Prihoda UK Ltd
Bretby Business Park
Ashby Road, Bretby,
Derbyshire DE15 0YZ

tel.: 0121 320 2496
fax.: 0121 320 2486
e-mail: info@prihoda.co.uk
web: www.prihoda.co.uk

Sports Hall Fabric Ducting Design

Sports Hall Ventilation / Air Conditioning can be a very difficult application to design. There are several incompatible factors...

1) Sports Halls have a large volume which would make an expensive system design if applying normal air change rates

2) Sports Halls are typically very high rooms & it's difficult to get warm bouyant air down into the occupied zone with a wide heating Δt.

3) Normally very low velocity is required in the court area for badminton games.

Quite often Sports Halls have low air volumes and wide temperature differences; which results in the supply air never really reaching the occupied zone at the temperature intended.

Ebbw Vale Sports Hall

Converted Hanger

Volume and Temperature Difference (Δt).

Getting the air volume and temperature difference to balance is a critical part of the design. It's a constant headache balancing the needs of the project with the commercial realities of winning a job on price. It is common for the AHU to be designed with quite a small air volume which often gives quite a wide Δt - without much thought being given as to whether the air has enough density to travel into the occupied zone. These systems require some high external static pressures to push the bouyant low density air down to the occupied zone, which although low on capital cost makes for an energy hungry system design.

Increasing the supply air volume on the AHU has the effect of decreasing the Δt across a coil of the same size. This makes the supply air temperature closer to room temperature which in turn gives the supply air a bit more density; this then allows it travel a little further for the same external static pressure.

So everything is linked. If we want to keep a reasonable 120pa - 150pa in the fabric duct and we have a mounting height of around 10.0m (not unusual for a Sports Hall) then we need a Δt of around 10°k. This then is the driver for the AHU air volume selection by using the known Δt and the known heating load to arrive at the ideal AHU air volume.

prihoda®
Fabric Ducting & Diffusers
UK & EIRE

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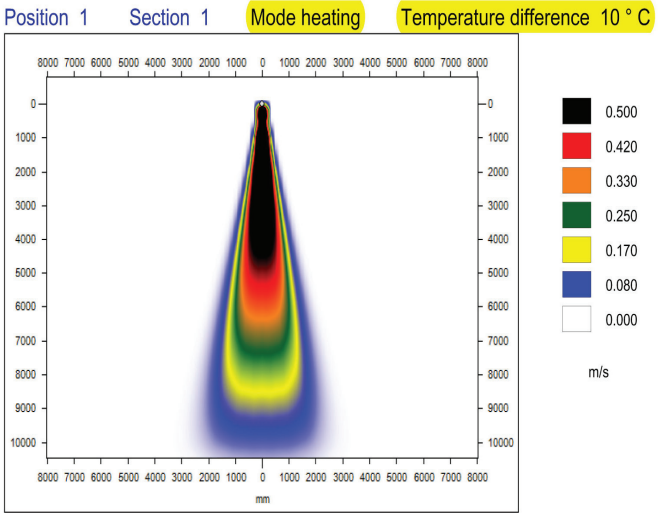
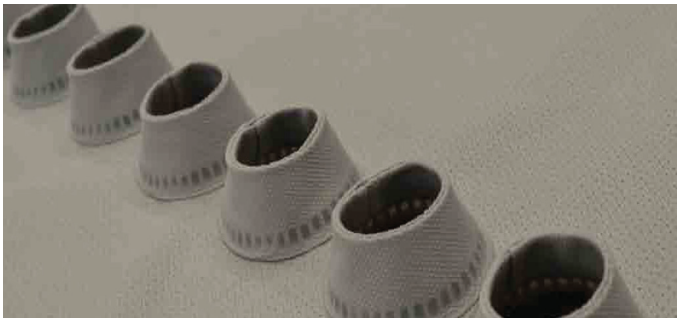
Prihoda UK design many Sports Halls each year and all of them, whether in schools and universities or professional clubs requiring Sport England standards for air movement and velocity, come with the same design challenges.

We usually identify these as follows...
- Achieving the correct air volume/ Δt balance
- Getting the air into the occupied zone (OZ)
- Achieving the correct air velocity in the OZ
- Heating and/or ventilating the OZ effectively
- Moving ALL of the air around (no stagnation)
- De-stratifying and mixing high level air

These issues can all be solved with careful diffuser selection; because the type and position of the diffuser has a big impact on the air movement and throw distance of the supply air.



Prihoda Software Air Flow Graphic (Quote Specific)



Fabric Nozzles

Fabric Ducting along the wall only - see why below...

Air Distribution and Velocity

So how do you distribute minimal air volume (in comparison to the room volume) and make an impact for the occupants? At the same time ensuring you're not blasting air at velocities above 0.15m/s in the courts areas to divert badminton shuttlecocks?

It's here that compromise is required and an understanding that Sports Hall ventilation design isn't the same as ventilation design for other areas. You cannot possibly hope to heat or ventilate the whole area with the volumes achievable in a commercial design.

In a large hall we will try to position Fabric Ducting at high level along either side wall and at intervals across the hall over the playing courts.

