INVOICE NO. 437600

INFRA-METALS CO

8 PENT HIGHWAY
WALLINGFORD, CT 06492
203-294-2980

RUBIN 28 207-324-2877

RUBB INC
P O BOX 711 SANFORD AIRPORT
SANFORD, ME 04073

RUBB INC
1 RUBB ROAD
SANFORD, ME 04073

SHIP VIA	F.O.B.	PURCHASE ORDER#	TERMS	DATE SHIPPED	INV.DATE
LJK	DELIVERED	28881 JES	1/2 10 NET 30	8/25/05	8/25/05

QTY	D E S C R I P T I O N	WEIGHT	PRICE	AMOUNT
3	12 X 4 X 3/16 REC TUBE(.188 X 45'0"	2654	46.95	1246.05
1	12 X 4 X 3/16 REC TUBE(.188 X 45'0"	885	46.95	415.51

MTRS ENCLOSED - !!!!6000 LB MAX LIFTS!!!!
ALL MATERIAL CONFORMS TO THE REQUIREMENTS
ON THE PO NUMBER REFERENCED ABOVE.
Job Name: 05014 MERRILLS
GC: RUBB INC.

T o t a l s 3539 $1,661.56

```
##############################################
# THIS FAX COPY IS YOUR ORIGINAL INVOICE #
##############################################
#   PLEASE NOTE NEW REMITTANCE ADDRESS:      #
#              INFRA-METALS CO.              #
#     12912 COLLECTIONS CENTER DRIVE         #
#              CHICAGO, IL 60693             #
##############################################
```

CARBON STEEL WARNING! PARTICULATES MAY BE HARMFUL
TO LUNGS - REFER TO M.S.D.S. FOR MORE INFORMATION.

477-14

05014-10-STL $1661.56

Sales Order# 351116

We Cover The World.™

FROM RUBB BUILDING SYSTEMS

PURCHASE ORDER

No. 28881
JES

Ship To: ☐ RUBB INC.
P.O. BOX 711, 1 RUBB LANE
SANFORD, ME 04073
TEL: 207-324-2877 FAX: 207-324-2347
☐ Other

Infra Metals

TO:

Attn: Oak
203-294-2993

05014 Merrills
End Steel.

DATE OF ORDER	DATE REQUIRED	SHIPPED VIA	F.O.B. POINT	PREPAID	COLLECT	TAXABLE / TAX EXEMPT NO.	TERMS
7-26-05							

QTY. ORDERED	QTY. RECEIVED	STOCK NUMBER/DESCRIPTION	UNIT PRICE	AMOUNT
2	2	TS 12x6x1/4x48'	46 95	
9	9	TS 12x6x1/4x45'	46 95	
5	5	TS 12x6x3/16x40'	46 95	
4	3/0 4	TS 12x4x3/16x48' (#45 Ft.)	46 95	
4	4	TS 10x4x3/16x48'	46 95	
		incomplet 8-2-05 JC		
		- A500C		
		- Mill Certs Req.		
		Rec incomplete JC 8 8 05		
		Rec. Complete 8/26/05 -MC		

1. Please send _____ copies of your invoice.
2. Order is to be entered in accordance with prices, delivery and specifications shown above.
3. Notify us immediately if you are unable to ship as specified.

BY _____
AUTHORIZED SIGNATURE

WHITE ORIGINAL YELLOW COPY

KC

Page 1 of 1 SHIPPING ORDER 351116

INFRA-METALS CO
8 PENT HIGHWAY
WALLINGFORD, CT 06492
203-294-2980

11:48 08/01/05

RUBIN 28 207-324-2877

RUBB INC
P O BOX 711 SANFORD AIRPORT
SANFORD, ME 04073

RUBB INC
1 RUBB ROAD
SANFORD, ME 04073

SHIP VIA	F.O.B.	PURCHASE ORDER#	TERMS	DATE REQ'D	ACK. DATE
OUR TRUCK	DELIVERED	28881 JES	1/2 10 NET 30	8/09/05	8/01/05

ORDERED	DESCRIPTION	LOC	WEIGHT
4	12 X 4 X 3/16 REC TUBE(.188 X 45'0" B17797	WAL 112	3539

MTRS REQUIRED - !!!!6000 LB MAX LIFTS!!!!
ALL MATERIAL CONFORMS TO THE REQUIREMENTS
ON THE PO NUMBER REFERENCED ABOVE.
Job Name: 05014 MERRILLS
GC: RUBB INC.

56 4 Totals 3539

Carrier: LTL 7282 Delivery Date: _____

Piece Count: 4 Driver Signature: Jon Lam

Time Signed Out: _____ AM / PM

VERIFY LOAD, YOU ARE RESPONSIBLE FOR WHAT YOU SIGN FOR

**** All discrepencies MUST be reported within 24 hours ****

Piece Count: 4 Customer Signature: [signature]

Rubb Inc. 8/26/05

Atlas TUBE INC.

Material Test Report

Ref.B/L:80158194
Date:07.29.2005
Customer:81

200 Clark Street, Harrow, Ontario, Canada N0R 1G0
Tel.: (519) 738-5000 Fax (519) 738-5087

Sold to
Infra-Metals Corporation
8 Pent Highway
WALLINGFORD CT 06492
USA

Shipped to
Infra-Metals Corporation
8 Pent Highway
WALLINGFORD CT 06492
USA

PO350-188 x 24

Material. 3.5x2.5x188x24'0"0(5x3)PB-D Material No. 35025188 Made in USA
Sales order 169745 Purchase Order B177970W Cust Material #

Heat No	C	Mn	P	S	Si	Al	Cu	Cb	Mo	Ni	Cr	V
4002D	0.170	0.760	0.009	0.005	0.020	0.030	0.050	0.000	0.010	0.030	0.040	0.003

Bundle No	Yield	Tensile	Eln.2in	Certification
M300190130	060469 Psi	072868 Psi	29.7 %	ASTM A500-03A GRADE C & B

Material Note:
Sales Or.Note:

Material. 12.0x4.0x188x45'0"0(1x1)REC Material No. 120040188 Made in Canada
Sales order 169853 Purchase Order B177970W Cust Material #

Heat No	C	Mn	P	S	Si	Al	Cu	Cb	Mo	Ni	Cr	V
632660	0.176	0.693	0.015	0.004	0.170	0.016	0.113	0.000	0.000	0.049	0.000	0.000

Bundle No	Yield	Tensile	Eln.2in	Certification
M200227649	062050 Psi	075100 Psi	28.4 %	ASTM A500-03A GRADE C & B

Material Note:
Sales Or.Note:

Material. 12.0x6.0x188x22'0"0(1x1)REC Material No. 120060188 Made in Canada
Sales order 169863 Purchase Order B177970W Cust Material #

Heat No	C	Mn	P	S	Si	Al	Cu	Cb	Mo	Ni	Cr	V
30417940	0.190	0.400	0.007	0.006	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Bundle No	Yield	Tensile	Eln.2in	Certification
M200247904	057540 Psi	070860 Psi	29.0 %	ASTM A500-03A GRADE C & B

Material Note:
Sales Or.Note:

Material. 12.0x6.0x188x20'0"0(1x1)REC Material No. 120060188 Made in Canada
Sales order 169853 Purchase Order B177970W Cust Material #

Heat No	C	Mn	P	S	Si	Al	Cu	Cb	Mo	Ni	Cr	V
3251D	0.170	0.730	0.010	0.006	0.020	0.028	0.040	0.000	0.010	0.020	0.020	0.003

Bundle No	Yield	Tensile	Eln.2in	Certification
B693035	059550 Psi	073120 Psi	26.6 %	ASTM A500-03A GRADE C & B

Material Note:
Sales Or.Note:

We Cover The World.™

FROM RUBB BUILDING SYSTEMS

PURCHASE ORDER

№ 28970

JES

Ship To: ☐ RUBB INC.
P.O. BOX 711, 1 RUBB LANE
SANFORD, ME 04073
TEL: 207-324-2877 FAX: 207-324-2347
☐ Other

TO: K L Jack.

Attn: Steve

SP.

#05014 Merrills

Hardware

DATE OF ORDER	DATE REQUIRED	SHIPPED VIA	F.O.B. POINT	PREPAID	COLLECT	TAXABLE / TAX EXEMPT NO.	TERMS
8-9-05	1 week.						

QTY. ORDERED	QTY. RECEIVED	STOCK NUMBER/DESCRIPTION	UNIT PRICE	AMOUNT
430		1 3/8 x 4 A325 HDG w/Bolt + Nut.	1218 00/100	
335		1 x 3 " " " "	214 12/100	
60		3/4 x 2 1/4 " " " "	94 17	
1050		3/4 x 2 " " " "	90 28	
250		5/8 x 1 3/4 " " " "	58 26.	
75		3/4 A325 HDG Flat Washer	12 68	
5		1" " " " "	14 80	
		- North American.		

1. Please send _____ copies of your invoice.
2. Order is to be entered in accordance with prices, delivery and specifications shown above.
3. Notify us immediately if you are unable to ship as specified.

BY.....
AUTHORIZED SIGNATURE

WHITE ORIGINAL

YELLOW COPY

K. L. JACK & CO.
1-800-639-8805
145 WARREN AVENUE
PORTLAND ME 04103

INVOICE

DATE	INVOICE NO.
08/18/05	579264-01

Invoice To: 96

RUBB
PO BOX 711
SANFORD ME 04073

Ship To: 1

RUBB
SANFORD AIRPORT
OLD AIRPORT ROAD
SANFORD ME 04073

P.O. Number	Ord Date	Slsmn	F.O.B.	Ship Via	Freight Terms	Opr
28970	08/08/05	00026	PTLD WAREHOUSE	BEST WAY	PREPAID	SAC

Item Number/Description		Qty Ord	Qty B/O	Qty Shp	Price/UM	Amount
*137C400BA3G	001	430	0	430	8.99EA	3865.70
1 3/8-6 X 4 BOLT A325 H.D.G.						
137CNA3G	002	430	0	430	319.00C	1371.70
1 3/8-6 A325 HVY NUT (A563 DH or 2H) HOT DIP GALV						

THERE IS A $3.00 FUEL SURCHARGE FOR DELIVERIES VIA OUR TRUCK

465.56

05014-10-HDW 5237.40

INVOICE TERMS	CONTACT	TOTAL AMT	DEPOSIT	MISC	CG FREIGHT	TAXES	AMOUNT DUE
NET 60	BOB	5237.40					5237.40

We Cover The World.™

FROM RUBB BUILDING SYSTEMS

PURCHASE ORDER

No. 28970

JES.

Ship To: ☐ RUBB INC.
P.O. BOX 711, 1 RUBB LANE
SANFORD, ME 04073
TEL: 207-324-2877 FAX: 207-324-2347
☐ Other

TO: K L Jack.
Attn: Steve.
SP.

#05014 Merrills

DATE OF ORDER	DATE REQUIRED	SHIPPED VIA	F.O.B. POINT	PREPAID	COLLECT	TAXABLE / TAX EXEMPT NO.	TERMS
8-9-05	1 Week.						

QTY. ORDERED	QTY. RECEIVED	STOCK NUMBER/DESCRIPTION	UNIT PRICE		AMOUNT	
430	430 B/O	1 3/8" x 4" A325 HDG w/Bolt + Nut.	1218	00/100		
335	335	1" x 3" " " " "	214	12/100		
60	60	3/4" x 2 1/4" " " " "	94	17		
1050	1050	3/4" x 2" " " " "	90	28		
250	250	5/8" x 1 3/4" " " " "	58	26.		
75	75	3/4" A325 HDG Flat Washer	12	68		
5	5	1" " " " "	14	80		
		- North American.				
		Rec 8/17/05 MB				

1. Please send _____ copies of your invoice.
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3. Notify us immediately if you are unable to ship as specified.

BY _____
AUTHORIZED SIGNATURE

WHITE ORIGINAL

YELLOW COPY

LEIGHTON'S EXPRESS
FALMOUTH, ME

(207)-797-8031

Bill To

Shipper / PO#

Pickup Date 8/16/2005

Freight Bill No 10001209

Consignee

RUBB/ SANFORD AIRPORT
OLD AIRPORT RD
SANFORD ME 04073

Shipper

KL JACK
145 WARREN AVE
PORTLAND ME 04103

C/L Pro	C/L Amt	Legh Amt	COD Amt

Pieces	HM	Description	Weight	Rate	Prepaid	Collect
1	☐	PLT OF MISC BOLTS 7 BOXES	1537			
	☐					
1			1537			

Delivery Date	Consignee (Signature) Rec In Good Order	Print Name	Driver

S 03414 8/12

K.L. JACK / CHEMFAST, LLC
145 WARREN AVE
PORTLAND ME 04103

207-878-3600

K.L.Jack

K.L. Jack Industrial Fasteners & Supplies
ChemFast Chemicals for Industry
SealTech W.R. Grace Waterproofing

PAGE	ORDER NUMBER
1	579264-01

SOLD TO: 96

JBB
O BOX 711
ANFORD ME 04073

SHIP TO: 1

RUBB
SANFORD AIRPORT
OLD AIRPORT ROAD
SANFORD ME 04073

OPR.	SLS	CONTACT	TERMS	DEPOSIT	DATE SHIPPED	TOTAL FREIGHT
AC	00026	BOB	NET 60		08-16-05	

P.O. NUMBER	DATE OF ORDER	DATE WANTED	F.O.B.	SHIP VIA	FREIGHT TERMS
3970	08/08/05	08/05/05	PTLD WAREHOUSE	BEST WAY ✓	PREPAID

ITEM NUMBER/DESCRIPTION	LINE	QTY. ORD.	QTY. SHIPD.	QTY. B.O.
37C400BA3G 3/8-6 X 4 BOLT A325 H.D.G.	08/05/05 001	430 PC	430	
37CNA3G 3/8-6 A325 HVY NUT (A563 DH or 2H) HOT DIP GALV	08/05/05 002	430 PC	430	

602437

Rec 8/17/05 MB

5014-10 HDW 5037.4

RECEIVED BY _____

PLEASE PRINT CLEARLY

PICKED BY	CHECKED BY	KEGS	CARTONS	WEIGHT

PACKING LIST/CUSTOMER

K. L. JACK & CO.
1-800-639-8805
145 WARREN AVENUE
PORTLAND ME 04103

INVOICE

DATE	INVOICE NO.
08/11/05	579264-00

Invoice To: 96

RUBB
PO BOX 711
SANFORD ME 04073

Ship To: 1

RUBB
SANFORD AIRPORT
OLD AIRPORT ROAD
SANFORD ME 04073

415.55

P.O. Number	Ord Date	Slsmn	F.O.B.	Ship Via	Freight Terms	Opr
28970	08/08/05	00026	PTLD WAREHOUSE	BEST WAY	PREPAID	SAC

Item Number/Description		Qty Ord	Qty B/O	Qty Shp	Price/UM	Amount
*137C400BA3G	001	430	430	0	8.99EA	0.00
1 3/8-6 X 4 BOLT A325 H.D.G.						
137CNA3G	002	430	430	0	319.00C	0.00
1 3/8-6 A325 HVY NUT (A563 DH or 2H) HOT DIP GALV						
100C300BA3G	003	335	0	√335	214.12C	717.30
1-8 X 3 A325 STRUCTURAL BOLT (W/NUT) HOT DIP GALV						
75C225BA3G	004	60	0	√ 60	94.17C	56.50
3/4-10 X 2 1/4 A325 STRUCTURAL BOLT (W/NUT) H.D.G.						
75C200BA3G	005	1050	0	√1050	90.28C	947.94
3/4-10 X 2 A325 STRUCTURAL BOLT (W/NUT) H.D.G.						
62C175BA3G	006	250	0	√250	58.26C	145.65
5/8-11 X 1 3/4 A325 STRUCTURAL BOLT (W/NUT) H.D.G.						
75NWA3G/DOM	007	75	0	√ 75	12.68C	9.51
3/4 A325 FLAT WASHER DOMESTIC HDG						
100NWA3G	008	5	0	√ 5	14.80C	0.74
1" A325 FLAT WASHER HOT DIP GALV						

THERE IS A $3.00 FUEL SURCHARGE FOR DELIVERIES VIA OUR TRUCK

05014-10-HDW 1877.64

INVOICE TERMS	CONTACT	TOTAL AMT	DEPOSIT	MISC	CG FREIGHT	TAXES	AMOUNT DUE
NET 60	BOB	1877.64					1877.64

We Cover The World.™

FROM RUBB BUILDING SYSTEMS

PURCHASE ORDER

№ 28970

JES.

Ship To: ☐ RUBB INC.
P.O. BOX 711, 1 RUBB LANE
SANFORD, ME 04073
TEL: 207-324-2877 FAX: 207-324-2347
☐ Other

TO: K L Jack.
Attn: Steve.
SP.

#05014 Merrills

DATE OF ORDER	DATE REQUIRED	SHIPPED VIA	F.O.B. POINT	PREPAID	COLLECT	TAXABLE	TAX EXEMPT	TERMS
8-9-05	1 Week.					NO.		

QTY. ORDERED	QTY. RECEIVED	STOCK NUMBER/DESCRIPTION	UNIT PRICE		AMOUNT
430		1 3/8 X 4 A325 HDG w/Bolt + Nut.	12	18.00	
335	335	1" X 3" " " " "	2	14.12	
60	60	3/4 X 2 1/4 " " " "		94.17	
1050	1050	3/4 X 2 " " " " Incomplete		90.28	
250	250	5/8 X 1 3/4 " " " " Rec 8/10/05		58.26.	
75	75	3/4" A325 HDG Flat Washer		12.68	
5	5	1" " " " "		14.80	
		- North American.			

1. Please send _____ copies of your invoice.
2. Order is to be entered in accordance with prices, delivery and specifications shown above.
3. Notify us immediately if you are unable to ship as specified.

BY _____
AUTHORIZED SIGNATURE

WHITE
ORIGINAL

YELLOW
COPY

EXPRESS
FALMOUTH, ME

Shipper / PO#	Pickup Date	
579264-00	8/9/2005	
	Freight Bill No	
	10001035	

Consignee

RUBB
SANFORD AIRPORT
SANFORD ME 04073

Shipper

KL JACK
145 WARREN AVE
PORTLAND ME 04103

C/L Pro	C/L Amt	Legh Amt	COD Amt

Pieces	HM	Description	Weight	Rate	Prepaid	Collect
1	☐	SKID NUTS & BOLTS- 12 PCS	1100			
	☐					
1			1100			

Delivery Date	Consignee (Signature) Rec In Good Order	Print Name	Driver

K.L. JACK / CHEMFAST, LLC
145 WARREN AVE
PORTLAND ME 04103

207-878-3600

K.L.Jack
K.L. Jack Industrial Fasteners & Supplies
ChemFast Chemicals for Industry
SealTech W.R. Grace Waterproofing

PAGE	ORDER NUMBER
1	579264-00

*** DUPLICATE ***

SOLD TO: 96
JBB
D BOX 711
ANFORD ME 04073

SHIP TO: 1
RUBB
SANFORD AIRPORT
OLD AIRPORT ROAD
SANFORD ME 04073

OPR.	SLS	CONTACT	TERMS	DEPOSIT	DATE SHIPPED	TOTAL FREIGHT
AC	00026	BOB	NET 60		8-9	

P.O. NUMBER	DATE OF ORDER	DATE WANTED	F.O.B.	SHIP VIA	FREIGHT TERMS
3970	08/08/05	08/05/05	PTLD WAREHOUSE	BEST WAY L	PREPAID

ITEM NUMBER/DESCRIPTION		LINE	QTY. ORD.	QTY. SHPD.	QTY. B.O.
137C400BA3G	08/05/05	001	430 PC	Ø	430
3/8-6 X 4 BOLT A325 H.D.G.					
37CNA3G	08/05/05	002	430 PC	Ø	430
3/8-6 A325 HVY NUT (A563 DH or 2H) HOT DIP GALV					602437
00C300BA3G	08/05/05	003	335 PC	335	
-8 X 3 A325 STRUCTURAL BOLT (W/NUT) HOT DIP GALV					
654730 X - 55		126	654731 026E	140	653977
5C225BA3G	08/05/05	004	60 PC	60	
/4-10 X 2 1/4 A325 STRUCTURAL BOLT (W/NUT) H.D.G.					
651504 026H		325	656326 026F	325	628833
656331 X		37	656330 X	325	651505
5C200BA3G	08/05/05	005	1050 PC	1050	
/4-10 X 2 A325 STRUCTURAL BOLT (W/NUT) H.D.G.				500	
679681 026C		500	679680 026C	500	679357
656325 X		50	671465 X .500	200	628832
				50	
				100	
2C175BA3G	08/05/05	006	250 PC	250	
/8-11 X 1 3/4 A325 STRUCTURAL BOLT (W/NUT) H.D.G.					
638421 X		600	656318 028I	600	656317

CONTINUED

RECEIVED BY _____
PLEASE PRINT CLEARLY

PICKED BY	CHECKED BY	KEGS	CARTONS	WEIGHT
FD				

PACKING LIST / CUSTOMER

K.L. JACK / CHEMFAST, LLC
145 WARREN AVE
PORTLAND ME 04103

207-878-3600

K.L.Jack
K.L. Jack Industrial Fasteners & Supplies
ChemFast Chemicals for Industry
SealTech W.R. Grace Waterproofing

PAGE	ORDER NUMBER
2	579264-00

*** DUPLICATE ***

SOLD TO: 96
JBB
O BOX 711
ANFORD ME 04073

SHIP TO: 1
RUBB
SANFORD AIRPORT
OLD AIRPORT ROAD
SANFORD ME 04073

OPR.	SLS	CONTACT	TERMS	DEPOSIT	DATE SHIPPED	TOTAL FREIGHT
AC	00026	BOB	NET 60			

P.O. NUMBER	DATE OF ORDER	DATE WANTED	F.O.B.	SHIP VIA	FREIGHT TERMS
3970	08/08/05	08/05/05	PTLD WAREHOUSE	BEST WAY	PREPAID

ITEM NUMBER/DESCRIPTION		LINE	QTY. ORD.	QTY. SHPD.	QTY. B.O.
					*667495
3NWA3G/DOM '4 A325 FLAT WASHER DOMESTIC HDG	08/05/05	007	75 PC	75	
517554 017J - 75					150 678486
)0NWA3G ' A325 FLAT WASHER HOT DIP GALV	08/05/05	008	5 PC	5	
					653956

RECEIVED BY _____
PLEASE PRINT CLEARLY

PICKED BY	CHECKED BY	KEGS	CARTONS	WEIGHT
RJ				

PACKING LIST / CUSTOMER

3/15/05

K-T Bolt Manufacturing Company, Inc.®
1150 Katy Fort-Bend Road
Katy, Texas 77494
Ph: 281-391-2196 Fax: 281-391-2673

Material Test Report

Company:	Gulf Coast Fasteners
Part Description:	600 pcs 1 3/8 X 4" Heavy Hex Bolts
Material Specification:	ASTM A325-'01a Type 1
Coating Specification	None
Purchase Order Number:	Verbal
Lot Number:	64836-2
Comments:	None
Material Heat Number:	239212

Chemical Analysis – Weight Percent

C	Mn	P	S	Si	Cu	Cr	Ni	Mo	V	Al	Sn	Ta	Cb	Ti	B	N
.48	.75	.007	.020	.21	.32	.08	.09	.029	.001	-	.015	-	.001	.001	.0003	-

100% Melted & Manufactured in the USA. Values reflect originating steel mill.

C&I Testing Labs, Inc.®
1170 Katy Fort-Bend Road
Katy, Texas 77494
Ph: 281-391-2197 Fax: 281-391-2044

Tensile and Hardness Test Results

Lab Reference Number:	127073
Lab ID:	N 20
Date Tested:	3/11/05
Test Specification:	ASTM F606-'00a
Sampling:	Per customer

COMPANY K L Jack 74992
INVOICE
P.O. 50341

Property	#1
Tensile:	
Proof/Yield	
Elongation	
ROA	
Hardness	28 HRC

Comments

Test results meet tensile/hardness requirements of specification.

