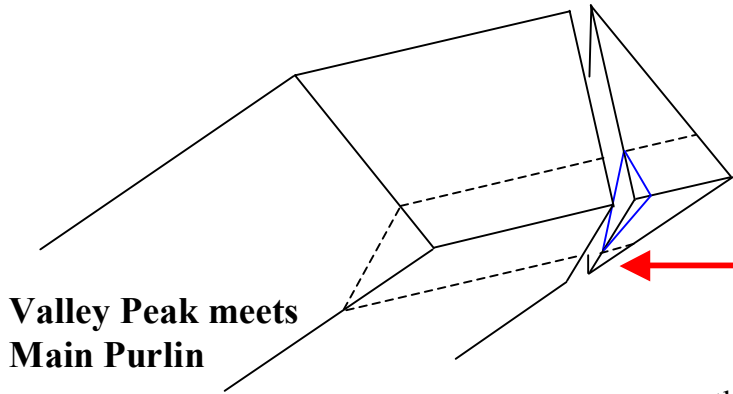# HIP / VALLEY SQUARE CUT ANGLES:

## Extracting kernels from the "stick":

The section of the Valley rafter is removed to accommodate the adjacent Valley; the intercept of this cut and the square cut on the bottom face produces another kernel.

**Valley Peak meets Main Purlin**

Main Purlin

Main Common Rafter

Valley Peak

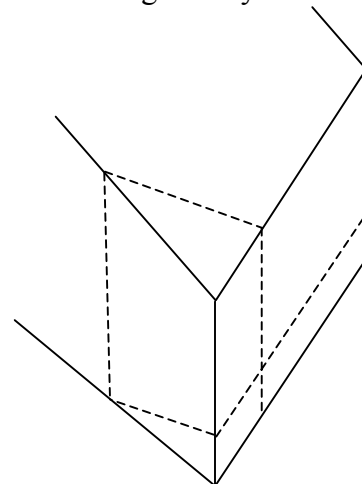**Plan**

**Valley Foot meets Main Common Rafter**

Acute angles are created by the compound angle cuts where the **Valley Peak meets Main Purlin** and **Valley Foot meets Main Common Rafter**.
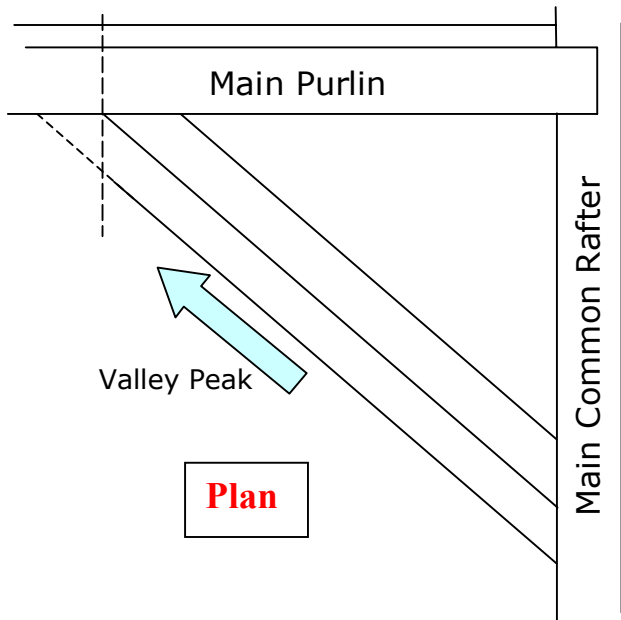
The process of extracting kernels to obtain a set of angles is the same as used to solve the square cuts for **Purlin meets Valley** and **Rafter meets Valley**. The appropriate square cut lines, with their planes, are moved until they are superimposed