The high level ducts mounted over the courts do not generally push air downwards - the air pattern leaving a duct mounted at 10.0m will be over 4.0m wide in the OZ (see diagram opposite) too broad for supplying air between courts. These ducts have Fabric Nozzles of large diameter (>80mm) which blow the supply air in the direction of the high level ducts mounted alongside the walls. These large Fabric Nozzles can deliver a large volume of supply air but, because they are designed to jet out supply air at high velocity, they also create a lot of mixing and entrainment from the air around these fabric ducts and more generally at high level in the centre of the room. This gets supply air and a proportion of room air moving around and flowing in the direction of the wall ducts.

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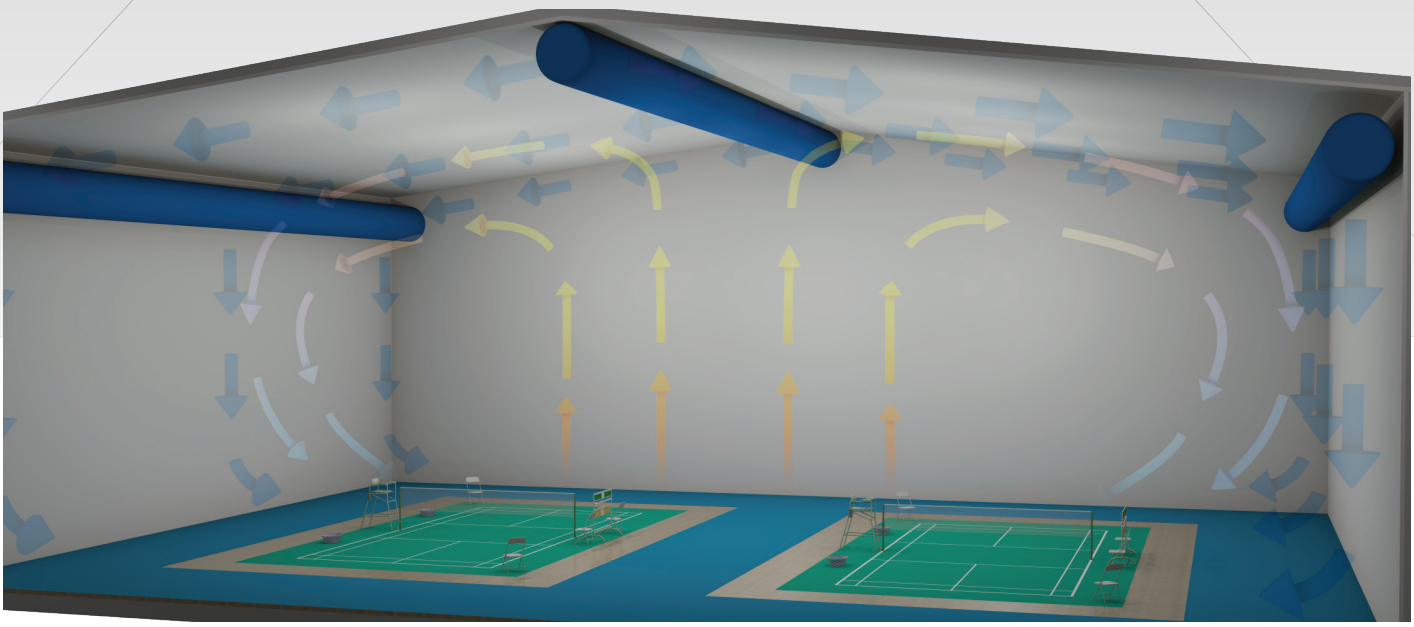
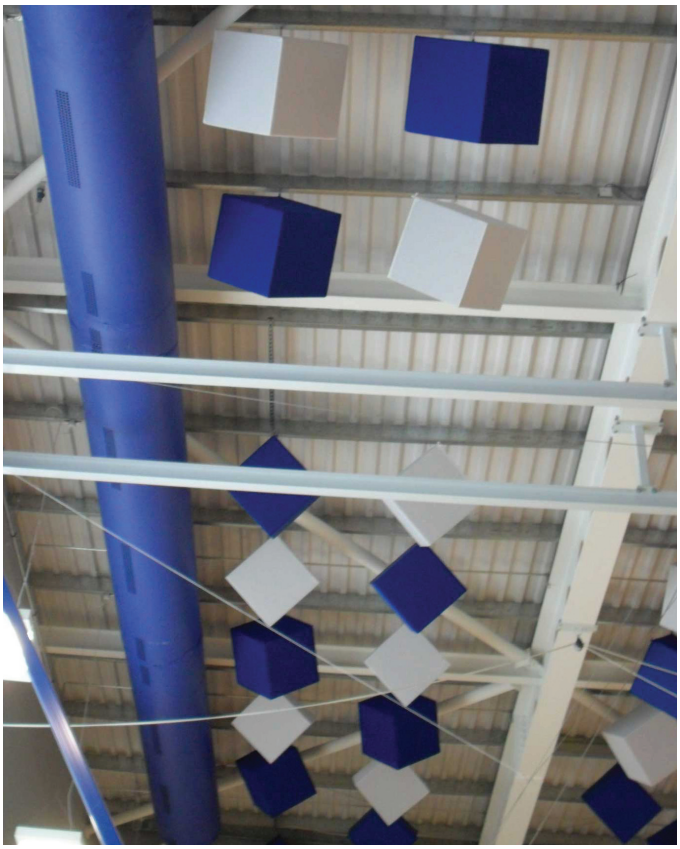
Sports Hall Fabric Ducting Design



Air movement principle using Fabric Nozzles in Sports Halls



Whitmore School Sports Hall showing the different outlet diffuser style used along the walls to entrain more room air

Air Distribution and Velocity continued....

