Goodwin, D.P. (2011). Letter to the editor on Paul Turner's designing for the sun article. Survey Quarterly (65): March 2011. The New Zealand Institute of Surveyors: 29.

Letter to the Editor re Paul Turner's "designing for the sun" article

David Goodwin, University of Otago

Paul Turner's excellent article, "Marketing our urban design skills – designing for the sun" in the last Survey Quarterly, Issue 64, focused on marketing surveyors' expertise in designing for the sun but did not set out to provide details of eave calculations done by surveyors. Neither does Andrew Duncan's article in Issue 56 give specifics of eave calculations, and the EcoWho site (www.ecowho.com/tools/passive_solar_eaves_calculator.php) does not furnish the assumptions on which their eave calculator algorithm is based. A fruitful exchange of e-mails with Paul Turner culminated in his suggestion that I write a letter to the Survey Quarterly clarifying some particulars about eave calculations.

I have assumed a latitude of 44° 20' S for the South Island, New Zealand, and 39° 15' S for the North Island. Quantities are named and defined in Figure 1 below:

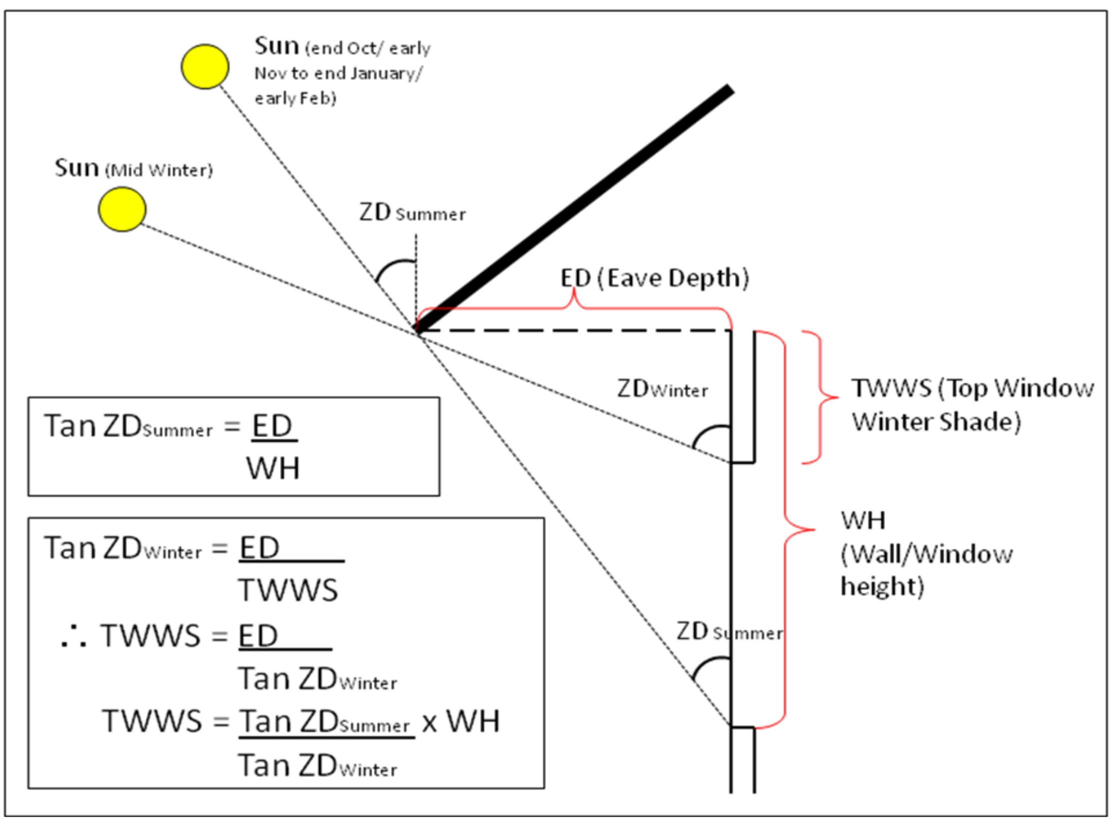

Figure 1

The US Naval Observatory portal, http://www.usno.navy.mil/USNO/astronomical-applications/data-services/ was used for computing topocentric Zenith Distances and Azimuths (assumed longitudes were 170° 25' E and 175° 45' E for South and North Islands respectively).

```
                                   Sun

                      Apparent Topocentric Positions
                        Local Zenith and True North

                             S Island 31st Jan
              Location:  E170°25'00.0", S44°20'00.0",     0m
                (Longitude referred to Greenwich meridian)

   Date          Time           Zenith          Azimuth
              (UT1)           Distance        (E of N)
             h  m   s          °  '   "        °  '   "
2010 Jan 31 00:51:30.0      26 52 21.7       0 05 49.2
2010 Jan 31 00:52:00.0      26 52 22.2     359 49 59.6

                            S Island 10th November

   Date          Time           Zenith          Azimuth
              (UT1)           Distance        (E of N)
             h  m   s          °  '   "        °  '   "
2010 Nov 10 00:22:00.0      27 16 56.6       0 06 31.6
2010 Nov 10 00:22:30.0      27 16 56.4     359 50 53.1

                            South Island Winter

   Date          Time           Zenith          Azimuth
              (UT1)           Distance        (E of N)
             h  m   s          °  '   "        °  '   "
2010 Jun 21 00:40:00.0      67 46 23.1       0 00 00.9
2010 Jun 21 00:40:30.0      67 46 23.4     359 52 34.9
```

Figure 2

Using the trigonometrical relationships in Figure 1, the eave distance, ED ≈ 0.51 WH (on 31st January and 10th November, to be in sympathy with the EcoWho figures), and TWWS ≈ 0.21 WH

Similarly, for N. Island (10th Feb, 31st Oct, again in line with EcoWho), ED ≈ 0.46 WH; TWWS ≈ 0.24 WH

These figures compare tolerably well with EcoWho's passive eave calculator algorithm, but two important points should be noted:

1) At the high south latitudes in New Zealand, the change in zenith distance with date is relatively rapid. For example, considering the zenith distance calculation above (for the end of January, South Island), the ZD increases by about 10° in only 28 days until the end of February, and the ED multiplication factor alters from 0.52 at the end of January to about 0.73. Similarly, at the start of October, ED ≈ 0.88 WH, appreciably higher than at the end of January. Clearly, if excluding the sun is important to a client, the eave distances recommended by the EcoWho site should be interpreted generously.

2) In the two hours either side of the meridian position, change in azimuth of the sun may be significant. For example, in the middle of summer on South Island (21st December), the change in azimuth in two hours is almost 60°. Because the sun is presented obliquely to the eaves, the eave distance perpendicular to the wall (i.e. taking the change in Azimuth into account) does not differ dramatically from the distance when the sun is in the meridian. However, if a window extends almost to a building corner then the eave needs to extend some distance beyond the building corner if the oblique sun is not to angle in beneath the eave.