

Guide to Safer Roof Framing



March 2012



Government of South Australia

Department of Planning,
Transport and Infrastructure

Guide to Safer Roof Framing

Department of Planning, Transport and Infrastructure

136 North Terrace, Adelaide
GPO Box 1815
South Australia 5001

www.dpti.sa.gov.au
www.sa.gov.au

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1. INTRODUCTION

The tragic roof collapse at the Riverside Golf Club has resulted in a number of actions, including a prosecution, a number of initial amendments to the *Development Act 1993*, and an inquest by the Coroner.

Numerous recommendations were made by the Coroner impacting on all areas of the industry having responsibility for roof framing.

At the request of key industry bodies and participants, the Minister for Planning established the Ministerial Taskforce on Trusses in May 2006.

The Taskforce considered the Coroner's Report and noted the comment in the Executive Summary that "...neither the builder nor the architect, engineer, software designer, truss manufacturer, roof contractor, roof tiler or Local Government authority took any responsibility for the overall integrity of the roof structure."

A key issue for the Taskforce was to ensure that there are clear pathways of responsibility and accountability. It is important to ensure that all systems and procedures relating to the design, approval, manufacture, handling, installation and inspection of trusses, are robust and appropriate.

While the Taskforce focused on prefabricated timber trusses as the basis for its deliberations, the Taskforce was mindful that any changes must also be applicable to steel and conventional roof framing. The Minister released the final report and recommendations of the Taskforce on 1 June 2008.

The Government subsequently approved an implementation plan for the Taskforce recommendations with the amendments to the *Development Regulations 2008* coming into effect on 1 July 2012.

This guide has been developed to assist the building industry, councils and private certifiers to understand and apply the new rules related to design, documentation, assessment, approval, storage, handling, construction, and inspection of roof framing.

2. DESIGN OF ROOF FRAMING

2.1 Structural design software

The Coroner made specific recommendations in relation to the design of trusses using computer programs and specifically commented— *‘The owners of the software have a choice. Either they meet the certifier’s criteria, or their customers do not get development approval.’*

As this has national implications the Department has worked with the Australian Building Codes Board (ABCB) for a suitable approach. The **ABCB Protocol for Structural Software** has been completed and it is referenced in the Building Code (from BCA 2012).

The suppliers of the software for structural engineering programs, that are intended to be used by people who are not engineers, should be able to provide evidence that their program has been tested to verify that the program is delivering consistent results, is compliant with the Protocol, and can be relied on.

Compliance with the Protocol is mandatory.

2.2 Combining roof trusses and conventional roof framing

All prefabricated truss systems are engineered proprietary systems where the adequacy of the roof framing is provided through the correct use of the system. With these systems some clear responsibilities can be established however, with hybrid roofs (i.e. combinations of trusses and conventional stick framing) there is no overall responsibility for the design. Problems arise with a combination of conventional framing and trusses when one relies on support from the other. Therefore, the **Minister’s Schedule 5 roof framing checklist** requires that the framing layout for a hybrid roof needs to be verified by a structural engineer, unless the truss software can accommodate the loads and connections for a hybrid roof.

If the roof is fully conventionally framed there is no need for engineer’s verification. Also, if the roof is part conventional frame and part trusses but each is independent of the other, there is no need for engineer’s verification. If the truss software cannot accommodate the loads and connections, an engineer’s verification is needed when one type of roof (conventional frame or trusses) is reliant on the other for support.

Additions to buildings can also present a problem as the extra load is not factored into the original roof design. If an addition relies on an existing roof structure for support, then evidence of suitability of the existing structure to provide support must be provided. For additions to buildings, the onus is on the applicant to provide evidence of suitability of the existing structure to withstand any new loads.

3. COMMUNICATION

The transfer of information throughout the process is critically important if the roof framing is to be properly constructed such that it performs as intended. Accordingly the Taskforce gave considerable attention to how information is communicated and how this can be done in a manner that is clear, reliable, transparent and robust.

3.1 Truss layout plans

The production of the truss layout plan for a building is considered to be critical in communicating key information between the design, fabrication and installation stages.

The Coroner's recommendations contain specific reference to the important nature and communication of the truss layout plans.

In order to ensure that all important aspects of the truss design are transferred onto the truss layout plan, the Taskforce determined that the fabricator must always use the software to produce the truss layout. If, by exception, the layout is not produced by the truss design software, the layout must be certified by a structural engineer.

Note: site specific additional information can be added to the layout provided it does not change or compromise the structural design.

The **Minister's Schedule 5 roof framing checklist** requires that the nail plate supplier's software must always be used to produce the truss layout for approval and erection; except that where an alternative is used the layout must be certified by a practicing structural engineer.

3.2 Separate roof and wall framing plans

Layout plans must convey information in a clear and concise manner as they need to be read and understood by a number of different people. When roof framing layouts and wall framing layouts are combined, too much information is shown on the one plan making the layout confusing and difficult to read. Therefore the Taskforce considered that roof framing layouts and wall framing layouts should not be combined.

The transfer of loads through the framing to the footings is important for the proper structural performance of the building and all load transfer points between different framing systems (such as roof-to-wall and wall-to-floor) must be shown on the layout plans so that anyone reading the plans is aware of the critical load carrying points in the building.

The **Minister's Schedule 5 roof framing checklist** requires that roof frame, wall frame, and floor frame layouts must not be combined, that is, separate layouts must be provided for clarity. All layouts must show critical load transfer points.

3.3 Documentation to be signed

It must be clear that the truss designer and the truss fabricator are taking responsibility for their work. For this reason, the documentation that is submitted for development authorisation (refer Figure 1) must be signed by the designer and the fabricator (this could be the same person, a person who takes responsibility for both design and fabrication).

The **Minister's Schedule 5 roof framing checklist** requires that the truss designer and fabricator must sign and verify the layout plan, and the design documentation used in the manufacture of the trusses.

3.4 Details to be shown on layout plans

Roof bracing, tie downs, and important truss-to-truss connections are critical components in the completed truss and building system. The Taskforce considered that these features must always be clearly specified and shown on the roof framing layout.

