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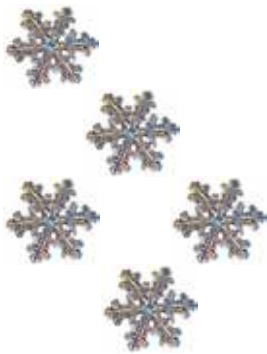
**IP65 and Pressure Drop Tests on a
Spraydown Solutions in Conjunction
with Engineered Air Treatment
Louvre with a G4 Panel Filter**

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Confidential Technical Report for Spraydown Solutions Ltd



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IP65 and Pressure Drop Tests on a Spraydown Louvre with a G4 Panel Filter

1.0 Introduction

Cambridge Refrigeration Technology is an independent research and test organisation. CRT provides expertise for industry within the area of environmental testing, refrigerated systems, insulated structures, refrigerated transport and perishable cargo storage.

CRT was commissioned to carry out IP65 and pressure drop tests on a Spraydown louvre with a G4 panel filter, on the 24th August 2020 the louvre arrived at CRT for testing.

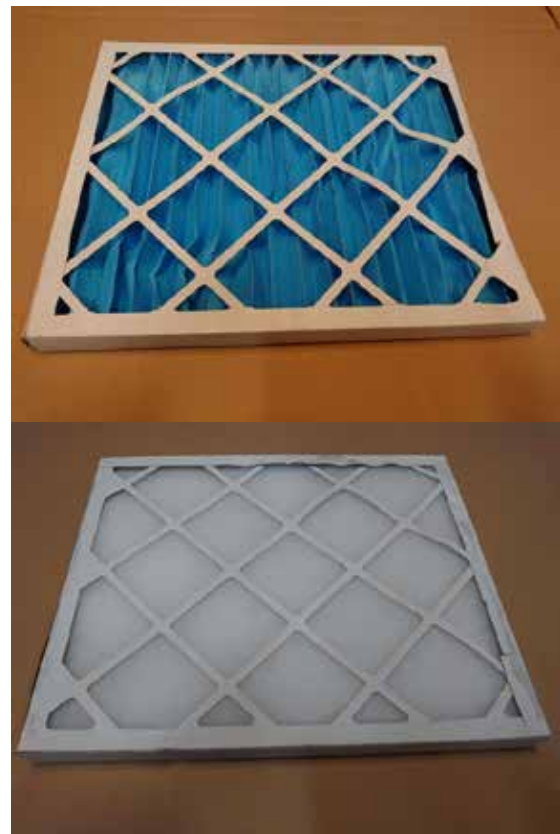
2.0 Enclosure Specification

The details of the louvre and filter can be found in table 1 and figure 1 shows the louvre prior to testing.



Table 1: Specification

Model / Type	SD ₂ PVC Profile
Dimensions (mm)	525 x 620 x 230
Material	PVC
Filter Types	Synthetic & Pleated G4 Panel

