

## *Design Checklist*

Successful building leakage air tests and air tight building construction stems from an attention to detail at both the design and construction stages of the project.

An airtight barrier layer needs to be identified within the building, and this layer extended to all facets of the building elevations. The following information identifies the most common types of materials used to construct building envelopes, and highlights the areas where particular attention needs to be paid.

### ***Wall Constructions:***

The inner skin of the external walls should ideally form the airtight barrier in wall constructions. External walls should be extended from floor level to the underside of intermediate floors and roofs. All gaps between blockwork and intermediate floors, roof members, windows/doors, steel columns, etc should be sealed.

#### **Blockwork:**

Standard blockwork is not impermeable to air unless it is plastered. The block density and standard of mortar joints have a significant impact on the overall permeability of the construction. Full mortar joints are preferable. Painting blockwork reduces the permeability and two coats of emulsion can make a significant improvement.

#### **Drylining:**

Ensure that the external walls are completed and fully sealed prior to springing internal stud partitions from them. Avoid/minimise service outlets such as sockets, data outlets etc in the dry lining of external walls as they are rarely well sealed. Make sure that blockwork behind dry lining has full mortar bed joints and perps. The gaps at the top & bottom of the plasterboard should be sealed.

#### **Sheet Metal Cladding:**

Insulation to the correct density needs to be used and compressed to the correct thickness within the construction and mastic joints used to seal the sheets. Profiled closer pieces of the correct size and profile must be used and sealed where panels meet other constructions.

Composite panel systems are generally better than in-situ built up systems, since the joints between panels have gaskets and the steel cladding layers are completely filled with foam.

Special attention needs to be paid at the interface between wall cladding and other methods of construction. **The head of the wall/ underside of roof junction is particularly susceptible to leaking.**

#### **Curtain Walling Systems**

Curtain walling systems are normally well designed and constructed with gasket joints between panels and frame construction. Generally it is the joints with other types of construction such as

Concrete edge beams, roof parapets, brickwork etc. In addition care needs to be taken with multi storey construction to avoid air leakage between floors.

### ***Floor constructions:***

#### **Cast In situ Concrete Slab:**

This type of floor provides the best type of airtight seal since the concrete fills any voids, both horizontally and vertically.

#### **Pre-cast Hollow Concrete Floor Planks:**

The hollow core of this type of floor can allow air to track horizontally and end up outside the airtight layer of a cavity wall. The problems are made worse with drainage and service penetrations, which if poorly sealed allows air to enter the hollow core and escape. Care should be taken to ensure all penetrations are sealed properly. We would recommend that the ends of the concrete planks are also sealed.

#### **Beam and Block Floors:**

This type of floor construction can lead to similar problems to those described for the pre cast planks above.

### ***Ceiling Constructions:***

Where roof/ceiling voids exist, lay in type false/suspended ceilings do not form an airtight barrier layer. Plasterboard type ceilings if plastered and edges sealed are significantly better than other types of lay in ceilings.

### ***Roof Constructions:***

#### **Profiled Metal Decking:**

The inside surface of the decking if possible should form the airtight barrier and needs to be sealed to all the adjoining structure and the sheets sealed to each other during the construction of the roof. Use of the vapour barrier as the airtight layer should be avoided since this is rarely an effective seal. Steelwork supporting the roof can sometimes prevent access to the roof decking above and prevent a satisfactory seal being formed. Careful detail is needed to address this. Any Profiled decking can cause difficulties in sealing walls where they run on the underside. A profiled closer piece should be used to fill the void, and this in turn should be sealed with mastic.

#### **Flat Roofs:**

These types of roof generally provide a good airtight barrier over the main horizontal area of the roof, since they are designed to prevent water ingress. Particular care needs to be taken around parapet walls, flashings and roof penetrations.

### ***Doors and Windows:***

Door and window frames need to be sealed to the internal air tight barrier and not just sealed to the external façade. Window sills are often an area, which performs particularly poorly and should be fitted after the cavity has been sealed using an appropriate cavity closer.

#### **Lift Shaft Doors:**

Lift shafts have a permanent vent to outside at the head of the shaft and should be fitted with effective doors seals at each landing. Any floor or ceiling voids adjacent to the shaft should also be adequately sealed to prevent leakage.

**Loading Bay Doors:**

Concertina type sliding doors are very difficult to seal. Where possible, Roller Shutter or Sectional type doors, with good quality rubber seals should be specified. The seal between the head of the door and the cladding soffit should be checked to make sure it fully closes the gap.

***Mechanical and Electrical Systems:***

The airtight barrier should generally step inside the building separate the plant rooms from the rest of the building. The plant room partition walls, floors and ceiling as well as service risers require careful sealing around all mechanical and electrical service penetrations. Particular care is needed to fill voids INSIDE electrical service trunking.

All incoming service ducts should be sealed after the services have been installed.

**Sanitary Services:**

All drainage traps including floor gullies and air handling plant condensate traps should be filled with water prior to the test.

Detailing and materials selection needs to be high on the list of priorities for all members of the team, right from the start of the project to ensure that:

- 1) The airtight barrier layer is identified
- 2) The correct products are used where required
- 3) The relevant areas are monitored throughout the construction phase

The use of certain types of products such as adhesive tapes or expanding foam should be avoided since these do not perform over the life of the building.