

**SIEMENS - WESTINGHOUSE
POWER CORPORATION
PACIFIC RIM ENERGY PROJECT**

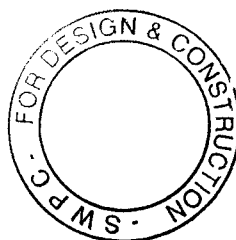
PURCHASE ORDER #4500499173//176/177

**Multi-Stage Static
Inlet Air Filter System**

**7-22169-XX4NOTE
INSTALLATION INSTRUCTIONS**

**7-22169-XX-98-OM
OPERATION AND MAINTENANCE MANUAL**

**PNEUMAFIL CORPORATION
Gas Turbine Division
4433 Chesapeake Drive
CHARLOTTE, NC 28216
SALES ORDER 7-22169
DOCUMENT #7-22169-XX-4NOTE
DOCUMENT #7-22169-XX-98OM
AUGUST 2005 REVISION B**



ISO9001 Certified Quality
Management System



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Installation Instructions, 7-22169-XX-4NOTE

Operation and Maintenance Manual, 7-22169-XX-98-OM

PREFACE

Pneumafil's Gas Turbine Division system of quality management adheres to the ISO9001 International Standards. As a major supplier of auxiliary systems to Gas Turbine OEM's (Original Equipment Manufacturers), we have undertaken the ISO9001 Certification to insure Customer Satisfaction.

This manual is provided to guide the operators through start-up operations and periodic service and maintenance. The maintenance and inspection procedures in this manual require the operator to have some knowledge of air filtration equipment and electrical wiring. Do not attempt any of the tasks or procedures in this manual without the proper working knowledge or training.

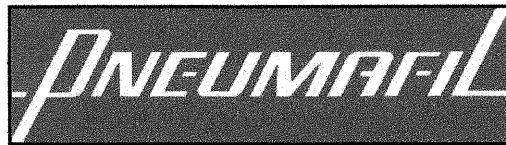
This manual is not intended for use as a technical installation guide. Those responsible for the construction and use of this equipment must satisfy themselves that all necessary precautions have been taken to assure that any applicable laws, regulations, codes, standards and safety measures have been met for assembly and installation.

This entire manual and the following safety notes should be read and understood before performing any inspection, service or maintenance procedures.

Failure to adhere to all safety precautions may result in personal injury, property damage, or death.

Suggestions on how this manual could be made more useful are welcomed. Please send your ideas or comments on the technical accuracy, completeness, or clarity of this manual to the Pneumafil Corporation, Specialty Air Products Division, and Operations Department. Be sure to include our sales order number and related manual page numbers.

**For Further
Information Concerning
This Equipment
Please Contact**



Gas Turbine Division

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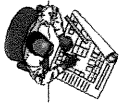



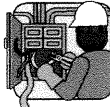
Replacement Parts/Orders or Inquiries

Telephone: (704) 398-7653

SUPPORT24 PROGRAM

1-800-525-1560

SAFETY NOTES

- (1)  Those responsible for the application and use of this equipment must satisfy themselves that all necessary precautions have been taken to assure that any applicable laws, regulations, codes, standards and safety measures have been met for assembly and installation.
- (2)  This manual and all installation and assembly drawings should be read and understood prior to any assembly and operation of this equipment. Throughout this manual special highlighted notes are made to make the operator aware of further safety considerations.
- (3)  **WARNING:** Filter and cooler media are flammable. Before any welding or flame cutting (inside or outside) is done, all media must be isolated and protected from possible contact with heat, sparks or fire. If installed, evaporative cooler media can be protected by keeping it thoroughly wet.
 *Smoking should be banned in the area of the filter system. The filter system should not ingest lighted cigarettes or any other burning object. The filter media should be treated as combustible solids.*
- (4)  *Welding should be performed only when appropriate fire protection equipment is immediately available. If installed, Evaporative Cooler Media must be completely wet with water.*
- (5)  Personnel performing maintenance operations should wear adequate protection apparatus. To avoid personal injury, property damage or death, disconnect all electrical circuits before maintenance or repair operations.

THE FOLLOWING CONVENTIONS ARE USED THROUGHOUT THIS MANUAL

<i>Italic</i>	type is used for referencing and emphasis	1.00" [25.40 mm]	all measurements are in inches followed by millimeter conversions
1)	lists for sequential steps in procedures	2.00" x 3.00" x 6.00" [50.80 x 76.20 x 152.40 mm]	all dimensions are in inches wide X deep X high followed by millimeter conversions
✓	check lists are used for visual maintenance inspections		
"ON"	this font is used for procedural component settings	Left / Right Orientation	typical left and right orientation is given with the presumption that the observer is looking in the direction of air flow
NOTE:	shaded text boxes contain special information and safety notes; failure to adhere to all safety precautions may result in personal injury, property damage or death	Abbreviations	are listed in an appendix

SAFETY CONCEPTS

General Safety Considerations

Pneumafil air filtration and air conditioning products are custom designed and built to operate safely, reliably, and efficiently. Safety hazards can be created if your Pneumafil equipment is not properly cleaned, maintained, and operated.

It is important that you establish operation and maintenance procedures that protect personnel, other equipment, and facilities. This manual is intended as a guide only to assist you in the preparation and implementation of your in-house safety, operation, and maintenance procedures.

Your Pneumafil air filtration and air conditioning equipment was designed and built specifically to meet your particular processing requirements. You should develop specific instructions that apply to the safe operation and maintenance of this equipment in your facility.



In the operation and maintenance of this equipment, always comply with all applicable state and federal EPA/OSHA standards and any other applicable federal, state, and local regulations.

Personnel Training

As part of your in-house procedures, all operating and maintenance personnel should read and understand the contents of this manual before working on the air filtration and air conditioning equipment.

The thorough training of operating and maintenance personnel is vital to the safe use of your air filtration and air conditioning equipment.

All personnel should be instructed under the supervision of experienced individuals and should adhere to the safety precautions set forth in this manual.

Do not allow any personnel to operate or perform maintenance on the equipment until they have demonstrated a complete understanding of the equipment and its operation.

Re-train and test individuals regularly to maintain a high level of proficiency and effectiveness.

SAFETY CONCEPTS

General Safety Instructions

- 1 Do not operate or perform maintenance on this equipment until you read and become familiar with the information contained in this manual.
- 2 Only trained and authorized personnel should be permitted to operate or maintain this equipment.
- 3 Do not operate the equipment unless all covers, guards, doors, and electrical systems are in place, fully secured, and operational. Never run machinery when a guard is removed.
- 4 Before performing any maintenance function; disconnect, lock out, and tag the electrical power supply to the equipment.
- 5 Never attempt to remove foreign objects or materials from machinery, drives, or other moving parts while the equipment is operating.
- 6 Pneumafil equipment is produced with standard instruction and warning decals affixed to the machine and controls. These are attached to the part or surface of the equipment where a safety hazard to operating or maintenance personnel could exist.



Warning labels are placed around the machinery for your protection.

Read and comply with all warning instructions and maintain them so that they are visible. Contact Pneumafil for replacements as needed.

- 7 Follow the "Confined Space Entry" procedures in the following section before entering the filter housing to perform maintenance activities.
- 8 Do not perform any maintenance on the roof of the equipment without providing fall protection as described under the "Fall Protection" heading that follows.
- 9 Follow all operating parameters regarding airflow rates, pressure drops, inspection, and cleaning cycles, etc. as specified by Pneumafil.
- 10 It is potentially hazardous to operate the filter at other than its designed pressure, temperature, and humidity. Using it for other than its designed purpose can also be dangerous. Consult Pneumafil before altering these conditions.
- 11 Pneumafil representatives will answer your questions on the safe operation and maintenance of this equipment. Contact them if you need assistance.

SAFETY CONCEPTS

Confined Space Entry

1. Prior to entry, analyze the area to be entered to determine if any hazardous conditions exist.
2. An employee should not enter a confined space unless provisions have been made for constant communication with another employee in the immediate vicinity who is not in the confined space. Provisions should be made for adequate rescue procedures.

Fall Protection

If, at any time, it is necessary to work on an elevated filter or structure, fall protection should be used. This may be a restraint harness, catwalk and railing, or elevated safety platform. Authorized and trained maintenance personnel only should perform this work.

Personal Safety

The highest priority a person can have on the job is personal safety. This is not a subject that should be thought about only at safety meetings. On the job, one thoughtless and careless act can alter the lives and futures of many people. The following guidelines are a minimum to be adhered to in an industrial environment.

1. Never wear loose clothing, ties, long hair, rings, or watches around operating machinery.
2. Always dress for your work with safety in mind. Wear safety glasses if there is any danger of airborne flying particles. Wear safety goggles and safety shields if there is any danger of splashing chemicals. Special clothing might be required, such as coveralls, hard hats, protective gloves, safety shoes, ear protection, etc. Ask your supervisor what safety equipment is required for the job.
3. Know your work area. Keep your work area clean and free of hazards that may cause falls, eye injury, or injury to feet and hands. Wipe up oil and grease spills immediately.
4. Do Not alter the mechanical or electrical parts of equipment in work area unless you are authorized and technically qualified to do so.
5. Always lock-out and tag the electrical disconnect switches before making adjustments or performing maintenance on powered equipment.
6. Obey all of the rules of the company's safety program. If you have any doubts or questions about safety, ask – when in doubt, check it out.
7. Report any new hazards to your supervisor as soon as you see them.
8. Know the location of safety equipment such as fire extinguishers, emergency shower, eyewash station, first aid station, etc.
9. Read and heed all warning and danger signs. If their meaning is not clear, ask.

SAFETY CONCEPTS

Electrical Safety

Pneumafil air filtration and air conditioning equipment is built to the latest edition of applicable electrical codes. Care should be taken to ensure that your applicable local codes are met. As with any mechanical or electrical equipment, always observe extreme caution and all standard safety rules for locking out electrical equipment. Work in two man teams when performing maintenance. The following safety guidelines for the service of electrical equipment should always be adhered to:

- 1 All electrical equipment must be properly grounded.
- 2 All wiring must conform to national and local electrical codes.
- 3 Do not bypass or jumper any electrical safety equipment in an attempt to operate the filter.
- 4 Start motors one at a time, allowing a 3-5 second delay between motors starts as applicable.
- 5 Before beginning any repair, maintenance, or lubrication procedures, shut-off and lock-out and tag the electrical power.

Fire Protection

Supplementary fire protection should also be installed as follows:

- 1 Approved portable fire protection equipment (by others) near the filter and related equipment, including processes operated in conjunction with the filter, is recommended. Install in accordance with NFPA 10, "Standard for Portable Fire Extinguishers."

Fire Prevention

To reduce the risk of fire during operation and prevent fires from occurring either in or around the filter unit, take the following precautions:

- 1 Clean the inside and outside of the filter housing to prevent heavy dust accumulation.
- 2 Do not store combustible products or any other material near the filter where it could be ignited by a fire in the filter.
- 3 Maintain moving equipment including belt drives, bearings and bushings to prevent friction heating from igniting nearby combustible materials.

FILTER INLET INSTALLATION INSTRUCTIONS

REV.	ISSUED BY	DATE	CHECKED BY	DATE	DESCRIPTION OF CHANGE
A	Huong Vu	6/15/05	BVC	7/7/05	Released
B	Huong Vu	8/25/05	BVC	8/25/05	Revised fire protection requirements and reference drawing list

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Document Title: Inlet Filter Installation Instructions		Document No.: XX-4NOTE	
Issue Date 6/15/05	Issued by: Huong Vu	Filename: 00C34	Revision No.: B
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FILTER INLET INSTALLATION INSTRUCTIONS

GENERAL STORAGE INSTRUCTIONS FOR INLET FILTER ASSEMBLY:

1. Upon receipt of system components, the installation contractor should store the components in a clean dry area or adequately protect the equipment to prevent corrosion and damage in storage.
2. Filters, other media, plastic piping, electrical components, paint, and other plastic components must be stored in a clean, dry, well ventilated interior environment not exceeding 120° F (48.8° C), and the components must be stored in their original packing.
3. All large components of the filter inlet shall be properly supported on a level surface on proper blocking (dunnage) while in storage to prevent distortion or warpage that could adversely effect final assembly. The material should be kept clean and dry to avoid corrosion and damage during storage
4. Filter elements and frames require protection from airborne contaminants during construction. Prior to installation, store filters and frames in a clean, dry, and vermin free location. Avoid prolonged exposure to temperature over 120°F (48.8°C) for longer than 8 hours, which could damage filter elements.
5. Keep the filters sealed in their original shipping packages until they are ready to be installed.
6. Provide approved portable fire protection equipment near the filter and related equipment, including processes operated in conjunction with the filter. Install in accordance with NFPA 10, "Standard for Portable Fire Extinguishers."
7. When in doubt, please contact Pneumafil for assistance.

NOTE: PROTECT ALL FINISH COATED SURFACES DURING ERECTION AND STORAGE BY APPROPRIATE MEANS, SUCH AS PLYWOOD, RUBBER MATS, ETC., TO AVOID DAMAGE TO THE UNIT.

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FILTER INLET INSTALLATION INSTRUCTIONS

GENERAL INSTRUCTIONS FOR INLET FILTER ASSEMBLY:

1. Prior to filter house installation, the contractor should review and become familiar with:
 - a) All drawings included in the installation drawing package (see list at end of this document)
 - b) All safety precautions listed under the "General Safety Considerations" section.
 - c) In addition, perform a final check per the section "Prior to Filter Installation" before system startup.
2. Upon receipt of equipment, all items should be inventoried against the packing list provided with shipment, and Pneumafil's Bills of Materials. Any shortages or damage to equipment **MUST BE NOTED** on the bill of lading and packing list at the time of receipt. A copy of the signed packing list and bill of lading must be forwarded to Pneumafil Logistics and Siemens Westinghouse with documentation for corrective action. Failure to provide notice of deficiencies at time of receipt will result in rejection of subsequent claims of shortages and shipping damage.
3. Shortages or damages not properly documented at time of receipt will be handled as replacement orders and will require an appropriate purchase order
4. Flat sections (wall, roof, and floor panels) and modules are to be lifted by the lifting lugs or lifting eyes. Spreader bars (provided by others) should be used for lift. Only vertical lifts should be performed. Proper dunnage must be provided between panels to prevent distortion and warpage during storage and handling.
5. It is recommended that all lifting lugs be used when handling components. Some wall panels may require only two lugs when positioning. This should be the only time two lugs are used. Excessive deflection during transport, storing and installation may damage the caulking and surface finishes. Cost of repairing such damage will be the responsibility of the party causing the damage.
6. Prior to any welding or other spark/flame producing process, all media, filters, and other flammable items must be removed from the inlet assembly. If these items burn the inlet system may be completely destroyed.
7. Prior to inlet erection, the structural steel foundation should be level to within $\pm 1/8"$. Any deficiency shall be corrected before the inlet system installation can proceed.

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FILTER INLET INSTALLATION INSTRUCTIONS

8. Individual system components shall be erected (plumb and square) to a tolerance of 1:1000. The total system must be erected to a tolerance of 1:750.
9. During the progressive steps of inlet erection, do not tighten module-to-module connection hardware completely. This will ease the alignment of the components. After the system is fully erected and all gaps removed, the hardware shall be tightened by a full impact of a man using an ordinary spud wrench.
10. All field welding and acceptance criteria shall be to the current edition of A.W.S. D1.1 or equivalent. All welding inspection shall be reviewed and signed off by a CWI. Failure to provide proper welding and certification may void warranty on equipment.
11. It is our recommendation that class E70XX electrode welding rod be used on carbon steel for the filter house system. Electrodes to be provided by others. Use a 309 filler rod material or equivalent when welding stainless to carbon steel (non-structural joints only) & 308 filler rod material or equivalent when welding stainless to stainless per A.W.S D1.6. In any event, the welding material shall comply with industry standards and code requirements.
12. Use rubber matting covered with plywood on floor under scaffolding that is constructed to minimize damage to painted surfaces.
13. All painted and galvanized coating damages due to handling, assembling and welding must be repaired. Refer to the appropriate section for coating repair information. **All intermittent or skip welds shall be caulked between welds per the applicable SWPC contract specification.** Failure to use the proper caulking and installation procedure will lead to premature failure and any subsequent repair charges will be the responsibility of the installing party.

For all galvanized areas requiring welding, the galvanizing shall be ground away (back to bare metal) prior to welding.

14. Before starting up the system, all field bolted connections in the clean air path downstream of filter elements (except where noted) shall have fasteners completely removed after component welding is complete. Fasteners should be counted as installed and counted as removed. This will eliminate any possibility of a fastener entering the turbine inlet. Once the system is fully erected and all coating repairs are complete, inspect the clean air plenum thoroughly and remove any debris that could be ingested into turbine during operation. All bolt holes shall be properly sealed and coated to prevent premature corrosion between panels.

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FILTER INLET INSTALLATION INSTRUCTIONS

STRUCTURAL STEEL INSTALLATION:

Reference drawings XX-2, XX-3, XX-4 and XX-4BOM for installation of structural steel.

1. Structural steel fasteners shall be tightened in accordance with "THE TURN OF THE NUT METHOD" as described in the Manual of Steel Construction, Allowable Stress Design, 9th edition. (Specification for Structural Joints using ASTM A325 bolts)
2. Top of steel elevation is 244.1 [9.61"] above Grade 00 (shown on Dwg XX-3 view A-A).
3. See XX-2 and XX-3 for foundation and base plate details.
4. See XX-4 for part marking.
5. All steel are A36, hot dip galvanized.

INLET FILTER HOUSE COMPONENT ARRANGEMENT

Refer to drawing XX-4 for full exploded view of the inlet filter house and section details. Refer to the installation drawing list and bill of material on this drawing for individual drawing for a specific section of the filter house. Also, see page 18 for list of installation drawings.

FILTER MODULE, CLEAN AIR PLENUM & HOOD INSTALLATION

Reference drawings XX-4, XX-4BOM, XX-57, XX-57BOM, for lifting & installation of the Clean Air Plenum, Filter Modules, and Weatherhoods.

1. Install the front plenum floor panels and front wall (Items 1, 2, 3, 4 and 23) onto the support steel. Position front floor per the location on drawings XX-1 & XX-2. Align rear floors and bolt together using 3 ½" long pull-up bolts. ***Verify the flange on the front wall panel is properly aligned with the turbine centerline and the filter house inlet flange centerline (See Dwg XX-2 Sht 1 of 2). Tack weld floor to support steel after it has been properly located.***
2. To assist in easier access of connecting and routing from the provided drain elbow under the filter floor, install the pipe before the filter module is placed in position and tack welded to steel. The customer supplied drain piping is to be routed to an area of choice. The drains are provided with plugs.
3. Position LH & RH level 1 filter modules onto support steel and align to the clean air plenum floors. Tack weld filter modules in place. Bolt modules together through the pass thru walls.

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4. Position LH & RH level 2 filter modules onto level 1 modules. Tack weld filter modules in place. Bolt modules together at roof/floor interface and at the pass thru walls.
5. Position LH & RH level 3 filter modules onto level 2 modules. Tack weld filter modules in place. Bolt modules together at roof/floor interface and at the pass thru walls.
6. Prior to installing the hoods, all joints on the air entering face of the filter modules must be seal welded. Once the hoods are installed, these joints will not be accessible for welding.
7. Install hood knee braces (XX-4) to all filter modules (XX-4). Install hood side-panels and secure to filter modules.
8. Position the LH & RH rain hood panels onto knee braces and filter modules. Bolt components together. Caulk all bolted joints.

CAUTION

Use temporary bracing to stabilize clean air plenum panels until all panels, support columns and support bracing have been fully bolted.

Reference drawing XX-57 for the following items:

9. Position RH lower clean air plenum walls (Items 6, 8 & 10) onto plenum floor and align/bolt to the downstream edge of the filter module. After aligning the RH lower plenum side walls to the plenum floor and RH side filter module bolt side wall panels to the angle clips on the plenum floor, to each other and the RH filter module.
10. Position RH middle - rear plenum wall (Item 12) onto lower - rear plenum wall (Item 6). Align/bolt middle - rear wall (Item 12 to the downstream edge of the filter module and RH lower - rear plenum wall Item 6). Position the remaining RH middle - center and middle - front plenum side walls (Items 14 and 16) onto lower - center and front plenum walls (Items 8 and 10). Align/bolt RH middle wall panels (Items 14 and 16) to the RH lower plenum side walls (Item 8 and 10).
11. Position RH upper rear plenum side wall (Item 18) onto middle rear plenum wall (Item 12). Align/bolt upper - rear wall (Item 18 to the downstream edge of the filter module and middle plenum wall Item 12).
12. Position RH upper - front plenum side wall (Item 20) onto middle - center and front plenum walls (Items 14 and 16). Align/bolt RH upper - front wall panel (Item 20) to the RH middle - center and front plenum walls (Item 14 and 16).
13. Position LH lower clean air plenum walls (Items 5, 7 & 9) onto plenum floor and align/bolt to the downstream edge of the filter module. After aligning the RH lower plenum side walls to the plenum floor and RH side filter module bolt side wall

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FILTER INLET INSTALLATION INSTRUCTIONS

panels to the angle clips on the plenum floor, to each other and the RH filter module.

14. Position LH middle - rear plenum wall (Item 11) onto lower - rear plenum wall (Item 5). Align/bolt middle – rear wall (Item 11 to the downstream edge of the filter module and LH lower - rear plenum wall Item 5).
15. Position the remaining LH middle – center and middle - front plenum side walls (Items 13 and 15) onto lower – center and front plenum walls (Items 7 and 9). Align/bolt LH middle wall panels (Items 13 and 15) to the LH lower plenum side walls (Item 7 and 9).
16. Position LH upper rear plenum side wall (Item 17) onto middle rear plenum wall (Item 11). Align/bolt upper - rear wall (Item 17 to the downstream edge of the filter module and middle plenum wall Item 11).
17. Position LH upper – front plenum side wall (Item 19) onto middle – center and front plenum walls (Items 13 and 15). Align/bolt LH upper – front wall panel (Item 19) to the LH middle – center and front plenum walls (Items 13 and 15).
18. Position front vertical support columns and plates (Items 26 (Qty 2) and 27) in the plenum floor locating pocket. Tack weld in place.
19. Position horizontal pipe supports (Items 28, Qty 4) between vertical support columns, align and tack weld in place maintaining vertical alignment.
20. Position horizontal pipe supports (Items 31 and 33) between filter module and vertical support columns, align and tack weld in place maintaining vertical alignment.
21. Position horizontal pipe supports (Items 29, Qty 4) between vertical support columns and side walls. Align and tack weld in place maintaining vertical alignment of the side walls.
22. Position diagonal pipe supports (Items 32 and 34) between the horizontal pipe supports and the vertical support columns, align and tack weld in place maintaining vertical alignment of the vertical support columns.
23. Position diagonal pipe supports (Item 35) between the horizontal pipe supports and the vertical support columns, align and tack weld in place maintaining vertical alignment of the vertical support columns.
24. Position RH and LH front roof panels (Items 24 and 23) over the side walls and vertical support columns. Align the two front roof panels with each other and insert bolting hardware to draw them up. Align the front roof panels with the side walls and tack weld in place.
25. Position RH and LH rear roof panels (Items 22 and 21) over top of the filter modules and behind the front roof panels (Items 24 and 23). Insert the bolting

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hardware and align/bolt the rear roof panels together. Align the RH and LH rear roof panels with the side walls and tack weld in place.

26. Align the filter house and verify the flange on the front roof panels is properly aligned with the turbine centerline and the filter house inlet flange centerline (See Dwg XX-2 Sht 1 of 2).
27. After all clean air plenum panels and filter module have been properly aligned and pulled tightly together, weld all joints in accordance with notes and sectional details on drawing XX-4.
28. Weld all internal support column/brace joints and remove hardware where required.
29. All joints between filter module levels on the upstream side shall be seal welded.
30. All joints on the outside of the unit must be seal welded. Inside joints of the inlet filter house shall be intermittent welded (2" on 12" centers), unless noted otherwise, except for the plenum to filter module floors. This seam is to be seal welded.
31. All erection hardware downstream of filters (except where noted) must be removed after installation is complete.
32. All lifting eyebolts used in the erection shall be removed and the appropriate hardware inserted. The hardware shall then be seal welded and the damaged coating repaired with cold galvanizing compound (supplied by others).

PLATFORMS, HANDRAILS, AND ACCESS LADDER INSTALLATION:

Refer to drawings XX-4, and XX-4BOM for installation of Platforms, Handrails, and Ladder.

1. Position lower platform support posts onto foundation pads and temporarily brace in an upright position.
2. Install handrails around all platforms (while on the ground). Align and attach 2nd level platform to module base and to top of support columns.
3. Install upper level platform support posts and platform assemblies onto the lower platforms and secure platform to module base.
4. Install caged ladder through upper two platform frames. Secure ladder to support pads and to both platforms with hardware provided.
5. Install lower access stair per detail on XX-4.
6. Install and adjust safety gates on all ladder access points.

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FILTER INLET INSTALLATION INSTRUCTIONS

RECHECK TO INSURE THAT SYSTEM IS PROPERLY ALIGNED AND LEVEL.

IMPORTANT: Ensure that all hardware is secure and all temporary blocking, bracing, etc., are removed at completion of installation process.

CLEAN ALL INTERNAL SURFACES THOROUGHLY: There must be absolutely **NO** dirt or debris remaining inside the system after installation.

ELECTRICAL INSTALLATION:

Use drawings XX-5, XX-6, XX-7, XX16, XX-17, XX-51 and XX-51-BOM to install electrical. Refer to XX-20 for instrument set points.

RECOMMENDED CAULKING PROCEDURE AND COMPOUND (BY OTHERS):

1. All intermittent welds must be caulked between welds per specification.
2. Caulk should be applied after priming and before intermediate or topcoat painting.
3. Caulk beads shall be the same size as the joint weld beads and shall be uniform within 20% of bead size; however, no caulk bead shall exceed ¼".
4. Caulk tails shall not exceed 3/16".
5. Surfaces where caulk to be applied shall be dried and clean to ensure adhesion.
6. Caulk should be silicone and asbestos free.
7. Caulk should be of the one-part formula type and be able to be applied with a standard caulking gun.
8. Caulk must be paintable, polyurethane-based caulk is preferred. (Ex.-Vulkem 116 or equivalent)
9. Caulk should be water resistant after cure and formulated to withstand and remain elastic between the temperature range from -20°F to + 150°F.

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FILTER INLET INSTALLATION INSTRUCTIONS

PRIOR TO FILTER INSTALLATION:

1. Complete the inlet filter assembly by welding and bolting all joints as required, and clean all repair areas.
2. Check all electrical connections to ensure they are completely secured. Close all junction boxes and latch.
3. Confirm all electrical circuits, conduit, and cable are properly terminated.
4. Confirm all instruments have been properly calibrated and are functional.
5. Confirm all lighting and receptacle circuits located in the filter inlet are energized.
6. Make sure all installed hardware used to assemble the inlet filter is firmly tightened. Hardware remaining inside inlet filter downstream of filters after assembly must be welded nut to bolt to prevent nut from backing out, and shall only be stainless steel.
7. Inspect the clean air plenums to make sure they are clean and contain no loose trash, hardware, or debris. Remove any debris and vacuum or wash down all surfaces and ledges that may hold debris.
8. Inspect the filter modules and make sure no loose debris is present inside the modules. Look over all crevices and ledges that could collect dirt and debris.
9. Restrict access to the clean air plenum and filter modules. All temporary erection and shipping bracing must be removed.
10. All downstream ducting must be installed and sealed to prevent debris from entering the clean air side of the filter house.
11. All temporary erection and shipping bracing must be removed.
12. Inspect the clean air plenum to ensure all seam joints are seal welded.
13. All welding, electrical, finish repairs, etc. must be completed inside the inlet filter house.
14. All welding to galvanized surfaces shall be repaired with cold galvanizing compound.
15. Inspect the filter retaining hardware to ensure the ends of all threaded rods are upset so that wingnuts cannot be removed. Verify that the threaded rods are securely attached, and there is no missing or damaged attached component.
16. All damaged paint surfaces must be repaired per the coating manufacturer's product recommendation. (See "Repair of Coating Damage" section)

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FILTER INLET INSTALLATION INSTRUCTIONS

17. Close and seal all module doors and access hatch to prevent contamination of the plenums.

FILTER ELEMENTS INSTALLATION:

Refer to the exploded view on Drawing XX-4, sheet 1 and the following steps:

- **Final Filter Installation:**

1. Align filter clips in 6 o'clock and 12 o'clock position.
2. Align the filter so that the rear flat sides are in the horizontal orientation. Insert the filter through the frame aperture, and verify that the filter is centered in the opening. Ensure that the gasket is compressed and sealed around the filter header and the grid. Ensure there is no gap between the filter header and holding frame to allow air bypass.
3. Rotate the filter clips to the 9 o'clock and 3 o'clock position, and secure filter with provided wingnuts. Tighten wingnuts to compress filter gaskets to 50% of their original depth. No gaps between the filter gasket and filter module grid will be permitted.
4. Refer to drawing, XX-51, sheet 4, for differential pressure sensing sampling point installation.

- **Pre-Filter Installation:**

1. Prior to installing the Pre-filter install the Pre-filter Support clip (item 34 on XX-4).
2. Pre-filter may have an airflow arrow mark on the side, ensure the arrow is pointed toward the final filter. Reference airflow details shown on drawing XX-1, sheet 2 for the correct orientation of filters.
3. After the final filter is installed, attach the pre-filter to the face of the final filter.
4. Rotate the filter clips to the 9 o'clock & 3 o'clock position and tighten the wingnuts.
5. To prevent crushing the pre-filter, do not over tighten the wingnuts.
6. The inlet filter system should be ready to operate.

SURFACE COATING INFORMATION

The components of this system have been finished as follows:

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FILTER INLET INSTALLATION INSTRUCTIONS

Filter Modules and Clean Air Plenum: Painted Carbon Steel

Interior & Exterior:

Metal preparation: Sandblast per SSPC-SP10, surface profile 1-2 mils
(25–50 microns)

Interior & Exterior:

Prime coat: Ameron Dimetcoat 9HS [3-4 mils (75-100 microns) DFT], Color: Green

Top coat: In field, supplied and applied by others, if required.

Structural Steel Hot Dip Galvanized

Hoods Galvanealed

Hood supports: Hot dip galvanized

Handrails, ladder & platform: hot dip galvanized

Hot dip galvanized coatings are in accordance with ASTM A123.

Touchup

1 gal. Amercoat 68HS for touching up Dimetcote 9HS coating

1 gal. of Thinner, Amercoat 65 for mixing

1 gal. of Thinner, Amercoat 12 for cleaning

REPAIR OF COATING DAMAGE (DIMETCOTE 9HS):

1. Ameron Dimetcote 9HS coating that has been damaged due to welding and handling can be repaired as follows:
 - a. Mechanically remove any areas of loose paint, rust, etc. with a wire brush to SP2 or SP3.
 - b. Lightly sand edges of repair area to feather edge the perimeter of the paint area to be repaired.
 - c. Apply Amercoat 68HS to the repaired area in accordance with the paint manufacturer's product data sheet. This can be applied over bare metal and does not need a specific blast profile to ensure adhesion.

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FILTER INLET INSTALLATION INSTRUCTIONS

REPAIR OF COATING DAMAGE (GALVANIZED):

1. Localized damaged areas due to welding should be wire brushed clean and can be touched up using a cold galvanizing compound as recommended by the coating manufacturer's product data sheet.
2. Repairs to damaged galvanized coatings with cold galvanizing compound shall be in accordance with ASTM A780.

GENERAL SAFETY CONSIDERATIONS

Pneumafil air filtration and air conditioning products are custom designed and built to operate safely, reliably, and efficiently. Safety hazards can be created if your Pneumafil equipment is not properly cleaned, maintained, and operated.

It is important that you establish operation and maintenance procedures that protect personnel, other equipment, and facilities. This manual is intended as a guide only to assist you in the preparation and implementation of your in-house safety, operation, and maintenance procedures.

Your Pneumafil air filtration and air conditioning equipment was designed and built specifically to meet your particular processing requirements. You should develop specific instructions that apply to the safe operation and maintenance of this equipment in your facility.



In the operation and maintenance of this equipment, always comply with all applicable state and federal EPA/OSHA standards and any other applicable federal, state, and local regulations.

• Personnel Training

As part of your in-house procedures, all operating and maintenance personnel should read and understand the contents of this manual before working on the air filtration and air conditioning equipment.

The thorough training of operating and maintenance personnel is vital to the safe use of your air filtration and air conditioning equipment.

All personnel should be instructed under the supervision of experienced individuals and should adhere to the safety precautions set forth in this manual.

Do not allow any personnel to operate or perform maintenance on the equipment until they have demonstrated a complete understanding of the equipment and its operation.


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Re-train and test individuals regularly to maintain a high level of proficiency and effectiveness.

- **General Safety Instructions**

- 1 Do not operate or perform maintenance on this equipment until you read and become familiar with the information contained in this manual.
- 2 Only trained and authorized personnel should be permitted to operate or maintain this equipment.
- 3 Do not operate the equipment unless all covers, guards, doors, and electrical systems are in place, fully secured, and operational. Never run machinery when a guard is removed.
- 4 Before performing any maintenance function; disconnect, lock out, and tag the electrical power supply to the equipment.
- 5 Never attempt to remove foreign objects or materials from machinery, drives, or other moving parts while the equipment is operating.
- 6 Pneumafil equipment is produced with standard instruction and warning decals affixed to the machine and controls. These are attached to the part or surface of the equipment where a safety hazard to operating or maintenance personnel could exist.

	<p>Warning labels are placed around the machinery for your protection.</p> <p>Read and comply with all warning instructions and maintain them so that they are visible. Contact Pneumafil for replacements as needed.</p>
---	---

- 7 Follow the "Confined Space Entry" procedures in the following section before entering the filter housing to perform maintenance activities.
- 8 Do not perform any maintenance on the roof of the equipment without providing fall protection as described under the "Fall Protection" heading that follows.
- 9 Follow all operating parameters regarding airflow rates, pressure drops, inspection, and cleaning cycles, etc. as specified by Pneumafil.
- 10 It is potentially hazardous to operate the filter at other than its designed pressure, temperature, and humidity. Using it for other than its designed

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FILTER INLET INSTALLATION INSTRUCTIONS

purpose can also be dangerous. Consult Pneumafil before altering these conditions.

- 11 Pneumafil representatives will answer your questions on the safe operation and maintenance of this equipment. Contact them if you need assistance.

• Confined Space Entry

1. Prior to entry, analyze the area to be entered to determine if any hazardous conditions exist.
2. An employee should not enter a confined space unless provisions have been made for constant communication with another employee in the immediate vicinity who is not in the confined space. Provisions should be made for adequate rescue procedures.

• Fall Protection

If, at any time, it is necessary to work on an elevated filter or structure, fall protection should be used. This may be a restraint harness, catwalk and railing, or elevated safety platform. Authorized and trained maintenance personnel only should perform this work.

• Personal Safety

The highest priority a person can have on the job is personal safety. This is not a subject that should be thought about only at safety meetings. On the job, one thoughtless and careless act can alter the lives and futures of many people. The following guidelines are a minimum to be adhered to in an industrial environment.

- 1 Never wear loose clothing, ties, long hair, rings, or watches around operating machinery.
- 2 Always dress for your work with safety in mind. Wear safety glasses if there is any danger of airborne flying particles. Wear safety goggles and safety shields if there is any danger of splashing chemicals. Special clothing might be required, such as coveralls, hard hats, protective gloves, safety shoes, ear protection, etc. Ask your supervisor what safety equipment is required for the job.
- 3 Know your work area. Keep your work area clean and free of hazards that may cause falls, eye injury, or injury to feet and hands. Wipe up oil and grease spills immediately.

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FILTER INLET INSTALLATION INSTRUCTIONS

- 4 Do Not alter the mechanical or electrical parts of equipment in work area unless you are authorized and technically qualified to do so.
- 5 Always lock-out and tag the electrical disconnect switches before making adjustments or performing maintenance on powered equipment.
- 6 Obey all of the rules of the company's safety program. If you have any-doubts or questions about safety, ask – when in doubt, check it out.
- 7 Report any new hazards to your supervisor as soon as you see them.
- 8 Know the location of safety equipment such as fire extinguishers, emergency shower, eyewash station, first aid station, etc.
- 9 Read and heed all warning and danger signs. If their meaning is not clear, ask.

• **Electrical Safety**

Pneumafil air filtration and air conditioning equipment is built to the latest edition of applicable electrical codes. Care should be taken to ensure that your applicable local codes are met. As with any mechanical or electrical equipment, always observe extreme caution and all standard safety rules for locking out electrical equipment. Work in two man teams when performing maintenance. The following safety guidelines for the service of electrical equipment should always be adhered to:

- 1 All electrical equipment must be properly grounded.
- 2 All wiring must conform to national and local electrical codes.
- 3 Do not bypass or jumper any electrical safety equipment in an attempt to operate the filter.
- 4 Start motors one at a time, allowing a 3-5 second delay between motors starts as applicable.
- 5 Before beginning any repair, maintenance, or lubrication procedures, shut-off and lock-out and tag the electrical power.

• **Fire Protection**

Supplementary fire protection should also be installed as follows:

- 1 Approved portable fire protection equipment (by others) near the filter and related equipment, including processes operated in conjunction with the filter, is recommended. Install in accordance with NFPA 10, "Standard for Portable Fire Extinguishers."

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• Fire Prevention

To reduce the risk of fire during operation and prevent fires from occurring either in or around the filter unit, take the following precautions:

- 1 Clean the inside and outside of the filter housing to prevent heavy dust accumulation.
- 2 Do not store combustible products or any other material near the filter where it could be ignited by a fire in the filter.
- 3 Maintain moving equipment including belt drives, bearings and bushings to prevent friction heating from igniting nearby combustible materials.

INLET FILTER HOUSE COMPONENT ARRANGEMENT AND INSTALLATION DRAWING LIST:

Pneumafil Drawing Number	Sheet Number	Revision Letter	Title
7-22169-XX-1	1-3	A	General Arrangement
7-22169-XX-2	1-2	A	Loading & Foundation
7-22169-XX-3	1	A	Structural Steel Arrangement
7-22169-XX-4	1-5	A	Field Installation – Inlet Air Filtration System 2 Stage Static
7-22169-XX-4BOM	1	A	Bill of Material
7-22169-XX-4NOTE	1	B	Installation Instructions
7-22169-XX-5	1-3	A	Module Wiring Diagram (NEMA 4)
7-22169-XX-6	1	A	Control Panel Assembly (NEMA 4)
7-22169-XX-6BOM	1	A	Bill of Material
7-22169-XX-7	1	A	Control Panel Enclosure Sub-Panel Assembly (NEMA 4)
7-22169-XX-7BOM	1	A	Bill of Material
7-22169-XX-16	1	A	Control Panel Enclosure Sub-Panel Assembly (NEMA 4)

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Pneumafil Drawing Number	Sheet Number	Revision Letter	Title
7-22169-XX-16BOM	1	A	Bill of Material
7-22169-XX-17	1	A	Disconnect Switch 480VAC (NEMA 4)
7-22169-XX-17BOM	1	A	Bill Of Material
7-22169-XX-20	1	A	P & ID Air Inlet Filtration System 2 Stage Static
7-22169-XX-41	1-2	A	Filter House Centroid & Component Weights
7-22169-XX-51	1-4	A	Electrical Shop & Field Installation (NEMA 4)
7-22169-XX-51BOM	1-2	A	Bill of Material
7-22169-XX-57	1	A	Field Installation-Clean Air Plenum
7-22169-XX-57BOM	1	A	Bill of Material
7-22169-XX-98OM	-	A	Operation & Maintenance Manual

See Reference Drawing XX-4 for the full exploded view of the inlet filter house and section details. See Section VI of O&M manual for all ABOVE drawings.

