Development Services

From Concept to Construction

Phone: 503-823-7300 Email: bds@portlandoregon.gov 1900 SW 4th Ave, Portland, OR 97201
More Contact Info (http://www.portlandoregon.gov//bds/article/519984)

APPEAL SUMMARY

Status: Decision Rendered

Appeal ID: 15956	**Project Address:** 4949 SE 25th Ave
Hearing Date: 10/11/17	**Appellant Name:** Michael Munzing
Case No.: M-004	**Appellant Phone:** 503-477-5936
Appeal Type: Mechanical	**Plans Examiner/Inspector:** Thomas Ng
Project Type: commercial	**Stories:** 2 **Occupancy:** F-1 **Construction Type:** V-B
Building/Business Name: 4949	**Fire Sprinklers:** Yes - Full Building
Appeal Involves: other: Alternative Mechanical Appliances	**LUR or Permit Application No.:** 17-188921-MT
Plan Submitted Option: pdf [File 1] [File 2]	**Proposed use:** Cannabis Production

APPEAL INFORMATION SHEET

Appeal item 1

Code Section	OMSC 105.2
Requires	OMSC 105.2 Alternative materials, methods, equipment and appliances. The provisions of this code are not intended to prevent the installation of any material or to prohibit any method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.
Proposed Design	The purpose of this report is to get approval to install a Natural Gas CO2 generator appliance in an indoor cannabis cultivation facility. The purpose of this appliance is to enrich the air, for the cultivation of plants, which require CO2 for the photosynthesis process. This appliance is not used for extraction, but for cultivation only. The proposed design intends to take a non-UL listed appliance, and proposes to modify it to include UL listed components. The Analysis Report included, performs a thorough analysis on the modified device and shows that it complies with OMSC Section 105.2 as an equivalent of that prescribed in the code in quality, strength, effectiveness, fire resistance, durability and safety. The analysis and Analysis Report is prepared by a licensed mechanical engineer, who has extensive experience preparing such evaluation/analysis reports, as demonstrated in past projects. The report also requires that a field special inspection be performed by the engineer of record to verify that the proposed appliance is installed correctly as specified in the report and the mechanical permit documents.
Reason for alternative	The City of Portland Fire Marshals office has indicated that it does allow for the use of Natural Gas CO2 generators, for the purposes of air enrichment in indoor cultivation facilities, but requires that

such devices are UL listed. Currently, we have performed an exhaustive search, and have found that there are no UL listed appliances available on the market for the purpose of Natural Gas CO2 generation. It is also our understanding that the listing for such devices was withdrawn by the licensing body in 1995 due to lack of interest from manufactures. Due to the lack of availability of listed appliances, we have prepared this analysis report which utilizes OMSC section 105.2, which is intended as a means to approve such alternative appliances. We have attached the Natural Gas CO2 Generator Analysis Report and a copy of the current Mechanical Permit Drawings for reference.

APPEAL DECISION

Unlisted natural gas CO2 generator with engineering analysis: Denied. Proposal does not provide equivalent Life Safety protection.

Appellant may contact Thomas Ng (503 823-7434) with questions.

Pursuant to City Code Chapter 24.10, you may appeal this decision to the Building Code Board of Appeal within 180 calendar days of the date this decision is published. For information on the appeals process and costs, including forms, appeal fee, payment methods and fee waivers, go to www.portlandoregon.gov/bds/appealsinfo, call (503) 823-7300 or come in to the Development Services Center.

ANALYSIS REPORT

July 20, 2017

TO:	Michael Munzing
COMPANY:	
PHONE:	FAX:
EMAIL:	michael@mstructural.com
PROJECT:	4949 TI – Mechanical Engineering Services
PROJECT NO:	217M1201A
SUBJECT:	CO2 Generator Analysis

FROM:	Steffen U. Brocks, P.E.
CC:	
RFC:	
MAIL ORIGINAL:	
PAGE:	1/30

Revised September 4, 2017

Revised September 30, 2017

Revised October 3, 2017

Mike-

Following is the analysis based upon our review of the Aries 8 NG CO2 generator that we have reviewed and inspected at our office.

Revised October 6, 2017

Intent of Analysis:

Revised October 8, 2017

The intent of this report is that it is stand alone and addresses code sections 2014 Oregon Mechanical Specialty Code (OMSC) 105.2.

> **105.2 Alternative materials, methods, equipment and appliances.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any method of construction not specifically prescribed by this code, provided that any such alternative has been *approved*. An alternative material or method of construction shall be *approved* where the *building official* finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

Additionally, following are additional codes and standards that this device and its various components meet:

- ETL
- UL-508
- CAN/CSA-C22.2 No. 14
- ANSI Z21.80
- OMSC C403.5

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Credentials:

Steffen Brocks, P.E. is an expert in the field for evaluating the equipment listed in this report. He has evaluated natural gas fired equipment on numerous projects in the City of Portland, and commissioned such equipment in Oregon, Washington, California and Hawaii. In this industry, he has also evaluated extraction equipment in Oregon and Washington.

- GoldenX Extracts, Eugene, Oregon – Provide design for extraction and post processing facility.
- ABCS Labs, Springfield, Oregon - Provide design for extraction and post processing facility.
- Precision Alchemy, Portland, Oregon - Provide design for extraction and post processing facility.
- BizzyBee Extractors, Seattle, Washington – Provide engineering consultation for CO2 extractor design

Steffen Brocks, P.E. will serve as third party or engineer in record to evaluate and verify the installation with report and testing method (the testing method outline is not part of this review) upon final acceptance.

Proposed CO2 Generator:

- Aries 8 NG (S/N J16666Q08D)
    - (8) burners
    - Electronic spark ignition
    - For use with the Atlas series CO2 Monitor/Controller
    - Flame is enclosed within the unit (solenoid valve operation), no pilot light.
    - Unit is modified with listed solenoid valve, gas regulator and gas piping.

- The following building departments have indicated that natural gas CO2 generators have been permitted for indoor production/cultivation facilities for the purposes of plant cultivation air enrichment in the City of Bend, Oregon, City of Reno, Nevada and City of Denver, Colorado.

- Titan Atlas-1 CO2 generator control unit, specified to regulate and control the CO2 generator and is UL-508 and CAN/CSA-C22.2 No. 14 approved. This has been verified at the ETL website at the following link:

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- http://etlwhidirectory.etlsemko.com/WebClients/ITS/DLP/products.nsf/4c8700f3b75987a08525777700583333/49bf7a271e739ba386258176005f3c23?OpenDocument
- http://etlwhidirectory.etlsemko.com/WebClients/ITS/DLP/products.nsf/4c8700f3b75987a08525777700583333/802a2aea94ec807b86258176005f4e56?OpenDocument

- The manufacturer of the unmodified Ares-8 CO2 generator does not recommend the use of the unmodified unit for liability reasons, as it is not listed because it includes a non-listed NG solenoid and regulator valve, which is why we have recommended modifying the unit with these modified components reference in the Conclusion Section of this report.

- The manufactures wiring schematics are not available on request.

- We have inspected the build and workmanship of the control panel and circuit panel (see photo details). The control panel and circuit panel complies with intent of the code section OMSC 105.2 and other applicable sections.

- The unit is well constructed with powder coated sheetmetal. Corners of the unit are rounded off and no sharp edges are present, and meets the intent of the Code and OMSC 105.2

- Parts are connected via stainless steel machine screws with washers.

  - Tubing in the unit is hard piped copper tubing with brass fittings.

  - Burners are constructed of brass w/stainless steel.

  - Wiring is constructed appropriately with shielding, wiring protection and wiring connectors.

  - Overall, the materials for the unit as modified per this report appear to be constructed well and meets the intent of the code and section OMSC 105.2.

- The 120VAC to 24VDC adapter of the modified Ares-8 plugs directly into the ETL listed Atlas-1 CO2 generator controller per the manufactures specifications, and that the proper electrical connection shall be verified during a field special inspection by the mechanical engineer of record, and city of Portland electrical permit inspections. The adapter shall not be modified as it is an ETL listed device and any modifications to the Atlas controller would void the ETL listing.

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- The combustion air calculations are not available from the manufacturer, but are included in the conclusion section of this report. These calculations show it complies with the OMSC Section C304.5, “Indoor Combustion Air”, and C501.8, “Appliances Not Required to be Vented”

- Overall the equipment, as modified per this report, complies with OMSC 105.2, and material method or work offered also meets equivalent quality, strength, effectiveness, durability and safety.

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Photo Detail 1 – Unit and accessories provided by manufacturer

Photo Detail 2 – Unit – front view

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Photo Detail 3 – Instruction manual

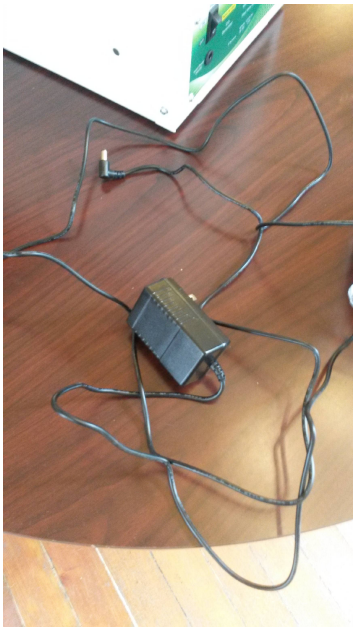

Photo Detail 4 – Low voltage transformer – unit operates on 24V DC/1A and is a listed device

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Photo Detail 5 – Unit control panel – front of unit

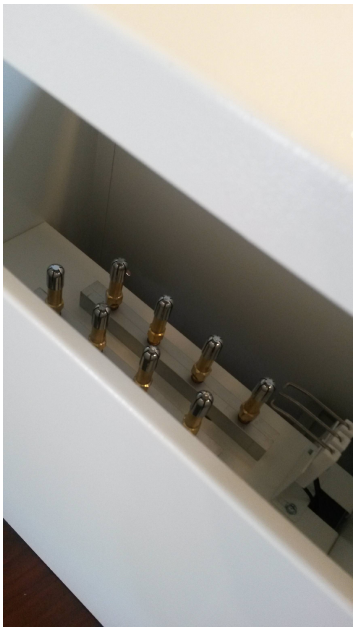

Photo Detail 6 – Gas burners on inside of unit

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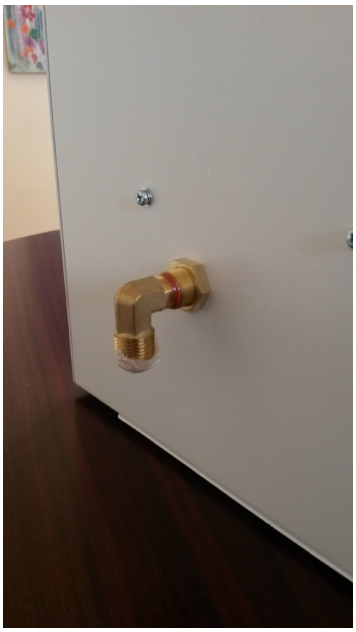

Photo Detail 7 – Gas connection at rear of unit

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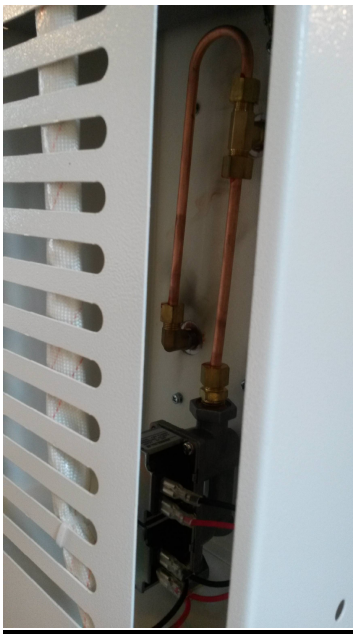