on the corresponding parallel line on the Compound face. This creates a false miter or bevel line, and dihedral angle, on one of the faces, from which a kernel describing the relationships between the angles may be extracted.
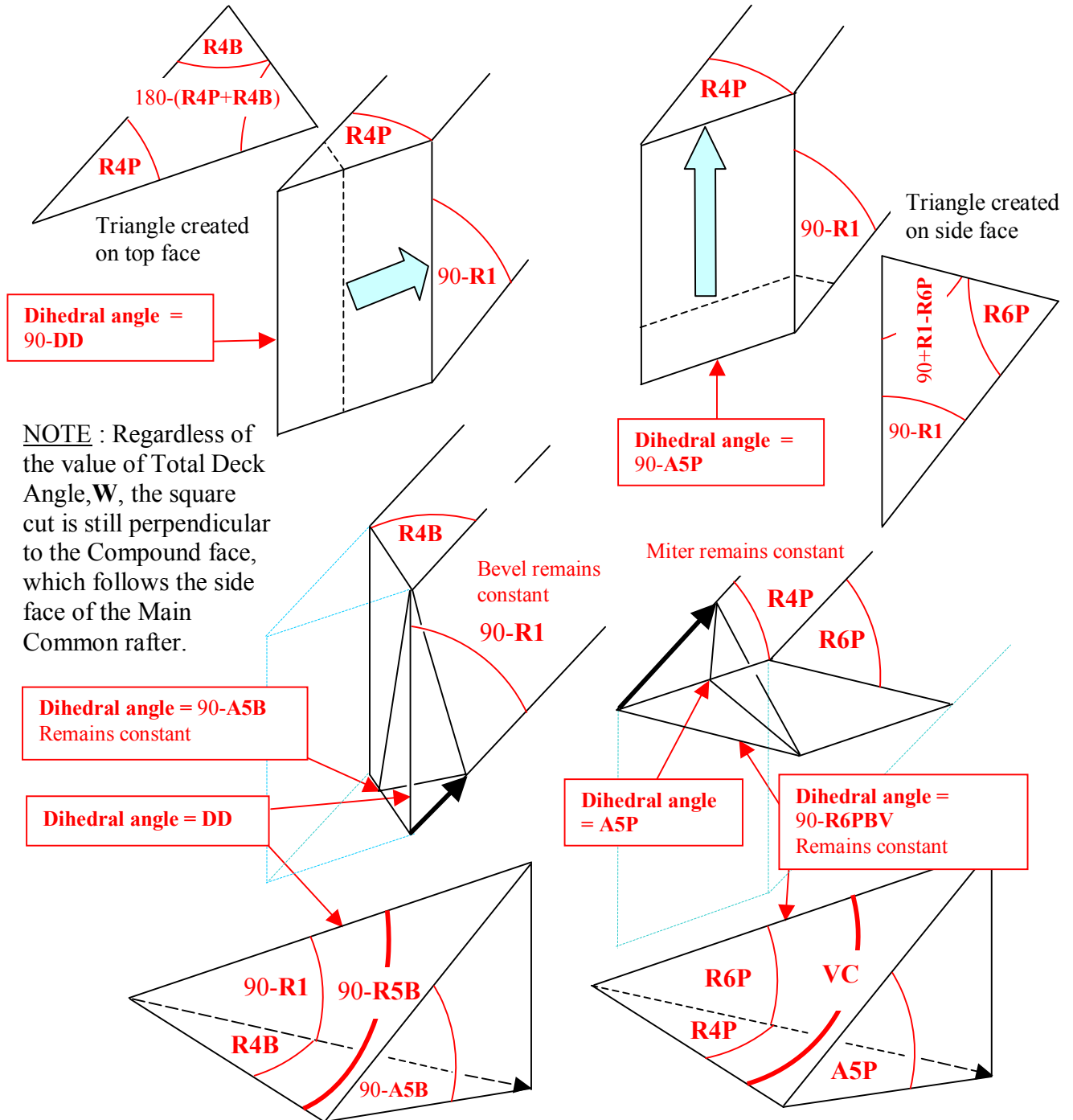
Since the angles concerned are at the bottom and side faces of the Valley rafter, for the sake of clarity, backing angle cuts and other planes on the final product are not depicted.

# HIP / VALLEY SQUARE CUT ANGLES:

## Valley Foot meets Main Common Rafter

R4B

180-(R4P+R4B)

R4P

R4P

Triangle created
on top face

**Dihedral angle =
90-DD**

90-R1

R4P

90-R1

Triangle created
on side face

90+R1-R6P

R6P

90-R1

**Dihedral angle =
90-A5P**

NOTE : Regardless of
the value of Total Deck
Angle,**W**, the square
cut is still perpendicular
to the Compound face,
which follows the side
face of the Main
Common rafter.

