

Spiralite® Insulated Non-Metallic Ductwork **Mechanical Questions & Answers**

1. How long has Spiralite® ductwork been on the market?

Spiralite® ductwork is patented product that has been manufactured and installed since 2006, first in the UK and then in many global markets, most recently by Khansaheb Industries (KIS) in the UAE. During that time, the product development team has added extensive experience in CAD/CAM manufacturing, ductwork fabrication and installation and the manufacture and installation of HVAC insulation products.

The two core materials from which Spiralite® is fabricated have both been used extensively in the industry for more than two decades and they are supported for use in the Spiralite® system by the material manufacturers.

2. What are the key selling points to the end user of a building where Spiralite® is being installed?

Energy efficiency: the installation of Spiralite® in preference to traditional insulated METAL ductwork results in substantial energy savings. This is due to enhanced airflow efficiencies, drastically reduced leakage (Spiralite® has been tested by BSRIA to better than Class C performance at 2500Pa) and superior thermal properties of the insulation panels.

If Spiralite® ductwork can be designed into a project at an early stage, due to the reduced pressure drops through friction and leakage, it will deliver the same volumes of air with lower fan power when compared to traditional steel ductwork.

The energy efficiency generated by the use of Spiralite® can reduce ongoing operating costs, allow for enhanced EPCs (Energy Performance Certificates) and improve compliance with increasingly onerous regulation and standards (both the UK, EU and globally).

BREEAM points: As well as energy efficiency in use, Spiralite® ductwork results in savings in greenhouse gases (carbon/embodied impact) during manufacture and installation. The embodied energy and carbon footprint is significantly lower than traditional steel ductwork and insulation and the lack of waste on site and elimination of heavy lifting on site offer significant advantages over traditional ductwork and insulation. This contributes positively to reducing the carbon footprint of any building.

Spiralite® is the only ductwork that can generate BREEAM credits in three award areas, namely:

- Responsible sourcing
- Embodied impact/energy
- Innovation

Time saving: As Spiralite® ductwork is only one fit for both the ductwork and the insulation, it requires only one site visit and overall installation time is typically reduced by over 50%. This is increased for external/roof ductwork or other ductwork that requires additional cladding, as it then becomes a 3-in-1 application, with a weatherproof laminate added to Spiralite® as part of the fabrication process, thereby saving further time.

Space saving: As Spiralite® ductwork requires no subsequent insulation, it can be installed up against the structure of a building, thereby saving valuable space in the ceiling void. If Spiralite® is designed into a project at an early stage, the reduced frictional pressure drops and reduced leakage enable the HVAC engineer to design a system with smaller ductwork which will save space and, of course, cost.

Weight saving: Spiralite® ductwork weighs less than 20% of traditional steel ductwork plus insulation. While we still insist that Spiralite® ductwork is supported and installed in accordance with DW144, the reduction in weight helps speed up installation time and reduce the health and safety issues on site. In addition, in certain buildings, the reduction in weight can eliminate the need for secondary steelwork and save time and cost on the structural side of the project.

Condensation: Spiralite® ductwork is fabricated and installed such that there is no thermal bridge from the internal airflow to the external environment. This eliminates the condensation issues which are seen with traditional steel ductwork on occasions where there is a large temperature differential between the air inside and outside the duct.

Greater user comfort: this is a result of the improved quality of the conditioned air through greater thermal efficiency and reduced humidity, as detailed above, as well as the correct quantity of air arriving at the designated destination through less leakages and lower pressure drops.

Aesthetics: Spiralite® ductwork offers a higher level of finish in its standard form than traditional ductwrap for on-view applications. In addition, Spiralite® is able to be laminated externally with coloured or textured finishes as desired.

Reduced cleaning and maintenance costs: this is more detailed elsewhere, but the use of Spiralite allows meaningful reductions in both cleaning and maintenance activities and costs.

3. What are the key advantages of Spiralite® ductwork to the M&E contractor?

Programme time savings: Spiralite® ductwork is an insulated duct, and as such, ductwork and thermal insulation is provided in a single application, removing an entire trade from the site. Spiralite® ductwork can be installed as quickly as traditional steel ductwork, and therefore the whole of the time normally spent insulating ductwork at the end of an M&E programme is saved. In addition, where additional protection or weatherproofing is required, a protective laminate (such as 3M VentureClad) can be factory applied to Spiralite® ductwork saving further installation time on site. In addition, this gives a high quality finish and a significant cost saving in relation to a traditional system.

