Understanding Bison Panel

Introduction

Bison Panel is a cement bonded particle board made out of 62% cement 28% wood. The wood used is of fast growing species like Eucalyptus and Casurina. Due to adoption of special manufacturing process, the panel acquires the strength, the durability of cement and easy workability of wood - a combination of qualities absent in other boards.

This multipurpose building board - a proven product in countries around the world is introduced in India by NCL with imported technology from Bison Werke of Germany.

Bison Panel conforms to IS 14276-1995

This manual contains general information and guidelines for understanding Bison Panel to get best results in its application.
## Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Density</strong></td>
<td>1250 Kgs/m³ average.</td>
</tr>
<tr>
<td><strong>Moisture content</strong></td>
<td>9% ± 3% at Factory Point.</td>
</tr>
<tr>
<td><strong>Modules of Elasticity (bending)</strong></td>
<td>3000 N/mm²</td>
</tr>
<tr>
<td><strong>Bending strength</strong></td>
<td>9N/mm²</td>
</tr>
<tr>
<td><strong>Transverse tensile strength (perpendicular to surface)</strong></td>
<td>0.4 N/mm²</td>
</tr>
<tr>
<td><strong>Compressive strength (perpendicular to surface)</strong></td>
<td>15 N/mm²</td>
</tr>
<tr>
<td><strong>Surface Alkalinity pH</strong></td>
<td>Between 11 and 13</td>
</tr>
<tr>
<td><strong>Nail holding power perpendicular to surface.</strong></td>
<td>205 Kgs</td>
</tr>
<tr>
<td><strong>Screw holding power perpendicular to surface</strong></td>
<td>312 Kgs</td>
</tr>
</tbody>
</table>
Fire Resistance

Bison Panel is highly fire resistant and has been classified as incombustible material in many countries around the globe.

Tested in accordance to BS 476, Fire test on building materials and structures - part 6, 7 classified it as class ‘O’ building board with class 1 surface spread of flame.

Bison Panel can be used for the construction of fire resisting building elements to satisfy the criteria of I.S.O. 834-1975 and I.S. 3809-1979 for 1/2 hour to 4 hours fire rating.

Weather Resistant

With cement constituting 62% of its composition the Bison Panel offers excellent resistance to weather. The board has been subjected to many cycles of soaking, freezing and heating without any sign of disintegration.

The board should generally be painted for external application to provide a weather seal.
Biological

Due to mineralisation of wood particles by cement, Bison Panel is resistant to termite and vermin attack. It does not support fungus growth. Even untreated samples exposed to contact with the ground surface for several years have shown no sign of rot or decay.

Sound Insulation

Air borne sound reduction varies between 30 and 37 dB for the frequency range 100-3150 HZ according to thickness of Bison Panel. When used in stud partitioning, a reduction of over 60 dB can be achieved with suitable construction.

<table>
<thead>
<tr>
<th>Thickness (mm)</th>
<th>6</th>
<th>8</th>
<th>10</th>
<th>12</th>
<th>16</th>
<th>20</th>
<th>30</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction (dB)</td>
<td>30</td>
<td>31</td>
<td>32</td>
<td>32</td>
<td>33</td>
<td>34</td>
<td>36</td>
<td>37</td>
</tr>
</tbody>
</table>
Chemically Stable

Bison Panel is produced by an irreversible process combining cement and wood particles into a chemically stable building material which maintains its strength with time and exposure to elements.

The board is unaffected by many dilute chemicals such as brines, bleaches, detergents and chlorine solutions.

Dimensionally Stable

Bison Panel has excellent dimensional stability in variable ambient temperatures and humidity conditions.

The swelling in thickness after 2 hours of immersion in water is 1% and after 24 hours immersion is only 1.5%.

Longitudinal and transverse swelling will be approximately 0.3% for change in relative humidity of air from 30% to 95% at 20 deg C.
Wood Workability

Bison Panel can be drilled, sawn and sanded with normal wood working tools.

For bulk volumes, the Bison Panel should be cut with Tungsten Carbide Tipped circular saw and drilled with high speed steel drill bits.

Bison Panel can be fixed using screws and nails. Pre-drilling a hole slightly smaller than the shank would be required.

Smooth Surface

Bison Panel is light grey in colour with a smooth finish. It can be decorated with minimum preparation. Bison Panel can be finished with Laminates, foils and paints using Alkaline resisting adhesives, primers and paints.
Durability

Due to dense monolithic structure, installations throughout the world show that even without sealing, the cement bonded particle board suffers insignificant deterioration when exposed to extreme climatic conditions. The board can withstand any temperatures from -40 to +90 deg. C.

Bison Panel contains no hazardous material like Asbestos or Formaldehyde. Its process dust is harmless. When sawing, cutting or drilling the board, the use of a dust mask is recommended as power tools in particular can produce fine nuisance dust.

