



## *State of West Virginia*

**Earl Ray Tomblin, Governor**

**WV Office of Miners' Health, Safety & Training**

**Eugene White, Director**

#7 Player Club Drive, Suite 2, Charleston, WV 25311-1626

Telephone 304-558-1425 • Fax 304-558-1282

[www.wvminesafety.org](http://www.wvminesafety.org)

May 2, 2013

Ed Roscioli, CEO  
ChemBio Shelter, Inc.  
968 Postal Road, Suite 320  
Allentown, PA 18109-9399  
(610)266-6667  
Fax (610)266-6575  
[ed@chembioshelter.com](mailto:ed@chembioshelter.com)

**Subject: Additional Approvals of ChemoBio Shelter™ under WV Legislative Rule Title 56, Series 4  
Emergency Rules Governing Protective Clothing and Equipment**

Sir,

The approval for the ChemBio Shelter™ is hereby amended to include the installation of MSHA CFR 30 Part 7 approved Breathable Air, Harmful Gas Removal, and Monitoring Components owned by ChemBio Shelter, Inc., into Refuge Alternatives constructed by others but meeting the specifications of the approved ChemBio Shelter models under West Virginia Code R. 56-4-8.

The redeployed shelters shall have pressure gauges in each of the air and oxygen cylinder valves and be branded as functionally identically to other ChemBio shelters using our "bottles off" design. All miners will be trained to operate these shelters the same as a newly manufactured ChemBio shelter.

The necessary structural changes have been shown to result in equal or improved performance as attested by a Finite Element Analysis conducted by professional engineers at MJ Engineering. The changes covered by this analysis include the following:

1. Remove the two (2) bolt on covers over the cylinder compartments and replace them with the same type of hinged door used on our ChemBio LifeShelter. This will allow operation with "bottles off" and pre-shift checks of cylinder and circuit pressures.
2. Add three (3) filler plates in the interior to isolate the cylinder compartments from the shelter interior area.
3. Continuously weld joints that were skip welded to isolate the cylinder compartments from the shelter interior area.

4. Remove the bolted-in Lexan window in the supply access panel and cover the entire area with a welded-on steel plate. The window functionality is no longer needed due to the operable doors.

Also attached is an updated list of specific shelter models ChemBio Shelter, Inc. has had reviewed by MSHA. Please review this list of models for West Virginia approval. All new or refit ChemBio shelters will be one of these specific models.

24 inch box	32 inch box	40 inch box
2428-03	3236-03	4042-03
2428-07	3236-07	4042-07
2428-10	3236-10	4042-10
2428-14	3236-14	4042-14
2428-16	3236-18	4042-18
2428-18	3236-22	4042-22
2428-20	3236-26	4042-26
	3236-30	4042-30
		4042-34

After installation of the ChemBio Shelter™ components, the serial number of the unit will be modified. The modification will be as follows:

Example Previous manufacturer serial number	New ChemBio serial number
LS9226	LS9226-R
RC11032	RC11032-R

ChemBio Shelter™ shall, upon request, provide this office with verification of valid orders, delivery dates, and status of delivery as required for this office to enforce §56-4-8.

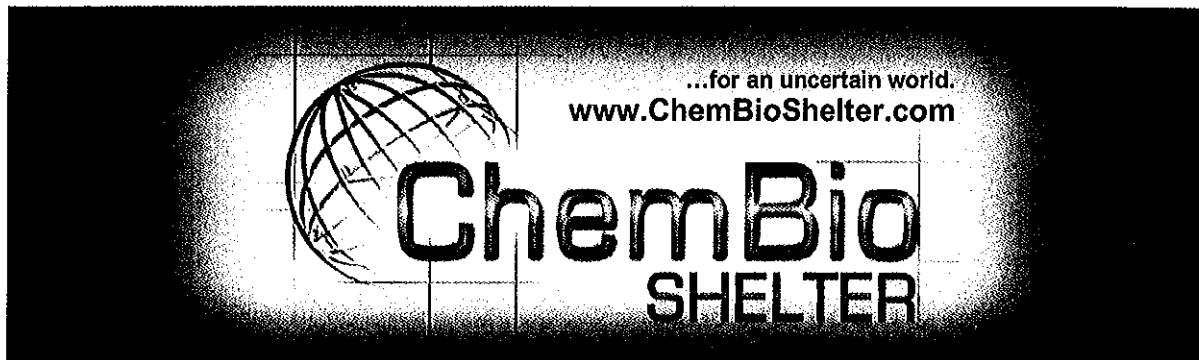
Prior to committing to modify any other manufacturer's shelter under this approval, ChemBio shall notify this office of the model and serial number of the units to be modified. The Director retains the authority to deny modification of an individual unit if it is determined not to meet the requirements stipulated in the approval.

Any changes required or enhancements to the approved design affecting the ability to meet any provision of §56-4-8 shall require approval of this Office prior to any affected ChemBio Shelter™ being placed into operation.

Sincerely,



Eugene White, Director  
Office of Miners' Health and Safety



Randall Harris  
Consultant to the State of West Virginia  
WV Office of Miners' Health Safety & Training  
#7 Players Club Rd, Suite 2  
Charleston, WV 25311-1626

April 29, 2013

Dear Mr. Harris,

The purpose of this letter is to seek approval from WVOMHST regarding the installation of MSHA CFR 30 Part 7 approved Breathable Air, Harmful Gas Removal, and Air Monitoring Components owned by ChemBio Shelter, Inc., into Refuge Alternatives structures constructed by others but meeting the specifications of the approved ChemBio Shelter models under West Virginia Code R. 56-4-8.

The new shelters will have pressure gauges in each of the air and oxygen cylinder valves and be branded as and function identically to other ChemBio shelters using our "bottles off" design. All miners will be trained to operate these shelters the same as a newly manufactured ChemBio shelter.

We have engaged MJ Engineering and Consulting of Westerville, OH to review the proposed changes to the refuge alternative required to accommodate the ChemBio design concept and our approved components. MJ Engineering is the company that performed the original Finite Element Analysis of the Refuge Alternative structures that were originally approved under West Virginia Code R. 56-4-8.

The necessary changes include the following:

1. Remove the two (2) bolt on covers over the cylinder compartments and replace them with the same type of hinged door used on our ChemBio *LifeShelter*. This will allow operation with "bottles off" and pre-shift checks of cylinder and circuit pressures.
2. Add three (3) filler plates in the interior to isolate the cylinder compartments from the shelter interior area.
3. Continuously weld joints that were skip welded to isolate the cylinder compartments from the shelter interior area.
4. Remove the bolted-in Lexan window in the supply access panel and cover the entire area with a welded-on steel plate. The window functionality is no longer needed due to the operable doors.

These changes are identified in more detail on the attached drawings.

I have also attached the MJ Engineering report on their review of these changes.

Also attached is an updated list of specific shelter models ChemBio Shelter, Inc. has submitted to MSHA. Please review this list of models for West Virginia approval. All new or refit ChemBio shelters will be one of these specific models.

After installation of the ChemBio components, the serial number of the unit will be modified by adding the suffix "-R" to the existing serial number. The modification will be as follows:

<u>Previous manufacturer serial number</u>	<u>New ChemBio serial number</u>
LS9226	LS9226-R

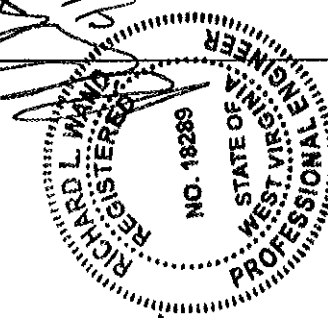
Thank you for your considerate attention to this matter. If you have any questions or need additional information, please feel free to contact me.

Have a great day!

