CORRECTIONS AND ADDENDA (dated 11 April 2020)

"Reinforced Concrete–The Designers Handbook" 2013 ed (blue cover) and 2015 ed (black cover)

by Beletich, Hymas, Reid and Uno

Please find attached the addenda to the textbook "Reinforced Concrete – The Designers Handbook" by Beletich, Hymas, Reid and Uno (2013 edition -blue cover), followed by some additional corrections to the 2015 edition (black cover)

As with all publications, typographical errors are usually made, however seldom are typo's compiled and made available to designers to make the necessary corrections to their text.

Similarly, 'updates' in that a specialised (in this case - concrete design) are rarely added in later. In the spirit of professionalism, the authors of this publication have compiled all the typos found to date (however small) as well as necessary updates to the publication.

We have thus attached the necessary PDF's herein for your attention. Please note that the publication was first released in 2013 with a blue cover then re-released in 2015 with a black cover (the second print version). Since that time the concrete standard AS3600 was revised in 2018* and so some of the new information in that Standard is not covered by this text.

A quick summary of the major changes from the AS3600-2009 version (which the book addressed) to AS3600-2018 Standard were:

(i) Phi (ϕ) factors have all been increase approximately 0.05 units thus the phi for beams used to be 0.80 and now is 0.85. Similarly, the phi for shear used to be 0.70 and now is 0.75 and finally the phi for columns used to be 0.60 and now is 0.65. In essence it means that the new Code has "relaxed" the old values so that the concrete has more capacity (about 5-10%) than what it did in the previous Code. This means that when you use this textbook (eg Column Charts) you will obtain a value that is slightly more conservative (by about 5-10%) than what you will get if you do it by hand or use software using the current 2018 Code.

(ii) The equation for Second Moment of Area (previously called Moment of Inertia) was recently changed from the Branson Equation (Dan Branson - American) to the Bischoff Equation (Peter Bischoff – Canadian). We were aware of this impending change to AS3600 and subsequently added a section to the text which covered the new equation. You will find this information plus worked examples in Chapter 4 (page 241 onwards) which deals with Serviceability.

(iii) The only major difference in our textbook from the 2009 to 2018 Standard is the method of calculating the Shear capacity (Vuc) in concrete. The 2018 Standard adopts the Modified Compression Field Theory Method which is very popular in the USA and Canada. We have addressed this issue by making available a revised PDF version of the Shear section in our textbook (Chapter 3 pages 132 to 140) which covered Vuc, on our website www.etia.net.au

* Also note that Standards Australia released an Amendment 1 to AS3600-2018 later in that same year to highlight the typo's that were found in some of the formulas listed in that Standard.

Regards,

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Corrections and Addenda to the 2013 edition (BLUE cover)

Page	Heading	Section	Action	CORRECTION +	DETAILS
ix	Notation		First 5 headings should start with lower case ‘a’ *eg*		***a*** = depth of rectangular stress block
“	“		eg $\mathbf{a_m}$ = average axis distance, $\mathbf{a_s}$ = axis distance, $\mathbf{a_{sup}}$ = support length etc, $\boldsymbol{a_v}$ = distance from shear etc		
x	“		First 3 headings should start with lower case ‘b’		
“	“		First heading for d’s should be lower case ‘d’		***d***= effective depth of beam etc
9	*page missing*	*Non Portland Cements*	*See attachment included at end of this addenda*		
35	Plastic Shrinkage	Equation 1.6	Place the 5 on the outside of the brackets		$E = \mathbf{5}[(Tc+18)^{2.5} – r(Ta+18)^{2.5}](V+4)x10^{-6}$
42	Table 1.12	(a) (i) Tension	ADD	**Class N**	$\boldsymbol{\phi = 0.80}$
42	“	“	ADD	**Class L**	$\boldsymbol{\phi = 0.64}$
42	“	(c) Bending with Axial tension	INSERT	Class N (in front of)	$\boldsymbol{\phi + (0.80 – \phi).(N_u / N_{uot})}$
42	“	“	ADD	**Class L**	$\boldsymbol{\phi + (0.64 – \phi).(N_u / N_{uot})}$
44	#1.9	Design Loads and Load Combinations		Section C: Remove ‘and WIND action’	
50	# Example 1.19	TASK	Remove “bending moments” and replace with “loads”		
75	#2.3.1.1	above Equation 2.12	REPLACE	0.95 d (with)	$\boldsymbol{(d – a/2) \approx 0.9d}$
76	“	Equation 2.13	ADD	2 to denominator	$\boldsymbol{M_{uo} = A_{st} f_{sy} (d – A_{st} f_{sy} / 2\ \alpha_2 f'_c\ b)}$
136	#3.1.3	Example 3.1	REPLACE	ϕV_{max} (with)	$\boldsymbol{V_{u\ max}}$
139	#3.1.6	Equation 3.11	ADD	subscript *f* to last f_{sy}	$\boldsymbol{A_{sv} f_{sy,f} / 0.35\ b_v}$
142	“	Equation 3.15	ADD	subscript v to A_s	$\boldsymbol{\phi V_{us} = \phi A_{sv} f_{sy,f} d_o \cot \theta_v / s}$
209	“	Text below 123 mm	REPLACE	“*The second moment of area about the neutral axis*...” (with the following):	

