

February 24, 2014

Elevator Safety Board  
Department of Licensing and Regulatory Affairs  
State of Michigan

RE: Variance Request

Dear Members of the Board,

I am writing on behalf of our clients, Larry and Alicia Winget of [REDACTED] Mr. and Mrs. Winget are requesting a variance to **ASME A17.1 rule 5.3.1.10.1 Capacity** which states in part, **"The maximum inside net platform area shall not exceed 15 sq. ft."** and further; **"For net platform areas greater than 12 sq. ft., the rated load shall be based upon 62.5 lb. / sq. ft."**

Mr. and Mrs. Winget are into construction of a new home in [REDACTED] in which they intend to reside for the foreseeable future. With that in mind the Wingets have incorporated some universal design features into the building plan, which includes a residential elevator. The Wingets are strongly desirous of having an elevator with sufficient car size to readily accommodate a person in a wheelchair with an attendant.

We propose to furnish a residential elevator manufactured by Bella Elevator. It has been determined that an elevator car size of 60" x 42" (17.5 sq. ft.) would be suitable for the Wingets' needs. For this application, the manufacturer has certified a rated capacity of 1,135 lb., with a five times safety factor. This is slightly in excess of the 62.5.lb. / sq. ft. ratio stipulated in rule 5.3.1.10.1.

With the exception of the larger car size, this installation would be like any typical residential elevator installation and fully code compliant, as such.

We appreciate the Board's consideration of this request.

Yours truly,



Mark F. Bosley, President  
Adaptive Environments, Inc.



# Bella Elevator LLC

8915 North Pioneer Road  
Peoria, IL 61615  
Phone (309) 689-8090  
Fax (309) 689-8091



February 24, 2014

To Whom It May Concern:

The Symmetry residential elevator car frame and rail structure is designed for a five times safety factor with a gross load of 2000# when cantilevered less than 48" off of the interior of the rail wall. The gross load includes both the weight of the car and the rated capacity.

The Winget Residence meets the above stated criteria with a rated capacity of 1125#, per drawing number 021814-06 revision R2.

Sincerely,

A handwritten signature in black ink, appearing to read "K. Heyungs", with a long horizontal line extending to the right.

Kevin L. Heyungs  
Engineering Manager

# SYMMETRY HYDRAULIC SPECIFICATIONS

## GENERAL:

- PIT DEPTH: 16"
- TRAVEL: 274" (MINIMUM 12" BETWEEN STOPS)
- OVERHEAD: 120"
- SPEED: 40 FPM
- LOAD CAPACITY: 1125#
- CAR/FRAME WEIGHT: 800#
- THREE STOPS
- OPPOSITE OPENING
- HOISTWAY SWING DOORS BY OTHERS

## CAR FEATURES:

- 42" X 60" CAB SIZE
- 7' 11" INTERIOR CAR HEIGHT
- UNFINISHED BIRCH FLAT PANEL INTERIOR WALLS WITH MATCHING CEILING
- MATCHING WOOD HANDRAIL
- MATCHING WOOD CAR SILL
- UNFINISHED PLYWOOD FLOOR WITH SILL SET FOR 3/4" (FLOORING BY OTHERS)
- (2) ENERGY SAVING RECESSED LED LIGHTS WITH BLACK TRIM RINGS
- (2) 7' 11" WHITE LAMINATE ACCORDION GATE WITH VINYL HINGING AND CLEAR HARDWARE - 14 PANEL GATES

## FIXTURES:

- #4 BRUSHED STAINLESS CAR OPERATING PANEL (COP) WITH LED FLOOR POSITION INDICATOR.
- (5) #4 BRUSHED STAINLESS HALL STATIONS WITH CALL BUTTON AND POSITION INDICATOR.
- #4 BRUSHED STAINLESS RECESSED PHONE BOX (PHONE JACK INCLUDED)

## MECHANICAL EQUIPMENT:

- MODULAR 6 1/4" T-RAIL STRUCTURE
- CAR FRAME ASSEMBLY
- 208 / 230 VAC, 60Hz, 30 AMP SINGLE PHASE POWER SUPPLY FOR MOTOR CONTROLLER
- 120 VAC, 60Hz, 15 AMP, SINGLE PHASE POWER SUPPLY FOR LIGHTING
- (2) 3/8" 7 X 19 GALVANIZED AIRCRAFT CABLE (WIRE ROPE) WITH WEDGE ROPE SHACKLES. BREAKING STRENGTH 14,400LB PER ROPE
- 80MM DIAMETER PISTON/102MM DIAMETER CYLINDER INCL. 1" - 3/4" REDUCER BUSHING
- 208 / 230, 3 HP SUBMERSED MOTOR WITH 2 SPEED VALVE ASSEMBLY (1750RPM, 17FL AMPS). MANUAL DOWN VALVE FOR EMERGENCY LOWERING SCREW PUMP (300 MICRON SCREEN)
- POSITIVE PRESSURE SWITCH
- CODE COMPLIANT ELECTRICAL DISCONNECTS

## SAFETY DEVICES:

(TYPE "A" INSTANTANEOUS)

- SLACK ROPE SAFETY DEVICE
- RUPTURE VALVE (TYPE "C" SAFETY)
- MOTOR CONTROLLER SUPPLY (LOCATED IN CONTROLLER)
- CAR LIGHT SUPPLY (LOCATED IN CONTROLLER)
- PIT STOP SWITCH
- CAR TOP STOP SWITCH
- IN-CAR EMERGENCY STOP SWITCH AND ALARM
- SAFETY SWITCH FOR CAR GATE(S)
- BATTERY BACK UP EMERGENCY CAR LIGHT AND ALARM
- (2) LH & (3) RH ELECTROMECHANICAL HOISTWAY DOOR INTERLOCKS (DOORS BY OTHERS)

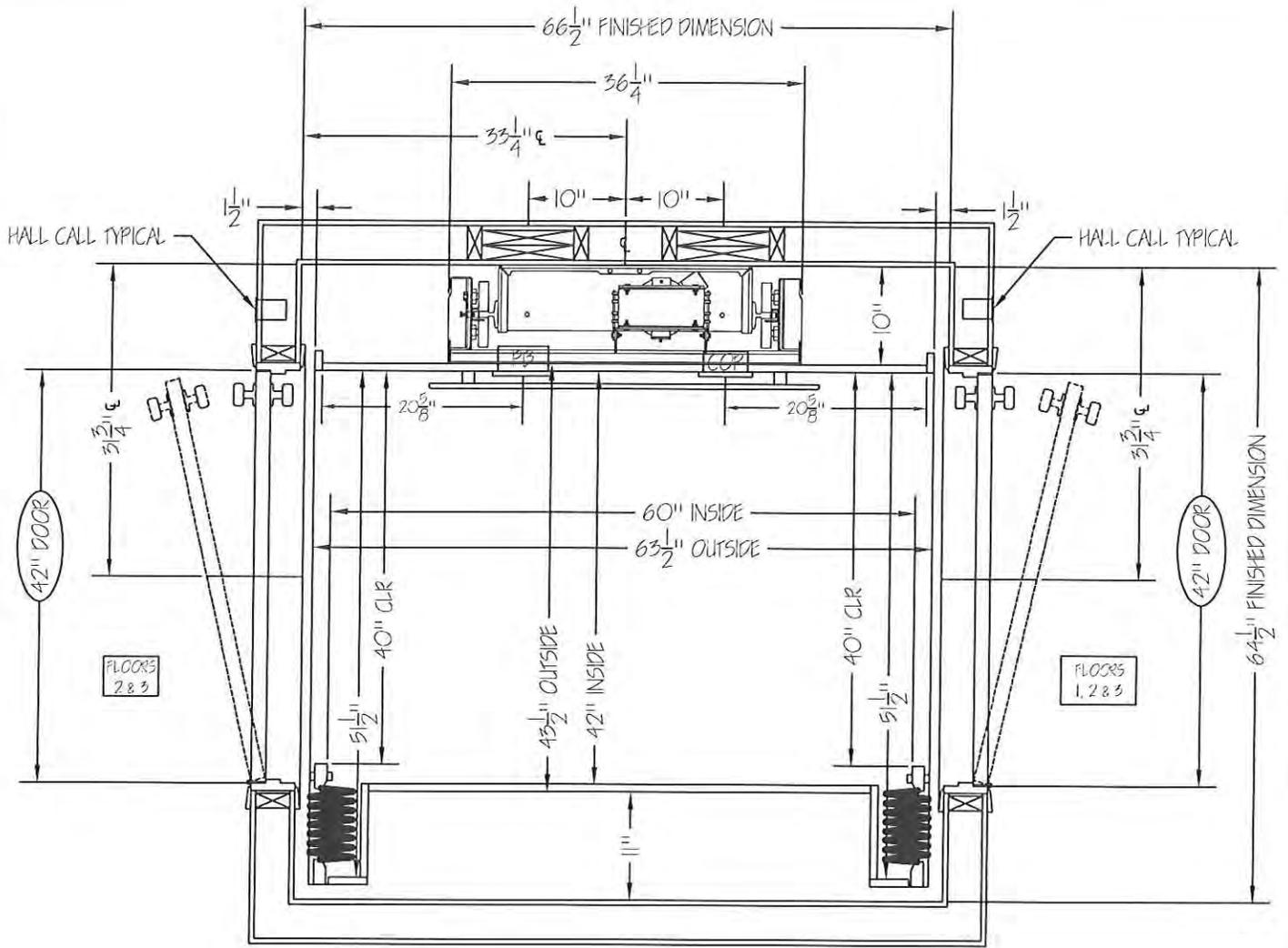
## CONTROLS: REMOTE CONTROLLER

- PROGRAMMABLE LOGIC CONTROLLER (PLC)
- NON-SELECTIVE COLLECTIVE AUTOMATIC OPERATION
- SELF DIAGNOSTIC SYSTEM WITH DIGITAL DISPLAY
- AUTOMATIC CAR LIGHTING
- SINGLE FLOOR DESIGNATED CAR HOMING
- UNINTERRUPTIBLE POWER SUPPLY (UPS) FOR CAR LOWERING AND AUTOMATIC GATE OPERATION ( IF PROVIDED) IN THE EVENT OF POWER FAILURE
- MANUAL LOWERING DEVICE

## OPTIONAL INCLUDED FEATURES:

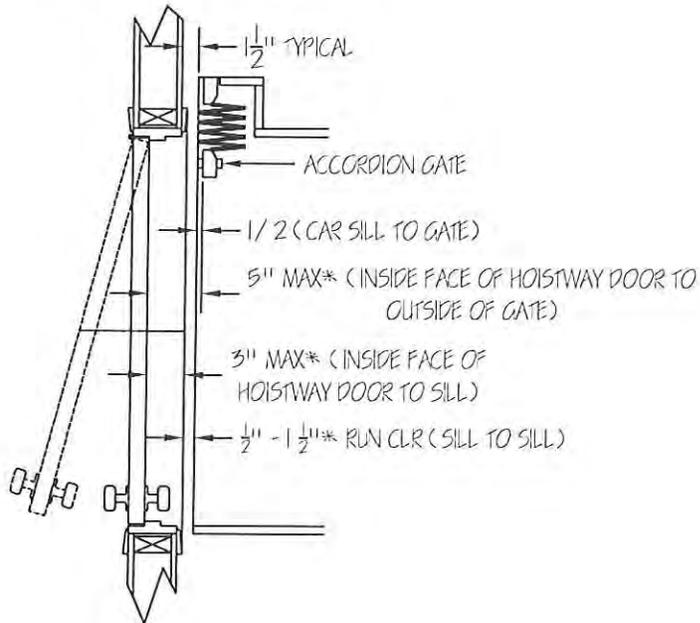
- CONCURRENT OPENINGS ON FLOORS 2 & 3
- 1 SET OF BUFFER SPRINGS
- SLIMLINE PHONE
- CAR OVER 15 SQ FT
- (1) 49" LH AUTOGATE OPERATOR - CLEAR ARM
- (1) 49" RH AUTOGATE OPERATOR - CLEAR ARM

<i>ADAPTIVE ENVIRONMENTS</i>			
TITLE HYDRAULIC SPECIFICATION			SCALE NONE
DRAWN BY DLC	ORIGINAL DATE 02/18/14	DRAWING NO. 021814-06	REV R2
JOB INFORMATION  WINGET RESIDENCE			



TYPICAL DOOR LOCATION DETAIL

\* HORIZONTAL RUNNING CLEARANCES  
 REQUIRED BY ASME A17.1, SECTION 5.3



ADAPTIVE ENVIRONMENTS			
TITLE OPPOSITE LH RH			SCALE NONE
DRAWN BY DLC	ORIGINAL DATE 02/18/14	DRAWING NO. 021814-06	REV R2
JOB INFORMATION WINGET RESIDENCE			

NOTES:

1) 9'0" OVERHEAD REQUIRED FOR 7'11" INTERIOR CAB HEIGHT FOR HYDRAULIC AND REMOTE CONTROLLER IN-LINE GEARED.