Sincerely,

Edward V. Roscioli, CEO

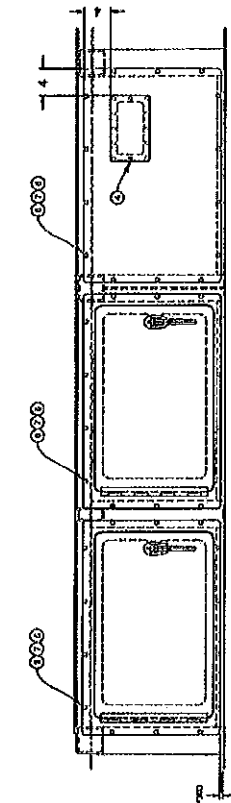
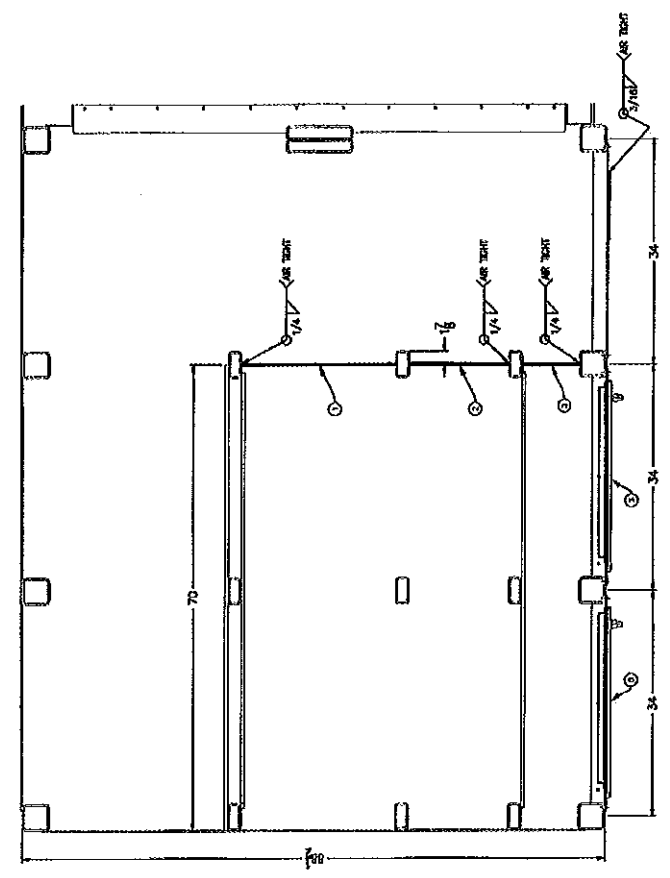
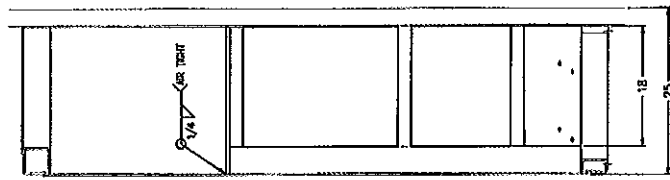
1/29/18



BILL OF MATERIAL ~ P/N 100687

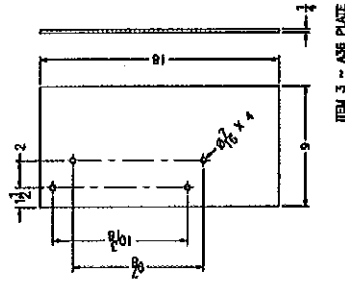
ITEM	QTY	PART NUMBER	DESCRIPTION	UNIT
1	1	18.00	23.50 x .25" A36 PLATE	30.0
2	1	15.00	15.00 x .25" A36 PLATE	19.2
3	1	18.00	9.00 x .25" A36 PLATE	11.5
4	1	6.00	10.00 x .25" A36 PLATE	4.2
5	2	100687	CYLINDER DOOR ASSEMBLY	84
6	42	100659	PHNS. 3/8"-16UNC x 1.25" Lg	-
7	42	100163	LWR. 3/8" SPRT	-
8	42	100159	FLWR. 3/8" PLAIN	-

- NOTES:
1. REMOVE ALL BURRS AND BREAK ALL SHARP EDGES.
  2. ALL WELDS TO BE AWS E-7018 OR EQUAL.
  3. PRIME & PAINT GLOSS WHITE ALL OVER.
  4. APPLY RTV TO SUPPLY ACCESS PANEL AT FINAL ASSY.

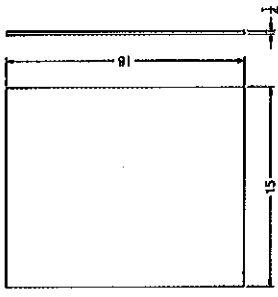


<b>ChemBio</b> CHEMICAL BIOLOGICAL CORPORATION 10000 W. 10TH AVENUE DENVER, CO 80231		SHELLER BOX CONVERSION A. L. LEE MODEL 2428 100687-1
PART NO. 100687 REV. 1 DATE 1/29/18	PART NO. 100687 REV. 1 DATE 1/29/18	PART NO. 100687-1 REV. 1 DATE 1/29/18

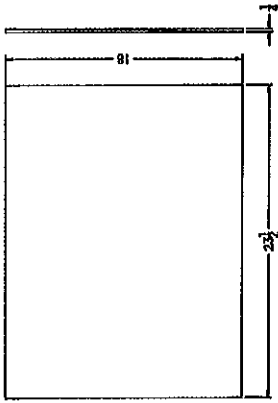
2/10/2017  
 REGISTERED PROFESSIONAL ENGINEER  
 STATE OF MISSISSIPPI  
 NO. 1828



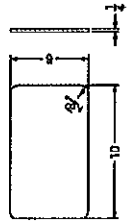
ITEM 3 ~ ASS PLATE



ITEM 2 ~ ASS PLATE



ITEM 1 ~ ASS PLATE

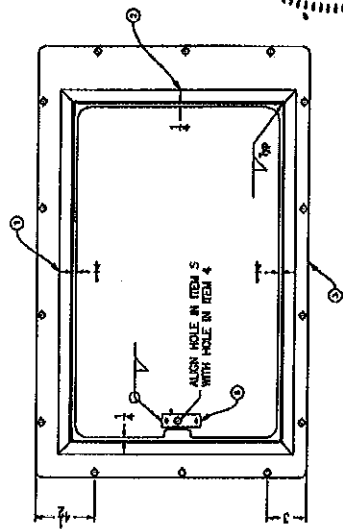
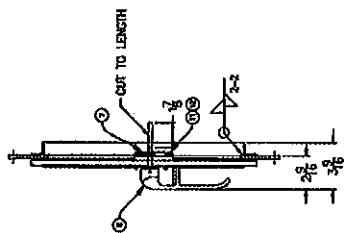
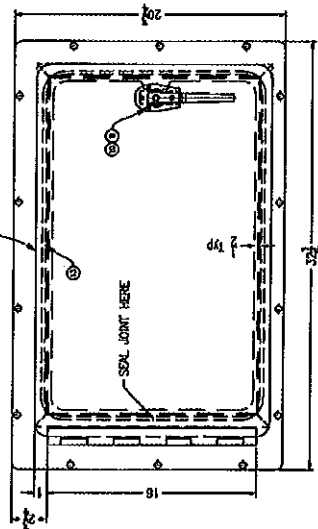
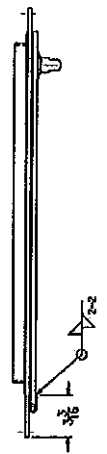
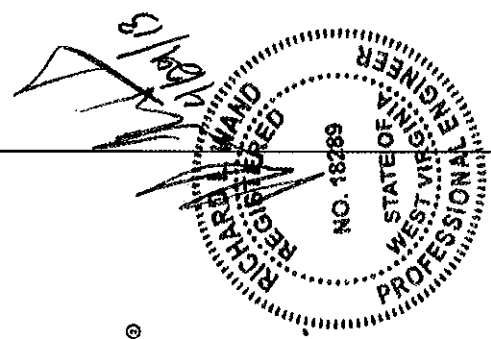


ITEM 4 ~ ASS PLATE

		BOX CONVERSION DETAILS A. L. LEE MODEL 242B	
DATE: 4-30-13 TIME: 10:00 AM	PROJECT NO.: 100637-2	SHEET NO.: 2 OF 2	SCALE: (AS SHOWN)
FUNCTIONS V/P X .Y Z .Z A .A B .B C .C D .D E .E F .F G .G H .H I .I J .J K .K L .L M .M N .N O .O P .P Q .Q R .R S .S T .T U .U V .V W .W X .X Y .Y Z .Z		SET ORG. ASSEMBLY	
DRAWING NO.: 100637-2		SHEET NO.: 2 OF 2	

