



COMPOSITE
TRAY
FLOORING
GUIDE

VERSION 2.0. NOVEMBER 23



*Promoting a Resilient
and Competitive Built Environment*

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WHO WE ARE

METALCRAFT STRUCTURAL

Metalcraft Roofing operates two structural manufacturing plants which share production sites with the Metalcraft Roofing branches at Auckland and Christchurch. These branches manufacture and supply a wide selection of purlins, girts and tophats to the construction markets in New Zealand.

MSS Purlins and Girts provide an efficient, lightweight rollformed support system for roofing and wall cladding and are recognised as being efficient, economical structural members suitable for a wide range of building applications.

METALCRAFT COMPOSITE FLOORING

Metalcraft Roofing is proud to announce the acquisition of SVELTE® and UNIFLOOR® manufacturing plants, with a proven New Zealand performance of 30 years.

Metalcraft Composite Flooring is managed by our Metalcraft Structural division in Auckland and the plants are located at Metalcraft Roofing's Hamilton branch.

SVELTE® and UNIFLOOR® state-of-the-art profiles have been developed using modern roll-forming techniques, finely crafted through our industry experience since 1972. It is an expertly engineered advanced composite steel floor system, suitable for industrial, commercial & residential multi-storey buildings.

DURABILITY

Metalcraft Roofing's MSS Purlins, Girts, MC Sections, MZ Purlins, Bracing Systems, MS Tophats, SVELTE® and UNIFLOOR® profiles will meet a service life of up to 50 years. Compliance with the conditions stated in the New Zealand Steel Durability Statement June 2016 will ensure that the durability requirements of NZBC Approved Document B2 are satisfied.

The MSS Purlins, Girts and Composite tray flooring profiles; SVELTE® and UNIFLOOR® are manufactured from high tensile G550 Mpa galvanised coil in accordance with AS1397.

METALCRAFT ROOFING

Metalcraft Roofing has been operating since the 1950's and originated in the lovely town known as Palmerston North. With more than 50 years experience in the industry, we have established a reputation for both manufacturing high quality roll formed products and for providing an unrivaled level of service.

Metalcraft Roofing consider themselves to be New Zealand's largest privately owned roofing company and experts at manufacturing. An extensive range of products are manufactured using locally sourced steel from New Zealand Steel. Solid material warranties backed by New Zealand Steel will give you an assurance of quality and peace of mind.

Metalcraft Roofing are members of the Roofing Association, New Zealand and the NZ Metal Roofing Manufacturers Incorporated.



METALCRAFT INSULATED PANELS

Metalcraft Insulated Panels specialise in the manufacture, supply and installation of insulated panels.

All products are backed by solid warranties and the range of insulated panels, supplied by Metalcraft Insulated Panels are used in a variety of applications from Industrial and Commercial Coolstore to Agricultural and Architectural buildings.

UNITED INDUSTRIES GROUP LIMITED

Metalcraft Roofing and Metalcraft Insulated Panels are part of United Industries Group Limited. United Industries is heavily involved in providing materials and services to the New Zealand construction market through its group companies.

For more information on United Industries, please visit: www.unitedindustries.co.nz

ENVIRONMENTAL POLICY

Metalcraft Roofing look to advance waste minimisation in their manufacturing processes wherever possible. Metalcraft Roofing promote recycling of ancillary non-steel waste by sorting to maximise their ability to recycle it. Transportation efficiency is another critical area for evaluation and improvement in order to minimise the adverse environmental effects from inefficient logistical movements, and to simultaneously generate cost efficiencies for the Group and its customers.

As an established provider of Solar Photovoltaic services, Metalcraft Roofing appreciate the value of investment in renewable energy generation, from both a sustainability and a cost saving point of view. Metalcraft Roofing seek to standardise renewable energy generation across our locations nation-wide. The current sites with PV, generate around 25% of Metalcraft Roofing's energy requirements. The long-term goal is to scale this up to generate 100% of Metalcraft Roofing's energy requirements from on-site PV Solar generation.

To complement this initiative, the auditing and optimising energy consumption in Metalcraft Roofing's manufacturing operations is a key point of focus. Energy efficiency measures are already being implemented in Metalcraft Roofing's older locations, and remains front of mind when designing new facilities and procuring new equipment. Furthermore, on-site water harvesting is another sustainability feature of note that is being integrated into Metalcraft Roofings new facilities.

SUSTAINABILITY

Steel is a recyclable product, so you can be confident in the knowledge that it does not have to be disposed of in landfill. Instead it can infinitely be recycled and reused, thereby minimising resource use and reducing impact on our environment.

ECO CHOICE AOTERAROA

New Zealand Steel pre-painted and resin coated products are third party certified to the Eco Choice Aoteraroa -57-16 standard.

Eco Choice Aoteraroa, licence No: 5717145 is New Zealand Steel's licence number and Metalcraft Roofing is an extension of New Zealand Steel's licence.

The products covered by this licence are those formed with feed from COLORSTEEL®, ZINCALUME® and GALVSTEEL® as made by New Zealand Steel Ltd.

Metalcraft Roofing has products that have been assessed by The New Zealand Eco labelling Trust which have been found to comply with the requirements of the Eco Choice Aotearoa Specification.

All Metalcraft Roofing branches have completed the ECNZ licence No: 5717145 audit and have been all awarded Environmental Choice certificates.





INTRODUCTION

HANDLING AND STORAGE

The presence of water between the stacked sections will create premature corrosion, it is recommended the sections are separated and dried if this situation occurs. Cutting if required should be done with hacksaws or power saws or snips, the use of abrasive disc blades are not recommended.

USE OF THIS MANUAL

The user of this manual is responsible for ensuring that this document is the most recent revision prior to using the information within for design purposes.

When selecting composite tray flooring systems for projects the specifier must consider the impact of the actual applied loads versus the stated capacities for the system as specified in the manual. Actual loading, while it may be less than stated values does not necessarily ensure adequacy of the selected system as member adequacy is highly dependent on the maximum moments applied and the moment profile in the member span. Such design actions can be significantly altered by the variations in the actual project specific calculated applied loads, and accordingly the Design Engineer is responsible for verifying their composite tray flooring selection complies with:

- AS/NZS 4600 "Cold formed structures code"
- AS/NZS2327:2017 Composite Structures -Composite Steel concrete construction in Buildings

MANUAL UPDATES

The user of this manual is responsible for ensuring this manual is the current revision prior to using and information contained within.

STEELSPEC™ DESIGN TOOL

Metalcraft Roofing have developed a specific design tool making specification of SVELTE® and UNIFLOOR® easier and quicker to do.

Steelspec™ by Engineers for Engineers to allow for quick and easy specification of Metalcraft Composite Flooring Systems.

Use this site to design your Steel Composite Floor solution. www.metalcraftcompositeflooring.co.nz

TECHNICAL SERVICES

Metalcraft Roofing can offer comprehensive advice on the design of SVELTE® and UNIFLOOR® systems to specifiers.

DISCLAIMER

This publication is intended to provide accurate information to the best of our knowledge in regards to the SVELTE® and UNIFLOOR® sections. It does not constitute a complete description of the goods nor an express statement about their suitability for any particular purpose. All data is provided as a guide only and Metalcraft Roofing, do not accept any liability for loss or damage suffered from the use of this data.

DESIGN NOTES

INTRODUCTION

The SVELTE® and UNIFLOOR® sections have been engineered to offer the best in lightweight steel decking for multi-storey buildings. Highly popular and with excellent spanning abilities, it offers excellent shear bond performance. Delivered to site pre-cut to the correct sizes and ready to fix, reducing on site work. Cost effective & easy to install, SVELTE® composite steel decking system makes an excellent flooring solution for your projects.

LATEST TECHNICAL SPECIFICATIONS

As the last word in quality, Metalcraft Composite Flooring systems apply the best of current technical thinking. This results in peerless performance, including:

- Enhanced shear performance due to deep embossing
- No rolling lube used to maintain concrete/steel bond
- Super concrete/steel indent in profile for superior bond
- Tested for concrete/steel bond and vibration, creep and shrinkage
- The formed stop end eliminates the need for separate stop ends, saving in materials and labour
- All profiles minimum 550mpa base steel strength
- 0.75mm, 0.95mm and 1.15mm in G550.

LONG-SPAN CAPABILITY

The exceptional profile designs of SVELTE® and UNIFLOOR® deliver outstanding unpropped spanning capability and strength. Ultimately this helps to reduce both project structural steel requirements and costs. Design software is available to give unpropped double span options. Longer deck spans broaden beam spacing and reduce the number of the support beams, resulting in rapid erection and savings on the cost of the supporting steelwork.

QUALITY & COST EFFICIENCIES

Metalcraft's composite flooring solutions are designed to be adaptable, easy to install and cost-effective on any project. All our profiles are manufactured from the highest grade steel, and designed utilizing up to date design standards including:

AS/NZS 4600 "Cold formed structures code"
AS/NZS 2327:2017 "Composite Structures
'Composite Steel concrete construction in Buildings"

Panels are manufactured from G550 (min: 550MPa yield stress) steel with a base metal thickness of 0.75mm, 0.95mm & 1.15mm. The steel panel is protected with a galvanized coating of Z275. A galvanized coating of Z450 is optional when required.

RELIABILITY & DEPENDABILITY

Metalcraft's machinery is run by automated data controlled systems to ensure 100% accuracy and control across the manufacturing process. We also have capability to produce Pre-formed crushed ends using extra tooling connected to our machinery. Once the decking profiles are made, the product is packed with the sheet description. This ensures the smooth delivery of our products to site without mistakes. The sheets are carefully loaded and transported to site on time and to your exact specification. Our team are experts, and fully-trained to execute to the standards that you demand. Quality control checks, and regular maintenance of our production facility ensure that we stay on track to your brief.

EXCELLENT ACOUSTIC & FIRE PERFORMANCE

Fire designs are available for 30min, 60 min, 90 min, 120 min and 180 min FRR.

SAFE MANUAL HANDLING

SVELTE® profiles are engineered to 600mm width sheets, UNIFLOOR® profile is engineered to 300mm wide sheets, both are lightweight and easy to handle, making them a safer option, especially when working at heights.

SHRINKAGE CONSIDERATION

The Designer shall specify reinforcing steel (mesh) for shrinkage

CREEP INCORPORATION

Composite floor design uses the notion of transformed area and modular ratio, to determine the combined member properties of the steel and concrete elements. Modular ratio values can vary between 8 and 26 depending on the nature and magnitude of loading.

DESIGN SOFTWARE TOOL - STEELSPEC™

Metalcraft developed this tool so that engineers are efficiently and quickly able to specify the right product. Steelspec™ has been designed to the latest standard AS/NZS2327:2017 Composite Structures – Composite Steel concrete construction in Buildings. A unique feature of the Steelspec™ tool, is the ability to optimise different solutions and provide you with the best suited design option. All designs are signed off by a Chartered Professional Engineer (CPEng). If requested the design may be reviewed and "signed off" by a Chartered Professional Engineer.

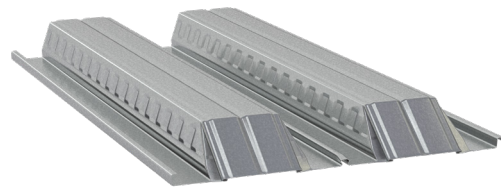
INSTALLATION

SVELTE® and UNIFLOOR® profiles are delivered to site pre-cut to the correct sizes ready to fix, reducing on site work. It acts as permanent formwork eliminating time and labour needed to strip formwork. Refer to installation guide.

SVELTE® PRE-FORMED STOP ENDS

Factory formed stop ends for the trapezoidal flooring offer both a material and labour advantage. This innovative process negates the need for costly and time consuming stop ends to close off the end of trapezoidal profiles.

Formed during the cutting action in our factory these stop ends can be accurately matched to your site dimensions. Added benefits include; less, or no concrete seepage at sheet ends, cost saving on supply and fitting of flashings, and creates a localised tapered thickening of concrete at sheets ends to give more integrated floor/beam strength.



PRE-FORMED STOP ENDS
Indicative 3D Render

INSTALLATION GUIDELINES

DELIVERY OF COMPOSITE STEEL DECKING

As with any construction, the success of the finished project is dependent on the handling and installation of the complete floor. SVELTE®60/80 and UNIFLOOR®Composite Steel Decking bundles are typically supplied by long vehicle trucks. We recommend that delivery is scheduled, and there are appropriate access points to the off-loading location. We deliver to specification, on time, everytime - however it is best practice to carry out your own delivery checks in conjunction with this. Check the product details against your own signed off specifications, and do a quick visual inspection.

MOVING & LIFTING SVELTE® 60 ON-SITE

Ensure the product is lifted from the truck using protective chain slings. For long lengths, a spreader bar should be used and the load should be lifted using several lifting points to stop any over-stressing. It is recommended that packs not be double handled to avoid any damage. Our product is super strong and durable, but tipping or dragging it off the truck may damage and compromise its performance. The use of synthetic slings can be compromised as they have a risk of being severed during lifting.

STORAGE

Where packs of tray flooring are required to be stored for any length of time the following precautions should be taken:

- (i) Panels are required to be placed off the ground on packers which will reduce the risk of corrosion on the sheet soffit.
- (ii) Locations where stacking occurs, should have adequate drainage.
- (iii) Stacks of panels are to be covered with waterproof covers, which allow air movement. This can be achieved by the use of packers over the top of the stacks, before cover placement.
- (iv) Extreme care is to be taken to ensure that moisture is not trapped between surfaces of nested sheets. Where moisture cannot evaporate, staining or surface deterioration may occur.

HANDLING

Sheets must be lifted from each bundle and not dragged, as this damages the coating on the sheets.

When sheets are required to be cut on-site, cuts are to be made with a hack saw or a power saw, preferably with a metal cutting blade. All cuts to individual panels are to be made away from other tray floor panels and with the panel facing downwards.

POSITIONING & LAYING OF DECKING

Installation of decking should start once all sheets are positioned and secured. Allow for adequate time and ideal weather conditions. Check layout drawing to ensure that all temporary supports required are in place. Accessibility for setup will usually be accomplished utilizing ladders linked to the steel framework. Once started, the tradesmen will create their own platform to complete the stages as they progress.

The ends to trays must overlap their bearing supports strictly in accordance with Figure 5 of BS5950: Part4.

Generally this includes:

A min of 50 mm bearing of simply supported ends of panels on steel or concrete.

A min of 75 mm bearing on internal continuous supports on steel or concrete.

A min of 100 mm bearing on internal continuous support substrates other than steel or concrete.

If a tray appears to be an incorrect length, it is likely to belong somewhere else on the floor layout.

