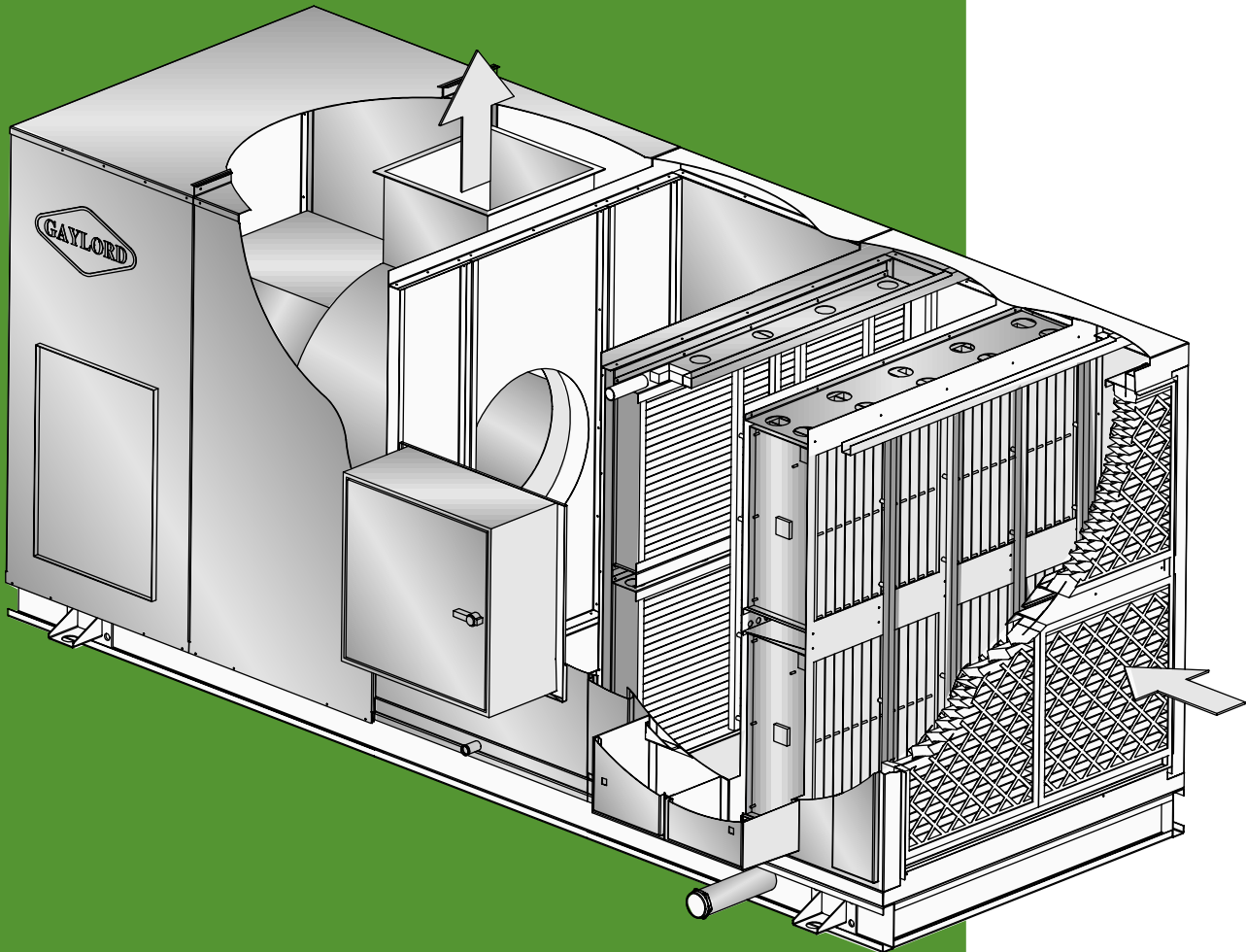




**"ClearAir"™**  
**Pollution Control Unit**  
**"ESP" Series**  
**Electrostatic Precipitator**



## Introduction

Air quality is a major concern in many large cities worldwide, particularly in America. As a result, many commercial kitchens will require pollution control equipment in their exhaust systems to comply with the increasing demands of environmental control agencies. In addition, pollution control equipment is being used for other reasons such as kitchens in high-rise buildings to allow the exhaust to discharge out the side of the structure saving the cost of running the duct up many floors to the roof.

Smoke pollution control, in kitchen exhaust systems, has typically been accomplished by any one of the following methods: gas fired incinerators, scrubbers, filtration units or electrostatic precipitators (ESP). Incinerators literally burn the pollutants and, while effective, can be very costly and hazardous to operate. Scrubbers consist of a water bath and extraction baffles to remove the pollutants and though quite effective on grease removal, they typically require the addition of high efficiency filters to abate smoke below control agencies' standards. Filtration units use a series of impingement filters to remove the pollutants and done properly can be quite effective on both smoke and grease.

**Gaylord Industries, Inc. has manufactured Pollution Control Equipment specifically designed for commercial kitchen exhaust systems since the early 1970's, longer than any other manufacturer. This experience has made us acutely aware of the special engineering operational and maintenance considerations to ensure the most efficient and cost effective design.**

Gaylord Industries manufactures two types of pollution control units, the ESP Series (electrostatic precipitator) detailed in this brochure and the TPF Series (triple pass filter) detailed in the TPF Series brochure. The ESP Series removes smoke particulate by high-voltage ionization using electrostatic cells, and the TPF Series by mechanical filtration, using a series of high efficiency filters. Both units are available with odor control and built-in exhaust fan. ESP units have a higher first cost than TPF. However, filtration units require frequent replacement of filters thereby generating additional costs in materials, labor and filter disposal.