C&I Testing Labs, Inc.
Keith Bryan
Quality Assurance Manager

K-T

K-T Galvanizing Company, Inc.
P.O. Box 72 – 5105 East 3rd Street
Katy, Texas 77492
Ph: 281-391-9201 Fax 281-391-5819

AGA

January 6, 2005

COMPANY KL Jack
INVOICE 79992
P.O. 503414

Gulf Coast Fasteners
P.O. Box 19331
Houston, Tx 77224

RE: CERTIFICATE OF COMPLIANCE BLANKET CERTIFICATE

To Whom It May Concern:

We certify that our Hot Dip process meets the requirements of ASTM A153, class C specifications.

Sincerely,

Al Peck

Al Peck
President

AP/pm

INSPECTION CERTIFICATE

Customer	Specification	Size	Lot No.	Date
	ASTM A-563 GRADE DH HEAVY HEX NUT	H.D.G. 1-3/8-6 UNC 0.027" BLUE DYE	27891	Jun. 16,'05

UNYTITE,INC.
One Unytite Drive
Peru, Illinois 61354
815-224-2221 — FAX# 815-224-3434

Mechanical properties tested in accordance to ASTM F606/F606M, ASTM A370, ASTM E18

Chemical Composition (%)

Mill Maker	Material Size	Heat No. / Spec.	C	Si	Mn	P	S	Cu	Ni	Cr	Mo	
			0.20 0.55	-	MIN. 0.60	MAX. 0.040	MAX. 0.050	-	-	-	-	-
GERDAU AMER	CARBON											
ISTEEL (NO	STEEL	S68958	0.45	0.22	0.70	0.013	0.030	0.24	0.09	0.13	0.02	-

Mechanical Property Inspection

Item	Proof Load	Cone Stripping	Hardness	Hardness	Absorbed Energy
Spec.	173,250 lbf	- kN • kgf • lbf	24-38 HRC	HRB • HB	J • kgfm • ftlbf
Results	n 5	n -	29.5 28.7 29.4 28.9 29.0 29.1		
	Results GOOD	Results -		Hardness Treatment After 24 HrX °F (°C)	

Heat Treatment

T:MIN.800° F

Q:FORGING Q
(W.Q.)

T:1184° F/45M.
(W.C.

Q : Quenching
T : Tempering
ST : Solution Treatment

Shape & Dimension Inspection

ANSI B18.2.2

GOOD

Thread Precision Inspection

ANSI B1.1
CLASS 2B
GOOD

Appearance Inspection

GOOD

Remarks:

" DH "

Production Quantity
10,800 pcs

OFFICIAL SEAL
JEAN MARGHERIO
Notary Public, State of Illinois
My Commission Expires 10-16-2005

6-17-05

Material used for the nut was melted and manufactured in the USA. The nut was manufactured in the USA to the above specification.

Chief of Quality Assurance Section

We hereby certify that the material described has been manufactured and inspected satisfactorily with the requirement of the above specification.

GERDAU AMERISTEEL Minnesota

M510732

P.O Box 64189
1678 Red Rock Road
Saint Paul, Minnesota 55164

Heat #:	S88958
Size:	1 9/16"
Product:	Round Bar
Grade:	C1045M23FC
Date Rolled:	1/28/2005
P.O	29805
M.O #:	245844

CERTIFIED TEST REPORT

CHEMICAL ANALYSIS (WT %)

C	Mn	P	S	Si	Sn	Cu	Ni	Cr	Mo	Cb	V	Co	Al	Ti	Ca ppm	N ppm
0.45	0.7	0.013	0.030	0.22	0.015	0.24	0.09	0.13	0.02	0.001	0.027	0.01	0.004	0.0032	18	63

MATERIAL 100% MELTED AND ROLLED IN THE USA. MANUFACTURING PROCESSES FOR THIS STEEL, WHICH MAY INCLUDE SCRAP MELTED IN AN ELECTRIC ARC FURNACE AND HOT ROLLING, HAVE BEEN PERFORMED AT GERDAU AMERISTEEL MINNESOTA, 1678 RED ROCK ROAD, SAINT PAUL MINNESOTA, USA. ALL PRODUCT PRODUCED FROM STRAND CAST BILLETS. NO WELD REPAIRMENT PERFORMED. STEEL NOT EXPOSED TO MERCURY OR ANY LIQUID ALLOY WHICH IS LIQUID AT AMBIENT TEMPERATURES DURING PROCESSING OR WHILE IN GERDAU AMERSITEEL MINNESOTA POSSESSION.

JOMINY END QUENCH HARDENABILITY RESULTS (HRc)

*	J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12
	J13	J14	J15	J16	J18	J20	J22	J24	J26	J28	J30	J32

MECHANICAL TEST REPORT

SPECIMEN AREA (in^2)	YIELD (Kips)	YIELD (Ksi)	TENSILE (Kips)	TENSILE (Ksi)	GAUGE LENGTH (in)	% ELONG	BEND	% R.A.

Additional Specifications/Comments:

ASTM A576-90b(2000) A29/A29M-04

Grain Size:	Fine	Reduction Ratio:	15.6:1	C.E Per:		As Rolled surface Hardness	
Coding:		D.I: 1.38 In.	Ms: 608.8 Deg F.	C.E:		HBW	HRc
					Test 1:		
					Test 2:		

CHARPY IMPACT TEST		
*	Test 1	Test 2
Temp (F)		
ft-lb 1		
ft-lb 2		
ft-lb 3		

ASTM E45 is not a laboratory accredited test.

Micro Clean Average

At: Ah: Bt: Bb: Ct: Ch: Dt: Dh: S-Rating: O-Rating:

Macro Etch :

	ASTM Test Method									
Accredited to:	ASTM A370	ASTM E8	ASTM E10	ASTM E18	ASTM E23	ASTM E112	ASTM E255	ASTM E290	ASTM E415	ASTM E1019
ISO 17025	X	X	X	X				X	X	X
subcontractor (ISO 17025)		*			*	*	*			

The above results relate only to the items tested.

Chemical tests performed in accordance with ASTM E415 and E1019. Mechanical tests performed in accordance to ASTM E8,E10, E18, E290 and A370. All other tests performed in accordance with the requirements of applicable specifications unless otherwise noted above. We hereby certify that the above test results are representative of those contained in the records of the company.

Any modification to this certificate as provided by Gerdau Ameristeel - Minnesota without the expressed written consent of Gerdau Ameristeel - Minnesota negates the validity of this test report. This report shall not be reproduced except in full, without the expressed written consent of Gerdau Ameristeel Minnesota. Gerdau Ameristeel- Minnesota is not responsible for the inability of this material to meet specific applications.

X Gerdau Ameristeel Minnesota, A2LA Certification #1055-01 Exp. 6/30/06

* Denotes Testing By Sub-Contractor:
Metallurgical Services Inc., A2LA Certification #510-01 Exp. 12/31/04
Stork Twin City Testing, A2LA Cerification #1479-01 Exp 12/31/04

Measurement of uncertainty information is available upon request.

SIGNED:

DATE: 04/14/2005

APPROVAL:

QA Approval
Dennis Harpole

DEBRA L. KARIESCH
Notary Public-Minnesota
My Commission Expires Jan 31, 2010

SWORN AND SUBSCRIBED TO BEFORE ME

THIS 14 DAY 4/2005

(NOTARY PUBLIC)

THIS CERTIFICATE IS NOTARIZED ONLY WHEN REQUESTED.

Universal Galvanizing, Inc.
107 Didion Drive
St. Peters, Missouri 63376
(636) 970-2272

CERTIFICATE OF COMPLIANCE
FOR HOT DIP GALVANIZING

CUSTOMER : Unytite, Inc.

DATE : June 10, 2005

ORDER NO : 31764

LOT NO. : 27891

ITEM : A563 DH HHN Nut

SIZE : 1-3/8-6 0.027

WE HEREBY CERTIFY THAT THE ABOVE SIZE AND LOT NUMBER WHICH WAS HOT DIP GALVANIZED IN OUR PLANT MEET THE SPECIFICATIONS OF ASTM-A153 CLASS C.

AVERAGE THICKNESS OF ZINC COATING : 5.0 MILS

Dave Gehris/mc
David Gehris, QUALITY CONTROL

INFASCO

BOLTS, NUTS AND FASTENER PRODUCTS

SET NO.: 2004-19901

FASTENER TEST REPORT

(THIS DOCUMENT MAY BE REPRODUCED, BUT ONLY IN ITS ENTIRETY)

DATE: 2004-11-25

DESCRIPTION A325-1+A563-DH O/S
1-8 X 3

BOLT

A325 TYPE 1 STRUCTURAL BOLT H.D. GALV.
MARKING: HOLLOW TRIANGLE & 3 RADIAL LINES (OPTIONAL) & A-325

LOT NO.	MANUFACTURED BY	HARDNESS (ROCKWELL)	PROOF LOAD (LBS)	TENSILE STRENGTH (LBS)	
0408-60008 3451G	INFASCO	HRC 25.0 - HRC 34.0	MIN: 51,500	MIN: 72,700	
MEAN VALUE		31.0	PASS	88,133	

HEAT NO.	C %	Mn %	P %	S %	Si %	Cu %			
C52464	0.37	1.02	0.006	0.010	0.19	0.06			

NUT

HVY HEX NUT A563 GR DH UNC OVERSIZE H.D. GALV.
MARKING: TRIANGLE & DH

LOT NO.	MANUFACTURED BY	HARDNESS (ROCKWELL)	PROOF LOAD (LBS)		
0409-60479 3151G	INFASCO	HRC 24.0 - HRC 38.0	MIN: 90,900		
MEAN VALUE		28.6	PASS		

HEAT NO.	C %	Mn %	P %	S %	Si %	Cu %			
C50825	0.44	0.82	0.008	0.015	0.22	0.06			

TESTED FOR ROTATIONAL CAPACITY WITH A TENSION MEASURING DEVICE, IN ACCORDANCE WITH SECTION 10.2 OF ASTM-A-325. THE ASSEMBLY MEETS THE REQUIREMENTS OF ASTM A 325, SECTION 6.3
-NUTS LUBRICATED.

Abdelhaq El Ouardi, eng.
ISO Coordinator

700 Ouellette, Marinville (Quebec) J3M 1P8
Tel.: (450) 658-8741 Fax: (450) 460-6496

Division of IFASTGROUPE and Company, Limited
Partnership (Ifastgroupe Inc., General partner)

INFASCO
Bolts, nuts and fastener products

SET NO.: 2005-22585

FASTENER TEST REPORT

(THIS DOCUMENT MAY BE REPRODUCED, BUT ONLY IN ITS ENTIRETY)

DATE: 2005-07-12

DESCRIPTION A325-1+A563-DH O/S
1-8 X 3

BOLT

A325 TYPE 1 STRUCTURAL BOLT H.D. GALV.
MARKING: HOLLOW TRIANGLE & 3 RADIAL LINES (OPTIONAL) & A-325

LOT NO.	MANUFACTURED BY	HARDNESS (ROCKWELL)	PROOF LOAD (LBS)	TENSILE STRENGTH (LBS)	
0504-54146 0990G	INFASCO	HRC 25.0 - HRC 34.0	MIN: 51,500	MIN: 72,700	
MEAN VALUE		30.9	PASS	88,966	

HEAT NO.	C %	Mn %	P %	S %	Si %	Cu %			
C54931	0.38	1.01	0.008	0.018	0.18	0.15			

NUT

HVY HEX NUT A563 GR DH UNC OVERSIZE H.D. GALV.
MARKING: TRIANGLE & DH

LOT NO.	MANUFACTURED BY	HARDNESS (ROCKWELL)	PROOF LOAD (LBS)		
0502-51320 5910G	INFASCO	HRC 24.0 - HRC 38.0	MIN: 90,900		
MEAN VALUE		27.1	PASS		

HEAT NO.	C %	Mn %	P %	S %	Si %				
IA76295	0.44	0.74	0.009	0.013	0.18				

TESTED FOR ROTATIONAL CAPACITY WITH A TENSION MEASURING DEVICE, IN ACCORDANCE WITH SECTION 10.2 OF ASTM-A-325. THE ASSEMBLY MEETS THE REQUIREMENTS OF ASTM A 325, SECTION 6.3
-NUTS LUBRICATED.

Gabriel Landry, eng.
Quality Assurance Engineer

INFASCO
A division of Ifastgroupe LP
A Heico Company
700 Ouellette, Marieville (Quebec) J3M 1P5
Tel.: (450) 658-8741 Fax: (450) 460-5496

INFASCO
Bolts, nuts and fastener products

LOT NO.: 0504-54146
0990G

FASTENER TEST REPORT

(THIS DOCUMENT MAY BE REPRODUCED, BUT ONLY IN ITS ENTIRETY)

DATE 2005-06-02

DESCRIPTION AND MARKING: A325 TYPE 1 STRUCTURAL BOLT H.D. GALV.
HOLLOW TRIANGLE & 3 RADIAL LINES(OPTIONAL) & A-325

SIZE	GRADE	QUANTITY
1-8 X 3	1037MB	36,400

HEAT CHEMICAL ANALYSIS

HEAT NO.	C %	Mn %	P %	S %	Si %	Cu %			
C54931	0.38	1.01	0.008	0.018	0.18	0.15			

METHOD	ASTM F606	ASTM F606			ASTM F606		ASTM E376
	PROOF LOAD (psi)	WEDGE TENSILE STRENGTH (psi)	SHEAR STRENGTH	SURFACE HARDNESS (HR 30N)	CORE HARDNESS (ROCKWELL)	MICRO HARDNESS	COATING THICKNESS (0.001 in)
SPEC. MIN.	85,000	120,000			HRC 25.0		2.00
SPEC. MAX:					HRC 34.0		
SAMPLE NO.1	85,000	148,000			HRC 30.8		3.76
SAMPLE NO.2	85,000	147,000			30.8		3.55
SAMPLE NO.3	85,000	146,000			31.3		3.11
SAMPLE NO.4					32.4		3.69
SAMPLE NO.5					29.4		

THE ABOVE TESTED SAMPLES HAVE BEEN INSPECTED FOR VISUAL DISCONTINUITIES AND FOUND ACCEPTABLE.
THEY COMPLY IN ALL RESPECTS WITH THE FOLLOWING SPECS:
ASTM A325 TYPE 1 ASME B18.2.6, THREADS PER ANSI B1.1 CLASS 2A. UNLESS OTHERWISE SPECIFIED.
MEETS THE SURFACE DISCONTINUITIES REQUIREMENTS
ASTM-A-153 Class C
THESE FASTENERS WERE OIL QUENCHED AND TEMPERED AT A TEMP. ABOVE 900°F.

MANUFACTURED BY: INFASCO

Raw material used to manufacture
fasteners is mercury and asbestos-free.
Fasteners were tested in the bare metal condition.

INFASCO
A division of Ifastgroupe LP
A Heico Company
700 Ouellette, Marieville (Quebec) J3M 1P6
Tel.: (450) 660-8741 Fax: (450) 460-5496

Gabriel Landry, eng.
Quality Assurance Engineer

INFASCO
Bolts, nuts and fastener products

LOT NO.: 0502-51320
5910G

FASTENER TEST REPORT

(THIS DOCUMENT MAY BE REPRODUCED, BUT ONLY IN ITS ENTIRETY)

DATE 2005-04-13

DESCRIPTION AND MARKING: HVY HEX NUT A563 GR DH UNC OVERSIZE HDG + LUB
TRIANGLE & DH

SIZE	GRADE	QUANTITY
1-8 .024 O/S	1046V	101,000

HEAT CHEMICAL ANALYSIS

HEAT NO.	C %	Mn %	P %	S %	Bi %				
IA76295	0.44	0.74	0.009	0.013	0.18				

METHOD	ASTM F606	ASTM F606			ASTM F606		ASTM B378
SAMPLES SELECTED BY: 0206	PROOF LOAD (psi)	WEDGE TENSILE STRENGTH	SHEAR STRENGTH	SURFACE HARDNESS (HR 30N)	CORE HARDNESS (ROCKWELL)	MICRO HARDNESS	COATING THICKNESS (0.001 in)
SPEC. MIN. SPEC. MAX:	150,000				HRC 24.0 HRC 38.0		2.00
SAMPLE NO.1	150,000				HRC 27.7		2.94
SAMPLE NO.2	150,000				27.2		3.51
SAMPLE NO.3	150,000				26.6		2.41
SAMPLE NO.4	150,000				27.5		2.02
SAMPLE NO.5	150,000				26.7		

THE ABOVE TESTED SAMPLES HAVE BEEN INSPECTED FOR VISUAL DISCONTINUITIES AND FOUND ACCEPTABLE.
THEY COMPLY IN ALL RESPECTS WITH THE FOLLOWING SPECS:
ASTM A563 DH AND ASME B18.2.2, THREADS PER ASME B1.1 CLASS 2B UNLESS OTHERWISE SPECIFIED.

ASTM-A-153 CLASS C + LUBRICANT

MANUFACTURED BY: INFASCO

Raw material used to manufacture fasteners is mercury and asbestos-free.
Fasteners were tested in the bare metal condition.

Gabriel Landry, eng.
Quality Assurance Engineer

INFASCO
A division of Reinforcement LP
A Heico Company
700 Ouellette, Marieville (Quebec) J3M 1P8
Tel.: (450) 658-8741 Fax: (450) 460-3490

INFASCO

BOLTS, NUTS AND FASTENER PRODUCTS

SET NO.: 2004-20126

FASTENER TEST REPORT

(THIS DOCUMENT MAY BE REPRODUCED, BUT ONLY IN ITS ENTIRETY)

DATE: 2004-12-08

DESCRIPTION A325-1+A563-C
3/4-10 X 2 1/4

BOLT

A325 TYPE 1 STRUCTURAL BOLT
MARKING: HOLLOW TRIANGLE & 3 RADIAL LINES (OPTIONAL) & A-325

LOT NO.	MANUFACTURED BY	HARDNESS (ROCKWELL)	PROOF LOAD (LBS)	TENSILE STRENGTH (LBS)	
0409-61704	INFASCO	HRC 25.0 - HRC 34.0	MIN: 28,400	MIN: 40,100	
MEAN VALUE		32.5	PASS	48,800	

HEAT NO.	C %	Mn %	P %	S %	Si %				
A76254	0.37	0.94	0.008	0.023	0.19				

NUT

HVY HEX NUT A563 GR C UNC
MARKING: TRIANGLE & 3 CIRCUMFERENTIAL LINES 120 DEG APART

LOT NO.	MANUFACTURED BY	HARDNESS (ROCKWELL)	PROOF LOAD (LBS)		
0410-61958	INFASCO	HRBW 78.0 - HRC 38.0	MIN: 48,100		
MEAN VALUE		93.4	PASS		

HEAT NO.	C %	Mn %	P %	S %	Si %				
095539	0.43	0.83	0.013	0.011	0.23				

Daniel Guilbault
Quality Assurance Foreman

700 Ouellette, Marieville (Quebec) J3M 1P8
Tel.: (450) 658-8741 Fax: (450) 460-5496

Division of IFASTGROUPE and Company, Limited
Partnership (Ifastgroupe Inc., General partner)

INFASCO
BOLTS, NUTS AND FASTENER PRODUCTS

SET NO.: 2004-19431

FASTENER TEST REPORT

(THIS DOCUMENT MAY BE REPRODUCED, BUT ONLY IN ITS ENTIRETY)

DATE: 2004-10-04

DESCRIPTION: A325-1+A563-DH O/S
3/4-10 X 2

BOLT

A325 TYPE 1 STRUCTURAL BOLT H.D. GALV.
MARKING: HOLLOW TRIANGLE & 3 RADIAL LINES (OPTIONAL) & A-325

LOT NO.	MANUFACTURED BY	HARDNESS (ROCKWELL)	PROOF LOAD (LBS)	TENSILE STRENGTH (LBS)	
0417-6B002 1878G	VERMONT FASTENERS	HRC 25.0 - HRC 34.0	MIN: 28,400	MIN: 40,100	
MEAN VALUE		29.7	PASS	46,533	

HEAT NO.	C %	Mn %	P %	S %	Si %				
A74094	0.34	0.93	0.009	0.013	0.21				

NUT

HVY HEX NUT A563 GR DH UNC OVERSIZE H.D. GALV.
MARKING: TRIANGLE & DH

LOT NO.	MANUFACTURED BY	HARDNESS (ROCKWELL)	PROOF LOAD (LBS)		
0405-56066 1904G	INFASCO	HRC 24.0 - HRC 38.0	MIN: 50,100		
MEAN VALUE		29.4	PASS		

HEAT NO.	C %	Mn %	P %	S %	Si %	Cu %			
C50366	0.44	0.85	0.010	0.013	0.22	0.06			

TESTED FOR ROTATIONAL CAPACITY WITH A TENSION MEASURING DEVICE, IN ACCORDANCE WITH SECTION 10.2 OF ASTM-A-325. THE ASSEMBLY MEETS THE REQUIREMENTS OF ASTM A 325, SECTION 6.3
-NUTS LUBRICATED.

Daniel Guilbault
Quality Assurance Foreman

700 Ouellette, Marieville (Quebec) J3M 1P6
Tel.: (450) 658-8741 Fax: (450) 460-5466
Division of IFASTGROUPE and Company, Limited
Partnership (Ifastgroupe Inc., General partner)

INFASCO

BOLTS, NUTS AND FASTENER PRODUCTS

SET NO.: 2004-19448

FASTENER TEST REPORT

(THIS DOCUMENT MAY BE REPRODUCED, BUT ONLY IN ITS ENTIRETY)

DATE: 2004-10-07

DESCRIPTION	A325-1+A563-DH O/S 5/8-11 X 1 3/4

BOLT

A325 TYPE 1 STRUCTURAL BOLT H.D. GALV.
MARKING: HOLLOW TRIANGLE & 3 RADIAL LINES (OPTIONAL) & A-325

LOT NO.	MANUFACTURED BY	HARDNESS (ROCKWELL)	PROOF LOAD (LBS)	TENSILE STRENGTH (LBS)	
0406-58526 1536G	INFASCO	HRC 25.0 - HRC 34.0	MIN: 19,200	MIN: 27,100	
MEAN VALUE		30.9	PASS	32,472	

HEAT NO.	C %	Mn %	P %	S %	Si %				
A73200	0.37	0.92	0.007	0.008	0.23				

NUT

HVY HEX NUT A563 GR DH UNC OVERSIZE H.D. GALV.
MARKING: TRIANGLE & DH

LOT NO.	MANUFACTURED BY	HARDNESS (ROCKWELL)	PROOF LOAD (LBS)		
0403-54015 1787G	INFASCO	HRC 24.0 - HRC 38.0	MIN: 33,900		
MEAN VALUE		30.4	PASS		

HEAT NO.	C %	Mn %	P %	S %	Si %	Cu %			
C50362	0.45	0.85	0.012	0.019	0.22	0.16			

TESTED FOR ROTATIONAL CAPACITY WITH A TENSION MEASURING DEVICE, IN ACCORDANCE WITH SECTION 10.2 OF ASTM-A-325. THE ASSEMBLY MEETS THE REQUIREMENTS OF ASTM A 325, SECTION 6.3
-NUTS LUBRICATED.

Daniel Guilbault
Quality Assurance Foreman

700 Ouellette, Marieville (Quebec) J3M 1P6
Tel.: (450) 658-8741 Fax: (450) 460-5498

Division of IFASTGROUPE and Company, Limited
Partnership (Ifastgroupe Inc., General partner)

TECHNICAL STAMPING TSI EST. 1991

TECHNICAL STAMPING, INC.

