

## **SECTION 8 CARBON FILTER SOLUTIONS**

### **1. ACTIVATED CARBON**

Activated carbon has been utilised for many years to reduce fumes and gases from the air. Currently a wide range of carbons is available for this purpose in the continuous battle against the emission of unpleasant or even dangerous odours and fumes from a wide variety of sources. The ever-increasing awareness of this problem by the public health authorities and environmentalists has resulted in a corresponding increase in the use of activated carbon filters.

The types of carbon most commonly used in the H & V Industry are grades 203C and 207C (or equivalents). A large variety of other activated carbons are available. some of which are specially impregnated for particular applications.

### **2. APPLICATIONS**

Carbon filters are desirable in many installations where airborne odours, chemical or toxic fumes are present and need to be reduced or eliminated. The carbon will adsorb the chemical molecules in the airstream in varying degrees according to the particular contaminants involved and the type of carbon utilised. It may be interesting to note that, when activated, one gram of carbon can have a surface area of approximately 1000 sq.m.

Incoming air at city offices, industrial plants, airports, art galleries, museums etc., can be purified by passing it through carbon units fitted in the system. Also air from kitchens, industrial processes, sewage plants etc., can be extracted through activated carbon before entering the atmosphere, greatly reducing its impact on the environment and to comply with pollution regulations or focal authority requirements.

### **3. PERMANENT SUSPENSION**

Activated carbon in its loose form can present problems in any installation since there is a tendency for the granules to move against each other causing bedding down, which produces dust and can also allow by-pass to take place. However, permanent suspension panels that are utilised throughout our range have the granules held together by a patented bonding process, and incorporate a non-woven fabric on both faces. This construction eliminates the problems described above, and produces a homogeneous biscuit of consistent quality with dimensional stability, thus producing an even resistance across the panel.

#### **4. DESIGN CRITERIA**

In order that a carbon filter may operate satisfactorily certain criteria have to be met which do not apply to particulate filters. The most important aspect is the dwell time (i.e. the period of time the air is in contact with the carbon) which in many applications is recommended to be approximately 0.1 seconds. This equates to a face velocity of 38 fpm (0.19 g m/s) when using a standard 1" (25mm) nominal thickness panel. However, the dwell time can vary with different applications and in some cases needs to be considerably increased. As can be seen from the face velocity quoted above, a much larger panel area is required for a given air volume than is needed for a particulate filter. For this reason carbon cells rather than panels are nearly always required in order to maintain a reasonable duct size in relation to the air volume being handled. The cells contain a number of panels in 'V' formation to give an extended surface area.

As far as possible water vapour should be removed from the airstream to eliminate possible condensation within the filter that could cause porous blockage and possible breakdown of the biscuit. Porous blockage will tend to nullify the adsorption effect of the carbon and cause a dramatic increase in air resistance (this also applies to carbon in loose form). However, conditions as high as 80% RH are normally acceptable provided no interstitial condensation takes place.

Airstream temperatures entering the filter in excess of 40C (104F) should be avoided if possible. If temperatures in excess of this figure are anticipated, steps should be taken to reduce the temperature to an acceptable level e.g. with fresh air bleed, cooling coil or heat exchanger, to prevent any regeneration taking place.

#### **5. NOTES ON USE AND SELECTION OF CARBON PANELS AND UNITS**

(a) Permanent suspension panels are normally supplied fitted with an aluminium frame and can be made to any reasonable size to existing panels of all makes.

(b) As a guide, a 1" nominal thickness panel should be selected to have a window velocity not exceeding 38 fpm (0.19 m/s) i.e. a 24" x 24" x 1" nominal panel will handle up to 132cfm (0.06m/s).

(c) Some processes give off large amounts of smoke, which is extremely detrimental if allowed to reach the carbon filters. In many cases this can be overcome by the use of a good quality pre-filter (see section 6). This will also protect the carbon from particulates that will block the carbon and prevent absorption taking place.

(d) Modules can be 'tailor-made' to any reasonable size to fit ducting, air-handling units etc.. Cells with removable panels are made in six sizes as shown.

(e) As stated in this leaflet and on the price lists, capacities shown for the Modules are based on a dwell time of 0.1 seconds, which is acceptable for many applications (refer to Module selection data for variations).

