DEPARTMENT OF THE ENVIRONMENT
2500 Broening Highway, Baltimore, Maryland 21224
Area Code 301 • 631-

William Donald Schaefer
Governor

Martin W. Walsh, Jr.
Secretary

TO: JOHN MCGRATH
US NUCLEAR REGULATORY COMMISSION

FROM: RAYMOND E. MANLEY
CENTER FOR RADIOLOGICAL HEALTH
(301) 631-3300

DATE: AUGUST 22, 1989

PAGES: 15 (including this cover sheet)

State in process of reviewing this information, including contacting compact vendors. Any support from NRC in the health physics area would be appreciated. Time line: approximately two week time frame for NRC comments.

John - passed this to T. White then Lee Bettenhausen on 8/22/89

A133

NEUTRON PRODUCTS inc

22301 Mt. Ephraim Road, P.O. Box 68
Dickerson, Maryland 20842 USA
301/349-5001 TWX: 710-828-0542

August 9, 1989

Mr. Roland G. Fletcher, Administrator
Center for Radiological Health
Maryland Department of the Environment
2500 Broening Highway
Baltimore, Maryland 21224

Dear Mr. Fletcher:

Enclosed, in fulfillment of Condition J of Amendment 33 to our MD-31-025-01 license, is our plan for compacting low level radwaste "in a safe manner". As we are accumulating a large volume of bagged low level waste, we feel an urgency to move on with the program. To that end, your prompt review will be appreciated. We are proceeding with procurement and fabrication of the new hardware in parallel with your review.

Yours truly,

NEUTRON PRODUCTS, INC.

Frank Schwoerer

Frank Schwoerer, Vice President

FS:mvc:8
Enclosure

cc: Mr. Lawrence M. Ward (w/o encl)

NEUTRON PRODUCTS, INC.
Plan for Compaction of Low Level Radwaste
August 9, 1989

A. General

This document describes our plan for compacting low level radwaste "in a safe manner" and is in response to Condition J of Amendment 33 to the MD-31-025-01 license. The plan comprises: (1) building a new drummed waste compactor, fitted with a shroud and sparging air flow, to contain and entrain airborne activity resulting from compaction; (2) provision of a HEPA filter (and blower) to remove radioactivity from the discharge air; (3) ducting of the filtered discharge air to the Hot Cell Exhaust system where it will be filtered again by the secondary HEPA filter and where the exhaust air is monitored for airborne radioactivity; (4) operating procedures to ensure that the compaction system is operated as intended; and (5) a monitored phase-in program to ensure that the system performs as intended.

Our Health Physics Consultant has worked with us in developing the design of the waste compaction unit, the air filtration and monitoring system, and procedural concepts and, as he states in a separate letter, considers our approach to be satisfactory. We hereby request review by the Maryland Department of the Environment (MDE) of the design, the procedures, and phase-in program. In parallel with MDE's review, we are proceeding to build the new waste compactor, purchase the new HEPA filter and blower, and install the tie-in to the Hot Cell Exhaust System. We will invite MDE representatives to witness preoperational tests and limited, closely monitored compaction operations of the system before we receive full authorization to resume compaction of low level radwaste.

B. Control and Monitoring of Airborne Radioactivity Releases

The provisions to collect, filter, and monitor airborne radioactivity will be as follows.

(1) A stainless-steel circular shroud (see attached sketch) will enclose the top 3 to 6" of the drum with a 1/2" nominal annular clearance. The front of the shroud will hinge open to insert or remove the drum and the closure joints will be sealed with neoprene or equivalent gasketing material. Air will be sparged from the shroud at a flow rate of about 100 CFM. This will maintain an upward flow of clean air at a velocity of about 360 ft/min through the annular gap between the drum and shroud. As the maximum rate of waste compaction will be less than 25 CFM, we expect the sparging flow of 100 CFM to be adequate to prevent escape of airborne radioactivity through the annular gap and keep the outside of the drum free from contamination.

(2) Air sparged from the shroud at about 100 CFM will be carried in a 2 to 4" diameter duct to a HEPA filter, mounted on a skid. A suitable filter unit is made by Flanders Filters; it is a G-1 Bag-In/Bag-Out unit described in the enclosed manufacturer's literature, with a rated flow of 105 CFM at an initial pressure drop of 0.62 inches of water. The blower will have to develop a head of from 0.7 to 1.2" of water at 100 CFM. A blower meeting these conditions is a Dayton Model 4C006, available from Grainger. We are investigating other filters and blowers and our final selections may be different models but will have equivalent performance.

(3) The filtered discharge of the filter/blower unit will be ducted (as shown in the attached flow diagram), by 2 to 4" flexible hose and hard-piping to the Hot Cell Exhaust System, where it will tie into an existing sampling port between the primary and secondary HEPA filters. The duct will have a damper, near the waste compactor, to be closed when waste compaction is not in process. This arrangement (a) ensures that airborne radioactive discharges from waste compaction are monitored by the continuous sampling system of the Hot Cell Exhaust System; (b) avoids the need to DOP-test the HEPA filter of the compactor because the discharge passes through the DOP-tested secondary HEPA filter; and (c) as shown in the attached graph provides for negative pressures throughout the system, except for the final exhaust duct, so that any leakage will be inleakage. When we first resume waste compaction, we will count the filter element in the hot cell exhaust sampling system frequently until we establish what levels of airborne activity are contributed by waste compaction.

(4) Waste compaction will be done in an enclosed space, in which airborne radioactivity concentrations will initially be sampled. If sampling establishes that there is no significant radioactivity release, local air sampling will be discontinued. Until the courtyard enclosure is completed, we plan to install and operate the waste compactor in the "decontamination room", located between the hot cell access room and the contaminated tool storage room.

C. Mechanical Design

The new compactor will have the following improved mechanical design features over our existing compactor.

(1) The horizontal distance between support legs will be increased to about 30", from the existing 25". This will provide space to install the circular shroud described in B(1), above.