APPENDIX

- **Material Safety Data Sheets Index**

Amercoat 68HS Paint
Amercoat 65 Thinner
Amercoat 12 Thinner

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I. DESCRIPTIONS

The Multi-Stage Static Filter System incorporates a number of components. The components used in each system are dependent upon the customer's individual needs. As such, each Multi-Stage Static Filter System is designed for a particular customer application. This section describes the specific auxiliary components purchased under this contract. *Reference Drawing 7-22169-XX-1, Section VI.*

A. GENERAL COMPONENT DESCRIPTION

1. Weather Hoods

Weather Hoods are an economical way of cutting down on the ingestion of rainwater into the filter compartment. Weather hoods create an extremely low air pressure drop. The weather hoods protrude out from the air entering face of the filter modules with nearly horizontal bottom openings. *Reference Drawing 7-22169-XX-1, Section VI.*

2. Bird Screens

Bird Screens, mounted on the air entering face of the filter modules, are constructed of sixteen (16) gauge, galvanized steel, welded wire mesh. They prevent large items (greater than 12.70 mm* x 12.70 mm [0.50" x 0.50"]) from blocking the flow of air through the filters. They prevent trash, birds and other wildlife from entering the filter compartments. Bird Screens create a low resistance in the air stream. *Reference Drawing 22169-XX-1, Section VI.*

3. Pre-Filter Inserts (Z-100) – Beverage Board

Pre-Filters are located inside the filter module. They are mounted in front of the final filters and are constructed of synthetic, non-woven, polyester fiber blend with a non-water soluble binder. The nominal dimensions are 609.60 mm x 101.60 mm x 609.60 mm [24.00" wide x 4.00" deep x 24.00" high]. The disposable filter element is encased in a beverage board enclosure. The Pre-Filter Insert removes large dust particles from the air stream, thereby extending the life of the more costly final filters. *Reference Drawing 7-22169-XX-1, Section VI.*

4. Final Filters (TMP-95)

The model TMP-95, Final Filters are located inside the filter module. They are held in the mild steel filter bank frame with clips and wing nuts.

The media is a pleated, glass fiber fabric formed into mats and integrated into a frame. Together, the media and frame form a self-supporting, robust and lightweight filter cartridge. Each Final Filter is equipped with a closed cell, Neoprene gasket on the downstream side of the filter header to insure proper sealing to the mounting frame. Their nominal dimensions are 609.60 mm x 304.80 mm x 609.60 mm [24.00" wide x 12.00" deep x 24.00" high]. *Reference Drawing 7-22169-XX-1, Section VI.*

B. SYSTEM ARRANGEMENT

To view the system general arrangement, *reference Drawing 7-22169-XX-1, Section VI.* To view an exploded isometric view of all of the major system components and master bill of material, *reference Drawing 7-22169-XX-4, Section VI.*

To view the system electrical schematic, *reference Drawing 7-22169-XX-5, Section VI.*

1. General

The overall assembled, nominal dimensions of the filter system are 13,411 x 5,234 x 11,795 mm [528.00" wide x 206.07" deep x 464.36" high].

The system is designed to mount on a structural steel support grid mounted at grade 00. *Reference Drawing 7-22169-XX-1, Section VI.*

In the direction of airflow, the general arrangement of this system is:

- ✓ Weather Hoods
- ✓ Bird Screens
- ✓ Pre-Filter
- ✓ Final Filters
- ✓ Clean Air Plenum

2. Platforms, Ladders, Handrails and Access Doors

One (1) caged ladder located on the right front corner of the right module to allow access to the platforms located at the middle and upper level modules. One (1) set of grated steps to access the lower module. Two (2) grated service platforms with handrails and safety gates are externally located to allow access to the middle and upper modules.

Each right side filter module is accessed via a door. The access doors open outward and are equipped with a door handle and cylinder lock. The doors can be opened from the inside by a push knob. The doors are

equipped with a sealing gasket. The left side filter modules are accessed by means of a walk through internal wall opening.

3. Filter Modules

The six (6) filter modules are stacked three (3) high and arranged in a side by side shape that feeds a centralized, common clean air plenum. The clean air plenum is equipped with one (1) access hatch, and each right side filter module is provided with one (1) access door.

C. ELECTRICAL COMPONENTS

The following is a listing and description of the major electrical components and their function:

1. Control Panel (INF-JB1)

(Reference Drawing #7-22169-XX-6 and XX-1, sheets 2 and 3)

The control panel (INF-JB1) is located adjacent to the handrail of the right hand side platform on the first level. The INF-JB1 provides for 120/1/60 VAC and 48 VDC customer electrical connection.

The control panel includes:

- a. Circuit breakers for branch circuits.
- b. Indicator lights for various system functions.
- c. DP Gauges for pressure monitoring and switches.

2. INF-JB1

The INF-JB1 provides for 120/1/60 VAC and 48 VDC customer electrical connection.

3. INF-JB2

The INF-JB2 provides for differential pressure switch control.

4. Lights

Internal lights are provided in all filter modules for filter system maintenance.

5. Convenience Outlets

A convenience outlet is provided on the lower right side filter module as a local power source.

6. Differential Pressure Gauges

Local indicators which show the pressure drop across the following filter stages: Pre-filter and Final Filter, (*reference Drawing #7-22169-XX-6*)

7. Differential Pressure Switch

The differential pressure switch provides an alarm signal to customer in case of a high pressure drop (4" w.c.) across the total filter system.

II. INSTRUCTIONS

A. GENERAL INSTALLATION INSTRUCTIONS

For this project, Pneumafil provides a separate Installation Instructions (7-22169-XX-4NOTE) which should be consulted prior to any assembly and operation of this equipment. *Reference all Safety Notes throughout both manuals. Reference all Drawings, Section VI. Reference all Technical Bulletins, Section VII.*

Those responsible for the construction and use of this equipment must satisfy themselves that all necessary precautions have been taken to assure that any applicable laws, regulations, codes, standards and safety measures have been met for assembly and installation. This manual is not intended for use as a technical installation guide. For general assembly instructions, *Reference Installation Instructions Manual, 7-22169-XX-4NOTE.*

B. INSPECTION INSTRUCTIONS

1. General

The purpose of the inspection is to assure proper operation of the control and monitor systems, the equipment, and to assure that no damage is caused to personnel or the turbine by mechanical or electrical error, loose hardware or other foreign materials upon startup.

NOTE: Only authorized personnel shall service electrical equipment. All power shall be disconnected prior to servicing any electrical device (switches, lights, receptacles, etc.). Failure to do so could result in serious personal injury or even death.

NOTE: Perform all inspection procedures prior to initial turbine startup and again after long periods of plant outages.

NOTE: IN CASE OF SYSTEM MALFUNCTION

- 1) Shut it down completely before attempting any repair.
- 2) Relieve internal pressure and allow the system to cool.
- 3) Make repairs as necessary.

2. Electrical-Control System Inspection

All electrical equipment shall be installed per the National Electrical Code or the Electrical Authority having jurisdiction. All shop & field installed electrical equipment shall be installed per the following electrical drawings:

- 7-22169-XX-5 – Wiring Schematic
- 7-22169-XX-20 – Pressure and Instrumentation Diagram
- 7-22169-XX-51 – Electrical Shop & Field Installation

Any deviation from these or other Pneumafil Corporation drawings will need written approval from Pneumafil, Gas Turbine Engineering.

- a. Confirm that the turbine is "OFF" with no airflow through the system.
- b. Confirm that the customer supplied MES to the control panel (INF-JB1, XX-5) is "OFF" and "locked out".
- c. Confirm that all light switches are off and that any local "GFI" circuits are reset.
- d. Verify that all terminations in ALL control panels and junction boxes (light and disconnect switches) are connected, identified, and tightened securely.
- e. Open the control panel and turn off all disconnect switches and circuit breakers.
 - i) Check for proper grounding.

- ii) Confirm that all wiring is complete, wire markers in place, and terminals secure.
- iii) Identify all spares and neatly bundle these separately and secure to the panel.
- f. Close and secure all junction box covers.
- g. Turn on the customer supplied MES to the control panel.
- h. Verify voltage in the control panel at the main disconnect or distribution terminal block.
- i. Turn on each circuit breaker and monitor voltage.
- j. Check to see that the power on indicator is illuminated.
- k. Verify each light switch and receptacle. Prove the ground fault circuit.

3. Differential Pressure Gauges

- a. Make sure all field-installed tubing has been installed and is sloped toward the drain valves on the Differential pressure panel.
- b. Check all indicators, and adjust, as necessary, to zero the pointer. (To zero the instrument, both the "LOW" and "HIGH" inputs must be open to ambient, so please remove tubing and/or filter at the instrument.) Please refer to Technical Bulletins Section.
- c. Check panel for plumb and level, as the instruments must be installed vertically.
- d. To verify indication, use either vacuum or a small hand pump.
 - i) Remove the "LOW" side tubing and connect a vacuum pump to the "LOW" inlet port and begin pumping slowly to increase pressure, or
 - ii) Remove the "HIGH" side filter and connect a small hand pump (30-psi. maximum) and begin pumping slowly to increase pressure.

4. Differential Pressure Switch

- a. Verify the connection points, as the device has ports marked "LOW" and "HIGH".

- b. To check to see if the device changes state
 - i) Remove the "LOW" side tubing and connect a vacuum pump to the "LOW" inlet port and begin pumping slowly to increase pressure, or
 - ii) Remove the "HIGH" side filter and connect a small hand pump (30-psi. maximum) and begin pumping slowly to increase pressure.
- c. Connect either a test light or ohmmeter to both the "C, common" and "N.O., normally open" contacts in the SOR or appropriate terminals in the control panel.
- d. The pressure indicator will move and the contacts will close.
- e. To change or adjust the alarm pressure, please refer to the Technical Bulletins Section.
- f. Verify that all stainless steel connections are tight and secure.
- g. Check to see that all sense line filters are installed. See XX-20 and XX-51.
- h. Open drains and check for moisture, then close.

C. STARTUP INSTRUCTIONS

1. General

NOTE: Startup instructions assume that all installation and inspection procedures have been performed satisfactorily.

NOTE: Failure to adhere to all safety notes, precautions and regulations may result in personal injury, property damage or death.

NOTE: IN CASE OF SYSTEM MALFUNCTION

- 1) Shut it down completely before attempting any repair.
- 2) Relieve internal pressure and allow to cool.
- 3) Make repairs as necessary.

- a. Read this entire manual and all installation and assembly instructions in the material provided.

- b. Remove all debris that may cause damage to, or be ingested by, the combustion air duct.
- c. Insure all filter elements are properly installed with no gaps between holding frame and elements.
- d. Confirm proper performance of all inspection procedures in this manual.

2. Electrical

- i. Reference Section III '**SYSTEM ELECTRICAL OPERATION**'.
- j. Verify that all switches supplying power to INF-JB1 are in the **ON** position.
- k. Verify that all circuit breakers located in CP-1 are in the **ON** position.

D. OPERATING INSTRUCTIONS

1. General

This entire manual and all installation and assembly drawings should be read and understood prior to any operation of this equipment. Throughout this manual, special highlighted notes are made to make the operator aware of safety considerations. *Reference Safety Notes, page V.*

NOTE: When entering the clean air system while the turbine is in operation, be sure to remove all personal loose articles, i.e. hats, pens, pencils, etc.

NOTE: When leaving the clean air system, be sure all articles taken in are removed and the clean air system is clean.

NOTE: Entering the clean air path while the turbine is operating is not recommended.

- a. This section assumes that all Inspection and Start-Up procedures have been performed.
- b. A regular, three-month interval inspection and maintenance schedule is recommended. *Reference all "MAINTENANCE INSTRUCTIONS", Section II.F.*

2. Filter System

Once the filter system is in operation, it needs little attention other than occasional replacement of the filters, *reference "MAINTENANCE INSTRUCTIONS", Section II.F.* Filter life is dependent on the amount and type of contaminant. Filter life may vary from turbine to turbine, even at the same location. Filter replacement will occur when the differential pressure readings do not return to low set points.

NOTE: If the alarm switch is activated, the filters should be replaced.

NOTE: Pre-filters may be replaced while the system is in operation; however, it is recommended that replacement of the Final Filter take place only after the turbine has been shut down. The replacement of these filters is described in the Maintenance Section.

E. SHUTDOWN INSTRUCTIONS

1. Electrical System

- a. Verify that all switches supplying power to INF-JB1 are in the "OFF" position.
- b. Verify that all circuit breakers located in CP-1 are in the "OFF" position.

F. MAINTENANCE INSTRUCTIONS

When the turbine is "OFF", Pneumafil recommends the following inspections to insure proper operation of the system.

1. Electrical Switches & Receptacles

All light switches, and receptacles should be routinely inspected at least every 3 months to confirm proper operation.

2. Control Panel (INF-JB1)

All components (circuit breakers, panel indicator lights, switches, etc.) located in the Control Panel Assembly (Drawings #7-22169-XX-6) should

be routinely inspected at least every 3 months to confirm proper operation.

3. How To Detect Clean Air System Leaks

Pneumafil recommends that the integrity of the plenum and ductwork be inspected at three-month intervals. For more information regarding the following procedures, reference *ASTM (American Society for Testing and Materials) E 515 Bulletin and ASTM E 1002 Bulletin, Section VII*.

NOTE: Any leaks that are found should be resealed.

NOTE: When entering the clean air system while the turbine is in operation, be sure to remove all personal loose articles, i.e. hats, pens, pencils, etc.

NOTE: When leaving the clean air system; be sure all articles taken in are removed and the clean air system is free of foreign articles.

NOTE: Entering the clean air path while the turbine is operating is not recommended. The following procedures are listed for reference.

4. How To Detect Leaks At Initial Start-Up

There are four (4) methods of checking for leaks during the initial start-up. Two (2) methods do not require the turbine to be in operation. Two methods (2) do require the turbine to be in operation.

Method 1 (Turbine Not In Operation)

This method must be done when there is bright sunlight outdoors.

- i) Enter the inside of the clean air system via service plenum area.
- ii) Check for light penetration of all weld seams and joints. When checking, the line of vision should be directly over (perpendicular) to the weld seam.
- iii) Clean all areas that are to be resealed.
- iv) Reseal all leaks.

Method 2 (Turbine Not In Operation)

Because the clean air system is a vacuum when compared to ambient, dirty air will flow from the outside to the inside. This will cause dust streaks to appear at or around any leak.

- i) Enter the inside of the clean air system via service plenum area.
- ii) Check for dust streaks at all welded seams and joints.
- iii) Clean all areas that are to be resealed.
- iv) Reseal all leaks.

Method 3 (Turbine In Operation)

- i) Enter the inside of the clean air system via service plenum area.
- ii) Apply a liquid soap solution to all weld seams and joints. (A commercial solution, Leak-Tec, is available from American Gas & Chemical Co., telephone 800-526-1008.) A leak will show as bubbles are created by the outside air flowing into the clean air system.
- iii) Clean all areas where soap solution has been applied.
- iv) Reseal all leaks.

Method 4 (Turbine In Operation)

Detecting leaks using this method can be accomplished from either outside or inside the clean air system depending on accessibility of area being tested (inside is the preferred location).

- i) Check all weld seams and joints using a Model Sonic 3000 leak detector, as manufactured and sold by American Gas & Chemical Company, *reference ASTM E 515 Bulletin, Section VII-* or equivalent.
- ii) Clean all areas that are to be resealed.
- iii) Reseal all leaks.

5. How To Detect Leaks On A Regular Schedule

Leaks that do not show up in the initial startup test may occur later. Therefore, ***it is important to check for leaks on a regularly scheduled basis.*** After a period of operation, the following method is effective and expedient and does not require the turbine to be in operation.

- a. Inspect all welded and bolted seams for dust streaks. Dust streaks will appear at or around leaks because the clean air chamber experiences a negative pressure relative to ambient.

What to Check:

- ✓ Access Doors
- ✓ All Joints and Connections
- ✓ Duct to Duct Connections
- ✓ Duct to Turbine Inlet
- ✓ Inspection Doors or Plates on Ductwork or the Turbine Inlet

- b. Clean all areas that are to be resealed.

- c. Reseal all leaks.

6. How To Evaluate Filter Conditions

There are no set rules for filter replacement. The maintenance schedule frequency will be determined by on-site personnel experience and the type of contaminants present in the air.

- a. Pre-filters

- i) It is recommended that the pre-filter be changed three (3) times for each time changing the final filter.
- ii) The pre-filter should be changed once the pressure drop across it reaches 250 PaGage* [1.00"] w.g. Reference "How to Install and Replace Pre-Filters", Section II.F.7.

- b. Final Filters

- i) Leakage in the area of the final filter gaskets may be seen as dust streaks on the downstream side of the final filter banks.

- ii) The TMP-95 final filter should be changed once the pressure drop across it reaches 620 PaGage [2.75"] w.g. Reference "How to Install and Replace Final Filters", Section II.F.8.

7. How to Install and Replace Pre-Filters

- a. Loosen the pre-filter clip wingnut.
- b. Rotate the clips ninety degrees.
- c. Remove and discard the pre-filter element.
- d. Install a clean pre-filter element against the face of the final filter.
- e. Reposition the pre-filter clip and tighten the wingnut.

8. How to Install and Replace Final Filters

- f. Remove the pre-filter (see above).
- g. Loosen the final filter retaining clips and rotate ninety degrees.
- h. Remove the final filter.
- i. Remove any gasket material left on holding frame from old element.
- j. Install a clean final filter.
- k. Reposition the final filter retaining clips and tighten.
- l. (Hand tighten only, 1.7 N-M* [15 in-lb*]).
- m. Reinstall old or new pre-filter element.

9. Installation and Replacement of Final Filters at Sensing Point

Reference Drawing #7-22169-XX-51, sheet 4.

- a. Loosen 90° union elbow .
- b. Remove tube assembly by removing tube clamps and rotating assembly away from filter frame.
- c. Insert Final Filter.

- d. Apply 1/4" x 1/2" gasket around face perimeter of final filter – allow gap for sensing tube.
- e. Rotate tube assembly against final filter and tighten 90° union elbow.
- f. Re-install tubing assembly using tube clamps.
- g. Install pre-filter.
- h. Tighten clamps for pre-filter.

10. How To Maintain The Turbine High Pressure Alarm Switches

The Turbine Air Inlet Filter System contains one differential pressure alarm switch, set at 101.60 mm [4.00"] w.c.

At least every six months:

- a. Confirm that there are no leaks at the connections.
- b. Calibrate the component, for adjustment, reference SOR Bulletin Form 492, in the Technical Bulletin Section VII.

11. DP Gauges

DP Gauges should be checked and calibrated at least every six (6) months. (*Reference Technical Bulletins, Section VII*).

- a. Disconnect pressure tubing from pressure ports.
- b. Adjust zero adjustment screw such that the indicating needle is set to zero (0).
- c. Reconnect pressure tubing.

III. SYSTEM ELECTRICAL OPERATION

Customer Supply (Controls): 120VAC/1-Phase/60 Hz/25 FLA
480V to 120V conversion by others

Customer Supply (Alarms): 48 VDC/24 VDC

A. GENERAL

1. Lights

Internal lights have been provided in all filter modules for maintenance purposes. All light switches are located externally adjacent to each module access door.

2. Receptacles

Receptacles have been provided in both filter modules for maintenance purposes. All receptacles are on a ground fault circuit and are located immediately underneath each light switch.

B. CUSTOMER ALARMS

1. High DP Alarm

One (1) high differential pressure alarm is provided to alert a high-pressure drop (101.6 mm [4"] w.c.) across the filter system.

IV. SYSTEM SPECIFICATIONS

A. MATERIALS AND FINISH SPECIFICATIONS

Exterior and Interior Surfaces: Painted Carbon Steel

Surface Prep: (Filter Modules and Plenum)

Exterior Surfaces: Sandblast per SSPC-SP10, profile 1-2 mils (25–50 microns)

Interior Surfaces: Sandblast per SSPC-SP10, profile 1-2 mils (25-50 microns)

Prime Coat:

Exterior Surfaces: Ameron Dimetcoat 9HS [3-4 mils (75-100 microns) DFT],
Color: Green

Interior Surfaces: Ameron Dimetcoat 9HS [3-4 mils (75-100 microns) DFT],
Color: Green

Top Coat: Applied in field by others

Rain Hoods: Galvanealed Steel

Bird Screen: Galvanized (0.50" x 0.50" mesh)

Structural Steel: Hot Dip Galvanized
Platform: Hot Dip Galvanized
Ladder: Hot Dip Galvanized

Galvanized Surfaces: No additional finish.

Hot Dip Galvanized is per ASTM 123

B. FILTER SPECIFICATIONS

Pre-Filters (Model Z-100) Quantity (357)

Final Filters (Model TMP-95) Quantity (357)

C. ELECTRICAL REQUIREMENT SPECIFICATIONS

Customer Supply (Controls): 120VAC/1-Phase/60 Hz

Customer Supply (Alarms): 48 VDC/24 VDC

D. FILTER SYSTEM PERFORMANCE SPECIFICATIONS

See 7-22169-XX-1, sheet 1 of 3, Performance Data

V. RECOMMENDED SPARE PARTS

RECOMMENDED SPARE PARTS			
ITEM DESCRIPTION	PART NUMBER	TOTAL SUPPLIED PER SYSTEM	RECOMMENDED SPARES PER SYSTEM
Element, Final Filter TMP-95	S51658-B1	357	10
Element, Pre-Filter Z-100	S52061-A1	357	10
Differential Pressure Gauge 0-2"	7-22169-xx-6P6	1	1
Differential Pressure Gauge 0-6"	7-22169-xx-6P7	1	1
Differential Pressure Switch	S52033-B1	1	1

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VI. REFERENCE DRAWINGS

REFERENCE DRAWINGS			
PNEUMAFIL DRAWING NUMBER	SHEET NUMBER	REVISION LETTER	TITLE
7-22169-XX-1	1-3	A	General Arrangement
7-22169-XX-2	1-2	A	Loading and Foundation
7-22169-XX-3	1	A	Structural Steel Arrangement
7-22169-XX-4	1 - 5	A	Field Installation – Inlet Air Filtration System
7-22169-XX-4BOM	1	A	Bill of Material
7-22169-XX-5	1-3	A	Module Wiring Diagram
7-22169-XX-6	1	A	Control Panel Assembly (NEMA 4)
7-22169-XX-6BOM	1	A	Bill of Material
7-22169-XX-7	1	A	Control Box Assembly (NEMA 4)
7-22169-XX-7BOM	1	A	Bill of Material
7-22169-XX-16	1	A	Control Panel Enclosure Sub-Panel Assembly (NEMA 4)
7-22169-XX-16BOM	1	A	Bill of Material
7-22169-XX-17	1	A	Disconnect Switch 480 VAC (NEMA 4)
7-22169-XX-17BOM	1	A	Bill of Material
7-22169-XX-20	1	A	P & I Diagram
7-22169-XX-41	1-2	A	Centroids and Component Weights
7-22169-XX-51	1-4	A	Field & Shop Installation-Electrical (NEMA 4)
7-22169-XX-51 BOM	1-2	A	Bill of Material
7-22169-XX-57	1	A	Field Installation – Clean Air Plenum
7-22169-XX-57BOM	1	A	Bill of Material

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VII. TECHNICAL BULLETINS

TECHNICAL BULLETINS		
BULLETIN NUMBER	PAGE(S)	DESCRIPTION
ASTM E 515	3	Leaks Using Bubble Emission Techniques
ASTM E 1002	3	Standard Method of Testing for Leaks Using Ultrasonics
Form #492	2	Series 107 Differential Pressure Switch
A-32	4	Capsuhelic Differential Pressure Gage – Dwyer Instruments

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VIII. APPENDICES

A. TROUBLESHOOTING GUIDE

1. Control System

TROUBLESHOOTING THE CONTROL SYSTEM		
PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
The module lights are not operating	Tripped circuit breaker	Reset the circuit breaker
	Burned out light bulb	Replace the light bulb
Receptacle is not operating	Tripped Circuit Breaker	Reset ground fault circuit breaker located in CP-1

NOTE: Before replacing major items (if they are not proven faulty) or if all suggested corrective action fails, be sure and check for loose connections or broken wires.

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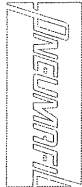
B. LIST OF ABBREVIATIONS

Amp	Ampere (s)	LED	Light Emitting Diode
ASTM	American Society for Testing and Materials	MES	Master Electrical Switch
°C	Degree (s) Celsius	M	Meters
CB	Circuit Breaker	MIN	Minimum
CFM	Cubic Feet per Minute	mm	Millimeter (s)
CSA	Canadian Standards Association	m/s	Meter (s) per Second
DP	Differential Pressure	m³	Cubic Meter (s)
Δ P	Differential Pressure	m³/s	Cubic Meter(s) per Second
DFT	Dry Film Thickness	NC	Normally Closed
DPDT	Double Pole Double Throw	NEMA	National Electrical Manufacturers Association
°F	Degree(s) Fahrenheit	NO	Normally Open
ft./min.	Feet per Minute	N-M	Newton-Meter (s)
F.L.A.	Full Load Ampere (s)	PaGage	Pascal Gage
GPM	Gallons per Minute	PB	Pushbutton
GRP	Group	PLC	Programmable Logic Controller
H-O-A	Hand-Off-Automatic	PS	Pressure Switch
hp	Horsepower	PSI	Puckorius Scaling Index
in-lb	Inch-pound (s)	psig	Pounds per Square Inch Gauge
JB	Junction Box	RPM	Revolutions Per Minute
kPaG	KiloPascal Gage	RSI	Ryznar Stability Index
KVA	Kilo-Volt-Ampere (s)		

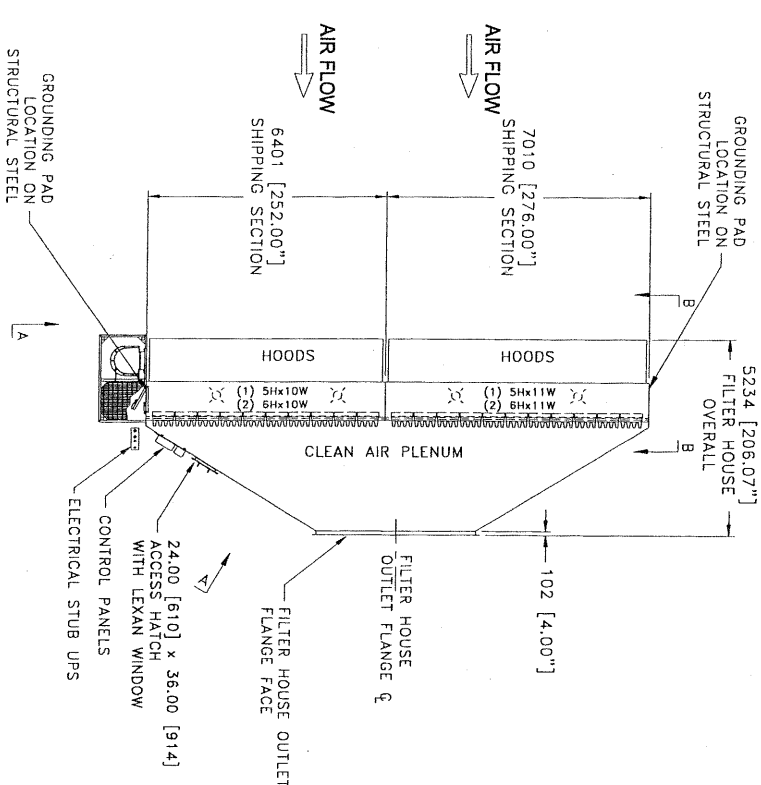
scfm	Standard Cubic Feet per Minute
Sm³/h	Standard Cubic Meters per Hour
SPDT	Single Pole Double Throw
SSPC-SP	Steel Structure's Painting Council-Surface Preparation
SSW	Selector Switch

TB	Terminal Block
V	Volt(s)
VA	Volt Ampere(s)
VAC	Voltage Alternating Current
VDC	Voltage Direct Current
w.c.	Water Column
W.G.	Water Gauge

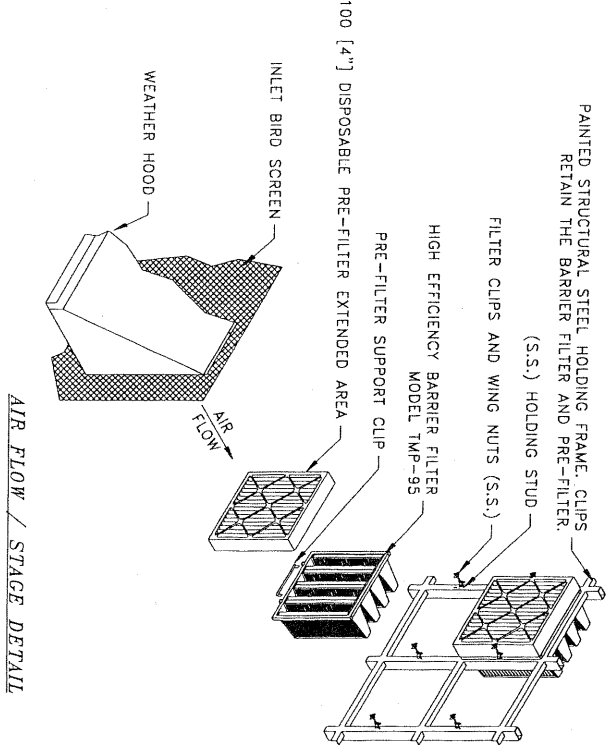
INLET FILTER HOUSE PERFORMANCE DATA SHEET

INLET FILTER HOUSE PERFORMANCE DATA SHEET						
DESCRIPTION		US units		SI units		
Total Air Flow (@ISO-59)		890,000 cfm		420.03 m3/s		Electrical: Input Required
Number of Elements		357 each		357 each		Power & Controls
Flow per Filter		2493 cfm		4238 m3/hr		Alarm
Pressure Drop:						Rating
- Hoods & Bird Screens		0.06 in. w.c.		2 mm w.c.		NEMA 4
- Pre-Filter		0.43 in. w.c.		11 mm w.c.		Material of Construction
- Final Filter		0.50 in. w.c.		13 mm w.c.		Hoods
- Plenum		0.15 in. w.c.		4 mm w.c.		Bird Screen
- Exit		0.15 in. w.c.		4 mm w.c.		Filter Module
-						Filter Bank frame
- Total Theoretical Pressure Drop		1.29 in. w.c.		33 mm w.c.		Clean Air Plenum
- Total Guaranteed Pressure Drop		1.42 in. w.c.		36 mm w.c.		Platforms (Internal/Ext)
Design Data:						Ladders/Handrail
- Hood Entrance Velocity		530 fpm		2.69 m/s		Structural Steel
- Filter Face Velocity		580 fpm		2.95 m/s		
- Filter Media Velocity		15.2 fpm		77.22 mm/s		
- Max. system pressure drop for 16,000 hours of life of filter elements*		4 in. w.c.		102 mm w.c.		
Design Criteria:						
- NaCl concentration downstream of filter media (ppm by weight)		<0.01				Surface Finish
- Initial atmospheric dust spot efficiency per ASHRAE 52.1-1992		60%				Carbon steel surfaces (INTERNAL & EXTERNAL)
New & Clean Filter Media Efficiency @ 5 micron particle size & larger		99.90%				Surface Prep SP-10, 1-2 Mils Blast Profile
- New & Clean Filter Media Efficiency @ 2 micron particle size & larger		99.00%				Prime Coat Inorganic Zinc, 3-4 mils DFT, Color: 0300 Green, Dimetcoat 9HS
Guaranteed Filter Dynamic Insertion Loss @		Octave Band				Stainless Steel Surfaces
		31.5 Hz		0		Galvanized Surfaces
		63 Hz		0		No additional finish
		125 Hz		2		No additional finish
		250 Hz		3		Filter Media/Type:
		500 Hz		5		Pre-Filter type
		1000 Hz		10		Final Filter type
		2000 Hz		12		
		4000 Hz		12		
		8000 Hz		10		
Evaporative Cooler Pump Sound Level (A-weighted) requirements						
- Not applicable						For Project specific design parameter, refer Vendor Confirmation Sheet
Rev	Comments	Checked	DATE	Dwg:	Sht 1 of 3	
A	RELEASED	BVC	5/25/05	Customer	Siemens Westinghouse Power Corp	
				Project	Pacific Rim Energy	
				Total Weight of the structure of EXHAUSTOR CORPORATION is estimated to be 100,000 lbs. This weight is based on the assumption that the structure is made of steel and is supported by a concrete foundation. The weight of the structure may vary depending on the materials and the design of the structure.		
				 PNEUMAFIL CORPORATION GAS TURBINE DIVISION P.O. BOX 16348, CHARLOTTE, N.C. 28297-6348		

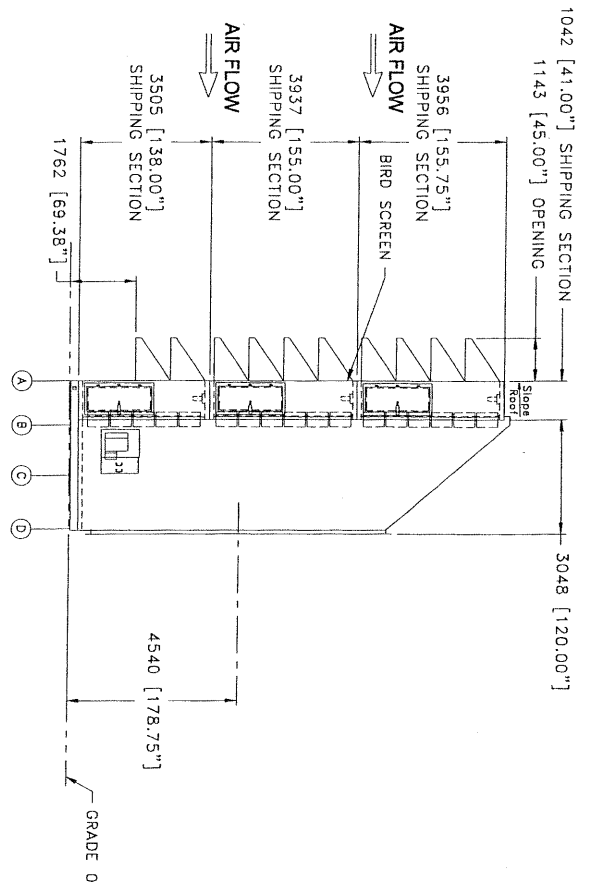
NO. / ZONE		REVISIONS		DATE	
		DESCRIPTION		APPROVED	CHECKED



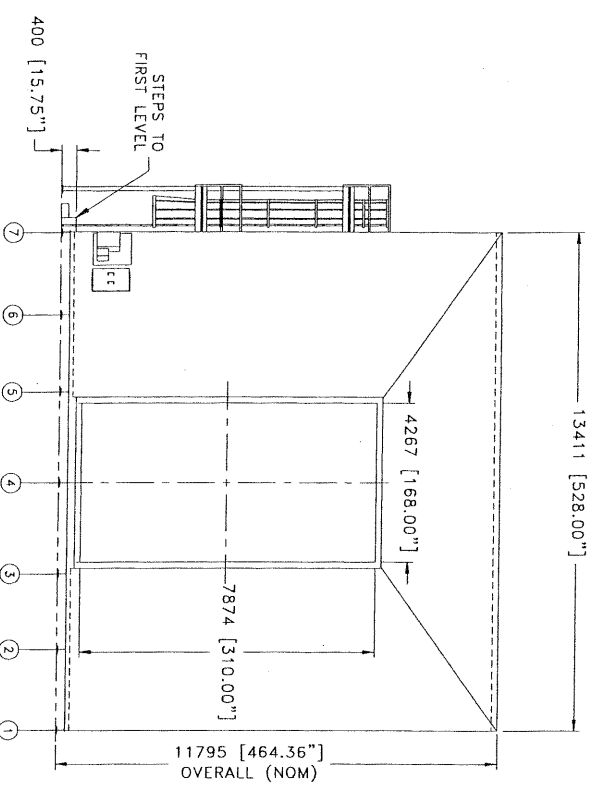
TOP VIEW



AIR FLOW / STAGE DETAIL



SIDE VIEW



FRONT VIEW

DESIGNED FOR:
SIEMENS WESTINGHOUSE
POWER CORPORATION
 SGT6-5000F
 PACIFIC RIM ENERGY
 (3) INLETS REQUIRED

PNEUMAFIL CORPORATION
 P.O. BOX 1546, CHANDLER, N.C. 28597-1546

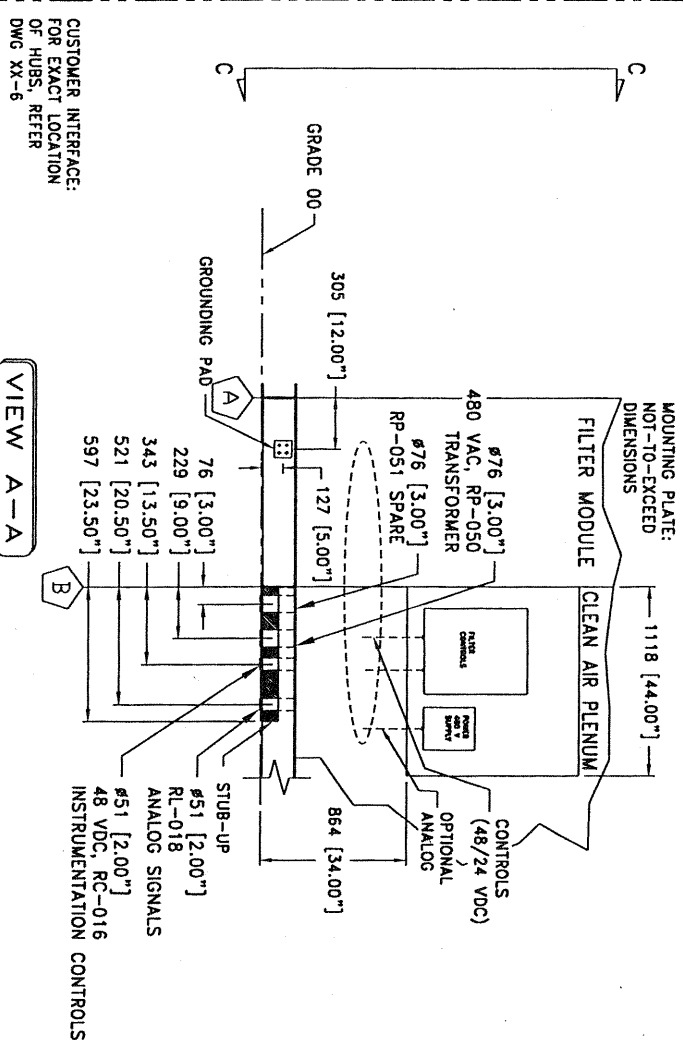
GENERAL ARRANGEMENT

THIRD ANGLE PROJECTION	CHECKED BY: BVC	CHECK DATE: 5/25/05
ALL DIMENSIONS: 1 INCH=25.4 MM		
This drawing is the property of PNEUMAFIL CORPORATION, Chandler, N.C. It is loaned for your use only and is not to be reproduced or used for any purpose other than that for which it was loaned. In the event of reproduction, permission must be obtained from PNEUMAFIL CORPORATION.		
SIZE: 11x17	DATE: 5/24/05	REV: 1
DRAWN BY: HVU	CHECKED BY: BVC	DATE: 5/24/05
PNEUMAFIL CORPORATION SHEET 2 OF 3		

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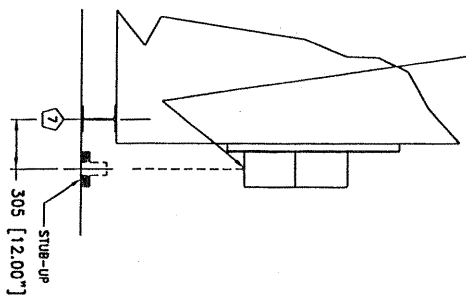
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ELECTRICAL INTERFACE



