u>2x4</u>
2	<u>20.1</u>	<u>20.7</u>	<u>21.1</u>	<u>2x4</u>
3	<u>20.1</u>	<u>19.8</u>	<u>20.1</u>	<u>2x4</u>
4	<u>20.1</u>	<u>19.3</u>	<u>22.0</u>	<u>2x4</u>
5				
6				
7				
8				
9				
10				
OVERALL TEST FUEL LOAD MOISTURE AVERAGE:				<u>20.46%</u>
Time (clock):	<u>09:25</u>	Room Temperature (F):	<u>65</u>	Initials: <u>K</u>

Technician signature: K. Morgan Date: 2-12-07

Run Notes

Client/Model: Morso Jernstoberi A/S

Model: 5660

Project #: 192-S-14-3

Tracking Number: 946

Run #: 2 Date: 2-12-07

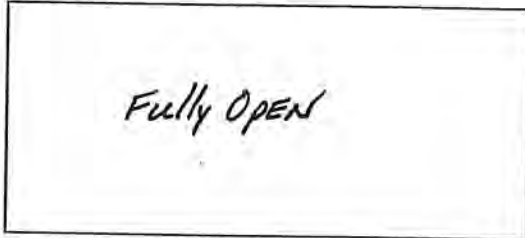
Test Crew: K. Morgan

OMNI Equipment ID Numbers: _____

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:



SECONDARY: Fixed^K
Inlet Area = 1.3254 in²

TERTIARY: NONE

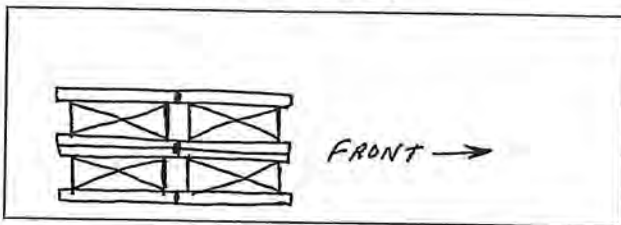
FAN: ON-High

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
0 70	test setting				x	Levelled

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: N/A

FUEL LOADING: loaded by 35 sec.

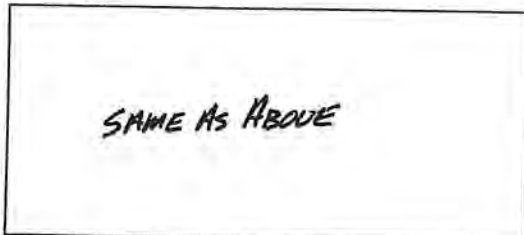
DOOR: closed at 51 sec.

PRIMARY AIR: Full open duration of test.

OTHER: NONE

DESCRIBE OR SKETCH TEST SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:



SECONDARY: FIXED IL
INLET AREA = 1.3254 in²

TERTIARY: NONE

FAN: ON-High

Technician signature: K. Morgan Date: 2-12-07

Supplemental Data EPA 5G/5H

Client: Morso Jernstoberi A/S

Model: 5660

Project No.: 192-S-14-3

Tracking No.: 946

Date: 2-12-07

Run No.: 2

Booth: 1

Test Crew: K. Morgan

Start Time: 10:37

Stop Time: 11:57

OMNI Equipment #'s: _____

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: _____

Initial: _____

Final: N/A

Final: N/A

Calibrations: Span Gas CO₂: N/A O₂: N/A CO: N/A CO₂(DT): N/A

Time	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span
O ₂							
CO ₂			<u>N/A</u>	<u>N/A</u>			
CO							
CO ₂ (DT)							

Stack Diameter (inches): 6.0

Air Velocity (ft/min): Initial: 450 Final: 450

Scale Audit (lbs.): Pretest: 10.0 Post Test: 10.0

Induced Draft: 0 %Smoke Capture: 100

Pitot Tube Leak Test: Pre: 0 @ 3.1" w.c. Post: 0 @ 3.2" w.c.

Flue Pipe Cleaned Prior to First Test in Series: Date: 2-06-07 Initials: K

	Initial	Middle	Ending
Pb (in. Hg)	<u>29.95</u>	<u>29.95</u>	<u>29.95</u>
Room Temp (°F)	<u>66</u>	<u>69</u>	<u>70</u>

Technician signature: K. Morgan Date: 2-12-07

Model: 5660
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark

Run 3

Wood Heater Test Data - EPA Method 5G

Manufacturer: Morso Jernstoberi
 Model: 5660 Insert
 Project No.: 946
 Tracking No.: 192-S-14-3
 Run: 3
 Test Date: 02/13/07

Burn Rate	1.18 kg/hr dry
Particulate Concentration (dry-standard) Particulate Emission Rate Adjusted Emissions	0.00036 grams/dscf 2.94 grams/hour 4.46 grams/hour
Average Tunnel Temperature	88 degrees Fahrenheit
Average Delta p	0.034 inches H2O
Total Sample Volume - Vm Average Gas Meter Temperature Average Gas Velocity in Dilution Tunnel - vs Average Gas Flow Rate in Dilution Tunnel - Qsd Total Sample Volume (Standard Conditions) - Vms	94.17 cubic feet 99 degrees Fahrenheit 12.36 feet/second 8127.53 dscf/hour 89.75 dscf
Total Particulates - mn Average Delta H Total Time of Test	32.5 mg 0.71 inches H2O 180 minutes

Wood Heater Test Data - EPA Method 5G

Signature/Date: *H. J. Morgan 4-24-07*

Run:	3
Manufacturer:	Morco Jenstobert
Model:	5660 Insert
Tracking No.:	946
Project No.:	192-S-14-3
Test Date:	13-Feb-07
Beginning Clock Time:	12:55
Recording Interval:	10 min.
Total Sampling Time:	180 min.

PM Control Module: 21

Dilution Tunnel MW (dry):	29.00	lb/lb-mole			
Dilution Tunnel MW (wet):	28.56	lb/lb-mole			
Dilution Tunnel H ₂ O:	4.00	percent			
Dilution Tunnel Static:	0.550	"H ₂ O			
Pilot Tube Cp:	0.99				
Meter Box Y Factor:	1.001				
Barometric Pressure:	30.09	30.12	30.14	30.12	"Hg

Tunnel Velocity:	12.36	ft/sec
Initial Tunnel Flow:	135.3	scfm
Average Tunnel Flow:	135.5	scfm
Tunnel Area:	0.196	ft ²
Post-Test Leak Check:	0.06 @ 3	cfm@"Hg
Fuel Moisture (dry basis):	20.39	%
Total Particulate:	32.5	mg
Filter Holder No.:		

Velocity Traverse Data									
	Pl.1	Pl.2	Pl.3	Pl.4	Pl.5	Pl.6	Pl.7	Pl.8	
Initial dp	0.034	0.034	0.036	0.032	0.032	0.034	0.032	0.034	
"H ₂ O	89	89	89	89	89	89	89	89	
of									

OMNI Equipment Numbers:

Elapsed Time	Particulate Sampling Data										Fuel Weight, lb										Wood Heater Temperature Data, °F										Stack	
	Gas Meter Cubic Feet	Sample Rate, cfm	Orifice dH	Meter of	Meas Visc. In. Hg.	Dilution Tunnel Temp.	Dilution Tunnel dp	Pro. Rate (10%)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Interior	Average Surface	Stack	Filter	Impinger ext.	Ambient	Draft In H ₂ O	Catalyst Temp.									
0	622.500	0.52	0.75	0.00	0	89	0.034	100	9.4	0.0	665	284	290	420	419	415.6	328	64	64	69	-0.060											
10	627.635	0.51	0.75	78	1	91	0.034	103	8.3	-1.1	598	288	284	395	396	392.2	336	72	55	69	-0.060											
20	632.770	0.51	0.75	86	1	83	0.034	101	7.5	-0.8	494	286	270	363	363	355.2	249	72	49	68	-0.053											
30	637.970	0.52	0.75	92	1	92	0.034	102	6.0	-1.5	618	275	261	347	344	369.0	417	69	47	65	-0.075											
40	643.150	0.52	0.75	94	1	95	0.034	101	4.4	-1.6	709	258	262	376	374	395.8	464	74	47	69	-0.078											
50	648.330	0.52	0.75	99	1	100	0.034	101	2.8	-1.6	811	238	281	430	442	440.4	482	77	47	72	-0.080											
60	653.520	0.52	0.75	100	1	99	0.034	101	2.0	-0.8	790	235	292	451	463	446.2	435	77	47	73	-0.073											
70	658.730	0.52	0.75	103	1	92	0.034	100	1.7	-0.3	688	232	307	466	474	433.4	340	76	47	73	-0.063											
80	663.980	0.53	0.75	104	1	90	0.034	100	1.5	-0.2	621	234	306	456	464	416.2	311	76	47	73	-0.060											
90	669.225	0.52	0.75	105	1	88	0.034	100	1.3	-0.2	550	241	299	438	445	394.6	284	76	48	72	-0.055											
100	674.470	0.52	0.75	106	1	86	0.034	100	1.1	-0.2	516	245	294	424	432	382.2	271	76	49	72	-0.055											
110	679.700	0.52	0.75	106	1	86	0.034	99	1.0	-0.1	486	249	288	409	417	369.8	260	75	49	71	-0.053											
120	684.975	0.53	0.75	106	1	85	0.034	100	0.8	-0.2	466	249	282	397	405	359.8	254	75	50	71	-0.050											
130	690.260	0.53	0.75	107	1	84	0.034	100	0.7	-0.1	445	249	274	386	394	349.6	247	74	50	71	-0.050											
140	695.510	0.53	0.75	106	1	83	0.034	99	0.5	-0.2	429	248	267	376	359	335.8	241	74	51	70	-0.050											
150	700.830	0.53	0.75	106	1	84	0.034	101	0.4	-0.1	421	247	263	371	378	336.0	238	74	51	70	-0.050											
160	706.120	0.53	0.75	106	1	83	0.034	100	0.3	-0.1	408	244	256	362	371	328.2	230	72	52	71	-0.048											
170	711.395	0.53	0.75	106	1	82	0.034	100	0.2	-0.1	394	242	250	353	363	320.4	224	73	53	70	-0.045											
180	716.673	0.53	0.75	106	1	82	0.034	100	0.0	-0.2	379	239	244	343	355	312.0	217	74	53	70	-0.045											
Avg/Total	94.173	0.52	0.71	99.21		88.11	0.034	100.47								104		73.68	50.32			-0.058	#DIV/0!									