The Fabric Ducts mounted along the walls have a slightly different outlet diffuser design to the Fabric Ducts with the large Fabric Nozzles in the centre of the Sports Hall.

Large Fabric Nozzles over the centre of the Sports Hall

Along the walls we use laser cut perforations sized and cut specifically for each individual project uniquely (see picture left). The large block of smaller holes deliver air at high exit velocities and allow high levels of entrainment from the surrounding air - which is being blown over by the centre ducts. The high entrainment value means that this entrained air needs replacing and this helps draw in the air thrown from the large Fabric Nozzles in the centre of the room.

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Sports Hall Fabric Ducting Design

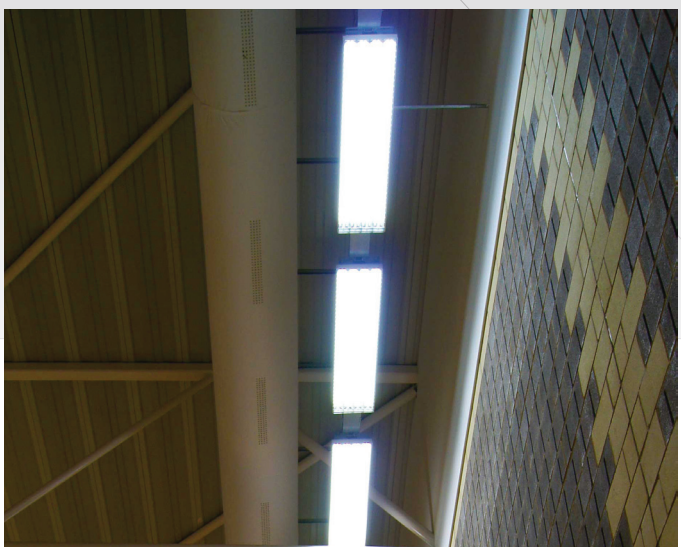
Air Distribution and Velocity continued....

The smaller laser cut perforations do not throw the air as far as the nozzles, this allows us to deliver the air into the OZ at the desired velocity - we can also make use of coanda effect - by blowing the air down the wall to increase the throw distance.

The air once at low level along the sides of the Sports Hall will flow towards the centre of the hall and anywhere else where it can replace rising air occuring as a result of individuals movement and heat generation generally.

Material Choice

It's important to choose the correct material whenever one uses a Fabric Duct. Here we would recommend a non-permeable material so that the supply air is being delivered solely through the nozzles or laser cut perforations. The use of a permeable material - where a proportion of the air exits through the weave of the material - is only really needed if the design calls for air to be delivered below dew point - as the permeable material stops the duct suffering from condensation. You can also choose between PVC coated material or plain woven. We generally recommend the plain woven material as its easy to clean in a washing machine and has a matt finish, not reflecting the lights in the Sports Hall.



Laser Cut Perforations against a Sports Hall wall

Suspension

We always recommend (especially for sports halls where accidental contact may occur) a rigid rail system, suspended by threaded bar (either Ø6mm or Ø8mm) whilst the fabric duct should be made with a sliding cord all along the top of the duct to ensure that the duct is supported all along the rail system - as system of tensioning exists to make the ducts taught, to hold them in place and remove any wrinkles.

Ebbw Vale Sports Hall

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Whitmore School Sports Hall Prihoda Fabric Ducting

Plenum Distribtion and branches all in Fabric showing Fabric Nozzles in the centre branch

The Benefits of Using Fabric Ducting

- Lower Purchase Cost
- Manufactured off site - efficient
- Delivered in a small box - efficient shipping
- Resource efficient - available as 100% recycled material using post consumer plastic PET bottles
- Light Weight - Less Secondary Support
- Quick installation - lower install cost
- Long lasting and aesthetic
- More effective air distrbution, more surface area in room

The Benefits of Using Prihoda

- Innovative products, constant development, competitive
- Established over 20 years ago - lots of design experience
- Unique and flexible diffusion options
- Multiple material choices and specifications
- Premium material with the following features as standard
  - Flame Retardant
  - Anti Bacterial Protection (Silver)
  - Anti-Static protection (inwoven carbon fibres)
  - Non fibre shedding cleanroom standard
- Choices from 9 stock colours at no additional cost
- 10 Year Warranty as standard
- ISO9001 Quality Certfiication
- ISO14001 Environmental Certification
- Customer focussed with fast quotation turnaround and comprehensive information including air flow graphics, noise data and detailed drawings for each quotation.