The ceiling diaphragm is often relied upon as part of the truss bracing system. Where there is no ceiling, or a suspended ceiling, alternative bracing/lateral restraint will need to be considered.

Truss roofs with suspended ceilings or no ceilings (exposed trusses) must have a structural bottom chord diaphragm/bracing system designed by an engineer.

The **Minister's Schedule 5 roof framing checklist** requires that required truss bracing, tie-downs, and truss-to-truss connections must be detailed on the layout plan submitted for approval.

3.5 Warning Labels

The building owner should be aware that the roof framing may not have been designed to accommodate extra loadings such as roof space storage, or other items such as water heaters or air conditioners. Also, service contractors sometimes cut truss members to accommodate services in the roof space. The Taskforce recommended that a notice be required on a truss or roof framing adjacent to the access point to a roof space, drawing attention to these matters for anyone working in the roof space.

The **supervisor's checklist** requires that, unless the roof framing has been designed otherwise, a label must be provided on a truss or roof framing immediately adjacent to the roof access hole, stating that the roof framing has not been designed for additional loads such as a water heater, air conditioner, or household storage. There should also be a warning label that truss members must not be cut to fit building services.

If the roof framing has been designed for additional loads, the trusses or roof framing that are to support any additional load must be clearly identified.

4. MANUFACTURING OF PREFABRICATED ROOF TRUSSES

4.1 Identification of trusses

The Taskforce agreed with the Coroner that trusses should be labelled so that they are readily identifiable on site, and their position clearly denoted on the approved truss layout. The Taskforce considered that the information on such labelling should include the name of the manufacturer, truss mark (as per the layout), any critical support points, other loads, and web bracing locations. The truss manufacturer's unique mark will be sufficient for the purpose of identifying the make of the truss.

The **supervisor's checklist** requires that all trusses are appropriately marked by the fabricator so the fabricator can be identified and the particular truss can be located as per the approved layout plan.

4.2 Documentation to be provided

It was recognised that changes to the roof design sometimes occur when it moves to the manufacturer for fabrication of the trusses. Any changes must be approved, and this may result in delays (refer Figure 1). If there are any changes, it is important that the roof design, as amended for production of the trusses and assembly on site, is properly checked by the building surveyor (either council or private certifier) who undertook the building rules assessment, so that the design can be verified as being compliant with the building rules. Any changes can be dealt with as variations to the original authorisation (building rules consent).

Accordingly the Taskforce considered it important that copies of the final production design and documentation must be forwarded by the manufacturer to both the client (for forwarding to the private certifier) and to the council as indicated in Figure 1. This will ensure that the council, which is responsible for inspection and enforcement, has the correct design documents to be used in construction, pending verification by the assessing building surveyor that the changes (if any) are approved.

Note: The Taskforce recommendation did not envisage a formal building rules consent for these production documents as these are usually in the nature of further refinement of the original consent. However, if there are significant changes such as a change from a trussed roof to a conventionally framed roof, then the change requires a consent.

All truss documentation (including layout and any amendments) must be forwarded by the manufacturer to the relevant council and client prior to manufacturing the trusses. It must be sent (preferably electronically) to the council and the builder, and should require confirmation of receipt (such as “read receipt”).

74A—Provision of truss information

(1) A person who is engaged to manufacture a roof truss must, before commencing the work, furnish to—

(a) the council for the area where the roof truss is to be installed; and

(b) —

(i) the licensed building work contractor responsible for the relevant building work; or

(ii) if there is no such licensed building work contractor—the person who is otherwise responsible for the relevant work,

the information required by the checklist that is also required for the purposes of clause 1(1)(g) of Schedule 5.

Maximum penalty: \$5 000.

Expiation fee: \$315.

(2) The information must be furnished in a manner determined by the Minister for the purposes of this regulation.

For the purpose of regulation 74A, the Minister determined (through a notice published in the Gazette) that the information must be furnished in the following manner—

1. The information must be sent in a manner that it is received by the parties specified in regulation 74A(1) within one business day of it being sent.
2. If the information is sent electronically, there must be a record that the message was received, such as a ‘read receipt’.

5. APPROVAL OF ROOF FRAMING

The building surveyor undertaking the building rules assessment must have sufficient information to be able to determine whether the proposed roof meets the requirements of the Building Rules. For this purpose, the **Minister’s Schedule 5 roof framing checklist** has been published, which should assist in providing the following advantages:

- Prompt approvals
- Reduced delays in needing to provide further information
- Clarity in the technical requirements approved for construction
- Greater confidence that the construction on-site matches the approved design
- Greater confidence in the structural adequacy of the roof design.

In the absence of adequate information the building surveyor may need to undertake a completely independent check of the structural calculations in order to be satisfied that the design is compliant. This would be quite onerous, as a separate structural analysis would be required, and even then it may not be possible to properly check the nailplate connectors. It would also delay the issuing of building rules consent.

