

Working in cold environments

Manage workers thermal comfort to avoid cold stress

As Experts in Safety we are committed to keeping you and your workforce safe and well in winter. In order to manage employees' health and wellbeing it is important to take their thermal comfort into consideration.

What is thermal comfort?

The HSE describes 'thermal comfort' as "a person's psychological state of mind and is usually referred to in terms of whether someone is feeling too hot or too cold."

"Environmental factors (such as humidity and sources of heat in the workplace) combined with personal factors (i.e. worker's clothing) and work-related factors (how physically demanding the work is) influence a person's 'thermal comfort'.

Thermal comfort is very difficult to define as you need to take into account a range of environmental, work-related and personal factors when deciding what makes a comfortable workplace temperature.

The best that an employer can realistically hope to achieve is a thermal environment that satisfies the majority of people in the workplace."

Why is thermal comfort important?

People working in uncomfortably hot or cold environments are more likely to behave unsafely because their ability to make decisions and/or perform manual tasks deteriorates.

For example;

- **People may take short cuts to get out of cold environments, or**
- **The workers' ability to concentrate on a given task may start to drop off increasing the risk of errors occurring**
- **Workers might not wear personal protective equipment properly in hot environments increasing risks**

Employers need to be aware of these risks and make sure the underlying reasons for these behaviours are understood and taken into account. Addressing the reasons for these behaviours is also likely to improve morale and productivity as well as improving health and safety.





The six basic factors

The most commonly used indicator of thermal comfort is air temperature – it is easy to use and most people can relate to it. However, air temperature alone is not a valid or accurate indicator of thermal comfort or thermal stress. It should always be considered in relation to other environmental and personal factors.

The six factors affecting thermal comfort are both environmental and personal. These factors may be independent of each other, but together contribute to an employee's thermal comfort.

Environmental factors:

- **Air temperature** - the temperature of the air surrounding the body
- **Radiant temperature** - Thermal radiation is the heat that radiates from a warm object. Radiant heat may be present if there are heat sources in an environment.
- **Air velocity** - The speed of air moving across the employee and may help cool them if the air is cooler than the environment.
- **Humidity** - High humidity environments have a lot of vapour in the air, which prevents the evaporation of sweat from the skin. When non-breathable vapour-impermeable personal protective equipment (PPE) is worn, the humidity inside the garment increases as the wearer sweats because the sweat cannot evaporate.

Personal factors:

- **Clothing Insulation** - Thermal comfort is very much dependent on the insulating effect of clothing on the wearer. Wearing too much clothing or PPE may be a primary cause of heat stress even if the environment is not considered warm or hot. If clothing does not provide enough insulation, the wearer may be at risk from cold injuries such as frostbite or hypothermia in cold conditions.
- **Metabolic heat** - The more physical work employees do; the more heat they produce. The more heat is produced; the more heat needs to be lost so workers don't overheat. The impact of metabolic rate on thermal comfort is critical.

The risk

It is the responsibility of management to ensure that a company adapts as necessary to reduce or eliminate the risk of thermal discomfort amongst their employees. If thermal discomfort is a risk, and your employees are complaining and/or reporting illnesses that may be caused by the thermal environment, then you are required to review the situation and if necessary implement appropriate controls to manage the risks.

We want to keep you and your employees warm and comfortable through winter to ensure they remain safe at work.

For more information on thermal comfort and how you can identify if there may be a risk of thermal discomfort to your employees please visit

www.hse.gov.uk/temperature/thermal/index.htm



Cold stress

What is it?

'Stress' is the means by which a person adapts to their environment. 'Cold stress' is a response of the body to cold temperatures, resulting in heat loss. Too much cold is a threat to the body mentally and physically.

How the Body Reacts to Cold Temperatures

When in cold environments the majority of the body's energy is used to maintain the body's core temperature of approximately 37°C. To maintain heat the body restricts blood flow by constricting its blood vessels. If the body starts to feel cold it will reduce blood flow to the extremities (hands, feet, arms, and legs) and rush it to its core (torso). This causes any exposed skin and the extremities to cool rapidly and increases the risk of cold stress and related injuries.

Human Variability

A person's general health also influences how well they adapt to changing temperatures. Poor general health and a low level of fitness will make people more susceptible to feeling the extremes of heat and cold.

Other groups more at risk of cold stress are:

- **Those carrying extra weight**, as they can find it difficult to maintain a stable body temperature.
- **Older people**, especially people aged 45 years and over. Age can also affect how people respond to temperature.
- **Individuals with a previous medical condition**, as certain conditions can also increase how susceptible the body is to heat and cold. People with heart disease or high blood pressure may need to take special precautions when working in the cold.
- **Anyone taking any medication**, as substances including prescription medications can also have an impact on how people react to heat and cold.

These factors all affect how people perceive their thermal comfort levels, even if they are doing the same work in the same environment.



