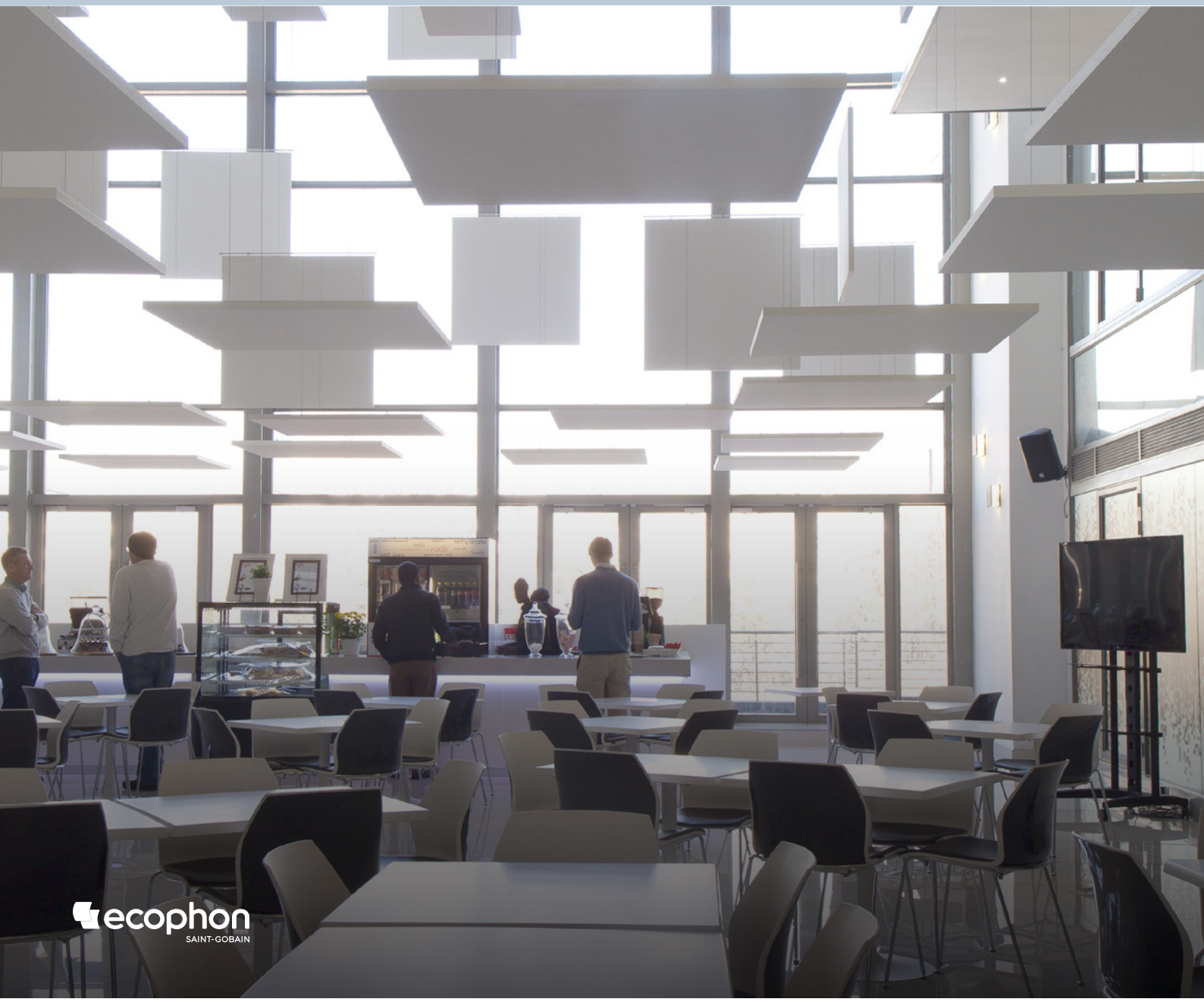
CEILINGS FOR HEALING

DESIGN AND SPECIFICATION GUIDE FOR HEALTHCARE SETTINGS



HIMMEL™ INTERIOR SYSTEMS | CSR

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INTRODUCTION

The world underwent a major transformation after the pandemic. The struggles of the healthcare and aged care sector were highlighted, particularly those of staff and vulnerable patients. As a result there is now a greater awareness of the link between environment design, health and sustainability.

Now, more than ever, there is an adherence to evidenced-based design principles for healthcare settings. Evidenced-based design is the process of basing design and construction decisions on scientific research to achieve optimal patient outcomes.