The second moment of area at the transformed section (about its centroid at a depth ŷ) is calculated using the parallel axis theorem:

$I_{total} = \Sigma_i [I_i + A_i (y_i - \hat{y})^2]$ based upon component areas A_i with centroids at depths $\hat{y}_i$ and second moments of areas I_i about their own centroids).

Page	Heading	Section	Action	CORRECTION + DETAILS
213	#4.2.2.1	Figure 4.7	DELETE	Remove equation $(d - kd / kd)\ \sigma_c$ above "Stresses in Transformed section"
217	#4.2.3	Figure 4.9	DELETE	" " " "
217	"	"	REPLACE	*d* with d_{sc} in compressive steel stress eqn $((kd - d_{sc})/ kd)\sigma_c$
224	#4.2.5	Deflection Equation	DELETE	second 384 value $\Delta = (5/384).wL^4/EI$
225	"	Δ/L_{ef} & L_{ef}/d equation	REPLACE	F_{ef} (with) $F_{d.ef}$
241	#4.2.8	2nd paragraph (Serviceability)	REPLACE	"Branson's original formula has been…" with ***"Bischoff's** original formula has been…"*
250	Immediate Deflection		REPLACE	I_{ef} value of '918' with '**875**' which then gives the short term deflection of **6.8** mm
252	Sustained	"	REPLACE	I_{ef} value of '918' with '**815**' (using M_{cr} = 12.6) which then gives sustained deflection of **7.2** mm
253	The above changes results in span to depth ratios of			L / **417** (not L / 438) and L / **266** (not L / 290)
256	"	"	"	L/ **574** (not L / 600) and L / **322** (not L / 340)
321	"	Text starting with "Assuming"	REPLACE with	*"Assuming there is no compression reinforcement then the long term multiplier k_{cs} is"*
334	"	Text top of page	DELETE	"or trapezoidal" thus text reads *"… applying the triangular load to…"*
371	Squash Load			Add decimal point to 072 **0.72** to 0.85
375	Columns Calculations		REPLACE	50 with 42.5 = 250 x 350 x ***42.5*** x 175 + 250 x 400 x **42.5**
"	"	"	REPLACE	text "…left hand term 11.09 x …" with *"…factor 11.09×10^6 in the left hand term…"*
406	Centroid of Equivalent Reinforcement			For 16 bars replace g' = 0.86g with **0.75g** ; For 12 bars replace g' = 0.83g with **0.78g** ; For 8 bars use g' = **0.75g**
507	*page missing*	*Walls*		*See attachment included at end of this addenda*
569	Solution	"	REPLACE	< 1 with **> 1**
570	Shear Strength	"	REPLACE	1536 kN (two spots) with **612 kN**
"	"	"	"	2276 kN with **1352 kN**

