

ENGINEERED BUILDING SOLUTIONS



Force 10 International Construction Manual

Note: This document is subject to revision and updates are available on request from Force 10 International Pty Ltd.

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Contents

1	INTRODUCTION	7
2	MAINTENANCE AND CARE	7
2.1	DURABILITY	7
2.2	ENVIRONMENTAL CONSIDERATIONS	8
2.3	NORMAL MAINTENANCE	8
2.4	AREAS NOT WASHED BY RAIN	8
3	TOOLS LIST	9
4	SUPERVISOR'S CHECKLIST - DOMESTIC BUILDING WORK	11
5	SAFETY REQUIREMENTS	12
6	PRE-REQUISITES	13
6.1	FORCE 10 DOCUMENTS	13
6.2	STANDARDS	13
6.3	LOCAL AUTHORITY REQUIREMENTS	13
6.4	ALLOCATION OF WORK	13
6.5	SERVICE CONNECTIONS	14
7	CONSTRUCTION	15
STEP 1.	UNLOADING MATERIALS	15
STEP 2.	PREPARATION OF SITE	15
STEP 3.	FOUNDATION	15
STEP 4.	FLOOR FRAMING AND SHEETING	15
STEP 5.	WALL SYSTEM	15
STEP 6.	FLOOR BEARERS (SECOND STOREY)	16
STEP 7.	ROOF SYSTEM	16
STEP 8.	WINDOWS AND DOORS	16
STEP 9.	SERVICES	16
STEP 10.	CEILING	16
STEP 11.	CUPBOARDS AND JOINERY	16
8	UNLOADING AND STORING MATERIALS	17
8.1	PART NUMBERS	17
8.1.1	Wall Components	17
8.1.2	Floor Components	18
9	FOUNDATIONS	18
9.1	GENERAL	18
9.2	FOOTINGS	18
9.2.1	Setting Out	18
9.2.2	Boundary Pegs	18
9.2.3	Corners	18
9.2.4	Profiles	19
9.2.5	Excavation	21
9.2.6	Stump /Post Foundation Types	21
9.2.7	Stump /Pile Length and Set-Out (incl Mega Anchors)	21
9.2.8	Position	22
9.3	CONCRETE	22
9.4	POUR THE CONCRETE SLAB	23
9.5	MEGA ANCHORS	24
10	FORCE 10 FLOOR SYSTEM	25
10.1	BEARERS AT GROUND FLOOR	25
10.2	FLOOR JOISTS	27

10.3	FLOOR SHEETING	28
10.4	FLOOR FLASHING	31
10.5	BEARER COVER.....	32
11	FORCE 10 WALL SYSTEM	35
11.1	THE GRID SYSTEM	35
11.2	WALL FLOOR BRACKETS	35
12	FORCE 10 WALL PANEL SIZES AND CODING	38
12.1	ERECTING EXTERNAL WALL PANELS	40
12.2	EXTERNAL PANEL RUNS	42
12.3	ERECTING DOUBLE JOINERY PANEL	44
12.4	ERECTING INTERNAL WALLS	44
12.5	PLASTIC COVERSTRIPS (TEXTURELINE AND SQUARE EDGE SHEETING ONLY)	44
12.6	INTERNAL WALLS	46
12.7	ERECTING DIAGONAL WALL PANELS	48
12.8	RE/RE JOINT.....	49
12.8.1	EXTERNAL RENDER APPLICATION	50
13	FORCE 10 TWO STOREY CONSTRUCTION	53
13.1	TWO AND THREE STOREY CONSTRUCTION	53
13.2	BEARERS OVER GROUND FLOOR WALLS	53
13.3	BEARERS OVER GROUND FLOOR DOUBLE PANELS	54
13.4	FLOOR JOISTS	54
13.5	TWO STOREY CEILING BATTENS	55
13.6	TWO STOREY FLASHINGS.....	56
14	FORCE 10 POST AND BEAM SYSTEM.....	57
14.1	75X75 RHS WALL POST / COLUMN.....	57
14.2	COLUMN BETWEEN PANELS	57
14.3	RHS BEAMS	58
15	FORCE 10 ROOF SYSTEM	61
15.1	ROOF	61
15.2	TRUSS ASSEMBLY	61
15.3	PRELIMINARY WORK.....	61
15.4	FIXING OF TRUSSES.....	62
15.5	GABLE END ROOF	63
15.6	TRUSS BINDERS.....	65
15.7	ROOF PURLINS.....	65
15.8	EAVES PURLINS.....	67
15.9	HIP ROOF ASSEMBLY	68
15.10	GIRDER TRUSSES	69
15.11	HIP PURLINS	72
15.12	EAVES LININGS	74
15.13	ROOF SHEETING.....	74
15.14	GABLE END CLADDING.....	74
15.15	GUTTERING/DOWNPipes AND FASCIA.....	74
15.15.1	Fixing and Fitting Facia /Gutter Brackets (Fall).....	75
16	SOUND CONTROLS	75
17	FIRE CONTROL (FRL).....	75
18	SKIRTING.....	75
18.1	SKIRTING BLOCKS.....	75
19	SERVICES.....	75
19.1	PLUMBING.....	75
19.2	ELECTRICAL	75