Figure 1: SD₂ PVC Profile & Filters



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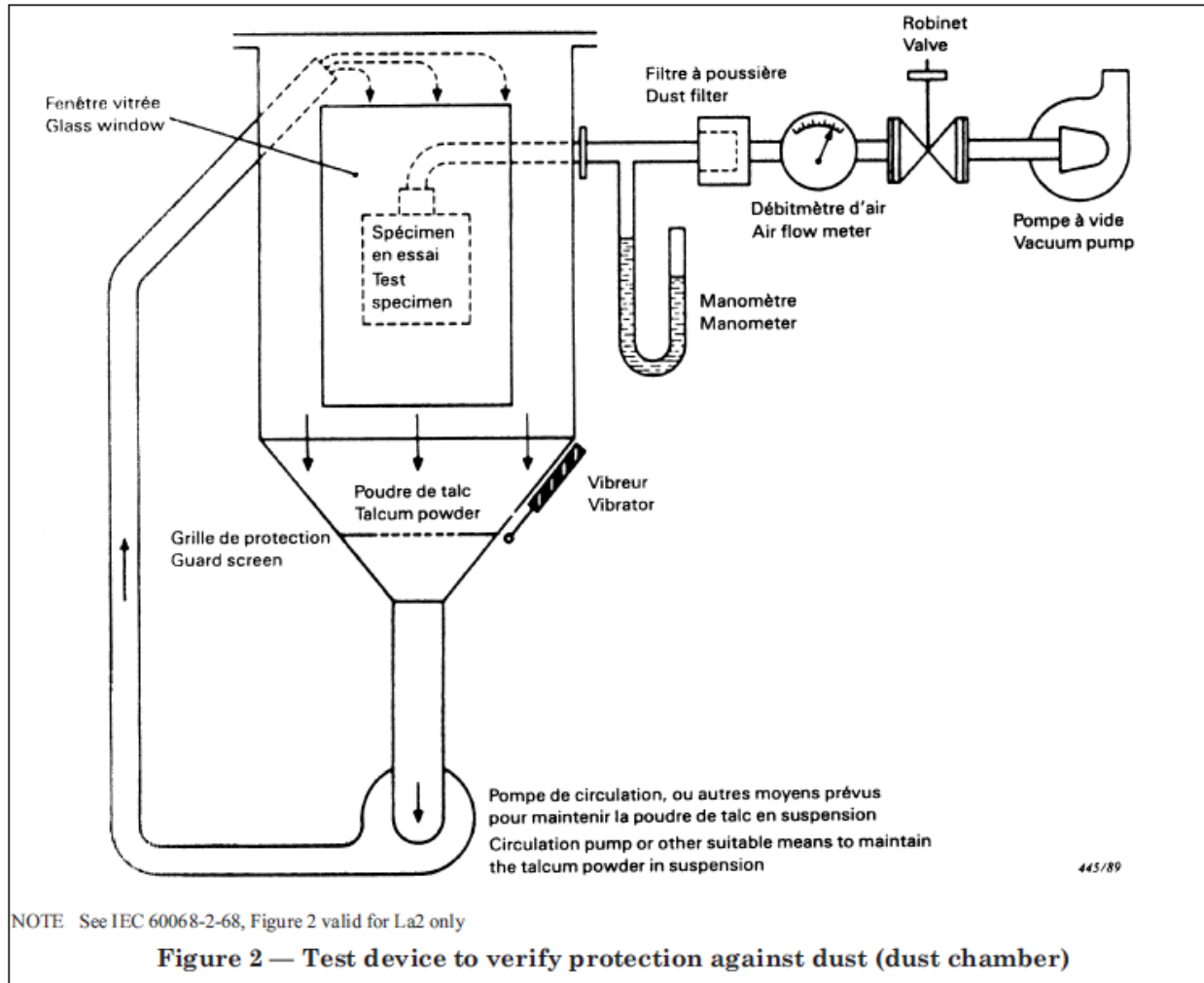
3.0 Methodology

The following sections contain the test methodology for the dust and water tests.

3.1 IP6X Dust Test

The chamber used for the dust test is constructed according to the British Standard BS EN 60529:1992+A2-2013. A schematic diagram of this chamber is reproduced in the figure below.

Figure 2: IP Dust Rig Schematic



Circulation and suspension of the 50-micron powder (magnesium silicate) was achieved by the use of two methods: a centrifugal fan piped to the hopper and taking the dust to the top of the construction, and an eccentric vibrator on one of the bottom sides of the construction to prevent settling.

This was a category 2 dust test, as the enclosure does not operate under vacuum. The duration of the test was 8 hours.

The acceptance conditions for IP6X specify that no ingress of dust is permitted to enter the enclosure.

3.2 IPX5 Test Methodology

Category 5 involves spraying the surface of the enclosure for 1 minute per m² of the surface area with a minimum time of 3 minutes.

The flow rate was 12.5 litres per minute \pm 5% through a 6.3mm diameter nozzle from a distance of 2.5 to 3 metres as specified by EN 60529:1992+A2-2013, section 14.2.5. The water was continually sprayed from all directions.

A schematic of the nozzle is given below together with a photo of the nozzle used.

Figure 3: IPX5 Nozzle Schematic

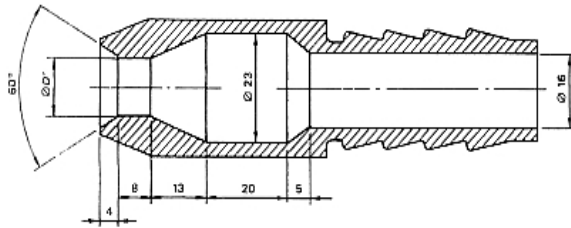


Figure 4: IPX5 Nozzle



Acceptance criteria specify that if any water has entered the enclosure, it must not:

- 1) Interfere with the correct operation of the unit or impair safety.
- 2) Deposit on insulation parts where it could lead to tracking along creepage distances.
- 3) Reach live parts or windings not designed to operate when wet.
- 4) Accumulate near any electrical cables.
- 5) Accumulate and must drain away without causing any potential harm to the equipment or impair safety.
- 6) For enclosures without fitted drain holes, the relevant product standard shall specify the acceptance conditions if water can accumulate to reach live parts.

3.2 Pressure Drop Test Methodology

The louvre was fitted into a plenum box and connected to CRT's airflow test rig, the largest rig was used for this test to provide the maximum obtainable airflow. The pipe diameter was 15" with an orifice plate of 11.25".

