Heat stress | Health & Work

# Occupational exposure to heat in the Netherlands

More than 4% of the Dutch workforce (358,000 workers) experience heat stress for over 80 hours each year during work.*

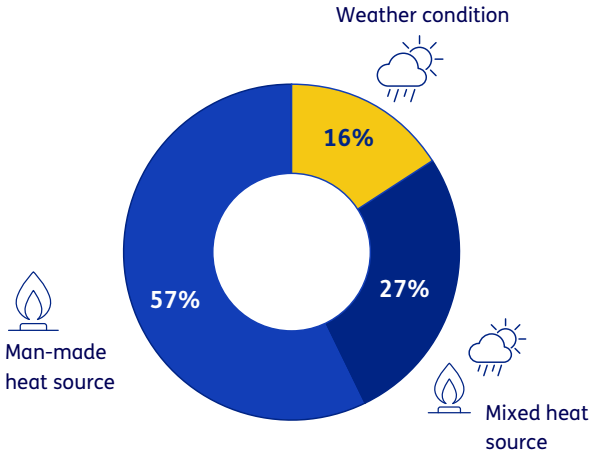
## What is heat stress?

Heat stress happens when the body absorbs more heat than it can get rid of, caused by a combination of environmental factors, physical activities, and work clothing. This leads to an increase in body temperature and can cause symptoms such as fatigue and loss of concentration. Prolonged exposure can result in more serious issues like kidney, heart, or respiratory diseases, as well as mental health problems.

## Why Pay Attention to Heat Stress at Work?

Heat stress occurs more quickly in the workplace, especially during heavy physical labor, when wearing thick protective clothing, or working near a heat source. Workers are particularly vulnerable because they often cannot postpone tasks or move to cooler conditions. Too much heat during work can negatively impact workers' productivity, safety, and health.

**Figure 1: Different heat sources.**




Both weather conditions and man-made heat sources can contribute to heat stress at work. Figure 1 shows that man-made heat sources (such as ovens, gas stoves, and machines) are involved in heat stress for 84% of workers, and weather conditions are for 43% of workers.

**Figure 2: Number of workers that experience heat stress for over 80 hours per year, separated by occupation.**

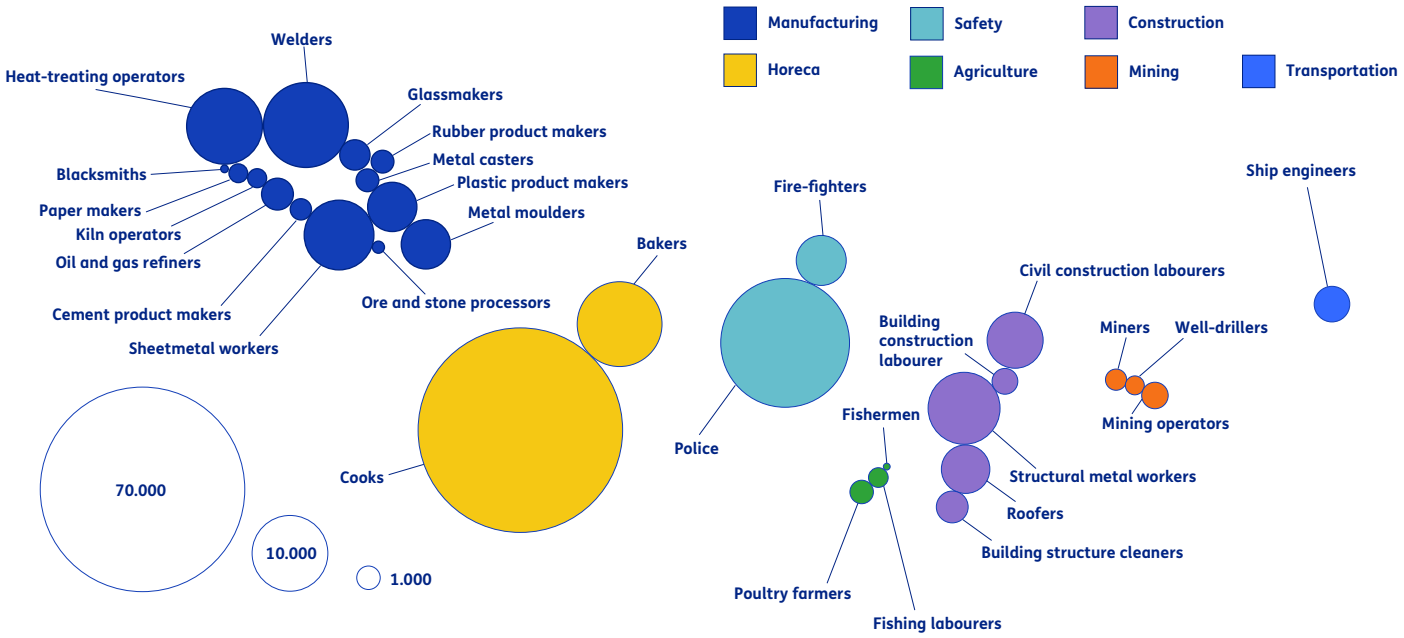



Figure 2 shows the number of workers in the 30 most heat-affected occupations in 2023. Each circle represents one occupation; the color indicates the sector. The larger the circle, the more workers in that occupation.