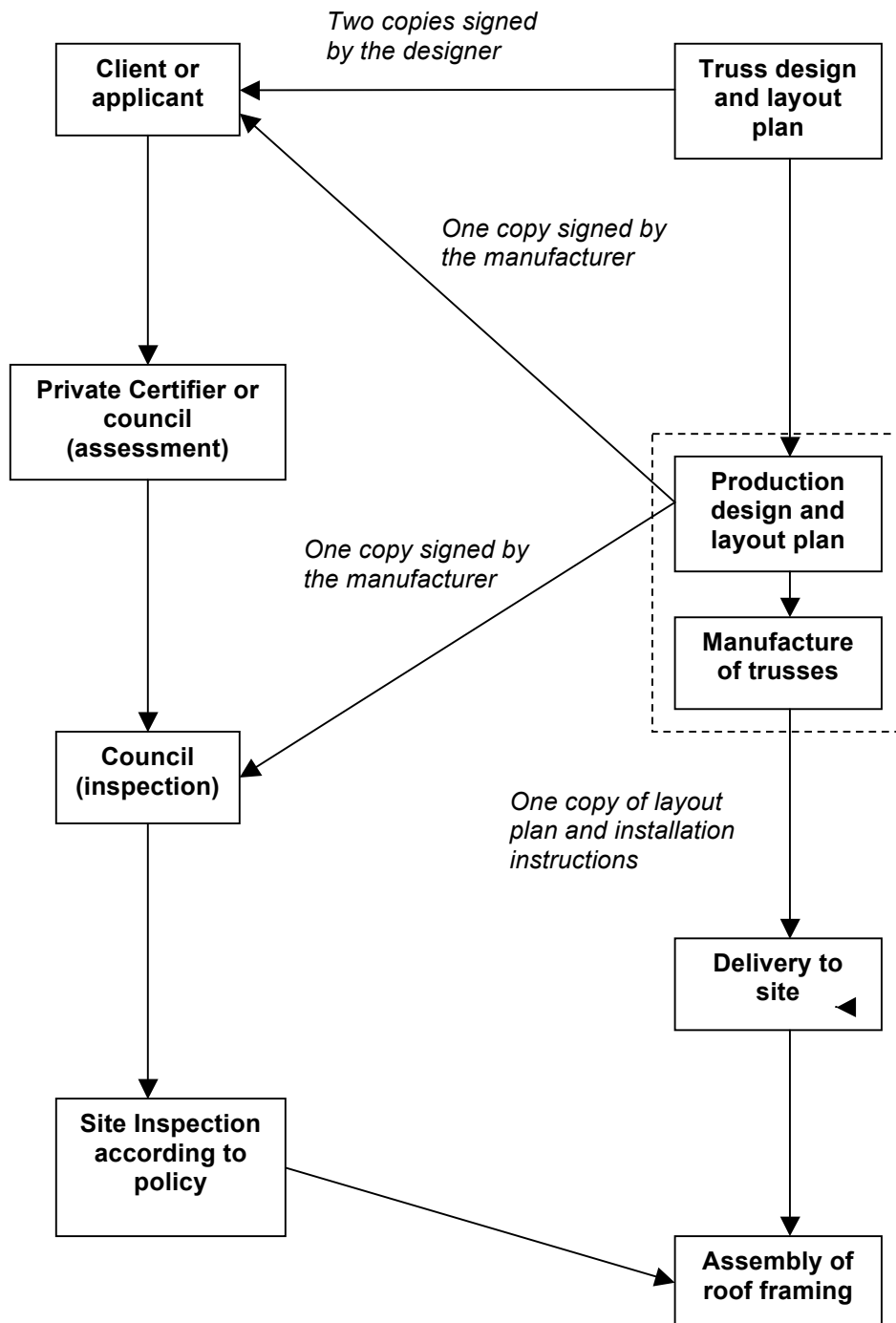


Figure 1 – Design, approval and manufacture procedure

5.1 Minister’s Schedule 5 roof framing checklist

The documentation submitted for provisional building rules consent must adequately communicate all of the relevant truss components.

A general rule for preparation of construction documentation is that a builder should be able to assemble the components into the building, using the documents, and the completed building should be exactly in accordance with the designer’s intentions—without the need for the builder to refer back to the designer with questions. The same rule applies to the documents submitted for provisional building rules consent. However, these ideals can be difficult to achieve.

It is a common frustration that the person preparing the documentation for provisional building rules consent doesn't always know exactly what information the building surveyor expects to be shown on the documents—and this can result in delays as the building surveyor needs to contact the applicant and request the additional information.

The Coroner recommended that a system be established whereby a truss roof design may be evaluated properly, and suggested a 'Checkers Manual' to provide builders and certifiers with a guide to assist in assessing the adequacy of roof truss design and installation.

Schedule 5 of the Development Regulations 2008 'requirements as to plans and specifications' refers to the **Minister's Schedule 5 roof framing checklist** – which was published in the Gazette on Thursday 19 January 2012, and is available at www.sa.gov.au/planning/building-professionals/Building-policy-news-and-practitioner-forms.

If every building surveyor uses the checklist when assessing the trusses against the Building Rules, then the person preparing the documentation will know exactly what information must be provided.

In the event of a truss failure, if the checklist is retained on the Building Rules assessment file, it provides evidence that the building surveyor assessed the documents against the prescribed checklist.

Note: If the software automatically produces and completes a documentation checklist, this would make the building surveyor's job easier.

6. INSTALLATION OF ROOF TRUSSES AND ROOF FRAMING

Prefabricated timber trusses are important components in a highly engineered system and from the moment of their manufacture they need to be handled with care if they are to retain their integrity sufficiently for satisfactory structural performance. The trusses are the largest components in the system but each part has an important role to play in the overall stability of the roof framing. With such systems there is little room for error which makes the on-site assembly and installation of the components a key aspect of the future performance of the system. The Taskforce considered this aspect and noted the important role it played in the collapse of the roof at the Riverside Golf Club.

6.1 Truss handling

During the manufacturing process the prefabricated trusses are appropriately handled within the factory and will be properly loaded on to the delivery vehicle. However, when the trusses reach the site there is often no prepared area for storing the trusses and the builder is often not in attendance either.

Common practice was to simply offload the trusses in the most convenient location. This can result in poor handling of the trusses which can cause the nailplate connectors to be sprung out of the timber. Prefabricated trusses are a highly engineered product and the Taskforce considered that careful handling is essential for satisfactory long term performance of the trusses. The delivery of the trusses to the site has been identified as a weak point in handling of the trusses.

Accordingly, it should be the builder's responsibility to provide a suitable area where the trusses can be unloaded without compromising their integrity. If such an area is not provided then the trusses should not be unloaded. The manufacturer and builder can then be confident of the condition of the trusses as delivered to the site and from that point on the handling of the trusses becomes the builder's responsibility.

Guidance on handling is set out in AS4440-2004 Appendix E.

The **supervisor's checklist** includes a check that timber trusses/roof framing were transported, stored, lifted and handled on the site in a proper manner and an area was provided on site for their satisfactory storage – as set out in Appendix E of AS 4440 and / or Appendix H of AS 1684.2.

6.2 Mandatory notification stage

The completion of roof framing is vital for structural stability and can only be verified while the framing is still visible before wall and ceiling linings are installed. As such, this is a critical stage of building construction, and therefore warrants a compulsory notification to the council.

