

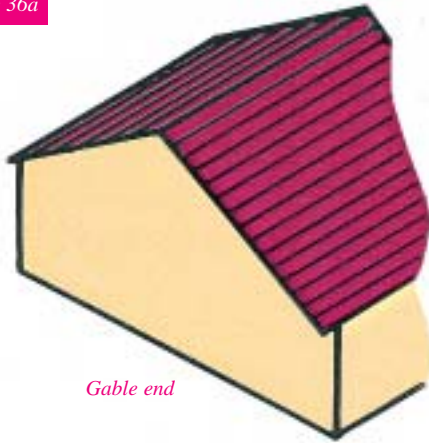
### Hip Ends and Corners

#### Typical Roof Features - Hipped Ends

The most common end shapes are the Gable End, which allows the simplest roof framing and uses most support wall surface; the Hipped End which offers a simple wall solution at the expense of a more

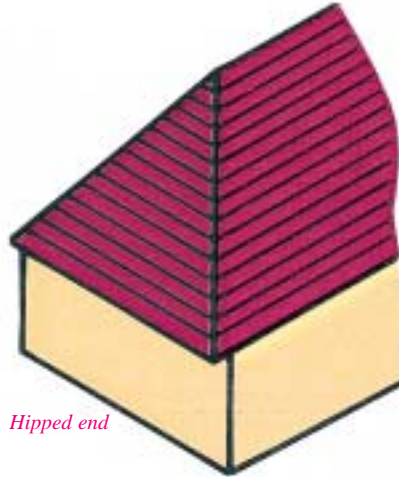
complex roof structure, and the Dutch Hip and Gable Hip, which are compromises between a gable and hip, easily formed using trussed rafters.

Figure 36a



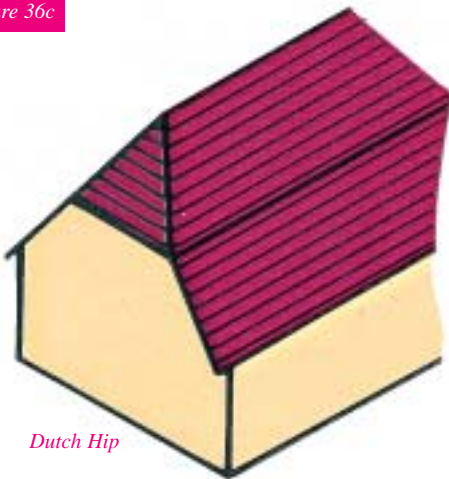
Gable end

Figure 36b



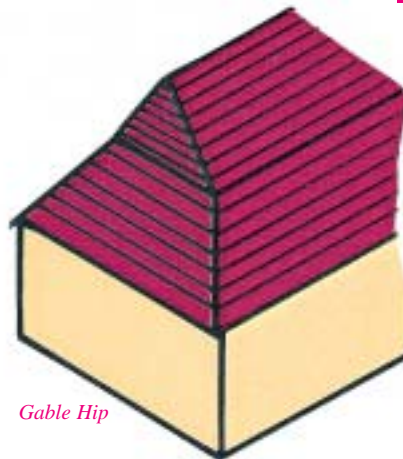
Hipped end

Figure 36c



Dutch Hip

Figure 36d



Gable Hip

Figure 37a



Action of hip end

Figure 37b



Traditional hipped end

Most traditional hipped ends behave like an inverted conical basket and, under load, the tendency for its rim (the wall plate) to spread is resisted by friction (lateral force on the wall), tension in the rim (tension and bending in the wall plate) and tension in the weft (the tiling battens). In the long term the results are sagging hip boards and rafters, bulging walls and characteristic horizontal cracks in the masonry at the inside corners of the dwellings roughly 300-600mm below ceiling level.

However, hipped end systems develop by MiTek do not depend on tension in battens, or a massive wallplate and horizontal resistance from the walls. With suitable bracing, the trussed rafter hip roof provides the walls with the stability required by Building Regulations.

## Hip Ends and Corners

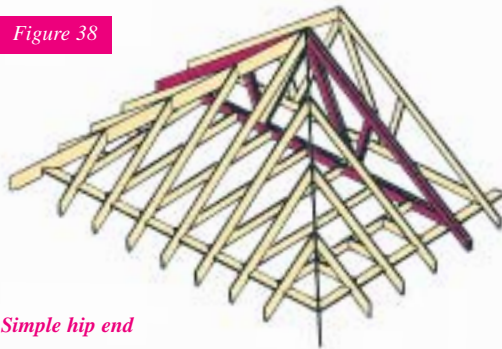
### Hipped Ends

The simplest form of hipped end consists of a multi-ply girder of standard trusses securely nailed or bolted together, which support loose rafters and ceiling joists, as in figure 38.