9'0" OVERHEAD REQUIRED FOR 7'-0" INTERIOR CAB HEIGHT FOR IN-LINE GEARED WITH CONTROLLER IN THE HOISTWAY. (INCLUDES 9" OF CARTOP CLEARANCE.)

CAB HEIGHT OVER 7'-0" REQUIRES ADDITIONAL OVERHEAD.

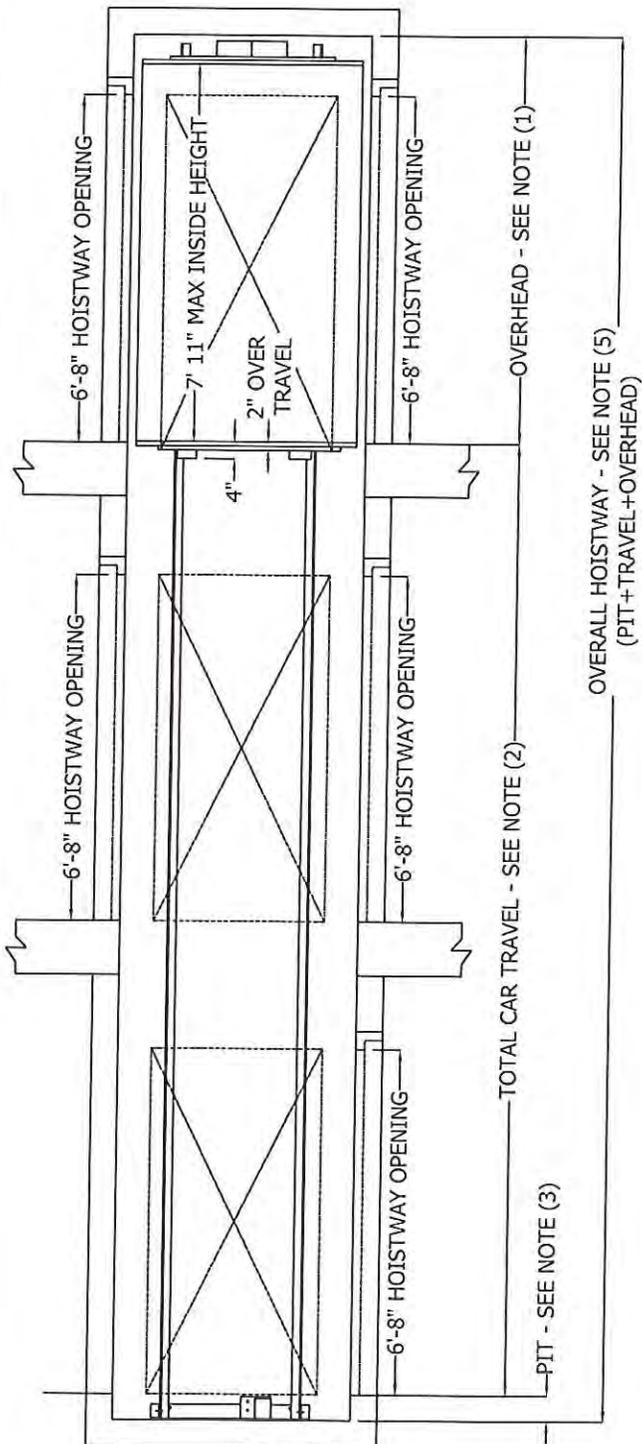
2) MINIMUM FLOOR TO FLOOR TRAVEL IS 12" BETWEEN FLOORS (IF TRAVEL IS LESS THAN 12" CONSULT FACTORY)

MAXIMUM FLOOR TO FLOOR TRAVEL:  
950LB UNIT= 50'0"

3) MINIMUM PIT DEPTH IS 6".  
BUFFER SPRINGS REQUIRE 9" PIT DEPTH MINIMUM.

Travel (ft)	0'0"-15'0"	15'1"-30'0"	30'1"-50'0"
Hydro Static Load (lbs)	2552	2942	3399
Hydro Impact Load (lbs)	5277	5667	6124
Travel (ft)	0'0"-15'0"	15'1"-30'0"	30'1"-50'0"
IGD Static Load (lbs)	3082	3374	3764
IGD Impact Load (lbs)	5807	6099	6489

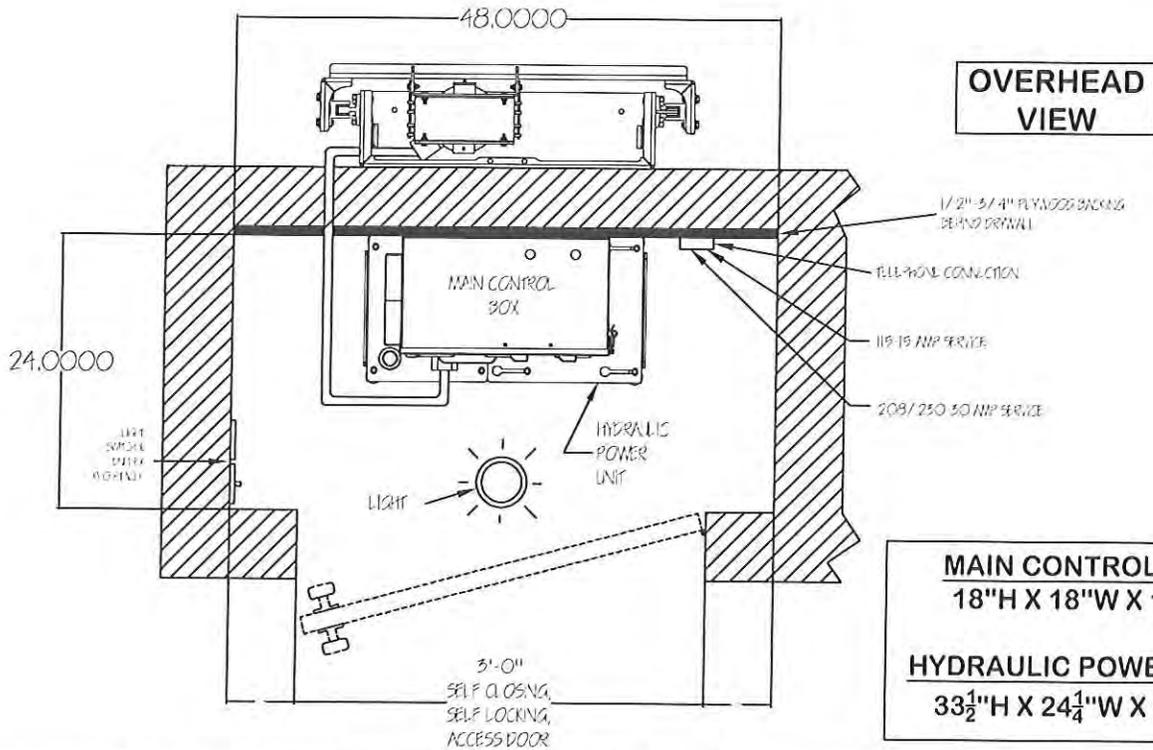
- 4) CONSULT LOCAL AUTHORITY TO ENSURE COMPLIANCE WITH STATE AND LOCAL CODES.
- 5) THE HOISTWAY IS REQUIRED TO BE FREE OF ALL PIPES, WIRING, AND OBSTRUCTIONS NOT RELATED TO THE OPERATION OF THE ELEVATOR.



JOB SPECIFIC INFORMATION:

410	OVERALL HOISTWAY
120	OVERHEAD
274	FLOOR TO FLOOR TRAVEL
16	PIT DEPTH

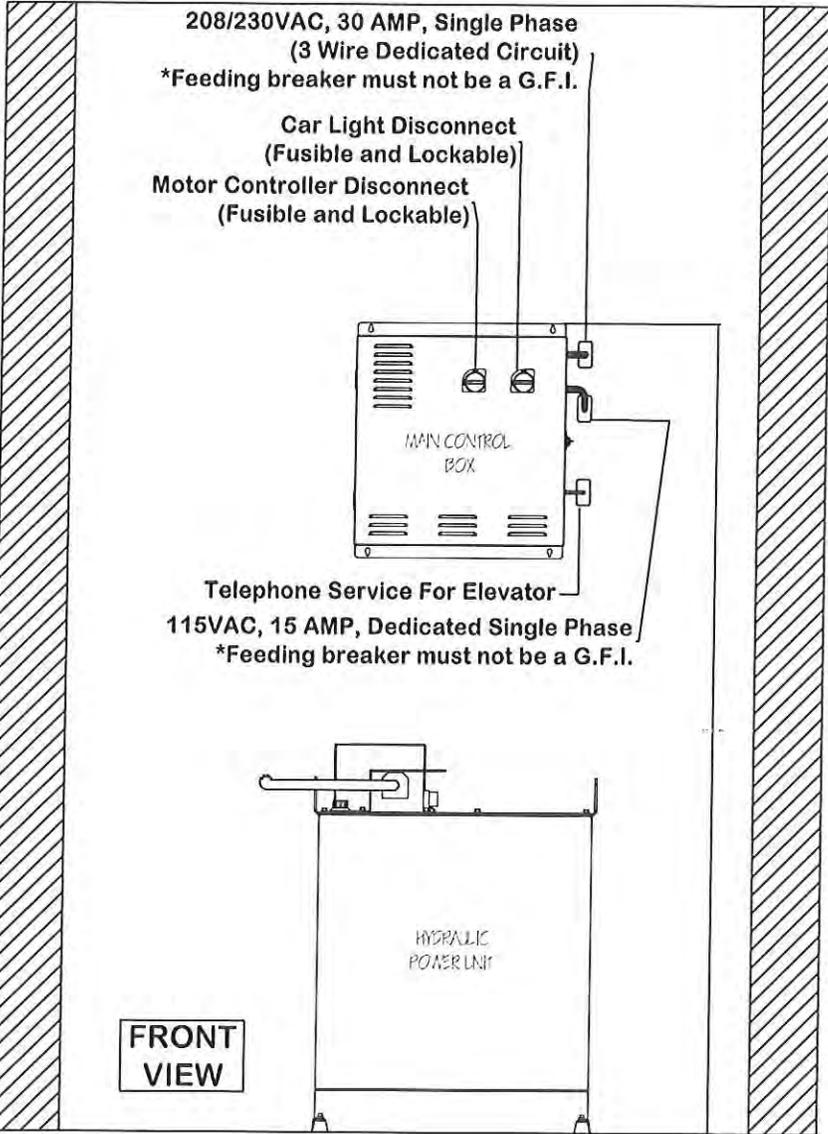
ADAPTIVE ENVIRONMENTS			
TITLE 3 STOP ELEVATION			SCALE NONE
DRAWN BY DLC	ORIGINAL DATE 02/18/14	DRAWING NO. 021814-06	REV R2
JOB INFORMATION			
WINGET RESIDENCE			



