



## **FAÇADE INTEGRITY TESTING APPARATUS AND METHOD**

### **FIELD OF THE INVENTION**

The invention relates to apparatus and methods for testing the water tightness of a building façade. Specifically, the invention relates to apparatus and methods of testing that will conform to multi-jurisdictional standards for the testing of resistance of a building façade to the ingress of rain and moisture. Said testing methods involve the application of water and air at pressure applied to building elements and their applicable fixing and jointing points.

### **BACKGROUND OF THE INVENTION**

In terms of compliance for water tightness in the building industry, there are two broad thresholds that need to be met. The first is a compliance threshold whereby new materials and methods of construction are tested for general applicability to building standards. Generally these tests are conducted under laboratory conditions in accordance with testing methods set or adopted by the appropriate building authorities.

Standard testing methods are normally determined and formalised within each jurisdiction, for example ASTM standards in the US, the Building Code of Australia, or the testing specifications of the Building Construction Authority of Singapore. For the purposes of testing the resistance of materials or methods of construction against water ingress, the various standard testing methods around the world generally involve the application of water and air to the test sample. The compliance threshold being a measure of the moisture detected on the opposing side of the test sample to the application of air and water.

Prior to the ending of a defect period following construction of a building, it is common in certain circumstances to subject the building façade to a similar compliance test to ensure that the quality of construction has met specification standards. To this end, portable methods of water ingress testing are applied. Consequently, apparatus is required that can conduct a water ingress test in the field. It is to this type of testing that the present invention is directed.

The Hose Method is a traditional compliance test conducted in the field whereby a hose similar to a fire hose is secured proximate the point on the façade to be tested. The position, pressure, flow rate and water jet orientation

are all variables controlled by the test method with the compliance threshold being a measure of moisture detected passing through the façade or the joints.

Apart from the very high water loss resulting from this test, the ability of this test method to simulate normal wind and rain conditions is limited. There is no provision for air pressure, nor is the use of a single water source representative of a rainstorm.

Another method involves an apparatus comprising a fan directing an air flow to a test head, the test head having water nozzles ejecting a water jet onto the testing portion of the façade. This method is disclosed in Singapore Patent No. 9801123-2, the contents of which are incorporated herein by reference. This method has an advantage over the Hose Method in that a multitude of water jets are applied to the test zone and an air pressure directed as a velocity head from the fan, together with the water, better simulates a storm condition.

In essence, this test method is an adaptation of a laboratory test method whereby a window tunnel, which is typically used in the equipment laboratory test, has been reduced in size to a fan plus a duct. The problem with this adaptation however is that the fan and associated drive mechanism for the fan remains relatively bulky and so whilst more portable than the laboratory method, it is nevertheless a difficult piece of apparatus to move up and down the façade of a multi-storey building. This problem could, to a degree, be ameliorated by a longer duct whereby the fan could be held in one place and the test head moved to each test location. However, as the air pressure is delivered as a velocity head, the longer the duct, the greater the shock losses involved with the air flow. In order to deliver a reasonable air pressure at the test head, a centralized version of the fan would need to be of a considerable size to overcome the frictional losses in the duct.

It follows therefore that in order to place the apparatus disclosed in Singapore Patent No. 9801123-2 near the test zone scaffolding will be required having brackets and other supporting fixtures to hold the fan in place proximate to the point on the façade being tested.

The apparatus of this method suffers further in that for different test methods, a different air pressure may be required. To vary air pressure, a variable fan would be required or a number of different fans used so as to give a

variety of velocity head pressures at the test head. Suitable fans are not an insubstantial cost and so a variable speed fan will be preferable to having a plurality of fans, albeit a variable speed fan and associated controllers being expensive in their own right.

Another shortcoming relates to the balance between the size of the test head and the fan size. As the air pressure is applied through a series of orifices in the test head interspaced by the water nozzles, the larger the cumulative area of the orifices, the lower the velocity of the air flow and consequently the lower the pressure of the air applied due to the  $\frac{V^2}{2g}$  relation of velocity head pressure.