Final Laboratory Report - Method 5G Dilution Tunnel Particulate Calculations

Client Name: Morso Jernstoberi A/S Equipment Numbers: _____ Run #: 3
 Model: 5660 Insert _____ Date: 02/13/07
 Project No.: 192-S-14-3 _____
 Tracking No.: 946 _____

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N302	524.5	495.5		29.0
B. Rear filter catch	Filter	N301	502.4	501.1		1.3
C. Rinse of probe and filter assembly	Acetone	75	104884.3	104881.9	0.0024	2.2

Total Particulate, mg :	32.5
-------------------------	------

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Rinse of probe and filter assembly	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg

Analyst: *H. J. Morgan* Date: 2-22-07

STOVE TEMPERATURE TEST DATA - METHOD 5G

Page of

Client/Model: Morso Jernstoberi A/S / 5600 Project # 192-S-14-3 Tracking # 946

Date: 2-13-07 Test Crew: K. Morgan

Run #: 3

OMNI Equipment ID #:

Preburn Test	Coal Bed:										Actual: <u>1.9</u>	Coal Bed: <u>1.9</u>
	Fuel Weight	Delta Weight	Stack Draft	Ambient	Top	Bottom	Back	Left	Right	Flue		
0	6.2		-1.090	68	798	262	211	355	341	667		
10	5.2	1.0	-1.073	68	677	281	233	389	385	400		
20	3.9	1.3	-1.073	67	683	285	249	401	398	422		
30	2.9	1.0	-1.073	68	685	287	264	426	417	407		
40	2.3	0.6	-1.068	68	703	298	283	447	429	361		
50	*3.2	*0.7	-1.065	68	677	311	292	438	424	351		
60	2.6	0.6	-1.065	70	708	308	292	431	423	349		
70	2.0	0.6	-1.063	69	713	288	291	425	423	342		
75	1.7	0.1	-1.063	69	707	287	291	424	423	335		
80												
90												
AVG												

* Add 1.6 lb of #5 waste

Not Used Catalyst

Preliminary: 1.18 @ 4.5

Technician signature: K. Morgan

Date: 2-13-07

FUEL DATA

Client: Morso Jernstoberi A/S

Model: 5660

Project #: 192-S-14-3 Tracking #: 946

Date: 2-13-07 Test Crew: K. Morgan Run #: 3

OMNI Equipment ID #: _____

FUEL LOAD PREPARED BY: K. Morgan

FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.

PRE-BURN FUEL					
MOISTURE CONTENT (METER -- DRY BASIS)					
CALIBRATION:	Cal Value (1) = 12%	Actual Reading	<u>12.0</u>		
	Cal Value (2) = 22%	Actual Reading	<u>22.0</u>		
Piece	Length	Readings			Type
1	<u>8</u> ft	<u>24.1</u>	<u>23.8</u>	<u>24.1</u>	<u>2x4</u>
2	<u>8</u> ft	<u>21.1</u>	<u>22.2</u>	<u>24.9</u>	<u>2x4</u>
3	ft				
Length of cut pieces: <u>4@15"</u> <u>4@5"</u> <u>2@9"</u>		Pre-Burn Fuel Average Moisture:			<u>23.37%</u>
Time (clock): <u>11:30</u>		Room Temperature (F):	<u>68</u>	Initials:	<u>K</u>

TEST FUEL					
FUEL TYPE AND AMOUNT:	<u>2 x 4</u>	<u>4</u>	<u>4 x 4</u>	<u>0</u>	
CALCULATED LOAD WEIGHT:	<u>10.444</u>	ACTUAL LOAD WEIGHT:	<u>9.4</u>	(2 x 4)	
			<u>0</u>	(4 x 4)	
FUEL PIECE LENGTH:	<u>18.0"</u>		<u>9.4</u>	Total	
MOISTURE CONTENT (METER -- DRY BASIS)					
PIECE	READINGS			TYPE	
1	<u>19.9</u>	<u>19.1</u>	<u>18.8</u>	<u>2x4</u>	
2	<u>19.8</u>	<u>19.6</u>	<u>18.6</u>	<u>2x4</u>	
3	<u>19.4</u>	<u>19.6</u>	<u>19.8</u>	<u>2x4</u>	
4	<u>21.1</u>	<u>24.9</u>	<u>24.1</u>	<u>2x4</u>	
5					
6					
7					
8					
9					
10					
OVERALL TEST FUEL LOAD MOISTURE AVERAGE:				<u>20.39%</u>	
Time (clock):	<u>11:45</u>	Room Temperature (F):	<u>68</u>	Initials:	<u>K</u>

Technician signature: K. Morgan Date: 2-13-07

Run Notes

Client/Model: Morso Jernstoberi A/S

Model: 5660

Project #: 192-S-14-3

Tracking Number: 946

Run #: 3 Date: 2-13-07

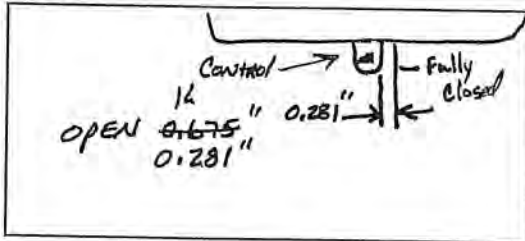
Test Crew: K. Morgan

OMNI Equipment ID Numbers: _____

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:



SECONDARY: inlet = .9501 in²

TERTIARY: NONE

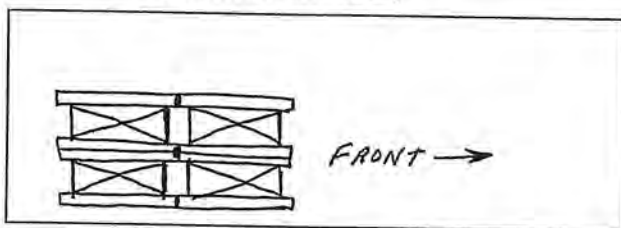
FAN: ON-Low

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
0	test setting					
8					X	Adjust
45			1.6		X	RAKED
75					X	Levelled

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)



START UP PROCEDURES

BYPASS: N/A

FUEL LOADING: Loaded by 50 seconds

DOOR: closed at 55 seconds

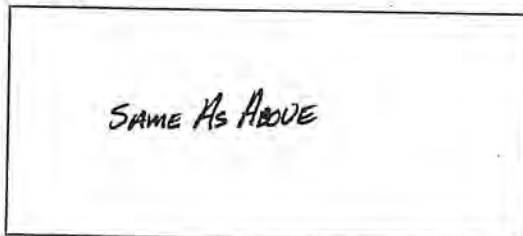
PRIMARY AIR: Fully open 5.0 minutes.

Abruptly closed to test setting at 5.0 minutes.

OTHER: NONE

DESCRIBE OR SKETCH TEST SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:



SECONDARY: inlet = .9501 in²

TERTIARY: NONE

FAN: OFF FOR FIRST 30 min,
ON REMAINDER OF TEST.