**OVERHEAD VIEW**

**MAIN CONTROL BOX**  
18"H X 18"W X 10"D

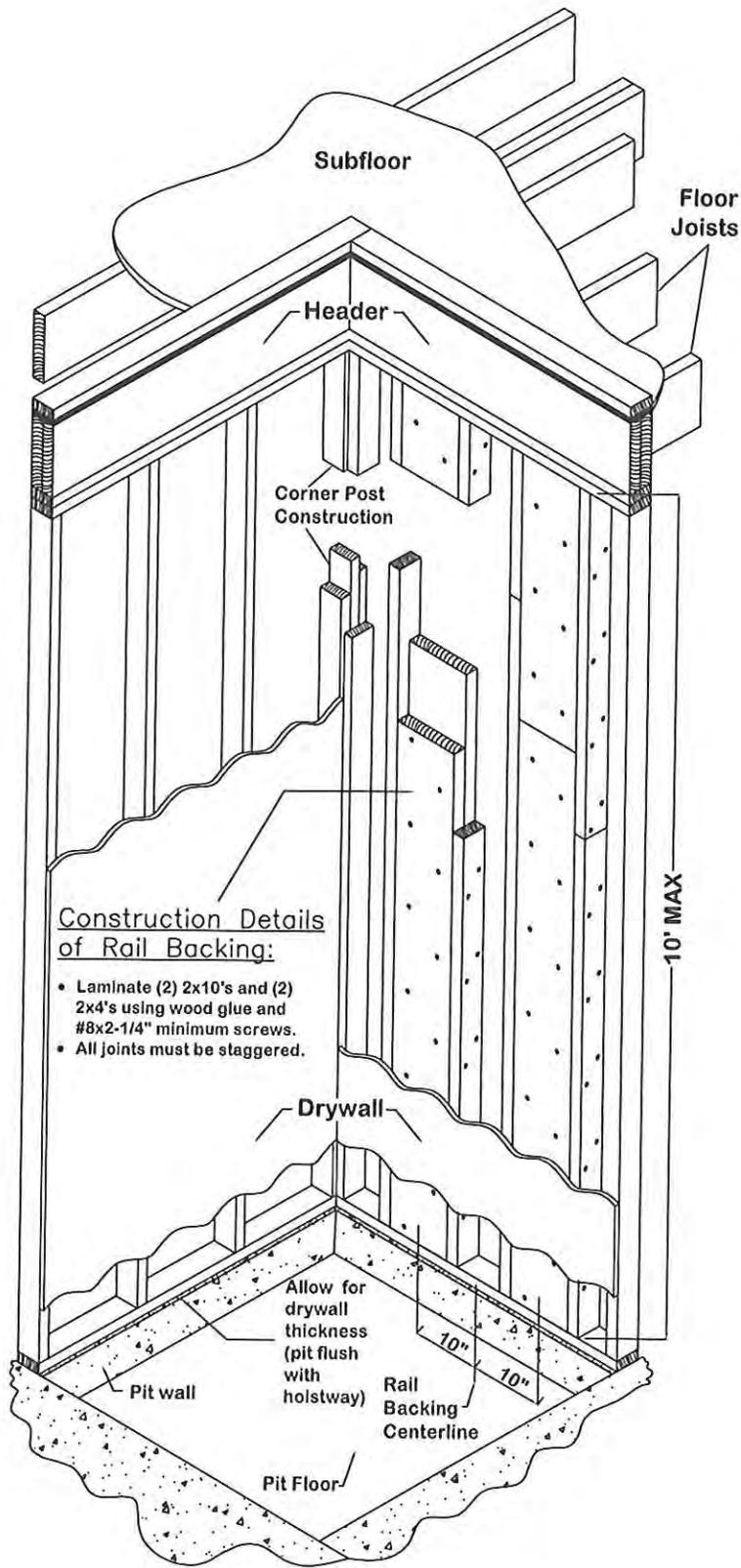
**HYDRAULIC POWER UNIT**  
33 $\frac{1}{2}$ "H X 24 $\frac{1}{4}$ "W X 12 $\frac{3}{4}$ "D



**FRONT VIEW**

- NOTES:**
- 1) THE ELEVATOR MACHINE ROOM LOCATION AND LAYOUT MUST MEET CODE REQUIREMENTS DEFINED BY THE LOCAL AUTHORITY HAVING JURISDICTION.
  - 2) 30" WIDE x 36" DEEP CLEAR WORKING SPACE REQUIRED IN FRONT OF THE MAIN CONTROL BOX BY NEC.
  - 3) LIGHT SWITCH TO BE LOCATED ON THE STRIKE SIDE OF THE MACHINE ROOM DOOR.
  - 4) THE HYDRAULIC POWER UNIT SHOULD BE LOCATED WITHIN 40' FROM THE CYLINDER.
  - 5) MACHINE SPACE SHALL BE FREE OF ANY EQUIPMENT OR APPURTENANCES NOT RELATED TO THE ELEVATOR.

<b>ADAPTIVE ENVIRONMENTS</b>		
TITLE COMPACT HYDRAULIC MACHINE ROOM		SCALE NONE
DRAWN BY DLC	ORIGINAL DATE 02/18/14	DRAWING NO. 021814-06
JOB INFORMATION		REV R2
WINGET RESIDENCE		

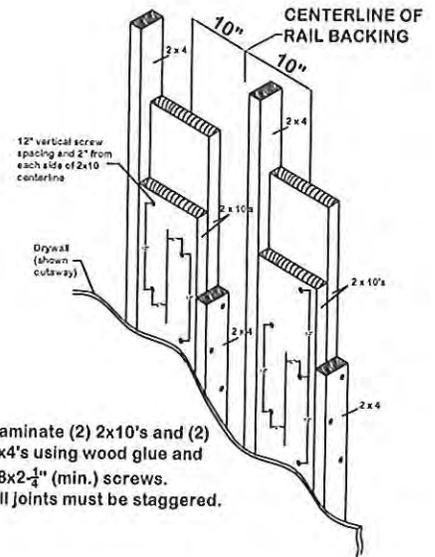


**Construction Details of Rail Backing:**

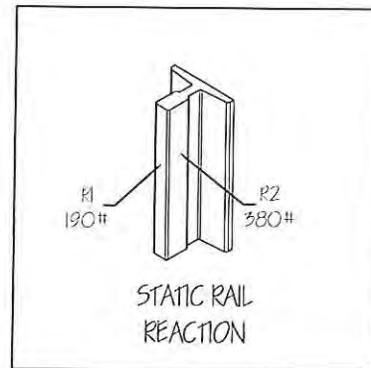
- Laminate (2) 2x10's and (2) 2x4's using wood glue and #8x2-1/4" minimum screws.
- All joints must be staggered.

**Typical Hoistway Construction Details**

**Typical Rail Backing Construction**



- Laminate (2) 2x10's and (2) 2x4's using wood glue and #8x2-1/4" (min.) screws.
- All joints must be staggered.



<b>ADAPTIVE ENVIRONMENTS</b>			
TITLE TYPICAL HOISTWAY CONSTRUCTION			SCALE NONE
DRAWN BY DLC	ORIGINAL DATE 02/18/14	DRAWING NO. 021814-06	REV R2
JOB INFORMATION			
WINGET RESIDENCE			



RICK SNYDER  
GOVERNOR

STATE OF MICHIGAN  
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS  
BUREAU OF CONSTRUCTION CODES  
IRVIN J. POKE  
DIRECTOR

STEVE ARWOOD  
DIRECTOR

March 3, 2014

TO: Members of the Elevator Safety Board  
FROM: C.W. Rogler, Chief, Elevator Safety Division *WR*  
SUBJECT: Variance Request for Pneumatic Vacuum Elevators, LLC.

**APPLICANT REPRESENTATIVE:**  
Sefan Gruber, Sales Manager

**APPLICANT:**  
Pneumatic Vacuum Elevators, LLC  
12602 NW 115<sup>th</sup> Ave.  
Miami, FL 33178

**AUTHORITY:**  
MCL 408.808(1)(c) of the Elevator Safety Board Act, 1967 PA 227

**VARIANCE REQUEST:**  
Request has been made by Pneumatic Vacuum Elevators, LLC for a variance request from ASME A17.1-2007 regarding a product approval for Pneumatic Vacuum Elevators.

**APPLICABLE CODE SECTION:**  
ASME A17.1-2007

**FINDINGS:**  
ASME A17.1-2007

**RECOMMENDATION:** Staff recommends that the variance only be approved if the board believes reasonable safety will be secured.

*Providing for Michigan's Safety in the Built Environment*

LARA is an equal opportunity employer  
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P.O. BOX 30254 • LANSING, MICHIGAN 48909  
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February 25<sup>th</sup>, 2014

RECEIVED

FEB 27 2014

ELEVATOR DIVISION



A WORK OF ART.  
POWERED BY AIR.

Attn:  
Calvin W. Rogler  
Chief Inspector  
Elevator Safety Division  
Bureau of Construction Codes  
P.O. Box 30254  
Lansing, MI 48909  
roglerc@michigan.gov

Dear Mr. Rogler,

Following up to our recent discussions regarding our Pneumatic Vacuum Elevators, I would like to formally request a product review for approval and/or variance within the State of Michigan at the March 28, 2014 Elevator Board Meeting.

In addition to this letter, please use the following attached information as our formal submission and let me know if anything further is required from my end to ensure that our Pneumatic Vacuum Elevators are included on the agenda for the March 28, 2014 meeting.

I appreciate your assistance in this matter and look forward to the opportunity to work with you and the State of Michigan in the near future.

Best Regards,

**Stefan Gruber**

Pneumatic Vacuum Elevators, LLC  
Sales Manager  
12602 NW 115th Avenue  
Miami, FL 33178 USA  
(305)884-1091 office  
(305)884-1092 fax  
(305)527-3385 cell  
grubers@vacuumelevators.com



## About PVE

Pneumatic Vacuum Elevators, LLC is the designer and manufacturer of the vacuum elevator. PVE is an innovative, technology-based company that has revolutionized how people and goods may be vertically transported within residential, marine and stage environments.

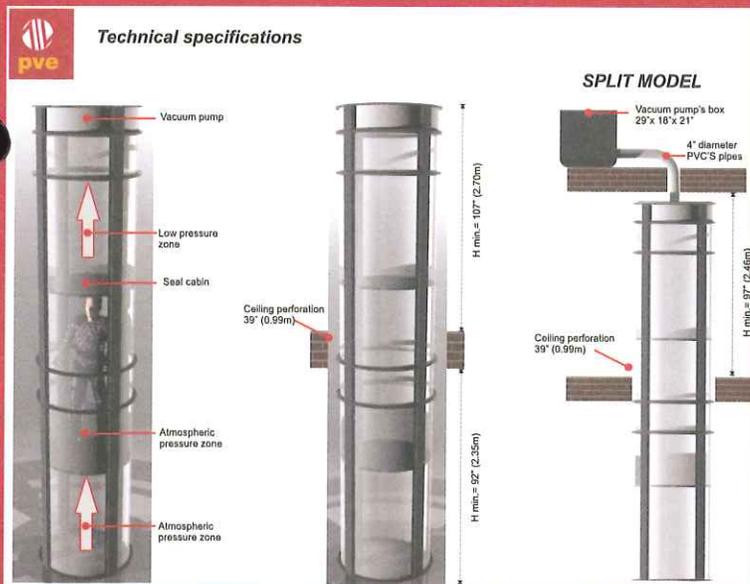
Through the application of fundamental physics and the utilization of attractive materials, PVE has virtually created a transportation vehicle within a bubble.

Founded in 2002, in Miami, Florida, the company proudly manufactures three versions of its vacuum elevators, ranging from single to a three-passenger, wheelchair-accessible model. Rather than using cables or pistons, PVE manufactures the only elevator that is powered by one of the most abundant resources in the world... AIR!

Due to its minimal footprint, rapid installation and a unique panoramic design, the vacuum elevator goes where other elevators simply cannot. PVE maintains an expanding network of more than 100 authorized dealers worldwide.

## PVE'S Features & Benefits

- No pit excavation, hoist-way, or machine room required
- Installation within one to two days
- Two to four stops for residential, marine, and stage applications [35ft. (10.5m) total rise]
- Ideal for new and existing homes due to the minimal footprint required to accommodate the structure
- Self-supporting structure: the elevator is capable of freestanding on any level ground surface
- "Green Elevator:" minimal energy consumption required during ascent and no energy necessary for descent
- Modern design allows 360° visibility without cables or pistons that block vision
- Minimal maintenance: no lubricants or regular service required
- Absolute safety: in the event of a power failure, the elevator cab automatically descends to the lowest level and the electro-mechanical door opens to allow passengers to exit
- 220Volt single phase service required for elevator operation and all cabin electric circuits are 24 volts
- Extremely smooth starting and stopping operations
- ASME A17.7 Code Compliance Certified
- Machinery Directive 2006/42EC Certified



## Components

*There are three main components to the transparent, self-supporting vacuum elevator:*

### Exterior Cylinder

Made up of an aluminum frame and polycarbonate panels.

### Elevator Car

Made of steel, which houses the brake and safety mechanisms along with the proprietary seal located on top of the car.

