# NATURAL VENTILATION AND COLOUR IN HOT CLIMATES

Good practice for perfect natural ventilation

Four times winner of The Queen's Award for Enterprise International Trade

FULLY CE COMPLIANT FOR EXECUTION CLASSES 1 TO 4 • BS EN ISO 9001:2015 • BS EN ISO 14001:2015 • BS EN ISO 45001:2018

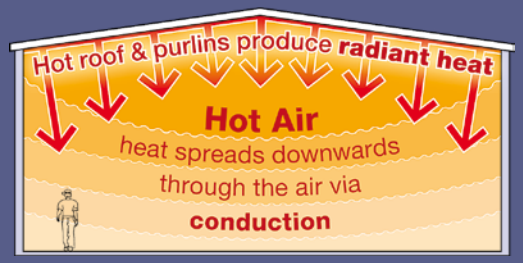
JOHN REID & SONS (STRUCSTEEL) LTD trading as REIDsteel, REIDglazing & REIDmarine • Company Registration No: 617773

REIDsteel

JOHN REID & SONS (STRUCSTEEL) LTD

# How buildings heat up when not ventilated

In a hot climate, the cost to air condition the entire volume of a large building is often prohibitive, and without some precautions a building quickly heats up during the day via radiant heat and heat conduction.

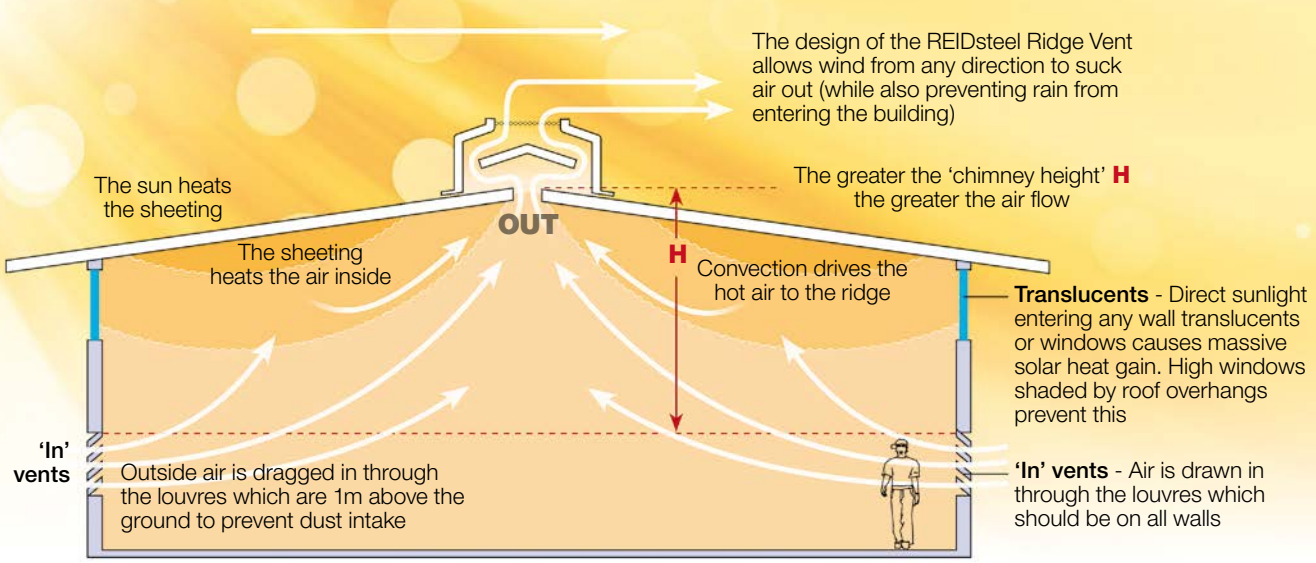



**Radiant heat** from the sheeting and purlins make the inside feel hotter and a lot more uncomfortable than the building's ambient air temperature would suggest.

**Conduction**. The ambient air temperature is also increasing via conducted heat from the hot sheeting and purlins. This creates a 'hot zone' which starts at the apex and spreads downwards during the day, heating more and more of the trapped air mass inside the building.

The air temperature at ground level will hit its peak by around mid afternoon.

# Using a REIDsteel ridge vent and louvres to produce perfect natural ventilation




## 'In' and 'out' vents, chimney heights and air flow

In the perfect natural ventilation system, the 'out' vent is at the apex (and nowhere else) and the 'in' vents are as close to the ground as practical.

This arrangement keeps the 'chimney' height as large as possible, and by doing so, not only creates the greatest air flow, but means that there is plenty of air movement near the ground where the people generally are. Vents should be on all of the walls.