## Basic Facts About Smoke

Smoke particles are extremely small and not visible to the human eye unless thousands of them are grouped together to form what we see as smoke. Individual particles are measured in units called microns and one micron equals 1/25,400 of an inch.

Smoke generated by commercial cooking equipment has a particulate size of between 0.3 and 0.8 microns and it is these very small particles that smoke abatement equipment must remove from the airstream. The amount of smoke discharging from a kitchen exhaust duct is measured in terms of its density, referred to as opacity - the degree to which emissions block light. A 100% opacity level would be solid black and 0% would be perfectly clear. Control agencies that have adopted smoke pollution ordinances are requiring an opacity level of no more than 20%, which is a very light blue smoke.

Typically, heavy smoke producing equipment such as charbroiling, creates an opacity level of 60% to 70%. Opacity readings are taken by the human eye by viewing the smoke being discharged and then assigning a percentage of opacity to what is seen. Though this method is quite subjective, it is the method practiced by control agency inspectors who are trained and certified in determining opacity percentages.

Other more technical methods of determining opacity or particulate density are achieved through the use of opacity meters and cascade impactors. This level of analysis is usually referred to as source testing. Control agencies occasionally require this type of analysis and if so, the testing is conducted by state certified contractors, which can be quite costly and time-consuming. The efficiency of a pollution control unit is based on how well it reduces the opacity level of a given airstream. The Gaylord ClearAir ESP Series unit will reduce the opacity level below 20%, thereby meeting the requirements of environmental control agencies.

## Basic Facts About Odor

Cooking odors (molecules) generated by the combustion of animal and vegetable matter result in an extremely complex mixture of reactive organic gases (ROG's). A small percentage of these odors may be absorbed by the grease particles but the vast majority exists separately in the airstream. The ROG molecules are much too small to be removed by any type of filter and therefore, other methods must be used. The three common methods of abating odor are 1) the use of activated charcoal, which absorbs and retains the odor molecules, 2) the use of an odor-oxidant (potassium permanganate) which oxidizes the molecules to solids and then retains them and 3) a spray odor neutralizer system. Activated charcoal media, while less expensive than odor-oxidant media, is not a popular choice, as charcoal is highly flammable and when it becomes fully saturated, begins to desorb and release odors. Odor-oxidant media is very effective, is not flammable and will not release odors. In either case, once the abatement media is saturated the media must be replaced. The life of the media is dependent upon several factors such as how much media is used, type of odor, amount of odor molecules, grease loading and air temperature. Spray odor control neutralizes the odor by adsorption and is typically non-toxic and biodegradable and is the least expensive initially and operationally.

Typically, either of the above mentioned types of odor control can remove 85% - 90% of the molecules depending upon the type of cooking. Determining the efficiency of odor control can be very subjective, as testing is usually conducted by the human nose. More scientific testing is available through ROG analysis, but this involves considerable costs.

Gaylord Industries offers spray odor control as the standard method and a media bed of 50/50 potassium permanganate and carbon blend as an option.

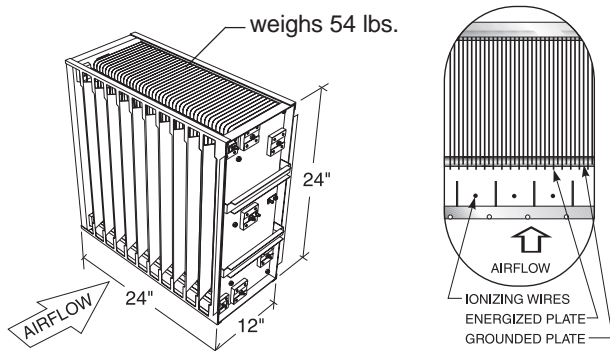
## Grease Removal – The Important First Step

Grease particles are also measured in terms of microns and grease generated by commercial cooking equipment varies in particulate size from sub-micron to 10 microns and up. Pollution control equipment is not limited to removing smoke particles, but will also remove a majority of the grease particles remaining in the airstream. Therefore, the grease extraction efficiency of the exhaust hood plays an important role in the operation and performance of pollution control equipment.

Removal of grease particles before they reach smoke and odor control equipment will significantly increase the smoke abatement efficiency and the life of the odor abatement media if media type is used. It is highly recommended that a Gaylord CG3 Series Ventilator be used with the ClearAir unit as it has a grease extraction efficiency of 95%. Other high efficiency exhaust hoods may be used with the ClearAir unit. Contact Gaylord Industries for details.

## Smoke Control

The ClearAir Pollution Control Unit, ESP Series, removes smoke particles by electrostatic precipitation. The principle of operation of electrostatic precipitation is actually quite basic. The electrostatic cell is made up of a series of aluminum plates spaced approximately 1/4" apart. Every other plate is energized with 5000 volts of D.C. power and the alternating plates are grounded. At the air entry point of the cell is a series of thin wires spaced approximately 4" apart. These wires, referred to as ionizing wires, are energized with 11,000 volts D.C. and as the smoke particles enter the cell and pass over the wires they receive a positive charge. As the charged particles continue through the cell, the positive plate repels them and the negative or grounded plate attracts them. Thus, the smoke particles are collected on the negative plates. The action is efficient, safe and simple.



**ELECTROSTATIC CELL**

ISOMETRIC VIEW

SIDE VIEW

## ClearAir Unit Description

The Gaylord Pollution Control Unit, ESP Series, is available in sizes from 1000 to 32,000 CFM and may include odor control and/or an exhaust fan as an option.

