CRESTHAVEN LIMITED

SPIRARE
BREATHING NEW LIFE

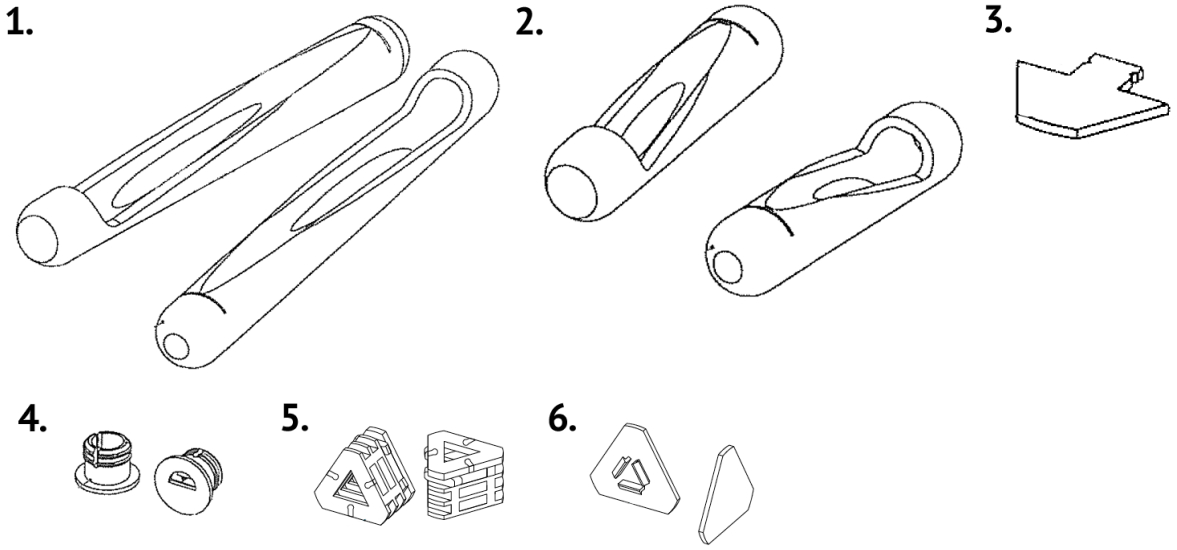
ZRT³ NOZZLE NUBS™

TECHNICAL SPECIFICATION

CRESTHAVEN LIMITED

MOISTURE MANAGEMENT SYSTEM

ZRT³ NOZZLE NUBS & COMPONENTS



1. 150mm ZRT ³ Nozzle Nub
2. 75mm ZRT ³ Nozzle Nub
3. Securing clip
4. Internal wall cap
5. External wall cap
6. Texture cap

DAMPNESS

There are various types of damp problems. These range from Rising damp, Penetrating damp, Lateral Penetrating damp, and Localised damp.

WHAT IS RISING DAMP?

Rising damp is a phenomenon that can occur in buildings. This is caused by water that is in the earth and travels up from the base of the walls by capillary attraction. The water can travel up walls by capillary attraction to a height on average of 1.5 metres and sometimes up as far as 2 metres, depending on the size of the pores in the structure of the walls and also evaporation of moisture due to heat from the sun. The water will travel up brick or stone walls and through the mortar. The moisture that travels up the structure needs to be controlled so Damp Proof Courses have been built into the walls in order to form a water tight barrier to stop the water going beyond this barrier. If there is a defective DPC, than rising moisture will penetrate into the living quarters or the building leading to a variety of building defects caused by dampness. If there is no DPC then the water will travel up the wall freely causing the same Problems. These problems can also occur when the DPC is bridged by internal plaster or external render, it can also occur by high ground levels.

IDENTIFYING RISING DAMP

There are various signs to identify rising damp. There are usually signs of damaged wallpaper or paintwork which will be damp and showing discoloured tidemarks. There may also be damp and damaged blistered plaster with signs of salt.