- (i) Panels have an interlocking lapping edge which minimizes the need for fasteners along this edge. It is recommended that the lapped edge 14g tek screws placed at 1500 mm centres for slab thicknesses up to 150 mm and at 750 mm centres for greater slab thickness. It is to be noted however, that in some cases the tray floor may be used as a diaphragm and both connections, to supporting structure and lap connections, must be installed to the design drawings for the particular project.
- (ii) It is recommended that ends are connected to supports using two 14g teks screws to each pan. Where trays are continuous over internal supports, one 14g tek per pan is adequate.
- (iii) Where trays are used as working platforms, care must be taken not to bend profiles locally or to overload pans. Timber boards are to be utilized when placing wet concrete or to distribute other loadings.
- (iv) All openings where it may be possible for concrete to flow through, must be eliminated, either by the use of closure units, placement of flashings or by the approved use of expanding foam (to be inspected by the design engineer).

CLEAN DOWN OF SHEETS

Prior to placing reinforcement, and again before pouring concrete, trays are to be cleaned down to ensure that all swarf and loose metal, reinforcing ties, oil and grease are removed. Any contaminants which may reduce the bonding of concrete to the steel tray must be cleaned off.

REINFORCEMENT PLACEMENT

Reinforcement is to be placed strictly in accordance with the covers specified within this manual. All reinforcement is to be placed on bar chairs spaced at 900 mm centres in both directions for lighter meshes (unless specified by the design engineer) and 1200 centres for heavier meshes. It is to be noted;

- (i) Primary reinforcement is to be placed on top of mesh and specified cover is to primary reinforcement.
- (ii) Top cover is to be 25 mm, and the minimum cover to top of tray profile and underside of mesh is to be 25 mm.
- (iii) There are to be no corner laps of mesh placed over internal supports.
- (iv) Positive FER reinforcement is to be positioned so that there is a minimum of 25 mm cover above the centre stiffening rib in pans.
- (v) The laying of mesh directly on top of the tray profile is strictly prohibited.
- (vi) The lifting of mesh during concrete pouring, instead of using bar chairs, is strictly prohibited.
- (vii) In all other cases reinforcement is to be placed in accordance with the design engineers drawings and NZS3103 "Concrete Structures Code".
- (viii) Unless stated otherwise, all primary reinforcement is to be placed so that it extends a minimum of a quarter of the clear span on both sides from the interior supports. Where primary reinforcement also serves as FER reinforcement then it must extend a minimum of 40% of the clear span in both directions from the internal supports.

INSTALLATION SPECIFIC REQUIREMENTS

CONCRETE PLACEMENT

Concrete must be ready mixed high grade concrete, and mix designs are to be prepared to minimize shrinkage and creep. The placement of concrete must be carried out so that concrete is not dumped on the trays in a heap as this will cause overloading and damage trays. The concrete must be poured progressively and placed from one side of the floor to the other in a manner where the laps of tray profiles are tightened or locked and not loosened.

CORROSION PREVENTION

As the tray floor provides the positive tensile reinforcement, it is imperative that it is protected against corrosion or similar influences which may reduce its structural adequacy.

Where tray flooring is placed immediately above bare ground, the requirements of the New Zealand Building Code are to be strictly followed. In any case a minimum sub-floor space of 450 mm is to be used with adequate ventilation provided to eliminate condensation on the tray soffit. Further, all floor spaces are to be accessible for maintenance.

The use of tray flooring adjacent to coastal areas, where hazardous corrosive chemicals are located, or near extreme industrial environments, is not recommended. In such circumstances, specialist advice should be sought with a view to using epoxy paint protection.

CONSTRUCTION DETAILS

Typical construction details are included for reference only. Actual details are to be specified by a chartered engineer after proper evaluation of a project's overall design.

TILT PANEL DETAILS

Tray flooring design complements that of vertical tilt panels. Their combined use allows design for commercial, industrial and residential buildings to be combined, utilizing diaphragms to connect to vertical shear walls.

Typical tilt panel details include:

- (i) Tray Edge/Intermediate Tilt Panel Connections
- (ii) Tray Edge/Top tilt Panel Connection
- (iii) Internal Connection, Tilt wall Parallel to Tray Span
- (iv) Integral Support at Tray Edge with Tilt Panel
- (v) Integral Support at End to Tilt Panel
- (vi) Integral Continuous Support over Tilt Panels, Small Span
- (vii) Integral Support connection at Intermediate Height of Tilt Wall
- (viii) Internal Continuous Support at Top of Tilt Panel
- (ix) Internal Simple Support at Top of Tilt Panel
- (x) Structural Steel Details

Tray flooring is supported over large clear span areas by secondary steel beams, or where unpropped construction is required, propping spans are permanently supported by primary steel beams. Typical structural steel beam details include:

- (i) Structural Steel Support for Continuous Spans with Shear Connections
- (ii) Edge Steel Support, with Shear Connections
- (iii) Structural Steel Support for Continuous Spans, Small Spans without Shear Connectors
- (iv) Structural Edge Beam parallel to Tray Span
- (v) Structural Beam Support for Simply Supported Spans
- (vi) Structural Beam in same Direction as Tray Span
- (vii) Balcony Step Detail Combined RC and Structural Beam
- (viii) Balcony Step Detail Structural Beam
- (ix) Edge Detail around Openings.

REINFORCED CONCRETE STEEL DETAILS

While less common, reinforced concrete prestressed shell beams are ideally suited to combine with tray flooring and may be combined with structural steel beams within particular projects.

Typical concrete beam details include:

- (i) Reinforced Concrete Internal Support Beam with Continuous Tray Floor
- (ii) Balcony Step Detail Reinforced Concrete Beam
- (iii) Reinforced Concrete Edge Support Beam
- (iv) Concrete Shell Beam Internal Support Beam with Continuous Tray Floor
- (v) Balcony Step Detail Prestressed Shell Beam
- (vi) Reinforced Concrete Spandrel Support Beam.

MASONRY DETAILS

Masonry is used in the same manner as tilt panel details.

Typical masonry details include:

- (i) Tray Edge/ Intermediate Masonry Panel Connection
- (ii) Tray Edge/Masonry Wall Connection
- (iii) Internal Connections, Masonry, Wall parallel to Tray Span
- (iv) Integral Support at Tray Edge with Masonry
- (v) Integral Support at Top with Masonry
- (vi) Continuous Internal Support at Intermediate.

HEIGHT / PENETRATIONS

Penetrations up to a single tray width (620 mm) can be dealt with by factoring a tray width either side of the opening by the increase in load caused by the opening. In this way the load on each sheet adjacent to the opening is increased by the width of half a sheet.

However for this to be achieved, significant lateral redistribution is required. Consequently, the sheets adjacent to the penetration should have applied loading increased by 75% to cater for the extra load carried. Further, boundary reinforcement should be placed around the opening, to the design of the consulting engineer and transverse reinforcement at 300 centres placed across the three sheets concerned, to provide distribution reinforcement.

For larger openings, the opening should be supported using structural framing which connects into the support system.

CUTTING SHEETS

Where required, sheets might be reduced making use of a grinder or a nibbler. However, field cutting ought to be kept to a minimum. Gaps beside the intersection of columns should be filled in with off-cuts or thin strips of steel. Additionally, sheets should never be cut at the location of a temporary support, and the steel decking should never be fastened to a temporary support.

As the work advances, scraps and off-cuts should be disposed of carefully. Partially used bundles of steel should be secured or stored in a place that prevents them from moving in strong winds.

SVELTE®

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SVELTE® PRODUCT SPECIFICATION

SVELTE® MANUFACTURED TO THE LATEST NZ BUILDING STANDARDS MAKES IT EASY TO SPECIFY SVELTE® FOR MULTI-RISE PROJECTS.

SVELTE® state-of-the-art profiles have been developed using modern roll-forming techniques, finely crafted through our industry experience since 1972. It is an expertly engineered advanced composite steel floor system, suitable for industrial, commercial & residential multi-storey buildings.

SVELTE® profiles have been designed to provide excellent acoustic performance, fire protection and improved vibration softening properties. SVELTE® also comes with pre-formed stop ends at the transition of the SVELTE® profile and beam, that resists crack-forming sharp ends. This also helps assist with laying and blends into beams.

All our profiles are manufactured from the highest grade steel, and designed utilizing up to date design standards including:

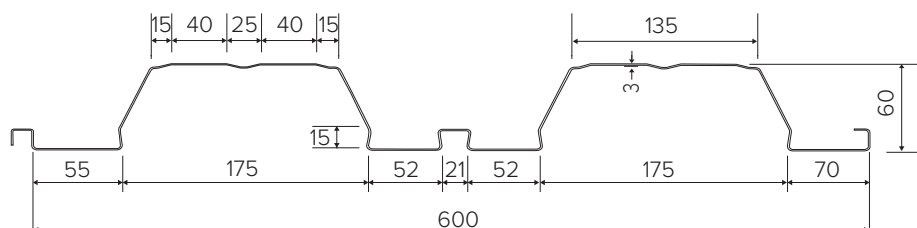
- AS/NZS 4600 “Cold formed structures code”
- AS/NZS2327:2017 Composite Structures -Composite Steel concrete construction in Buildings

Panels are manufactured from G550 (550MPa yield stress) steel with a base metal thickness of 0.75mm, 0.95mm and 1.15mm
The steel panel is protected with a galvanized coating of Z275. A galvanized coating of Z450 is optional when required.

SVELTE® profiles are delivered to site pre-cut to the correct sizes and ready to fix, reducing on site work. Cost effective & easy to install, SVELTE® composite steel decking system delivers longer spans, requires less concrete, and ultimately drives down project cost.

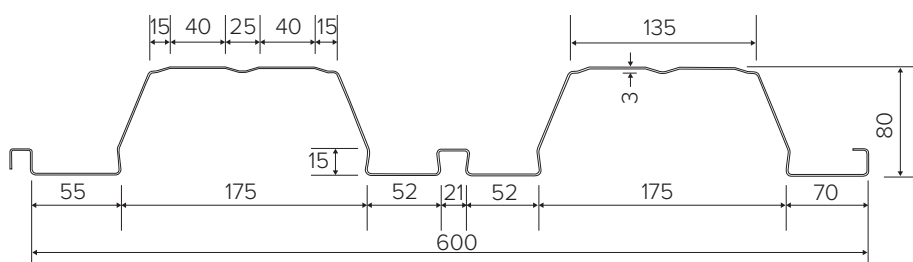
SVELTE® 60 PROFILE

Dimensions are nominal. Do not scale.

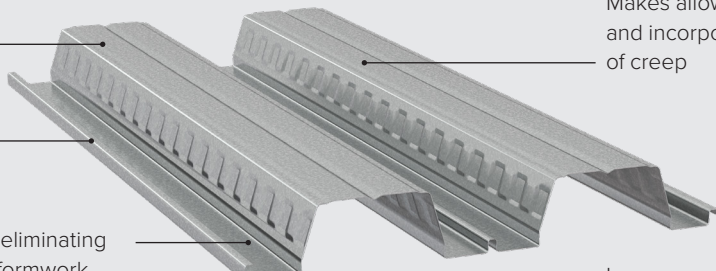


SVELTE® 80 PROFILE

Dimensions are nominal. Do not scale.



SVELTE® PROFILE AND FEATURES



Manufactured from corrosion resistant hot dipped galvanized steel

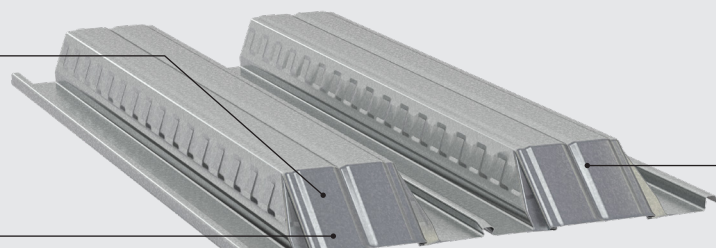
Interlocking edge lap which eliminates the use of seam fasteners

Acts as permanent formwork eliminating time / labour needed to strip formwork. Allows services to be incorporated within the depth of the floor

Makes allowance for basic shrinkage and incorporates an enhanced concept of creep

Less concrete for a given depth compared to flat profiles - Fewer props saving expensive prop hire & installation

PRE-FORMED END

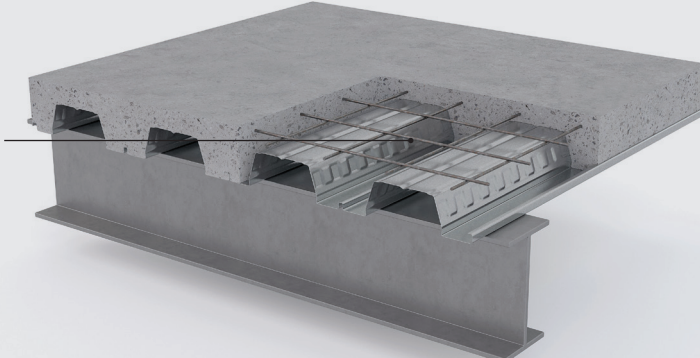


Formed stop end at transition of floor & beam

No spread or creep when installing & strengthens join on beam

No end cap preparation

INSTALLED CROSS SECTION



Combined with shrinkage mesh near the top of the concrete slab gives the composite slab superb structural strength and fire properties

SVELTE® SPAN TABLES

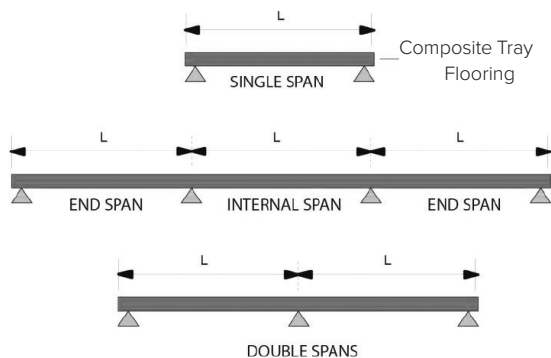
SVELTE® 60 & SVELTE® 80 SPAN TABLES

The following tables provide maximum formwork span tables for the Metalcraft Composite Flooring range of products. The following notes apply to these tables and shall be read in conjunction with the tables.

These tables are intended for competent, experienced installers only. Installers shall ensure that these tables are the latest issue prior to use. It is the contractors responsibility to comply with all Health & Safety and Worksafe requirements.

"D" denotes the overall thickness of the slab.
"L" is the maximum span measured centre to centre between temporary or permanent supports.

Refer to diagrams below for typical formwork slab configurations.



THE USE OF DOUBLE OR END SPANS MAY ONLY BE USED IF:

- (i) All spans have the same thickness.
- (ii) Double spans are within 10% of each other, and the largest span is used in these tables.
- (iii) Internal spans are within 10% of each other & the largest internal span is used in these tables.
- (iv) The end span is within 5% of the internal span and that the end and internal spans are designed using the appropriate tables.

Construction loads (Q) are taken from BS5950, which provides for a minimum of 1.5kPa for spans greater than 3.0m, or 4500/L.

