Monodraught
The vertical balanced-flue and natural ventilation system
The Problem

Tall, ugly, freestanding chimneys are relics of the past when either oil fired or coal fired boilers were often used on Schools, Hospitals, and similar Projects. Old metal and asbestos flues running up the outside of a building are also a common sight but do nothing to enhance the appearance of commercial properties.

Monodraught provides the perfect modern day answer to this problem.

The Company

It was nearly 40 years ago that William Stranks, an Aeronautics Engineer from Norwich, first invented the Monodraught system, initially to eliminate the ‘smokey fire’ problem. He determined that nearly all problems of poor combustion were related to the pressure differential between the source of air supply and the chimney discharge. He accordingly perfected the Monodraught design of taking air for combustion from the top of the chimney, from the same pressure zone as the flue outlet, thereby creating the correct conditions for optimum boiler function.

He obtained a Patent No. 1063909 for his invention in 1965 and many thousands of his small domestic chimneys were sold in the Eastern Counties area and are still known by many to this day as a ‘Stranks Flue’.

The Solution

The Monodraught vertical balanced-flue system provides all the requirements for combustion air, ventilation and flueing in one neat, composite unit, available in any size for single or modular boilers. Now recognised by British Standards as an approved method for boiler house ventilation this attractive, but highly cost effective balanced-flue system provides the perfect answer for every Architect and Building Services specifier.

Sadly Mr Stranks died in 1973 and the present Company was formed by Terry Payne of High Wycombe, who developed the range of Monodraught systems, initially from 2 domestic sizes in 1974 to now over 15 sizes.

The lightweight glassfibre system was launched in 1985 and its concept and designs are still based on the same principles laid down by Mr Stranks 40 years ago. To this day there has never been any known failure of the system to eliminate all problems of downdraught regardless of outside wind conditions, and to create the correct environment for maximum boiler efficiency.
The Monodraught system, however, provides a natural draught vertical balanced-flue system which, by its very design, eliminates all possibility of downdraught without relying on any mechanical means for operation. Previously it has always been necessary to take the flue of any conventional boiler to above the highest part of the roof level to avoid problems of downdraught. Conversely, a fan dilution system of mechanically assisted flue venting at low level, is often required to overcome these problems of potential downdraught.

By taking air for combustion and ventilation through air intakes sited at the top of the system, passing down through ducts formed in the sides of the chimney system to an enclosed boiler room below, a balanced condition is created. The flue gases are contained in a highly insulated twin wall flue system passing through the centre of the Monodraught arrangement, usually rising directly from the boilers.

Any wind movement, no matter how slight, is encapsulated by the air intakes on the windward side of the chimney, and this air is conveyed to the boiler house below. Any excess wind pressure is vented on the leeward side of the system, leaving the optimum operation of the appliance unaffected by wind turbulence.

Elimination of Downdraught

Downdraught conditions on a conventional chimney/boiler house arrangement occur when the flue exit is subjected to a higher pressure than the air inlets to the boiler house, which are normally in the form of a louvred door. This pressure differential will normally be overcome by extending the height of the conventional chimney to create the additional buoyancy necessary to overcome the downdraught problem.

With a Monodraught flue terminal the external flow pattern is always such, that the pressure at the top of the flue exit is less than the stagnation pressure which occurs at the windward side inlet. No matter which way the wind is blowing, there will always be at least one air intake subject to wind pressure with the air ducts on the opposite side of the chimney system always acting as permanent ventilators to the boiler house.

The air inlet/ventilation ducts will be constantly changing according to wind conditions with the boiler house acting as the 'balancing chamber' to equalise these pressure variations at the head of the chimney.

Features of the System

- Guaranteed to completely eliminate downdraught regardless of higher surrounding building.
- Operates on just 1m chimney height as a vertical balanced-flue.
- Provides a neat, attractive, simple, low cost chimney system.
- Enables any single storey building to be used as a boiler house eliminating the need for tall, expensive and sometimes unsightly chimneys.
- Provides a clean, controlled supply of combustion and ventilation air from high level, free from dust, dirt or contamination, which would otherwise be entrained through low level air intakes.
- Fulfils the requirements of the Boiler Manufacturer to provide a well insulated chimney.
- Eliminates the incidence of excessive condensation.
- Virtually maintenance free with nothing to rust, rot, wear out or break down and guaranteed for 60 years.
- Available in a wide range of sizes, colours and finishes to complement any building project.
- Ensures a 'balanced' condition in the boiler house and provides the Customer and Specifier with all the long term benefits and economies of balanced-flue combustion.
Monodraught

Selecting the right system

Monodraught offer a wide range of systems to suit all clients’ needs for a neat, unobtrusive solution.