Conditioning

At the factory, the boards are stored under controlled environmental conditions, so that they are delivered with a moisture content of 9%. On site they should therefore be stored dry within the area of application for a minimum of 24 hours. This will allow the material an acclimatisation period prior to fixing, to adjust to its working condition.
Sizes

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>2440 X 1220 mm (8’ X 4’)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3050 X 1220 mm (10’ X 4’)</td>
</tr>
<tr>
<td>Thickness</td>
<td>6, 8, 10, 12, 16, 20, 25, 30, 40 mm</td>
</tr>
<tr>
<td>Tolerance</td>
<td>6-10 mm ± 0.7 mm</td>
</tr>
<tr>
<td></td>
<td>12-16 mm ± 1 mm</td>
</tr>
<tr>
<td></td>
<td>20-40 mm ± 1.5 mm</td>
</tr>
<tr>
<td>Length/Width</td>
<td>± 5 mm</td>
</tr>
<tr>
<td>Squareness</td>
<td>2.5 mm on the width of the panel</td>
</tr>
</tbody>
</table>

Normal Packing

Weight - 2 tons (approx) per pallet.

<table>
<thead>
<tr>
<th>Thickness mm</th>
<th>No. of boards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2440 X 1220 mm (8’ X 4’)</td>
</tr>
<tr>
<td>6</td>
<td>80</td>
</tr>
<tr>
<td>8</td>
<td>60</td>
</tr>
<tr>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>12</td>
<td>40</td>
</tr>
<tr>
<td>16</td>
<td>30</td>
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<tr>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>30</td>
<td>17</td>
</tr>
<tr>
<td>40</td>
<td>13</td>
</tr>
</tbody>
</table>
Handling

Strapped pallets should preferably be handled by fork lifts. If crane is used, broad plastic or fabric slings may be used, but not chain slings which can break the edges of the boards.

Bison Panels should be carried one by one and in vertical position. They should not be laid down on their edges but always laid flat.

When moving single boards manually they must be carried on edge by 2 men.

Storage

When storing Bison Panel, they must be laid flat on levelled surface. If out side, they must be protected - top and sides with water proof sheeting. Panels must never be stored on edge or leaned upright.

Bison Panel should be stored under cover in dry surroundings. Supports should be placed at regular intervals and in sufficient numbers according to the panel length, to avoid any deformation.
Working with Bison Panel

Tools

Working with Bison Panel is like working with any other particle board - Fastening is done in the same way as any other boards. No special tools are required.

However for large volumes of cutting work, an electric power saw is recommended. A Power saw 1500 w - 4000 rpm with a blade of 250 mm dia provided with straight set teeth and tungsten carbide tips is ideal for use.

Similarly a hand held electric drill with high speed steel bits will be faster to work.
Fixing

Bison Panel can be fixed to timber or steel supports. Thin cold roll formed steel section in the form of studs and tracks are available in the market. They can be used with advantage for applications like partitions, false ceilings, floors etc.

The boards must be supported in all four edges and at intermediate positions at centres not exceeding 610 mm. The board joints should occur on the centre supports.

Rust proof fixings should be used for all external applications or when conditions of high humidity and dampness are expected.

Nails

Bison Panel upto 8mm thick can be nailed directly to timber supports with round wire nails. For boards over 8mm thick, a pilot hole of 0.8 times the nail diameter must be predrilled. The nail length should be approximately 3 times the thickness of the board.
Screws

Two types of screws will be available in the market - the wood screws and the Metal screws.

The wood screws are used for fixing Bison Panel to wooden supports. A prehole of 0.8 times the diameter of the screw shank shall be provided in the Panel before screwing. In case countersinking of head is necessary, slightly oversize hole can be drilled to required depth. The length of the screws shall be 2.5 to 3 times the thickness of the board.

Regarding metal screws, fully threaded self tapping type screws must be preferred. The size of the screws will be according to thickness of the board and the gauge of framing. Predrilling of the board is a must. The length of the screws shall be 2 to 2\(\frac{1}{2}\) times the thickness of the board.
Fixing Points

The recommended fixing distance between two fixing points around the perimeter is 200 to 300 mm. The fixing distance between two fixing points in the intermediate support is 300 to 600 mm.

The fixing point has to be 15 mm (Minimum) away from the edge of the board. Similarly the fixing point shall be 40 mm away from the corner of the board.

<table>
<thead>
<tr>
<th>Board thickness</th>
<th>Recommended edge distance A</th>
<th>Spacing of edge fixing B</th>
<th>Intermediate C</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 - 12 mm</td>
<td>12 - 15 mm</td>
<td>200 mm</td>
<td>400 mm</td>
</tr>
<tr>
<td>16 mm</td>
<td>20 mm</td>
<td>300 mm</td>
<td>500 mm</td>
</tr>
<tr>
<td>20 mm</td>
<td>20 mm</td>
<td>400 mm</td>
<td>600 mm</td>
</tr>
</tbody>
</table>
Screws for sideways

Whenever screws are to be driven through the thickness of the board, the following points shall be noted.

- Side screwing is not recommended for boards of 12 mm and below thickness.
- The diameter of the screw shank shall not be more than one fourth the thickness of the board.
- Screwing shall be done in the centre line of the thickness.
- A pilot hole shall be provided in the board.
- The depth of penetration into the board shall be $2^{1/2}$ be 3 times the thickness of the board.

Jointing

Bison Panel is subject to slight dimensional changes due to variations in temperatures and relative humidity of air. Provision should be made in the joint by allowing a gap of 2 to 3 mm. The gaps can be left as seams or sealed with cover strips as the case may be.
Binding

Bison Panel has an alkalinity pH value 11 to 13. So alkaline resistant glues or adhesives are to be used for binding the panel. Please refer to adhesive manufacturer’s specifications.