Mould growth may be present and rotting floor boards, joists and wall plates, skirting boards, door facing or any other timbers within the vicinity of the dampness. There may also be wet rot or dry rot present.

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PENETRATING DAMP

Penetrating damp is when water saturates through walls horizontally from the outside. The main cause can be building defects such as damaged or ineffective roof tiles, slates, felt coverings, cracked brickwork, stone, render, broken gutters and downpipes, ineffective doors, door frames and windows.

LATERAL PENETRATING DAMP

Lateral penetrating damp occurs when the external ground is higher than the internal floor level.

LOCALISED DAMP

Localised dampness shows random damp patches at high and low level that does not dry out and can occur one metre above ground level, or even higher in severe cases.

The signs of penetrating damp are the same as for Rising damp but can also include signs of localised damp.

TREATMENT OF DAMP PROBLEMS

For any damp problems to be rectified, a survey must be carried out by a competent and experienced person to establish the extent and cause of the problem. They will give advice on the best solution to eliminate the dampness using the most cost effective solution so that the building can dry out after the defects has been rectified. The building can then be made good by a competent tradesperson.

Rising damp, Penetrating damp, Lateral and Localised damp can impact on the environment and in the building but the Spirare ZRT^3 NozzleNubs is the best and most cost effective solution to overcome and eliminate all sources of damp. Simply insert Spirare ZRT ^{3} NozzleNubs System into the walls and let the walls dry out, and re-plaster if necessary. Unaffected plaster will be left to dry out.

WHAT IS CONDENSATION?

Condensation is the process of change of physical matter from gas into liquid. Many peoples' conception of condensation is that it is water, but it is not, it is this process of change. The air that we breathe has moisture in it and when the air cools, it cannot hold all the moisture so tiny drops of water are released and this is what we see and, mistakenly, call it, condensation.

Condensation can sometimes be found in places where there is little or no air circulation, such as, on the surface glass in windows, window sills, corners, in or behind wardrobes and cupboards.

DEW POINT

Dew point is the when moisture in the air condensates and turns into water, it is the point of change from gas into liquid. It occurs when the temperature in one room is different from the temperature in another room, or outside temperature. When the temperature in the warm room meets a cold surface, the vapour in the air is released from the air and forms water droplets.

The dew point is related to relative humidity. A high relative humidity shows that the dew point is closer to the current air temperature. Relative humidity of 1OO% indicates that the dew point is the same as the current temperature and the air saturated with water. When the temperature increases and the dew point stays constant, the relative humidity will be reduced.

When the dew point temperature falls below freezing it is often called the frost point, because the water vapour no longer creates dew but instead creates frost.

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IS IT CONDENSATION?

Condensation forms on glass in windows. It is the main surface for condensation to be identified. It can also form on walls or other cold surfaces so it is important to be able to make the correct diagnosis as to the cause of the damp.

Damp can also cause building defects such as, damaged or ineffective roof tiles, slates, felt coverings, cracked brickwork, stone, render, broken gutters and downpipes, ineffective doors, door frames and windows and rising damp, so make sure these sources are explored and eliminated before defining that condensation is the cause of the damp. These other causes of damp can leave watermarks on surfaces and on decoration such as wallpaper. These causes must be rectified to eliminate these sources of damp.

New homes or buildings that have been re-plastered could show signs of damp, but this is due to water that was used during construction that could still be drying out, and could still take some time to dry out. Heating the rooms would help speed up the drying time or a dehumidifier can be used to collect the moisture.

HOW TO REDUCE CONDENSATION

To help reduced condensation you need to produce less moisture. To do this, choose a heating system that does not produce excess moisture, one gallon of gas or paraffin produces about a gallon of water.

- Make sure rooms are adequately ventilated without creating draughts; this will help to remove moisture from the air.
- You need much more ventilation in the kitchen when cooking, washing up and in bathrooms when bathing.
- Use extractor fans in kitchens and bathrooms to remove the steam and use lids on pans when cooking and don't over boil kettles.
- When washing clothes, dry them outside if possible, or use a tumble dryer if you have one that is self condensing or is ventilated to the outside.
- Do not encourage cold spots on walls but allow air to circulate around and behind furniture and position wardrobes and furniture against internal walls if possible.