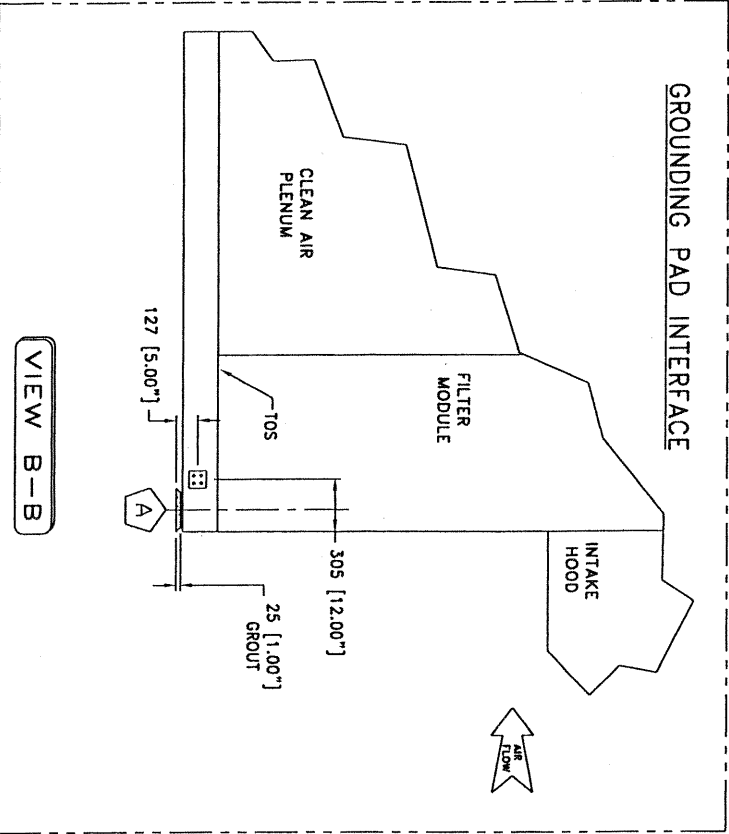
VIEW A-A

MOUNTING PLATE:
INCLUDING JUNCTION BOX(ES)
CONTROL ENCLOSURE(S), GAGES,
(2) 1-1/2" HUBS PLUS
(1) OPTIONAL 1-1/2" HUB
FOR ANALOG SIGNAL



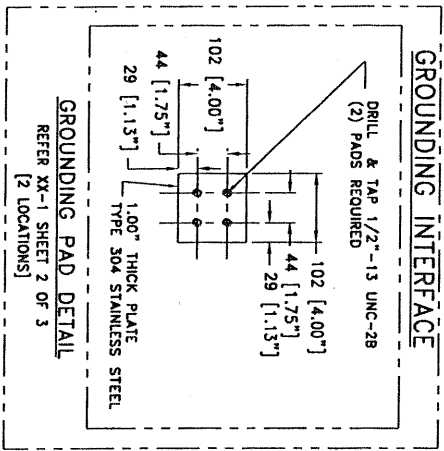
VIEW C-C

GROUNDING PAD INTERFACE

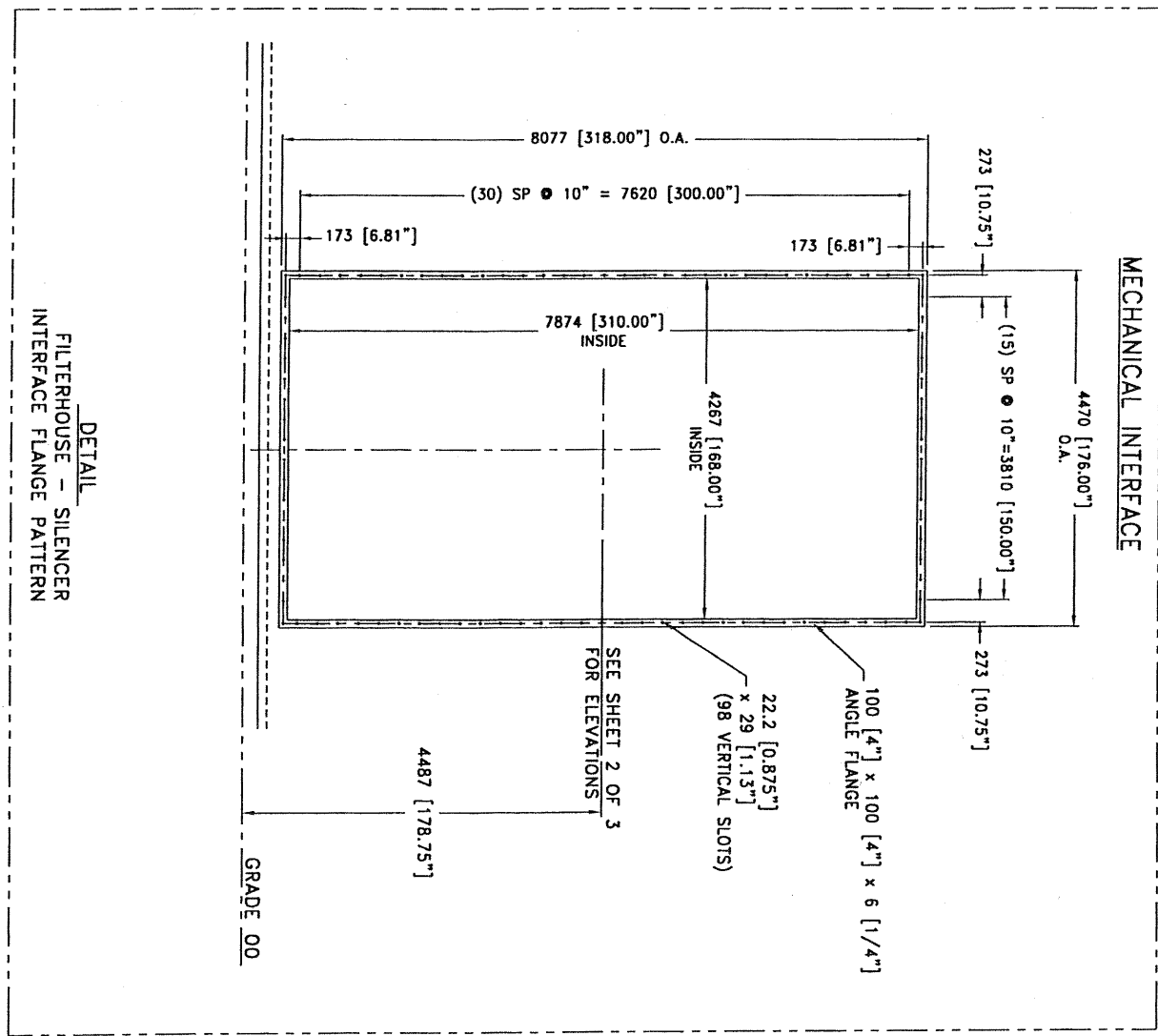


VIEW B-B

GROUNDING INTERFACE



MECHANICAL INTERFACE



DETAIL

FILTERHOUSE - SILENCER
INTERFACE FLANGE PATTERN

THIRD ANGLE PROJECTION		CHECKED BY	5/23/05	DATE	5/23/05	
ALL DIMENSIONS: 1 INCH=25.4 MM		DESIGNED BY	BVC	DATE	5/23/05	
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		REV	2	DATE	5/24/05	
		REV	3	DATE	5/24/05	
		REV	4	DATE	5/24/05	
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		REV	174	DATE	5/24/05	
		REV	175	DATE	5/24/05	

REVISIONS		DATE	APPROVED	CHECKED	DATE
NO.	ZONE				

GENERAL LOADS IN KIPS				WIND LOADS IN KIPS				SEISMIC LOADS IN KIPS			
LOADS FROM DEAD LOAD		LOADS FROM LIVE LOAD		LOADS FROM SNOW LOAD		LOADS FROM WIND +X		LOADS FROM WIND -X		LOADS FROM WIND +Y	
LOC	X	Y	Z	X	Y	X	Y	X	Y	X	Y
A-1	-	-	-1.5	-	-	-1.5	-	-1.5	-	-1.5	-
A-2	-	-	-2.8	-	-	-2.8	-	-2.8	-	-2.8	-
A-3	-	-	-2.8	-	-	-2.8	-	-2.8	-	-2.8	-
A-4	-	-	-2.8	-	-	-2.8	-	-2.8	-	-2.8	-
A-5	-	-	-2.8	-	-	-2.8	-	-2.8	-	-2.8	-
A-6	-	-	-2.8	-	-	-2.8	-	-2.8	-	-2.8	-
A-7	-	-	-1.5	-	-	-1.5	-	-1.5	-	-1.5	-
B-1	-	-	-4.3	-	-	-4.3	-	-4.3	-	-4.3	-
B-2	-	-	-8.3	-	-	-8.3	-	-8.3	-	-8.3	-
B-3	-	-	-8.3	-	-	-8.3	-	-8.3	-	-8.3	-
B-4	-	-	-8.3	-	-	-8.3	-	-8.3	-	-8.3	-
B-5	-	-	-6.3	-	-	-6.3	-	-6.3	-	-6.3	-
B-6	-	-	-6.3	-	-	-6.3	-	-6.3	-	-6.3	-
B-7	-	-	-4.3	-	-	-4.3	-	-4.3	-	-4.3	-
C-2	-	-	-3.4	-	-	-3.4	-	-3.4	-	-3.4	-
C-6	-	-	-3.4	-	-	-3.4	-	-3.4	-	-3.4	-
D-3	-	-	-1.9	-	-	-1.9	-	-1.9	-	-1.9	-
D-4	-	-	-1.9	-	-	-1.9	-	-1.9	-	-1.9	-
D-5	-	-	-1.9	-	-	-1.9	-	-1.9	-	-1.9	-
TOTAL	-	-	-79.9	-	-	-41.5	-	-11.2	68.4	-	-

GENERAL LOADS PER ASCE 7-95
LIVE LOADS FOR ROOFS..... 20 PSF
LIVE LOAD FOR PLATFORMS..... 100 PSF
LIVE LOAD FOR PLENUM FLOOR..... 20 PSF
LIVE LOAD FOR MODULE WALKWAY..... 40 PSF

WIND - ASCE 7-95
V = 110 MPH
EXP C I=1.15
TOPOGRAPHIC FACTOR, Kzt=1.0
CATEGORY III

SNOW - ASCE 7-95
Pg = 30 PSF
I = 1.1
Ce = 1.0

SEISMIC PER UBC-97
CATEGORY II
SEISMIC ZONE - 3
SOIL PROFILE - SD

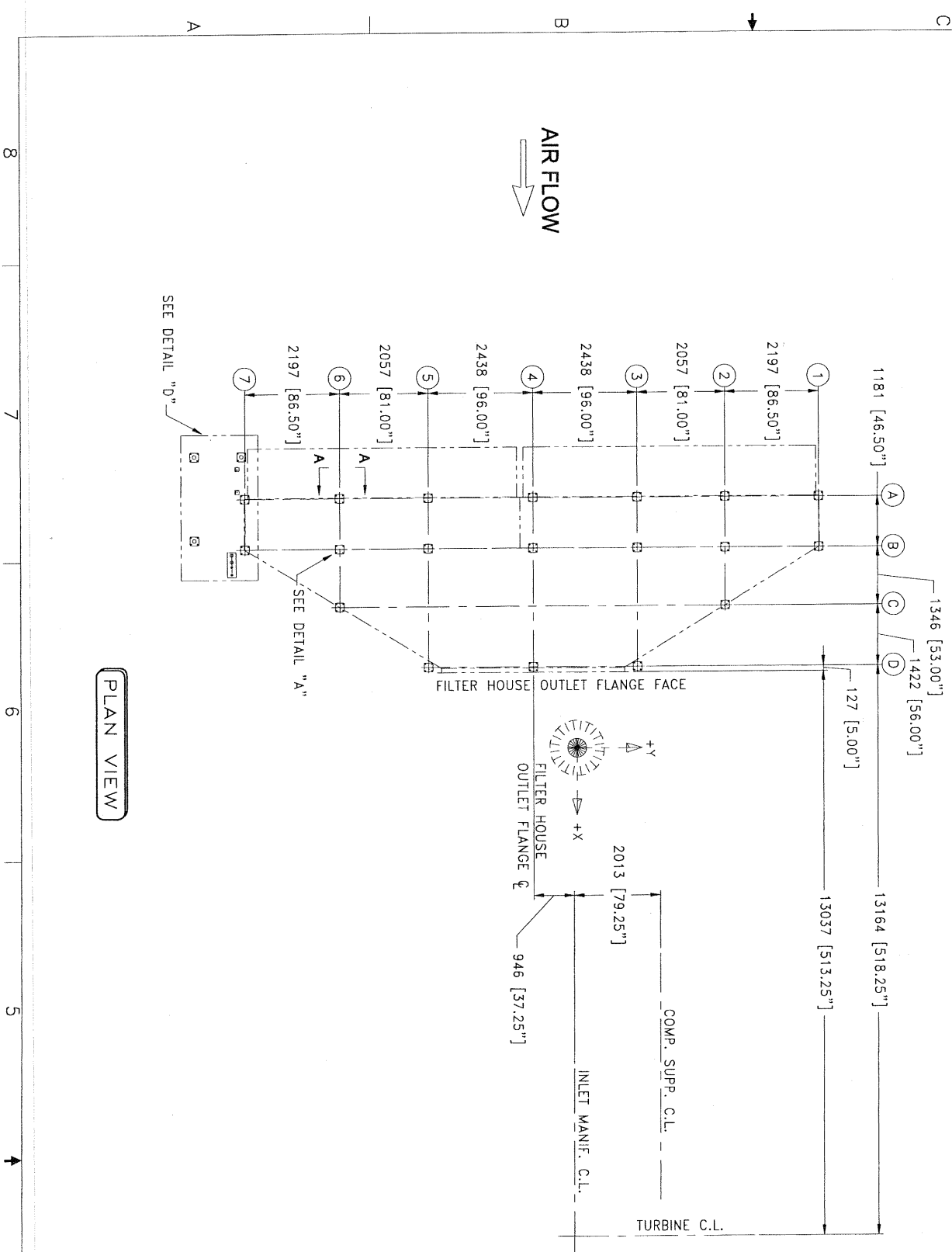
DESIGNED FOR:

SIEMENS WESTINGHOUSE
POWER CORPORATION
SGT6-5000F
PACIFIC RIM ENERGY
(3) INLETS REQUIRED

PNEUMAFIL CORPORATION
P.O. BOX 1524, CHAMBERS, NC 28520-1524

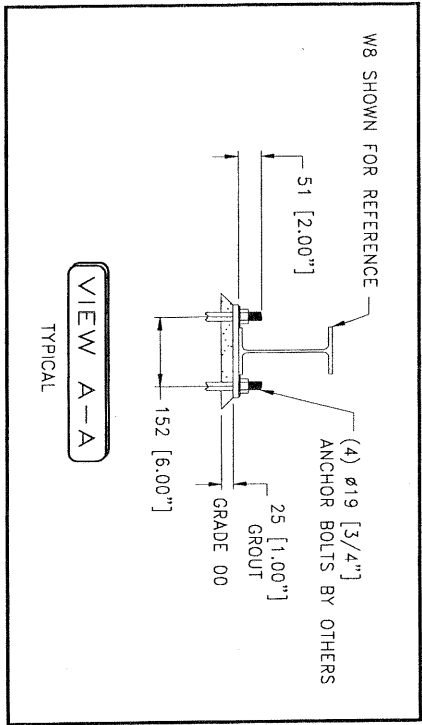
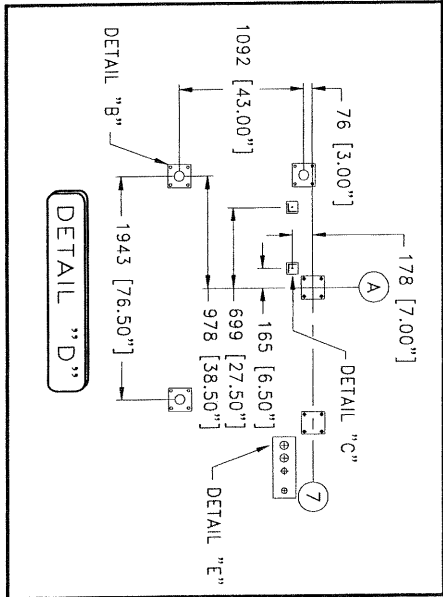
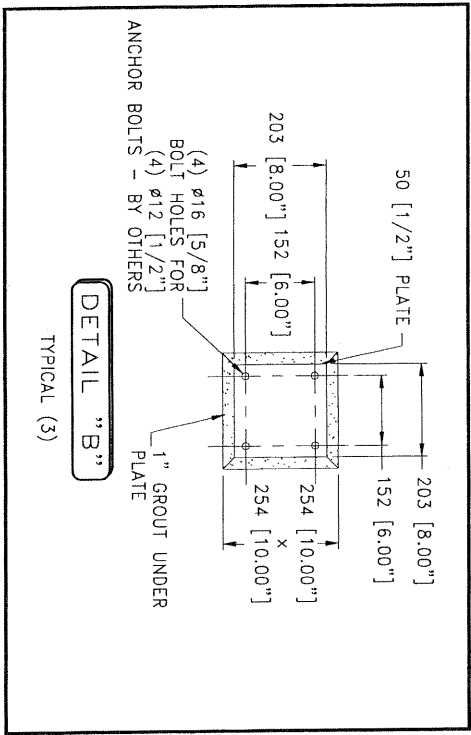
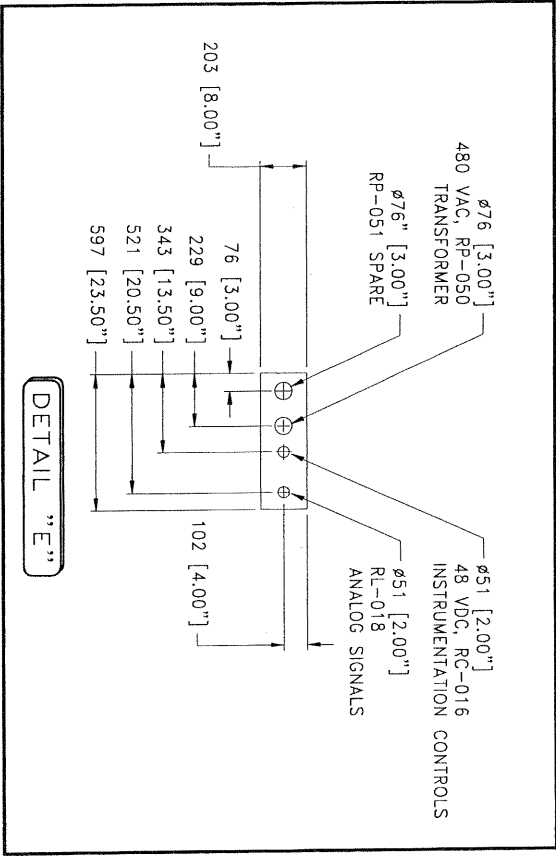
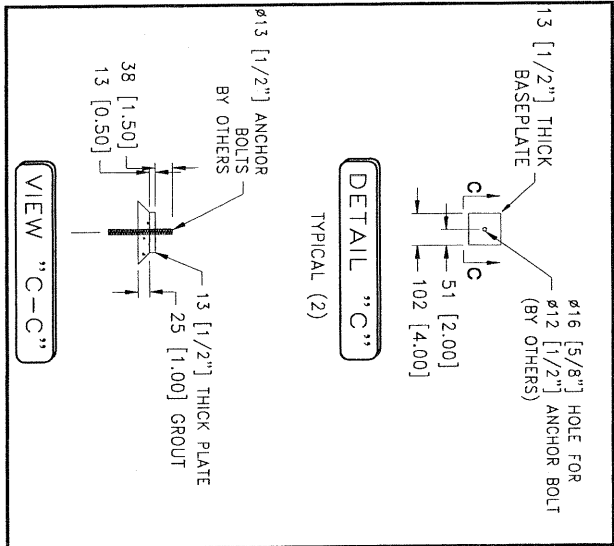
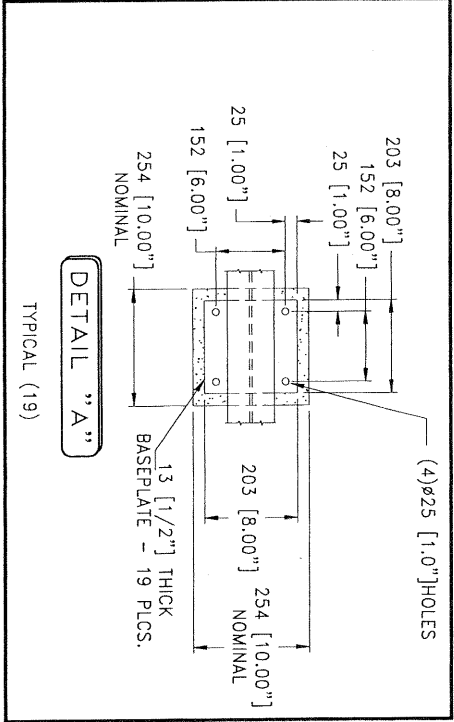
LOADING AND FOUNDATION

THIRD ANGLE PROJECTION	CHECKED BY BVC	DATE 5/25/05
ALL DIMENSIONS: 1 INCH=25.4 MM	SCALE 1"=1'-0"	DATE 5/24/05
ST. 1: 64.00	DATE 7-22169-XX-2	REV A
DATE 7/24/05	SCALE 1"=1'-0"	DATE 7/24/05
DATE 7/24/05	SCALE 1"=1'-0"	DATE 7/24/05



PLAN VIEW

NO. ZONE		REVISIONS		DATE		APPROVED		CHECKED		DATE	



THIRD ANGLE PROJECTION

ALL DIMENSIONS: 1 INCH=25.4 MM

CHECKED BY: BVC CHECK DATE: 5/25/05

DESIGNED BY: HVU DRAWN BY: HVU DATE: 5/14/05

SCALE: 1" = 1'-0"

PNEUMAFIL CORPORATION
P.O. BOX 15480, CHARLOTTE, NC 28215-0480

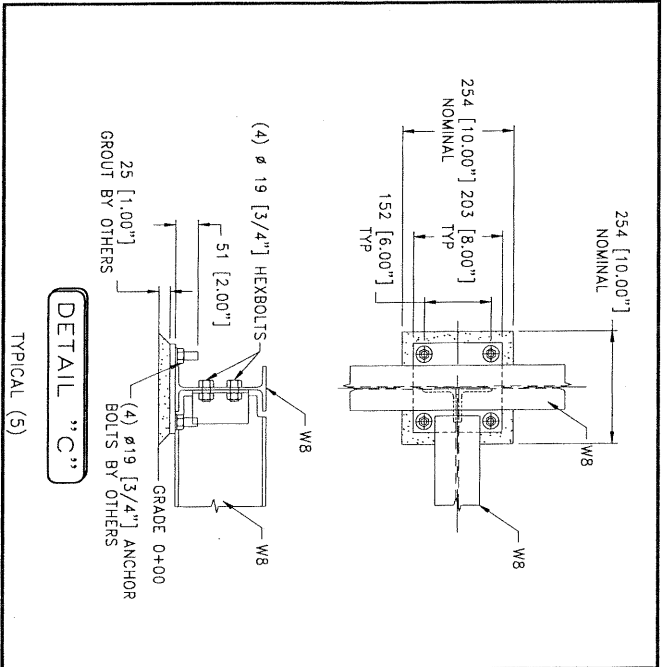
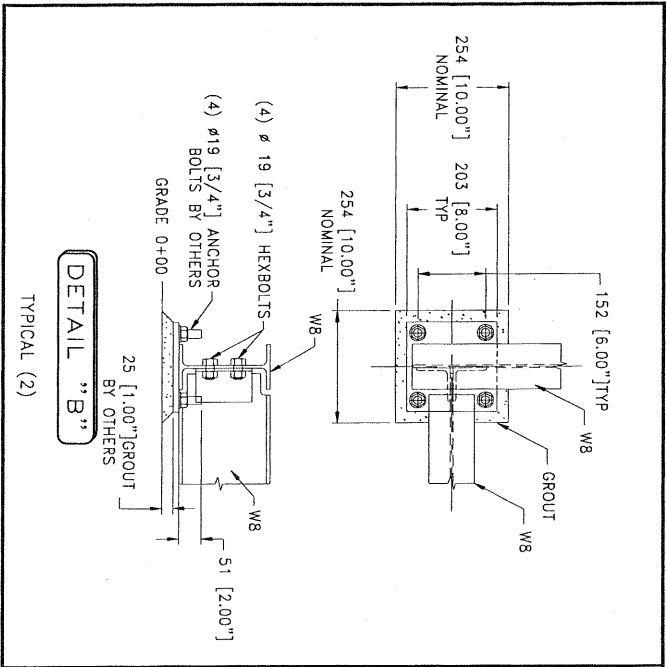
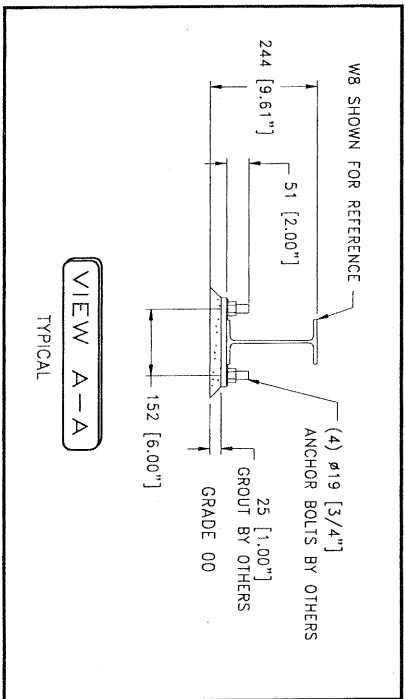
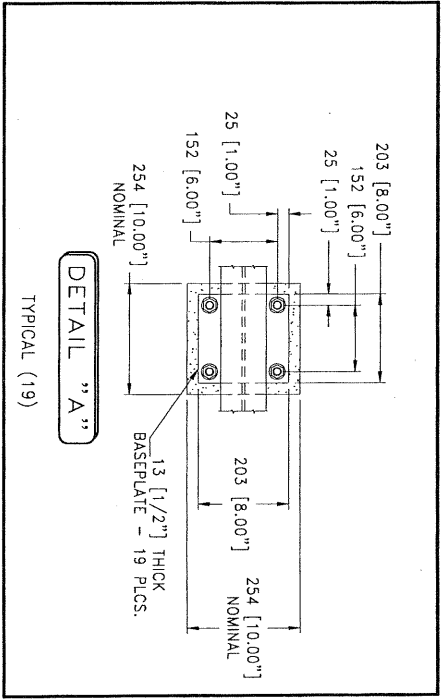
7-22169-XX-2

2 OF 2

NO. / ZONE		REVISIONS	DATE	APPROVED	CHECKED	DATE
		DESCRIPTION				

DWG. NO. 7-22169-KX-003

SHEET 1 REV. A



- STEEL NOTES:
- 1) TOP OF STEEL (T.O.S.) ELEVATION IS 9.61" ABOVE GRADE 0+00
 - 2) ALL STEEL SHALL BE ASTM GRADE A36
 - 3) STRUCTURE SHALL BE DETAILED AND FABRICATED IN ACCORDANCE WITH AISC, 1989.
 - 4) SEE XX-4 FOR PART MARKING. SEE XX-2 FOR FOUNDATION AND BASEPLATE DETAILS.

DESIGNED FOR:

SIEMENS-WESTINGHOUSE
POWER CORPORATION

SGT6-5000

PACIFIC RIM ENERGY

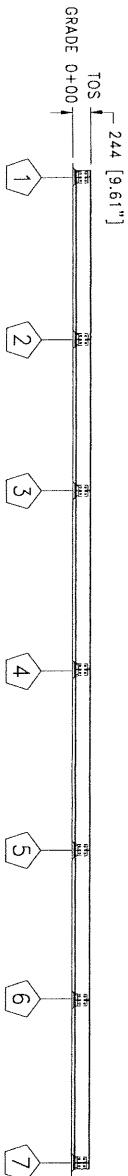
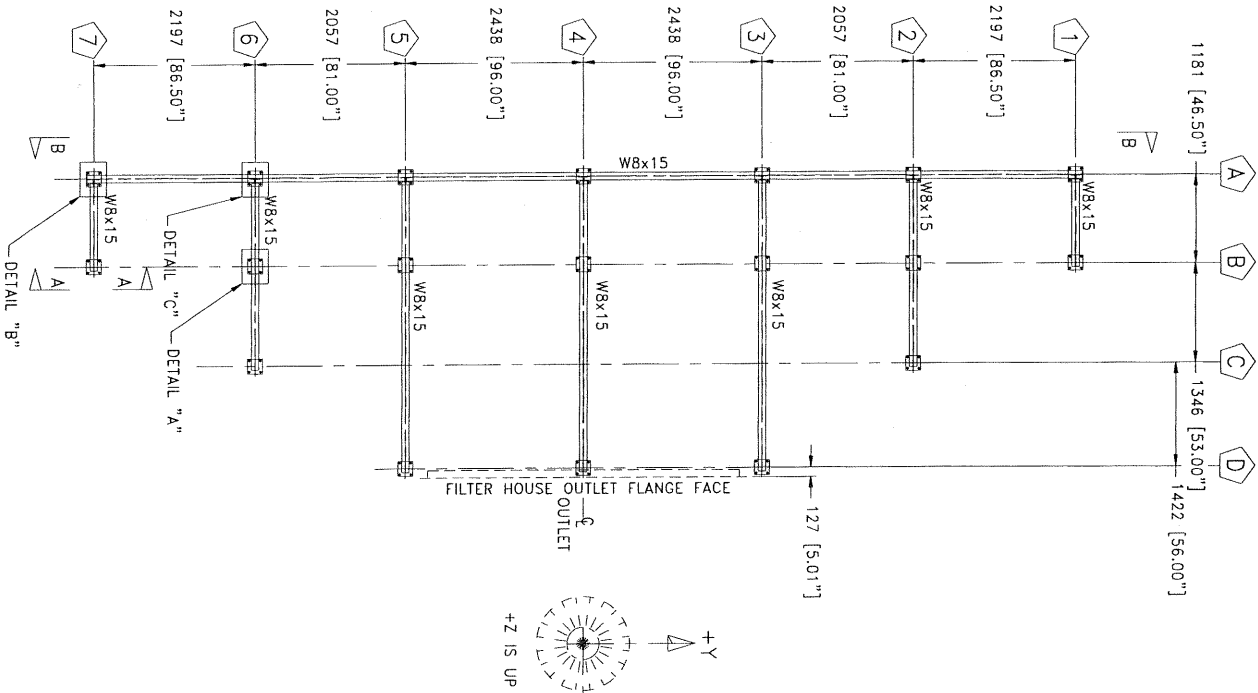
(3) INLETS REQUIRED

PNEUMAFIL CORPORATION
P.O. BOX 18348, CHARLOTTE, N.C. 28217-3348

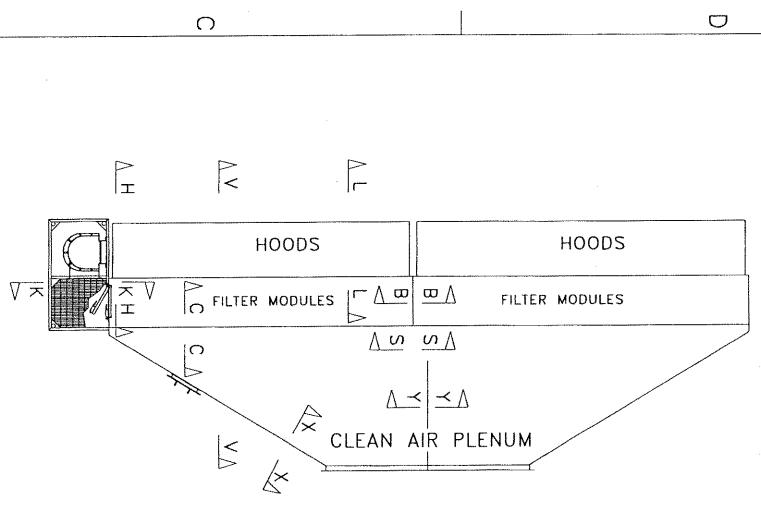
STRUCTURAL
STEEL
ARRANGEMENT

THIRD ANGLE PROJECTION		ALL DIMENSIONS: 1 INCH=25.4 MM	
CHECKED BY: BVC		CHECK DATE: 7/7/05	
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SCALE: 1/8"=1'-0"		SHEET: 1 OF 1	

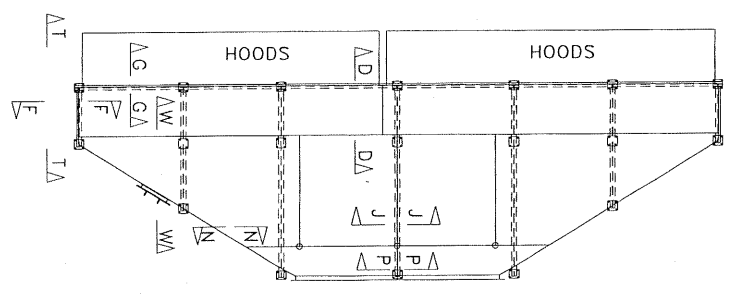
PLAN VIEW



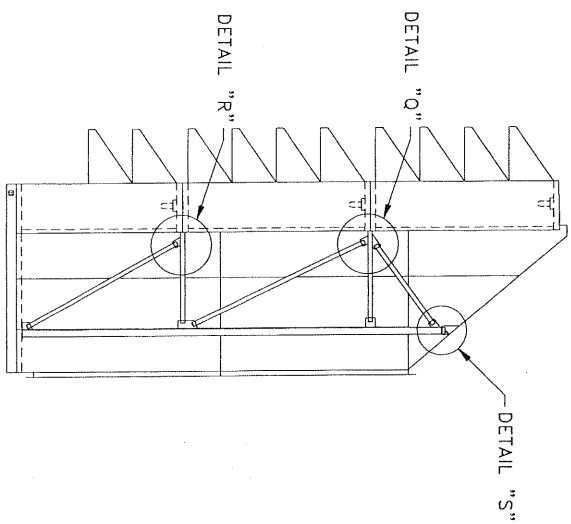
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REVISIONS				
NO.	ZONE	DESCRIPTION	DATE	APPROVED
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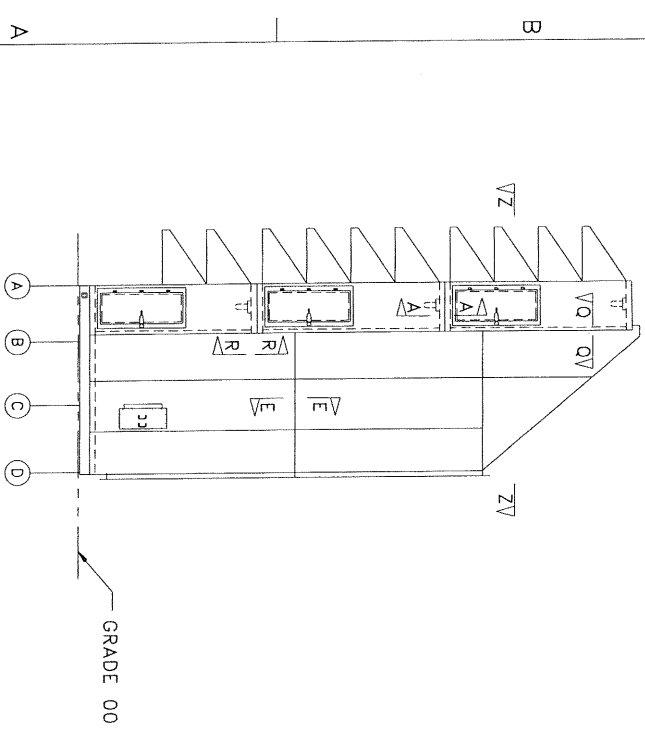
TOP VIEW



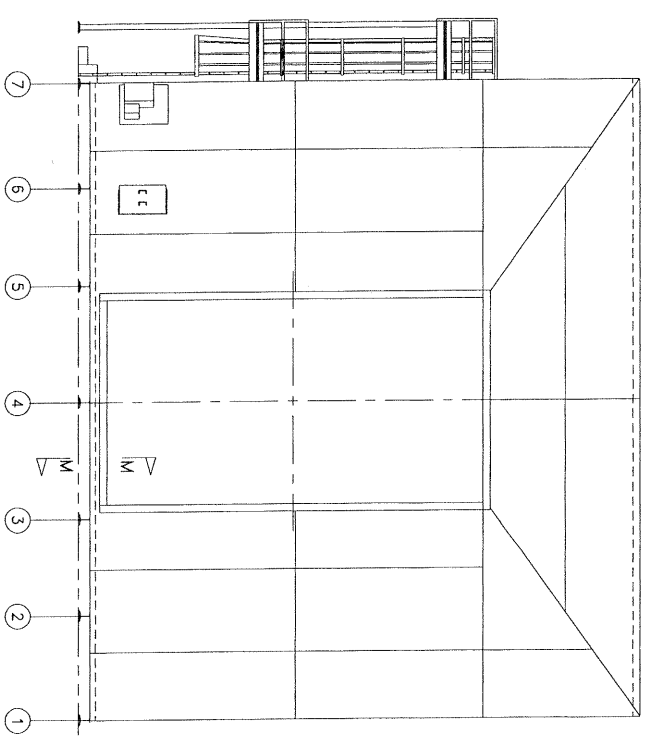
SECTION Z-Z



SECTION "V-V"



SIDE VIEW



FRONT VIEW

THIRD ANGLE PROJECTION

ALL DIMENSIONS: 1 INCH=25.4 MM

DESIGNED BY BVC

CHECKED BY JVC

DATE 11/1/05

TOLERANCE UNITS:
DIMENSIONAL: FRACTIONAL
ANGULAR: DEGREE

9999.97
DWG NO. 7-22169-X-004

SIZE: 11" x 17" (A)