A roof that is not structurally sound can cause death or injury. **Regulation 74** now prescribes one business day's notice of the completion of all roof framing forming part of the building work (including top and bottom chord restraints, bracing and tie-downs). A person must not conceal any completed roof framing until after the expiration of two clear business days after the notice of completion of roof framing has been received by the council. This provides the council with sufficient time to inspect the work, and if the council does not inspect within this time then the builder should not be delayed any further and is able to proceed. An example of what this means is, if the person provides the notice to the council at any time on a Friday, the roof framing must not be concealed on the following Monday or Tuesday.

6.3 Supervisor's checklist

The Coroner was concerned about who should take responsibility for the proper installation of roof trusses.

To ensure the safety of roof framing in buildings, the person responsible for the roof framing must notify the local council that the work is complete and must provide the council with a completed **supervisor's checklist** signed by a registered building work supervisor.

Regulation 74(5) requires that the **supervisor's checklist** must be completed by a registered building work supervisor who has undertaken required training. A list of registered building work supervisors who have undertaken the required training is available at www.sa.gov.au>Housing, property and land>Customer entry points and contacts>Local government entry point>Local government and planning professionals>Registered building work supervisors for roof framing; or

www.sa.gov.au, search for 'registered building work supervisors for roof framing'.

The training course approved by the Minister is currently being provided by the Master Builders Association of SA, and the Housing Industry Association.

This training is required under the scheme approved by the Minister, in accordance with **regulation 74(5)** of the Development Regulations 2008.

The person who completes the checklist must be a person who has inspected the completed truss installation, and must return the checklist to the council within 1 business day of the notification referred to in **regulation 74(1)(a)**. Only a registered building work supervisor who has undertaken the required training can provide the required checklist. A person who fails to comply with this requirement is guilty of an offence, and may be liable to pay an expiation fee of \$500, or be liable to a maximum penalty of \$10,000.

6.4 Council inspection policies

Completion of roof framing is a critical stage of building construction, and should be given high priority in terms of inspections. Historically, footings have been given higher priority for inspections than other stages of building work. Although footing failure can be devastating for the building owner due to severe cracking in the superstructure, it is unlikely to cause complete structural collapse. Conversely, there has been loss of life due to truss failure. Therefore, there is a demonstrated need for changing the emphasis in inspection policy, and higher priority must be given to inspection of roof framing.

In recognition of the critical nature of the roof framing, the Taskforce decided that the proposed mandatory notification for completion of framing must be complemented by a requirement for councils to undertake a prescribed level of inspections, as none existed.

The Coroner was concerned about council inspections of building work and made recommendations in relation to them.

Where a licensed builder is undertaking the work (who will also be required to sign the Statement of Compliance) the Taskforce considered that there is a reasonable chance of the building work being properly completed by qualified tradespeople. Accordingly, the Taskforce proposed that inspection of 66% of these buildings would suffice.

However, for owner builders the likelihood of the work being undertaken by unqualified people (having a poor understanding of good building practice) is considerably greater. In these circumstances the Taskforce considered that 90% of the framing should be inspected.

Note: In response to concerns raised in a number of submissions, the Taskforce reduced the recommended levels of inspections.

For the purposes of **section 71A(4a)** of the Development Act, with respect to any building work involving the construction of any roof framing within the area of the council, **regulation 80AB(2)** requires that each council's inspection policy must prescribe the following minimum inspection levels:

- (a) a number of inspections equal to 66% of building rules consents issued over the course of the year for building work involving the construction of any roof framing where a licensed building work contractor is responsible for the relevant building work;
- (b) a number of inspections equal to 90% of building rules consents issued over the course of the year for building work involving the construction of roof framing where a licensed building work contractor is not responsible for the relevant building work.

If in doubt as to whether a licensed building work contractor is responsible for the relevant building work, it would be appropriate to rely on the information provided on the application form submitted for building rules consent.

- (3) All classes of buildings, other than Class 10 buildings, under the *Building Code* are prescribed under section 71A(2) of the Act for the purposes of subregulation (2).
- (4) A reference in subregulation (3) to Class 10 buildings does not include a Class 10 building that is attached to any part of the roof framing of a building of another class.

The **supervisor's checklist** is required on 100% of building rules consents involving the construction of roof framing, as the supervisor takes responsibility for the proper construction of the roof framing. Accordingly, the council inspections only need to be audit inspections to verify the truthfulness of the checklists. That is, the council inspection should not be about checking the roof framing it should be about establishing the veracity of the checklist. More thorough

inspections of the roof framing may be warranted where there appear to be discrepancies between the **supervisor's checklist** and the roof framing, however it should not be necessary for the council inspection to double-up on the inspection conducted by the registered supervisor who has undertaken the required training (**regulation 74(5)**).

Regulation 80AB does not mandate that all of the minimum prescribed inspection levels occur only at the roof framing stage – the inspections are prescribed as percentages of 'any building work involving the construction of any roof framing'. This means that each council must have a policy to inspect the minimum prescribed amount of applications that involve the construction of roof framing, at some stage during the construction process. While provisions have been made to enable the inspection of roof framing to occur, flexibility was built-in to allow inspection at other stages to be taken into account. This acknowledged that it may not be possible to inspect at the completion of roof framing every time – particularly in rural and remote areas of the State. The Taskforce envisaged that councils might do less inspections on relatively low-risk (to life safety) stages of building work in order to do more inspections at the roof framing stage.

There has also been discussion about the implications of the inclusion of Class 10 buildings that are attached to any part of the roof framing of a building of another Class. Commonly, a Class 10 garage roof is a continuous part of the Class 1 house roof, and it makes sense that the requirements for notification, **supervisor's checklist**, and inspections apply to these.

It is also common for Class 10 carports, verandahs and pergolas to be attached to the fascia of existing Class 1 (house) roofs. It is important that tie-downs, connections, and adequacy of the existing structure to support the additional roof load width be properly assessed. The importance of these aspects of design and construction will become more apparent when wind speeds approach design limits. As with flooding, earthquakes, and bushfires—building failures due to occurrence of design wind speeds are a foreseeable risk, and therefore proper design and assessment should not be overlooked.