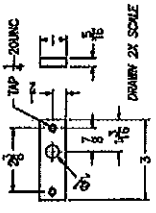
**BILL OF MATERIAL - P/N 100638**

ITEM	QTY	PART NUMBER	DESCRIPTION	UNIT	WEIGHT
1	2	1.0x1.0x.13 AS5	Angle x 27.25" Lg	1.8	
2	2	1.0x1.0x.13 AS5	Angle x 10.00" Lg	1.1	
3	1	20.75 x 32.25 x .25" AS5	Plate	20.2	
4	1	16.00 x 28.00 x .38" AS5	Plate	53.5	
5	1	37x1.00 AS5	Flat x 3.00" Lg	0.3	
6	1	100250	Hinge = McMaster Carr #1555KA101	2.8	
7	1	100251	Latch = McMaster Carr #1452AK2	1.0	
8	1	100251	Latch = McMaster Carr #1452AK3	0.2	
9	4	RMHS, #1D-240NC	x 3/8" Lg	--	
10	4	LNWR, #1D SPLIT		--	
11	2	RMHS, 1/4-20UNC x 3/8"	Lg	--	
12	2	LNWR, 1/4" SPLIT		--	
13	700R	100247	SEAL = McMaster Carr #5994K124	--	

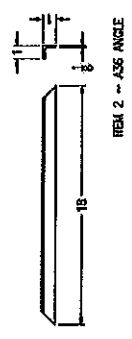


- NOTES:**
1. REMOVE ALL BURRS AND BREAK ALL SHARP EDGES.
  2. ALL WELDS TO BE AWS 1/8" CONTINUOUS FILETS UNLESS OTHERWISE SPECIFIED.
  3. PRIME & PAINT ALL OVER WITH BUSH #CJDS-0002 DECKLACK 2X WHITE TOPCOAT OR EQUAL.
  4. INSTALL HANDLE & LATCH AFTER PAINTING AND LUBRICATE ALL JOINTS WITH HEAVY OIL.
  5. INSTALL SEAL AFTER PAINTING AND LATCH CLOSED.

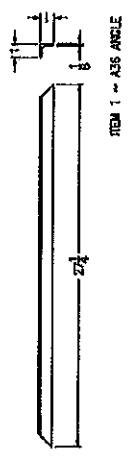
CYLINDER DOOR ASSEMBLY	
A. L. LEE MODEL 242B CONVERSION	
DATE: 4-30-13	REV: 1
100637	100638-1
REV: 1	REV: 2
REV: 3	REV: 4
REV: 5	REV: 6
REV: 7	REV: 8
REV: 9	REV: 10
REV: 11	REV: 12
REV: 13	REV: 14
REV: 15	REV: 16
REV: 17	REV: 18
REV: 19	REV: 20
REV: 21	REV: 22
REV: 23	REV: 24
REV: 25	REV: 26
REV: 27	REV: 28
REV: 29	REV: 30
REV: 31	REV: 32
REV: 33	REV: 34
REV: 35	REV: 36
REV: 37	REV: 38
REV: 39	REV: 40
REV: 41	REV: 42
REV: 43	REV: 44
REV: 45	REV: 46
REV: 47	REV: 48
REV: 49	REV: 50
REV: 51	REV: 52
REV: 53	REV: 54
REV: 55	REV: 56
REV: 57	REV: 58
REV: 59	REV: 60
REV: 61	REV: 62
REV: 63	REV: 64
REV: 65	REV: 66
REV: 67	REV: 68
REV: 69	REV: 70
REV: 71	REV: 72
REV: 73	REV: 74
REV: 75	REV: 76
REV: 77	REV: 78
REV: 79	REV: 80
REV: 81	REV: 82
REV: 83	REV: 84
REV: 85	REV: 86
REV: 87	REV: 88
REV: 89	REV: 90
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REV: 95	REV: 96
REV: 97	REV: 98
REV: 99	REV: 100



