27th August 2006

SUBMISSION - STANDARD SETTING

I have used a number of Australian standards over the years and while finding them to be generally of a high standard, have nevertheless found some shortcomings.

1.
AS 1170 part 1.

Office floor loading 3Kpa UDL, - concentrated load 6.7Kn see Australian wood panels Association structural flooring design manual comments on page 4 attached; 3.4 floor loads or http://www.woodpanels.org.au go to publications, scroll to design manuals click on structural flooring, scroll to 3.4
22mm thick particle board supported at 600mm c-c will carry a concentrated load of 2.3Kn x 4 legs = 9.2Kn or 920Kg which is a significant load on a shelving unit. Library floors require a provision for only 4.5Kn. concentrated load. A pallet trolley carrying 690kg of load can safely be wheeled around on 22mm thick particle board flooring supported at 600c-c. Similarly for general storage particularly as shelving units can easily be fitted with back to front or left to right rails or beams to convert point loads into line loads and transfer loads directly to joists.

2.
Mr Costello, the Treasurer pointed out last year that there is a wealth of knowledge, experience and expertise in older Australians and that they should not be retiring early but should instead be employed to age 70 and beyond if possible.

I purchased a copy of DRO3518 (AS4600 cold formed steel structures code) on 3 October 2005. I sent in a submission pointing out that many letters in the code were too small to read, ie print size lmm high letters (see page 17 attached) particularly " 1 L I and 1 and a c and e" are hard to differentiate without a magnifying glass. ABS states that 41% of Australians in the 45-49 age group are longsighted. My observations are that a significantly higher proportion of engineers over 50 use reading glasses.

The Perth white pages (Business & Government) print size is lmm high but the customer service guarantee Page 65l is in letters 1.2mm high and the print contract terms on Page 653 (attached) are in letters 1.8mm high. So, if Sensis want its customers to read something as opposed to providing something which they are obliged to do, the print size varies between almost illegible to legible.

There is a great and urgent need for a new Australian standard to set a minimum print size. Why should older Australians continue to work when they are being excluded from the work force because they lack 20-20 vision. Why should some 5 million Australians be regarded as disabled because of ridiculously small and illegible print size? Do not think that a 20% increase in print size of the white pages equals a 20% thicker telephone directory. There is a great deal of blank paper on a page and better

layout and use of abbreviation mean the same number of legible entries on a page - see attached p253. eg.
Flea-stoppers Applecross Mob. Serv. 041
867 864 Fleetwood Corp. Ltd
Fletcher Prof D
R Flexiglass
Challenge
26 Cooper Rd. Jndkt. (sales) 9417
2111 Head Office Admin 9417
6888
There would be significant increases in productivity, and older Australians wouldn't find it so hard and exasperating to continue working.

3.
DR03518 (AS4600) p65 3.3.6.2 line 5 states web crippling strength of channel section webs with holes shall be applicable within the following limits: d) clear distance between holes 450mm (presumably along the web) e) distance between the end of the member and the edge of the hole is greater than or equal to d." So if d=150mm and the hole is 155mm from end that is ok - so why 450mm in d?
h) is ridiculous on 100, 150, 200 and 250mm purlins -
i) so if the hole is less than 15mm diameter it can be ignored?

In search of clarity on this matter I purchased a copy of the AISI North American specification for the design of cold-formed steel structures 2001 edition and found that 3.3.6.2 is a copy of the North American code C3.4.2. with a bit of re-arranging of the words. The words "within the following limits" in both specifications are unspecific and subject to interpretation or misinterpretation. The commentary on the North American specification 2001 edition p48 - 4th paragraph last sentence states "for each case the design provisions apply to the geometry of the virtual hole not the actual hole or holes: - copy attached. Still unsatisfactory

In my comment to Standards Australia (8-11-2005) on the draft DR03518 (AS4600) I raised the question as to exactly what 3.3.6.2 meant. This was ignored and the standard was published as per the draft.

It would seem that a poorly drafted, partly non-sensical section from 2001 North American specification has been included in our December 2005 AS4600 despite the fact that some clarity on the meaning of the clause was available in the North American commentary from 2001. Why must we repeat the American mistake and inadequacy?
Furthermore supplement 2004 to the commentary on the North American specification published in December 2004 one full year before AS4600 2005 includes 3 pages of amendments and drawings to C3.4.1.. It seems to me that part of AS4600 December 2005 was obsolete before it was published.