All Gaylord ESP Series ClearAir units include a wash down system which, when activated by pushing the "Start Wash" button on the control cabinet, shuts off the exhaust fan and initiates the washing of the ESP cells with hot, detergent injected water to remove the daily accumulation of smoke and grease particles. The wash time of the ESP cells is adjustable and varies with the size of the unit and the type of cooking. At the conclusion of the ESP wash, the wash cycle for the water wash ventilator is initiated and runs for the length of its timed cycle.

The controls, "Command Center", for the ClearAir unit and water wash ventilators are common and are located in the Control Cabinet. There are two common arrangements of Control Cabinets as illustrated on page 4. Figure 1 illustrates a Control Cabinet serving both the ventilator and ClearAir unit. Figure 2 illustrates a Main Control Cabinet for the ventilator electrically interfaced with a sub panel that serves the ClearAir unit. This arrangement is normally used when the ClearAir unit is located some distance away from the exhaust hood. In both arrangements the exhaust fan, ESP, wash cycles and fire cycle functions are controlled by the Main Control Cabinet. The difference between the two is the location of the plumbing components.

## Non Washing Option

The unit is available without the wash down system. With this option the ESP cells are removed periodically and pressure washed or washed by other means. A wash manifold is still included with the unit for future use if desired.

## Required Number Of ESP Cells

The number of ESP cells required is dependent upon the total CFM and the type of cooking equipment involved. In some cases when heavy and extra heavy duty cooking equipment is involved, double pass ESP cells with double wash is required.

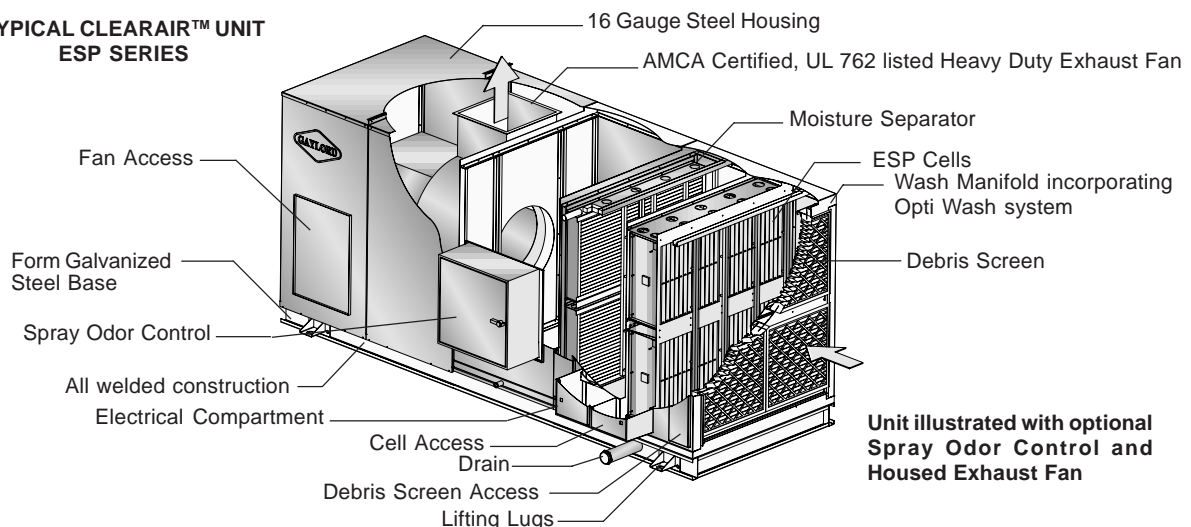
## Odor Control Options

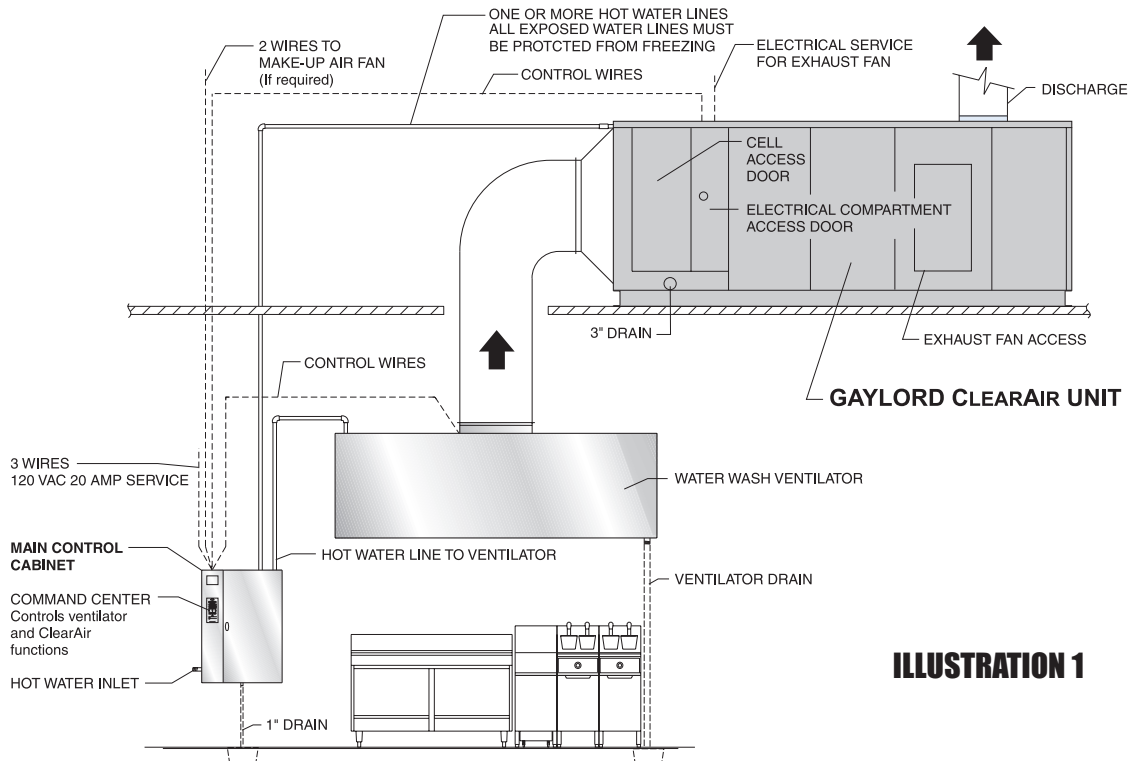
The standard odor control offered is a spray odor control system using Gaylord Formula GS-710 that neutralizes odors by adsorption. This system works well on all types of smells and is economical and efficient. The second option is a media bed of 50/50 potassium permanganate and carbon blend. When heavy and extra heavy duty cooking equipment is involved, a double pass media bed is required. The life of the media is dependent upon several factors such as the type of odor, amount of odor molecules, grease loading and air temperature. The media bed has better performance than spray odor control. Refer to the specifications on page 6 for further details.