Painting

Bison Panel can be coated with any kind of paint including distempers, Acrylic resins, Acrylic emulsions, Epoxy systems, Polyurethanes and most other alkali resistant Paints. The board has to be given a primer coat with cement primer / wood primer before applying decorative paints.

All kinds of boards will show a tendency to warp when exposed to unequal conditions, i.e. when one face is effectively sealed and the other face is left free. To avoid this, the other face must also be treated with a coating of equivalent effect in order to balance the board against warping.

Painting should be done when the board is completely dry and atmospheric humidity is dry. Whenever the board is subjected to different humidity conditions, the absorption or release of moisture in the board is very slow. Hence a minimum of 48 hours will have to be allowed to attain moisture equilibrium in the board.

Painting is not recommended when the moisture in the board is more than 12%, particularly in case of impermeable paints.
Laminations

Bison Panel can be used for cold pressing or low temperature laminating. The surface of the board can take wood veneer, PVC, foils, melamine laminate and paper overlay etc. Prior to lamination, the board should be acclimatised for atleast 48 hours before providing decorative laminates. It should always be balanced by applying a compensating laminate on the other side. To control absorption of adhesive, the surface of the board may need to be primed with a dilution of the adhesive.

Tiling

Ceramic tiles can be fixed to Bison Panels with alkali resistant elastic tile adhesive. Refer to the tile adhesive manufacturer’s specifications. The tile joints will have to be provided with an alround gap of 2 mm and the gaps should be filled with an elastic sealent.
Partitions

The excellent qualities of fire resistance and acoustic insulation apart from natural resistance to weather, fungus, termite and vermin attack, makes the Bison Panel an ideal choice for partitions, in residential, commercial, industrial complexes and public buildings.

Bison Panel is an ideal material for many types of dry wall partitions including double skin, single skin, with steel and timber studs. These partitions are light in weight and economical.

Steel Studs

Steel stud partitions are very light and provide high values of fire resistance and sound insulation.

The basic system can be adopted to achieve up to 4 hours fire rating by the incorporation of thermal insulation materials and by providing various thicknesses of Bison Panel.
A typical partition wall is constructed by conventional stud and track method, which is known to most of the carpenters.

Galvanised steel studs (C section) 48 mm x 35 mm & 8 mm lip or 70 mm x 35 mm & 8 mm lip with suitable tracks (channel sections) are available in the market.

The tracks are fixed to the floor and ceiling by means of masonry nails or screws.

The vertical studs are cut to size and fitted (gripped) between the top and bottom tracks at 610 mm centres.

The length of the stud shall be 2 to 3 mm shorter to allow for expansion. When the partition is constructed between masonry walls, the starter stud and end studs will be fixed to the walls by screws spaced at 400mm centres. The Board is fixed on the studs with a gap of 2 to 3 mm to allow for expansion.
Openings

Openings required for doors and windows are marked on the studs and blockouts left while fixing the boards. Upon completion of board fixing, the doors and window frames are fixed with screws.

Board Fixing

The boards are cut slightly shorter than the overall floor to ceiling height. The board fixing is commenced from a fixed point with a full width board on the outside.

The board is fixed around the perimeter with self tapping self embedding screws fixed at 400mm centres duly maintaining minimum edge clearance.

The board is not fixed to intermediate studs until the boards on the other side have been fixed into place. This is to allow for adjustments to suit the width.
The process is continued till one side of the partition wall is complete. Wherever openings occur, the boards are cut to suit the frame of the opening. The installation of all services are completed at this stage.

Then the other side of the system is started with a board cut to half width. (This will ensure staggering of the vertical joints of inside and outside boards). Boards are fixed to the metal studs as previously described. The securing of the boards to the intermediate studs can now take place using recommended fixing centres.

**Services**

The vertical studs are normally provided with slots for running service lines.

When services are to be installed within the system, care is taken to ensure that fire resistance and sound insulation performance are not impaired.

**Jointing**

The grooves in the joints can either be painted neatly or covered with metal or plastic tee sections. In case flush joints are required, the following procedure is to be adopted using proprietary jointing compound.
Flush Joints

The board should be fixed with a ‘gap’ of 1-2 mm and in any case not exceeding 3 mm. Edges of the Bison Panel should be recessed to a width of 70 mm and a depth of 1.5 mm - 2.0 mm.

Ensure the moisture content of Bison Panel is within the stated specification of 9% ± 3% before jointing commences. Use only the Alltek jointing/scrim materials and proceed as follows:

1. Lightly sand cut edges of boards to remove wood flakes and other irregularities. Apply an oil based alkaline resistant primer to the recess and immediate surrounding, say 2-3” either side of surfaces of boards which are to be jointed. - Allow to dry.

2. Apply a thin layer of ‘Alltek flex’ to joint areas and embed a layer of the 65 mm wide ‘Jointing scrim’ by covering with a further layer of ‘Alltek flex’. Allow to dry for 24 hours. For better results leave it for 4 or 5 days.
3. Apply a full coat of ‘Alltek flex Fine’ to joint and level off in a manner to leave slightly ‘Proud’. Allow to dry for 24 hours and sand down to a flat smooth surface level with boards.

4. Nail and screw heads should be ‘spotted’ i.e. the impression over the heads should be filled flush with the boards surface. This is done with one or two application of the ‘Alltek Flex Fine’ filler.

**Dwarf Partitions**

Double skin dwarf partitions are effective space dividers for work stations in offices and commercial buildings.