(f) Some units on the market are based on dwell times as low as 50% of our units. Where this information is available the amount of carbon in the Module cells can be adjusted accordingly.

## **6. PRE-FILTERS**

Since carbon filters remove odours by adsorption, any build-up of dirt or grease on the carbon face will result in the blanking or encapsulation of the open porous structure of the carbon, and will inhibit or totally destroy the process.

It is therefore essential that a suitable pre-filter is provided to protect the carbon filters, and this should be of the highest grade economically viable. The pre-filter would normally be a panel or bag with a minimum performance of EU3 to Eurovent 4/5 (although an absolute or electrostatic filter may be required in some applications). We do not consider a glass panel to be suitable. If a disposable panel is to be used we recommend a 3" nominal thickness Pre-Carb filter. This consists of a 2" pleated element plus a 1" synthetic pad contained in a card frame with a classification of EU4 to Eurovent 4/5.

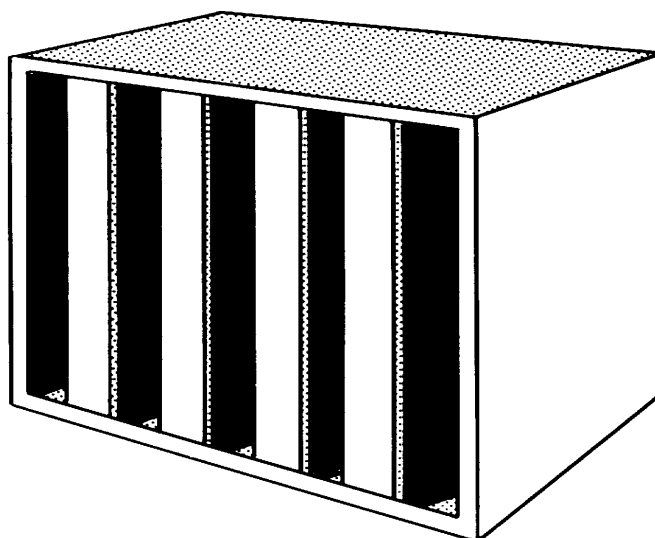
In kitchen extract or similar applications where grease is present, a high efficiency or electrostatic filter should be fitted before the carbon unit, which should be as far as possible from the air inlet. All pre-filters should be checked regularly and replaced if necessary.

NOTE: We cannot stress sufficiently that every effort should be made to ensure that grease and smoke particles are prevented from reaching the carbon filters, both of which will very rapidly destroy the effectiveness of the carbon.

## **7. METAL CASED 'MODULES'**

The metal cased 'Module' cells have the highest carbon loading in our range, with standard or heavy duty carbon panels permanently sealed into a galvanised sheet steel casing. This construction gives a very strong unit capable of handling large air volumes, or where conditions dictate, increased contact time. The advantage of this unit is that with the panels sealed in, there is no possibility of air leakage within the cell.

Also, these units can be manufactured to almost any reasonable size, the limiting factors being overall weight for handling purposes and the size of individual panels. They can therefore be 'tailor-made' to fit air handling unit's etc.. When the unit has finished its useful life it is discarded and replaced with a complete new cell.



Where points of discharge from extract systems are in critical locations with regard to surrounding buildings, consideration should be given to increasing dwell time accordingly.