### Suction Assembly

Located on top of the upper cylinder. Houses the turbine engines, valves, and the PVE control board.

## Options & Upgrades

### Colors



Cabin Phone

Cabin Key Lock

Foldable Car Seat (PVE37 Only)



### PVE30

Single passenger elevator  
350 lbs lift capacity (159 kg)  
External cylinder diameter: 30 inches (750 mm)  
30 ft/min traveling speed  
Aluminum & polycarbonate structure  
Automatic interior LED lighting and fan  
In-line door openings



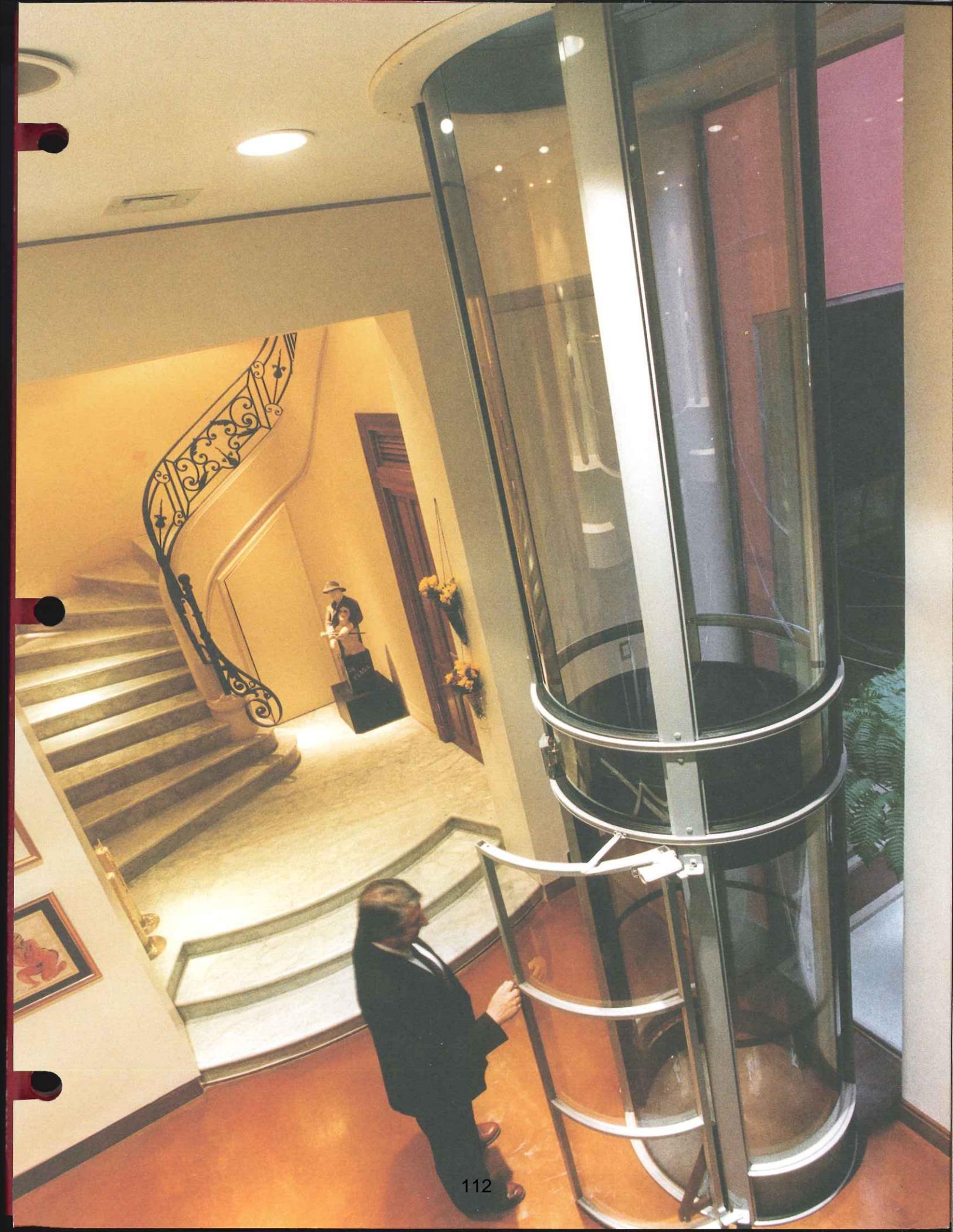
### PVE37

Two passenger elevator  
450 lbs lift capacity (205 kg)  
External cylinder diameter: 37 inches (950 mm)  
30 ft/min traveling speed  
Aluminum & polycarbonate structure  
Automatic interior LED lighting and fan  
In-line and walk-through door openings



### PVE52

Three passenger elevator  
Wheelchair accessible  
525 lbs lift capacity (238 kg)  
External cylinder diameter: 52 11/16 inches (1,338 mm)  
20 ft/min traveling speed  
Aluminum & polycarbonate structure  
Automatic interior LED lighting and fan  
In-line and walk-through door openings





 Print Article

## **ANSI Issues First Set of Accreditations under Pilot Accreditation Program for Elevator/Escalator Certification Organizations**

New York March 17, 2009

The American National Standards Institute (ANSI), coordinator of the U.S. standards and conformity assessment system, today named three Accredited Elevator and Escalator Certification Organizations (AECO) that were part of the pilot program launched by ANSI in February 2008.



The following Certification Bodies are the first to be recognized under the AECO program, which operates according to requirements defined in the international standard ISO/IEC Guide 65, *General Requirements for Bodies Operating Product Certification Systems*, and in ASME A17.7/CSA B44.7, *Performance-based safety code for elevators and escalators*.

- Liftinstituut Holding BV
- TUV SUD America Inc.
- Underwriters Laboratories, Inc.

With hundreds of thousands of elevators and escalators transporting citizens in North America each day, manufacturers are eager to demonstrate the safety and reliability of their products. Through this program, AECOs are accredited by ANSI to evaluate and certify elevator and escalator systems, subsystems, components, and functions. These products are evaluated against the guidelines of ASME A17.7/CSA B44.7, a standard that was developed jointly by ASME and the CSA. Those that meet these guidelines can be certified.

“The AECO designation demonstrates that accredited organizations are competent and capable at assessing compliance to standards that help assure the safety and reliability of elevators and escalators,” said Lane Hallenbeck, ANSI vice president of accreditation services. “ANSI congratulates the three organizations that achieved accreditation under the first round of this new initiative.”

Third-party accreditation by ANSI enhances the credibility and value of the process by attesting to the competence and qualification of Certification Bodies to act as certifiers, offering them a significant distinction from their competitors in the marketplace.

ANSI values the importance of accreditation in enhancing consumer safety and international trade. The Institute’s portfolio of accreditation services includes programs for a wide variety of product certification bodies, such as AECOs, personnel certification bodies, greenhouse gas validation and verification bodies, and standards developers.

In 2007, ANSI signed a Multilateral Recognition Agreement (MLA) with the International Accreditation Forum (IAF), bringing worldwide recognition and acceptance to the Institute's accreditation program for product certification bodies.

"Mutual recognition of product certification eliminates duplicative conformity assessment costs for importers and exporters on a global scale. It also helps reduce technical barriers to trade, assuring that evaluations of competence can cross borders," explained Hallenbeck. "ANSI is pleased to extend the benefits of our 2007 signatory to the IAF MLA to our new Accredited Elevator and Escalator Certification Organizations."

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#### **About ANSI**

The American National Standards Institute (ANSI) is a private non-profit organization whose mission is to enhance U.S. global competitiveness and the American quality of life by promoting, facilitating, and safeguarding the integrity of the voluntary standardization and conformity assessment system. Its membership is comprised of businesses, professional societies and trade associations, standards developers, government agencies, and consumer and labor organizations. The Institute represents the diverse interests of more than 125,000 companies and organizations and 3.5 million professionals worldwide.

The Institute is the official U.S. representative to the International Organization for Standardization (ISO) and, via the U.S. National Committee, the International Electrotechnical Commission (IEC), and is a U.S. representative to the International Accreditation Forum (IAF).

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[Close This Window](#)

# CERTIFICATE OF CONFORMANCE

Acting under ASME A17.7.1/CSA B44.7.1 issued by Liftinstituut B.V.  
Identification number ANSI AECO #0842  
(AECO = Accredited Elevator/Escalator Certification Organization)  
Certification system 3 according to ISO Guide 67: 2004

Certificate no. : NA 10-0842-1004-003-01      Revision no.: 2

Description of the product : Residential vacuum elevator

Rating, type, model no. : Pneumatic Vacuum Elevator, PVE 30, PVE 37, PVE 52

Name and address of the manufacturer : Pneumatic Vacuum Elevator LLC  
12602 N.W. 115<sup>th</sup> Ave  
Medley, FL 33178  
USA

Name and address of the certificate holder : Pneumatic Vacuum Elevator LLC  
12602 N.W. 115<sup>th</sup> Ave  
Medley, FL 33178  
USA

Certificate issued on the basis of the following requirements : ASME A17.7-2007 / CSA B44.7-07  
I-4 Elevator Systems

Test laboratory/location : Pneumatic Vacuum Elevator LLC  
14804 SW 136<sup>th</sup> Street  
Miami, FL, 33196 USA

Date and number of the laboratory report : None

Date of verification of conformance : July 2009 – February 2010

Annexes with this certificate : Certificate of Conformance Report  
no: NA 10-0842-1004-003-01 Rev. 2

Additional remarks : For GESRs, SPs and other information see supporting report.

Conclusion : The Elevator System meets the requirements of the ASME  
A17.7-2007 / CSA B44.7-07, taking into account any additional  
remarks mentioned above.

Issued in Amsterdam  
Date of issue : March 6<sup>th</sup>, 2013

  
ing. A.J. van Ommen  
Manager Business Unit  
Certification

  
Certification decision by

Valid thru : March 6<sup>th</sup>, 2016



## 2. Elevator Description

The vacuum lift is an residential elevator were the movement of the lift occurs by creating under pressure on top of the car. The under pressure is made by means of five or seven high capacity air pumps which can be installed on top of the well or in the vicinity of the well.

The nominal load range of the lift is 100 kg – 238 kg. The platform is circular shaped and has a car door. The lift moves inside a circular well with wall which has a perfectly smooth and flat surface. The car is guided along four guides rails. Two of them are used for the safety gear.

The lift is connected to 220 - 240V single phase. With a 3 phase circuit, the current can be divided between the three phases if a neutral is present. The lift has a safety gear which is operated with the loss of vacuum above the car.

The lift is operated automatically by one of the buttons inside the car. Or outside the well by a single push. The nominal speed is limited to 0,15 m/s.

### 2.1. General specification

Type	PVE 30	PVE 37	PVE 52
Nominal load	159 kg	205 kg	238 kg
Max. number of persons	1	2	3
External diameter	750 mm (30")	950 mm (37")	1338 mm (52")
Internal diameter	640 mm (30")	820 mm (32")	1118 mm (44")
Nominal speed	Maximum 0,15 m/s or 6"/s		
Maximum travel	10 m		
Construction of the well	Aluminum frame circular formed with 4.5 mm polycarbonate walls. The doors for the UN52 have 6.0 mm polycarbonate walls		

### 2.2 Drive system

Type	Lamb electric, Vacuum turbine motors
Number of units	5 or 7
Power consumption (kW)	5 or 7 x 1 kW
Supply voltage	220 – 240 V AC
Maximum total current	21 A, 30 A or 35 A

## 2.3 Safety components

Safety on car	Vacuum lift, Type A safety
Landing door locking device	Prudhomme LR 180 E UL File no SA12749
Buffers	Dictator EDH 28 Order nr. 200203
Elevator control panel	USC, CNC model U237 UL File no E239478

## 3. Examinations and Tests

To prove an equal safety level the A17.7-2007/CSA B44.7-07 appendix I-4 has to be followed. Pneumatic Vacuum Elevator has provided amongst others a Code Compliance Documentation (CCD), a risk assessment, a Maintenance Control Program (MCP), approval criteria and test results.

### 3.1. Calculations

Calculations of a number of parts are delivered, as hoist way according the requirements of the ASME A17.1, as also for other parts, mostly concerning deviations because of the MRL layout.