20	CEILINGS	76
20.1	CEILING BATTENS	76
20.2	CEILING LINING	76
21	DOORS	76
21.1	DOORS	76
22	FINISHING TRADES	80
22.1	TRADES	80
22.2	WET AREAS	80
22.3	CUPBOARDS	80
23	EXTERNAL FINISHING	81
23.1	WINDOW DETAILS	81
23.2	WINDOW COVERSTRIPS	81
24	FINISHING SYSTEM	82
24.1	EXTERNAL FINISH REQUIREMENTS	82
24.2	FACADES.....	82
24.3	INTERNAL FINISHING	82

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Table of Figures

Figure 1 Panel Identification Label	17
Figure 2 Boundary Site Layout	19
Figure 3 Profiles (Stump /post Foundations)	20
Figure 4 Inner profiles	20
Figure 5 String Line Profiles	21
Figure 6 Cross Bracing	21
Figure 7 Measure and Align Stumps /posts to stringline	22
Figure 8 Stumps /posts - concreting details	22
Figure 9 Fix bearer	25
Figure 10 Adjoining bearer	25
Figure 11 Corner bearers on stumps /posts	26
Figure 12 Intersecting bearers	26
Figure 13 Intersecting bearer on stump	26
Figure 14 Joists to bearers	27
Figure 15 Non load bearing and non bracing panel	27
Figure 16 Floor system overview of components	28
Figure 17 Applying adhesive	29
Figure 18 Staggered floor sheets	29
Figure 19 Floor Sheet fixings	29
Figure 20 Panel sheet layout	30
Figure 21 Sheet joint and diaphragm floors	30
Figure 22 Wall /floor flashing	32
Figure 23 Wall bearer flashing	32
Figure 24 Deck bearer flashing	33
Figure 25 Flashing - Mitred details	33
Figure 26 Grid location	35
Figure 27 Chalk out grid lines	35
Figure 28 Hole layout	36
Figure 29 Wall/floor bracket	36
Figure 30 Slab hold down bracket General Epoxy Installation Guidelines (Refer to Specification)	36
Figure 31 Epoxy Installation guidelines (Internal and External)	37
Figure 32 Single module panels	38
Figure 33 Double module panels	39
Figure 34 45 Degree module panels	39
Figure 35 Corner floor bracket layout	40
Figure 36 Shim fitment	40
Figure 37 Corner floor bracket layout - Slab floor	41
Figure 38 Corner intersecting panel	41
Figure 39 Panel Erection Runs	42
Figure 40 Window head support	44
Figure 41 Textureline Square Edge PVC Cover strip	45
Figure 42 External corner PVC cover strip	45
Figure 43 Erection of panels to wall/floor and truss brackets	46
Figure 44 Internal wall fixings - Wall panel on gridline	47
Figure 45 Internal wall fixing Wall panels off gridline	47
Figure 46 Internal wall panels Wall panels on concrete slab on ground	48
Figure 47 Diagonal panel fixing	48
Figure 48 45 Degree floor bracket	49
Figure 49 Diagonal panels shifting of centreline	49
Figure 50 Wall Tee bracket	53
Figure 51 Bearers supported by ground floor panel	53
Figure 52 Lintel bearer plate	54
Figure 53 Lintel bearer plate to bearer	54
Figure 54 Joists to bearers	55
Figure 55 Two storey ceiling battens	55
Figure 56 Fitting wall/floor flashing	56
Figure 57 Two storey galvanised flashing	56