4) AS 1252 metric high strength structural bolts - this standard is 14 pages long and drawings are unnecessarily duplicated. Having read it I found that I had to go to yet another standard to find out what grade of steel to use.
The American specification A325 for high strength structural bolts includes the chemical composition and grade of steel to be used and tensile and hardness testing requirements and is 8 pages long!

5)
I purchased from AISI the North American specification for the design of cold-formed steel structures 2001, and the 2001 commentary, plus manual on cold formed steel design (450 pages) plus 2004 supplement and 2004 commentary for A$200 plus postage. AS4600 2005 costs $164.00 plus the 98 supplement to the 96 edition (note 2 year time gap) @ $118.00 = A$282.00

The AISI set including postage from the USA came to A$278.00 and is all up four times longer and much more informative and very much better value for money AND the smallest letter is 1.5mm high which is very readable!
SAI Global quoted me $773.95 + postage and handling $16 and 4 weeks delivery for the AISI set, ie $278 + 180% markup = $778.40

This raises the question as to whether our combined Australian/New Zealand economies can support standards of the complexity of AS4600 given the shortage of skilled and knowledgable people prepared to give their time for free to draft and prepare these standards or will Government and industry pay people to do the job, or should we just adopt the North American or some other specification?
If we are to adopt standards from other countries someone has to check them and ensure that they are accurate, correct, intelligible, up-to date and value for money bearing in mind that the purchaser is buying something in good faith and sight unseen and cannot return it for a refund if dissatisfied with the product.

Yours faithfully

Ivan Quail

*[Note: Extracts from DR03518 (AS4600) and from
AISI North American Cold-formed Steel Specification attached]*

TABLE 1.4 (*continued*)

Symbol	Description	Clause reference
I_g	gross second moment of area	7.1.4
$I_{min.}$	minimum second moment of area	2.6
I_s	second moment of area of a full stiffener about its own centroidal axis parallel to the element to be stiffened	2.4.1, 2.5
$I_{s,\ min.}$	actual second moment of area of a pair of attached shear stiffeners, or of a single shear stiffener	2.7.2
I_{sf}	second moment of area of the full area of a multiple stiffened element, including the intermediate stiffeners, about its own centroidal axis	2.5
I_w	warping constant for a cross-section	3.3.3.2, Paragraph E1
I_x, I_y	second moment of area of the cross-section about the major principal x- and y-axes	3.3.3.2, 4.3.3.4
I_{xy}	product of second moment of area of the full section about its major and minor principal axes	4.3.3.4
I_{yc}	second moment of area of the compression portion of a section about the centroidal axis of the full section parallel to the web, using the full unreduced section	3.3.3.2
J	torsion constant for a cross-section; *or* warping constant for a cross-section	3.3.3.2, Paragraph E1
k	plate buckling coefficient; *or* non-dimensional yield stress	2.2.1.2, 2.3.2.2, 2.3.2.3, 2.4.1, 3.3.6, Table F1
k_f	total population variation due to fabrication	6.2.2.3
k_m	total population of variation due to material	6.2.2.4
k_s	shear stiffener coefficient	2.7.2
k_{st}	stiffener type coefficient	2.7.2
k_t	correction factor for distribution of forces; *or* factor to allow for variability of structural units	3.2.1, Table 3.2, 8.2.2
k_v	shear buckling coefficient	2.7.2, 3.3.4
k'	coefficient used to determine N_{ib} where neither flange is connected to the sheeting or connected to the sheeting with concealed fasteners	4.3.3.4
l	actual length of a compression member; *or* full span for simple beams; *or* distance between inflection points for continuous beams; *or* twice the length of cantilever beams; *or* unbraced length of a member; *or* length of a member	1.3.18, 2.1.3.3, 3.3.3.2, 3.4.2, 4.1.1, 4.3.3.3
l_a	lap length	Figure G1
l_b	actual length of bearing; *or* effective length in the plane of bending; *or* unbraced length of member; *or* length of bracing interval; *or* distance between centre-line of braces	3.3.6, 4.3.3.4
l_c	unclamped length of the specimen	Figure G1
l_e	effective length of the member	1.3.25, 3.4.2
l_{ex}, l_{ey}, l_{ez}	effective lengths for bending about the x- and y-axes, and for twisting, respectively	3.3.3.2

