Australian Owned and Made Modular Floor,
Wall, Roof Truss System resistant to:
Cyclones, Earthquakes, Fire,
Termites, Tornadoes

FORCE 10 TM
A better way to build!

Force 10 International Capability Document

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Force 10 International

Force 10 International Pty Ltd is located in Brisbane, Queensland, and is the manufacturer and supplier of the Force 10 innovative building construction solution.

Force 10 International Pty Ltd can provide building solutions for residential and commercial buildings for virtually any project. We can provide the solutions required under many projects – namely innovative building solutions for housing, duplexes, small unit complexes, low-rise school buildings and covered areas.

Force 10 International Pty Ltd is the manufacturer and supplier of the internationally tested and highly regarded **Force 10** Engineered Building System. The Force 10 system is selected for its inherent suitability for any project as a faster method of construction, value for money and its environmental sustainability. Additionally, Force 10 has an enviable reputation as a designer, manufacturer and supplier. The Force 10 system includes off site manufacture in the factory and /or on site fabrication and construction systems.

Advantages of the Force 10 Engineered Building System

The Force 10 Engineered Building System is an innovative building system that provides many advantages including:

- Suitable for all high wind areas
- Strength of steel and structural insulated wall panels
- Durable using steel and fibre cement sheeting
- Minimum components for maximum economy
- Ease and speed of assembly
- Comprehensive floor, wall and roof system with all fixings and components
- Ease/economy of shipment
- Maximum strength, durability and style
- Aesthetic appeal
- Cyclone resistance
- Fire resistance
- Green Environmental focus
- Maximum insulation benefits
- Innovative and precision engineering
- Stability of foundations
- Simplicity of connections
- Vermin and termite resistant.

Force 10 has been involved in building projects since 1988 and has built thousands of building units in excess of 40 countries. We have successfully constructed many buildings for various corporate

and private clients including Government agencies. We strictly adhere to specification requirements and comply with contractual conditions. Force 10 International Pty Ltd holds ISO9001 certification from NCIS.

The Force 10 Engineered Building System is a breakthrough in innovative construction and has been designed to use a minimum number of modular components. Primarily of light-weight galvanised and galvanised or zinc coated steel, the floor wall and roof systems are totally integrated and all components lock together easily and smoothly. A complete house of approximately 100 square metres can be packed into a 20' container and shipped anywhere in Australia or the world with ease. Regardless of size, a Force 10 building can be erected quickly, efficiently and economically, by trained workers, with limited supervision.

Force 10 addresses the solutions that allow for:

- significant proportions of the construction process to occur off site; and /or
- innovative transport and reduction in on site fabrication and erection systems.

Need for stakeholder consultation

Force 10 recognises that the methodology for stakeholder consultation is the primary input in defining how the construction and the final product is designed “fit for purpose”.

We, as part of this type of process and in our previous and current experience with clients, ensure that the stakeholders in the project are involved from the outset.

Types of Construction

Force 10 manufactures buildings suitable the following areas:

- Affordable housing
- Residential housing
- Luxury housing
- Remote area housing
- Commercial offices
- Medical centres
- Eco villages
- Retirement villages
- Resort accommodation
- Schools and Classrooms
- Modular accommodation and facility buildings for mining camps.

Force 10 is an associated company of **Canstruct Pty Ltd**, a civil engineering and building company with over 40 years experience in delivering difficult projects with formidable time, cost and environmental constraints.

Force 10 System Specification

General:

The Force 10 Engineered Building System consists of interlocking steel sections (floor, wall and roof). Each building design is delivered to site in kit form after plans have been approved by the local regulatory authority.

Components:

Major components of the system have code labels attached which describes their size, type and finish. Each code number will have a corresponding number on the component layout documentation.

Footings and Stumps:

Metal stumps in 'Duragal' finish are placed on concrete pads. A plate is welded to the bottom of the stump. The stump is positioned in a concrete pad; the bottom of the stump being at least 100 mm above the bottom of the stump hole. The design of the footing is dependent on soil classification and loading.

Floor:

The Force 10 floor uses galvanized steel bearers and zincalume joists. Floor bearers are provided with pre-punched holes for ease of on-site assembly. The steel floor joists nest securely inside the structural bearers and are fastened together. The floor sections come in multiple module lengths.

When all bearers and joists have been screwed together the floor sheeting is fixed to the frame. Floor decking is usually Supaboard or Structrafloor particleboard flooring. It is glued to all joists and bearers as well as being screwed to the bearers and joists.

The Force 10 system can also be constructed on a concrete slab with no difference in fixings required.

Walls:

The **Force 10** wall panel system consists of two steel components (stud and nog) that tab-lock together to form a rectangular steel frame. Cellulose fibre cement sheets of 6 mm thickness are bonded to the frame and non-toxic fire retardant polyurethane foam is injected into the cavity. Full height PVC conduit ducts are used for electrical services.

Panel widths are based on a modular width of 1000 mm and heights of 2435, 2700 and 3000 mm are available in a panel thickness of 76 mm. Panel weights are 58, 64 and 71 kg, respectively.

The panels have been designed to withstand permissible wind speeds 'V_p' according to AS1170.2 up to 60 m/s using -0.3 internal and +0.7 external pressure factors giving a combined pressure coefficient of 1.0. The allowable racking force per panel when connected to bearer and in

conjunction with other panels is 4.7 kN for a panel height of 2435 mm, 3.9 kN for a panel height of 2700 mm and 3.4 kN for a panel height of 3000 mm. The thermal insulation value, R, is 3.6 m^2 °CW^{-}·

Once installed, all wall panels are ready to paint. Texture coating, plaster rendering or brick veneer are among the range of exterior finishes, with tiles, Paint or any alternative interior finish.

Roofs:

The Force 10 trusses and purlins are cold-formed steel site manufactured from 1.2 mm 550 MPa coated coil steel (in accordance with Standards Australia, AS 2551-1982). Roof widths are based on 1000 mm modules up to 14 metres.

The roofing system has been designed to withstand wind speeds up to 60 m/s using +0.7 internal and -0.9 external factors giving a combined pressure coefficient of 1.6.

The roofing system consists of lightweight steel sections. All sections nest together to allow mechanical fixing. Trusses fold flat for ease of transport. Purlins are fixed by screws on top of the trusses and allow for the use of a variety of conventional steel roof sheeting.