Figure 58 One way column	Figure 59 Two way column	57
Figure 60 Three way column	Figure 61 Four way column	57
Figure 62 Column to panel connection		58
Figure 63 Column to panel connection		58
Figure 64 Beam to truss fixings		59
Figure 65 Beam to column fixings		59
Figure 66 Beam to panel junction		60
Figure 67 Beam bracket to external corner panel		60
Figure 68 Factory assembled trusses		61
Figure 69 Factory assembled trusses		61
Figure 70 Truss fixings		62
Figure 71 Truss fixing details		62
Figure 72 Typical gable end truss		63
Figure 73 Gable End Detail		63
Figure 74 Gable end truss assembly #1		64
Figure 75 Gable end truss assembly #2		64
Figure 76 Gable end roof space brace		65
Figure 77 Truss binders		65
Figure 78 Purlin joints		66
Figure 79 Purlin location screws		66
Figure 80 Purlin location Details		66
Figure 81 Purlin location screws		67
Figure 82 Gable end purlins		67
Figure 83 Gable end purlin details		68
Figure 84 Typical hip end roof layout		68
Figure 85 Hip end bottom chords		69
Figure 86 Typical girder truss		69
Figure 87 Fixing hip end bottom chords		71
Figure 88 Corner assembly		71
Figure 89 Fixing centre jack rafter at apex		71
Figure 90 Hip roof module sizing and framing layout		72
Figure 91 Hip ridge purlins		72
Figure 92 Hip ridge purlins at apex		73
Figure 93 Fixing roof purlins to hip		73
Figure 94 Fascia fixing and setting of Eaves linings		74
Figure 95 Door frame finish		77
Figure 96 Door fixings details drawing		77
Figure 97 Window /door packer detail fixings		78
Figure 98 Window fixing detail drawing		78
Figure 99 Packer details		79
Figure 100 Wet area fixings		80
Figure 101 Window Fixing and Sealing		81

1 Introduction

This Construction Manual contains the full details of the Force 10 Building Systems Construction procedure and are contained in this easy to follow manual. **Also included with the manual are the applicable CodeMark drawings noted as CMxx for Australia NCC compliance, NZ CMxx for New Zealand Building Code compliance and Force 10 DT (detail) drawings and a current set of Tech Tips to identify any improvements or changers that are not included in this manual.**

The stage by stage format is designed to ensure that any possible problems during construction are avoided and compliance items are clearly defined. The site drawings referred to and described in this manual must be carefully studied prior to commencing work and then referred to continually during each stage of work.

This construction manual should be passed to the owner of the building for ongoing care and maintenance at handover (if required further copies are available from Force 10).

Time will also be saved if all of the components are unpacked and identified (not panels) before actually starting. Containers should be provided for small items to avoid loss during construction. All components (particularly **all** Roof Sheeting, Fascia and Gutter and Ceiling Sheeting) are to be kept dry and under cover during construction. This is important for tightly nested products such as corrugated roof sheeting which needs to be separate and dried immediately they get wet as discoloration may occur. Any problems that are encountered during construction contact your Force 10 supplier or Force 10 International.