Health and Safety: the use of Spiralite® ductwork on a site results in substantial Health & Safety benefits - no sharp edges, no heavy cutting or lifting equipment required, easier and quicker to install, no hot works permit (for METAL cutting) required, no toxicity or hazardous materials of any sort, easier manual handling and transportation around site, etc.

Co-ordination: As one trade is removed from the site and both the ductwork and insulation is effectively installed as one fix, the overall project co-ordination is dramatically simplified.

Furthermore, ductwork insulation is often a source of variation time and costs for the M&E contractor where the thermal insulation for steel ductwork may need to be installed around other services or, for example, through a ceiling grid. As Spiralite® ductwork is a pre-insulated system, the incidence and cost of variations minimized.

Additionally, the lightweight nature of Spiralite® and ease of adaption and flexibility of installation (most changes can be made on site by the installer) allows it to be manually handled in tight areas and in circumstances where the installation of traditional steel ductwork would be very problematic and prevents delays, bottlenecks and costly variations arising from last minute alterations.

Cost: The installed cost of Spiralite® ductwork is comparable to the cost of installing traditional steel ductwork and then applying ductwrap insulation. However, in certain instances as described above (plant rooms, external ductwork, swimming pools) Spiralite® is considerably cheaper due to the elimination of additional on-site installation processes. Furthermore, the earlier that Spiralite® is considered, the more money it can save by saving void space (to increase ceiling heights), influencing structural design (due to its light weight) or reducing AHU plant size (due to its efficiency).

There are other cost savings through, inter alia:

- a. Quicker and cheaper delivery
- b. Lower incidence of variations, as referred to above
- c. Less defects and quicker/cheaper defect rectification
- d. Virtually zero wastage on site

4. What type of material is used?

Spiralite® ductwork fabricated using rigid phenolic insulation board instead of insulated galvanised steel ductwork. The insulation panel is cut in such a way as to allow it to be formed into a complete circular or flat oval duct and sealed with a heavy duty reinforced foil tape. The internal surface is lined using an aluminium foil and PET composite laminate sealed onto itself to give a strong, airtight and pressure resistant duct system.

Its other qualities are:

- A thermal conductivity of between 0.018 and 0.022 W/m·K at 10°C mean, the lowest of any standard HVAC insulation material
- Fire & smoke performance with a Class 0/Low Risk fire classification to the Building Regulations/Standards:
 - BS 476-6: 1989 (Fire tests on building materials and structures. Method of test for fire propagation for products)
 - BS 476-7: 1997 (Fire tests on building materials and structures. Method of test to determine the classification of the surface spread of flame of products)
- < 5% smoke obscuration when tested to BS 5111-1: 1974
- > 90% closed cell content making it non-wicking & highly resistant to moisture penetration
- Thicknesses of 20mm and 22mm (standard) and 30mm (risers, external ductwork, larger ductwork) to satisfy requirements of the TIMSA Guide, BS 5422: 2009, NHS CO2, NES Specification Expert Y50 and DEO Specification 037
- Suitable for continuous operating temperatures between -20°C and +80°C

- Manufacturing under a quality control system approved to BS EN ISO 9001: 2000
- BSRIA Airtightness test in accordance with BS EN 13403:2003 – ductwork made from insulation duct boards

5. Does the product(s) conform to HVCA specification DW/144?

The DW144 specification covers only metal ductwork and governs, inter alia, air leakages and pressures. As detailed in the BSRIA report, Spiralite® exceeds these DW/144 specifications and the BS standards (BS EN 13403:2003 - Ventilation for Buildings – Non-metallic Ducts – Ductwork made from insulated ductboards) – see page 4 paragraph 1.1

Furthermore, Spiralite® is installed only by qualified and certificated installers, and the installation methodology for Spiralite® ductwork is fully in accordance with the stipulations of DW144 in relation to supports, access doors etc.

Furthermore, the Spiralite® ductwork material conforms to all the relevant building standards and certifications, as follows:

- BS EN 1507:2006 – Pre-insulated Ductwork Systems
- Approved Document L – Conservation of fuel and power
- TIMSA-HVAC Compliance Guide – Insulation of Ductwork
- Non-domestic Heating, Cooling and Ventilation Compliance Guide - Insulation of Ductwork
- A and A+ ratings in BRE Global Environmental Profiles January 2010
- European Ventilation Standard EN1886 Air Leakage Class L1(M)
- SMACNA and ASHRAE Standards (USA)

6. What is the expected life span vs traditional sheet metal duct system - i.e. does the internal surface degrade over time leading to reduction of air quality?