(b) The vertical clearance between the top of the drum and the bottom of the fully-raised compaction piston will be increased to about 14", from the existing 1-3/4", in order to provide space for the circular shroud and to allow the option of attaching a stainless steel collar of about 10" height to the top of the drum during the compaction process. The collar will make it possible to load and compact a greater quantity of material into each drum.

(3) The stroke of the hydraulic cylinder will be increased to at least 36", from the existing 24", as an adjunct to the increased vertical clearance described in C(2), above.

(4) Stops will be provided on the base plate of the compactor to aid in properly positioning the drum in the compactor.

None of these mechanical design features is considered to be safety-related. However, they will facilitate incorporation of the safety-related features described in B, above and improve the efficiency and convenience of the compaction process.

D. Operating Procedures

Prior to each use of the waste compactor, the operators will verify that valves in the Hot Cell Exhaust System and between the compactor and Hot Cell Exhaust system are properly aligned and that air flows are as intended. Since the Hot Cell Exhaust System is aligned to provide flow through the primary HEPA filter just upstream of the tie-in from the compactor, except when that filter is being changed, waste compaction can be done at any time, except when that primary HEPA filter is being changed.

At least initially, local air samples will be taken in the enclosed area where the compactor is operated.

To prevent spread of contamination, low level waste to be compacted will be brought to the compactor in closed plastic bags, and drums of compacted waste will be capped in the enclosed area where the compactor is operated.