The REIDsteel ridge vent has been designed to sit at the building apex and adds its power to the ventilation by allowing wind from any direction to suck air out of the building. Vents can be added to our buildings.

Our standard vent has a throat of 200mm, it should be the full length of the building except in hurricane/cyclone areas where, to avoid damage, the vent should be set in from the gable ends. The 200mm vent is good for up to a 30m span or so.

The area of 'in' vent on one side and on one end added together should equal the area of the ridge vent.

In buildings with a heat source and in very big buildings, the ridge vent and the matching wall vents should be increased. Mechanical ventilation may also be needed, preferably assisting the natural ventilation.

## Internal air temperatures

With perfect natural ventilation the internal air temperatures stay very similar to the external air temperatures, but it is the air movement past the workforce which keeps them cool.

## Sheeting colours and radiant heat

The amount of radiant heat within the building will depend on how hot the inside of the roof/wall sheeting becomes.

To minimise this heating, the colour of the roof should always be white, or as light a colour as possible. The colour of the walls should also be as light as possible, though this is less important than the roof.

At the hottest part of the day, white sheeting may reach temperatures of up to 50°C. Black sheeting however, may reach temperatures up to 110°C !

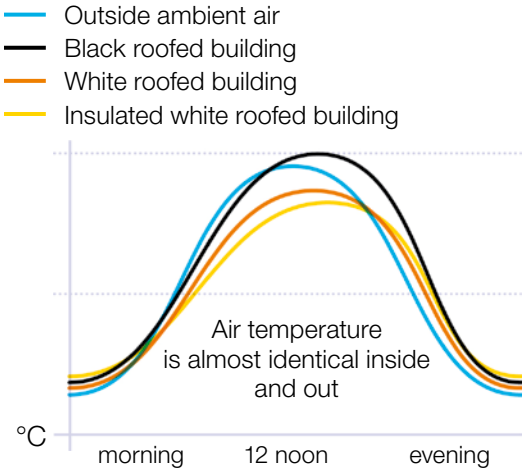
If you want to be at 25°C, the black sheeting could be as much as 85°C above the chosen temperature - that's 3.4 times worse than the equivalent sheeting in white!

## Roof insulation

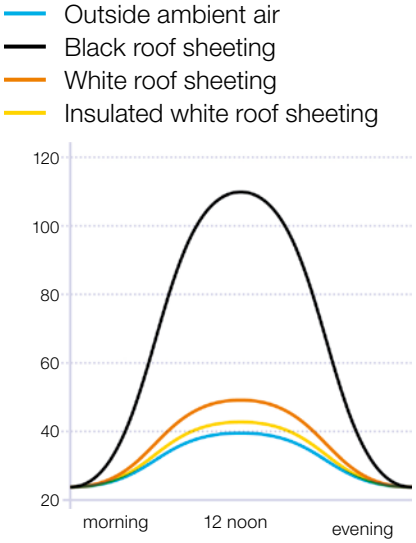
Insulation reduces the temperature of the inside of the sheeting. This greatly reduces radiant heat, and reduces the warming of the high level air.

Roof insulation is more effective than wall insulation, however, if the building is to be cooled (or heated) then insulation to the roof, walls and even floors is essential.

## Inside ambient air temperatures of a building with natural ventilation (°C):

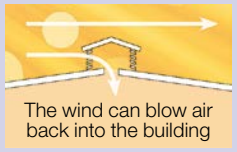



## Roof sheeting temperatures by colour/type (°C):



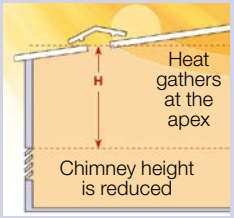

Radiant heat increases with roof sheeting temperature

## Ventilation mistakes to avoid and why they are not helpful



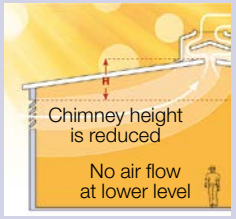

### Lantern vents

Lantern vents are not a good design as the wind works against the natural convection and they can let rain in.



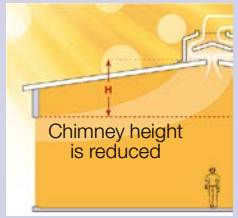

### Roof vents not at the apex

This reduces the chimney height which reduces air flow. Furthermore, hot air builds up at the apex and the purlins & sheeting in the apex area are not cooled. Only extract at the apex.




### High level 'in' vents

Do not ventilate the walls higher than 2.1m. Chimney height is reduced, so the flow is reduced and there is no air movement near the ground where the people are. Only let air in at low level.