This is the most inexpensive form of hip because no special trusses are needed other than the girder, but their use is limited to spans up to 5m.

Loose rafter and ceiling joist sizes should be taken from Approved Document A to the Building Regulations. Hip boards should be supported off the girder by means of a ledger. The ceiling joists should be supported by proprietary joist hangers.

Figure 38



Simple hip end

Figure 40

### EAVES MATCHING

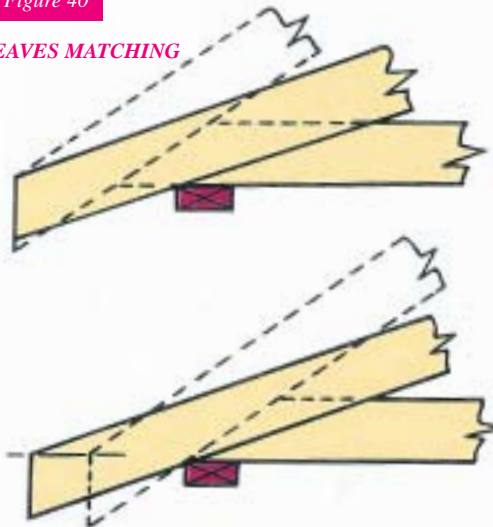
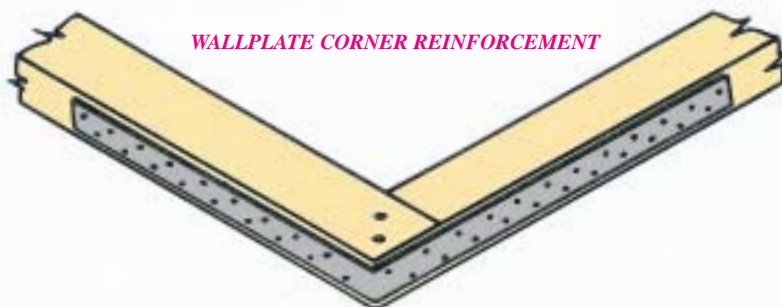


Figure 41



### WALLPLATE CORNER REINFORCEMENT

### LEDGER DETAILS

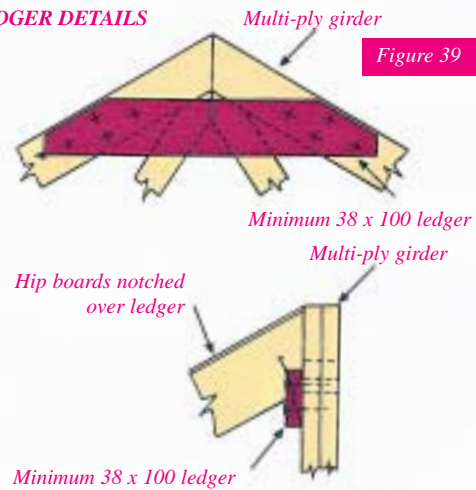


Figure 39

If the end pitch is different to the pitch of the main roof, the eaves details should be discussed with your trussed rafter supplier. It is advisable to ensure that the top extremities of rafter overhangs are at the same level to provide for continuous guttering. Note that whilst adjustments can be dealt with on site in loose timber construction, the mono-pitched trusses used in other hip types must be made correctly in the factory.

It should also be noted that all forms of hip construction employing a hip board exerts a horizontal thrust at the wallplate corner junction. Having taken up any horizontal movement, of course, the structure becomes stable. Movement of the wallplate can be controlled by fixing a 1200mm length of galvanised steel restraint strap around the outside. See figure 41.

MiTek trussed rafter suppliers can provide detailed advice on hipped end roof details.

## Hip Ends and Corners

### Hipped Ends - 'Stepdown'

The step-down hip system uses flat top hip trusses of progressively diminishing height from the ridge to the girder truss position. This system is rarely used as each truss is different to make. The number of step-down hip trusses is determined by the need to maintain reasonable sizes for the loose ceiling joists and hip board in the hipped corner infill areas. For these reasons, the span of mono-pitch trusses is not usually greater than 3 metres in the case of regular hips, where the hip end pitch is the same as the pitch of the main roof.

hip truss to support tiling battens. The web configuration of the various truss types shown (including the mono-pitch) are typical, but will be chosen to provide the best structural solution. Fortunately, this system is flexible in accommodating large spans and irregular hips with unequal roof pitches and employs standard, designed truss types throughout.