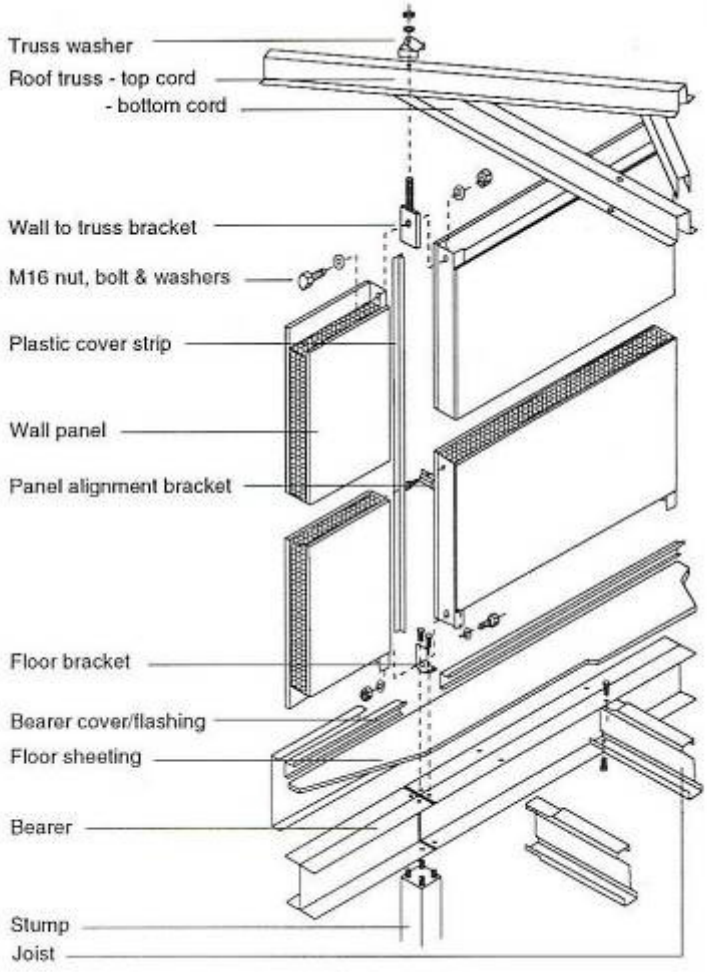


Figure 1. Exploded view of components of a Force 10 building.

Design Stage

In completing an initial design Force 10 develops the detailed design of the preferred plan, reviews the procurement methods and can provide a total estimated investment (Cost Plan). The Cost Plan will outline a limit of cost that is the basis for the project budget and/or justification for the project cost. At this stage of the design the form and function of the project will have been designed sufficiently.

Importantly, the design will be consistent with the existing environment and architecture of any individual site. Our designs are developed with our customer and incorporating this theory.

The design will set out the requirements for the first detailed design phase of the process - design development and documentation for the project and identify the critical performance criteria and to ensure that the design is “fit for purpose”.

The design will describe the proposed scope of works in architectural and engineering terms (i.e. plans and elevations). We understand that this can be commenced after the client has agreed to the approved development option and scope of works.

Force 10 ensures that the design is compliant with regulatory requirements including design requirements under Occupational Health and Safety, essential services, planning requirements and building regulations and will ensure requirements are met whether they are for classrooms, ablution blocks or other buildings.

Critical Design Issues

The critical design issue requirements are taken as defined in the project requirements and through the preparation of the project design. These will be identified and resolved to a satisfactory solution with the stakeholders and other interested parties.

Force 10 can use the current networking relationships that it has with architects, engineers, environmental requirements, landscape, acoustic engineers and other persons in the identification and resolution of design issues.

Force 10 with its own in-house design centre can provide preliminary design capabilities to fast track the resolution of critical design issues with the project requirements.

Housing Design Principles

Force 10 designs and manufactures in line with the following housing principles:

- Are comfortable, pleasant and safe to live in (our solution is safe in all climatic conditions);
- Is designed to meet its residents’ needs, both current and future (our solution is flexible and can be adjusted to suit the needs of the client);

- Maximises use of its site and without wastage of built space or land (our solution can be designed to make the best possible use of the site especially on difficult and sloping sites)
- Looks attractive, and fits into its neighbourhood (our solution is attractive and can be adjusted to meet the local ambiance including changes to facades and external finishes);
- Is well designed for the local climate and does not rely substantially upon mechanical cooling or heating systems (our solution's insulation properties ensure compliance with an energy rating from 6 to 9 stars);
- Responds sensitively and creatively to the characteristics of its site (our innovative floor system designs reduce the need for cutting and shaping and aesthetically sit with the dimensions and natural fall of the land); and
- Represents value for money for the community (our solution cannot be matched when considering all value for money principles).

Time saving in construction using the Force 10 system

- **Our experience** - A Force 10 building can be constructed to lock up stage quicker than a conventional building due to our modular floor system and panelised wall construction with an integrated roof system, our modular engineered approach and our many years of experience in a variety of building projects. On past projects we have taken a 150M^2 house to lock up stage in just 14 days – this is in the region of 30% more efficient or productive on site construction time than most other conventional building solutions.

- **Secure product supply** – we manufacture the Force 10 product in a controlled, secure factory environment thus ensuring that the capacity to supply the materials is not affected by external factors such as weather, vandalism, theft and delivery delays from other suppliers. Secure product supply is a significant time saver in ensuring that project timelines are met and milestones achieved on time.

- **Up to 50% off-site construction** – Significant delays can arise in circumstances of on-site construction specifically when waiting on the many deliveries to arrive for conventional building projects. The Force 10 building system is manufactured totally off-site in a factory which provides a significant time reduction in not needing to wait on the various suppliers to provide products on time for job completion.

- **Delivered at once –** Force 10 system, where the whole project is supplied, means that all items required to take a building to lock up are delivered on site at once (in just one delivery). All components are supplied and this reduces time in waiting for site deliveries of products from other suppliers and significantly speeds up the construction process. It also eliminates costly delays in incorrectly delivered products and supplier delays. This is particularly useful for remote projects where in traditional construction the lack of one small item on the project can cause days or even weeks of delays.

- **Quality and Strength –** The quality, strength and durability of the Force 10 solution means that additional delays in replacing damaged walls (such as plasterboard in conventional buildings) is eliminated. Our product is made from steel and is virtually indestructible. It has weather resistant materials which means no delays due to rain or damaged materials.

