



CHARTEK

PRODUCT TECHNICAL STATEMENT

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STATEMENT VERSION Version 2.0 (10-05-2022)

PRODUCT NAME CHARTEK Charred Finish (Shou Sugi Ban)

PRODUCT DESCRIPTION Timber weatherboard with show faces finished with a wood preserving technique, created by charring with fire.

PURPOSE AND USE Suitable for internal or external cladding of any residential, commercial or industrial building where timber cladding systems are utilised.

VISUAL INSPECTIONS

The appearance of this product through its life will be dependent on the degree of maintenance. Time can be allowed to age the timber naturally, otherwise known as patina or these effects can be significantly slowed with a pragmatic maintenance schedule.

Preserving the char

Some people decide they want the product to remain looking like it did when new. Chartek has developed a method to slow the effects of aging by applying a hardening oil which is absorbed through the depth of the char and into the timber. This is a natural oil which sets hard, locking it all together. A natural charcoal stain can be included in this oil to refresh any fading of the charcoal over time.



New Charred



Old, but preserved

Patina

This product can be charred, installed on a house and left to age naturally (patina). In this condition it will change and evolve over time. It will fade, pockmark and the charcoal lugs will eventually fall off leaving a mellow chocolate hew. In conditions with high UV light, this will continue to fade and bleach. Some people celebrate this patina and embrace the changing colours and imperfections which come with the age of this product. This earthy, organic effect creates a beautiful juxtaposition with clean, precise modern materials like glass and steel.



Old Patina



Very Old Patina

MAINTENANCE REQUIREMENTS

Charred timber requires significantly less maintenance when compared with standard timber. This may be as simple as a light wash down to remove dust when required.

Maintenance schedules will vary depending on the environmental conditions at each unique build site and depending on the visual expectations each customer has for their product (refer to visual expectations above).

Chartek oil can be re-applied when required to maintain the visual characteristics of the charred timber. Current testing in a "worst case scenario" indicates that re-application of oil should not be required within 5 years and shows promising potential to last much longer.

CONDITIONS & LIMITATIONS

Timber should be profiled with grain orientation concave to the show face (charred surface on pith side – refer to figure 1). This significantly reduces the likelihood of grain sections popping off, leaving small uncharred areas exposed. These would still be oiled (maintaining the required durability) but present a visual imperfection.

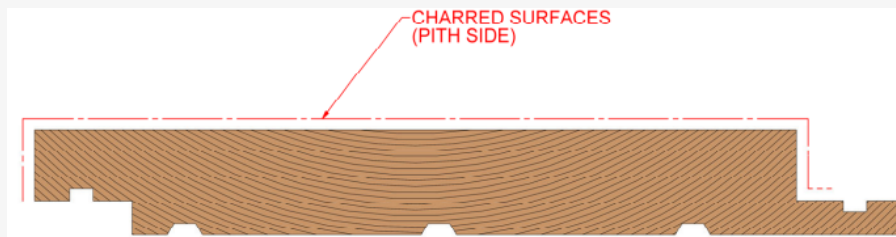


Figure 1: Required Profile and grain orientation

Profile geometry should be selected to align with the limitations illustrated in figure 2.

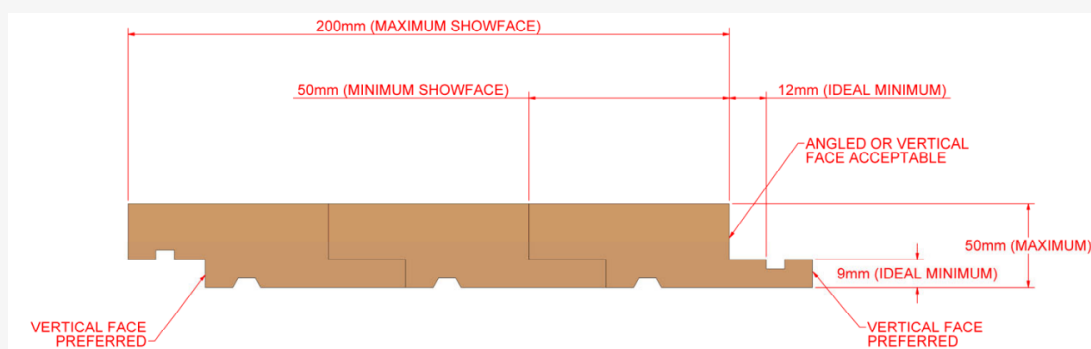


Figure 2: Profile Limitations

Selected weatherboard must be part of an approved cladding system and therefore must comply with the required variables of the selected system. For example - timber species, treatment process (if required) and geometric tolerances (profile and length dimensions, flatness and straightness).

Cladding must be installed according to the timber supplier's installation manual. Please also refer to our Handling and Installation guide

COMPLIANCE WITH NZ BUILDING CODE

The surface treatment of approved timber cladding by thermal modification is considered an alternative solution which complies with the NZ building code.

Approved cladding systems are utilised without compromising their performance, therefore a certificate of conformity from Codemark or Brandz is unnecessary. As this surface treatment is not covered by existing certification, this technical statement provides a pathway for compliance.