Slab weights (G) are based on wet concrete with a density of 2400 kg/m³ and 10 kg/m² for reinforcing. No allowance is made for ponding by ensuring that deflections are less than $D/10$, where D equals the overall deflection limits are as follows;

- (i) $L/180$ maximum due to dead load (G) only
- (ii) $D/10$ maximum, so that concrete ponding does not affect the design. The above limits are the "Code Limit" column in the tables. The "6mm limit" column in the tables shall be referenced when minimal soffit deflection is critical.

It is the contractors responsibility to confirm and verify soffit deflection limits with the Main Contractor and/or Design Engineer.

Adequate restraint and bearing length to the steel flooring shall be provided at each end.

Propping design, and it's loading onto any supporting structure shall be undertaken by others.

Refer to Design Engineers drawings for specific propping requirements, additional reinforcing, mesh etc.

SVELTE® 60 - 0.75 mm BMT

MAXIMUM SPANS (m)

*Full range of single, double, end or internal span limits available on Metalcraft's Steelspec™ design tool.

Overall Depth (mm)	Slab Weight (kg/m ²)	Concrete Quantity (m ³ /m ²)	Maximum Span, L (m)					
			Single		Double or End		Internal	
			Code Limit	6mm Limit	Code Limit	6mm Limit	Code Limit	6mm Limit
100	197.3	0.0725	2.580	2.270	2.890	2.830	3.240	3.240
110	221.3	0.0825	2.570	2.210	2.800	2.750	3.130	3.130
120	245.3	0.0925	2.560	2.150	2.710	2.680	3.030	3.030
130	269.3	0.1025	2.550	2.100	2.640	2.620	2.950	2.950
140	293.3	0.1125	2.550	2.060	2.570	2.570	2.870	2.870
150	317.3	0.1225	2.490	2.020	2.500	2.500	2.800	2.800
160	341.3	0.1325	2.430	1.980	2.440	2.440	2.730	2.730
170	365.3	0.1425	2.370	1.950	2.390	2.390	2.670	2.670
180	389.3	0.1525	2.320	1.920	2.340	2.340	2.610	2.610
190	413.3	0.1625	2.280	1.890	2.290	2.290	2.560	2.560
200	437.3	0.1725	2.240	1.860	2.250	2.250	2.510	2.510
210	461.3	0.1825	2.200	1.840	2.210	2.210	2.470	2.470
220	485.3	0.1925	2.160	1.820	2.170	2.170	2.420	2.420
230	509.3	0.2025	2.130	1.790	2.130	2.130	2.380	2.380
240	533.3	0.2125	2.090	1.770	2.100	2.100	2.340	2.340
250	557.3	0.2225	2.060	1.750	2.060	2.060	2.310	2.310
260	581.3	0.2325	2.030	1.740	2.030	2.030	2.270	2.270
270	605.2	0.2425	2.010	1.720	2.000	2.000	2.240	2.240
280	629.2	0.2525	1.980	1.700	1.970	1.970	2.210	2.210
290	653.2	0.2625	1.960	1.690	1.940	1.940	2.180	2.180
300	677.2	0.2725	1.930	1.670	1.890	1.890	2.140	2.140

Notes:

1. The limits used on this table may not suit the specific use of your project.
2. To achieve greater spans, use two rows of temporary propping and/or wider beams during the temporary stage, then the span length of double span can be increased (at permanent stage) by adding negative rebars over the support.
3. The spans shown in the above table are indicative only. For specific designs, using the Steelspec® design software is recommended.
4. For any specific queries, we recommend that you contact us directly for advice relating to your project.

SVELTE® 60 - 0.95 mm BMT

MAXIMUM SPANS (m)

*Full range of single, double, end or internal span limits available on Metalcraft's Steelspec™ design tool.

Overall Depth (mm)	Slab Weight (kg/m ²)	Concrete Quantity (m ³ /m ²)	Maximum Span, L (m)					
			Single		Double or End		Internal	
			Code Limit	6mm Limit	Code Limit	6mm Limit	Code Limit	6mm Limit
100	197.3	0.0725	2.790	2.460	3.480	3.060	3.920	3.920
110	221.3	0.0825	2.780	2.390	3.390	2.970	3.790	3.790
120	245.3	0.0925	2.770	2.330	3.290	2.900	3.670	3.670
130	269.3	0.1025	2.760	2.270	3.190	2.830	3.570	3.570
140	293.3	0.1125	2.750	2.220	3.100	2.770	3.470	3.470
150	317.3	0.1225	2.740	2.180	3.020	2.720	3.380	3.380
160	341.3	0.1325	2.690	2.140	2.950	2.670	3.300	3.300
170	365.3	0.1425	2.630	2.110	2.890	2.620	3.230	3.230
180	389.3	0.1525	2.580	2.070	2.820	2.580	3.160	3.160
190	413.3	0.1625	2.530	2.040	2.760	2.540	3.090	3.090
200	437.3	0.1725	2.480	2.010	2.650	2.510	3.010	3.010
210	461.3	0.1825	2.430	1.990	2.550	2.480	2.900	2.900
220	485.3	0.1925	2.390	1.960	2.460	2.440	2.800	2.800
230	509.3	0.2025	2.360	1.940	2.380	2.380	2.700	2.700
240	533.3	0.2125	2.320	1.920	2.300	2.300	2.610	2.610
250	557.3	0.2225	2.290	1.900	2.230	2.230	2.530	2.530
260	581.3	0.2325	2.250	1.880	2.160	2.160	2.450	2.450
270	605.2	0.2425	2.220	1.860	2.100	2.100	2.380	2.380
280	629.2	0.2525	2.190	1.840	2.030	2.030	2.310	2.310
290	653.2	0.2625	2.170	1.820	1.980	1.980	2.250	2.250
300	677.2	0.2725	2.140	1.800	1.920	1.920	2.190	2.190

Notes:

1. The limits used on this table may not suit the specific use of your project.
2. To achieve greater spans, use two rows of temporary propping and/or wider beams during the temporary stage, then the span length of double span can be increased (at permanent stage) by adding negative rebars over the support.
3. The spans shown in the above table are indicative only. For specific designs, using the Steelspec® design software is recommended.
4. For any specific queries, we recommend that you contact us directly for advice relating to your project.

SVELTE® 60 - 1.15 mm BMT

MAXIMUM SPANS (m)

*Full range of single, double, end or internal span limits available on Metalcraft's Steelspec™ design tool.

Overall Depth (mm)	Slab Weight (kg/m ²)	Concrete Quantity (m ³ /m ²)	Maximum Span, L (m)					
			Single		Double or End		Internal	
			Code Limit	6mm Limit	Code Limit	6mm Limit	Code Limit	6mm Limit
100	197.3	0.0725	2.930	2.580	3.650	3.220	4.490	4.490
110	221.3	0.0825	2.920	2.510	3.640	3.130	4.330	4.330
120	245.3	0.0925	2.910	2.440	3.620	3.050	4.120	4.120
130	269.3	0.1025	2.900	2.390	3.610	2.980	3.880	3.880
140	293.3	0.1125	2.890	2.340	3.540	2.910	3.670	3.670
150	317.3	0.1225	2.880	2.290	3.380	2.860	3.490	3.490
160	341.3	0.1325	2.880	2.250	3.210	2.800	3.320	3.320
170	365.3	0.1425	2.810	2.210	3.070	2.760	3.170	3.170
180	389.3	0.1525	2.750	2.180	2.940	2.710	3.030	3.030
190	413.3	0.1625	2.700	2.150	2.810	2.670	2.910	2.910
200	437.3	0.1725	2.650	2.120	2.700	2.640	2.790	2.790
210	461.3	0.1825	2.600	2.090	2.600	2.600	2.690	2.690
220	485.3	0.1925	2.560	2.060	2.510	2.510	2.590	2.590
230	509.3	0.2025	2.520	2.040	2.420	2.420	2.500	2.500
240	533.3	0.2125	2.480	2.010	2.340	2.340	2.420	2.420
250	557.3	0.2225	2.440	1.990	2.270	2.270	2.340	2.340
260	581.3	0.2325	2.410	1.970	2.200	2.200	2.270	2.270
270	605.2	0.2425	2.380	1.950	2.130	2.130	2.200	2.200
280	629.2	0.2525	2.350	1.930	2.070	2.070	2.140	2.140
290	653.2	0.2625	2.320	1.910	2.010	2.010	2.080	2.080
300	677.2	0.2725	2.290	1.900	1.960	1.960	2.020	2.020

Notes:

1. The limits used on this table may not suit the specific use of your project.
2. To achieve greater spans, use two rows of temporary propping and/or wider beams during the temporary stage, then the span length of double span can be increased (at permanent stage) by adding negative rebars over the support.
3. The spans shown in the above table are indicative only. For specific designs, using the Steelspec® design software is recommended.
4. For any specific queries, we recommend that you contact us directly for advice relating to your project.

SVELTE® 80 - 0.75 mm BMT

MAXIMUM SPANS (m)

*Full range of single, double, end or internal span limits available on Metalcraft's Steelspec™ design tool.

Overall Depth (mm)	Slab Weight (kg/m ²)	Concrete Quantity (m ³ /m ²)	Maximum Span, L (m)					
			Single		Double or End		Internal	
			Code Limit	6mm Limit	Code Limit	6mm Limit	Code Limit	6mm Limit
100	175.0	0.0628	3.130	2.750	3.840	3.430	4.290	4.290
110	199.0	0.0728	3.100	2.660	3.690	3.320	4.130	4.130
120	223.0	0.0828	3.080	2.590	3.560	3.230	3.980	3.980
130	247.0	0.0928	3.060	2.520	3.450	3.150	3.860	3.860
140	271.0	0.1028	3.050	2.470	3.330	3.070	3.740	3.740
150	295.0	0.1128	3.040	2.410	3.150	3.010	3.580	3.580
160	319.0	0.1228	3.030	2.370	2.990	2.950	3.400	3.400
170	343.0	0.1328	3.000	2.330	2.850	2.850	3.230	3.230
180	367.0	0.1428	2.940	2.290	2.720	2.720	3.090	3.090
190	391.0	0.1528	2.870	2.250	2.600	2.600	2.950	2.950
200	415.0	0.1628	2.820	2.220	2.490	2.490	2.830	2.830
210	439.0	0.1728	2.770	2.190	2.390	2.390	2.720	2.720
220	463.0	0.1828	2.720	2.160	2.300	2.300	2.620	2.620
230	487.0	0.1928	2.670	2.130	2.220	2.220	2.520	2.520
240	511.0	0.2028	2.630	2.110	2.140	2.140	2.430	2.430
250	535.0	0.2128	2.590	2.080	2.070	2.070	2.350	2.350
260	559.0	0.2228	2.550	2.060	2.000	2.000	2.280	2.280
270	583.0	0.2328	2.520	2.040	1.940	1.940	2.210	2.210
280	607.0	0.2428	2.480	2.020	1.880	1.880	2.140	2.140
290	631.0	0.2528	2.450	2.000	1.830	1.830	2.080	2.080
300	655.0	0.2628	2.420	1.980	1.780	1.780	2.020	2.020

Notes:

1. The limits used on this table may not suit the specific use of your project.
2. To achieve greater spans, use two rows of temporary propping and/or wider beams during the temporary stage, then the span length of double span can be increased (at permanent stage) by adding negative rebars over the support.
3. The spans shown in the above table are indicative only. For specific designs, using the Steelspec® design software is recommended.
4. For any specific queries, we recommend that you contact us directly for advice relating to your project.

SVELTE® 80 - 0.95 mm BMT

MAXIMUM SPANS (m)

*Full range of single, double, end or internal span limits available on Metalcraft's Steelspec™ design tool.

Overall Depth (mm)	Slab Weight (kg/m ²)	Concrete Quantity (m ³ /m ²)	Maximum Span, L (m)					
			Single		Double or End		Internal	
			Code Limit	6mm Limit	Code Limit	6mm Limit	Code Limit	6mm Limit
100	175.0	0.0628	3.360	2.960	4.180	3.680	5.140	5.140
110	199.0	0.0728	3.330	2.860	4.150	3.570	4.750	4.750
120	223.0	0.0828	3.310	2.780	3.890	3.470	4.420	4.420
130	247.0	0.0928	3.290	2.710	3.640	3.380	4.140	4.140
140	271.0	0.1028	3.280	2.650	3.420	3.300	3.890	3.890
150	295.0	0.1128	3.260	2.590	3.230	3.230	3.670	3.670
160	319.0	0.1228	3.250	2.540	3.060	3.060	3.480	3.480
170	343.0	0.1328	3.240	2.500	2.910	2.910	3.310	3.310
180	367.0	0.1428	3.230	2.460	2.780	2.780	3.160	3.160
190	391.0	0.1528	3.160	2.420	2.660	2.660	3.020	3.020
200	415.0	0.1628	3.100	2.380	2.540	2.540	2.890	2.890
210	439.0	0.1728	3.040	2.350	2.440	2.440	2.780	2.780
220	463.0	0.1828	2.990	2.320	2.350	2.350	2.670	2.670
230	487.0	0.1928	2.940	2.290	2.260	2.260	2.570	2.570
240	511.0	0.2028	2.890	2.260	2.180	2.180	2.480	2.480
250	535.0	0.2128	2.850	2.240	2.110	2.110	2.400	2.400
260	559.0	0.2228	2.810	2.210	2.040	2.040	2.320	2.320
270	583.0	0.2328	2.770	2.190	1.970	1.970	2.240	2.240
280	607.0	0.2428	2.730	2.170	1.910	1.910	2.180	2.180
290	631.0	0.2528	2.700	2.150	1.860	1.860	2.110	2.110
300	655.0	0.2628	2.660	2.130	1.800	1.800	2.050	2.050

Notes:

1. The limits used on this table may not suit the specific use of your project.
2. To achieve greater spans, use two rows of temporary propping and/or wider beams during the temporary stage, then the span length of double span can be increased (at permanent stage) by adding negative rebars over the support.
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SVELTE® 80 - 1.15mm BMT

MAXIMUM SPANS (m)

*Full range of single, double, end or internal span limits available on Metalcraft's Steelspec™ design tool.