Noggings must be fitted between the flat chords of the step-down

Figure 42

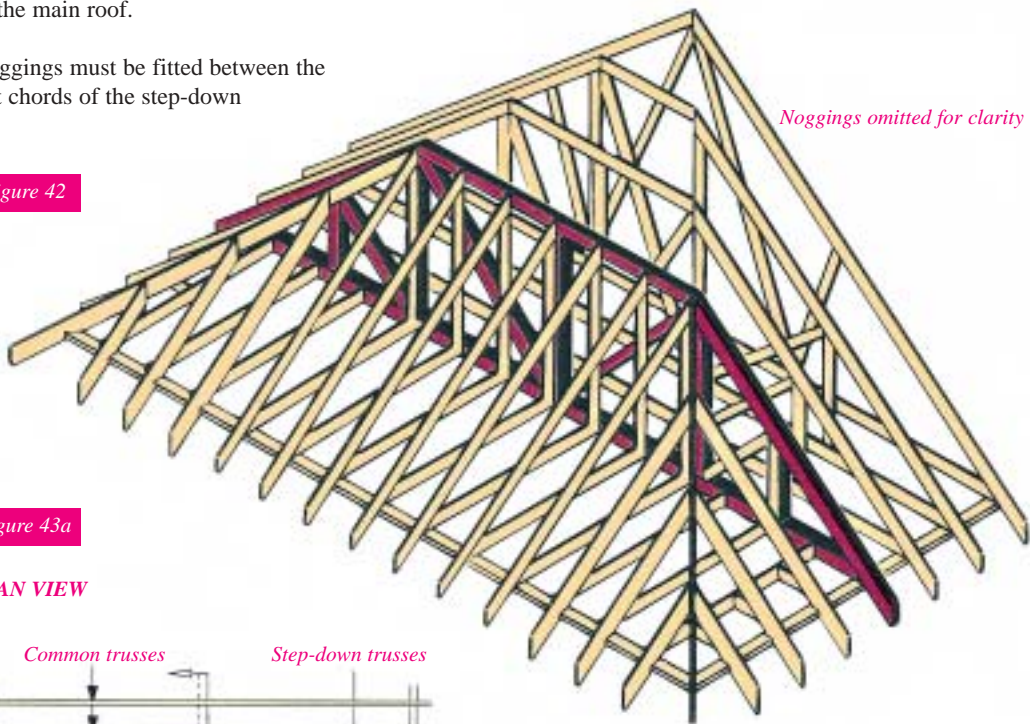


Figure 43a

#### PLAN VIEW

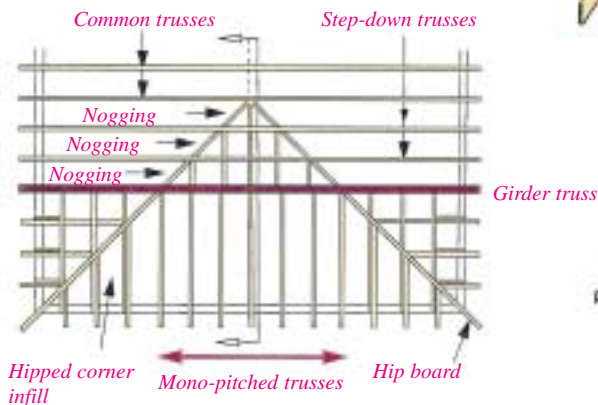


Figure 43b

#### SECTION

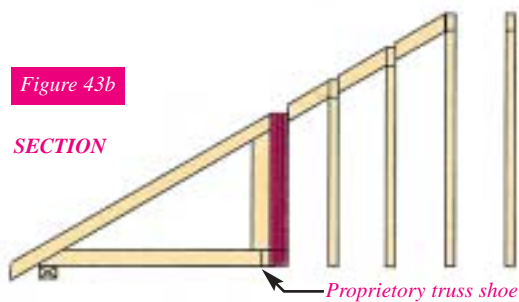
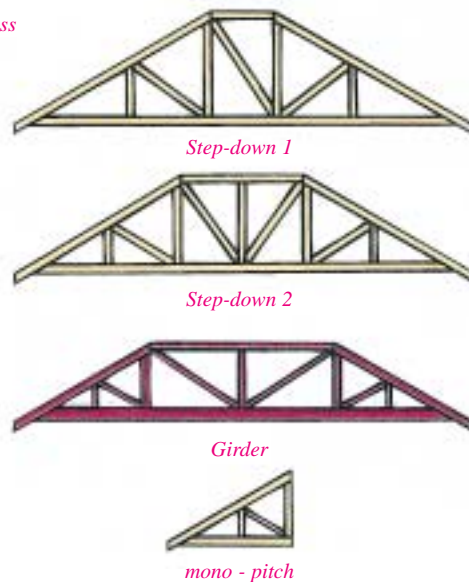


Figure 43c

#### TRUSS COMPONENTS



## Hip Ends and Corners

### Hipped Ends - 'Flying Rafter'

Of the many types of hip systems this one has an obvious manufacturing advantage: There is only one basic hip truss profile. All the hip trusses, including those forming the girder truss are identical; and the mono-pitch trusses supported off the girder have the same profile as the sloped part of the hip trusses, which speeds up fabrication and reduces the overall cost of the hip system.