In Australia, all building work must be carried out in accordance with the National Construction Code Australia (NCC), which refers to various Australian standards (these provide acceptable standards of product design, manufacture and building practices) and in NZ to the New Zealand Building Code and referred Acceptable Solutions. All Force 10 constructors should firstly ensure that they understand these requirements and any specific local or state or territory specific requirements that may apply.

Upon completion of the building the Force 10 constructor is to return to Force 10 the CodeMark Compliance document to verify that the building has been constructed in accordance with the building design.

2 Maintenance and Care

2.1 Durability

Steel floor framing, sub floor framing, steel roof trusses and the connections have a galvanised or zinc coating which provides protection against corrosion resulting from wetting during construction and temporary leakage associated with damaged cladding. The long term durability is dependent on the steel components being maintained in a dry condition.

When marking steel for cutting use a coloured pencil. Black or lead pencil contains graphite that will produce rust. Use hand tools such as a hacksaw or snips for cutting steel. If this is impractical use steel metal cutting blades in a power saw. Swarf damage (hot metal particles) can occur when cutting, drilling or filing steel as these particles weld themselves to surrounding metal surfaces, then rust causing unsightly brown stains that are very visible on roof sheeting etc.

Avoid swarf damage by cutting away from other products or using a cover, when cutting Colorbond sheets with a saw use padded supports and cut the sheets with the colour face down. Swarf can be removed from steel by scrubbing the area with a stiff nylon brush dipped in a mild detergent solution. Rinse the surface with water afterwards to ensure any particles are washed away. If necessary mop up any excess water with a clean cloth. If any swarf staining has already occurred and it is not easily removed the badly affected areas may need to be painted or replaced.

When finished works always sweep down the roof and clean the gutters to ensure that rivet stubs and all metal cuttings are removed. Where floor, wall and roof framing is protected from the exterior environment i.e. completely encapsulated by weather tight linings, flashings and claddings, long term durability is maintained.

For steel sub floor framing including steel stumps /piles to meet this condition the following requirements apply:

- Sub floor framing must not be used within 300m of the sea, in areas where geothermal activity is known to be high or in heavy industrial areas. The appropriate authority should be consulted for advice about which areas are affected.
- As defined in the BCA the sub floor must be enclosed with ventilators installed to provide the required ventilation.
- Floor framing, used for decks, posts and beams for verandas must be completely enclosed.

The strength and stiffness of Force 10 wall panels is related to the sandwich panel action which in part relies on the durability of the polyurethane foam that fills the cavity. It is expected that the durability of the foam will exceed 25 years and that adherence of the foam to the fibre cement board will also exceed this period.

2.2 Environmental Considerations

The area where the steel products are used needs to be considered. While roofing and floor materials have a lifespan in excess of 30 years this can reduce to only a few years in severe coastal or industrial environments.

Steel products in a non-aggressive environment will have a long lifespan. Non aggressive areas are outer urban and rural areas, away from pollution and the shoreline. In an aggressive environment (coastal/industrial close to salt or pollution) steel life span may be reduced if not maintained correctly. Very severe conditions are within 100 metres of active surf and /or industrial pollution. Severe conditions are between 100 and 1,000 metres of these areas. Moderate conditions can still contain salt or moist acid laden air for up to 1,000 metres away from surf or industrial pollution. Benign conditions are outer urban and rural areas away from the shoreline.

2.3 Normal Maintenance

Regular maintenance is essential to maintain the good looks of your Force 10 building. This will ensure that you receive the maximum possible life span for steel manufactured products in the building location (this is particularly important for pre-coated steel).