Overall Depth (mm)	Slab Weight (kg/m ²)	Concrete Quantity (m ³ /m ²)	Maximum Span, L (m)					
			Single		Double or End		Internal	
			Code Limit	6mm Limit	Code Limit	6mm Limit	Code Limit	6mm Limit
100	175.0	0.0628	3.550	3.120	4.420	3.890	4.710	4.710
110	199.0	0.0728	3.520	3.020	4.280	3.770	4.420	4.420
120	223.0	0.0828	3.500	2.940	3.990	3.660	4.120	4.120
130	247.0	0.0928	3.480	2.870	3.730	3.570	3.850	3.850
140	271.0	0.1028	3.460	2.800	3.510	3.490	3.620	3.620
150	295.0	0.1128	3.450	2.740	3.310	3.310	3.420	3.420
160	319.0	0.1228	3.430	2.690	3.130	3.130	3.240	3.240
170	343.0	0.1328	3.420	2.640	2.980	2.980	3.080	3.080
180	367.0	0.1428	3.420	2.600	2.840	2.840	2.930	2.930
190	391.0	0.1528	3.400	2.550	2.710	2.710	2.800	2.800
200	415.0	0.1628	3.340	2.520	2.600	2.600	2.680	2.680
210	439.0	0.1728	3.270	2.480	2.490	2.490	2.570	2.570
220	463.0	0.1828	3.220	2.450	2.390	2.390	2.470	2.470
230	487.0	0.1928	3.160	2.420	2.300	2.300	2.380	2.380
240	511.0	0.2028	3.110	2.390	2.220	2.220	2.300	2.300
250	535.0	0.2128	3.070	2.360	2.150	2.150	2.220	2.220
260	559.0	0.2228	3.020	2.340	2.070	2.070	2.140	2.140
270	583.0	0.2328	2.980	2.310	2.010	2.010	2.070	2.070
280	607.0	0.2428	2.940	2.290	1.950	1.950	2.010	2.010
290	631.0	0.2528	2.900	2.270	1.890	1.890	1.950	1.950
300	655.0	0.2628	2.870	2.250	1.830	1.830	1.890	1.890

Notes:

1. The limits used on this table may not suit the specific use of your project.
2. To achieve greater spans, use two rows of temporary propping and/or wider beams during the temporary stage, then the span length of double span can be increased (at permanent stage) by adding negative rebars over the support.
3. The spans shown in the above table are indicative only. For specific designs, using the Steelspec® design software is recommended.
4. For any specific queries, we recommend that you contact us directly for advice relating to your project.

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C/AS1: June 2001
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SVELTE® ACOUSTICS AND BUILDINGS

NOISE TRANSMISSION

The transmission of noise into an occupancy, whether this is a residential apartment, commercial office, television studio, or another kind of development is often a fundamental aspect which the building must be designed and constructed to achieve. For example, a television studio constructed next to a busy highway or under the flight path of an airport. Sometimes, noise transmission out of a building is the main concern, for example, a nightclub in the central business district - where apartments may also be located.

In these situations, the 'building envelope' may need to be acoustically treated so that an appropriate internal noise level is achieved or neighbours are not disrupted by noise. Such treatment may include upgrades to windows, doors, wall and roof assemblies.

Noise transmission within a building is often also a concern. Again, using the television studio as an example, there may be a plant room containing a noisy air conditioning plant which is located next to or above a recording studio. Thus the noise from the mechanical plant needs to be controlled to low levels within the studio, appropriate for the recording of sound.

The provision of 'mass' is critical to achieving good reduction of noise, especially at low frequencies. Concrete has a high density and is ideal for providing this mass, and both the SVELTE® 60 and SVELTE® 80 systems satisfies this requirement. When further elements are added, such as suspended ceilings and 'soft' floor coverings, very high acoustic ratings can be achieved with the SVELTE® floor system.

NZ BUILDING CODE

The NZ Building Code contains acoustic performance criteria in relation to noise transmission between multi-unit developments e.g., between apartments within a building. A brief discussion of the criteria and rating methods used in the Building Code will be useful: Sound Transmission Class (STC) - The Sound Transmission Class is a rating procedure for walls and floor/ceiling assemblies in terms of its ability to reduce 'airborne' sound. This is the transmission of 'airborne noise' from sources such as televisions, people talking, radios etc.

The acoustic performance of a wall or floor/ceiling assembly is described by a single figure – the higher the STC, the better the acoustic performance of the assembly in terms of reducing sound from next door. However, there are limitations with this method since sound which is heard has different frequency content, e.g. a concrete wall with a rating of FSTC 50 may reduce sound differently to a timber-framed wall with the same FSTC 50 rating.

The concrete block wall is typically heavier and will control low-frequency sounds better than a timber or steel-framed wall which is lined on both sides with plasterboard sheets. An example of this where there are two bedrooms 'back to back' with a stereo playing rock music in one room and a person is trying to sleep in the room next door. The low frequency 'bass beat' of the music will be controlled better by the concrete wall.

AIRBORNE SOUND INSULATION

The performance requirement for airborne sound insulation in the NZ Building Code is set out below. This requirement relates to the transmission of 'airborne noise' from sources such as televisions, people talking, radios etc.

- The Sound Transmission Class of walls, floors and ceilings shall be no less than 55" (G6.3.1).
- The performance for airborne sound insulation may be verified using the procedures detailed in ASTM E336, and the field sound transmission class may be verified using the method described in ASTM E413. Field test results shall be within 5 dB of the performance requirement." (G6/VM1).

As such, the laboratory rating of the assembly must be 55 or greater, but the minimum 'Field' (on-site rating, or out in the 'field') Sound Transmission Class allowed is FSTC 50. This applies to build elements such as inter-tenancy walls and floor/ceiling assemblies, which are common between different occupancies such as adjoining apartments. The performance requirement only applies to 'habitable spaces' such as bedrooms and living areas (not to service areas such as laundries or bathrooms).

IMPACT INSULATION CLASS (IIC)

The Impact Insulation Class (IIC) is used to rate the impact transmission performance of a floor/ceiling assembly. This can be described as the transmission of 'footfall' noise from one apartment into another apartment, such as from a kitchen/dining area into a similar area directly below.

The acoustic performance of a wall or floor/ceiling assembly is described by a single figure – in general terms, the higher the IIC figure, the better the acoustic performance of the assembly, in terms of reducing impact sound from the floor above. However, there are limitations with this method since impact sound transmitted through one type of floor/ceiling assembly can be quite different from the impact sound, which is transmitted/heard through a different assembly. For example, the transmission of sound through a concrete floor is quite different to the sound transmitted through a timber joist assembly. The concrete floor with a rating of FIIC 50 will sound different to a timber joist assembly with the same FIIC 50 rating.

Again, like a concrete block wall, a concrete floor system is typically heavier and stiffer and will control low-frequency sounds better than a timber or steel joist floor system, which is significantly lighter. Transmission of low-frequency 'thuds' and 'thumps' is often an issue where timber joist assemblies are used between apartments.

With respect to impact sound insulation, the performance requirement in the NZ Building Code is set out below:

"The Impact Insulation Class of floors shall be no less than 55" (G6.3.2). The performance for impact sound insulation may be verified using the procedures detailed in ISO 140: Part VII and the field impact insulation class may be verified using the method described in ASTM E989. Field test results shall be within 5 dB of the performance requirement." (G6/VM1). As such, the minimum Field Impact Insulation Class allowed on site is FIIC 50. This applies to the floor/ceiling assemblies between apartments. For example, noise from footfall on the floor of an apartment, which is transmitted down into the apartment directly below.

The performance requirement only applies to 'habitable spaces' on the level below, such as bedrooms and living areas (not to service areas such as laundries or bathrooms). The test uses a tapping machine, which is a mechanical unit with a series of hammers which drop sequentially onto the floor.

REVISED NZ BUILDING CODE

The acoustic criteria of the building code is currently under revision. It is likely that alternative ISO rating methods (instead of STC and IIC) will be used, and the requirements will be more stringent and expanded to cover more situations. In general, the criteria are likely to be at least 5 points stricter than the existing STC/IIC criteria; for example, minimum on-site requirements would be equivalent to FSTC 55 and FIIC 55.

It is expected that additional acoustic performance criteria will also apply to more situations in residential developments, such as impact noise from kitchen cupboards, noise from plumbing and sound from external noise sources.

SVELTE® ACOUSTICS AND BUILDINGS

FLOOR/CEILING ASSEMBLIES

In New Zealand, a standard floor/ceiling assembly used for multi-storey residential buildings is a concrete floor slab with a plasterboard ceiling suspended beneath. This system provides excellent control of both airborne and structure-borne noise and both the SVELTE® 60 and SVELTE® 80 floor systems can be used with confidence in this regard. However, as for all other concrete (and timber joist) floor assemblies, care must be taken with the selection of the floor/ceiling assembly, particularly the type of floor coverings ('soft' coverings, such as carpet, or 'hard' finish floors such as ceramic tiles and timber strip flooring). In general, hard finish floors must have an acoustic underlay beneath the flooring in order to achieve acceptable impact ratings and comply with the NZ Building Code. The installation of the acoustic underlay and the hard finish flooring is critical to the on-site FIC rating which is achieved. The acoustic underlay must be installed in full accordance with the manufacturer's written instructions, and the underlay must not be 'short-circuited', e.g. around the perimeter or at the junction with a wall.

The ceiling cavity is often used for services such as supply and waste-water pipework and electrical services. The ceiling will help reduce noise from these services, but additional treatment is often required to provide further attenuation; e.g. lagging of waste-water pipework in the ceiling above a bedroom. The STC and IIC ratings for a range of floor/ceiling assemblies, using both the SVELTE® 60 and SVELTE® 80 systems, have been estimated. Note that these are laboratory ratings and not on-site ratings since the 'Field' performance is affected by many factors. The acoustic performance of three generic types of floor/ceiling assembly have been assessed, and these are summarized and shown on the following figures and tables and classified as:

TYPE A: SVELTE® 60 and SVELTE® 80 floor system with various concrete topping thicknesses, and with various floor coverings. No ceiling.

TYPE B: SVELTE® 60 and SVELTE® 80 floor system with various concrete topping thicknesses, and with various floor coverings, and also with a suspended plasterboard ceiling beneath the floor.

TYPE C: SVELTE® 60 and SVELTE® 80 floor system with various concrete topping thicknesses, and with various floor coverings, and also with a suspended plasterboard ceiling beneath the floor including Batt insulation to the ceiling cavity.

PREDICTED STC AND IIC RATINGS

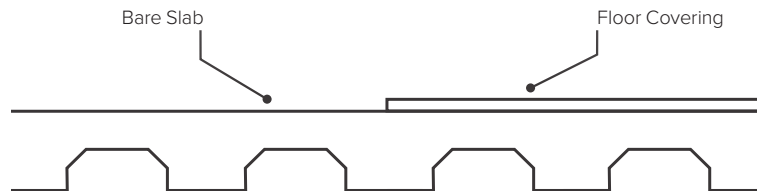
Predicted STC and IIC ratings for both SVELTE® 60 and SVELTE® 80 flooring system tables highlight the following factors which affect acoustic performance:



- Solid 10-13mm plasterboard ceilings, suspended on a wire suspension system, significantly improve the STC ratings of floor/ceiling assemblies. Note that the wire suspension system (a combination of rods/wires/strongback/furring channel) provides 'resilience' in the system, providing a degree of structural disconnection between the floor slab and the plasterboard ceiling. A suspended ceiling also typically provides a larger air-gap between the slab and the ceiling. These factors provide further acoustic benefits, compared with a ceiling which is fixed directly to the underside of the slab, e.g. with timber battens. Note that the above ratings will not be achieved with a solid connection between the floor and the ceiling (such as a steel beam, or timber battens fixed directly to the underside of the floor slab).
- Batt insulation, located within the ceiling cavity, provides further acoustic benefits.
- Soft floor coverings such as carpet and pad underlay provide high IIC ratings, and significantly reduce the generation and transmission of impact sound. However, this covering is impractical in kitchens and bathrooms.
- Acoustic underlayments must be installed beneath hard finish floorings such as ceramic tiles and timber strip flooring in order to comply with the Building Code. Products on the NZ market are often withdrawn or reformulated. On-site testing, initially on 1200x1200 samples laid on representative floor areas is often the only method to initially confirm that the underlay is suitable and whether or not compliance with the relevant acoustic criterion can be achieved.



PREDICTED STC AND IIC RATINGS FOR SVELTE® 60 AND SVELTE® 80 FLOORING SYSTEM

TYPE A: SVELTE® 60 AND SVELTE® 80 FLOOR SYSTEM WITH VARIOUS CONCRETE TOPPING THICKNESSES, AND WITH VARIOUS FLOOR COVERINGS. NO CEILING.

FLOOR CEILING ASSEMBLY TYPE A



AIRBORNE NOISE TRANSMISSION			IMPACT NOISE TRANSMISSION				NOTES
Floor/ceiling Assembly	SVELTE® 60 Floor System with overall thickness (mm) from bottom of trough	STC (Rw)	WITH FLOOR COVERING				
			None, bare slab	Hard flooring on  IIC/Lw 15+ underlay	Hard flooring on  IIC/Lw 20+ underlay	Carpet with pad underlay	
TYPE A	Slab only, no ceiling	110	41(42)	20(90)	27(83)	39(71)	1. 4.
		140	43(43)	22(88)	28(82)	39(71)	
		170	47(48)	24(86)	33(77)	40(70)	
		200	49(49)	25(85)	34(76)	40(70)	

AIRBORNE NOISE TRANSMISSION			IMPACT NOISE TRANSMISSION				NOTES
Floor/ceiling Assembly	SVELTE® 80 Floor System with overall thickness (mm) from bottom of trough	STC (Rw)	WITH FLOOR COVERING				
			None, bare slab	Hard flooring on  IIC/Lw 15+ underlay	Hard flooring on  IIC/Lw 20+ underlay	Carpet with pad underlay	
TYPE A	Slab only, no ceiling	130	42(42)	20(90)	27(83)	38(72)	1. 4.
		160	44(44)	22(88)	29(81)	36(74)	
		180	46(46)	24(86)	31(79)	38(72)	
		200	48(48)	25(85)	33(77)	39(71)	

Note 1: Sound Transmission Class (STC) is similar to Weighted Sound Reduction Index (Rw). Impact Insulation Class (IIC) cannot be directly compared to Weighted Normalized Impact Sound Pressure Level (Lnw) but as a guide, IIC = 110-Lnw, and the larger the IIC (and the lower the Lnw), the better reduction of impact sound. Delta IIC (Lw) is a weighted reduction in impact sound pressure level, provided by the acoustic underlayment.

Note 2: Plasterboard ceiling, the minimum surface weight of 6.4kg/m². Ceiling suspended on a wire suspension system, approximately 300mm below the underside of the SVELTE® floor system. No other rigid or structural connections between the slab and the ceiling. No penetrations in the ceiling.