SCALE: 1" = 25.4 MM

DATE: 11/1/05

DATE: 11/1/05

SCALE: 1" = 25.4 MM

WEIGHT: 1.00

2

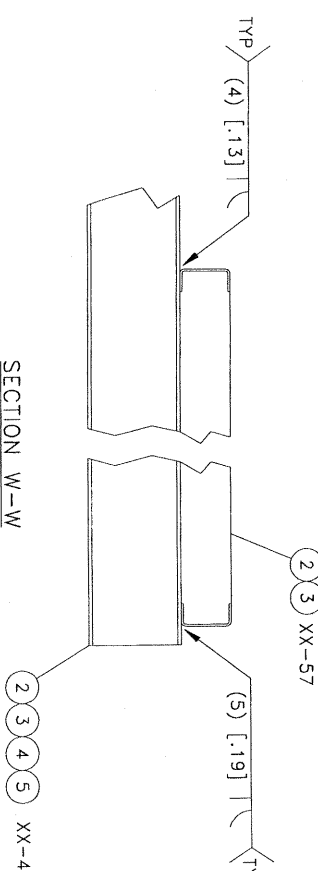
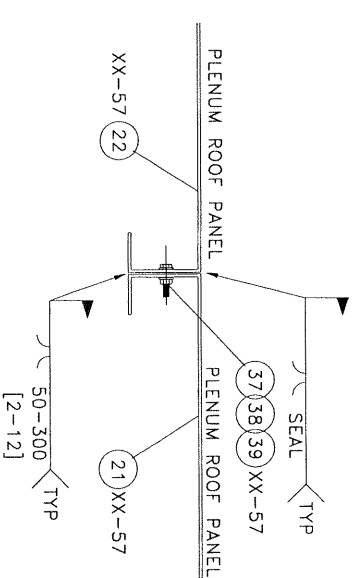
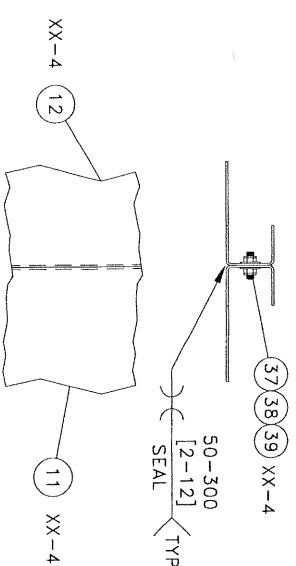
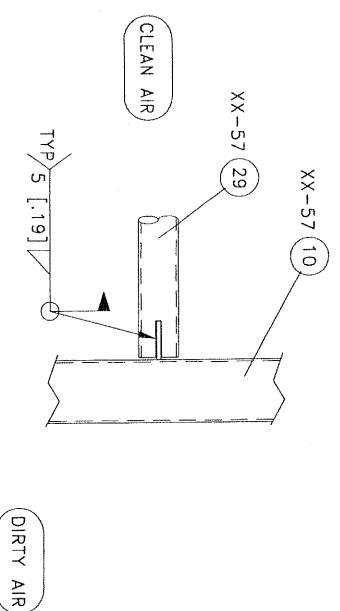
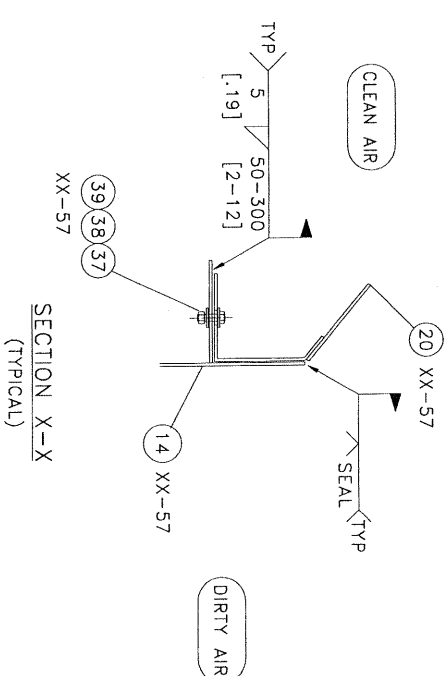
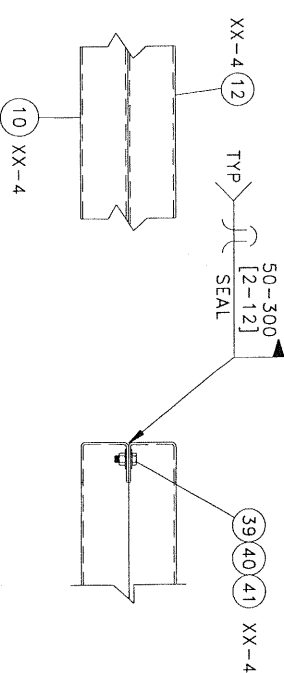
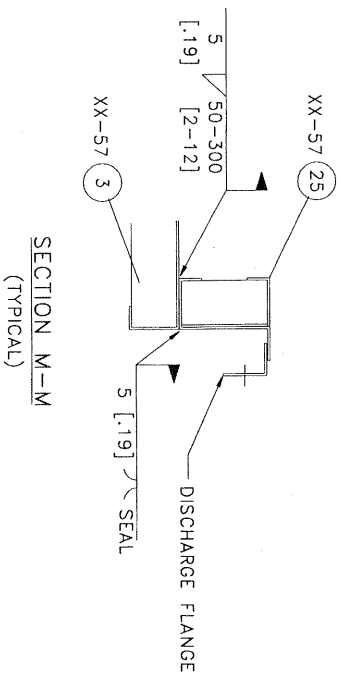
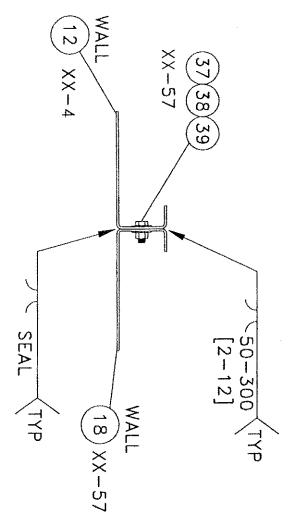
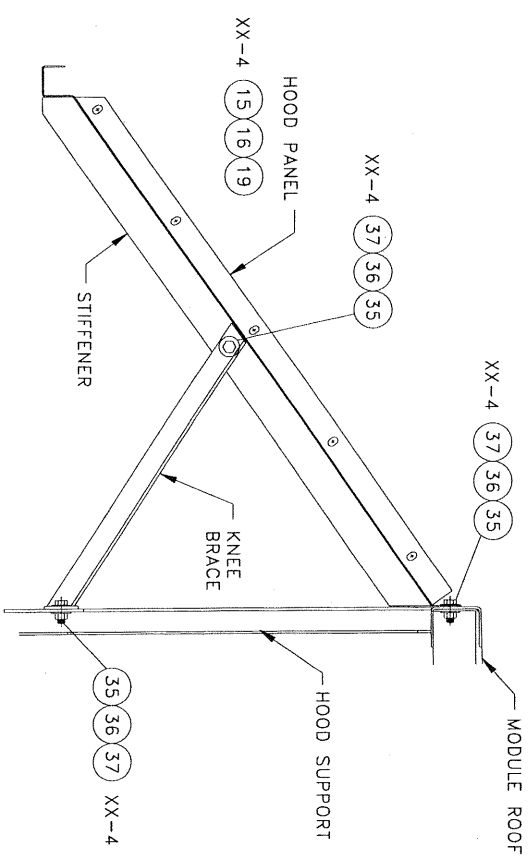
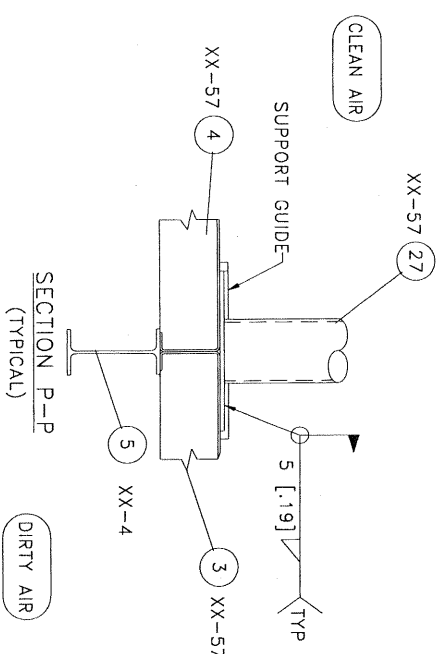
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PNEUMATIC CORPORATION

20 BOX 1548 CHARLOTTE, N.C. 28203-9448

[illegible]

WELD CROSS BEAM WIDTH
PRIOR TO INSTALLING
FILTER MODULE

SECTION W-W
(TYPICAL)

2 3 4 5 XX-4

SECTION L-L
(TYPICAL)

SECTION Q-Q
(TYPICAL)

SECTION M-M
(TYPICAL)

SECTION R-R
(TYPICAL)

SECTION X-X
(TYPICAL)

SECTION Y-Y
(TYPICAL)

SECTION N-N
(TYPICAL)

SECTION S-S
(TYPICAL)

THIRD ANGLE PROJECTION

ALL DIMENSIONS: 1 INCH=25.4 MM

CHECKED BY	CHECK DATE
BVC	7/7/05

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PNEUMAFIL

PNEUMAFIL CORPORATION

GAS TURBINE DIVISION

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CUSTOMER P.O. #	DRAWING NAME:
PNEUMAFIL S.O. #	7-22169
COMPLETED BY:	DWT
NUMBER OF SYSTEMS:	3

PROJECT NAME: PACIFIC RIM ENERGY

DWG. NO.: 7-22169-XX4BOM

FIELD INSTALLATION - INLET AIR FILTRATION SYSTEM

FOR PICTORIAL REPRESENTATION
REFERENCE DRAWING 7-22169-XX-4

LETTER	DATE
A	6/15/05
CURRENT REVISION:	A
SEE LAST PAGE FOR REVISION HISTORY	

ENGINEERING

ITEM NO.	PART NUMBER	BOM REVISION	DESCRIPTION	MATERIAL	QTY.	EXT. QTY.	WEIGHT		LENGTH		WIDTH		HEIGHT		SHIPPABLE
							Kg	POUND	mm	INCH	mm	INCH	mm	INCH	
1	7-22153-AF-1	A	WELDMENT - BEAM, LH, REAR	HDG. CS	1 EA	3 EA	267.2	589.00	10985.5	432.50	203.2	8.00	218.7	8.61	Y
2	7-22153-AF-2	A	WELDMENT - BEAM, LS	HDG. CS	1 EA	3 EA	34.9	77.00	1279.7	50.38	203.2	8.00	218.7	8.61	Y
3	7-22153-AF-2A	A	WELDMENT - BEAM, RS	HDG. CS	1 EA	3 EA	34.9	77.00	1279.7	50.38	203.2	8.00	218.7	8.61	Y
4	7-22153-AF-3	A	WELDMENT - BEAM, LH & RH	HDG. CS	2 EA	6 EA	67.1	148.00	2625.9	103.38	203.2	8.00	218.7	8.61	Y
5	7-22153-AF-4	A	WELDMENT - BEAM, MIDDLE	HDG. CS	3 EA	9 EA	98.9	218.00	4048.3	159.38	203.2	8.00	218.7	8.61	Y
6	7-22153-AF-5	A	WELDMENT - BEAM, RH, REAR	HDG. CS	1 EA	3 EA	68.0	150.00	2603.5	102.50	203.2	8.00	218.7	8.61	Y
7	7-22153-AA-1	A	ASSEMBLYWELDMENT - FILTER MODULE, LOWER, LH	PTD. CS	1 EA	3 EA	3110.3	6857.00	7010.4	276.00	1041.4	41.00	3505.2	138.00	Y
8	7-22153-AA-2	A	ASSEMBLYWELDMENT - FILTER MODULE, LOWER, RH	PTD. CS	1 EA	3 EA	2839.9	6261.00	6400.8	252.00	1041.4	41.00	3505.2	138.00	Y
9	7-22153-AA-3	A	ASSEMBLYWELDMENT - FILTER MODULE, MIDDLE, LH	PTD. CS	1 EA	3 EA	2878.5	6346.00	7010.4	276.00	1041.4	41.00	3937.0	155.00	Y
10	7-22153-AA-4	A	ASSEMBLYWELDMENT - FILTER MODULE, MIDDLE, RH	PTD. CS	1 EA	3 EA	2628.1	5794.00	6400.8	252.00	1041.4	41.00	3937.0	155.00	Y
11	7-22153-AA-5	A	ASSEMBLYWELDMENT - FILTER MODULE, UPPER, LH	PTD. CS	1 EA	3 EA	2878.5	6346.00	7010.4	276.00	1041.4	41.00	3956.1	155.75	Y
12	7-22153-AA-6	A	ASSEMBLYWELDMENT - FILTER MODULE, UPPER, RH	PTD. CS	1 EA	3 EA	2628.1	5794.00	6400.8	252.00	1041.4	41.00	3956.1	155.75	Y
13	7-22169-AC-1	A	PANEL, HOOD, RS	GALVND. CS	20 EA	60 EA	16.8	37.00	1145.8	45.11	927.1	36.50	76.2	3.00	Y
14	7-22169-AC-2	A	PANEL, HOOD, LS	GALVND. CS	20 EA	60 EA	16.8	37.00	1145.8	45.11	927.1	36.50	76.2	3.00	Y
15	7-22169-AC-3	A	WELDMENT - HOOD PANEL, LH, LH & RH MODULES	GALVND. CS	20 EA	60 EA	101.6	224.00	2272.8	89.48	1520.4	59.86	106.2	4.18	Y
16	7-22169-AC-4	A	WELDMENT - HOOD PANEL, RH, LH MODULE	GALVND. CS	10 EA	30 EA	101.6	224.00	2272.8	89.48	1520.4	59.86	106.2	4.18	Y
17	7-22169-AC-5	A	WELDMENT - KNEE BRACE, LH	HDG. CS	60 EA	180 EA	4.5	10.00	757.7	29.83	254.0	10.00	66.0	2.60	Y
18	7-22169-AC-6	A	WELDMENT - KNEE BRACE, RH	HDG. CS	40 EA	120 EA	4.5	10.00	757.7	29.83	254.0	10.00	66.0	2.60	Y
19	7-22169-AC-7	A	WELDMENT - HOOD PANEL, MIDDLE, LH & RH MODULES	GALVND. CS	20 EA	60 EA	93.4	206.00	2261.1	89.02	1520.4	59.86	106.2	4.18	Y
20	7-22169-AC-8	A	WELDMENT - HOOD PANEL, RH, RH MODULE	GALVND. CS	10 EA	30 EA	79.4	175.00	1663.4	65.49	1520.4	59.86	106.2	4.18	Y
21	7-22153-AG-1	A	WELDMENT - PLATFORM, MIDDLE	HDG. CS	1 EA	3 EA	154.2	340.00	2070.1	81.50	1219.2	48.00	187.5	7.38	Y
22	7-22153-AG-2	A	WELDMENT - PLATFORM, UPPER	HDG. CS	1 EA	3 EA	147.0	324.00	2070.1	81.50	1219.2	48.00	187.5	7.38	Y
23	7-22153-AG-3	A	WELDMENT - HAND RAIL, RS	HDG. CS	2 EA	6 EA	45.4	100.00	1257.3	49.50	1117.6	44.00	1231.9	48.50	Y
24	7-22153-AG-4	A	WELDMENT - HAND RAIL, LS, REAR	HDG. CS	2 EA	6 EA	10.0	22.00	215.9	8.50	44.5	1.75	1231.9	48.50	Y
25	7-22153-AG-5	A	WELDMENT - CAGED LADDER	HDG. CS	1 EA	3 EA	326.6	720.00	9194.8	362.00	838.2	33.00	898.4	35.37	Y
26	7-22153-AG-6	A	WELDMENT - SUPPORT COLUMN, UPPER	HDG. CS	3 EA	9 EA	46.3	102.00	3765.6	148.25	279.4	11.00	279.4	11.00	Y
27	7-22153-AG-7	A	WELDMENT - SUPPORT COLUMN, LOWER	HDG. CS	3 EA	9 EA	47.6	105.00	3714.8	146.25	279.4	11.00	279.4	11.00	Y
28	7-22153-AG-8	A	WELDMENT - ACCESS STAIRS	HDG. CS	1 EA	3 EA	63.5	140.00	1092.2	43.00	787.4	31.00	363.2	14.30	Y
29	S52004-B1	A	GATE, SAFETY, SELF CLOSING, FABENCO #A71-24 OR EQUAL	HDG. CS	2 EA	6 EA	11.3	25.00	873.3	34.38	152.4	6.00	609.6	24.00	Y
30	7-22153-XX-57	A	FIELD INSTALLATION - CLEAN AIR PLENUM	PTD. CS	1 LOT	3 LOT	12024.7	26510.00	3048.0	120.00	13411.2	528.00	11550.7	454.75	Y
31	7-22153-XX-4P31	A	ANGLE, 50.0 [2.00] x 50.0 [2.00] x 3.2 [1.3], 6705.6 [264.00] LONG	PTD. CS	2 EA	6 EA	17.3	38.10	6705.6	264.00	50.8	2.00	50.8	2.00	Y
32	S52061-A1	A	PRE-FILTER, BEVERAGE BOARD	-	357 EA	1071 EA	0.5	1.00	590.6	23.25	590.6	23.25	101.6	4.00	Y
33	S51658-B1	A	FINAL FILTER - MODEL TMP-95	-	357 EA	1071 EA	3.6	8.00	593.9	23.38	593.9	23.38	300.2	11.82	Y
34	A52297-B1	A	PRE-FILTER SUPPORT CLIP	GALV. CS	357 EA	1071 EA	0.1	0.20	304.8	12.00	19.1	0.75	35.1	1.38	Y
35	S52165-C4	A	BOLT, HEX HEAD, 1/2-13 x 1 3/4" LONG	HDG. A307	1750 EA	5250 EA	-	-	-	-	-	-	-	-	Y
36	S52200-C31	A	NUT, HEX, 1/2-13	HDG	1754 EA	5282 EA	-	-	-	-	-	-	-	-	Y
37	S52195-D10	A	WASHER, FLAT, 1/2 NOMINAL	HDG	3508 EA	10524 EA	-	-	-	-	-	-	-	-	Y
38	S52165-C13	A	BOLT, HEX HEAD, 1/2-13 x 3" LONG	HDG. A307	4 EA	12 EA	-	-	-	-	-	-	-	-	Y
39	S52166-C4	A	BOLT, HEX HEAD, 5/8-11 x 1 3/4" LONG	HDG. A307	166 EA	498 EA	-	-	-	-	-	-	-	-	Y
40	S52200-C33	A	NUT, HEX, 5/8-11	HDG	166 EA	498 EA	-	-	-	-	-	-	-	-	Y
41	S52195-D12	A	WASHER, FLAT, 5/8 NOMINAL	HDG	332 EA	996 EA	-	-	-	-	-	-	-	-	Y
42	S52164-C5	A	BOLT, HEX HEAD, 3/4-10 x 2" LONG, TYPE 1	HDG. A325	31 EA	93 EA	-	-	-	-	-	-	-	-	Y
43	S52202-D8	A	NUT, HEAVY HEX, 3/4-10	HDG. A194	36 EA	108 EA	-	-	-	-	-	-	-	-	Y
44	S52209-C7	A	WASHER, FLAT, 3/4 NOMINAL, HARDENED STEEL	HDG. F436	72 EA	216 EA	-	-	-	-	-	-	-	-	Y
45	S52164-C7	A	BOLT, HEX HEAD, 3/4-10 x 2 1/2" LONG, TYPE 1	HDG. A325	5 EA	15 EA	-	-	-	-	-	-	-	-	Y

HARDWARE INCLUDES 10% SPARES

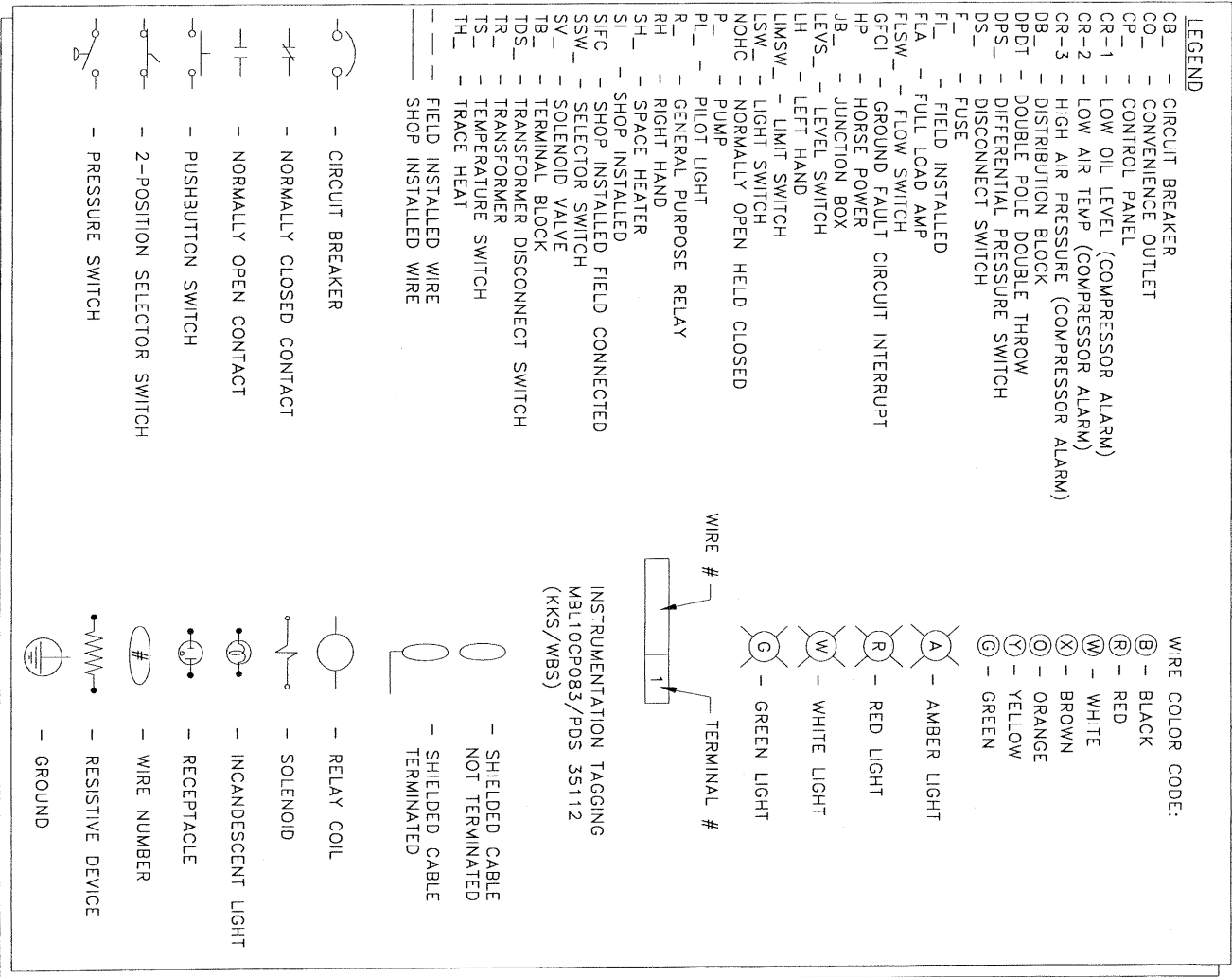
REVISION HISTORY:

LETTER	DATE	BY	CHKD	DATE	DESCRIPTION
REV. A	6/15/05	DWT	BVC	7/7/05	RELEASED

MATERIAL LEGEND:

SS = STAINLESS STEEL	CS = CARBON STEEL
MS = MILD STEEL	SNTR BRZ = SINTERED BRONZE
AL = ALUMINUM	HDG = HOT DIPPED GALVANIZED
PTD = PAINTED	GALVND = GALVANEAL
GALV = GALVANIZED	RBR = RUBBER
PVC = POLYVINYL CHLORIDE	CPVC = CHLORINATED POLYVINYL CHLORIDE
NPRN = NEOPRENE	NYL = NYLON
LOT = SUB BILL OF MATERIAL	FT = FOOT
EA = EACH	EPY = EPOXY
PRM = PRIMED	

- NOTES:
- 1) ALL WIRING SHALL CONFORM TO THE LATEST EDITION OF THE NEC (CURRENT EDITION) OR THE AUTHORITY HAVING JURISDICTION.
 - 2) ALL WIRES, BOTH ENDS, SHALL BE MARKED WITH CORRESPONDING TERMINAL NUMBERS AND COVERED WITH SHRINK TUBING.
 - 3) ALL SWITCHES AND RELAYS ARE SHOWN IN THE STATIC STATE (OFF-SHELF).
 - 4) ALL SWITCHES SHALL BE FACTORY PRESET TO SETTINGS NOTED ON THIS DRAWING.
 - 5) ALL JUNCTION BOXES, SWITCHES, TERMINAL BLOCKS SHALL BE IDENTIFIED WITH LEGEND PLATES DENOTING APPROPRIATE LABEL PER THIS DRAWING.
 - 6) ALL WIRING SHALL BE STRANDED COPPER, TYPE "XHHW", 600V, 90°C, UNLESS OTHERWISE NOTED.
 - 7) ALL WIRES SHALL BE TERMINATED ON TERMINAL BLOCKS OR DESIGNATED WIRE TERMINALS. THERE SHALL BE NO SPLICING OF WIRES.
 - 8) CONTROL CIRCUITS SHALL BE #14 AWG AND POWER CIRCUITS SHALL BE #12 AWG UNLESS OTHERWISE NOTED. REFERENCE NOTE 1 FOR ALL OTHER CIRCUITS.
 - 9) ALL WIRE JUMPERS SHALL BE SHOP INSTALLED.
 - 10) ALL CONDUIT SHALL BE SUPPORTED AT LEAST EVERY 10 FT. IN ADDITION, CONDUIT SHALL BE SECURELY FASTENED WITHIN 1 FT. OF EACH OUTLET BOX, JUNCTION BOX, DEVICE BOX, CABINET, CONDUIT BODY, OR OTHER CONDUIT TERMINATION. SEE NOTE 1 FOR EXCEPTIONS.
 - 11) CONDUIT SHALL NOT BE USED FOR GROUNDING. THEREFORE, A SEPARATE GROUNDING CONDUCTOR SHALL BE RUN THROUGHOUT RACEWAY TO ALL DEVICES. CONTROL CIRCUITS SHALL BE A MINIMUM #14 AWG. POWER CIRCUITS SHALL BE A MINIMUM #12 AWG. ALL GROUNDING CONDUCTORS SHALL HAVE GREEN OR GREEN WITH ONE OR MORE YELLOW STRIPES INSULATION. REFERENCE NOTE 1 FOR ALL OTHER CIRCUITS.
 - 12) THE NUMBER OF TERMINALS SHOWN SHALL BE SUPPLIED AS A MINIMUM.
 - 13) NO MORE THAN TWO WIRES SHALL BE CONNECTED TO AN INDIVIDUAL TERMINAL POINT.
 - 14) ALL WIRING DEVICES AND ELECTRICAL HARDWARE SHALL BE CERTIFIED BY UNDERWRITERS LABORATORY (UL), FACTORY MUTUAL (FM), AND ELECTRICAL TESTING LABORATORY (ETL) OR OTHER APPROPRIATE THIRD PARTY TESTING LABORATORY.
 - 15) MODULE CONVENTION FOR THIS DRAWING IMPLIES STANDING INSIDE THE CLEAN AIR PLENUM FACING THE DISCHARGE FLANGE.
 - 16) SEE DWG XX-20 FOR REQUIRED TAGGING AND INSTRUMENT SETPOINTS VALUES AND RANGES.
 - 17) ALL SHOP INSTALLED WIRING SHALL BE INSPECTED FOR CONTINUITY PRIOR TO SHIPPING EQUIPMENT.
 - 18) ALL WIRING SHALL BE FIELD INSPECTED FOR CONTINUITY PRIOR TO ENERGIZING ANY CIRCUIT. ANY REPAIRS SHALL BE MADE PRIOR TO ENERGIZING SYSTEM.
 - 19) SHIELDED (SHD) CONTROL WIRING TO BE UNGROUNDED. DEVICE END INCORPORATES FLOATING SHIELD. TERMINAL BLOCK END IS SECURED TO TERMINAL BLOCK LUG.



CHECKED BY BVC		CHECK DATE 7/7/05	
THIRD ANGLE PROJECTION		ALL DIMENSIONS: 1 INCH=25.4 MM	
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SIZE 1: 1.00 PLOT DATE DWG NO. 7-22169-XX-5 SCALE NONE WEIGHT SHEET 1 OF 3		MODULE WIRING DIAGRAM (NEMA 4)	

REVISIONS		DATE	APPROVED	CHECKED	DATE
NO.	ZONE				

DESCRIPTION

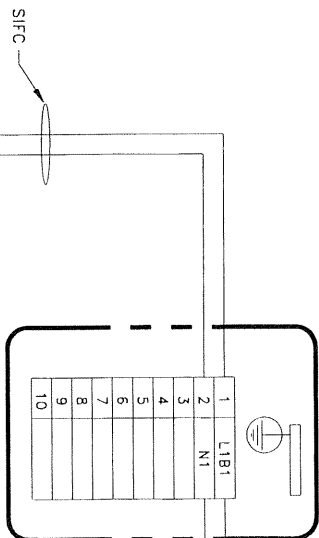
DATE APPROVED

CHECKED

DATE

D

JB-3
THIRD LEVEL

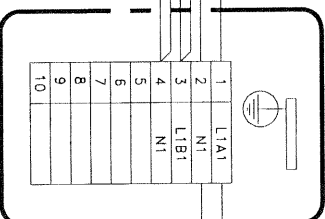


SEE NOTE 'B'
ZONE [A3]

THIRD LEVEL

C

JB-2
SECOND LEVEL

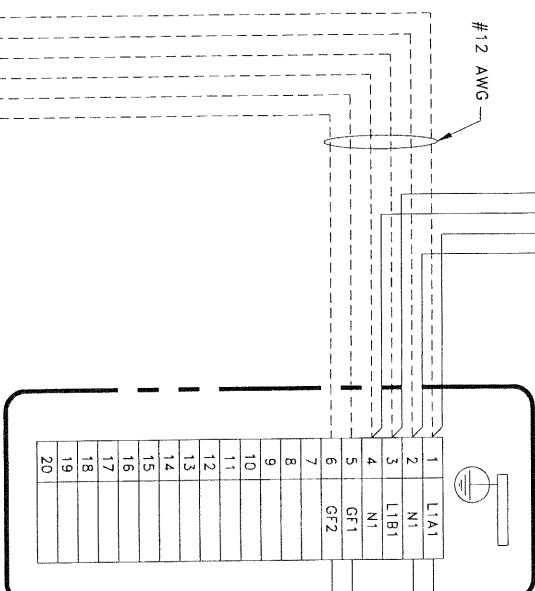


SEE NOTE 'B'
ZONE [A3]

SECOND LEVEL

B

JB-1
FIRST LEVEL



SEE NOTE 'B'
ZONE [A3]

FIRST LEVEL

SEE NOTE 'A'
ZONE [B3]
TYPICAL

#12 AWG

INF-1B1
(TB)
SHT 2, ZONE [08]

NOTE 'A'
ALL SHOP INSTALLED FIELD CONNECTED WIRES ARE
PIG-TAIL CONNECTIONS. THE WIRES ARE CONNECTED AT
ONE END AND THE OPPOSITE ENDS ARE LABELED, SECURED,
AND SEALED IN PLASTIC TO PREVENT CONTAMINATION
DURING SHIPMENT. SHOP SHALL LEAVE ADEQUATE LENGTH
OF FLEXIBLE CONDUIT AND WIRE FOR FIELD TERMINATION

NOTE 'B'
WIRING AND CONDUIT BETWEEN LEFT-HAND MODULES LIGHTS
AND RIGHT-HAND MODULES LIGHTS SHALL BE FIELD INSTALLED

CHECKED BY: BVC
CHECK DATE: 7/1/05

THIRD ANGLE PROJECTION

ALL DIMENSIONS: 1 INCH=25.4 MM

SCALE: 1" = 1.00'

DATE: 7-22169-XX-5

PNEUMATIC CORPORATION
P.O. Box 1846, Charlotte, N.C. 28217-1846

REV. A

2

SCALE: NONE

WEIGHT

SHEET

3 OF 3

GROUP

8

7

6

5

4

3

A

B

C

D

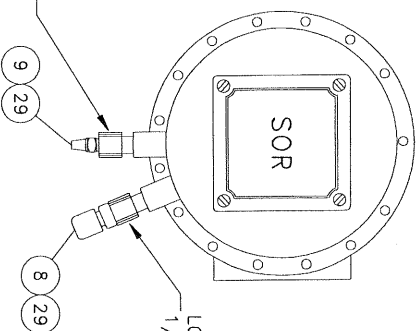
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- Figure 1: Schematic diagram of the experimental setup. The diagram shows a laser beam incident on a sample. The scattered light is collected by a detector. The distances are labeled as follows: 44.00 [1117.6] cm between the sample and the detector, 42.00 [1066.8] cm between the sample and the laser, and 1.00 [25.4] cm between the laser and the detector.



Ø0.63 [Ø16.0
(6 HOLES)

CONTROL PANEL MOUNTING ANGLES
SHOWN FOR REFERENCE ONLY
(NOT PART OF THIS ASSEMBLY)

LOW PRESSURE PORT
1/4" NPT (F) CONN.



HIGH PRESSURE PORT
1/4" NPT (F) CONN.

VIEW A-A
ZONE [C3]

FINISHED PARTS MUST
BE FREE OF BURRS
AND SHARP EDGES

CHECKED BY BVC	CHECK DATE 7/7/05
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PNEUMAFIL CORPORATION
GAS TURBINE DIVISION
P.O. BOX 16348, CHARLOTTE, N.C. 28287-0348

CONTROL PANEL
ASSEMBLY
(NEMA 4)

SIZE	PLOT SCALE 1: 3.00	DWG NO.	7-22169-XX-6	REV.	A
D	PLOT DATE				
SCALE 4"=1'-0"	WEIGHT		SHEET	1 OF	1

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PROJECT NAME: PACIFIC RIM ENERGY

DWG. NO.: 7-22169-XX-6BOM
CONTROL PANEL ASSEMBLY (NEMA 4)

FOR PICTORIAL REPRESENTATION
REFERENCE DRAWING 7-22169-XX-6

CUSTOMER P.O. #	DRAWING NAME:
PNEUMAFIL S.O. #	7-22169
COMPLETED BY:	DWT
NUMBER OF SYSTEMS:	3

LETTER	DATE
A	6/15/05
CURRENT REVISION:	A
SEE LAST PAGE FOR REVISION HISTORY	

ENGINEERING											
ITEM NO.	PART NUMBER	BOM REVISION	DESCRIPTION	MATERIAL	QTY.	EXT. QTY.	WEIGHT		LENGTH		SHIPPABLE
							POUND	Kg	INCH	mm	
1	7-22169-XX-6P1	A	PANEL, 44" x 40" x 10 GAUGE	SS	1 EA	3 EA					N
2	7-22169-XX-7	A	CONTROL PANEL ENCLOSURE SUB-PANEL ASSEMBLY (INF-JB1)	-	1 EA	3 EA					N
3	7-22169-XX-16	A	CONTROL PANEL ENCLOSURE SUB-PANEL ASSEMBLY (INF-JB2)	-	1 EA	3 EA					N
4	7-22169-XX-17	A	ASSEMBLY, SWITCH, DISCONNECT, 120V, 3 PHASE	-	1 EA	3 EA					N
5	SS2033-B1	A	SWITCH, DIFFERENTIAL PRESSURE	-	1 EA	3 EA					N
6	7-22169-XX-6P6	B	GAUGE, CAPSULELIC DIFFERENTIAL PRESSURE, 0-600 Pa	-	1 EA	3 EA					N
7	7-22169-XX-6P7	B	GAUGE, CAPSULELIC DIFFERENTIAL PRESSURE, 0-1.5 Kpa	-	1 EA	3 EA					N
8	Q-9385	A	CONNECTOR, STR., 1/4" NPT x 1/4" TUBE	SS	4 EA	12 EA					N
9	Q-9847	A	MUFFLER, 1/4" NPT	SNTR BRZ	2 EA	6 EA					N
10	AS1663-B1	A	STAND-OFF BRACKET	SS	2 EA	6 EA					N
11	Q-4490	A	CONDUIT, 3/4" LIQUIDTIGHT FLEXIBLE METAL	-	2 FT	6 FT					
12	Q-10903	A	CONNECTOR, STR., 3/4", LIQUIDTIGHT FLEX., INSULATED	-	1 EA	3 EA					N
13	AS2129-D100	A	LEGEND PLATE, 1" x 3" x 1/16" PHENOLIC, WHT W/BLK CORE	-	1 EA	3 EA					N
14	AS2129-D101	A	LEGEND PLATE, 1" x 3" x 1/16" PHENOLIC, WHT W/BLK CORE	-	1 EA	3 EA					N
15	AS2129-D105	A	LEGEND PLATE, 1" x 3" x 1/16" PHENOLIC, WHT W/BLK CORE	-	1 EA	3 EA					N
16	AS2129-D107	A	LEGEND PLATE, 1" x 3" x 1/16" PHENOLIC, WHT W/BLK CORE	-	1 EA	3 EA					N
17	AS2129-D108	A	LEGEND PLATE, 1" x 3" x 1/16" PHENOLIC, WHT W/BLK CORE	-	1 EA	3 EA					N
18	AS2129-D109	A	LEGEND PLATE, 1" x 3" x 1/16" PHENOLIC, WHT W/BLK CORE	-	1 EA	3 EA					N
19	SS2174-D90	A	BOLT, HEX HEAD, 3/8-16 x 1 1/4" LONG	SS	10 EA	30 EA					N
20	SS2200-C43	A	NUT, 3/8-16	SS	10 EA	30 EA					N
21	SS2196-D109	A	WASHER, FLAT, 3/8" NOMINAL	SS	20 EA	60 EA					N
22	SS2197-C40	A	WASHER, LOCK, 3/8" NOMINAL	SS	10 EA	30 EA					N
23	SS2174-D24	A	BOLT, HEX HEAD, 1/4-20 x 1 1/4" LONG	SS	10 EA	30 EA					N
24	SS2200-C41	A	NUT, 1/4-20	SS	10 EA	30 EA					N
25	SS2196-D107	A	WASHER, FLAT, 3/8" NOMINAL	SS	20 EA	60 EA					N
26	SS2197-C38	A	WASHER, LOCK, 3/8" NOMINAL	SS	10 EA	30 EA					N
27	SS2175-C11	A	SCREW, PAN HEAD, #6-32 x 1/2" LONG	SS	20 EA	60 EA					N
28	SS2175-C32	A	SCREW, PAN HEAD, #8-32 x 3/4" LONG	SS	10 EA	30 EA					N
29	Q-9388	A	TAPE, PTFE THREAD SEALANT, 1/2" ROLL	-	1 EA	3 EA					N

NOTE: HARDWARE INCLUDES 10% SPARES

REVISION HISTORY:				DESCRIPTION
LETTER	DATE	BY	CHKD	DATE
REV. A	6/15/05	DWT	BVC	7/7/05
				RELEASED

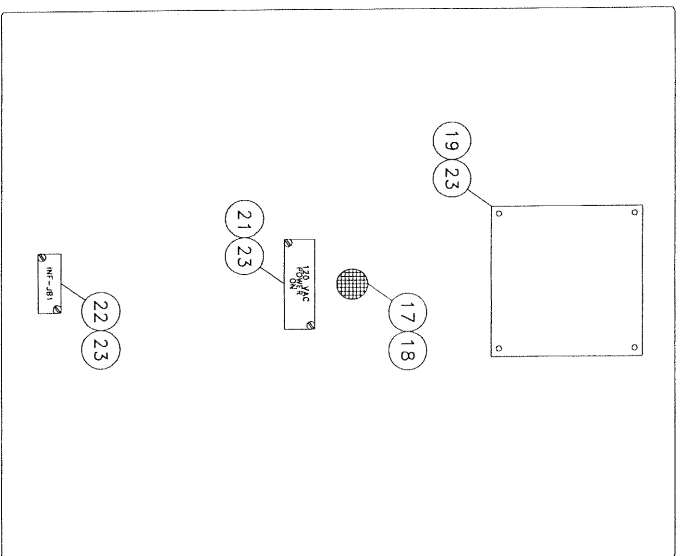
MATERIAL LEGEND:			
SS = STAINLESS STEEL	CS = CARBON STEEL		
MS = MILD STEEL	SNTR BRZ = SINTERED BRONZE		
AL = ALUMINUM	HDG = HOT DIPPED GALVANIZED		
PTD = PAINTED	GALVND = GALVANEAL		
GALV = GALVANIZED	RBR = RUBBER		
PVC = POLYVINYL CHLORIDE	CPVC = CHLORINATED POLYVINYL CHLORIDE		
NPRN = NEOPRENE	NYL = NYLON		
LOT = SUB BILL OF MATERIAL	FT = FOOT		
EA = EACH	EPY = EPOXY		
PRM = PRIMED			

NOTES:

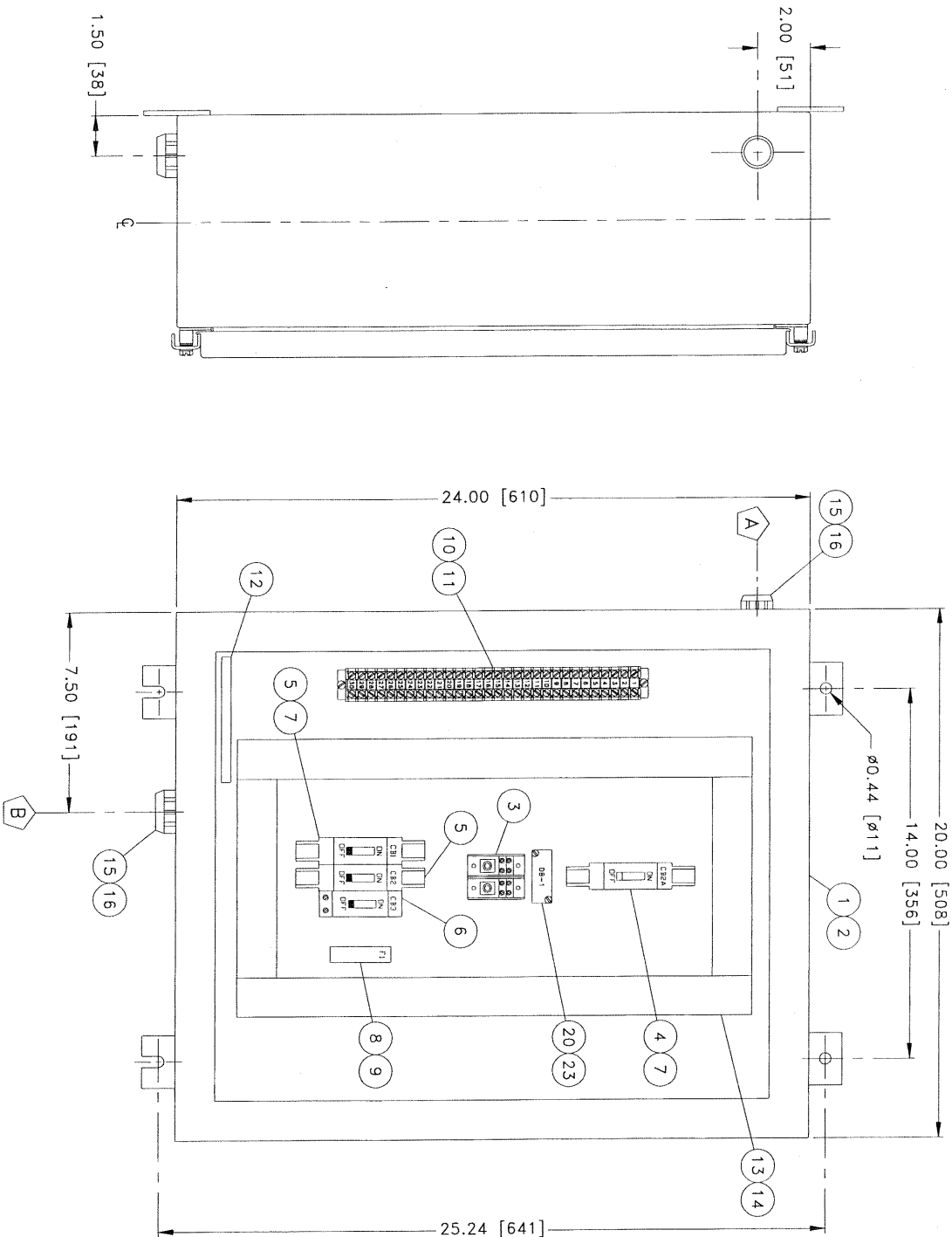
- 1) ALL WIRING SHALL CONFORM TO THE LATEST EDITION OF THE NEC (NATIONAL ELECTRICAL CODE) OR THE AUTHORITY HAVING JURISDICTION.
- 2) ALL WIRES, BOTH ENDS, SHALL BE MARKED WITH CORRESPONDING TERMINAL NUMBERS AND COVERED WITH SHRINK TUBING.
- 3) LEGEND PLATES ON ENCLOSURES SHALL BE ATTACHED VIA SS SCREWS INTO TAPPED HOLES.
- 4) ALL WIRING SHALL BE STRANDED COPPER, TYPE "XHHW", 600V, 90°C, UNLESS OTHERWISE NOTED.
- 5) ALL WIRES SHALL BE TERMINATED ON TERMINAL BLOCKS OR DESIGNATED WIRE TERMINALS. THERE SHALL BE NO SPLICING OF WIRES.
- 6) CONDUIT SHALL NOT BE USED FOR GROUNDING, THEREFORE, A SEPARATE GROUNDING CONDUCTOR SHALL BE RUN THROUGHOUT RACEWAY TO ALL DEVICES. CONTROL CIRCUITS SHALL BE A MINIMUM #14 AWG. POWER CIRCUITS SHALL BE A MINIMUM #12 AWG. ALL GROUNDING CONDUCTORS SHALL HAVE GREEN OR GREEN WITH ONE OR MORE YELLOW STRIPES INSULATION. REFERENCE NOTE 1 FOR ALL OTHER CIRCUITS.
- 7) THE NUMBER OF TERMINALS SHOWN SHALL BE SUPPLIED AS A MINIMUM WITH 10% SPARES.
- 8) NO MORE THAN TWO WIRES CAN BE CONNECTED TO ONE TERMINAL POINT.
- 9) ALL WIRING DEVICES AND ELECTRICAL HARDWARE SHALL BE CERTIFIED BY UNDERWRITERS LABORATORY (UL), FACTORY MUTUAL (FM), ELECTRICAL TESTING LABORATORY (ETL) OR OTHER APPROPRIATE THIRD PARTY TESTING LABORATORY.
- 10) PLACE TWO (2) BAGS OF DESSICANT (CALCIUM CHLORIDE) INSIDE OF ENCLOSURE PRIOR TO SHIPMENT TO PREVENT CONDENSATION.