Technician signature: K. Morgan Date: 2-13-07

Supplemental Data EPA 5G/5H

Client: Morso Jernstoberi A/S

Model: 5660

Project No.: 192-S-14-3

Tracking No.: 946

Date: 2-13-07

Run No.: 3

Booth: 1

Test Crew: K. Morgan

Start Time: 12:55

Stop Time: 15:55

OMNI Equipment #'s: _____

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: _____

Initial: _____

Final: N/A

Final: N/A

Calibrations: Span Gas CO₂: N/A O₂: N/A CO: N/A CO₂(DT): N/A

Time	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span
O ₂							
CO ₂			<u>N/A</u>				
CO							
CO ₂ (DT)							

Stack Diameter (inches): 6.0

Air Velocity (ft/min): Initial: <50 Final: <50

Scale Audit (lbs.): Pretest: 10.0 Post Test: 10.0

Induced Draft: Ø @ 3.2" W.C. K %Smoke Capture: 100

Pitot Tube Leak Test: Pre: Ø @ 3.2" W.C. Post: Ø @ 3.1" W.C.

Flue Pipe Cleaned Prior to First Test in Series: Date: 2-06-07 Initials: K

	Initial	Middle	Ending
Pb (in. Hg)	<u>30.09</u>	<u>30.12</u>	<u>30.14</u>
Room Temp (°F)	<u>69</u>	<u>72</u>	<u>70</u>

Technician signature: *K. Morgan* Date: 2-13-07

Model: 5660
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark

Run 4

Wood Heater Test Data - EPA Method 5G

Manufacturer: Morso Jernstoberi
 Model: 5660 Insert
 Project No.: 946
 Tracking No.: 192-S-14-3
 Run: 4
 Test Date: 02/14/07

Burn Rate	2.11 kg/hr dry
Particulate Concentration (dry-standard) Particulate Emission Rate Adjusted Emissions	0.00034 grams/dscf 2.69 grams/hour 4.14 grams/hour
Average Tunnel Temperature	100 degrees Fahrenheit
Average Delta p	0.033 inches H2O
Total Sample Volume - Vm Average Gas Meter Temperature Average Gas Velocity in Dilution Tunnel - vs Average Gas Flow Rate in Dilution Tunnel - Qsd Total Sample Volume (Standard Conditions) - Vms	51.83 cubic feet 93 degrees Fahrenheit 12.45 feet/second 8004.61 dscf/hour 50.02 dscf
Total Particulates - mn Average Delta H Total Time of Test	16.8 mg 0.68 inches H2O 100 minutes

Wood Heater Test Data - EPA Method 5G

Signature/Date: *M. J. Morgan* 4-4-07

Tunnel Velocity: 12.45 ft/sec.
 Initial Tunnel Flow: 133.0 scfm
 Average Tunnel Flow: 133.4 scfm
 Tunnel Area: 0.196 ft²
 Post-Test Leak Check: .006 @ 3.0 cfm @ 17 ftg
 Fuel Moisture (dry basis): 20.97 %
 Total Particulate: 16.8 mg
 Filler Holder No.:

PM Control Module: 21
 Dilution Tunnel MW (dry): 29.00 lb/lb-mole
 Dilution Tunnel MW (wet): 28.56 lb/lb-mole
 Dilution Tunnel H₂O: 4.00 percent
 Dilution Tunnel Status: -0.550 H₂O
 Pilot Tube Cp: 0.99
 Meter Box Y Factor: 1.001
 Barometric Pressure: 30.16 30.16 30.15 30.16 30.15 30.16 30.15

Velocity Traverse Data								
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8
Initial dp	0.030	0.034	0.034	0.032	0.036	0.038	0.032	0.030
Initial Temp.	103	103	103	103	103	103	103	103

OMNI Equipment Numbers:

Manufacturer: Morso Jenbacher
 Model: 5660 Insert
 Tracking No.: 946
 Project No.: 192-S-14-3
 Test Date: 14-Feb-07
 Beginning Clock Time: 11:40 min.
 Recording Interval: 10 min.
 Total Sampling Time: 100 mm.

Elapsed Time	Particulate Sampling Data										Fuel Weight, lb										Wood Heater Temperature Data, °F										Stack	
	Gas Meter Cubic Feet	Sample Rate, cfm	Orifice dH	Meter of	Meter In. Hg	Dilution Tunnel Temp.	Dilution Tunnel dp	Pro Rate (10%)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Interior	Average Surface	Stack	Filter	Impinger exit	Ambient	Draft In. H ₂ O	Catalyst Temp.									
0	717.100		0.00	67	0	103	0.033	9.4			660	339	305	487	189	396.0	383	71	62	70	-0.065											
10	722.180	0.51	0.75	78	1	106	0.033	7.4	-2.	702	345	290	461	462	452.0	505	75	52	52	69	-0.085											
20	727.315	0.51	0.75	86	1	112	0.033	5.2	-2.2	816	323	282	458	460	467.8	587	78	51	51	69	-0.090											
30	732.425	0.51	0.75	92	1	117	0.033	2.9	-2.3	927	305	290	486	490	499.6	649	79	51	51	71	-0.093											
40	737.590	0.52	0.75	95	1	108	0.033	1.6	-1.3	908	295	310	521	526	512.0	562	77	50	50	70	-0.085											
50	742.770	0.52	0.75	97	1	102	0.033	1.0	-0.6	813	292	328	540	539	502.4	460	77	50	50	70	-0.078											
60	747.980	0.52	0.75	99	1	95	0.033	0.8	-0.2	679	293	324	527	525	469.6	387	76	50	50	69	-0.070											
70	753.220	0.52	0.75	101	1	92	0.033	0.6	-0.2	607	296	311	504	503	444.2	355	76	50	50	70	-0.065											
80	758.455	0.52	0.75	102	1	90	0.033	0.4	-0.2	547	297	297	475	474	418.0	330	75	51	51	69	-0.063											
90	763.680	0.52	0.75	103	1	89	0.033	0.2	-0.2	514	296	287	457	467	404.2	317	74	51	51	69	-0.060											
100	768.935	0.53	0.75	103	1	87	0.033	0.0	-0.2	478	292	276	434	431	382.2	300	74	51	51	68	-0.058											
Avg/Total	51.835	0.52	0.68	93.00		100.09	0.033	100.27								14	75.64	51.73			-0.071	#DIV/0!										

Final Laboratory Report - Method 5G Dilution Tunnel Particulate Calculations

Client Name: Morso Jernstoberi A/S Equipment Numbers: _____ Run #: 4
 Model: 5660 Insert _____ Date: 02/14/07
 Project No.: 192-S-14-3 _____
 Tracking No.: 946 _____

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N308	561.0	550.1		10.9
B. Rear filter catch	Filter	N307	554.5	553.3		1.2
C. Rinse of probe and filter assembly	Acetone	75	110174.5	110169.6	0.0024	4.7

Total Particulate, mg :	16.8
-------------------------	------

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Rinse of probe and filter assembly	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg

Analyst: *H. J. Morgan* Date: 2-22-07

STOVE TEMPERATURE TEST DATA - METHOD 5G

Page ___ of ___

Client/Model: Morso Jernstoberi A/S / 5600 Project # 192-S-14-3 Tracking # 946

Date: 2-14-07 Test Crew: K. Moran

Run #: 4

OMNI Equipment ID #: _____

Preburn Test	Coal Bed:										Actual:	
	Fuel Weight	Delta Weight	Stack Draft	Ambient	Top	Bottom	Back	TEMPERATURES (oF)			Flue	Coal Bed:
Time								Left	Right	Not Used	Gatayst	
0	12.9		-0.43	64	408	252	217	306	324		243	
10	12.1	0.8	-0.50	64	341	231	197	275	286		257	
20	11.2	1.1	-0.70	64	405	213	182	250	264		359	
30	9.5	1.7	-0.80	65	599	201	185	242	264		476	
40	7.2	2.3	-0.85	65	697	207	200	265	309		556	
50	4.9	2.3	-0.90	66	808	251	233	342	409		625	
60	3.2	1.7	-0.85	66	860	293	275	426	485		557	
70	2.4	0.8	-0.78	68	774	316	295	478	502		461	
80	2.0	0.4	-0.70	69	691	334	302	488	492		404	
90												
00												
10												
20												
30												
40												
50												
60												
70												
80												
90												
AVG												

Preliminary: 2.11 @ 3.9 g/hr

Technician signature: K. Moran

Date: 2-14-07

FUEL DATA

Client: Morso Jernstoberi A/S

Model: 5660

Project #: 192-S-14-3 Tracking #: 946

Date: 2-14-07 Test Crew: K. MORGAN Run #: 4

OMNI Equipment ID #: _____

FUEL LOAD PREPARED BY: K. MORGAN

FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.

