

10 20



# IMPROVE ANY SPACE BY STARTING WITH THE FLOOR

**How the design of the workplace**  
influences well-being and productivity



## PRODUCTIVITY AT WORK IS INFLUENCED BY VARIOUS FACTORS

---

### FACT

A suitable look and feel contributes to pleasure at work.

**A wrong working environment can negatively influence our productivity, health and sense of well-being.** While there is overwhelming evidence for this, we are not always fully aware of its importance as a society. This white paper therefore looks at the role played by the office building – and particularly the floor – in our physical and mental well-being. How do we feel about a space? What makes it a nice place to work, in which you put your best foot forward? What are the main problems in terms of design and the choice of a floor? A look at the facts.



## ABSENTEEISM CAN BE INFLUENCED

### FACT

Better acoustics results in less absenteeism.

**In the Netherlands, 3.3 million employees take sick leave each year. That translates as 47% of all employees and 4% of all days to be worked. It costs employers 11.5 billion euros per year.**

What is more, personnel costs including salaries and benefit payments account for approximately 90% of operational costs, which explains why many companies work hard at a healthy and happy complement of personnel. And that this is part of policy for the majority of employers, also due to other reasons such as philanthropy or idealism. Relatively minor measures can have a major effect on this absenteeism, according to research and this white paper.

Let us have a look at what influences users in and around the office. Where possible, we shall take a closer look at flooring in the working environment.





## AIR QUALITY WORKING ENVIRONMENT

---

**FACT** Productivity is boosted in rooms with healthy air.

One of the main problems in any working environment is the poor air quality. While polluted air is hardly visible with the naked eye, air quality does greatly influence the well-being and productivity of office staff. Poor air quality can even result in respiratory illnesses and other diseases. It is especially caused by poor ventilation and the evaporation of volatile organic compounds (VOC emissions) from furniture and floors, cleaning detergents and building materials, for example.

There has been extensive research into air quality and its effects on health, well-being and productivity. The 2003 study titled Linking Energy to Health and Productivity in the Built Environment shows the relationship

between improved air quality and increased ventilation, direct introduction of fresh air at workplaces and reduced levels of permitted substances, versus productivity increases of up to 11%. Meta analysis from 24 studies in 2006 demonstrated that poor air quality in a working environment can lower productivity by as much as 10%. There is no maximum volume of fresh air, but if the fresh air supply drops below 30 to 40 m<sup>3</sup>/h per person, the risk of odour problems and health disorders (sick building syndrome) increases significantly.



## SOLUTION AIR QUALITY

---

**FACT** Good ventilation can help increase productivity.

Many experts are of the opinion that the combination of a climate control system and natural ventilation is the best solution, as it provides an optimum balance between energy consumption and quality of the climate and air quality. The ceiling height in offices also plays a role: the higher the ceiling, the more room there is for so-called air stratification (various temperature layers). This results in effective natural air displacement and allows more opportunity for air intake. Extensive analysis by the Carnegie Mellon University showed that natural ventilation or a multi-modal system could reduce health-care costs by 0.8 to 1.3% and increase productivity by 3 to 18% while at the same time

achieving a 47 to 79% saving in the climate control system at an ROI of at least 120%.

An effective method of solving another part of this problem is to tackle it at source, as in the case of printers and copiers, while also precluding materials which have high emissions of volatile organic compounds (VOCs). Do you want to remove pollutants from the air? An office with plants and flowing water is an option, as these two features extract a certain degree of pollutants from the air.



## **PARTICULATE POLLUTION** AND THE OFFICE FLOOR

### **FACT**

Fresh air keeps employees healthy.

So how does that translate into flooring in the office? Let's start with the effect on hard floors. Marmoleum is produced from exclusively natural raw materials and does not contain any phthalate softening agents, which are harmful for people and the planet. On the other hand, Marmoleum offers natural protection against bacteria, which would apparently make it the ideal floor for a clean working environment. The Forbo Flooring vinyl floors are free from phthalates and therefore from harmful emissions. As far as carpet is concerned, the fibres can trap particulate pollution, and the degree to which they do so depends on the density, thickness of the fibres and their structure.

A subject of discussion in the flooring world is whether there is a relationship between the volume of particulate pollution indoors and the type of flooring. Two scientists have researched this issue independently of each other: scientific journalist Dr. Anton Duisterwinkel and TNO staff member Dr. Jan Duyzer. The exposure to particulate pollution in the air is a complex subject, and is only partially solved by ventilating offices, due to the intake air not always being equally clean. The research studied whether the type of flooring

chosen in an office can play a role in reducing the volume of particulate pollution indoors. Does textile flooring retain particulate pollution more effectively than a smooth floor? And does it matter how and how often the floor is cleaned?