R4B

Bevel remains
constant

90-R1

Miter remains constant

R4P

R6P

**Dihedral angle = 90-A5B
Remains constant**

**Dihedral angle = DD**

**Dihedral angle
= A5P**

**Dihedral angle =
90-R6PBV
Remains constant**
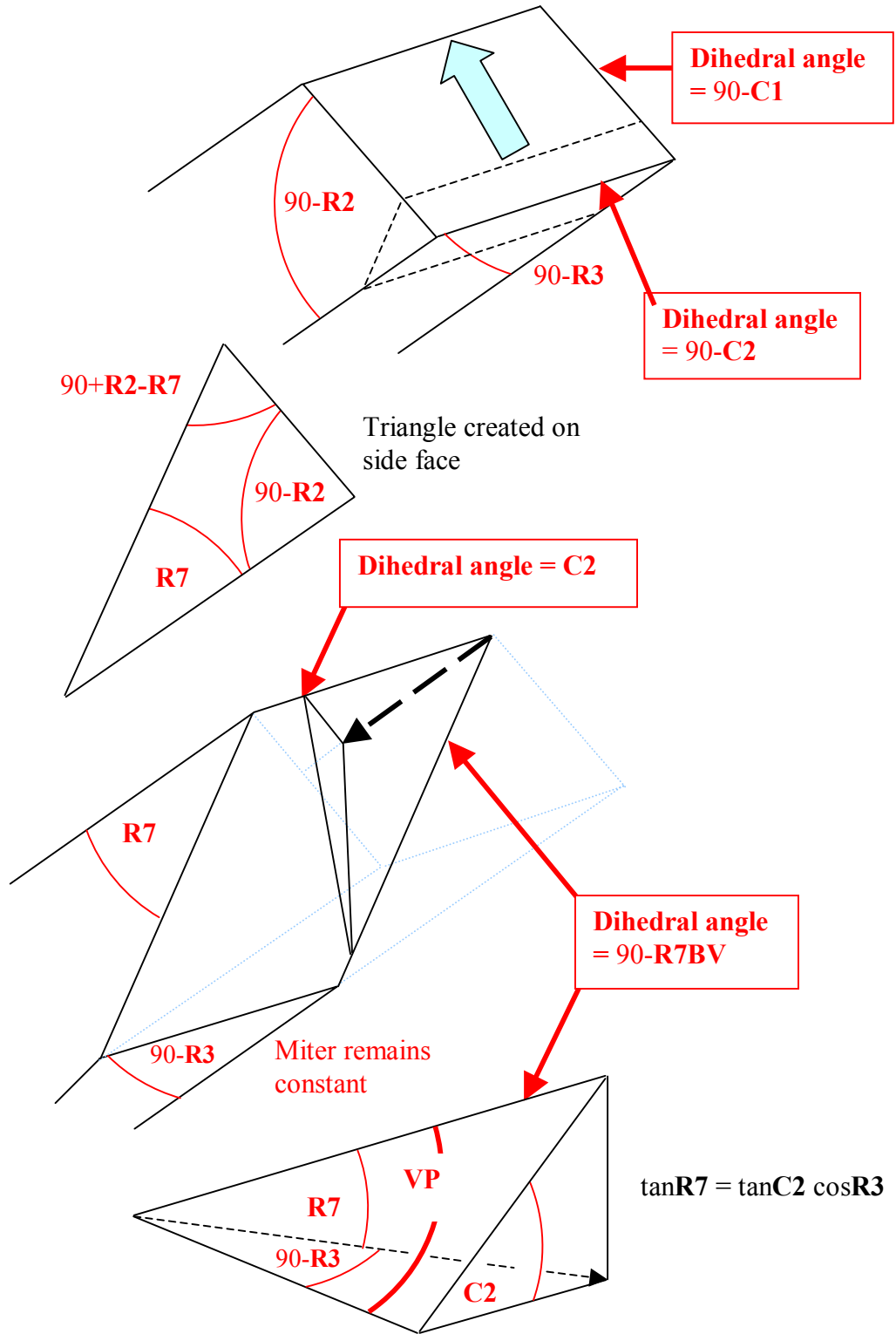
90-R1   90-R5B

R4B

90-A5B

R6P   VC

R4P

A5P

The same kernel as **Valley Peak meets Header**. Since the
cut is square to the side face of the Main Common Rafter,
the angles follow the plumb, parallel plane equivalent to a
Header. If **W** = 90 degrees, the equal Adjacent peak
values may be substituted.

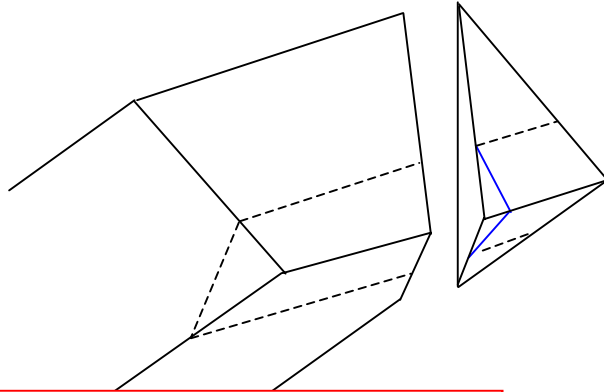A kernel which describes **R6P** :
tan **R6P** = tan**A5P** sin**R4P**