Spiralite® ductwork is fabricated from phenolic panels that are designed to last for the lifetime of a building and have been proven to do so over several decades. The manufacturers have verified that their phenolic board will perform as intended within the Spiralite® ductwork system. As such, the lifespan of Spiralite® is at least equal to that of traditional sheet metal ductwork. To back this quality standard KIS offer an unprecedented and unrivalled 10-year warranty on the products.

7. How are connections made between the same product, different products, different duct sizes and with plant?

Spiralite® has a very simple, robust, durable and airtight connecting system between sections of the same size and using reducers/tapers where the dimensions change – internal connectors, tiger clips and tape. Furthermore, the internal collar does not allow a thermal transfer, has no protrusions and has a built-in vapour seal to ensure the internal thermal integrity is maintained.

Connection to bends (90° and 45° standard), shoes, branches, tees, etc are made in a similar way. Connections to metal ductwork of all shapes are by way of protruding spigots over which Spiralite® is fixed and taped. Linkages between metal and Spiralite® are manufactured by KIS and are standard. All fittings available in metal ductwork can be made in Spiralite® so branches, for example, are cut in and fixed to Spiralite® in a manner developed by KIS and are manufactured in the factory.

Connecting Spiralite® to standard duct ancillaries e.g. fire dampers, VCD's, attenuators, heating & cooling batteries, etc is also a simple process of connecting the ductwork to the circular spigots coming off a square ancillary or a simple push connection for circular and applying tape

(and mastic where no rubber safeseal). These can also be mechanically fixed using an aluminium plate or flange and tech screws, bolts or rivets.

Any change in shape from a plant outlet to ductwork or ductwork to ductwork (metal or pre-insulated) can be accommodated using a standard transformation piece with or without a taper.

8. What is the range of sizes that Spiralite® can do, in particular what is the largest diameter?

100mm to 2000 mm is standard in circular, and we have been asked to make flat oval ductwork up to 2,500mm in width; there is no reason why we could not make something bigger. The Spiralite® fabrication process can be scaled up to make any commercial duct size required.

9. While it has taken some time to establish air flow patterns in both rectangular and spiral duct, this product in spiral form is constructed from sections of straight phenolic sheet, so the cross-sectional area is a polygon. This may require them to establish the new air flight profile for their product range?

The inner lining of Spiralite® ductwork has an exceptionally smooth finish with a much lower coefficient of friction than metal. In addition, Spiralite® ductwork is substantially airtight at normal operating pressures (it is above Class C at 2500Pa) and therefore suffers from minimal leakage when compared to Class A/B wound spiral metal ductwork. When comparing Spiralite® flat oval to rectangular metal ductwork, the rounded shape of Spiralite® reduces friction and allows air to pass with less internal turbulence.

The combination of all these factors mean that Spiralite® ductwork is always more efficient in use than the equivalent length of traditional steel ductwork. As such, if a system has been designed around metal ductwork, replacing it with Spiralite® will not only deliver the required volumes of air, it will do so with less fan power. Therefore, if Spiralite® can be designed into a project, a smaller AHU can be used.

10. Fire resistance - can Spiralite® better traditional ductwork by offering 60, 90 or 120-minute resistance, to save going to systems like Conlit or Durasteel or using plasterboard encasement?

Phenolic foam has the highest rating (Class O) for combustibility, prevention of the spread of flame, smoke generation and toxicity, but Spiralite® ductwork is not currently suitable for fire-rated applications.

11. How easily does it burn and are any toxic fumes released?

Spiralite® will only burn at very high temperatures and no toxicity is released if burnt. As stated above, the fire and smoke performance has the optimal rating at Class 0/Low Risk fire classification and has less than 5% smoke obscuration when tested to BS 5111-1: 1974.

12. Recyclability of insulation and green/environmental credentials of Spiralite® (mineral wool is now about 80/90% and can be used as a credit in a BREEAM assessment)?

As with mineral wool and glass silk, if the phenolic material is returned in a clean form then it will be recycled. The phenolic panel, from which Spiralite® is made, gains maximum BREEAM credits for its zero ODP and low GWP. Kingspan, the manufacturers of the phenolic panel, are currently working with the DTI in the ROPOF Initiative, which is looking at ways of treating foam waste on building and demolition sites. Finally, Kingspan are about to begin testing the phenolic panel to the European Standard, namely EN 13403 Ventilation for Buildings – Non-metallic Ducts – Ductwork made from insulated ductboards. This standard is within a series of British Standards

for Mechanical Building Services – Ventilation and Air Conditioning Systems. This standard and the series are likely to be featured in future regulations.

It should be noted that, while traditional steel ductwork and the insulation material can be recycled, the zinc content in galvanised steel makes this very difficult and Spiralite removes this problem.