In the absence of the top fixing, the stability of the dwarf partitions depends only on the strength of bottom track. Hence the bottom track is strengthened either by using higher thicknesses of tracks or by stuffing the tracks with wooden scantlings. Anchoring to the floor is with deep screws and plugs spaced at closer intervals (300 mm).

**Timber studs**

Timber studs can be used in place of steel studs. In this case the frames are first assembled on the ground and then fixed between the floor and the roof. Boards are fixed only after completing the frame work.
Single skin partitions with Bison Panels provide an easy and economical answer to the division of space in basic building.

Bison Panels in 610 mm widths are supported in a timber frame which is fixed between floor and ceiling. The panels are retained by timber beadings screwed to the frame work. Bison Panel 10 mm or 12 mm thick will normally be suitable in combination with a frame of 75 mm x 38 mm timber section with 25 mm x 20 mm beading.
Thermal Properties

<table>
<thead>
<tr>
<th>Thickness of Bison Panel</th>
<th>Thermal Resistance R:M²k/W</th>
<th>Head Transmission Co-efficient K:w/m²R</th>
<th>Critical Value of Fire Resistance in Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 mm</td>
<td>0.0231</td>
<td>3.722</td>
<td>-</td>
</tr>
<tr>
<td>8 mm</td>
<td>0.0308</td>
<td>3.666</td>
<td>0.07</td>
</tr>
<tr>
<td>10 mm</td>
<td>0.0385</td>
<td>3.565</td>
<td>0.15</td>
</tr>
<tr>
<td>12 mm</td>
<td>0.0461</td>
<td>3.471</td>
<td>0.21</td>
</tr>
<tr>
<td>16 mm</td>
<td>0.615</td>
<td>3.295</td>
<td>0.31</td>
</tr>
<tr>
<td>20 mm</td>
<td>0.769</td>
<td>3.136</td>
<td>0.38</td>
</tr>
<tr>
<td>40 mm</td>
<td>0.1538</td>
<td>2.527</td>
<td>0.61</td>
</tr>
</tbody>
</table>

Advantages of Bison Panel Partitions

- They are highly fire resistant, fire rating upto 4 hours is possible with suitable construction arrangement.
- Good sound proof.
- Moisture & Weather resistant
- Termite proof
- Economical, durable & element.
PARTITION SYSTEMS
FIRE RATING AND SOUND REDUCTION

Timber Studs

10 mm Bison Panel each side of 75 mm x 50 mm timber Studs at 610 mm centres with 25 mm thick Fibre Glass (12 kg/m³) to cavity: \(-\frac{1}{2}\) hour: 44dB at 100 - 3150 Hz.

16 mm Bison Panel each side of 75 mm x 50 mm timber studs at 610 mm centres: \(-\frac{1}{2}\) hour: 45dB at 100 - 3150 Hz.

12 mm Bison Panel each side of 75 mm x 50 mm timber studs of 610 mm centres with 40 mm thick Rockwool (43 kgs/m³) to cavity: \(-\) 1 hour: 46 dB at 100 - 3150 Hz.

16 mm Bison Panel each side 75 mm x 50 mm timber studs at 610 mm centres with 40 mm Rockwool (43 kgs/m³) to cavity: \(-\) 1\(\frac{1}{2}\) hours: 47 dB at 100 - 3150 Hz.

As above but with 75 mm rockwool (43 mgs/m³) to cavity: \(-\) 2 hours: 47 dB at 100 - 3150 Hz.

Two layers of 10 mm Bison Panel each side of 100 mm x 50 mm timber studs at 610 mm centres with 100 mm thick Rockwool (60 Kgs/m³) to cavity: \(-\) 4 hours: 48 dB at 100 - 3150 Hz.
10 mm Bison Panel each side of 48 mm x 32 mm Galvanised steel studs at 610 mm centres faced with 100 mm x 10 mm Bison Panel strips with 25 mm thick Fibre Glass (60 kgs/m³) to cavity ½ hours : 45 dB at 100 - 3150 Hz.

12 mm Bison Panel each side of 48 mm x 32 mm Galvanised steel studs at 610 mm centres faced with 100 mm x 12 mm Bison Panel strips with 50 mm thick Fibre Glass (60 kgs/m³) to cavity 1 hour : 52 dB at 100 - 3150 Hz.

16 mm Bison Panel each side of 48 mm x 32 mm Galvanised steel studs at 610 mm centres faced with 100 mm x 16 mm Bison Panel strips with 50 mm thick Fibre Glass (60 Kgs/m³) to cavity 1½ hours : 53 dB at 100 - 3150 Hz.

16 mm Bison Panel each side of 70 mm x 32 mm Galvanised steel studs at 610 mm centres faced with 100 mm x 20 mm Bison Panel strips with 2 layers of 50 mm thick Rock wool (60 kgs/m³) to cavity : 2½ hours : 53 dB at 100 - 3150 Hz.

Two layers of Bison Panel outer 12 mm and Inner 20 mm each side of 146 mm C stud boxed with 18 mm x 120 mm fillet at 610 mm centres with 100 mm Mineral wool *85 kgs/m³) to cavity : 4 hours : 55 dB at 100 - 3150 Hz.
Doors

Bison Panel is excellent for doors and window shutters. It is durable and economical. The board is used both as panel inserts and as flush doors. In door shutter making the following guidelines will help to get best results.

As panel inserts

Bison Panel 8 mm, 10 mm and 12 mm are used as panel inserts depending on the size of the door.