Photo Detail 8 – Gas piping and solenoid valves at bottom of unit

Photo Detail 9 – Specific S/N of unit being inspected

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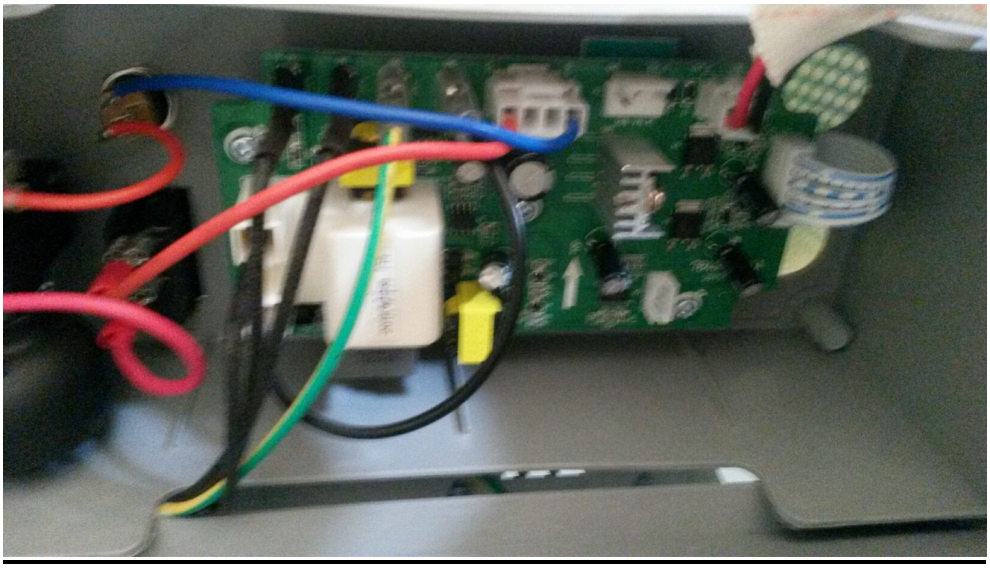

Photo Detail 10 – Circuit board

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Sequence of Operations:

- Turn power switch to “ON” position.
- Green power light shall illuminate.
- The ignition module shall attempt to ignite burners.
- The yellow “pilot valve on” LED shall illuminate. Once the generator is operational, it shall be controlled via the Titan Atlas controller.
- If the burners do not fire, after a 30 second pause, the generator shall attempt to fire the burners again for 15 seconds. This cycle shall repeat a maximum of (5) times.
- If the generator does not fire after the 5th attempt, the generator shall activate the “lock out” procedure and the “lock out” LED shall illuminate.
- If generator is locked out, operator shall wait 5 minutes for gas to dissipate before turning generator power switch back to “ON” position.
- See the following detail for grow room schematic.
- See the following Atlas-1 for additional sequence of operations for CO2 controller.
- The power supply of the modified Ares-8 shall be plugged into the Atlas-1 CO2 controller at all times which operates the Ares-8 by supplying power to the modified Ares-8 unit when CO2 levels drop below the specified set point.
- Power is shut off to the modified Ares-8 when the intended CO2 levels have been reached, closing the solenoid valve and stopping all gas supply to the appliance.
- The modified Ares-8 shall be rendered non-operational during a power outage, closing the solenoid and stopping all gas flow to the appliance.

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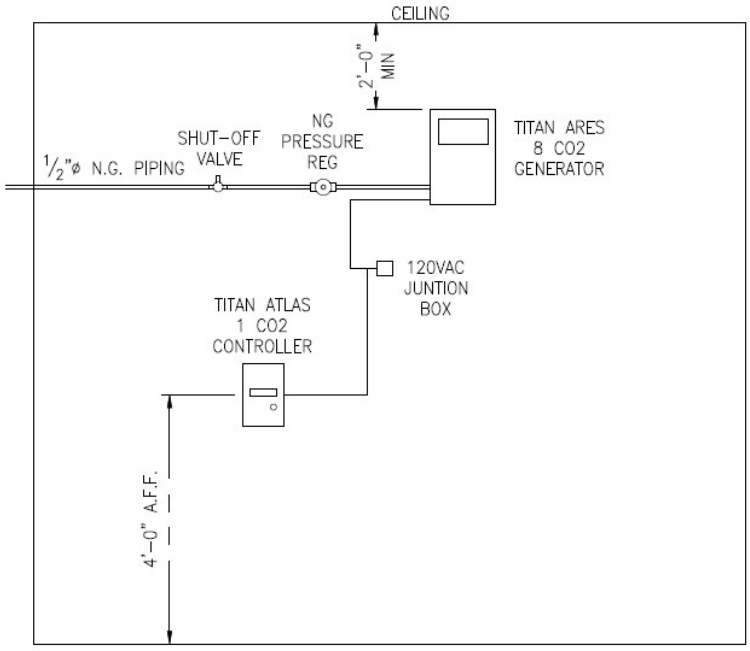

GROW ROOM INTERIOR

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Atlas® 1 Remote CO_2 Monitor/Controller Overview

The Atlas® 1 Remote CO_2 Monitor/Controller has an adjustable CO_2 set point, elevation correction adjustment and a user calibration feature. These adjustments are made with the "Increase" and "Decrease" buttons located on the front of the monitor/controller. The Atlas® 1 is also equipped with a photocell that detects day/night conditions and will automatically disable the load output of the CO_2 monitor/controller during nighttime conditions when CO_2 is not required in your garden. The Atlas® 1 provides up to 15 amps of capacity on a standard 120 volt circuit. A green LED located between the "Increase" and "Decrease" buttons will illuminate when the load output is "active". We recommend that you set the Atlas® 1 between 1000 PPM (Parts Per Million) and 1500 PPM. Settings at above 2050 PPM are NOT recommended. The Atlas® 1 Remote CO_2 Monitor/Controller is built with the highest quality components and will provide the user with years of trouble free service.

Instructions for Operation

- Using the CAT 45 cable included with your system, plug one end into the 'sensor input' on the Atlas® 1 Remote Sensor, then plug the other end of the CAT 45 cable into the 'sensor output' on the Atlas® 1 Monitor/Controller.
- Place your Atlas® 1 Remote CO_2 Sensor in your enclosure at approximately the height of your plants and away from any spray/water/mist, etc.
- The Atlas® 1 has a factory preset set point of 1000 PPM, and can be adjusted from 0 PPM to 2050 PPM.
- To adjust the **set point**:
  - Press and hold the "Increase" button for approximately 5 seconds until the display reads "rSEL".
  - Use the "Increase" or "Decrease" button to adjust your PPM set point to your desired level.
  - Set point adjustments are made in increments of 10 PPM.
  - After a few seconds without buttons being pressed, the Atlas® 1 will reset and the new set point is saved in memory.

The Atlas® 1 is calibrated at sea level and the calibration changes slightly with an increase in elevation. The "Elevation Adjustment" feature will compensate for these changes. It may be adjusted from 0 feet to 9999 feet above sea level.

- To adjust the **elevation**:
  1. Press and hold the "Decrease" button for approximately 5 seconds until the display reads "ELE".
  2. Use the "Increase" or "Decrease" button to adjust the elevation to the desired level.
  3. Elevation adjustments are made in increments of 100 feet.
  4. After a few seconds without buttons being pressed, the Atlas® 1 will reset and the elevation correction will be complete.

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Conclusions:

- The equipment as modified complies with code sections sections OMSC 105.2. The material method or work offered also meets equivalent quality, strength, effectiveness, durability and safety and the intent of the code.

- The generator must be installed so that there is unrestricted airflow through the bottom.

- The generator must be installed with the correct gas supply, solenoid valve and regulator to match the fuel being used. Provide code compliant gas piping/connection with shut-off valve from building gas supply to generator unit.

    - The regulator shall be a Maxitrol 325-3 with a 12A09 vent limiter. Both of these are ANSI Z21.80 compliant. This will be configured with a 5" WC outlet pressure. Attach specifications in the appendix.

    - The Solenoid shall be replaced with an ASCO 8262 24VDC ¼" Normally Closed Solenoid Valve. Attach specifications in the appendix.

    - Installation of the proper regulator and solenoid shall be verified during a field inspection.

    - The gas piping shall be ½" Tracpipe. ICC PMG-1058 is included in the Appendix and the piping meets meets OMSC C403.5.

- All gas connections shall be tested per industry best practices.

- Only the power supply provided by the manufacturer shall be used. It is a UL listed 120V to 24V power supply via a standard connector, so hard wiring will not be required.

- A CO2 detection system interlocked with visual and audio alarms and proper signage shall be utilized in the space served so that C02 levels do not endanger occupants.

- A CO detection system shall be utilized to ensure that CO levels do not endanger occupants.

- The unit shall be tested on an annual basis to ensure that the ignition module, firing sequence and safety shutdown are operating properly.

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- Unit produces 23,000 btu/h of heat at full capacity. Unit shall be located so that no fire hazard is presented by installing in a fully sprinklered facility with a minimum clear distance of 24" from any combustible materials.

- Combustion air calculations have been provided on the mechanical permit drawings. These are excerpted here:

CO2 GENERATOR UNIT SCHEDULE

UNIT	MAKE & MODEL	N.G. RATING	CO2 RATING CUBIC FT/HR
CO2G-1	* TITEN ARES-8 NG	22,163 BTU	22
CO2G-2	* TITEN ARES-8 NG	22,163 BTU	22
CO2G-3	* TITEN ARES-8 NG	22,163 BTU	22
CO2G-4	* TITEN ARES-8 NG	22,163 BTU	22

* TITEN ARES-8 NG CO2 GENERATORS SHALL BE MODIFIED AS FOLLOWS:
- REPLACE THE NG REGULATOR WITH A MAXITROL 325-3 REGULATOR WITH A 12A09 VENT LIMITER CONFIGURED WITH A 5" WC OUTLET PRESSURE
- REPLACE THE SOLENOID VALVE WITH AN ASCO 8262 24VDC 1/4" NORMALLY CLOSED SOLENOID VALVE
- REPLACE THE GAS HOSE WITH 1/2" TRACPIPE.

SPECIAL INSPECTIONS:
- THIRD PARTY OR MECHANICAL ENGINEER OF RECORD SHALL AND VERIFY THE INSTALLATION OF MODIFIED COMPONENTS.
- TESTING SHALL INCLUDE GAS LEAK TEST AND VERIFY THAT TEMPERATURE OF METAL HOUSING DOES NOT EXCEED 350-DEG FAHRENHEIT.
- EVALUATION SHALL INCLUDE THAT THE UNIT IS OPERATING PROPERLY.
- FIELD INSPECTION REPORT SHALL BE PROVIDED TO THE BUILDING OFFICIAL.

2

COMBUSTION AIR CALCULATIONS:
- SMALLEST ROOM WHERE TITEN ARES-8 INSTALLED = 108 GROWING ROOM.
- 108 GROWING ROOM VOLUME = 717(SF) x 12(Ft TALL) = 8604 Cu-FT
- 22,163(Btu/h) x 50(Cu-Ft) / 1000(Btu/h) = 1108(Cu-Ft) < 8604(Cu-Ft)
  * COMPLIES WITH 2014 OMSC SECTION C304.5.
- 22,163(Btu/h) / 8604(Cu-Ft) = 2.58(Btu/(h Cu-Ft)) < 20(Btu/(h Cu-Ft)
  * COMPLIES WITH 2014 OMSC SECTION C501.8

- The appendix includes Ares-8 Instructions and Applications Diagram in the report, as well as Atlas 1 Instructions in the report.

- It is our conclusion, based upon inspection of this specific Ares 8 NG CO2 generator (S/N J16666Q08D) when modified with the UL listed ASCO solenoid valve, ANSI Z21.80 compliant Maxitrol Regulator Valve with vent limiter, and OMSC C403.5 compliant gas piping, that it is safe for use for the purpose of CO2 air enrichment in an indoor cultivation facility, using the Sequence of Operations

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specified in this document and on the Mechanical permit documents, and the equipment complies with OMSC 105.2 and material method or work offered also meets equivalent quality, strength, effectiveness, durability and safety.

Please call if you have any questions or require additional information.