Consequently in designing the apparatus within a reasonable budget, either a small test head having a small cumulative orifice area and so a smaller test sample space, or a larger fan to produce a higher velocity air flow is required. Thus, there is a balance between the cost of the fan and the cost involved in an increased testing period. It follows that in order for a test authority to be competitive in the marketplace, the time taken to test a standard façade for a high-rise building would need to be minimized and so the area under test. Consequently the size of the test head would need to be maximized.

## **SUMMARY OF INVENTION**

It is therefore an object of the present invention to provide a test apparatus and associated method that minimizes the constraints on the prior art in terms of capital cost of equipment, and the time taken to conduct the test whilst providing a reasonable storm simulation for the test method.

Therefore, in one aspect of the present invention there is provided a testing head for testing the resistance to water ingress of a façade, including a plurality of water nozzles each for projecting a water jet, a plurality of air nozzles each for projecting an air jet, a head frame for supporting the water and air nozzles in a predetermined spaced relation to each other, support means for supporting the head proximate a testing zone wherein the water nozzles are in communication with a water supply means and the air nozzles are in communication with an air supply means, said air supply means supplying air to the air nozzles at a predetermined static pressure.

Thus, the present invention provides the advantages delivered by the method of Singapore Patent No. 9801123-2 over the Hose Method but avoids the problems of the air supply being delivered through a velocity head pressure. By supplying the air at a static pressure, this allows the air supply means to be located at a point remote to the testing head so long as the air pressure is in communication with the testing head. As an example, in a preferred embodiment, the air supply means may be an air compressor creating an air reservoir at a constant static pressure, which may be delivered to the test head through a hose. As the air is supplied as a static pressure, there is not the associated frictional losses as would be encountered with a velocity head pressure. The pressure at the air nozzles will therefore be substantially the same as that provided by the air compressor almost irrespective of the distance between the compressor and the nozzle. This provides the advantage that only the test head and not the associated water supply means and air supply means need to be moved from test zone to test zone and so minimizing the time taken between each actual test and so decreasing the overall test period for the testing of a façade.

In another preferred embodiment capitalizing on the maneuverability of the testing head in relation to the compressor etc., it may be possible to locate the air and water supply means within the building whilst in communication with the testing head. In this embodiment, having the air and water supply means in the building and perhaps feeding the supply hoses to the testing head, there is no need for the scaffolding (or other fixtures) which are required for the method of Singapore Patent No. 9801123-2. Consequently, this test method according to this preferred embodiment may provide substantial cost savings in not having to erect new scaffolding or delay the dismantling of the existing scaffolding.

Further, in order to increase the size of the test head instead of providing a larger more expensive fan so as to meet the air pressure requirements for the test, all that is required is a larger reservoir for the compressor. The compressor motor will be the same whether the reservoir is large or small and so there is only an incremental cost increase between providing a large test head and a small test head.

In another preferred embodiment, there may be provided a plurality of testing heads in communication with the water supply means and the air supply

means. Given that the size of a test head is merely a function of the size of the compressor reservoir in one preferred embodiment, having more than one test head in communication with the compressor and therefore the reservoir will lead to a plurality of testing zones being tested at one time. This further reduces the total testing time for a façade and so makes the overall exercise more cost effective.

In a preferred assembly according to the present invention, the air and water supply means may feed air and water to a distribution manifold. The distribution manifold may then be in communication with several different testing heads located at several different testing locations. In another preferred embodiment, the distribution manifold may include a plurality of ports into which may be plugged hoses feeding individual testing heads. For instance, the distribution manifold may include six different ports to which may be connected any number of testing heads up to six depending upon the testing regime. Of course, the number of ports for the distribution manifold may vary considerably with the current example included for illustration purposes only.

The exact arrangement of testing head size, number of air nozzles, and number of water nozzles may be guided by the testing specification for which the testing head is being used. In a preferred embodiment however, the head frame may include two rigid tubular manifolds, one for air and one for water to which the air and water nozzles are connected.

In another preferred embodiment, the testing head may further include direction means whereby the direction of the air and/or water jet may be adjusted to contact the testing zone at a preferred position. The placement of the testing head using the support means in this preferred embodiment may be considered a course adjustment so as to position the testing head in approximately the correct position. The direction means may therefore be considered a fine adjustment whereby the exact contact of the jet on the testing zone can be finely adjusted to within a very small tolerance. In a more preferred embodiment, the direction means may be a rotational adjustment of the nozzles or manifold so as to angle the jet accordingly. Thus, the position of the testing head through the support means may provide translational adjustment, the rotation of the manifold may provide the fine rotational adjustment.