If the Class 10 verandah is not attached to any part of the roof structure of the Class 1 building, the requirements for notification, **supervisor's checklist**, and inspections do not apply.

If an applicant insists on attaching a Class 10 structure to the roof framing of a building of another Class, they will need to comply with the Building Rules, including:

- Verification that the existing structure is able to support the load(s)
- Notice of completion of roof framing (**regulation 74(1)(ca)**)
- Requirement to leave the roof framing unconcealed for two clear business days (**regulation 74(6)**)

The following aspects of design and construction should also be assessed:

- Strength of rafters at birdsmouth – is the birdsmouth cut excessive?
- Additional studs at sides of openings
- Additional tie-downs to existing structure
- Additional fixings of existing bottom plate to slab
- Adequate back-span of rafters – particularly jack trusses at a hip ends

Representatives from, both, steel and timber framing industries are very clear that it should not be assumed their structures could support additional roof load widths, unless designed to do so.

6.5 Resolution of minor and major discrepancies

When the council's building officer inspects the roof framing (**regulation 80AB**), if there is a minor discrepancy that needs to be resolved (eg at time of inspection, bracing was not adequately fixed at one location) it should be possible to resolve the issue without holding-up the job. The council's building surveyor and the builder should be able to resolve minor issues through normal communication. In some instances it may be necessary to issue a written direction under section

84 of the Development Act, to rectify the discrepancy and contact the building surveyor once the problem is fixed.

If the council's building officer inspects the roof framing, and it is significantly at variance with the approved documents and checklist submitted by the builder, the discrepancy must be approved by the council or private certifier who issued the provisional building rules consent, and a copy of the amended, approved truss documentation forwarded to the council. The builder must then notify the council again, and send-in a new completed checklist (see figure 2).

Other than for very minor issues, where there is a discrepancy between the roof framing and the approved documentation, the council must ensure that any remedial work is carried out properly. Proper construction, bracing and connections of trusses is too important to assume that significant faults will be rectified, and to allow the work to be concealed without checking and ensuring that the fault has been rectified.

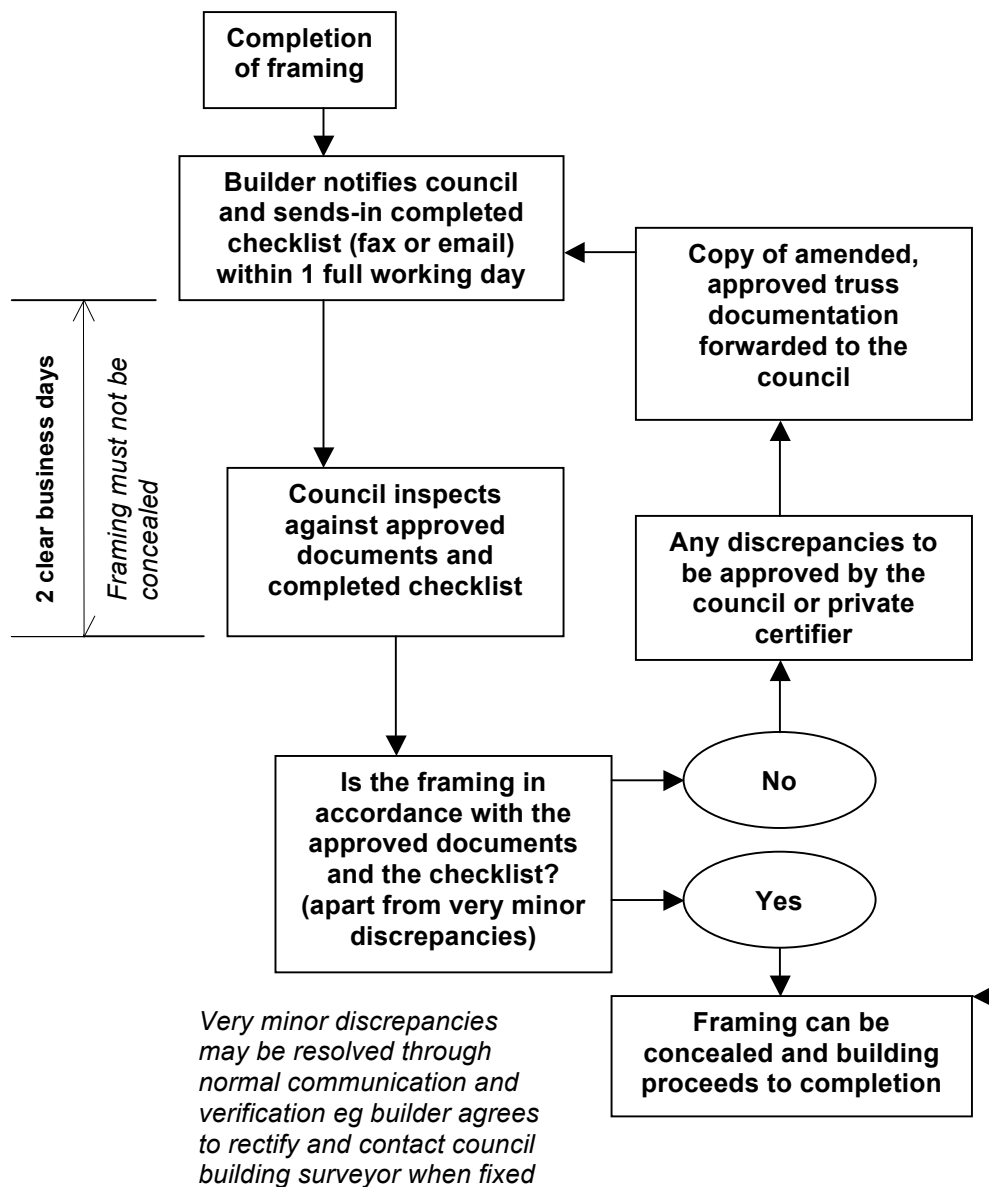


Figure 2 – Framing inspection procedure

7. TRAINING

The industry and consumers need to have confidence that the people who are either involved in the detailing and manufacture, installation and inspection of trusses, or who oversee the work, are trained to perform the work. This is particularly important because these people all need to understand their role and responsibility for the performance of the roof framing.