(*continued*)

TABLE 3.3.6.1(D)
SINGLE HAT SECTIONS

Support conditions	Load cases		C	C_r	C_l	C_w	ϕ_w	Limits
Fastened to support	One-flange loading or reaction	End	4	0.25	0.68	0.04	0.75	$r_i/t_w \leq 5$
		Interior	17	0.13	0.13	0.04	0.80	$r_i/t_w \leq 10$
	Two-flange loading or reaction	End	9	0.10	0.07	0.03	0.85	$r_i/t_w \leq 10$
		Interior	10	0.14	0.22	0.02	0.85	
Unfastened	One-flange loading or reaction	End	4	0.25	0.68	0.04	0.75	$r_i/t_w \leq 4$
		Interior	17	0.13	0.13	0.04	0.90	$r_i/t_w \leq 4$

NOTE:The coefficients in Table 3.3.6.1(D) apply if $d_1/t_w \leq 200$, $l_b/t_w \leq 200$, $l_b/d_1 \leq 2.0$ and $\theta = 90°$.

TABLE 3.3.6.1(E)
MULTI-WEB DECK SECTIONS

Support conditions	Load cases		C	C_r	C_l	C_w	ϕ_w	Limits
Fastened to support	One-flange loading or reaction	End	3	0.08	0.70	0.055	0.65	$r_i/t_w \leq 7$
		Interior	8	0.10	0.17	0.004	0.85	$r_i/t_w \leq 10$
	Two-flange loading or reaction	End	9	0.12	0.14	0.040	0.85	$r_i/t_w \leq 10$
		Interior	10	0.11	0.21	0.020	0.85	
Unfastened	One-flange loading or reaction	End	3	0.08	0.70	0.055	0.65	$r_i/t_w \leq 7$
		Interior	8	0.10	0.17	0.004	0.85	
		End	6	0.16	0.15	0.050	0.90	$r_i/t_w \leq 5$
		Interior	17	0.10	0.10	0.046	0.90	

NOTE:The coefficients in Table 3.3.6.1(E) apply if $d_1/t_w \leq 200$, $l_b/t_w \leq 210$, $l_b/d_1 \leq 3.0$ and $45° < \theta \leq 90°$.

3.3.6.2 *Web crippling strength of channel section webs with holes*

When a web hole is within the bearing length, a bearing stiffener shall be used. For beam webs with holes, the web crippling strength shall be calculated in accordance with Clause 3.3.6.1 multiplied by the reduction factor (R_c), given in this Clause.

Web crippling strength of channel section webs with holes shall be applicable within the following limits:

(a) $d_{wh}/d_1 < 0.7$.

(b) $d_1/t \leq 200$.

(c) Holes centred at mid-depth of the web.

(d) Clear distance between holes is greater than or equal to 450 mm.

(e) Distance between the end of the member and the edge of the hole is greater than or equal to d.

(f) Non-circular holes corner radii less than or equal to $2t$.

(g) Non-circular holes with $d_{wh} \leq 65$ mm and $b \leq 115$ mm.

(h) Circular hole diameters less than or equal to 150 mm.

(i) $d_{wh} > 15$ mm.

TABLE C3.4.1-4
SINGLE HAT SECTIONS

Support Conditions	Load Cases		C	C_R	C_N	C_h	USA and Mexico ASD Ω_w	USA and Mexico LRFD ϕ_w	Canada LSD ϕ_w	Limits
Fastened to Support	One-Flange Loading or Reaction	End	4	0.25	0.68	0.04	2.00	0.75	0.65	$R/t \le 5$
		Interior	17	0.13	0.13	0.04	1.90	0.80	0.70	$R/t \le 10$
	Two-Flange Loading or Reaction	End	9	0.10	0.07	0.03	1.75	0.85	0.75	$R/t \le 10$
		Interior	10	0.14	0.22	0.02	1.80	0.85	0.75	
Unfastened	One-Flange Loading or Reaction	End	4	0.25	0.68	0.04	2.00	0.75	0.65	$R/t \le 4$
		Interior	17	0.13	0.13	0.04	1.70	0.90	0.75	$R/t \le 4$

Note:
The above coefficients apply when $h/t \le 200$, $N/t \le 200$, $N/h \le 2$ and $\theta = 90°$.