MOULD

Moulds are fungus and release millions of tiny spores into the air. They need moisture to grow and can be found in cold damp surfaces in poorly ventilated areas in buildings. Moulds come in various colours such as black, green or grey. They include all species of microscopic fungi that grow in the form of multi-cellular filaments called hyphae. A connected network of these tubular branching hyphae has multiple, genetically identical nuclei and is considered a single organism, referred to as a colony or a mycelium.

Mould feeds on dead organic matter and they are visible when colonies grow and secrete hydrolytic enzymes. These enzymes break down biopolymers such as starch, cellulose and lignin that are absorbed by the hyphae. Moulds also secrete mycotoxins which together with hydrolytic enzymes, inhibit the growth of competing micro-organisms.

Many mould types vary enormously in their tolerance to temperature and humidity extremes and can remain in the air indefinitely. Some moulds can grow at temperatures as low as 2°C. When conditions do not enable growth, moulds can remain in dormant state and within a large range of temperature before they die. Temperatures and humidity in buildings are often stable enough to foster the growth of mould colonies.

The repeated exposure to large amount of particular Fungal propagules is an important risk factor for the development of specific allergic reactions. There are also a large number of toxic mould metabolites which can have a range of biological activities. Black Mould (Stachybotrys chartarum), in particular has been implicated in illnesses associated with living in damp houses. Reactions may be severe as in recent reports of idiopathic pulmonary haemorrhage in very young children.

HEALTH EFFECTS

Mould spores are a common component of household and workplace dust. However, when mould spores are present in large quantities, they can present a health hazard to humans, potentially causing allergic reactions and respiratory problems. Moulds that produce myctoxins can create serious health risks to humans and animals. Exposure to high levels of mycotoxins can lead to neurological problems and in some cases death. Prolonged exposure, e.g. daily workplace exposure, can be particularly harmful. The term toxic mould refers to mould that produce mytoxins.

Damp conditions in cold buildings can encourage the growth of moulds and mites. These mites feed on moulds and can increase the risk of respiratory illnesses in some people. It is necessary to reduced moisture levels in buildings to inhibit their growth. Removal of affected materials after the source of moisture has been removed is vital for remediation.

What are the health effects of mould?

Most common types of moulds are generally not harmful to healthy individuals. However, exposure to moulds can cause reactions depending on overall health, age and the amount of time an exposed person spends in the home.

The elderly, pregnant women, infants and young children, people with allergies, chronic respiratory illness and/or chemical sensi tivities and those with weakened immune systems are most likely to experience health effects from mould,

The most common health problems associated with exposure to mould are:

1. Eye, nose and throat irritation
2. Runny nose, sinus congestion, frequent cold symptoms
3. Increased asthma attacks
4. Allergic reactions

Anyone experiencing any of these symptoms should consult a physician.

ASTHMA

Asthma affects more than ½ million people in Ireland. It can occur at any age, but is most likely to develop in children by the age of 5 and in adults during their 30's. People over 65 are also prone to developing the disease. It is an allergic condition that can be inherited by children from their parents. Approximately 1 in 3 children who suffer from asthma will have no symptoms by the time they reach adulthood. Symptoms of asthma in a person can increase or decrease in severity through life. This type of asthma is often related to eczema and hay fever, with 50% of adults and 80% of children who have other allergies commonly developing asthma.

Asthma affects the airways and disrupts the transport of air in and out of the lungs. Asthma sufferers have sensitive airways which become inflamed and narrowed under certain conditions. The inflammation is caused by the body's immune system, in order to counteract the irritant. When inflammation occurs it becomes difficult for oxygen to reach the lungs. Consequently asthmatics may experience difficulty with breathing.