To maintain your Force 10 building wash with clean water at least each six months, or more frequently in a coastal or industrial area. Maintenance must be enough to prevent dust, salts, pollutants or any other material to accumulate on the building and reduce its life. When it is washed by rain there may be no need for additional maintenance. Carefully inspect the exterior for all water tight seals and silicone areas to ensure that there is no chance of any water entering the building, roof cavity or external cladding voids, remove and replace if any noticeable deterioration.

2.4 Areas not washed by rain

More regular maintenance is required of the areas of the building that are not naturally washed by rain. These areas include the underneath of verandas, decks and buildings where the Force 10 floor system is used, roofing visible through exposed eaves, fascia or guttering. The building's lifespan may be reduced from not following a regular maintenance program because night time condensation in these areas can combine with salt and pollution on surfaces resulting in accelerated corrosion.

Wash areas that are not naturally washed by rain with fresh, clean water regularly. This maintenance must be sufficient to prevent dust, salts, pollutants or any other material to accumulate on the building and reduce its life.

3 Tools List

The following tools are required during the construction stage:

- Jack Hammer for mega anchors
- Jack Hammer dolly for mega anchors
- TEK Gun Electric and or battery powered impact drivers
- Tek Gun Drive bits
- Impact hammer drill 750W minimum
- Metric steel drill set 2mm - 18mm
- Masonry drill bits 10mm, 12mm, 14mm
- Circular power saw
- 4" Angle Grinder
- 9" Angle Grinder
- Metal cut off blades to Grinders
- Masonry cutting blades to Grinders
- Diamond Hardies Masonry cutting blade (suit Circular Saw)
- Wood Chisels 12mm, 18mm, 25mm
- Sharpening stone (Chisels)
- Wood spade drill bits (Door Locks)
- Wood hole saws (Door Locks 54mm)
- Electric planner
- Carpenters combination square
- Black felt marker pens
- 10m steel measuring tape
- 30m steel measuring tape
- Metric folding rule (WHITE TYPE)
- Nail bag
- Claw hammer
- Pin punch
- Podger bar (tapered bar) 16mm Dia
- Tin snips LH, RH Good Quality
- Rivet gun
- Caulking gun 300ml
- String line
- Chalk line and Chalk
- Power extension leads (TAGGED)
- Earth leakage box (TAGGED)
- Crow bar / Wonder bar/ Pinch bar
- Spirit level 1.8m
- 1/2" drive socket set (complete ratchets, extensions, universals etc)
- 1/2" air ratchet (narrow neck)
- Impact extension sockets 5/8", 5mm, 17mm , 18mm and 19mm
- Air Hoses with fittings male & female
- Air Compressor 2 - 3 HP
- Air blower
- Air oil
- Gloves
- Hacksaw and Blades
- Flat nose vice grips (Folding)
- Standard vice grips (Clamping)
- Dust masks / respirator
- Safety Goggles / Cutting face shield
- Stanley knife and blades
- Builders pencil

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



- Ear muffs
- Personal protection equipment
- Compound mitre drop saw
- Finishing nailing gun complete with nails
- Ring / open ended spanners 5/8", 5mm, 17mm , 18mm and 19mm
- Sledge Hammer 7 - 8lbs
- Rubber Mallet (pvc jointers)
- Bolster 115mm Blade
- Laser level
- Step drill 8 - 24mm
- Paint scraper 100mm blade
- 300 mm long 1/4" drive extension (off grid panels)
- Nibbler electric 1.6mm (hip roof sheet)
- Metal cut off saw and blades
- Wax crayons (red & black)
- Battery drill or impact drill
- Ladders
- Scaffold planks – with edge protection
- Painter's trestles.