A Radiation Work Permit will specify protective clothing and personal dosimetry to be worn, training requirements for the operators, and supervision requirements.

E. Phase-In Program

Before low level radioactive waste is compacted, the new waste compaction system will be subjected to the following preoperational tests and its performance monitored.

- Operation of all mechanical systems, including the hydraulic cylinder and piston and opening and sealing of the front of the shroud.
- Operation of the sparging air system and verification of flow rates, flow velocities in the annular gap between the drum and shroud, and pressure drops.
- Our HP Consultant and representatives of MDE will be invited to witness these tests.

We will request authorization to resume limited waste compaction, upon successful completion of the preoperational tests.

Limited waste compaction will consist of compacting waste in a limited number (say 3 to 5) drums under closely monitored conditions; this monitoring to include:

- Local air sampling in the enclosed area where compaction is being done.
- Measurement of radioactivity collected on the filter in the Hot Cell Exhaust Sampling System.
- Wipe samples of removable contamination on the outside of the drums, before and after waste compaction.
- Wipe samples of the floor of the compaction area before and after waste compaction.
- Witnessing by our HP Consultant.
- Witnessing by MDE representatives, if they desire to do so.

Upon successful demonstration that the compaction system operates as intended, we expect to receive full authorization to resume radwaste compaction utilizing the system and procedures so demonstrated.

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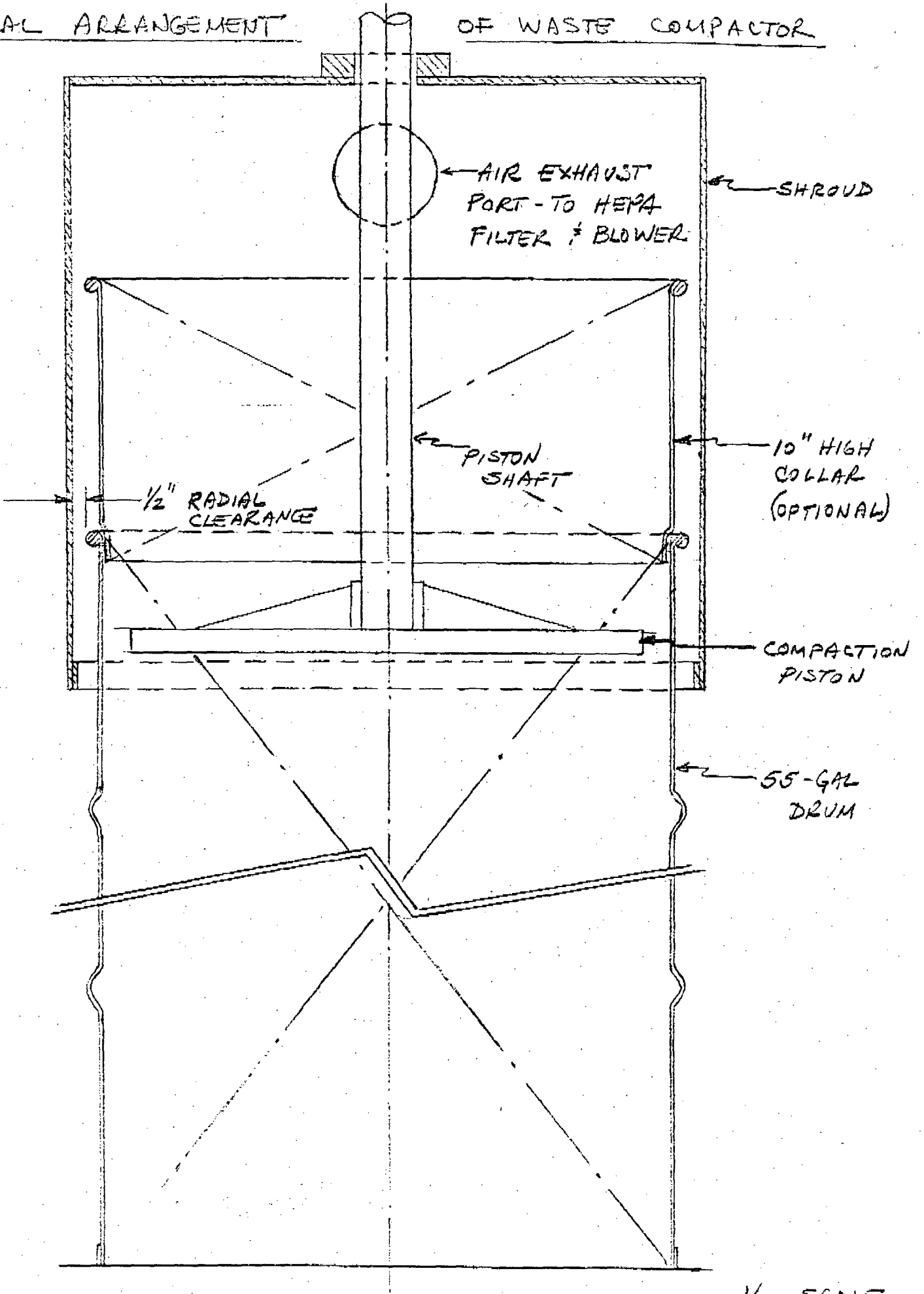
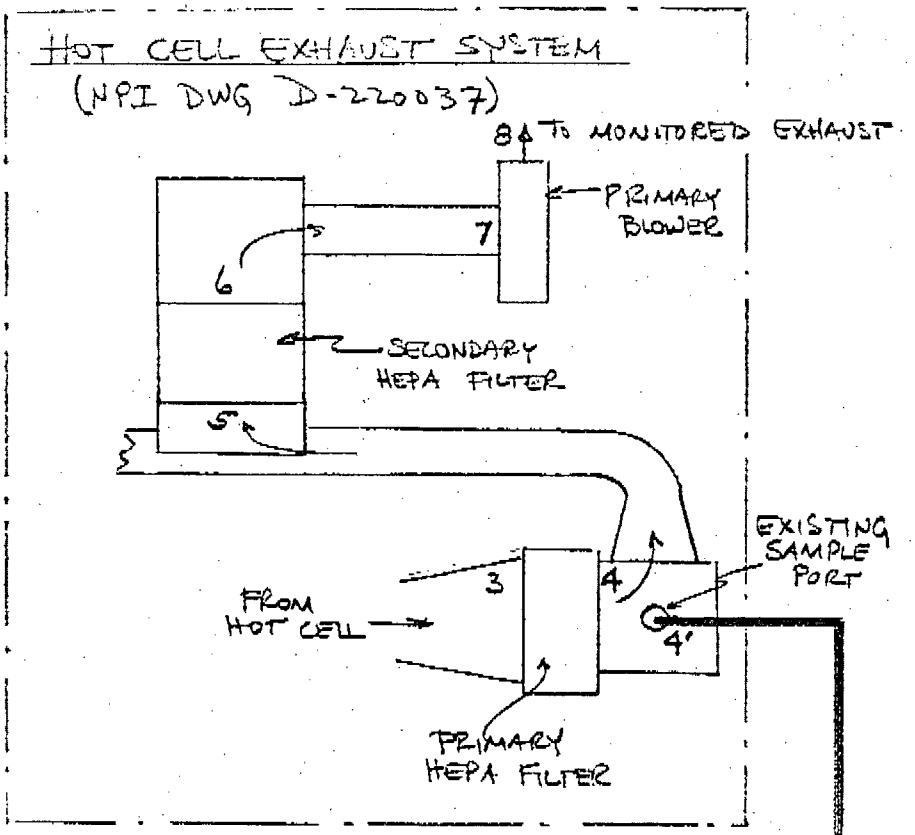
WST-CMP