- **Local subcontractors** – Under any project the client can engage with subcontractors who are local to the project site. This will provide a reduction in construction time as the subcontractors are on site quickly, without any separate mobilisation requirements or travel delays. Examples of the subcontractors that will be sourced locally to project sites are electricians, painters, plumbers, landscapers and similar subcontractors.

- **Co-ordination of product –** significant time savings are achieved in project co-ordination by using the innovative Force 10 system. A great deal of time can be exhausted in the co-ordination and follow up of suppliers in ensuring their products arrive and are available on site on time. This is eliminated with the Force 10 system as only one delivery and one contact is required. Conventional building systems could require 70 plus deliveries with as many or more follow ups with suppliers.

- **Design –** Our internal design office fast tracks building designs and compliance to the Building Code of Australia (BCA) and other relevant codes. In line with this we have partnerships with engineering consultants, architects, air and hydraulic consultants and all of the resources that are required to ensure that a quick project start up will be achieved.

- **Force 10 Floor system –** The Force 10 floor system is manufactured from steel, it clips and screws together and can be installed on steel stumps with traditional concrete footings. Unlike conventional concrete slab flooring, the time saving benefits of using the Force 10 floor system are impressive. The delay whilst earthmoving equipment shift and compact earth for a concrete slab prior to installation is eliminated altogether. The Force 10 floor system can be installed on sloping and uneven surfaces. A concrete slab takes 7 or more days to cure (weather permitting) prior to the erection/construction of the building. No such delays are incurred with the Force 10 floor system.

- **Force 10 Mega Anchor system (footings) -** the Force 10 Mega Anchor system is a **low** concrete footings solution that allows very fast floor system construction. The floor can be installed on most average sized buildings immediately after installation as there are no footings to be dug and no concrete required for the footings. As soon as the Mega Anchors are in place installation of the Force 10 floor system can be commenced.

- **Force 10 Wall system -** The Force 10 wall system is a panelised wall system, in which the panels are manufactured to close tolerance and thus allow the walls to be erected on site faster than in normal construction projects. The wall panels are manufactured in our factory (no on-site construction) and arrive on site finished, ready for setting and painting. Conventional buildings require additional time for construction and finishing walls, followed by filling the nail and screw

holes. In addition, the manufacture of the Force 10 wall system allows for tight quality control tolerances – which provides another important time saving and standardises quality.

- **Force 10 Roof system –** All Force 10 steel roof trusses are fully fabricated and trial assembled in the factory. The trusses are then identified as to the type and design, then folded flat to produce a compact truss which is then packaged ready for crating or packing in a container ready for shipping.

- **Integration of the floor, wall and roof systems –** The three systems are fully integrated to ensure easy erection and minimum delays on site and provided with all of the fixings required for site assembly.

- **Green & Clean –** The requirement for machine and crane hire and waste collection on site is reduced due to the design and manufacture of our solution. Likewise our solution leads to significantly reduced Occupational Health and Safety (OH&S) incidents. Our product has minimal site wastage which eliminates additional time for site clean up, as well as the requirement for minimal measurement and site cutting as opposed to traditional methods. All of these benefits provide further savings in construction and on site time.

- Our solution is provided on a 'lock-up' or 'turnkey basis'. It can be shipped to virtually any location including difficult regional and remote locations by selecting the preferred method:

    - Supply only (kit)
    - Turnkey (to lock up or complete handover)
    - We can provide training for your certified construction personnel.

Examples of completed projects and timeframes

Some examples of how we have demonstrated that we have not only reduced time in construction but also the total project time are:

- **School project –** For the recently completed project at a college in Brisbane the building is 554 M^2 and over 2 floors with 4 classrooms and 4 computer rooms. The project site works commenced in August 2008 and practical completion was in December 2008 (approximately 4 months) with completion dates set to enable classes to resume after holiday breaks. The Board of Directors of the school management were most impressed with the speed of construction and quality of the finish and the price, all of which features were considerably superior to other projects which were built by traditional methods.

- **Housing projects** with multi units involved. The Force 10 system is able to achieve building lock up much faster than a conventional building. Force 10 has built many houses over the past few years for both the Queensland and Federal governments.

For time saving in project completion, Force 10 cannot be matched as:

- Site preparation is absolutely minimal with no waiting for earthworks and curing.
- The bulk of the work is completed in our factory, and materials with consistent quality arrive in one delivery.
- Delays due to weather and trades people are minimised.
- Replacement of damaged materials on site by weather or trades is eliminated.
- Typical downtime for machine and crane hire is reduced.
- Construction to lock-up is speedy.
- Finishing trades are sourced locally, and workplace accidents are rare
- Architectural drawings, structural drawings and structural certification are finished in house in a very short time frame.

The result is a speedy, clean project, with virtually no site wastage and a quality structure which is resistant to weather and designed to last and last.

Life cycle (Whole of Life Solution)

We understand that all buildings need to be safe, secure and functional spaces that enhance life. We also understand that housing needs to be safe, secure, well designed, adaptable and designed for special needs where appropriate.

The Force 10 Engineered Building System, which has been patented worldwide, is a unique pre-fabricated building system that is exported all over the world and is suitable for housing, resorts, hospitals, multiple dwelling units, schools and virtually any project. It provides efficiency, strength, durability, value for money and speed of construction.

Our building solution has the capability to withstand the harsh elements of nature such as cyclones, and seismic violation, as well as being fire resistant, impervious to water penetration, resistant to mould, and provides absolute protection against Termite Infestation.

Innovation

*"Innovation will be the key to addressing some of the biggest challenges facing the future, such as **climate change**, **population growth**, **sustainable development**, **health and wellbeing**"* Our innovative Force 10 Building system provides answers to each of these challenges in relation to building projects. Some of those answers being:

- **Climate Change** – The Force 10 solution provides for highly energy-efficient buildings with energy star ratings with a minimum of 6 stars and up to 9 stars. The maximum insulation properties of the Force 10 wall panels minimises the cost of heating or cooling and reduces the drain on energy supplies to heat and cool our buildings in the future. Transporting all components to site at once

limits the amount of time, logistical incidentals, including fuel emissions (which reduce global resources) and expenses from other transportation deliveries.

- **Population growth** – Our solution provides for a shorter construction time compared to conventional building methods. This means that we can assist quickly in housing or schooling an ever-increasing population.