Page	Heading	Section	Action	CORRECTION	+	DETAILS
571	“	“	“	1593 kN	with	**946 kN**
575	Footings 8.1	Soil Mechanics	REPLACE	D_f = footing thickness	with	*“D_f = Depth from ground level to base of footing”*
624	Footings	Example 8.9	ADD	text after “… column design axial load N*.“		*“The column is assumed to be pinned at the base”*
624	“	Example 8.9	REPLACE	$\alpha_1 f'_c$ = 0.85 x 25	with	$\alpha_1 f'_c$ = **0.805 x 65**
“	“	“	REPLACE	= 21.25 MPa (this value governs)	with	$\alpha_1 f'_c$ = **52** MPa **>> 24.3** MPa
625	“	“ (F brg equation)	REPLACE	21.25	with	*F_{brg} = **24.3** x $(400)^2$ / 1000*
625	“	“ (F brg equation)	REPLACE	3400 kN	with	*F_{brg} = **3888 kN***
626	“	“	REPLACE	4800 – 3400	with	*F_{brg} = 4800 – **3888***
626	“	“ (F brg equation)	REPLACE	1400	with	*F_{brg} = **912** kN*
626	“	Dowel Area required	REPLACE	1400	with	= ***912*** *x 10^3 / 500*
626	“	“	REPLACE	2800	with	A_{dow} = ***1824 mm^2***
626	“	“	REPLACE	10-N20 dowels	with	8-N20 dowels
626	“	“	REPLACE	A_s = 3100 mm^2	with	A_s = **2480 mm^2**
672	Reinf Develop	9.2.2	REPLACE	“Expressing Equations 9.2.2 and 9.2.4”	with	*“Expressing Equations 9.1.2 and 9.1.4”*
696	Figure 9.37		EXTEND	Length of the 4 stirrups to below (ie just under) the bottom reinforcement		
697/699	Two (2) different figures title Fig 9.38		ADD	For time being add suffix A and B so that the first figure is 9.38A and then the second figure is 9.38B		
683	#9.2.4.4	Example 9.5	REPLACE	“A previous example provided a design”	with	*A previous example (Ex.5.5) provided…”*
698	#9.2.6	4th paragraph	REPLACE	“Figure 2.37”	with	*“Figure 9.37”*
700	#9.2.6	Fig 9.39	REPLACE	text stating “see Drawing D1”	with	*see Fig 9.40*
728	#10.1	7th paragraph	ADD	ϕ factor missing … should read		*“applying lower ϕ factor..”*
717	#9.3.5	Fig 9.59		Modify drawing: The long bars located deepest in the tread running up the stairs should be lapped, not continuous.		

Page	Heading	Section	Action	CORRECTION +		DETAILS
797	Special Topics	Calculations for ε_{cse}	REPLACE	$\varepsilon_{cse} = 9.1 \times 10^{-6}$	with	$\varepsilon_{cse} = 52.7 \times 10^{-6}$
798	"	Calculations for ε_{cs}	REPLACE	9.1 with 52.7 thus answer is		$\varepsilon_{cs} = 141$ microstrain
798	"	Calculations for P_{sh}	REPLACE	97.5 with 141 thus answer is		$P_{sh} = 52{,}450$ N
799	"	Calculations for $\sigma_{sh,a}$	REPLACE	36,270 with 52,450	thus	$\sigma_{sh,a} = 0.26$ MPa
799	"	Calculations for $\sigma_{sh,f}$	REPLACE	36,270 with 52,450	thus	$\sigma_{sh,f} = 0.67$ MPa
799	"	Calculations for σ_{sh}	REPLACE	0.18+0.46 with 0.26+0.67	thus	$\sigma_{sh} = 0.93$ MPa
800	"	Calculations for σ_t	REPLACE	0.18+0.46+2.93 with 0.26+0.67+2.93	thus	$\sigma_t = 3.86$ MPa

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Six (6) Corrections and Addenda to the 2015 edition (**BLACK cover**)