Regards-

Steffen U. Brocks, P.E.
BEA CONSULTING LLC

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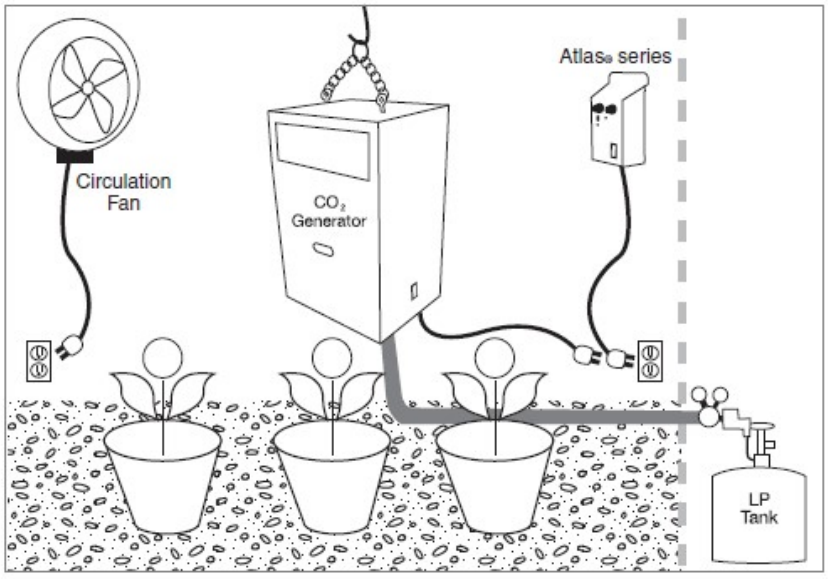
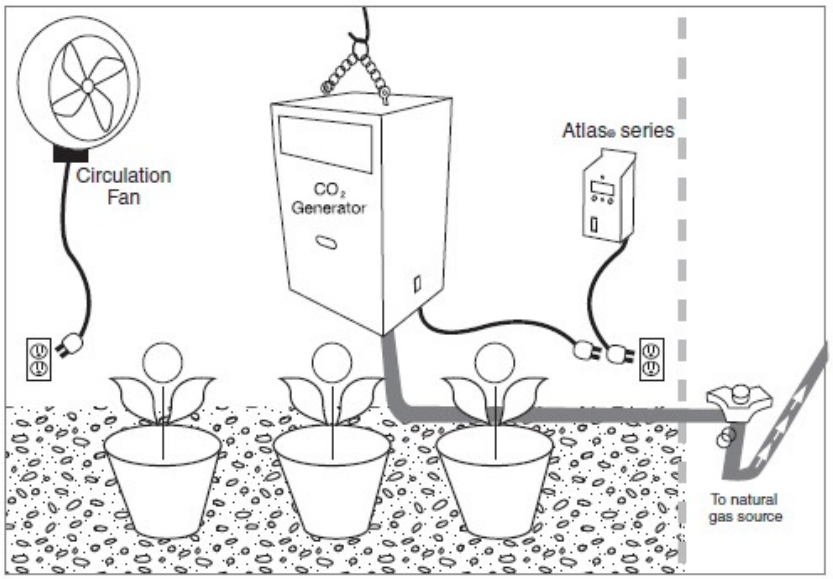
APPENDIX

Ares® Application Diagram





Atlas® 1 Remote CO_2 Monitor/Controller Overview

The Atlas® 1 Remote CO_2 Monitor/Controller has an adjustable CO_2 set point, elevation correction adjustment and a user calibration feature. These adjustments are made with the "Increase" and "Decrease" buttons located on the front of the monitor/controller. The Atlas® 1 is also equipped with a photocell that detects day/night conditions and will automatically disable the load output of the CO_2 monitor/controller during nighttime conditions when CO_2 is not required in your garden. The Atlas® 1 provides up to 15 amps of capacity on a standard 120 volt circuit. A green LED located between the "Increase" and "Decrease" buttons will illuminate when the load output is "active". We recommend that you set the Atlas® 1 between 1000 PPM (Parts Per Million) and 1500 PPM. Settings at above 2050 PPM are NOT recommended. The Atlas® 1 Remote CO_2 Monitor/Controller is built with the highest quality components and will provide the user with years of trouble free service.

Instructions for Operation

- Using the CAT 45 cable included with your system, plug one end into the 'sensor input' on the Atlas® 1 Remote Sensor, then plug the other end of the CAT 45 cable into the 'sensor output' on the Atlas® 1 Monitor/Controller.
- Place your Atlas® 1 Remote CO_2 Sensor in your enclosure at approximately the height of your plants and away from any spray/water/mist, etc.
- The Atlas® 1 has a factory preset set point of 1000 PPM, and can be adjusted from 0 PPM to 2050 PPM.
- To adjust the **set point**:
  - Press and hold the "Increase" button for approximately 5 seconds until the display reads "rSEL".
  - Use the "Increase" or "Decrease" button to adjust your PPM set point to your desired level.
  - Set point adjustments are made in increments of 10 PPM.
  - After a few seconds without buttons being pressed, the Atlas® 1 will reset and the new set point is saved in memory.

The Atlas® 1 is calibrated at sea level and the calibration changes slightly with an increase in elevation. The "Elevation Adjustment" feature will compensate for these changes. It may be adjusted from 0 feet to 9999 feet above sea level.

- To adjust the **elevation**:
  1. Press and hold the "Decrease" button for approximately 5 seconds until the display reads "ELE".
  2. Use the "Increase" or "Decrease" button to adjust the elevation to the desired level.
  3. Elevation adjustments are made in increments of 100 feet.
  4. After a few seconds without buttons being pressed, the Atlas® 1 will reset and the elevation correction will be complete.

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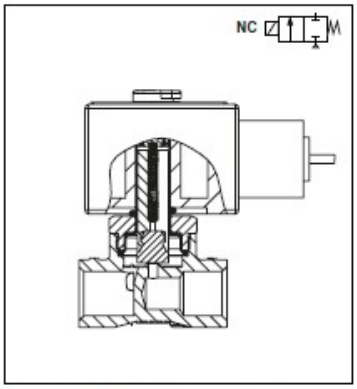
ASCO RedHat

Direct Acting, Normally Closed
General Service Solenoid Valves
Brass or Stainless Steel Bodies
1/8" to 3/8" NPT

2/2 SERIES 8262 8263 2-WAY

Features

- Welded core tube provides higher pressure ratings
- Reliable, proven design with high flows
- Small poppet valves for tight shutoff
- Wide range of elastomers for specialty service applications
- Mountable in any position
- Tapped mounting holes in body standard



Construction

Valve Parts in Contact with Fluids		
Body	Brass	Cast 304 Stainless Steel
Seals and Discs	NBR or Cast UR	
Core Tube	305 Stainless Steel	
Core and Plugnut	430F Stainless Steel	
Springs	302 Stainless Steel	
Shading Coil	Copper	Silver

Electrical

Watt Rating and Power Consumption				Spare Coil Part No.			
	AC			General Purpose		Explosionproof	
DC Watts	Watts	VA Holding	VA Inrush	AC	DC	AC	DC
10.6	6.1*	16	30	238210	238510	238214	238514
18.6	9.1*	20	45	238210	238510	238214	238514
11.6	10.1	25	50	238610	238910	238614	238914
22.6	17.1	40	70	238610	238910	238614	238914

Standard Voltages: 24, 120, 240, 480 volts AC, 60 Hz (or 110, 220 volts AC, 50 Hz). 6, 12, 24, 120, 240 volts DC. Must be specified when ordering.
Other voltages available when required.
*On 50 hertz service, the rating for the 6.1/F solenoid is 8.1 watts, and the rating for the 9.1/F solenoid is 11.1 watts.

Solenoid Enclosures

Standard: Watertight, Types 1, 2, 3, 3S, 4, and 4X.

Optional: Explosionproof and Watertight, Types 3, 3S, 4, 4X, 6, 6P, 7, and 9. (To order, add prefix "EF" to catalog number)

See Optional Features Section for other available options.

Options

Mounting bracket (suffix MB)
Quarter-turn manual operator with screw slot (suffix MS)
Panel mount (prefix GP for conduit; *consult ASCO for other electrical connections*)
Vacuum service (suffix VVM, VVH; *see Vacuum Section for more details.*)
Oxygen service (suffix N)
Silicone Free (suffix SF)

Elastomers: FKM (suffix V), Ethylene Propylene (suffix E), CR (suffix J), Teflon (suffix T), Low Temp NBR (suffix A)

Note: For suffix A, Fluid temp. range -40°F to 167°F only for valves with 10.1, 17.1, 11.6, and 22.6 watt coils.

Refer to Engineering Section for fluid and temperature compatibility.

Nominal Ambient Temp. Ranges

The nominal limitation of 32°F (0°C) is advisable for any valve that might contain moisture (water vapor).
AC: -13°F to 131°F (-25°C to 55°C)
DC: -13°F to 104°F (-25°C to 40°C)
-13°F to 131°F (-25°C to 55°C)

Note: Max ambient for explosionproof (EF) is 125°F (52°C) for AC, 131°F (55°C) for DC.

Optional: For AC, the max. ambient temperature is 140°F (60°C) with Class H coil (with or without prefix EF)

Refer to Engineering Section for details.

Approvals

CSA certified. UL listed, as indicated. Safety Shutoff Valves FM approved. Meets applicable CE directives.

Refer to Engineering Section for details.

2574 NW Thurman, Suite 100 Portland, Oregon 97210-2524 Phone 503.295.4953 Fax 503.222.1453

75-6138 Alii Drive, Suite 13 Kailua-Kona, Hawaii 96740

2-WAY

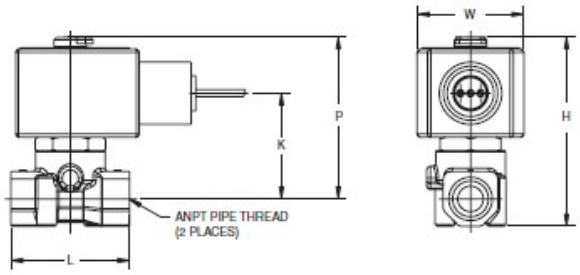
2/2 SERIES 8262 8263

ASCO®

Dimensions: inches (mm)

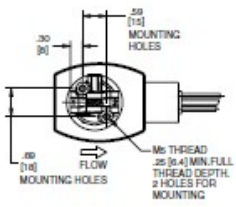
Const. Ref.		H	K	L	P	W
1	Ins	3.05	1.71	1.19	2.69	1.96
	mm	77	43	30	68	50
2	Ins	2.85	1.60	1.19	2.50	1.69
	mm	72	41	30	63	43
3	Ins	3.12	1.79	1.56	2.76	1.96
	mm	79	45	40	70	50
4	Ins	2.96	1.72	1.56	2.60	1.69
	mm	75	44	40	66	43
5	Ins	3.20	1.79	1.88	2.77	1.96
	mm	81	45	48	70	50
6	Ins	3.03	1.72	1.88	2.60	1.69
	mm	77	44	48	66	43

Const. Ref. 1-6

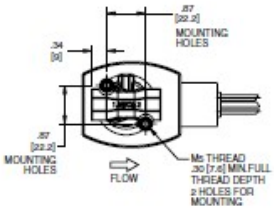


Mounting Dimensions

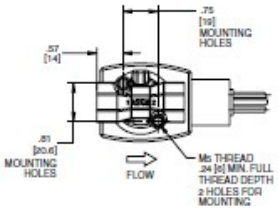
Const. Ref. 1, 2
(1/8" Pipe)



Const. Ref. 3, 4
(1/4" Pipe)



Const. Ref. 5, 6
(3/8" Pipe)



Note: Mounting holes will accept a standard #10-32 machine screw.

34

8262_8263_H9series_GP_R5

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325 SERIES

Lever Acting Design

Maxitrol's 325 Series pounds to inches regulators are for use on residential, commercial, and industrial applications.
The 325 Series features a high leverage valve linkage assembly to deliver positive dead-end lockup. The regulators are capable of precise control from full flow down to pilot flow.

325-3

Specifications

Pipe Sizes ..... 3/8" to 2" threaded connections with NPT or ISO7-1 threads.

Housing Material ..... 325-3, 325-5, 325-7A, 325-9: aluminum.

Mounting ..... Suitable for multi-positional mounting. If ball check vent limiting device is installed, mount in an upright position only.
NOTE: All Maxitrol gas pressure regulators should be installed and operated in accordance with Maxitrol Safety Warning Instructions (see GPR_MI_EN.ES or GPR_CSA_MI_EN.FR).

Certifications ..... 325-3, 325-5: ANSI Z21.18/CSA 6.3 Gas Appliance Pressure Regulators.

Gas Types ..... Suitable for natural, manufactured, mixed gases, liquefied petroleum gases, and LP gas-air mixtures.

Maximum Inlet Pressure ..... CSA Certified: 325-3, 325-5: 2 psi (13.8 kPa), 5 psi (34.5 kPa)
Maxitrol Tested: 325-3, 325-5, 325-7A, 325-9: 10 psi (69 kPa)
With Vent Limiter 12A09, 12A39, or 12A49 Installed:
325-3, 325-5, 325-7A, 325-9: 5 psi (34.5 kPa) - Natural, 2 psi (13.8 kPa) - LP

Emergency Exposure Limits .....65 psi (450 kPa) (inlet side only)

Maximum Individual Load ..... Largest single appliance served by the regulator: 325-3: 100,000 Btu/h; 325-5: 325,000 Btu/h; 325-7A: 1,250,000 Btu/h, 325-9: 2,250,000 Btu/h

Capacity .....Total load of multiple appliances combined: 325-3: 150,000 Btu/h; 325-5: 325,000 Btu/h; 325-7A: 1,250,000 Btu/h; 325-9: 2,250,000 Btu/h
NOTE: Capacities are used to determine the maximum multiple appliance load. The largest single appliance served by the regulator should not exceed the maximum individual load specified above.