4 Supervisor's checklist - Domestic building work

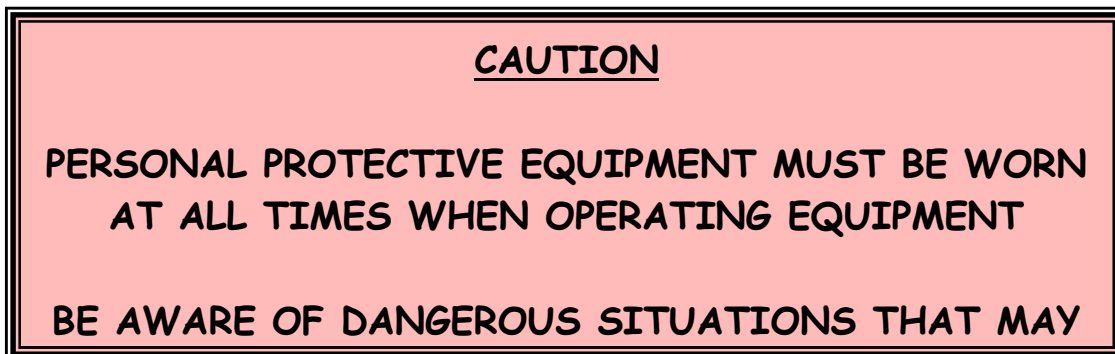
When inspecting and checking building work to ensure that it complies with plans and specifications and is of an appropriate standard, there are numerous matters that need to be taken into account. The below table provides a guide to the key building work items that should always be checked and inspected when constructing a new dwelling. Relevant parts of the guide may also be useful for those contractors undertaking renovations.

STAGE	ITEM
Pre-construction	Mandatory approvals obtained. (e.g. Development permits for building work, operational works, plumbing, town planning etc.).
Site identification	Site description and boundary alignments verified.
Site Works	Correct level of building platform established. Earth batters or retaining walls established. Required fill compaction achieved.
Building set out	Set back from titled boundaries accord with approval documents. Building footprint reflects approval and contract documents.
Footings	Mandatory inspections undertaken and approved by relevant approving authority. Relevant plumbing and drainage inspections undertaken and approved by relevant approving authority. Excavation, steel reinforcement, concrete placement and compaction accords with approval and engineering documents.
Slab	Mandatory inspection undertaken and approved by relevant approving authority. Plumbing and drainage inspections undertaken and approved by relevant approving authority. Steel reinforcement, concrete placement and compaction, construction and control joints accord with approval and engineering documents. Finished slab level accords with any minimum levels set by local government (eg. flood, overland flow etc.). Termite management system in place where needed.
Panel	Mandatory inspection undertaken and approved by approving authority. Panel set out and dimensions and waterproofing /sealing accord with approval documents. All structural elements and wind bracing accord with approval documents. Ceiling heights and door widths accord with the contract documents and minimum standards set by legislation. Wall panels plumb and square.
Plumbing works	Plumbing rough-in inspection undertaken and approved by approving authority. Position of final fixtures accord with contract documents.
Electrical works	Electrical supply authority requirements satisfied. Smoke detector locations accord with approval documents. Position of final electrical fittings accord with contract documents.
Window and external door joinery	External window and door fitments meet correct wind loading requirements and waterproofing requirements. External window and door flashings in place. Correct glass used in areas of human impact risk. Installation and glazing certificates obtained.
External cladding	Articulation, construction and control joints correctly positioned. Any weepholes clear and correctly positioned. Damp proof courses in place. External cladding waterproofed where required. Brick cladding plumb.
Roof and site drainage	Roof Roof fixings in place and correct for wind category. Sarking correctly lapped and placed.

STAGE	ITEM
	Flashings in place and of compatible materials. Minimum falls and laps to sheet roofs correct. Roof drainage and downpipes located in accordance with approval documents. Site Downpipe connections adequate for soil conditions. Roof water discharge to approval authority's satisfaction. Site drainage falls adequate. Site drainage discharge to approving authority's satisfaction.
Internal and External finishes	Plasterboard and Panel Joins Frame checked prior to plaster fixing in ceiling. Expansion and control joints correctly located. Selected class of finish achieved in accordance with contract documents. Painting Pre-paint inspection carried out to ensure adequate surface. Correct paint type used for internal and external environment. Selected finish accord with contract documents.
Final	Mandatory inspection undertaken and approved by relevant approving authority. Relevant certification obtained and provided to relevant approving authority.
Miscellaneous	Driveways constructed with appropriate falls, control and construction joints and surface finishes.