In another preferred embodiment, the direction means may be a manually deformable extension of the nozzle or nozzles so as to direct the jet to precisely the point required through both rotation and translation.

A key advantage of a preferred embodiment of the present invention is its applicability to a range of testing specifications involving the application of water and air to a joint on a building façade. Consequently, it may be preferable to adjust the distance between the nozzle and testing zone. Thus, in another preferred embodiment, the testing head may further include spacing means whereby adjustment of the spacing means increases or decreases the distance between the nozzles and the testing zone. The spacing means may be a selectively adjustable extension to the nozzles. In a more preferred embodiment, the support means may be in communication with the spacing means whereby adjustment of the spacing means draws the testing head closer or further away from the testing zone. In one most preferred embodiment, the support means may include at least one suction cap, preferably a pair, connected to a bracket arrangement to which is fixed the manifolds of the testing head. The spacing means may be a means of adjustment on the brackets such as slotted bolt holes or other means so as to slide the manifolds, and consequently the nozzles, along an axis orthogonal to the façade.

In a further preferred embodiment, where the air supply means and the water supply means delivers the air and water to the testing head via hoses, these hoses may be connected directly to the manifolds so as to deliver the air and water to the nozzles. Consequently, the head frame may only need a further bracket to hold the manifolds together and link this with the support means so as to form the entire testing head. In addition to simplicity of construction, this embodiment further reduces the weight of the testing head, making the testing head very portable and simple to set up and break down.

The support means are used to hold the testing head in place during testing. In a preferred embodiment, these may be devices to connect directly to the façade and in a most preferred embodiment may be vacuum sealing devices whereby a resilient member is contacted with the façade and an interstitial volume reduced in size so as to create a negative pressure leading to a vacuum seal between the support device and the façade. This has the advantage of not

adversely affecting the façade and may also make connection and release a simple and quick exercise. In another preferred embodiment, said vacuum sealing devices may be suction caps applicable for use on a wide range of surfaces applicable to building facades.

The various water and air flows, water and static air pressure, spacing of nozzles, and the number of nozzles will vary in accordance with the testing specification being adopted. The determination of these parameters is a straightforward exercise by a skilled person. The testing specification is likely to specify at least some of the following parameters, being the air flow, water flow, air pressure, and water pressure at the testing zone. By determining the available water and air pressure at the nozzles and deciding upon an ideal shape of the water jet, the spacing of the nozzles on the testing head becomes a straightforward exercise. Consequently, the shape of the water jet will be important in determining these parameters. The water jet may be in a planar shape but most preferably will be conical in shape having a circular pattern of water inscribed at the testing zone. The diameter of this circular pattern will be determined by the distance of the testing head to the testing zone and the angle of the cone. An example of the spray angle of the zone may place said angle in the range  $55^{\circ}$  to  $60^{\circ}$ . This however may vary given other circumstances, convenience or following the requirements of a testing specification.

Maintaining a constant air and water pressure may be particularly vital in conforming to quality assurance and so maintain the veracity of the testing procedure. In circumstances where the water supply means may be somewhat variable or where the building under test is very high, the relevant pressures may vary without means to control this pressure. Therefore, there may be provided a pressure regulator to regulate air pressure, water pressure, or both with said regulator or regulators being in communication with any one, or a combination, of the water supply means, air supply means, communication means or testing head. Said regulator or regulators may function so as to provide a pressure buffer whereby the air and/or water supply means feed unregulated pressure to the regulator which stores said pressure in a reservoir arrangement and so maintain a constant pressure to the nozzles.

In a second aspect of the invention there is provided a method for testing resistance to water ingress of a façade including the steps of supporting a testing head at a distance from a testing zone on the façade, supplying air to a plurality of air nozzles on the testing head at a predetermined static pressure, supplying water to a plurality of water nozzles on the testing head, simultaneously projecting water jets from the plurality of water nozzles, and projecting air jets from the plurality of air nozzles, said air jets and water jets coinciding at the testing zone.