## Exhaust Fan Options

An exhaust fan may be provided as an integral part of the ClearAir unit as illustrated on the following pages. The fan may be a utility set with upblast discharge or a tubular centrifugal type for discharge out the end of the unit. Refer to the specifications on page 7 for further details.

**TYPICAL CLEARAIR™ UNIT  
ESP SERIES**

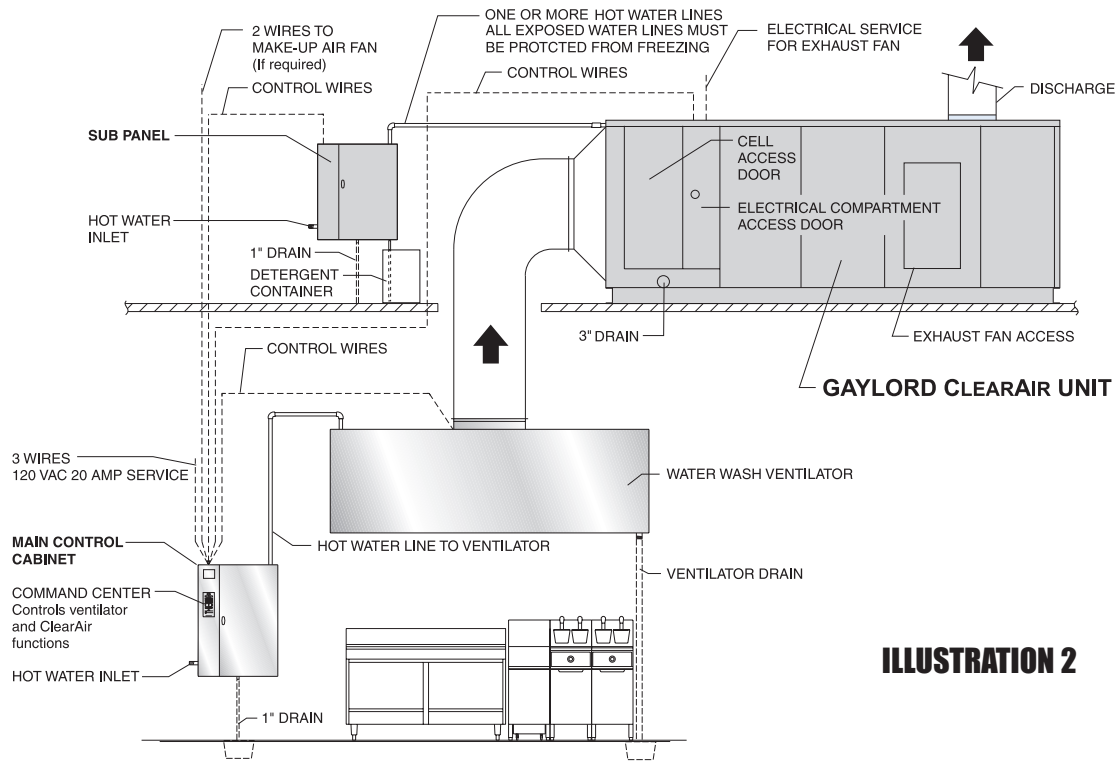




**TYPICAL SCHEMATIC**  
 WATER WASH VENTILATOR WITH MAIN  
 CONTROL CABINET SERVING BOTH  
 WATER WASH VENTILATOR AND THE CLEARAIR UNIT

WATER PRESSURE =	60 PSI MIN.
	80 PSI MAX.
WATER TEMPERATURE =	160° F. MIN.
	180° F. MAX.