5 Safety Requirements

Site Safety must be a prime concern at all times – Refer to the attached documents for details.



Beware of wet, windy conditions as the installation of some of the Force 10 components can be dangerous. When installing roof sheets be careful as the wind can easily lift the sheets and cause damage to people or property. Always ensure that roofing is securely tied down before fixing. Walking on roofing or using power tools in wet conditions is dangerous.

Always take appropriate care when handling steel products. The edges of many steel products can be very sharp and will easily cut. Always wear cut resistant gloves that are clean and dry to prevent marking face sheet surfaces and to prevent cuts.

As the Force 10 system is installed outdoors and it is recommended that suitable sun protection is applied when during exterior construction. However it is important to note that sunscreens include semi-conducting materials such as zinc oxide or titanium dioxide and these can speed the deterioration of paint. To protect the surface of any pre-coated steel prevent any sunscreens that contain zinc oxide or titanium dioxide from coming into contact with any pre-coated surface.

6 PRE-REQUISITES

6.1 Force 10 Documents

All Force 10 projects are supplied with the following documentation as a hard or soft copy:

A3 CONSTRUCTION DRAWINGS	2
A3 LAMINATED CONSTRUCTION DRAWINGS	1
CONSTRUCTION MANUAL, SCREW AND BRACKET APPENDIX AND TECH TIP SET	1
BILL OF MATERIALS	2
COLOURED LAYOUTS	1
SPECIAL SUPPLY DETAILS (IE SENTAUR/CAGE BOLTS ETC)	1
SHOP /FACTORY DRAWINGS /TRUSS ASSEMBLY DRAWINGS	2
WINDOW COMPLIANCE LETTER	1
EXTERNAL TEXTURE APPLICATION INSTRUCTIONS	1
INTERNAL PLASTER APPLICATION INSTRUCTIONS	1

6.2 STANDARDS

The specific design details the foundations required and other special aspects referred to for construction in accordance with local standards. You will need a copy of the relevant standard to work with.

6.3 Local Authority Requirements

Your local authority or certifying body may require the following information before a Building Approval or Consent can be issued:

- A floor plan at each level
- An elevation of each external wall
- The type and location of each foundation element
- Adequate information on all walls and subfloor, floor, and roof framing, including the type and location of each subfloor brace, diagonal brace, and wall bracing element and the number of wall bracing units assigned to each wall bracing element.
- The type and location of roof cladding and ceiling and wall linings
- Building Consent application form.

After the local authorities have issued consent, please contact your Force 10 Customer Services Officer or your dealer for any alterations the local authority may require to approve plans. Only stamped plans are used and considered valid. There will be an extra fee payable if changes are to be made to existing plans unless the changes are required to obtain a Building Consent.

6.4 Allocation of Work

It is recommended that all the Force 10 work on the project is supervised by a competent Force 10 trained installer.

The following table identifies the recommendations for who may carry out the work for the various tasks:

A	Work that may be undertaken by an owner builder (ensuring compliance with all reference codes and standards and the approved technical assessment requirements) <i>Note: owner builder construction can only be undertaken by those persons who have been trained in the method of construction of the Force 10 building system, and are deemed competent</i>
B	Work that must only be undertaken by registered Tradesperson
C	Work that is recommended undertaken by specialist subcontractor

Work	Who may carry out the work
Concrete or masonry foundation walls	B
Post or stump foundation	A
Concrete-slab-on-ground	A and C
Construction of floor, walls and roof	A
Installation of linings, floor sheathing and roof cladding	A
Exterior joinery	A and C
Electrical work	B
Plumbing and Drainage	B
Gas	B
Carpentry and tiling	A and C
Plasterboard fixing and stopping	A and C

6.5 Service Connections

Connections associated with electricity, gas and telephone must be lodged with the appropriate service authorities, through a registered certifier, contractor or tradesperson.