## **DESCRIPTION OF PREFERRED EMBODIMENT**

It will be convenient to further describe the present invention with respect to the accompanying drawings, which illustrate possible arrangements of the invention. Other arrangements of the invention are possible and the particularity of the accompanying drawings is not to be understood as superseding the generality of the preceding description of the invention.

Figure 1 is an elevation view of the testing head according to the present invention.

Figure 2 is a side elevation view of the testing head of Figure 1.

Figure 3 is a schematic view of a plurality of testing heads and associated water and air supply means according to a preferred embodiment of the present invention.

Figure 4 is a perspective view of a suction cap according to another preferred embodiment of the present invention.

Figure 5 is a side elevation view of the testing head according to a further preferred embodiment of the present invention.

Figures 1 and 2 show a testing head 1 according to one embodiment of the present invention attached to a façade 2 of the building, in this case a window. In particular, the testing head 1 is arranged so as to test a vertical joint 3 between adjacent windows and so measure any water ingress through the joint 3 to determine the compliance of the construction method. Testing head 1 is of light and simple construction so as to make it suitable for easy installation and movement between portions on the façade. As shown in Figure 1, the testing head 1 is applied to a portion of the joint 3 defining a testing zone 4. Water nozzles 5a and air nozzles 5b are oriented so as to project water and air onto the

testing zone 4 at a particular flow rate and pressure. In this embodiment, the water nozzle 5a is oriented so as to provide a conical shaped water jet 9 onto the testing zone 4, being a particularly efficient means of testing. The testing head itself includes a framework of members, including twin manifolds 6a and 6b dedicated to supplying water and air to the nozzles via communication means 7a and 7b. In this embodiment, the communication means 7a and 7b provide water and air to the manifold 6a and 6b and consequently to nozzles 5a and 5b. The testing head is held in place by support means 8, being devices to connect directly to the window 2 and in this embodiment are vacuum seal devices whereby a vacuum is selectively created between the vacuum seal device and the window by reducing the volume of a resilient member in contact with the window. This has the advantage of being quickly engagable and disengagable and further does not adversely impact the appearance of the façade. It is advantageous for a window as the glass surface is particularly suited to a vacuum seal and further the window is less likely to provide a base upon which the test head could be mounted in any other form. For example, the prior art methods almost exclusively rely on scaffolding to be mounted around the test zone 4 and the testing apparatus attached thereto. Consequently, not only is the prior art testing apparatus difficult to set up but the reliance on scaffolding indicates that the testing method involves a considerable amount of work in supporting the test apparatus.

In another preferred embodiment, the water supply means and air supply means may be located at a point distal from the testing zone and so therefore may be ground based. However, the nature of the invention is such that with the testing heads supported from the façade, the water and air supply means may be conveniently placed with the building at a point near to the area under test. As distinct from the method of Singapore Patent No. 9801123-2, there is no large fan to be supported outside the building but instead air and water may be provided through a hose for instance. As a hose can be passed through a window and the water and air supply means may be distal from the testing zone, this preferred embodiment avoids any need for scaffolding to support the test device. There will of course be access for the operator so that the test head may be placed. However, this can be achieved through a mobile gondola, cherry picker, or other

device which is suited to moving an individual and small apparatus from point to point.

A further advantage of the testing head 1 according to the present invention is that as the testing head can be mounted proximate to the testing zone 4, the pressure at the water and air nozzles 5a and 5b need only be relatively small. As the distance between the testing head and zone increases, the inverse square rule suggests the pressure and flow rate will need to be increased substantially so as to maintain intensity at the testing zone. The prior art testing apparatus requiring support techniques such as scaffolding, place the testing apparatus away from the testing zone leading to a proportionate increase in the pressure and flow rate required at the test head and in the capital cost of the testing apparatus.

A significant distinguishing feature of the present invention is the use of a static pressure source supplied through communication means 7b, in this case a hose. Because the air pressure is static, there are not the shock losses associated with a velocity head air pressure supply and so the hose 7b can be of small diameter. The pressure generated by the air supply means is substantially the same as that at the nozzle despite the lighter, more flexible, and more convenient communication means being a hose 7b.

The combination of the convenient support device 8 and the use of a static air pressure not only translate to a smaller more maneuverable testing head but also permit the use of multiple testing heads simultaneously with only an incremental cost to increase the capacity of the air supply and water supply means.