50820 E. RUSSELL SCHMIDT BLVD.
CHESTERFIELD TWP., MI 48051
PH(586)949-3265 / FX(586)949-3266

MATERIAL CERTIFICATION

CUSTOMER	[illegible]	[illegible]
	109192-1	2/15/02

PART NO./SIZE	[illegible]	[illegible]
3/4" F436 USTR34GV	0112-121	60,000

STEEL GRADE								
	2115006	.39	.84	.011	.002	.22	.048	Rel.

SPECIFICATION		ACTUAL	GAUGE
O.D	1.438 - 1.500	1.447 - 1.449	CALIPER
I.D	.813 - .844	.823 - .826	CALIPER, PIN GAUGE
THICKNESS	.122 - .177	.130 - .132	MICROMETER
FLATNESS	MAX .010	.002	CALIPER
STEEL			
HEAT TREAT		SEE CERT	
PLATING		SEE CERT	
OTHER			

WE HEREBY CERTIFY THAT THE SUBJECT PARTS CONFORM TO THE REQUIREMENTS OF THE APPLICABLE SPECIFICATIONS INDICATED FOR THE SUBJECT PARTS AND ARE IN COMPLETE CONFORMANCE TO ASTM F436 HARDENED TO RC 38-45.
THE MATERIAL WAS MELTED DOMESTICALLY. THE SUBJECT PARTS WERE MANUFACTURED DOMESTICALLY IN CHESTERFIELD TWP., MI U.S.A.

Shannon C[illegible]
AUTHORIZED SIGNATURE

2524, 2525

1029

SABRE STEEL INC.

23680 Research Drive
Farmington Hills, MI 48335

PH. (248) 615-0500
FAX (248) 615-0508

CERTIFICATE of ANALYSIS

CUSTOMER	CUSTOMER ORDER NUMBER
Technical Stampings	V&B

	GAUGE & WIDTH	GRADE	WORK ORDER
2524	122 mm .295	C1040	7029
2525	182 mm 4.310		

COIL	HEAT	C	MN	P	S	SI	AL	[illegible]	V
	2115001	.39	.84	.011	.002	.22	.048		

HEAT NUMBER	YIELD PSI	TENSILE PSI	ELONGATION	ROCKWELL	OTHER TEST

MADE AND MELTED
IN THE USA

REMARKS:

THE ABOVE PHYSICAL AND CHEMICAL ANALYSIS WERE SUPPLIED BY THE PRODUCING MILL OR TESTED ON OUR OWN EQUIPMENT, OR AN INDEPENDENT LABORATORY.

BY: [signature]

QF-097 REV. DATE [illegible]

PURE METAL GALVANIZING

Date 9/18/01

Technical Stamping Inc.
50600E Russel Schmidt
Chesterfield, Michigan
U.S.A. 48051

Attention: Shannon

Material galvanized on your Purchase Order Number #6028 – 5/8" F436;LOT# 4191 has been done in accordance with the General Requirements outlined in CAN/CSA-G164 – M92, "Hot Dip Galvanizing of Irregularly Shaped Articles" and ASTM A153, "Zinc Coating (Hot Dip) on Iron & Steel Hardware". Random inspection of production galvanizing indicates that specified coating weights are routinely met.

Yours truly
PURE METAL GALVANIZING

R. Bruce Hook
Plant Manager

RBH:js

INFASCO

BOLTS, NUTS AND FASTENER PRODUCTS

I. T O.: 9805-90357

FASTENER TEST REPORT

(THIS DOCUMENT MAY BE REPRODUCED, BUT ONLY IN ITS ENTIRETY)

10314
JACK K L & CO
145 WARREN AVE
PORTLAND, ME 04103
USA

PART NO.:	DATE: 1999-04-19
CUSTOMER P.O. NO.: T282	REFERENCE NO.: 04-9663
INVOICE DATE: 1999-04	INVOICE NO.: Infasco 225768

DESCRIPTION AND MARKING: F-436-1 STRUCTURAL WASHER H.D. GALV.

SIZE:	GRADE:	QUANTITY
1 BOLT SIZE	IMP	200,000

HEAT CHEMICAL ANALYSIS

HEAT NO.:	C %	Mn %	P %	S %	Si %				
2117879	0.280	0.850	0.008	0.006	0.210				

MECHANICAL PROPERTIES *(TESTED ACCORDING TO ASTM F606/606M)* CORROSION RE I TANCE *(ASTM B117)*

SAMPLES SELECTED BY: 1957	PROOF LOAD	WEDGE TENSILE STRENGTH	SHEAR STRENGTH	SURFACE I DNESS (R: I	CORE HARDNESS (ROCKWELL)
SPEC. MIN.:					C 26.0
SPEC. MAX.:					C 45.0
SAMPLE NO.1-					C 42.0
NO.2-					41.0
NO.3-					42.0
NO.4-					41.0
NO.5-					42.0

THE ABOVE TESTED SAMPLES COMPLY IN ALL RESPECTS WITH THE FOLLOWING SPE :
ASTM F 436
UNLESS OTHERWISE SPECIFIED
ASTM-A-153

Raw material used by Infasco to manufacture fasteners is mercury and asbestos-free.

Original test r t signed :
by MARCEL JI , Quality assurance manager
Copy of this r eport signed

Manufactured by: UNITED STATES

By: Tra ine Demers

ANCINE DEMERS

700 Ouellette, Marieville (Quebec) Canada J3M 1P6 Division of IFASTGROUPE and Company, Limited

2525

CERTIFICATION

AMP
American Metal Processing

Tel: (586) 757-7144 Fax: (586) 757-8232

Date: 12/14/01
PO #: 1714
Work Order #: 1952
Lot #: 0112-121
Heat #:

TO:
Technical Stamping, Inc.
50600 E. Russell Schmidt Blvd.
Chesterfield Twp, MI 48051
Phone: (810) 948-3285
Fax: (810) 948-3286

Part #: F0034
Description: washer

Material Chemistry assumed for this order

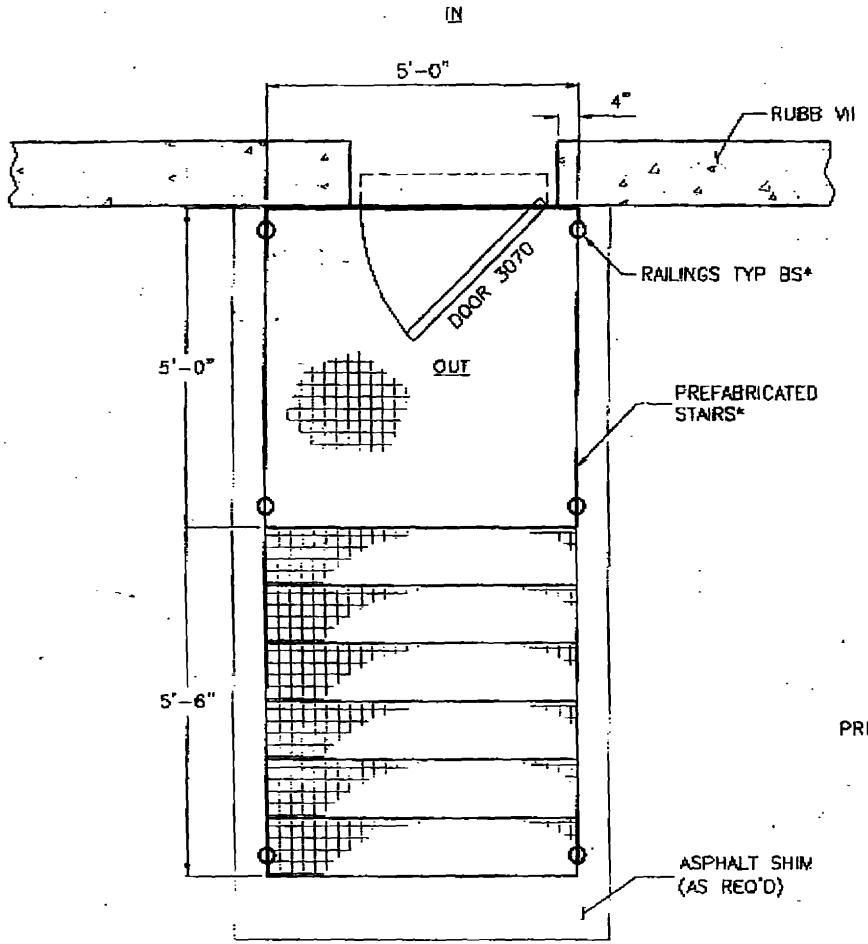
Element	Weight %	Element	Weight %	Element	Weight %	Element	Weight %
C	0.39	Si	0.00	Cr	0.00	V	0.00
Mn	0.84	Ni	0.00	Mo	0.00	P	0.00

		Surface Hardness	Total Case Depth	Core Hardness	Eff. Case Depth
Scale / Units		HRC	inches		inches
Comments					
Customer Requirements:	minimum	38.00			
	maximum	45.00			
Results:		41.40			
		42.41			
		41.31			
		42.87			
		40.99			
		41.48			
		41.46			
		41.33			
		42.32			
		40.69			
		41.34			
		40.99			
		41.68			
		42.11			
		40.65			
		41.60			
		38.62			
		41.51			
		42.15			
		40.72			
Mean:		41.39			
Standard Deviation:		0.88			

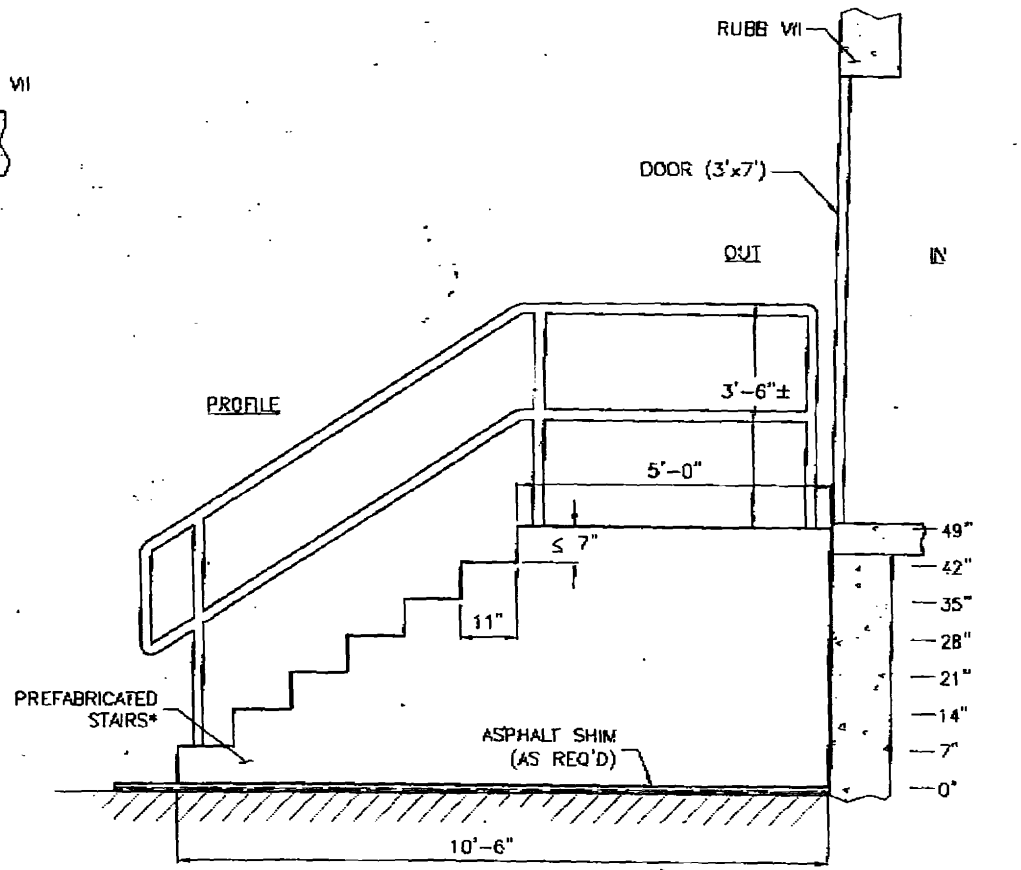
PROJECT: MERRILL MARINE TERMINAL/RUBB BUILDING VII
SUBJECT: PREFABRICATED METAL STAIRS
ITEM: PLAN & PROFILE

GAGNON ENGINEERING INC.
Structural Consultants
198 MAIN STREET
GORHAM, MAINE 04038

DATE: 06/22/05
BY: RG / JC
SHEET: 1 OF 1
PROJECT NO. 407
REV DATE: 06/24/05



PLAN
SCALE: 1/2"=1'-0"



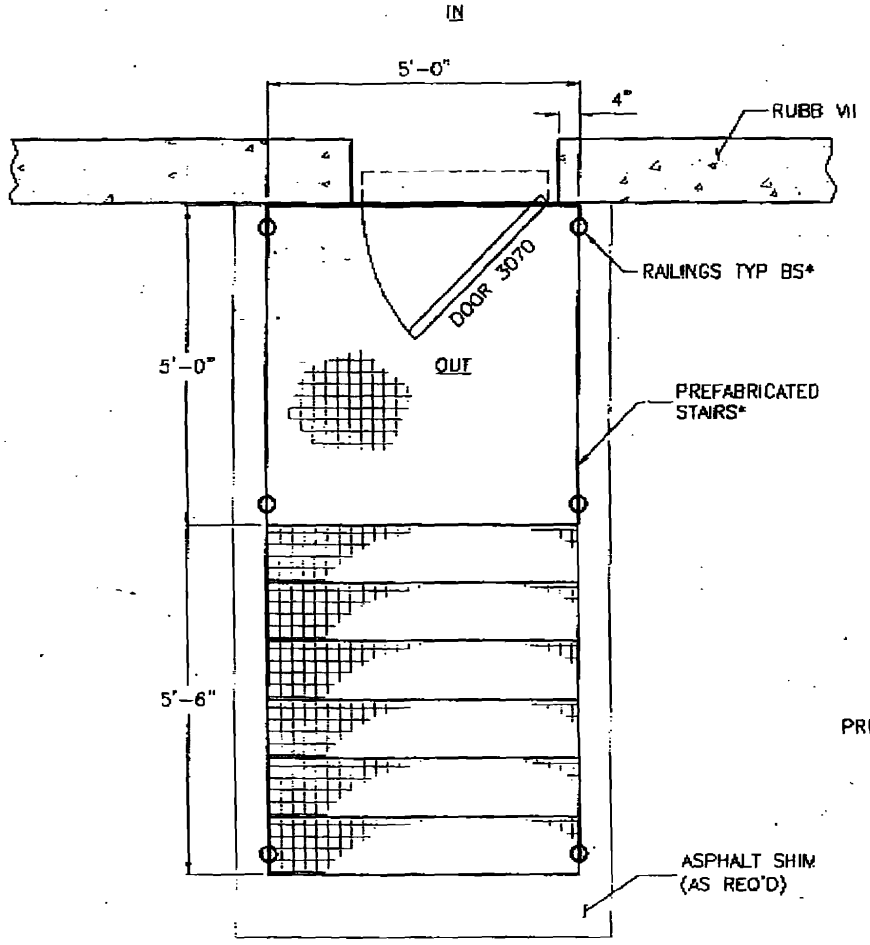
PROFILE
SCALE: 1/2"=1'-0"

*NOTE:
STAIRS & RAILINGS SHALL COMPLY TO IBC SECTION 1009.

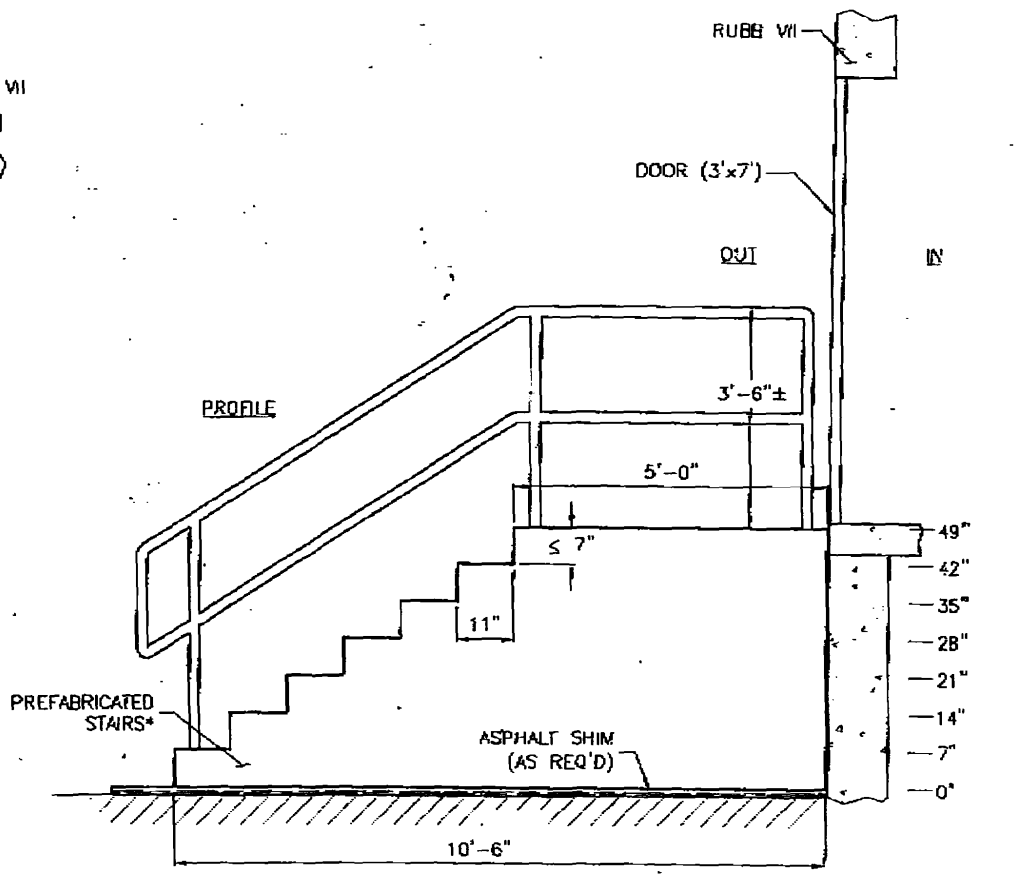
PROJECT: MERRILL MARINE TERMINAL/RUBB BUILDING VII
SUBJECT: PREFABRICATED METAL STAIRS
ITEM: PLAN & PROFILE

GAGNON ENGINEERING INC.
Structural Consultants
198 MAIN STREET
GORHAM, MAINE 04038

DATE: 06/22/05
BY: RG / JC
SHEET: 1 OF 1
PROJECT NO. 407
REV DATE: 06/24/05



PLAN
SCALE: 1/2"=1'-0"



PROFILE
SCALE: 1/2"=1'-0"

*NOTE:
STAIRS & RAILINGS SHALL COMPLY TO IBC SECTION 1009.

GAGNON ENGINEERING, INC.
Structural Consultants

City of Portland
Building Code Enforcement Office
389 Congress Street
Portland, Maine 04101

November 22, 2005

Attn: Michael Nugent, Building Code Enforcement Officer

Re: Merrill – Rubb VII Project (Merrill's Marine Terminal), GEI Plans & Specs, Rev#7, 8/24/05
Special Inspections – Foundations and Site Work

Dear Michael:

This letter serves notice that all Special Inspections were performed in accordance with applicable requirements of Section 1704 of IBC 2003, and as detailed in GEI Project-Specific Special Inspection Forms for Concrete and Site Work, dated 6-14-05.

Materials Testing, Concrete and Earthwork, was performed by S.W.Cole Engineering, Inc. (Agent #2, Gray, Maine) as the Work was installed. I (Gagnon Engineering, Agent #1, Gorham Maine) inspected Details of the Work as Concrete and Earthwork were installed. All Testing and Inspection Work has been documented; all documents and records are on file at our (GEI) office.

Foundation and Site Work was Installed As Designed. Few (minor) discrepancies occurred during Construction; all were satisfactorily resolved. There are no outstanding issues with this Work.

Attached, please find completed Forms a) Report of Special Inspection (interim), and b) Final Report of Special Inspection, for this Project.

I trust that this information meets your immediate needs. Please call if you need more.

Sincerely,

Roger R. Gagnon, P.E.

Attachment:
Special Inspection Reports & Forms (4 shts)

CC: P.D. Merrill
Lou Campbell (Cianbro)
Mark Barnes (Shaw Brothers)
Roger Dimingo (S.W.Cole Engrg.)
File #407

GAGNON ENGINEERING, INC.
Structural Consultants

Final Report of Special Inspections

Project: Merrill / Rubb VII, (Foundations & Site)

Location: West Commercial – Merrill's Marine Terminal

Owner: Merrill's Marine Terminal

Owner's Address: 601A Danforth Street, Portland ME

Agent: Gagnon Engineering, Inc.

Special Inspector: Roger R. Gagnon, P.E.

Inspection Item: Foundations & Site

To the best of my information, knowledge, and belief, the Special Inspections or testing required for this project, and designated for this agent in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments: N/A

(Attach continuation sheets if required to complete the description of corrections.)

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Agent or Special Inspector

ROGER R. GAGNON

Type or print name

11/22/05

Signature Date

STATE OF MAINE
ROGER
R.
GAGNON
3409
REGISTERED
PROFESSIONAL ENGINEER

Licensed Professional Seal

GAGNON ENGINEERING, INC.
Structural Consultants

Report of Special Inspections

Project: Merrill / Rubb VII (Foundations & Site)

Location: West Commercial – Merrill's Marine Terminal

Owner: Merrill's Marine Terminal

Owner's Address: 601A Danforth Street, Portland ME

Agent: Gagnon Engineering, Inc.

Special Inspector: Roger R. Gagnon, P.E.

Inspection Item: Foundations & Site Work

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Comments: N/A

(Attach continuation sheets if required to complete the description of corrections.)

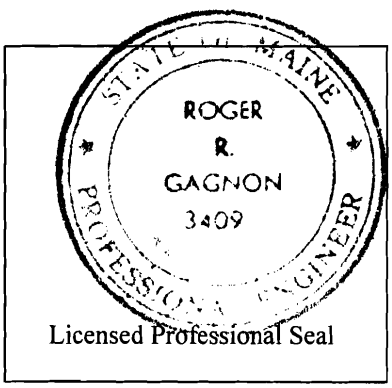
Respectfully submitted,
Agent or Special Inspector

ROGER R. GAGNON, P.E.

Type or print name

11/22/05

Signature Date



Licensed Professional Seal

GAGNON ENGINEERING, INC.
Structural Consultants

Project: Merrill / Rubb VII

Special Inspections: Concrete

Date 06-14-05 By: RG

No.	Item	Agent #	Scope	Freq.
	(1)	(2)		(3)
1	Reinforcing Shop Drawings	#1	Materials, sizes, Layout, General	
			Compliance, Footings, Walls, Slabs	
2	Concrete Mix Designs	#1	Compressice Strength, Ingredients, w/c,	
			Slump, Additives, Walls, Footings, Slabs	
3	Footings	#1	Forms, Steps, Reinforcing	B/C
4	Walls	#1	Forms, Reinforcing, Protect & Cure	B/C
5	Inserts	#1	Anchor Bolts, Anchors & Inserts	B/C
6	Floor Slabs	#1	Reinforcing Layout, Detials, Surface Preps,	C/W
			Concrete Placements, Protect & Cure	
7	Testing	#2	Strength, Air, Slump, etc.	C/W

Notes.