Using this method air was drawn into the rig by a fan downstream of the orifice plate. Pressure was measured across the orifice plate using inverted manometers and converted to a volumetric airflow using a standard equation. A second manometer measured the pressure drop across the louvre.

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4.0 Results

The test results are given below.

4.1 IP6X Dust Test

After removing the louvre from the dust chamber and brushing down, the unit was opened to ascertain whether there had been any ingress of dust. The figures below show that no dust ingress occurred.

Figure 5: Dust Ingress



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4.2 IPX5 Water Test

After wiping down the excess water from the louvre enclosure the cardboard back plate was opened to evaluate whether there had been any ingress of water. Examination showed that a small quantity of water had occurred, upon closer inspection this was due to the silicon seal not being correctly applied.

Figure 6: Water Test



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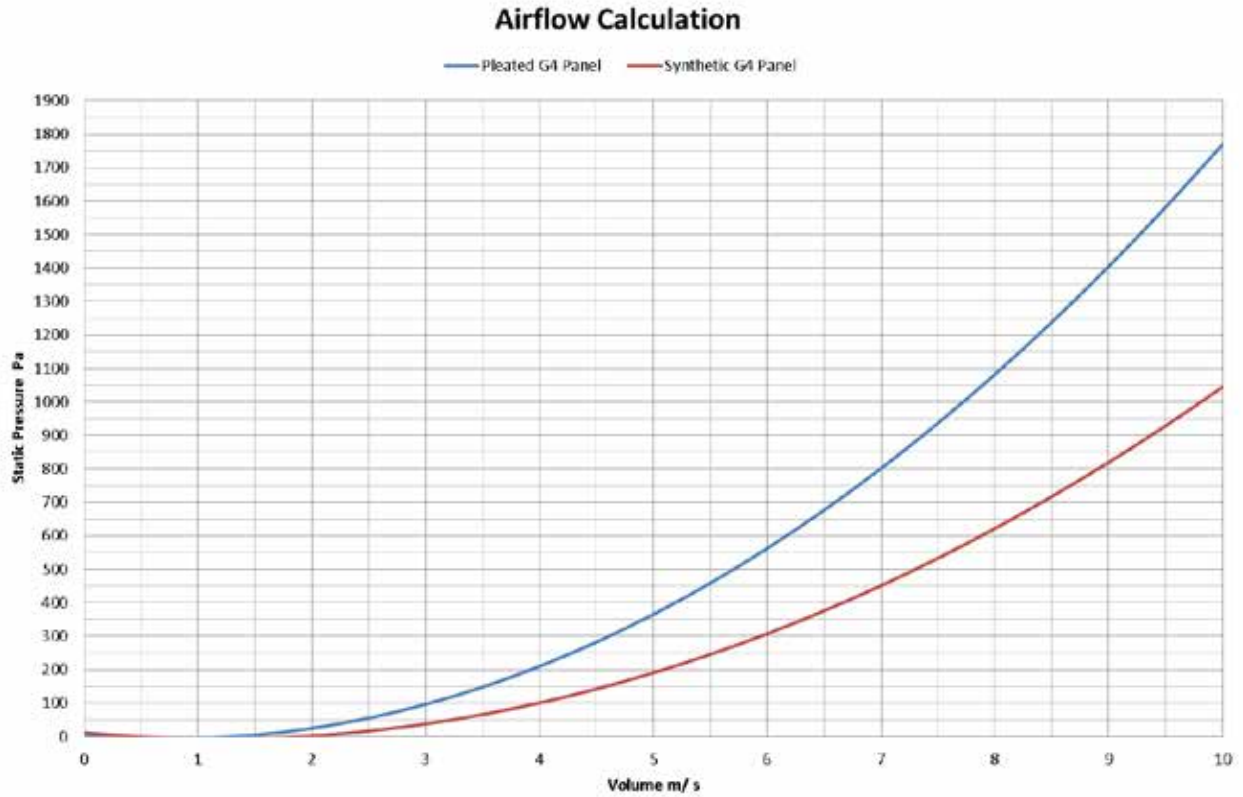
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4.3 Pressure Drop Test

After both the dust and water tests, the louvre was subjected to a pressure drop test which was requested by Spraydown.

The graph below has been extrapolated based on existing trends from CRT test data.

Figure 7: Pressure Drop Test



5.0 Conclusions

The SD₂ PVC profile with a G4 panel filter presented to CRT by Spraydown Solutions Ltd met the requirements laid out in BS EN 60529:1992+A2-2013 for IP65 classification.

The pressure drop test yielded the results given above.

Tobias Mynott BSc (Hons) M.Inst.R

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