A thickness equal to 3 to 3.5 times the thickness of the panel insert is recommended for the wooden frame. This will ensure sufficient thickness of wood on either sides of the grooves. Of course, the section used for the main frame also depends on the size of door shutter.

The depth of the grooves for the panel inserts shall be 1.5 times the thickness of the panel insert. While inserting the panel in the groove, a depth of 1 to 1.5 mm is left free for taking care of expansion in the board if any.
The size of the groove should be just as much required for the tight fit of the panel.

The panel inserts shall be deep primed with a coat of primer paint in dry condition.

Lamination if any shall be provided on both sides of the panel inserts.

**As Flush Doors**

Bison Panel 16 mm thick with lipping can be directly used as door shutters. The lipping can be either with steel, timber or plastic.

When butt hinges are used wooden lipping provided for the board shall be as thin as possible to ensure maximum depth of penetration of screw into the board.

In case of light gauge steel lipping, channel sections shall be preferred. This will protect the sharp edges of the board during misuse of the door shutter. Lip fixing shall be by screws, nails and also by glue.
Surface hinges or Tee hinges are preferred for Bison Panel shutters. However in case butt hinges have to be used, the screw holes of the hinges shall be located in the centre line of the thickness of the board.

The screws shall be as thin as possible (dia not exceeding 25% of the thickness of the board) and the length of the screw shall be sufficient to allow a minimum depth of penetration i.e. 2 to 2.5 times the thickness of the board.

The board shall be deep primed either with cement primer or wood primer.

When laminated or finished with emulsion paints, same type of decoration shall be given on both sides of the board.
Fire Doors:

Bison Panels has an intrinsic fire resistant property, having a thermal conductivity of 0.25 Kcal/Hr/°C/M. This property can be technically utilised in the manufacture of Fire Resistant Doors.

Half an hour fire resistant doors with Bison Board have been successfully tested at the Central Building Research Institute Roorkee. Shutter Frame is made out of hard wood with top, bottom, middle & intermediate rails and two vertical members, providing an air gap of about 25 mm. Bison Panels 12 mm thick, protected with a special coating are fixing on either side of the shutter frame.

Door Frame is also made of hard wood suitably painted with a special coating alround. Shutter is hung with 4 hinges from the door frame.

Doors to cater to fire rating up to 1 hr also can be manufactured from Bison Panels, with special insulating material mats filled in the core.

These doors are very cost effective as compared to any other fire resistant doors.

For further details, please contact the technical cell of NCL Industries Limited, Hyderabad.
False Ceilings

The ceiling system adopted for Bison Panel is the usual suspended ceiling system which has gained popularity in the building industry. The usual methods adopted for any other suspension ceiling also will hold good for the Bison Panel.

The thickness of the Bison Panel for false ceiling can be 6 mm or 8 mm depending on the requirement of thermal comfort.

The false ceiling can be either ‘T’ grid type or flush jointed type. In either case the longitudinal supports shall be spaced at 610 mm intervals and cross supports at 610 mm or 1220 mm centres.
Grid System

- Grid can be made either with steel or aluminium Tee sections or with timber with suitable wall line supports. The suspension arrangement can be with G.I. wires of adequate gauge taken to required level from the sofit.

- Bison Panels 6 mm and 8 mm thick are recommended for false ceilings.

- The grid shall be 610 x 610 mm or 610 x 1220 mm (2’0 x 2’0 or 2’0 x 4’0.)

- NCL supplies prepainted Seccolor T-Sections for grid frames. The size is 30 x 35 mm - rolled with 0.5 mm thick G.I. sheet. They come in a kit form comprising of longitudinal runners, cross bits and junction components.

- In case, Aluminium T-sections are used for the grid, the minimum thickness of the section shall be 1.2 mm and size 30 x 35 mm.

- Suspenders can be either 8 swg G.I. wire or 0.7 x 12 mm G.I. flats. They are available in the market as coils.

- The maximum distance allowed between suspenders in longitudinal direction and cross direction is 1220 mm or 4’0. Closer intervals may be adopted depending on the sofit conditions.
• It is necessary to introduce a turn buckle in the suspender for easy and faster levelling of the grid. Ordinary G.I. J-bolt can serve as turn buckle.

• It is important to fix wall rest perfectly level, as the level of the entire grid depends on the level of wall rest.

• In areas where change in humidity and temperature are appreciable and frequent, it is desirable to provide a lock pin on the top of the panels to ensure structural integrity of the grid and the panel. The lock pin can be either a headless nail or a screw taken across the web of the Tee section (please refer sketch).

  This will avoid lifting of the Board in the grid due to thermal expansion that may take place in the material of the grid or the Board.

• Wherever the lighting points occur, extra suspenders will have to be provided to take the load of the outfits.

• The panels will have to be painted in dry condition on both sides and the ends in particular before inserting them in the grid.

• A clearance of 1-2 mm shall be given between the board and the grid on all sides for taking care of thermal expansion if any.
Floorings

Bison Panel is the first choice, in many countries, as an alternative to wooden flooring, to suit different climatic conditions - as a thermal insulating floor, as a covering for under floor heating systems, hollow flooring, floating floors and mezzanine flooring.