(1) Refer to Contract Plans & Specifications for Details.
(2) Agents:
    #1) Gagnon Engineering, Inc.
    #2) SW Cole Engineering, Inc
(3) Frequency Codes. Perform Initial and work-complete inspections for all items; follow-up as required. Perform intermediate inspections or tests as follows:
    X/R = min percent / random
    C/W = continuous / with work
    B/C = Before covered

REJ

GAGNON ENGINEERING, INC.
Structural Consultants
Gorham, Maine 04038

Tel: (207) 839-8085 Fax: 839-8035

Fax Transmission Cover Sheet

Date: 11/23/05 From: Roger

To: Clint C _____ Fax: 839 5036 Tel: 5039

Co./Org.: Gorham CEO No.of Pgs: 2 (Incl Cover Pg)

Re: Gorham Sports Center

Message: Clint As Requested

Please call with questions or if you need more

Original of Plans are in the mail

Thanks,
Roger

Please Review and Call if Questions, Problems, etc.
Steve Martin 839-6767

Copy: _____ Fax/Tel: _____/_____
File (GEI#): _____

GAGNON ENGINEERING, INC.
Structural Consultants

City of Portland
Building Code Enforcement Office
389 Congress Street
Portland, Maine 04101

Attn: Michael Nugent, Building Code Enforcement Officer

Re: Merrill – Rubb VII Project (Merrill's Marine Terminal), GEI Plans & Specs, Rev#7, 8/24/05
Special Inspections – Foundations and Site Work

Dear Michael:

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Foundation and Site Work was Installed As Designed. Few (minor) discrepancies occurred during Construction; all were satisfactorily resolved. There are no outstanding issues with this Work.

Attached, please find completed Forms a) Report of Special Inspection (interim), and b) Final Report of Special Inspection, for this Project.

I trust that this information meets your immediate needs. Please call if you need more.

Sincerely,

Roger R. Gagnon, P.E.

Attachment:
Special Inspection Reports & Forms (4 shts)

CC: P.D. Merrill
Lou Campbell (Cianbro)
Mark Barnes (Shaw Brothers)
Roger Dimingo (S.W.Cole Engrg.)
File #407

GAGNON ENGINEERING, INC.
Structural Consultants

Final Report of Special Inspections

Project: Merrill / Rubb VII, (Foundations & Site)

Location: West Commercial – Merrill's Marine Terminal

Owner: Merrill's Marine Terminal

Owner's Address: 601A Danforth Street, Portland ME

Agent: Gagnon Engineering, Inc.

Special Inspector: Roger R. Gagnon, P.E.

Inspection Item: Foundations & Site

To the best of my information, knowledge, and belief, the Special Inspections or testing required for this project, and designated for this agent in the *Statement of Special Inspections* submitted for permit, have been performed and all discovered discrepancies have been reported and resolved other than the following:

Comments: N/A

(Attach continuation sheets if required to complete the description of corrections.)

Interim reports submitted prior to this final report form a basis for and are to be considered an integral part of this final report.

Respectfully submitted,
Agent or Special Inspector

ROGER R. GAGNON

Type or print name

11/22/05

Signature Date

STATE OF MAINE
ROGER
R.
GAGNON
3409
PROFESSIONAL ENGINEER

Licensed Professional Seal

GAGNON ENGINEERING, INC.
Structural Consultants

Report of Special Inspections

Project: Merrill / Rubb VII (Foundations & Site)

Location: West Commercial – Merrill's Marine Terminal

Owner: Merrill's Marine Terminal

Owner's Address: 601A Danforth Street, Portland ME

Agent: Gagnon Engineering, Inc.

Special Inspector: Roger R. Gagnon, P.E.

Inspection Item: Foundations & Site Work

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Comments: N/A

(Attach continuation sheets if required to complete the description of corrections.)

Respectfully submitted,
Agent or Special Inspector

ROGER R. GAGNON, P.E.

Type or print name

11/22/05

Signature Date

STATE OF MAINE
ROGER
R.
GAGNON
3409
PROFESSIONAL ENGINEER

Licensed Professional Seal

GAGNON ENGINEERING, INC.
Structural Consultants

Project: Merrill / Rubb VII

Special Inspections: Concrete

Date 06-14-05 By: RG

No.	Item	Agent #	Scope	Freq.
	(1)	(2)		(3)
1	Reinforcing Shop Drawings	#1	Materials, sizes, Layout, General	
			Compliance, Footings, Walls, Slabs	
2	Concrete Mix Designs	#1	Compressice Strength, Ingredients, w/c,	
			Slump, Additives, Walls, Footings, Slabs	
3	Footings	#1	Forms, Steps, Reinforcing	B/C
4	Walls	#1	Forms, Reinforcing, Protect & Cure	B/C
5	Inserts	#1	Anchor Bolts, Anchors & Inserts	B/C
6	Floor Slabs	#1	Reinforcing Layout, Detials, Surface Preps,	C/W
			Concrete Placements, Protect & Cure	
7	Testing	#2	Strength, Air, Slump, etc.	C/W

Notes.

(1) Refer to Contract Plans & Specifications for Details.
(2) Agents:
#1) Gagnon Engineering, Inc.
#2) SW Cole Engineering, Inc
(3) Frequency Codes. Perform Initial and work-complete inspections for all items; follow-up as required. Perform intermediate inspections or tests as follows:
X/R = min percent / random
C/W = continuous / with work
B/C = Before covered

GAGNON ENGINEERING, INC.
Structural Consultants

Project: Merrill / Rubb VII

Special Inspections: Site Work

Date: 06-14-05 By: RG

No.	Item	Agent #	Scope	Freq.
	(1)	(2)		(3)
1	General Pre-Excavation & Prep	#1	Asphalt Removal, Pre-Excavation,	50/R
			Proof-Compaction	
2	Wall Excavations	#1	Initial Excavations, Bearing Capacity,	B/C
			Sub-Footing Fills	
3	Wall Fills	#2	Materials, Specs/Gradations, ASTM D1557,	C/W
			Placement, Moisture Contr., Compaction	
4	Sub-Floor Fills	#2	Materials, Specs/Gradations, ASTM D1557,	C/W
			Placement, Moisture Contr., Compaction	
5	Storm & Underdrain	#1	Materials, Prep Install, Back-Fill	50/R

Notes.

(1) Refer to Contract Plans & Specifications for Details.
(2) Agents:
#1) Gagnon Engineering, Inc.
#2) SW Cole Engineering, Inc
(3) Frequency Codes. Perform Initial and work-complete inspections for all items; follow-up as required. Perform intermediate inspections or tests as follows:
X/R = min percent / random
C/W = continuous / with work
B/C = Before covered

Form # P 01

ELECTRICAL PERMIT
City of Portland, Me.

To the Chief Electrical Inspector, Portland Maine:
The undersigned hereby applies for a permit to make electrical installations in accordance with the laws of Maine, the City of Portland Electrical Ordinance, National Electrical Code and the following specifications:

Date 11/2/05
Permit # 2005-5046
CBL# 72 A 3

LOCATION: 601 DANFORTH ST. **METER MAKE & #**
CMP ACCOUNT # **OWNER** SPRAGUE ENERGY
TENANT MERRILL MARINE TERMINAL **PHONE #** 772-3254
SPRAGUE ENERGY

								TOTAL	EACH FEE
OUTLETS	16	Receptacles	7	Switches	12	Smoke Detector		.20	) -
FIXTURES		Incandescent	39	Fluorescent		Strips		.20	7.80
SERVICES	1	Overhead		Underground		TTL AMPS	<800	15.00	15 -
		Overhead		Underground			>800	25.00	
Temporary Service		Overhead		Underground		TTL AMPS		25.00	
								25.00	
METERS		(number of) (PRIMARY METERED)						1.00	
MOTORS	12	(number of)						2.00	24. -
RESID/COM		Electric units						1.00	
HEATING	1	oil/gas units		Interior		Exterior		5.00	5 -
APPLIANCES		Ranges		Cook Tops		Wall Ovens		2.00	
		Insta-Hot		Water heaters		Fans		2.00	
		Dryers		Disposals		Dishwasher		2.00	
		Compactors		Spa		Washing Machine		2.00	
		Others (denote)						2.00	
MISC. (number of)		Air Cond/win						3.00	
		Air Cond/cent				Pools		10.00	
		HVAC		EMS		Thermostat		5.00	
		Signs						10.00	
		Alarms/res						5.00	
		Alarms/com						15.00	
		Heavy Duty(CRKT)						2.00	
		Circus/Carnv						25.00	
		Alterations						5.00	
		Fire Repairs						15.00	
	5	E Lights						1.00	5 -
		E Generators						20.00	
PANELS	1	Service	1	Remote		Main		4.00	8 -
TRANSFORMER		0-25 Kva						5.00	
	1	25-200 Kva						8.00	8. -
		Over 200 Kva						10.00	
						TOTAL AMOUNT DUE			79.80
		MINIMUM FEE/COMMERCIAL 45.00				**MINIMUM FEE**	**35.00**		

DEPT. OF BUILDING INSPECTION CITY OF PORTLAND, ME NOV RECEIVED

CONTRACTORS NAME MILLIKEN BROS. INC **MASTER LIC. #** MS 6001873 99
ADDRESS 434 RIVERSIDE IND. PKWY **LIMITED LIC. #**
TELEPHONE 797-8375

SIGNATURE OF CONTRACTOR

White Copy - Office • Yellow Copy - Applicant

City of Portland, Maine - Building or Use Permit Application

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

PERMIT ISSUED
NOV 5 2005
CITY OF PORTLAND

Permit No:	Issue Date:	CBL:
05-1621		072 A003001

Location of Construction:	Owner Name:	Owner Address:	Phone:
601 Danforth St	Merrill Industries Inc	601 Danforth St	
Business Name:	**Contractor Name:**	**Contractor Address:**	**Phone**
	Protec, Inc.	216 Lafayette Road N Hampton	6039649421
Lessee/Buyer's Name	**Phone:**	**Permit Type:**	**Zone:**
		HVAC	

Past Use:	Proposed Use:	Permit Fee:	Cost of Work:	CEO District:
Commercial	Commercial/ install a Applied Air Direct Vent heating system	$66.00	$4,950.00	3

FIRE DEPT: ☑ Approved ☐ Denied

TO NFPA 54

Signature: Greg Cass

INSPECTION:
Use Group: U Type: HVAC

State Gas Reg

Signature:

Proposed Project Description:
install a Applied Air Direct Vent heating system

PEDESTRIAN ACTIVITIES DISTRICT (P.A.D.)

Action: ☐ Approved ☐ Approved w/Conditions ☐ Denied

Signature: Date:

Permit Taken By:	Date Applied For:
ldobson	11/04/2005

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

Zoning Approval

Special Zone or Reviews	Zoning Appeal	Historic Preservation
☐ Shoreland	☐ Variance	☐ Not in District or Landmark
☐ Wetland	☐ Miscellaneous	☐ Does Not Require Review
☐ Flood Zone	☐ Conditional Use	☐ Requires Review
☐ Subdivision	☐ Interpretation	☐ Approved
☐ Site Plan	☐ Approved	☐ Approved w/Conditions
Maj ☐ Minor ☐ MM ☐	☐ Denied	☐ Denied
Date:	Date:	Date:

CERTIFICATION

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

SIGNATURE OF APPLICANT | ADDRESS | DATE | PHONE

RESPONSIBLE PERSON IN CHARGE OF WORK, TITLE | DATE | PHONE

FILL IN AND SIGN WITH INK

PERMIT ISSUED
NOV 5 2005
CITY OF PORTLAND

APPLICATION FOR PERMIT
HEATING OR POWER EQUIPMENT

To the INSPECTOR OF BUILDINGS, PORTLAND, ME.

The undersigned hereby applies for a permit to install the following heating, cooking or power equipment in accordance with the Laws of Maine, the Building Code of the City of Portland, and the following specifications:

Location / CBL 601 Danforth Street Use of Building Paper Storage Date 11/3/05

Name and address of owner of appliance MERRILL MARINE TERMINAL (SPRAGUE ENERGY)
601A DANFORTH ST. PORTLAND, ME 04103

Installer's name and address PLOTEL, INC.
216 LAFAYETTE RD. N.HAMPTON NH 03862 Telephone 603 964 9471

Location of appliance:
- ☐ Basement
- ☑ Floor
- ☐ Attic
- ☐ Roof

Type of Fuel:
- ☒ Gas
- ☐ Oil
- ☐ Solid

Appliance Name: Applied Air
U.L. Approved ☐ Yes ☐ No

Will appliance be installed in accordance with the manufacture's installation instructions? ☐ Yes ☐ No

IF NO Explain: _____

The Type of License of Installer:
- ☐ Master Plumber # _____
- ☐ Solid Fuel # _____
- ☐ Oil # _____
- ☐ Gas # PNT 3306
- ☐ Other _____

Type of Chimney:
- ☐ Masonry Lined
  Factory built _____
- ☐ Metal
  Factory Built U.L. Listing # _____
- ☑ Direct Vent
  Type 14GA 4305S UL# _____

Type of Fuel Tank
- ☐ Oil
- ☐ Gas

Size of Tank _____

Number of Tanks _____

Distance from Tank to Center of Flame _____ **feet.**

Cost of Work: $ 4,950.00

Permit Fee: $ 75.00

Approved

Fire: _____

Ele.: _____

Bldg.: _____

Approved with Conditions

☐ See attached letter or requirement

_____ Inspector's Signature _____ Date Approved

Signature of Installer _____

White - Inspection Yellow - File Pink - Applicant's Gold - Assessor's Copy

City of Portland, Maine - Building or Use Permit

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

Permit No:	Date Applied For:	CBL:
05-1621	11/04/2005	072 A003001

Location of Construction:	Owner Name:	Owner Address:	Phone:
601 Danforth St	Merrill Industries Inc	601 Danforth St	
Business Name:	**Contractor Name:**	**Contractor Address:**	**Phone**
	Protec, Inc.	216 Lafayette Road N Hampton	(603) 964-9421
Lessee/Buyer's Name	**Phone:**	**Permit Type:**	
		HVAC	

Proposed Use:	Proposed Project Description:
Commercial/ install a Applied Air Direct Vent heating system	install a Applied Air Direct Vent heating system

Dept: Zoning **Status:** Not Applicable **Reviewer:** Tammy Munson **Approval Date:** 11/09/2005

Note: **Ok to Issue:** ☑

Dept: Building **Status:** Approved with Conditions **Reviewer:** Tammy Munson **Approval Date:** 11/09/2005

Note: **Ok to Issue:** ☑

1) The installation must comply with the State of Maine Gas Regulations.

Dept: Fire **Status:** Approved with Conditions **Reviewer:** Cptn Greg Cass **Approval Date:** 11/07/2005

Note: **Ok to Issue:** ☑

1) Install to comply with NFPA 54

11/4/05

COMMERCIAL / INSTALL GAS
HEATING EXHAUST VENT
ARRANGEMENT

ATTN: DONNA

PLEASE EXPEDITE

1950.00

OPERATION

MAINTENANCE

Applied Air

4830 Transport Drive
Dallas TX 75247
T 214.638.6010
F 214.638.3324

4830 TRANSPORT DRIVE DALLAS, TX 75247 (214) 638-6010

Indirect Fired Unit Specification Data: F.O. # 94143

MODEL NUMBER	GHLIFP-400/250/200	UNIT TAG(s)	MERRILL MARINE
UNIT QUANTITY	ONE	BURNER MANUFACTURER	Power Flame
CUSTOMER ORDER #	2866-10110	BURNER MODEL	C2-G-20A
UPPLY AIR VOLUME	61,000 CFM	BURNER MOTOR HP	3/4 HP
SUPPLY FAN	(2) 54"	BURNER MOTOR VOLTAGE	460/3/60
SUPPLY FAN TYPE	PROP	MAXIMUM INPUT BTU/HR	2,500,000
SUPPLY FAN RPM	625	MINIMUM INPUT BTU/HR	833,333
TOTAL STATIC PRESSURE	0.25" W.C.	MAXIMUM OUTPUT BTU/HR	2,000,000
SUPPLY FAN MOTOR HP	7-1/2 HP	TYPE OF FUEL	LP GAS
SUPPLY FAN MOTOR TYPE	ODP	SUPPLY GAS PRESSURE	14"WC
EXHAUSTER MOTOR HP	2 HP	UNIT F.L.A.	28.1 AMPS
EXHAUSTER VOLTAGE	460/3/60	LINE VOLTAGE	460/3/60
INSURANCE APPROVAL	STANDARD	CONTROL VOLTAGE	115/1/60
ETL APPROVAL	YES	CONTROL X-FORMER VA	500

Standard Accessories

							Approx. Weight
✓	Intake / Prop Section						2,585 lbs
✓	Heat Exchanger	☐ S.S. Primary/Mild Steel Tubes		✓ S.S. Primary/S.S. Tubes			5,716 lbs
✓	Extended Grease Lines						
✓	Adjustable Pitch Motor Sheave						
✓	Disconnect Switch						
✓	Burner Control	☐ On-Off	✓ High-Low_Off	☐ Modulating			
☐	High Gas Pressure Regulator	☐ Factory Mounted		☐ Shipped Loose			
☐	1 Damper - Standard Arrangement	☐ Two Position	☐ Locking Quadrant				
☐	2 Dampers - Alternate Arrangement	☐ Modulating	☐ Two Position	☐ Locking Quadrant			
☐	Modulating Damper Control	☐ Mixed Air	☐ Manual Pot	☐ Building Pressure			
☐	Flat Bank Filter - For One Damper	☐ No Filters	☐ Cleanable	☐ Pleated	☐ Throwaway		
☐	Flat Bank Filter - 4 Sides	☐ No Filters	☐ Cleanable	☐ Pleated	☐ Throwaway		
☐	V-Bank Filter	☐ No Filters	☐ Cleanable	☐ Pleated	☐ Throwaway		
✓	Discharge Plenum "Screened"	✓ 3 Sides	☐ 4 Sides	☐ w/ Fresh Air Intake Opening			358 lbs
✓	Discharge Plenum Extension - Uninsulated			Four Foot Extension			576 lbs
☐	Six Blade Propeller Fans						
☐	Painted Cabinet / Accessories						
☐	Heating Coil Section						
☐	Heating Coil Section Coil Type	☐ HW Coil	☐ Steam	☐ Future Coil	☐ Customer Supplied		0 lbs
☐	Electronic Time Clock	☐ Factory Mounted					
☐	Alarm Horn w/ Silencing Switch						
☐	Remote Control Station	☐ NEMA 1	☐ NEMA 12				
☐	Smoke Detector	☐ Factory Mounted					
☐	Night Set-Back Thermostat	☐ Factory Mounted					
☐	U.L. Labeled Control Panel						

Standard Ship Loose Items:

1) SILICONE, 3/16 x 3/4 GASKET, SHEET METAL SCREWS.
2) MANUAL BALL VALVE (GP-11)

Special Notes:

Approximate Shipping Weight: **9,235 lbs**

Prepared By: ***BZP***

Rev #	Rev Date	Description

SEQUENCE OF OPERATION

All safety interlocks are closed and unit main disconnect switch (**SW-01**) is closed.

FAN OPERATION:

FAN ON OFF Switch **(SW-15)** in **ON** position(or relay **RE-15**). Fans will run continuously. The heating circuit is enabled.

FAN ON OFF Switch **(SW-15)** in **OFF** position(or relay **RE-15**). Fans are off. The heating circuit is disabled.

HEAT OPERATION:

HEAT ON OFF (relay **RE-16**)in **ON** position. If return air temperature falls below the set point of return air ductstat **(TC-55)**, and all safety interlocks are satisfied, then the induced draft fan and burner motors will be energized, and the flame safety relay **(RE-02)** will begin a ninety second pre-purge cycle. After the purge is complete the flame safety relay checks that both the induced draft fan **(PS-01)** and burner **(PS-02)** air flow switches are made before attempting to light the pilot. Once pilot is proven the main gas valve **(VG-02)** and auxilary gas valve **(VG-03)** are energized. If the temperature continues to fall below the second stage set point of return air thermostat **(TC-55)** then the burner will cycle to high fire.

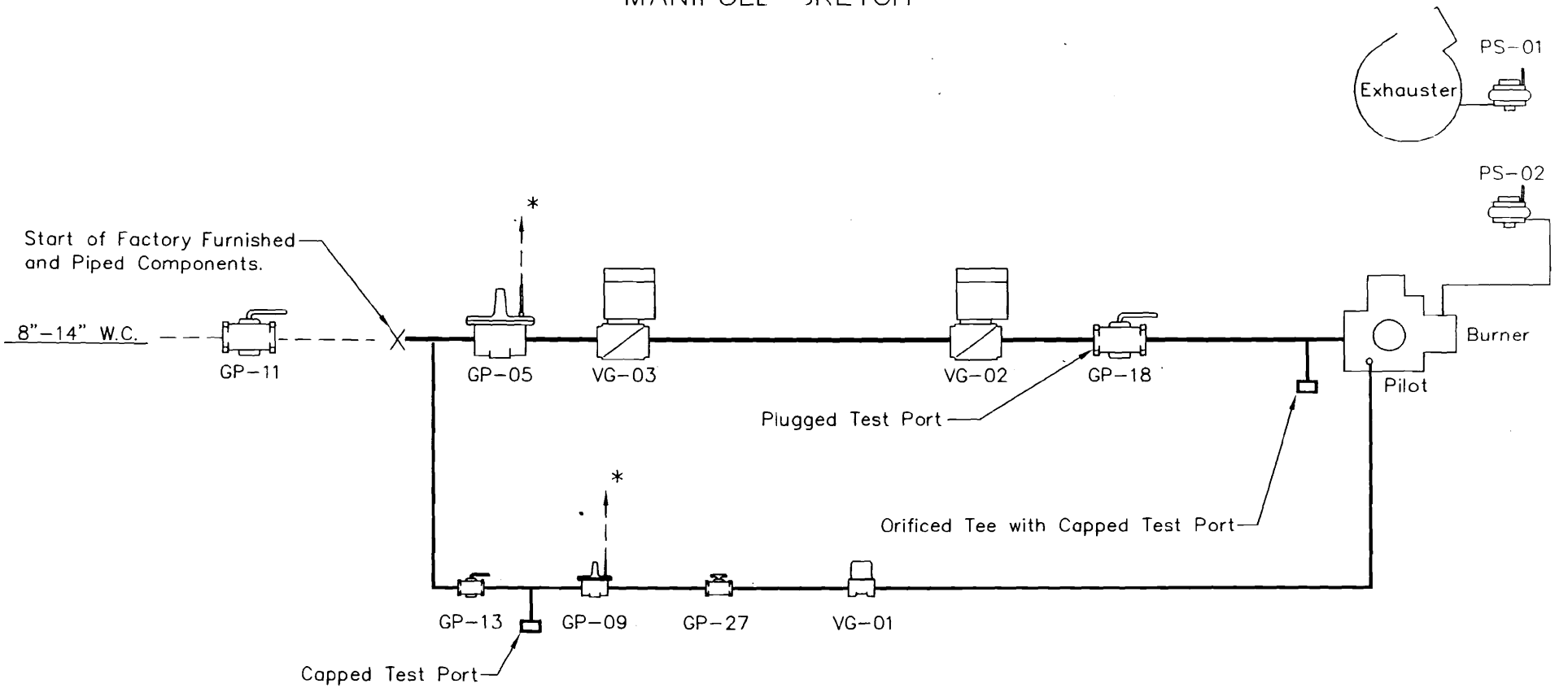
HEAT ON OFF (relay **RE-16**) in **OFF** position. The burner circuit is disabled.

FAN SWITCH (FL-01): In the event that the heat exchanger temperature is above the set point on the the fan switch **(FL-01)** the fan switch will energize the main fan motor starter **(ST-01)** to cool down the combustion chamber. **Caution:** Latent heat in the system may cause main fans to start unexpectedly. Always open and lock out main power supply before servicing equipment.