These calculations are performed for all the three sizes and the following parts:

- guide rails integrated with the complete hoist way design;
- cabin;
- vacuum pressure;
- earthquake

All calculations were checked, between and are approved for their last version. There has been given special attention to the fact that it should be possible to conduct inspections without the need to execute calculations at site. For that reason system limits are given where possible.

### 3.2. CCD

During the examination the deviations of the A17.1 were defined in a CCD. The following GESR's were considered:

- 3.1.1 Supports for the elevator equipment
- 3.1.2 Elevator maintenance
- 3.1.4 Floors of LCU
- 3.1.7 Evacuation
- 3.2 Falling into hoist way
- 3.3.1 Access and egress

- 3.3.2 Horizontal sill to sill gap
- 3.4.2 LCU (Car) Support/Suspension
- 3.4.3 Overloaded LCU (Car)
- 3.4.5 LCU (Car) Travel path Limits
- 3.4.7 LCU (Car) Collision with Objects in or beyond Travel Path
- 3.4.9 Change of Speed or Acceleration
- 3.5.1 Working Space
- 3.5.2 Accessible equipment
- 3.5.3 Access to and egress from working spaces in the hoistway
- 3.5.4 Strength of Working Areas
- 3.5.5 Restrictions on Equipment in Elevator Spaces
- 3.5.7 LCU (car) Movement under Control of Elevator Personnel
- 3.5.9 Means of Protection from Various Hazards

### **3.2. Risk assesment**

#### **3.2.1. Risk assessment A17.1 chapter 5.3**

All articles in chapter 5.3 are verified for compliance. Deviations are determined and by additional measures mitigated.

#### **3.2.2.Risk assessment A17.7 GESR's**

All global essential safety requirements are listed and scenarios are described. The taken measures are described to mitigate the risk to an acceptable level.

### **3.3. Examination of the model**

In this section the results which are of importance for the model are listed.

#### **3.3.1 Normal operation**

The lift can be operated both from the landings as inside the LCU. The LCU is completely enclosed so both on the out and inside automatic run is used. On the landing a single push of the call buttons is sufficient to move the lift up or down to the required level. If the lift is on the bottom floor it's resting on fully compressed buffers. If the lift reaches a landing it will run by the landing with approximately 15 cm. After this the pawl device is de-energized and the motors are switched off. This will invert the movement causing the lift to descent. The pawl device will stop the lift on the landing also activating the unlocking of the landing door. If the pawl device does not work the lift will make a home landing to the bottom floor.

#### **3.3.2 Overload device**

Because no weight detection is provided it was important to check in what way the overload detection was established. If the car is on a landing 2 pumps will be activated to release the clamping device. If the load is more than the nominal load the power of the pumps is not sufficient to lift the car out of the pawl device. This is established by a pressure valve. After the runtime is over the car is stopped and an alarm and indication in the car is activated.

### 3.3.3 Control panel

The control panel is situated on the top landing floor on top of the well or placed in the vicinity of the well.

### 3.3.4 Main switch

The lockable main switch is located at the wall outside the well. This will also function as a working switch for maintenance purposes. A label is placed on the main switch indicating to switch off the lift only on the bottom floor. Provide by home owner.

### 3.3.5 Rescue of entrapped passengers

In case of power failure the car will run automatically to the ground floor if not already parked on a landing. The alarm and car lighting are provided with backup batteries. In case of the operation of the safety gear outside help is needed. By opening the control panel one is able to activate the pumps and release the safety gear. If this is not possible a winch can be installed to lift the car out of the safety gear. Furthermore panels of the well wall can be removed to rescue entrapped persons.

### 3.3.6 Provisions for disabled users

Only the UB52 is large enough to hold a single wheelchair. For the smaller car sizes no provisions are added for disabled users.

### 3.3.7 Fire protection

Because of the use of polycarbonate walls the danger of melting of these walls is present in case of fire. If local legislation demands a additional fire curtain can be provide covering the complete well on the outside with a type of fire blanket protecting the well.

### 3.3.8 Minimum free space in the pit

Because no pit is needed some additional features are added. When opening the door and the lift is moving the pawl device will stop the LCU at the first landing or at least at 1m above the bottom floor. On the pit floor a marking is placed instructing the maintenance engineer to use the pit prop, provided on the outside of the well. By doing so a chain prevents the landing door from closing

### 3.3.9 LCU

To operate the lift because the car is fully enclosed, the automatic operation is allowed. The car door is not locked but is closed by the wall of the well.

The car interior height is 200 cm (79 inch). The lighting inside the car is provided with LED or Halogen lighting providing a light intensity of over 50 lux. The lighting is also backed up with a battery in case of power failure. A telephone or similar device is not foreseen by the manufacturer and is up to the client. However the travelling cable is equipped with two additional wires for connection of such a device.

### 3.3.10 Safety

A type A safety is provided on top of the car. The safety gear is activated by the loss of vacuum in the space above the car. For safety tests, the door can be opened above the car level. Because the safety is activated when the lift is level with a landing a contact provided which is bridged during the start-up procedure. The gears are directly linked with the top ceiling of the car which acts like a plunger. When the vacuum is built up the ceiling rises so releasing the safety gear. The procedure for safety tests is described in the user manual.

## 4. Results

After the examination of the CCD, the risk assessment, test reports etc., the technical file was found in accordance with the requirements.

## 5. Conditions

On the certificate of conformance the following conditions apply:

- The wiring of the shaft and car safety switches shall comply with NEC NFPA 70. The switches are integrated with the cables within UL/CSA electrical certification. These devices are low voltage and limited to 6 feet distance – where the wiring must enter traditional metallic duct, EMT, or flexible conduit as per NEC.
- The machine is certified to UL/CSA as per A17.5 wiring as supplied from the factory. This includes the main power cable, brake switch wiring, encoder and sensor wiring that is provided within properly rated cable. This complies with NEC NFPA 70.
- Minimum operating temperature 18°C or 65 °F

### LCU

- Interior height 2 m.
- Lighting intensity minimum 50 Lux.
- Emergency lighting and alarm with backup.
- Telephone or similar device inside the car (provided by installer or client).
- Top and bottom proximity switches provided over the full width of the car opening.
- Max distance in between car and well wall 15 mm at opening side.
- Dead man's drive for operation of the lift.
- Stop switch provided in car panel.
- Labels for the use of the lift in an emergency and the operation of the stop switch.
- On the car roof a label is placed indicating that the car roof is not accessible
- In case of emergency a safety valve on the car roof can be operated by hand or feet to release the under pressure.

#### Pit and well

- The bottom floor has the same level as the landing floor.
- On the floor a label is fixed indicating that the pit is not accessible without the use of the safety prop.
- On the outside of the well along the bottom landing door a pit prop (pin) is fixed with a chain to the outside of the well. The pin can be installed in the guide rail next to the door. The chain prevents the landing door from completely closing.
- Polycarbonate walls of the well are exchanged every 10 years

#### Controller and drive system

- Free depth for the controller 70 cm.
- Free height in front of the controller 200 cm.
- Runtime limiter is adjusted to 45 s.
- Main contactors are checked automatically on the breaking of the contacts.
- Safety circuit is connected to earth.
- IP 2X for all connectors above 24 V.

#### Instructions to be provided

- The general manual.
- Inspection manual.
- Maintenance manual

#### Documents

- The following instructions must be available at final inspections and periodical examinations:
  - Acceptance test;
  - Procedure to check the deactivation of the main contactors;
  - Latest version of MCP
- The following documents must be available at the lift always, as part of the lift book:
  - Layout drawings of the hoistway and inside parts;
  - Electrical diagrams;

For the other not deviating parts of the lift, the requirements of the standard A17.1-2007/CSA B44-07 have to be fulfilled.

## 6. Conclusions

Based upon the results of the conformance examination Liftinstituut B.V. issues a Certificate of Conformance.

The Certificate of Conformance is only valid for products which are in conformity with the same specifications as the type certified product. Products deviating of these

specifications need additional examination by Liftinstituut in order to determine whether a new Certificate of Conformance is necessary. Additional examination shall be requested by the certificate holder.

The Certificate of Conformance is issued based on the requirements that are valid at the date of issue. Liftinstituut reserves all rights regarding the validity of the certificate with respect to changes in the requirements or changes in the state of the art of the product.

## 7. Marking

Every elevator placed on the market by Pneumatic Vacuum Elevator LLC, type designation PVE 30, PVE 37 or PVE 52 that is in complete conformity with the examined type must be labeled marked or tagged with following data:

- (a) the name or trademark of the manufacturer, or AECO Certificate of Conformance identification by which the organization that manufactured the elevator can be identified;
- (b) the AECO mark, name, or identifying symbol which can be found on our website [www.liftinstituut.com](http://www.liftinstituut.com);
- (c) the AECO Certificate of Conformance identification;
- (d) statement of compliance with ASME A17.7/CSA B44.7;
- (e) a distinctive type, model, or style letter or number; and any conditions of validity of the certificate and any particulars necessary to identify the type of component certified, as determined by the AECO.

Prepared by:



R.E. Kaspersma MEng  
Senior Specialist  
Liftinstituut B.V.

Reviewed by:



Annexes

Annex 1



Annex 2 : Overview of previous revisions of certificate(s) and report(s)

#### REVISIONS OF CERTIFICATE

Rev.:	Date	Summary of revision
-	March 11 <sup>th</sup> , 2010	Original
1.0	December 1 <sup>st</sup> , 2011	Update on NFPA 70 requirements
2	March 6 <sup>th</sup> , 2013	Renewal certificate

#### REVISIONS OF REPORT, BELONGING TO THE CERTIFICATE

Rev.:	Date	Summary of revision
-	March 11 <sup>th</sup> , 2010	Original
1.0	December 1 <sup>st</sup> , 2011	Update on NFPA 70 requirements
2	March 6 <sup>th</sup> , 2013	Renewal certificate



## TEXAS DEPARTMENT OF LICENSING AND REGULATION

*Compliance Division/Elevator Program*

*P. O. Box 12157 • Austin, Texas 78711 • (512) 539-5725 • (800) 722-7843*

*Fax (512) 539-5729 • Web site: [www.license.state.tx.us](http://www.license.state.tx.us)*

July 29, 2011

Stefan Gruber  
Pneumatic Vacuum Elevators LLC  
12602 NW 115<sup>th</sup> Avenue  
Miami, FL 33178

RE: Application for New Technology Variance NTV 11-01 Pneumatic Vacuum Elevator

Dear Mr. Gruber:

This is to acknowledge receipt of your above referenced application dated May 20, 2011. Based on the written information previously submitted by your organization and after consultation and review within the Department, the Department is pleased to inform you that your request for New Technology Variances to permit the use of pneumatically operated vacuum private residential elevators has been approved based on the following conditions:

1. This approval is based on written information submitted by your organization during the course of the application/review process, which includes The Certificate of Conformance Report NA-0482-1004-003-01 dated March 11, 2010. Any deviation from the product as submitted for approval that would violate any provision of the current or any future adopted standard would require another New Technology Variance application and approval by the Department. Changes that do not result in a violation of any current or future adopted standard, or product changes that do not vary from those contained in the written materials submitted by your organization as part of the review process, will not require another New Technology Variance application but will require notice in writing to the Department documenting said changes. Notices submitted in compliance with this paragraph must describe each product change and explain why the change is compliant with applicable codes.
2. The requirements for which this New Technology Variance are based on the ASME A17.1-2007 edition of the Safety Code for Elevators which is the currently adopted standard. The approvals are granted for:
  - a. Requirement 5.3.1.16 and 5.3.1.12 driving machine suspension means
  - b. Requirement 5.3.1.11 safety mechanisms
  - c. Requirement 5.3.1.3 top car clearance
  - d. Requirement 5.3.1.4 horizontal car clearance
  - e. Requirement 5.3.1.9 car frames and platform
  - f. Requirement 5.3.1.17 terminal stopping devices
3. The maximum capacity of the car shall not exceed 525 pounds/238kg
4. The maximum car speed shall not exceed 30 FPM/0.15 MPS

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*Frank S. Denton, Chair – Conroe, Texas*

*Mike Arismendez – Shallowater, Texas*

*LuAnn Morgan – Midland, Texas*

*Fred Moses – Plano, Texas*

*Lillian Norman-Keeney – Taylor Lake Village, Texas*

*Ravi Shah, Carrollton, Texas*

*Deborah A. Yurco – Austin, Texas*

5. These units shall be installed in an indoor location capable of maintaining a minimum operating temperature of not less than 65 degrees F

6. This equipment shall be installed only in private residences in conformance with all of the conditions noted in Section 5-Conditions of the Certificate of Conformance described in #1 above.