The largest circle represents approximately 70,000 employees, the smallest approximately 1,000. Occupations in the horeca, manufacturing, and safety sectors, such as cooks, police officers, bakers, and welders, have a particularly high number of workers that experience heat stress.

**Figure 3: Total hours of heat stress per year.**

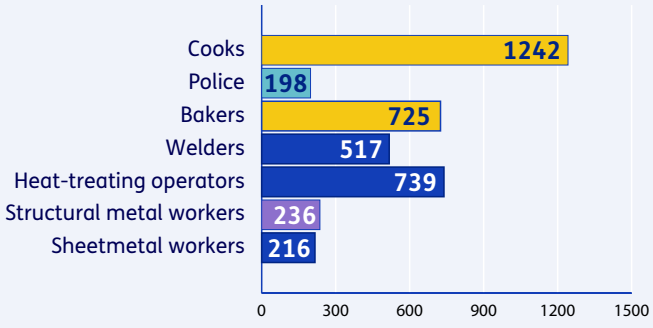



Figure 3 shows the total annual hours of heat stress per worker for heat-affected occupations with the most workers. Cooks experience the highest number of hours of heat stress, followed by bakers, welders, and heat-treating operators. These occupations involve frequent use of man-made local heat sources. When man-made heat sources are used less often, or when heat stress mainly comes from weather conditions (as in outdoor occupations), the total hours of heat stress is lower.

These results reflect the general conditions for each occupation. Differences between specific work situations within the same occupation were not taken into account.

## Weather conditions

Weather plays an important role in heat stress. High outdoor temperatures, high humidity, strong sunlight, and little wind make it harder for the body to cool down. This is especially challenging for people working outdoors without shade or in buildings without cooling.

## Climate change and future heat stress

Weather conditions are currently involved in 43% of jobs with heat stress, usually less than man-made heat sources. With climate change, this proportion will grow: With climate change, the frequency and intensity of heat waves will increase.

## Heat stress at work: a preventable risk

Heat exposure at work can often be prevented. Taking timely measures can reduce health problems. For instance by providing shade or ventilation at the workplace, by adjusting work hours or adding extra breaks, or by wearing light clothing and drinking enough water. Employers are responsible for adapting working conditions during hot weather. Good planning and clear information are key to preventing overheating and exhaustion.

## Heat strength and heat fit: how we know when heat is a problem and for whom

Heat strength and heat fit were developed by KNMI, TNO, RIVM, and VU.

Heat strength is an index that summarizes how much heat someone is exposed to at work. It doesn't just look at temperature—it also considers humidity, radiant heat, and wind, because these affect how easily your body can cool down.

Heat fit shows how well a person can handle heat. This depends on five factors:

- The physical activity levels: how heavy the work is.
- Clothing: what kind of clothing is worn.
- How much the environment can be adjusted (such as adding shade or ventilation).
- Personal factors such as health, age, and fitness
- Acclimatization: whether someone is used to working in the heat. People who work in the heat regularly can handle it better

## Heat stress prevention: A sector-specific approach

Heat strength and heat fit help identify the causes of heat stress at work and provide perspectives for action. Because working conditions differ between industries and companies, effective solutions need to be tailored to each sector or workplace.

Need help or advice on creating practical and effective heat management plans? We're happy to assist! Contact via jody.schinkel@tno.nl.

* All results are based on average weather data from Copernicus for years between 2020 and 2023 and workforce data from National Employment Survey from year 2023. To calculate heat stress for each job, we combined weather conditions with workplace factors like local heat sources, physical activity, and clothing.

Experts in occupational hygiene estimated the average working conditions for each occupation through dedicated sessions.

To calculate exposure time, we assumed 1,840 working hours per year (230 workdays). We also assumed that workers are not acclimatized to heat, which might not be true for people who work near heat sources all year.

The method to determine heat stress at work is based on ISO standards (7243, 8996 & 9920) and was developed in the projects EU EPHOR (874703) and EU INTERCAMBIO (101137149)