INTERLOCKING RELAY: Energized when fan is on

Applied Air	REV: 0	TITLE: INDIRECT FIRED UNIT SEQUENCE OF OPERATION			DRAWING NO. SI—94143
	F.O. NO. 94143	TAG: MERRILE MARINE	DRN. BY: BZP	DATE: 08.22.05	

MANIFOLL SKETCH



BTU/Hr. OUTPUT	350,000 ~~THRU 750,000~~	850,000 THRU 1,250,000	~~1,500,000 THRU~~ 1,750,000	2,000,000
PIPE SIZE	1"	1-1/4"	1-1/2"	2"

MARK	DESCRIPTION
GP-05	MAIN GAS PRESSURE REGULATOR
GP-09	PILOT GAS PRESSURE REGULATOR
GP-11	GAS SHUT-OFF VALVE (SHIP LOOSE)
GP-13	PILOT GAS SHUT-OFF VALVE
GP-18	AUXILIARY GAS SHUT-OFF VALVE
GP-27	ORIFICED NEEDLE VALVE
PS-02	BURNER AIR FLOW SWITCH
PS-01	DRAFT PROVING SWITCH
VG-01	PILOT GAS VALVE
VG-02	MAIN GAS VALVE (3 POSITION)
VG-03	AUXILIARY GAS VALVE

GAS PIPING - INDIRECT FIRED NOTES

BTU BASED ON 8" INLET NATURAL GAS

- - DENOTES PIPING BY OTHERS

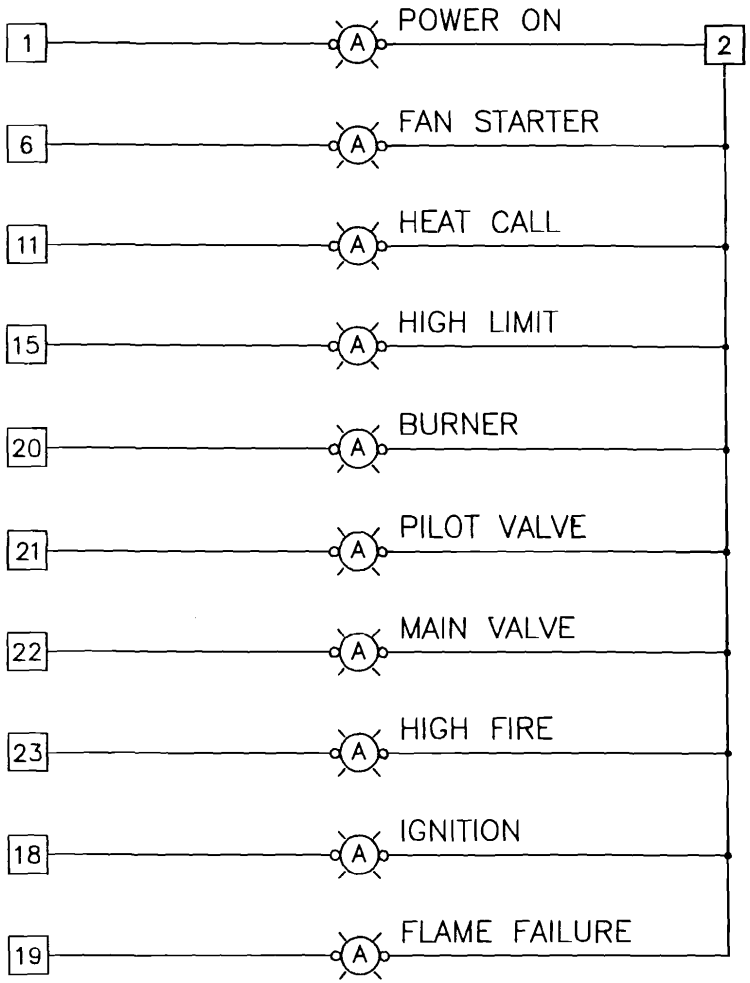
* VENT LIMITING DEVICES ARE PROVIDED WHEREVER POSSIBLE, WHEN VENTING IS REQUIRED THE VENTING TO OUTSIDE IS BY OTHERS ON INDOOR UNITS, FURNISHED BY FACTORY ON OUTDOOR UNITS.

REV	DATE	BY	DESCRIPTION
1	03/19/03	R.B.	SWITCHED POSITIONS WITH VG-01 & GP-27

Applied Air

TITLE: OFF/LOW/HIGH
STANDARD-SINGLE STAGE INDIRECT FIRED

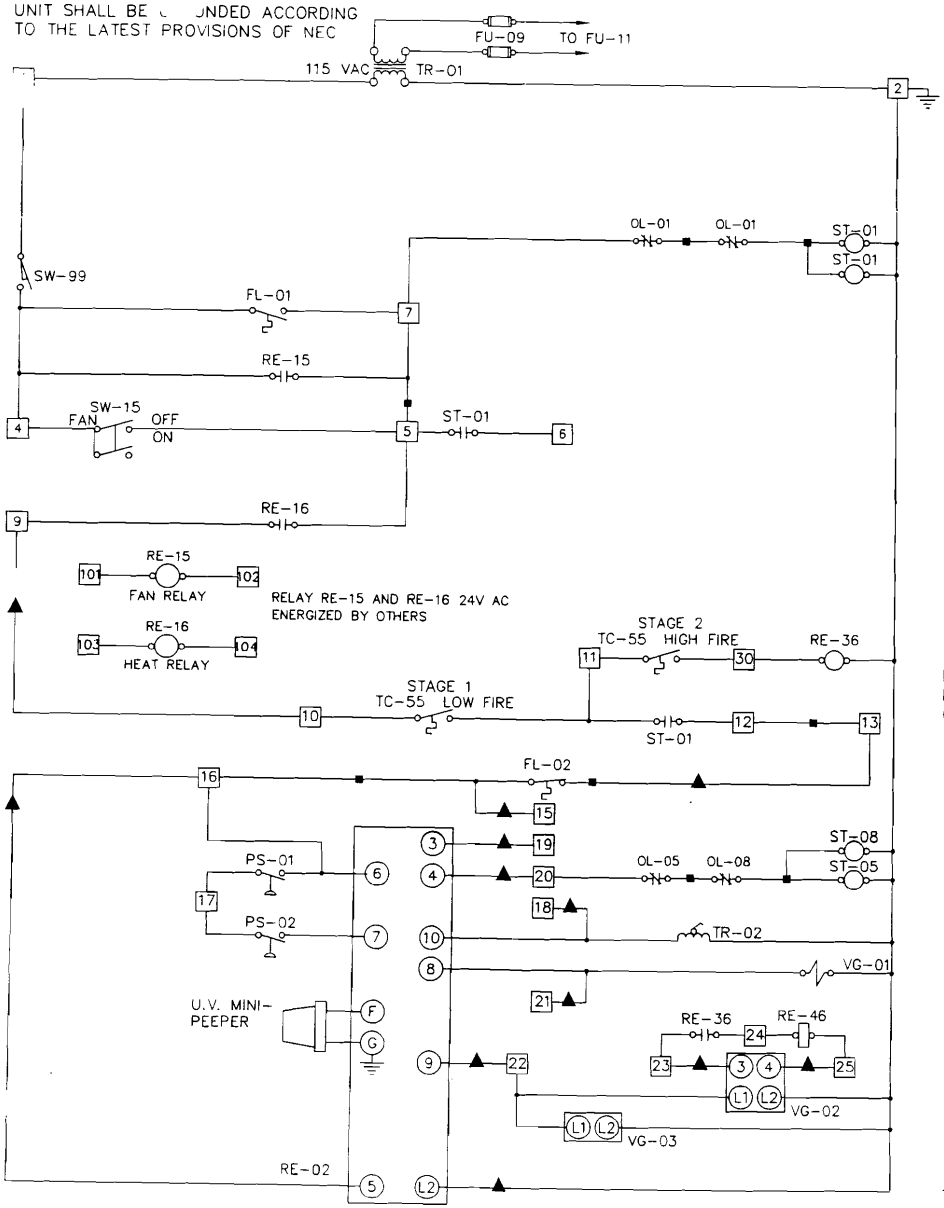
SCALE:		TAG: MERRILL MARINE	
REV:	1	F.O.#: 94143	DRAWING NO. PI-94143
BY:	BZP	DATE: 01/10/03	

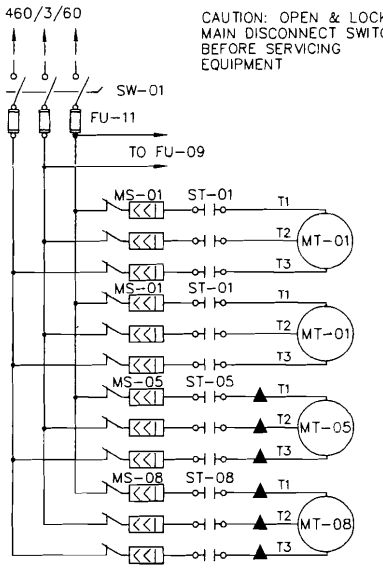


☐ DENOTES CONTROL CABINET TERMINAL

Applied Air

REV:	TITLE:				DRAWING NO.
0	10 POINT CIRCUIT ANALYZER MOUNTED AND WIRED				AI-94143
F.O. NO.	TAG:	DRN. BY:	DATE:		
94143	MERRILL MARINE	BZP	08.22.05		





NOTES

NOTE: BECAUSE OF SHIPPING RESTRICTIONS FIELD CONNECTIONS AND/OR WIRING BETWEEN COMPONENTS OR SECTIONS MAY BE REQUIRED

- ○ DENOTES COMPONENT TERMINAL NUMBER AND WIRING
- DENOTES JUMPER WIRE
- DENOTES WIRE CONNECTION
- □ DENOTES CONTROL CABINET TERMINAL BLOCK & WIRE NUMBER
- ⬡ DENOTES BURNER TERMINAL BLOCK & WIRE NUMBER
- - - DENOTES WIRING BY OTHERS
- DENOTES WIRE NUMBER LEADS
- DENOTES WIRE CONNECTION BY OTHERS BETWEEN HEAT EXCHANGER J-BOX AND MAIN CONTROL CABINET AFTER FIELD MOUNTING OF SECTIONS
- △ DENOTES COMPONENTS BY OTHERS

1-TO-99 TERMINAL BLOCK-115 VOLT
101-TO-199 TERMINAL BLOCK-24 VOLT

COMPONENT IDENTIFICATION

FL-01	FAN SWITCH
FL-02	HIGH TEMPERATURE LIMIT SWITCH (AUTO)
FU-09	CONTROL TRANSFORMER FUSE
FU-11	MAIN DISCONNECT FUSE
MS-01	MANUAL MAIN MOTOR PROTECTOR
MS-05	MANUAL INDUCED DRAFT FAN PROTECTOR
MS-08	MANUAL BURNER FAN PROTECTOR
MT-01	MAIN SUPPLY FAN MOTOR
MT-05	INDUCED DRAFT FAN MOTOR
MT-08	BURNER MOTOR
PS-01	DRAFT PROVING SWITCH
PS-02	BURNER AIR SWITCH
RE-02	BURNER RELAY
RE-15	FAN RELAY (24V)
RE-16	HEAT RELAY (24V)
RE-36	HIGH FIRE RELAY
RE-46	TIME DELAY RELAY (SET @ 10 SEC.)
ST-01	MAIN SUPPLY FAN MOTOR STARTER
ST-05	INDUCED DRAFT FAN MOTOR STARTER
ST-08	BURNER FAN MOTOR STARTER
SW-01	MAIN DISCONNECT SWITCH
SW-15	FAN ON-OFF SWITCH
SW-16	HEAT ON-OFF SWITCH
SW-99	DOOR INTERLOCK SWITCH
TC-55	2 STAGE RETURN AIR DUCTSTAT
TR-01	CONTROL VOLTAGE TRANSFORMER
TR-02	GAS IGNITION TRANSFORMER
VG-01	PILOT GAS VALVE
VG-02	MAIN GAS VALVE
VG-03	AUX. GAS VALVE

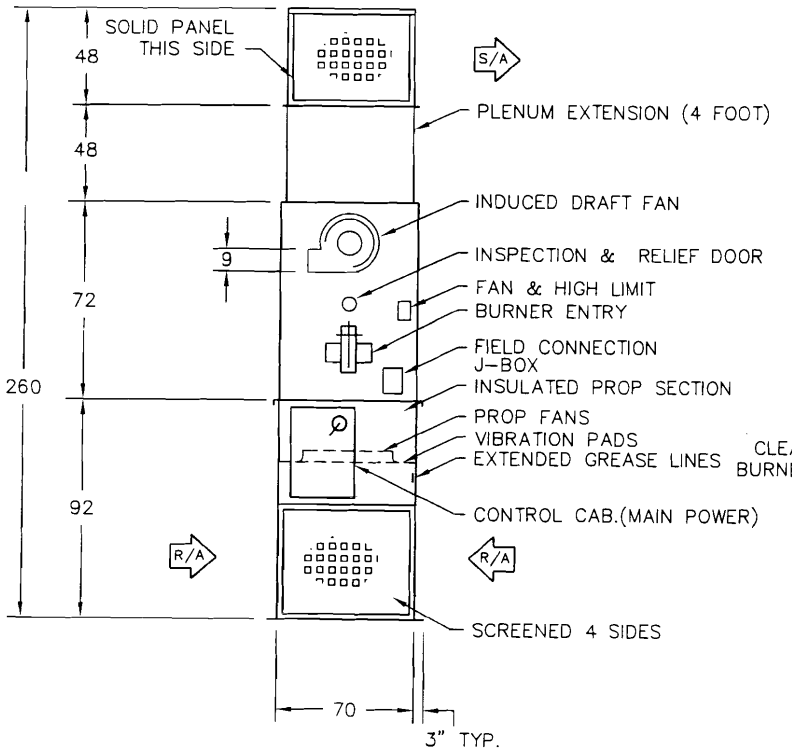
REV	DATE	BY	DESCRIPTION

Applied Air

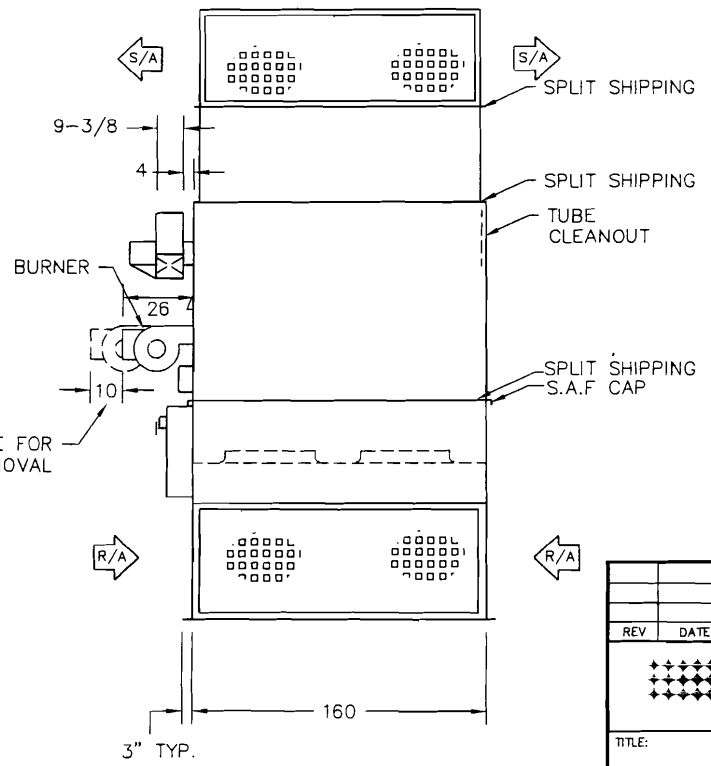
TITLE:	GHLIFP-400/250/200		
SCALE:		TAG:	MERRILL MARINE
REV.	0	F.O.#:	94143
BY:	BZP	DATE:	08.22.05
		DRAWING NO.	WI-94143

NOTES

1. UNIT SUITABLE FOR INDOOR APPLICATION.
2. DISCHARGE SECTION SHIPPED KNOCKED DOWN.
3. DISCHARGE PLENUM EXTENSION 4 FOOT.



FRONT



RIGHT SIDE

REV	DATE	BY	DESCRIPTION

Applied Air

TITLE:	GHLIFP-400/250/200		
SCALE:		TAG:	MARRILL MARINE
REV:	0	F.O.#:	94143
BY:	BZP	DATE:	08.22.05
		DRAWING NO.	DI-94143

Applied Air

INSTALLATION, OPERATION AND MAINTENANCE MANUAL FOR INDIRECT GAS-FIRED HEATERS

ATTENTION: READ THIS MANUAL AND ALL LABELS ATTACHED TO THE UNIT CAREFULLY BEFORE ATTEMPTING TO INSTALL, OPERATE OR SERVICE THESE UNITS! CHECK UNIT DATA PLATE FOR TYPE OF GAS AND ELECTRICAL SPECIFICATIONS AND MAKE CERTAIN THAT THESE AGREE WITH THOSE AT POINT OF INSTALLATION. RECORD THE UNIT MODEL AND SERIAL No.(s) IN THE SPACE PROVIDED. RETAIN FOR FUTURE REFERENCE.

FOR YOUR SAFETY

The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.

POUR VOTRE SÉCURITÉ

L'utilisation et l'entreposage d'essence ou d'autres liquides ou produits émettant des vapeurs inflammables dans des récipients ouverts à proximité de cet appareil est dangereux.

	FOR YOUR SAFETY	POUR VOTRE SÉCURITÉ
ETL SINCE 1896 ETL C SINCE 1896	If you smell gas: 1. Open Windows 2. Don't touch electrical switches. 3. Extinguish any open flame. 4. Immediately call your gas supplier.	Si vous sentez une odeur de gaz : 1. Ouvrez les fenêtres. 2. Ne pas actionner d'interrupteur. 3. Éteindre toute flamme ouverte. 4. Appelez immédiatement votre fournisseur de gaz.

WARNING: Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.

AVERTISSEMENT : Une installation déficiente, de même qu'un mauvais réglage, modification, entretien ou maintenance peuvent occasionner des dommages matériels, corporels voire causer la mort. Lire attentivement les instructions d'installation, d'utilisation et d'entretien avant d'installer ou d'intervenir sur cet appareil.

WARNING

Install, operate and maintain unit in accordance with manufacturer's instructions to avoid exposure to fuel substances or substances from incomplete combustion which can cause death or serious illness. The state of California has determined that these substances may cause cancer, birth defects, or other reproductive harm.

INSTALLER'S RESPONSIBILITY

Installer Please Note: This equipment has been test fired and inspected. It has been shipped free from defects from our factory. However, during shipment and installation, problems such as loose wires, leaks or loose fasteners may occur. **It is the installer's responsibility to inspect and correct any problems that may be found.**

Applied Air 4830 Transport Drive, Dallas, TX 75247 Phone: 214-638-6010 Fax: 214-905-0806
www.appliedair.com

SECTION II - GENERAL INFORMATION

A. Purpose

The purpose of this manual is to present a guide for proper installation, maintenance, and operation of the Indirect Gas-Fired System, and supplement, **but not to replace,** the services of qualified field service personnel to supervise the initial start-up and adjustment of the unit. Persons without previous experience with large commercial and industrial heating equipment should not attempt the initial adjustment and checkout procedure, which is essential before such installations may be considered ready for operation. This manual should be made readily available to all operating personnel as an aid in troubleshooting and proper maintenance. Due to the custom nature of Applied Air equipment, not all possibilities are addressed in this manual. The customer or installer can obtain information from Applied Air's sales representative or the Applied Air factory.

B. Shipping

Base Indirect Gas-Fired units are shipped completely assembled where shipping limitations allow. Optional inlet hoods, filter and /or damper sections, or other large accessories are assembled and shipped mounted and wired whenever possible within limitations of shipping and handling. Some optional accessories shipped separately may require field assembly. Any wired accessories, which have been disassembled for separate shipment, require no additional conduit or wire for field reassembly. All wire leads will be tagged for ease of reconnection in the field.

If the heater and/or accessories cannot be installed immediately, they should be stored in a clean dry environment. If this is not possible and the heater must be stored outdoors, it should be protected from the weather with tarpaulins or plastic coverings. Do not assume that simply covering a unit will keep insects, dust, and condensation out of the unit and critical components. Rotate the fans monthly.

Shipments are made F.O.B. Dallas, Texas by truck. The unit is securely strapped, tied, and blocked to prevent shipping damage. All shipments are checked by an inspector before they are accepted by the carrier. Parts that are shipped un-mounted are noted on the bill of lading. These parts, where feasible, are packaged and shipped with the units. Upon receipt of shipment, all units should be checked against the bill of lading to insure all items have been received. All equipment (and any optional accessories) should be checked carefully for physical damage in the presence of the carrier's representative. If parts are missing or damage has occurred, you should request an inspection, and a claim should be filed immediately with the carrier.

All Indirect Gas–Fired units are given a complete operations test and control circuit checkout before shipment. Copies of the wiring diagram, piping diagram and bill of material are included with each unit shipped. If correspondence with the factory is necessary, please provide the unit model and serial number.

C. Optional Factory Service

Periodic service on any piece of mechanical equipment is necessary for efficient operation. A nationwide service support network is available to provide quick and dependable servicing of make-up air, heating, ventilating, or air handling types of equipment. The factory also offers start-up service, which includes the presence of a service engineer to supervise the initial start-up and adjustment of the equipment and provide instructions for the owner's maintenance personnel in proper operations and maintenance. Consult factory for quotations on periodic or start-up service.

When unloading and setting the unit, use the lifting lugs provided or move the equipment on rollers. Hooks, jacks, or chains must not be used around the casing, main control panel or exterior mounted controls.

During transit, unloading and setting of the unit, bolts and nuts may have become loosened, particularly in the pillow block ball bearing assemblies in the fan section. It is recommended that all nuts and setscrews be tightened. Turn fan shaft by hand to make certain that blower does not rub against blower housing, and that bearing setscrews are tight.

Open the cover on the electrical control box located on the unit and ensure that all connections are tight.

B. Locating the Unit

Prior to locating the unit, authorities having jurisdiction should be consulted before installations are made. Approval permits should be checked against the unit received.

Combustion air shall be provided at a rate of at least 10 CFM, or 1 square inch of free opening, per 1000 BTU per hour of rated input. If a separate mechanical means provides this air, an interlock with the combustion blower shall be provided.

The rated output of gas burning appliances decreases with higher altitudes above 2,000 feet, the furnace shall be de-rated 4 % for each 1,000 feet of altitude above sea level. Factory testing rating plate information is recorded on sea level conditions. High altitude ratings may be obtained by a change in manifold pressure. Appliances must be suitably marked to indicate their altitude adjusted input rating.

Under no circumstances should this equipment be installed in a negatively pressurized space. Consult jurisdictional authority for proper ventilation requirements.

Combustion air containing or recirculation of room air may be hazardous in the presence of:

a) Flammable solids, liquids and gases.
b) Explosive materials (i.e., grain, dust, coal dust. gunpowder, etc).
c) Substances, which may become toxic when, exposed to heat (i.e., refrigerant, aerosols, etc.).

Locate the unit exactly level. Special attention should be given to the duct, electrical, and fuel connection points. Install ductwork with adequate flexible connection to isolate vibration from the ductwork.

All ductwork should have taped or caulked seams. Ductwork should be properly sized so as not to inhibit airflow. This information should be crossed-checked with the position of support beams and stand pipes to insure that clearance dimensions coincide with those of the unit. The minimum clearance to combustible material must be maintained as listed in Table 1

Table 1

Minimum clearance to combustible material, also, consult local codes and regulations.

Clearances to Combustible Material		
	Vertical Units	Horizontal Units
Front*	48 inches	48 inches
Rear	18 inches	18 inches
Right	18 inches	18 inches
Left	18 inches	18 inches
Top	18 inches	18 inches
Floor	Zero	6 inches

*Consider control side as front of unit

In addition to the combustible clearances listed above, access for service should be allowed around the unit. The recommended minimum access clearance is shown in Table 2.