In general the Monodraught range can be summarised as follows.

Balanced Flue Systems
Standard lightweight glass fibre systems, available as square, circular or rectangular. GRP systems suitable for gas and oil fired boilers and for outputs between 30kW to 6MW.

Turret Systems
Architectural feature Turrets can become the focal point of the building but still retain the benefits and advantages of a vertical balanced-flue condition. Available in closed and open top discharges.

GRP Ridgeline Systems
A low profile range of systems that blend with the ridge of any building. Suitable for any number of boilers as single, double or triple terminations and outputs between 30kW to 6MW.

Monovent Systems
GRP Monovent systems share the same appearance as the balanced-flue range. Suitable for any intake or exhaust requirement including AHU, lift shaft terminations and toilet extracts.

Chimney Shrouds
Where full vertical balanced-flue systems cannot be used, but Architects still want to benefit from the appearance of the Monodraught range, with the same pleasing appearance.

Clad Systems
Where a brick or stone finish is required, these systems share the same air intake arrangement but can be clad externally. They are popular with listed buildings and conservation areas.

Monoflue
Where it is not possible to incorporate the advantage of a vertical balanced-flue system, Monodraught can design and supply all the internal and external flue arrangements.

Notes:
(1) Figures quoted are maximum boiler ratings to fully comply with BS 6644: 1991 and BS 5440 parts 1 & 2.
(2) All GRP systems are available finished to any British Standard or RAL Colour.
(3) Twin wall insulated flues must be used in the boiler house to fully comply with BS 6644: 1991 and to ensure maximum boiler efficiency.
(4) On natural draught, gas fired atmospheric boiler installations, the chimney size will normally be governed by the modular flue header size recommended by the boiler manufacturer and British Gas recommendation IM11, which must not be reduced.
(5) GRP Square sizing chart is applicable for Turrets.
(6) See page 7 for Ridgeline Systems sizing chart.

Monodraught Sizing Charts

GRP Square Sizing Chart

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<tr>
<th>Flue Size</th>
<th>Core Size</th>
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System Weight
1m high overall
25kg 32kg 40kg 58kg 75kg 88kg 102kg
Additional 1m lengths
20kg 26kg 32kg 48kg 61kg 71kg 79kg

GRP Circular Sizing Chart

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<th>Flue Size</th>
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System Weight
1m high overall
21kg 28kg 35kg 42kg 49kg 56kg 63kg
Additional 1m lengths
17kg 24kg 31kg 38kg 45kg 52kg 59kg
The vertical balanced-flue and natural ventilation system

Upstand Details to suit 600 Circular Monodraught system for a Tiled Pitched Roof Application

Isometric Detail of Upstand for Circular system

Upstand Details to suit 600 Square Monodraught system for a Tiled Pitched Roof Application

Isometric Detail of Upstand for Square system

Upstand Details to suit Monodraught Square system for a Flat Concrete Roof Application

Isometric Detail of Upstand for Flat Roof

Upstand Details to suit Monodraught 600 Circular system for a Flat Felt Roof Application

Isometric Detail of Upstand for Flat Roof

Standard Specification Clause

“Supply and fix.........No. Monodraught GRP.......square/circular system manufactured to suit.......boiler.........high overall. In 3 ply flat roofing system with Class 1 fire retardant resin, with air intake louvres protected internally with anti-bird mesh. The installation of the Monodraught system is relatively simple and the standard upstand details shown below apply to most Projects.

UPSTANDS

Aluminium
For a standing seam/aluminium profile roof a welded upstand should be provided by the roofing contractor as part of the normal roof coverings. Alternatively, Monodraught can include this work as part of their package.

Existing Roofs
For existing metal profile, tile or slate roofs Monodraught can provide a purpose designed GRP moulded flashing soaker sheet for

Slate or Tile
For a slate or tile roof using a square system, an 18mm external quality plywood upstand is required to be covered with Code 4 lead and this is normally provided by the builder.