### **Performance Chart**

			STANDARD DUTY				EXTRA DUTY			
NOMINAL SIZE	ACTUAL SIZE	NO OF PANELS	AIR VOLUME	AIR RESISTANCE	CARBON WEIGHT	TOTAL WEIGHT	AIR VOLUME	AIR RESISTANCE	CARBON WEIGHT	TOTAL WEIGHT
24 X 24 X 12	597 X 597 X 298	12	860 cfm	0.10wg	19kg	32kg	1130 cfm	0.15wg	25kg	42kg
24 X 24 X 18	597 X 597 X 451	12	1300 cfm	0.12wg	29kg	49kg	1700cfm	0.17wg	38kg	65kg
24 X 24 X 24	597 X 597 X 597	12	1725 cfm	0.14wg	38kg	65kg	2250 cfm	0.20wg	50kg	85kg
18 X 18 X 12	451 X 451 X 298	8	345 cfm	0.10wg	10kg	17kg	570 cfm	0.15wg	13kg	22kg
18 X 18 X 18	451 X 451 X 451	8	650 cfm	0.12wg	14kg	25kg	860 cfm	0.17wg	19kg	32kg
18 X 18 X 24	451 X 451 X 597	8	860 cfm	0.14wg	19kg	32kg	1150 cfm	0.20wg	25kg	42kg
12 X 12 X 12	298 X 298 X 298	6	215 cfm	0.10wg	5kg	9kg	280 cfm	0.15wg	6kg	10kg
12 X 12 X 18	298 X 298 X 451	6	325 cfm	0.12wg	7kg	12kg	425 cfm	0.17wg	10kg	17kg
12 X 12 X 24	298 X 298 X 597	6	460 cfm	0.14wg	10kg	17kg	565 cfm	0.20wg	13kg	22kg

The capabilities shown are based on a dwell time of 0.1 seconds

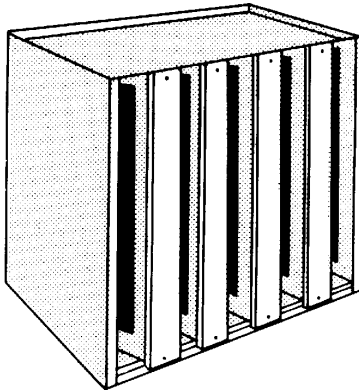
Notes: Modules should be installed with panel's vertical. For larger air volumes multiple cells should be used. 'Modules' with reduced carbon weights can be provided to match the carbon content of other manufacturers units where required. **Non-standard sizes:** These units can be manufactured to any reasonable size to suit individual requirements.

## Module selection data

Application	Capacity
Canteens, normal kitchens and restaurants.	As listed.
Kitchens producing large amounts of fried foods or concentrated cooking of burgers.	Base on 50% of listed capacities if possible.
Indian restaurants etc.(i.e. curry, spices etc.)	Base on 50% maximum (or in extreme cases 25%) of listed capacities and use special carbon if possible
Excess of onions or garlic smells from cooking	Base on 25% to 50% of listed capacities and use special carbon. Sudden 'bursts' of onion or garlic odours are more likely to be satisfactorily dealt with by using increased carbon weight.
General air conditioning	As listed.
Specialised applications (chemicals, etc.)	Refer to PA. Obtain concentrations and chemical details (formulae) where possible
Airports – Kerosene/petrol fumes	As listed
Museums, art galleries	Special carbon may be required with a reduction in listed capacities. Refer to PA.

## 8. METAL CASED CELLS WITH REPLACEABLE PANELS

These units are suitable for applications where larger quantities of carbon relative to air flow are unnecessary, or where Modules are unsuitable. They are manufactured from galvanised sheet steel and have slides for the insertion and removal of individual carbon panels. The panels have an aluminium channel frame surround to prevent damage to the panels. when being inserted, and to provide a base for sealing gaskets.

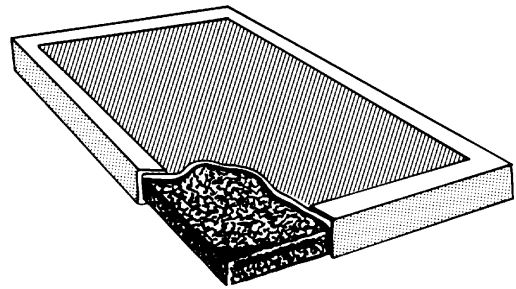


The Short Cell panels are removed from the side of the casing, whereas the Long Cell and Double Duty Cell are front/rear withdrawal. The Long cell & double duty cell should be installed with carbon panels vertical. For higher carbon loadings we recommend the use of the Modules.