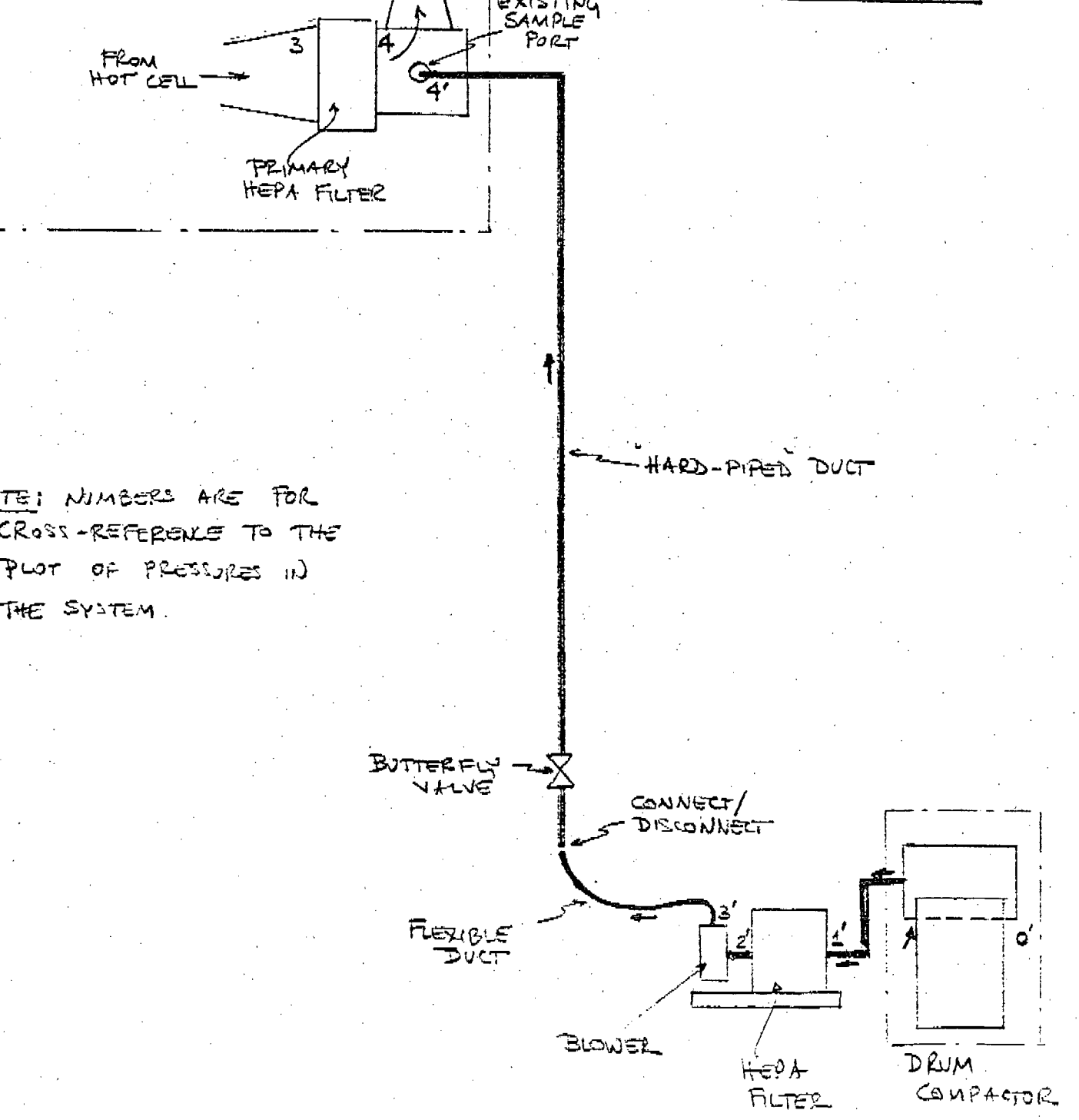
GENERAL ARRANGEMENT OF WASTE COMPACTOR



1/5 SCALE

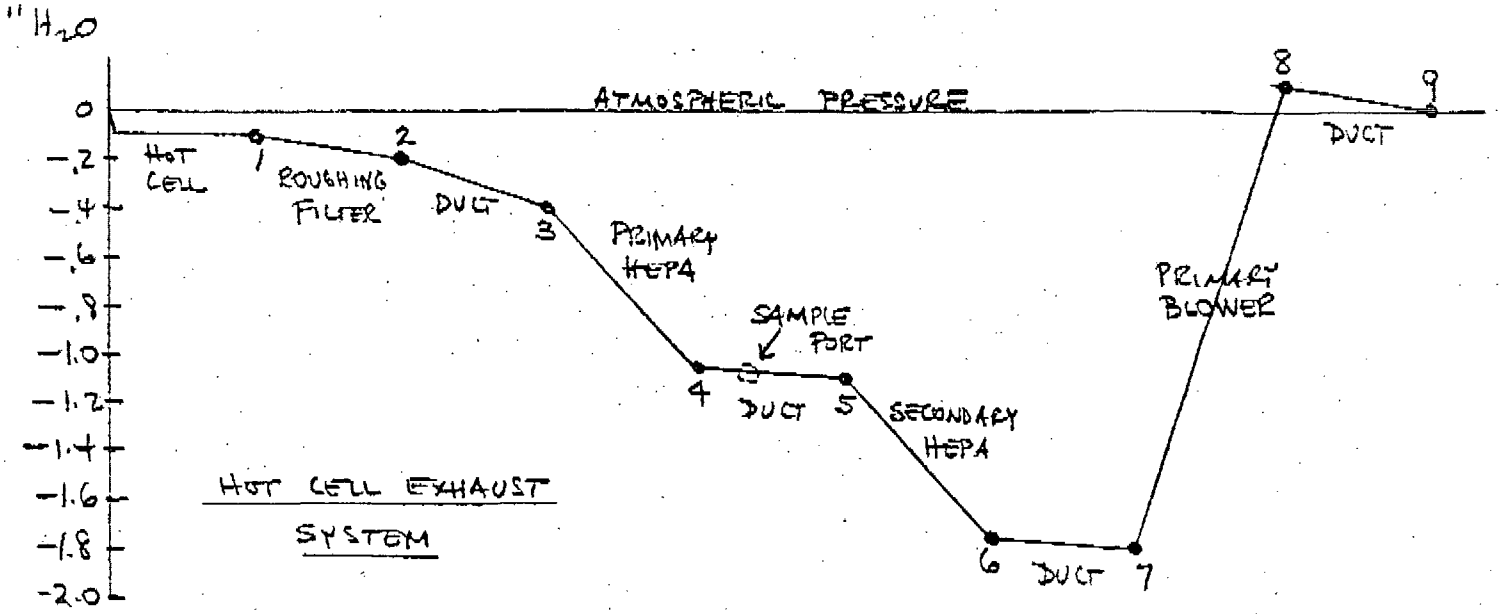
WASTE COMPACTOR CONNECTION TO HOT CELL EXHAUST SYSTEM



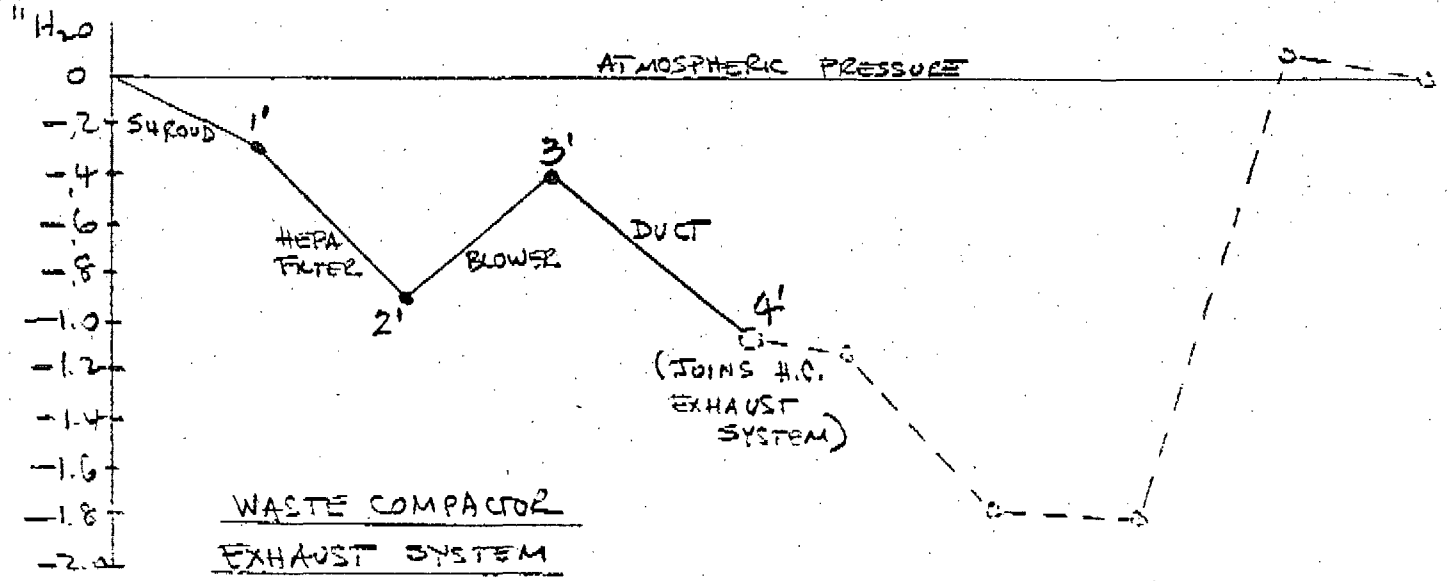


NOTE: NUMBERS ARE FOR CROSS-REFERENCE TO THE PLOT OF PRESSURES IN THE SYSTEM.

APPROXIMATE PRESSURES IN EXHAUST SYSTEMS



HOT CELL EXHAUST SYSTEM



WASTE COMPACTOR EXHAUST SYSTEM

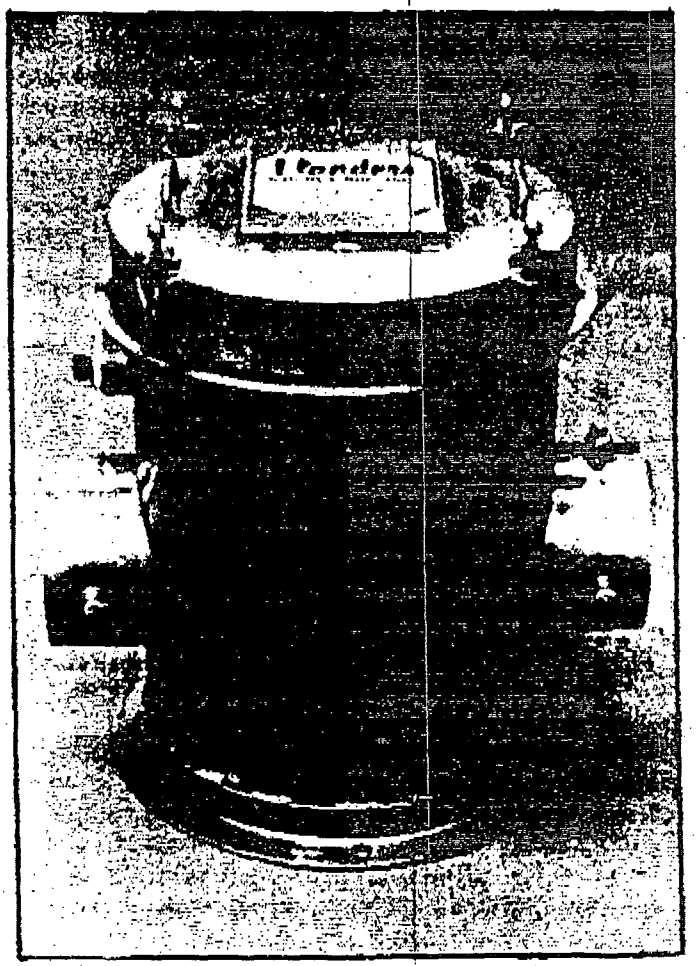
G-1 Bag-In/Bag-Out Filter Housing

One of the primary uses of hepa filters is for the containment of toxic material. This means that the material collected on the filter has more than likely been generated within the facility and is of such a nature that it should not be permitted to escape into the atmosphere. When filters become contaminated in-service, a method for their removal without direct operator contact is necessary.

The Flanders G-1 Bag-In/Bag-Out Filter Housing is designed for installation of a single element (prefilter, hepa filter, carbon filter) in low CFM ventilation systems. It is designed to accomodate either 12" square or 24" square filters in various depths. (Refer to the chart on page 3 for applications.) The G-1 shall feature the ability for the operator to change filters without coming into direct contact with the filter and the toxic material collected during its service life.

Located within the housing door shall be a double ribbed bag-out port which shall be designed to accept the opening of a heavy duty PVC bag. The port has been hemmed on its outer edge to prevent cutting or tearing of the bag during servicing or filter change. When the door is opened for filter removal, the bag shall serve as a barrier between the operator and the contaminated