LEGEND:

- A** - (3/4" NPT) TO LIGHTING CIRCUITS (120VAC/1/60)
- B** - (3/4" NPT) FROM TRANSFORMER (120VAC/1/60)



COVER SHOWN SEPARATELY FOR CLARITY

FOR BILL OF MATERIALS
REFERENCE DWG XX-7BOMCHECKED BY: BVC
CHECK DATE: 7/7/05PNEUMAFIL CORPORATION
GAS TURBINE DIVISION
P.O. BOX 1636, CHAMLOTTE, N.C. 28027-6366CONTROL BOX
ASSEMBLY
(NEMA 4)

THIRD ANGLE PROJECTION

ALL DIMENSIONS: 1 INCH=25.4 MM

SIZE: 1:1
SCALE: 1:1
WEIGHT: 1 OF 1
SHEET: 1 OF 1
PNEUMAFIL CORPORATION
2005

PROJECT NAME: PACIFIC RIM ENERGY

DWG. NO.: 7-22169-XX-7BOM

CONTROL BOX ASSEMBLY (NEMA 4)

FOR PICTORIAL REPRESENTATION
REFERENCE DRAWING 7-22169-XX-7

CUSTOMER P.O. #	DRAWING NAME:
PNEUMAFIL S.O. #	7-22169
COMPLETED BY:	DWT
NUMBER OF SYSTEMS:	3

LETTER	DATE
A	6/15/05
CURRENT REVISION:	A
SEE LAST PAGE FOR REVISION HISTORY	

ENGINEERING																
ITEM NO.	PART NUMBER	BOM REVISION	DESCRIPTION	MATERIAL	QTY.	EXT. QTY.	WEIGHT		LENGTH		WIDTH		HEIGHT		SHIPPABLE	
							POUND	Kg	INCH	mm	INCH	mm	INCH	mm		
1	Q-11095	A	ENCLOSURE, 24" x 20" x 8", NEMA 4	-	1 EA	3 EA									N	
2	Q-7848	A	PANEL, MOUNTING, 21" x 17"	-	1 EA	3 EA									N	
3	Q-10955	A	DISTRIBUTION BLOCK, 2-POLE, 600 VAC, (1) #2/0-#14 AWG x (6) #4-#14 AWG	-	1 EA	3 EA									N	
4	S51847-C8	A	CIRCUIT BREAKER, 50 AMP, SP, 120 VAC	-	1 EA	3 EA									N	
5	S51847-C2	A	CIRCUIT BREAKER, 20 AMP, SP, 120 VAC	-	2 EA	6 EA									N	
6	Q-11286	A	CIRCUIT BREAKER, 20 AMP, SP, 120 VAC, GFCI	-	1 EA	3 EA									N	
7	Q-10916	A	MOUNTING HARDWARE FOR SERIES C G-FRAME CIRCUIT BREAKERS (GC), ACCEPTS UP TO 6 POLES	-	1 EA	3 EA									N	
8	Q-11053	A	HOLDER, FUSE, 1/4" x 1 1/4", 15A, 250VAC	-	1 EA	3 EA									N	
9	Q-11052	A	FUSE 1A, 250VAC, NON-TIME DELAY, 1/4" x 1 1/4"	-	1 EA	3 EA									N	
10	Q-10958	A	TERMINAL BLOCK, 600 VAC, 40 AMP, #10-#22 AWG, KANT KUT CONNECTOR, FLAT MOUNT	-	30 EA	90 EA									N	
11	Q-10884	A	TERMINAL BLOCK, END SECTION, FLAT MOUNT	-	1 EA	3 EA									N	
12	Q-10928	A	GROUNDING BUSS BAR, #14-#4 AWG, 14 TERMINALS	-	1 EA	3 EA									N	
13	Q-11088	A	DUCT, WIRE, PVC, TYPE "E", 1"W x 2"H, 6 FT, LENGTHS	PVC	1 EA	3 EA									N	
14	Q-11089	A	COVER, WIRE DUCT, 1" W, 6 FT, LENGTHS	PVC	1 EA	3 EA									N	
15	Q-10927	A	HUB, BULLET, 3/4", INSULATED	AL	2 EA	6 EA									N	
16	Q-10872	A	PLUG, 3/4" NPT, RED	POLYETHYLENE	2 EA	6 EA									N	
17	7-22169-XX-7P17	A	LIGHT, INDICATOR, 22mm, WHITE	-	1 EA	3 EA									N	
18	7-22169-XX-7P18	A	HOLDER, LAMP, 22mm, WHITE	-	1 EA	3 EA									N	
19	7-22169-NPT	A	NAMEPLATE, SYSTEM	-	1 EA	3 EA									N	
20	A52129-D3	A	LEGEND PLATE, 3/4" x 2" x 1/16" THICK, WHITE W/BLACK CORE, ENGRAVED "DB-1"	-	1 EA	3 EA									N	
21	A52129-D102	A	LEGEND PLATE, 1" x 3" LG, PHENOLIC, WHT W/BLK CORE, "120 VAC, POWER, ON"	-	1 EA	3 EA									N	
22	A52129-D13	A	LEGEND PLATE, 3/4" x 2" x 1/16" THICK, WHITE W/BLACK CORE, ENGRAVED "INF-JBT"	-	1 EA	3 EA									N	
23*	SS2175-C11	A	SCREW, PAN HEAD, #6-32 x 1/2" LONG	SS	20 EA	60 EA									N	
24*	7-22169-XX-7P25	A	WIRE NUMBERS AND SHRINK TUBING PER XX-5	-	1 EA	3 EA									N	
25*	Q-11251	A	WIRE, #12 AWG, STRANDED CU, TYPE "XHHW", 600 V, BLACK	-	30 FT	90 FT									N	
26*	Q-11171	A	WIRE, #12 AWG, STRANDED CU, TYPE "XHHW", 600 V, WHITE	-	30 FT	90 FT									N	
27*	Q-10945	A	WIRE, #12 AWG, STRANDED CU, TYPE "XHHW", 600 V, GREEN	-	10 FT	30 FT									N	
28*	Q-10918	A	WIRE, #14 AWG, STRANDED CU, TYPE "XHHW", 600 V, BLACK	-	10 FT	30 FT									N	
29*	Q-10919	A	WIRE, #14 AWG, STRANDED CU, TYPE "XHHW", 600 V, WHITE	-	10 FT	30 FT									N	
30*	Q-10920	A	WIRE, #14 AWG, STRANDED CU, TYPE "XHHW", 600 V, GREEN	-	10 FT	30 FT									N	
31*	Q-10917	A	WIRE, #14 AWG, STRANDED CU, TYPE "XHHW", 600 V, RED	-	10 FT	30 FT									N	
	OPEN NUMBER															
33*	Q-11404	A	WIRE FERRULE, #8 AWG, RED	-	5 EA	15 EA									N	
34*	Q-11356	A	WIRE FERRULE, #12 AWG, GRAY	-	40 EA	120 EA									N	
35*	Q-11355	A	WIRE FERRULE, #14 AWG, BLUE	-	20 EA	60 EA									N	

NOTE: HARDWARE INCLUDES 10% SPARES
* - INDICATES NOT SHOWN ON DRAWING

REVISION HISTORY:			
LETTER	DATE	BY	CHKD
REV. A	6/15/05	DWT	BVC
DESCRIPTION			
RELEASED			

MATERIAL LEGEND:			
SS = STAINLESS STEEL	CS = CARBON STEEL		
MS = MILD STEEL	SNTR BRZ = SINTERED BRONZE		
AL = ALUMINUM	HDG = HOT DIPPED GALVANIZED		
PTD = PAINTED	GALVND = GALVANEAL		
GALV = GALVANIZED	RBR = RUBBER		
PVC = POLYVINYL CHLORIDE	CPVC = CHLORINATED POLYVINYL CHLORIDE		
NPRN = NEOPRENE	NYL = NYLON		
LOT = SUB BILL OF MATERIAL	FT = FOOT		
EA = EACH	EPY = EPOXY		
PRM = PRIMED			

8

7

6

5

4

3

DWG NO. 7-22169-XX-016

SHEET 1 REV A

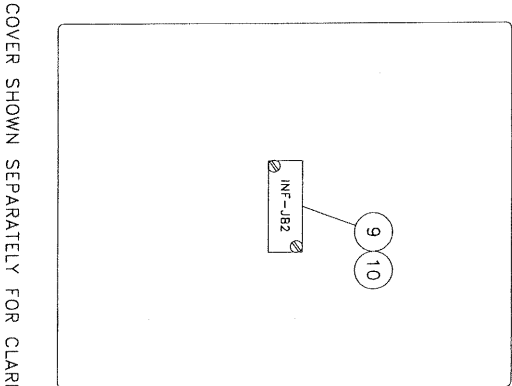
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NOTES:

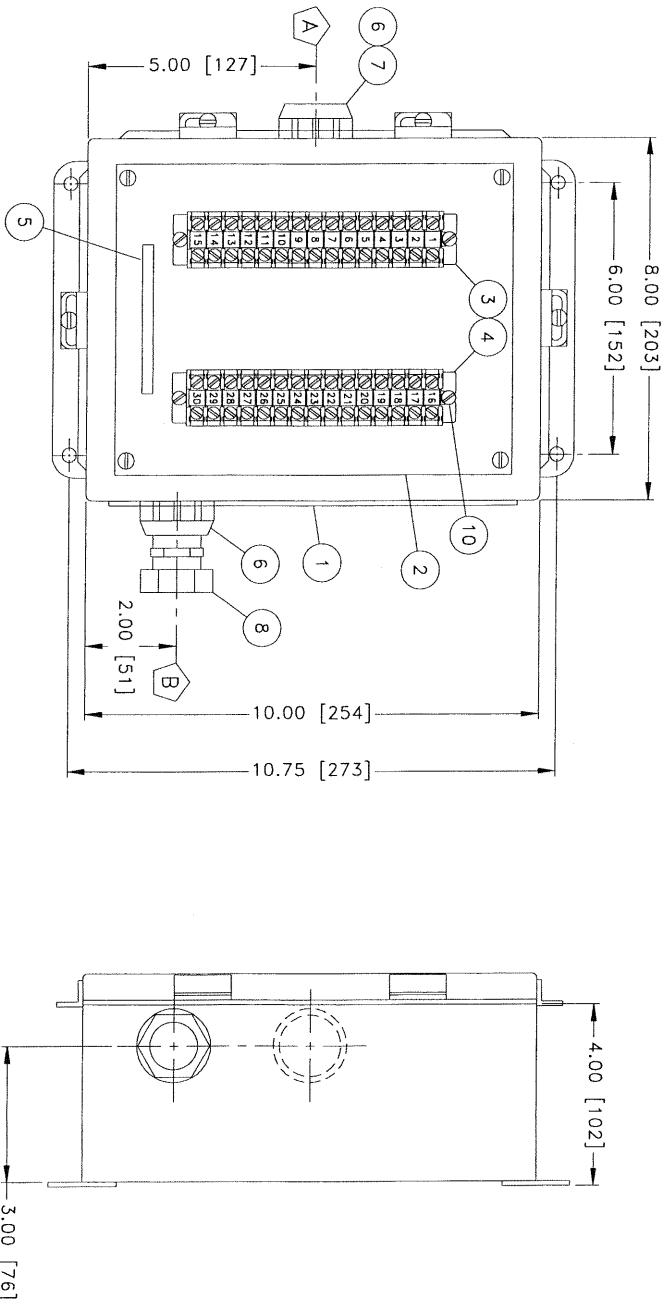
- 1) ALL WIRING SHALL CONFORM TO THE LATEST EDITION OF THE NEC (NATIONAL ELECTRICAL CODE) OR THE AUTHORITY HAVING JURISDICTION.
- 2) ALL WIRES, BOTH ENDS, SHALL BE MARKED WITH CORRESPONDING TERMINAL NUMBERS AND COVERED WITH SHRINK TUBING.
- 3) LEGEND PLATES ON ENCLOSURES SHALL BE ATTACHED VIA SS SCREWS INTO TAPPED HOLES.
- 4) ALL WIRING SHALL BE STRANDED COPPER, TYPE "XHHW", 600V, 90°C, UNLESS OTHERWISE NOTED.
- 5) ALL WIRES SHALL BE TERMINATED ON TERMINAL BLOCKS OR DESIGNATED WIRE TERMINALS. THERE SHALL BE NO SPLICING OF WIRES.
- 6) CONDUIT SHALL NOT BE USED FOR GROUNDING. THEREFORE, A SEPARATE GROUNDING CONDUCTOR SHALL BE RUN THROUGHOUT RACEWAY TO ALL DEVICES. CONTROL CIRCUITS SHALL BE A MINIMUM #14 AWG, POWER CIRCUITS SHALL BE A MINIMUM #12 AWG., ALL GROUNDING CONDUCTORS SHALL HAVE GREEN OR GREEN WITH ONE OR MORE YELLOW STRIPES INSULATION. REFERENCE NOTE 1 FOR ALL OTHER CIRCUITS.
- 7) THE NUMBER OF TERMINALS SHOWN SHALL BE SUPPLIED AS A MINIMUM WITH 10% SPARES.
- 8) NO MORE THAN TWO WIRES CAN BE CONNECTED TO ONE TERMINAL POINT.
- 9) ALL WIRING DEVICES AND ELECTRICAL HARDWARE SHALL BE CERTIFIED BY UNDERWRITERS LABORATORY (UL), FACTORY MUTUAL (FM), ELECTRICAL TESTING LABORATORY (ETL) OR OTHER APPROPRIATE THIRD PARTY TESTING LABORATORY.
- 10) PLACE TWO (2) BAGS OF DESSICANT (CALCIUM CHLORIDE) INSIDE OF ENCLOSURE PRIOR TO SHIPMENT TO PREVENT CONDENSATION.

LEGEND:

- (A) - (1/2" NPT) CUSTOMER INTERFACE (24/48 VDC)
- (B) - (1/2" NPT) TO DPS1



COVER SHOWN SEPARATELY FOR CLARITY



FOR BILL OF MATERIALS
REFERENCE DWG XX-16BOM

DESIGNED BY
BVC

CHECKED BY
7/7/83

PNEUMAFIL CORPORATION
P.O. Box 6346, Charlotte, N.C. 28217-4346

**CONTROL PANEL
ENCLOSURE SUB-PANEL
ASSEMBLY (NEMA 4)**

THIRD ANGLE PROJECTION		ALL DIMENSIONS: 1 INCH=25.4 MM	
SIZE	SCALE	DATE	REV
D	1:2.00	7-22169-XX-16	A
TOLERANCE UNLESS OTHERWISE SPECIFIED:		SHEET 1 OF 1	
DIMENSIONAL	2	PNEUMAFIL CORPORATION	
ANGULAR	0.005	© 2005	

PROJECT NAME: PACIFIC RIM ENERGY

DWG. NO.: 7-22169-XX-16BOM

CONTROL PANEL ENCLOSURE SUB-PANEL ASSEMBLY (NEMA 4)

FOR PICTORIAL REPRESENTATION

REFERENCE DRAWING 7-22169-XX-16

CUSTOMER P.O. #	DRAWING NAME:
PNEUMAFIL S.O. #	7-22169
COMPLETED BY:	DWT
NUMBER OF SYSTEMS:	3

LETTER	DATE
ORIGINAL ISSUE:	A6/15/05
CURRENT REVISION:	A6/15/05
SEE LAST PAGE FOR REVISION HISTORY	

ENGINEERING															
ITEM NO.	PART NUMBER	BOM REVISION	DESCRIPTION	MATERIAL	QTY.	EXT. QTY.	WEIGHT		LENGTH		WIDTH		HEIGHT		SHIPPABLE
							POUND	Kg	INCH	mm	INCH	mm	INCH	mm	
1	Q-10879	A	ENCLOSURE, 10" x 8" x 4", NEMA 4	-	1 EA	3 EA									N
2	Q-7334	A	PANEL, MOUNTING, 8.75" x 6.88"	-	1 EA	3 EA									N
3	Q-10958	A	TERMINAL BLOCK, 600 VAC, 40 AMP, #10-#22 AWG, KANT KUT CONNECTOR, FLAT MOUNT	-	30 EA	90 EA									N
4	Q-10884	A	TERMINAL BLOCK, END SECTION, FLAT MOUNT	-	2 EA	6 EA									N
5	Q-10928	A	GROUNDING BUSS BAR, #14-#4 AWG, 14 TERMINALS	-	1 EA	3 EA									N
6	Q-10927	A	HUB, BULLET, 3/4", INSULATED	AL	2 EA	6 EA									N
7	Q-10953	A	PLUG, 3/4" NPT, RED	POLYETHYLENE	1 EA	3 EA									N
8	Q-10903	A	CONNECTOR, STR., 3/4", LIQUIDTIGHT FLEX., INSULATED	-	1 EA	3 EA									N
9	A52129-D14	A	LEGEND PLATE, 3/4" x 2" x 1/16" THICK, WHITE W/BLACK CORE, ENGRAVED "INF-JB2"	-	1 EA	3 EA									N
10	S52175-C11	A	SCREW, PAN HEAD, #6-32 x 1/2" LONG	SS	8 EA	24 EA									N

NOTE: HARDWARE INCLUDES 10% SPARES

REVISION HISTORY:					DESCRIPTION
LETTER	DATE	BY	CHKD	DATE	
REV. A	6/15/05	DWT	BVC	7/7/05	RELEASED

MATERIAL LEGEND:									
SS = STAINLESS STEEL					CS = CARBON STEEL				
MS = MILD STEEL					SNTR BRZ = SINTERED BRONZE				
AL = ALUMINIUM					HDG = HOT DIPPED GALVANIZED				
PTD = PAINTED					GALVND = GALVANEAL				
GALV = GALVANIZED					RBR = RUBBER				
PVC = POLYVINYL CHLORIDE					CPVC = CLORINATED POLYVINYL CHLORIDE				
NPRN = NEOPRENE					NYL = NYLON				
LOT = SUB BILL OF MATERIAL					FT = FOOT				
EA = EACH					EPY = EPOXY				
PRM = PRIMED									

PROJECT NAME: PACIFIC RIM ENERGY

DWG. NO.: 7-22169-XX-17BOM

DISCONNECT SWITCH 480 VAC (NEMA 4)

FOR PICTORIAL REPRESENTATION
REFERENCE DRAWING 7-22169-XX-17

CUSTOMER P.O. #	DRAWING NAME:
PNEUMAFIL S.O. #	7-22169
COMPLETED BY:	DWT
NUMBER OF SYSTEMS:	3

LETTER	DATE
A	6/15/05
CURRENT REVISION:	A
6/15/05	
SEE LAST PAGE FOR REVISION HISTORY	

ENGINEERING																
ITEM NO.	PART NUMBER	BOM REVISION	DESCRIPTION	MATERIAL	QTY.	EXT. QTY.	WEIGHT		LENGTH		WIDTH		HEIGHT		SHIPPABLE	DETAIL DESCRIPTION
							POUND	Kg	INCH	mm	INCH	mm	INCH	mm		
1	Q-11126	A	ENCLOSURE, 18" x 8 7/8" x 9 5/16" (NEMA 4/4X)	SS	1 EA	3 EA									N	ENCLOSURE, ENCLOSURE, 18" x 8 7/8" x 9 5/16", SS, (NEMA 4/4X), CUTTLER-HAMMER #WFDN100
2	EHD3015L	A	BREAKER, CIRCUIT, 15A, 3 POLE	-	1 EA	3 EA									N	BREAKER, CIRCUIT, 15A, 3 POLE, CUTLER-HAMMER #EHD3015
3	Q-10927	A	HUB, BULLET, 3/4", INSULATED	AL	1 EA	3 EA									N	HUB, BULLET, 3/4", ALUMINUM, INSULATED, THOMAS & BETTIS #371
4	Q-10872	A	PLUG, 3/4" NPT, RED	POLYETHELENE	1 EA	3 EA									N	PLUG, 3/4" NPT, POLYETHELENE, RED, CAP PLUGS #P-68H
5	Q-10807	A	HUB, BULLET, 1 1/2", INSULATED	AL	1 EA	3 EA									N	HUB, BULLET, 1 1/2", ALUMINUM, INSULATED, THOMAS & BETTIS #374
6	Q-10874	A	PLUG, 1 1/2" NPT	STEEL	1 EA	3 EA									N	PLUG, 1 1/2" NPT, STEEL, CROUSE-HINDS #PLG65
7	Q-11473	A	BUSS BAR, GROUNDING, #14 #4 AWG, 10 TERMINALS	-	1 EA	3 EA									N	BUSS BAR, GROUNDING, #14 #4 AWG, 10 TERMINALS, CUTLER-HAMMER #GBK10
8	\$S2129-D157	A	LEGEND PLATE, 2" x 3/4" x 1/16" PHENOLIC, WHT W/BLK CORE	-	1 EA	3 EA									N	LEGEND PLATE, 2" x 3/4" x 1/16" PHENOLIC, WHT W/BLK CORE
9	\$S2175-C11	A	SCREW, PAN HEAD, #6-32 x 1/2" LONG	SS	4 EA	12 EA									N	SCREW, PAN HEAD, #6-32 x 1/2" LONG, SS

NOTE: HARDWARE INCLUDES 10% SPARES

REVISION HISTORY:					DESCRIPTION	
LETTER	DATE	BY	CHKD	DATE		
REV. A	6/15/05	DWT	BVC	7/7/05		RELEASED

MATERIAL LEGEND:											
SS = STAINLESS STEEL MS = MILD STEEL AL = ALUMINUM PTD = PAINTED GALV = GALVANIZED PVC = POLYVINYL CHLORIDE NPRN = NEOPRENE LOT = SUB BILL OF MATERIAL EA = EACH PRM = PRIMED						CS = CARBON STEEL SNTR BRZ = SINTERED BRONZE HDG = HOT DIPPED GALVANIZED GALVND = GALVANEAL RBR = RUBBER CPVC = CLORINATED POL.VINYL CHLORIDE NYL = NYLON FT = FOOT EPY = EPOXY					

CONVENTIONAL INSTRUMENT SYMBOLS

DCS LOOP TAG * (TYPICAL FOR ALL INSTRUMENT AND ELECTRICAL DEVICES)

FIRST THREE DIGITS INDICATE E&ID OR P&ID DRAWING NUMBER WHERE ITEM ORIGINATES

INDICATES ELECTRICAL (E) OR INSTRUMENT (I) FUNCTION

FIELD INSTRUMENT

INDICATION ON DCS CONTROL SYSTEM

MCC CONTROL SYSTEM

MCC & DCS CONTROL SYSTEM

LINE SYMBOLS & IDENTIFICATION

MAIN WATER LINE
AND FLOW DIRECTIONAUXILIARY PROCESS OR
SERVICE LINE AND
FLOW DIRECTIONCOMPRESS AIR LINE AND
FLOW DIRECTION

ELECTRIC LINE

PIPING SYMBOLS AND NOTATION

BALL VALVE

GATE VALVE

GLOBE VALVE

THROTTLING FLOW VALVE

CHECK VALVE

SOLENOID VALVE

SCREEN

DIRECTION OF FLOW

REDUCER

STRAINER

INSTRUMENT TAG NO. PREFIXES

CR - CONTROL RELAY

DPG - DIFFERENTIAL PRESSURE GAUGE

DPS - DIFFERENTIAL PRESSURE INDICATOR

DPSG - DIFFERENTIAL PRESSURE SWITCH GAUGE

FI - FLOW INDICATOR

FLSW - FLOW SWITCH

LEVS - LEVEL SWITCH

P - PUMP

PDI - PRESSURE DIFFERENTIAL INDICATOR

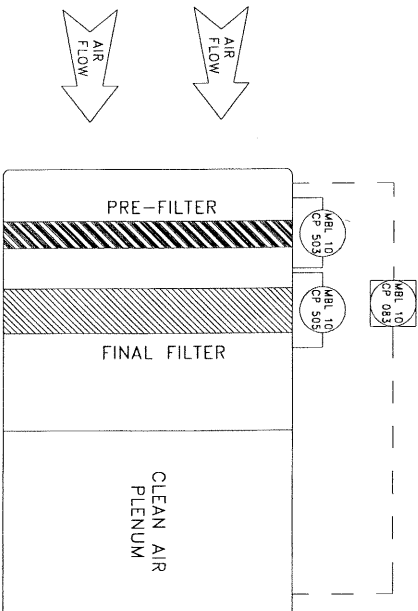
PDIS - PRESSURE DIFFERENTIAL INDICATOR SWITCH

PI - PRESSURE INDICATOR

PT - PRESSURE TRANSMITTER

TS - TEMPERATURE SWITCH

FUNCTION	S/W ID		PNEUMAFIL ID	SETTING/RANGE	
	KKS	WBS		SETTING/RANGE	SI UNITS
TOTAL FILTER DIFFERENTIAL PRESSURE SWITCH	MBL 10 CP 083	PDS 35113	DPS1	4.00" W.C.	992 Pa
PRE-FILTER DIFFERENTIAL PRESSURE GAUGE	MBL 10 CP 503	PDI 35111	DPGA	0-2" W.C.	0-498 Pa
FINAL FILTER DIFFERENTIAL PRESSURE GAUGE	MBL 10 CP 505	PDI 35112	DPGB	0-6" W.C.	0-1494 Pa



INSTRUMENTATION FOR INLET AIR CIRCUIT

CHECKED BY
BYCCHECK DATE
7/7/05

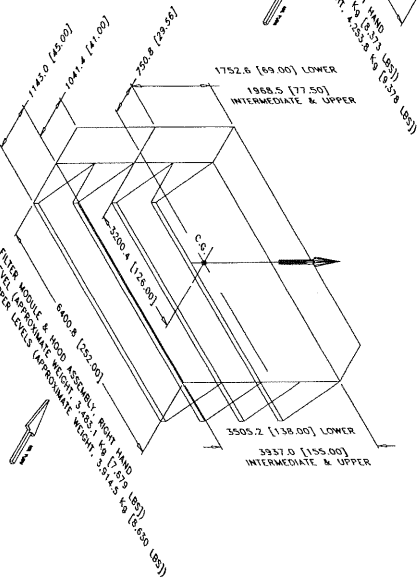
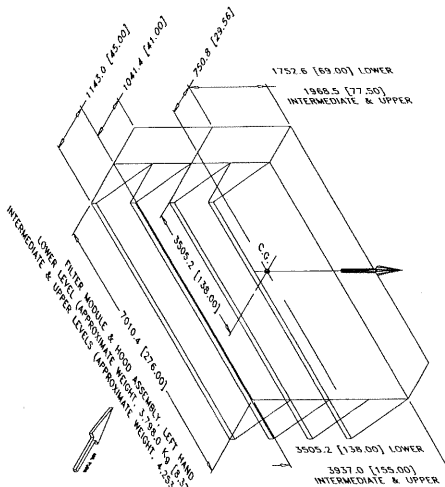
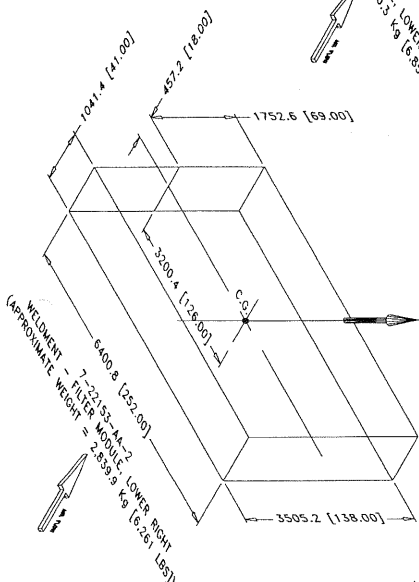
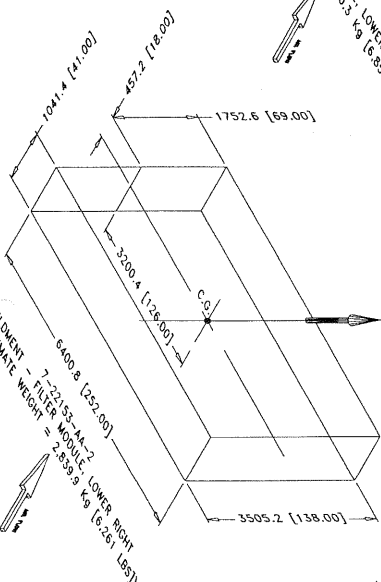
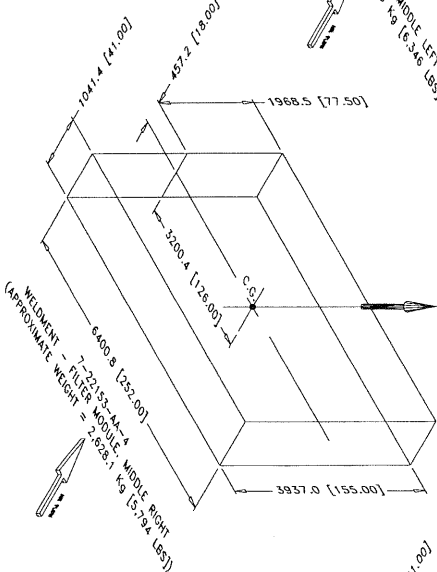
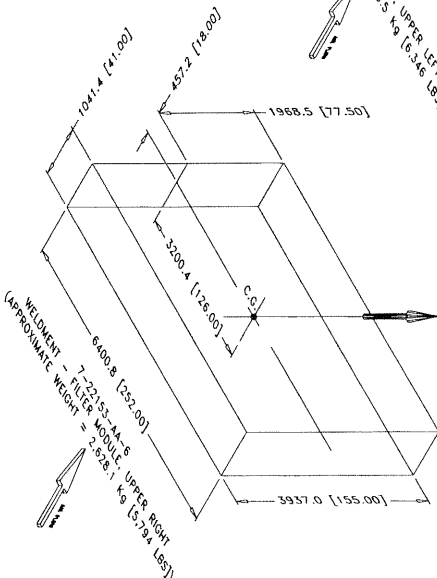
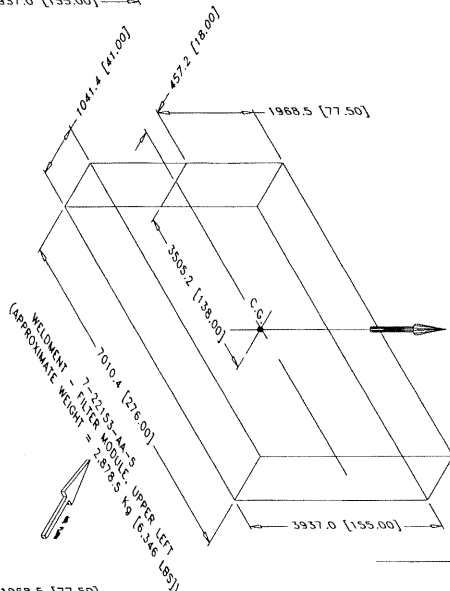
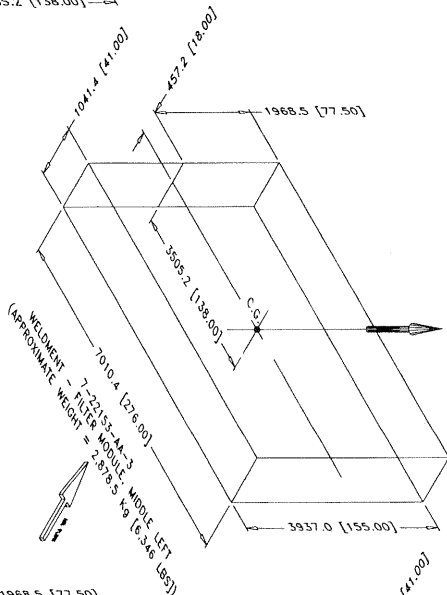
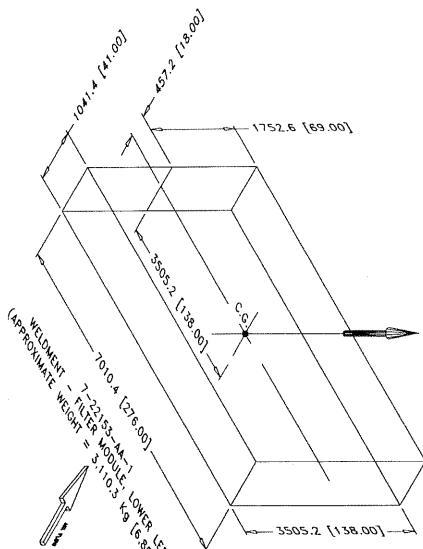
NO. ZONE		REVISIONS		DATE		APPROVED		CHECKED		DATE	

PNEUMAFIL PNEUMAFIL CORPORATION
P.O. BOX 1000, CHARLOTTE, N.C. 28217-0000

P & I DIAGRAM

THIRD ANGLE PROJECTION	ALL DIMENSIONS: 1 INCH=25.4 MM
DATE 7-22169-XX-20	SCALE NONE
ISSUE NO. 1	OF 1

- NOTE:
- 1) REFER TO DRAWINGS XX-4 AND XX-57 FOR COMPONENT ARRANGEMENT.
 - 2) PICTORIAL REPRESENTATION ON THIS DRAWING MAY NOT REFLECT THE ACTUAL CHARACTERISTIC OF FINISHED COMPONENTS.
 - 3) ADD 5" TO THE PANEL THICKNESS WHERE LIFTING LUGS ARE SHOWN.
 - 4) WEIGHTS AND DIMENSIONS SHOWN ARE APPROXIMATE.