PRE-BURN FUEL					
MOISTURE CONTENT (METER -- DRY BASIS)					
CALIBRATION:	Cal Value (1) = 12%	Actual Reading	<u>12.0</u>		
	Cal Value (2) = 22%	Actual Reading	<u>22.0</u>		
Piece	Length	Readings		Type	
1	<u>8</u> ft	<u>24.1</u>	<u>22.8</u>	<u>22.4</u>	<u>2x4</u>
2	<u>8</u> ft	<u>18.9</u>	<u>19.4</u>	<u>19.4</u>	<u>2x4</u>
3	ft				
Length of cut pieces: <u>4@9"</u> <u>5@15"</u> <u>4@5"</u> inches		Pre-Burn Fuel Average Moisture: <u>21.17%</u>			
Time (clock): <u>09:00</u>		Room Temperature (F): <u>64</u>	Initials: <u>K</u>		

TEST FUEL					
FUEL TYPE AND AMOUNT:	<u>2x4</u>	<u>4</u>	<u>4x4</u>	<u>0</u>	
CALCULATED LOAD WEIGHT:	<u>10.444</u>	ACTUAL LOAD WEIGHT:	<u>9.4</u>	<u>0</u>	(2x4) (4x4) Total
FUEL PIECE LENGTH:	<u>18.0"</u>		<u>9.4</u>		
MOISTURE CONTENT (METER -- DRY BASIS)					
PIECE	READINGS			TYPE	
1	<u>19.8</u>	<u>19.0</u>	<u>18.8</u>	<u>2x4</u>	
2	<u>21.3</u>	<u>22.5</u>	<u>23.8</u>	<u>2x4</u>	
3	<u>22.3</u>	<u>24.8</u>	<u>21.2</u>	<u>2x4</u>	
4	<u>18.9</u>	<u>19.8</u>	<u>19.4</u>	<u>2x4</u>	
5					
6					
7					
8					
9					
10					
OVERALL TEST FUEL LOAD MOISTURE AVERAGE:					<u>20.97%</u>
Time (clock): <u>09:15</u>		Room Temperature (F): <u>64</u>		Initials: <u>K</u>	

Technician signature: K. Morgan Date: 2-14-07

Run Notes

Client/Model: Morso Jernstoberi A/S

Model: 5660

Project #: 192-S-14-3

Tracking Number: 946

Run #: 4 Date: 2-14-07

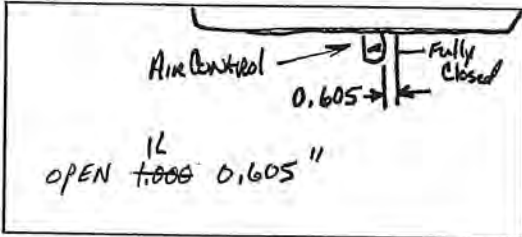
Test Crew: K. Morgan

OMNI Equipment ID Numbers: _____

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:



SECONDARY: Inlet Area = 1.182 in²

TERTIARY: NONE

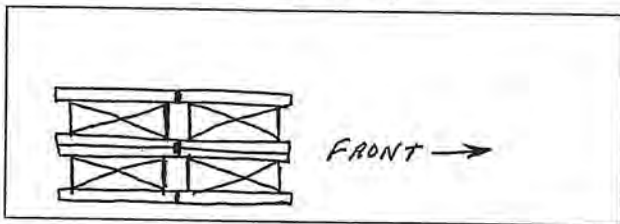
FAN: ON-High

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
0 30	TEST setting				X	Levelled

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)

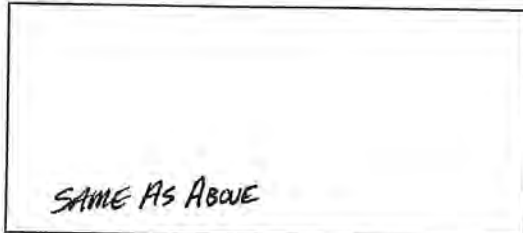


START UP PROCEDURES

BYPASS: N/A
 FUEL LOADING: Loaded by 15 sec.
 DOOR: Closed AT 26 sec.
 PRIMARY AIR: Full open 4.0 min. Abruptly
Adjusted to test setting at
4.0 min.
 OTHER: NONE

DESCRIBE OR SKETCH TEST SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:



SECONDARY: INLET AREA = 1.182 in²

TERTIARY: NONE

FAN: ON-High DURATION of
test.

Technician signature: K. Morgan Date: 2-14-07

Supplemental Data EPA 5G/5H

Client: Morso Jernstoberi A/S

Model: 5660

Project No.: 192-S-14-3

Tracking No.: 946

Date: 2-14-07

Run No.: 4

Booth: 1

Test Crew: K. Morgan

Start Time: 11:40

Stop Time: 13:20

OMNI Equipment #'s: _____

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: _____

Initial: _____

Final: N/A

Final: N/A

Calibrations: Span Gas _____ CO₂: N/A O₂: N/A CO: N/A CO₂(DT): N/A

Time	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span
O ₂							
CO ₂			<u>N/A</u>				
CO							
CO ₂ (DT)							

Stack Diameter (inches): 6.0

Air Velocity (ft/min): Initial: 150 Final: 150

Scale Audit (lbs.): Pretest: 10.0 Post Test: 10.0

Induced Draft: 0 %Smoke Capture: 100

Pitot Tube Leak Test: Pre: φ @ 3.0" W.C. Post: φ @ 3.2" W.C.

Flue Pipe Cleaned Prior to First Test in Series: Date: 2-06-07 Initials: JK

	Initial	Middle	Ending
Pb (in. Hg)	<u>30.16</u>	<u>30.16</u>	<u>30.15</u>
Room Temp (°F)	<u>70</u>	<u>70</u>	<u>68</u>

Technician signature: K. Morgan Date: 2-14-07

Model: 5660
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark

Run 5

Wood Heater Test Data - EPA Method 5G

Manufacturer: Morso Jernstoberi
 Model: 5660 Insert
 Project No.: 946
 Tracking No.: 192-S-14-3
 Run: 5
 Test Date: 02/15/07

Burn Rate	1.32 kg/hr dry
Particulate Concentration (dry-standard) Particulate Emission Rate Adjusted Emissions	0.00034 grams/dscf 2.65 grams/hour 4.09 grams/hour
Average Tunnel Temperature	105 degrees Fahrenheit
Average Delta p	0.033 inches H2O
Total Sample Volume - Vm Average Gas Meter Temperature Average Gas Velocity in Dilution Tunnel - vs Average Gas Flow Rate in Dilution Tunnel - Qsd Total Sample Volume (Standard Conditions) - Vms	89.45 cubic feet 101 degrees Fahrenheit 12.41 feet/second 7910.05 dscf/hour 85.03 dscf
Total Particulates - mn Average Delta H Total Time of Test	28.5 mg 0.71 inches H2O 170 minutes

Wood Heater Test Data - EPA Method 5G

Run: 5
 Manufacturer: Morse Jernstobern
 Model: 5660 Insert
 Tracking No.: 946
 Project No.: 192-S-14-3
 Test Date: 15-Feb-07
 Beginning Clock Time: 12:09
 Recording Interval: 10 min.
 Total Sampling Time: 170 min.

PM Control Module: 21
 Dilution Tunnel MW(dry): 29.00 lb/lb-mole
 Dilution Tunnel MW(wet): 28.56 lb/lb-mole
 Dilution Tunnel H₂O: 4.00 percent
 Dilution Tunnel Static: -0.550 "H₂O
 Pilot Tube Cp: 0.99
 Meter Box Y Factor: 1.001
 Barometric Pressure: _____

Signature/Date: R. J. Morgan 4-4-07
 Tunnel Velocity: 12.41 ft/sec.
 Initial Tunnel Flow: 131.7 scfm
 Average Tunnel Flow: 131.8 scfm
 Tunnel Area: 0.196 ft²
 Post-Test Leak Check: 003 @ 3 cfm @ 1" Hg
 Fuel Moisture (dry basis): 20.86 %
 Total Particulate: 28.5 mg
 Filter Holder No.: _____

Velocity Traverse Data						
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.8
Initial dp	0.032	0.034	0.032	0.034	0.032	0.034
Initial Temp.	106	106	106	106	106	106

OMNI Equipment Numbers:

Elapsed Time	Particulate Sampling Data										Fuel Weight, lb										Wood Heater Temperature Data, °F										Stack	
	Gas Meter Cubic Feet	Sample Rate, cfm	Orifice dH	Meter dH	Meter oF	Meter Vac. In. Hg	Dilution Tunnel Temp.	Dilution Tunnel dp	Pro. Rate (10%)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Interior	Average Surface	Stack	Filter	Impinger ext	Ambient	Draft in H ₂ O	Catalyst Temp.								
0	769.300		0.00	0.00	71	0	106	0.033	10.0		332	298	419	465	420.2	330	69	67	71	-0.063												
10	774.440	0.51	0.75	80	1	113	0.033	103	8.4	-1.6	329	285	439	449	409.6	377	69	56	70	-0.070												
20	779.580	0.51	0.75	89	1	128	0.033	103	6.7	-1.7	321	268	426	436	432.2	514	80	53	72	-0.085												
30	784.750	0.52	0.75	94	1	136	0.033	103	4.5	-2.2	842	297	272	455	464.6	573	81	51	72	-0.088												
40	789.930	0.52	0.75	99	1	137	0.033	102	2.4	-2.1	945	280	287	495	500.6	582	82	51	75	-0.088												
50	795.150	0.52	0.75	102	1	120	0.033	101	1.8	-0.6	865	272	305	523	498.4	453	81	51	75	-0.075												
60	800.390	0.52	0.75	104	1	110	0.033	100	1.5	-0.3	726	271	312	518	470.6	373	80	51	73	-0.068												
70	805.655	0.53	0.75	105	1	103	0.033	100	1.3	-0.2	618	271	308	493	438.6	321	79	51	72	-0.063												
80	810.930	0.53	0.75	106	1	100	0.033	100	1.1	-0.2	552	272	301	466	413.0	298	78	51	71	-0.060												
90	816.190	0.53	0.75	107	1	97	0.033	99	1.0	-0.1	513	272	293	445	395.0	283	77	52	71	-0.055												
100	821.480	0.53	0.75	108	1	96	0.033	99	0.9	-0.1	481	271	283	423	377.6	274	77	53	72	-0.055												
110	826.780	0.53	0.75	108	1	95	0.033	99	0.7	-0.2	460	270	276	407	365.4	266	77	54	73	-0.055												
120	832.090	0.53	0.75	108	1	94	0.033	100	0.6	-0.1	443	269	268	392	354.6	260	76	55	73	-0.053												
130	837.430	0.53	0.75	109	1	93	0.033	100	0.4	-0.2	427	267	262	390	345.0	251	76	56	72	-0.053												
140	842.760	0.53	0.75	109	1	92	0.033	100	0.3	-0.1	410	264	255	368	335.2	244	76	56	72	-0.050												
150	848.090	0.53	0.75	109	1	91	0.033	99	0.2	-0.1	391	261	248	356	324.6	233	76	57	72	-0.050												
160	853.420	0.53	0.75	109	1	90	0.033	99	0.1	-0.1	373	255	239	341	312.2	225	75	59	71	-0.048												
170	858.752	0.53	0.75	109	1	89	0.033	99	0.0	-0.1	358	250	231	329	301.6	218	75	59	71	-0.048												
Avg/Total	89.452	0.53	0.71	101.44			105.00	0.033	100.43						119		76.89	54.61				-0.063	#DIV/0!									

Final Laboratory Report - Method 5G Dilution Tunnel Particulate Calculations

Client Name: Morso Jernstoberi A/S Equipment Numbers: _____ Run #: 5
 Model: 5600 Insert _____ Date: 02/15/07
 Project No.: 192-S-14-3 _____
 Tracking No.: 946 _____

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N312	569.6	547.5		22.1
B. Rear filter catch	Filter	N313	553.9	553.4		0.5
C. Rinse of probe and filter assembly	Acetone	75	102451.0	102444.9	0.0024	5.9

Total Particulate, mg :	28.5
-------------------------	------

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Rinse of probe and filter assembly	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg

Analyst: *H. A. Morgan* Date: 2-22-07

STOVE TEMPERATURE TEST DATA - METHOD 5G

Page ___ of ___

Client/Model: Morso Jernstoberi A/S / 5600 Project # 192-S-14-3 Tracking # 946

Date: 2-15-07 Test Crew: K. Morgan Run #: 5

OMNI Equipment ID #: _____

Preburn Test	Coal Bed:										Actual:
	Fuel Weight	Delta Weight	Stack Draft	Ambient	Top	Bottom	Back	Left	Right	Flue	
0	12.8		-0.058	72	344	341	267	347	357	291	
10	11.7	1.1	-0.053	70	388	315	235	324	333	265	
20	10.2	1.5	-0.065	70	414	296	215	304	313	329	
30	8.3	1.9	-0.080	70	560	286	209	308	322	466	
40	6.6	1.7	-0.083	70	656	277	225	345	381	499	
50	4.9	1.7	-0.083	70	743	275	247	395	436	518	
60	3.3	1.6	-0.083	71	826	281	275	453	472	512	
70	2.8	0.5	-0.073	70	753	300	296	493	508	413	
80	2.5	0.3	-0.068	71	682	313	298	488	499	377	
90	2.3	0.2	-0.063	71	589	336	298	467	480	335	
00											
10											
20											
30											
40											
50											
60											
70											
80											
90											
AVG											

Preliminary: 1.32 @ 3.91

Technician signature: K. Morgan Date: 2-15-07

FUEL DATA

Client: Morso Jernstoberi A/S

Model: 5660

Project #: 192-S-14-3 Tracking #: 946

Date: 2-15-07 Test Crew: H. Morgan Run #: 5

OMNI Equipment ID #: _____

FUEL LOAD PREPARED BY: H. Morgan

FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.

PRE-BURN FUEL					
MOISTURE CONTENT (METER -- DRY BASIS)					
CALIBRATION:	Cal Value (1) = 12%	Actual Reading	<u>12.0</u>		
	Cal Value (2) = 22%	Actual Reading	<u>22.0</u>		
Piece	Length	Readings		Type	
1	_____ ft	<u>23.4</u>	<u>22.6</u>	<u>23.4</u>	<u>2x4</u>
2	_____ ft	<u>23.8</u>	<u>22.4</u>	<u>22.3</u>	<u>2x4</u>
3	_____ ft	_____	_____	_____	_____
Length of cut pieces: <u>50.5"</u> <u>40.9"</u> <u>40.5"</u> inches		Pre-Burn Fuel Average Moisture: <u>22.98%</u>			
Time (clock): <u>10:30</u>		Room Temperature (F): <u>69</u>	Initials: <u>JK</u>		

TEST FUEL					
FUEL TYPE AND AMOUNT:		<u>2x4</u>	<u>4</u>	<u>4x4</u>	<u>0</u>
CALCULATED LOAD WEIGHT: <u>10.444</u>		ACTUAL LOAD WEIGHT:		<u>10.0</u>	(2x4)
FUEL PIECE LENGTH: <u>18.0"</u>				<u>0</u>	(4x4)
				<u>10.0</u>	Total
MOISTURE CONTENT (METER -- DRY BASIS)					
PIECE	READINGS			TYPE	
1	<u>19.0</u>	<u>20.7</u>	<u>23.2</u>	<u>2x4</u>	
2	<u>23.7</u>	<u>19.4</u>	<u>19.3</u>	<u>2x4</u>	
3	<u>23.5</u>	<u>20.2</u>	<u>19.7</u>	<u>2x4</u>	
4	<u>19.3</u>	<u>19.0</u>	<u>23.3</u>	<u>2x4</u>	
5	_____	_____	_____	_____	
6	_____	_____	_____	_____	
7	_____	_____	_____	_____	
8	_____	_____	_____	_____	
9	_____	_____	_____	_____	
10	_____	_____	_____	_____	
OVERALL TEST FUEL LOAD MOISTURE AVERAGE: <u>20.86%</u>					
Time (clock): <u>10:30</u>		Room Temperature (F): <u>70</u>	Initials: <u>JK</u>		

Technician signature: H. Morgan Date: 2-15-07

Run Notes

Client/Model: Morso Jernstoberi A/S

Model: 5660

Project #: 192-S-14-3

Tracking Number: 946

Run #: 5 Date: 2-15-07

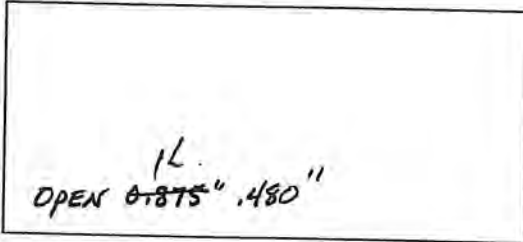
Test Crew: K. Morgan

OMNI Equipment ID Numbers: _____

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:



SECONDARY: Inlet AREA = 1.09 IN²

TERTIARY: NONE

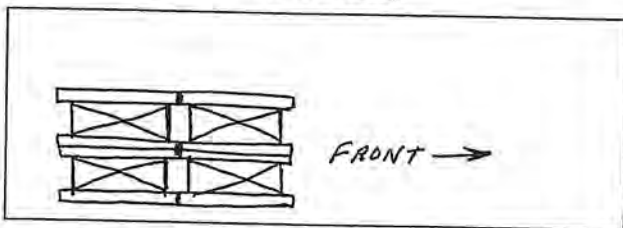
FAN: ON-High

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
<u>8:40</u>	<u>TEST SETTING</u>				<u>X</u>	<u>LEVELLED</u>

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)

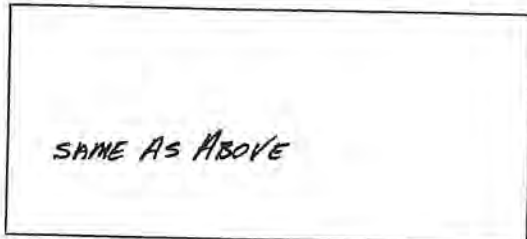


START UP PROCEDURES

BYPASS: N/A
 FUEL LOADING: Loaded by 40 sec.
 DOOR: Closed at 45 sec.
 PRIMARY AIR: Fully Open 5.0 MIN. ABRUPTLY
Closed to test setting at 5.0
MIN.
 OTHER: NONE

DESCRIBE OR SKETCH TEST SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:



SECONDARY: Inlet AREA = 1.09 IN²

TERTIARY: NONE

FAN: ON-High Duration of
Test.