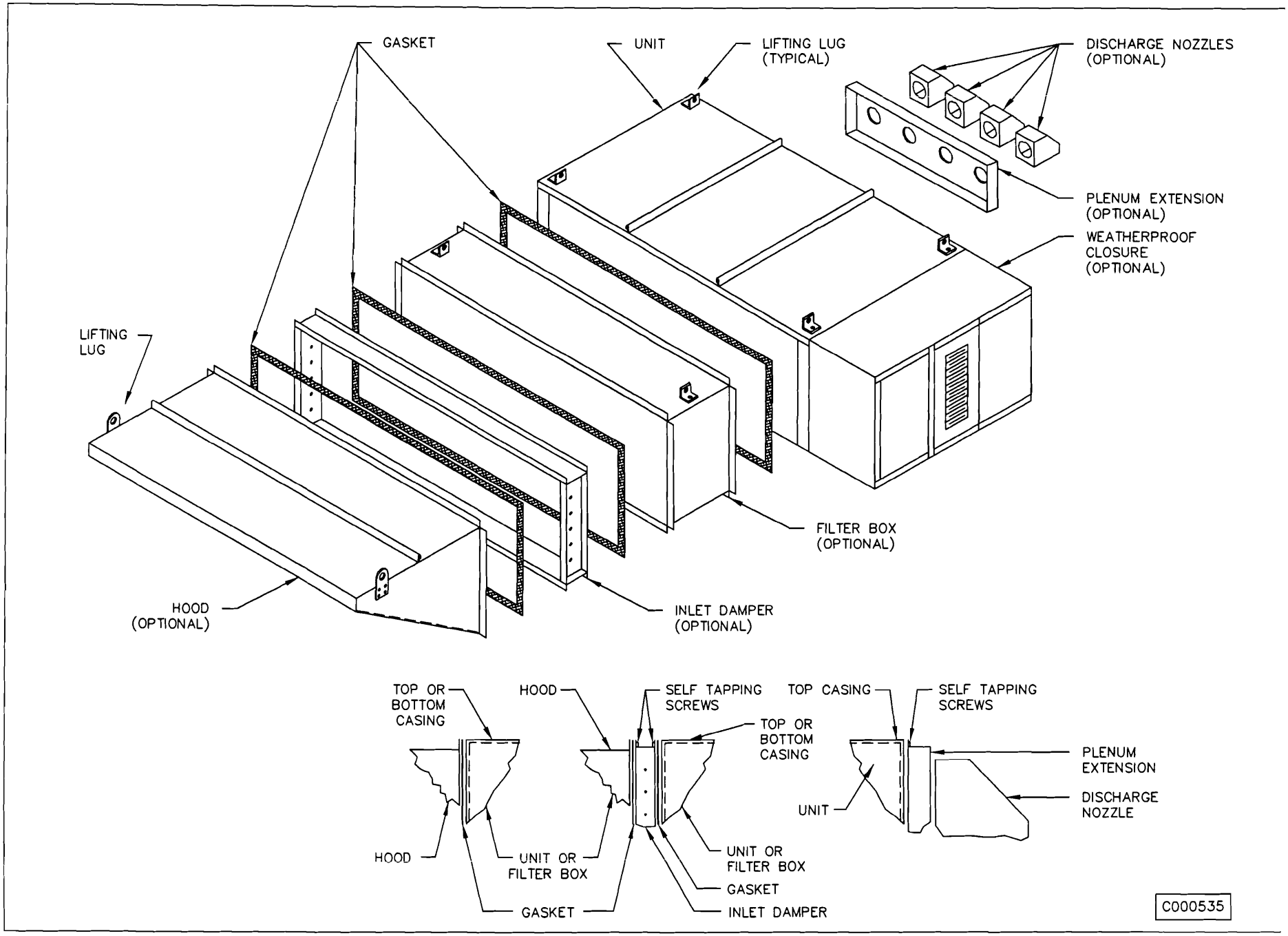
Table 2

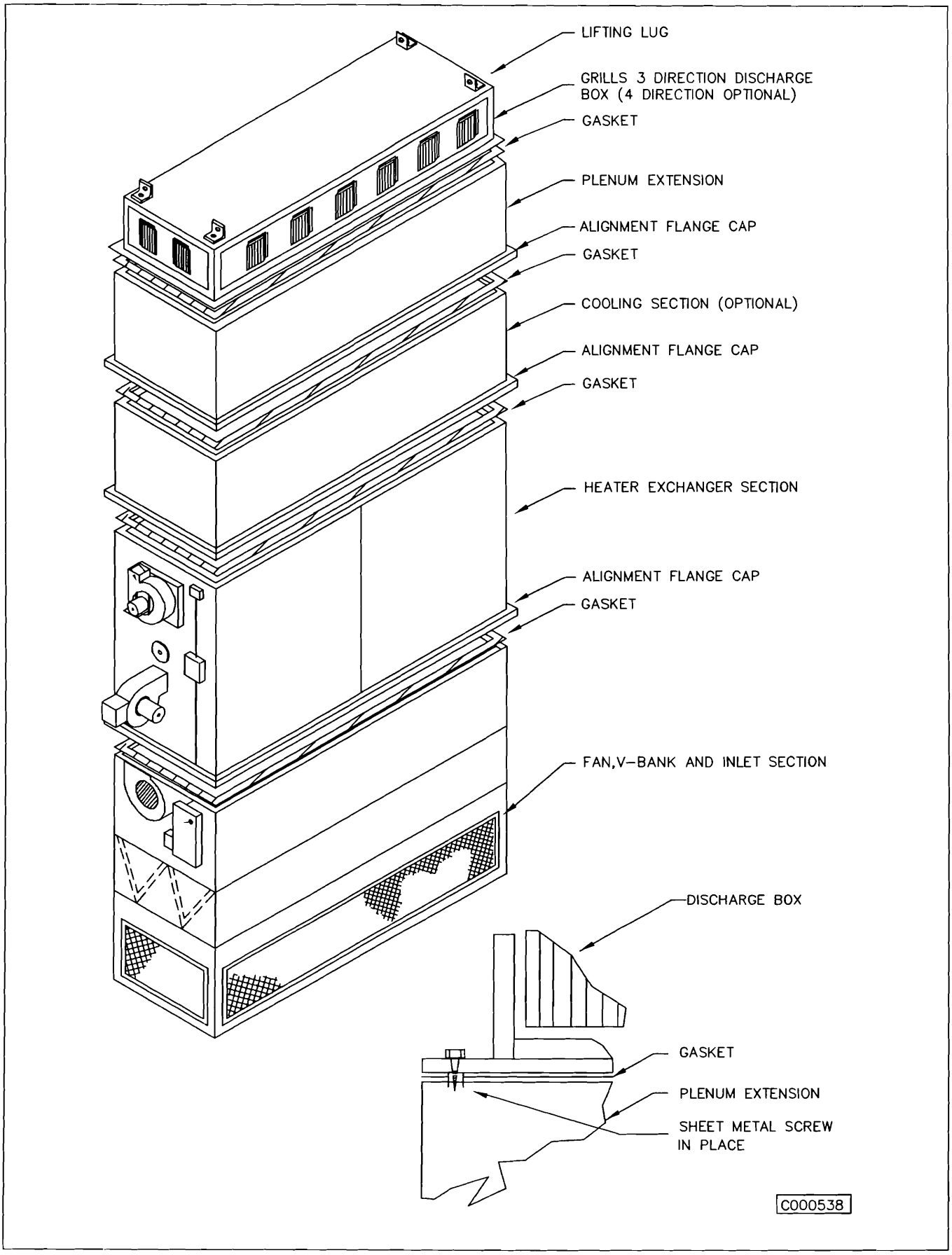
Unit Size	Minimum Access*	Unit Size	Minimum Access*
Up to 1750 MBH Output	36 inches	2000 MBH Output and Larger	50 inches

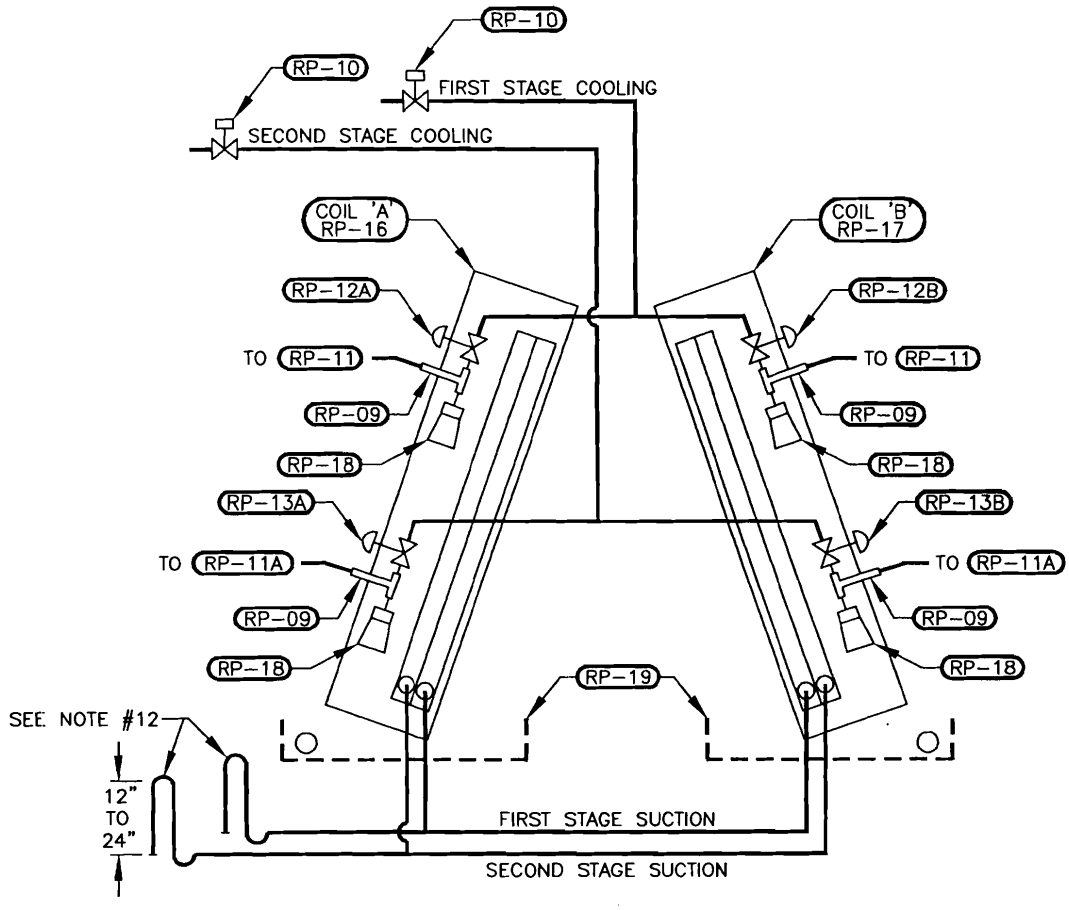
*Optimum clearance for shaft removal for units with centrifugal blowers would be equivalent to cabinet width.

On outdoor curb mounted installations, flash and seal the roof curb to prevent leakage. The cross section of factory provided curb is formed to accept wood nailing strip and insulation provided by others.

It is the customer and installation personnel responsibility to determine if the unit is equipped with all of the safety devices required for the particular application. Safety considerations include the accessibility of the unit to non-service personnel, the provision of electrical lockout switches, maintenance procedures, and automatic control sequences. Clearly mark all emergency shut off devices.


GASKET
UNIT
LIFTING LUG (TYPICAL)
DISCHARGE NOZZLES (OPTIONAL)
PLENUM EXTENSION (OPTIONAL)
WEATHERPROOF CLOSURE (OPTIONAL)
LIFTING LUG
FILTER BOX (OPTIONAL)
HOOD (OPTIONAL)
INLET DAMPER (OPTIONAL)
TOP OR BOTTOM CASING
HOOD
SELF TAPPING SCREWS
TOP OR BOTTOM CASING
HOOD
UNIT OR FILTER BOX
GASKET
UNIT OR FILTER BOX
GASKET
INLET DAMPER
TOP CASING
SELF TAPPING SCREWS
PLENUM EXTENSION
UNIT
DISCHARGE NOZZLE
C000535


LIFTING LUG
GRILLS 3 DIRECTION DISCHARGE BOX (4 DIRECTION OPTIONAL)
GASKET
PLENUM EXTENSION
ALIGNMENT FLANGE CAP
GASKET
COOLING SECTION (OPTIONAL)
ALIGNMENT FLANGE CAP
GASKET
HEATER EXCHANGER SECTION
ALIGNMENT FLANGE CAP
GASKET
FAN,V-BANK AND INLET SECTION
DISCHARGE BOX
GASKET
PLENUM EXTENSION
SHEET METAL SCREW IN PLACE
C000538



A-FRAME COIL ASSEMBLY END ELEVATION

THE ABOVE PIPING SCHEMATIC SHOULD BE USED AS A GUIDE ONLY.

PROPER ENGINEERING DESIGN OF THE OVERALL REFRIGERATION SYSTEM MAY DICTATE AN ALTERNATE PIPING SCHEMATIC BE USED TO THE ONE ILLUSTRATED ABOVE.

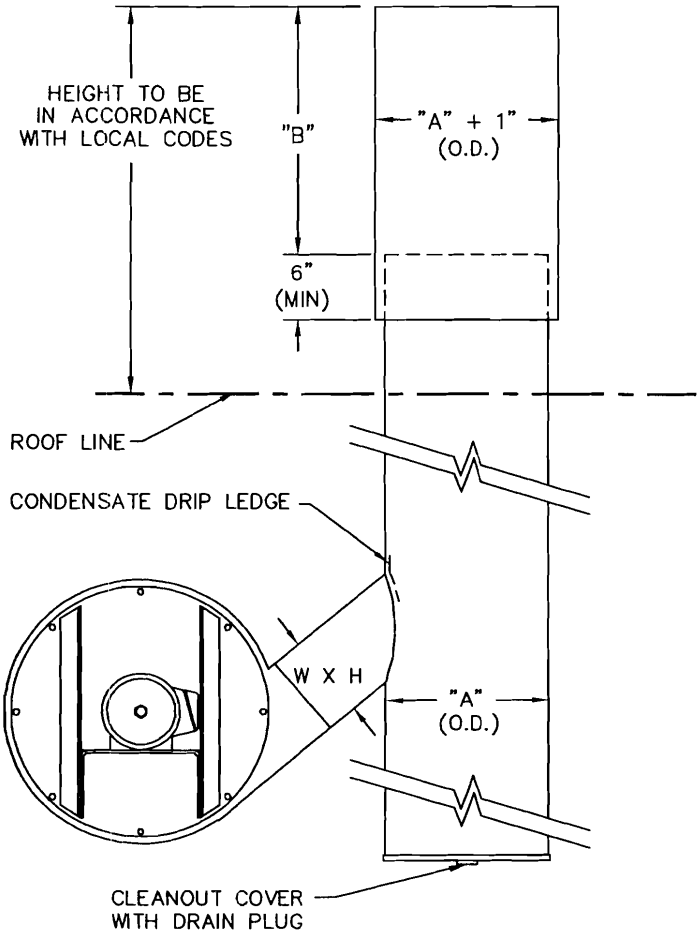
GENERAL NOTES:

1. RECOMMEND FIRST STAGE AND SECOND STAGE OF COOLING BE PROVIDED WITH HOT GAS BYPASS.
2. ALL PIPING TO BE ACR TYPE 'L' COPPER.
3. ALL PIPING TO BE PITCHED IN THE DIRECTION OF REFRIGERANT FLOW. PITCH TO BE 1 INCH PER 10 FEET.
4. ALL SUCTION LINES TO BE INSULATED.
5. LIQUID LINE FILTER/DRIER, SIGHT GLASS, SUCTION LINE FILTER/DRIER, ISOLATION VALVES, FITTINGS, DISCHARGE VIBRATION ABSORBER, ACCUMULATORS AND OTHER AVAILABLE SYSTEM OPTIONS ARE NOT SHOWN.
6. RECOMMEND LONG RADIUS ELBOWS BE USED TO MINIMIZE SYSTEM PRESSURE DROP.
7. RECOMMEND LIQUID LINES FOR R-22 BE SIZED FOR A MAXIMUM PRESSURE DROP OF 6 PSIG.
8. RECOMMEND SUCTION LINES FOR R-22 BE SIZED FOR A MAXIMUM PRESSURE DROP OF 3 PSIG.
9. RECOMMEND CONDENSOR SUBCOOLING CIRCUIT FOR R-22 BE CAPABLE OF SUBCOOLING LIQUID BETWEEN 12 TO 19°F.
10. CONNECT 1/4" O.D. EXTERNAL EQUALIZING LINE GENERALLY LOCATED IN EACH SUCTION HEADER OF EACH DX COIL TO THE APPROPRIATE THERMAL EXPANSION VALVE (TXV).
11. SENSING BULB FROM THERMAL EXPANSION VALVE (TXV) TO BE LOCATED ON THE SIDE OF A HORIZONTAL PORTION OF THE DX COILS' SUCTION LINE PIPING AT AN ANGLE OF APPROXIMATELY 120° FROM VERTICAL. DO NOT LOCATE SENSING BULB ON ANY PIPING USED IN A TRAP OR DOWNSTREAM OF A TRAP.
12. INSTALL TRAP IN SUCTION LINE AS ILLUSTRATED IF COMPRESSOR IS LOCATED BELOW THE THE DX COIL.
13. ALL COIL SPECIALTIES AND REFRIGERANT PIPING SHOWN OTHER THAN THE REFRIGERANT DISTRIBUTOR AND ANY OTHER REQUIRED REFRIGERATION SYSTEM SPECIALTIES ARE TO BE PROVIDED BY AND INSTALLED IN THE FIELD BY OTHERS.

COMPONENT IDENTIFICATION

RP-09	HOT GAS BYPASS TEE
RP-10	LIQUID LINE SOLENOID VALVE
RP-11	HOT GAS BYPASS VALVE - FIRST STAGE
RP-11A	HOT GAS BYPASS VALVE - SECOND STAGE
RP-12A	THERMAL EXPANSION VALVE (TXV-1A) CIRCUIT #1 - COIL 'A'
RP-13A	THERMAL EXPANSION VALVE (TXV-2A) CIRCUIT #2 - COIL 'A'
RP-12B	THERMAL EXPANSION VALVE (TXV-1B) CIRCUIT #1 - COIL 'B'
RP-13B	THERMAL EXPANSION VALVE (TXV-2B) CIRCUIT #2 - COIL 'B'
RP-16	DX EVAPORATOR COIL 'A' - INTERTWINED
RP-17	DX EVAPORATOR COIL 'B' - INTERTWINED
RP-18	REFRIGERANT DISTRIBUTOR
RP-19	CONDENSATE PAN PROVIDED WITH DRAIN CONNECTIONS ON BOTH ENDS

P-000971



DIMENSIONS				
SIZE	"A"	"B"	"H"	"W"
35	8	32	6-3/8	6-1/4
40	8	32	6-3/8	6-1/4
45	8	32	6-3/8	6-1/4
55	8	32	6-3/8	6-1/4
65	10	40	7-3/8	7
75	10	40	7-3/8	7
85	10	40	7-3/8	7
100	10	40	7-3/8	7
125	12	48	9-3/8	9
150	12	48	9-3/8	9
175	12	48	9-3/8	9
200	14	56	9-3/8	9
250	16	64	11-1/8	10-5/8
275	16	64	11-1/8	10-5/8
300	16	64	11-1/8	10-5/8
325	16	64	11-1/8	10-5/8
350	16	64	11-1/8	10-5/8
400	16	64	11-1/8	10-5/8
500	18	72	11-1/8	10-5/8
600	18	72	11-1/8	10-5/8

NOTES:
1. WEIGHT OF STACK MUST BE SUPPORTED FROM FLOOR OR BUILDING STRUCTURE. DO NOT SUPPORT STACK FROM INDUCED DRAFT FAN.
2. RECOMMENDED STACK MATERIAL IS 14 GAGE SERIES 400 STAINLESS STEEL, CONTINUOUSLY BUTT WELDED STACK.

C000541

F. Field Piping

All gas piping must be in accordance with the requirements outlined in the National Fuel Gas Code – ANSI Z223.1. It is required that a ground union be installed adjacent to the manifold for easy servicing. A drip leg and/or filter should be provided upstream of the unit's inlet gas connection. An additional shut-off must be located external of the unit's enclosure where required by local code. The location of this valve must comply with all local codes. A 1/8 inch N.P.T. plugged tapping, accessible for test gauge connection, must be installed immediately upstream of the gas supply connection to the unit.

WARNING: To avoid equipment damage or possible personal injury, do not connect gas piping to this unit until a supply line pressure/ leak test has been completed. Connecting the unit before completing the pressure/leak test may damage the unit gas valve and result in a fire hazard.

DANGER: Never use an open flame to detect gas leaks. Explosive conditions may exist which would result in personal injury or death.

The gas line should be supported so that no strain is placed on the unit. Pipe compounds, which are not soluble to liquid petroleum gases, should be used on threaded joints.

The appliance and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of $^1/_2$ PSIG.

The appliance must be isolated from the gas supply piping system by closing it's individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressure equal to or less than $^1/_2$ PSIG.

Correctly sized piping must be run to the unit.

Please note that gas line pressure must be as shown on specification plate when unit is operating at full input. The high-pressure regulator and relief valve should be, if possible, mounted at least 5 to 10 feet upstream from the appliance regulator on the unit (if applicable).

G. Field Wiring and Remote Control Installation

1. If the optional low temperature limit was not an integral part of the heater, the factory recommends that a low temperature limit control be installed in areas where freeze protection is needed in the event of burner shut down.
2. Connect the power lines to the line side of the power distribution block or optional main disconnect switch.
3. Field wiring is indicated on the wiring diagram, typically dashed lines. Where field wiring of the control circuit is required, take care to size the wires for a maximum 10% voltage drop. The VA rating of the transformer should be the maximum load.
4. Mount and wire remote control panel, thermostat temperature sensors, and any other field-installed controls as indicated on the unit control-wiring diagram.
5. Connect all wiring to the appropriate field wiring terminal and any shielded or twisted wires as indicated on the unit control-wiring diagram.

H. Locating Temperature Controls

The room or outdoor thermostats should be mounted where they will not be subjected to direct impact of the heated air or radiant heat from the sun. It is also recommended that thermostats, especially those with mercury bulb contacts, be mounted on a vibration free surface. The sides of building columns, away from the heater or interior walls, are usually the location best suited for mounting thermostats.

Controls with outdoor bulbs require that the outdoor bulb be shielded from direct radiation from the sun. Unit mounted sensors are factory located and mounted.

I. Drains and Traps

Some furnaces may be supplied with condensation removal pipe connections. Condensate from the heat exchanger is acidic and may contain chemical compounds requiring special drainage. The drain must be installed in accordance with all plumbing codes. The condensate is to be drained via PVC or steel pipe with an indirect connection to the plumbing wastes. Where a condensate neutralizer is used, an overflow shall be provided such that condensate will be directed to the drain in the event that the neutralizer becomes plugged. Indoor units typically require a condensate trap to be installed to prevent combustion gasses from entering the space. Outdoor units may require installing a heat-trace or special attention to drains to prevent freezing and clogging of the drain line.

Since the condensate is drained by gravity, avoid long runs of drain piping. If a long run of trapping cannot be avoided or the piping has water flow restrictions such as several elbows, and extra height to provide enough hydrostatic head to overcome the frictional losses. Always slope piping down a minimum of 1/8" per foot in the direction of the flow.