Relevant New Zealand Building code clauses:

Structure - B1.3.1, B1.3.2

Durability - B2.3.1 (b)

External Moisture – E2.3.2, E2.3.3, E2.3.5

Hazardous Building Materials - F2.3.1

This product complies with the required performance criteria for the following reasons:

ACCEPTABLE SOLUTION - NO COMPROMISE

Only approved timber species, profiles, fastening systems and oils are used. Profile geometry and integrity are preserved with a specialised process and protection mechanism. Oil is applied to all surfaces of the product immediately after surface treatment. The product is hot when oil is applied to ensure adequate penetration. The specialised process and mechanism which have been developed to apply this surface treatment does not accentuate cupping. The specified grain orientation (charring the pith side) ensures that any cupping after installation due to further water evaporation (drying) will move in a direction which will maintain profile tip contact with the mounting surface (growth rings try to straighten when they dry). To remove the unlikely potential of moisture ingress from the rear, all faces of the Chartek profile are oiled.

INCREASED DURABILITY – MAIN INFLUENCING CHARACTERISTICS

The thermal modification process has been substantiated to increase the durability of timber. This will improve the performance of any currently acceptable solution. The following aspects represent the main contributing factors to this increased durability.

Surface thermal modification

Thermal modification of wood changes its structure into a more durable form. This is characterized by decreased moisture sorption and, consequently, increased dimensional stability and resistance to biological degradation. The micro structure of wood is made up of a lattice of material called lignin which supports a soft cellulose material within its structure. Lignin is a natural polymer which is resistant to rot and indigestible for bugs and insects, while cellulose is a sugar, which is both digestible and susceptible to rotting. When a timber surface is subjected to flame, the pyrolysis zone is thermally modified. The cellulose is degraded, leaving the hard lignin exposed to the surface and providing a reduction in hygroscopicity.

Barrier formed by charcoal layer

Charcoal is more hydrophobic than timber, but porous. This means that water can be held within the porous macrostructure but will not penetrate the microstructure of the charcoal. We can conclude from this that charcoal is able to evacuate and dispel moisture quickly.

Oiling of charcoal barrier

A hardening oil can be applied which soaks through the full depth of the charcoal and into the timber surface, then hardens and sets (this is a natural resin). Oil fills the porous cavities of the charcoal and sets, thus removing the ability to hold water at all (water proof). The hardening oil sets the charcoal lugs in place, locking in any friable particulates and creating a more durable charcoal layer which doesn't rub off on clothing.

FIRE RESISTANCE

The NZ standards authority haven't formally tested and validated the fire resistance of charred wood; however, the Japanese developed this technology to protect their valuables by reducing the likelihood of their store houses catching fire.

When evaluating building materials for fire safety, factors including ignition temperature and flame-spread are considered. Considering these factors relative to the performance of charred timber, the following observations can be made;

- Charcoal has a lower ignition temperature than standard timber but has a higher resistance to ignition from low density energy sources (eg. sparks, which have a high temperature, but a low energy density). This is what makes charcoal inherently difficult to ignite.
- Charred timber has a lower flame propagation rate than most timber species and has been certified in the United States to achieve a Class B flame spread rating. Tested to ASTM E84-15 Standard Test Method for Surface Burning Characteristics of Building Materials.

SUPPORTING RESEARCH

The most recent and relevant research publication;

Title: "Sorption-Related Characteristics of Surface Charred Spruce Wood"

Date: 24th October 2018

Research by: Aalto University Finland, South-Eastern Finland University of Applied Sciences, Mendel University Czech Republic.

Citation: Kymäläinen, M., Turunen, H., Čermák, P., Hautamäki, S., & Rautkari, L. (2018) Sorption-Related Characteristics of Surface Charred Spruce Wood. *Materials (Basel, Switzerland)*, 11(11), 2083. doi:10.3390/ma11112083

Link: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6266808/>

Note: This International study is very relevant for validating charred timber's compliance with the performance criteria of the New Zealand building code. This research substantiates the fundamental characteristics of timber when subjected to heat treatment. Acceptable timber species used in New Zealand present no exception and allow a parallel to be drawn.

IN-SERVICE HISTORY

The performance of this product has been substantiated with historic evidence. Preserving and finishing wood by charring with fire is an ancient technique which has been utilised by the Japanese for thousands of years. Many of the ancient Japanese castles, temples, houses and store houses have been preserved with Shou Sugi Ban and have stood for generations.

EXPERT EVIDENCE—THIRD PARTY REVIEW

"Charred Timber by CHARTEK is an advanced method in treatment for interior and exterior cladding. The benefits of charred timber from CHARTEK are numerous.

"Charred timber is created by cauterising the timber cell, which stops it reacting to atmospheric change and thereby stabilises its mobility. The charred finish will be durable and potentially maintenance free. The charred surface is sealed with a coat of natural oil stain. This charred surface is then rot, pest, weather, UV, and fire resistant, in addition to being aesthetically unique, striking, and beautiful.

"With an increase in requests for designs that incorporate a dark finish that will last, charred timber fits the bill perfectly."

Tricia Connolly (Chemist, Director)

Tricia is an industrial chemist for Mainland Paint & Printing Ink 2018 Limited, specialising in the development of products for timber protection and durability.