Flat Roof
For a flat roof of asphalt or built up felt roofing, Monodraught can provide a galvanised or GRP soaker sheet to be built in by the builder. Alternatively, a conventional plywood (or concrete for asphalt) upstand should be specified.

Single Ply Membrane
For a single ply membrane roof Monodraught provide a GRP soaker sheet.

Note:
Measurements shown below refer to a standard 600mm system, but are typical of the tolerances required for the complete range of Monodraught balanced-flue systems.
Roof Top Boiler Houses

Roof top boiler houses have considerable operational advantages for the Building Services Engineer, but create problems on the final appearance of a building as a result of the uncompromising appearance of stainless steel flues and the necessity to provide high and low level ventilation.

The Monodraught vertical balanced-flue, therefore, overcomes all these problems in providing one composite self-contained unit.

The Monodraught system can be positioned on the 'opposite' side of the ridge, where necessary, and horizontal ducting provided within the roof space to the boiler compartment, to convey fresh air for combustion and ventilation, provided the horizontal distance does not exceed the effective vertical height, and the installation complies with British Gas IM/11.

- No ugly flue pipes above roof level.
- Eliminates requirement for low level air supply.
- No ugly louvres or ducting.
- Single operation installation.
- Maintenance free and fully weatherproof.
- Supplied in any BS or RAL

South Leeds Athletics and Bowls Centre: Oval Multi-flue system serving 2 x Broag 3000 Condensing boilers.

Basement Boiler Houses

Basement Boiler Houses have always posed a problem of providing combustion air to low level, the normal method being to use mechanically driven air input. The Monodraught vertical balanced-flue arrangement is therefore ideal in providing all combustion air requirements without the need to rely on any mechanical means.

The Monodraught system is unaffected by vertical height. Once the cold intake air at roof level has entered the Monodraught system it will descend to basement floor level, the throughput of air being dependent on the firing action of the boilers. Warm air will rise up through the duct providing the necessary ventilation to the boiler compartment, discharging at high level to atmosphere.

The British Standard BS6644: 1991 makes a clear reference to Basement Boiler Houses and Clause 19.2.5. states:-

For natural draught boilers installed in basement underground or similarly sited boiler houses where:

(a) communication with the outside air is possible only by means of high level openings and

(b) it is not intended or possible to use a proprietary vertical balanced-flue system, the inlet air shall be ducted to low level

The strong recommendation of the British Standard therefore is that the proprietary system should be used wherever possible.

Oxford Islamic Centre: Rectangular Dome Turret system serving 2 x Hamworthy Wessex 200, 1 x Wessex 300 Boilers and 2 x Andrews R2000 Water heaters.

The Velodrome National Cycling Centre, Manchester: Oval Multi-flue system serving 3 x Ideal Viscount boilers.
The vertical balanced-flue and natural ventilation system

**Turret Systems**

There are a wide range of standard styles and Turrets available. These Architectural feature Turrets provide a striking termination to any flue system and are produced as open or closed top systems, all operating on the vertical balanced-flue principle.

Open Top Turret systems can incorporate a stove enamelled rain cap or where a drain point can be provided at the base of the main flue, the Monodraught ‘mesh’ grill top can be specified.

Classic Turret systems operate on the same principle as a domestic balanced-flue arrangement, with the internal flue terminating in a ‘cross box’. Therefore, whichever way the wind blows, the products of combustion can be safely discharged without any restriction to the flue gas flow.

Weather vanes are available in a wide range of styles or finials can be provided. Further information is available from our Technical Dept.

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**Ridgeline Systems**

Based on the well proven Monodraught principle of providing all the air requirements for combustion and ventilation from the roof level system, the Ridge Terminal design provides Architects with a neat and unobtrusive termination, but at the same time provides the correct conditions for optimum boiler efficiency. Most systems are manufactured to fit neatly between roof trusses but all systems are purpose made to fit the roof construction, depending on flue size and total boiler output.