Page	Heading	Section	Action	CORRECTION +		DETAILS
569	Walls	Example 7.5	REPLACE	<	with	>
570	Walls	Concrete Shear Strength	REPLACE	1536 kN	with	**612 kN**
624	Footings	Example 8.9 (Bearing)	REPLACE	0.85 x 25 = 21.25 MPa	with	**0.805 x 65 = 52 MPa > 24.3 MPa**
625	Footings	F brg	REPLACE	21.25 MPa and 3400 kN	with	**24.3 MPa and 3888 kN**
626	Footings	Dowels	REPLACE	1400 kN and 2800 mm2	with	**912 kN and 1824 mm2**
626	Footings	Dowels	REPLACE	10-N20 dowels; 3100 mm2	with	**8-N20 dowels; 2480 mm2**

Below are the Two (2) Missing Pages from the 2013 edition (Blue Cover) '*Reinforced Concrete -The Designers Handbook'* ie Pg 9 and Pg 507

CHAPTER 1

Pozzolanic materials such as flyash (ie only flyash from black coal, not brown coal) serve concrete well in that they reduce the heat of hydration and bleeding, and they provide long term durability advantages including better resistance to AAR (alkali aggregate reaction) and higher long term strength, but as mentioned earlier they take a little more time to gain their strength (see Figure 1.3 and Figure 1.4) which may be an issue for early age requirements on some sites.

Blended cement mixes using silica fume (which is an extremely fine powder about 100 times finer than GP cement), are very good at reducing chloride diffusion rates in concrete. This helps protect the reinforcing steel however these SF mixes also produce a very sticky mix which is more prone to plastic shrinkage cracking on hot windy days when the concrete is being placed.

1.1.4 Non-Portland Cements

1.1.4.1 Calcium Aluminate Cements

These cements are materials formulated primarily on Alumina rather than Calcium. In other words, the amount of aluminates in these cements far exceeds the amount of calcium (which gives these products quite different properties to normal Portland cement). These high alumina cements are usually termed Calcium Aluminate Cements (CAC's) or sometimes Ciment Fondu cements (a French term for *cements resisting melting* since this cement originated in France).

The two main advantages of these cements are (a) Rapid strength gain eg 30 MPa in about 8 hrs (which is why they are used in self levelling compounds), and (b) High temperature resistance eg up to 1500 deg C (which is why they are also used in the manufacture of refractory's and ovens). They are also very good at resisting sulphate environments, bacteria and scouring.

1.1.4.2 Geopolymers

This type of cement is fairly new in the marketplace though the research has been ongoing for at least 20 years.

These cements contain no Portland cement but rely purely on the chemical reaction between (a) Flyash satisfying AS3582.1 and in much higher amounts (eg 400 kg, compared to the standard 20 kg to100 kg used in conventional concretes) and (b) Liquid Potassium or liquid Sodium.

The quantity of water used in geopolymers is very small, since it does not take part in the chemical reactions but is merely added into the mix to provide some workability.

To date these cements have only been used in concrete in simple construction (eg footpaths) but with time they may very well overtake conventional concrete due to the omission of GP cement (and thus improve sustainability/carbon emissions issues).

Bending moment M_{ecc} at mid hgt (of 1m strip) due to eccentric load N^* resultant

$$M_{ecc} = \frac{(mid\ hgt\ DL\ g^* - w_{up}) \times ecc}{2}$$

$$= \frac{(20.1 - 9.4) \times 0.187}{2}$$

$$= 1.00\ kNm / m$$

Total bending moment M_b

$$M_b = M_{wind} + M_{ecc}$$

$$= 9.93 + 1.00$$

$$= 10.93 \text{ kNm}$$

Cracked moment of inertia I_{cr}

$$I_{cr} = \frac{b.(k'd)^3}{3} + nA_{st}(d - k'd)^2$$

$$= \frac{1000.(25)^3}{3} + 6.99 \times 362(139 - 25)^2$$

$$= 38.09 \times 10^6 mm^2$$

Bending Stiffness K_{bf}

$$K_{bf} = \frac{9.6 E_c I_{cr}}{H_w^{\ 2}}$$

$$= \frac{9.6 \times 28600x10^3 \times 38.09 \times 10^6}{8500^2} \ /1000$$

$$= 144.75\ kN$$