The rafters of the mono-pitched trusses and/or hip trusses are extended and are site cut to fit against the upper hip board. Off-cuts may be required to be nailed in position to the rafters of the hip trusses. For the longer rafters props may be required to run down to the trusses underneath.

The flat parts of the top chords of the hip trusses and girder must be securely braced together to ensure stability.

The hip corner may be constructed from pre-fabricated rafter/joist components commonly called Open Jacks or all the corner can be framed with loose rafters, joists and hipboards on site. The hip board is notched over the girder truss and supported off ledgers at the apex of the hip.

This system offers the advantage of continuous rafters and thus easily constructed smooth roof slopes.

Typical spans using this construction with one primary multi-ply hip girder would be 9.6 metres.

Larger spans, up to 13.2 metres, may be accommodated by the use of intermediate girders between the main girder carrying the mono-pitch trusses and the hip apex.

It is possible to construct several types of hip end using the *'Flying Rafter'* concept, or indeed, to combine the *'Step-down'* concept within the hip trusses with the *'Flying Rafters'* on the hip end mono-pitch trusses.

Please contact your truss supplier if you have a preference for a particular method of construction, as the MiTek design system can encompass any method.

- 1 Flat top chords require bracing
- 2 Ledger under to support hip boards
- 3 'Flying Rafters' on hip trusses (may require props to trusses below)
- 4 Girder
- 5 Infill rafters
- 6 Hipboard
- 7 Infill ceiling joists
- 8 Mono-pitch trusses