Ambient Temperature Ranges .....-40 to 205°F (-40 to 96°C)

Minimum Regulation..... Suitable for pilot flow applications. Ⓟ (Circle P) (0.15 CFH NG), None (1.5 CFH NG).

Imblue Technology™ 325-3, 325-5, 325-7A, 325-9 models may be ordered with Imblue Technology™. Imblue Technology™ increases corrosion resistance and provides extra protection against the elements for regulators used in outdoor applications. Add suffix letter "B" to model number when ordering.

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APPLIANCE REGULATORS

TF02

Capacities: based on 1" w.c. pressure drop, from set point**

Capacities expressed in CFH (m³/h) @ 0.64 sp gr gas

Model	Pipe Size	Outlet Pressure Set Point	CSA MAX CFH	Operating Inlet Pressure					
				0.5 psi (3.4 kPa)	0.75 psi (5.2 kPa)	1 psi (6.9 kPa)	2 psi (13.8 kPa)	5 psi (34.5 kPa)	10 psi (69.0 kPa)
325-3	3/8" x 3/8" 1/2" x 1/2"	4.0" w.c. (1.0 kPa)	150 (4.2)	160 (4.5)	190 (5.4)	220 (6.2)	220 (6.2)	300 (8.5)	320 (9.1)
		7.0" w.c. (1.7 kPa)	150 (4.2)	120 (3.4)	150 (4.2)	180 (5.1)	220 (6.2)	290 (8.2)	320 (9.1)
		10.0" w.c. (2.5 kPa)	150 (4.2)	100 (2.8)	120 (3.4)	150 (4.2)	220 (6.2)	280 (7.9)	320 (9.1)
325-5	1/2" x 1/2" 3/4" x 3/4" 1" x 1"	4.0" w.c. (1.0 kPa)	325 (9.2)	340 (9.6)	390 (11.0)	450 (12.7)	560 (15.9)	680 (19.3)	750 (21.2)
		7.0" w.c. (1.7 kPa)	325 (9.2)	260 (7.4)	360 (10.2)	410 (11.6)	530 (15.0)	680 (19.3)	750 (21.2)
		10.0" w.c. (2.5 kPa)	325 (9.2)	240 (6.8)	320 (9.1)	360 (10.2)	500 (8.5)	650 (18.4)	750 (21.2)
325-7A	1 1/4" x 1 1/4" 1 1/2" x 1 1/2"	4.0" w.c. (1.0 kPa)	—	850 (24.0)	1060 (30.0)	1190 (33.7)	1600 (45.3)	2090 (59.2)	2190 (62.0)
		7.0" w.c. (1.7 kPa)	—	780 (22.0)	950 (26.9)	1060 (30.0)	1500 (42.5)	1860 (52.7)	2060 (58.3)
		10.0" w.c. (2.5 kPa)	—	650 (18.4)	860 (24.4)	990 (28.0)	1300 (36.8)	1620 (45.9)	2060 (58.3)
325-9	1 1/2" x 1 1/2" 2" x 2"	4.0" w.c. (1.0 kPa)	—	1815 (51.4)	2075 (58.8)	2250 (63.7)	2660 (75.3)	3550 (100.5)	3750 (106.2)
		7.0" w.c. (1.7 kPa)	—	1430 (40.5)	1660 (47.0)	1960 (55.5)	2570 (72.8)	3420 (96.8)	3750 (106.2)
		10.0" w.c. (2.5 kPa)	—	1275 (36.1)	1450 (41.1)	1720 (48.7)	2160 (61.2)	3150 (89.2)	3750 (106.2)

NOTE: Maximum Individual Load: 325-3(B) is 100 CFH (2.8 m³/h); 325-5(B) is 325 CFH (9.2 m³/h); 325-7A(B) is 1250 CFH (35.4 m³/h); 325-9(B) is 2250 CFH (63.7). Approval based on use as an appliance regulator. **Set points (in CFH): 325-3(B) = 50; 325-5(B) = 150; 325-7A(B) = 500; 325-9(B)=1000.

See pages 58-59 for Regulator Sizing Requirements and Examples.

Pressure Drop: 0.64 sp gr gas expressed in CFH (m³/h) (for system pressure drop calculations)

Model	7.0" w.c. (1.7 kPa)	0.5 psi (3.4 kPa)	0.75 psi (5.2 kPa)	1 psi (6.9 kPa)	2 psi (13.8 kPa)
325-3	145 (4.0)	204 (5.8)	250 (7.0)	289 (8.2)	—
325-5	400 (11.3)	550 (15.6)	670 (19.0)	770 (21.8)	—
325-7A	815 (23.1)	1149 (32.5)	1405 (39.8)	1624 (46.0)	2305 (65.3)
325-9	1360 (38.5)	2113 (59.8)	2557 (72.4)	2949 (83.5)	4059 (114.8)

Spring Selection Chart: inches w.c. (kPa) unless noted

Model Number	CSA Certified				Standard Spring	Other Springs Available			
	2 psi (13.8 kPa)		5 psi (34.5 kPa)						
325-3	5 to 9 (1.25 to 2.25) Plated	7 to 11 (1.7 to 2.7) White	6 to 10 (1.5 to 2.5) Plated	7 to 11 (1.7 to 2.7) White	4 to 12 (1.0 to 3.0) Violet	2 to 6 (0.5 to 1.5) Plated	10 to 22 (2.5 to 5.5) Red	15 to 30 (3.7 to 7.5) Yellow	1 to 2 psi (6.9 to 13.9) Tagged
325-5	5 to 9 (1.25 to 2.25) Plated	7 to 11 (1.7 to 2.7) White	6 to 10 (1.5 to 2.5) Plated	7 to 11 (1.7 to 2.7) White	4 to 12 (1.0 to 3.0) Violet	2 to 6 (0.5 to 1.5) Plated	10 to 22 (2.5 to 5.5) Red	15 to 30 (3.7 to 7.5) Yellow	1 to 2 psi (6.9 to 13.9) Tagged
325-7A	—	—	—	—	4 to 12 (1.0 to 3.0) Violet	2 to 5 (0.5 to 1.5) Plated	10 to 22 (2.5 to 5.5) Red	15 to 30 (3.7 to 7.5) Yellow	20 to 42 (5.0 to 10.4) Black
325-9	—	—	—	—	4 to 12 (1.0 to 3.0) Violet	2 to 5 (0.5 to 1.5) Plated	10 to 22 (2.5 to 5.5) Red	15 to 30 (3.7 to 7.5) Yellow	20 to 42 (5.0 to 10.4) Black

NOTE: See pages 56-57 for complete Spring Selection Chart.

MAXITROL 15

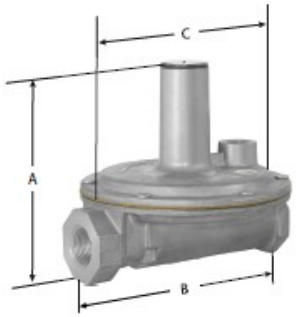
325 SERIES
Lever Acting Design

Dimensions

Model	Pipe Size	Vent Connection	Swing Radius	Dimensions		
				A	B	C
325-3	3/8", 1/2"	1/8" NPT	3" (76 mm)	3.5" (89 mm)	4.2" (108 mm)	3.9" (98 mm)
325-5	1/2", 3/4", 1"	3/8" NPT	4.9" (124 mm)	5.3" (133 mm)	5.9" (149 mm)	5.4" (138 mm)
325-7A	1 1/4", 1 1/2"	1/2" NPT	6.1" (156 mm)	7.3" (184 mm)	8" (203 mm)	7" (178 mm)
325-9	1 1/2", 2"	1/2" NPT	7.8" (198 mm)	9.4" (239 mm)	10.8" (274 mm)	9.1" (231 mm)

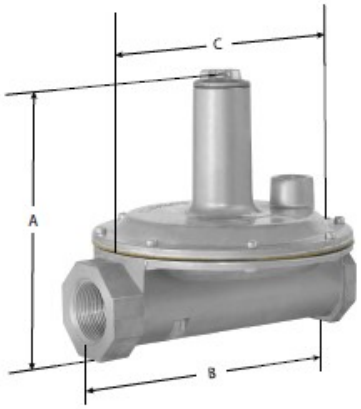
NOTE: Dimensions are maximums and to be used only as an aid in designing clearance for the valve. Actual production dimensions may vary somewhat from those shown.

325-3

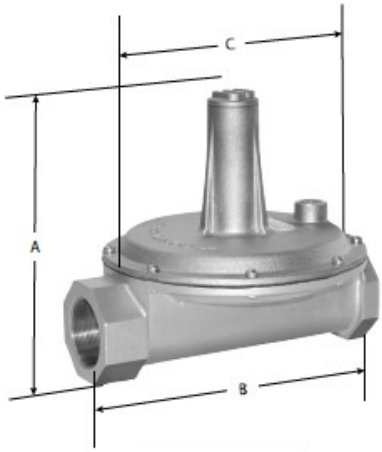


325-5

APPLIANCE REGULATORS

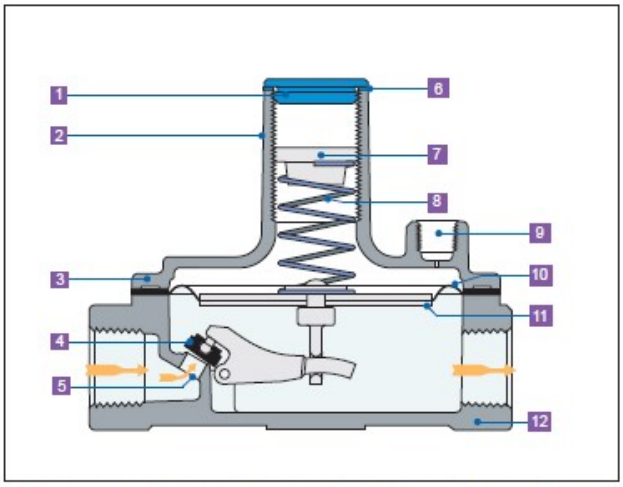


325-7A



325-9

Lever Acting Design



1	Seal Cap
2	Stack
3	Top Housing
4	Rubber Valve
5	Valve Seat
6	Seal Cap Gasket
7	Adjusting Screw
8	Spring
9	Vent Connection
10	Diaphragm
11	Diaphragm Plates
12	Bottom Housing

NOTE: Diagrams are graphical representations only and may differ from actual product.

MAXITROL

17

Vent Tube Connector

Threaded sleeve - two piece assembly where the nut is tightened inside male connector.

- **11A03:** connects 1/8" female pipe thread to 1/8" O.D. tubing.
- **11A04:** connects 1/8" female pipe thread to 1/4" O.D. tubing.

Threaded sleeve nut - for RV20V.

- **11A08:** 5/16-24 threaded sleeve nut for 1/8" O.D. tubing.

Compression fitting - where nut and sleeve are slipped over tubing and tightened into fitting body.

- **11A05-42:** connects 1/4" female pipe thread to 1/4" O.D. tubing.
- **11A05-61:** connects 1/8" female pipe thread to 1/8" O.D. tubing.
- **11A05-63:** connects 3/8" female pipe thread to 3/8" O.D. tubing.
- **11A05-64:** connects 1/2" female pipe thread to 3/8" O.D. tubing.

11A03 11A08 11A05

Vent Limiting Device: vLimiter®

Optional automatic vent limiting device - ball check permits unobstructed inhalation for fast regulator diaphragm response on opening cycle, but limits gas escapement to within ANSI standards should a diaphragm rupture.

NOTE: When using the vent limiting device, regulator must be mounted in a horizontal upright position.

- **12A04:** CSA certified for up to 1/2 psi (14" w.c.) inlet pressure.
  Use on RV48, RV52, RV53, RV61, R400(S), R500(S), R600(S) regulators.
  Color - brass. 1/8" NPT.
- **12A09:** CSA certified for 2 psi (LP) and 5 psi (natural) inlet pressure with 325-3 and 325-3L regulators; OPD48, OPD600.
  Color - green. 1/8" NPT.
- **12A34:** CSA certified for up to 1/2 psi (14" w.c.) inlet pressure with RV81.
  Color - brass. 3/8" NPT.
- **12A39:** CSA certified for 2 psi (LP) and 5 psi (natural) inlet pressure with 325-5 and 325-5L regulators; OPD210D.
  Color - brass. 3/8" NPT.
- **12A49:** CSA certified for 2 psi (LP) and 5 psi (natural) inlet pressure with 325-7A, 325-7AL, 325-9, and 325-9L regulators; OPD210E.
  Color - brass. 1/2" NPT.

Satisfies ANSI Standards for both Natural and LP gas.