Numerous factors can be responsible for triggering an asthma attack. Asthmatics are usually allergic to more than one trigger and their asthma symptoms may vary from wheeziness, to shortness of breath, chest tightening or the over production of mucus.

Both indoor and outdoor pollution, natural and man-made, can trigger asthma attacks. Common indoor pollutants triggers include the dust mite, mould and cigarette smoke. As much as 85% of children that experience asthmatic symptoms are allergic to dust mites. Cigarette smoke is damaging to everyone's airways, but can be particularly bad for people with asthma. Smoke causes the airways to narrow, making it more difficult to breathe.

Outdoors, natural plant, grass and tree pollen can act as triggers in some asthmatics. Man-made pollution may also be detrimental to asthmatics. Although it has not been proven that the link exists between air pollution and asthma, certain pollutants, including sulphur-dioxide, nitrogen dioxide and ozone are known to restrict the airways and make it more difficult for asthma sufferers to breathe. Fine particle matter is also suspected to be a lung irritant.

Although there is no cure for asthma at present, inhalers can be used to reduce the severity of the symptoms. Preventer inhalers may be used to build up a long-term resistance to asthma triggers, whilst relievers are used as an instantaneous means of relieving asthmatic symptoms, by relaxing the muscles controlling the airways.

INDOOR AIR POLLUTION

We spend a large part of our lives at home. Keeping the air that we breathe at home clean is therefore of necessary importance, particularly for certain vulnerable members, including babies, pregnant women, unborn babies, the elderly, and those suffering from respiratory or allergic diseases, such as asthma.

In most houses the level of indoor air pollution is very low, because there are controls on the design and construction of buildings.

However, if ventilation of rooms is poor, or household appliances are faulty, pollution can build up to levels which may be detrimental to human health.

There are many possible sources of air pollutants in the home and indoor air quality can vary widely. Building work may lead to a temporary increase in indoor pollutants such as volatile organic compounds (VOCs), during painting or stripping enclosed spaces or laying loft insulation. Another significant source of indoor pollution is the burning of fuels in flueless appliances, such as paraffin stoves, portable gas heaters, gas stoves and ovens. If the appliance is faulty, incomplete combustion may result in the release of carbon monoxide, a highly poisonous gas. Carbon monoxide also builds up when people smoke cigarettes indoors. Dirty homes in disrepair may be a source of dust mite and mould spores. In some parts of Ireland, and in other parts of the world, the radioactive gas radon can seep into the house from the underlying geology, and indoors if ventilation is poor.

A Public Health Legislation exists to help prevent air quality problems arising indoors in the first place. In the majority of homes there is no need for concern over existing levels of pollutants.

Mould spores are a course of indoor air pollution. Airborne mould spores can produce allergic reactions in sensitive people similar to hay fever. People who experience allergic reactions to mould spores are also more likely to suffer from asthma. Moulds spores can be reduced by improving ventilation in the home, and by limiting sources of moisture and condensation.

TACKLING MOULD

In order to tackle mould it is necessary to wipe down walls and window frames with a fungicidal wash taking care to follow the instructions provided by the manufacturer. After doing this, it is necessary to redecorate, if so you must use a good quality fungicidal paint, and when wall papering, use paste with a fungicide to help prevent any mould re-establishing.

Clean carpets with shampoo and wet clothes that have mildewed dry-cleaned. This will help kill and remove any mould. Take care when brushing or vacuuming because this can disturb mould increasing the risk of respiratory problems.

The most effective way to avoid mould is to eliminate dampness.

EVALUATE

It is essential that the surveyor correctly identifies the types and source of any dampness. This is best achieved by a process of investigation and elimination. Once the dampness has been identified, it is essential that the risk of decay to any timbers is assessed and appropriate remedial measures undertaken. The combination of dampness and wood can lead to rot.