The goal of evidenced-based design is simple; through thoughtful design and material specification, it is possible to improve patient and staff wellbeing, patient healing, stress reduction, and safety. The key parameters to achieve this in a healthcare setting include thermal comfort, acoustics, air quality, daylighting, cleanliness and sustainability.

A well-designed ceiling system address all these parameters to create a positive healthcare environment. As we examine below, with the right specifications, ceilings can enhance the acoustic quality of a space, support infection control and cleaning measures, enhance natural light and add elements of sustainability to a healthcare building.

ACOUSTICS IN HEALTHCARE SPACES

There is a growing body of evidence illustrating the impact of acoustics on health outcomes. Research has shown that a good acoustic environment is beneficial to patients' therapeutic and healing process.[1] The opposite is true for poor acoustic environments. For example, it has been shown that the negative impacts of noise pollution on patients include sleep disturbances, and negative cardiovascular responses, wound healing, and pain management.[5] Poor acoustic quality may lead to patients withholding important information if they feel they can be overheard.[3]

The quality of care given may also decrease. In poor acoustic environments, there are reports of staff experiencing increased stress levels and fatigue, hearing loss at high noise levels, general annoyance, and an increased rate of job burnout.[2]

The use of acoustic ceiling tiles has been proven as an effective strategy for increasing sound quality within a healthcare setting. A recent Swedish study looked into the health impact of modifying room acoustics using acoustic ceilings. It was found that when sound-absorbing ceiling tiles were installed, pulse amplitudes were lower among coronary-care patients in the acute myocardial infarction groups and unstable angina pectoris groups as compared to patients in bad acoustical conditions.[3]

Ceilings with acoustic absorption properties will lessen echo and reverberation within a room thereby improving speech intelligibility and sound quality. The amount of absorption you will need depends on the background sound levels in the room.[4] Noise Reduction Coefficient (NRC) is the average rating of how much sound an acoustic product can absorb. The rating ranges from 0 to 1; an NRC of 0 means the product absorbs no sound while a product with an NRC rating of 1 absorbs all sound. Acoustic ceilings with high NRC ratings are better at absorbing sound.

Blocking sound from adjacent spaces is also important in healthcare spaces. The ceiling attenuation class (CAC) is a metric used to assess how well a ceiling system prevents the transmission of airborne sound between adjacent closed spaces that have a common air plenum. Better performance is indicated by a higher CAC rating. High CAC (30+) ceilings will aid in preventing sound from reverberating into adjacent spaces through the plenum.

HOW CEILINGS IMPACT INDOOR AIR QUALITY

Indoor air quality (IAQ) is the sum of all the characteristics of indoor air that have an impact on a person's health and wellbeing. It is beneficial to health, productivity, comfort, and mental clarity to have clean, ventilated, and well-managed indoor air. Some sources, such as building materials, furnishings and cleaning products, can release toxic substances and volatile organic compounds that can lead to irritation or more serious health complications in staff, patients and visitors. Patients with compromised immune systems are especially vulnerable.

There are several design strategies that can promote good IAQ. Building materials should be carefully selected so that they do not provide the right conditions or nourishment for harmful microorganisms or mould to grow and spread. Surfaces should be easy to clean without compromising their appearance or performance. Ceiling panels should be demountable for ease of cleaning and maintenance. In hygiene-critical spaces, proactive hygiene and anti-bacterial features may be required. Additionally, ceiling materials should not contain or emit harmful substances.

When specifying ceiling systems, hygiene classifications and certifications provide an indication of the best-performing products in terms of health and cleanliness. Below are some useful examples:

- Global GreenTag is a third party, green product rating and certification system. Global GreenTag certified products meet the strictest safety, health, and environmental performance standards in the world.
- ISO 14644-1 is the standard for constructing particle-controlled environments and covers the classification of air cleanliness in cleanrooms and associated controlled environments. This standard provides a classification table for the level of air cleanliness within a cleanroom by measuring the number and size of airborne particulates in a cubic metre of air. Ceilings tested under ISO 14644-1 are classified into ISO classes 1 to 8.
- In situations where there is a severe deterioration in the air quality in the space as a result of increased loads, the ceiling system must not absorb and re-transmit any contaminants. The decontamination class, according to NF S 90-351, is decided by the number of minutes it takes for 90 percent of the increased load to be broken down. Leading ceiling systems can achieve optimum values in less than five minutes (decontamination class CP (0.5) 5).
- The ability of ceiling materials to kill fungi and bacteria is determined by two testing standards: NF S 90-351 and ISO 22196. In the NF S 90-351 test, three different pathogens—Escherichia coli, Aspergillus niger, and Candida albicans—are used to contaminate the ceiling components. The decrease in germs on surfaces and in the air is then monitored at predetermined intervals. The maximum possible rating is M1, which would make the ceiling suitable for all risk areas.

IMPROVING NATURAL DAYLIGHTING

Natural light can have a positive impact of health outcomes. According to a study, patients who were close to a window had shorter stays than those who were close to a door.[5] Additionally, there are studies demonstrating a positive correlation between good lighting and reports of less distress and pain, the need for fewer painkillers and savings in total treatment costs.[6]

Green building rating systems, such as LEED (Leadership in Energy and Environmental Design), recognise the power of natural light. Lighting quality is one of the considerations in the determination of a LEED rating, which can be improved by the surface reflectance of the ceiling. Lighting and visual comfort are also considered in Green Star, the WELL Building Standard and BREEAM (Building Research Establishment Environmental Assessment Methodology).

How does this impact ceiling specification? The amount of light that is reflected off or absorbed by the surface of a ceiling is known as the light reflectance value (LRV). High light reflectance ceilings (generally LR 0.83 or greater) make work, healing, and educational environments brighter and more efficient. Additionally, they improve lighting efficiency by enabling fewer light fixtures, a lower electrical light output, lower maintenance costs, and a lower cooling load.

OPERATIONS AND MAINTENANCE

Balancing cost of operations with quality of care is always a challenge in the health and aged care sectors. Thoughtful specification of ceiling materials can help reduce operational costs by being easy to clean and durable, thus minimising maintenance and replacement requirements.

Ceilings need to be durable for longer periods to maintain visual continuity. In a healthcare setting, they need to endure regular cleaning and disinfecting. This may require materials with anti-bacterial and moisture and humidity resistance properties.

It is crucial that the ceiling tile you choose for a high-humidity area can withstand the moisture in the air. If an unsuitable tile is exposed to high humidity, it will absorb the moisture, grow heavy, and eventually sag or break.

Ceilings are frequently subjected to high moisture levels in healthcare facilities. Relative humidity (RH), the term used to describe moisture, is always influenced by the ambient temperature. Use of the appropriate ceiling products is critical for these application areas. The majority of indoor environments for regular occupancy are intended to be between 15 and 29°C and 40 and 70% RH. Conditions can occasionally go beyond these ranges due to modern building techniques and in specialised areas within buildings.

Ceilings for healthcare applications should be classified under EN 13964:2014 and state its suitability when exposed to varying RH. This European Standard covers, among other suspended ceiling characteristics, the requirements and test methods for durability of flexural tensile strength and load bearing capacity against moisture.

SUSTAINABILITY IN HEALTHCARE

While sustainable design may reduce environmental effects and operating expenses, it also goes a step further by fostering environments that are healing for patients, visitors and staff. Governments are increasingly recognising the connection between the health and wellbeing of Australians and a healthy environment. Accordingly, there are growing expectations for healthcare facilities and major redevelopments to achieve best practice in environmental sustainability.

As with other building elements, ceiling systems contribute to the sustainable design of healthcare interior environments. Designers and specifiers need to keep low carbon, energy, water and resource intensity in mind when selecting ceiling materials. Recycled content and recyclability of materials is another consideration, as is the end-of-life disposal of the ceiling at the end of its service life. To promote indoor air quality, non-toxic materials should be selected.

Certification by internationally recognised ecolabels is a good indicator of the sustainability credentials of the ceiling system. For example, ceiling products achieving GreenTag GreenRate Level A can contribute to Green Star points including acoustic comfort, lighting comfort, sustainable products, life cycle impacts and more.

TAKING A HOLISTIC APPROACH WITH CEILING DESIGN

Hospital and healthcare facilities require careful attention to design and material specification. Different areas have different performance needs, so choosing a ceiling with the appropriate performance, quality, durability, sustainability and aesthetics is essential in meeting the requirements of any given space.

CSR Himmel offers a complete range of ceiling systems to the Australian healthcare market. Their vision is to lead the market in the creation of productive and intelligent spaces by delivering superior acoustic and aesthetic interior solutions. Below we look how their products fit into high-performing, sustainable healthcare environments.

General hospital rooms and corridors

Healthcare corridors are busy and can be a source of unwanted noise. Ceilings designed for acoustics can help keep the space quiet while meeting healthcare requirements for hygiene.

OWA Sinfonia Privacy Humancare is a mineral fibre ceiling tile that offers premium acoustic properties and prevents the spread of bacteria, fungi, and germs. It is also effective in stopping the growth of MRSA pathogens.

Product properties
- 0.70 NRC and up to 41 CAC based on the plenum depth
- Achieves Hygiene Finish with Particle class ISO 4 (ISO 14644-1)
- RH 99
- 87% Light Reflectance
- Global Green Tag Level A Certified
- 100% Recyclable

Patient rooms

To create a peaceful space to recover, ceilings with high acoustic absorption and light reflectance are required. Due to patient turnover, and visits from staff and loved ones, ceilings should also enable easy and efficient cleaning and maintenance.

Ecophon Hygiene Meditec A is a sound absorbing ceiling system intended for environments where disinfection and cleaning is required on a regular basis.

Product Properties
- 0.80 NRC
- Particle class ISO 4 (ISO 14644-1)
- RH 95
- 84% Light Reflectance
- 100% Recyclable

Ecophon Hygiene Performance A is suitable for humid areas and withstands advanced cleaning, such as steam and high/low pressure washing on a regular basis.

Product Properties
- RH 95
- Particle class ISO 4 (ISO 14644-1)
- 84% Light Reflectance
- 100% Recyclable

Treatment and examination rooms

One of the goals in treatment and examination rooms is to improve communication between patients, doctors and staff. To do this, a high-performing acoustic ceiling is required that also meets elevated hygiene requirements to reduce the spread of disease.

OWA Humancare Pro offers outstanding acoustic performance with a disinfectable surface that makes routine cleaning processes and hygiene practices easy and efficient. This product provides a high level of protection for medical staff and patients thanks to its ISO 3 classification.

Product properties
- 0.95 NRC and 24 CAC
- Particle class ISO 3 (ISO 14644-1)
- 84% Light Reflectance
- RH 100
- Global Green Tag Level A Certified
- 100% Recyclable

Wet area rooms, rooms requiring wet cleaning and cleanrooms

Certain healthcare spaces, such as hydrotherapy rooms, can expose ceilings to high levels of moisture. It is important to choose a ceiling that is resistant to sag for such applications.

OWA Sinfonia RH+ Humancare is a mineral fibre ceiling that offers premium acoustics and prevents the spread of bacteria, fungi, and germs. Thanks to its special core, this product is stable in high humidity environments.

Product properties
- 0.80 NRC and 37 CAC
- Particle class ISO 5 (ISO 14644-1)
- 87% Light Reflectance
- RH 100
- Global Green Tag Level A Certified
- 100% Recyclable

There are growing expectations for healthcare facilities and major redevelopments to achieve best practice in environmental sustainability.

REFERENCES

1 Zhou, T, Y Wu, Q Meng and J Kang. “Influence of the Acoustic Environment in Hospital Wards on Patient Physiological and Psychological Indices.” Frontiers of Psychology, Vol. 11 (2020): 1600.

2 ScienceDaily. “Rise In Hospital Noise Poses Problems For Patients And Staff.” ScienceDaily. https://www.sciencedaily.com/releases/2005/11/051121101949.htm (accessed 22 October 2023).

3 Joseph, Anjali and Roger Ulrich. “Sound Control for Improved Outcomes in Healthcare Settings.” Center for Health Design. https://www.healthdesign.org/sites/default/files/Sound%20Control.pdf (accessed 22 October 2023).

4 There are several acoustic design guidelines that will help designers in this area. The Association of Australasian Acoustical Consultants publishes a Guideline for Healthcare Facilities (see https://aaac.org.au/Guidelines-&-Downloads) with detailed acoustic requirements for reducing internal noise, reverberation control, acoustic separation and more. The National Construction Code and AS/NZS 2107:2000 “Acoustics-Recommended design sound levels and reverberation times for building interiors” should also be considered.

5 Young Park, Man, Choul-Gyun Chai, Hae-Kyung Lee, Hani Moon and Jai Sung Noh. “The Effects of Natural Daylight on Length of Hospital Stay.” Environmental Health Insights, Vol. 12 (2018): 1178630218812817.

6 Walch, JM, BS Rabin, R Day, JN Williams, K Choi, JD Kang. “The effect of sunlight on post-operative analgesic medication usage: a prospective study of patients undergoing spinal surgery.” Psychosomatic Medicine, Vol. 67 (2005): 156–163.