ADDENDA to “Reinforced Concrete–The Designers Handbook” 2013 edition (19/8/15)

Please find attached the addenda to the textbook “Reinforced Concrete – The Designers Handbook” by Beletich, Hymas, Reid and Uno (2013 edition)

As with all new publications, typographical errors are usually made.

However seldom are the typo’s compiled and made available so that designers can 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 recently compiled all the typos found to date (however small) as well as necessary updates to the publication.

We have therefore attached the necessary PDF’s herein for your attention.

Regards,

Joanne

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ADDENDA to “Reinforced Concrete – The Designers Handbook” 2013 edition (19 August 2015) *continued*

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 a_m = average axis distance, a_s = axis distance, a_{sup} = support length etc, 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		$E = 5[(Tc+18)^{2.5} – r(Ta+18)^{2.5}](V+4)x10^{-6}$
42	Table 1.12	(a) (i) Tension	ADD	**Class N**	$\phi = 0.80$
42	"	"	ADD	**Class L**	$\phi = 0.64$
42	"	(c) Bending with Axial tension	INSERT	Class N (in front of)	$\phi + (0.80 – \phi).(N_u / N_{uot})$
42	"	"	ADD	**Class L**	$\phi + (0.64 – \phi).(N_u / N_{uot})$
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)	$(d – a/2) \approx 0.9d$
76	"	Equation 2.13	ADD	2 to denominator	$M_{uo} = A_{st} f_{sy} (d – A_{st} f_{sy} / 2 \alpha_2 f'_c b)$
136	#3.1.3	Example 3.1	REPLACE	ϕV_{max} (with)	$V_{u\ max}$
139	#3.1.6	Equation 3.11	ADD	subscript *f* to last f_{sy}	$A_{sv} f_{sy.f} / 0.35 b_v$
142	"	Equation 3.15	ADD	subscript v to A_s	$\phi V_{us} = \phi A_{sv} f_{sy.f} d_o \cot \theta_v / s$
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 $\hat{y}$) 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).*

213	#4.2.2.1	Figure 4.7	DELETE	Remove equation $(d – kd / kd)\ \sigma_c$ above "Stresses in Transformed section"	

Page	Heading	Section	Action	CORRECTION +	DETAILS
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 '**859**' which then gives the short term deflection of **6.8** mm	
252	Sustained	"	"	" "	sustained deflection of **6.0** 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**
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"*

Page	Heading	Section	Action	CORRECTION +	DETAILS
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 10³ / 500*
626	"	"	REPLACE	2800 with	A_{dow} = ***1824 mm²***
626	"	"	REPLACE	10-N20 dowels with	8-N20 dowels
626	"	"	REPLACE	A_s = 3100 mm² with	A_s = **2480 mm²**
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.		
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	ε_{cs} = ***141*** *microstrain*

Page	Heading	Section	Action	CORRECTION +	DETAILS
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	σ_{sh} = 0.93 MPa
800	"	Calculations for σ_{t}	REPLACE	0.18+0.46+2.93 with 0.26+0.67+2.93 thus	σ_{t} = 3.86 MPa

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.

Note that 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}

$$K_{bf} = \frac{9.6 E_c I_{cr}}{H_w^{\ 2}}$$
$$= \frac{9.6 \times 28600 x 10^3 \times 38.09 \times 10^6}{8500^2}\ /1000$$
$$= 144.75\ kN$$