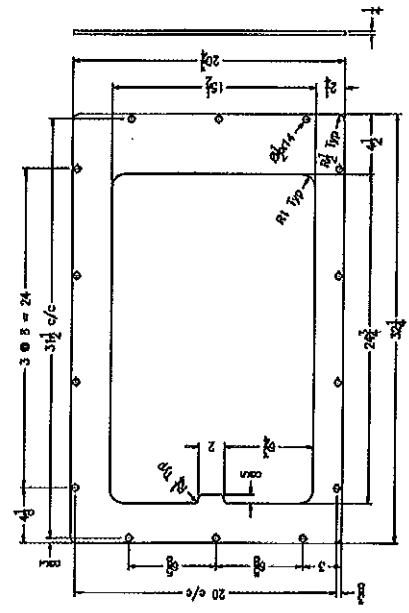
ITEM 5 ~ AS5 FLAT



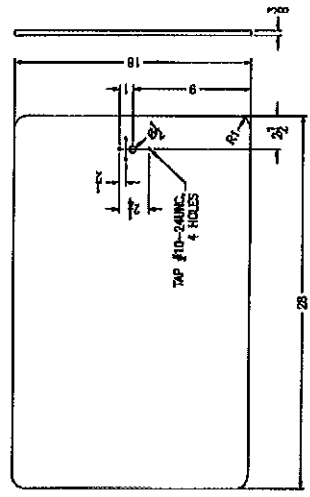
ITEM 2 ~ AS5 ANGLE



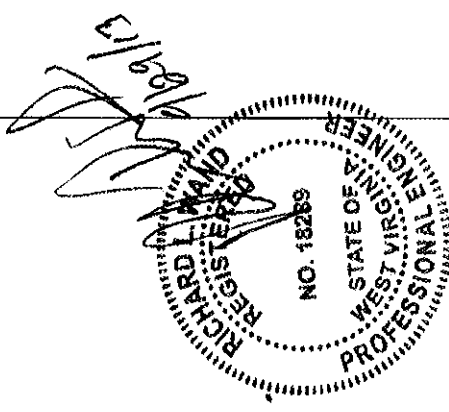
ITEM 1 ~ AS5 ANGLE



ITEM 3 ~ AS5 PLATE



ITEM 4 ~ AS5 PLATE



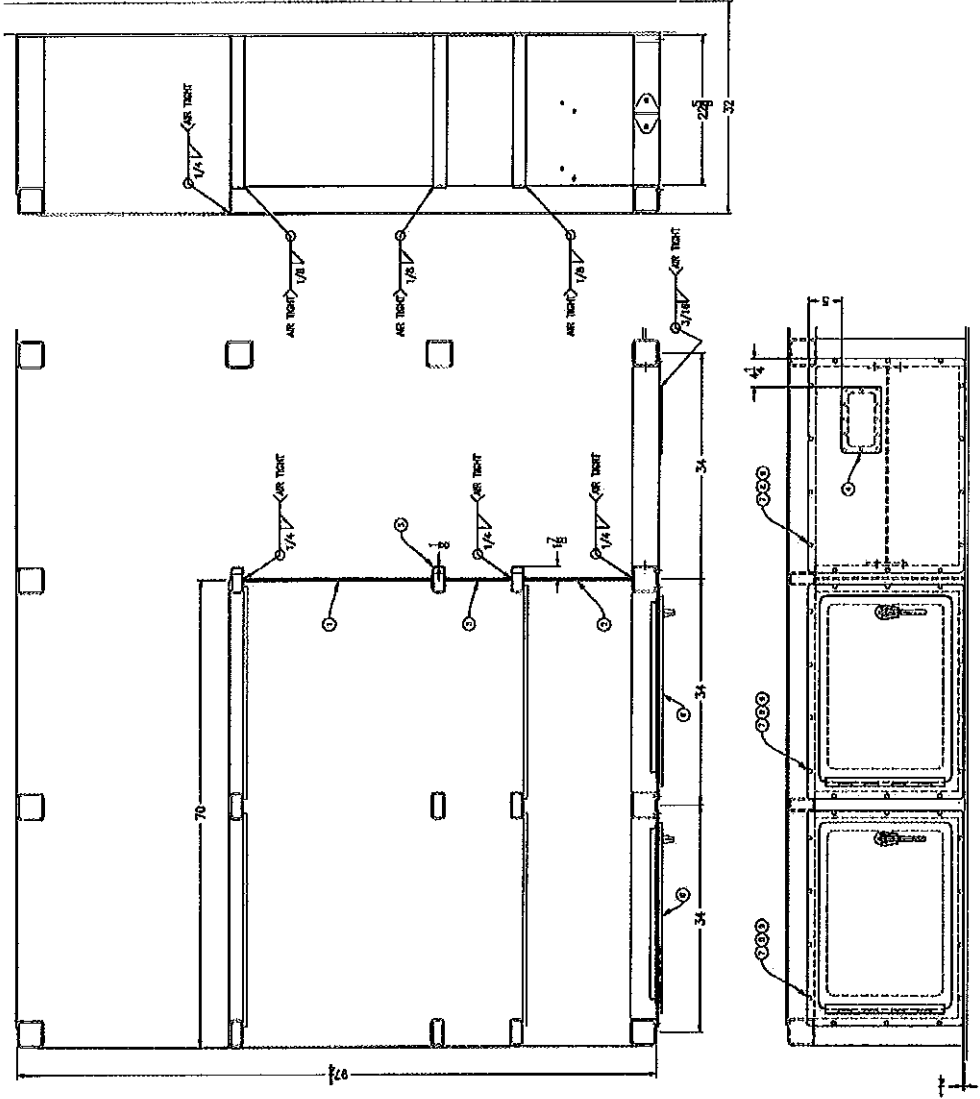
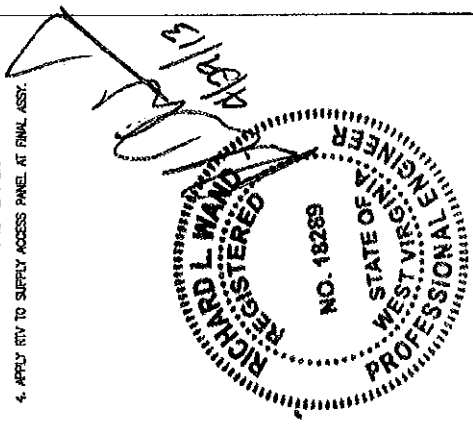
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DATE: 4-30-13 DRAWN BY: [illegible] CHECKED BY: [illegible]	PROJECT NO.: 100658-2	SHEET NO.: 2 OF 2	SCALE: [illegible]



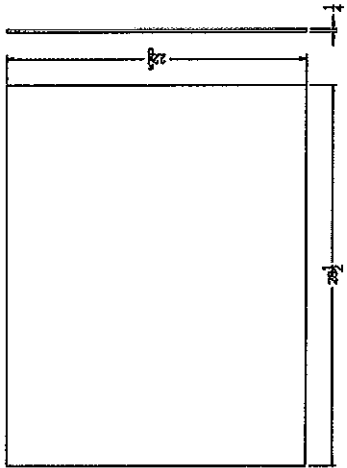
BILL OF MATERIAL ~ P/N 100629

ITEM	QTY	PART NUMBER	DESCRIPTION	UNIT
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2	1	22.63	26.50 x 25" AS6 PLATE	45.8
3	1	22.63	16.50 x 25" AS6 PLATE	26.5
4	1	22.63	10.00 x 25" AS6 PLATE	16.1
5	4	6.00	10.00 x 25" AS6 PLATE	4.2
6	2	1.00	3/8-16 INCH x 1.25" LG	0.1
7	42	100059	CLUMBER DOOR ASSEMBLY	35
8	42	100163	LINER, 3/8" SPLIT	~
9	42	100158	FLWR, 3/8" FLAN	~

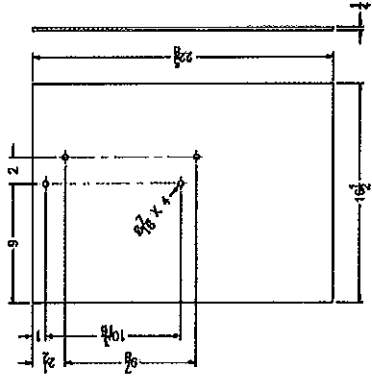
- NOTES:
1. REMOVE ALL BARRIS AND BREAK ALL SHARP EDGES.
  2. ALL WELDS TO BE AWS E-7018 OR EQUAL.
  3. PRIME & PAINT GLOSS WHITE ALL OVER.
  4. APPLY RTV TO SUPPLY ACCESS PANEL AT FINAL ASSY.



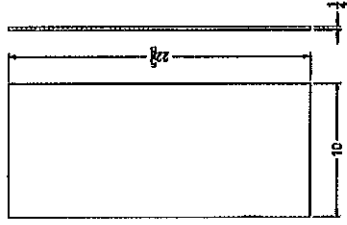
		100629-1	
PROJECT NO. 100629-1 PROJECT NAME: SHELTER BOX CONVERSION PROJECT LOCATION: A. L. LEE MODEL 3236 PROJECT DATE: 4-16-13 PROJECT STATUS:	SHEET NO. 100629-1-1 SHEET TOTAL: 100629-1-1	DATE: 4-16-13 TIME:	100629-1



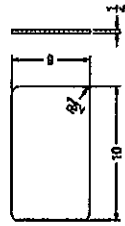
ITEM 1 - ASB PLATE



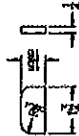
ITEM 2 - ASB PLATE



ITEM 3 - ASB PLATE



ITEM 4 - ASB PLATE



ITEM 5 - ASB PLATE

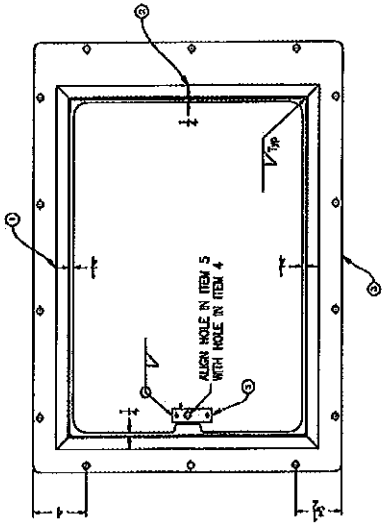
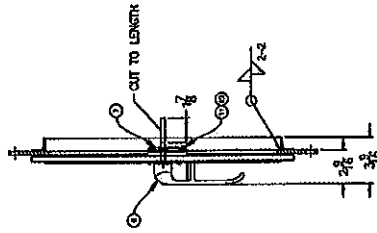
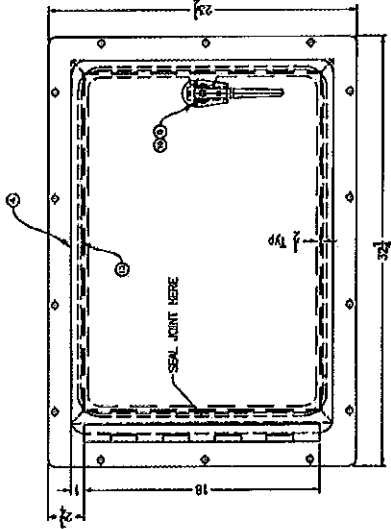
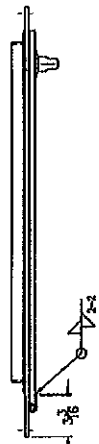
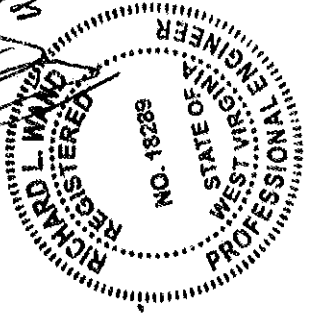
DRAWING 2X SCALE