For application as basic flooring, the following guidelines are recommended:

1. The minimum thickness for flooring shall be with 16 mm panels.

2. The supporting rafters are to be spaced at 610 mm centre to centre or less. The edges of the boards are to be fully supported and fixed to rafters with screws at 400 mm centres. Oversize holes are to be drilled into the board for allowing expansion.
3. The supporting rafters should be of non twisting type, since the screws may be forced out by continuous traffic loads. Curved and round supports are not permitted.

4. No gaps need be given for board joints. They can be fixed flush. But, a gap of about 10 to 15 mm must be left on the periphery of the floor next to walls to allow for expansion. The gap can be concealed by a skirting board.

5. When laid, the boards should be staggered lengthwise preferably by half their length, but at least by a third of their length from row to row, it does not matter whether they are laid on supports or fully floated.

6. The joint between the boards must always be positioned over a support. In addition to screwing, it is better to bond the joints, with alkaline resistant adhesives as this will hold the panels more firmly together and increase overall rigidity.

7. In order to avoid creaking, the edges will have to be provided with tongue and groove.

8. The choice of either steel or timber supports depends mainly on the thermal insulation, fire rating and sound insulation requirements.

9. The boards may be deep primed with a coat of primer and kept in dry condition. If damp boards are used for flooring, the water vapour will collect and will cause the floor coverings (PVC etc) to become loose from the boards.
Floor Coverings

Bison Panel is basically restricted to dry floor applications. However occasional wetting will not pose any serious problems. The flooring can be finished with many kinds of floor coverings like tiles, PVC coverings, etc.,

Carpets

Carpets made of synthetic fabrics, coir and jute can be used on Bison Panel flooring. When synthetic fibre carpets with an underside coat of impervious material is used, the board in the reverse side should be balanced with an appropriate covering.

Decking

Bison Panel is ideal for Duct covers, Decking for Catwalk Bridges, Decking for operation platforms, Planking for steps, Parquet floors, Dance floors, Attics etc.,

Working loads

The working loads for different thickness of Bison Panel are given in the following table. As 610 mm is recommended as optimum span, loads corresponding to 600 mm may be adopted. The values given under L/300 corresponds to safe loads allowing a deflection of 1 in 300 in the board.
<table>
<thead>
<tr>
<th>Thickness in mm</th>
<th>Span in mm</th>
<th>2 to 3 supports</th>
<th>Multiple supports</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
<td>Max load</td>
<td>Max Load</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kgs/Sq.M</td>
<td>Kgs/Sq.M</td>
</tr>
<tr>
<td>10 mm</td>
<td>300</td>
<td>267</td>
<td>333</td>
</tr>
<tr>
<td></td>
<td>400</td>
<td>150</td>
<td>188</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>96</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>66</td>
<td>83</td>
</tr>
<tr>
<td>12 mm</td>
<td>300</td>
<td>391</td>
<td>457</td>
</tr>
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<td></td>
<td>400</td>
<td>220</td>
<td>257</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>141</td>
<td>164</td>
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<tr>
<td></td>
<td>600</td>
<td>174</td>
<td>203</td>
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<tr>
<td>16 mm</td>
<td>300</td>
<td>697</td>
<td>812</td>
</tr>
<tr>
<td></td>
<td>400</td>
<td>392</td>
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<tr>
<td></td>
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<td>251</td>
<td>293</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>174</td>
<td>203</td>
</tr>
<tr>
<td>20 mm</td>
<td>300</td>
<td>1088</td>
<td>1269</td>
</tr>
<tr>
<td></td>
<td>400</td>
<td>612</td>
<td>714</td>
</tr>
<tr>
<td></td>
<td>500</td>
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<td></td>
<td>600</td>
<td>272</td>
<td>317</td>
</tr>
<tr>
<td>30 mm</td>
<td>300</td>
<td>2411</td>
<td>2812</td>
</tr>
<tr>
<td></td>
<td>400</td>
<td>1356</td>
<td>1582</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>868</td>
<td>1012</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>603</td>
<td>703</td>
</tr>
<tr>
<td>40 mm</td>
<td>300</td>
<td>2720</td>
<td>3182</td>
</tr>
<tr>
<td></td>
<td>400</td>
<td>1625</td>
<td>1909</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>972</td>
<td>1142</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>680</td>
<td>795</td>
</tr>
</tbody>
</table>
BISON - MULTI PURPOSE BOARD

Bison Panel has innumerable applications - internally, it can be used in all places where an ordinary particle board can be used, for example:— Partitions, False Ceilings, Doors, Wall Cladings, Flooring, Kitchen Platforms, Table tops, Stair Cases, Louvers, Cabinets, Cabins and many more.

Recommended Thickness

<table>
<thead>
<tr>
<th>Application</th>
<th>Panel thickness in MM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Partitions</td>
<td></td>
</tr>
<tr>
<td>Fire Rated</td>
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</tr>
<tr>
<td>Partitions</td>
<td></td>
</tr>
<tr>
<td>Wall cladings</td>
<td></td>
</tr>
<tr>
<td>False Ceiling</td>
<td>☐</td>
</tr>
<tr>
<td>Facia Panels</td>
<td></td>
</tr>
<tr>
<td>Floors</td>
<td></td>
</tr>
<tr>
<td>Almirah Planks</td>
<td></td>
</tr>
<tr>
<td>Furniture</td>
<td>☐</td>
</tr>
<tr>
<td>Sign boards</td>
<td></td>
</tr>
<tr>
<td>Doors</td>
<td></td>
</tr>
</tbody>
</table>
Panel Houses with Bison Panel

Bison Panel is extensively used in countries abroad as the chief material for the construction of panel houses for dwelling purpose. The board is used for wall construction as well as the inside layer of the roofs.