- **Sustainable development** – Our Mega Anchor solution requires **no** site-cutting or levelling and limits degradation to the site by limiting multiple heavy vehicles for deliveries. No unnecessary construction items are required to be delivered to the site, which means less opportunity for dumping and run off of topsoil into waterways, or damage to flora and fauna. We use steel which is a recyclable product. Steel components replace traditional timber frames, reducing the need to fell trees and destroy habitat. These components ensure maximum longevity of the structure and also decrease the need to replace items due to pests or damage.

- **Integration of the floor, wall and roof systems** – Unlike virtually all other building systems the materials and fittings supplied by Force 10 are comprehensive and designed specifically so that all items from the footings to the roof purlins can be fixed together without any supplies from external sources. This provides minimal delay in sourcing other items or in trying to use "round pegs in square holes" it also provides great strength as all fittings are designed for "fit for purpose" including cyclonic wind forces.

- **Health and wellbeing** – With the use of steel, there is no need for harmful wood and pest treatments and termite barriers. This provides significant health benefits to not only the inhabitants but also to the environment.

- **A healthier option** - No additional chemical treatments are required for a Force 10 building solution (as is usually required in conventional buildings) which is recognised both in Australia and overseas as a healthy alternative for people suffering from asthma, respiratory problems, allergies and other health issues.

- **VOC** – Force 10 complies with the VOC (Volatile Organic Compounds) requirements for government projects and can assist in selection of low VOC products. In recent testing by CEETEC, Victoria on a sample Force 10 building has provided VOC levels of 72 (µg/m3) and Formaldehyde levels of <12(µg/m3). These Results show formaldehyde to be below the detection limit which indicates that construction materials used to build the prototype had very little or no formaldehyde emissions. Further details are available in the CEETEC report dated September 2010.

Chemical Air Testing Results

Units	Total Volatile Organic Compounds		Formaldehyde
Prototype	(µg/m3)	72	<12
Outside	(µg/m3)	<12	-
Recommended Air Quality Limits	(µg/m3)	500	100

- **Fire resistant** – The innovate Force 10 wall panels are manufactured from fibre-cement and filled with fire retarded self extinguishing polyurethane foam (PUR) that will give self extinguishing foam according to ASTM6092 and would be a B3 according to DIN4102.

Product Innovation (R&D)

Force 10 understands the significance of product innovation in assisting Australia to successfully compete in the global economic market. This is one of the main drivers for our leading edge commitment. The Force 10 solution has been supplied and installed in approximately 40 countries, many of which are island nations that face aggressive weather conditions.

Economists estimate that 50 to 80 percent of economic growth comes from innovation and new knowledge. The Force 10 building system as a whole was developed and enhanced over many years to produce a unique innovative construction method utilising the very latest environmentally friendly raw materials. This building system is a unique innovative solution in relation to design, quality, environmental sustainability, longevity, safety and security – especially when faced with the extreme challenges that mother-nature throws our way in Queensland and Australia.

To remain at the leading edge of innovation Force 10 ensures that research and development is the main focus of our product enhancement. Keeping abreast of/and applying the latest technologies means a financial commitment to R&D, ongoing education and training of our workforce, and a willingness to change and incorporate new information.

The Force 10 building system as a whole was developed and refined over many years to produce a unique innovative construction method utilising the very latest environmentally friendly raw materials. Force 10 understands the significance of product innovation in assisting Australia to successfully compete in the global economic market. This is one of the main drivers for our leading edge commitment.

Extensive Testing of the Force 10 Building System

The Force 10 Building System has been extensively tested by QUT, CSIRO, BRANZ and by USA based testing organisations to ensure that the system meets the relevant codes and standards. These test reports are:

- BRANZ T670 Report On Thermal Resistance Of Force 10 Building Panels (January 1998)

- QUT CET4999 Modular Wall Panel Test Report (July 1998) – ASTM E564 And ASTM E 72
- QUT CET4999/1 Modular Panel Test Report - Compression Testing (August 1998)
- QUT CET5077 Report On Results Of Testing Modular Wall Panels (December 1998) ASTM E 72 (Standard Test Methods of Conducting Strength Tests of Panels for Building Construction)
- QUT CET5115 Report On Results Of Testing Modular Wall Panels (Racking Tests) (December 1998) AS3623 (Domestic Steel Framing)
- CSIRO Fire Test To UL1715 (Standard for Test for Surface Burning Characteristics of Building Materials)
- BRANZ FSR689 AS1530.4 (Methods for fire tests on building materials, components and structures (Part 4: Fire-resistance tests of elements of building construction)
- BRANZ Fire Resistance Test FP2599 AS1530.4 1997(January 1999) AS1530.4
- BRANZ Fire Resistance Test FR2600 AS1530.4 1997(February 1999) AS1530.4
- University Of North Carolina –International Building Code ICC AC04 Testing To ASTM E72
- Code Testing – Miami Dade USA (TAS201, TAS202, TAS203).
- BRANZ Testing to AS1530 (AS3659 BAL-FZ Bushfire requirements).
- CEETEC Indoor Air Quality Assessment of Prefabricated Building Force 10 Prototype.

The Force 10 Building System complies with the relevant clauses of the BCA and relevant steel framing and wind load standards.

Strength, Durability and Benefits of using the Force 10 Solution

- **The strength and durability of steel** - A building with a 'heart' of steel is designed to stand the test of time. The inherent strength and durability of steel provides structural integrity in all types of environments and conditions. Force 10 uses Bluescope TRUE CORE® as its steel framing systems for floor, wall panels and the roof system. TRUECORE® steel is a zinc/aluminium alloy coated steel with a distinctive blue resin surface finish, made by BlueScope Steel specifically for the house framing market. Wall and roof frames made from TRUECORE® steel are termite and fire resistant, straight and true, lightweight yet strong. In short, a dependable solution for homes built to last. Floor systems are made from Bluescope Supagal - Structural RHS DualGrade C350L0/C450L0 SupaGal is suitable for use in a wide range of applications. Typically it will be used in various forms of structural fabrication for mild and sheltered environments. It is also suitable with top coats, for use in moderate and severe environments. The Bluescope TRUE CORE® steel framing system is used in the Force 10 floor, wall and roof systems thus providing **outstanding durability** in high-traffic domestic and school situations.

- **Accurate - Straight and true** - Wall panels, floor systems and roof trusses made for the Force 10 building system are from steel and are precision engineered to be dimensionally accurate. They won't shrink, twist or warp, significantly reducing the likelihood of problems such as cracking cornices, jamming doors, sticking windows or wavy rooflines.