RICHARD L. WARD  
 REGISTERED PROFESSIONAL ENGINEER  
 NC. 18289  
 STATE OF NORTH CAROLINA  
 WEST VIRGINIA  
 4/19/13

PROFESSIONAL SEAL RICHARD L. WARD REGISTERED PROFESSIONAL ENGINEER NC. 18289		PROJECT NO. 100629-2 SHEET NO. 2 OF 2
DRAWING TITLE BOX CONVERSION DETAILS A. L. LEE MODEL 3236		DATE 4-22-13
PROJECT LOCATION WEST VIRGINIA		SCALE AS SHOWN
DRAWING NO. 100629-2		SHEET NO. 2 OF 2

**BILL OF MATERIAL ~ P/N 100630**

ITEM	QTY	PART NUMBER	DESCRIPTION	UNIT PRICE
1	2	1.0x1.0x.13 AS6	Angle x 27.25" Lg	1.8
2	2	1.0x1.0x.13 AS6	Angle x 20.00" Lg	1.2
3	1	23.50 x 23.25 x .25"	AS6 Plate	23.0
4	1	20.00 x 28.00 x .35"	AS6 Plate	59.4
5	1	21x1.00 AS6	Flat x 3.00" Lg	0.3
6	1	100250	Handle = McMaster Carr #15629A101	2.8
7	1	100250	Handle = McMaster Carr #15629A101	1.0
8	1	100251	Latch = McMaster Carr #13454AS	0.2
9	4	FRMS. #10-24XING	x 3/8" Lg	"
10	4	LNWR. #10 SPLIT		"
11	2	FRMS. 1/4-20XINC	x 3/8" Lg	"
12	2	LNWR. 1/4" SPLIT		"
13	17.3R	100247	SEAL = McMaster Carr #66RRT24	"



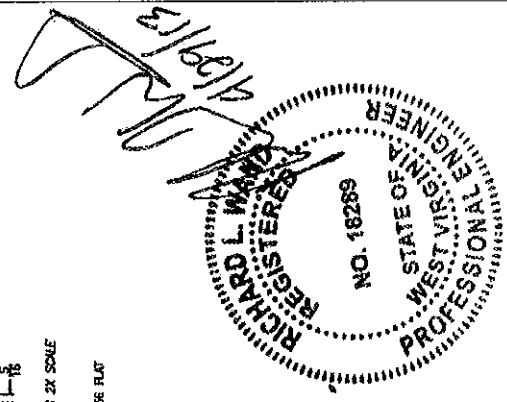
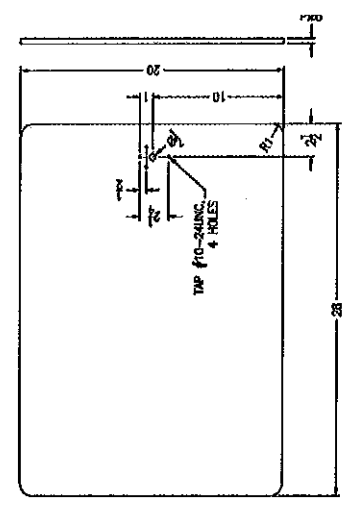
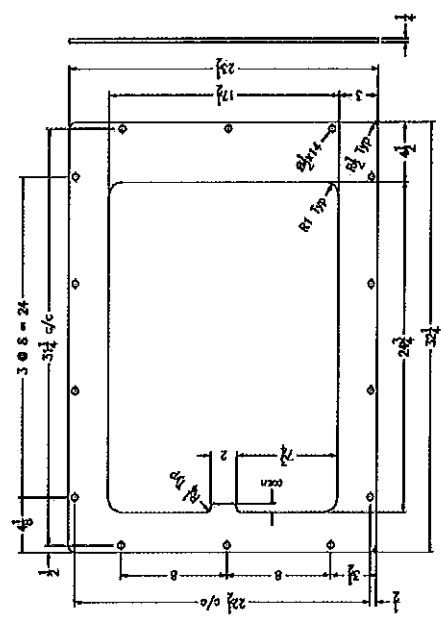
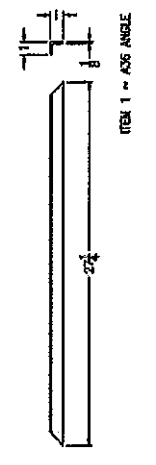
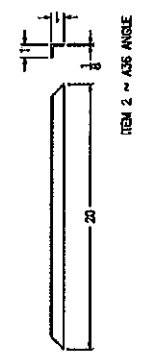
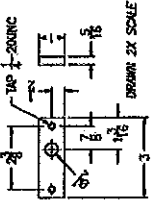
- NOTES:**
1. REMOVE ALL BURRS AND BREAK ALL SHARP EDGES.
  2. ALL WELDS TO BE AWS 1/8" CONTINUOUS FILLETS UNLESS OTHERWISE SPECIFIED.
  3. PRIME & PAINT ALL OVER WITH BASE #6019-002 RECOAT ZN WHITE TOP-COAT OR EQUAL.
  4. INSTALL HANDLE & LATCH AFTER PAINTING AND LUBRICATE ALL JOINTS WITH HEAVY OIL.
  5. INSTALL SEAL AFTER PAINTING AND LATCH CLOSED.

**ChremBio**

**CYLINDER DOOR ASSEMBLY**  
A. L. LEE MODEL 3236 CONVERSION

**100630-1**

REV 1 OF 2 (P)

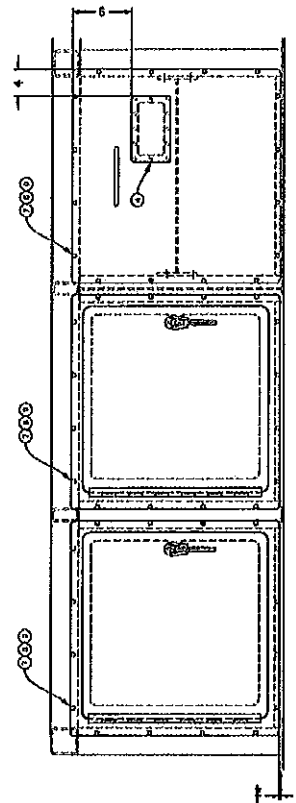
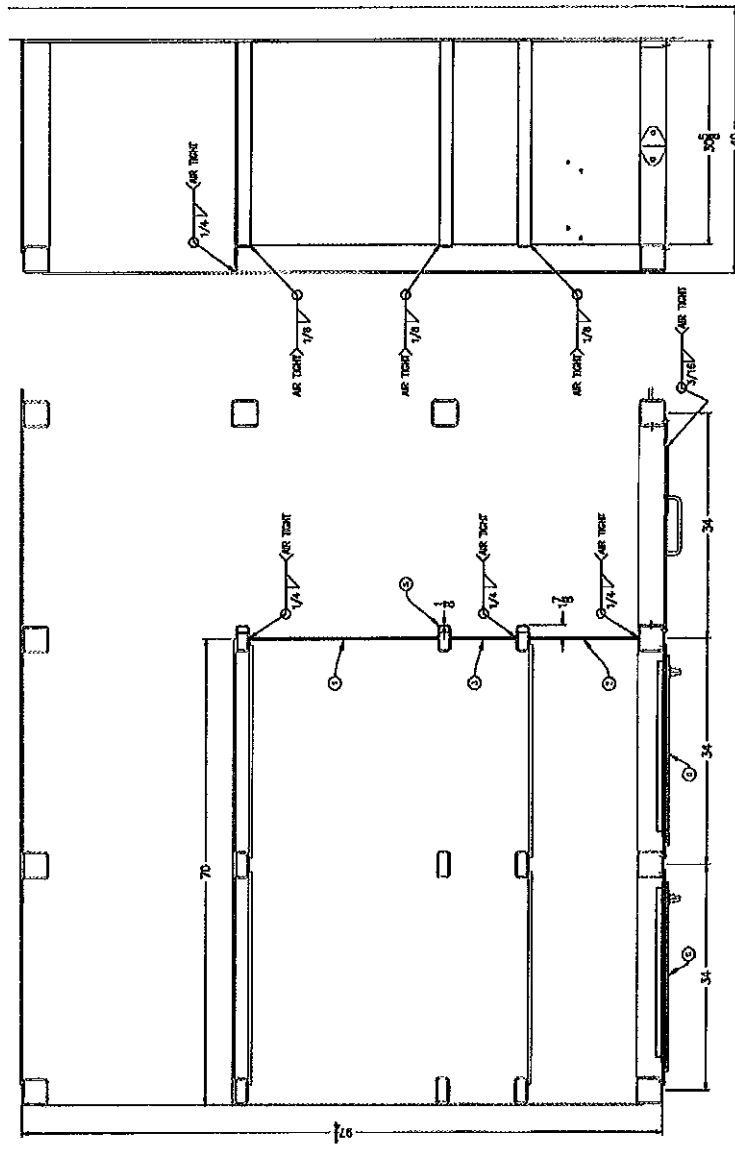
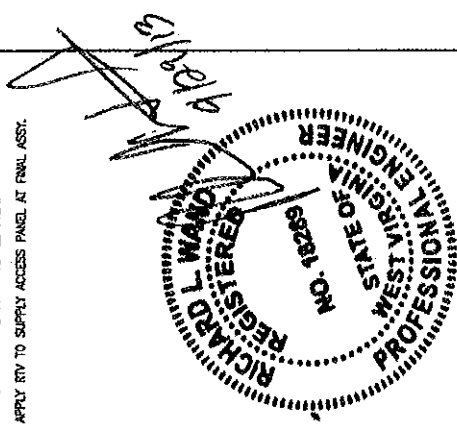