NOTE: Vent limiters are not recommended for use in models RV91, RV111, RV131, and 210 Series.

12A09 12A39 12A49

Vent Limiting Orifice

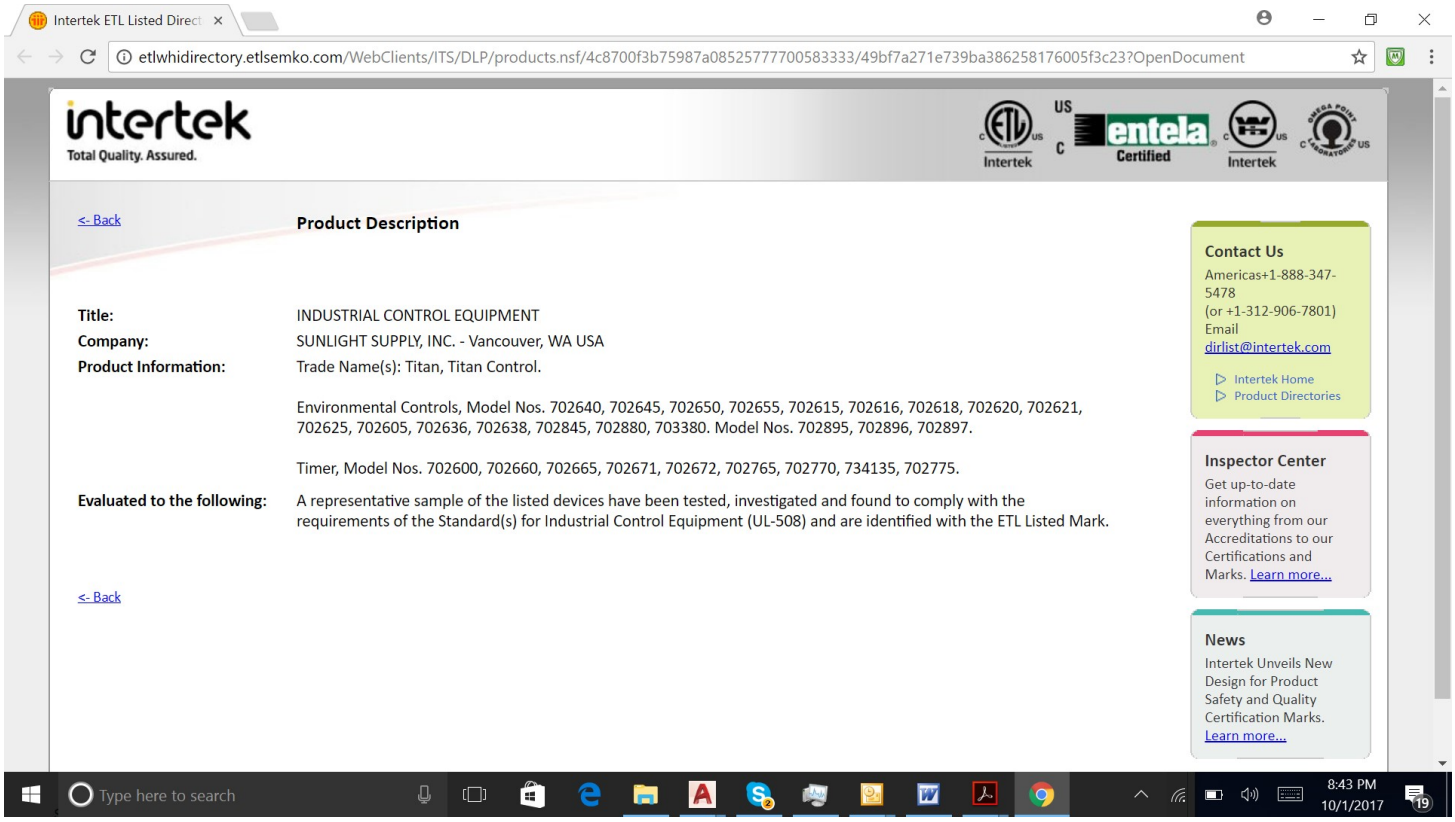
- **12A06:** Orifice hole is on side of body, under head. Fixed orifice equally limits inhalation and escapement. Use on RV48, RV52, RV53, RV61, R400(S), R500(S), R600(S) regulators.
  Color- brown. 1/8" NPT.

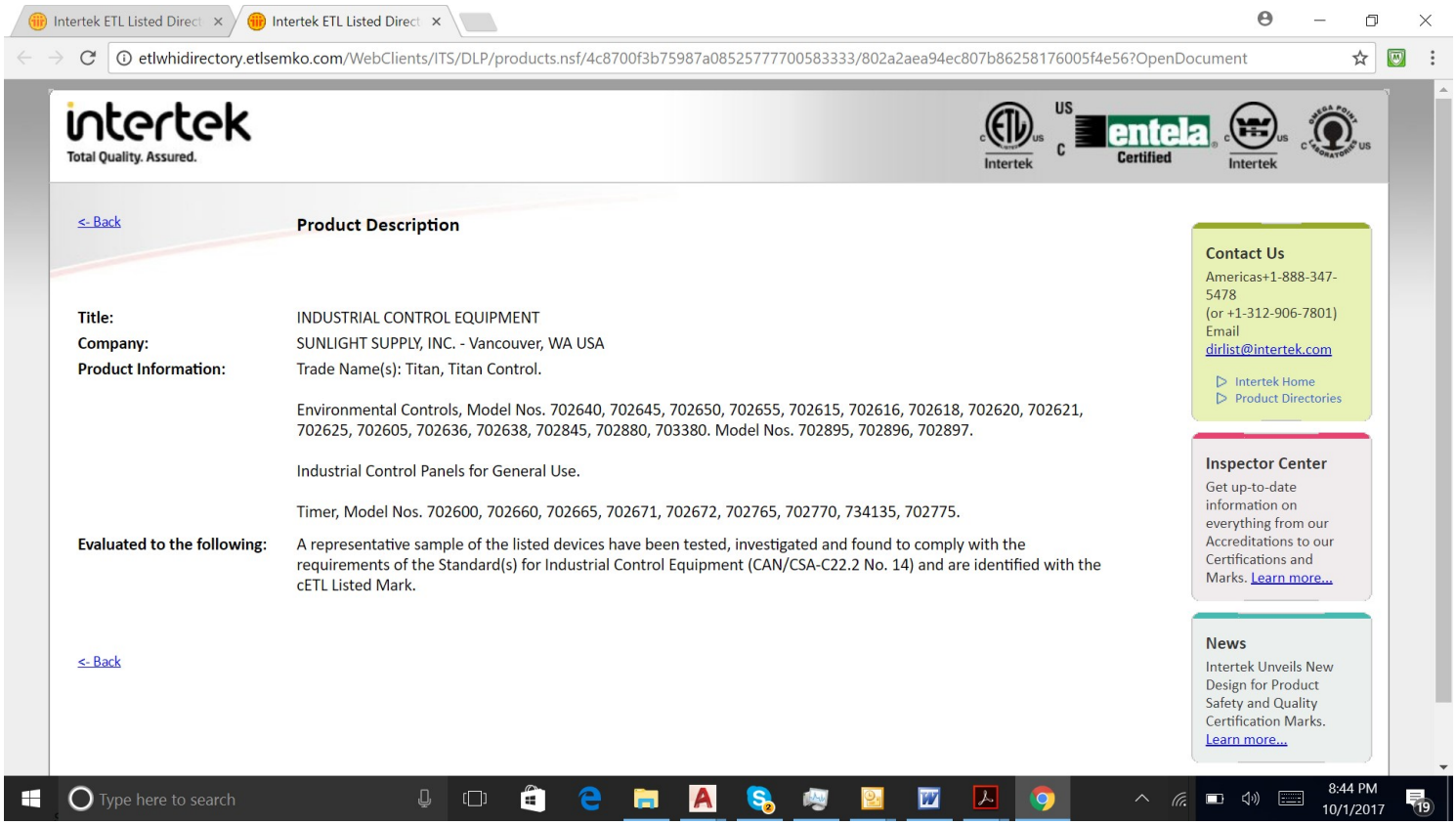
Satisfies ANSI Standards for both Natural and LP gas.

12A06

ETL Approval for Atlas

(Atlas 1 is UL-508 and CAN/CSA-C22.2 No. 14 approved)





- http://etlwhidirectory.etlsemko.com/WebClients/ITS/DLP/products.nsf/4c8700f3b75987a08525777700583333/49bf7a271e739ba386258176005f3c23?OpenDocument
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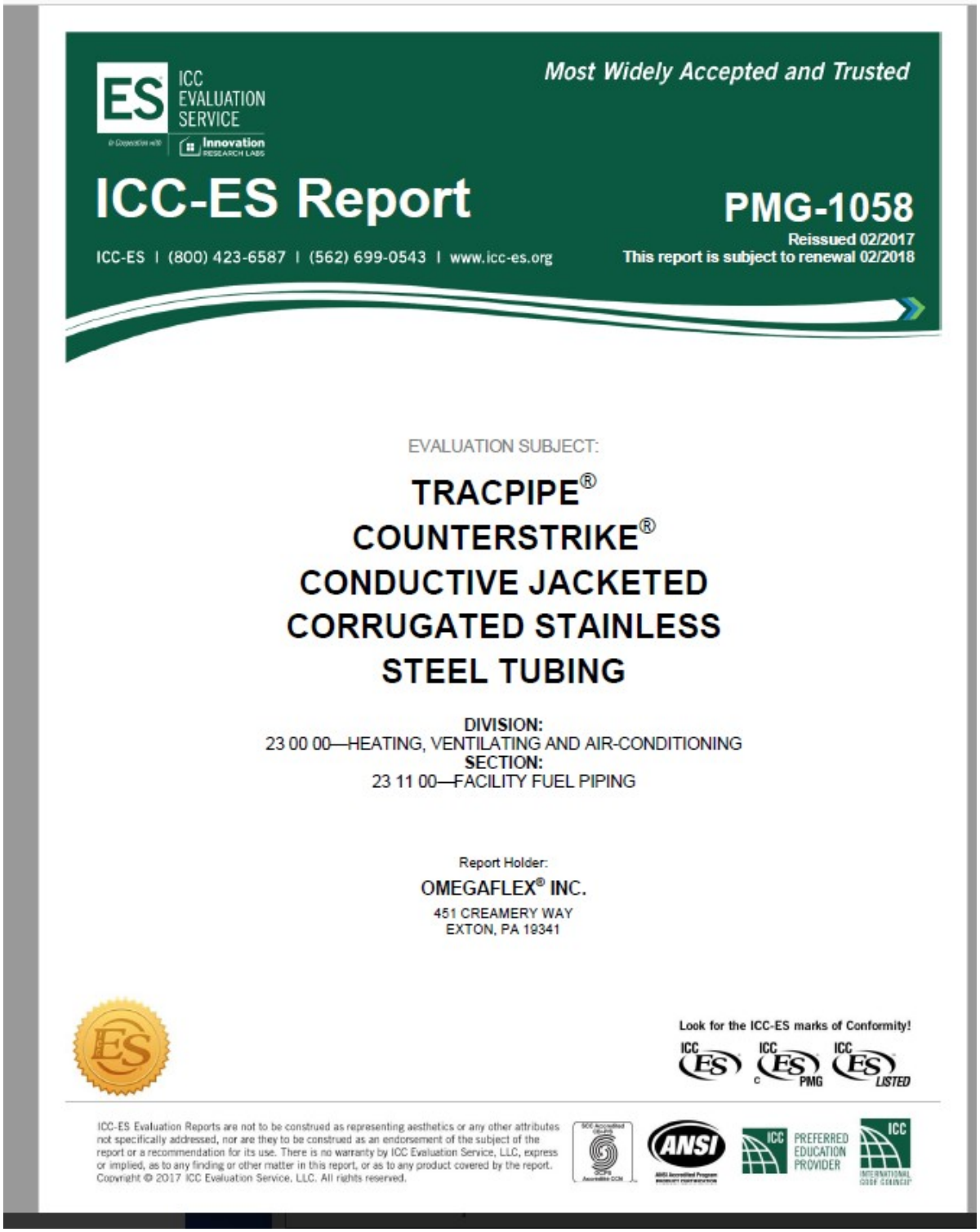

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ICC-ES Report

PMG-1058

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Reissued 02/2017
This report is subject to renewal 02/2018

EVALUATION SUBJECT:

TRACPIPE®
COUNTERSTRIKE®
CONDUCTIVE JACKETED CORRUGATED STAINLESS STEEL TUBING

DIVISION:
23 00 00—HEATING, VENTILATING AND AIR-CONDITIONING
SECTION:
23 11 00—FACILITY FUEL PIPING

Report Holder:
OMEGAFLEX® INC.
451 CREAMERY WAY
EXTON, PA 19341

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ICC-ES PMG Product Certificate

PMG-1058

Effective Date: February 2017

This listing is subject to re-examination in one year.