**ILLUSTRATION 1**



**TYPICAL SCHEMATIC**  
 WATER WASH VENTILATOR WITH MAIN  
 CONTROL CABINET SERVING VENTILATOR AND  
 A SUB PANEL SERVING THE CLEARAIR UNIT

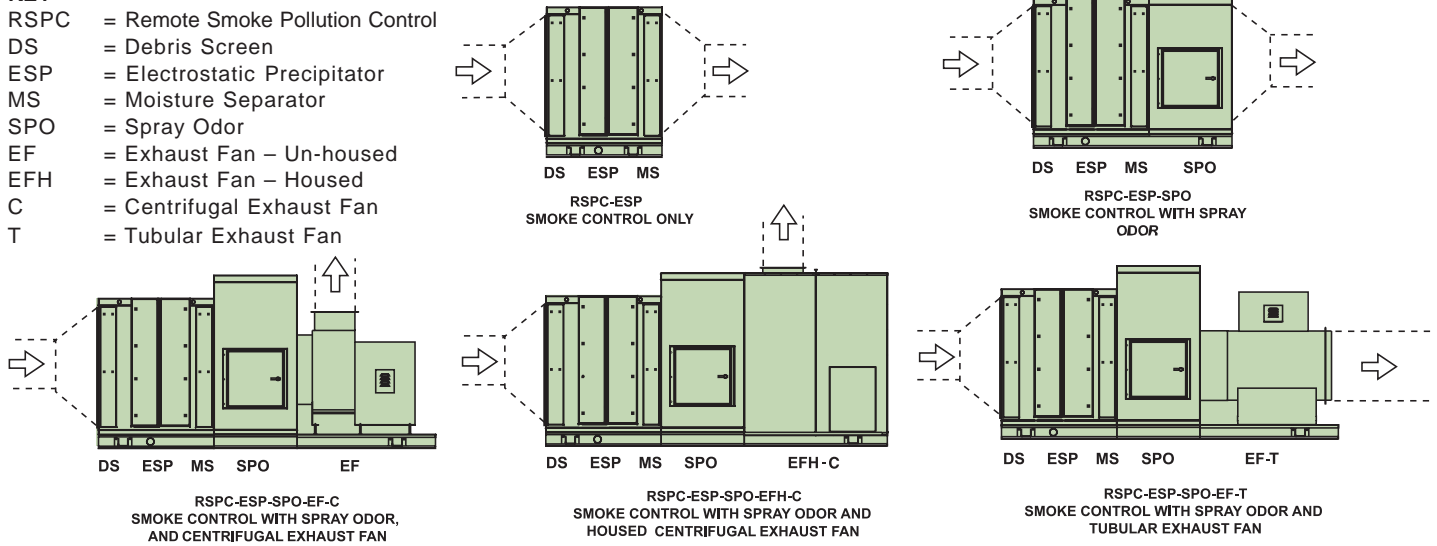
WATER PRESSURE =	60 PSI MIN.
	80 PSI MAX.
WATER TEMPERATURE =	160° F. MIN.
	180° F. MAX.

**ILLUSTRATION 2**

## TYPICAL CONFIGURATIONS

### KEY

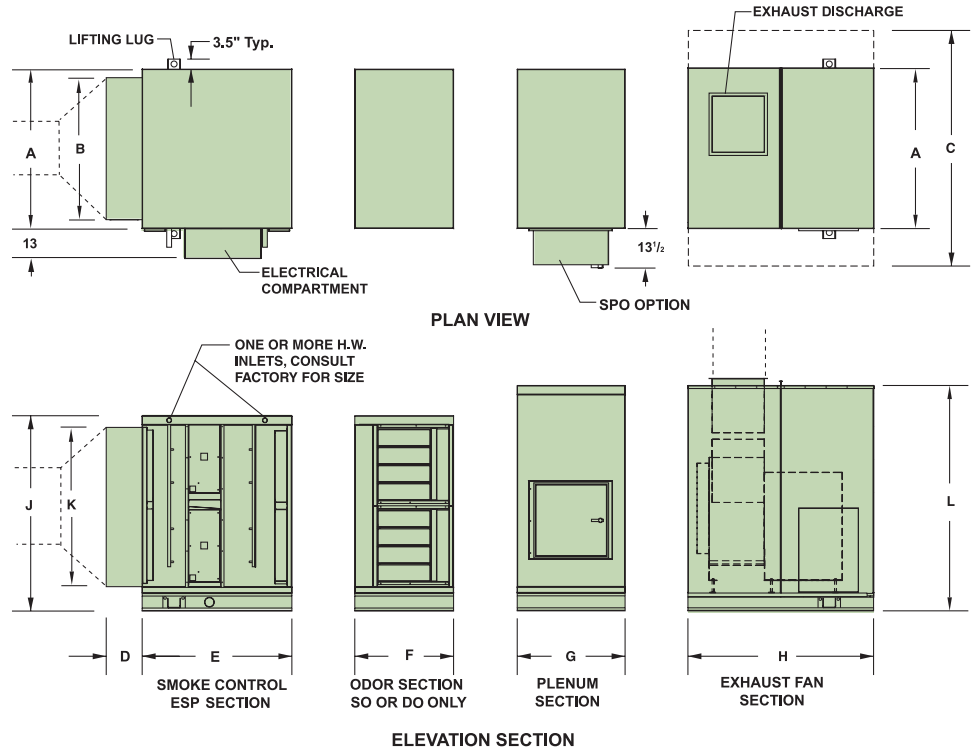
- RSPC = Remote Smoke Pollution Control
- DS = Debris Screen
- ESP = Electrostatic Precipitator
- MS = Moisture Separator
- SPO = Spray Odor
- EF = Exhaust Fan – Un-housed
- EFH = Exhaust Fan – Housed
- C = Centrifugal Exhaust Fan
- T = Tubular Exhaust Fan