SUGGESTED TOOLS AND INSTRUMENTS

Volt/Ohm meter
Tachometer
Stack & Temperature Thermometer
Gas Pressure Gauge
Ammeter/Amprobe (or equal)
U-Tube Manometer (0 – 10" W.C.) Two Required
Flue Gas Test Equipment
Standard Hand Tools
D.C. Volt Meter

SUGGESTED CONTROLS SETTINGS

FL-01 Fan Control..... 95° – 110° F
FL-02 High Limit (IFR Down Discharge) .....165° F
FL-02 High Limit (All Other Units) .....200° F
FL-04 Auxiliary High Limit .....210° F
PS-01 Draft Proving Switch.....Adjust to field condition
PS-02 Burner Proving Switch..Adjust to field condition
PS-04 Low Gas Pressure Switch.....1.0" W.C.
PS-07 High Gas Pressure Switch.....125% above burner firing rate
PS-10 Main Air Proving Switch Adjust to field condition
PS-12 Clogged Filter Switch....Adjust to field condition
RE-21 Time Clock.....Customer Discretion
TC-01 Room Thermostat ..... Customer Discretion
TC-02 Modulating Discharge Ductstat..... 70° F
TC-03 On-Off Inlet Ductstat.....65° F
TC-06 High Limit Discharge Ductstat..... 100° F
TC-07 Low Limit Discharge Ductstat.....60° F
TC-08 Freeze Thermostat.....45° F & 3 Minutes
TC-09 Night Setback Thermostat.Customer Discretion

BEFORE ATTEMPTING TO START THE HEATER, READ THE TYPICAL SEQUENCE OF OPERATION AS SHOWN BELOW:

Typical Sequence Of Operations Note: This sequence is written for only the burner safety and operating portion of the heater. Other control systems for dampers, mixing boxes, and temperature controls are included in the unit typical sequence of operation and / or wiring diagram:

1. With main supply air fan(s) on, thermostat calling for heat, and all switches and operating controls in their normal position, the exauster motor and burner motor will run and "pre-purge" the combustion chamber. Pre-purge timing is not adjustable and is approximately 90 seconds.

2. With pre-purge timing complete, the pilot solenoid valve and ignition transformer are energized. The pilot flame will be established and sensed by the flame sensor.

3. Ignition transformer is de-energized and pilot valve remains on.

4. Main fuel valve(s) will open. The main burner flame will be established.

5. Pilot valve is de-energized. (This is only on heaters with interrupted pilots).

6. Once thermostat is satisfied, the main fuel valve(s), burner motor, and exhauster motor will be de-energized. Main supply air fan(s) will continue to run.

If flame signal drops significantly when main gas valves open, slightly increase pilot gas pressure to attain a steady flame signal.

After the burner lights; adjust gas pressure regulator, using a manometer, and combustion air damper to match firing rate shown on unit nameplate. Make sure the thermostat and gas valves are in high fire.

These units have an induced draft fan, a minimum of -0.20" W.C. must be maintained at the relief door, simultaneously while setting the fuel to air pressure on the burner at full input. This is done by changing the damper setting at the induced draft fan outlet. Be sure to lock down the locking quadrant when you are done.

Check all gas piping again for leaks using a soap bubble solution.

On-Off Operation

Check to make sure operating thermostat cycles burner and induced draft fan.

See final checks and adjustments.

High-Low-Off Operation

Turn the two stage thermostat down slowly until main gas valve begins to drive closed (low fire) or the power on the second stage may be disconnected.

NOTE: Low fire rate should be set at approximately 50% of high fire.

CAUTION: Too low of an input setting will cause condensation of the flue gases.

To reset low fire, remove the cover from the Two Stage gas valve actuator and using the wrench provided readjust the internal cam setting.

Check to make sure Two Stage thermostat cycles burner and induced draft fan.

See final checks and adjustments.

Modulating Operation

Set high fire by adjusting main gas regulator and by the high fire adjusting screw on the butterfly valve.

Turn all modulating thermostats to their lowest setting without turning the burner off, or with power off remove the coil wire on low fire hold relay and restart burner.

Observe flame as burner modulates.

NOTE: Flame should modulate slowly and evenly throughout the entire travel, although flame may become somewhat "dirty" during travel. If stopped at any point, proper combustion should resume.

Observe low fire, it should be substantial enough to maintain proper combustion and be within the designed turndown range of the burner.

Set low fire with the low fire adjusting screw on the butterfly valve.

CAUTION: Too low of an input setting will cause condensation of the flue gases, this should be avoided unless condensate drains are provided.

See following drawings for operation of modulating thermostat and typical circuit. SW-13 should cycle the burner.

See final checks and adjustments.

FINAL CHECKS AND ADJUSTMENTS

With the gas input pressure established, the flue gas analysis can now be preformed. This is checked in the stand off box where the induced draft fan airflow switch tube is located.

The following readings should be taken but not limited to:

CO_2 %	Net Stack Temperature
O_2 %	Combustion Efficiency
CO %	

If necessary, make adjustments on burner air shutter. **DO NOT** change the fuel input rate.

The following list covers general combustion problems and some of the possible cures. Conditions may vary in the field. Refer to combustion chart for efficiency.

CAUTION: Check local codes for maximum allowable percentages and amounts of emissions.

Low Carbon Dioxide (CO_2)

- Fuel input too low
- Excess burner air
- Wrong draft setting

Detectable Carbon Monoxide (CO)

- Fuel input too high
- Not enough burner air
- Restricted draft
- Flame impingement

Excessive Stack Temperature

- Draft setting too high
- Excess burner air
- Fuel input too high

Low Oxygen (O_2)

- Oxygen reading must always be a positive percentage

Cycle burner several times to ensure smooth light off and proper operation. Visually observe the flame pattern. There must be no flame impingement or hot spots on the combustion chamber that could cause scaling.

Check voltage and amperage on all motors.

Check all dampers, linkages, and locking quadrants to make sure they are secure and operating correctly.

SAFETY AND CONTROLS CHECKOUT

Flame Safeguard – Close the last manual gas valve before burner. Operate unit in heat mode. After pilot flame has been established, close manual pilot gas valve. The flame safeguard must trip out within 15 seconds.

Gas Pressure Switches – The low gas pressure switch will trip out and must be reset before resuming operation when the inlet gas shut off valve is turned off, or inlet gas pressure is lower than the trip point. The high gas pressure switch can be checked by reducing the setting of its trip point lower than the burner operating pressure. The switch should trip out and shut off the burner. Return the adjustment to its original setting and reset to resume operation.

Temperature Controls – The temperature controls are checked by adjusting control to a higher temperature to allow burner to cycle on. Adjust control to a lower temperature to allow burner to cycle off. Return the control to its original setting.

Air Pressure Switches – The air pressure switches can be checked by turning the adjusting screw to call for a higher pressure than is normally used on the system. Recycle is automatic when the switch is returned to its original setting. If the burner or draft proving switches open, this could cause the flame safeguard to go into lockout mode.

Limit Controls – The limit controls are checked by adjusting control to a lower temperature setting while the unit is operating on high fire and observe cut-off. Return the control to its original setting. Manual reset may be required on some controls.

Make sure all the safety and controls are working properly.

SECTION VII - TROUBLE SHOOTING

HONEYWELL RM7895A,B,C,D/EC7895A,C; RM7896A,B,C,D 7800 SERIES RELAY MODULES

PRINCIPAL TECHNICAL FEATURES

The RM7895, RM7896 provides all customary flame safeguard functions as well as significant advancements in safety, annunciation, and system diagnostics.

Safety Shutdown (Lockout) Occurs if:

1. INITIATE PERIOD
   a. Purge card is not installed or removed.
   b. Purge card is bad.
   c. Configuration jumpers have been changed (after 200 hours).
   d. AC line power errors occurred, see Operation.
   e. Four minute INITIATE period has been exceeded.
2. STANDBY PERIOD
   a. Airflow lockout feature is enabled and the airflow switch does not close after ten seconds or within the specified purge card timing.
   b. Flame signal is detected after 30 seconds.
   c. Ignition/pilot valve/intermittent pilot valve terminal is energized.
   d. Main valve terminal is energized.
   e. Delayed (2nd stage) main valve terminal is energized (RM7895C,D/EC7895C; RM7896C, D).
   f. Internal system fault occurred.
   g. Purge card is removed.
   h. Purge card is bad.
3. PREPURGE PERIOD
   a. Airflow lockout feature is enabled and the airflow switch opens.
   b. Ignition/pilot valve terminal is not energized.
   c. No flame present at end of PFEP.
   d. Main valve terminal is energized.
   e. Delayed main valve terminal is energized (RM7895C,D).
   f. Internal system fault occurred.
   g. Purge card is removed.
   h. Purge card is bad.
4. PILOT FLAME ESTABLISHING PERIOD (PFEP)
   a. Airflow lockout feature is enabled and the airflow switch does not close after ten seconds or within the specified purge card timing.
   b. Flame signal is detected after 30 seconds.
   c. Ignition/pilot valve/intermittent pilot valve terminal is energized.
   d. Main valve terminal is energized.
   e. Delayed (second stage) main valve terminal is energized (RM7895C,D/EC7895C; RM7896C,D).
   f. Internal system fault occurred.
   g. Purge card is removed.
   h. Purge card is bad.
5. MAIN FLAME ESTABLISHING PERIOD (MFEP) (RM7895C,D/EC7895C; RM7896C,D)
   a. Airflow lockout feature is enabled and the airflow switch opens.
   b. Ignition terminal is energized.
   c. Ignition/pilot valve terminal is not energized.
   d. Main valve terminal is not energized.
   e. Delayed main valve terminal is energized.
   f. No flame present at end of MFEP.
   g. Internal system fault occurred.
   h. Purge card is removed.
   i. Purge card is bad.
6. RUN PERIOD
   a. No flame present.
   b. Airflow lockout feature is enabled and the airflow switch opens.
   c. Interrupted pilot valve terminal is energized (RM7895C,D/EC7895C; RM7896C,D).
   d. Main valve terminal is not energized.
   e. Delayed (second stage) main valve terminal is not energized (RM7895C,D/EC7895C; RM7896C,D).
   f. Internal system fault occurred.
   g. Purge card is removed.
   h. Purge card is bad.

OPERATION

Sequence of Operation

The RM7895A,B,C,D/EC7895A,C; RM7896A,B,C,D has the operating sequences listed below; see Fig. 2 and 3. The RM7895A,B,C,D/EC7895A,C; RM7896A,B,C,D LED provide positive visual indication of the program sequence: POWER, PILOT, FLAME, MAIN and ALARM.

Initiate

The RM7895A,B,C,D/EC7895A,B,C; RM7896A,B,C,D Relay Module enters the INITIATE sequence when the relay module is powered. The RM7895A,B,C,D/EC7895A,C; RM7896A,B,C,D can also enter the INITIATE sequence if the relay module verifies voltage fluctuations of +10/-15% or frequency fluctuations of ±10% during any part of the operating sequence. The INITIATE sequence lasts for ten seconds unless the voltage or frequency tolerances are not met. When not met, a hold condition is initiated and displayed on the optional KDM for at least five seconds; when met, the INITIATE sequence restarts. If the condition is not corrected and the hold condition exists for four minutes, the RM7895A,B,C,D/EC7895A,C; RM7896A,B,C,D locks out.

SETTINGS AND ADJUSTMENTS

Selectable Site-Configurable Jumpers

The relay module has three site-configurable jumper options, see Fig. 6 and Table 7. If necessary, clip the site-configurable jumpers with side cutters and remove the resistors from the relay module.

SERVICE NOTE: Clipping and removing a site-configurable jumper enhances the level of safety.

Figure 5 - Sequence Status LEDs

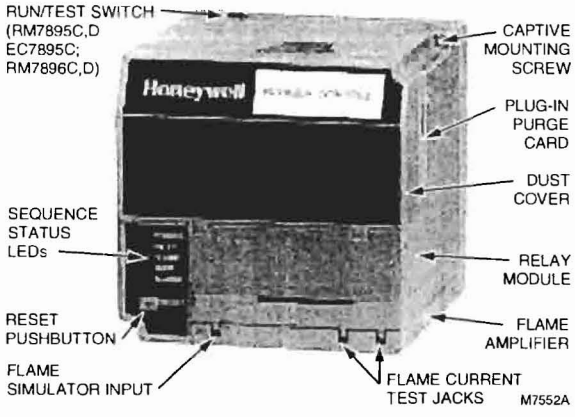


Figure 6 - Selectable Site-Configurable Jumpers

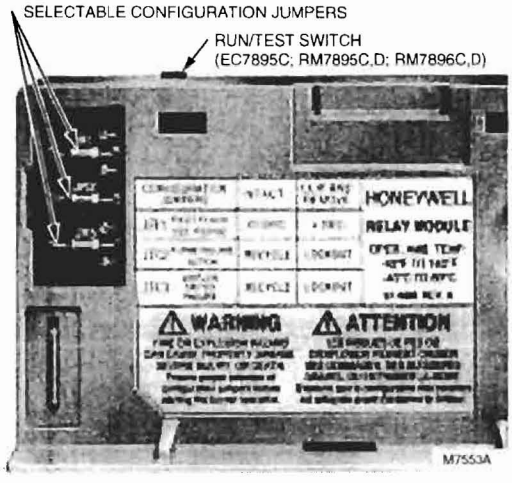


Table 7 - Site-Configurable Jumper Options

Jumper Number	Description	Intact	Clipped
JR1*	Pilot Flame Establishing Period (PFEP)	10 Seconds	4 Seconds
JR2	Flame Failure Action	Recycle	Lockout
JR3	Airflow Switch (ILK) Failure	Recycle	Lockout

IMPORTANT: Clipping and removing a jumper after 200 hours of operation causes a nonresettable Fault 110. The relay module must then be replaced.

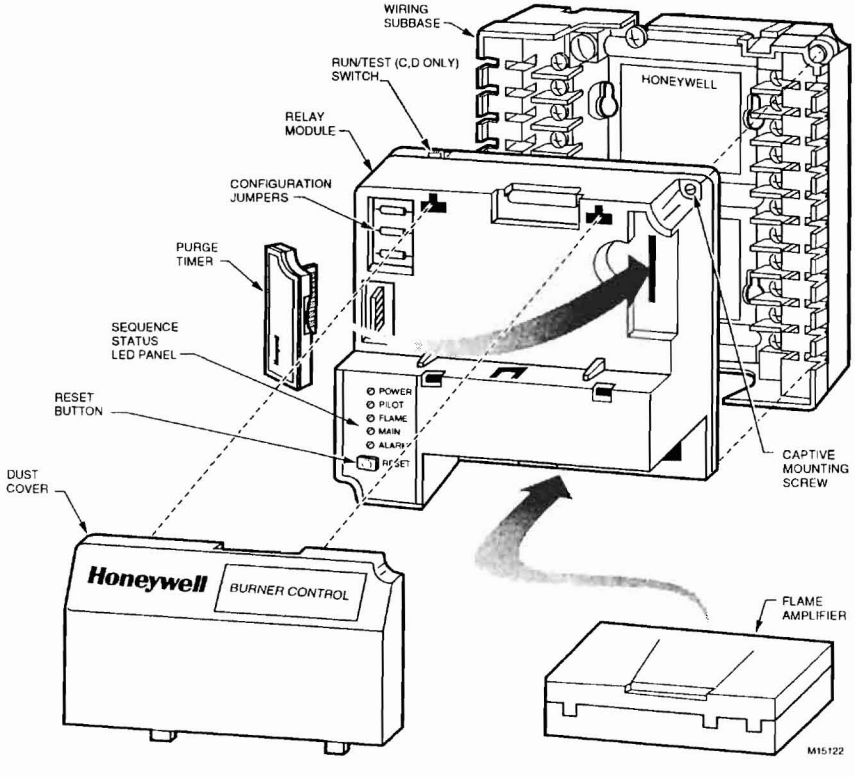
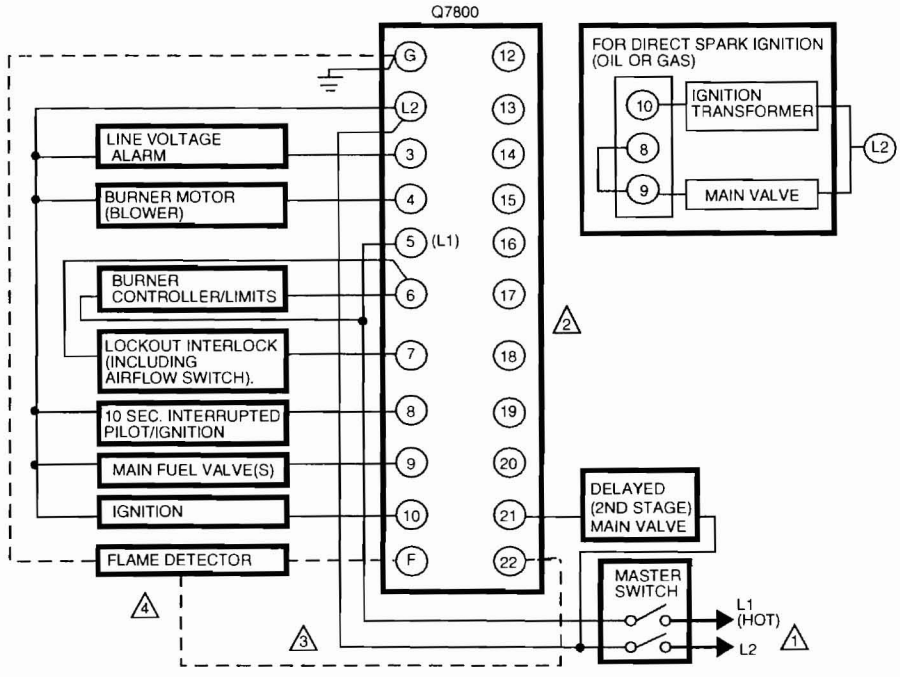
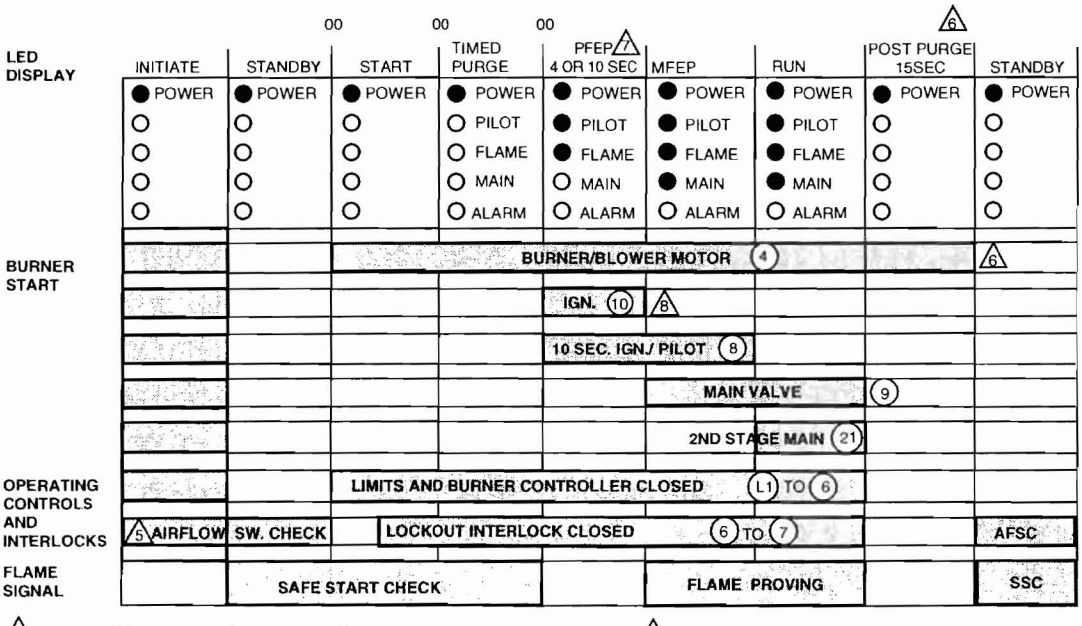


Figure 4 - RM7895A,B,C,D/EC7895A,C; RM7896A,B,C,D Relay Module Exploded View

Figure 3 - Wiring Subbase and Sequence Chart for RM7895C,D/EC7895C,D; RM7896C,D





1. RM7895, RM7896: 120 VAC , 50/60 HZ; EC7895: 220-240 VAC, 50/60 HZ POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.
2. DO NOT CONNECT ANY WIRES TO UNUSED TERMINALS.
3. FOR EC7895, A 220 TO 240 VAC TO 120 VAC, 10 VA MINIMUM STEPDOWN TRANSFORMER (NOT PROVIDED) MUST BE USED TO DRIVE THE SHUTTER.
4. SEE FLAME DETECTOR SPECIFICATIONS FOR CORRECT WIRING.
5. AIRFLOW SWITCH CHECK FEATURE IS FOR THE RM7895D, RM7896D.
6. RM7896C,D ONLY.
7. RM7895C1020, RM7896C1036 PFEP 10 SECONDS ONLY.
8. RM7895C1020, RM7896C1036: DURING FIRST 8 SECONDS OF PFEP, WHEN A FLAME SIGNAL IS DETECTED, TERMINAL 10 IS DE-ENERGIZED. IF FLAME SIGNAL IS LOST, TERMINAL 10 WILL RE-ENERGIZE.

M15124GR

SECTION VII - TROUBLESHOOTING *continued*

Symptom	Cause	Remedy
B. No voltage at flame safeguard relay input terminals.	1. Fan and Heat "off-on" switch in "off" position. 2. SW-13 in MT-11 (if applicable) not closed. 3. Auxiliary switch on starter not closed. 4. Proof of closure switch open (if applicable). 5. Thermostat open. 6. High temperature limit is open. 7. High-Low gas pressure switches open. 8. Outside air temperature higher than on-off inlet ductstat setting. 9. Time clock or field installed controls open.	1. Place switch in "on" position. 2. Check modulating motor for proper operation (see sheet in manual). 3. Check auxiliary circuit wiring and contacts. 4. Check and see if gas valve is closed, check wiring on circuit. 5. Check thermostat for proper setting. 6. Check limit for proper settings. 7. Correct gas pressure and reset switches. 8. Check ductstat for proper setting. 9. Check time clock and field controls for correct settings and voltage.
C. Flame safeguard relay goes into safety shutdown (Lockout).	1. See technical data sheets on flame safeguard relay.	1. Determine the cause of lockout. Push reset button on flame safeguard relay.
D. Pilot does not light after pre-purge has timed out and voltage is present on flame safeguard output terminals.	1. Manual pilot shut-off valve closed. 2. Inlet gas pressure lower than minimum gas pressure required. 3. No gas through pilot regulator with sufficient inlet gas pressure. 4. No gas flow through pilot solenoid valve. 5. Type of gas supplied (natural gas or propane) different than shown on unit rating plate. 6. Flame detection system not sensing pilot flame. (See section for servicing burner). 7. No voltage on secondary side of ignition transformer.	1. Slowly open valve. 2. Increase gas pressure. 3. Clear obstruction in vent orifice or line, replace if defective. 4. Check for proper installation, and voltage. Correct or replace if defective. 5. Connect to proper fuel supply of contact factory for field conversion parts. 6a. U.V. Sensor – Clean lens, check wiring and spark rod. 6b. Flame Rod - Assure rod is in pilot flame, check wiring, and flame rod. 7. Check wiring. Replace transformer if defective.