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CSI: DIVISION: 23 00 00—HEATING, VENTILATING, AND AIR-CONDITIONING
Section: 23 11 00—Facility Fuel Piping

Product certification system:

The ICC-ES product certification system includes testing samples taken from the market or supplier's stock, or a combination of both, to verify compliance with applicable codes and standards. The system also involves factory inspections, and assessment and surveillance of the supplier's quality system.

Product: TracPipe® CounterStrike® Conductive Jacketed Corrugated Stainless Steel Tubing

Listee: OmegaFlex® Inc.
451 Creamery Way
Exton, Pennsylvania 19341-2509
www.omegaflex.com

Compliance with the following codes:

2015, 2012, 2009 and 2006 *International Fuel Gas Code®* (IFGC)
2015, 2012, 2009 and 2006 *International Mechanical Code®* (IMC)
2015, 2012, 2009 and 2006 *International Residential Code®* (IRC)
2015, 2012, 2009 and 2006 *Uniform Plumbing Code®* (UPC)*
2015, 2012, 2009 and 2006 *Uniform Mechanical Code®* (UMC)*

**Uniform Mechanical Code and Uniform Plumbing Code are copyrighted publications of the International Association of Plumbing and Mechanical Officials*

Compliance with the following standards:

ANSI LC 1/CSA 6.26-2016, Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (CSST)
NFPA 54-2015, National Fuel Gas Code
ICC-ES LC1024-2012 (Revised July 2016), PMG Listing Criteria for Corrugated Stainless Steel Tubing Utilizing a Protective Jacket

Identification:

Tubing: Each 2 feet (610 mm) of tube bears the trade names TracPipe® CounterStrike®, part number, rated pressure [25 psi (172 kPa)], equivalent hydraulic diameter (EHD), the words "Fuel Gas", "ANSI LC1•CSA 6.26", and the ICC-ES PMG listing mark.

Components: Fittings, termination outlets and distribution manifolds are stamped with the OmegaFlex® logo, the part number and a date stamp.

Installation:

General: Installation must be in accordance with the TracPipe® Flexible Gas Piping Guide and Installation Instructions, IFGC Section 404, IRC Section 2415, UMC Section 1309 and UPC Section 1211, as applicable. The system installation consists of CSST distribution lines installed between the point of delivery and fuel gas appliances. The use and system installation must be in accordance with ICC-ES PMG-1046.

Plenum Installation: When tested in accordance with ASTM E 84, TracPipe® CounterStrike® satisfies the plenum installation requirement, with a flame spread index of less than 25 and a smoke developed index of less than 50.

Electrical Bonding: The TracPipe® CounterStrike® Conductive Jacketed Corrugated Stainless SteelTubing (CSST) System is electrically continuous and is considered to be bonded where it is connected to appliances that are connected to the equipment grounding conductor of the circuit supplying that appliance. Additional bonding prescribed by IFGC Section 310.1.1 is not required for TracPipe® CounterStrike® Conductive Jacketed Corrugated Stainless Steel Tubing when it is installed in accordance with this listing.

Models:

The TracPipe® CounterStrike® Conductive Jacketed CSST System consists of three parts: (1) a black conductive exterior jacket; (2) corrugated stainless steel tubing which is recognized in PMG-1046 as conforming to ANSI LC-1; and (3) mechanical fittings designed for use only with the OmegaFlex® Inc. CSSTs. Mechanical fittings utilize a metal-to-metal seal, and include mechanical fittings, distribution manifolds, shutoff valves, termination outlet devices, pressure regulators and protection devices.

Conditions of Listing:

1. TracPipe® CounterStrike® has been tested (in accordance with LC1024) and shown to resist a transient arc of 1000 amps minimum peak delivering 4.5 coulombs within 20 milliseconds (0.020 seconds). Assumed energy associated with a transient arc from lightning inside a building is less than 2.0 coulombs, providing a factor of safety of 2.25 for CounterStrike. Evaluation of this product for an arc exceeding this level or a direct strike from lightning is outside the scope of this listing.
2. The CSST piping system must not be used as a grounding electrode for an electrical system.
3. Additional information and requirements are defined in ICC-ES PMG-1046.
4. The TracPipe® CounterStrike® is manufactured by OmegaFlex® Inc. in Exton, Pennsylvania, under a quality control program with semi-annual surveillance inspections by ICC-ES.

TABLE 1—PART NUMBERS FOR TRACPIPE COUNTERSTRIKE TUBING

TUBING SIZE (inches)	PART NUMBER
3/8	FGP-CS-375-XXX
1/2	FGP-CS-500-XXX
3/4	FGP-CS-750-XXX
1	FGP-CS-100-XXX
1 1/4	FGP-CS-125-XXX
1 1/2	FGP-CS-150-XXX
2	FGP-CS-200-XXX

For SI: 1 inch = 25.4 mm.

XXX: Length of tubing in feet.

END OF ANALYSIS

2574 NW Thurman, Suite 100 Portland, Oregon 97210-2524 Phone 503.295.4953 Fax 503.222.1453

75-6138 Alii Drive, Suite 13 Kailua-Kona, Hawaii 96740

SUPPLY FAN SCHEDULE

			ELECTRICAL				
UNIT	MAKE & MODEL	FAN CAPACITY	VOLTAGE	HP	FLA	WEIGHT	NOTES
SF-1	CAPTIVEAIRE A1-G10	1575 CFM @ .430"	208/3	0.5	1.7	233	1
SF-2	FLOAIRE SA10	3150 CFM @ .595"	208/3	1.5	4.6	244	1
SF-3	FLOAIRE SA10	3150 CFM @ .595"	208/3	1.5	4.6	244	1
SF-4	FLOAIRE SA10	3150 CFM @ .595"	208/3	1.5	4.6	244	1
SF-5	CANFAN PRO SERIES 6"	364 CFM @ .378"	115/1			6	1, 2, 3
SF-6	CANFAN PRO SERIES 6"	131 CFM @ .378"	115/1			6	2, 3

1) PROVIDE TWO POSITION MOTORIZED DAMPER AT OPENING. ACTUATOR VOLTAGE TO MATCH FAN DAMPER TO POWER OPEN ON FAN START, SPRING RETURN ON FAN OFF.
2) FAN TO OPERATE CONTINUOUSLY.
3) PROVIDE ACTIVATED CARBON FILTER INLINE BEFORE EXHAUST FAN

EXHAUST FAN SCHEDULE

			ELECTRICAL				
UNIT	MAKE & MODEL	FAN CAPACITY	VOLTAGE	HP	FLA	WEIGHT	NOTES
EF-1	CAPTIVEAIRE DR50HFA	1575 CFM @ .375"	208/3	0.50	2.0	82	1, 3
EF-2	CAPTIVEAIRE DD15FA	3150 CFM @ .375"	208/3	0.75	2.5	130	1, 3
EF-3	CAPTIVEAIRE DD15FA	3150 CFM @ .375"	208/3	0.75	2.5	130	1, 3
EF-4	CAPTIVEAIRE DD15FA	3150 CFM @ .375"	208/3	0.75	2.5	130	1, 3
EF-5	BROAN XB-80	80 CFM @ .25"	115/1	1			
EF-6	CANFAN MAXFAN 10"	884 CFM @ .5"	115/1	1		8	1, 2, 3

1) PROVIDE TWO POSITION MOTORIZED DAMPER AT OPENING. ACTUATOR VOLTAGE TO MATCH FAN DAMPER TO POWER OPEN ON FAN START, SPRING RETURN ON FAN OFF.
2) FAN TO OPERATE CONTINUOUSLY.
3) PROVIDE ACTIVATED CARBON FILTER PER DETAIL 1/M-3

CONDENSING UNIT SCHEDULE

					ELECTRICAL				
UNIT	MAKE & MODEL	COOLING CAPACITY	SEER	EER	VOLTAGE	MCA	HP	WEIGHT	NOTES
CU-1	DAIKIN DX13SA0603A	57,000 BTUH	14	11.5	208/3	21.3	.25	301	
CU-2	DAIKIN DX13SA0603A	57,000 BTUH	14	11.5	208/3	21.3	.25	301	
CU-3	DAIKIN DX13SA0603A	57,000 BTUH	14	11.5	208/3	21.3	.25	301	
CU-4	DAIKIN DX13SA0603A	57,000 BTUH	14	11.5	208/3	21.3	.25	301	
CU-5	DAIKIN DX13SA0603A	57,000 BTUH	14	11.5	208/3	21.3	.25	301	
CU-6	DAIKIN DX13SA0603A	57,000 BTUH	14	11.5	208/3	21.3	.25	301	
CU-7	DAIKIN DX13SA0603A	57,000 BTUH	14	11.5	208/3	21.3	.25	301	

AIR HANDLING UNIT SCHEDULE

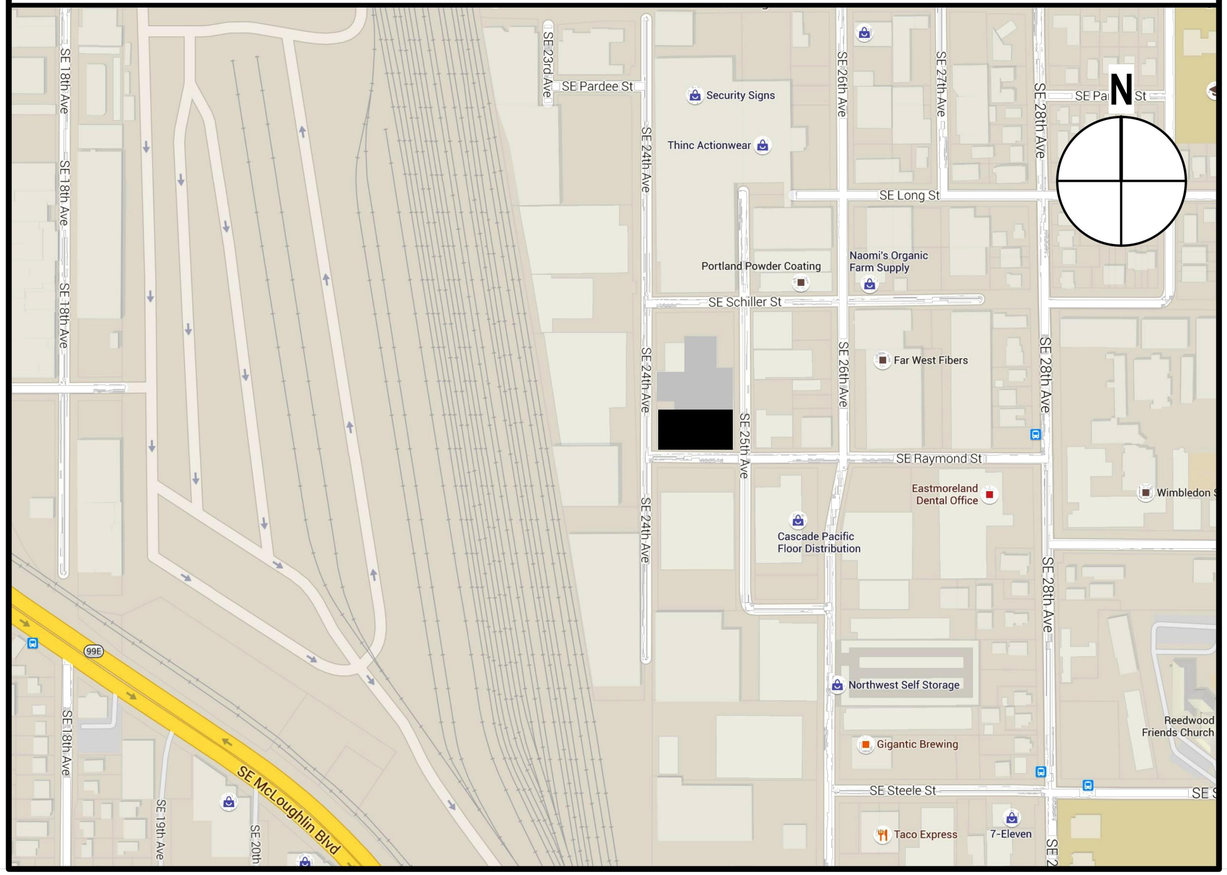
				ELECTRICAL				
UNIT	MAKE & MODEL	FAN CAPACITY	COOLING CAPACITY	VOLTAGE	MCA	HP	WEIGHT	NOTES
AHU-1	GOODMAN CHPF4860D6D+MBVC2000	1575 CFM	57,000 BTUH	208/1	5.8	.75	86	1, 2
AHU-2	GOODMAN CHPF4860D6D+MBVC2000	1575 CFM	57,000 BTUH	208/1	5.8	.75	86	1, 2
AHU-3	GOODMAN CHPF4860D6D+MBVC2000	1575 CFM	57,000 BTUH	208/1	5.8	.75	86	1, 2
AHU-4	GOODMAN CHPF4860D6D+MBVC2000	1575 CFM	57,000 BTUH	208/1	5.8	.75	86	1, 2
AHU-5	GOODMAN CHPF4860D6D+MBVC2000	1575 CFM	57,000 BTUH	208/1	5.8	.75	86	1, 2
AHU-6	GOODMAN CHPF4860D6D+MBVC2000	1575 CFM	57,000 BTUH	208/1	5.8	.75	86	1, 2
AHU-7	GOODMAN CHPF4860D6D+MBVC2000	1575 CFM	57,000 BTUH	208/1	5.8	.75	86	1, 2

1) HANG AIR HANDLING UNIT PER STRUCTURAL. CONNECT REFRIGERANT PIPING, CONDENSATE PIPING, AND THERMOSTAT ACCORDING TO REQUIREMENTS.
2) PROVIDE CONTROL MODULE FOR 0-100% OUTSIDE AIR ECONOMIZER.