filter. By working through the bag, the operator can remove the filter without direct contact. The bag shall then be separated from the housing by cutting between the tie off points. This procedure is described in further detail in the Installation, Operation, Maintenance and Spare Parts Manual provided with each housing.

Each G-1 Housing is provided with a durable, 8 mil, transparent yellow PVC bag with a smooth non-sticking finish. The bag features an elastic shock cord hemmed into the opening for a firm fit when being stretched around the bag-out port. PVC mittens are incorporated into the bag for added convenience and safety. Each bag has its stock number rolled into the hem for convenient identification and re-ordering. (See ordering information on page 9).



Seismic G-1 Bag-In/Bag-Out Filter Housing.
NOTE: Cover photo is a Seismic G-1 Housing supplied for FAST Project at Idaho Falls, Idaho.

Description

The G-1 Housing is designed for filter removal from the top of the unit. The housing can be used with side access, but Flanders does not recommend that the unit be supported by the inlet and outlet connections. Instead, a mounting stand or some other means of support should be used.

The G-1 Housing is equipped with a double rib on the bag out port inside the housing door so that when a PVC bag is installed with the original filter, it can be removed directly into the bag. The double rib works in conjunction with an elastic opening on the bag and a nylon safety strap to ensure that it fits tightly on the bag-out opening of the housing. These features help to protect the operator when the filter contains dangerous particulates such as viable organisms, radioactive dust, carcinogens, or other toxic material.