# HIP / VALLEY SQUARE CUT ANGLES:
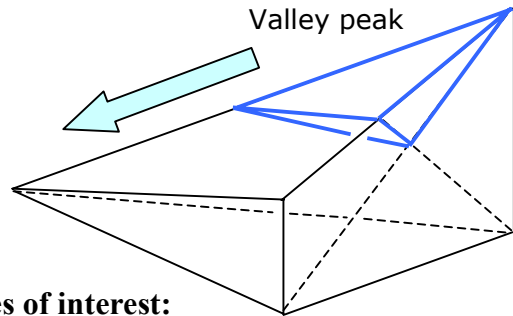
## Valley Peak meets Main Purlin

**Dihedral angle = 90-C1**

90-**R2**

90-**R3**

**Dihedral angle = 90-C2**

90+**R2-R7**

90-**R2**

**R7**

Triangle created on side face

**Dihedral angle = C2**

**R7**

90-**R3**

Miter remains constant

**Dihedral angle = 90-R7BV**

**VP**

**R7**

90-**R3**

**C2**

$$\tan\mathbf{R7} = \tan\mathbf{C2}\ \cos\mathbf{R3}$$

# HIP / VALLEY SQUARE CUT ANGLES:

## Valley Peak meets Main Purlin
## **W** = 90 Degrees

**General Model of Valley Angles:**
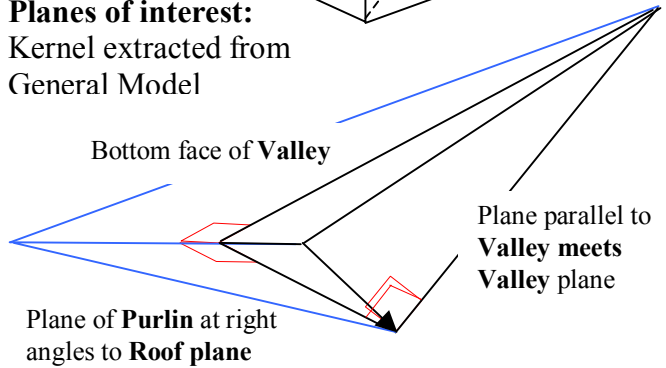Main side. Refer to appropriate section for angle details.

Valley peak

A kernel is created where the **Valley Peak meets Main Purlin** square cut intercepts the **Valley Peak meets Valley Peak** cut.

**Planes of interest:**
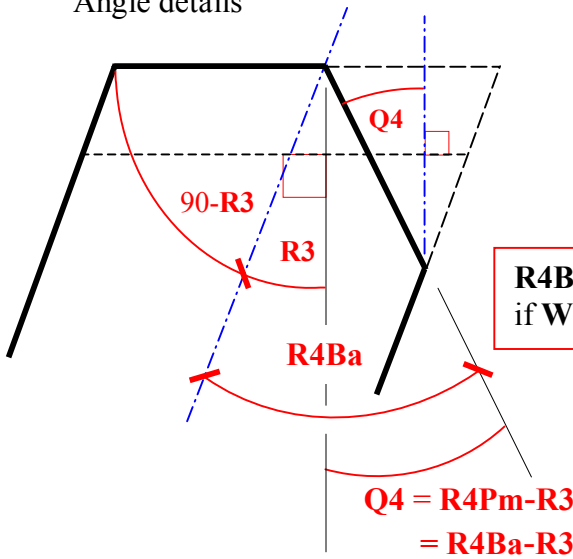Kernel extracted from
General Model

Bottom face of **Valley**

Plane parallel to
**Valley meets
Valley** plane

Plane of **Purlin** at right
angles to **Roof plane**

Bottom face of Valley rafter:
Angle details

Q4

90-**R3**

**R3**

**R4Ba**

**R4Ba** = **R4Pm** only
if **W** = **90** Degrees

**Dihedral angle
= 90-A5P**

Q4 = R4Pm-R3
= R4Ba-R3

90-P6      90-Q4

90-P3

90-C2
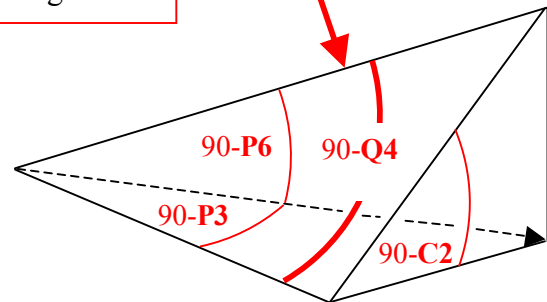
Angles **R6P**, **R7**, and **Q4** are not strictly necessary to complete the square cut; they are projections of dihedral angles **A5** and **C2** respectively (much as **P3** and **P6** are projections of **C5**), and will occur "naturally" on the side faces of members after making the cut. These angles are required for developments if a 3-D model of a joint is desired.

Kernel extracted from kernel, and re-drawn in standard position. This model clearly shows that the required angle is to calculate **Q4** is **R4P**.