PNEUMAFIL CORPORATION
P.O. Box 1648, Charlotte, N.C. 28201-9648

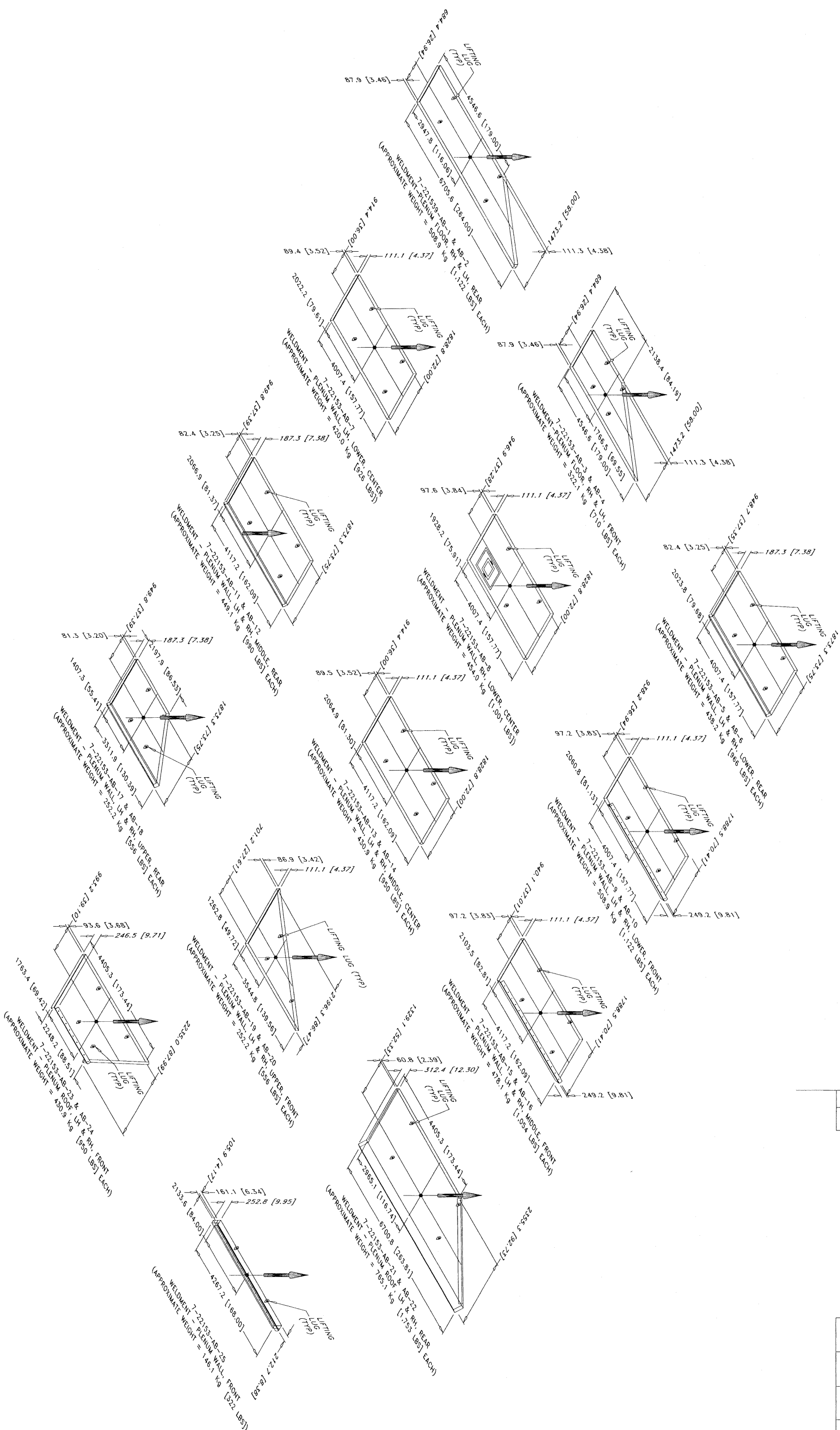
CENTROID AND
COMPONENT WEIGHTS

THIRD ANGLE PROJECTION

ALL DIMENSIONS: 1 INCH=25.4 MM

CREATED BY: BVC
DATE: 7/7/05

SIZE: 1:1.00
SCALE: 1:1.00
DATE: 7-22169-XX-41
REV: A



[illegible]

CUSTOMER P.O. #	DRAWING NAME:
PNEUMAFIL S.O. #	7-22169
COMPLETED BY:	DWT
NUMBER OF SYSTEMS:	3

PROJECT NAME: PACIFIC RIM ENERGY
DWG. NO.: 7-22169-XX-51BOM
FIELD AND SHOP INSTALLATION-ELECTRICAL (NEMA 4)

FOR PICTORIAL REPRESENTATION
REFERENCE DRAWING 7-22169-XX-51

LETTER	DATE
A	6/15/05
A	6/15/05

SEE LAST PAGE FOR REVISION HISTORY

ENGINEERING															
ITEM NO.	PART NUMBER	BOM REVISION	DESCRIPTION	MATERIAL	QTY.	EXT. QTY.	WEIGHT		LENGTH		WIDTH		HEIGHT		SHIPPABLE
							POUND	Kg	INCH	mm	INCH	mm	INCH	mm	
1	7-22169-XX-6	A	CONTROL PANEL ASSEMBLY	-	1 EA	3 EA									Y
2	SS2171-C3	A	BOLT, 1/2-13 x 1 1/2" LONG	SS	7 EA	21 EA									Y
3	Q-11209	A	NUT, NYLOCK, 1/4-20	GALV	7 EA	21 EA									Y
4	SS2197-C42	A	WASHER, LOCK, 1/2"	SS	7 EA	21 EA									Y
5	SS2196-D111	A	WASHER, FLAT, 1/2"	SS	14 EA	42 EA									Y
6	Q-7322	A	CONDUIT, 3/4", RIGID, 10 FT LENGTHS, WITH COUPLING	HDG	5 EA	15 EA									Y
7	Q-11076	A	CONDULET BODY ASSEMBLY, 3/4", TYPE "T"	ALUMINUM	5 EA	15 EA									Y
8	7-22169-XX-51P8	A	DRAIN, ORDINARY LOCATION, 3/4" MPT	ALUMINUM	5 EA	15 EA									Y
9	Q-11056	A	NIPPLE, CLOSE, 3/4" RIGID	HDG	4 EA	12 EA									Y
10*	Q-11245	A	COUPLING, 3/4", NPT	HDG	8 EA	24 EA									Y
11*	Q-11061	A	UNION, M/F, 3/4"	-	14 EA	42 EA									Y
12	Q-11062	A	CLAMP, STAND-OFF, 3/4"	HDG	8 EA	24 EA									Y
13	SS2174-D24	A	BOLT, 1/4-20 x 1 1/4" LONG	SS	12 EA	36 EA									Y
14	Q-11342	A	NUT, NYLOCK, 1/4-20	SS	12 EA	36 EA									Y
15	SS2196-D107	A	WASHER, FLAT, 1/4"	SS	24 EA	72 EA									Y
16	Q-11079	A	UNISTRUT, 1-5/8" x 1-5/8", 10 FT LENGTHS	HDG	2 EA	6 EA									Y
17	Q-10934	A	CLAMP, 3/4", FOR USE WITH UNISTRUT	GALV	8 EA	24 EA									Y
18	Q-10933	A	CLAMP, 1/2", FOR USE WITH UNISTRUT	GALV	2 EA	6 EA									Y
19	Q-10932	A	CLAMP, 1/4", FOR USE WITH UNISTRUT	GALV	12 EA	36 EA									Y
20	Q-7311	A	TUBING, 1/4", 10 FT LENGTHS	SS	5 EA	15 EA									Y
21	Q-9909	A	UNION, TEE, 1/4" TUBE x 1/4" TUBE	SS	2 EA	6 EA									Y
22	Q-10962	A	VALVE, BALL, 2-WAY, 1/4" TUBE x 1/4" TUBE	SS	2 EA	6 EA									Y
23	Q-9908	A	CONNECTOR, STR, 1/4" TUBE x 1/2" NPT	SS	4 EA	12 EA									Y
24	Q-9912	A	TEE, 150 LB, 1/2" NPT	SS	2 EA	6 EA									Y
25	Q-9913	A	NIPPLE, 1/2" NPT, 6" LONG, SCHEDULE 40	SS	2 EA	6 EA									Y
26	Q-9911	A	VALVE, BALL, 2-WAY, 1/2"	SS	2 EA	6 EA									Y
27	Q-9907	A	CONNECTOR, 90 DEG., 1/4" NPT x 1/4" TUBE	SS	2 EA	6 EA									Y
28	Q-10966	A	GASKET, 1/4" x 1/2", CLOSED CELL SPONGE, ADHESIVE ON 1/2" SIDE	NEOPRENE	8 FT	24 FT									Y
29	AS2129-D160	A	LEGEND PLATE, WHT WBLK CORE, PHENDUC, 2' x 3/4' x 1/16" THK, ENGRAVED "TR-1"	-	1 EA	3 EA									Y
30	Q-11397	A	TRANSFORMER, 5 KVA, 480V - 120V, 1 PHASE	-	1 EA	3 EA									Y
31	SS2174-DB2	A	BOLT, 3/8-16 x 1 1/4" LG.	SS	4 EA	12 EA									Y
32	SS2196-D109	A	WASHER, FLAT, 3/8"	SS	8 EA	24 EA									Y
33	SS2197-C40	A	WASHER, LOCK, 3/8"	SS	4 EA	12 EA									Y
34	Q-11418	A	NUT, CLAMPING, 3/8", WITH SPRING, FOR USE WITH UNISTRUT	GALV	4 EA	12 EA									Y
35	SS2177-D11	A	SCREW, RHM, #6-32 x 1/2" LONG	SS	2 EA	6 EA									Y
36	Q-10927	A	HUB, BULET, 3/4", INSULATED	ALUMINUM	1 EA	3 EA									Y
37*	Q-9368	A	TAPE, PTFE THREAD SEALANT, 1/2" x 277" ROLL	-	1 EA	3 EA									Y
38*	Q-10963	A	COMPOUND, ANTI-SEIZE, 16 OZ CAN W/BRUSH	-	1 EA	3 EA									Y
39*	Q-10964	A	LOC-TITE, #290 GREEN, .32 FLUID OZ., THREAD LOCK, PERMANENT	-	1 EA	3 EA									Y
40*	7-22169-XX-51P55	A	WIRE NUMBERS AND SHRINK TUBING PER SO#-XX-5	-	1 LOT	3 LOT									Y
41*	Q-11251	A	WIRE, #12 AWG, STRANDED CU, TYPE XHHW, 600 VAC, BLACK	-	50 FT	150 FT									Y
42*	Q-11171	A	WIRE, #12 AWG, STRANDED CU, TYPE XHHW, 600 VAC, WHITE	-	50 FT	150 FT									Y
43*	Q-10945	A	WIRE, #12 AWG, STRANDED CU, TYPE XHHW, 600 VAC, GREEN	-	50 FT	150 FT									Y
44*	Q-11401	A	WIRE, #8 AWG, STRANDED CU, TYPE XHHW, 600 VAC, BLACK	-	20 FT	60 FT									Y
45*	Q-11402	A	WIRE, #8 AWG, STRANDED CU, TYPE XHHW, 600 VAC, WHITE	-	20 FT	60 FT									Y
46*	Q-11403	A	WIRE, #8 AWG, STRANDED CU, TYPE XHHW, 600 VAC, GREEN	-	20 FT	60 FT									Y
47*	Q-11356	A	WIRE FERRULE, #12 AWG, GRAY	-	20 EA	60 EA									Y
48*	Q-11404	A	WIRE FERRULE, #8 AWG, RED	-	10 EA	30 EA									Y
SHOP INSTALLED ITEMS															
200	Q-7322	A	CONDUIT, 3/4", RIGID, 10 FT, LENGTHS	HDG	14 EA	42 EA									N
201	Q-11063	A	CONDULET BODY ASSEMBLY, 3/4", TYPE "LB"	ALUMINUM	3 EA	9 EA									N
202	Q-11056	A	NIPPLE, CLOSE, 3/4", RIGID	HDG	3 EA	9 EA									N
203	Q-11062	A	CLAMP, STAND-OFF, 3/4"	HDG	25 EA	75 EA									N
204	SS2174-D24	A	BOLT, 1/4-20 x 1 1/4" LONG	SS	50 EA	150 EA									N
205	Q-11342	A	NUT, NYLOCK, 1/4-20	SS	50 EA	150 EA									N
206	SS2196-D107	A	WASHER, FLAT, 1/4"	SS	100 EA	300 EA									N

PROJECT NAME: PACIFIC RIM ENERGY

DWG. NO.: 7-22169-XX-51BOM

FIELD AND SHOP INSTALLATION-ELECTRICAL (NEMA 4)

FOR PICTORIAL REPRESENTATION
REFERENCE DRAWING 7-22169-XX-51

CUSTOMER P.O. #		DRAWING NAME:	
PNEUMAFIL S.O. #	7-22169	COMPLETED BY:	DWT
NUMBER OF SYSTEMS:	3		

LETTER	DATE
A	6/15/05
ORIGINAL ISSUE:	
CURRENT REVISION:	
A	6/15/05
SEE LAST PAGE FOR REVISION HISTORY	

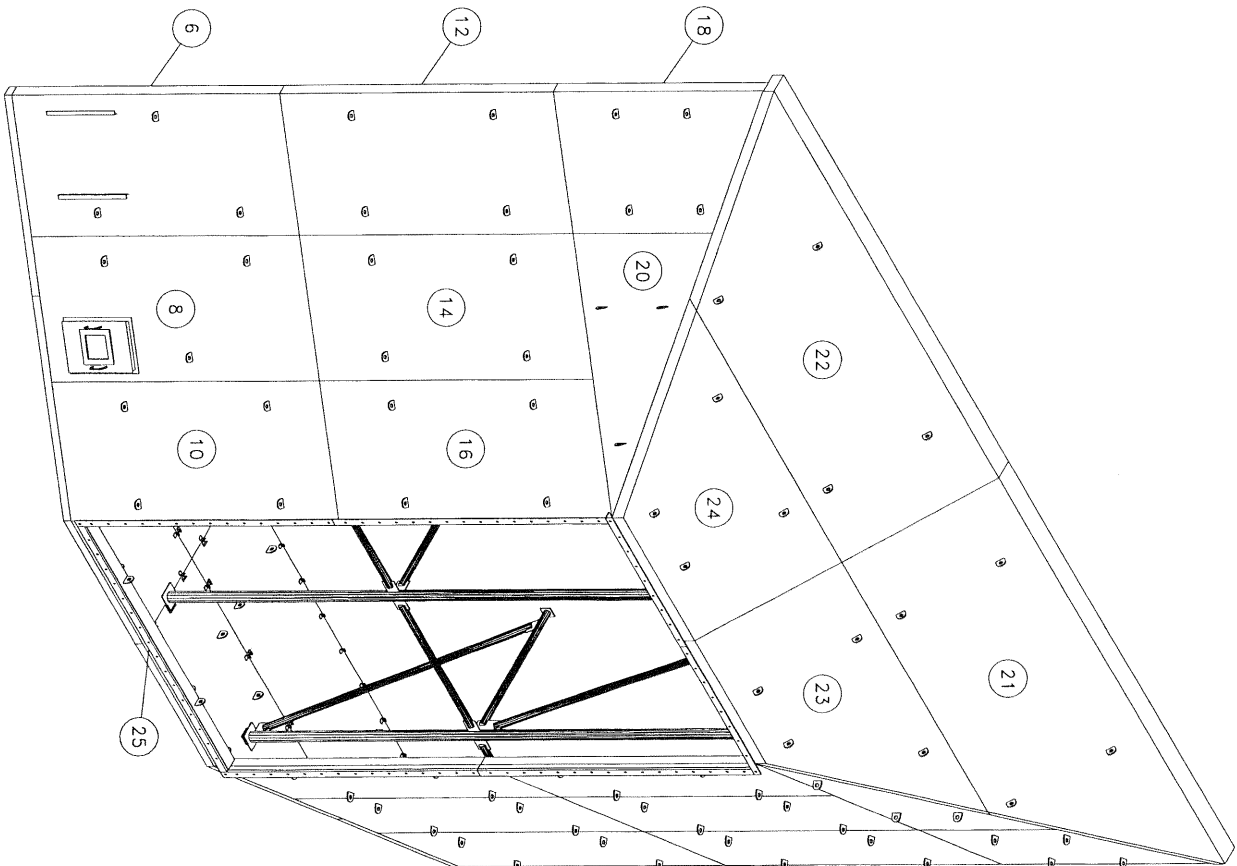
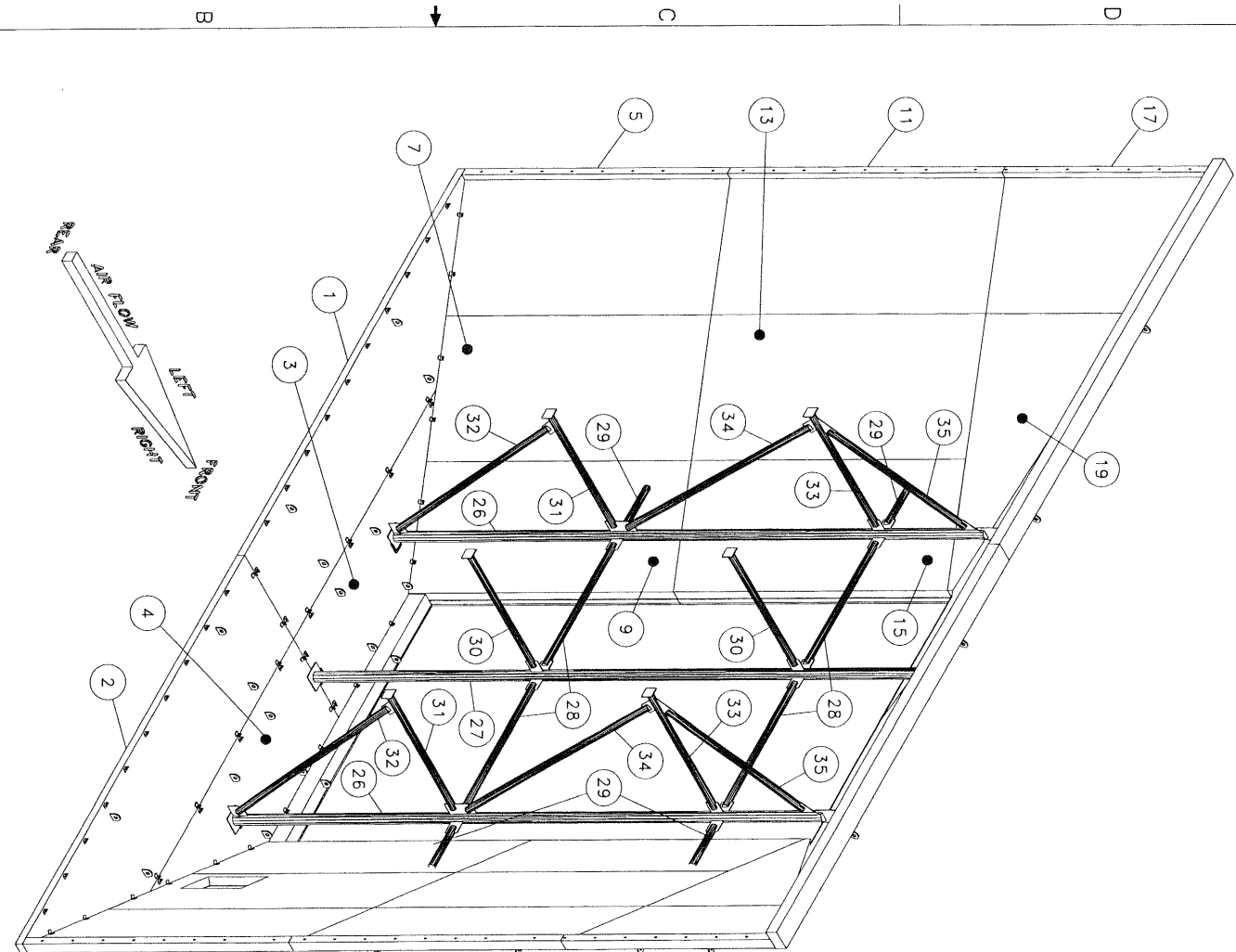
ENGINEERING																
ITEM NO.	PART NUMBER	BOM REVISION	DESCRIPTION	MATERIAL	QTY.	EXT. QTY.	WEIGHT		LENGTH		WIDTH		HEIGHT		SHIPPABLE	
							POUND	Kg	INCH	mm	INCH	mm	INCH	mm		
207*	Q-11061	A	UNION, M/F, 3/4"	-	10 EA	30 EA									N	
208	S52206-C1	A	LIGHT FIXTURE ASSEMBLY, 150 WATT, 120 VAC	-	12 EA	36 EA									N	
209	S51840-B2	A	SWITCH/RECEPTACLE COMBINATION, 120 VAC, 20 AMPS	-	1 EA	3 EA									N	
210	7-22169-XX-51P210	A	DRAIN, ORDINARY LOCATION, 3/4" MPT	ALUMINUM	1 EA	3 EA									Y	
211	S51839-B3	A	TOGGLE SWITCH ASSEMBLY, w/MP COVER, 20 A, 120 VAC	-	2 EA	6 EA									N	
212	Q-10902	A	CONNECTOR, 3/4" LIQUIDTIGHT FLEX, STRAIGHT	-	2 EA	6 EA									N	
213	Q-4490	A	CONDUIT, 3/4", LIQUIDTIGHT FLEX, METALLIC	-	10 FT	30 FT									N	
214	Q-10879	A	JUNCTION BOX, 10" x 8" x 4", NEMA 4	-	2 EA	6 EA									N	
215	Q-7334	A	PANEL, 10.75" x 6.88"	-	2 EA	6 EA									N	
216	Q-10883	A	TERMINAL BLOCK, 600 VAC, 40 AMP, #10-#22 AWG, KANT KUT CONNECTOR, FLAT MOUNT	-	30 EA	90 EA									N	
217	Q-10884	A	TERMINAL BLOCK, END SECTION, FLAT MOUNT	-	2 EA	6 EA									N	
218	Q-10928	A	GROUNDING BUSS BAR, #14#4 AWG, 14 TERMINALS	-	2 EA	6 EA									N	
219	Q-10927	A	HUB, BULLET, INSULATED, 3/4"	ALUMINUM	7 EA	21 EA									N	
220	Q-10872	A	PLUG, 3/4", RED	POLYETHYLENE	3 EA	9 EA									N	
221	A52129-D21	A	LEGEND PLATE, WHT w/BLK CORE, PHENOLIC, 1" x 3/4" x 1/16" THK, ENGRAVED "JB-1"	-	1 EA	3 EA									N	
222	A52129-D22	A	LEGEND PLATE, WHT w/BLK CORE, PHENOLIC, 1" x 3/4" x 1/16" THK, ENGRAVED "JB-2"	-	1 EA	3 EA									N	
223	S52177-D11	A	SCREW, RHM, #6-32 x 1/2" LONG	SS	16 EA	48 EA									N	
224	Q-7311	A	TUBING, 1/4", 10 FT LENGTHS	SS	2 EA	6 EA									N	
225	Q-9907	A	CONNECTOR, 90 DEGREE, 1/4" NPT x 1/4" TUBE	SS	1 EA	3 EA									N	
226	Q-9923	A	ELBOW, 90 DEGREE, UNION, 1/4" TUBE	SS	2 EA	6 EA									N	
227	Q-11060	A	CLAMP, 1/4", ONE HOLE, STEEL	-	4 EA	12 EA									N	
228	Q-9847	A	MUFFLER, EXHAUST, 1/4", MALE	SNTR BRZ	2 EA	6 EA									N	
229	Q-9874	A	CONNECTOR, BULKHEAD FEMALE, 1/4" TUBE x 1/4" NPT	SS	1 EA	3 EA									N	
230	Q-11242	A	PLUG, 1/4", RED	POLYETHYLENE	1 EA	3 EA									N	
231	Q-11259	A	PLUG, PIPE, 1/4" NPT, 150#	STEEL	1 EA	3 EA									N	
232*	Q-10918	A	WIRE, #12 AWG, STRANDED CU, TYPE XHHW, 600 VAC, BLACK	-	250 FT	750 FT									N	
233*	Q-10919	A	WIRE, #12 AWG, STRANDED CU, TYPE XHHW, 600 VAC, WHITE	-	250 FT	750 FT									N	
234*	Q-10920	A	WIRE, #12 AWG, STRANDED CU, TYPE XHHW, 600 VAC, GREEN	-	250 FT	750 FT									N	
235*	Q-11356	A	WIRE FERRULE, #12 AWG, GRAY	-	80 EA	240 EA									N	
236*	7-22169-XX-51P235	A	WIRE NUMBERS AND SHRINK TUBING PER SO# XX-5	-	1 LOT	3 LOT									N	
237*	Q-9388	A	TAPE, PTFE THREAD SEALANT, 1/2" x 27" ROLL	-	1 EA	3 EA									N	
238*	Q-10963	A	COMPOUND, ANTI-SEIZE, 16 OZ CAN w/BRUSH	-	1 EA	3 EA									N	
239*	Q-10964	A	LOC-TITE, #290 GREEN, .32 FLUID OZ., THREAD LOCK, PERMANENT	-	1 EA	3 EA									N	

NOTE: HARDWARE INCLUDES 10% SPARES
• INDICATES NOT SHOWN ON DRAWING

REVISION HISTORY:				DESCRIPTION	
LETTER	DATE	BY	CHKD	DATE	
REV. A	6/15/05	DWT	BVC	7/7/05	RELEASED

MATERIAL LEGEND:	
SS = STAINLESS STEEL	CS = CARBON STEEL
MS = MILD STEEL	SNTR BRZ = SINTERED BRONZE
AL = ALUMINUM	HOG = HOT DIPPED GALVANIZED
PTD = PAINTED	GALVND = GALVANNEAL
GALV = GALVANIZED	RBR = RUBBER
CPVC = POLYVINYL CHLORIDE	CPVC = CLORINATED POLYVINYL CHLORIDE
NPRN = NEOPRENE	NTL = NYLON
LOT = SUB BILL OF MATERIAL	FT = FOOT
EA = EACH	EPY = EPOXY
PRM = PRIMED	

NO. ZONE		REVISIONS		DATE		APPROVED		CHECKED		DATE	
		DESCRIPTION									



PICTORIAL REPRESENTATION ON THIS
DRAWING MAY NOT REFLECT THE ACTUAL
CHARACTERISTIC OF FINISHED COMPONENTS

REFER TO DRAWING XX-57BOM FOR PART
NUMBERS, QUANTITIES AND DESCRIPTION

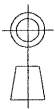
A
HARDWARE INCLUDES 10% SPARES
2 WASHERS REQUIRED PER BOLT

INTERFACE		* HARDWARE REQUIRED		ITEM NO.	
CLEAN AIR PLENUM FLOOR TO FLOOR		36	BOLT, HEX HD, 5/8-11 x 3 1/2, A307, HDG	36	
CLEAN AIR PLENUM FLOOR TO FILTER MODULE FLOOR		36	NUT, HEX HD, 5/8-11, A194, HDG	38	
CLEAN AIR PLENUM WALLS TO FILTER MODULE WALLS		72	WASHER, FLAT, 5/8 NOMINAL, F436, HDG	39	
ALL OTHER CLEAN AIR PLENUM CONNECTIONS		250	BOLT, HEX HD, 5/8-11 x 1 3/4, A307, HDG	37	
		250	NUT, HEX HD, 5/8-11, A194, HDG	38	
		500	WASHER, FLAT, 5/8 NOMINAL, F436, HDG	39	

DRAWN BY
BVC

CHECK DATE
7/17/05

THIRD ANGLE PROJECTION



ALL DIMENSIONS: 1 INCH=25.4 MM

PNEUMAFIL CORPORATION
P.O. BOX 15466, CHARLOTTE, N.C. 28217-5466

FIELD INSTALLATION
CLEAN AIR
PLENUM

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TOLERANCE UNLESS OTHERWISE SPECIFIED		SCALE: 1" = 1'-0"		SHEET: 1 OF 1	
ANGULAR: 1/2°		DATE: 6/15/05		REV: A	
DRAWN BY: DWT		SCALE: NONE		WEIGHT: 1	

CUSTOMER P.O. #	
PNEUMAFIL S.O. #	7-22153
COMPLETED BY:	DWT
NUMBER OF SYSTEMS:	3

PROJECT NAME: PACIFIC RIM ENERGY
DWG. NO.: 7-22169-XX-57BOM
FIELD INSTALLATION - CLEAN AIR PLENUM

FOR PICTORIAL REPRESENTATION
REFERENCE DRAWING 7-22169-XX-57

ORIGINAL ISSUE:	A	6/15/05
CURRENT REVISION:	A	6/15/05
SEE LAST PAGE FOR REVISION HISTORY		

ENGINEERING																
ITEM NO.	PART NUMBER	BOM REVISION	DESCRIPTION	MATERIAL	QTY.	EXT. QTY.	WEIGHT		LENGTH		WIDTH		HEIGHT		SHIPPABLE	
							Kg	POUND	mm	INCH	mm	INCH	mm	INCH		
1	7-22153-AB-1	A	WELDMENT - FLOOR, LH, REAR	PTD, CS	1 EA	3 EA	508.9	1122.00	6705.6	264.00	1473.2	58.00	231.9	9.13	Y	
2	7-22153-AB-2	A	WELDMENT - FLOOR, RH, REAR	PTD, CS	1 EA	3 EA	508.9	1122.00	6705.6	264.00	1473.2	58.00	231.9	9.13	Y	
3	7-22153-AB-3	A	WELDMENT - FLOOR, LH, FRONT	PTD, CS	1 EA	3 EA	322.1	710.00	4546.6	179.00	1473.2	58.00	231.9	9.13	Y	
4	7-22153-AB-4	A	WELDMENT - FLOOR, RH, FRONT	PTD, CS	1 EA	3 EA	322.1	710.00	4546.6	179.00	1473.2	58.00	231.9	9.13	Y	
5	7-22153-AB-5	A	WELDMENT - WALL, LH, LOWER, REAR	PTD, CS	1 EA	3 EA	438.2	966.00	4007.4	157.77	1869.7	73.61	304.8	12.00	Y	
6	7-22153-AB-6	A	WELDMENT - WALL, RH, LOWER, REAR	PTD, CS	1 EA	3 EA	444.1	979.00	4007.4	157.77	1869.7	73.61	304.8	12.00	Y	
7	7-22153-AB-7	A	WELDMENT - WALL, LH, LOWER, CENTER	PTD, CS	1 EA	3 EA	420.0	926.00	4007.4	157.77	1828.8	72.00	231.9	9.13	Y	
8	7-22153-AB-8	A	WELDMENT - WALL, RH, LOWER, CENTER	PTD, CS	1 EA	3 EA	454.0	1001.00	4007.4	157.77	1828.8	72.00	300.0	11.81	Y	
9	7-22153-AB-9	A	WELDMENT - WALL, LH, LOWER, FRONT	PTD, CS	1 EA	3 EA	508.9	1122.00	4007.4	157.77	1788.4	70.41	249.2	9.81	Y	
10	7-22153-AB-10	A	WELDMENT - WALL, RH, LOWER, FRONT	PTD, CS	1 EA	3 EA	508.9	1122.00	4007.4	157.77	1788.4	70.41	249.2	9.81	Y	
11	7-22153-AB-11	A	WELDMENT - WALL, LH, MIDDLE, REAR	PTD, CS	1 FT	3 FT	449.1	990.00	4117.1	162.09	1869.7	73.61	304.8	12.00	Y	
12	7-22153-AB-12	A	WELDMENT - WALL, RH, MIDDLE, REAR	PTD, CS	1 EA	3 EA	449.1	990.00	4117.1	162.09	1869.7	73.61	304.8	12.00	Y	
13	7-22153-AB-13	A	WELDMENT - WALL, LH, MIDDLE, CENTER	PTD, CS	1 EA	3 EA	430.9	950.00	4117.1	162.09	1828.8	72.00	231.9	9.13	Y	
14	7-22153-AB-14	A	WELDMENT - WALL, RH, MIDDLE, CENTER	PTD, CS	1 EA	3 EA	430.9	950.00	4117.1	162.09	1828.8	72.00	231.9	9.13	Y	
15	7-22153-AB-15	A	WELDMENT - WALL, LH, MIDDLE, FRONT	PTD, CS	1 EA	3 EA	478.1	1054.00	4117.1	162.09	1788.4	70.41	249.2	9.81	Y	
16	7-22153-AB-16	A	WELDMENT - WALL, RH, MIDDLE, FRONT	PTD, CS	1 EA	3 EA	478.1	1054.00	4117.1	162.09	1788.4	70.41	249.2	9.81	Y	
17	7-22153-AB-17	A	WELDMENT - WALL, LH, UPPER, REAR	PTD, CS	1 EA	3 EA	313.9	692.00	3311.9	130.39	1869.7	73.61	304.8	12.00	Y	
18	7-22153-AB-18	A	WELDMENT - WALL, RH, UPPER, REAR	PTD, CS	1 EA	3 EA	313.9	692.00	3311.9	130.39	1869.7	73.61	304.8	12.00	Y	
19	7-22153-AB-19	A	WELDMENT - WALL, LH, UPPER, FRONT	PTD, CS	1 EA	3 EA	252.2	556.00	3541.0	139.41	2196.3	86.47	231.9	9.13	Y	
20	7-22153-AB-20	A	WELDMENT - WALL, RH, UPPER, FRONT	PTD, CS	1 EA	3 EA	252.2	556.00	3541.0	139.41	2196.3	86.47	231.9	9.13	Y	
21	7-22153-AB-21	A	WELDMENT - ROOF, LH, REAR	PTD, CS	1 EA	3 EA	795.1	1753.00	6015.0	236.81	2394.0	94.25	432.1	17.01	Y	
22	7-22153-AB-22	A	WELDMENT - ROOF, RH, REAR	PTD, CS	1 EA	3 EA	795.1	1753.00	6700.8	263.81	2394.0	94.25	432.1	17.01	Y	
23	7-22153-AB-23	A	WELDMENT - ROOF, LH, FRONT	PTD, CS	1 EA	3 EA	430.9	950.00	4405.4	173.44	2243.8	86.34	396.2	15.60	Y	
24	7-22153-AB-24	A	WELDMENT - ROOF, RH, FRONT	PTD, CS	1 EA	3 EA	430.9	950.00	4405.4	173.44	2243.8	86.34	396.2	15.60	Y	
25	7-22153-AB-25	A	WELDMENT - WALL, FRONT	PTD, CS	1 EA	3 EA	430.9	950.00	4405.4	173.44	2243.8	86.34	396.2	15.60	Y	
26	7-22153-AB-26	A	WELDMENT - VERTICAL SUPPORT COLUMN, LH & RH	PTD, CS	2 EA	6 EA	146.1	322.00	4267.2	168.00	212.9	8.38	373.4	14.70	Y	
27	7-22153-AB-27	A	WELDMENT - VERTICAL SUPPORT COLUMN, MIDDLE	PTD, CS	1 EA	3 EA	213.2	470.00	8899.7	350.38	375.4	14.78	254.0	10.00	Y	
28	7-22153-AB-28	A	WELDMENT - PIPE SUPPORT, HORIZONTAL, MIDDLE, FRONT	PTD, CS	4 EA	12 EA	24.0	53.00	9030.5	355.53	496.8	19.56	354.1	13.94	Y	
29	7-22153-AB-29	A	WELDMENT - PIPE SUPPORT, HORIZONTAL, MIDDLE, LH & RH	PTD, CS	4 EA	12 EA	8.2	18.00	2116.1	83.31	88.9	3.50	88.9	3.50	Y	
30	7-22153-AB-30	A	WELDMENT - PIPE SUPPORT, HORIZONTAL, MIDDLE, REAR	PTD, CS	2 EA	6 EA	24.0	53.00	679.5	26.75	88.9	3.50	88.9	3.50	Y	
31	7-22153-AB-31	A	WELDMENT - PIPE SUPPORT, HORIZONTAL, LOWER, REAR, LH & RH	PTD, CS	2 EA	6 EA	24.9	55.00	1968.5	77.63	152.4	6.00	152.4	6.00	Y	
32	7-22153-AB-32	A	WELDMENT - PIPE SUPPORT, DIAGONAL, LOWER, REAR, LH & RH	PTD, CS	2 EA	6 EA	40.8	90.00	3613.2	142.25	88.9	3.50	88.9	3.50	Y	
33	7-22153-AB-33	A	WELDMENT - PIPE SUPPORT, HORIZONTAL, UPPER, REAR, LH & RH	PTD, CS	2 EA	6 EA	27.2	60.00	1971.8	77.63	455.2	17.92	152.4	6.00	Y	
34	7-22153-AB-34	A	WELDMENT - PIPE SUPPORT, DIAGONAL, MIDDLE, REAR, LH & RH	PTD, CS	2 EA	6 EA	45.8	101.00	4025.9	158.50	152.4	6.00	152.4	6.00	Y	
35	7-22153-AB-35	A	WELDMENT - PIPE SUPPORT, DIAGONAL, UPPER, REAR, LH & RH	PTD, CS	2 EA	6 EA	24.0	53.00	2082.8	82.00	152.4	6.00	152.4	6.00	Y	
36	SS2166-C11	A	BOLT, HEX HEAD, 5/8-11 x 3 1/2" LONG	HDG, A307	36 EA	108 EA	-	-	-	-	-	-	-	-	Y	
37	SS2166-C4	A	BOLT, HEX HEAD, 5/8-11 x 1 3/4" LONG	HDG, A307	250 EA	750 EA	-	-	-	-	-	-	-	-	Y	
38	SS2200-C33	A	NUT, HEX, 5/8-11	HDG	286 EA	858 EA	-	-	-	-	-	-	-	-	Y	
39	SS2195-D12	A	WASHER, FLAT, 5/8 NOMINAL	HDG	572 EA	1716 EA	-	-	-	-	-	-	-	-	Y	
40	7-22153-XX-57Pa0	A	PAINT, AMERON, AMERCOAT 68HS (QTY IN 1 GAL KIT)	-	1 EA	3 EA	-	-	-	-	-	-	-	-	Y	
41	7-22153-XX-57Pa1	A	THINNER, AMERCOAT 65 (FOR MIXING)	-	1 GAL	3 GAL	-	-	-	-	-	-	-	-	Y	
42	7-22153-XX-57Pa2	A	THINNER, AMERCOAT 12 (FOR CLEANING)	-	1 GAL	3 GAL	-	-	-	-	-	-	-	-	Y	

HARDWARE INCLUDES 10% SPARES

REVISION HISTORY:				DESCRIPTION	
LETTER	DATE	BY	CHKD	DATE	
REV A	6/15/05	DWT	BVC	7/7/05	RELEASED

MATERIAL LEGEND:	
SS = STAINLESS STEEL	CS = CARBON STEEL
MS = MILD STEEL	SNTR BRZ = SINTERED BRONZE
AL = ALUMINUM	HDG = HOT DIPPED GALVANIZED
PTD = PAINTED	GALVNL = GALVANNEAL
GALV = GALVANIZED	RBR = RUBBER
PVC = POLYVINYL CHLORIDE	CPVC = CLORINATED POLYVINYL CHLORIDE
NPRN = NEOPRENE	NYL = NYLON
LOT = SUB BILL OF MATERIAL	FT = FOOT
EA = EACH	EPY = EPOXY
PRM = PRIMED	



Standard Test Method for Leaks Using Bubble Emission Techniques¹

This standard is issued under the fixed designation E 515; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon indicates an editorial change since the last revision of reapproval.

1. Scope

1.1 This test method covers procedures for detecting or locating leaks, or both, by bubble emission techniques. A quantitative measure is not practical. The normal limit of sensitivity for this test method is 4.5×10^{-10} mol/s (1×10^{-5} Std cm^3/s)².

1.2 Two techniques are:

1.2.1 Immersion technique, and

1.2.2 Liquid application technique.

NOTE – Additional information is available in ASME Boiler and Pressure Vessel Code, Section V, Article 10 – Leak Testing, and Guide E 479.

1.3 *This standard does not purport to address the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

E 479 Guide for preparation of a Leak Testing Specification.

E 1316 Terminology for Nondestructive Examinations³

2.2 *Other Documents:*

SNT-TC-1A Recommended Practice for Personnel Qualification and Certification of Nondestructive Testing⁴

ANSI/ASNT CP-189 ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel⁴

ASME Boiler and Pressure Vessel Code, Section V, Article 10-Leak Testing⁵

2.3 *Military Standard:*

MIL-L-25567D Leak Detection Compound Oxygen Systems⁶

3. Terminology

3.1 **Definitions** – For definitions of terms used in this standard, see Terminology E1316, Section E.

¹This test method is under the jurisdiction of ASTM Committee E-7 on Non-destructive Testing and is the direct responsibility of Subcommittee E07.08 on Leak Testing.

Current edition approved Sept 10, 1995. Published November 1995. Originally published as E515-74. Last previous edition E 515-94.

²The gas temperature is referenced to 0°C. To convert to another gas reference temperature, T_{ref} , multiply the leak rate by $(T_{ref} + 273)/273$.