Figure 3 shows one preferred embodiment of the full testing apparatus.

The full apparatus in a most preferred embodiment includes a supply assembly 10 having the air and water supply means combined into a suitably packaged kit. The kit may include an air compressor for the air supply means, and a variable displacement water pump for taking water from a self-contained storage unit, underground storage or directly from the mains. The assembly 10 may include a power generator or for an assembly 10 that is designed to be used within the building, it may have direct connection to the power means. Further,

the assembly may include a regulator for the water or air supply means so as to ensure a constant pressure to the test head.

A feature of this particular embodiment is the addition of the distribution manifold 11, being fed by hoses 7a and 7b. A distinct advantage of the present invention is its applicability to operating multiple testing heads at a number of different testing zones. As shown in Figure 3, connected to the distribution manifold 11 are three testing heads 1a, 1b and 1c located at three distinct testing zones 4a, 4b and 4c. In this embodiment, the apparatus is configured so as to conduct the required test at the three separate zones and so complete the entire testing regime three times faster than a single head arrangement. It will be appreciated that whilst three distinct testing heads 1a, 1b and 1c are being serviced by this arrangement, any reasonable number of testing heads can be accommodated subject to the capacity of the air supply means and water supply means.

Figure 4 shows an example of one part of the support means. Consistent with the maneuverability and applicability of the present invention this embodiment of the support means shows a suction cap 8 consisting of a flexible rubber boot having a façade contactable surface 13. The suction cap 8 is placed against the façade and lever 14 is engaged so as to reduce the volume encapsulated by the boot 12. The resulting vacuum created holds the suction cap 8 and associated testing head to the façade. The suction cap 8 further has an engagement portion 15 to connect to a series of brackets to hold the manifolds of the testing head. The use of the suction cap 8 is particularly useful in that it is applicable to a wide range of façade surfaces and has sufficient capacity to comfortably support the testing head whilst in operation. Further, the quick release mechanism through lever 14 permits a very rapid engagement and disengagement from the façade. When compared to previous methods whereby significant brackets and scaffolding is required, the use of the suction cap significantly reduces the time taken to dismantle a testing head and reassemble it at the next testing zone.

Figure 5 shows a close up view of the testing head and, in particular, the interaction of the nozzles 5a and 5b with each other and the façade 2. In a preferred embodiment of the present invention, in addition to the advantages of

maneuverability and ease of use provided by the present invention, there is further provided means to assist in the fine adjustment of the nozzles so as to accurately test a test portion 4. As with previous methods, a significant amount of water and air flow was required in order to adequately test a particular joint. The testing head 1 of the present invention provides means to very accurately and precisely test a joint by bringing the water and air flow much closer to the zone to be tested. The addition of a direction means to the testing head further enhances this accuracy and consequently provides for a more accurate test. In the embodiment shown in Figure 5, the manifolds 6a and 6b are held in place by U-brackets 16a and 16b which are mounted to lateral bracket 17. The engagement between the manifolds 6a and 6b and the U-brackets 16a and 16b is such to allow rotation 18a and 18b in order to direct the respective water and air jets 9a and 9b. Consequently, by identifying test zone 4 which may be a joint for a window on the façade 2, the testing head 1 may be placed using suction caps 8 so that the testing zone 4 is located directly below one or both of the nozzles 5a and 5b. In order to accurately project the water and air jets 9a and 9b to the testing zone 4, one or other of the manifolds 6a and 6b may be rotated 18a and 18b so as to very accurately place the jets.

With the various embodiments described, it is clear that the invention is applicable to a wide range of test specifications requiring the use of water and air. A further means to enhance this applicability is the ability to adjust 19 the relative positions of the nozzles 5a and 5b and the façade 2. In this embodiment lateral bracket 17 is mounted to an orthogonal bracket 20 which in turn is mounted to the suction cap 8. The mounting point 21 connecting the lateral bracket 17 to the orthogonal bracket 20 provides for a sliding engagement or a plurality of discrete bolt holes so as to manually fix at the desired distance. Consequently, it is possible for the operator to adjust this distance to meet a test specification subject to the availability of water and air pressure and flow.