Section 45(2a) of the *Development Act 1993* makes any person who designs, manufactures, supplies or installs an item incorporated into a building, responsible for that item's compliance with the Building Rules.

The Taskforce considered that training of building work contractors responsible for truss installation, including bracing, roof coverings, ceiling linings and service installations such as air conditioning, should be required as a condition of licence renewal. Consumer and Business Services are producing a guide to roof truss safety for any contractor who may need to work around roof framing.

7.1 Truss designers

Computer software programs vary considerably in their complexity and the degree to which they are user-friendly depends very much on the software designer, the intended users and whether there is any organised feedback from users. Many structural engineering programs are designed specifically for use by practising structural engineers but this is not the case for prefabricated nailplate trusses. They are intended to be used by people who have no structural qualifications and it is therefore important they need to be trained in the proper use of the software.

There should be evidence of people who have had the necessary training and are authorised to certify the detailing and manufacture of the trusses so that, when a person's name and signature appears on a set of truss documentation, the building surveyor can readily determine if the person is authorised to certify the work.

If the person whose name and signature appear on the documentation provides a copy of evidence of their training, and what version of software they have been trained in, together with the truss documentation, the building surveyor will be easily able to verify that the person has been trained in the use of the software.

The ***Minister's Schedule 5 roof framing checklist*** requires the name and signature of the person producing the structural design report and the layout plans on the documentation; and verification that each person who signed the documents has been trained in the use of the software.

7.2 Building surveyors

Sections 18, 19 and 63 of the Development Act set-out the rights and terms of access to building sites for authorised officers. In conjunction with strengthening requirements for inspections, the Taskforce considered it essential to ensure that building surveyors are aware of their powers to enter and inspect buildings, and have opportunities for training in this area.

The Taskforce recommended that training should be provided to building surveyors (as authorised officers pursuant to section 18 of the *Development Act 1993*) to inform them of their rights and obligations in respect to entering and inspecting property under the Act.

The Australian Institute of Building Surveyors has conducted some training on the rights and obligations of authorised officers in respect to entering and inspecting building work.

7.3 Industry - tile batten splicing

The Coroner's report identified tile batten splicing at critical locations as being a critical factor and made a number of recommendations that are relevant.

In this respect the roof tiler (who normally fixes the tile battens in place) must have an understanding of how their work impacts on the ability of the roof framing to support the load. Accordingly, the tile manufacturers (who normally have the contract with the builder to perform the work but who then subcontract to a tile fixer) must ensure that their tile fixers are provided with training on appropriate batten splicing for trussed roofs. Further the Taskforce also considered that any person inspecting a truss installation needs to be able to identify where tile

batten splicing is a critical issue, and they also need to be able to check whether or not it has been performed correctly.

The Taskforce recommended that appropriate training must be provided by industry to roof tilers, and that the training of anyone required to inspect the installation of trusses should include methods for ensuring adequate lateral restraint for trusses at critical locations.

7.4 Industry – truss installers

The Coroner made reference to the need for roof installers to be trained in roof installation, and this is reflected in his recommendations.

The Taskforce recommended that all installers of trusses must be trained by industry in truss installation.

Regulation 74(5) requires that the **supervisor's checklist** must be completed by a registered building work supervisor who has undertaken required training. A list of registered building work supervisors who have undertaken the required training is available at www.sa.gov.au>Housing, property and land>Customer entry points and contacts>Local government entry point>Local government and planning professionals>Registered building work supervisors for roof framing; or

www.sa.gov.au, search for 'registered building work supervisors for roof framing'.

The training course approved by the Minister is currently being provided by the Master Builders Association of SA, and the Housing Industry Association.

APPENDIX A - Checklists

Checklists

The following checklists have been published by the Minister in the Gazette, and are provided in this Appendix:

- Minister's Schedule 5 roof framing checklist
- Supervisor's checklist

Development Act 1993
Minister's Schedule 5 roof framing checklist

| | |
|---------------------------------|--|
| Development Application number: | |
| Applicant: | |
| Site address: | |

Part 1 – Process and communication

Software

- Structural design software in accordance with the ABCB Protocol for Structural Software
- Check that the program is being used within any limitations

Structural design report

- Name and signature of person producing structural design report from the program
- Check design inputs for loading conditions
- Check the suitable selection and application of any discretionary parameters in relevant Australian Standards
- Check that the person who produced and signed the report has been trained in the use of the software program

Truss details

- Elevation of each truss, showing dimensions, layout of members, connections, support points, and web bracing (if any)
- Web tie / web brace details
- Details of trusses or truss elements required to be laminated together (if any), including the fasteners pattern

Layout plan(s)

- Separate roof frame, wall frame, floor frame layouts
- Name and signature of person producing layout plan – on each layout Plan
- All tie-downs, bracing and truss-to-truss connections, and critical load paths shown
- Check for girder trusses and any load transfer points to supporting framing through the structure
- Check that the person who produced and signed the layout plan(s) has been trained in the use of the software program
- If the layout was not produced by the nailplate supplier's software, check that the layout is signed by a practising structural engineer

Hybrid roof design (combination of roof trusses and conventional framing)

- Do roof trusses or conventional framing rely on each other for support or stability?
Y N if Yes ...
- Has the software program accounted for the loads and connections?
Y N if No ...
- Design and layout certified by a structural engineer

Additions to buildings

- Does the new roof rely on the existing structure for support?
Y N if Yes ...
- Evidence of suitability of the existing structure to support the new roof provided

Part 2 – Truss / framing layout

The roof layout must include the following items:

(Cross off all items *Not Applicable*, details to be specified on drawings for all remaining items)