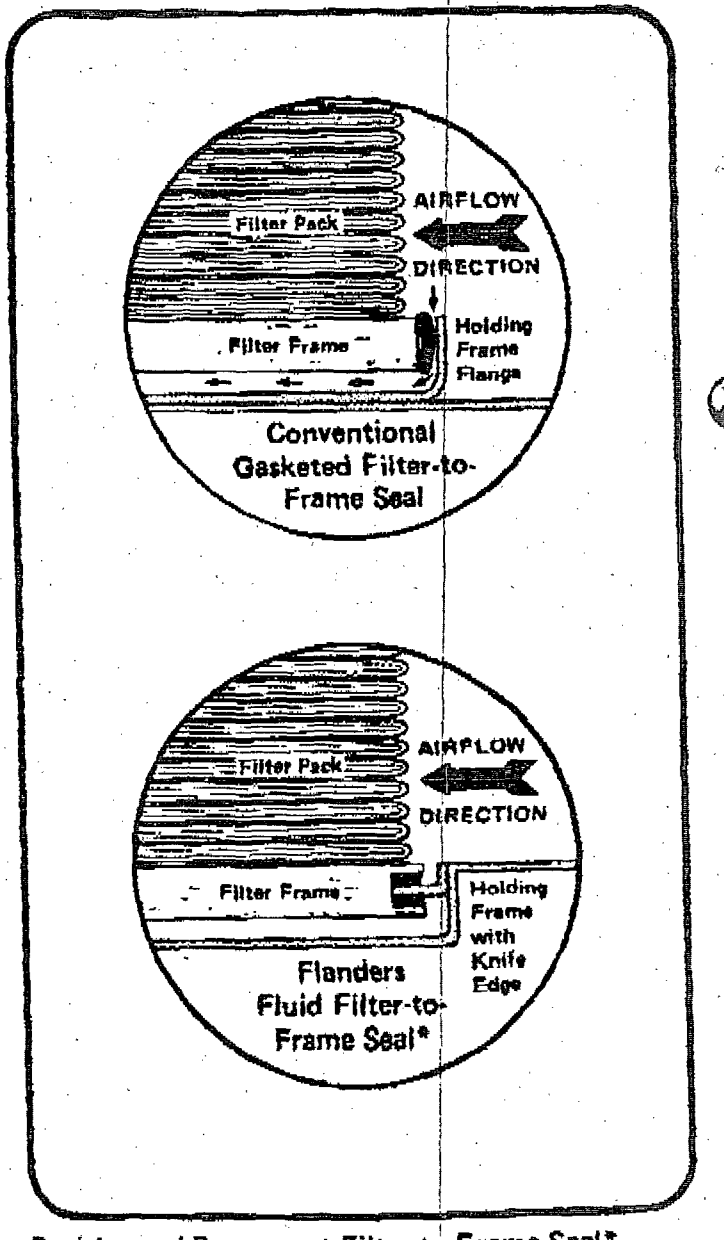
All filters used with the G-1 Housing shall have a filter-to-frame seal on one side of the filter's frame. The Fluid Filter-to-Frame Seal* shall be effected by means of a continuous knife edge on the face of the frame which mates into a continuous channel on the air-entering side of the filter. This channel shall be filled with a highly viscous, non-drying, silicone-based adhesive. This filter-to-frame seal eliminates the possibility of a bypass of unfiltered air around the filter which can occur when using gasket seals. Gaskets may lose their memory, separate from bonded joints and adhere to the frame causing tearing upon filter removal.

Flanders developed and patented the Fluid Filter-to-Frame Seal and guarantees it to pass an in place DOP test after installation into the operator's system (when used with the properly selected and undamaged filters and when tested per ANSI-N510-1980). **NOTE:** This claim is based on the selection of the correct fluid against potential hazards in the system. Silicone grease is the standard medium.

There shall not be a specific diameter inlet and outlet flange connection for the G-1 Housing, since requirements vary considerably for materials and pipe sizes. Therefore the purchaser must specify the required pipe sizes. This system can be made to adapt directly to your present duct work.