### Just open the doors

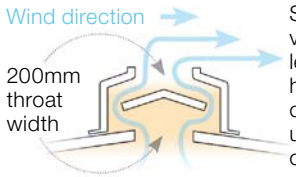
Opening the large doors (in a warehouse for example) will reduce or stop the ventilation from all the low level vents.


### Glazing in the roof

Do not have translucents in the roof the solar heat gain will be enormous! Likewise, do not have windows in the walls without an overhang to provide shade.

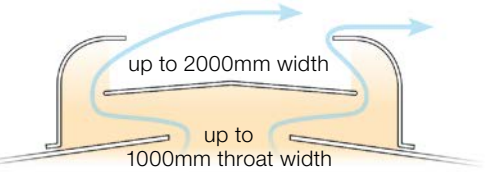
# ‘In’ and ‘Out’ vents

Standard REIDsteel ridge vent

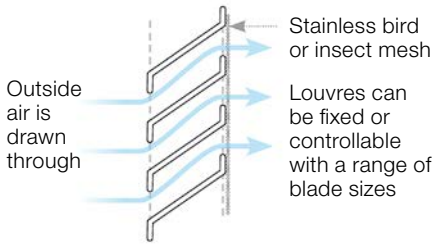


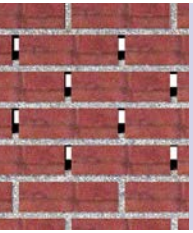

Standard (or large) vents can be any length. We also have a 3m long operable ridge vent unit with an open/close system

Large REIDsteel ridge vent



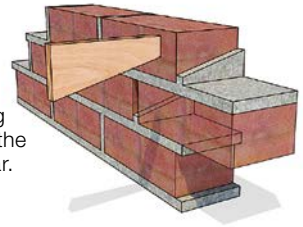

REIDsteel Louvre



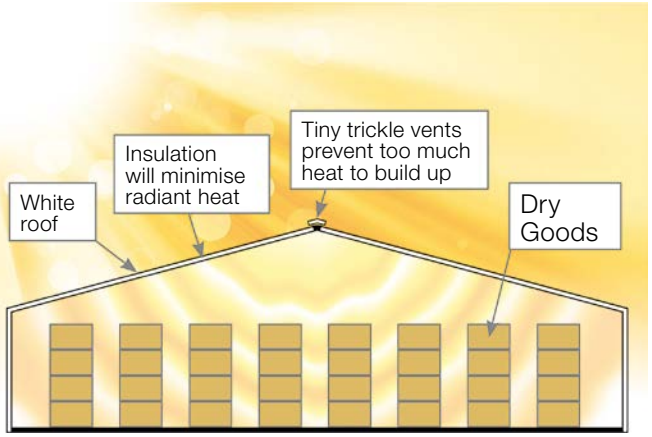
Simple masonry venting

A plywood form is used to create sloping vent holes in the vertical mortar.



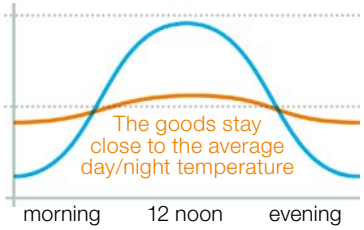
# Sealed Storage

Sometimes there is no advantage to ventilation. For example, for storage of dry goods where there are no people present, it is better to have no ventilation other than tiny trickle vents at the ridge.




**Inside temperature of dry goods in a sealed storage building** (°C):

- Outside ambient air
- Inside temperature of dry goods




REIDsteel are experts in the design and build of the following:

- **Aircraft hangars, hangar doors and hangar extensions**
- **Bridges**
- **Car parks**
- **Church and community buildings**
- **Cranes**
- **Environmental structures**
- **Grandstands and stadia**
- **Housing, hospitals and schools**
- **Hurricane and earthquake resistant buildings**
- **Industrial and warehouse buildings**
- **Leisure and sports buildings**
- **Office buildings, commercial buildings and retail superstores**
- **Security gates, barriers and defensive structures**

Four times winner of the Queen’s Award for Enterprise International Trade


**REIDsteel**

**JOHN REID & SONS (STRUCSTEEL) LTD**

Strucsteel House, Reid Street,
Christchurch, Dorset BH23 2BT England

Telephone: + 44 (0) 1202 48 33 33
Facsimile: + 44 (0) 1202 47 01 03
E-mail: sales@reidsteel.co.uk

Website: **REIDsteel.com**



NaturalVentilation&ColourinHotClimatesAWBitmapGraphics2020-4LowRes-13/02/20