		CYLINDER DOOR DETAILS A. L. LEE MODEL 3236 CONVERSION	
PROJECT NO. 100630-2	DATE 04-22-13	SHEET NO. 2 OF 2	PROJECT NO. 100630-2
DESIGNER A. L. LEE		CHECKED A. L. LEE	
DRAWN A. L. LEE		SCALE AS SHOWN	

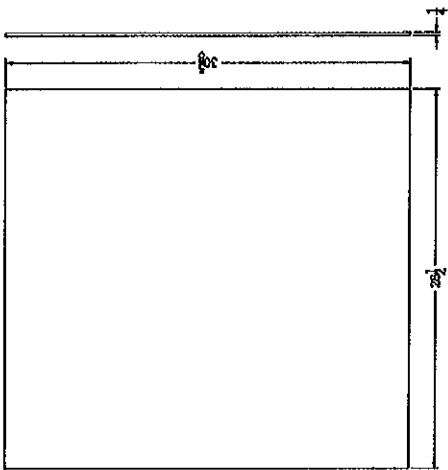
BILL OF MATERIAL ~ P/N 100634

ITEM	QTY	PART NUMBER	DESCRIPTION	UNIT
1	1	28.50	30.63 x 25" AS6 PLATE	60.0
2	1	16.50	30.63 x 25" AS6 PLATE	33.6
3	1	10.00	30.63 x 25" AS6 PLATE	21.7
4	1	6.00	10.00 x 25" AS6 PLATE	4.2
5	4	34	1.75 x 25" AS6 PLATE	0.1
6	2	100635	CYLINDER DOOR ASSEMBLY	124
7	48	100659	HRCS. 3/8-16 ING. x 1.25" LG	~
8	48	100183	LNBR. 3/8" SPLIT	~
9	48	100158	FLWR. 3/8" PLAIN	~

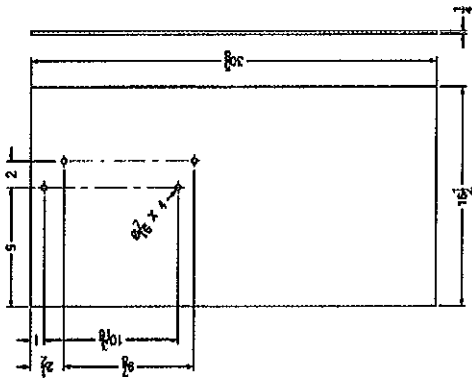
- NOTES:
1. REMOVE ALL BURRS AND BREAK ALL SHARP EDGES.
  2. ALL WELDS TO BE AWS E-7018 OR EQUAL.
  3. PRIME & PAINT GLOSS WHITE ALL OVER.
  4. APPLY RTV TO SUPPLY ACCESS PANEL AT FINAL ASSY.



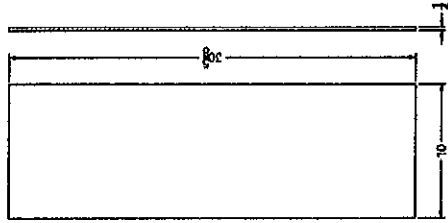
		SHELLER BOX CONVERSION A. L. LEE MODEL 4042	
PROJECT NO. 100634 DATE 10/24/19	DRAWN BY: [blank] CHECKED BY: [blank]	SHEET NO. 1 OF 2	PROJECT NO. 100634-1



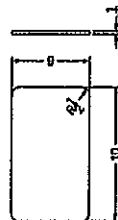
ITEM 1 ~ AS6 PLATE



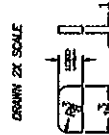
ITEM 2 ~ AS6 PLATE



ITEM 3 ~ AS6 PLATE



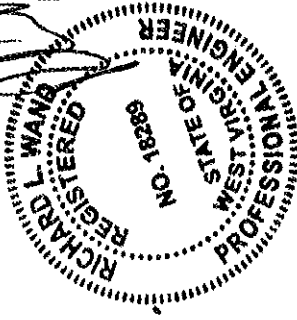
ITEM 4 ~ AS6 PLATE



ITEM 5 ~ AS6 PLATE

DRAWN 2X SCALE

4/27/13

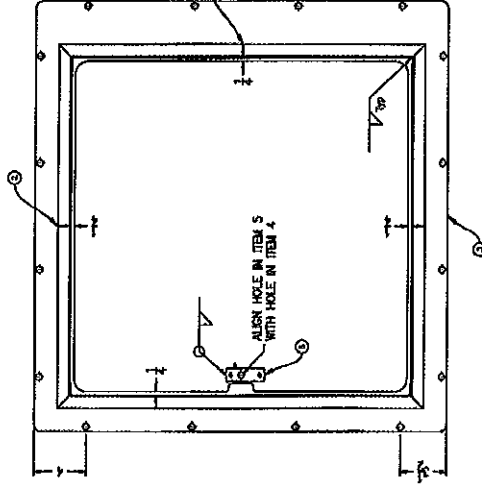
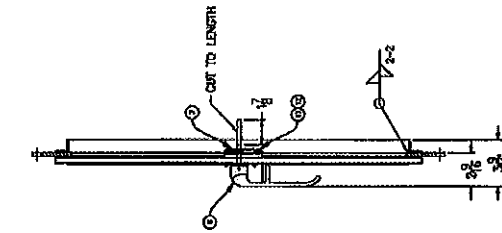
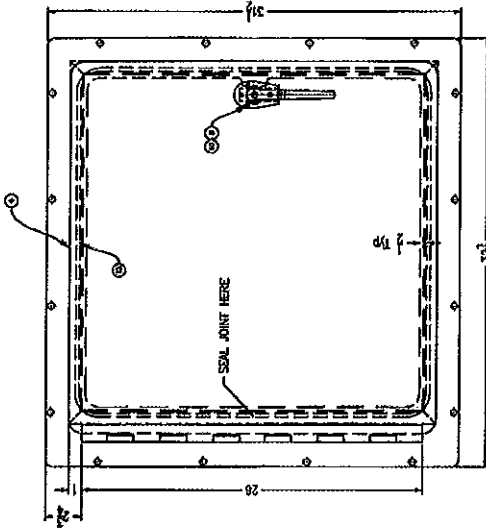


REGISTERED PROFESSIONAL ENGINEER RICHARD L. WANG WEST VIRGINIA		BOX CONVERSION DETAILS A. L. LEE MODEL 4042		100634-2	
PROJECT NUMBER 100634	SHEET NUMBER 2 OF 2	DATE 4-23-13	SCALE 1" = 1"	DRAWN BY RLW	CHECKED BY RLW
MATERIALS LISTED AS6 ALUMINUM PLATE	FINISHES 1/16" X 1/2" X 1/2" ANGLE 1/2" X 1/2" ANGLE 1/2" X 1/2" ANGLE FINISH 105-1	PROJECT NUMBER 100634	SHEET NUMBER 2 OF 2	DATE 4-23-13	SCALE 1" = 1"