VENTILATION SCHEDULE

ROOM	AREA	OCCUPANT DENSITY #/1000 SQ FT	CFM/PERSON (Rp)	CFM/SQ FT (Ra)	ZONE EFFICIENCY	OUTSIDE AIR	SF	EF	NOTES
107 GROWING ROOM	1515	5	10	0.06	1	98.5	SF-5		
110 GROWING ROOM	888	5	10	0.06	1	57.7	SF-6		
109 GROWING ROOM	881	5	10	0.06	1	57.3	SF-6		
108 GROWING ROOM	717	5	10	0.06	1	46.6	SF-5		
113 STORAGE	128	5	10	0.06	1	8.3	SF-5		
112 WORKSHOP	225	5	10	0.06	1	14.6	SF-5		
111 WORKSHOP	225	5	10	0.06	1	14.6	SF-5		
104 DRYING ROOM	298	5	10	0.06	1	19.4	SF-5		
102 TRIMMING/PRODUCT	586	5	10	0.06	1	38.1	SF-5		
106 BATHROOM	41	–	–	–	–	80		EF-5	
105 BREAKROOM	49	–	–	–	–				
101 SHIPPING	234	5	10	0.06	1	14.6	SF-5		

LOCATION MAP



CO2 GENERATOR UNIT SCHEDULE

UNIT	MAKE & MODEL	N.G. RATING	CO2 RATING CUBIC FT/HR
CO2G-1	* TITEN ARES-8 NG	22,163 BTU	22
CO2G-2	* TITEN ARES-8 NG	22,163 BTU	22
CO2G-3	* TITEN ARES-8 NG	22,163 BTU	22
CO2G-4	* TITEN ARES-8 NG	22,163 BTU	22

* TITEN ARES-8 NG CO2 GENERATORS SHALL BE MODIFIED AS FOLLOWS:
- REPLACE THE NG REGULATOR WITH A MAXITROL 325-3 REGULATOR WITH A 12A09 VENT LIMITER CONFIGURED WITH A 5" WC OUTLET PRESSURE
- REPLACE THE SOLENOID VALVE WITH AN ASCO 8262 24VDC 1/4" NORMALLY CLOSED SOLENOID VALVE
- REPLACE THE GAS HOSE WITH 1/2" TRACPIPE.

SPECIAL INSPECTIONS:
- THIRD PARTY OR MECHANICAL ENGINEER OF RECORD SHALL AND VERIFY THE INSTALLATION OF MODIFIED COMPONENTS.
- TESTING SHALL INCLUDE GAS LEAK TEST AND VERIFY THAT TEMPERATURE OF METAL HOUSING DOES NOT EXCEED 350-DEG FAHRENHEIT.
- EVALUATION SHALL INCLUDE THAT THE UNIT IS OPERATING PROPERLY.
- FIELD INSPECTION REPORT SHALL BE PROVIDED TO THE BUILDING OFFICIAL.

2

BUILDING AIR BALANCE TABLE

SUPPLY UNIT	SUPPLY (CFM)	EXHAUST UNIT	EXHAUST (CFM)
SF-1	1575	EF-1	1575
SF-2	3150	EF-2	3150
SF-3	3150	EF-3	3150
SF-4	3150	EF-4	3150
SF-5	364	EF-5	80
SF-6	131	EF-6	884
TOTAL	11,520	TOTAL	11,989

NOTE: 11,520 – 11,989 = (–464) CFM
BUILDING IS AT NEGATIVE PRESSURE

COMBUSTION AIR CALCULATIONS:
- SMALLEST ROOM WHERE TITEN ARES-8 INSTALLED = 108 GROWING ROOM.
- 108 GROWING ROOM VOLUME = 717(SF) x 12(Ft TALL) = 8604 Cu-FT
- 22,163(Btu/h) x 50(Cu-Ft) / 1000(Btu/h) = 1108(Cu-Ft) < 8604(Cu-Ft)
  * COMPLIES WITH 2014 OMSC SECTION C304.5.
- 22,163(Btu/h) / 8604(Cu-Ft) = 2.58(Btu/(h Cu-Ft)) < 20(Btu/(h Cu-Ft)
  * COMPLIES WITH 2014 OMSC SECTION C501.8

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PORTLAND, OR 97238
PH: 503-536-6344
CCB # 87256

MECHANICAL PERMIT
4949 SE 27TH AVE, SUITE 201
PORTLAND, OREGON 97202

COVER SHEET

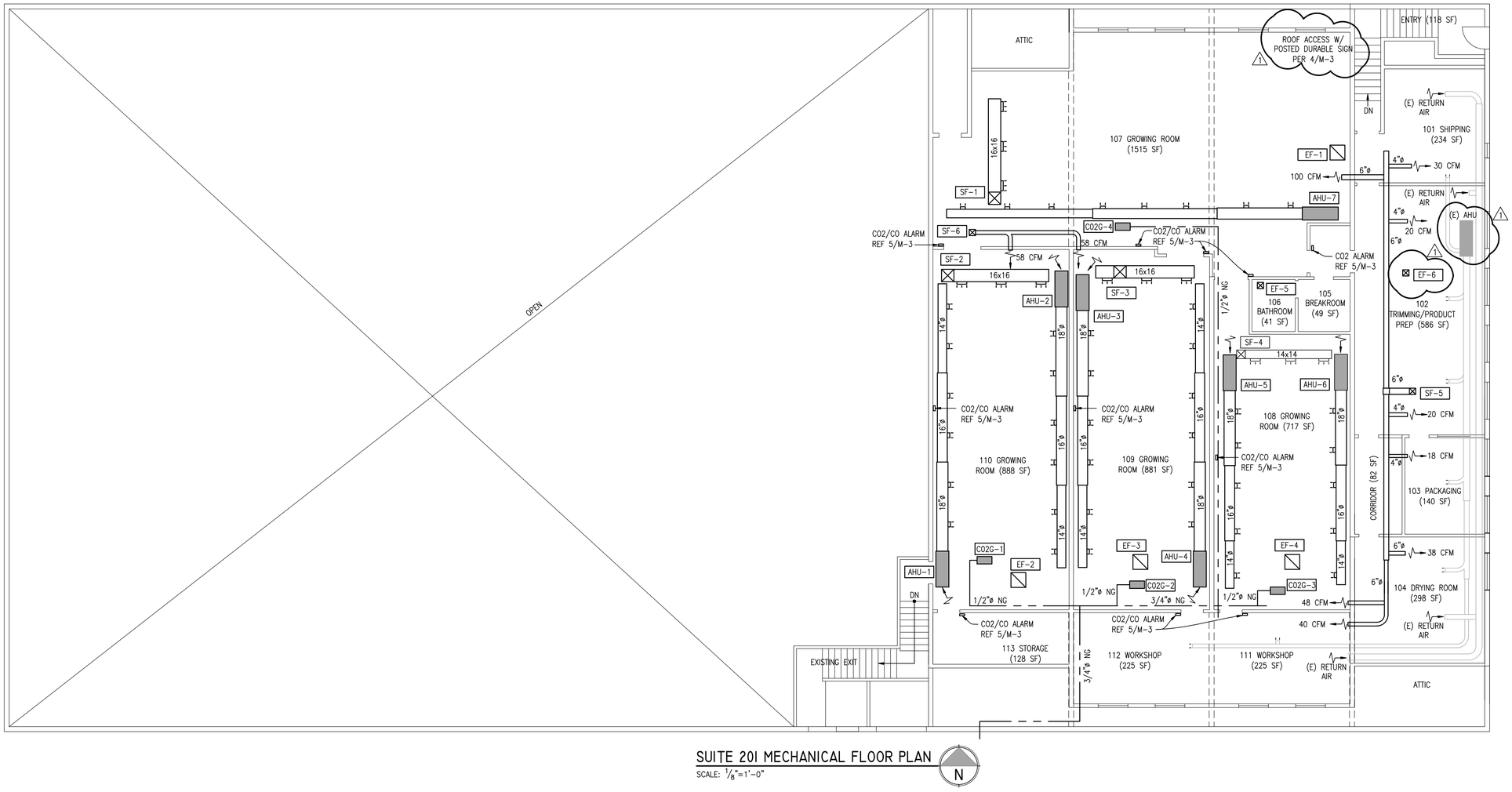
REVISIONS

1	07-25-17
2	10-05-17

PROJECT NO:	17-138
DATE:	06-19-2017
BY:	MM
DRAWN:	MM

SHEET NO:

M-0



SUITE 201 MECHANICAL FLOOR PLAN

SCALE: 1/8"=1'-0"

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MECHANICAL PERMIT

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2ND FLOOR MECH PLAN

REVISIONS

1	07-25-17

PROJECT NO:	17-138
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BY:	MM
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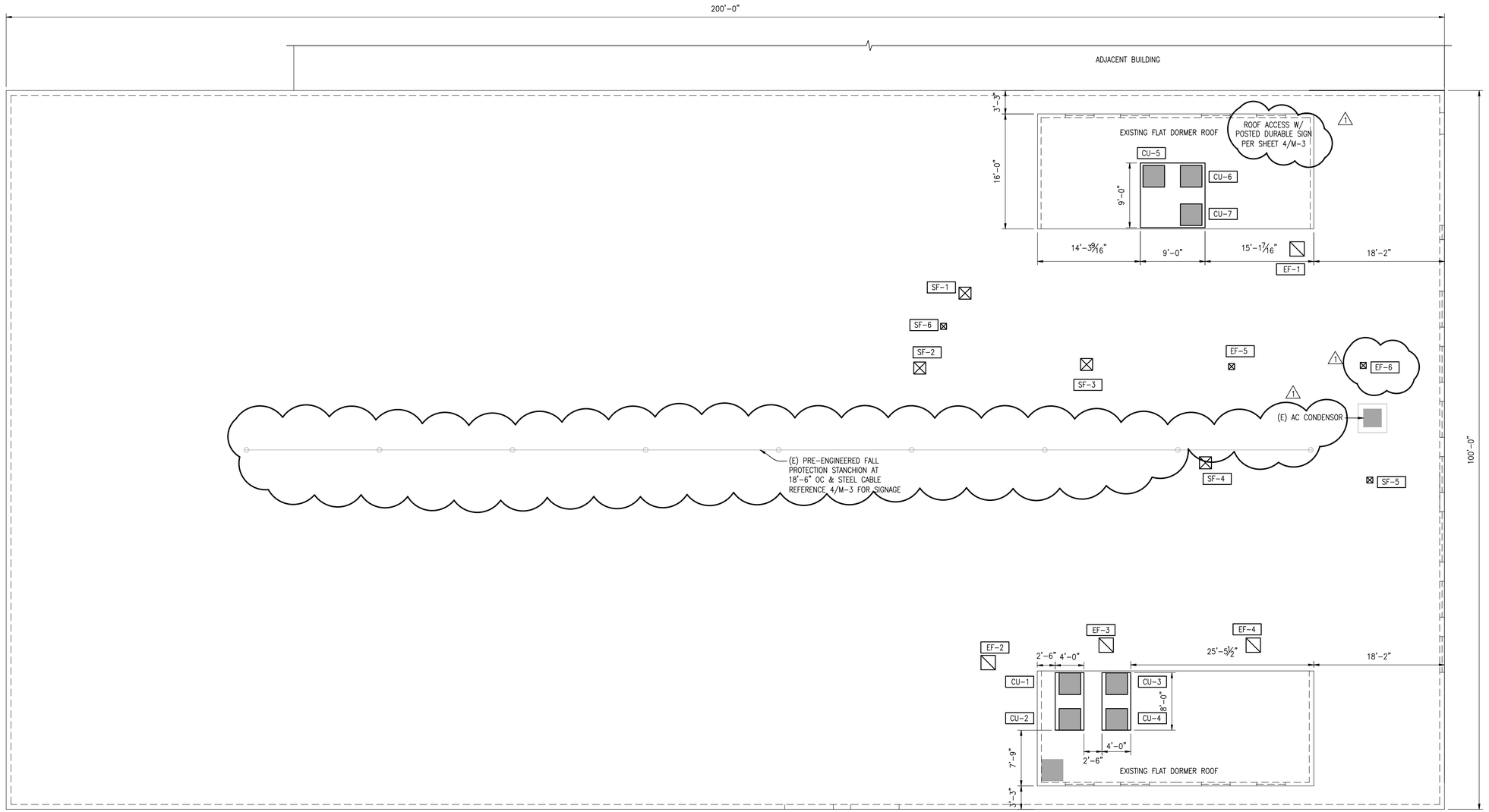
SHEET NO:

M-1



SUITE 201 MECHANICAL ROOF PLAN

SCALE: 1/8"=1'-0"

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MECH ROOF PLAN

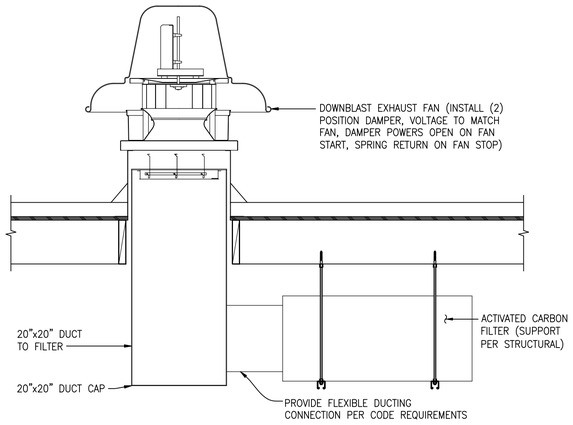
REVISIONS

1	07-25-17

PROJECT NO:	17-138
DATE:	06-19-2017
BY:	MM
DRAWN:	MM

SHEET NO:

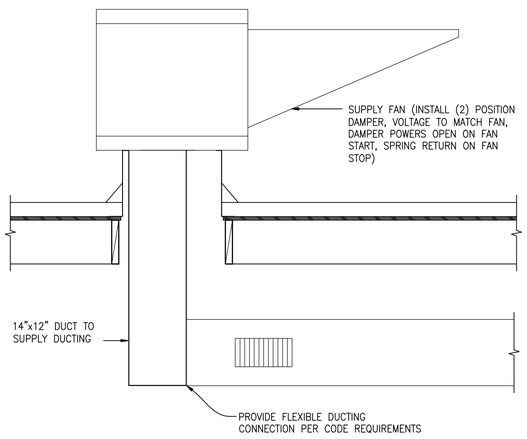
M-2



ECONOMIZER RELIEF AIR FAN DETAIL

SCALE: 3/4"=1'-0"

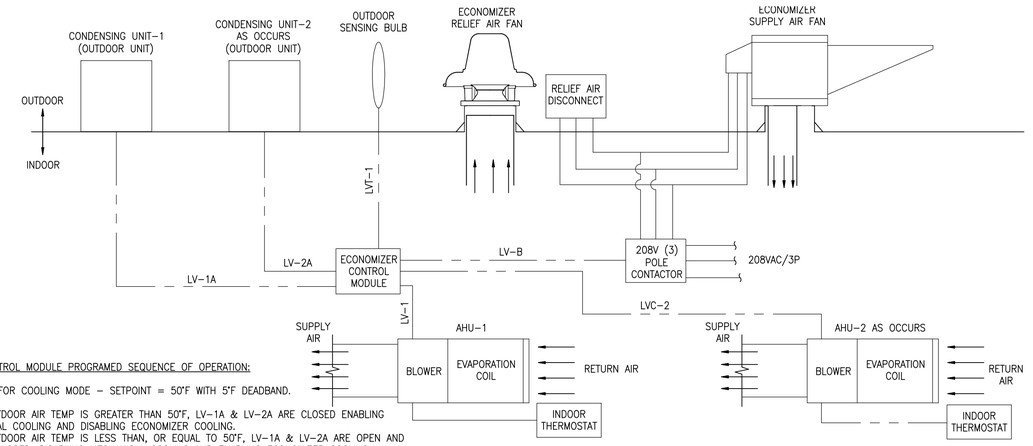
1



ECONOMIZER SUPPLY AIR FAN DETAIL

SCALE: 3/4"=1'-0"

2



ECONOMIZER CONTROL MODULE PROGRAMED SEQUENCE OF OPERATION:

PROGRAMMED FOR COOLING MODE – SETPOINT = 50°F WITH 5°F DEADBAND.

- WHEN OUTDOOR AIR TEMP IS GREATER THAN 50°F, LV-1A & LV-2A ARE CLOSED ENABLING MECHANICAL COOLING AND DISABLING ECONOMIZER COOLING.
- WHEN OUTDOOR AIR TEMP IS LESS THAN, OR EQUAL TO 50°F, LV-1A & LV-2A ARE OPEN AND LV-B IS CLOSED, DISABLING MECHANICAL COOLING AND ENABLING ECONOMIZER COOLING.

ECONOMIZER CONTROL DETAILS

SCALE: N.T.S.

3

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MECHANICAL PERMIT

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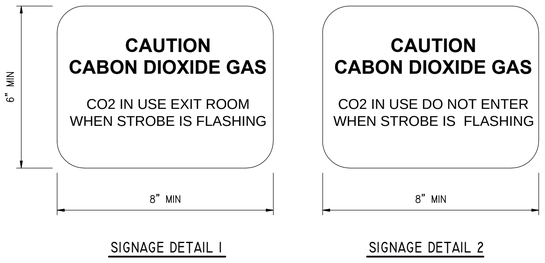
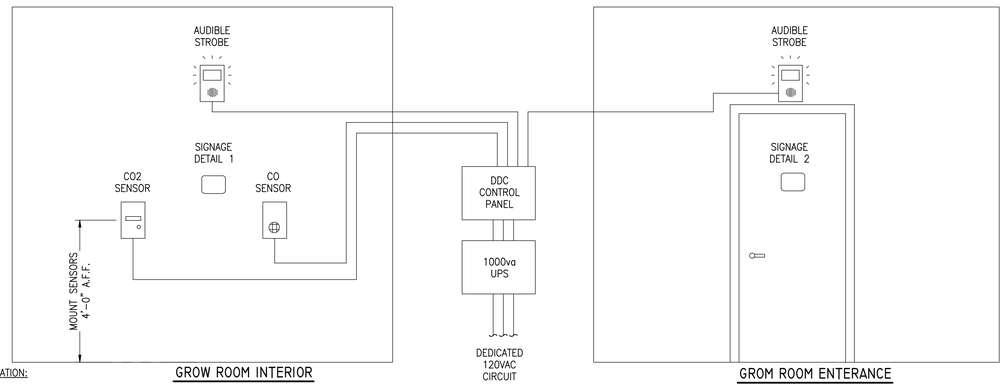


SIGNAGE DETAIL 1 SIGNAGE DETAIL 2

CARBON DIOXIDE CAUTION SIGNAGE

SCALE: N.T.S.

4



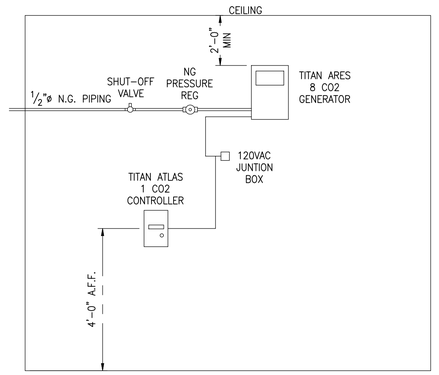
SEQUENCE OF OPERATION:

- EACH GROW ROOM SHALL BE MONITORED FOR BOTH CARBON DIOXIDE (CO2), AND CARBON MONOXIDE (CO) LEVELS.
- IF THE CO2 LEVEL RISES ABOVE 5,000 PPM, OR CO LEVEL RISES ABOVE 9 PPM, THE FOLLOWING ACTIONS SHALL OCCUR.
  1. IN THE SPACE WHERE THE HIGH LEVEL CONCENTRATIONS OF CO2 AND/OR CO ARE DETECTED AN ALERT HORN AND STROBE SHALL BE ENERGIZED.
  2. ALERT HORNS AND STROBES SHALL ALSO BE ENERGIZED FOR ADJACENT CORRIDORS RELATED TO EFFECTED ROOM(S).
  3. IF THE CO2 LEVEL DROPS BELOW 2,000 PPM AND THE CO LEVEL IS NEAR 0 PPM THAN THE HORN/STROBE SHALL BE DE-ENERGIZED.

CO2 AND CO DETECTION AND ALARM CONTROL SCHEMATIC

SCALE: N.T.S.

5



NOTES:
1. CO2 SHALL BE LIMITED TO 1000 PPM OR LESS

CO2 ENHANCEMENT SCHEMATIC

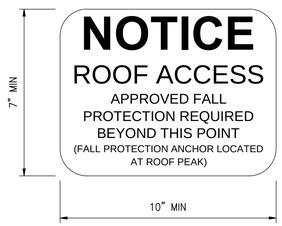
SCALE: N.T.S.

6

SEQUENCE OF OPERATION:

1. TURN POWER SWITCH TO "ON" POSITION.
2. GREEN POWER LIGHT SHALL ILLUMINATE.
3. THE IGNITION MODULE SHALL ATTEEMPT TO IGNITE BURNERS.
4. THE YELLOW "PILOT VALVE ON" LED SHALL ILLUMINATE. ONCE THE GENERATOR IS OPERATIONAL, IT SHALL BE CONTROLLED VIA THE TITAN ATLAS CONTROLLER.
5. IF THE BURNERS DO NOT FIRE, AFTER A 30 SECOND PAUSE, THE GENERATOR SHALL ATTEMPT TO FIRE THE BURNERS AGAIN FOR 15 SECONDS. THIS CYCLE SHALL REPEAT A MAXIMUM OF (5) TIMES.
6. IF THE GENERATOR DOES NOT FIRE AFTER THE 5TH ATTEMPT, THE GENERATOR SHALL ACTIVATE THE "LOCK OUT" PROCEDURE AND THE "LOCK OUT" LED SHALL ILLUMINATE.
7. IF GENERATOR IS LOCKED OUT, OPERATOR SHALL WAIT 5 MINUTES FOR GAS TO DISSIPATE BEFORE TURNING GENERATOR POWER SWITCH BACK TO "ON" POSITION.
8. THE POWER SUPPLY OF THE MODIFIED ARES-8 SHALL BE PLUGGED INTO THE ATLAS-1 CO2 CONTROLLER AT ALL TIMES, WHICH OPERATES THE ARES-8 BY SUPPLYING POWER TO THE MODIFIED ARES-8 UNIT WHEN CO2 LEVELS DROP BELOW THE SPECIFIED SET POINT.
9. POWER IS SHUT OFF TO THE MODIFIED ARES-8 WHEN WHEN THE INTEDED CO2 LEVELS HAVE BEEN REACHED, CLOSING THE SOLENOID VALVE, STOPPING ALL GAS SUPPLY TO THE APPLIANCE.
10. THE MODIFIED ARES-8 SHALL BE RENDERED NON-OPERATIONAL DURING A POWER OUTAGE, CLOSING THE SOLENOID VALVE, AND STOPPING ALL GAS SUPPLY TO THE APPLIANCE.

△2



SIGNAGE DETAIL 1

NOTE:
DURABLE SIGNAGE SHALL BE POSTED AT ROOFTOP ACCESS LOCATION.
REFERENCE SHEETS M-1 AND M-2 FOR LOCATION.

ROOFTOP EQUIPMENT MAINTENANCE ACCESS SIGNAGE

SCALE: N.T.S.

7

DETAILS AND SCHEMATICS

REVISIONS

△1	07-25-17
△2	10-05-17

PROJECT NO:	17-138
DATE:	06-19-2017
BY:	MM
DRAWN:	MM

SHEET NO:

M-3