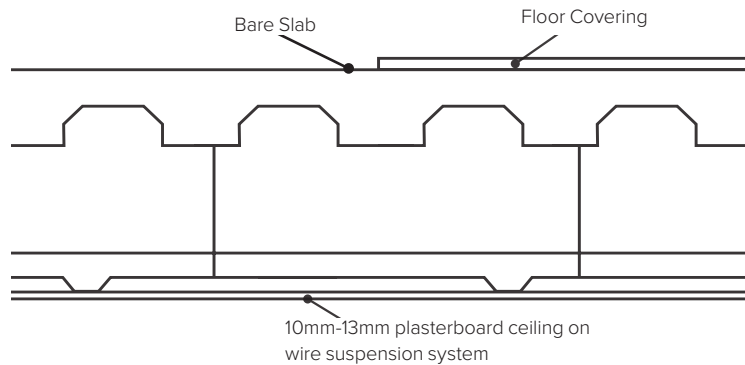
Note 3: Minimum 75mm thick, R1.8 fibrous batt insulation(10kg/m³) to the entire ceiling cavity, eg. Fibreglass or polyester Batts.

Note 4: Best engineering estimates only.

PREDICTED STC AND IIC RATINGS FOR SVELTE® 60 AND SVELTE® 80 FLOORING SYSTEM

TYPE B: SVELTE® 60 AND SVELTE® 80 FLOOR SYSTEM WITH VARIOUS CONCRETE TOPPING THICKNESSES, AND WITH VARIOUS FLOOR COVERINGS, AND ALSO WITH A SUSPENDED PLASTERBOARD CEILING BENEATH THE FLOOR.

FLOOR CEILING ASSEMBLY TYPE B



AIRBORNE NOISE TRANSMISSION			IMPACT NOISE TRANSMISSION					NOTES
Floor/ceiling Assembly	SVELTE® 60 Floor System with overall thickness (mm) from bottom of trough	STC (Rw)	WITH FLOOR COVERING					
			None, bare slab	Hard flooring on \triangle IIC/Lw 15+ underlay	Hard flooring on \triangle IIC/Lw 20+ underlay	Carpet with pad underlay	IIC (Lnw)	
TYPE B	Slab with suspended 10-13mm plasterboard ceiling. No batt insulation to cavity	110	55(56)	36(74)	42(68)	44(66)	65(45)	1. 2. 4.
		140	56(56)	37(73)	43(67)	46(64)	65(45)	
		170	58(59)	42(68)	45(65)	50(60)	68(42)	1. 2. 3. 4.
		200	59(59)	44(66)	46(64)	52(58)	69(41)	

AIRBORNE NOISE TRANSMISSION			IMPACT NOISE TRANSMISSION					NOTES
Floor/ceiling Assembly	SVELTE® 80 Floor System with overall thickness (mm) from bottom of trough	STC (Rw)	WITH FLOOR COVERING					
			None, bare slab	Hard flooring on \triangle IIC/Lw 15+ underlay	Hard flooring on \triangle IIC/Lw 20+ underlay	Carpet with pad underlay	IIC (Lnw)	
TYPE B	Slab with suspended 10-13mm plasterboard ceiling. No batt insulation to cavity	130	55(55)	36(74)	42(68)	44(66)	64(46)	1. 2. 4.
		160	56(56)	38(72)	43(67)	46(64)	65(45)	
		180	57(57)	40(70)	44(66)	48(62)	66(44)	1. 2. 3. 4.
		200	58(58)	42(68)	46(64)	51(59)	67(43)	

Note 1: Sound Transmission Class (STC) is similar to Weighted Sound Reduction Index (Rw). Impact Insulation Class (IIC) cannot be directly compared to Weighted Normalized Impact Sound Pressure Level (L_{nw}) but as a guide, IIC = 110 - L_{nw}, and the larger the IIC (and the lower the L_{nw}), the better reduction of impact sound. Delta IIC (L_w) is a weighted reduction in impact sound pressure level, provided by the acoustic underlayment.

Note 2: Plasterboard ceiling, the minimum surface weight of 6.4kg/m². Ceiling suspended on a wire suspension system, approximately 300mm below the underside of the SVELTE® floor system. No other rigid or structural connections between the slab and the ceiling. No penetrations in the ceiling.

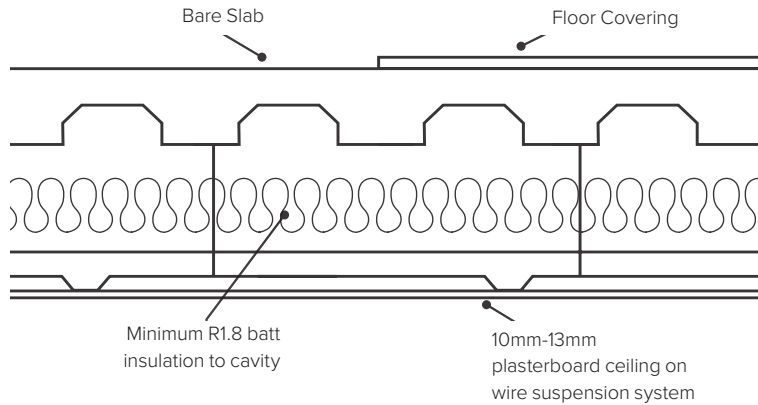
Note 3: Minimum 75mm thick, R1.8 fibrous batt insulation(10kg/m³) to the entire ceiling cavity, eg. Fibreglass or polyester Batts.

Note 4: Best engineering estimates only.

PREDICTED STC AND IIC RATINGS FOR SVELTE® 60 AND SVELTE® 80 FLOORING SYSTEM

TYPE C: SVELTE® 60 AND SVELTE® 80 FLOOR SYSTEM WITH VARIOUS CONCRETE TOPPING THICKNESSES, AND WITH VARIOUS FLOOR COVERINGS, AND ALSO WITH A SUSPENDED PLASTERBOARD CEILING BENEATH THE FLOOR INCLUDING BATT INSULATION TO THE CEILING CAVITY.

FLOOR CEILING ASSEMBLY TYPE C



AIRBORNE NOISE TRANSMISSION			IMPACT NOISE TRANSMISSION					NOTES
Floor/ceiling Assembly	SVELTE® 60 Floor System with overall thickness (mm) from bottom of trough	STC (Rw)	WITH FLOOR COVERING					
			None, bare slab	Hard flooring on Δ IIC/Lw 15+ underlay	Hard flooring on Δ IIC/Lw 20+ underlay	Carpet with pad underlay	IIC (Lnw)	
TYPE C	Slab with Suspended 10-13mm plasterboard ceiling. Minimum R1.8 fibrous batt Insulation to cavity	110	60(61)	37(73)	52(58)	55(55)	70(40)	1. 2. 3. 4.
		140	61(62)	38(72)	53(57)	56(54)	72(38)	
		170	63(64)	43(67)	57(53)	59(51)	75(35)	
		200	64(65)	45(65)	58(52)	60(50)	75(35)	

AIRBORNE NOISE TRANSMISSION			IMPACT NOISE TRANSMISSION					NOTES
Floor/ceiling Assembly	SVELTE® 80 Floor System with overall thickness (mm) from bottom of trough	STC (Rw)	WITH FLOOR COVERING					
			None, bare slab	Hard flooring on Δ IIC/Lw 15+ underlay	Hard flooring on Δ IIC/Lw 20+ underlay	Carpet with pad underlay	IIC (Lnw)	
TYPE C	Slab with suspended 10-13mm plasterboard ceiling. Minimum R1.8 fibrous batt insulation to cavity	130	59(59)	37(73)	52(58)	55(55)	68(42)	1. 2. 3. 4.
		160	61(61)	39(71)	53(57)	56(54)	69(41)	
		180	62(62)	40(70)	55(55)	59(51)	71(39)	
		200	63(63)	42(68)	57(53)	60(50)	75(35)	

Note 1: Sound Transmission Class (STC) is similar to Weighted Sound Reduction Index (Rw). Impact Insulation Class (IIC) cannot be directly compared to Weighted Normalized Impact Sound Pressure Level (L_{nw}) but as a guide, IIC = 110-L_{nw}, and the larger the IIC (and the lower the L_{nw}), the better reduction of impact sound. Delta IIC (L_{nw}) is a weighted reduction in impact sound pressure level, provided by the acoustic underlayment.

Note 2: Plasterboard ceiling, the minimum surface weight of 6.4kg/m². Ceiling suspended on a wire suspension system, approximately 300mm below the underside of the SVELTE® floor system. No other rigid or structural connections between the slab and the ceiling. No penetrations in the ceiling.

Note 3: Minimum 75mm thick, R1.8 fibrous batt insulation(10kg/m³) to the entire ceiling cavity, eg. Fibreglass or polyester Batts.

Note 4: Best engineering estimates only.

CONSTRUCTION & ON-SITE PERFORMANCE

CONSTRUCTION AND ON-SITE ACOUSTIC PERFORMANCE

The on-site acoustic performance can be significantly affected by the following:

- Poor detailing or insufficient sealing, for example, at the perimeter of a wall or floor where there are small gaps, which provide a path for sound. Even very small gaps can significantly degrade the acoustic performance of the assembly.
- Service penetrations such as air conditioning ducts, supply and wastewater pipework, fire sprinkler pipework and electrical services can provide a path for noise.
- Flanking transmission paths, both airborne and structure-borne.

Flanking transmission paths are paths for sound other than through the building element which separates the two spaces. An example is a common suspended floor slab which is continuous between two apartments. While the inter-tenancy wall separating the two apartments may have a high STC rating, and is constructed very carefully without any penetrations and fully sealed, the acoustic performance of the wall assembly may be well below its laboratory performance and even fall below the minimum requirement of the Building Code.

This apparent 'failure' of the wall may not be due to the wall at all, but maybe attributed to flanking transmission such as via a common ceiling cavity, or via a common flooring system, which runs continuously between the apartments. This can occur with timber joist assemblies but can also arise with 'thin' concrete floor systems, for example, where the slab is less than 120mm thick. See airborne noise flanking paths A and B in Figure 1.0.

For this reason, it is very important that in multi-storey residential developments where the floor slab is proposed to be continuous between units, the floor slab is not too thin so that it causes problems with flanking transmission in the horizontal direction. Rib direction is also important. In general, both SVELTE® 60 and SVELTE® 80 with at least 110mm topping (170mm overall depth) should be considered as the minimum to help achieve on-site ratings of at least FSTC 50. For higher ratings, SVELTE® 80 with 140mm topping should be considered.

Another example of flanking transmission, this time in relation to impact noise, is where internal wall partitions are constructed up to the underside of the floor slab above. These partitions will 'short-circuit' a suspended plasterboard ceiling which is installed after the partitions have been constructed. Transmission of impact noise via a continuous external wall can also be an issue. See impact noise flanking paths A and B in Figure 1.0.

Care must be taken to detail these correctly, including sufficient mass and structural disconnections to minimise airborne and impact noise flanking paths so that these do not reduce the acoustic performance below the minimum required. Flanking paths cannot be completely eliminated, but their contribution can be minimised.

For these reasons, high on-site FSTC and FIIC ratings are very difficult to achieve. In general, airborne FSTC ratings in the mid-high 50s are achievable, but FSTC 60+ is difficult. In terms of impact noise, ratings of FIIC 60+ are achievable with carpet and pad floor coverings and vinyl with thick cushion-backing, but hard floor coverings (ceramic tiles, timber strip, laminated flooring etc.) must be installed on an acoustic underlayment. And even with these installed correctly, ratings in the mid-high 50's are often the best that can be achieved.

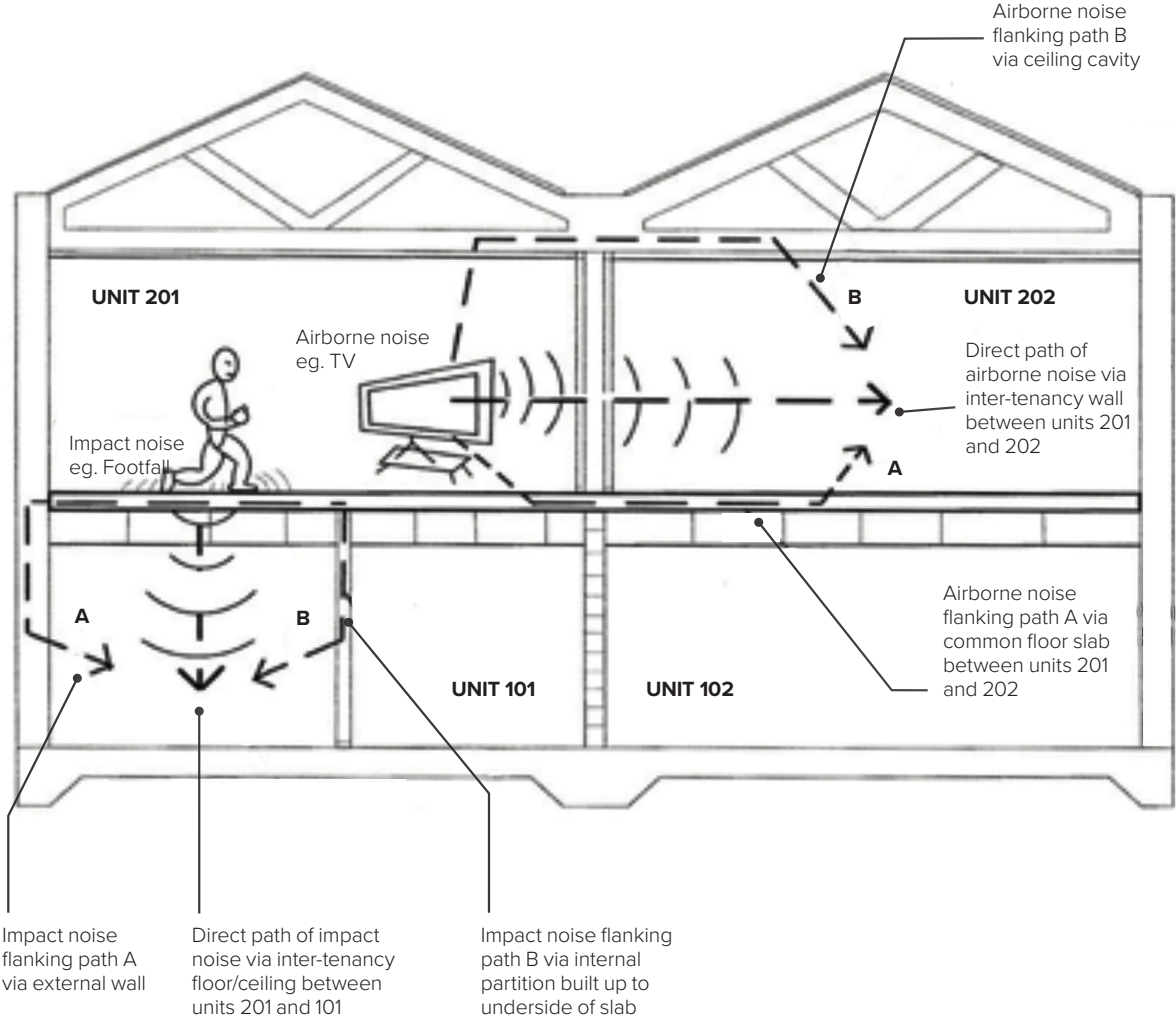
DISCLAIMER

Best engineering estimates of laboratory STC and IIC ratings have been made, using a combination of theoretical and empirical models. Estimates are of laboratory ratings, not on-site (Field) ratings, which are affected by a range of factors such as on-site conditions and installation.

