

ADVICE ON CONSTRUCTING SMALL AFFORDABLE DWELLINGS

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Minimum size

The BCA (Building Code of Australia) does not specify a minimum size for a dwelling. It is possible to make a complying dwelling in a very small space. A 2.44m wide, 6m long shipping container can be made into a dwelling provided:

- it is the 'high' type allowing 2.4m minimum finished floor to ceiling height
- a complying insulated roof is placed over the container
- the hot water system is placed outside
- a half-width laundry tub and small shower are used in place of more conventional items.

A shipping container of this type has an area of 14.64m². This can be taken as a practical minimum size. However, for most of us this would not be a comfortable size for a permanent dwelling even for a single person. Use of a shipping container will usually require assessment by a structural engineer, as it is not covered under the "deemed to satisfy" provisions of the building code. There are other suggestions below and on my website.

The local Council has powers to designate a minimum size for a dwelling, but only by formal resolution of the Council. If you are told that there is a minimum size, ask for the Council Minute confirming this resolution: it is common for Council staff to "invoke the Bluff Act 1947" as the saying goes **J**

In Queensland the rules on the siting of dwellings on residential lots is contained in parts 1.1 and 1.2 of the Queensland Development Code (QDC). These Codes can be obtained as PDF files from the State Government website.

While it is now being curtailed, it is possible for Council Planning Schemes to overrule the QDC so you will need to check if this has occurred. The provisions must be contained in the Planning Scheme, and only the Planning Scheme, so again, you may need to check for the Bluff Act.

Some sales of undeveloped residential land are subject to a developer "covenant" which claims to impose rules on how the land may be further developed.

However, the Building Act has been amended (s.246O) to severely restrict these rules, eg they must not contain any measure that is contrary to sustainable development principles, and they must not include a minimum size and type of construction.

You may be advised to the contrary, but it is a fact that developer covenants are "binding in honour only" eg they are not enforceable in the courts. If your project complies with Federal law (the Building Code), State law (in Queensland the "building assessment provisions") and the Planning Scheme, then it is lawful – no arguments. However, you may need to consider the circumstances. If it is evident that other property owners in the area have complied with the covenant, then it may not be comfortable for you to depart from the perceived standard. It might be preferable to work up a design for a dwelling that is acceptable under the covenant but can be built in stages, the first stage being the basics.

Minimum requirements for dwellings

A single detached dwelling is a “Class 1a” structure under the Building Code. It must comply with certain standards and facilities which include:

- Structural adequacy, including cyclone rating if applicable
- Minimum floor to ceiling height 2.4m or 2.4m average or more over 2/3rds of the ceiling area, eg a raked ceiling of 2.15m on the low side to 3m on the high side will comply over a span of 3.5m.
- Energy efficiency requirements for the particular climate zone
- Sustainability features such as shower roses, gas/solar assisted water heating, dual volume toilet flush etc.
- Termite protection requirements
- Minimum services: bath or shower, wash basin, laundry (a laundry tub plus washing machine attachments), WC, facilities for preparing food (sink, cooker outlet or space for bench top cooking items)
- Minimum window openings for light and ventilation proportionate to the size of the room. The bathroom must have mechanical ventilation if there is no window.

The primary WC facilities must have a degree of separation from the living area. The laundry facility may be outside the dwelling. In fact, there is no rule requiring all of the components of a dwelling to be under one roof. They can be separated, but you may need to consider how the separated parts will work in inclement weather.

There are no specified minimum sizes for “living” space, but a bedroom would need to have enough space for a bed and room to get in and out, and a bed/living room would need to have some circulation space, room for a chair, TV etc.

Cost versus size

The cost of constructing a dwelling does not vary directly in proportion to the size. Because of the mandatory facilities listed above, there will be a minimum cost. Small dwellings are cheaper, but the cost per square metre (\$/m²) is higher. \$/m² drops as the size of the dwelling increases to around 3-4 bedspaces, then starts to rise again as structural spans increase above optimum, and additional facilities are required.

Who does the design?

You are allowed to design your own house, but the building certifier has the right not to accept the plans if there are technical deficiencies. In most cases the assistance of an architect or building designer will be required, and you may also need assistance from a licenced engineer, for soil tests, structural calculations etc.

In choosing a designer, explain the constraints you are under and go by the body-language; there are a number of architects and designers who are interested in affordable housing and will rise to the occasion, others who prefer to go with the conventional.

Builder or owner/builder?

Some saving can be obtained if you have construction experience and can construct the dwelling as an owner/builder. You need to be licenced with the Queensland

Building and Construction Commission, and may have to do a short training course. You will still need to employ licenced persons for electrical and plumbing work.

If you employ a builder or building tradesperson, check that they are licenced by QBCC.

Type of dwelling? Timber frame, steel frame or masonry block? Slab-on-ground or elevated? What about a removal dwelling or prefabrication?

Timber framing

From the 1950s to the early 1980s the predominant method for constructing houses in the tropics was low-set or high-set hardwood timber frame. Provided the framing components were securely connected and protected from moisture, this method was extremely durable. However, hardwoods are difficult to work and are now expensive. Timber framing is now predominantly constructed in graded and treated pine. Timber framing requires considerable carpentry skills, but it is possible for framing components to be fabricated off-site if accurate “shop” drawings can be prepared.