Technician signature: K. Morgan

Date: 2-15-07

Supplemental Data EPA 5G/5H

Client: Morso Jernstoberi A/S

Model: 5660

Project No.: 192-S-14-3

Tracking No.: 946

Date: 2-15-07

Run No.: 5

Booth: 1

Test Crew: K. Morgan

Start Time: 12:09

Stop Time: 14:59

OMNI Equipment #'s: _____

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: _____

Initial: _____

Final: N/A

Final: N/A

Calibrations: Span Gas CO₂: N/A O₂: N/A CO: N/A CO₂(DT): N/A

Time	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span
O ₂							
CO ₂			<u>N/A</u>				
CO							
CO ₂ (DT)							

Stack Diameter (inches): 6.0

Air Velocity (ft/min): Initial: <50 Final: 250

Scale Audit (lbs.): Pretest: 10.0 Post Test: 10.0

Induced Draft: 0 %Smoke Capture: 100

Pitot Tube Leak Test: Pre: 0 @ 3.1" w.c. Post: 0 @ 3.2" w.c.

Flue Pipe Cleaned Prior to First Test in Series: Date: 2-06-07 Initials: JK

	Initial	Middle	Ending
Pb (in. Hg)	<u>30.16</u>	<u>30.16</u>	<u>30.16</u>
Room Temp (°F)	<u>71</u>	<u>71</u>	<u>71</u>

Technician signature: K. Morgan Date: 2-15-07

*Model: 5660
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark*

Run 6

Wood Heater Test Data - EPA Method 5G

Manufacturer: Morso Jernstoberi
 Model: 5660 Insert
 Project No.: 946
 Tracking No.: 192-S-14-3
 Run: 6
 Test Date: 2/016/07

Burn Rate	1.17 kg/hr dry
Particulate Concentration (dry-standard) Particulate Emission Rate Adjusted Emissions	0.00026 grams/dscf 2.11 grams/hour 3.39 grams/hour
Average Tunnel Temperature	97 degrees Fahrenheit
Average Delta p	0.034 inches H2O
Total Sample Volume - Vm Average Gas Meter Temperature Average Gas Velocity in Dilution Tunnel - vs Average Gas Flow Rate in Dilution Tunnel - Qsd Total Sample Volume (Standard Conditions) - Vms	93.92 cubic feet 101 degrees Fahrenheit 12.47 feet/second 8112.19 dscf/hour 89.86 dscf
Total Particulates - mn Average Delta H Total Time of Test	23.4 mg 0.71 inches H2O 180 minutes

Wood Heater Test Data - EPA Method 5G

Run:	6
Manufacturer:	Morso Jemstoberi
Model:	5660 Insert
Tracking No.:	946
Project No.:	192-S-14-3
Test Date:	2/01/07
Beginning Clock Time:	11:40
Recording Interval:	10 min.
Total Sampling Time:	180 min.

Velocity Traverse Data								
	Pt.1	Pt.2	Pt.3	Pt.4	Pt.5	Pt.6	Pt.7	Pt.8
Initial dp	0.032	0.034	0.036	0.032	0.032	0.034	0.036	0.034
Initial Temp.	104	104	104	104	104	104	104	104

Signature/Date:	<i>K.J. Mery</i> / 4-4-07
Tunnel Velocity:	12.47 ft/sec
Initial Tunnel Flow:	134.4 scfm
Average Tunnel Flow:	135.2 scfm
Tunnel Area:	0.196 ft ²
Post-Test Leak Check:	0.06 @ 3 cfm @ 1" Hg
Fuel Moisture (dry basis):	21.26 %
Total Particulate:	23.4 mg
Filter Holder No.:	

PM Control Module:	21
Dilution Tunnel MW (dry):	29.00 lb/lb-mole
Dilution Tunnel MW (wet):	28.56 lb/lb-mole
Dilution Tunnel H ₂ O:	4.00 percent
Dilution Tunnel Static:	-0.550 "H ₂ O
Pilot Tube Cp:	0.99
Meter Box Y Factor:	1.001
Barometric Pressure:	

Begin	Middle	End	Average
30.37	30.35	30.35	30.36

OMNI Equipment Numbers:

Elapsed Time	Particulate Sampling Data										Fuel Weight, lb										Wood Heater Temperature Data, °F										Stack	
	Gas Meter Cubic Feet	Sample Rate, cfm	Orifice dH	Meter dH	Meter Vac. In. Hg.	Dilution Tunnel Temp.	Dilution Tunnel dp	Pro. Rate (10%)	Scale Reading	Weight Change	Firebox Top	Firebox Bottom	Firebox Back	Firebox Left	Firebox Right	Firebox Interior	Average Surface	Stack	Filter	Impinger exit	Ambient	Draft In. H ₂ O	Catalyst Temp.									
0	859.200	0.52	0.00	0.70	0	104	0.034	9.4	9.4	665	300	287	425	439	410	423.2	344	68	65	69	-0.063											
10	864.330	0.51	0.75	80	1	110	0.034	8.0	-1.4	632	325	289	414	410	414.0	386	69	53	71	68	-0.073											
20	869.470	0.51	0.75	88	1	108	0.034	6.7	-1.3	611	320	283	392	382	397.6	391	69	51	68	68	-0.075											
30	874.567	0.51	0.75	96	1	107	0.034	5.2	-1.5	754	297	297	406	372	425.2	400	77	50	72	72	-0.075											
40	879.720	0.52	0.75	99	1	109	0.034	3.9	-1.3	779	291	302	411	378	432.2	416	77	51	72	72	-0.075											
50	885.000	0.53	0.75	101	1	109	0.034	2.7	-1.2	818	280	318	431	398	449.0	421	78	51	72	72	-0.075											
60	890.100	0.51	0.75	103	1	104	0.034	2.0	-0.7	812	273	340	444	423	458.4	370	78	53	74	74	-0.068											
70	895.305	0.52	0.75	105	1	99	0.034	1.6	-0.4	734	272	352	439	428	445.0	324	78	54	73	73	-0.063											
80	900.550	0.52	0.75	106	1	96	0.034	1.4	-0.2	653	274	353	428	419	425.4	291	77	55	73	73	-0.058											
90	905.750	0.52	0.75	107	1	93	0.034	1.2	-0.2	599	281	347	416	410	410.6	271	77	56	72	72	-0.055											
100	911.020	0.53	0.75	107	1	93	0.034	1.1	-0.1	571	287	342	408	403	402.2	261	76	57	73	73	-0.053											
110	916.255	0.52	0.75	107	1	92	0.034	0.9	-0.2	538	296	336	397	393	392.0	251	76	58	73	73	-0.053											
120	921.570	0.53	0.75	108	1	90	0.034	0.7	-0.2	518	300	334	388	386	385.2	243	75	58	71	71	-0.050											
130	926.780	0.52	0.75	108	1	90	0.034	0.6	-0.1	499	305	330	379	380	378.6	235	75	60	71	71	-0.048											
140	932.020	0.52	0.75	108	1	90	0.034	0.5	-0.1	485	307	326	372	375	373.0	231	76	61	71	71	-0.048											
150	937.300	0.53	0.75	108	1	89	0.034	0.4	-0.1	469	307	322	363	368	365.8	224	75	61	71	71	-0.048											
160	942.570	0.53	0.75	109	1	89	0.034	0.2	-0.2	457	307	317	356	362	359.8	220	76	62	72	72	-0.045											
170	947.840	0.53	0.75	109	1	88	0.034	0.1	-0.1	446	307	313	349	356	354.2	216	75	62	71	71	-0.045											
180	953.118	0.53	0.75	108	1	87	0.034	0.0	-0.1	437	307	307	344	351	349.2	214	75	63	70	70	-0.045											
Avg/Total	93.918	0.52	0.71	101.42		97.21	0.034	100.43							74		75.11	56.89				-0.059	#DIV/0!									