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**Ridgeline Sizing Chart**

<table>
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<tr>
<th>Flue Size</th>
<th>kW</th>
<th>160kW</th>
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<th>1050kW</th>
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**Stepping Hill Hospital, Salford: Clock Tower Turret serving 4N° Hartley & Sugden Junior SCP50 boilers.**

**Dussingdale Nursing Home: Dovecote Turret serving 3N° Ideal Concord Cx90 boilers.**

**Cromwall Court, Ascot: Venetian Turret serving 3N° Modular Heating Regency boilers.**

**Dussingdale Nursing Home: Dovecote Turret serving 3N° Ideal Concord Cx90 boilers.**

**Salvation Army, Shildon: Open Top Turret serving 2N° Hamworthy Purewell P50 boilers.**

**Classic Turret**

**Weathervanes are available in a wide range of styles or finials can be provided. Further information is available from our Technical Dept.**

**Open Top Turret systems can incorporate a stove enamelled rain cap or where a drain point can be provided at the base of the main flue, the Monodraught ‘mesh’ grill top can be specified.**

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**Guy's Hospital, London: Serving 3N° Babcock Robey steam generators.**

**Waitrose Supermarket, Stroud, Gloucestershire: Serving 3N° Hamworthy UR430 boilers.**

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**Turrell Systems**

**Ridgeline Systems**

**The Observatory, Chatham, Kent: Serving 3N° Modular Heating SLP211 boilers and Hamworthy DR35L water heater.**

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**A bespoke balanced-flue terminal for Primrose Cottage, Harefield.**

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**A bespoke balanced-flue terminal for Pinrose Cottage, Harefield.**

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**A bespoke balanced-flue terminal for Pinrose Cottage, Harefield.**
There is an increasing demand for rectangular systems that not only enjoy all the advantages of the Monodraught principle, but also satisfy the Engineer’s requirement to keep certain flues separate.

Condensing Boilers
Many major Contracts designed these days have at least one condensing boiler. It is normally considered preferable to maintain the flue from the condensing boiler within its own separate flue system. Atmospheric boilers and water heater flues can be kept separate or combined into a single flue. Two, three or more flues can be taken through the Monodraught system as may be required.

Oil-Fired Boilers
It is generally preferable to keep flues to oil-fired boilers separate so as to maintain the target velocity of 7.5 m/s under all firing conditions. In this case separate flues should be used. Splitter plates can also be used in combined flues to maintain optimum flue gas buoyancy.

Heating and Hot Water
Most contracts have heating and hot water generating plant where the heating requirements are a far greater proportion of the total heat load. Consequently during the non-heating season if the heating and hot water plant are connected into the same flue header then this could have an adverse effect on the performance of the water heater flue. For this reason it is preferable to have a separate flue for the water heater.

C.H.P. Engines
Where required, this type of exhaust can also be incorporated within the Monodraught system as part of the general flueing arrangement. The louvred area can be increased to provide the correct air flow requirements.

Soil and Vent Pipes
With the increasing demand to conceal ugly penetrations through the roof, other services can also be combined into the Monodraught rectangular system. The air intakes are carefully sized accordingly to maintain the correct amount of combustion and ventilation air and the neat overall appearance complements the building.

Multi-Flue Applications
There is no reason why two or more flues cannot be incorporated within standard Monodraught systems provided the total air requirements are calculated so as to be suitable for the total boiler load. Some typical illustrations are shown in this respect.

British American Tobacco in Turkey: One of Monodraught’s largest balanced flue systems to date, measuring 4m x 2m x 3.8m and serving 3N° Dessa Otak 100 steam raising boilers.

Huddersfield College: Rectangular system serving 2N° Broag condensing and 1N° Broag standard atmospheric boilers.

McAlpine Stadium: 2N° Rectangular systems serving five Hoval gas fired condensing boilers.

Wellington North Hospital: 3m high multi-flue system terminating at car park level serving Atlantic Optimagaz condensing boilers.
Monodraught take great pride in being able to manufacture systems to any size, shape or colour to suit any building feature. Whether it be a high tech building or a listed building that is very sensitive to planning restrictions, Monodraught produce systems that are sympathetic to the Architects requirements.

One off and bespoke systems can be produced to add the finishing touch to any project because all systems are manufactured in GRP. Monodraught systems are used extensively in conservation areas where a tall unsightly conventional flueing arrangement would not be welcome.

Systems can be manufactured to a very low profile to ‘hide’ the termination or they can be designed to be the main feature of the building. Apex or ridge mounted systems can incorporate lightning protection where necessary. There is virtually no limit to what we can provide and we always relish a new challenge.