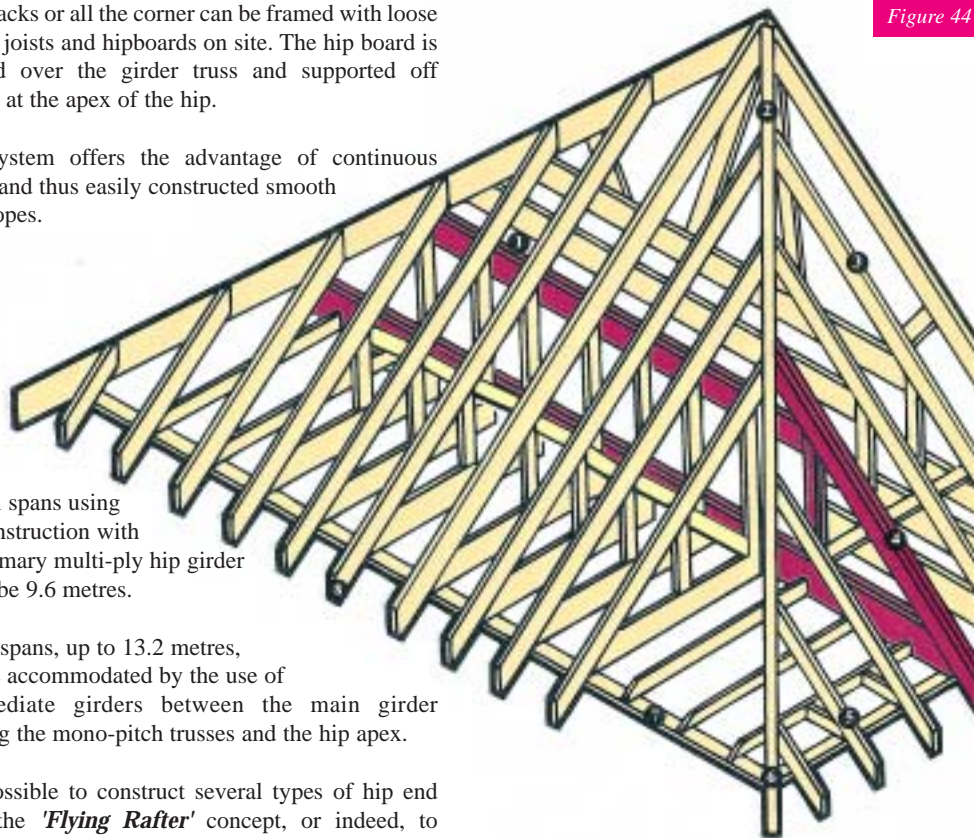


Figure 44

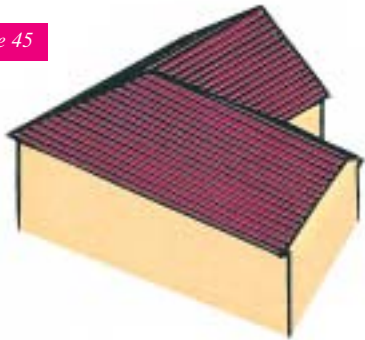
*Rafters omitted for clarity*

## Hip Ends and Corners

### Hipped Corners

A hipped corner is formed by the intersection, at 90 degrees, of two roofs which may, or may not be the same span or pitch.

Figure 45



Hipped corners for mono-pitched and other roof shapes are based on the same principles described below for duo-pitched roofs.

The common framing consist of a SECONDARY half-hip girder truss supported by a PRIMARY duo-pitch girder truss. An internal load-bearing wall or beam support can often be used to perform the function of the primary girder truss.

The duo-pitch girder truss is specially designed for the exceptional loads it carries and includes a wider than normal vertical web to which a proprietary girder hanger can be fixed to carry the half-hip girder.

Figure 46a

### COMPONENTS OF HIPPED CORNER

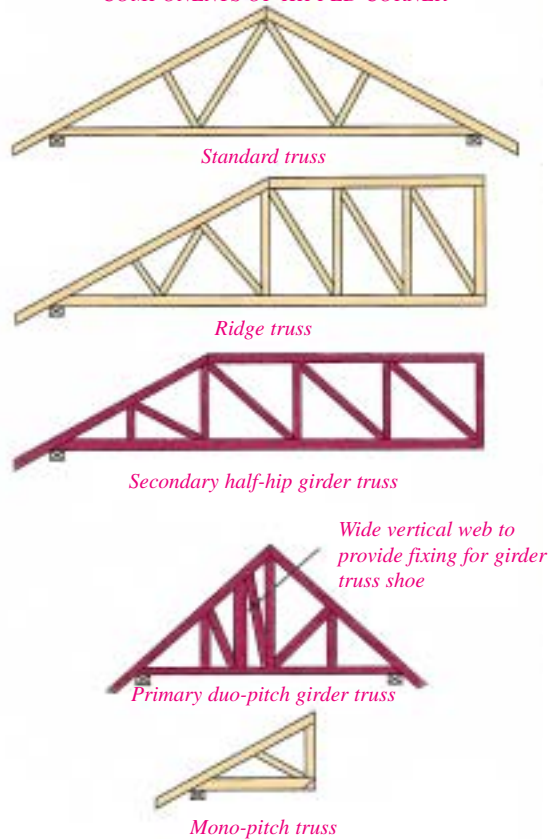
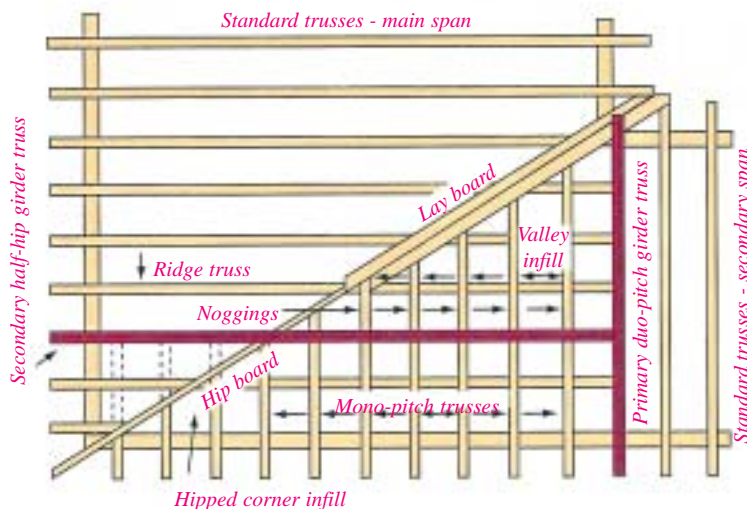


Figure 46b

### PLAN VIEW



The roof is built up in the valley area using a mono-pitched valley set so that the half-hip girder carries the mono-pitch trusses and hipped corner infill, in the same way as at a hipped end. The span of the mono-pitch trusses is not generally greater than 3 metres and more than one half-hip truss may be needed between the ridge truss and the half-hip girder.

The details shown correspond to the method of construction used in the Step-down hipped end, in which noggings have to be sited between trusses to support the tiling battens.

Hipped corners with a Flying Rafter can also be provided.