Drainage and water connections are covered by the building approval for the project.

7 CONSTRUCTION

The Force 10 building system construction procedure follows a step-by-step pattern and is normally adhered to, although it may vary according to sub-contractor availability.

After the arrival of the Force 10 kit, check carefully for any damage. Contact Force 10 info@force10global.com.au or the dealer and report any damages or missing parts within three days, or no responsibility can be accepted.

Following is a suggested construction program:

STEP 1. UNLOADING MATERIALS

Check all items against the supplied Take-off or Bill of Materials list (refer to attached labels). Arrange covered storage for materials in dry conditions clear of the ground (Note always use dunnage to store materials off the ground).

STEP 2. PREPARATION OF SITE

Check survey information and position of services. Remove topsoil and prepare site for hardfill (slab-on-ground) or for excavation (stump /pile or foundation wall footings).

Ensure the finished ground surface immediately adjacent to the building is shaped adequately to facilitate surface drainage away from the building and the site and building floor levels meet the provisions of required standards.

Arrange for the excavation and placement of all buried services, eg. water, gas stormwater and sewer drains.

STEP 3. FOUNDATION

- **Slab-on-ground:**

Erect profiles, place and compact hardfill. Excavate footings, place Damp Proof Membrane (DPM), install formwork and fix footing and slab mesh reinforcing in place.

Call for local authority inspection prior to placing concrete. Set out holding down bolts in the wet concrete where desired as an alternative to chemical anchors. All concrete work should be carried out in accordance with the relevant standard.

- **Using Stumps, Mega Anchors or a Post foundation:**

Erect profiles, excavate for footings, fabricate floor framing on stumps /posts, lift and support framework in position and call for Local authority inspection before placing concrete in the footings. Note that some footings will be anchor stump /pile footings.

STEP 4. FLOOR FRAMING AND SHEETING

Bolt bearers to foundation wall or stump /pile tops (This is required for stumps /posts before placing footing concrete - see step 3). Fix joists into bearers. Erect stairs.

Fit stump /pile bracing in accordance with the specific design. Lay flooring sheets and screw fix into position. For a slab-on-ground, wall panels are fixed directly to the slab.

STEP 5. WALL SYSTEM

Following the wall panel layout plan, mark out grids and wall panel positions. Fix floor brackets, fit floor flashings, then erect walls. Check that all walls and wall panels are square and plumb.

STEP 6. FLOOR BEARERS (SECOND STOREY)

Bolt bearers to wall tee brackets which are fixed to bottom storey wall panels and install joists, flooring sheets and walls as in Steps 4 and 5 above.

STEP 7. ROOF SYSTEM

Place trusses, purlins, binders, barge, fascia and gutter. Fix gable end braces to gable ends if applicable. On hip roof, fix girder trusses first, then standard trusses between.

Brace up roof where required and fix purlins. Attach gutter brackets, fascia/barge, gutter (valleys if applicable) and do not forget downpipe droppers. Check that these are not over window or door openings.

Frame up eaves and gables, fix ceiling and soffit battens, and fix soffit linings (where applicable).

STEP 8. WINDOWS AND DOORS

Window frames are normally factory pre-fitted. Fit and fix of pre-hung door frames. Fit door furniture.

STEP 9. SERVICES

Installation of plumbing and drainage. Run all electrical cables prior to plastering or installing ceiling. This work must be undertaken by a licensed Tradesperson.

STEP 10. CEILING

Fix ceiling battens and fix ceiling linings.

STEP 11. CUPBOARDS AND JOINERY

Install cupboards and fix skirtings, joinery and architraves.

For a complete copy of the manual please contact Force 10

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