NCL has developed most innovative systems, suitable to Indian conditions, for the construction of prefabricated panel houses using Bison Panels. Hundreds of houses were supplied to many prestigious customers in the country in private and public sectors.
The models include Farm Houses, Dwelling Houses, Row Houses, Project Houses, Custom made Houses, Rest Houses, Guest Houses, Hill Resorts, Store Sheds, Pent Houses, Security Cabins, Mobile Check posts, Industrial Sheds, Disaster Housing, Defence Barracks, School Buildings and many more.

Wall panels are made using cold roll formed steel profiles specially developed by NCL. The ‘S; shaped profile and ‘W' shaped profiles are used for making the panel walls in single skin and double skin respectively. Same profiles are also used for the assembly of roof sheets in single skin and double skin.

The construction technique is simple. First, a thin channel section frame (Ground track) is fixed on a level base with screws and plugs. The track frame will be as per the plan configuration of the shelter. Bison panels fitted with steel profiles are then inserted in the track frame vertically by interlocking the joints of the panels to form a continuous panel wall.
Specially designed posts are provided for the wall junctions and the corners. During erection, the wall panels are held in position by providing temporary props or supports. Upon completion of the wall panels, another channel frame (top track) is fixed on the top of the panel walls to keep the wall panels tight in position. The top track also helps to distribute the roof load uniformly on the wall panels. Special panels and ready fit frames are used for doors and windows.

Light weight trusses and purlins are fixed on the top track with specially designed components. Roof sheets are then spread on the purlins duly interlocking the panels as was done in the case of wall panels. Roofs can be either gable type or pitched type. A roof coat is given to the panels to prevent leakages.
NCL Prefab Houses have the following advantages:

- The houses are made in small components, easy for transportation to difficult terrains.
- As the structures are light they require very little foundation. They can be erected on any firm base or on stilts.
- The erection is simple and fast and requires no high skills.
- These shelters can be dismantled and reerected at a different place if required.
- As the structures are light they are safe in earthquake prone areas.
- Prefab shelters help to provide instant accommodation with better living conditions in projects and other townships.
- They are comfortable, durable and affordable.

The profiles and components required for panel house making are available only with NCL. Contact NCL for the supply of Prefab shelters or Technical Guidance.
# COMPARISON OF STANDARDS OF “CEMENT BONDED PARTICLE BOARDS”

|--------|------------------------|-----------------|-----------------------------|---------------------|------------------------------|

## DIMENSIONAL TOLERANCE:

1. **Length (mm)**
   - ISO (8335) 1987: ± 5.0 mm
   - B.S.I. Bs 5669 Part 4 1989: ± 5.0 mm
   - Bison DIN Standards: ± 5.0 mm
   - Bison Panel (Present result): ± 5.0 mm

2. **Width (mm)**
   - ISO (8335) 1987: ± 5.0 mm
   - B.S.I. Bs 5669 Part 4 1989: ± 5.0 mm
   - Bison DIN Standards: ± 5.0 mm
   - Bison Panel (Present result): ± 5.0 mm

3. **Thickness (Unsanded)**
   - **6 mm to 15 mm**
     - ISO (8335) 1987: 6 to 12 mm ± 1.0 mm
     - B.S.I. Bs 5669 Part 4 1989: 6 to 15 mm ± 0.9 mm
     - Bison DIN Standards: 4 to 10 mm ± 0.7 mm
     - Bison Panel (Present result): 4 to 10 mm ± 0.7 mm
   - **16 to 27 mm**
     - ISO (8335) 1987: 12 to 20 mm ± 1.5 mm
     - B.S.I. Bs 5669 Part 4 1989: 16 to 27 mm ± 1.2 mm
     - Bison DIN Standards: 12 to 20 mm ± 1.0 mm
     - Bison Panel (Present result): 12 to 20 mm ± 1.0 mm
   - **28 to 40 mm**
     - ISO (8335) 1987: 20 to 40 mm ± 2.0 mm
     - B.S.I. Bs 5669 Part 4 1989: 28 to 40 mm ± 1.7 mm
     - Bison DIN Standards: 22 to 40 mm ± 1.5 mm
     - Bison Panel (Present result): 22 to 40 mm ± 1.5 mm

**Thickness (Sanded):**

- All thicknesses in mm: ± 0.3 mm

4. **Edge Straightness (mm/mm)**
   - ISO (8335) 1987: ± 1.0 mm
   - B.S.I. Bs 5669 Part 4 1989: 1/1000 mm/mm ± 3.0 mm
   - Bison DIN Standards: ± 3.0 mm
   - Bison Panel (Present result): ± 3.0 mm

5. **Squarness (mm/mm)**
   - ISO (8335) 1987: ± 2.0 mm
   - B.S.I. Bs 5669 Part 4 1989: 2/1000 mm/mm ± 2.5 mm
   - Bison DIN Standards: ± 2.5 mm
   - Bison Panel (Present result): ± 2.5 mm