- **Tough - High impact resistance –** It is virtually impossible to cause significant damage to our walls by normal wear and tear as experienced in a home or a school building. The same activity carried out on a conventional gyprock wall would easily damage the wall.

- **Corrosion resistance –** All steel members and fixings in the Force 10 floor, wall and roof systems have zinc/aluminium alloy coated steel which provides protection against corrosion. All exposed metal work (stumps, beams etc) is coated with Dulux MetalShield protection before being despatched and on site requires a final finish coat. In more severe application (near sea or salt spray areas) the stumps and structural steel work can be hot dip galvanized.

- **Design flexibility –** Using steel as the framing encourages home and school designers to think outside the square and make the most of available space. It lends itself to innovative designs helping to create distinctive, appealing, highly individualised structures In particular, the high strength-to-weight ratio of steel roof truss allows for longer spans, creating larger, more open living areas, and again because it's steel, it measures well against increasingly stringent building and fire regulations.

- **Aesthetics and environmental adaptability –** The Force 10 building system can be adapted to suit the local environment wherever it is situated. This includes changes to the building aesthetics by the application of rendering and applying different composite materials such as timber, metal, awnings and similar. This ensures that unlike most other modular buildings the Force 10 building can easily blend into the environment when compared to other buildings in the locale.

- **Accessibility & remote areas -** We have manufactured, transported and successfully erected various buildings in remote areas – even those that are considered by many to be inaccessible. These include Doomadgee, Lockhart River and various communities and islands in the Torres Strait including Murray Island, Darnley Island and Umagico.

- **Transportation –** The Force 10 building system is flat-packed and delivered to project sites by road, rail, barge and ships depending on location. The ability to flat-pack our product means that there is no wasted space in shipping containers and that a whole building (of approximately 100m^2) can be delivered in a 20' (6m) container in one delivery. Importantly, transportation of conventional prefabricated building modules is inefficient as they are mostly empty space.

Weather and Climatic Suitability

The Force 10 building system is designed and tested to withstand extreme climate regimes in Queensland and Australia and in other parts of the world. The **design pressure** is **246 kph** or **153 mph (60 psf)** and **structural design load** is **301kph or 187.5 mph (90 psf)** (as tested by Architectural Testing April 2009 to Miami Dade TAS201, TAS202 and TAS203 requirements). **The Force 10 system** can also resist **earthquakes**, **tremors** and other extreme conditions. It is fire resistant, impervious to water penetration, resistant to mould and rotting, and resistant to termites and other pests

The innovative Force 10 system enables our buildings to withstand weather and environmental hardships that would compromise or even devastate other conventional building systems.

- **High Winds –**In wind speed testing, the Force 10 solution easily met the requirement of the BCA. All buildings are independently certified by a RPEQ (or as applicable for each state) to meet the BCA and local codes.

Housing Provisions Description	Wind Class — AS 4055			
	For non cyclonic regions A and B	For cyclonic regions C and D	Design gust wind speed (m/sec) Ultimate Limit State (Vh,u)	Ultimate Limit State wind speed (km/h)
N1	N1		34	123
N2	N2		40	144
N3/C1	N3	C1	50	180
N4/C2	N4	C2	61	220
N5/C3	N5	C3	74	267
N6/C4	N6	C4	86	310

- **Fire resistant** – The Force 10 wall panels are manufactured from fibre-cement and filled with fire retarded self extinguishing polyurethane foam (PUR) that will give self extinguishing foam according to ASTM6092 and would be a B3 according to DIN4102. Steel used in the system is also non-combustible, so its use significantly reduces the amount of flammable material in a home. In multi-dwelling or in commercial construction the Force 10 system can be rated to achieve an FRL of 120/120/120 as defined in AS1530.2. In fire zone areas the Force 10 design meets up to FZ – Fire Zone requirements

- **Termite resistant** - The Force 10 floor, wall and roof truss systems are made from steel. Because of this, the panels, floor framing and roof trusses do not require additional chemical treatments to protect them from normal climatic conditions.

Low Maintenance

- **Product materials –** The materials used in a Force 10 building require very low maintenance and the replacement of materials becomes almost redundant. The use of polyurethane as insulation together with steel framing and an external facing of various finishes, makes the internal and external walls virtually indestructible. In the case of a repair being required (e.g. picture holes), these can easily be repaired with normal plaster products.

- **Stainless steel fittings** – The wall/floor flashings are manufactured from stainless steel and sealed to ensure that no water can enter the building at the base of the wall panels.

- **Windows and Doors** – The face fixed windows are totally weather proofed and water resistant and are fitted in the factory before shipping, as well the pre-hung doors are supplied with stainless steel hinges to prevent any corrosion and these are easily replaced as needed.

- **Timber Trims** - All internal timber trims such as skirtings and architraves are screw fixed and can be easily removed and replaced.

- **Roof Sheeting** - The roof sheeting, being long run Colorbond and 0.42mm (BMT) for non cyclonic areas and 0.48mm (BMT) for cyclonic areas, is easily repaired or replaced if required, as are the guttering and rainwater products.

Value for money

Value for Money benefits of using the Force 10 solution - Transportation

Transportation costs to a minimum – Transportation costs for shipping a **Force 10** building to site are significantly less when compared to conventional modular housing - which requires specialist and costly transportation. The Force 10 'flat packing' system allows for shipping in containers or by crating the components using flat bed trucks to site. The Force 10 system is similar to the familiar flat pack furniture

that has become a staple 'pack 'n go' format around the world. There is no wasted space when shipping a Force 10 building.

Transporting conventional prefabricated building modules is relatively inefficient and costly, as they are mostly empty space and require 2-3 flat bed trailers where the Force 10 solution only requires one shipping container for the same size building – a 20' container will hold approximately the full "kit" for a standard 100 m^2 building.

Force 10 can assist in reducing transport costs and greenhouse gas emissions. Two truck loads of Force 10 components for a 170m2 building can replace around 4 to 5 truck loads of trusses, insulation, timber, plaster, paints, fascias, wire and fittings etc.