## DIMENSIONAL DATA

### NOTES

1. "D" dimension is either 3/4" or 12" depending if an Ansul fire system is used. If a water spray fire system is used or if no fire system is installed, "D" dimension = 3/4"
2. 1 ESP = Single Pass ESP cells  
2 ESP = Double Pass ESP cells  
3 ESP = Triple Pass ESP cells
3. SO = Single Pass Media Bed Odor Control  
DO = Double Pass Media Bed Odor Control
4. A Plenum Section is required for exhaust fan and spray odor options.
5. Varies with Size of Exhaust Fan



Max. CFM	No. of ESP Cells	Cell Configuration W x H	Plan View Dimensions		
			A	B	C
2000	1	1 x 1	29	23	42
4000	2	2 x 1	53	47	N/A
6000	3	3 x 1	77	71	N/A
8000	4	2 x 2	53	47	N/A
12000	6	3 x 2	77	71	N/A
16000	8	4 x 2	101	95	N/A
18000	9	3 x 3	77	71	N/A
24000	12	3 x 4	77	71	N/A
24000	12	4 x 3	101	95	N/A
32000	16	4 x 4	101	95	N/A

Elevation Section View Dimensions											
D		E			F		G	H	J	K	L
No Ansul Note 1	with Ansul Note 1	1ESP Note 2	2ESP Note 2	3ESP Note 2	SO Note 3	DO Note 3					
0.75	12	50	78	102	33	50	36	42	39	26	50
0.75	12	50	78	102	33	50	36	42-54	39	26	50
0.75	12	50	78	102	33	50	36	54	39	26	50
0.75	12	50	78	102	33	50	36	70	65	52	70
0.75	12	50	78	102	33	50	36	70-78	65	52	80
0.75	12	50	78	102	33	50	36	70-78	65	52	85
0.75	12	50	78	102	33	50	36	90	91	78	91
0.75	12	50	78	102	33	50	36	90	117	104	117
0.75	12	50	78	102	33	50	36	90	91	78	91
0.75	12	50	78	102	33	50	36	90-92	117	104	117

All dimensions in inches

## SPECIFICATIONS

### General

Furnish one (1) Gaylord ClearAir Pollution Control Unit model number RSPC-ESP-\_\_\_\_\_ as manufactured by Gaylord Industries Inc. of Tualatin, Oregon in accordance with the following:

The pollution control unit shall consist of a smoke control section, odor control section (optional) and exhaust fan section (optional) all built into on a common base as an integral unit. Smoke control shall be accomplished by electrostatic precipitation (ESP). The unit shall be ETL listed and labeled.

### Smoke Control Section

The smoke control section shall contain one or more electrostatic precipitator (ESP) cells to remove smoke particles from the air stream to a level no higher than 20% opacity when operated in accordance with the operation and maintenance guidelines. The ESP cells shall be of a floating plate design to eliminate plate warpage during high heat operation. The cells shall be positioned on slide tracks so that they may be easily removed through a hinged cell access door(s). For ease of handling, individual cells shall weigh less than 54 lbs. There shall be removable, cleanable debris screens located immediately upstream of the ESP cells and a moisture separator immediately downstream. An electrical panel mounted on the unit shall contain the high voltage power pack assembly, safety disconnect switch, main disconnect switch, fuses and a magnetic starter for the exhaust fan when fan is included. The safety disconnect switch shall interface with the electrical panel access door such that when opened it will shut off service to the power pack(s) and ground them to drain the residual electrical charge from both the power pack(s) and ESP cells. The ESP cell access door shall interface with the electrical panel access door so that it cannot be opened without first opening the electrical panel access door. The high voltage power pack(s) shall be self-limiting type and shall be self contained. The electrical panel shall include indicating lights to monitor cell and transformer voltage. The main disconnect switch for the exhaust fan and control circuits shall lock the electrical panel access door closed when in the "on" position. The unit shall contain one or more oscillating wash manifold(s) with Opti-wash spray nozzles to wash the ESP cells with hot detergent injected water each time the exhaust fan is shut off.

### Control Cabinets

#### No wash option

The unit shall not include automatic water wash and the ESP cells shall be easily removed for periodic pressure washing. The unit shall be equipped with non-oscillating wash manifolds in the event of adding automatic washing in the future.

*Specifier Note: If this option is chosen, do not specify any of the following control cabinets.*

#### EXPLANATORY NOTE REGARDING CONTROL CABINETS

*There are two arrangements of controls for the operation of Water Wash Exhaust Hoods and the ClearAir Unit (see page 4). In the first arrangement, the Control Cabinet in the kitchen serves both the Exhaust Hood and the ClearAir Unit. In the second arrangement there is a Control Cabinet for the Exhaust Hood electrically interfaced with a Sub Panel that serves the ClearAir Unit. In both arrangements the Exhaust Fan, ESP, Wash Cycles and Fire Cycle Functions are controlled by the Hood Control Panel. The difference between the two is the location of the plumbing components.*

**1. Main Control Cabinet Only** - This arrangement is typically used when the ClearAir Unit is located on the roof or mechanical room immediately above or in close proximity of the ClearAir Unit.

**2. Main Control Cabinet and Sub Panel Combination** - This arrangement is typically used in the following situations: (a) When the ClearAir Unit is located in a mechanical room some distance away from the Exhaust Hood or (b) when it is impractical to inter-connect the hot water lines between the hood panel and the ClearAir Unit or (c) when there is insufficient space in the kitchen area to store the detergent required for the wash system of the ClearAir Unit.

#### Control Cabinet (When Sub Panel is not Used)

The controls and plumbing components for the operation of the Exhaust Fan, ESP, Wash System and Fire Cycle of the Pollution Control Unit shall be an integral part of the Kitchen Exhaust Hood Control Cabinet as specified in Division 11. All inter connecting wiring and piping shall be the responsibility of the appropriate trades.