TABLE C3.4.1-5
MULTI-WEB DECK SECTIONS

Support Conditions	Load Cases		C	C_R	C_N	C_h	USA and Mexico ASD Ω_w	USA and Mexico LRFD ϕ_w	Canada LSD ϕ_w	Limits
Fastened to Support	One-Flange Loading or Reaction	End	3	0.08	0.70	0.055	2.25	0.65	0.55	$R/t \le 7$
		Interior	8	0.10	0.17	0.004	1.75	0.85	0.75	$R/t \le 10$
	Two-Flange Loading or Reaction	End	9	0.12	0.14	0.040	1.80	0.85	0.70	$R/t \le 10$
		Interior	10	0.11	0.21	0.020	1.75	0.85	0.75	
Unfastened	One-Flange Loading or Reaction	End	3	0.08	0.70	0.055	2.25	0.65	0.55	$R/t \le 7$
		Interior	8	0.10	0.17	0.004	1.75	0.85	0.75	
	Two-Flange Loading or Reaction	End	6	0.16	0.15	0.050	1.65	0.90	0.80	$R/t \le 5$
		Interior	17	0.10	0.10	0.046	1.65	0.90	0.80	

Notes:
(1) The above coefficients apply when $h/t \le 200$, $N/t \le 210$, $N/h \le 3$.
(2) $45° \le \theta \le 90°$

C3.4.2 Web Crippling Strength [Resistance] of C-Section Webs with Holes

When a web hole is within the bearing length, a bearing stiffener shall be used.

For beam webs with holes, the web crippling strength [resistance] shall be computed by using Section C3.4.1 multiplied by the reduction factor, R_c, given in this section.

These provisions shall be applicable within the following limits:

(1) $d_0/h \leq 0.7$

(2) $h/t \leq 200$

(3) Hole centered at mid-depth of web

(4) Clear distance between holes ≥ 18 in. (457 mm)

(5) Distance between end of member and edge of hole ≥ d

(6) Non-circular holes, corner radii ≤ 2t

(7) Non-circular holes, $d_0 \leq 2.5$ in. (64 mm) and $b \leq 4.5$ in. (114 mm)

(8) Circular holes, diameters ≤ 6 in. (152 mm)

(9) $d_0 > 9/16$ in. (14 mm)

For end-one flange reaction (Equation C3.4.1-1 with Table C3.4.1-2) when a web hole is not within the bearing length:

$$R_c = 1.01 - 0.325 d_0/h + 0.083 x/h \leq 1.0 \qquad (Eq.\ C3.4.2\text{-}1)$$

$N \geq$ 1 in. (25 mm)

For interior-one flange reaction (Equation C3.4.1-1 with Table C3.4.1-2) when any portion of a web hole is not within the bearing length:

$$R_c = 0.90 - 0.047 d_0/h + 0.053 x/h \leq 1.0 \qquad (Eq.\ C3.4.2\text{-}2)$$

$N \geq$ 3 in. (76 mm)

where

b = Length of web hole
d = Depth of cross section
d_0 = Depth of web hole
h = Depth of flat portion of web measured along plane of web
x = Nearest distance between web hole and edge of bearing
N = Bearing length

C3.5 Combined Bending and Web Crippling

C3.5.1 ASD Method

Unreinforced flat webs of shapes subjected to a combination of bending and concentrated load or reaction shall be designed to meet the following requirements:

(a) For shapes having single unreinforced webs:

$$1.2\left(\frac{\Omega_w P}{P_n}\right) + \left(\frac{\Omega_b M}{M_{nxo}}\right) \leq 1.5 \qquad (Eq.\ C3.5.1\text{-}1)$$

Exception: At the interior supports of continuous spans, the above equation is not applicable to deck or beams with two or more single webs, provided the compression edges of adjacent webs are laterally supported in the negative moment region by continuous or intermittently connected flange elements, rigid cladding, or lateral bracing, and the spacing between adjacent webs does not exceed 10 in. (254 mm).

(b) For shapes having multiple unreinforced webs such as I-sections made of two C-sections connected back-to-back, or similar sections which provide