As a result, Spiralite® is the only ductwork that can generate BREEAM credits in three award areas, namely:

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- Embodied impact/energy
- Innovation

13. How do you clean – access hatches?

There is the same cleaning process using access hatches as with metal ductwork. This has been tested by Systems Hygienic, who are part of the Hotchkiss Group and who have found Spiralite® to be easier to clean using their equipment due to the movement of their brushes. The inner lining is highly durable and does not deteriorate in quality as a result of the application of the brushes (as long as abrasive brushes are not used). Furthermore, due to the significantly reduced ingress of air and dirt, it may be that substantially less access doors are required as the cleaning requirements and regularity thereof are materially reduced.

Where access doors are required, there is a simple installation process – a hole in the duct is cut, the access door fitted and mastic applied with fastening screws through to the inner lip. The fitting is secure and the duct retains its strength and durability. Finally, access doors can easily be fitted on site or in the factory as part of the ductwork fabrication process.

14. Can it be painted or other applications applied?

Yes, it can be painted or otherwise decorated in the normal way. All ductwork and fittings come foil faced (standard) or with an optional 3-ply outer laminate for internal use to enhance the aesthetics or a 5-ply weatherproof laminate for external or plant room applications or a 9-ply 'metal standard' laminate for use where additional strength or protection is required (plant rooms, roofs, risers, etc.)

15. Flat oval availability and connection/transformation to other shapes

We have a full range of flat oval ducts and fittings that are fabricated in the same way as the circular Spiralite® ductwork, using the same board and the continuous internal laminate. This gives Spiralite® flat oval ductwork the same qualities as Spiralite® circular ductwork with vastly enhanced airflow and air retention efficiencies.

Connections or transformations from flat oval to round and square ductwork (for AHU connections etc.), and visa versa, are also manufactured and supplied by us. These are done by either reducers/expanders incorporating a change in shape or a box join connecting one shape to another using spigots or doby flanges.

16. What is the potential for damage to Spiralite® on site?

As with metal ductwork, if it is mishandled then it could get damaged. However, with a small amount of training and instruction most damage can be avoided. Provided Spiralite® is handled and stored properly, damage through carelessness will be avoided. Accidental damage is easy to repair or replace with new. Minor damage can be repaired with reinforced foil tape and a more seriously damaged section can easily be cut out and a new section inserted using standard connecting pieces. To date damage has not been a problem on the sites that have used

Spiralite®. These include installations in glacial tunnels in Norway and repeated installation and removal in the Chanel Pavilion, without any damage.

17. Can the product be damaged through exposure to rain or other elements?

Due to the closed cell and non-porous qualities of the insulation board used in the manufacture of Spiralite®, it will not be damaged by minor exposure to water. The outer reinforced foil laminate offers additional protection, but the material should be stored under cover as watermarks could stain the foil. Spiralite covered by a weatherproof laminate will resist all damage from standard weather conditions.

18. Are there any problems with transportation of the prefabricated sections?

Spiralite® is suitable for low-cost transportation in that it is very light and minimal support is required to secure the components in the shipping process. Furthermore, different sizes of ductwork can easily fit inside each other, so less space is needed. If there are delivery difficulties (site access, high traffic loads, etc) then the ductwork can be delivered to site in a flat-pack format.

19. Can all types of diffusers and grilles easily be attached?

Yes, in the normal via flexible ductwork and/or plenums/grille boxes.

20. Where ductwork goes through the roof, what is done to prevent rainwater ingress?

By using a cravat in the normal way – constructed to be sealed to the outer circumference of the ductwork with an overhang up to 100mm greater than the outer perimeter of the roof shaft.

21. Are turning vanes required in the bends?

Turning vanes are only required for our mitred flat oval bends – for the rest of the range of Spiralite® ductwork all the bends are segmented and vanes are therefore not required.

22. What are the implications of using Spiralite® in areas of seismic activity?

There are three advantages to be derived from the installation of Spiralite® in such areas:

- The installed ductwork is more flexible and better suited to bear movements and shudders in the building structure. This is most suitable where gripple wire hangers are used, as recommended, rather than rigid hanging braces.
- The ductwork is lighter and much less liable to cause damage should it dislodge and fall.
- Spiralite® is easier to re-use and repair in the re-building process.

23. Where should Spiralite® NOT be used?

Spiralite® should not be used where fire rated ductwork is specified and for commercial kitchen extract ductwork where the excessive oil build-up requires robust scrubbing to clean that may damage the internal laminate.

Spiralite® ductwork is manufactured and supplied by Khansaheb Industries LLC

www.spiraliteductwork.com

www.khansahebindustries.ae