Type	Actual Size WxHxL	No.of Panels	Nominal Rating (cfm)	Dwell Time (secs)	Air Resistance (in wg)	Carbon Weight (kg)	Rating @ 0.1 secs(cfm)	Total weight (kg)
Short Cell	597x597x298	12	1000	0.074	0.26	16.5	740	30
Half Size	298x597x298	6	500	0.074	0.26	8.2	370	20
Long Cell	597x597x546	10	1500	0.074	0.26	24.7	1110	52
Half Size	298x597x546	5	750	0.074	0.26	12.3	555	32
Double Duty	597x597x660	12	2000	0.082	0.18	36.6	1640	70
Half Size	298x597x660	6	1000	0.082	0.18	18.3	820	44

## 9. CARBON PANELS

Our unique patented bonding system produces carbon biscuits of consistent quality which are dimensionally stable and dust free. The biscuits incorporate a non-woven fabric on both faces and all edges, are normally supplied fitted into an aluminium channel frame.



Galvanised or stainless steel frames can be provided if required, or the biscuit can be supplied unframed.

These panels can be manufactured to any reasonable size and in a range of densities and thickness'.

## 10. CARBON TESTING SERVICE

Since accurate information is not normally available regarding details and concentrations of all the contaminants in the airstream, it is generally extremely difficult to calculate in advance the life expectancy of an activated carbon filter.

However, it is possible to obtain reasonably accurate life expectancy levels by testing the carbon using a method known as CTC testing. This is a free service to our customers. To carry out a test we would require a small sample (150 gms minimum) of carbon from one of the cells or panels, together with an indication of the date of installation. From this information we can assess the likely remaining useful life of the carbon

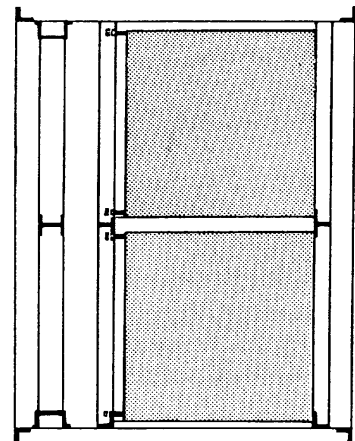
## 11. SIDE ACCESS CASINGS ('MODULES')

Side access casings to house 'Modules' are available for single or multiple cell applications, with access on one or both sides as required.

For single cell installations, the casing consists of a galvanised sheet steel casing with either sheet or proprietary type flanges. E.g. -MEZ' or 'Ductmate'.

The cell sits against an angle frame within the casing, which is fitted with a neoprene seal. An additional frame at - the inlet to the filter has jacking bolts to push and hold the -Module against the seal.

Pre-filter slides are also provided where required.



For multiple cell installations we recommend that, due to the weight of the 'Modules', a heavier construction casing is provided.

Our standard multiple unit consists of a GSS casing, with 50 x 50 x 6mm RSA flanges both ends. Internally, 50 x 50 x 6mm RSA frames are provided at both ends of the cells, which in turn sit on 10g shelves, welded to both frames. This gives a very rigid internal structure which avoids distortion of the casing.

The inlet frame is again provided with 'jacking' bolts to push the 'Module' against the sealed frame on the outlet. Pre-filter slides are provided when required. On multiple cell casings separate access doors for the 'Module' and pre-filters are normally provided.

## 12. SIDE ACCESS CASINGS (PANELS)

This unit is constructed to house a series of carbon panels in 'V' formation arranged for side withdrawal and consists of a galvanised sheet steel flanged casing, with side access doors to facilitate the removal of the various panels.

Each carbon panel is fully supported by mesh, and slides are provided for a pre-filter, plus slides for a grease filter where required (i.e. kitchen extract applications).

Since different applications require varying weights of carbon to ensure an effective reduction in odour or fume emission, we offer this unit with a range of carbon loadings to cover light, medium and heavy duty situations. However, carbon cell life will be increased proportionately to the weight of carbon utilised, and therefore the more carbon used the less frequently will maintenance be required. Apart from being more effective, higher carbon loadings may be essential where high odour concentrations are present.

## OTHER PRODUCTS IN OUR RANGE INCLUDE (See Product Guide)

- Bag Filters
- Disposable Panels
- Washable Panels
- Grease Filters
- Grease Filter Casings
- Cleaning Products
- Pad Frames
- Filter Media
- Pad Holding Frames
- Absolute (HEPA) Filters
- Front & Side Access
- Frames & Casings