#### Control Cabinet and Sub Panel Combination

The controls for the operation of the Exhaust Fan, ESP, Wash System and Fire Cycle of the Pollution Control Unit shall be an integral part of the Kitchen Exhaust Hood Control Cabinet as specified in Division 11. All plumbing components for the ClearAir unit shall be housed in the Sub Panel. All inter connecting wiring shall be the responsibility of the appropriate trades.

A Sub Panel shall be furnished with the pollution control unit. The Sub Panel shall be constructed of 18 gauge stainless steel, number 4 finish, with welded corners and hinged doors to the plumbing and electrical compartments. The plumbing compartment shall be pre-plumbed with a reduced pressure principle device back flow preventer, shut off valve, pressure/temperature gauge, one or more slow close solenoid valves, detergent pump and a detergent flow switch. The electrical compartment shall have a terminal block for single point connection of all electrical components. The detergent container shall be located next to the sub panel and shall be provided by the detergent supplier. The sub panel shall be shipped loose for field installation by the appropriate trades.

### Odor Control Options

#### Media bed of 50/50 Blend Potassium Permanganate and Carbon Blend

The unit shall be provided with odor control utilizing a media bed of 50% potassium permanganate/50% carbon blend that is UL class I. The odor removal media shall be housed in slide out reusable steel modules. There shall be a 30% pleated media after filter located immediately downstream of the odor control media. Replaceable filters shall be mounted in filter slide tracks to prevent air bypass around the ends of the installed filter bank. The odor control media and after filters shall be removable through side access doors with lift and turn latches.

#### Spray Odor Control

The unit shall be provided with a spray odor control system utilizing an odor neutralizer chemical. The odor spray control cabinet shall be mounted on the side of the unit and shall contain an air compressor piped to the atomizing spray nozzle in the fan plenum, adjustable delay timers with fuse protected circuitry factory wired to the unit electrical panel. The cabinet shall include one 5 gallon container of Gaylord Formula GS-710 Odor Neutralizer. The cabinet shall contain a heater to prevent freezing of the odor neutralizer,

## SPECIFICATIONS

### Exhaust Fan Options

#### Exhaust Fan (Standard Centrifugal Fan)

The unit shall include a centrifugal exhaust fan. The exhaust fan shall be an SWSI upblast arrangement #9 or #10 with a non-overloading BI, AF or FB wheel. The motor, drives, bearings and fan mounting base shall be located out of the exhaust air stream as required by the IMC (International Mechanical Code) and NFPA-96. The fan shall be AMCA certified and bear the AMCA seal for performance. The fan shall be UL 762 listed. The fan housing shall be constructed of heavy gauge steel. The fan bearings shall be heavy duty self-aligning pillow block type rigidly mounted on heavy structural steel supports. The motor shall be ODP three phase mounted on a common base with the fan and shall be pre-wired to the electrical cabinet located on the unit. The electrical cabinet shall include a disconnect switch, motor starter, overloads and fuses. The factory provided drive assembly shall be adjustable pitch on 5 HP and smaller, fixed pitch on 7.5 HP and larger. It shall also be sized for a minimum 1.5 service factor. After final system balancing, fixed pitch sheaves shall be provided and installed by the air balancing contractor to provide proper flow at actual installed conditions.

#### Exhaust Fan (Optional Tubular Fan)

The unit shall include a tubular centrifugal exhaust fan. The exhaust fan shall be an arrangement #10 with a non-overloading BI, AF wheel. The motor, drives, bearings and fan mounting base shall be located out of the exhaust air stream as required by the IMC (International Mechanical Code) and NFPA-96. The fan shall be AMCA certified and bear the AMCA seal for performance. The fan shall be UL 762 listed. The fan housing shall be constructed of heavy gauge steel. The fan bearings shall be heavy duty rigidly mounted on heavy structural steel supports. The motor shall be ODP three phase mounted on a common base with the fan and shall be pre-wired to the electrical cabinet located on the unit. The electrical cabinet shall include a disconnect switch, motor starter, overloads and fuses. The factory provided drive assembly shall be adjustable pitch on 5 HP and smaller and fixed pitch on 7.5 HP and larger. It shall also be sized for a minimum 1.5 service factor. After final system balancing, fixed pitch sheaves shall be provided and installed by the air balancing contractor to provide proper flow at actual installed conditions.

#### Exhaust Fan Housing

The exhaust fan section of the unit shall be enclosed with the same material as the smoke control section. There shall be a removable panel for access to the fan.

### Internal Fire Detection

The unit shall be equipped with a thermostat(s), set at 250°F, located in the smoke control section of the unit. The thermostat shall be interfaced with the kitchen exhaust hood Main Control Cabinet such that in the event of a fire condition, when the thermostat reaches its set point of 250°F, the system control goes into a fire mode. The fire mode shall shut off the exhaust fan, activate the kitchen hoods wash sprays, and turn on the wash sprays in the pollution control unit.

### Unit Construction

The unit housing shall be constructed of a minimum of 16 gauge G90 bright galvanized steel. The perimeter base shall be 12 gauge formed channel with lifting lugs at each corner and along

the length as required. The housing shall be externally welded liquid tight for compliance to the International Mechanical Code and NFPA-96 grease duct construction requirements.

### Accessories Options

#### Spare ESP cells

The unit shall be supplied with a minimum of one extra ESP cell of each type of cell and one soak tank. The soak tank shall be constructed of 18 gauge stainless steel and shall be mounted on heavy-duty casters. There shall be a hose bib at the bottom of the tank for draining.