While every effort has been made, no warranty on the correctness of this information is provided by Design Acoustics Ltd. No liability or responsibility is accepted by Design Acoustics Ltd for any consequences resulting from the use of this information.

Acoustic consultants should be engaged at an early date to assist the acoustical design of the building project. On-site testing of walls, floor/ceiling assemblies etc. during the construction of the project, is strongly recommended to ensure that the acoustic criteria specified for the project will be achieved on completion. This design guide shall not be treated as a substitute for detailed technical advice from an acoustic professional.

AIRBORNE NOISE FLANKING PATHS A AND B IN FIGURE 1.0.



UNIFLOOR®

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UNIFLOOR® PRODUCT SPECIFICATION

AN ADAPTABLE & EASY TO INSTALL FLOORING SOLUTION FOR A RANGE OF PROJECTS.

UNIFLOOR® is a long span Flat Soffit profile with a 300mm cover. It's an interlocking, adaptable and easy to install floor solution for a range of building & construction projects. Engineered with a unique profile that has an interlocking edge lap, the UNIFLOOR design complements that of vertical tilt panels. Their combined use allows design for commercial, industrial and residential buildings to be combined, utilising diaphragms to connect to vertical shear walls in their major orientation.

All our profiles are manufactured from the highest grade steel, and designed utilizing up to date design standards including:

- AS/NZS 4600 "Cold formed structures code"
- AS/NZS2327:2017 Composite Structures -Composite Steel concrete construction in Buildings

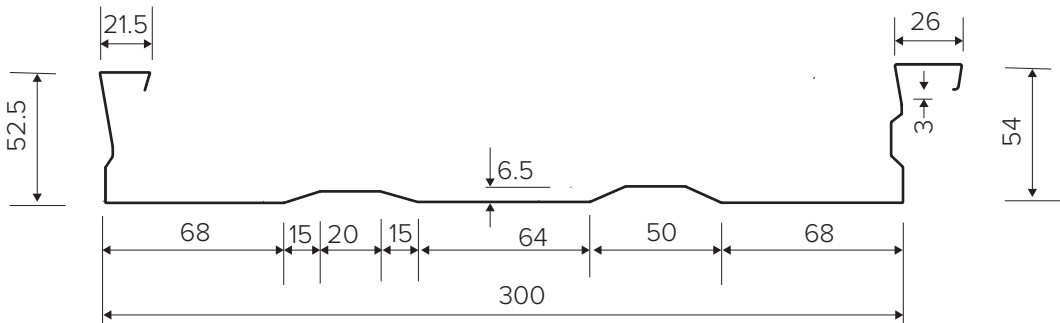
Panels are manufactured from G550 (550MPa yield stress) steel with a base metal thickness of 0.75mm, 0.95mm and 1.15mm

The steel panel is protected with a galvanized coating of Z275. A galvanized coating of Z450 is optional when required.

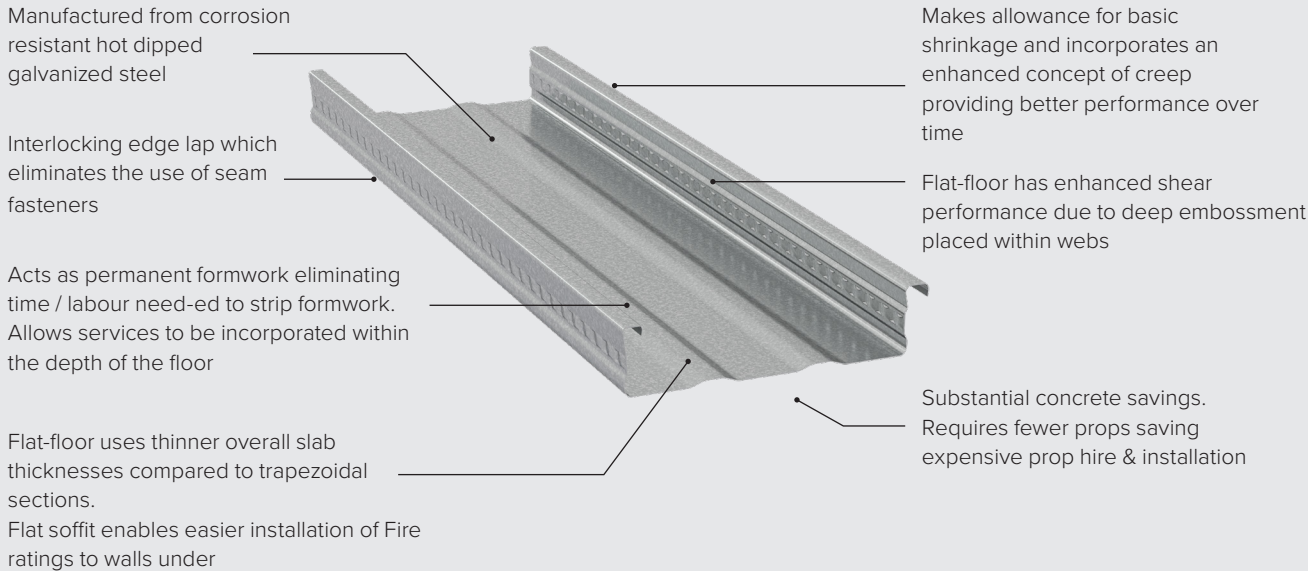
UNIFLOOR® is delivered to site pre-cut to the correct sizes and ready to fix, reducing on- site work. Cost effective & easy to install, UNIFLOOR® composite steel decking system delivers longer spans, requires less concrete, and ultimately drives down project cost.

UNIFLOOR® PROFILE

Dimensions are nominal. Do not scale.



PROFILE AND FEATURES



UNIFLOOR® SPAN TABLES

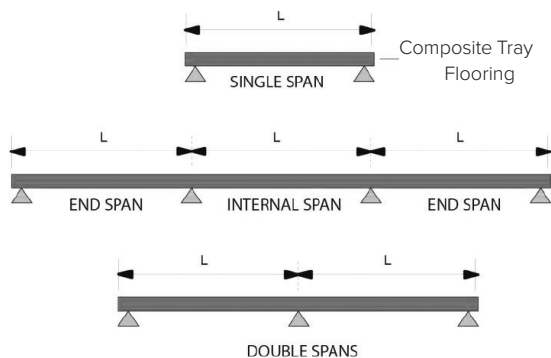
UNIFLOOR® SPAN TABLES

The following tables provide maximum formwork span tables for the Metalcraft Composite Flooring range of products. The following notes apply to these tables and shall be read in conjunction with the tables.

These tables are intended for competent, experienced installers only. Installers shall ensure that these tables are the latest issue prior to use. It is the contractors responsibility to comply with all Health & Safety and Worksafe requirements.

"D" denotes the overall thickness of the slab.
"L" is the maximum span measured centre to centre between temporary or permanent supports.

Refer to diagrams below for typical formwork slab configurations.



THE USE OF DOUBLE OR END SPANS MAY ONLY BE USED IF:

- All spans have the same thickness.
- Double spans are within 10% of each other, and the largest span is used in these tables.
- Internal spans are within 10% of each other & the largest internal span is used in these tables.
- The end span is within 5% of the internal span and that the end and internal spans are designed using the appropriate tables.

Construction loads (Q) are taken from BS5950, which provides for a minimum of 1.5kPa for spans greater than 3.0m, or 4500/L.

Slab weights (G) are based on wet concrete with a density of 2400 kg/m³ and 10 kg/m² for reinforcing. No allowance is made for ponding by ensuring that deflections are less than $D/10$, where D equals the overall deflection limits are as follows;

- $L/180$ maximum due to dead load (G) only
- $D/10$ maximum, so that concrete ponding does not affect the design. The above limits are the "Code Limit" column in the tables. The "6mm limit" column in the tables shall be referenced when soffit deflection is critical.

It is the contractors responsibility to confirm and verify soffit deflection limits with the Main Contractor and/or Design Engineer.

Adequate restraint and bearing length to the steel flooring shall be provided at each end.

Propping design, and it's loading onto any supporting structure shall be undertaken by others.

Refer to Design Engineers drawings for specific propping requirements, additional reinforcing, mesh etc.

UNIFLOOR® - 0.75 mm BMT

MAXIMUM SPANS (m)

*Full range of single, double, end or internal span limits available on Metalcraft's Steelspec™ design tool.

Overall Depth (mm)	Slab Weight (kg/m ²)	Concrete Quantity (m ³ /m ²)	Maximum Span, L (m)		
			Single	End	Internal
			Code Limit	Code Limit	Code Limit
100	263.4	0.1000	2.25	2.32	2.59
110	287.4	0.1100	2.26	2.26	2.52
120	311.4	0.1200	2.26	2.20	2.46
130	335.4	0.1300	2.24	2.15	2.40
140	359.4	0.1400	2.19	2.10	2.35
150	383.4	0.1500	2.14	2.06	2.30
160	407.4	0.1600	2.10	2.01	2.25
170	431.4	0.1700	2.06	1.97	2.21
180	455.4	0.1800	2.02	1.94	2.16
190	479.4	0.1900	1.99	1.90	2.12
200	503.4	0.2000	1.96	1.87	2.09
210	527.4	0.2100	1.93	1.84	2.05
220	551.4	0.2200	1.90	1.81	2.02
230	575.4	0.2300	1.89	1.80	2.01
240	599.3	0.2400	1.84	1.75	1.95
250	623.3	0.2500	1.81	1.72	1.92
260	647.3	0.2600	1.79	1.70	1.90
270	671.3	0.2700	1.76	1.67	1.87
280	695.3	0.2800	1.74	1.65	1.84
290	719.3	0.2900	1.72	1.63	1.82
300	743.3	0.3000	1.69	1.61	1.79

Notes:

1. The limits used on this table may not suit the specific use of your project.
2. To achieve greater spans, use two rows of temporary propping and/or wider beams during the temporary stage, then the span length of double span can be increased (at permanent stage) by adding negative rebars over the support.
3. The spans shown in the above table are indicative only. For specific designs, using the Steelspec® design software is recommended.
4. For any specific queries, we recommend that you contact us directly for advice relating to your project.

UNIFLOOR® - 0.95 mm BMT

MAXIMUM SPANS (m)

*Full range of single, double, end or internal span limits available on Metalcraft's Steelspec™ design tool.

Overall Depth (mm)	Slab Weight (kg/m ²)	Concrete Quantity (m ³ /m ²)	Maximum Span, L (m)		
			Single	End	Internal
			Code Limit	Code Limit	Code Limit
100	263.4	0.1000	2.37	2.56	3.00
110	287.4	0.1100	2.38	2.58	2.92
120	311.4	0.1200	2.38	2.55	2.85
130	335.4	0.1300	2.39	2.49	2.78
140	359.4	0.1400	2.35	2.43	2.72
150	383.4	0.1500	2.30	2.38	2.66
160	407.4	0.1600	2.25	2.33	2.61
170	431.4	0.1700	2.21	2.29	2.55
180	455.4	0.1800	2.17	2.24	2.51
190	479.4	0.1900	2.13	2.20	2.46
200	503.4	0.2000	2.10	2.16	2.42
210	527.4	0.2100	2.07	2.13	2.38
220	551.4	0.2200	2.04	2.09	2.34
230	575.4	0.2300	2.03	2.08	2.33
240	599.3	0.2400	1.98	2.03	2.26
250	623.3	0.2500	1.95	1.99	2.23
260	647.3	0.2600	1.93	1.97	2.20
270	671.3	0.2700	1.91	1.94	2.17
280	695.3	0.2800	1.88	1.91	2.14
290	719.3	0.2900	1.86	1.89	2.11
300	743.3	0.3000	1.84	1.86	2.08

Notes:

1. The limits used on this table may not suit the specific use of your project.
2. To achieve greater spans, use two rows of temporary propping and/or wider beams during the temporary stage, then the span length of double span can be increased (at permanent stage) by adding negative rebars over the support.
3. The spans shown in the above table are indicative only. For specific designs, using the Steelspec® design software is recommended.
4. For any specific queries, we recommend that you contact us directly for advice relating to your project.

UNIFLOOR® - 1.15 mm BMT

MAXIMUM SPANS (m)

*Full range of single, double, end or internal span limits available on Metalcraft's Steelspec™ design tool.

Overall Depth (mm)	Slab Weight (kg/m ²)	Concrete Quantity (m ³ /m ²)	Maximum Span, L (m)		
			Single	End	Internal
			Code Limit	Code Limit	Code Limit
100	263.4	0.1000	2.47	2.67	3.37
110	287.4	0.1100	2.48	2.69	3.29
120	311.4	0.1200	2.48	2.71	3.21
130	335.4	0.1300	2.49	2.72	3.13
140	359.4	0.1400	2.48	2.74	3.06
150	383.4	0.1500	2.43	2.68	3.00
160	407.4	0.1600	2.38	2.63	2.93
170	431.4	0.1700	2.33	2.57	2.88
180	455.4	0.1800	2.29	2.53	2.82
190	479.4	0.1900	2.25	2.48	2.77
200	503.4	0.2000	2.22	2.44	2.72
210	527.4	0.2100	2.18	2.39	2.68
220	551.4	0.2200	2.15	2.35	2.63
230	575.4	0.2300	2.14	2.34	2.62
240	599.3	0.2400	2.09	2.28	2.55
250	623.3	0.2500	2.06	2.25	2.51
260	647.3	0.2600	2.04	2.21	2.47
270	671.3	0.2700	2.01	2.18	2.44
280	695.3	0.2800	1.99	2.15	2.41
290	719.3	0.2900	1.97	2.12	2.37
300	743.3	0.3000	1.95	2.10	2.34

Notes:

1. The limits used on this table may not suit the specific use of your project.
2. To achieve greater spans, use two rows of temporary propping and/or wider beams during the temporary stage, then the span length of double span can be increased (at permanent stage) by adding negative rebars over the support.
3. The spans shown in the above table are indicative only. For specific designs, using the Steelspec® design software is recommended.
4. For any specific queries, we recommend that you contact us directly for advice relating to your project.

UNIFLOOR® ACOUSTICS AND BUILDINGS

SOUND INSULATION & ARCHITECTURAL ACOUSTIC SYSTEMS

Noise and Sound are important factors in the amenity of people, whether at home or at work. The use of sound insulation within buildings is a means to control the levels of sound which may be intrusive. Within New Zealand, building elements which are common between occupancies (and common spaces) are required to be constructed to prevent undue noise transmission in accordance with Clause G6 of the NZBC [ref 8]. Specifically, performance requirements are: -

- (i) For airborne sound insulation, the Sound Transmission Class (STC) of walls, floors, and ceilings, shall be no less than 55 (specified in clause G6.3.1 of NZBC).
- (ii) For impact sound insulation, the Impact Insulation Class of floors (IIC) shall be no less than 55 (specified in clause G6.3.2 of NZBC).