Having discussed the features, both essential and preferable, of the present invention and the relative and absolute advantages offered by the system, an example is now offered of the use of said apparatus for the testing of a façade. It should be noted that the following scenario is but one example to assist the skilled addressee in appreciating the applicability of the invention. The

invention is applicable to a wide range of applications and should not be limited to any of the arrangements of the parameters stated in the example.

The Building Construction Authority of Singapore provides for a field water tightness test for external walls (including windows and curtain wall joints). When subjected to the test environment, the external wall must not show any sign of leakage. The Building Construction Authority of Singapore's water tightness test parameters are as follows:

|                                          |                                                             |
|------------------------------------------|-------------------------------------------------------------|
| Water intensity:                         | 300 mm per hour<br>1 litre per minute per metre<br>of joint |
| Wind pressure:                           | 240 P                                                       |
| Nozzle inclination:                      | 90° to wall                                                 |
| Distance of nozzle from wall:            | 200 mm                                                      |
| One sample equals to 2 m length of joint |                                                             |
| Spray duration:                          | 10 minutes                                                  |

In using the apparatus of the present invention to conduct the above test, the following test methodology is adopted.

a) For any building façade for which the water tightness test is to be conducted, the contractor will be informed in advance so that the necessary scaffolds will be erected or gondola installed for placement of the test head.

b) The machine (pump/compressor assembly) will be downloaded on the ground near the façade to be tested and the power supply from the mains will be connected.

c) The suction end of the pump is connected to water mains or underground reservoir by hose. The delivery valve of the compressor is closed and the compressor supply power is switched on. The delivery hoses are connected to the pump and compressor and the other end to the test heads. The tester will carry the test heads and climb the scaffold or lifted by the gondola to the test zone of the façade. The tester will fix the heads on the joints to be tested by aligning the manifolds to the joint tested and clamping the suction cups. Once the desired air pressure is reached (cut-off pressure) the delivery valves of pump/compressor are opened to the required pressure.

d) Water and air jets will strike the joint to be tested. The tester will make sure the jet strikes at the joint by rotating the manifolds. The current testing specifications for Singapore are the air strike pressure of 240 Pa on the window joint and water strike volume of 1 lit/min/metre joint length. However, if variations are required for testing in different geographical locations the deliveries can be adjusted as per the required specifications by adjusting the cut off pressure of the compressor and delivery pressure of the pump and further regulating from the manifolds.

e) The test duration for each joint is 10 minutes and if the leak is observed within 10 min, the test is considered failed and the heads shifted to the next test location. To shift the head, the tester will first disconnect the hoses from the manifolds which will automatically stop the flow in the hose by the quick relief connector. (The pump is provided with the relief valve to relieve the pressure surge at the pump due to sudden closure of the delivery. However this is not a problem for the compressor).

f) The suction clamps are relieved from the test window pane and re-clamped at the new location and the hoses connected and the test repeated.

g) In case if the scaffold or gondola is not provided, the tester can carry the heads and the hoses to the interior of the building. The test window can be opened and the head clamped to the outer face. The hoses connected to the manifolds and the other ends dropped and connected to the pump/compressor located at the ground and test can be carried out.

h) In this case, repeating the test is difficult since the hoses have to be disconnected at both ends and rolled up by the tester and carried through the interior of the building to the next location and repeat as in g).

**THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:**

1. A testing head for testing the resistance to water ingress of a façade, including a plurality of water nozzles each for projecting a water jet, a plurality of air nozzles each for projecting an air jet, a head frame for supporting the water and air nozzles in a predetermined spaced relation to each other, support means for positioning the nozzles at a distance from a testing zone on the façade wherein the water nozzles are in communication with a water supply means and the air nozzles are in communication with an air supply means, said air supply means supplying air to the air nozzles at a predetermined static pressure.
2. The testing head according to claim 1, wherein the head frame includes a rigid tubular water manifold having the water nozzles affixed thereto such that water passes through the manifold to the nozzles.
3. The testing head according to claim 1 or 2, wherein the head frame includes a rigid tubular air manifold having the air nozzles affixed thereto such that air passes through the manifold to the air nozzles.
4. The testing head according to any one of the preceding claims, wherein the air supply means includes an air compressor and an air hose intermediate the air compressor and the testing head.
5. The testing head according to any one of the preceding claims, wherein the water supply means includes any one or a combination of a water pump, water mains, and a building dedicated water reservoir, and a hose connecting the one or combination and the testing head.
6. The testing head according to any one of the preceding claims, wherein the support means includes at least one support device selectively connectable to the façade.