- Truss locations: spans, station for truncated girder trusses
- Girder truss position and girder boot details
- Top chord bracing details: layout and fixing
- Top chord restraint: purlin/batten fixing, spacing, purlin splice details
- Intermediate top chord ties (valley truss – sheet roof only)
- Bottom chord restraint (spacing and size of restraint)
- Bottom chord restraint bracing: suspended or no ceiling
- Hip end framing: loose timber or jack truss
- Tie-down location/details
- Location of special loads: solar heating, air con., HWS, ¹fire service, other
- Overhangs: eave detail (supported, not supported) structural or non-structural fascia, verge detail
- Gable end truss supported on end wall or free spanning, verandah, pergola.
- Truss connections: hip ends, girder trusses, valley trusses, non load-bearing walls
- Bearing width see AS4440-2004, Appendix B Section B4 (p.56.)
- Internal support/tie-down
- Trusses or truss elements required to be laminated together on site (eg double girder trusses, chord stiffeners, etc) shall be shown on the roof layout plan
- Supporting structure: separate wall frame layout indicating locations and details of support for concentrated loads such as girder trusses or beams

Part 3 – Design criteria

As shown on truss engineering data sheets submitted, with cover sheet signed and dated by an appropriate person

| | | | | |
|-----------------------|--------------------------|---------------|--------------------------|---|
| Building Type: | <input type="checkbox"/> | Residential | <input type="checkbox"/> | Does the scope of the truss design method include design of commercial / post-disaster buildings? |
| | <input type="checkbox"/> | Commercial | | |
| | <input type="checkbox"/> | Post-disaster | | |

| Design Criteria | Unit | Specified | Accepted |
|---------------------------------------|-------------------------------|-----------|----------|
| Roofing | Material or kg/m ² | | |
| Top Chord Restraint Spacing | mm | | |
| Ceiling | Material or kg/m ² | | |
| Ceiling batten or direct fix | Batten or Direct | | |
| Bottom chord design restraint spacing | mm | | |

¹ If commercial or post-disaster building, check that the scope of the truss design method includes design of commercial / post-disaster buildings as appropriate.

| Design Criteria | Unit | Specified | Accepted |
|--|---------------------------------|-----------|----------|
| Wind classification | N1 to N4, C1 to C3 | | |
| Internal Pressure co-efficient | (C _{pi}) = 0.2 or 0.7 | | |
| Truss Spacing | mm | | |
| Roof Pitch | degrees | | |
| Bottom Chord Pitch (if applicable) | degrees | | |
| Truss Overhang | mm | | |
| Eaves supported by wall structure | Yes or No | | |
| Structural Fascia | Yes or No | | |
| Special Conditions (e.g. trusses over swimming pool or in a corrosive environment) | | | |
| Girder Trusses – Specify type of lateral restraint & fixing (eg. battens/purlins or other) | | | |

| Special Loads: | Unit | Specified | Accepted |
|------------------|--------------|-----------|----------|
| Water Tank | Litres or kg | | |
| Solar System | kg | | |
| Air-Conditioning | Kg | | |
| Others | Kg | | |

The truss design and documentation submitted for building rules consent have been checked against the items contained in this checklist, and accepted by:

Signature:

Name:

Date:

Development Regulations 2008
 Regulation 74 – Supervisor’s checklist
 Handling / installation / inspection of roof framing

| | | |
|-----------------------------------|--|------------------------------------|
| Development Application number: | | |
| Site address: | | |
| Council: | | Private certifier (if applicable): |
| Phone: | | |
| Fax: | | Phone: |
| Email: | | Email: |
| Person completing this checklist: | | Name: |
| Qualification: | Registered building work supervisor in accordance with regulation 74 – licence number: | Phone: |
| | | Training certificate number: |

Part 1 – Process and communication

- Timber trusses/roof framing were transported, stored, lifted and handled on the site in a proper manner and an area was provided on the site for their satisfactory storage – as set out in Appendix E of AS 4440 and/or Appendix H of AS 1684.2.
- All trusses appropriately marked by the fabricator so the fabricator can be identified and the particular truss can be located as per the approved layout plan.
- Unless the roof framing has been designed otherwise, a label is provided on a truss or roof framing immediately adjacent to the roof access hole, stating that the roof framing has not been designed for additional loads such as attached carports/verandahs, a water heater, air conditioner or household storage; and that truss members must not be cut to fit building services. If the roof framing has been designed for additional loads, the trusses or roof framing that are to support any additional load must be clearly identified.
- At least 1 business day’s notice of completion of all roof framing forming part of the building work (including top and bottom chord restraints, bracing and tie-downs) provided to the council. The completed roof framing must not be concealed until after the expiration of 2 clear business days after the notification.
- This handling / installation / inspection checklist completed by a registered building work supervisor in accordance with regulation 74, who has inspected the work, and provided to the council within 1 business day after notice of completion of all roof framing.

Signature:

Date:

Print name:

Part 2 – Timber roof truss erection, fixing and bracing

For a timber truss roof, check the following items for compliance with the approved documents:

| Item | Site Work: Truss Erection and Bracing | Tick | AS 4440-2004 Ref | Defects/Comments |
|------|---|------|-------------------|------------------|
| 1 | Hip end framing: Loose timber or jack trusses | | 1.2(f)5 Fig. 5.1 | |
| 2 | Location of special loads: Solar heating, air con. HWS, other | | 1.6 | |
| 3 | Bottom chord clear of non-load bearing walls | | 2.2.2 | |
| 4 | Internal support/tie-down | | 2.2.1 & 3.7 | |
| 5 | Fixing to tops of bracing walls - slotted brackets | | Fig. 2.2 | |
| 6 | Fixing to non-loadbearing walls – slotted brackets | | Fig. 2.3 | |
| 7 | Truss locations/orientation: Spacing, span | | 3.1 | |
| 8 | Truss bow (L/200 max) | | Fig. 3.2 | |
| 9 | Truss plumb (H/50 max) | | Fig. 3.3 | |
| 10 | Supplementary timber: ceiling trim | | 3.5 & 3.6 | |
| 11 | Truss Tie-Down requirements – as per approval | | 3.7 | |
| 12 | Fixing of multi-ply truss | | 3.8 | |
| 13 | Top Chord Bracing: Layout and Fixing – steel-brace | | 4.1 | |
| 14 | Steel-brace splice | | Fig. 4.20 | |
| 15 | Steel-brace end-fixing at apex | | Fig. 4.21 | |
| 16 | Steel-brace end-fixing at heel-to-top plate | | Figs. 4.22 & 4.23 | |
| 17 | Steel-brace at heel-to-girder truss | | Fig. 4.24 | |
| 18 | Steel- brace at cantilevers | | Fig. 4.25 | |
| 19 | Top Chord Restraint (spacing and fixing) | | Fig. 4.1 | |
| 20 | Intermediate Top Chord Ties (Valley Truss) | | Fig. 4.2 | |
| 21 | Fixing of Valley Trusses | | Fig. 5.6 | |
| 21 | Bottom Chord Restraint. Spacing and Size of Restraint | | 4.4 | |
| 22 | Web Tie/Web Brace | | 4.5 | |
| 23 | Bottom Chord Restraint Bracing | | Fig. 4.28 | |
| 24 | Truss-to-truss connections appropriate for wind speed: Hip Ends, Girder Trusses, Valley Trusses, Non Load-Bearing Walls | | Section 5 | |
| 25 | Girder Truss Position and Girder Boots | | 5.3 | |
| 26 | Girder Truss Restraint. | | | |
| 27 | Overhangs: Eaves Detail (Supported, Not Supported) Structural or Non-Structural Fascia Verge Detail (Gable End Truss Supported on End Wall Or Free Spanning) Verandahs and Pergolas must not be attached to the ends of truss overhangs without specific design | | Section 6 | |
| 28 | Waling plate fixing | | Fig 5.5 | |
| 29 | Truss connection to timber/steel beams | | | |
| 30 | Gable end framing | | 6.2 | |
| 31 | Truss modification/defects | | 3.9 | |
| 32 | Truss site suitability: corrosive environments | | 3.10 | |
| 33 | Advice on cornice fixing to Appendix B | | B3 | |
| 34 | Bearing Width to Appendix B | | B4 | |
| 35 | Steel roof battens, where used, must be legibly and durably marked with the reference AS 1397, the base steel thickness, and the designation of the steel base and coating | | | |

Signature:

Date:

Print name:

Part 3 – Conventional timber roof frame erection, fixing and bracing

For a conventionally framed roof, check the following items for compliance with the approved documents:

| I T E M | Site Work: Truss Erection and Bracing | T I C K | AS 1684 Reference Clause/Fig. | Defects/Comments |
|------------------|--|------------------|-------------------------------------|------------------|
| 1 | Roof constructed in accordance with approved layout | | | |
| 2 | Bracing | | Section 8 | |
| 3 | Coupled roof connections – ceiling joists to rafters, collar ties to rafters | | 7.1.2.2 | |
| 4 | Tie-downs | | Section 9 | |
| 5 | Transfer of wall frame bracing | | 8.3.6.9 | |
| 6 | Point loads - including beams, struts, are adequately supported | | | |
| 7 | Location of special loads: Solar heating, air con, HWS, Other | | | |
| 8 | Steel roof battens, where used, must be legibly and durably marked with the reference AS 1397, the base steel thickness, and the designation of the steel base and coating | | | |
| 9 | Where an additional structure is attached to any part of the roof framing of an existing building- the existing structure is adequate to support the additional loads | | | |

Signature:

Date:

Print name:

Part 4 – Steel roof truss erection, fixing and bracing

For a steel-framed roof, check the following items for compliance with the approved documents:

| I T E M | Site Work: Truss Erection and Bracing | T I C K | Defects/Comments |
|----------------------------|---|----------------------------|-------------------------|
| 1 | Steel is legibly and durably marked with the reference AS 1397, the base steel thickness, and the designation of the steel base and coating | | |
| 2 | Hip end framing: jack trusses or hip trusses | | |
| 3 | Location of special loads: Solar heating, air con. HWS, Other | | |
| 4 | Bottom chord clear of non-loadbearing walls | | |
| 5 | Internal support/tie-down | | |
| 6 | Fixing to non-loadbearing walls – slotted brackets | | |
| 7 | Truss locations/orientation: Spacing, span, station | | |
| 8 | Truss, rafters, ceiling joists overall straightness (L/500 max) | | |
| 9 | Truss plumb (H/100 or 20 mm max) unless trusses designed to be installed out of plumb | | |
| 10 | Truss Tie-Down requirements – as per approval | | |
| 11 | Fixing of double truss | | |
| 16 | Top Chord Bracing: Layout and Fixing – steel-brace | | |
| 17 | Top Chord Restraint (spacing of purlin/tile batten) | | |
| 18 | Bottom Chord Restraint. Spacing and Size of Restraint | | |
| 20 | Web Tie/Web Brace | | |
| 21 | Truss-to-truss connections | | |
| 22 | Girder Truss Position and Girder Boots | | |
| 22 | Girder Truss Restraint. | | |
| 23 | Waling plate fixing | | |
| 24 | Truss connection to timber/steel beams | | |
| 25 | Gable end framing | | |
| 26 | Truss modification/defects | | |
| 27 | Truss site suitability: corrosive environments | | |
| 28 | Where an additional structure is attached to any part of the roof framing of an existing building- the existing structure is adequate to support the additional loads | | |

Signature:

Date:

Print name:

Part 5 – Conventional steel roof frame erection, fixing and bracing

For a conventionally framed roof, check the following items for compliance with the approved documents:

| I T E M | Site Work: Truss Erection and Bracing | T I C K | Defects/Comments |
|------------------|---|------------------|------------------|
| 1 | Steel is legibly and durably marked with the reference AS 1397, the base steel thickness, and the designation of the steel base and coating | | |
| 2 | Roof constructed in accordance with approved layout | | |
| 3 | Bracing | | |
| 4 | Coupled roof connections – ceiling joists to rafters, collar ties to rafters | | |
| 5 | Tie-downs | | |
| 6 | Transfer of wall frame bracing | | |
| 7 | Point loads - including beams, struts, are adequately supported | | |
| 8 | Location of special loads: Solar heating, air con, HWS, Other | | |
| 9 | Where an additional structure is attached to any part of the roof framing of an existing building- the existing structure is adequate to support the additional loads | | |

Signature:

Date:

Print name:

