Specifying Impact-Resistant Plasterboard for Commercial Applications

What, Where, When & How

GYPROCK® CSR

INTRODUCTION

Plasterboard is a widely-used construction material, providing options for sound insulation, fire performance, moisture resistance and mould resistance. Currently, a significant quantity of plasterboard is utilised as interior walls in challenging heavy-use environments despite its susceptibility to damage from human contact, moving furniture, and other objects. Once an internal wall has been compromised, the cost of repair and replacement can be high.

In high-traffic commercial spaces, a more robust solution is required. It is frequently more cost-effective to make a one-time investment in specially-designed and tested impact-resistant plasterboard than it is to continually maintain and repair standard plasterboard wall systems. Many jurisdictions are also adopting design standards and regulations that require the use of higher performing, multi-functional plasterboard that meets specific impact resistance criteria.

But what exactly is “impact-resistant” plasterboard, and what are the best ways to use it? In this whitepaper, we take a closer look at specifying impact-resistant plasterboard, including how such products are tested, potential applications and the relevant design and installation considerations.

BUILDING CODE REQUIREMENTS

The National Construction Code (NCC) requires greater levels of abuse and impact resistance in several critical areas (such as fire-resisting walls and lift shafts) to ensure the safety of the property and its occupants.

Specification C1.8 of the NCC 2019 (the equivalent of Specification 6 C6 in the NCC 2022, which is effective from 1 May 2023) describes structural tests to be applied to and criteria to be satisfied by a wall system of lightweight construction. These tests include:

- **Material tests** — The methods specified for the constituent materials of the construction of the standards adopted by reference in the NCC.
- **Resistance to static pressure** — The provisions for testing walls under transverse load in ASTM E72-15.
- **Resistance to impact** — The soft body impact test in ASTM E695-03.
- **Resistance to surface indentation** — The test for resistance to surface indentation, which involves a steel ball of 10mm diameter with a load of 150N placed on the surface of an undamaged test sample for five minutes, and the impression of the ball on the surface measured after it is removed.

To be compliant, the wall system or the specimen of it must fulfil the criteria in Clause 6 of Specification C1.8 (NCC 2022 Clause S6C11). For example, when it comes to surface indentation, no impression must be more than 5 mm in diameter.

ASTM C1629 PRODUCT TESTING & CLASSIFICATION

Leading products will have undergone impact resistance testing to confirm their ability to withstand impact damage. ASTM C1629 is the international technical standard that establishes four test methods to quantify the level of abuse and/or impact resistance of non-decorated interior plasterboard products.

- **Surface abrasion** — ASTM Test Method D4977;
- **Surface indentation** — ASTM Test Method D5420;
- **Soft body impact** — ASTM Test Method E695; and
- **Hard body impact** — ASTM Test Method Annex A1.

These tests provide a way of comparing the expected performance of different brands of impact-resistant plasterboard. Depending on the level of damage each sample endures under each testing method, the samples are categorised into one of three classification levels (1 to 3, with 3 being the best).

Table 1. Classifications for Abuse-Resistant and Impact-Resistant Panels (ASTM C1629)

Test Method	Level 1	Level 2	Level 3
Surface abrasion A sample is placed underneath a wire brush that is 11.3 kg in weight. The surface is then passed by the brush 50 times in a row. The resulting surface wear is measured to determine level of abrasion resistance.	Abraded depth (maximum): **3.2 mm**	Abraded depth (maximum): **1.5 mm**	Abraded depth (maximum): **0.3 mm**
Surface indentation The sample is struck with 12.6 J of force by a hemispherical die. To calculate the level of indentation resistance, the indentation's depth is measured.	Indentation depth (maximum): **3.8 mm**	Indentation depth (maximum): **2.5 mm**	Indentation depth (maximum): **1.3 mm**
Soft body impact A 27.2 kg leather bag is suspended on a rope and raised away angularly from a sample. The bag is raised in increments and released to impact the sample. The impact energy (based on bag weight and drop height) where structural failure occurs determines the level of impact resistance.	Minimum Impact Load (structural failure): **122 Joules (J)**	Minimum Impact Load (structural failure): **265 J**	Minimum Impact Load (structural failure): **408 J**
Hard body impact A sample is struck with a weighted swinging ram while being fixed vertically to a metal frame. The amount of weight is increased by 1.1 kg at a time. When penetration through the face into the frame cavity occurs, failure energy is calculated.	Minimum Impact Load (structural failure): **68 J**	Minimum Impact Load (structural failure): **136 J**	Minimum Impact Load (structural failure): **204 J**

WHAT IS IMPACT-RESISTANT PLASTERBOARD?

“Impact-resistant” plasterboard can be defined as products that achieve very high levels of resistance to soft and hard body impact and surface indentation. Under the testing methods established by ASTM C1629, these products have been proven to deliver exceptional results in the key performance areas.

This type of plasterboard is reinforced with materials that provide enhanced durability. It is manufactured with a layer of fibreglass mesh in addition to a dense, fibre-reinforced core and high grammage face paper. The reinforcing fibreglass mesh is incorporated into the panel’s core, at the back of the product, to provide added resistance to penetrations.

Impact-resistant plasterboard offers several architectural benefits due to its unique construction. Its superior strength and durability offers significant lifecycle efficiency by enhancing the ability of interior walls to withstand impacts and abuse. In addition, the installation process is simple, speedy, and cost-effective, resulting in reduced engineering demands, labor expenses, and shortened delivery schedules. When necessary, surface damage and even forceful impacts can be repaired quickly and effectively with common tools and methods.

Leading products in this category offer other special properties suited for specific construction applications. For example, the plasterboard core can be treated to resist water absorption and mould growth. Most solutions are also tested for fire performance to ensure they meet the fire safety requirements of the NCC. Some products offer enhanced acoustic properties for applications that require high levels of noise control and reduction, such as in education and healthcare.

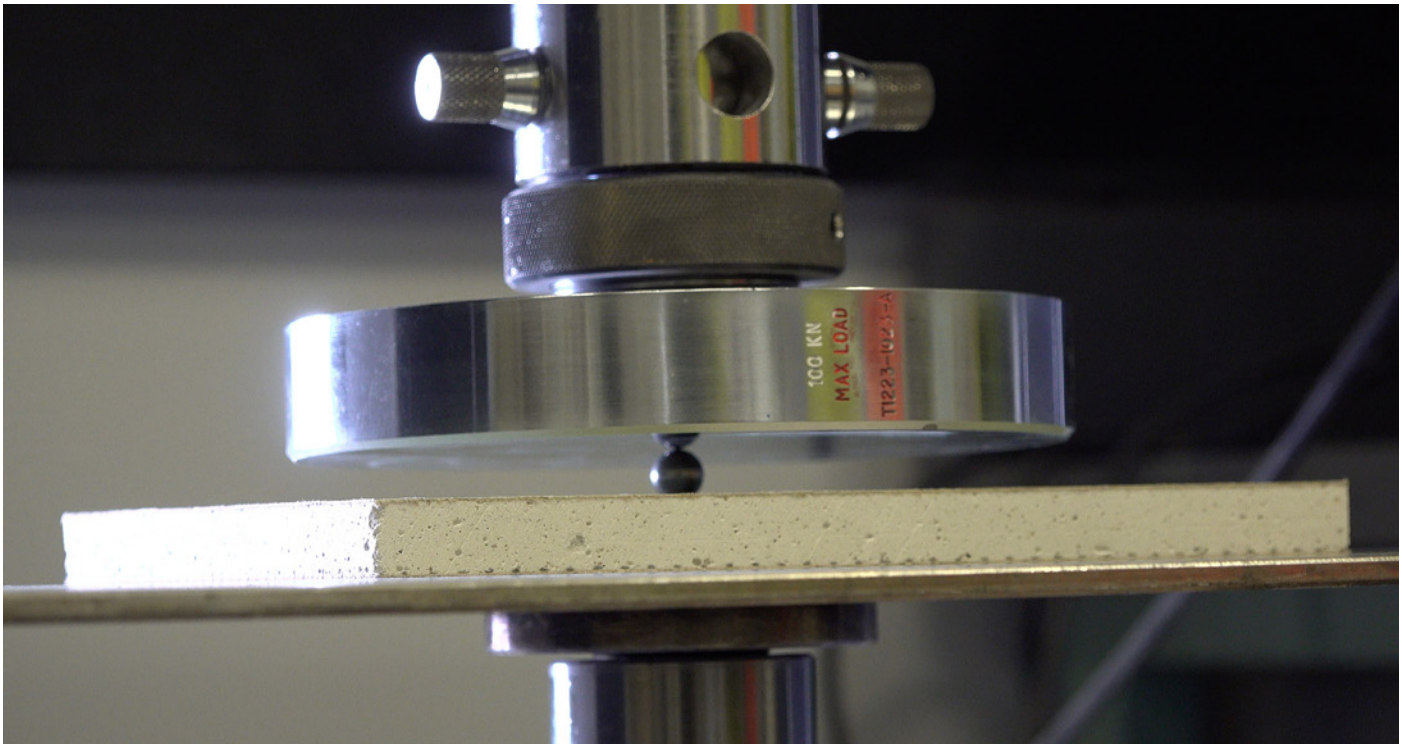
In high-traffic commercial spaces, it is frequently more cost-effective to make a one-time investment in specially-designed and tested impact-resistant plasterboard than it is to continually maintain and repair standard plasterboard wall systems.

WHERE IS IT COMMONLY USED?

There are high-traffic areas in all commercial and institutional buildings where people and objects move through regularly. Walls can be damaged by hard body impacts from a variety of sources, including shopping carts, hospital gurneys, sports in school gymnasiums, and luggage in hotel lobbies. Sports balls and bodies typically cause soft body impacts that apply pressure to a larger surface. The condition of the walls will rapidly deteriorate if the materials used are not more durable than the standard products specified for normal use.

Impact-resistant plasterboard is ideal for protecting walls from damage and penetration in such circumstances. Below are some of the areas in which this solution is recommended:

- hospital corridors, operating rooms, and patient rooms;
- psychiatric wards;
- server rooms or mechanical rooms;
- service corridors, back rooms and storage facilities;
- school classrooms, cafeterias, gymnasiums, and hallways;
- hallways and communal areas in dormitories;
- means of egress, such as stairwells and lift shafts; and
- industrial areas and other areas with heavy machinery, such as garages, warehouses, and loading docks.



DESIGN AND INSTALLATION CONSIDERATIONS

To specify the right product, the specifics of the installation environment and its intended use will need to be examined. This involves asking detailed questions about the space, such as how many people will be using the space, how frequently will it be used, what types of activities will be it be used for, will there be heavy furniture or equipment, and so on.

Because it is required by building codes and standards, certain applications will call for specific levels of impact resistance, moisture resistance and/or fire resistance. When assessing plasterboard products, check for relevant testing information, performance data and certifications across the relevant categories to ensure that the specified product will perform as expected.

Cost and maintenance will be a key factor for building owners. While impact-resistant plasterboard may cost more up front, the savings in repair and maintenance costs will outweigh the initial investment. There is no additional cost for installing impact-resistant plasterboard compared to similar non-resistant counterparts as they both have the same basic installation considerations.

Impact-resistant plasterboard can be cut, taped, finished and decorated in much the same way as regular plasterboard, though it might require a sharper knife and a little more work to “score and snap”. It is, however, important to specify the correct studs for the product you are using. Due to the density and hardness of impact-resistant plasterboard, it takes more force for screws to pierce these boards, which increases the risk of spinout when using thinner gauge studs. Consult with your supplier if there is any doubt.

SUSTAINABILITY

When evaluating the sustainability of plasterboard products, a number of factors should be considered, including their lifespan, embodied emissions, lifecycle energy consumption, resource use, and recycling potential. Properties such as high recycled content and low volatile organic compounds are common indicators of sustainable plasterboard products, provided such claims are backed by independent testing and certification. One prominent example of green certification is the GECA (Good Environmental Choice Australia) ecolabel.

In any case, impact-resistant plasterboard contributes to green building by virtue of its high durability. The connection is clear: a structure with a longer lifespan is, by extension, more sustainable. Furthermore, a durable building is one that requires less energy and resources to maintain and repair.

INTRODUCING EC08™ EXTREME

CSR Gyprock's most impact-resistant plasterboard

Since the introduction of Green Building standards, Gyprock has led the Australian plasterboard market with the EC08™ range of plasterboards. Along with performance attributes designed for the needs of the Australian building industry, all boards in the EC08™ range contain high levels of recycled content and are manufactured to AS/NZS 2588 – Gypsum Plasterboard.

The newest addition to the EC08™ range, Gyprock EC08™ Extreme is an Australian made, GECA certified, multi-function plasterboard with the highest level of specifications. It has been engineered and tested to meet the highest standards across a broad range of performance requirements, but with a focus on superior impact resistance in three key areas: hard body impact, soft body impact and surface indentation.

This low-VOC board is manufactured with a layer of fibreglass mesh in addition to a dense, fibre-reinforced core and high grammage face paper, which means EC08™ Extreme walls offer extreme resistance to damage of all types and stay looking newer for longer. This can result in a reduction of regular and unplanned maintenance, saving ongoing operational costs to the building.

In addition to reducing damage from hard and soft body impact, and surface indentation, EC08™ Extreme is mould and moisture resistant, and features a high level of recycled content. With the added benefit of fire and acoustic ratings, EC08™ Extreme delivers on all fronts while still retaining all the proven benefits and ease of handling with Gyprock™ Plasterboard that the Australian construction industry expects.

EC08 Extreme is easily identified by its green-coloured face paper.

Tested impact performance

Thorough testing is undertaken and independently witnessed here in Australia to ensure proven performance.
A series of comparative tests were conducted on EC08™ Extreme at Gyprock's research facility to the following local and international standards:

- ASTM C1629/C1629M-18 (hard body)
- ASTM E695-03 (soft body)
- NCC 2022 S6C10 [NCC 2019: C1.8:5] (surface indentation)

Hard body impact

EC08™ Extreme 13mm is the best performer in the EC08 range in a set of comparative hard body impact tests where a weighted hammer strikes the board, in accordance with ASTM C1629/C1629M-18. In testing, 114.3 joules of energy was required to damage the board, which is equivalent to a golf ball travelling at over 250 km/hr.

Soft body impact

EC08™ Extreme 13mm meets the requirement of NCC 2022 Clause S6C10(c) (see NCC 2019, C1.8, Clause 5(c)). To verify this a weighted sandbag is swung into the board and the deflection of the board is measured, in accordance with ASTM E695-03. In comparative testing conducted EC08™ Extreme was CSR Gyprock's best performing plasterboard for soft body impact.

Surface Indentation

EC08™ Extreme 13mm meets the requirements of NCC 2022 Clause S6C10(d) (see NCC 2019, C1.8, Clause 5(d)). This requires no more than a 5 mm diameter impression when tested. EC08 Extreme measured 3.42 mm when tested, which was the best result achieved in CSR Gyprock's plasterboard range.

“Impact-resistant” plasterboard can be defined as products that achieve very high levels of resistance to soft and hard body impact and surface indentation. Under the testing methods established by ASTM C1629, these products have been proven to deliver exceptional results in the key performance areas.

All information provided correct as of May 2023

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