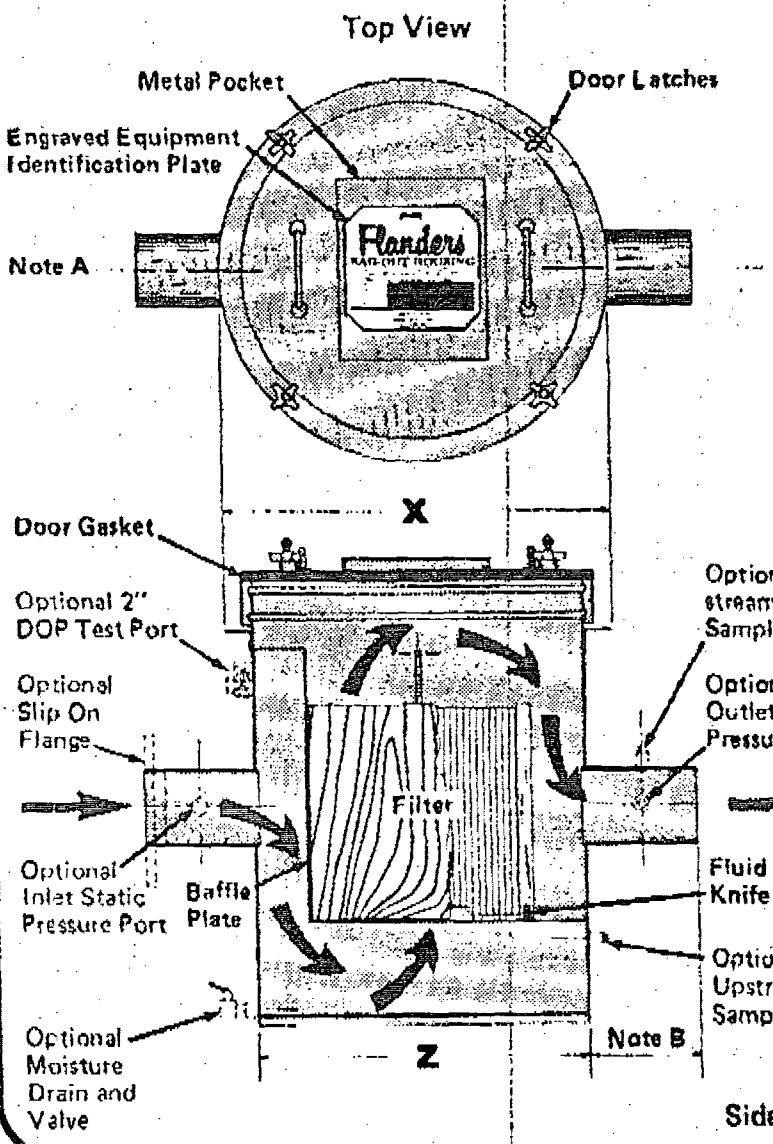
*U.S. Patent No. RE27701

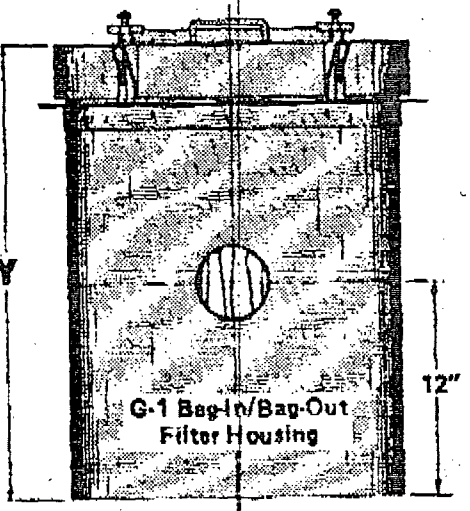
The base price includes either a rolled sheet metal nipple (for connections to flexible hose clamps) or any standard steel or stainless steel ASME piping up to 12" in length. Flange connections are **not** included in the base price but can be furnished with the housing as an option.



Positive and Permanent Filter-to-Frame Seal*

G-1 Bag-In/Bag-Out Filter Housing





NOTES: INLET AND OUTLET CONNECTIONS

(A) Available in either standard pipe sizes or in rolled and seam welded nipple connections. Buyer to specify diameter and/or piping requirements as applicable.

(B) Up to 12" long furnished. Buyer to specify length.

(C) Flange Connections are not included in the base price. Buyer to specify by schedule, o.d., thickness, bolt hole circle diameter, bolt hole size, etc, as required.

(D) Also, the pipe connection can be ordered in various angular configurations. (Contact Factory).

G-1 Filter Size Designation Chart

Housing Model Number	Filter Size	Housing Dimensions			Nominal Filter Dimensions			Average Initial Resistance Inches w.g.		
		X	Y	Z	Height (H)	Width (W)	Depth (D)	Nominal Rated Capacity	SUPER-FLOW®	Separator
G-1 1R CC-D	CC-D	21"	19"	18"	12"	12"	5-7/8"	105 CFM	.62	.62
G-1 1R CC-F	CC-F	21"	25"	18"	12"	12"	11-1/2"	160 CFM	.75	.82
G-1 1R GG-D	GG-D	39"	25"	36"	24"	24"	5-7/8"	500 CFM	.62	.62
G-1 1R GG-F	GG-F	39"	25"	36"	24"	24"	11-1/2"	1000 CFM	.75	.82

Construction Details

Housing Material

The G-1 Filter Housing shall be constructed from either 14 gage type 409 stainless steel painted with gray epoxy or 14 gage type 304 stainless steel with a 2-B mil finish. All joints and seams are welded airtight per AWS D 9.1 1980 and ground smooth where applicable, so the unit is free of all burrs and sharp edges.

Door Latches

There shall be four tie down latches per access door, which shall be spring loaded in such a manner that they pivot away from the bag-out port after release and do not impede the bag-out process. The knob of the tie down latch is designed to spin free for door removal, but is captured on the threaded rod and cannot be lost. The entire assembly can be quickly and easily replaced should it become damaged.

Leak Testing of Housing

Prior to shipment from the factory, each G-1 Housing shall be blanked off at the inlet and outlet and tested by the pressure decay method in accordance with ANSI-N510-1980 to 10"w.g. as specified in ANSI-N509 1980, Table 4-4. Following this test, each filter position shall be fitted with an airtight, filter-shaped plug and the housing knife edge shall be tested by the pressure decay method in accordance with ANSI-N510-1980 to 10" w.g. as specified in ANSI-N509-1980, Table 4-4.

Safety Strap

A one inch wide nylon safety strap shall be provided with each G-1 Filter Housing to fit around the lip of the bag out port, in between the two ribs and over the mouth of the bag. This shall supplement the elastic band in the bag and prevent the bag from pulling away from the lip in case the filter is dropped accidently during replacement. The inner side of the strap shall have a sponge neoprene laminate so the strap can be cinched tight around the bag and the metal lip. The efficiency of the safety strap can be demonstrated by its ability to lift a G-1 Housing and filter by the bag, even though it is neither intended nor recommended for this purpose.

Cinching Strap

A 1" x 6" cinching strap shall be provided with each housing for use in tying off the slack in the bag during the interval between filter changes, in order to prevent the bag from being drawn into the housing. The strap shall be tied around the bag at a point near the lip of the bag-out port, drawing the bag tautly across the port and allowing the slack to fall off to the outside. When the door is closed, the bag shall remain inside the door.

Metal Pocket

Each door shall be equipped with a metal pocket for the housing instruction manual which is provided with the housing. The manual contains complete, detailed information on the G-1 Housing including installation and operation instruction and spare parts information. A waterproof vinyl envelope is included for safe storage of the manual.

Engraved Equipment Identification Plate

Each housing door shall have a painted aluminum label with the manufacturer's name, housing model number, filter model number, PVC bag number, manufacturer's order number, and where specified, the owner's ventilation system number, permanently engraved on the label to facilitate reordering of critical replacement parts and components.