Additional VFM benefits are achieved when shipping a Force 10 building by:

- Using rail and road transportation companies that provide quality, safe and cost effective services

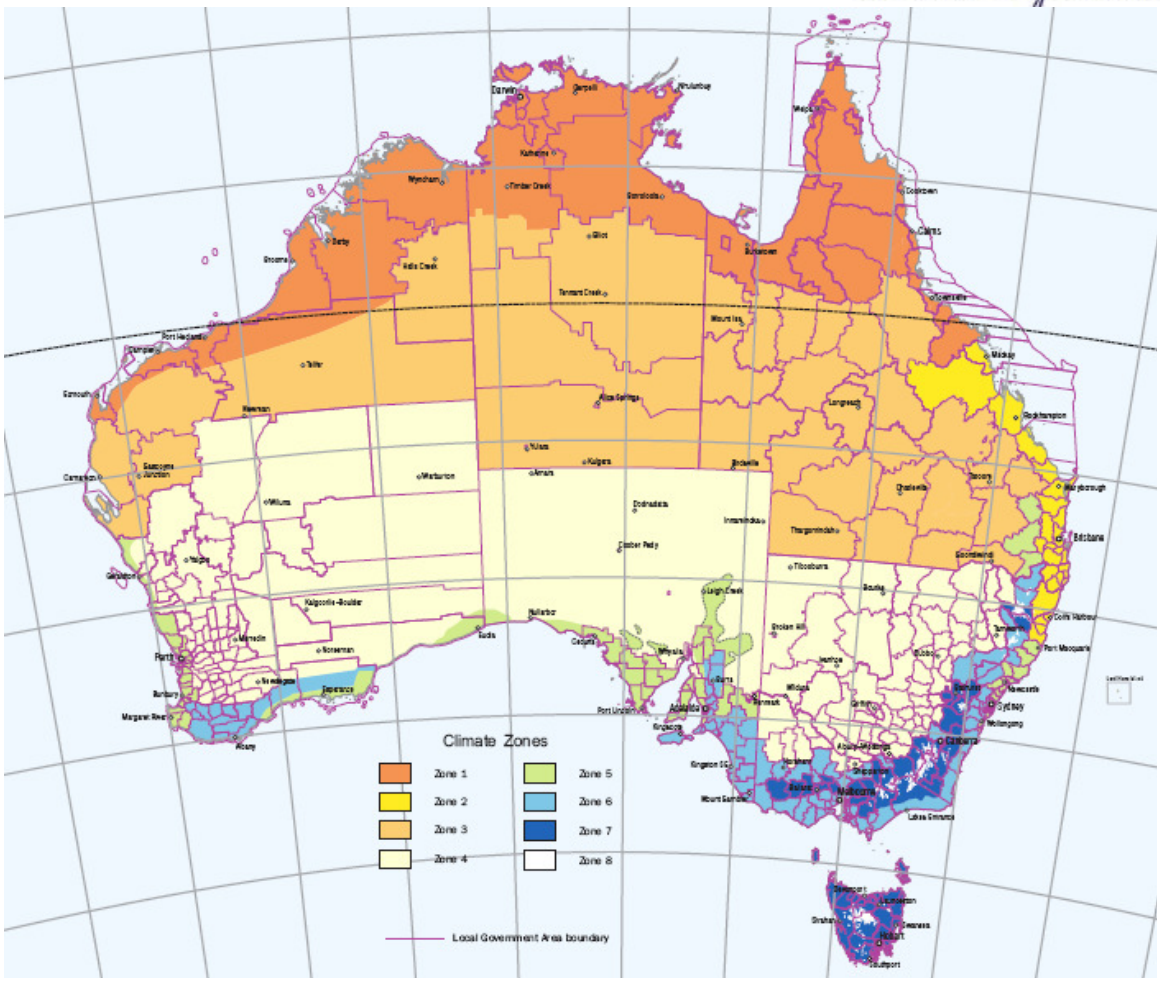
- The flat-pack supply of the Force 10 building solution allows for flexibility of transportation methods. For example rail, truck, ship or barge (where no docks are available). Delivery to remote locations can be extremely expensive, when limited to the use of conventional transportation and for delivery of multiple shipping containers. Our organisation's advantage is in the ability to actually deliver the product where others cannot, and with minimal effect to the environment.

Value for Money benefits of using the Force 10 solution – Energy efficiency

Energy efficiency – Due to the method of construction and the significant 'R Values' (meaning resistance to heat transfer and a guide to its performance as a head insulator) obtained, the Force 10 system is completely suitable for building in all areas. There are significant insulation values to be gained from our solution system namely:

- The Force 10 wall panels achieve R3.6 (Conventional buildings are usually in the region of R2.4)
- The standard Force 10 ventilated roof design with Aircell Glareshield achieves R2.7
- By the addition of up to R3.5 insulated ceiling batts the roof cavity can achieve up to R4.7.

In addition, on previous projects the Force 10 building system has achieved an outstanding BCA Energy Efficiency Verification Method BERS Ver 2 star rating of 9. The climate zone that the building is in will affect the rating. The attached map shows the Climate Zones as defined in the BCA.



Value for Money benefits of using the Force 10 solution – Withstanding the elements

Our building solution has the capability to withstand the harsh elements of nature such as cyclones and seismic violation. A large number of Force 10 buildings are in high-risk areas. Force 10 **has not had major damage to a single building** while many buildings in the same vicinities had suffered major structural damage or been totally demolished by intense weather conditions. The Force 10 system requires that each wall be tied down at 1m centres by robust fittings. The roof is tied through the roof trusses, wall studs, bearers, joists and stumps to the ground. In addition, the whole building is engineered so that it can withstand intense weather conditions.

Value for Money benefits of using the Force 10 solution – Key issues

- **Ease and Speed of On-Site Construction** - The Force 10 system is designed with precise engineering, careful planning and factory manufactured so that the work "on-site" is minimal. The requirement for higher skill sets on-site is reduced due to design and manufacturing occurring off-site.

- **Strength and durability -** The **Force 10** system is able to 'take a beating' in relation to high volumes of people traffic and to withstand the more frequent incidences of impact that can be expected in school and social housing. For example the Force 10 wall system is virtually indestructible.

- **Completeness and Lack of waste produced –** The Force 10 system includes all materials to "lock-up" stage including roof, purlins, roof trusses, walls (inside and out), floor system, bearers, joists, stumps (or concrete floor), windows, insulation and doors. This includes every single nut, rivet, bolt and screw, as well as numerous unique fixings supplied by Force 10. It also includes detailed drawings and schedules for each building and detailed instructions. Our product has almost no site wastage. Exact quantities are supplied which eliminates product and packaging waste.

- **Flexibility –** The Force 10 system is suitable for a range of applications, and is commonly used for schools, low-cost buildings and multi-storey commercial buildings.