Where there is more than one source of water ingress then it may be difficult to distinguish between their origins. Generally, the presence of active rising dampness is indicated by excessive moisture at the base of the wall which slowly declines on going up the wall. This moisture gradient is usually observed up to heights of 1.5 metres but, depending on conditions and the structure of the masonry; it may rise to greater heights. Sometimes, a "tidemark" can be observed running almost horizontally along the wall and the area below it was obviously damp.

THE SOLUTION

ZRT^3 NOZZLE NUB SYSTEM

The ZRT ^{3} (Zoom Rate Thermal Transfer Technology) NozzleNub is a device that cures the problem of water penetration in buildings. This device is a new innovation that has been designed to tackle Damp problems in buildings. It is small ceramic insert used for removing unwanted moisture from existing and new buildings. The ZRT3 attracts water in the walls to it, and then expels the water out of the building and into the atmosphere as moisture. Normally about 250/300 ADNN for most existing and new buildings.

The ZRT ^{3} NozzleNubs are placed into holes drilled into brick, block, stone or mortar, at 200mm or 225mm centres on brickwork in a horizontal line around the external walls of buildings. It is also inserted internally behind existing skirting boards on the external walls. They have a special formulation, which has a natural tendency to instantaneously re-hydrate when placed near water.

The ZRT ^{3} NozzleNubs attracts and dissipates unwanted moisture vapour moving through the walls because the material experiences an electrical and chemical metamorphous due to the DNA of the material. This happens due to the design and shape to the ZRT ^{3}, allowing the moisture to take the route with the least resistance back into the atmosphere. It functions like a one-way non-return valve.

What are the Innovations?

Although, the ZRT ^{3} NozzleNubs are not a damp proofing course, they stop moisture rising into parts of walls that cause decay and damp problems. They reduce re-hydration syndrome caused in brickwork reducing render repairs. It also reduces the moisture in walls because natural ventilation takes place due to the function of the ZRT ^{3} NozzleNubs giving a reduction in CO^2 levels, dry walls use less energy to heat buildings. They are also safer for both the installer and the occupants, because no harmful chemicals emit from the walls causing chemical syndrome.

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CASE STUDY

TEST PROPERTY:

Greyabbey, Northern Ireland

The Spirare ZRT ^{3} was developed as a result of the managing director's desire to provide a more environmentally friendly, cost effective, easier to handle, faster, safer and more measurable alternative to traditional chemical fluid injections.

IMPLEMENTATION

The Spirare ZRT ^{3} was first tested in a laboratory setting in 2002 at the University of Paisley. Two sections of wall were constructed in trays filled with sand and flooded with water to simulate saturated ground. Then in one of the walls, in the third course of brickwork from the bottom, a hole was drilled in the centre of each of the bricks. Spirare ZRT ^{3}'s were then inserted into the holes. It was found that moisture readings in a wall without ceramic inserts remained the same as before, with readings ranging from 95% to 100% at the bottom of the wall, gradually reducing to around 25% near the top of the wall. However, in the wall with ceramic inserts, moisture levels fell immediately to levels of around 25% above the course of bricks containing the inserts, indicating a sharp cut off at this level. Furthermore, it was calculated that moisture readings of 95% to 100% indicated actual moisture content of 12% to 15% by weight and meter readings of 25% corresponded to a moisture content of less than 1% by weight, Thus, in a small scale laboratory testing, the Spirare ZRT ^{3} reduced the moisture levels in a treated wall section to acceptable values. A full-scale trial on buildings with a history of rising dampness was recommended.