It is not within the scope of this document to provide detailed acoustic theory and definitions, however extensive coverage is included within "Architectural Acoustics" [ref 3]

FACTORS AFFECTING AIRBORNE SOUND INSULATION PERFORMANCE

"Sound Control for Homes" [ref 9] states: -
"The airborne sound insulation of a suspended concrete floor with floating layer is controlled mainly by the mass of the base floor, the isolation between the floating layer and the concrete base, quality of construction, and flanking transmission."

ACOUSTIC PERFORMANCE COMPOSITE FLOORS

"The Acoustic performance of composite floors" [ref 4] states :-

"Acoustic insulation is often associated with high mass constructions. However, this is constructionally and economically inefficient, and inappropriate for dry assembled construction. Furthermore, there is a need for resilient layers to be introduced to deal with the effect of impact sound, even in concrete floors.

Composite floor constructions provide a mixture of mass and resilient layers. Multiple layers are used to provide very good levels of acoustic insulation. The mass is provided by the composite slab, and acoustic testing in buildings has shown that generally the effective mass per m² of floor area can be used to predict performance.

The resilience is provided by mounting the plasterboard on a proprietary metal frame ceiling. This decouples the ceiling from the slab and reduces sound transfer. In addition, a variety of acoustic floors can be used on top of the slab to decouple the floor finish from the slab.

Further, in regard to ceilings :-
"The ceiling usually consists of one or two layers of gypsum board fixed to a metal frame system that is fixed to the underside of the steel deck. This reduces the rigidity of the connection between the plasterboard and the structure above, reducing the acoustic vibration that is transmitted."

STC AND IIC RATINGS OF FLOORS INCORPORATING 105MM THICK UNIFLOOR

Acoustic insulation ratings have been obtained from a review of technical information, bulletins and reports issued by the respected organizations detailed within the references section of this technical Information Sheet. A series of acoustic floor types have been included within this section, all of which meet or exceed the requirements of the NZBC.

The specific floors are based on test data and/or “Robust Details” which have demonstrated, by testing, the acoustic insulation requirements. Where carpets have been utilized, improvements in sound insulation have been based on published values by ‘The Carpet and Rug Institute’. And where vinyl has been incorporated, values of improvements are based on stated performance improvements by the manufacturer ‘Tarkett’.

It is to be noted that for any floor, where sound insulation incorporates the use of soft floor coverings fixed directly to the concrete floor, it relies on the floor finish remaining permanently in place to maintain acoustic performance. In this respect a quality assurance schedule must be implemented for all floor coverings.

FLANKING TRANSMISSION

Flanking transmission occurs when airborne sound travels around dividing elements between two occupancies. The degree to which flanking transmission occurs depends on the floor wall junction details and the quality of construction. Values of sound insulation given in this document assume that the surrounding elements have the same or better insulation values, and care must be taken to eliminate any possible bridging of acoustic insulation. The following measures can be taken to reduce flanking transmission in structures incorporating composite floors:

- Ensure that all gaps between the composite floor and separating walls are sealed. Dense mineral wool can be utilized and edges sealed.
- Care must be taken to make certain that internal columns do not bridge the separating wall.
- Construct ceiling spaces so that secondary / primary beams do not come in direct contact with plasterboard ceilings.
- When structural beams come below ceiling lines, box beams with mineral wool and two layers of plasterboard lining. Take care that linings do not strut off or contact the steel beam concerned.
- Prohibit the use of exposed steel beams in internal spaces.
- Avoid any air paths through separating elements. Seal junctions at service openings. Check that where two layers of plasterboard are used, that joints are staggered from one layer to the next.
- Where boarding is used on the floor, ensure that a 5mm gap occurs between skirtings and flooring. Ensure that wall linings finish above finished floor and that any gaps are sealed with acoustic sealant.

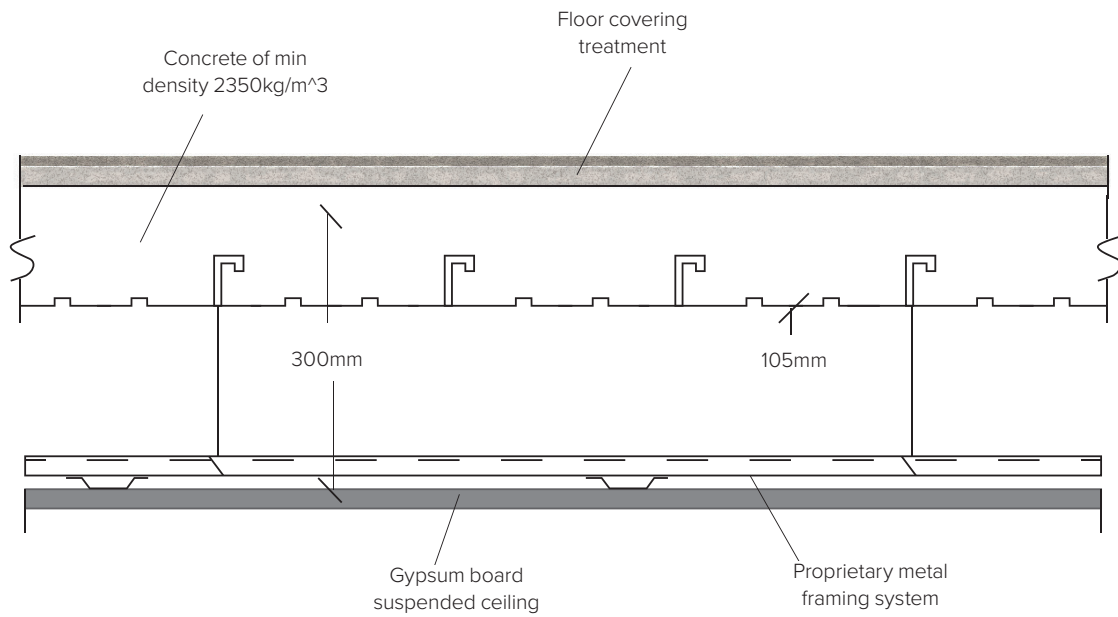
SERVICE PENETRATIONS

All services and penetrations have the potential to reduce the insulation performance of acoustic floors detailed within this document. All light fittings, including down lights and flush mounted lighting boxes must be acoustically tested to ensure their suitability for a specific application. Air pathways through insulation layers are to be avoided where possible and seals, acoustic quilts, and cavity barriers should be used, where appropriate, to seal air gaps.

REFERENCES

- (1) SCI -P128 "Building Design using Cold Formed Steel Sections: Acoustic Insulation", Technical Information Sheet, The Steel Construction Institute, Silwood Park, Ascot, Berkshire SL5 7QN.
- (2) DCB -N057 "Acoustic Performance of Steel Framed Apartment Buildings", HERA Report R4-113, HERA Steel Design 8: Construction Bulletin, New Zealand Heavy Engineering Research Association, May 2002.
- (3) "Architectural Acoustics", M David Egan, McGraw -Hill Publishing Co 1988.
- (4) SCI-P322 "Acoustic Performance of Composite Floors", Technical Information Sheet, M.T. Gorgolewski and R.M. Lawson, The Steel Construction Institute, Silwood Park, Ascot, Berkshire SL5 7QN. 2003
- (5) SCI-P336 "Acoustic Detailing for Multi-Storey Residential Buildings", A.G. Way and G.H. Couchman, The Steel Construction Institute, Silwood Park, Ascot, Berkshire SL5 7QN. 2004
- (6) "The White Book" Concealed grid MF suspended ceiling system, British Gypsum Limited, Drywall Academy Advice Centre, East Leake, Loughborough, Leicestershire, LE12 6JT, issue 2004.
- (7) "Acoustical Characteristics of Carpet", Technical Bulletin, CRI-The Carpet and Rug Institute, P.O. Box 2048, Dalton, Georgia 30722, United States of America.
- (8) NZBC:1992, New Zealand Building Code; Building Industry Authority, Wellington.
- (9) "Sound Control for Homes", Report BR 238, C1RIA Report 127, Building Research Establishment, Garston, Watford, WD2 7JR, UK. 1993
- (10) 'Tapiflex' and 'Granit Acoustiflor' Technical Data Sheets, Tarkett SAS, rue de l'Egalite, F-92748 Nanterre, Cedex, France.
- (11) SCI -P320 "Acoustic Performance of Light Steel Framed Systems" M T Gorgolewski and G H Couchman, Technical Information Sheet, The Steel Construction Institute, Silwood Park, Ascot, Berkshire SL5 7QN. 2003
- (12) AS ISO 717.2-2004 "Acoustics -Rating of sound insulation in buildings and of building elements-Part 2: Impact sound insulation." Standards Australia International Ltd. GPO Box 5420, Sydney, NSW 2001, Australia.
- (13) HERA Report R4-121 , "HERA Acoustic Guide" New Zealand heavy Engineering Research Association.

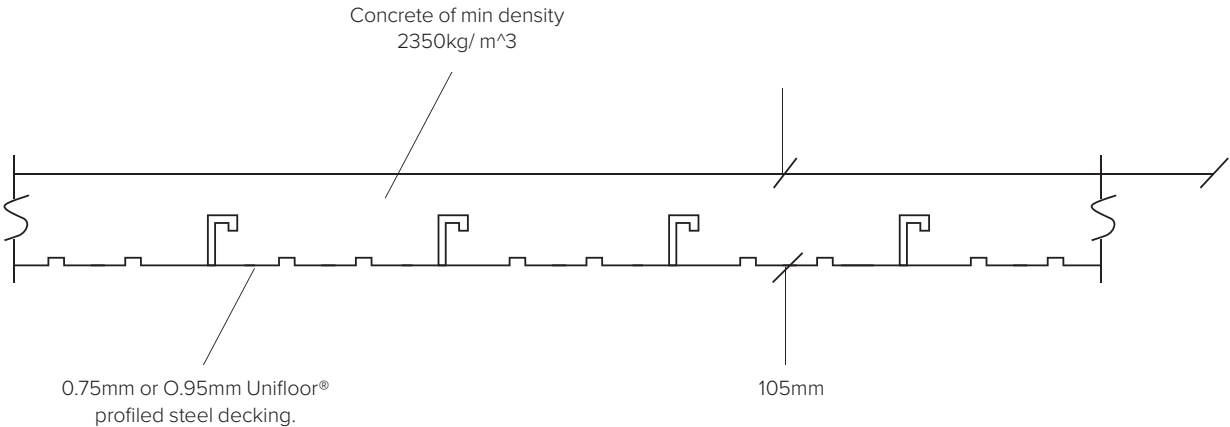
TYPICAL SECTION THROUGH COMPOSITE FLOOR



UNIFLOOR® AIRBORNE AND IMPACT IIC RATING

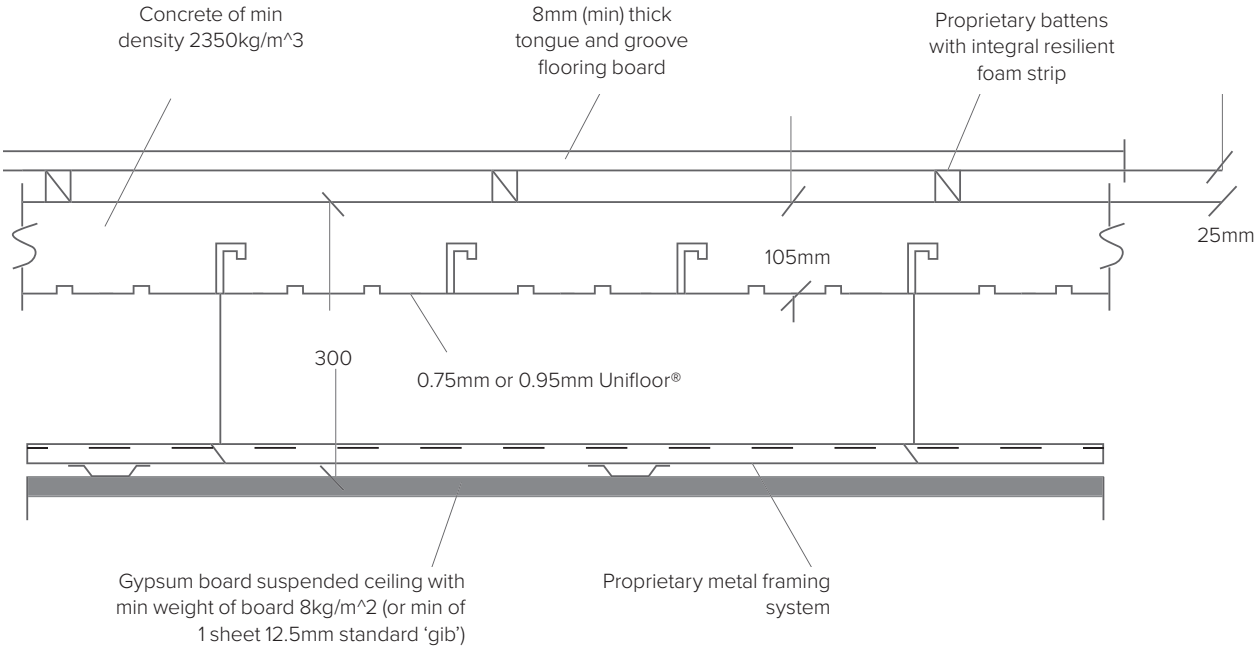
Designation	Floor Base	Ceiling Treatment	Floating Floor / Floor Covering Treatment	Airborne Rating	Impact IIC Rating
Type 1	105mm Unifloor	Nil	Nil	44	25
Type 2	105mm Unifloor	1 / layer 12.5mm gypsum board	18mm T&G flooring on 45mm composite resilient battens.	57	70
Type 3	105mm Unifloor	2 / layer 12.5mm gypsum board	18mm TftG flooring on 25mm 18mm TftG flooring on 25mm	57	72
Type 4	105mm Unifloor	2 / layers 12.5mm gypsum board	9mm TftG flooring with pre bonded resilient layer.	56	69
Type 5 / A	105mm Unifloor	1 / layer gypsum board (min10kg/m ²)	Carpet (weight 32 oz/ yd ²) Tufted Nylon. No Underlay	56	57
Type 5 / B	105mm Unifloor	1 / layer gypsum board (min10kg/m ²)	Carpet (weight 44 oz/ yd ²) Tufted Wool. No Underlay.	56	68
Type 5 / C	105mm Unifloor	1 / layer gypsum board (min10kg/m ²)	Carpet (weight 60 oz/ yd ²) Tufted Wool. No Underlay.	56	70
Type 5 / D	105mm Unifloor	1 / layer gypsum board (min10kg/m ²)	Carpet (weight 44 oz/ yd ²) Tufted Wool. Foam Underlay.	56	79
Type 5 / E	105mm Unifloor	1 / layer gypsum board (min10kg/m ²)	Tarkett Commercial Vinyl, 'Granit Acoustiflor'	56	57
Type 5 / F	105mm Unifloor	1 / layer gypsum (min10kg/m ²)	Tarkett Commercial Vinyl, 'Tapiflex Series'	56	62