³Annual Book of ASTM Standards, Vol 03.03.

⁴Available from American Society of Nondestructive Testing, 1711 Arlington Plaza P.O. Box 28518, Columbus, OH 43228-0518.

⁵Available from American Society of Mechanical Engineers, 345 E. 47th New York, NY 100 17, U.S.A.

⁶Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

4. Summary of Test Method

4.1 The basic principle of this method consists of creating a pressure differential across a leak and observing for bubbles in a liquid medium located on the low pressure side. The sensitivity of the method is dependent on the pressure differential, the gas used to create the differential, and the liquid used for testing. As long as the pressure differential can be maintained across the area to be tested, this method can be used.

5. Personnel Qualification

5.1 It is recommended that personnel performing leak testing attend a dedicated training course on the subject and pass a written examination. The training course should be appropriate for NDT level II qualification according to Recommended Practice No. SNT-TC-1A of the American Society for Nondestructive Testing or ANSI/ASNT Standard CP-189.

6. Significance and Use

6.1 The immersion technique is frequently used to locate leaks in sealed containers. Leaks in a container can be seen independently. Leak size can be approximated by the size of the bubble. It is not suitable for measurement of total system leakage.

6.2 The liquid film technique is widely applied to components and systems that can not easily be immersed and is used to rapidly locate leaks. An approximation of leak size can be made based on the type of bubbles formed, but the technique is not suitable for measuring leakage rate. It cannot be used with a vacuum box to test vessels which cannot be pressurized or where only one side is accessible.

7. Interferences

7.1 Surface contamination of the test specimen, if small immersed parts, in the form of grease, rust, weld slag, etc., may be a source of bubbles giving false indication of leakage. Test specimens should be thoroughly cleaned to avoid rejection of acceptable items.

7.2 Contaminated detection fluid or one that foams on application can cause spurious surface bubbles on the test specimen.

7.3 An excessive vacuum on the low-pressure side when using the vacuum differential technique may cause the detection fluid to boil.

7.4 If the component to be tested has parts made of stainless steel, nickel, oil chromium alloys, the test fluid must have a sulfur and halogen content of less than 10 ppm of each.

7.5 Immediate application of high pressure may cause large leaks to be missed in the liquid application technique.

7.6 If the component to be tested has parts made of polyethylene or structural plastic, the test fluid must not promote environmental stress cracking (E.S.C.).

7.7 If the test fluid is to be used on oxygen systems it must meet the requirements of MIL-L-25567D.

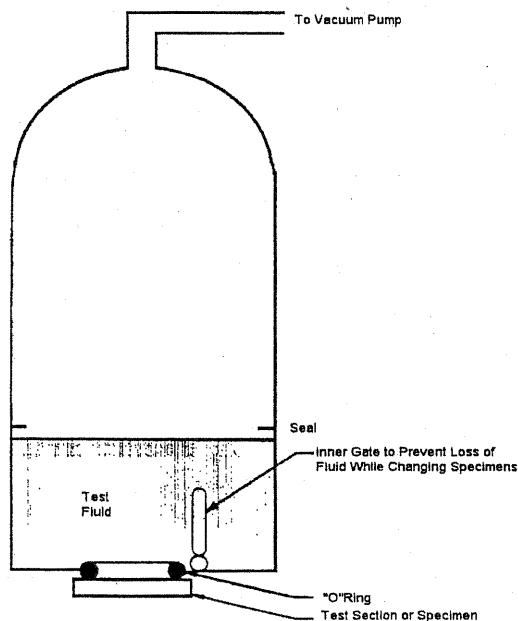


FIG. 1 Vacuum Chamber Technique

8. Immersion Technique

8.1 Application – This technique is applicable to test specimens whose physical size allows immersion in a container of fluid when the test specimen can be sealed prior to the test.

8.2 Techniques for Creating Pressure Differential.

8.2.1 Pressurization of Test Specimen – Seal components and apply an elevated pressure, or if accessible, increase the internal pressure for test purposes.

8.2.2 Elevated-Temperature Test Fluid – Heat the test fluid to a temperature not exceeding the maximum rated temperature of the test specimen. This will cause expansion of the gas inside the test specimen, creating a pressure differential. This technique is usually limited to use on very small parts.

8.2.3 Vacuum Technique – Immerse the test specimen in the test fluid and then place the test fluid container in the vacuum chamber. Reduce the pressure in the chamber to a point that does not allow the test fluid to boil, thus creating a pressure differential. This technique is normally used on very small parts.

8.3 Test Fluids Used in Immersion Techniques – The following test fluids may be used, provided they are not detrimental to the component being tested:

8.3.1 Water – Should be treated with a wetting agent up to $1/3$ by volume to reduce surface tension and promote bubble growth.

8.3.2 Methyl Alcohol (Technical Grade), Undiluted – Not suitable for the heated-bath technique or the vacuum technique.

8.3.3 Ethylene Glycol (Technical Grade), Undiluted.

8.3.4 Mineral Oil – Degreasing of the test specimens may be necessary. This is the most suitable fluid for the vacuum technique.

8.3.5 Fluorocarbons or Glycerin – Fluorocarbons are not recommended for stainless steel nuclear applications.

8.4 Procedures.

8.4.1 Pressurized Test Specimen:

8.4.1.1 Specimens Sealed at Elevated Pressures – Place the test specimen or area being tested in the selected test fluid and observe for a minimum period of 2 min.. Interpret as leakage a stream of bubbles originating from a single point or two or more bubbles that grow and then release from a single point.

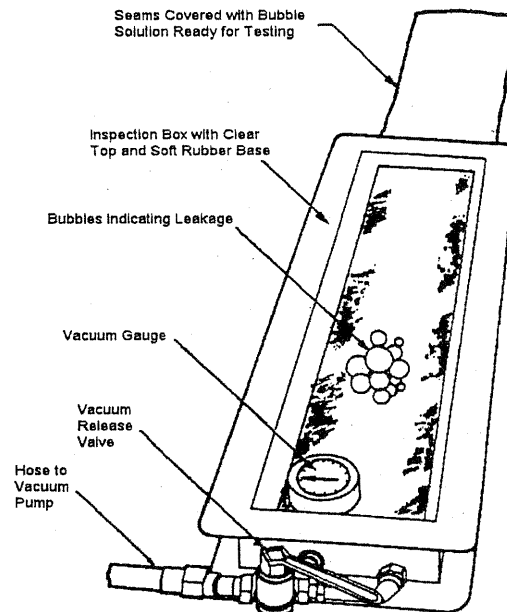


FIG. 2 Vacuum Box

8.4.1.2 Very Small Specimens Sealed at Ambient or Reduced Pressures – Place the test specimen in a pressure chamber and expose to an elevated pressure.

8.4.2 Elevated Temperature Test Fluid – Place the test specimen in the test fluid which is stabilized and maintained at an elevated temperature at a temperature dependent on the specimen. Observe for a stream of bubbles originating from a single point or two or more bubbles that grow and then release from a single point. Interpret either as indicating leakage. The time of observation shall be dependent on the internal volume of the specimen and the case materials of the enclosure. Dwell time must be sufficient to allow a pressure increase to a pressure dependent on the specimen.

8.4.3 Vacuum Technique – Place the test specimen in a container of the selected test fluid and place the container in a vacuum chamber with viewing ports. Reduce the pressure in the vacuum chamber and observe for a stream of bubbles originating from a single point or two or more bubbles that grow and then release from a single point. The amount of vacuum used will be dependent on the test fluid and should be the maximum obtainable without the test fluid boiling. This technique is also applicable to unsealed components or specimen sections by use of the apparatus shown in Fig. 1.

9. Liquid Application Technique

9.1 Application – This technique is applicable to any test specimen on which a pressure differential can be created across the area to be examined. An example of this technique is the application of leak-test solutions to pressurized gas line joint. It is most useful on piping systems, pressure vessels, tanks, spheres, pumps, or other large apparatus on which the immersion techniques are impractical.

9.2 Location of Bubble Test Fluid – Apply the test liquid to the low-pressure side of the area to be examined and then examine the area for bubbles in the fluid. Take care in applying the fluid to prevent formation of bubbles. Flow the solution on the test area. Joints must be completely coated. The pressure differential should be created before the fluid is applied, to prevent clogging of small leaks.

9.3 Type of Bubble Test Fluid – A solution of commercial leak-testing fluids may be used. The use of soap buds or household detergents and water is not considered a satisfactory leak-test fluid for a bubble test, because of lack of sensitivity due to masking by foam. The fluid should be capable of

being applied free of bubbles so that a bubble appears only at a leak. The fluid selected should not bubble except in response to leakage.

9.4 *Vacuum Technique* – Place a vacuum box (see Fig. 2) over the bubble test fluid. In testing equipment, such as storage tank floors and roofs, place the vacuum box over a section of the weld seam and evacuate to 3 psi (20.68 kPa) (or what the applicable standard requires) and hold for a minimum time of 15 seconds.

10. Precision and Bias

10.1 *Accuracy* – The methods are not intended to measure leakage rates but to locate leaks on a go, no-go basis. Their accuracy for locating leaks of 4.5×10^{-9} mol/s (1×10^{-4}

Std cm^3/s)² and larger is $\pm 5\%$. Accuracy for locating smaller leaks depends upon the skill of the operator.

10.2 *Repeatability* – On a go, no-go basis, duplicate tests by the same operator should not vary by more than $\pm 5\%$ for leaks of 4.5×10^{-9} mol/s (1×10^{-4} Std cm^3/s)².

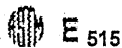
10.3 *Reproducibility* – On a go, no-go basis, duplicate tests by other trained operators should not vary by more than 10 % for leaks of 4.5×10^{-9} mol/s (1×10^{-4} Std cm^3/s)² and larger.

11. Keywords

11.1 bubble leak testing; film solution leak test; immersion leak test; leak testing; vacuum box leak testing.

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This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either re-approved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 100 Barr Harbor drive, West Conshohocken, PA 19428.





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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Test Method for Leaks Using Ultrasonics¹

This standard is issued under the fixed designation E 1002; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon indicates in editorial change since the last revision or re-approval.

1. Scope

1.1 *Test Method A. Pressurization* – This test method covers procedures for calibration of ultrasonic instruments, location, and estimated measurements of gas leakage to atmosphere by the airborne ultrasonic technique.²

1.2 In general practice this should be limited to leaks producing leakage of 4.5×10^{-7} mol/s (1×10^{-2} std. cm³/s at 0° C) or more for the pressure method of gas leakage to atmosphere. Refer to Guide E 432 for additional information.

1.3 *Test Method B. Ultrasonic Transmitter* – For object under test not capable of being pressurized but capable of having ultrasonic tone placed/injected into the test area to act as an ultrasonic leak trace source.

1.3.1 This test method is limited to leaks producing leakage of 4.5×10^{-6} mol/s (1×10^{-1} std. cm³/s at 0° C) or greater.

1.4 The values stated in SI units are to be regarded as standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards

E 432 Guide for Selection of Leak Testing Specification³.

E 1316 Terminology for Nondestructive Examinations³

2.2 Other Documents:

SNT-TC-1A Recommended Practice for Personnel Qualification and Certification of Nondestructive Testing.⁴

ANSI/ASNT CP-189 ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel.⁴

ASME Boiler and Pressure Vessel Code, Sect. V, Article 10-Leak Testing⁵

3. Terminology

3.1 *Definitions*—For definitions of terms used in this test method, see Terminology E 1316, Section E.

4. Summary of Test Method

4.1 *Test Method A* – This test method sets minimum requirements for an ultrasonic detector. It provides for cali-

¹This test method is under the jurisdiction of ASTM Committee E-7 on Non-destructive Testing and is the direct responsibility of Subcommittee E07.09 on Leak Testing.

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²The gas temperature is referenced to 0°C. To convert to another gas reference temperature, T_{ref} multiply by $(T_{ref} + 273)/273$.

³Annual Book of ASTM Standards, Vol 03.03.

⁴Available from American Society for Nondestructive Testing, 1711 Arlingate Plaza, P.O. Box 28518, Columbus, OH 43228-5180.

⁵Available from American Society of Mechanical Engineers, 3345 E. 47th, New York, NY 10017.

⁶Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Phila. PA 19111-5094, Attn:NPODS

bration of the detector and gives procedures for pressurizing the test object, locating leaks, and estimating the leakage rates.

4.2 *Test Method B* – This test method sets minimum requirements for an ultrasonic detector used in conjunction with an ultrasonic transmitter. It gives procedures for locating leaks using an electronically generated ultrasonic leak tracer source.

5. Personnel Qualification

5.1 It is recommended that personnel performing leak testing attend a dedicated training course on the subject and pass a written examination. The training course should be appropriate for NDT level II qualification according to Recommended Practice No. SNT-TC-1A of the American Society for Nondestructive Testing or ANSI/ASNT Standard CP-189.

6. Significance and Use

6.1 *Test Method A*—This test method is useful for locating and estimating the size of pressurized gas leaks, either as a quality control or a field inspection procedure. It is also valuable as a pretest before other more time consuming and more sensitive leak tests are employed. It should not be used exclusively to locate highly toxic or explosive gas leaks.

6.2 *Test Method B*—This test method is useful for locating leaks in systems that are not under pressure or vacuum as either a quality control or a field inspection procedure. It is not useful for estimating the size of a leak. It is also valuable as a pretest before leak tests using pressurized gas methods and more sensitive leak tests are employed.

7. Interferences

7.1 The areas to be tested must be free of oil, grease, paint, and other contaminants that might mask a leak.

7.2 Under certain conditions background noise detected by the instrument can prevent the detection of relevant leakage. This background noise can result from equipment vibration and air movement due, for example, to wind, or air-cooled motors, aircraft engines, pneumatic systems, etc.

7.3 Use of earphones is required in areas where the background noise might interfere with hearing the audible output of a speakers.

8. Apparatus

8.1 Ultrasonic Leak Detection System

8.1.1 The system shall consist of an instrument, probes, focusing probe accessory and earphones. (A speaker may or may not be utilized.)

8.1.2 The system shall provide for detection of acoustic energy in the ultrasonic range from 20,000 to 100,000 Hz and shall translate this energy into an audible signal that can be heard by use of earphones or speaker, or both.

8.1.3 The detected energy shall be indicated on a meter readout.

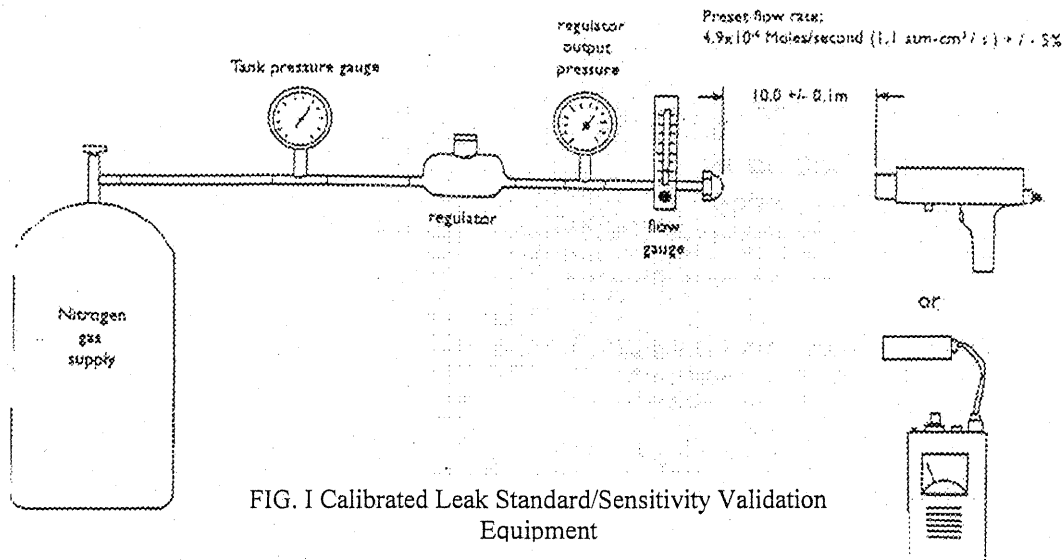


FIG. I Calibrated Leak Standard/Sensitivity Validation Equipment

8.2 *Minimum Instrument Requirements* – The instrument shall meet the following requirements:

8.2.1 The detected ultrasonic energy shall be indicated on a meter readout that shall have pointer deflection great enough to exceed normal background fluctuations. The meter indication may have a correlation to decibels..

8.2.2 The audible response shall consist of the down-converted heterodyned ultrasonic signal. This audio signal will be representative of the amplitude or frequency characteristics, or both, of the original ultrasonic signal. Heterodyned signals could allow the operator to discriminate audible background interference as in 7.2..

8.2.3 The instrument shall be equipped with a sensitivity control or gain adjustment, of both, to achieve the conditions of 9.3.3.

8.2.4 The instrument may be equipped with a ten-turn sensitivity control with a three-digit readout.

8.2.5 The internal power supply shall be regulated to provide repeatability of the sensitivity set point to within $\pm 5\%$ of full scale over the full range of battery condition.

8.2.6 The instrument may include additional features which could enhance leak detection such as frequency controls or meter response selection, or both.

8.3 *Other Apparatus* – Pressure gages, valves, and piping as required.

8.4 *Ultrasonic Transmission*

8.4.1 The system shall consist of an apparatus described in 8.1 through 8.3 with the addition of an ultrasonic transmitter.

8.4.2 The transmitted shall produce an ultrasound between the frequencies of 38 to 42 kHz.

8.4.3 The output of the transmitter transducer shall be in excess of 100 dB at 1 ft.

8.4.4 The intensity of the output may be adjustable.

8.4.5 The heterodyned signal received by the ultrasonic leak detection system from the ultrasonic transmitter must be easily identified and recognized as the ultrasonic tracer source.

8.4.6 The internal power supply me regulated and be sufficient to produce the required output (see 8.4.3).

8.4.7 The transmitter may include additional features that could enhance the leak detection process such as a warble tone transmission and amplitude adjustments.

9. Calibration

9.1 *Calibration / Sensitivity and Validation* – The ultrasonic instrument should be calibrated or have the sensitivity validated before each initial use.

9.2 *Calibration / Sensitivity Validation Equipment* - Use the following equipment for calibration of the test system:

NOTE – This equipment serves a dual function; either to calibrate the ultrasonic instrument for leakage rate approximation as in 11.3, or to verify the sensitivity for detection and location as in 11. 1.

9.2.1 *Leak Standard*, with a preset flow rate of 4.9×10^{-5} mol/s (1.1 std. cm³/s at 0°C) $\pm 5\%$. The orifice size shall be approximately 0.2 mm (0.008 in.).

9.2.2 *Regulator*, for the nitrogen supply with output pressure and flow gages. The tank pressure gage is optional.

9.3 Calibration for Air Probe:

9.3.1 Locate the detection probe a distance of 10.0m (± 0.1 m) from the calibrated leak standard specified in 9.2.1.

9.3.2 Check to see that the detector probe and leak source are aligned to obtain the peak response. (see Fig.1).

9.3.3 Adjust the instrument's meter to a meter reading of 50% of full scale ($\pm 5\%$).

9.3.4 Place a sound absorbing barrier in front of the microphone, blocking out the calibrated leak source; the meter reading should zero with a corresponding an absence of an audible signal.

9.4 Re-calibration:

9.4.1 Recheck or validate the sensitivity of the equipment at the beginning of each shift or designated work period interval. This test must be performed at the same sensing frequency as the initial test.

9.4.2 Recheck the equipment when abnormalities are observed in its operation.

9.5 *Ultrasonic Transmitter Method*, should have the sensitivity calibrated or have the generated amplitude validated before each initial use. This could be done by placing the ultrasonic transmitter in a container with a known leak that is equivalent to the leaks that are to be detected.

10. General Considerations

10.1 Openings:

10.1.1 Seal all openings using plugs, covers or other suitable materials that can be readily and completely removed after the completion of the test.

10. 1.2 Provide a gas inlet by attaching a valve to one of the test covers on all items to be pressurized.

10.2 Check of Test Parts.

10.2.1 Examine the part and test equipment before pressure is applied to ensure that it is tight and all appurtenances that should not be subjected to the test pressure

have been disconnected or isolated by valves or other suitable means.

10.2.2 Check safe pressure rating to be sure it will not be exceeded during test.

10.3 *Temperature of Vessel and Testing Medium:*

10.3.1 The temperature of the pressurizing gas must not be at a level that would be injurious to the part or its components.

10.3.2 The test gas is dry nitrogen. (Compressed air can contain oil or water droplets which can seal leaks.)

10.4 *Pressure.*

10.4.1 Unless otherwise specified the gage pressure shall be at least 70 kPa (10 psig). Normal safety precautions should be observed when pressurizing the part under test with the gas to avoid test part ruptures.

10.4.2 Gradually increase the pressure in the part to final test pressure.

10.5 *Ultrasonic Transmitter Method* – Inspect test object to be sure it is free of debris and liquids at the test sites.

11. Detection and Location of Pressurized Gas Leaks.

11.1 *Detection:*

11.1.1 Set the sensitivity at maximum.

11.1.2 Begin to scan by pointing the probe towards the test area. The procedure is to go from "high sensitivity" to "low sensitivity," reducing the sensitivity as the leak is approached.

11.1.3 Note the fluctuations in meter readings and the volume from the earphones or speaker.

11.1.4 If there is too much ultrasound in the area, reduce the sensitivity and continue to scan.

11.1.5 If it is difficult to isolate the leak due to competing ultrasound, place the focusing probe accessory over the scanning probe. This increases the directional response characteristics of the probe.

11.1.6 Listen for a "rushing" sound while observing the meter.

11.1.7 Follow the ultrasound to the loudest point. The meter will show a higher reading as the leak is approached.

11.2 *Ultrasonic Transmitter Method* – Provide for access of transmitter placement in the test object or provide an inlet pipe conduit fitting to couple with the transmitter allowing it to adequately saturate the test object with ultrasound in such a way as to shield stray ultrasonic leakage into the ultrasonic leak detection side.

11.2.1 All potential interferences shall be cleared away from the test areas either by cleaning or by blowing the areas dry with compressed gas.

11.2.2 *Transmitter Placement* – The transmitters shall be placed to adequately cover the test object with a uniform ultrasound.

11.2.3 Listen for the distinct heterodyned ultrasound produced by the ultrasonic transmitter. This may be a whistle or warbling tone.

11.3 *Location:*

11.3.1 In order to focus on the leak, keep reducing the sensitivity until a leak is located.

11.3.2 *To Confirm a Leak* – Position the scanning probe with or without the rubber focusing extension close to the suspect leak site and move it, slightly back and forth, up and down. If the leak is at this location, the sound and meter readings will both increase and decrease in intensity. This source discrimination technique will eliminate false leak identification due to reflected leak signals from other sites near the suspect leak site.

11.4 *Leakage Rate Approximation* – The leakage rate may be estimated:

$$LR = 4.9 \times 10^{-6} \text{ mol/s} \times \text{DDM}$$

or

$$LR = \times 10^{-2} \text{ std. cm}^3/\text{s at } 0^\circ\text{C} \times \text{DDM}$$

Where:

LR = leakage rate, and

DDM = detection distance meters.

12. Report

12.1 The following information should be recorded at the time of the measurements and included in the report:

12.1.1 Date tested.

12.1.2 Test conditions such as temperature and pressure.

12.1.3 Location of the leak.

12.1.4 Name and model of apparatus used.

12.1.5 Calibration.

12.1.6 Signature of tester.

13. Precision and Bias

13.1 This procedure is based on laboratory results and is believed to represent the best available method. Operational procedures that might affect precision and bias have been defined as closely as appears practicable.

14. Keywords

14.1 leak detection – ultrasonic; leak testing; leakage rate; ultrasonic detector.

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Series 107 Differential Pressure Switch

General Instructions

Form #492

General

These instructions provide information for mounting, electrical connection, process connection and calibration of Series 107 differential pressure switches.

Principle of Operation

Process pressure is sensed by a diaphragm and piston assembly. The piston responds to differential pressure and moves a shaft that actuates (deactuates) an electrical switching element. Low side pressure and a wetted adjustable range spring oppose high side pressure. Calibration is accomplished by adjusting the range spring with the set point adjustment.

Application

The 107 differential pressure switch is suited for draft range service as well as industrial air and gas services which are compatible with the wetted parts and within nameplate specifications. Contact the SOR representative in your area or the factory in Lenexa, Kansas for details.

CAUTION: Use care during installation not to inadvertently move the electrical switching element or its housing. Movement of either could disturb the relative positions of internal working parts and alter calibration or render the device inoperative.

Mounting

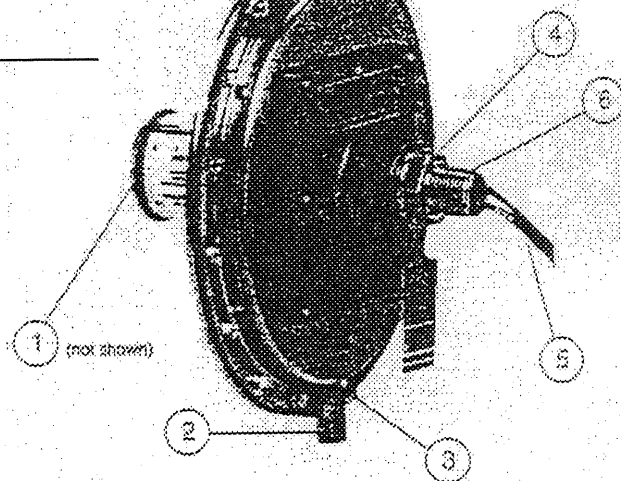
The 107 is position sensitive. Mount the 107 so that the diaphragm is vertical (as shown in photos at right). Non-vertical mounting positions will cause calibration scale error.

If condensation is expected within process piping, pressure ports should be located at 6 o'clock to prevent moisture accumulation within the instrument. If condensation is not expected, the pressure ports can be positioned to any location as long as the diaphragm remains vertical.

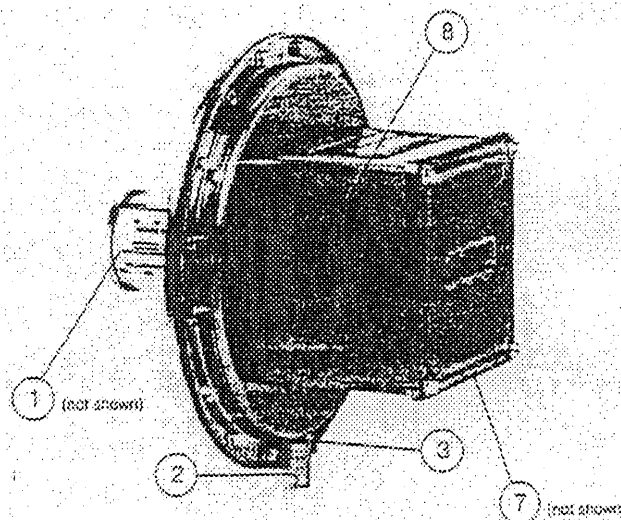
Securely mount the base plate bracket to flat surface using suitable bolts.

Process Connection

The high pressure side (stamped HIGH) and the low pressure side (stamped LOW) have 1/4 NPT (F) process connections unless 1/4 NPT (F) adapters were specified.



Hazardous Locations – 107EL



Non-Hazardous Locations – 107EL

- 1 High Point Adjustment screw
- 2 High side process connection
- 3 Low side process connection
- 4 Hermetically sealed switching element capsule
- 5 18 AWG wire leads
- 6 1/2 NPT (M) electrical conduit connection
- 7 3/4 NPT (F) electrical conduit connection
- 8 Weathertight switching element housing



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Tel. 913-888-2630 • Fax 913-888-0767

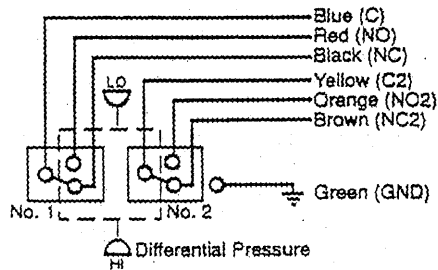
Electrical Connection

107AL (weathertight): Interrupt electrical power. Remove top cover plate. Screw terminals are standard. Terminals are identified C – Common, NO – Normally Open and NC – Normally Closed.

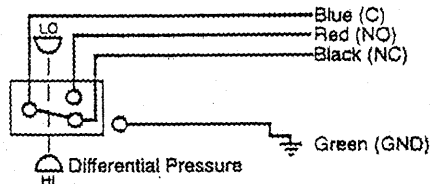
107EL (explosion proof): Hermetically sealed switching element capsule has 18" – 18 AWG wire leads color coded and stamped C – Common, NO – Normally Open, NC – Normally Closed and G – Ground (earth). See schematic.

Wire Lead Color Code

DPDT (2 SPDT)



SPDT



Calibration

Normal Calibration: Turn set point adjustment screw to move spring guide plate into alignment with desired set point on calibration scale.

Precise Calibration: Device calibrated without reference to calibration scale and low side vented. Test apparatus:

Manometer
Variable Pressure source
Test light or ohmmeter

1. Connect variable pressure source to manometer and high side pressure port.
2. Connect test light or ohmmeter to C-Common and NO-Normally Open switching element contacts.
3. Raise pressure and note manometer reading when circuit closes.
4. Slowly drop pressure and note manometer reading when circuit opens.
5. Use a screwdriver to turn set point adjusting screw: counterclockwise to increase set point, or clockwise to decrease set point.

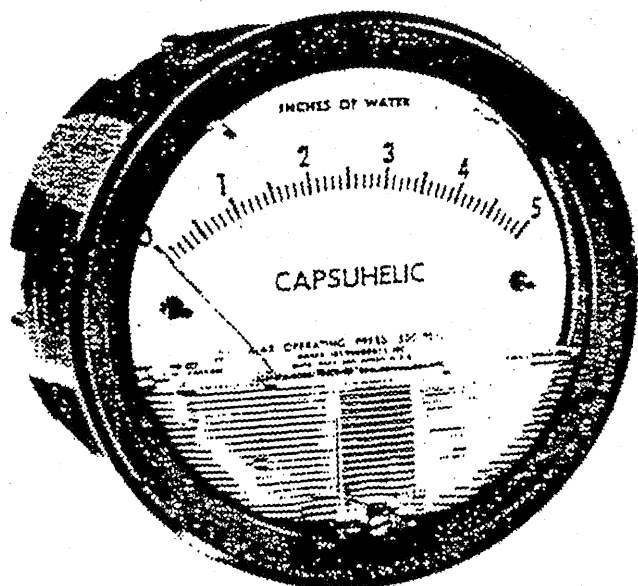
CAUTION: Do not remove other covers or attempt to adjust other parts of the mechanism. All have been precisely positioned at the factory and should not be moved in the field.

Design and specifications are subject to change without notice.

See SOR Catalog #459 for reference dimension drawings. For certified dimension drawings, contact the factory

SOR

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Tel. 913-888-2630 • Fax 913-888-0767

CAPSUHELIC® Differential Pressure Gage**Dwyer**

CAUTION: Use of a line filter (Dwyer model A-391 or equivalent) is recommended to prevent entry of liquid borne particles into gage. Dwyer Instruments cannot assume responsibility for failure of gages due to clogging of internal passages.

SPECIFICATIONS

Dimensions: 5" diameter x $3\frac{3}{32}$ " length

Weight: 3 lb., 3 oz. (Brass-7 lb., 13 oz.)

Finish: Baked dark gray hammerloid except for optional brass case which is uncoated.

Housing: Die cast aluminum with Teflon® impregnated hard coat anodizing, standard or optional forged brass housing, (series 4000B),

Connections: $\frac{1}{4}$ NPT high and low pressure taps, duplicated – one pair top and one pair bottom.

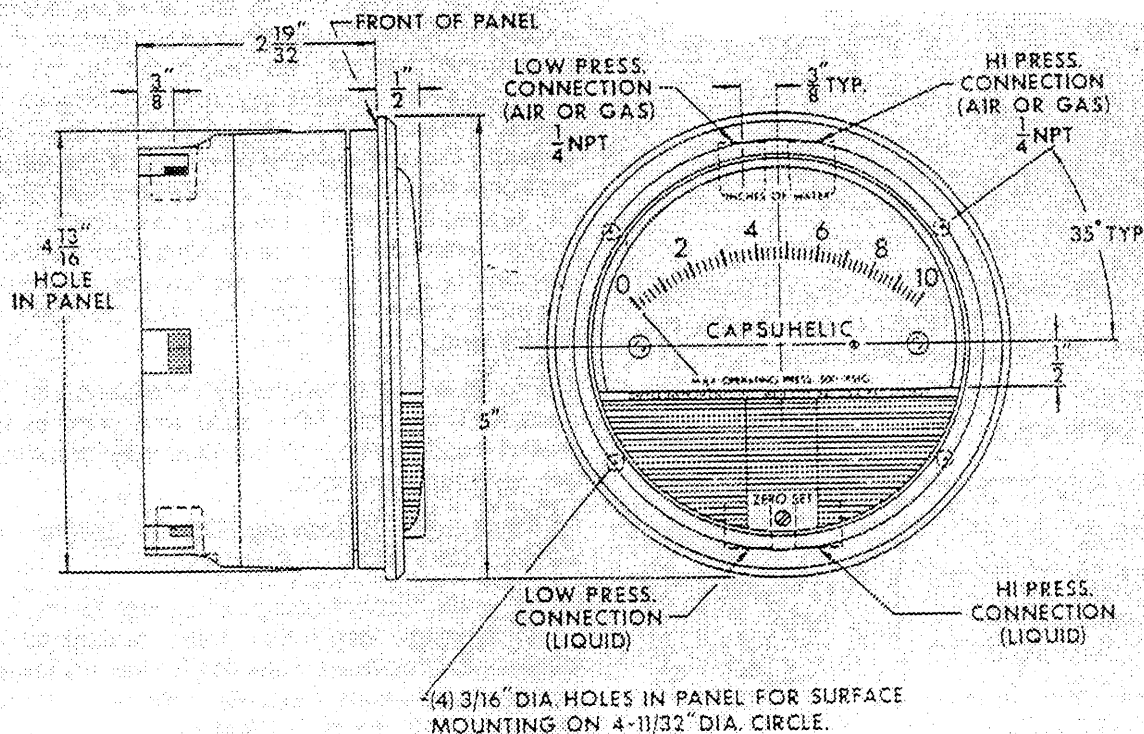
Accuracy: Plus or minus 3% of full scale at 70°F. (2% on 4000S models, 4% on 4215, 4220, and 4500)

Pressure Rating: - 20" Hg to 500 psig.

Differential Pressure (Scale) Range: 20° to 200°F.

Service: Compatible gases or liquids. For water or water based liquids, use only series 4000B models with brass case. DO NOT use with hydrogen gas. Toxic and/or explosive gas may form due to reaction with rare earth magnet.

Standard gage accessories include two $\frac{1}{4}$ " NPT plugs for duplicate pressure taps and four flush mounting adapters with screws.



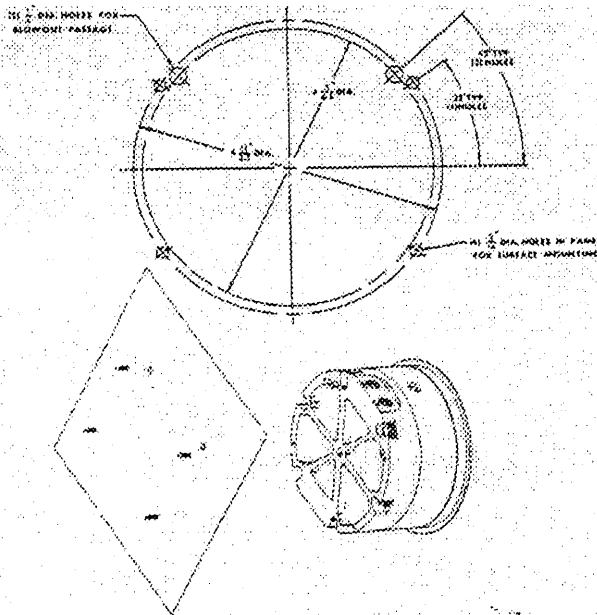
DWYER INSTRUMENTS, INC.
P. O. BOX 373 • MICHIGAN CITY, INDIANA 46360, USA

Telephone 219/879-8000
Fax 219/872-9057

1. Select a location free from excessive vibration and where the ambient temperature will not exceed 200°F. Sensing lines may be run any necessary distance. For example, 250 foot lines will not affect accuracy but will damp the reading slightly. Do not restrict lines. If pulsating pressures or vibration cause excessive pointer oscillation, consult factory for means of providing additional damping.

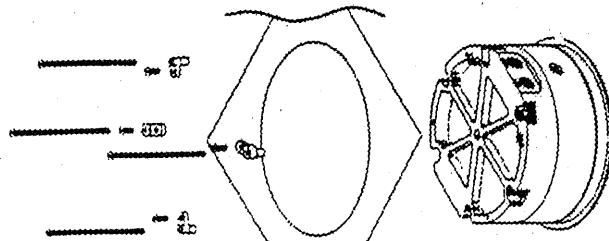
2. All standard models are calibrated for use with the diaphragm and scale in a vertical position. Special factory calibration is necessary for operation in an inclined or horizontal position. The exceptions are ranges under 5 in. w.c., (or metric equivalents) which can only be calibrated for vertical operation.

3. Surface Mounting



Locate 4 mounting holes, 35° from horizontal centerline on a 4 $\frac{11}{32}$ " diameter circle. Use No. 6-32 machine screws of appropriate length.

Be sure to drill 1/4" holes for blowout protection as shown in the diagram.



4. Flush Mounting

Provide a 4 $\frac{13}{16}$ " diameter opening in panel. Insert gage and secure in place with No. 6-32 machine screws of appropriate length, with mounting

lugs firmly secured in place.

5. To zero the gage after installation

Set the indicating pointer exactly on the zero mark, using the external zero adjust screw on the cover at the bottom. Note that the zero check or adjustment can only be made with the high and low pressure taps both open to atmosphere.

Caution

Note location of blowout or vent holes in the surface mounting diagram. Do not block these holes as their function is to vent overpressure failure out the back of the gage rather than blowing off the front cover.

Important Notes

Two pairs of high and low pressure taps are provided, one pair on the top and a duplicate pair on the bottom. These fittings may be utilized according to the type of services for which the gage will be used. For gas or vapor service the gage should be connected from the pressure source to the top pressure fittings so that any accumulation of condensate may be drained or bled out the bottom fittings. For liquid service the pressure source should be connected to the bottom taps so that any trapped gas may be vented out the top fittings. For liquid service the pressure source should be connected to the bottom taps so that any trapped gas may be vented out the top fittings. Optional bleed fittings may be obtained to replace the standard 1/4 NPT plugs for installations requiring frequent draining or venting of the gage. Note that the unused pair of pressure taps must be plugged in order for the gage to operate. For straight pressure or vacuum applications where only one of a pair of high and low pressure taps are being utilized, the other tap must be open to atmosphere.

For portable use of temporary installation use 1/4 male NPT to male flare fitting and connect to pressure source with high pressure hose or tubing with flare nut connectors.

For permanent installation 1/4" OD copper or stainless steel tubing is recommended.

Proper installation of fittings and plugs is important. Sparingly apply pipe thread sealant to threads. Excessive amounts can fall into pressure passages and cause blockage. We recommend Loctite® 69-31 Hydraulic Sealant. Install using torque wrench. Tighten only to 20 ft/lbs. Overtightening can damage case.

Note: Capsuhelic® differential pressure gages are high precision instruments assembled and calibrated in a modern factory. If trained instrument mechanics are not available, we recommend that any instruments requiring repair be returned to the factory.

1. No lubrication or periodic servicing is required. If the interior is protected from dust, dirt, corrosive gases and fluids, years of trouble free service may be expected.