#### Detergent

Provide 30 Gallon Drum of Gaylord Formula G-510 Detergent

### Fire Extinguishing System Options

*Specifier Note: NFPA-96 requires a fire extinguishing system for protection of the smoke and odor control sections and protection of the duct down stream of any filters or dampers. Not all authorities having jurisdiction require protection. Check with your AHJ. If required, specify one of the following systems.*

#### Wet chemical system

Provide a complete factory mounted Ansul wet chemical fire extinguishing system, including nozzles piping and detection runs. Pipe penetrating the unit cabinet shall use a UL listed fitting. System shall be installed in accordance with the systems listing and NFPA-96. The Ansul Automan cabinet shall be mounted on the side of the unit for easy access, certification and service. If the unit is exposed to freezing conditions, the Ansul Automan cabinet shall be mounted in an insulated thermostatically controlled heated cabinet.

#### Water spray sprinkler fire system

*Specifier Note: Units that are located indoors may be factory pre-piped for a wet pipe building sprinkler system.*

Provide a pre-piped water spray fire system installed in accordance with NFPA-96. The unit shall be piped with one pendent type sprinkler nozzle located in the smoke control section, one in the odor control section, if equipped with 50/50 media bed, and one in the exhaust fan section for interconnection to the building sprinkler system by the appropriate trades. Pipe penetrating the unit cabinet shall use a UL listed fitting. Nozzles shall be the bulb type rated at 325° F.

### Check Out and Demonstration

Upon completion of installation, the entire pollution control system, including the kitchen exhaust hoods, shall be commissioned by a factory certified service technician. Start-up shall include checking all ESP cells, filters, high voltage components, exhaust fan, control cabinets and sub panels as well as running the system through wash and fire cycles. The appropriate maintenance personnel shall be given a technical manual and a complete demonstration of the system, including operation and maintenance procedures. Upon completion of the commissioning, a detailed start-up report shall be made available to the architect and owner certifying proper system operation. Changes required in fan drive components shall be performed by the air balancing contractor per instruction of the Gaylord start-up representative.

## GAYLORD CLEARAIR™ FEATURES

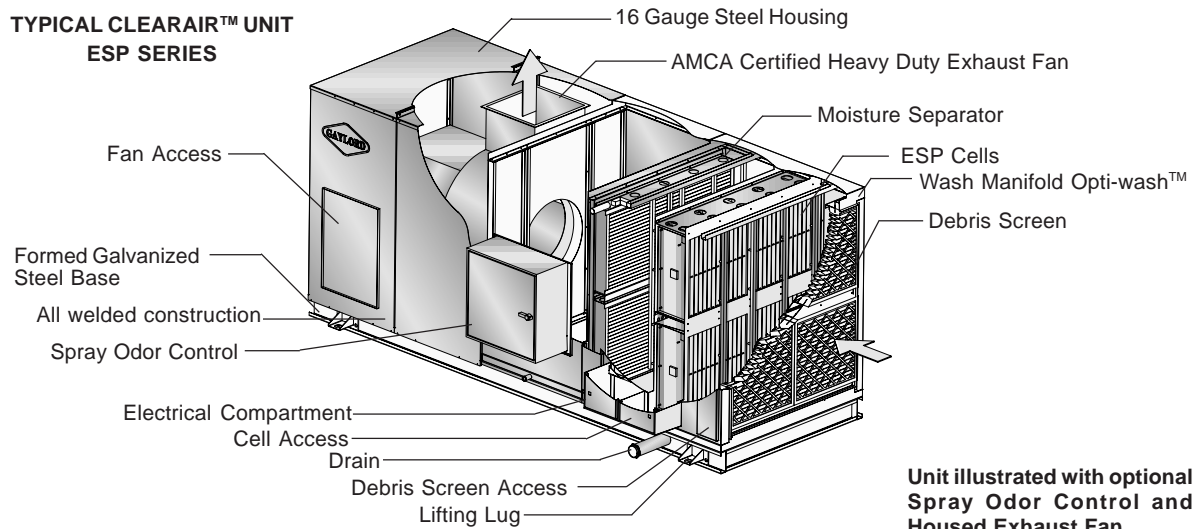
- Constructed specifically to meet kitchen exhaust duct standards
- Single point plumbing, electrical and mechanical connections
- Programmable hot water, detergent injected washdown system
- Access doors with voltage clearing safety disconnect switches
- Thermostatically activated internal fire protection system
- Patented “Expand-O-Cell”™ design protects against cell warpage
- Self-limiting power packs for cell grounding protection
- Heavy duty exhaust fan, AMCA certified, listed to UL 762, and bearings, motors and drives located outside the Airstream

## GAYLORD CLEARAIR™ BENEFITS

- Single source responsibility when Gaylord Ventilators are used guaranteeing compatibility between the two systems
- Pre-engineered for the most efficient and cost-effective systems
- Listed by ETL Testing Laboratories, assuring acceptance by local building officials
- Service network of over 100 factory trained agencies responding to your service needs
- 30 years of experience in the engineering, design and manufacturing of pollution control equipment specifically for commercial kitchen exhaust systems
- One year parts warranty

Over 55 years of experience in kitchen ventilation has made us acutely aware of the special engineering and operational considerations necessary for the proper design of pollution control equipment in kitchen exhaust systems. Each ClearAir unit is designed for the specific application, guaranteeing the most efficient and cost effective system.

**TYPICAL CLEARAIR™ UNIT  
ESP SERIES**



### For More Information:

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