7. All installation sales proposals for the installation of this product shall contain a clause that informs buyers that this product has been approved under the New Technology provisions of Chapter 754. As an alternative, you may provide buyers with a copy of this approval letter in lieu of a clause in the sales proposal contract.

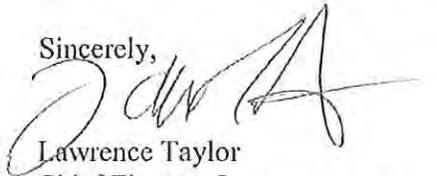
8. The buyers of this equipment shall be provided a copy of the installation and maintenance manuals contained in the submittal and a copy of this approval letter shall be included in those documents until such time as the equipment meets all adopted standards in the State of Texas.

This approval shall apply to all private residence Pneumatic Vacuum Elevator installations, consistent with the contingencies listed above, installed anywhere in the State of Texas, except the City of Houston. The City of Houston must also approve this product for installation within their jurisdiction.

The approval by the Department shall remain in effect unless revoked. A copy of this approval will be forwarded to all licensed inspectors and will be posted on the Department website. Inspectors shall be informed that the requirements covered by the above variances are not to be cited on any inspection reports provided to the buyers.

If you agree with the conditions contained in this approval letter, please so indicate by signing and dating a copy of this letter and returning it to me for our files. If we can be of any further assistance in this matter, please do not hesitate to contact us.

Sincerely,



Lawrence Taylor  
Chief Elevator Inspector  
Building and Mechanical Section  
Compliance Division-TDLR

---

Austin Headquarters: E.O. Thompson State Office Building · 920 Colorado · Austin, Texas 78701

The undersigned acknowledges acceptance of the conditions contained in this letter of approval for NTV 11-01.

<u>Stefan Gruber</u>	<u>Sales Manager</u>	<u>8/5/11</u>
Typed or Printed Name	Title	Date
<u></u>		
Signature		



State of New Jersey  
 DEPARTMENT OF COMMUNITY AFFAIRS  
 101 SOUTH BROAD STREET  
 PO Box 816  
 TRENTON, NJ 08625-0816

CHRIS CHRISTIE  
 Governor

KIM GUADAGNO  
 Lt. Governor

RICHARD E. CONSTABLE, III  
 Acting Commissioner

Date: February 28, 2012

Mr. Stefan Gruber  
 Sales Manager, Pneumatic Vacuum Elevators, LLC  
 Pneumatic Vacuum Elevators, LLC  
 12602 NW 115th Avenue  
 Medley, FL. 33178 USA

Dear Mr. Gruber:

We have reviewed the information submitted for approval of Pneumatic Vacuum Elevators in NJ. The requested approval is hereby granted. The approval shall remain in effect for a maximum of one year after the ASME publishes an edition/supplement of the A17.1 code stipulating the rules pertaining to such elevators, after which time the ASME A17.1 requirement(s) shall apply and enforcement responsibilities over the ASME A17.1 elevator devices shall be followed.

Furthermore, as part of this approval, Pneumatic Vacuum Elevators is requested to notify the Elevator Safety Unit of any problems associated with the elevators, regardless of whether the problem arises on equipment installed in New Jersey or anywhere else.

With respect to other codes, the elevators shall be in compliance with the applicable codes in effect in New Jersey.

Also in New Jersey, installation of elevators in private residences is subject to a permit process, i.e., requires a permit. Such devices shall not be registered with the State.

Under a permit process, enforcement responsibilities over the ASME A17.7 elevator devices installed in private residences are as follows:

1. A job specific variation authorizing use of an A 17.7 elevator device shall be in place. An Application for a Variation shall be accompanied by a Certificate of Conformance issued by an AECO for the device. The Application for a Variation shall further be accompanied by information about the entity that will perform and submit reports of plan reviews as well as reports of Final Acceptance inspections.
2. Plan review and Final Acceptance inspections (FA) shall be performed / witnessed by the equipment manufacturer, installer, or consultants specializing in such equipment.
3. The aforementioned reports shall be filed with the appropriate municipal building department. Appropriate certificates (Certificate of Occupancy, Temporary Certificate of Occupancy, or Certificate of Approval as the case may be) shall be issued by the municipality.

Very truly yours,

Paulina Caploon,  
 Construction Official,  
 Elevator Safety Unit

Copy: Hector Salazar, Director of Engineering  
 Pneumatic Vacuum Elevators, LLC  
 Curt Lampe, CEO, Total Access & Mobility Inc.  
 Michael Baier, Acting Chief, Bureau of Code Services, DCA,  
 Paul Lamberti, Manager, Bureau of Code Services, DCA





Safety and Buildings  
141 NW BARSTOW ST FL 4TH  
WAUKESHA WI 53188-3789  
Contact Through Relay  
[www.dsps.wi.gov](http://www.dsps.wi.gov)  
[www.wisconsin.gov](http://www.wisconsin.gov)

Scott Walker, Governor  
Dave Ross, Secretary

March 30, 2012

MR STEFAN GRUBER  
PNEUMATIC VACUUM ELEVATORS LLC  
12602 NW 115<sup>TH</sup> AVE  
MEDLEY FL 33178

Re: Wisconsin approval of the Pneumatic Vacuum Elevator (PVE) models UB 30, UB 37 and UB 52.

Dear Mr. Gruber,

The review of the above PVE models was based on the following:

- One-page letter from accredited elevator/escalator certifying organization (AECO) LiftInstituut verifying the safety factors for components of the PVE elevators meet or exceed the requirements of the ASME A17.1 code. For those components not directly addressed in A17.1, Section 5.3 and referenced sections, alternative components of the PVE system are understood to be meet minimum safety factor requirements as required by A17.1, 1.2.2.
- Information provided by yourself at the Wisconsin Elevator Constructors Symposium, Wednesday October 12, 2011 in Lake Geneva, Wisconsin. Symposium was attended by the Wisconsin elevator safety program staff, Milwaukee and Madison elevator program staff, other elevator inspectors and contractors.
- Ten-page Certificate of Conformance Report from LiftInstituut dated March 11, 2010 verifying the above Pneumatic Vacuum Elevator products meet or exceed the requirements of the ASME A17.7 code.
- Certificate of Conformance from LiftInstituut to ASME A17.7
- Declaration of Calculations from LiftInstituut dated February 28, 2012.
- Pneumatic Vacuum Elevator General Description, technical data including description of the brake device and list of jurisdictional approvals.
- Pneumatic Vacuum Elevator Principles of Operation, totaling five pages.
- Pneumatic Vacuum Elevator Overview of cylinder, lock, safety brake, seal and other components, totaling four pages.
- Pneumatic Vacuum Elevator photographs of various components totaling 37.

The product includes the following features and limitations:

- Model PVE 30 - 350 lb capacity, 30" cylinder O.D., 30 fpm, in-line door openings.
- Model PVE 37 - 450 lb capacity, 37" cylinder O.D., 30 fpm, front/rear door openings.
- Model PVE 52 - 525 lb capacity, 52-11/16" O.D., 20 fpm, front/rear door openings.
- Maximum travel: 35 feet.
- Cylinder: aluminum and polycarbonate.
- Car: steel and polycarbonate.
- Brake and safety mechanism at top of car.
- Pneumatic drive machine either at top of hoistway or remote.
- Controller and electrical components listed by a recognized third party testing agency with the components properly labeled.
- Controller and disconnect with overcurrent protection located with required electrical working clearances.

Based on the information provided, the PVE residential elevator models UB 30, UB 37 and UB 52 are approved in the state of Wisconsin. This product approval alleviates the need for safety factor data and other general evidence of code compliance to be submitted for each installation.

Before beginning installation of an elevator, plans specific to the project must be approved by this department or the cities of Milwaukee or Madison as applicable per s. SPS 318.1013.

Project specific plans must meet SPS 318.1013(2)(b). For installation within the cities of Milwaukee and Madison, see the application forms provided by those cities. For each installation not within Milwaukee or Madison, see the Safety & Buildings Division web page for application form SBD-22.

Currently, the codes and standards for determining code compliance for elevators in Wisconsin are as follows:

- Wisconsin ch. SPS 318 (Dec. 2011) Elevators, Escalators and Lift Devices
- Adopted ASME A17.1 (2007) Safety Code for Elevators and Escalators
  
- Wisconsin ch. SPS 316 (Dec. 2011) Electrical Code
- Adopted NFPA 70 (2008) National Electrical Code
  
- Wisconsin ch. SPS 362, (Dec. 2011) Commercial Building Code
- Adopted IBC (2009) International Building Code
  
- Wisconsin ch. SPS 302, (Dec. 2011) Fee schedule
  
- Wisconsin ch. SPS 305, (Dec. 2011) Licenses, Certifications and Registrations

SPS codes and forms may be accessed at <http://dsps.wi.gov>. Select the link to "Safety & Buildings Division" then "Codes" or "Forms".

Plan reviews and inspections may reveal code issues requiring your attention. Failure to address code issues may result in recinding of the product approval. Changes to the PVE products will require PVE to submit a revision to the product review information.

If you have any questions please feel free to contact me.

Sincerely,

Brian Rausch, P.E.  
Engr. Consultant - Building Systems  
Elevator Safety Program  
141 NW Barstow St, 4th Fl.  
Waukesha, WI. 53188  
Ph: (262) 521-5444  
Fax: (262) 548-8614  
E-Mail: [Brian.Rausch@Wisconsin.gov](mailto:Brian.Rausch@Wisconsin.gov)

cc: Eric Verkaik, Senior specialist, LiftInstituut  
State of Wisconsin elevator program staff  
City of Milwaukee elevator inspection department  
City of Madison elevator inspection department



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SUBMITTAL OF PNEUMATIC VACUUM ELEVATOR

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### General Description

The “Pneumatic Elevator” works on a vacuum concept. Our driving machine (located on top of cylinder) are vacuum motors which remove the air from top of the car/cabin, letting the laws of physics to take place, moving the car/cabin. Due to this concept our design does not use check valves, pressure switch, pulley, hoist, chain, and/or counterweight components. We do however have a safety valve located on top of car/cabin, if for some odd reason someone is on top of car/cabin, this valve can be easily opened – breaking the vacuum. This same valve will open if the car reaches the top of travel and does not shut down. We further have a timer in which the system will shut down if the car does not reach a floor after a given amount of time.

When landing on ground floor the cabin sits on the actual floor. When landing on other floors the cabin sits on steel mechanical locks at each floor removing the concern or need for an anti-creep component. We also have safety brakes which will be described later in the section called Emergency Brakes.

If there is a loss of power as the cabin is descending or ascending to any floor the cabin will slowly descend down to ground floor and mechanically the door will unlock once the cabin is sitting on ground. This is possible since we are using a vacuum concept vs. a conventional pulley, hoist, chain, or counterweight concept and there is no need to do an additional step to get someone out.

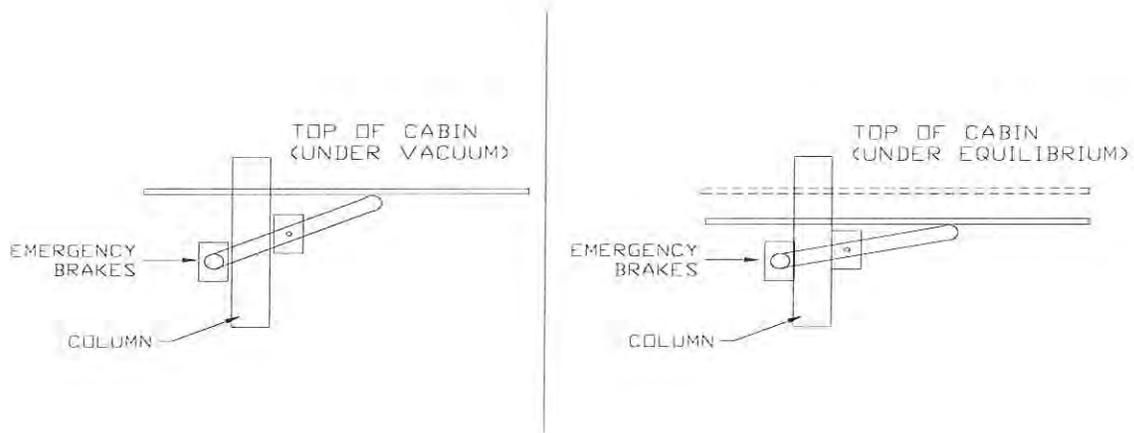
Other features that the “Pneumatic Elevator” has:

- Our design has a switch which turns on the car light when the door is opened and runs off a timer at that point.
- Our elevator walls are see through allowing light to continuously enter the car and cylinder.
- Our driving machine has double suspension; if one fails the other will still keep the car moving.
- Our elevator will not run if the door is not closed. The elevator will also shut if the door does not lock.