## MECH. CHARACTERISTICS

1. **Density (Kg/m³)**
   - ISO (8335) 1987: Not less than 1000 kg/m³
   - B.S.I. Bs 5669 Part 4 1989: 1250 ± 10% kg/m³ (Not less than 1200 kg/m³)
   - Bison DIN Standards: 1250 ± 10 kg/m³ (Not less than 1200 kg/m³)
   - Bison Panel (Present result): 1250 ± 10 kg/m³ (Not less than 1200 kg/m³)
2. Bending Strengths (Modulus of rupture) Min. 9.0 N/mm² Min 10 N/mm² Min. 9 N/mm² Upto 12 mm 11.0 to 12 N/mm² Upto 16 to 25 mm 10.5 to 11.5 N/mm² Upto 30 to 40 mm 9 to 10 N/mm²

3. Modulus of Elasticity (MDE) 3000 N/mm² 4500 N/mm² Min 3000 N/mm² Min 3000 N/mm²

4. Swelling in thickness % 2% 1.5% to 1.8% Max. 1.5% 0.5% to 1.0% 24 hours after immersion

5. Tensil strength (Perpendicular to the Surface) - Min 0.45 N/mm² Min 0.4 N/mm² 0.6 to 0.9 N/mm²

6. Moisture (%) 6 to 12% 6 to 12% 6 to 12% 7 to 11%

7. Screw Holding (N)
   a) Surface _ _ Min 1250 N to 1600 N
   b) Edge - 450N Min 850N Min 1200N

8. Impact Strength Record 20 mm/mm Min 18.0 mm/mm 22-25 mm/mm

---

### BISON PANEL : VOLUME & WEIGHT

<table>
<thead>
<tr>
<th>Thickness</th>
<th>Volume per board (8' x 4') (Qu. mtrs)</th>
<th>Weight per board (8' x 4') (in Kgs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2440 x 1220 mm</td>
<td>2440 x 1220 mm</td>
</tr>
<tr>
<td>6 mm</td>
<td>0.0179</td>
<td>23.22</td>
</tr>
<tr>
<td></td>
<td>0.0223</td>
<td>29.02</td>
</tr>
<tr>
<td>8 mm</td>
<td>0.0238</td>
<td>30.95</td>
</tr>
<tr>
<td></td>
<td>0.0297</td>
<td>38.69</td>
</tr>
<tr>
<td>10 mm</td>
<td>0.0297</td>
<td>38.69</td>
</tr>
<tr>
<td></td>
<td>0.0372</td>
<td>48.36</td>
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<tr>
<td>12 mm</td>
<td>0.0357</td>
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<tr>
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<td>0.0446</td>
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<td>0.0476</td>
<td>61.90</td>
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<tr>
<td></td>
<td>0.0595</td>
<td>77.38</td>
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<tr>
<td></td>
<td>0.0744</td>
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<tr>
<td></td>
<td>0.1488</td>
<td>193.44</td>
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<tr>
<td>S. No.</td>
<td>Particulars</td>
<td>Bison Panel</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>Bending Strength (N/MM²)</td>
<td>12-13</td>
</tr>
<tr>
<td>2.</td>
<td>Tensile Strength (N/MM²)</td>
<td>0.8-1.0</td>
</tr>
<tr>
<td>3.</td>
<td>Swelling 24 Hrs. (%)</td>
<td>1.0</td>
</tr>
<tr>
<td>4.</td>
<td>Water Absorption 24 Hrs. (%)</td>
<td>27</td>
</tr>
<tr>
<td>5.</td>
<td>Screw Holding on Face N</td>
<td>2000</td>
</tr>
<tr>
<td>6.</td>
<td>Fire Combustibility, Ignitability, Flame Spread</td>
<td>Virtually Incombustible</td>
</tr>
<tr>
<td></td>
<td>Insect Attack</td>
<td>Highly Resistant</td>
</tr>
<tr>
<td>8.</td>
<td>Fungus Attack,</td>
<td>Highly Resistant</td>
</tr>
<tr>
<td>10.</td>
<td>Painting Finish</td>
<td>Excellent Finish</td>
</tr>
<tr>
<td>11.</td>
<td>Lamination</td>
<td>Possible</td>
</tr>
</tbody>
</table>
BISON PANEL - PRECAUTIONS

1. HANDLING
   Carry the Panel vertically as the Panel may break due to sag and swing if carried horizontally. Do not lift the board when it is wet.

2. STORING
   Stack the boards flat on a level ground or on level supports to avoid bending of the boards due to self-weight.

3. EDGE SUPPORTS
   While fixing the board on a frame work all the edges of the board are to be fully supported. Unsupported edges may chip off.

4. NAILING/SCREWING
   Drill a Prehole 0.8 times Dia before Nailing or Screwing to avoid local cracks.

5. EDGE CLEARANCE
   Nail holes shall be away from the edge of the board by a minimum of 12 mm and away from the corner by a minimum of 40 mm.

6. EDGE SCREWING
   Screwing through the thickness of the board is not recommended for Boards less than 12 mm thick.

7. FIXING
   Fix the Panels on flat frame. Do not fix on curved surfaces like pipes.

8. PAINTING
   Bison Panel can be painted with variety of paints. Apply a cement primer/wood primer coat before painting. Do not paint in wet conditions and ensure the board is dry before Painting.

9. BALANCING
   When one side of the board is painted or laminated, the other side also requires painting / lamination to arrest warping in the board.

10. JOINTS
    Whenever the board is cladded on a frame work; board joints shall have a minimum gap of 2 mm to take care of the expansion in the board.