- **Termite Resistance** - The Force 10 system is made from steel and is termite and borer resistant and does not require chemical treatments to protect them from pest attack. This provides significant cost savings in relation to pest inspections (approximately $200 per year) and additional costs for pest treatments (which can cost thousands of dollars). Additional costs can be expected from repairs to conventional wood products for any identified pest damage. These costs are eliminated through the Force 10 building system.

- **Non-Combustible Option** – Using a non-combustible materials such as steel (the core of the **Force 10** building system) significantly reduces the amount of flammable material in a home in the case of fire or electrical faults.

- **Insulation -** The insulation properties of the Force 10 wall panels, minimises the cost of heating or cooling the building and reduces the amount of energy resources needed.

- **Fire Resistance** – The Force 10 system has been measured by various testing authorities. They found the Force 10 building system benefits from features which render them less susceptible to fire than most other building systems. Force 10 uses self-extinguishing foam in accordance with ASTM6092 and rates to B3 according to DIN4102. In addition on request of the client, a Force 10 building can be supplied with non-flammable materials such as doors, internal trim and floor coverings or to comply with BAL up to FZ requirements

- **Maintenance costs minimised –** Maintenance and upkeep cost of Force 10 buildings are significantly reduced due to the following reasons:

    - No need for costly pest inspections and treatments;
    - No repair costs for holes in walls (due to high impact resistance), no cracking walls, warping due to strength, durability and weather resistant materials;
    - Doors and windows can easily be removed in the case of broken glass or damage to doors.
    - Timber fixtures and trim are screwed in and can be easily removed for repairs

Whilst transportation costs, lack of product waste, and ease and speed of construction definitely minimise this initial cost, we see the whole of life cost as equally important. Our building system minimises ongoing energy costs, repairs and maintenance and other incidentals such as pest control.

Environmental sustainability

Environmental Sustainability is of key importance to our organisation. This is the area in which we believe **our green solution really "shines".** What environmental sustainability means to us is that we help protect the environment for a sustainable future through lower impact on the environment over the life cycle of the building when compared to our competitor's products and services for the same purpose.

Our **environmental considerations** when delivering building solutions relate to sourcing recyclable or recycled raw materials or from sustainable sources. Manufacture within our factory is carried out with a view to minimising use of pollutants, waste and packaging. Then when the materials are delivered on site, it is a low weight, once only delivery so that fuel and transportation emissions are reduced. Then with little site preparation needed, fuels and emissions are again reduced and the soil is not degraded. With no additional building and packaging materials wasted the whole cycle of production, transportation and waste are yet again minimised.

Add to these increased efficiencies in heating and cooling and no harmful toxins and hazardous substances - we really do have the best green solution.

Environmental Policy – Force 10's Environmental Policy includes procedures in which we employ to ensure that we remain environmentally conscious. All personnel involved with the operation of our organisation have a responsibility for environmental management. Activities that impact on the environment must be managed and controlled. The amount of impact any activity has on the environment must be considered and the risks determined before commencement of the activities. This consideration applies to all types of activities conducted by our organisation.

Energy Efficiency

Every Force 10 building is assessed by an independent energy efficiency auditor to ensure a minimum energy efficient rating of a minimum of 6 stars. They are assessed against the Building Code of Australia Energy Performance Requirements, both residential and commercial. Amongst other areas, the Code measures conformance with external walls, roofs, floors, lights, air movements, building sealing and insulation. Force 10 uses the BERS Pro second-generation thermal simulation for residential buildings to achieve a minimum of 6 Star energy rating.

The Force 10 building system is very flexible and allows many features, which enhance Energy Efficiency. From the base residential building design, changes include a combination of:

- light external colours for hot climates,
- ceiling and roof insulation,
- roof space mechanical ventilation,
- ceiling fans in all habitable rooms,
- tinted, low-E or double-glazing in PVC frames (if required),

- external shade (eaves, deck or shading devices) and
- underfloor insulation, where warranted.

Regardless of the size of a Force 10 building, location, orientation or placement of rooms, the Force 10 system is able to meet or exceed the minimum of 6 Stars. Optimising orientation and room placement will minimise the amount of changes to the base design. In this way, our buildings in tropical Queensland have achieved a rating of 9 Stars.

- Insulation – Due to the method of construction and the significant R values obtained, the Force 10 system is completely suitable for buildings in all areas. The insulation properties of the Force 10 wall panels minimise the cost of energy intensive heating or cooling to the building and reduces the amount of energy resources needed.

- Recycling and reuse – Steel is one of the most recycled materials on the planet. Steel is 100% recyclable, and approximately 60% of all steel use in Australia has been produced from recyclable scrap.

- Non-Combustible Option – Using a non-combustible material such as steel (the core of the Force 10 building system) significantly reduces the amount of flammable material in a home. Force 10 uses self-extinguishing foam thus ensuring the safety to not only the inhabitants but also to the local environment.

- Long lasting materials - Steel components replace traditional timber frames, reducing the need to fell trees and destroy habitat. These components ensure maximum longevity of the structure and also decrease the need to replace items due to rotting, pests or damage.

- Reduced toxic and hazardous substances – In providing impact resistance to the Force 10 walls, non-toxic foam, containing fire retardants, is injected into the walls. Likewise, all other products used in the Force 10 building system are non-toxic and do not contain hazardous substances. Additionally there is no need for harmful pest treatments at any time in the life of the building system. This provides significant benefits to the local environment and also health benefits to people and wildlife.

- Transportation – There are many environmental benefits in relation to the transportation of a Force 10 building compared to other building solutions including:

    - Delivered at once – Force 10's system, where the whole project is supplied in just one delivery, means that all items required to take a building to lock up are delivered on site at once. This provides benefits in relation to the need for less fuel for deliveries.

    - No Waste - All components sent to site are accounted to be used in the construction, therefore no onsite wastage occurs. This means no unnecessary construction items dumped onsite to be carried into water ways or to be discovered by fauna.

- Up to 50%-off-site construction – The majority of the construction of our building solution occurs off-site in our factory. This provides less disturbance to the local environment such as:
    - Construction noise - significantly reduced;
    - Fewer trades people and heavy vehicles on-site (reduces the amount of fuel required);
    - Less time in on-site construction this means reduced impact on the local environment.

- Designs & Features – The innovative Force 10 building solution provides additional benefits to the local environment including:
    - Our designs are flexible and can be adapted to suit the local environment.
    - We can incorporate additional energy benefits such as solar power, energy efficient lighting.