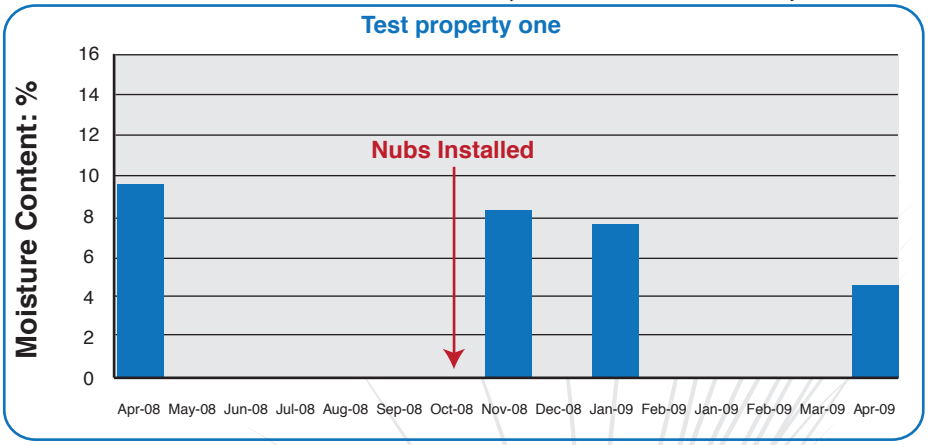
Subsequent to this research, and as a pre-requisite for endorsement by the British Board of Agreement, Spirare ZRT ^{3} 's were installed into houses with a history of rising damp in Greyabbey, Northern Ireland and Prestonpans, East Lothian in 2008.

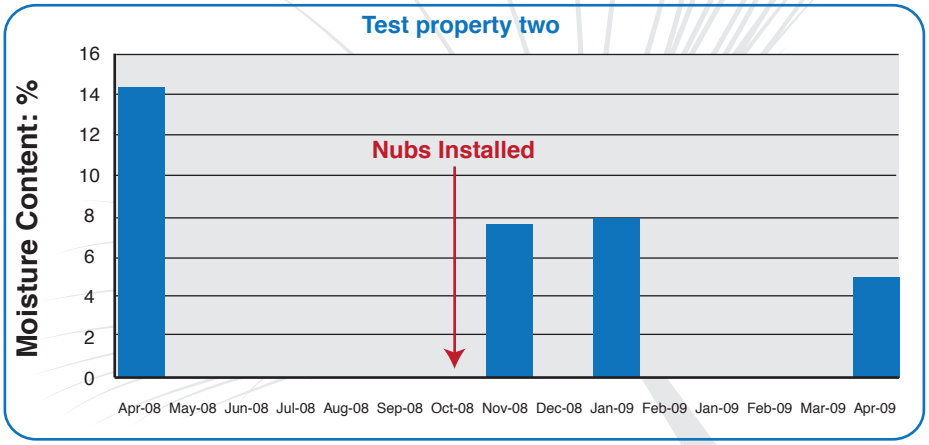
In Greyabbey, samples of the exterior brickwork were taken from the exterior walls of two houses before and at regular intervals after the installation of the ZRT ^{3} s. On each visit by Glasgow Caledonian University's Centre for Research on Indoor Climate and Health, samples were obtained by drilling a series of holes vertically upwards from the level of the ZRT ^{3}'s. the technique used followed that recommended in BRE Digest 245 'Rising damp in walls; Diagnosis and treatment'. Individual drillings were collected determined by weighing and drying.

As can be seen in the graphs below which were created with data from the test properties, the moisture content of the walls has fallen from just over 14% to 5% after the Spirare ZRT ^{3}'s have been installed. Without installation of the inserts, it would have required an average heat input equivalent to two 100W bulbs to evaporate the misture. The reduction in heat transmissions through the walls was 0.6%, but as half the heat loss from a house is through fabric, and the other through ventilation, the actual saving in energy demand will be about 0.3%. the figures show a similar pattern in the two properties and by April 2009, the walls are uniformly drier, thus suggesting that the nubs are promoting drying of the walls.