## Emergency Brakes

- Our design has safety brakes. The safety brakes are a mechanical locking action component that lock immediately after a loss of vacuum is detected. The brakes will brake/lock onto the columns causing the cabin to stop immediately.



Please refer to the attached drawings for a visual display of the PVE safety brake system.



## Technical Data

### Polycarbonate

- Polycarbonate sheet is 250 times stronger than glass.
- ¼” Glass impact resistance = 3ft-lbs
- ¼” Polycarbonate sheet impact resistance = over 200ft-lbs
- The polycarbonate sheets have a forced entry protection; UL 972 and the following approvals: ANSI Z97.1, ASTM D256, ASTM D638, ASTM D790, ASTM D792, & ASTM D1929

### Columns

- Aluminum Columns – Alloy 6063-T6  
(Strength will be shown under the Calculation section.)

## Approvals

### United States of America

ANSI AECO “Certificate of Conformance in accordance with ASME A17.7/CSA B44.7.1 # NA 10-0842-1004-003-01

### Door Locks

- Manufactured by Prudhomme SA
- Designed for swing type doors
- Compliance with ASME A 17.1 & CSA B-44
- UL Approved  
Elevator Door Locking Devices & Contacts  
File No.: SA12746  
Project No.: 02NK31731  
PD No.: 03G03361

### Elevator Electrical & Control Panel

- UL Approved Controls
- File No.: E239478
- Project No.: 02NK37284
- PD No.: 03G31226
- Compliance with ANSI / ASME A17.1 & A17.5



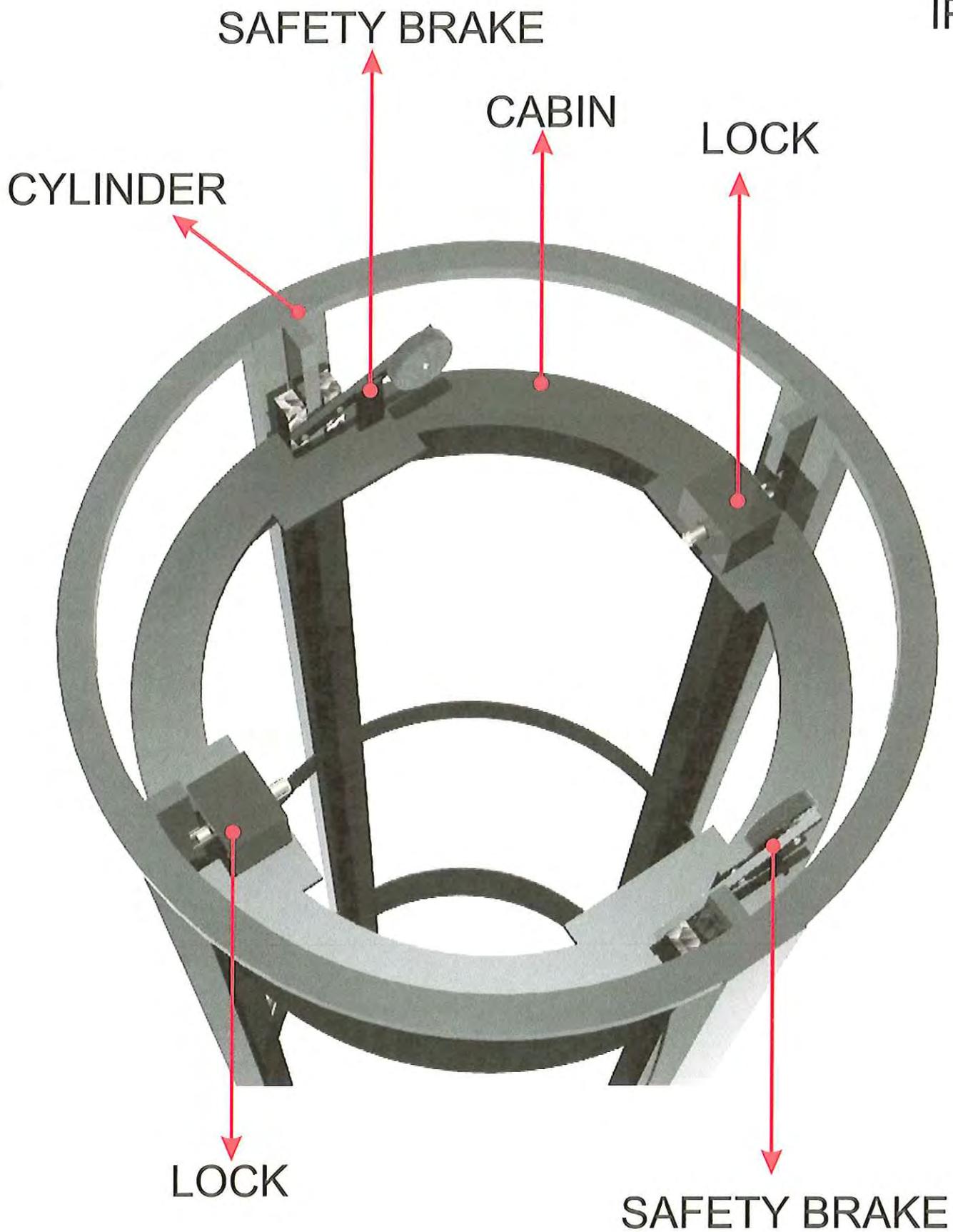
### Summary of Loads

Emergency Brakes (with & without load – other than cabin weight)

- Weight limit: tested at =749.51lb force, rated at = 450lbs.

### Platform

- The platform in car is made from steel and is attached to car frame.
- The platform area is 5.55 ft<sup>2</sup>
- The rated platform load is 81 lbs./ft<sup>2</sup>
- The internal diameter of cabin is 32"