2. For service requiring a high degree of continued accuracy, periodic calibration checks are recommended, using the following procedure.

a. As a companion gage, use a hook gage, micromanometer or inclined gage of known accuracy.

b. Connect the Capsuhelic® gage and test gage together with two legs from a "T" or "Y" fitting. Connect tubing to the third leg and impose the pressure, slowly.

c. Be certain no leaks exist in the system and provide adequate time for comparison gages to reach equilibrium, since fluid drainage and different dynamic characteristics can affect the reading.

3. To recalibrate:

Note: Capsuhelic® gages in ranges of 30 PSI and above are not field adjustable and must be returned to the factory if recalibration is required.

a. Remove 1/8 NPT hex plug located on top of gage exposing coaxial rate adjust/clamp screws.

b. Insert 5/32 hex driver and turn hex screw counterclockwise until resistance is felt (approximately four turns).

c. Adjust rate by turning coaxial slotted screw with a .10 inch diameter jeweler's screwdriver. Clockwise rotation of rate adjust screw will decrease gage rate and counterclockwise rotation will increase the pressure rate,

d. Reclamp system by turning hex screw clockwise until firm, taking care not to over-tighten system.

e. Replace 1/8 NPT plug to leak tight position.

f. Check calibration as described in preceding comments.

g. Repeat a. through f. until desired calibration is reached.

4. Trouble Shooting.

a. Gage sluggish or fails to indicate.

1) Sensing lines may be plugged or leaking.

2) Pressure ports plugged by particulate.

3) Pointer may be touching scale.

4) Jews supporting helix over tightened.

b. Gage fails to indicate zero properly.

1) See comments above regarding sluggish readings.

2) Iron particles in strong magnetic field between helix and pressure wall. If found, they may be removed by touching each particle and withdrawing it with a small screwdriver.

3) Magnet shifted and touching inside of pressure wall.

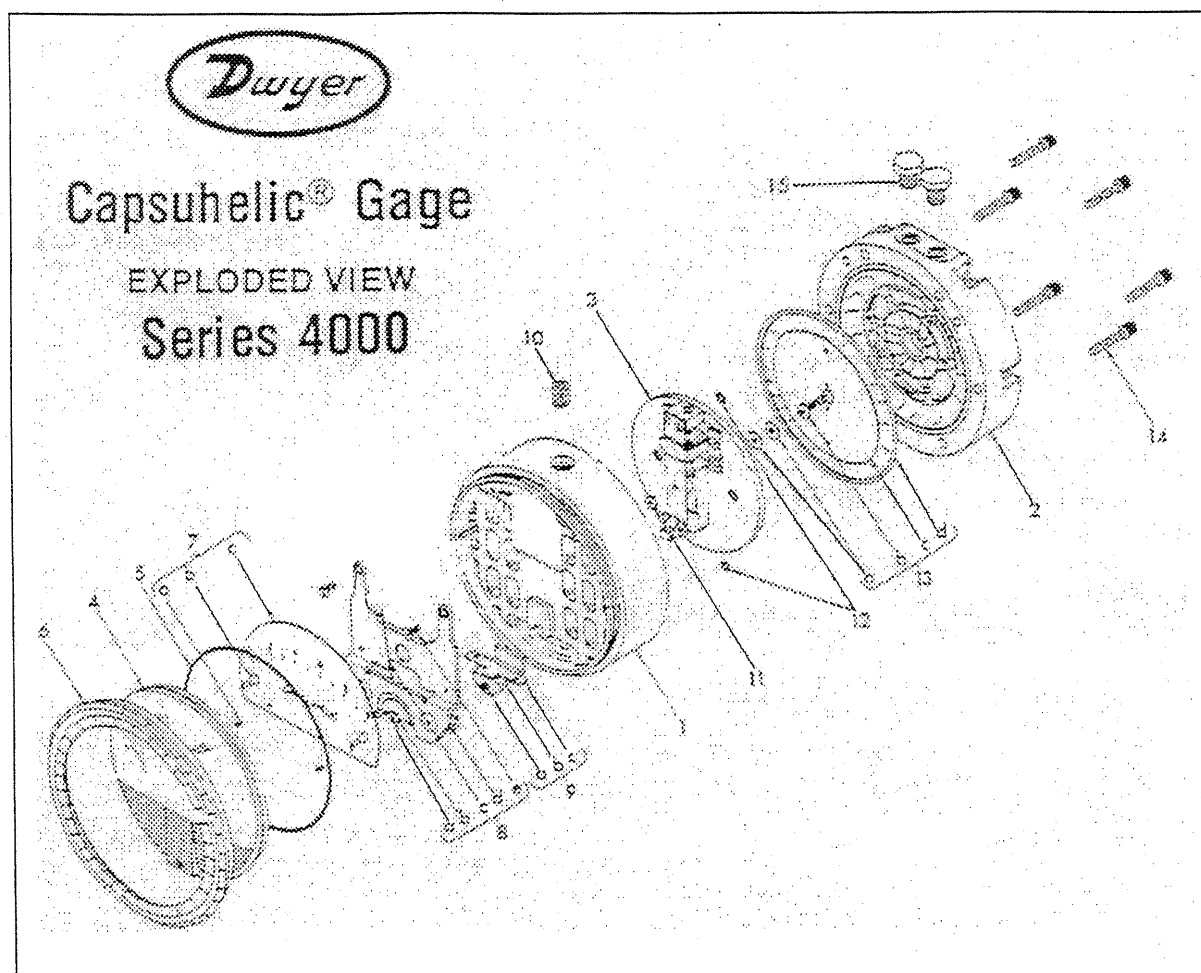
c. Apparent inaccuracy.

1) See preceding comments.

2) Improper connections to pick up desired pressure differential. For example, static pressure connections also sensing velocity pressure, pitot tube improperly located, etc.

3) Gage connections leaking.

d. Consult factory for unusual conditions of temperature, pressure, etc., and the effect on gage operation and accuracy.



- | | |
|-------------------------------------|---------------------------------------|
| 1. Case | 9. Zero adjust assembly |
| 2. Back plate | a. Adjust screw |
| 3. Range spring assembly | b. Foot |
| 4. Cover with zero adjust assembly | c. Bracket |
| 5. "O" ring seal | 10. Rate adjust plug |
| 6. Bezel | 11. Connecting link nut |
| 7. Scale Assembly – consists of: | 12. "O" ring |
| a. Mounting Screws | 13. Diaphragm assembly – consists of: |
| b. Bumper pointer stop | a. Washers |
| c. Scale | b. Linkage assembly, complete |
| 8. Wishbone assembly – consists of: | c. Front Plate |
| a. Front jewel | d. Diaphragm |
| b. Locking nut | e. Back plate (not shown) |
| c. Pointer | 14. Case bolts |
| d. Wishbone | 15. Mounting hardware kit |
| e. Mounting screws | a. Pipe plug ¼ NPT |
| f. Helix assembly | b. Mounting lug |
| g. Pivots | c. Long screws |
| h. Rear jewel | d. Short screws |

When corresponding with the factory regarding Capsuhelic® gage problems refer to the call out numbers in this view. Be sure to include the model number and range. Field repair is not recommended; contact the factory for repair service.

Note: The exploded view above depicts only Capsuhelic® gages with ranges up to 20 PSI. Higher range gages employ a spirally wound Bourdon tube movement.



AMERON
Coatings

M. S. D. S.

Material Safety Data Sheet

12VT00032

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : AMERCOAT 12V CLEANER
 IDENTIFICATION NUMBER: 12VT00032
 PRODUCT CLASS : CLEANER
 HEALTH : DANGER HMIS/NFPA : H2F3R0

Ameron International
 Protective Coatings Group
 201 North Berry St.
 Brea, CA 92821

EMERGENCY: 800-424-9300 (ChemTrec)
 24 Hours Emergency Hotline

INFORMATION: William B. Dances, PHONE: 714-529-1951 PREPARE DATE: 05/27/05
 PREVIOUS REVISION DATE: New Form

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

ITEM	CHEMICAL NAME	CAS NUMBER	WT/WT % LESS THAN
01	ACETONE ACGIH STEL-750PPM, 1782mg/m3	67-64-1	100.00 %

(SARA, CERCLA)

ITEM	EXPOSURE LIMITS				VP mmHg @68F	TOXICITY	
	ACGIH TLV-TWA ppm	ACGIH TLV-TWA Mg/M3	OSHA PEL-TWA ppm	OSHA PEL-TWA Mg/M3		LD50 g/kg	LC50 ppm
01	500	1188.0	1000	2400	186.0	20.000	21086.000

REGULATORY: All ingredients are on TSCA inventory or are exempt. Toxic chemicals marked (SARA, CERCLA, HAPs) are subject to reporting requirements of SARA (40CFR 355 and 372), CERCLA (40CFR 302), or HAPs (40CFR 63).

(S)=Skin; LD50=Dermal.rabbit; LC50=Inhalation,rat; dna=data not available;
 na=not applicable

SECTION 3 - HAZARDS IDENTIFICATION

EXPOSURE EFFECTS: Material and vapor harmful. Irritating to eyes, skin, and if inhaled; to nose and throat. Excessive or prolonged inhalation can cause headache, nausea or dizziness. Repeated and prolonged occupational overexposure to solvents is associated with permanent brain and nervous system damage. Intentional abuse, misuse or other massive exposure to solvents may cause multiple organ damage and/or death.

OVER-EXPOSURE (prolonged or repeated use): CAN AGGRAVATE OR ACCENTUATE ANY OF THESE EFFECTS.

SKIN: Irritant. Can cause defatting and drying of skin.

INHALATION: Irritant. Lethargy and tremors. High vapor concentrations may cause drowsiness.

EYES: Severe irritant. Corneal injury.

INGESTION: Harmful if swallowed. Aspiration into lungs can damage lungs and cause chemical pneumonia.

TARGET ORGANS: Kidneys. Liver. Lungs. Skin. Eyes. Stomach. Central nervous system.

MEDICAL CONDITIONS AGGRAVATED: Skin. Eyes.

PRIMARY ROUTE(S) OF ENTRY: SKIN CONTACT INHALATION INGESTION EYE CONTACT

SECTION 4 - FIRST AID MEASURES

FIRST AID PROCEDURES: INHALATION: Remove to fresh air. Restore normal breathing. Treat symptomatically. See physician. SKIN: Wash thoroughly with soap and water. Remove contaminated clothing. Consult physician if irritation persists. EYES: Flush immediately with plenty of water for at least 15 minutes and get medical attention. INGESTION: Drink 1 or 2 glasses of water to dilute. Never give anything by mouth to an unconscious person. Do not induce vomiting. Consult physician or poison control center IMMEDIATELY. Treat symptomatically.

SECTION 5 - FIRE FIGHTING MEASURES

FLASH POINT: -4 F (SETA)

LOWER EXPLOSIVE LIMIT: 2.6 %

UPPER EXPLOSIVE LIMIT: 12.8 %

FLAMMABILITY - OSHA: FLAMMABLE - CLASS IB
DOT: FLAMMABLE

SECTION 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: FOAM CO2 DRY CHEMICAL

LOWEST FLASHING SOLVENT: 67-64-1

UNUSUAL FIRE AND EXPLOSION HAZARDS: Closed containers may explode when exposed to extreme heat and pressure buildup. May produce a floating fire hazard.

FIREFIGHTING PROCEDURES: Wear full protective equipment, self-contained breathing apparatus. Water may be used to cool closed containers to prevent pressure build-up or explosion when exposed to extreme heat.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL, LEAKS: Remove all sources of ignition. Avoid breathing vapors. Ventilate area. Use absorbent, inert cleanup materials. (DO NOT use sawdust.) Remove absorbent material with non-sparking tools. Place in separate container. Keep out of sewers and waterways. If entry is threatened or occurs, notify local authorities.

SECTION 7 - HANDLING AND STORAGE

HANDLING AND STORAGE: Keep container closed, upright when not in use. Store in cool, dry, well-ventilated area. Avoid prolonged storage temperatures above 100F. Use caution when pouring. Avoid breathing sanding dust. Do not weld or flame cut on empty container.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION: Implement administrative and engineering controls to reduce exposure. Provide sufficient ventilation in volume and pattern to keep air contaminant concentrations below the TLV limits. Remove welding or flame cutting decomposition products; follow current, ANSI Z49.1, "Safety in Welding and Cutting". Refer to 29 CFR parts 1910 and 1915, for coating operations; part 1910.146, Confined Spaces.

RESPIRATORY PROTECTION: Wear NIOSH/MSHA certified respirator designed to remove a combination of particulates (dust or spray mist) and vapor. When brushing, rolling or spreading; select the appropriate respiratory protection for the conditions. For specific conditions, refer to current "NIOSH Pocket Guide to Chemical Hazards". In confined or restricted ventilation areas use air-line respirators or hoods. Refer to 29 CFR, OSHA parts 1910.134 and 1915 for coating operations; part 1910.146 Confined Spaces; ANSI Z88.2, Practices for Respiratory Protection; 42 CFR, part 84 Particulate Respirators.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

PROTECTIVE CLOTHING AND EQUIPMENT: Dependent upon application method, wear resistant coveralls, gloves and shoe coverings to prevent skin contact. Wear solvent resistant glasses with splash guards or face shield to protect eyes from splash, spatter and/or spray mist. Consult 29 CFR 1910.132, 133, 136, 138; ANSI Z87.1, Z41.

HYGIENIC PRACTICES: Wash thoroughly after handling and before eating, smoking or using toilet. Launder contaminated clothing before use.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

BOILING RANGE	: 133 - 133 F	VAPOR DENSITY	: Is heavier than air
ODOR	: SOLVENT	WEIGHT PER GAL	: 6.6500
APPEARANCE	: LIQUID	EVAPORATION RATE:	Is faster than Butyl Acetate
SOLUBILITY IN H2O	: YES		
MIXED VOC, G/L	: 0	PHOTOCHEMICALLY REACTIVE:	No
VOLATILE VOLUME %	: 100.00		

SECTION 10 - STABILITY AND REACTIVITY

CONDITIONS TO AVOID: Heat, open flame, arc or sparks.

INCOMPATIBILITY: Strong oxidizers, acids and alkalies.

HAZARDOUS DECOMPOSITION PRODUCTS: (BY FIRE, BURNING OR WELDING); CO, CO2.

HAZARDOUS POLYMERIZATION: Will not occur under normal conditions.

STABILITY: This product is stable under normal storage conditions.

SECTION 11 - TOXICOLOGICAL PROPERTIES

TOXICOLOGICAL PROPERTIES: See Section 2.

SECTION 12 - ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION: No Information.

SECTION 13 - DISPOSAL CONSIDERATIONS

EPA Waste No.: D001

DISPOSAL METHOD: Place in separate, appropriate, closed container in accordance with all applicable local, State, and Federal regulations. This material has NOT been tested by Toxicity Characteristic Leaching Procedure (TCLP).

SECTION 14 - TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: Acetone

DOT HAZARD CLASS: 3

HAZARD SUBCLASS: NA

DOT UN/NA NUMBER: 1090

IMO: NA

PACKING GROUP : II

SECTION 15 - REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS: AS FOLLOWS -

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200)

NEW JERSEY RIGHT-TO-KNOW:

The following materials are non-hazardous, but are among the top five components in this product:

----- CHEMICAL NAME ----- CAS NUMBER

No non-hazardous materials are among the top five ingredients.

PENNSYLVANIA RIGHT-TO-KNOW:

The following non-hazardous ingredients are present in the product at greater than 3%:

----- CHEMICAL NAME ----- CAS NUMBER
No non-hazardous ingredients are present at greater than 3%.

INTERNATIONAL REGULATIONS: AS FOLLOWS -

CANADIAN WHMIS: This MSDS has been prepared in compliance with Controlled Product Regulations except for use of the 16 headings.

CANADIAN WHMIS CLASS: No information available.

SECTION 16 - OTHER INFORMATION

NOTICE: No Information.



AMERON
Coatings

M. S. D. S.

Material Safety Data Sheet

65T00032

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : AMERCOAT 65 THINNER
 IDENTIFICATION NUMBER: 65T00032
 PRODUCT CLASS : THINNER
 HEALTH : WARNING HMIS/NFPA : H2F3R0

Ameron International
 Protective Coatings Group
 201 North Berry St.
 Brea, CA 92821

EMERGENCY: 800-424-9300 (ChemTrec)
 24 Hours Emergency Hotline

INFORMATION: William B. Dances, PHONE: 714-529-1951 PREPARE DATE: 03/08/05
 PREVIOUS REVISION DATE: 03/05/02

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

ITEM	CHEMICAL NAME	CAS NUMBER	WT/WT % LESS THAN
01	XYLENE (STEL 150ppm; Ceiling 300ppm; trace contaminant benzene***# @<10ppm, toluene#<1%) (HAPS, SARA, CERCLA)	1330-20-7	80.00 %
02	ETHYL BENZENE ACGIH: A3 IARC: 2B (STEL 125ppm) (HAPS, SARA, CERCLA)	100-41-4	19.00 %
03	TOLUENE# (STEL 150 ppm, Ceiling 500 ppm; trace contaminant benzene***# @<300ppm) (HAPS, SARA, CERCLA)	108-88-3	1.00 %

ITEM	EXPOSURE LIMITS				VP mmHg @68F	TOXICITY	
	ACGIH TLV-TWA ppm	ACGIH TLV-TWA Mg/M3	OSHA PEL-TWA ppm	OSHA PEL-TWA Mg/M3		LD50 g/kg	LC50 ppm
01	100	434	100	435	6.6	3.900	6700.000
02	100	434	100	435	7.1	dna	dna

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

ITEM	EXPOSURE LIMITS				VP mmHg @68F	TOXICITY	
	----- ACGIH -----		----- OSHA -----			LD50 g/kg	LC50 ppm
	TLV-TWA ppm	TLV-TWA Mg/M3	PEL-TWA ppm	PEL-TWA Mg/M3			
03	50	188	50	188(S)	22.0	14.000	8000.000

REGULATORY: **CALIF.TITLE 26:22-12000 (PROP 65). WARNING: This product contains a chemical known to the State of California to cause cancer.
 #CALIF.TITLE 26:22-12000 (PROP 65). WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. All ingredients are on TSCA inventory or are exempt. Toxic chemicals marked (SARA, CERCLA, HAPs) are subject to reporting requirements of SARA (40CFR 355 and 372), CERCLA (40CFR 302), or HAPs (40CFR 63).

(S)=Skin; LD50=Dermal.rabbit; LC50=Inhalation,rat; dna=data not available; na=not applicable

SECTION 3 - HAZARDS IDENTIFICATION

EXPOSURE EFFECTS: Material and vapor harmful. Irritating to eyes, skin, and if inhaled; to nose and throat. Excessive or prolonged inhalation can cause headache, nausea or dizziness. Repeated and prolonged occupational overexposure to solvents is associated with permanent brain and nervous system damage. Intentional abuse, misuse or other massive exposure to solvents may cause multiple organ damage and/or death.

OVER-EXPOSURE (prolonged or repeated use): CAN AGGRAVATE OR ACCENTUATE ANY OF THESE EFFECTS.

SKIN: Severe irritant. Can be absorbed through skin. Can cause defatting and drying of skin.

INHALATION: Irritant. Lung injury. Central nervous system damage. Chemical pneumonia. Xylene or toluene may cause irregular heart beat.

EYES: Irritant. Corneal injury. DO NOT wear contact lenses when using this material.

INGESTION: Can be fatal if swallowed. Aspiration into lungs can damage lungs and cause chemical pneumonia.

TARGET ORGANS: Kidneys. Liver. Lungs. Heart. Skin. Eyes. Stomach. Central nervous system. Reproductive organs. Fetal defects.

MEDICAL CONDITIONS AGGRAVATED: Kidneys. Liver. Heart. Skin. Eyes. Respiratory. Lungs.

SECTION 3 - HAZARDS IDENTIFICATION

PRIMARY ROUTE(S) OF ENTRY: SKIN CONTACT INHALATION INGESTION EYE
CONTACT SKIN ABSORPTION

SECTION 4 - FIRST AID MEASURES

FIRST AID PROCEDURES: INHALATION: Remove to fresh air. Restore normal breathing. Treat symptomatically. See physician. SKIN: Wash thoroughly with soap and water. Remove contaminated clothing. Consult physician if irritation persists. EYES: Flush immediately with plenty of water for at least 15 minutes and get medical attention. INGESTION: Drink 1 or 2 glasses of water to dilute. Never give anything by mouth to an unconscious person. Do not induce vomiting. Consult physician or poison control center IMMEDIATELY. Treat symptomatically.

SECTION 5 - FIRE FIGHTING MEASURES

FLASH POINT: 81 F (SETA)

LOWER EXPLOSIVE LIMIT: 1.0 %
UPPER EXPLOSIVE LIMIT: 7.0 %

FLAMMABILITY - OSHA: FLAMMABLE - CLASS IC
DOT: FLAMMABLE

EXTINGUISHING MEDIA: FOAM CO2 DRY CHEMICAL

LOWEST FLASHING SOLVENT: 108-88-3

UNUSUAL FIRE AND EXPLOSION HAZARDS: Closed containers may explode when exposed to extreme heat and pressure buildup. May produce a floating fire hazard.

FIREFIGHTING PROCEDURES: Wear full protective equipment, self-contained breathing apparatus. Water may be used to cool closed containers to prevent pressure build-up or explosion when exposed to extreme heat.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL, LEAKS: Remove all sources of ignition. Avoid breathing vapors. Ventilate area. Use absorbent, inert cleanup materials. (DO NOT use sawdust.) Remove absorbent material with non-sparking tools. Place in separate container. Keep out of sewers and waterways. If entry is threatened or occurs, notify local authorities.

SECTION 7 - HANDLING AND STORAGE

HANDLING AND STORAGE: Keep container closed, upright when not in use. Store in cool, dry, well-ventilated area. Avoid prolonged storage temperatures above 100F. Use caution when pouring. Avoid breathing sanding dust. Do not weld or flame cut on empty container.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION: Implement administrative and engineering controls to reduce exposure. Provide sufficient ventilation in volume and pattern to keep air contaminant concentrations below the TLV limits. Remove welding or flame cutting decomposition products; follow current, ANSI Z49.1, "Safety in Welding and Cutting". Refer to 29 CFR parts 1910 and 1915, for coating operations; part 1910.146, Confined Spaces.

RESPIRATORY PROTECTION: Wear NIOSH/MSHA certified respirator designed to remove a combination of particulates (dust or spray mist) and vapor. When brushing, rolling or spreading; select the appropriate respiratory

protection for the conditions. For specific conditions, refer to current "NIOSH Pocket Guide to Chemical Hazards". In confined or restricted ventilation areas use air-line respirators or hoods. Refer to 29 CFR, OSHA parts 1910.134 and 1915 for coating operations; part 1910.146 Confined Spaces; ANSI Z88.2, Practices for Respiratory Protection; 42 CFR, part 84 Particulate Respirators.

PROTECTIVE CLOTHING AND EQUIPMENT: Dependent upon application method, wear resistant coveralls, gloves and shoe coverings to prevent skin contact. Wear solvent resistant glasses with splash guards or face shield to protect eyes from splash, spatter and/or spray mist. Consult 29 CFR 1910.132, 133, 136, 138; ANSI Z87.1, Z41.

HYGIENIC PRACTICES: Wash thoroughly after handling and before eating, smoking or using toilet. Launder contaminated clothing before use.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

BOILING RANGE	: 231 - 277 F	VAPOR DENSITY	: Is heavier than air
ODOR	: SOLVENT	WEIGHT PER GAL	: 7.2500
APPEARANCE	: LIQUID	EVAPORATION RATE:	Is faster than Butyl Acetate
SOLUBILITY IN H ₂ O	: NO		
MIXED VOC, G/L	: 871		

VOLATILE VOLUME % : 100.00

PHOTOCHEMICALLY REACTIVE: Yes

SECTION 10 - STABILITY AND REACTIVITY

CONDITIONS TO AVOID: Heat, open flame, arc or sparks.

INCOMPATIBILITY: Strong oxidizers, acids and alkalies.

HAZARDOUS DECOMPOSITION PRODUCTS: (BY FIRE, BURNING OR WELDING); CO, CO₂. SO_x. Toxic gases or fumes.

HAZARDOUS POLYMERIZATION: Will not occur under normal conditions.

STABILITY: This product is stable under normal storage conditions.

SECTION 11 - TOXICOLOGICAL PROPERTIES

TOXICOLOGICAL PROPERTIES: See Section 2.

SECTION 12 - ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION: No Information.

SECTION 13 - DISPOSAL CONSIDERATIONS

EPA Waste No.: D001

DISPOSAL METHOD: Place in separate, appropriate, closed container in accordance with all applicable local, State, and Federal regulations. This material has NOT been tested by Toxicity Characteristic Leaching Procedure (TCLP).

SECTION 14 - TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: Paint Related Material

DOT HAZARD CLASS: 3

HAZARD SUBCLASS: NA

DOT UN/NA NUMBER: 1263

IMO: NA

PACKING GROUP : III

SECTION 15 - REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS: AS FOLLOWS -

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR

SECTION 15 - REGULATORY INFORMATION

1910.1200)

NEW JERSEY RIGHT-TO-KNOW:

The following materials are non-hazardous, but are among the top five components in this product:

----- CHEMICAL NAME ----- CAS NUMBER

No non-hazardous materials are among the top five ingredients.

PENNSYLVANIA RIGHT-TO-KNOW:

The following non-hazardous ingredients are present in the product at greater than 3%:

----- CHEMICAL NAME ----- CAS NUMBER

No non-hazardous ingredients are present at greater than 3%.

INTERNATIONAL REGULATIONS: AS FOLLOWS -

CANADIAN WHMIS: This MSDS has been prepared in compliance with Controlled Product Regulations except for use of the 16 headings.

CANADIAN WHMIS CLASS: No information available.

SECTION 16 - OTHER INFORMATION

NOTICE: No Information.



AMERON
Coatings

M. S. D. S.

Material Safety Data Sheet

68HSB20229

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : AMERCOAT 68HS LIGHT GRAY RESIN
 IDENTIFICATION NUMBER: 68HSB20229
 PRODUCT CLASS : ZINC-RICH EPOXY PRIMER
 HEALTH : WARNING HMIS/NFPA : H2F3R0

Ameron International
 Protective Coatings Group
 201 North Berry St.
 Brea, CA 92821

EMERGENCY: 800-424-9300 (ChemTrec)
 24 Hours Emergency Hotline

INFORMATION: William B. Dances, PHONE: 714-529-1951 PREPARE DATE: 03/08/05
 PREVIOUS REVISION DATE: 04/25/03

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

ITEM	CHEMICAL NAME	CAS NUMBER	WT/WT % LESS THAN
01	SILICA (QUARTZ**) * Fed OSHA: S NTP: Y ACGIH: A2 IARC: 1 *Cancer or cancer suspect agent	14808-60-7	25.0 %
02	EPOXY RESIN (Also CAS# 25085-99-8. Diglycidyl ether<2ppm, phenyl glycidyl ether**<6ppm)	25068-38-6	20.0 %
03	EPOXY RESIN (Epch**# @ <1ppm, Bisphenol A @ <100ppm)	25036-25-3	15.0 %
04	METHYL N-AMYL KETONE	110-43-0	11.40 %
05	METHYL ISOBUTYL KETONE (STEL 75ppm, 307 mg/m3)	108-10-1	9.80 %
06	(HAPS, SARA, CERCLA) XYLENE (STEL 150ppm; Ceiling 300ppm; trace contaminant benzene**# @<10ppm, toluene#<1%)	1330-20-7	4.40 %

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

ITEM	CHEMICAL NAME	CAS NUMBER	WT/WT % LESS THAN
07	(HAPS, SARA, CERCLA) + TITANIUM DIOXIDE (As TiO2 trace contaminants 2.5% aluminum hydroxide 3% amorphous silica)	13463-67-7	5.0 %
08	EPOXY RESIN (Epichlorohydrin**# @ <25 PPM)	68413-24-1	5.0 %
09	HIGH FLASH NAPHTHA (Mfg TLV 50ppm; trace contaminant benzene**#<1ppm SARA, toluene#<0.1%SARA)	64742-95-6	2.70 %
10	RHEOLOGY ADDITIVE (Crystalline silica** @ <1%. Also CAS# 71011-24-0)	121888-68-4	5.0 %
11	1,2,4-TRIMETHYLBENZENE	95-63-6	2.00 %
12	(SARA) ETHANOL	64-17-5	1.70 %
13	EPOXY RESIN (Epichlorohydrin**# @ 1ppm max, benzene**# <0.01%)	25036-25-3	5.0 %
14	PROPRIETARY (Methanol @ <0.2%, 200ppm skin, trace contaminant toluene# <100ppm)	PROPRIETARY	5.0 %
15	BUTYL ACETATE (STEL 200ppm, 950mg/m3.)	123-86-4	1.20 %
16	(CERCLA) ETHYL BENZENE ACGIH: A3 IARC: 2B (STEL 125ppm) (HAPS, SARA, CERCLA)	100-41-4	1.00 %

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

EXPOSURE LIMITS				VP mmHg	TOXICITY	
----- ACGIH -----	----- OSHA -----				LD50	LC50
TLV-TWA	TLV-TWA	PEL-TWA	PEL-TWA			

ITEM	ppm	Mg/M3	ppm	Mg/M3	@68F	g/kg	ppm
01	.05	dna	dna	10	N.A.	dna	dna
02	dna	dna	dna	dna	N.A.	20.000	dna
03	dna	dna	dna	dna	N.A.	5.000	5000.000
04	50	233	50	235	2.1	12.000	4000.000
05	50	205	50	205	16.0	10.000	4000.000
06	100	434	100	435	6.6	3.900	6700.000
07	dna	5.0	dna	5.0	N.A.	10.000	6820.000
08	dna	dna	dna	dna	N.A.	2.000	dna
09	dna	dna	100	dna	2.7	3.100	3670.000
10	dna	3.0	dna	10.0	N.A.	dna	dna
11	25.0000	125.00	25.000	125.000	1.0	dna	dna
12	1000	1900	1000	1900	59.0	dna	dna
13	dna	5.0	dna	5.0	N.A.	3.000	dna
14	dna	dna	dna	dna	N.A.	3.900	dna
15	150.0000	713.00	150.000	713.000	10.0	10.000	1800.000
16	100	434	100	435	7.1	dna	dna

REGULATORY: + Pigment content is dependent on color. **CALIF.TITLE 26:22-12000 (PROP 65). WARNING: This product contains a chemical known to the State of California to cause cancer. #CALIF.TITLE 26:22-12000 (PROP 65). WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. All ingredients are on TSCA inventory or are exempt. Toxic chemicals marked (SARA, CERCLA, HAPs) are subject to reporting requirements of SARA (40CFR 355 and 372), CERCLA (40CFR 302), or HAPs (40CFR 63).

(S)=Skin; LD50=Dermal.rabbit; LC50=Inhalation,rat; dna=data not available; na=not applicable

SECTION 3 - HAZARDS IDENTIFICATION

EXPOSURE EFFECTS: Vapor or spray mist or spattered material can be harmful. Irritating to eyes, skin, and if inhaled; to nose and throat. Excessive or prolonged inhalation can cause headache, nausea or dizziness. Dust or powder can be harmful due to mechanical irritation. Irritating to eyes, skin and if inhaled; to nose and throat. Excessive or prolonged inhalation can cause headache, nausea or dizziness. Repeated and prolonged occupational overexposure to solvents is associated with permanent brain and nervous system damage. Intentional abuse, misuse or other massive exposure to solvents may cause multiple organ damage and/or death.

OVER-EXPOSURE (prolonged or repeated use): CAN AGGRAVATE OR ACCENTUATE ANY OF THESE EFFECTS.

SECTION 3 - HAZARDS IDENTIFICATION

SKIN: Irritant. Sensitization or allergic reaction, such as rash or hives. Can be absorbed through skin. Can cause defatting and drying of skin.

INHALATION: Severe irritant. Delayed lung injury. Respiratory sensitization and allergic reaction such as asthma. Central nervous system damage. Repeated exposure to silica dust can cause silicosis. Crystalline silica may cause cancer. Risk of cancer depends on duration and level of exposure to dust from sanding surfaces or spray mist. Chemical pneumonia. Xylene or toluene may cause irregular heart beat. High vapor concentrations may cause drowsiness. High vapor concentrations may cause

kidney and/or liver damage.

EYES: Severe irritant. Corneal injury. Methanol, if swallowed, can cause eye damage and blindness.

INGESTION: Can be fatal if swallowed. Aspiration into lungs can damage lungs and cause chemical pneumonia. Liver damage.

TARGET ORGANS: Kidneys. Liver. Lungs. Heart. Skin. Eyes. Stomach. Central nervous system. Cell genetic material. Reproductive organs. Fetal defects.

MEDICAL CONDITIONS AGGRAVATED: Kidneys. Liver. Skin. Eyes. Respiratory. Allergies. Lungs.

PRIMARY ROUTE(S) OF ENTRY: SKIN CONTACT INHALATION INGESTION EYE CONTACT

SECTION 4 - FIRST AID MEASURES

FIRST AID PROCEDURES: INHALATION: Remove to fresh air. Restore normal breathing. Treat symptomatically. See physician. SKIN: Wash thoroughly with soap and water. Remove contaminated clothing. Consult physician if irritation persists. EYES: Flush immediately with plenty of water for at least 15 minutes and get medical attention. INGESTION: Drink 1 or 2 glasses of water to dilute. Never give anything by mouth to an unconscious person. Do not induce vomiting. Consult physician or poison control center IMMEDIATELY. Treat symptomatically. EYES: After flushing eyes for 15 minutes, get IMMEDIATE medical attention from an ophthalmologist.

SECTION 5 - FIRE FIGHTING MEASURES

FLASH POINT: 82 F (SETA)

LOWER EXPLOSIVE LIMIT: 1.0 %
UPPER EXPLOSIVE LIMIT: 19.0 %

SECTION 5 - FIRE FIGHTING MEASURES

FLAMMABILITY - OSHA: FLAMMABLE - CLASS IC
DOT: FLAMMABLE

EXTINGUISHING MEDIA: FOAM CO2 DRY CHEMICAL

LOWEST FLASHING SOLVENT: 64-17-5

UNUSUAL FIRE AND EXPLOSION HAZARDS: Closed containers may explode when exposed to extreme heat and pressure buildup. May produce a floating fire hazard. Isolate from electrical equipment, sparks, heat and open flame. Vapors may spread long distances, cause flash fire or ignite explosively.

FIREFIGHTING PROCEDURES: Wear full protective equipment, self-contained breathing apparatus. Water may be used to cool closed containers to prevent pressure build-up or explosion when exposed to extreme heat.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL, LEAKS: Remove all sources of ignition. Avoid breathing vapors. Ventilate area. Use absorbent, inert cleanup materials. (DO NOT use sawdust.) Remove absorbent material with non-sparking tools. Place in

separate container. Keep out of sewers and waterways. If entry is threatened or occurs, notify local authorities.

SECTION 7 - HANDLING AND STORAGE

HANDLING AND STORAGE: Keep container closed, upright when not in use. Store in cool, dry, well-ventilated area. Avoid prolonged storage temperatures above 100F. Use caution when pouring. Avoid breathing sanding dust. Do not weld or flame cut on empty container.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

VENTILATION: Implement administrative and engineering controls to reduce exposure. Provide sufficient ventilation in volume and pattern to keep air contaminant concentrations below the TLV limits. Remove welding or flame cutting decomposition products; follow current, ANSI Z49.1, "Safety in Welding and Cutting". Refer to 29 CFR parts 1910 and 1915, for coating operations; part 1910.146, Confined Spaces.

RESPIRATORY PROTECTION: Wear NIOSH/MSHA certified respirator designed to remove a combination of particulates (dust or spray mist) and vapor. When brushing, rolling or spreading; select the appropriate respiratory protection for the conditions. For specific conditions, refer to current "NIOSH Pocket Guide to Chemical Hazards". In confined or restricted

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

ventilation areas use air-line respirators or hoods. Refer to 29 CFR, OSHA parts 1910.134 and 1915 for coating operations; part 1910.146 Confined Spaces; ANSI Z88.2, Practices for Respiratory Protection; 42 CFR, part 84 Particulate Respirators.

PROTECTIVE CLOTHING AND EQUIPMENT: Dependent upon application method, wear resistant coveralls, gloves and shoe coverings to prevent skin contact. Wear solvent resistant glasses with splash guards or face shield to protect eyes from splash, spatter and/or spray mist. Consult 29 CFR 1910.132, 133, 136, 138; ANSI Z87.1, Z41. Use explosion and spark-proof equipment.

HYGIENIC PRACTICES: Wash thoroughly after handling and before eating, smoking or using toilet. Launder contaminated clothing before use. Destroy contaminated leather and absorbent shoes, which cannot be decontaminated, to prevent reuse.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

BOILING RANGE	: 172 - 336 F	VAPOR DENSITY	: Is heavier than air
ODOR	: SOLVENT	WEIGHT PER GAL	: 9.8129
APPEARANCE	: LIQUID	EVAPORATION RATE:	Is faster than Butyl Acetate
SOLUBILITY IN H2O	: NO		
MIXED VOC, G/L	: 288	MIXED THINNED VOC, G/L	: 336
THINNER	: 65 @ 0.5 pints	PHOTOCHEMICALLY REACTIVE:	Yes
VOLATILE VOLUME %	: 50.10		

SECTION 10 - STABILITY AND REACTIVITY

CONDITIONS TO AVOID: Heat, open flame, arc or sparks. Water or moisture.

INCOMPATIBILITY: Strong oxidizers, acids and alkalies. Water.

HAZARDOUS DECOMPOSITION PRODUCTS: (BY FIRE, BURNING OR WELDING); CO, CO2.

NOx. Hydrogen chloride fumes. Aldehydes. Phenols. Silicon oxide fumes.
Toxic gases or fumes. Formaldehyde at temperatures above 300F (150C).
ammonia

HAZARDOUS POLYMERIZATION: Will not occur under normal conditions.

STABILITY: This product is stable under normal storage conditions.

SECTION 11 - TOXICOLOGICAL PROPERTIES

TOXICOLOGICAL PROPERTIES: See Section 2. Crystalline silica (respirable size, 10 microns or less). IARC Monograph on the Evaluation of Carcinogenic

SECTION 11 - TOXICOLOGICAL PROPERTIES

Risk of Chemicals to Humans (Vol 68.1997) concludes that there is sufficient evidence of carcinogenicity to experimental animals and limited evidence of carcinogenicity to humans. - IARC Class 1.

SECTION 12 - ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION: No Information.

SECTION 13 - DISPOSAL CONSIDERATIONS

EPA Waste No.: D001

DISPOSAL METHOD: Place in separate, appropriate, closed container in accordance with all applicable local, State, and Federal regulations. This material has NOT been tested by Toxicity Characteristic Leaching Procedure (TCLP).

SECTION 14 - TRANSPORTATION INFORMATION

DOT PROPER SHIPPING NAME: Paint

DOT HAZARD CLASS: 3

HAZARD SUBCLASS: NA

DOT UN/NA NUMBER: 1263

IMO: NA

PACKING GROUP : III

SECTION 15 - REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS: AS FOLLOWS -

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200)

NEW JERSEY RIGHT-TO-KNOW:

The following materials are non-hazardous, but are among the top five components in this product:

----- CHEMICAL NAME ----- CAS NUMBER

No non-hazardous materials are among the top five ingredients.

SECTION 15 - REGULATORY INFORMATION

PENNSYLVANIA RIGHT-TO-KNOW:

The following non-hazardous ingredients are present in the product at greater than 3%:

----- CHEMICAL NAME -----	CAS NUMBER
---------------------------	------------

No non-hazardous ingredients are present at greater than 3%.

INTERNATIONAL REGULATIONS: AS FOLLOWS -

CANADIAN WHMIS: This MSDS has been prepared in compliance with Controlled Product Regulations except for use of the 16 headings.

CANADIAN WHMIS CLASS: No information available.

SECTION 16 - OTHER INFORMATION

NOTICE: Removal of old lead paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as a properly fitted respirator (NIOSH approved) and proper containment and cleanup. For additional information, contact the USEPA/Lead Information Hotline at 1-800-424-LEAD.