Final Laboratory Report - Method 5G Dilution Tunnel Particulate Calculations

Client Name: Morso Jernstoberi A/S Equipment Numbers: _____ Run #: 6
 Model: 5600 Insert _____ Date: 02/16/07
 Project No.: 192-S-14-3 _____
 Tracking No.: _____ 946 _____

Sample Component	Reagent	Filter # or Volume, ml	Weights			
			Final, mg	Tare, mg	Blank, mg/ml	Particulate, mg
A. Front filter catch	Filter	N315	558.3	545.3		13.0
B. Rear filter catch	Filter	N314	558.3	556.7		1.6
C. Rinse of probe and filter assembly	Acetone	75	102174.0	102165.0	0.0024	8.8

Total Particulate, mg :	23.4
-------------------------	------

Component	Equations:
A. Front filter catch	Final (mg) - Tare (mg) = Particulate, mg
B. Rear filter catch	Final (mg) - Tare (mg) = Particulate, mg
C. Rinse of probe and filter assembly	(Final, mg - Tare, mg) - (Blank, mg/ml x Volume, ml) = Particulate, mg

Analyst: *V. J. Morgan* Date: 2-22-07

STOVE TEMPERATURE TEST DATA - METHOD 5G

Page ___ of ___

Client/Model: Morso Jernstoberi A/S / 5600 Project # 192-S-14-3 Tracking # 946

Date: 2-16-07 Test Crew: H. Morgan Run #: 6

OMNI Equipment ID #: _____

Preburn Test	[X] []		Coal Bed: Data: 0 =										Range: 1.9 - 2.3		Actual: 1.9	
	Fuel Weight	Delta Weight	Stack Draft	Ambient	Top	Bottom	Back	TEMPERATURES (oF)			Left	Right	Flue	Coal Bed:		
0	8.5		-0.078	67	589	282	214	317	321	317	321	513	1.9			
10	7.2	1.3	-0.070	66	602	270	219	308	343	308	343	371				
20	6.2	1.0	-0.068	67	596	266	222	307	356	307	356	359				
30	4.8	1.4	-0.073	67	654	268	237	316	389	316	389	400				
40	3.8	1.0	-0.075	68	699	273	253	344	423	344	423	416				
50	2.7	1.1	-0.073	68	728	283	269	380	439	380	439	412				
60	2.1	0.6	-0.068	69	718	300	283	425	443	425	443	370				
65	1.9	0.2	-0.065	68	692	303	285	427	439	427	439	347				
80																
90																
00																
10																
20																
30																
40																
50																
60																
70																
80																
90																
AVG																

PRELIMINARY: 1.17 @ 2.72

Not Used

3.39

Technician signature: H. Morgan Date: 2-16-07

FUEL DATA

Client: Morso Jernstoberi A/S

Model: 5660

Project #: 192-S-14-3 Tracking #: 946

Date: 2-16-07 Test Crew: K. Morgan Run #: 6

OMNI Equipment ID #: _____

FUEL LOAD PREPARED BY: K. MORGAN

FUEL: DOUGLAS-FIR SPECIES, UNTREATED, AIR-DRIED, STANDARD GRADE OR BETTER, DIMENSIONAL LUMBER.

PRE-BURN FUEL					
MOISTURE CONTENT (METER -- DRY BASIS)					
CALIBRATION:	Cal Value (1) = 12%	Actual Reading	<u>12.0</u>		
	Cal Value (2) = 22%	Actual Reading	<u>22.0</u>		
Piece	Length	Readings		Type	
1	<u>8</u> ft	<u>23.4</u>	<u>22.8</u>	<u>22.8</u>	<u>2x4</u>
2	<u>8</u> ft	<u>19.4</u>	<u>18.9</u>	<u>19.0</u>	<u>2x4</u>
3	ft				
Length of cut pieces: <u>4@15"</u> <u>2@9"</u> <u>4@5"</u> inches		Pre-Burn Fuel Average Moisture: <u>21.05%</u>			
Time (clock): <u>09:30</u>		Room Temperature (F): <u>65</u>	Initials: <u>KL</u>		

TEST FUEL					
FUEL TYPE AND AMOUNT:	<u>2x4</u>	<u>4</u>	<u>4x4</u>	<u>0</u>	
CALCULATED LOAD WEIGHT:	<u>10.444</u>	ACTUAL LOAD WEIGHT:	<u>9.4</u>	(2x4)	
			<u>0</u>	(4x4)	
FUEL PIECE LENGTH:	<u>18.0"</u>		<u>9.4</u>	Total	
MOISTURE CONTENT (METER -- DRY BASIS)					
PIECE	READINGS			TYPE	
1	<u>19.7</u>	<u>21.0</u>	<u>19.0</u>	<u>2x4</u>	
2	<u>23.0</u>	<u>19.6</u>	<u>19.7</u>	<u>2x4</u>	
3	<u>22.3</u>	<u>23.6</u>	<u>24.1</u>	<u>2x4</u>	
4	<u>24.3</u>	<u>19.7</u>	<u>19.1</u>	<u>2x4</u>	
5					
6					
7					
8					
9					
10					
OVERALL TEST FUEL LOAD MOISTURE AVERAGE: <u>21.26%</u>					
Time (clock): <u>09:46</u>		Room Temperature (F): <u>67</u>	Initials: <u>KL</u>		

Technician signature: K. Morgan Date: 2-16-07

Run Notes

Client/Model: Morso Jernstoberi A/S

Model: 5660

Project #: 192-S-14-3

Tracking Number: 946

Run #: 6 Date: 2-16-07

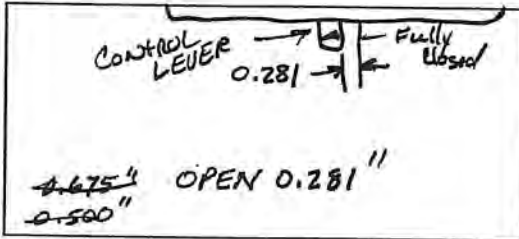
Test Crew: K. Morgan

OMNI Equipment ID Numbers: _____

PREBURN

DESCRIBE OR SKETCH AIR OR THERMOMSTAT SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:



SECONDARY: Inlet AREA = .9501 in²

TERTIARY: NONE

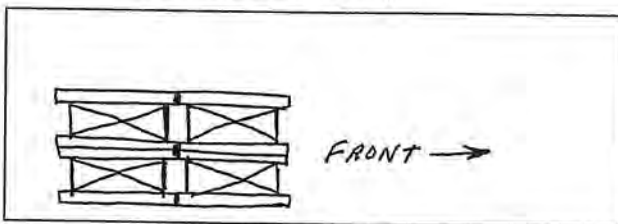
FAN: On hold OFF

PREBURN SETTINGS AND ACTIVITIES

TIME	AIR (THERMO) CHANGES PRIMARY/SECONDARY/TERTIARY	FAN SETTING CHANGE	ADD FUEL + WT.	ADD FUEL - WT.	RAKE COAL	COMMENT
<u>65</u>	<u>TEST setting</u>				<u>x</u>	<u>Levelled</u>

TEST

TEST FUEL CONFIGURATION SKETCH
(INDICATE VIEW ANGLE)

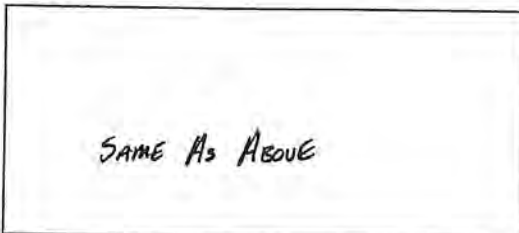


START UP PROCEDURES

BYPASS: N/A
 FUEL LOADING: Loaded by 65 sec.
 DOOR: Closed at 70 sec.
 PRIMARY AIR: Fully open 510 min -
Abruptly closed to test setting
at 510 min.
 OTHER: NONE

DESCRIBE OR SKETCH TEST SETTINGS BELOW: (SETTINGS MUST BE ACCURATE AND REPRODUCIBLE)

PRIMARY:



SAME AS ABOVE

SECONDARY: Inlet AREA = .9501

TERTIARY: NONE

FAN: OFF 1st 1/2 hour, ON
Remainder of test.

Technician signature: K. Morgan Date: 2-16-07

Supplemental Data EPA 5G/5H

Client: Morso Jernstoberi A/S

Model: 5660

Project No.: 192-S-14-3

Tracking No.: 946

Date: 2-16-07

Run No.: 6

Booth: 1

Test Crew: K. Morgan

Start Time: 11:40

Stop Time: 14:40

OMNI Equipment #'s: _____

Gas Analyzer Train Leak Check:

Stack:

Dilution Tunnel (Method 5G Only):

Initial: _____

Initial: _____

Final: N/A

Final: N/A

Calibrations: Span Gas CO₂: N/A O₂: N/A CO: N/A CO₂(DT): N/A

Time	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span	N ₂ Span
O ₂							
CO ₂			<u>N/A</u>				
CO							
CO ₂ (DT)							

Stack Diameter (inches): 6.0

Air Velocity (ft/min): Initial: <50 Final: <50

Scale Audit (lbs.): Pretest: 10.0 Post Test: 10.0

Induced Draft: 0 %Smoke Capture: 100

Pitot Tube Leak Test: Pre: 0 @ 3.2" w.c. Post: 0 @ 3.1" w.c.