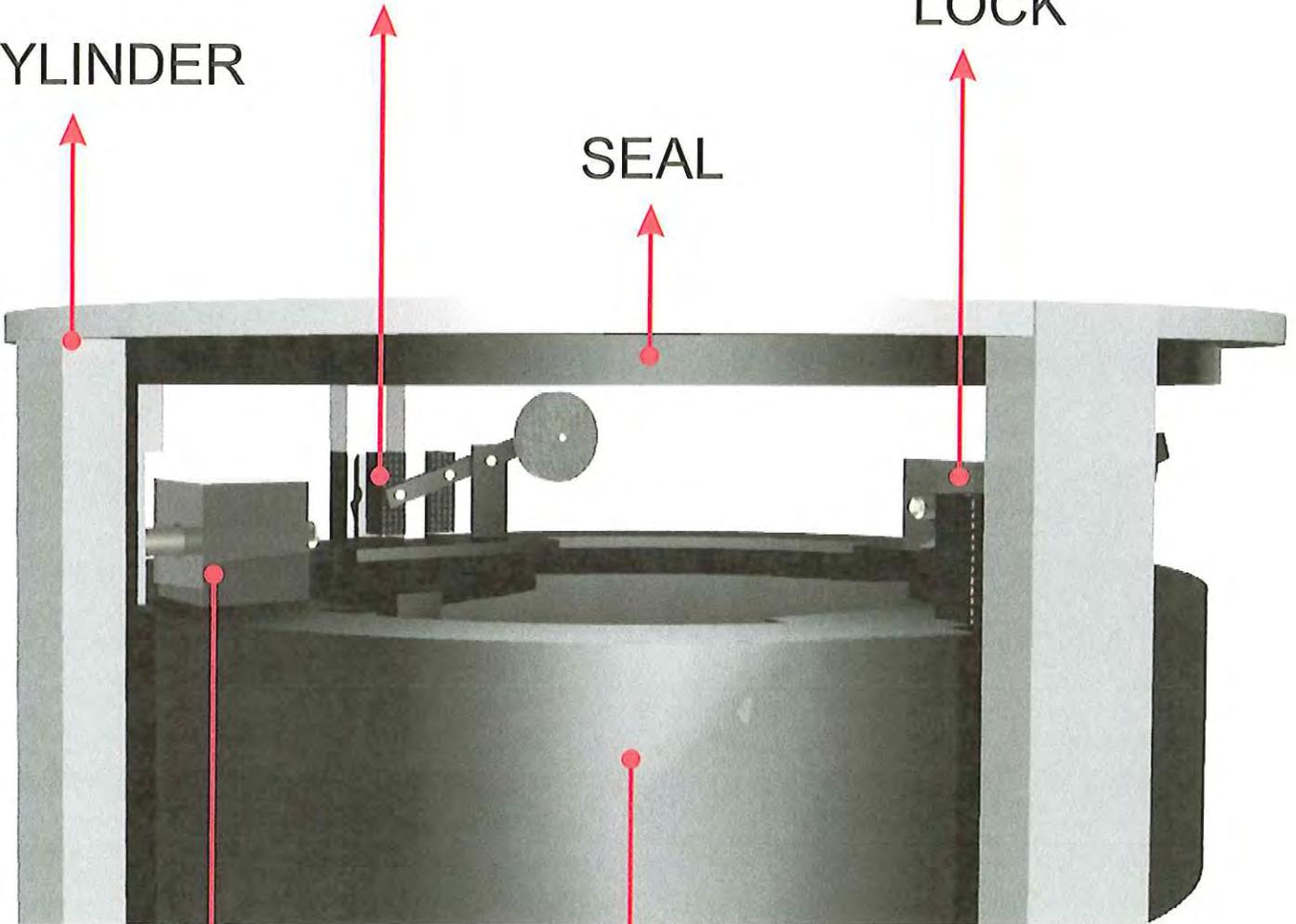


# SAFETY BRAKE

CYLINDER

LOCK

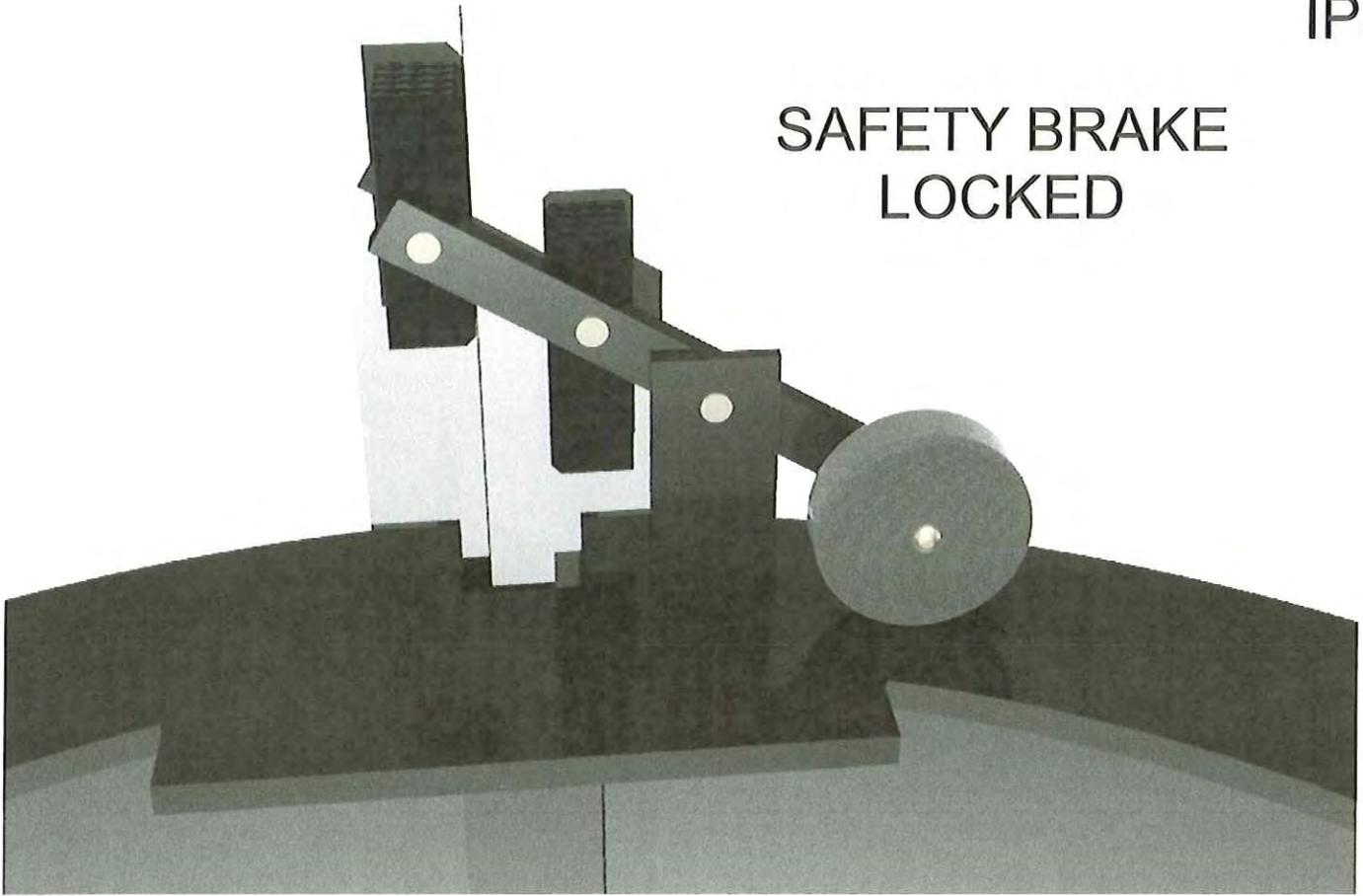
SEAL



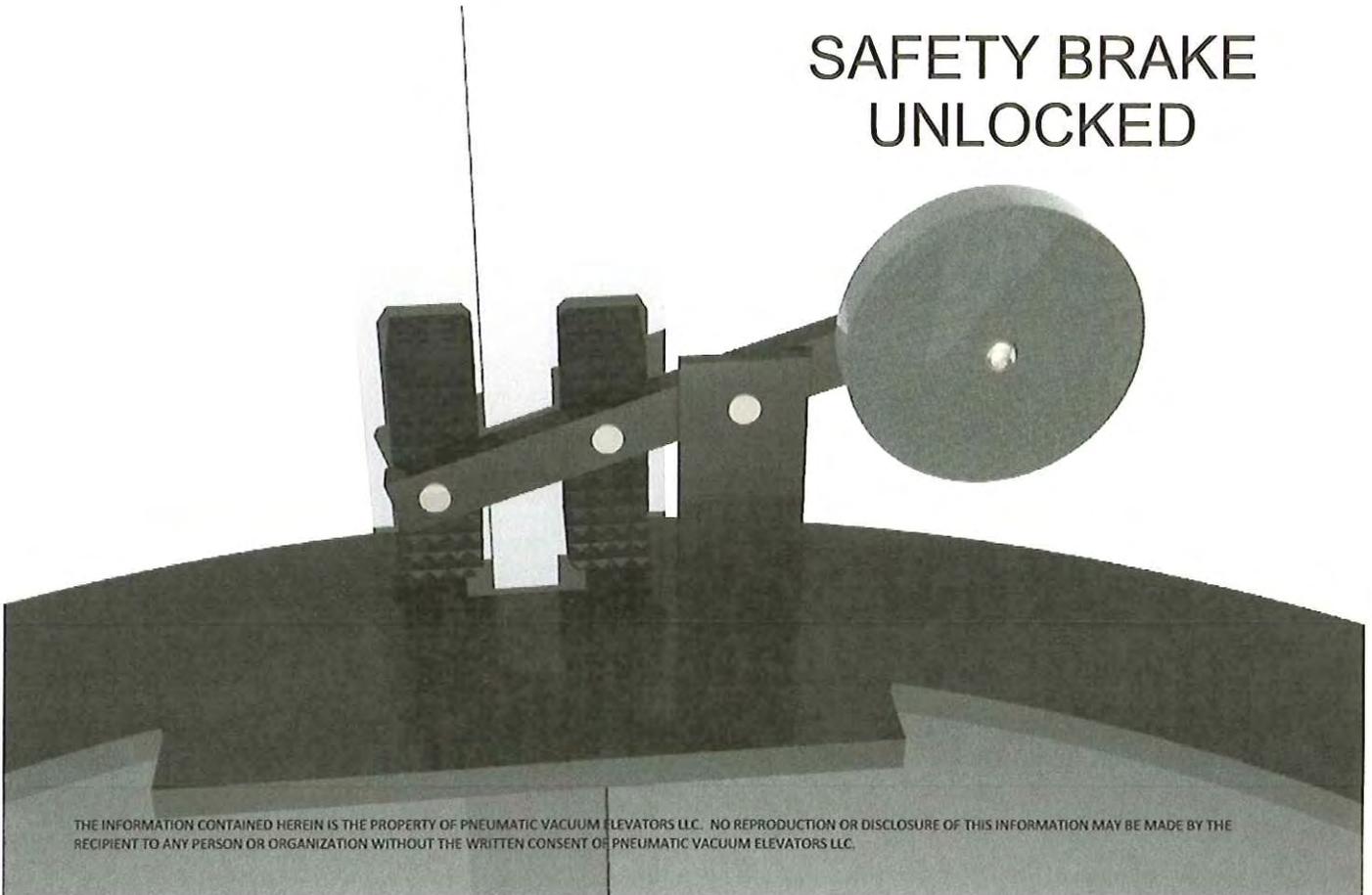
LOCK

CABIN

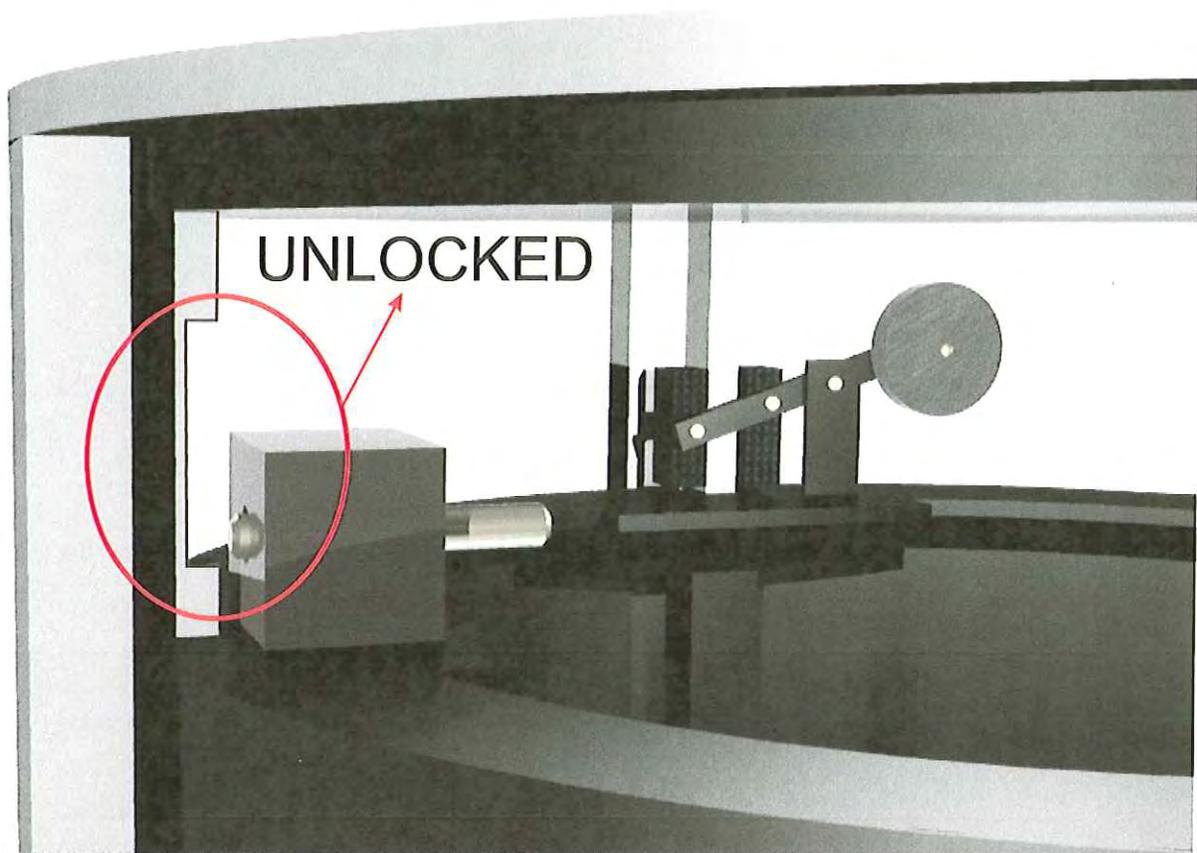
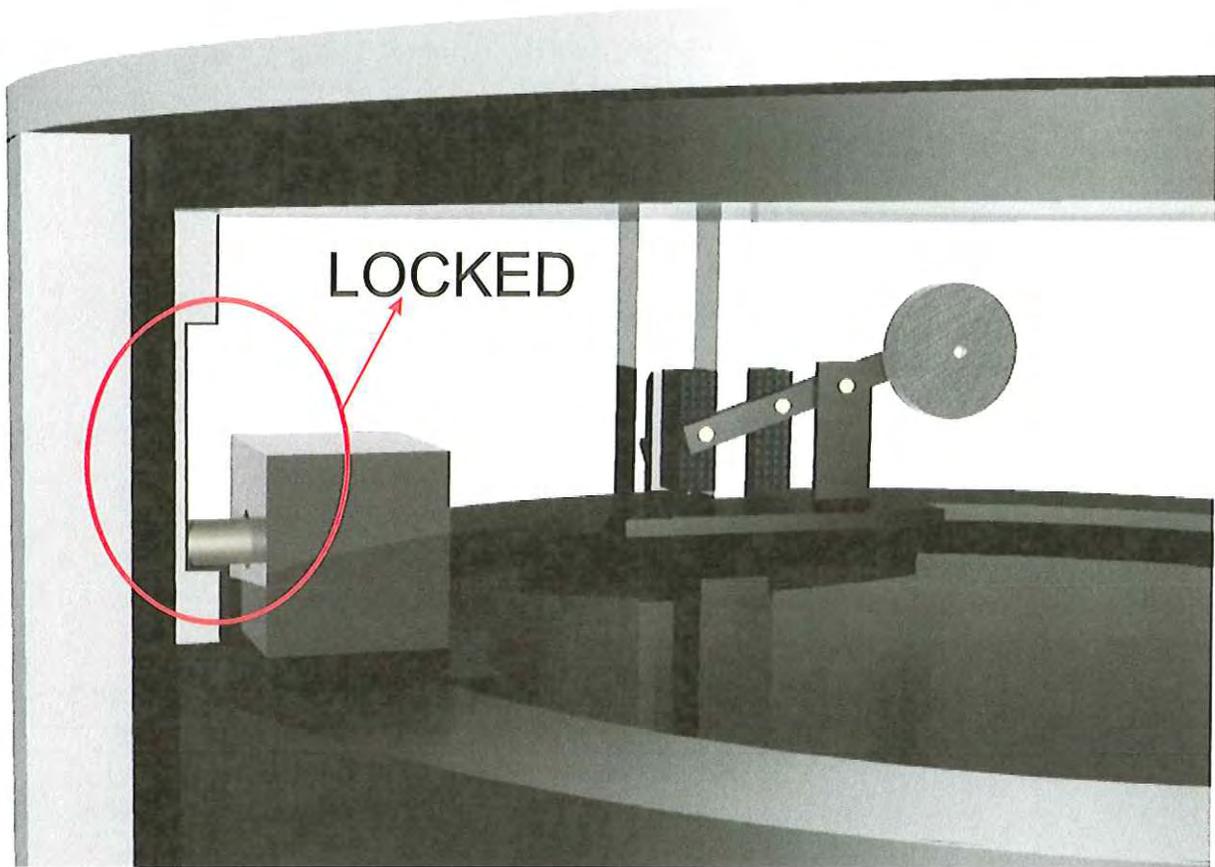
# SAFETY BRAKE LOCKED



# SAFETY BRAKE UNLOCKED



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