UNIFLOOR® ACOUSTIC FLOOR TYPE 1



TYPE 1 - ACOUSTIC FLOOR			
Bare Slab			
STC	44	IIC	25

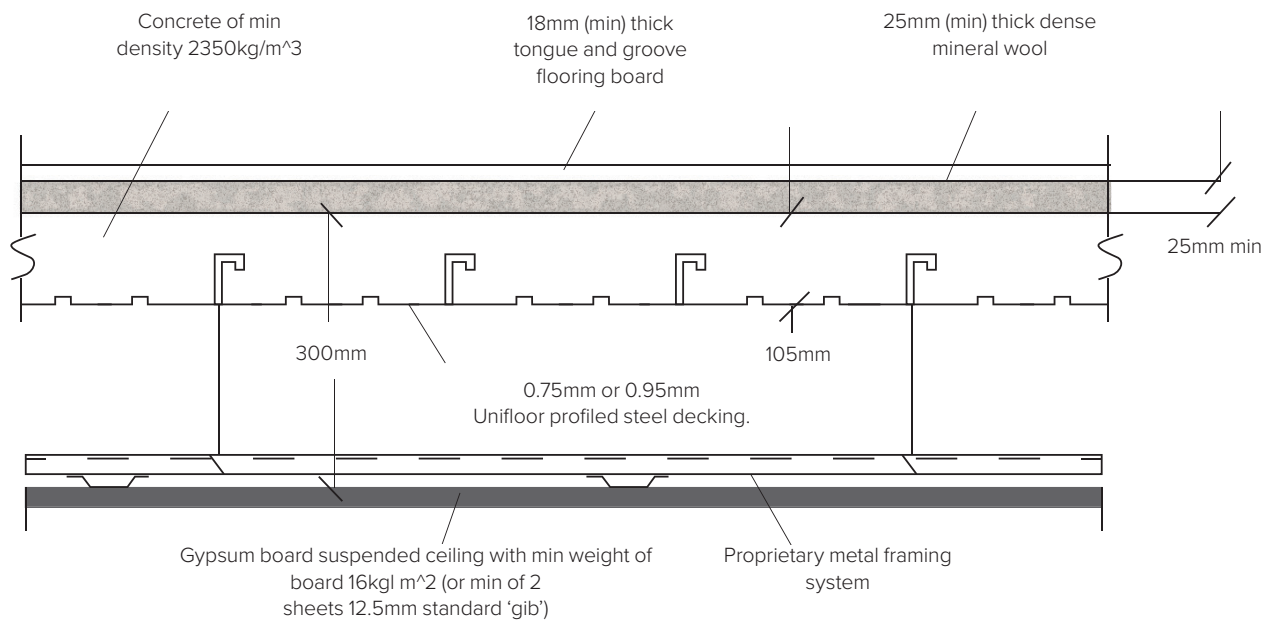
UNIFLOOR® ACOUSTIC FLOOR TYPE 2



TYPE 2 - ACOUSTIC FLOOR			
Bare Slab			
STC	57	IIC	70

- Total Floating Floor weight to be greater than 25kg/m².
- Timber batten to be bonded to resilient foam strips at the top or at the bottom.
- Services in the floor should not bridge the resilient layer.
- Flanking strips are to be used to isolate the walls from the floating floor system.
- Floor and ceiling treatments are to be installed in accordance with the manufacturer's instructions with regard to sound insulation.
- This referenced system has expected sound insulation values stated with an estimated margin of error of +/- 3 for airborne sound insulation (STC) and +/- 5 for impact sound insulation
- The intersection of ceiling with walls must be airtight. The floor / wall intersections must be detailed to eliminate flanking transmission.

UNIFLOOR® ACOUSTIC FLOOR TYPE 3

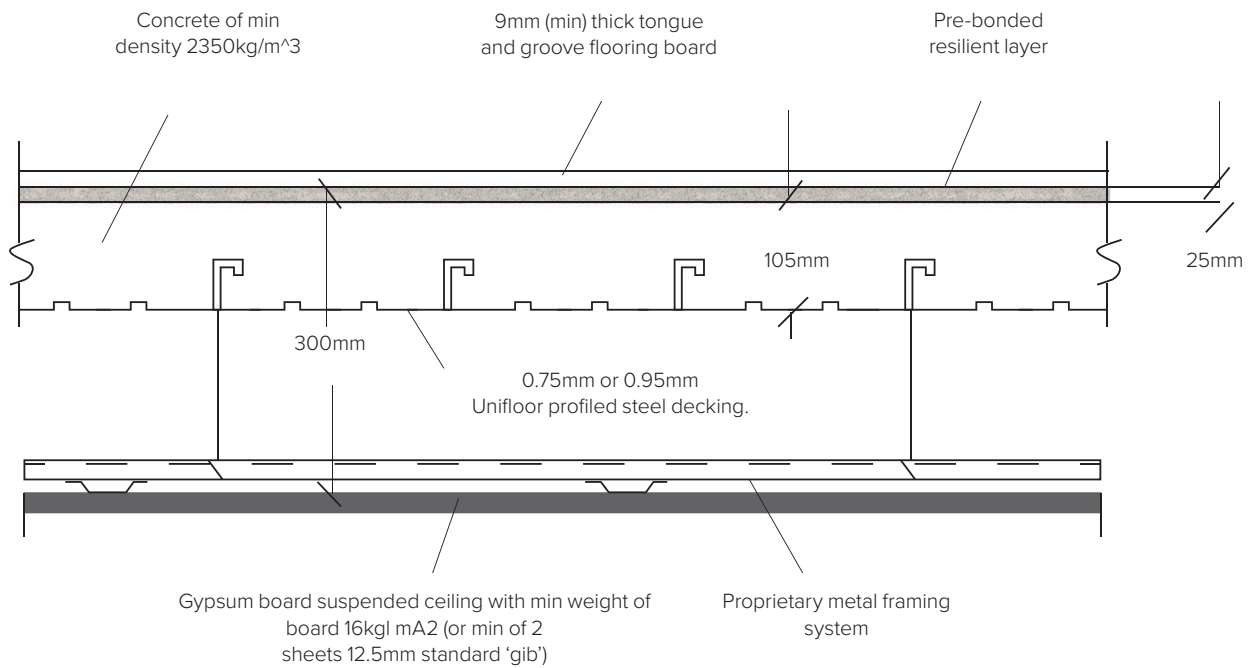


TYPE 3 - ACOUSTIC FLOOR			
Platform Floor			
STC	57	IIC	72

Total Platform Floor weight to be greater than 16kg/m².

- Mineral wool resilient layer to be at least 25mm thick (150kg/m³) or 30mm thick (140kg/m³).
- No surfaces are to be installed within the resilient layer.
- Flanking strips are to be used to isolate the walls from the floating floor system.
- Floor and ceiling treatments are to be installed in accordance with the manufacturer's instructions with regard to sound insulation.
- This referenced system has expected sound insulation values stated with an estimated margin of error of +/- 4 for airborne sound insulation (STC) and +/- 4 for impact sound insulation.
- The intersection of ceiling with walls must be airtight. The floor / wall intersections must be detailed to eliminate flanking transmission.

UNIFLOOR® ACOUSTIC FLOOR TYPE 4



TYPE 4 - ACOUSTIC FLOOR

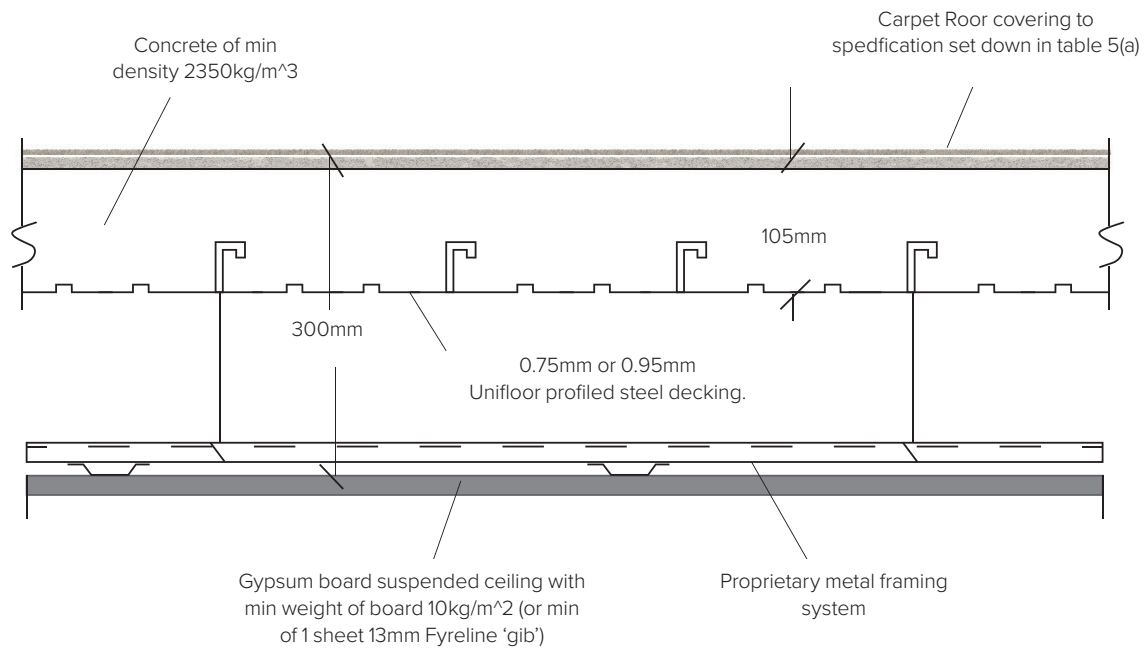
Platform Floor

STC	56	IIC	69
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Timber flooring to be bonded to resilient foam strips at the top or at the bottom.

- Services in the floor should not bridge the resilient layer. Flanking strips are to be used to isolate the walls from the floating floor system
- Floor and ceiling treatments are to be installed in accordance with the manufacturer's instructions with regard to sound insulation.
- This referenced system has expected sound insulation values stated with an estimated margin of error of +/-4 for airborne sound insulation (STC) and +/-6 for impact sound insulation.
- The intersection of ceiling with walls must be airtight. The floor / wall intersections must be detailed to eliminate flanking transmission.

UNIFLOOR® ACOUSTIC FLOOR TYPES 5A TO 5D - VINYL FLOOR TREATMENT



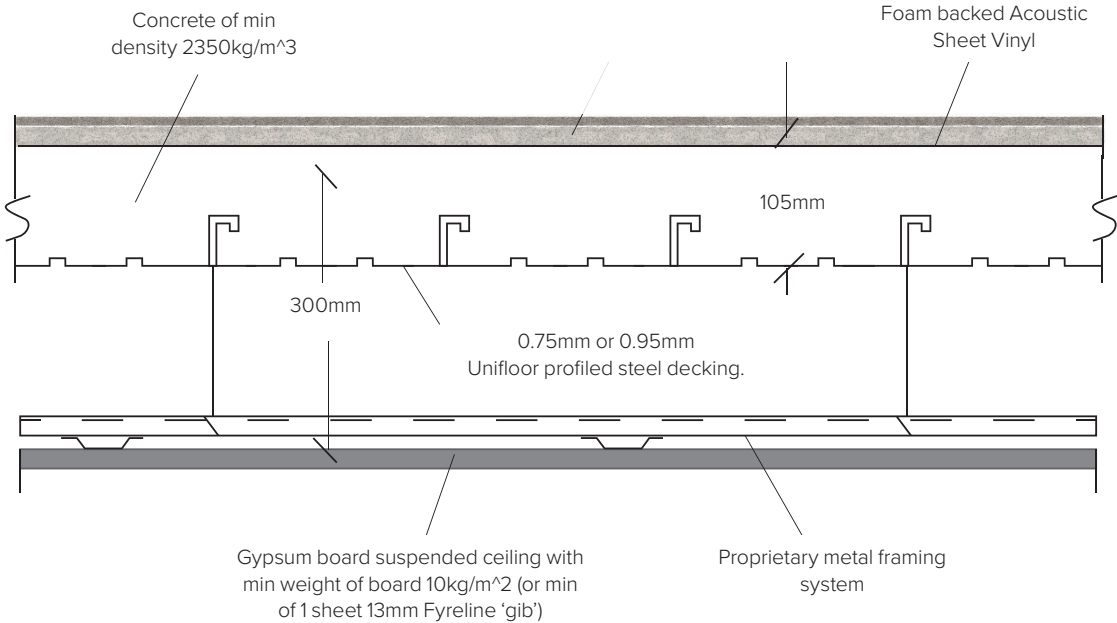
DESIGNATION	CARPET FLOOR COVERING	DC RATING
5A	32 oz/yd ² tufted nylon carpet laid with no underlay.	57
5B	44 oz/ydA2 tufted wool carpet laid with no underlay	68
5C	60 oz/ydA2 tufted wool carpet laid with no underlay.	70
5D	44 oz/ydA2 tufted wool carpet laid with foam underlay (underlay 44oz/ydA2)	79

TYPE 5 - ACOUSTIC FLOOR	
Covered Floor	
STC	56

Floor and ceiling treatments are to be installed in accordance with the manufacturer's instructions with regard to sound insulation.

- The intersection of ceiling with walls must be airtight.
- The floor / wall intersections must be detailed to eliminate flanking transmission.
- All floor coverings must be installed utilizing a quality assurance procedure. Floors designated as being type 5 floors must remain in compliance with this specification to satisfy NZBC regulations.

UNIFLOOR® ACOUSTIC FLOOR TYPES 5E TO 5F - VINYL FLOOR TREATMENT



DESIGNATION	VINYL FLOOR COVERING	DC RATING
5E	Tarkett Commercial Vinyl 'Granit Acoustiflor'.	57
5F	44 oz/ydA2 tufted wool carpet laid with no underlay	62

TYPE 5 - ACOUSTIC FLOOR		
Covered Floor		
STC	56	

Floor and ceiling treatments are to be installed in accordance with the manufacturer's instructions with regard to sound insulation.

- The intersection of ceiling with walls must be airtight.
- The floor / wall intersections must be detailed to eliminate flanking transmission.
- All floor coverings must be installed utilizing a quality assurance procedure. Floors designated as being type 5 floors must remain in compliance with this specification to satisfy NZBC regulations.

BRANCHES

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