Flue Pipe Cleaned Prior to First Test in Series: Date: 2-06-07 Initials: JK

	Initial	Middle	Ending
Pb (in. Hg)	<u>30.37</u>	<u>30.35</u>	<u>30.35</u>
Room Temp (°F)	<u>69</u>	<u>72</u>	<u>70</u>

Technician signature: *K. Morgan* Date: 2-16-07

Model: 5660
Morsø Jernstøberi A/S
Furvej 6
7900 Nykøbing Mors
Denmark

Section 5

Sampling Procedures and Test Results

INTRODUCTION

Morsø Jernstøberi A/S retained *OMNI* to perform U.S. Environmental Protection Agency (EPA) certification testing on the 5660 wood stove. The 5660 wood stove is a non-catalytic, radiant-type insert wood stove. The firebox is constructed of cast iron. The usable firebox volume was measured to be 1.49 cubic feet. The stove is vented through a 6-inch diameter flue collar located at the top of the unit.

The testing was performed at *OMNI*'s testing facility in Beaverton, Oregon. The altitude of the laboratory is 204 feet above sea level. The unit was received in good condition and logged in on January 11, 2007, then assigned and labeled with *OMNI* ID #946. *OMNI* representative Ken Morgan conducted the certification testing and completed all testing by February 16, 2007. The EPA was notified of the testing dates in a letter dated February 9, 2007. A testing contract, including provisions for Random Compliance Audit (RCA) testing, has been signed by Karsten Aagaard of Morsø Jernstøberi A/S and is on file at *OMNI*'s testing facility.

The 5660 wood stove was tested in accordance with the U.S. EPA 40 CFR Part 60, Subpart AAA – Standard of Performance for Residential Wood Heaters (Appendix A, Methods 28 and 5G). Particulate emissions were measured using a Method 5G sampling train consisting of two filters (front and back). The weighted average emissions of the five test runs included in the results indicate a particulate emission level of 4.5 grams per hour. Run #5 was added to fulfill all burn category obligations due to Run #4 being too fast. Run #6, a fan confirmation test run, was performed and was not used in the weighted average emission results. Test runs were conducted in each of three burn rate categories (0.80-1.25 kg/hr, 1.25-1.90 kg/hr, and maximum). Emissions for each of their individual test runs did not exceed the cap. The 5660 results are within the emission limit of 7.5 grams per hour for non-catalytic affected facilities manufactured on or after July 1, 1990, or sold at retail on or after July 1, 1992.

The wood heater was sealed after completion of testing in compliance with the EPA regulation as follows:

- “DO NOT TAMPER” labels were placed on the door and on all other openings.
- Plastic material sealed with “DO NOT TAMPER” labels and tape was wrapped around the unit.
- The unit was sealed in a wood box constructed for the unit and secured with steel banding.
- “DO NOT TAMPER” labels were placed on all outer surfaces of the box.

This report is organized in accordance with the EPA-recommended outline and is summarized in the Table of Contents immediately preceding this report.

Table 1.1 – Particulate Emissions

Run	Burn Rate (kg/hr dry)	Method 5G Emissions (g/hr)
1	0.85	4.50
2	2.99	7.81
3	1.18	4.46
4	2.11	4.14
5	1.32	4.09

Weighted particulate emission average of five test runs: 4.5 grams per hour.

Table 1.2 – Test Facility Conditions

Run	Room Temperature (°F)		Barometric Pressure (Hg)		Air Velocity (ft/min)	
	Before	After	Before	After	Before	After
1	73	66	29.92	29.88	<50	<50
2	66	70	29.95	29.95	<50	<50
3	69	70	30.09	30.14	<50	<50
4	70	68	30.16	30.15	<50	<50
5	71	71	30.16	30.16	<50	<50

Table 1.3.1 – Fuel Measurement and Crib Description Summary – PRETEST

Run	Pretest Fuel Weight (Starting weight in lbs)	Pretest Moisture (Dry basis - %)	Coal Bed Weight (lbs)
1	6.6	23.4	2.1
2	13.9	23.8	2.3
3	6.2	23.4	1.9
4	12.9	21.2	2.0
5	12.8	23.0	2.3

Table 1.3.2 – Fuel Measurement and Crib Description Summary – TEST

Run	Test Fuel Wet Basis (lbs)	Firebox Volume (ft ³)	Fuel Loading Density Wet Basis (lbs/ft ³)	Fuel Moisture Content Dry (%)	Piece Length (in)	2x4s Used	4x4s Used
1	9.9	1.49	6.64	21.5	18	4	0
2	10.6	1.49	7.11	20.5	18	4	0
3	9.4	1.49	6.31	20.4	18	4	0
4	9.4	1.49	6.31	21.0	18	4	0
5	10.0	1.49	6.71	20.9	18	4	0

Table 1.4 – Dilution Tunnel Gas Measurements and Sampling Data Summary

Run	Length of Test (min)	Average Dilution Tunnel Gas Measurements		
		Velocity (ft/sec)	Flow Rate (dscf/min)	Temperature (°F)
1	260	12.44	135.6	85.5
2	80	12.96	135.0	112.0
3	180	12.36	135.5	88.1
4	100	12.45	133.4	100.1
5	170	12.41	131.8	105.0

Table 1.5 - Heater Operation Data (Average Temperature Data)

Run	Beginning Surface Temperature Average ^a	Ending Surface Temperature Average ^a	Surface Delta T ^b
1	360.0	281.4	79
2	491.2	445.6	46
3	415.6	312.0	104
4	396.0	382.2	14
5	420.2	301.6	119

a. All temperatures are in degrees F.
b. Represents the difference between beginning and ending average surface temperatures.

Table 1.6 – Pretest Configuration

Run	Combustion Air (in)	Fuel Added	Fuel Removed	Time (min)
1	Fully Closed	6.6 lbs at start; no addition; coal bed 2.1 lbs	0.0	80
2	Fully Open	13.9 lbs at start; no addition; coal bed 2.3 lbs	0.0	70
3	Open 0.281"	6.2 lbs at start; 1.6 lbs. added; coal bed 1.9 lbs	0.0	75
4	Open 0.605"	12.9 lbs at start; no addition; coal bed 2.0 lbs	0.0	80
5	Open 0.480"	12.8 lbs at start; no addition; coal bed 2.3 lbs	0.0	90

Table 1.7 – Run Data

Run	Average Dry Burn Rate (kg/hr)	Initial (Induced) Draft (H ₂ O)	Primary Air Setting (in)	Run Time (min)	Average Draft (H ₂ O)
1	0.85	0	Fully Closed	260	-0.050
2	2.99	0	Fully Open	80	-0.082
3	1.18	0	Open 0.281"	180	-0.058
4	2.11	0	Open 0.605"	100	-0.074
5	1.32	0	Open 0.480"	170	-0.063

Table 1.8 – Test Configurations

Run	Five-Minute Startup	Combustion Air
1	<u>Bypass</u> : N/A. <u>Fuel Loading</u> : Loaded by 55 seconds. <u>Door</u> : Closed at 1 minute. <u>Primary Air</u> : Fully open for 5 minutes. <u>Other</u> : None. <u>Secondary</u> : Inlet area = 0.8836 in ² . <u>Tertiary</u> : None. <u>Fan</u> : Off for first 30 minutes; on low for remainder of test.	Fully Closed
2	<u>Bypass</u> : N/A. <u>Fuel Loading</u> : Loaded by 35 seconds. <u>Door</u> : Closed at 51 seconds. <u>Primary Air</u> : Fully open for duration of test. <u>Other</u> : None. <u>Secondary</u> : Inlet area = 1.3254 in ² . <u>Tertiary</u> : None. <u>Fan</u> : On high.	Fully Open
3	<u>Bypass</u> : N/A. <u>Fuel Loading</u> : Loaded by 50 seconds. <u>Door</u> : Closed at 55 seconds. <u>Primary Air</u> : Fully open for 5 minutes. <u>Other</u> : None. <u>Secondary</u> : Inlet area = 0.9501 in ² . <u>Tertiary</u> : None. <u>Fan</u> : Off for first 30 minutes; on for remainder of test.	Open 0.281"
4	<u>Bypass</u> : N/A. <u>Fuel Loading</u> : Loaded by 15 seconds. <u>Door</u> : Closed at 26 seconds. <u>Primary Air</u> : Fully open for 4 minutes. <u>Other</u> : None. <u>Secondary</u> : Inlet area = 1.182 in ² . <u>Tertiary</u> : None. <u>Fan</u> : On high.	Open 0.605"
5	<u>Bypass</u> : N/A. <u>Fuel Loading</u> : Loaded by 40 seconds. <u>Door</u> : Closed at 45 seconds. <u>Primary Air</u> : Fully open for 5 minutes. <u>Other</u> : None. <u>Secondary</u> : Inlet area = 1.09 in ² . <u>Tertiary</u> : None. <u>Fan</u> : On high.	Open 0.480"

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TEST RESULTS AND DISCUSSION

A total of six test runs were performed on the 5660 insert wood stove. Five test runs were conducted in the following categories and included in the weighted average emission level results: two in the 0.80 to 1.25 kg/hr dry category; one in the 1.26 to 1.90 kg/hr dry category; and two at maximum.

The weighted particulate emission level was measured to be **4.5 g/hr**.

The proportionality results for all five test runs were acceptable. Quality check results for each test run are presented in Section 2 of this report.