Monodraught have long held the view that it is wrong and potentially dangerous to discharge large volumes of flue products at ground level through fan dilution systems. The Monodraught system however offers considerable advantages to these mechanical arrangements resulting in considerable cost savings to the Client not only in initial capital costs, but in running costs and ultimately in maintenance and replacement costs.

- Nothing to rust, rot, wear out or break down.
- There are no moving parts of the Monodraught system.
- No noise, no maintenance; low initial capital cost, no replacement costs.
- No ground level air pollution; Monodraught systems are environmentally friendly!

Monodraught have long held the view that it is wrong and potentially dangerous to discharge large volumes of flue products at ground level through fan dilution systems. Even though the feature of fan dilution systems is that they dilute the products, they are still the same products of combustion! The Monodraught systems discharge their products of combustion vertically, maintaining the momentum of the natural thermal rise of flue products.

1993 saw the introduction of the H.M.I.P Document D1 which identifies pollutant discharges from commercial boiler plant. This document highlights the importance of dispersion of products and the vertical discharge of a vertical balanced-flue will always be preferable.
Clad Systems

For listed buildings, brick, slate or stone cladding can be added to the standard Monodraught arrangement with the internal balanced-flue system in GRP.

Special oversize stone cappings can be provided together with clay chimney pots, alternatively brick-on-edge capping and corbel courses can be incorporated in the final design providing the essential air intakes are maintained.

Please refer to our Technical Department for further details.

Richard Hind School, Stockton-on-Tees: Finished installation after brick cladding. System serving 4N° Ideal Cx205 boilers.

Puckrup Hall, Tewkesbury: Internal GRP arrangement prior to brick cladding.

Manor House Hotel, Castle Coombe: Finished installation after slate cladding. System serving 3N° Hoval Unolyt boilers.


Manor House Hotel, Castle Coombe: Serving 2N° Hoval Unolyt boilers.

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The vertical balanced-flue and natural ventilation system

**British Standards**

**BS 6644: 1991**

*British Standard Specification for Installation of gas-fired hot water boilers of rated inputs between 60kW and 2MW (2nd and 3rd family gases)*

Previously, it has always been necessary to provide high and low level ventilation to any boiler house. The British Standard now permits high level only ventilation, or a Boiler Compartment, provided a proprietary system is used.

The main Clauses covering the Balanced Compartment system are shown, and this method is to be preferred against any mechanical means of boiler house ventilation.

The proprietary Monodraught system is manufactured for each Project according to the boiler loading, number of boilers and flue size. Advice is readily given on the correct size system for each individual Project. Further Technical Specification guidance notes are available from Monodraught to cover all aspects of installation details.

Monodraught enjoy a very close working relationship with all leading boiler manufacturers and suitable advice is always readily available regarding the siting of any Monodraught terminal.

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The most important aspect relating to terminal location is to ensure that the products of combustion cannot re-enter the building through any window or openings in such concentrations as could be prejudicial to health. Since, however, the Monodraught maintains a balanced-flue condition, the system is unaffected by "building effects". A balanced-flue condition will always ensure optimum performance from the appliance regardless of external wind conditions.

Monodraught have always maintained that the balanced-flue condition created by the system ensures higher efficiency from the appliance and by reducing the level of emission of unburnt hydrocarbons and other preventable pollutants, airborne pollution can be reduced.

In July 1993 a document was published by Her Majesty's Inspector of Pollution entitled "D1" which relates to the control of polluting emissions mainly from process plant and other combustion processes, other than boilers serving space heating and hot water generation. The indications of this legislation is that the emissions from gas-fired plant is not considered a serious pollutant, but nevertheless, Monodraught still recommend the heights and distances to window openings as set out on the attached tables which is still based on the original Memorandum requirements.

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<th><strong>GAS-FIRED</strong></th>
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<tr>
<td><strong>Boiler Output</strong></td>
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<td>150kW</td>
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<td>1250kW</td>
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<tr>
<td>1500kW</td>
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<td>2000kW</td>
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<tr>
<th><strong>OIL-FIRED</strong></th>
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</table>

Assuming boilers are operating at 80% efficiency and that the installation is to take place in Area B - partially developed area.

Note: 35 sec oil sulphur content = 0.2%, 28 sec oil = 0.06%
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