SECTION VIII - SERVICING THE BURNER

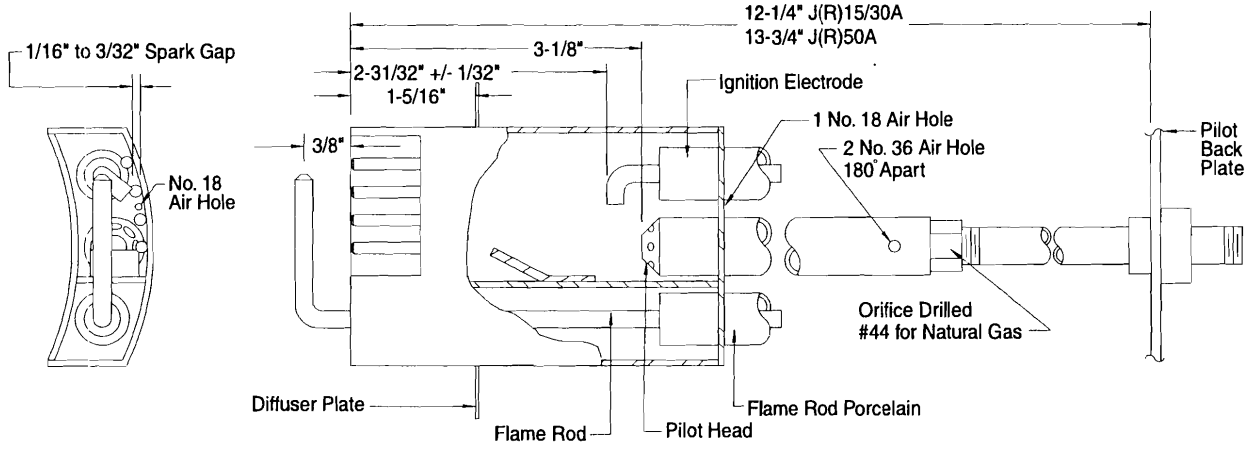
This section is intended as a guide in making some repairs and adjustments to the power burner. Many of the repairs will require the service of a skilled heating service technician. For more information refer to the burner I.O.M.

Power Flame Burners

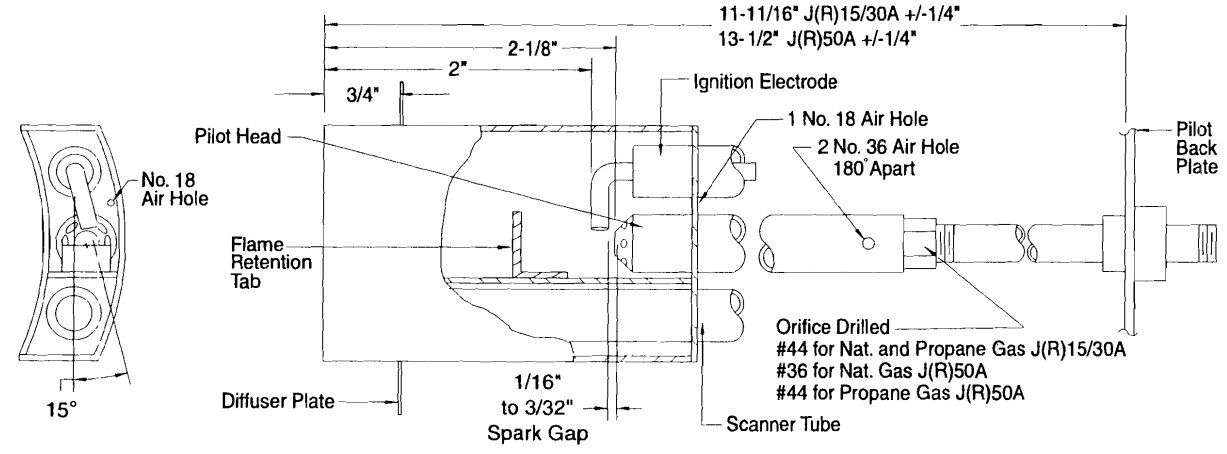
1) GAS-ELECTRIC IGNITION
   The gas-electric pilots used on Power Flame burners are either flame rod or scanner design.
2) POOR FLAME SIGNAL
   Try adjusting needle valve or pilot pressure regulator. Should this not be successful, check the primary pilot air. If neither of these methods improve the reading, inspect the flame rod position.

   The spark is to arc against the outside radius of the pilot assembly case (not the pilot head nozzle). The normal spark gap should be 1/16" – 3/32". See the drawings for pilot assembly for the J-Burner.

Pilot Assembly–J-Burner with Flame Rod - Natural Gas Only



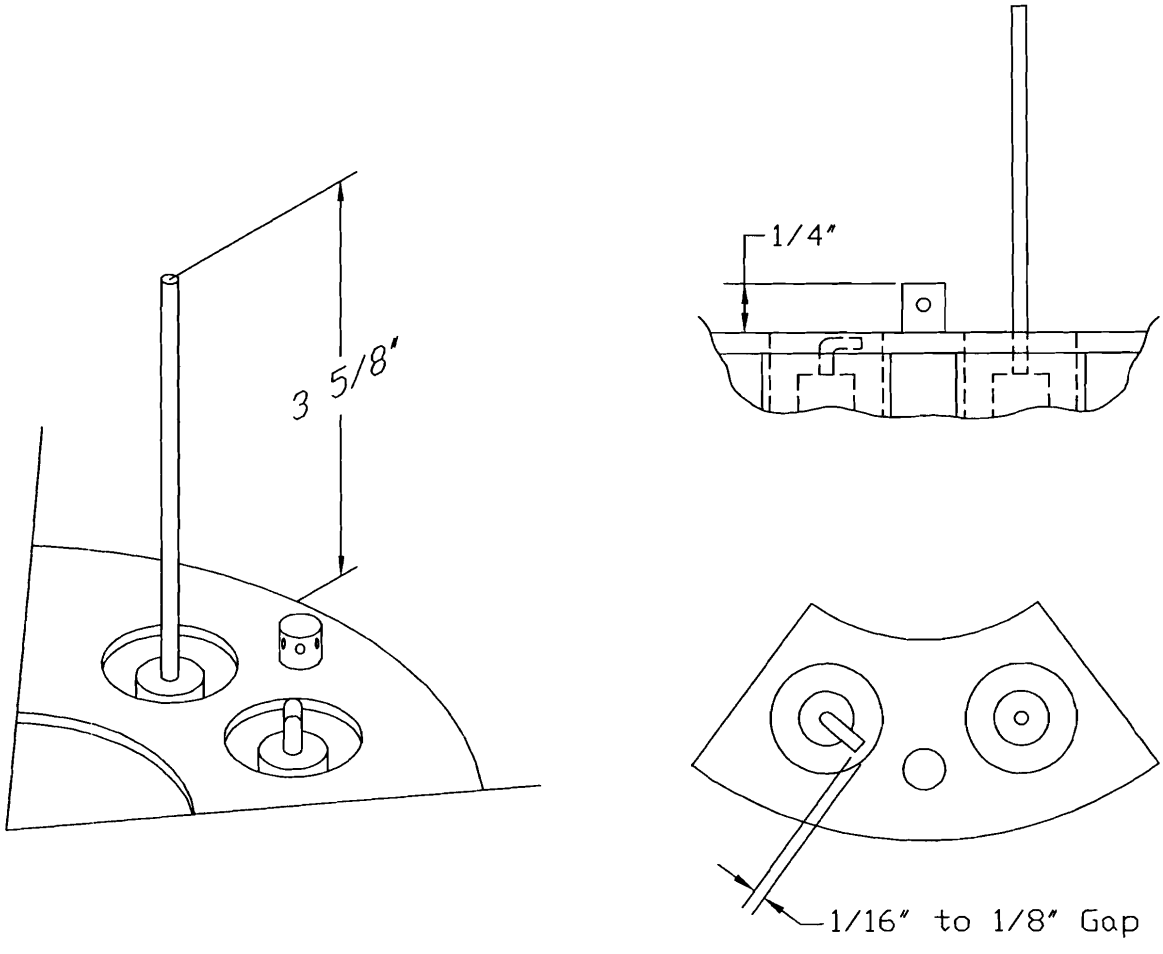
Pilot Assembly–J-Burner with Scanner - Natural or LP Gas



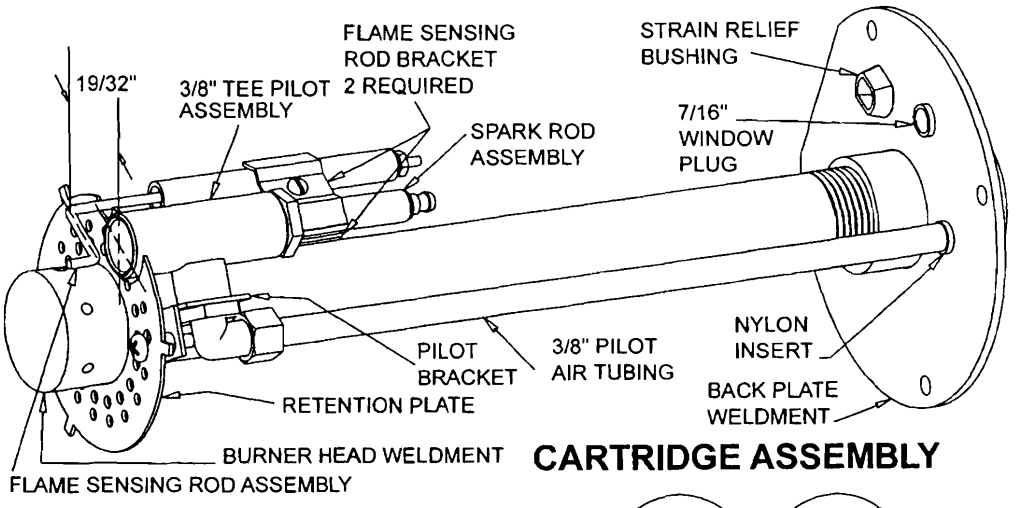
G-P Burners

1) GAS-ELECTRIC IGNITION
   The gas-electric pilots used on G-P burners are either flame rod or scanner design.
2) POOR FLAME SIGNAL
   Try adjusting needle valve or pilot pressure regulator. Should this not be successful, check the primary pilot air. If neither of these methods improve the reading, inspect the flame rod position.

Ignition Electrode For Straight G-P Gas Burners Using A Flat Diffuser Plate

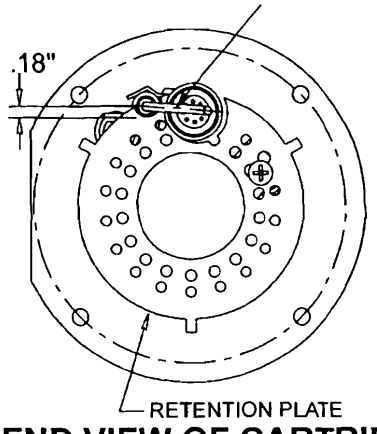


3) IGNITION ELECTRODE
   The ignition electrode is positioned as shown, with the horizontal part of the electrode flush with the diffuser plate. Leaving a gap of 1/16" to 1/8" wide. The pointing direction of the electrode is as shown, but is not critical.
4) FLAME SENSOR
   a. The flame sensor shown is a rectification, or flame rod. A UV scanner can be used instead. In that case the scanner tube is positioned in the same holder as the flame rod.

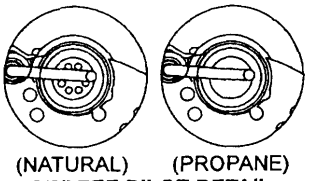


CARTRIDGE ASSEMBLY

NOTE:
MAKE SURE THAT THE FLAME SENSING ROD CENTER-LINE COINCIDES WITH THE 1/2" RETENTION PLATE CENTER-LINE.

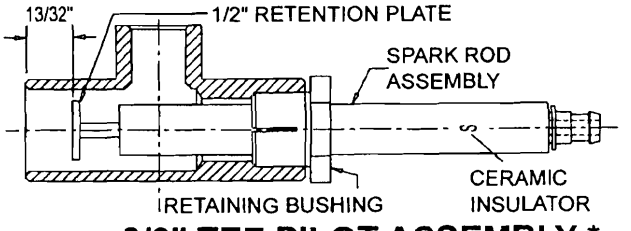


END VIEW OF CARTRIDGE



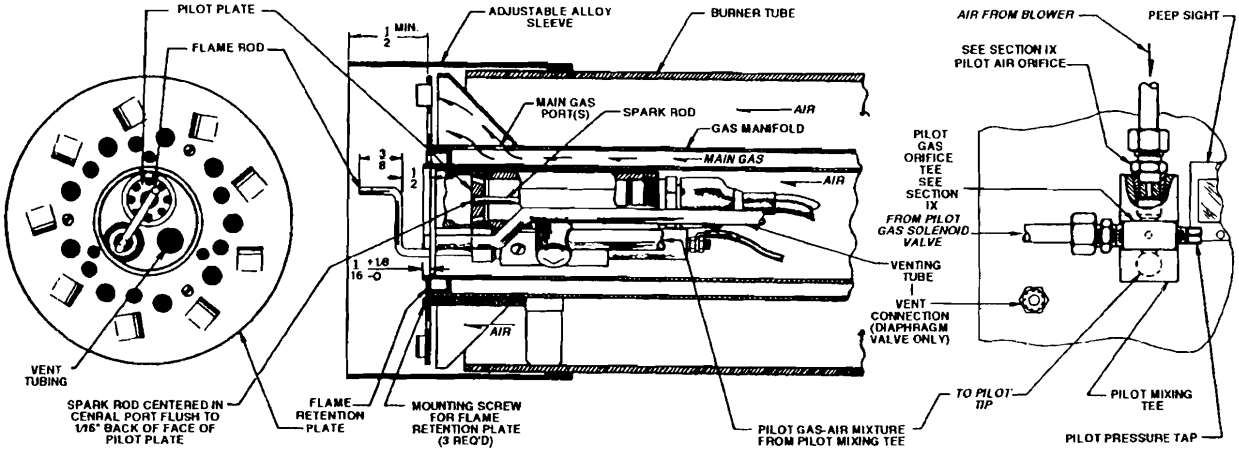
(NATURAL) (PROPANE)
3/8" TEE PILOT DETAIL

*NOTE:
SPARK ROD SHOULD BE CENTERED IN THE TEE & HELD SECURELY BY THE RETAINING BUSHING. OVER TIGHTENING OF THE RETAINING BUSHING MAY CRACK THE CERAMIC INSULATOR.

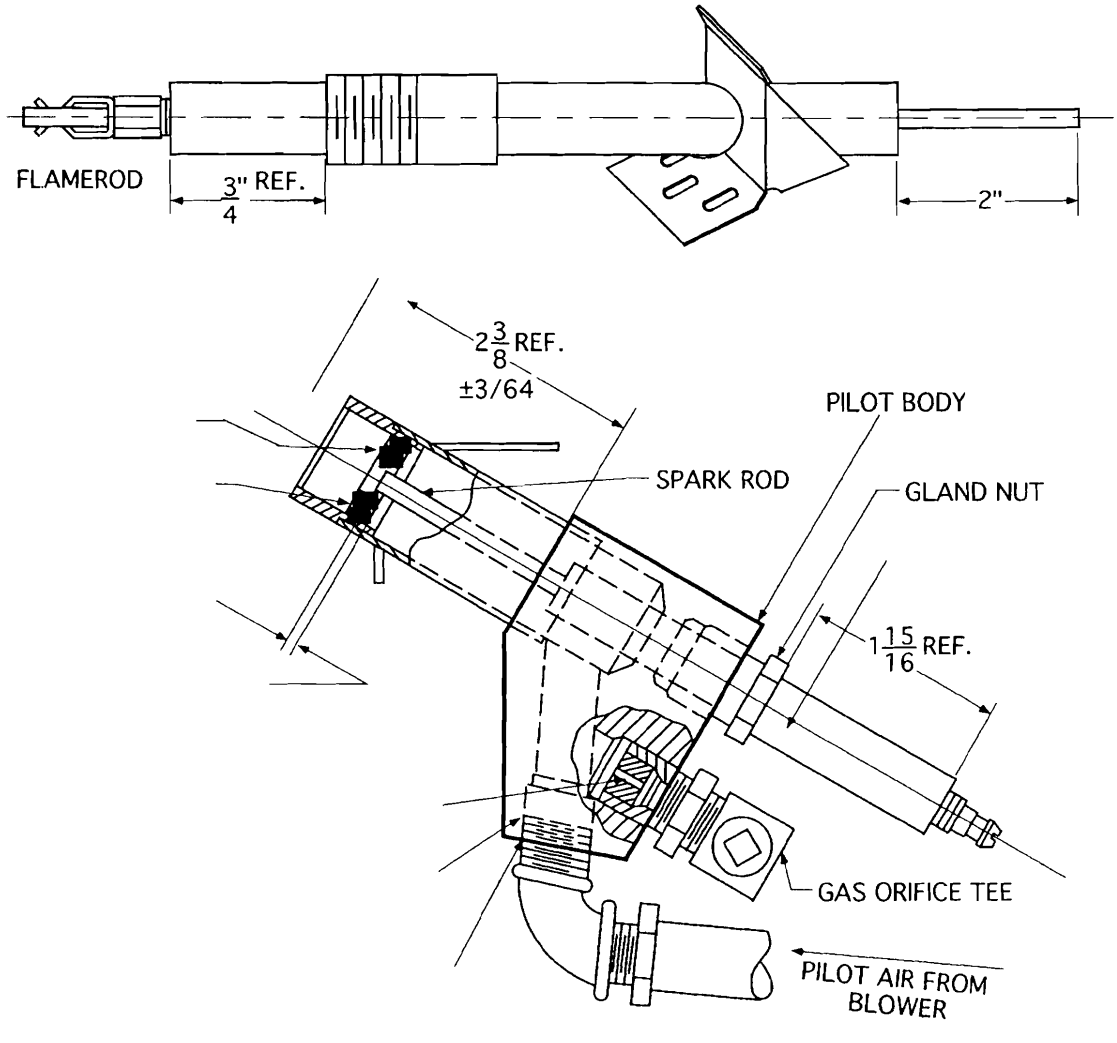


3/8" TEE PILOT ASSEMBLY *
(PARTIAL CUT-A-WAY VIEW)

Midco "G" Series



Midco "A" Series



SECTION IX - MAINTENANCE

Periodic maintenance is essential to the efficient operation and extended service life of this equipment. Failure to provide maintenance as recommended may void the equipment warranty.

A. Maintenance Schedule

1. Daily
   a. Check gages, monitors, instruments and equipment settings.
2. Weekly
   a. Check that fan belts are tight and sheaves are aligned. **CAUTION: Do Not Over Tighten Belts.** The fan belts can be checked every 30 days after the first 60 days of new belt run-in.
   b. Check gas pressure at regulator.
3. Monthly
   a. Check all valves, piping and connections for leaks.
   b. Check the pilot and burner flame signal.
   c. Check the fuel pressure in the fuel supply line to each heater.
   d. Check the burner manifold pressure and draft.
   e. Do a flue gas analysis.
   f. Inspect filters. Clean or replace as necessary.
   g. Inspect main fan bearings; lubricate if necessary. See following section on bearing lubrication.
   h. Check all dampers, damper actuators and linkages. Adjust and tighten if necessary.
   i. Inspect area and make sure that no combustible or hazardous material has been stored within clearances as shown on the specification plate.
   j. Check for any vibration or unusual noise. If any is observed, locate the cause and correct.
   k. Ensure the supply, discharge, combustion air, vents, and stack remains clean and open.
4. Quarterly
   a. Complete the monthly maintenance schedule.
   b. Inspect all drives for proper belt tension, wear, and alignment.
   c. Check that bearings, fans, and drives set-screws are securely locked to the shaft.
   d. Inspect the burner and pilot assembly. Clean and adjust if necessary.
   e. Check the voltage and amps on all motors.
   f. Check the operation of all safety limits and controls. Clean and recalibrate or replace.
   g. Check the operation of the automatic gas shut off valves, and check them for leakage at the pressure test ports provided.
   h. Inspect all electrical components, connections, and terminals. Clean or replace and tighten as necessary.
5. Off Season or Yearly
   a. Complete the monthly and quarterly maintenance schedules.
   b. Inspect, and if necessary, clean all fan wheels and housings.
   c. Check that all fan wheels, or props, and sheaves are securely set to the shaft.
   d. Inspect all bearings and check condition and alignment.
   e. Check the condensation lines for any leaks or blockages (if applicable).
   f. Test ignition spark. Adjust gap if necessary.
   g. Clean flame sensor, ignition electrodes, and check for cracks.
   h. Test the flame safeguard relay (RE-02) and replace components if necessary.
   i. Inspect all regulators, relief valves, motorized valves, solenoid valves, vent valves, manual shut off valves, and safety shut off valves. Check their operation and clean as necessary.
   j. Inspect and clean all drip legs in fuel lines and in the flue.
   k. Remove the rear panel and the rear header box cover. Inspect the header box and tubes. Look for carbon deposits, soot, scale or rust. Clean if necessary.
   l. Inspect the combustion chamber for carbon deposits, soot, scale or flame impingement. Clean if necessary. If there is evidence of flame impingement, complete burner adjustment must be made.
   m. Lubricate fan motors as directed by motor manufacturer. Inspect motors for loose connections.
   n. Lightly oil all door latches.
   o. Check that the cabinet is weather-tight. Replace door gaskets and re-caulk as needed.

B. Lubrication Instructions

Motor	Manufacturer	Bearing Type
All 3 phase fan motors (1 HP to 100 HP) ODP, TEFC	U.S., Baldor or equal	Single row ball bearings
Recommendation: See following note.		
All 1 phase motors (Fractional HP) ODP, TEFC or TEAO	Century, G.E., or equal	Bronze sleeve bearings
Recommendation: See following note.		

The frequency of cleaning and replacing air filters applies twelve months of the year, **where blowers are used for ventilation and heating.**

D. Belt Tensions and Adjustments

Belt tension is adjusted during the initial run-in and test periods at the factory. However, the belts are run as slack as possible to prevent excessive damage to the bearings, yet tight enough to prevent slippage.

It is necessary, therefore, to tighten all belts during the first few months of operation, and to **check for proper tension weekly during the first 60 days**, after which 30-day check intervals are sufficient.

NOTE: Turn off all power to the equipment before checking belt tensions.

CAUTION: Do not attempt to tighten any belt or belts by changing the pitch of an adjustable pulley, as this will change the speed of a driven pulley, causing the unit to be rendered OUT OF AIR BALANCE. Do Not over tighten belts.

Suggested Belt Tension Method

1. Check tension frequently during the first 24-48 hours of run-in operation. Ideal tension is the lowest tension at which the belt will not slip under peak load conditions. Over tensioning shortens belt and bearing life.

2. To properly tension a conventional V-belt drive use the following procedure:
   a. Measure the span length.
   b. At the center of the span, apply a force perpendicular to the span to deflect the belt 1/64 inch for every inch of span length. For example, for a 40 inch span, apply a force that will deflect the belt 40/64 or 5/8 of an inch.
   c. Compare the force you have applied with the values given in the following table. If the force is between the values for normal tension and 1-1/2 times normal tension, the belt tension should be satisfactory. If the belt tension is not within this range, it can be adjusted by loosening the motor mounting bolts, and adjusting the position of the motor on its base.

NOTE: A new drive can be tightened to two times the minimum value shown to allow for normal drop in tension during the run-in period.

B Section small pulley diameter range in inches	Belt Manufacturer & Type Belt	Pounds Force for Normal Tension	Pounds Force for 1½ times Normal Tension
3.4 – 4.2	Gates Hi-Power	4.4	6.6
4.4 – 4.6	Gates Hi-Power	4.9	7.4
5.8 – 8.6	Gates Hi-Power	5.8	8.7

Note: For recommendation of other types of belts, consult respective manufacturers.

E. Optional Coils and Related Items

1. Coils – Coil surfaces must be kept clean of dirt and lint in order to operate at rated efficiency. Coils should be inspected on a regular basis and cleaned as required.

CAUTION: Solutions used to clean coils must not be corrosive to metals or materials used in the manufacturer of this equipment. If cleaning solutions are applied through means of high pressure spray, care must be taken to avoid damaging coil fins.

2. Condensate Drain Pan – Periodically flush the condensate pan and drain system.

F. Gaskets

Gaskets are used on doors, inspection covers, some filter racks, and some outdoor air dampers. Inspect gaskets periodically and repair or replace as required.

G. Support Means

Inspect the entire unit support means to be sure everything is firmly in place.