Steel framing

Conventional framing in steel has the advantage of being more dimensionally stable and is generally stronger than softwood for the same cross-sectional dimensions. Roof and wall framing panels are usually fabricated off-site.

Steel portal frame

Portal frame is probably the most cost-effective way of constructing enclosed space. Architects often use hot-formed welded RHS (rectangular hollow section) portal frames in dwelling projects. An alternative is to use cold-formed ‘C’ section portal frames such as are predominantly used for framing garages and sheds. Examples of dwellings using this method can be obtained from my website.

Cold-formed portal-framed structures used for dwellings have a number of advantages. The method is common for non-residential structures, there are numerous suppliers, and it is easy to meet and indeed exceed energy-efficiency requirements. The disadvantages include the following:

- Shed structures do not normally have eaves and verge overhangs. It is not difficult to provide these, but additional fabrication and engineering certification is required.
- Sheds used as dwellings need to be built to a higher internal pressure value for cyclonic design.
- Sheds often incorporate internal angle-bracing, which needs to be replaced with heavier plate connections if the structure is to be used as a dwelling.
- External cladding is easy to fix if it runs vertically, but additional vertical battens are required if it is to run horizontally.

Masonry block

Reinforced single-leaf masonry block is now the most common form used for constructing basic housing. It will comply if both sides of the wall are painted. The biggest disadvantage of conventional masonry block is energy efficiency. If significant areas of blockwork are exposed to the sun, they will absorb heat which is

re-radiated into the interior, and unlike framed walling, heat will be retained overnight and exposed walls will not cool down during the summer months.

Removal dwellings and transportable structures

A dwelling removed from one site to another may be an option for affordable accommodation. Removal dwellings become available on a regular basis as original sites are redeveloped. They represent a good example of sustainability, since the embodied energy in the original structure is retained for future use. However, it must be realised that a removal dwelling is assessed in the same way as a new dwelling; it must as far as possible be brought up to current standards. Also, moving a dwelling from one site to another is not a trivial exercise, and the plant and equipment required is expensive. Most removal dwellings constitute an “exceptional load” under Queensland road rules and will require approval from the Council and Department of Main Roads.

Some removal dwellings may contain asbestos material. If in doubt, get the advice of an accredited asbestos inspector. (Some removal contractors are accredited.) Asbestos roofs will require replacement. Asbestos-based wall linings may be present in the bathroom and other ‘wet’ areas. It may be preferable to leave these alone if they are in good condition. Watch out for asbestos dust in the roof space. Don’t attack any material with power tools if it may contain asbestos, and in any event make sure you wear at least a P2 dust mask.

Other framed structures such as site accommodation can form the basis of a dwelling. “Atco” type site offices and living quarters are generally easier to move, but may require a degree of adaptation if they are required to look more like houses. Occasionally, tourist resort cabins become available and are similarly easy to move. A structure up to 3.5m in width and perhaps 6m in length can fit on a conventional truck, will constitute at worst a “wide” load under road rules, and be capable of being lifted onto a site using moderate cranes.

Slab-on-ground or elevated

Since most conventional dwellings are constructed with masonry block, they are built on a concrete slab on the ground. Constructing a large reinforced concrete slab adequate for residential purposes is usually outside the scope of an owner/builder. There may be a need to treat the ground below the slab against termites.

Where timber or steel framing is used, it is possible to elevate the building off the ground, on steel stumps. This has several advantages. Wastewater and plumbing services are easier to install, maintain and modify. An elevated house will usually perform better where natural ventilation is concerned, being closer to unimpeded airflow. Stumps up to 1m in height are not difficult to engineer and install on reasonable ground, and the cost of a framed floor will be comparable to a concrete base. Disadvantages may include the need to construct steps, a landing, provide for wheelchair access, and meet workplace health & safety requirements in the form of staging during construction where the height exceeds 3m.

It would also be possible to construct a portal frame building with an elevated floor – if you can find an engineer who will undertake the structural design at reasonable cost.

The problem of span

In traditional timber-framed structures, floor joists were provided with intermediate support using heavy hardwood bearers. These are now very expensive. The alternative involves using steel bearers, trusses or proprietary laminated timber sections.

Roof structures are now generally constructed using triangular timber trusses fabricated off-site. It is unusual for a roof structure to be built on site by a carpenter. If a raked ceiling is required, truss manufacturers can design and construct trusses that provide a profile similar to a traditional roof with its associated storage space, but this may come at a considerable cost penalty. A substitute may involve using steel sections, plywood box beams or laminated sections to replace the traditional heavy sections, but again, engineering calculations will be required. A portal frame will provide a raked ceiling, but see 'internal linings' below.

Internal linings

Framed dwellings usually involve fixing edge-tapered gypsum boards for the internal wall and ceiling linings. These require taping and plastering to provide an even finish. It is easy to under-estimate the time this will take if undertaken by an owner/builder and the cost if undertaken by a tradesperson. An alternative may be to use plain, untapered boards with cover strips, but in this case care will be needed to match the wall panels to the sheet module so that a regular pattern across the surface is maintained.

Cheapest way to cover a floor?

Use particleboard flooring such as "Structaflor". This comes in sheets, 3.9m long, 900mm wide, costing between \$40 – 50 per sheet. It can be fixed on flooring joists or glued directly onto concrete. If handled with care, it is only necessary to apply two coats of a clear sealant to achieve a finish similar to cork flooring, and it can be maintained for many years with the occasional application of floor polish.

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