Safety Tips to Prevent Cold Stress

When temperatures drop workers are at risk of suffering from cold stress. Here are some tips to try and prevent cold stress or cold-induced illnesses and injuries in your workforce:

1. Train Your Employees on the Dangers of Working in the Cold

Workers must be trained on the dangers of working in colder conditions, not only on the cold-induced illnesses and injuries that could occur but also which environmental or working conditions can cause cold stress.

Training should include: the risks, prevention, the importance of monitoring yourself and co-workers for symptoms, the symptoms and how cold stress is treated.

2. Use a Buddy System

Working with a partner means individuals can monitor each other for signs of cold stress. It is easier to notice signs in a partner than it is in yourself.

3. Adjust Work Schedules around Cold Conditions

Where possible, schedule maintenance and repair jobs in cold areas for warmer months. Also try to schedule tasks during the warmest part of the day. Breakdown tasks into shifts so workers can take frequent breaks.

4. Provide Warm Areas for Use During Break Periods

If workers are exposed to cold conditions during their working day, their employer should try to provide warm dry places where they can take their breaks and warm up.

5. Eat and Drink Hot or Warm Food and Drinks

Workers can also suffer dehydration in cold weather so they need to drink plenty of fluids. For most people water is the most efficient for re-hydration. Drinking caffeinated or alcoholic beverages is not recommended while working in cold weather because they are dehydrating.

6. Layer Clothing

It's better to wear multiple layers of clothing rather than one thick layer, the layering concept allows the wearer to make simple changes based on the weather or their level of activity in order to maintain a comfortable body temperature.

7. Have a Spare Set of Clothing

Try to encourage employees to keep a change of dry clothing available in case worn clothes become wet.

8. Protect the Extremities

Encourage workers to protect their ears, face, hands and feet in extremely cold or wet weather.



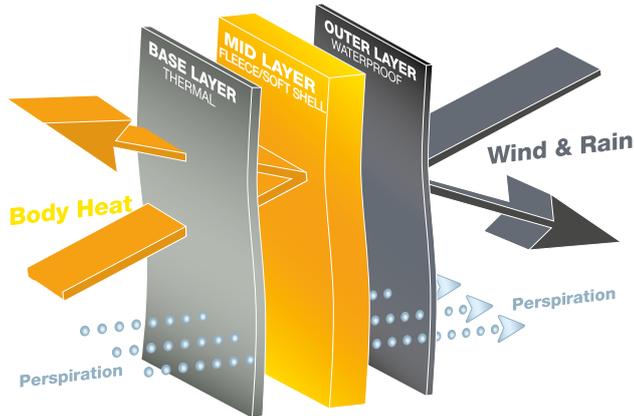
Layering

Manage workers thermal comfort to avoid cold stress by introducing a layering system

What is a layering system?

A layering system is a way of wearing technical garments to protect the wearer from extreme temperatures, changing temperatures, the weather, or any particular conditions they may be facing. The concept allows the wearer to make simple changes based on their level of activity or external environment. The changes they make help them to remain in control of their own personal 'thermal comfort' levels at all times.

How layering works



Base Layer The Base Layer retains body heat and sits next to the skin to wick away perspiration.

Mid Layer It is the role of the mid layer to trap heat and retain warmth.

Outer Layer This is the weather protection layer, which protects against wind and rain.

How to dress for the weather

What to wear			
Weather	Base Layer	Mid Layer	Outer Layer
Warm and dry	✓		
Cold and dry	✓	✓	
Warm and wet	✓		✓
Windy, cold and wet	✓	✓	✓



3 Layer System

The layering system has three key steps and each layer has a function and purpose:



The Base Layer is the 1st layer.

This is the moisture management layer and sits against the skin to wick away any perspiration

Base layers are comfortable, will help keep the wearer warm and assist to help regulate body temperature. A base layer alone is not enough to keep you warm outdoors. Additional layers will be required.

Your base layer wicks away any moisture from the skin keeping you dry



The Mid Layer is the 2nd layer.

This is the insulating layer and sits over the base layer. Its role is to protect the wearer from the cold.

This layer should be quite fitted allowing minimal air movement for maximum heat retention.

Synthetic fabrics such as a polyester fleece/soft shell are ideal for the mid layer because they are great at resisting moisture but retain maximum heat.

Your mid layer keeps you warm



The Outer Layer is the 3rd layer.

The outer layer sits on top of the base layer and mid layer and protects the wearer from wind and rain.

This layer needs to be waterproof, windproof and also breathable enough for your chosen activity so you don't overheat.

Your outer layer protects you against rain and wind.

The wearer can add or remove layers as required

Why wearing layers is important

Wearing multiple layers traps air near your skin which keeps heat close to your body. Wearing multiple layers is more effective than one thick layer, as air is trapped between the layers thus helping to retain warmth. Layers must be selected based on the level of activity you will be doing.