- Force 10 Floor System - The Force 10 floor system is installed on steel stumps and is clipped and screwed together. It can be installed on sloping and uneven surfaces. Traditional concrete slab flooring requires earthmoving equipment to shift, smooth and compact the earth prior to installation. The benefits to the Force 10 flooring include:
    - No run off of earth into water ways and water courses;
    - Less disturbance to the environment cause by heavy equipment;
    - Less requirement for building retaining walls and other site works.

- Strength and durability – A Force 10 Building has the ability to withstand harsh extremes in weather and environmental hardships such as high cyclonic winds, earthquakes, tremors, fire resistance, impervious to water penetration, resistant to mould and rotting and resistant to termites and other pests. The benefits to the environment of a strong and durable building solution include:
    - Less impact due to minimal requirement for maintenance and repairs.
    - Less need to rebuild after extreme conditions such as weather.

The Force 10 solution can withstand all manner of weather extremes. It is also well-equipped to deliver a solution that doesn't further impact the environment in the future. Our organisation can clearly show our leadership in environmental sustainability and green principles as outlined in this response. It's not just a selling position, our off-site construction, lack of waste, positive transportation methods and flexible energy efficient designs are clearly best for Queensland and Australia - now and in the future.

Project Examples

BUILDING DESCRIPTION: Richmond Private Practice Clinic
LOCATION: Richmond, Queensland
PRINCIPAL: Project Services Queensland
, Depart. of Public Health
FLOOR AREA: 120 m²
FLOORING USED: Force 10 Flooring System

BUILDING DESCRIPTION: Doomadgee Council Chambers
LOCATION: Doomadgee, Queensland
PRINCIPAL: Project Services QLD, Dep. of Public Works
FLOOR AREA: 643 m²
FLOORING USED: Locally Supplied Concrete Slab

BUILDING DESCRIPTION: 5 x 2BR Community Housing
LOCATION: Wujal Wujal, Queensland
PRINCIPAL: Chappel Developments
FLOOR AREA: 96m² ea
FLOORING USED: Force 10 Flooring System

BUILDING DESCRIPTION: Doctor's Residence, 2 Bed Duplex
LOCATION: Bamaga, Queensland
PRINCIPAL: Bamaga Ingino Community Council
FLOOR AREA: 156 m²
FLOORING USED: Force 10 Flooring System

BUILDING DESCRIPTION: Indigenous Housing
1 x 4 & 1 x 3 Bed
LOCATION: Lockhardt River, Queensland
PRINCIPAL: Project Services QLD,
Dep. of Public Works
FLOOR AREA: 4 Bed - 171m², 3 Bed - 142m²
FLOORING USED: Force 10 Flooring System

BUILDING DESCRIPTION: Five (5) Senior Units
LOCATION: Mt. Isa Queensland
PRINCIPAL: Project Services QLD, Dep. of Public Works
FLOOR AREA: Units 1/2 Duplex: 210m²
Units 3, 4, 5: 105m² each unit
FLOORING USED: Locally Supplied Concrete Slab

BUILDING DESCRIPTION: Science Block, Commercial Building
LOCATION: Djurragun College, Cairns
FLOOR AREA: 203 m²
FLOORING USED: Force 10 Floor System

BUILDING DESCRIPTION: Residential Dev., 119 Affordable Buildings
LOCATION: Mennhorst, Aruba
PRINCIPAL: Aruba Government
FLOOR AREA: 91m² ea
FLOORING USED: Locally Supplied Concrete Slab

BUILDING DESCRIPTION: Disaster Relief, 100 Buildings
LOCATION: Montserrat
PRINCIPAL: Brown and Root
FLOOR AREA: 96m² ea
FLOORING USED: Force 10 Steel Flooring System

BUILDING DESCRIPTION: 60 School Classrooms
LOCATION: Saipan
PRINCIPAL: Saipan Government
FLOOR AREA: 81m² ea
FLOORING USED: Locally Supplied Concrete Slab

BCA Compliance

Building Class	Type of building	Applies
Class 1	Class 1a - a single dwelling being a detached house; one of a group of two or more attached dwellings, each being a building, separated by a fire-resisting wall, including a row house, terrace house, town house or villa unit; Class 1b - a boarding house, guest house, hostel or the like with a total area of all floors not exceeding 300 m2 measured over the enclosing walls of the Class 1b; and in which not more than 12 persons would ordinarily be resident, which is not located above or below another dwelling or another Class of building other than a private garage.	YES YES
Class 2	a building containing 2 or more sole-occupancy units each being a separate dwelling.	YES
Class 3	Backpacker accommodation, residential parts of hotels or motels, residential parts of schools, accommodation for the aged, disabled or children a residential building, other than a building of Class 1 or 2, which is a common place of long term or transient living for a number of unrelated persons, including - a boarding-house, guest house, hostel, lodging-house or backpackers accommodation; or a residential part of a hotel or motel; or a residential part of a school; or accommodation for the aged, children or people with disabilities; or a residential part of a health-care building which accommodates members of staff; or a residential part of a detention centre.	YES
Class 4	a dwelling in a building that is Class 5, 6, 7, 8 or 9 if it is the only dwelling in the building.	YES
Class 5	an office building used for professional or commercial purposes, excluding buildings of Class 6, 7, 8 or 9.	YES
Class 6	a shop or other building for the sale of goods by retail or the supply of services direct to the public, including— an eating room, cafe, restaurant, milk or soft-drink bar; or a dining room, bar, shop or kiosk part of a hotel or motel; or a hairdresser's or barber's shop, public laundry, or undertaker's establishment; or market or sale room, showroom, or service station.	YES
Class 7	Class 7a - a carpark; or Class 7b - for storage, or display of goods or produce for sale by wholesale.	NO YES
Class 8	a laboratory, or a building in which a handicraft or process for the production, assembling, altering, repairing, packing, finishing, or cleaning of goods or produce is carried on for trade, sale, or gain.	YES
Class 9	Class 9a - a health-care building, including those parts of the building set aside as a laboratory; or Class 9b - an assembly building, including a trade workshop, laboratory or the like in a primary or secondary school, but excluding any other parts of the building that are of another Class; or Class 9c - an aged care building.	YES YES YES
Class 10	Class 10a - a non-habitable building being a private garage, carport, shed, or the like; or Class 10b - a structure being a fence, mast, antenna, retaining or free-standing wall, swimming pool, or the like.	YES NO