Anton Duisterwinkel is a scientific journalist specialised in hygiene matters, who has undertaken much research into the relationship between cleaning and particulate pollution, on behalf of the VSR Association for Cleaning Research. The volume of particulate pollution in the air changes continuously. Duisterwinkel: 'If you measure the particulate concentration in an empty office, you will find only minor pollution in the air. And this concentration increases once the office staff arrive. The more mobile the users, the higher the concentration due to it floating up.'

TNO researcher Jan Duyzer has conducted introductory desk research into the dust-binding properties of textile flooring. The TNO study confirms the dust-binding properties of textile flooring, though the study does not answer the question of what exactly this means in practice. The Duyzer report states: 'It has not been ascertained to what degree the reduced floating and increased binding results in less exposure of people to allergens and particulate pollution.' Duyzer explains: 'There are too many factors involved which we have not studied, and we therefore lack a comprehensive picture. It would be very expensive to research that effectively.'

Anton Duisterwinkel has also studied the healthy and effective cleaning of floors. 'Any floor can be equally good or bad for the air quality, depending on maintenance aspects. Hard flooring can be more easily and effectively cleaned than textile flooring, but you do need to do so correctly. Hard flooring should not be vacuumed, as this will cause more dust floating than you are actually removing. The best way to remove dust and particulate pollution from hard floors is to use a wiper and dust-binding cloths. Textile flooring can only be vacuumed, on the other hand'

Duisterwinkel is unwilling to compare a hard floor with a textile floor, as comparative measurements are almost impossible. 'I therefore find it very risky to make a claim regarding your product, as was recently the case, that it greatly reduces the concentration of particulate pollution in the air in comparison with other types of flooring', is the conclusion given by Duisterwinkel.



# POOR ACOUSTICS IN A WORKING ENVIRONMENT REDUCES PRODUCTIVITY

**FACT** Pleasant acoustics means happier employees

Studies have shown poor acoustics to be the main annoyance factor in an office environment and to have the strongest relationship to loss of productivity. Privacy and the possibility to concentrate remain important factors for employees. A pleasant acoustic climate is essential in order to limit physical health problems and employee absenteeism as much as possible. Ideally speaking, the (acoustic) design of an office environment is in keeping with the activities of its users. It is worth paying attention to sustainable acoustic design solutions as they can safeguard the productivity and health of employees. In the longer term, this can prevent the high costs of absenteeism of employees or productivity losses.

The floor plays an important role in office acoustics. At Forbo's request, the Peutz research agency tested the acoustic quality of various hard and soft floors. There was attention not only for the sound absorption of the floor finishing, but also the improvement of contact sound insulation, focused on walking noise. The study showed the use of Granit needlefelt, Budget carpet or Helix



carpet tiles to contribute considerably to total sound absorption. The use of Flotex and Forbo carpet reduced walking noise in a neighbouring room by up to two classes (10 dB). Hard floors scored less impressive results of course, though Marmoleum was more effective than wood and stone, for example. Nowadays, special backing materials are produced for flooring, known as soft backs, which perform spectacularly in terms of acoustics. Forbo supplies soft back floors which can absorb up to 28 dB of noise, for example.





## OFFICE TEMPERATURE

---

**FACT** An agreeable temperature improves concentration.

Beside air quality, the floor and acoustics, temperature also plays a role in productivity at work. When an office is 15°C, the circulation to your fingers is reduced and you do not type as quickly. If it is relatively warm on the other hand, you will begin to experience problems with the internal cooling of your brain, resulting in you thinking less alertly. The perception of thermal comfort also has an important impact on workplace satisfaction and productivity. The way in which people perceive their thermal internal climate is not

only dependent on the air and radiation temperature, but also on their expectations and ability to control this. Our perception of thermal comfort directly influences our productivity. Successes have been booked with sunscreens, a cooling system, but especially also measures to promote individual controllability. Think in terms of windows which can be opened and/or adjustable ventilation grills, the installation of thermostatic controls (in each room) or the introduction of a relatively liberal clothing protocol at work.



## DAYLIGHT AND LIGHTING IN THE OFFICE

---

**FACT** Eyes are more relaxed in sufficient daylight.

It will come as no surprise that daylight and lighting are also factors which influence productivity at work. While it is physically simple to determine the light concentration in a workspace, there is an initially weak relationship between light concentration and productivity. Loss of productivity does not occur until lighting levels drop significantly below 300 lux. As far as floors are concerned, the so-called LRVs (light reflection values) are important. Most manufacturers such as Forbo supply such information along with their floors. By choosing wisely, you are not only ensuring sufficient light but also saving on lighting.

Problems with lighting are relatively subjective but above a certain limit will lead to drastic loss of productivity with direct financial consequences. Annoying reflections in a computer screen or the contrasts around a viewed task can result in losses of tens of percent. Nowadays, a camera with special analysis software allows effective quantification of the degree of lighting problems. Under certain circumstances, strongly reflective floors should not be installed in an office as they may give troublesome reflections.