**BILL OF MATERIAL ~ P/N 100635**

ITEM	QTY	RECD PART NUMBER	DESCRIPTION	UNIT	WEIGHT
1	2		1.0x1.0x.13 AS5 Angle x 28.00" Lg	Lg	1.8
2	2		1.0x1.0x.13 AS5 Angle x 27.25" Lg	Lg	1.8
3	1		31.50 x 32.25 x .25" AS5 Plate	Plat	27.3
4	1		26.00 x 26.00 x .38" AS5 Plate	Plat	63.2
5	1		31x1.00 AS5 Flat x 3.00" Lg	Lg	0.3
6	1	100250	Headle = Mallester Carr #1585K101		4.0
7	1	100251	Latch = Mallester Carr #1585K101		3.0
8	1		Headle = Mallester Carr #1585K101		4.0
9	4		PHMS, #10-20UNC x 3/8" Lg	LWRK	0.2
10	4		LWRK, #10 SPLT		
11	2		PHMS, 1/4"-20UNC x 3/8" Lg	LWRK	0.2
12	2		LWRK, 1/4" SPLT		
13	1	100247	SEAL = Mallester Carr #809K124		0.2

- NOTES**
1. REMOVE ALL BURRS AND BREAK ALL SHARP EDGES.
  2. ALL WELDS TO BE WELDED 1/8" CONTINUOUS FILLETS UNLESS OTHERWISE SPECIFIED.
  3. PRIME & PAINT ALL OVER WITH BASS' ACGLSS-0002 DECKLACK 2K WHITE TOPCOAT OR EQUAL.
  4. INSTALL HANDLE & LATCH AFTER PAINTING AND LUBRICATE ALL JOINTS WITH HEAVY OIL.
  5. INSTALL SEAL AFTER PAINTING AND LATCH CLOSED.



*Handwritten signature and date:* 4/27/13

**REGISTERED PROFESSIONAL ENGINEER**  
**RICHARD J. WAND**  
 NO. 10833  
 STATE OF MISSISSIPPI

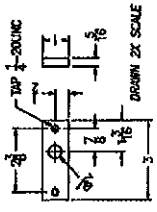
<p>FRCTIONS: 1/16"          X .125"          X .250"          ANGULAR: 5°          FINISH: 125-μ"          REF: 4-29-13</p>	<p>100635-1</p>
<p>100634</p>	<p>100635-1</p>
<p>100634</p>	<p>100635-1</p>

**CYLINDER DOOR ASSEMBLY**  
**A. L. LEE MODEL 4042 CONVERSION**

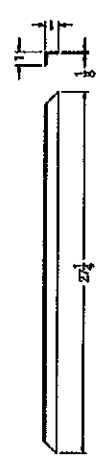
100635-1

100634

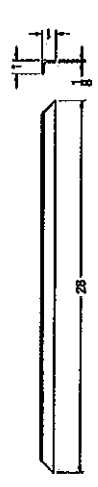
100634



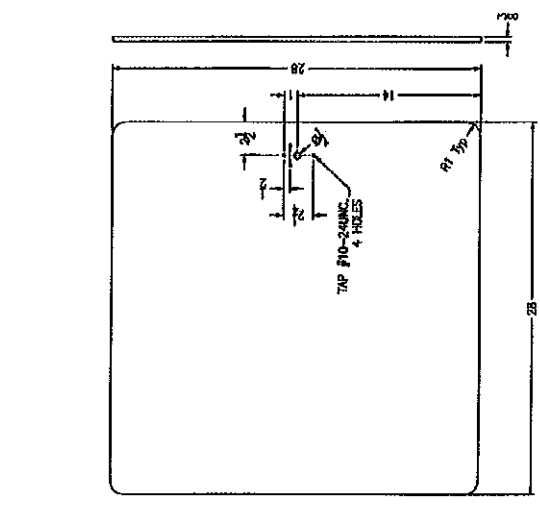
ITEM 5 ~ A36 PLAT



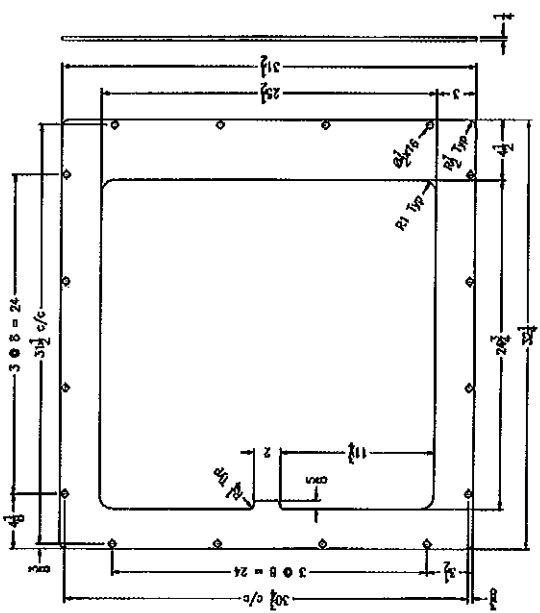
ITEM 2 ~ A36 ANGLE



ITEM 1 ~ A36 ANGLE



ITEM 4 ~ A36 PLATE



ITEM 3 ~ A36 PLATE

RICHARD L. WALKER  
 REGISTERED PROFESSIONAL ENGINEER  
 NO. 18288  
 STATE OF WEST VIRGINIA  
 4/26/13

		100635-2	
CYLINDER DOOR DETAILS A. L. LEE MODEL 4042 CONVERSION			
DATE 4-26-13	DRAWN BY A. L. LEE	CHECKED BY A. L. LEE	SCALE 1/4" = 1'-0"
SHEET NO. 2	TOTAL SHEETS 2	PROJECT NO. 100635-2	DATE PLOTTED 4/26/13



### ChemBio Shelter Models

Note: The model number format includes the height of the box, the height of the tent, and the maximum person capacity.

The model number format is XXYY-ZZ;  
where XX is the height of the box, YY is the height of the tent, and ZZ is the maximum person capacity.

For example 4042-34 is a 40 inch high box, a 42 inch high tent, and a maximum person capacity of 34.

There are a total of 24 different models.

24 inch box	32 inch box	40 inch box
2428-03	3236-03	4042-03
2428-07	3236-07	4042-07
2428-10	3236-10	4042-10
2428-14	3236-14	4042-14
2428-16	3236-18	4042-18
2428-18	3236-22	4042-22
2428-20	3236-26	4042-26
	3236-30	4042-30
		4042-34



653 McCorkle Blvd. Unit F, Westerville, Oh 43082  
614-891-6111 (ph); 614-891-6136 (fax)

Name: Richard Wand Date: 04/28/2013  
Customer: ChemBio  
Project: 130460  
Subject: Certification of Shelter Modifications

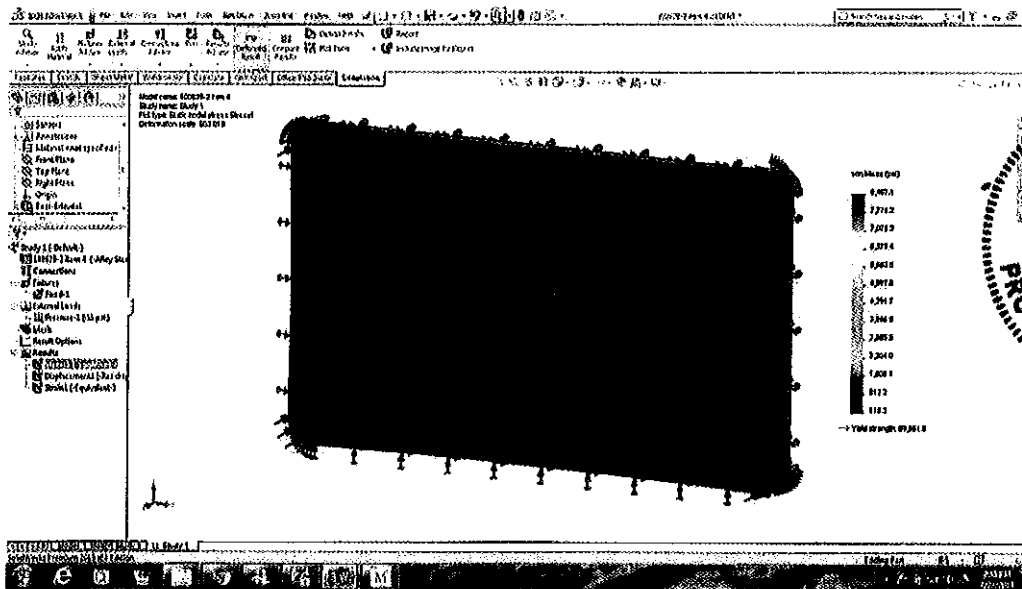
MJ Engineering has been contacted by ChemBio to review and certify some shelter modifications to existing WV approved shelters. The existing approved shelter boxes are A.L. Lee approved, 24-in (2428), 32-in (3236) and 40-in (4042) models.