BENEFITS

- Reduction in carbon emissions
- Reduction in the use of building materials as a result of the preservation of walls and buildings
- Ease of installation
- Reduction in cold spots
- Reduction in condensation and mould growth
- Reduction in airborne spores
- Reduction in re-hydration syndrome in brickwork which causes the wear ing down of physical membrane over the service years, resulting in subse quent rising damp
- Reduction in heating bills
- Reduction in maintenance costs
- Increase in the number of ZRT ^{3} tradesmen in the market
- Safer to handle and more environmentally friendlier than chemical injections





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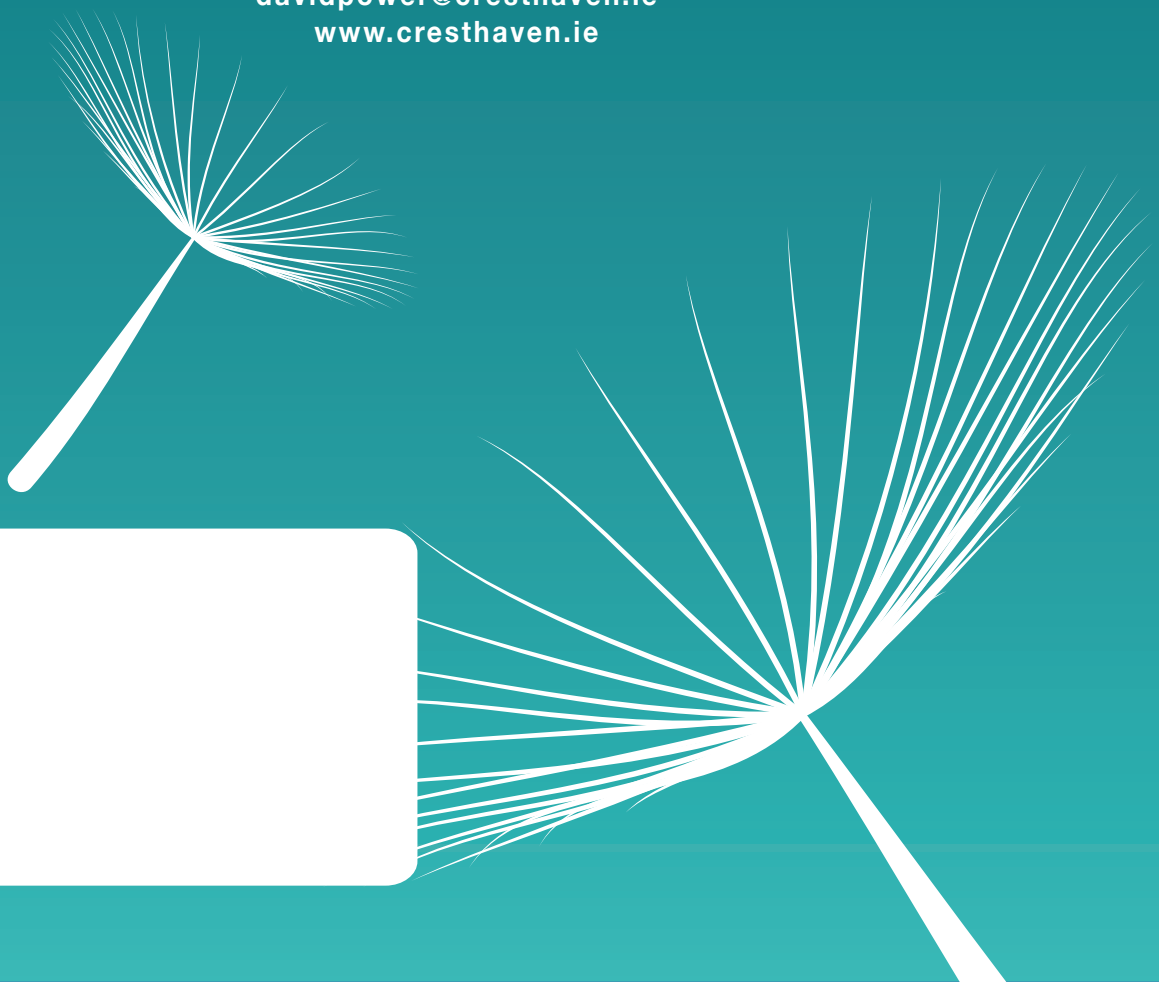

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