7. The testing head according to claim 6, wherein the support device includes at least one vacuum sealing device engagable with the façade.
8. The testing head according to claim 6 or 7, wherein the support means further includes an orthogonal bracket projecting away from the façade at right angles and a lateral bracket mounted intermediate the orthogonal bracket and head frame.
9. The testing head according to claim 8 wherein the support means further includes a sliding engagement between the orthogonal bracket and lateral bracket for adjusting the distance between the nozzles and the façade.
10. The testing head according to claim 8 wherein the support means further includes a plurality of discrete mounting points so as to position the nozzles at any one of a plurality of discrete distances from the façade.
11. The testing head according to any one of claims 8 to 10 wherein the air and water manifolds are in rotational engagement with the lateral bracket.
12. The testing head according to claim 11 wherein said water manifold is rotatable about a longitudinal axis so as to vary an angle of the water jet.
13. The testing head according to claim 11 or 12 wherein said air manifold is rotatable about longitudinal axis so as to vary an angle of the air jet.
14. The testing head according to any one of the preceding claims, wherein the water nozzles are adapted to project the water jet in a conical shape.
15. The testing head according to any one of claims 1 to 13, wherein the water nozzles are adapted to project the water jet in a substantially planar shape.

16. The testing head according to any one of the preceding claims, wherein the predetermined spaced relation is a function of the flow and pressure of the water and air at the respective nozzles, the distance of the testing head from the testing zone, the number of water nozzles, and the number of air nozzles.

17. The testing head according to any one of the preceding claims, wherein the air supply means and the water supply means are adapted to simultaneously supply water and air to a plurality of testing heads.

18. The testing head according to any one of the preceding claims, wherein the façade includes precast fascia panels, windows, aluminium cladding, cast in-situ concrete walls and associated joints for said panels, windows, walls and cladding

19. The testing head according to any one of the preceding claims, wherein the distance from the nozzles to the testing zone is in the range 50mm to 300mm.

20. The testing head according to claim 19, wherein the distance between the nozzles and the testing zone is 200mm. 21. The testing head according to any one of the preceding claims, wherein the static air pressure is in the range 3 bar to 10 bar.

22. The testing head according to claim 21, wherein the static air pressure is in the range of 5 bar to 7 bar.

23. The testing head according to any one of the preceding claims, said testing head including six air nozzles and six water nozzles.

24. The testing head according to any one of the preceding claims, wherein the flow rate for the water jet is in the range 1 to 10 litres per square metre minutes.

25. The testing head according to claim 24, wherein the flow rate of the water jet is in the range 3.5 to 10 litres per square metre minutes.

26. The testing head according to any one of claims 1 to 23, wherein the flow rate of the water jet applied to a longitudinal joint within the façade is in the range 0.5 to 3.0 litres per minute per metre of longitudinal joint.

27. The testing head according to claim 26, wherein the flow rate of the water jet applied to the longitudinal joint is 1.0 litre per minute per metre of longitudinal joint.

28. The testing head according to any one of the preceding claims, wherein the testing head when disconnected from the air supply means and the water supply means is less than 10kg in weight.

29. A method for testing resistance to water ingress of a façade including the steps of :

supporting a testing head at a distance from a testing zone on the façade, supplying air to a plurality of air nozzles on the testing head at a predetermined static pressure,

supplying water to a plurality of water nozzles on the testing head, simultaneously projecting water jets from the plurality of water nozzles, and projecting air jets from the plurality of air nozzles, said air jets and water jets coinciding at the testing zone.

30. The method according to claim 29 further including adjusting the testing head to façade distance or an angle of the water or air jets, directly following the supporting step.

31. The method according to claim 29 or 30 wherein the supporting step includes applying a suction cup to which the testing head is mounted to the façade adjacent the testing zone.

32. The method according to any one of claims 29 to 31 wherein the adjusting step includes the step of rotating an air and/or water manifold to which the nozzles are fixed so as to cause an interaction between the water jet and air jet.