# HOLISTIC

## FACT

A comfortable workplace is an effective workplace.

Studies also show that the interior of a working environment can influence people's concentration, cooperation, privacy and creativity, which directly affects the health, mental well-being and cognitive performance of employees. With this in mind, it would seem important to design buildings from a holistic point of view, which means that the total picture of the office makes sense; it is not only about working. Efforts are made to reach a complete state of physical, mental and social well-being, rather than simply preventing illness or disorders.

The following are worth a mention in that sense: give employees ownership, i.e. allow them to exercise their own influence on their working environment. Flexible furniture, various workplace typologies, control of the interior climate at work and personalisation of their working environment – an own mat under the desk and working in stockings feet – can give employees a sense of empowerment and autonomy. There are strong scientific indications that ownership has a positive influence on productivity, motivation, group cohesion and satisfaction at work.

Solidarity has also been shown to be significant for productivity at work. An environment which facilitates intimate personal conversations and mutually pleasurable activities makes people feel more under-



stood and valued, and results in a strong feeling of solidarity. Informal breakout areas, where employees can relax, socialise and spontaneously exchange ideas, result in extra relaxation and more productivity on the work floor.





## OFFICE IMAGE

---

**FACT** Employees who are proud of their workplace are more productive.

The look and feel of an office can have a positive influence and can contribute to our sense of well-being, comfort and effectiveness in a working environment. Diversity in the use of colours and materials seems to be important, though unlike other subjects in this white paper, we cannot claim to have conducted any real amount of qualitative research into the importance of the look and feel. There are assumptions based on the idea of an instinctive reaction to our environs and the colour theory. Red stands for attraction for example, and green for activity (while this colour also reminds us of the presence of water and life), blue signifies clarity, yellow reflects riches and white stands for spaciousness. We also tend to choose round and soft

shapes rather than sharp and hard shapes, due to the sense of danger suggested by the latter.

These assumptions are in stark contrast to other studies conducted into diversity and the role played by gender, age, cultural background and religion in the perception of the working environment. One group may perceive a certain factor as being unpleasant, while it is considered very agreeable by another group. Individual perceptions are of course extremely subjective but there is no doubt that the look and feel of a working space influences its users and visitors.





## EXERCISE AT WORK

### FACT

At least 30 minutes' exercise per day helps keep people healthy.

Exercise has a positive effect on the cognitive capacities, general health and mood of people. Certain elements can spontaneously 'tempt' employees to become more mobile on the work floor, such as standing tables, walking routes, a garden, table football or visually attractive staircases. Walking routes to printers, coffee machines and pigeon-holes, etc., can be combined with stimulating (visual or interactive) experiences, which make employees inquisitive and motivate them to move around more often. A gym, changing rooms, showers and bike sheds can also meet the needs of employees with a sporty lifestyle.



## RELAXATION AT THE OFFICE

---

**FACT** Views of greenery promote relaxed working.

Although relaxation between working tasks has been demonstrated to have positive effects on the psychological well-being, physical health, cognition and productivity, it has been paid little attention in the workplace so far. A relaxing interior can be achieved, for example, by creating room for yoga and meditation or private reflection spots such as secluded corners or an open hearth. Moreover, power naps have extremely positive effects on the performance and health of employees.

According to the World Health Organisation, a healthy eating pattern can increase employee productivity by 20%. Healthy nutrition not only stimulates learning capacity but also reduces the risk of obesity and increases life expectancy.

The large majority of people believes in the relaxing effect of nature, and the same applies to natural and varying views. This approach is supported by results of a growing number of scientific studies, with hard proof. Healthcare is paying more and more attention to surrounding views and greenery, as well as more natural elements, thanks to the insight gained with healing environments. Studies in healthcare centres built on that basis have confirmed the positive effects on the physical and psychological well-being of patients and staff alike. This can be directly translated into a reduction in healthcare costs due to quicker healing and less absenteeism among staff.



## HEALTH IS A SPEARHEAD OF THE FORBO FLOORING POLICY

Forbo Flooring advocates the above aspects and has included individual health as a spearhead in its policy, research, products and services, upon introduction of its global Committed to the Health of One campaign. How can Forbo floors contribute even more to people's health in the urban environment now and in the future? An important factor is the influence exercised by a floor on the interior environment in the broadest sense of

the word. The new Forbo mission can be expressed in three sub-areas: health and safety, health and hygiene, and health and well-being. Furthermore, Forbo is involved in development of a BREEAM interior hallmark which not only looks at the building 'exterior' but also at its interior and other 'soft' factors mentioned earlier.

**Forbo Flooring B.V.**

P.O. Box 13  
1560 AA Krommenie  
The Netherlands  
Tel.: +31 75 647 74 77  
Fax: +31 75 647 77 01  
E-mail: [contact@forbo.com](mailto:contact@forbo.com)

**Follow us on**

---