The purpose of this document/certification is to demonstrate that the modifications ChemBio wishes to make to the 24-in, 32-in and 40-in shelter boxes will meet the WV certification requirements (pressure load of 15-psi) and will not invalidate the original structural certification.

ChemBio is adding internal plates to make the tank area of the shelter air tight. This will not invalidate the original structural certification provided none of the 4x4 structural tubes are cut or modified and according to the ChemBio drawings they will not be modified. These internal plates are not subjected to the 15-psi load and therefore are not further considered for this certification.

The outer doors are being modified along with a cover plate adding to an existing window.

The existing window was already part of the certification and capable of carrying the 15-psi load. Assuming the certified window is removed and the plate (same across all three shelters) placed over the hole in the side, lets look at the strength of the plate under a 15-psi load.



*Richard A. Wand*  
9/27/13  
RICHARD A. WAND  
REGISTERED  
NO. 18289  
WEST VIRGINIA  
PROFESSIONAL ENGINEER

As shown in the above plot, the plate is capable of supporting the 15-psi load with a FOS that is more than adequate for A36 plate (as shown on drawing 100629-2). This is satisfactory and will transfer the 15-psi pressure in the side plate of the structure in accordance with the original design thus not violating the original certification.

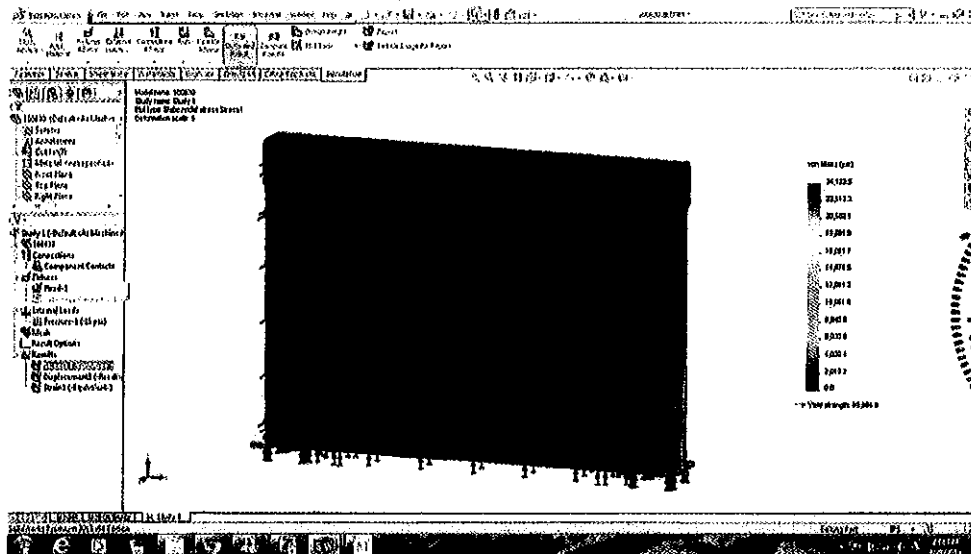


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Subject: Certification of Shelter Modifications

The original doors are being replaced with hinge doors that will allow inspection of gauge pressures on the tanks. Because of the internal plates being added with air tight welds, these doors can be opened without harming the shelter.

A finite element analysis was performed to determine if the new door designs are capable of supporting the 15-psi load without sustaining permanent deformation. The door is made of a two plate assembly with the outermost plate backed by 1 x 1 x 1/8 steel angles to provide additional support.



As can be seen from the plot above (32-in door, 100630), the door design has a max stress of 24-ksi, which is well below the 36-ksi minimum for the materials specified on drawing 100630-2. Therefore the design ChemBio proposes is certified to support 15-psi load as required by MSHA and WV applicable codes.

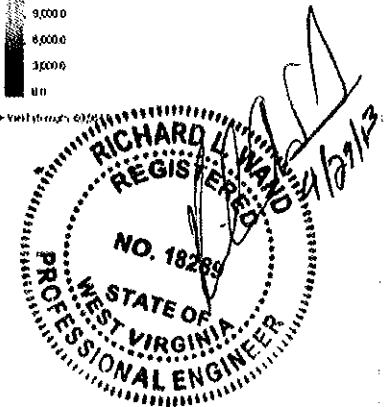
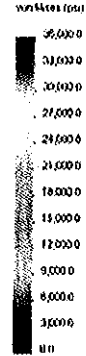
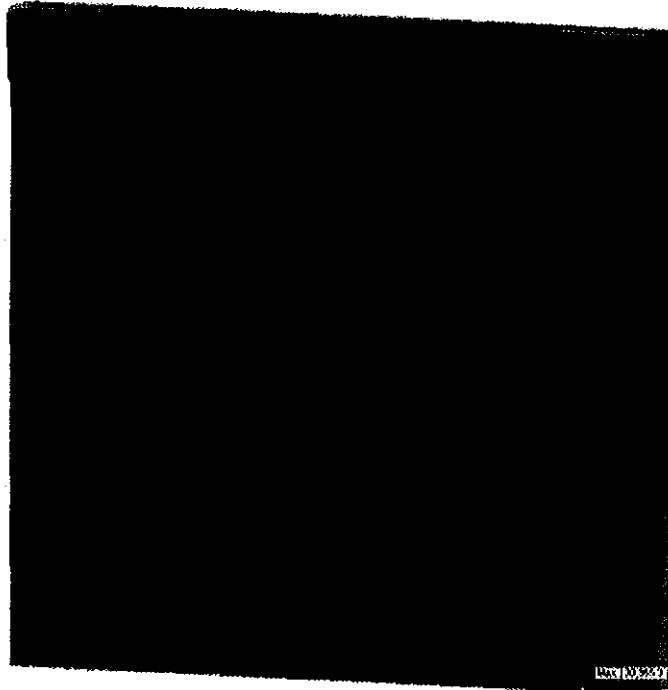
The door will also carry the load in the same manner as the original doors/plates and will load the 4x4 internal tubes in the same manner as the original shelter. The internal 4x4 structure is the load carrying frame for this shelter and again provided no modifications are made to this structure then the load carrying capability is not modified by the ChemBio modifications and the existing certification should not be violated.

ChemBio also asked MJ Engineering to review a larger door (for larger 4042 shelters) and a smaller door (for smaller 2428) shelters. The smaller door uses the same construction techniques, materials and because of the smaller area carries less load than the previously reviewed door, this is acceptable to meet the MSHA and WV certification requirements of 15-psi.



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 Subject: Certification of Shelter Modifications



Reviewing the larger door (shown in the plot above), 100635, against the 15-psi pressure load we see the max stress on the door (either back plate or front plate) is 23,753-psi, well below the yield strength of A36 material.

This door as designed will properly transfer the 15-psi load into the frame of the shelter where it was intended to be carried. These doors do not alter the strength carrying ability of the shelter.

This door meets the 15-psi certification requirements of MSHA and WV.

Given the review of the shelter modifications for all three sizes (24-in, 32-in and 40-in), the changes ChemBio propose to make should not invalidate the certification of the original structure. This certification covers the following drawings that have been reviewed and approved in this report. These include 100629, 100630, 100634, 100635, 100637, 100638.

Respectfully Submitted,

Richard Wand, P.E.  
 MJ Engineering