Internal Details

Filter Clamps

Spring loaded filter clamps on the G-1 Housing shall prevent the filter from becoming loose during operation. The two (2) clamps shall be constructed of type 304 stainless steel with a 1/4" stainless steel rod handle. The handle turns in one direction only and locks when in the closed position.

Baffle Plate

As the air enters the housing, a baffle plate shall turn the air downward. At the point where the air hits the bottom of the unit, the air turns upward and passes through the filter element. After passing through the filter element, the air hits the access door and is turned downward hitting a baffle plate that forces the air out of the filter housing. (See illustration on page 3).

Fluid Seal Knife Edge

The filter-to-frame seal in the housing shall be effected by means of a continuous knife edge on the mounting frame that mates to a continuous perimeter channel on the face of the filter. This channel shall be filled with a viscous, non-drying compound. (See illustration on page 2.)

Door Gasket

The gasket on the door of the G-1 Housing is a black neoprene, 1/2" thick sheet permanently adhered to the inside of the door.

Standard Options

Code Welding

All welding shall be performed by qualified welders and procedures are in accordance with ASME Section IX as specified in ANSI-N509-1980, Paragraph 7.3.

Static Pressure Port

Static pressure ports shall be located in the inlet and outlet connections of the housing. Connections shall be with a stainless steel quarter-inch half-coupling with plug.

DOP Test Ports

The DOP test port (2" 150 pound, half-coupling with plug) shall be located on the inlet side of the G-1 Housing. The upstream and downstream sample ports shall be located on the outlet side of the housing (upstream of the bulkhead) and inside the outlet nipple.

Slip on Flanges

Additional 150 pound or 125 pound slip on flanges shall be available in carbon steel or type 304 stainless steel, and in any standard IPS sizes. Other sizes and types of flanges shall be available upon customer request.

Moisture Drain and Valve

Where there is a potential for moisture condensation in the system, the G-1 Housing shall be available with a moisture drain which consists of a stainless steel, half-inch, half-coupling with plug and ball valve.

(Continued)

Filter Removal Tray

A removable bag out tray shall be available to provide support to the filter being removed from the housing and to the replacement filter during the change-out procedure. Following removal of the door, the shelf shall be fastened to the housing by means of the door latches. (The filter removal tray cannot be used for top access applications.)

Custom Engraved Plates

Standard G-1 Housings feature labels which include the housing model number, the filter model number, the original Flanders order number, and if specified, the owner's system number. Where additional information is needed, the owner or design engineer can furnish the information to Flanders and custom engraved plates shall be provided. These plates shall be permanently welded to the housing and shall be made from polished stainless steel. Lettering height shall be 1/8".

Low Leak Test

(The leak test described in paragraph three of Construction Details (page 4), e.g. the pressure decay method per ANSI-N510-1980, is considerably less stringent than the the leak test required in the Nuclear Air Cleaning Handbook, ERDA 76-21, Table 4.5 for all welded, man-entry steel housings. [There is no category for multiple filter, side-servicing housings.] The comparison of the respective permissable leak rate is 1:651. Therefore, the Low Leak Test as specified below, is offered as an alternative to the ANSI test.) The pressure decay leak test of both the housing and of the filter-to-frame seal at each filter position shall be performed in two separate tests in accordance with ANSI-N510 1980, ERDA 76-21, Table 4.5. The leak rate shall not be greater than 0.2% of the volume of the housing per hour at 10" w.g.

Banding Kit

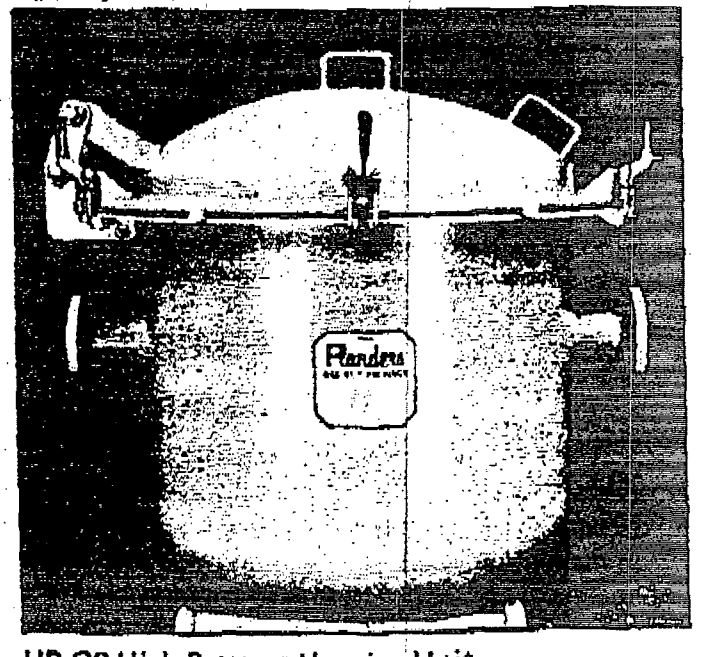
Although no bag out tools shall be required for filter changes, Flanders can provide a banding kit to facilitate in the secure clamping off of the bag between the housing and the spent filter. The band should be cinched down tight and locked in place to prevent any leakage of air from the contaminated filter. The kit shall include a supply of 25 bands and the necessary tools to perform the banding operation. (See page 16)

Seismic Qualification

Seismic qualification testing has been performed on some units to certain levels. The owner or design engineer should contact the factory with design requirements and specifications to ensure that the manufacturer's test results are in accordance with the seismic loading requirements for the owner's facility and plant site. The following information is required before Flanders can prepare a quotation: **1)** design specification and author, **2)** project name, **3)** location of project, **4)** required acceleration levels, and **5)** required response spectra curves.

High Pressure Unit

Flanders has designed a special HP-G2 Housing which is capable of pressures up to 15 psi positive and 14.7 psi negative. Welding qualification per ASME Section VIII is neither required nor available on these units. All welds will be performed under AWS D1.1 1982 and AWS D1.3 1981 (Code Welding program per ASME Section IX).



HP-G2 High Pressure Housing Unit