

## ROUNDING CONSIDERATIONS

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Rounding occurs when the worksheet for a rate is calculated and stored to a fixed number of decimals. As good practice the estimator should compare the Trade Totals display, bill summary and resource analysis in order to determine the rounding error that may exist within a job. Rounding errors are dependent on each job but a rounding discrepancy of approximately 0.2% of the job allowable would be considered to be reasonable.

When estimating a job, production calculations are normally based on a guess, say excavate 4m<sup>3</sup> and not 4.137m<sup>3</sup> per hour, therefore rounding discrepancies are best accepted for what they are.

It is important to appreciate how rounding errors occur and ensure that the rounding errors are kept to a minimum wherever possible. Jobs containing large quantities and macro bill items are especially prone to rounding errors.

### **Calculating the resource analysis:**

When analysing the resources on each worksheet the utilisation is stored and calculated to 8 decimal places. Therefore for each line of a worksheet, CCS calculates the resource utilisation to 8 decimals and then sums the total utilisation for the resource in all the worksheets to 8 decimals. The final utilisation answer is then rounded and multiplied by the resource rate. The resource analysis should contain the least rounding error.

### **Calculating the resource analysis on each worksheet:**

The resource utilisation for each worksheet is kept to 3 decimal places in the worksheet. The utilisation is rounded to 3 decimals and then multiplied by the resource rate. The worksheet analysis will contain more rounding errors than the resource analysis.

With the above in mind it is considered bad practice to be dividing by very big numbers on a worksheet, as this practice will be prone to rounding errors which will be compounded by very large quantities.

Consider the following worksheet analysis:

E101 Op Code worksheet Created: The 04/04/2005 Amended: The 04/04/2005

Stored: 04/04/05  
 18,800,880 m3 ?MacroQty  
 Worksheet mode  
 RECALC WORKSHEETS

**L=1.11 Rate=1.11**

Utilisation calculated as follows and kept to 8 decimal places for the RESOURCE ANALYSIS  
 $1/10000 = 0.00010000$

Utilisation is kept to 3 decimal places in the WORKSHEET = 0.000  
 multiply by 10.00 = 0.00

200 Labourer 10.00hr/10000 = 0.00

Utilisation calculated as follows and kept to 8 decimal places for the RESOURCE ANALYSIS  
 $1/1000 = 0.00100000$

Utilisation is kept to 3 decimal places in the WORKSHEET = 0.001  
 multiply by 10.00 = 0.01

200 Labourer 10.00hr/1000 = 0.01

Utilisation calculated as follows and kept to 8 decimal places for the RESOURCE ANALYSIS  
 $1/1000 = 0.00100000$

Utilisation is kept to 3 decimal places in the WORKSHEET = 0.010  
 multiply by 10.00 = 0.10

200 Labourer 10.00hr/100 = 0.10

Utilisation calculated as follows and kept to 8 decimal places for the RESOURCE ANALYSIS  
 $1/1000 = 0.00100000$

Utilisation is kept to 3 decimal places in the WORKSHEET = 0.100  
 multiply by 10.00 = 1.00

200 Labourer 10.00hr/10 = 1.00

= 1.11

BILL TOTAL = 1.11 \* 10 000 = 11 100.00

TOTAL UTILISATION = 0.11110000 (kept to 0 decimal places)

RESOURCE ANALYSIS TOTAL : 0.11110000 \* 10 \* 10 000 = 11 110.00

Therefore the resource analysis total is more accurate than the bill summary or the trade totals display.

Page 1 Bill Of Quantities

BOQ PAGE 1 CLIENT'S PAGE

ITEM	OP CODE	DESCRIPTION	UNIT	BILLED QUANTITY	NETT RATE	NETT AMOUNT
	*A0000	SUBSTRUCTURE	LEVEL	0		
		Reinforcing				
		High Tensile Steel Bar Reinforcement in various diameters				
A	R1011	Walls	kg	120,000	1.82	218,400.00
B	R1012	Walls	Item	1	218,910.00	218,910.00
Page 1 total						437,310.00

### Rounding considerations

Be particularly careful with reinforcing items when considering rounding. Dividing by large numbers on a worksheet can create rounding errors. Note the labour component of Opcode R1011 has been rounded to zero.

R1011 Op Code worksheet Created: The 04/04/2005 Amended: The 04/04/2005

R1011 Walls 120,000.000 kg ?MacroQty  
 Stored: 04/04/05 Worksheet mode  
 RECALC WORKSHEETS  
**M=1.92 Rate=1.92**

5100	Rebar	1900.00Ton+1*waste/1000	=	1.92
=				1.92
Moving				
2111	Plant Operator	9.250/Hr/5000kg/hr	=	0.00
2112	Labour	5.500/Hr*4men/5000kg/hr	=	0.00
=				0.00

R1012 Op Code worksheet Created: The 04/04/2005 Amended: The 04/04/2005

R1012 Walls 1,000 Item ?MacroQty  
 Stored: 04/04/05 Worksheet mode  
 Rate: 04/04/05  
**L=750.00 M=218,160.00 Rate=218,910.00**

5100	Rebar	1800.00Ton+1*waste*120TONS	=	218,160.00
=				218,160.00
Moving				
2111	Plant Operator	9.250/Hr/5tons/hr*120tons	=	222.00
2112	Labour	5.500/Hr*4men/5tons/hr*120tons	=	528.00
=				750.00

Rounding errors are minimised by dividing by small numbers on a worksheet.

Trade Totals Display

Rounding Job 2

NETT TRADE TOTALS - Billed Quantity

TRADE DESCRIPTION	NETT AMOUNT	LABOUR	PLANT	MATERIAL	TEMP MATS.
B REINFORCING	437,310.00	750.00		436,560.00	
GRAND TOTAL in STERLING	437,310.00	750.00		436,560.00	

CCS Support  
 05/04/2005 11:46:15 RESOURCE ANALYSIS Cans

Based on Billed Quan  
 All Trades -

T CODE	RESOURCE NAME	UNIT	P CLASS	RATE	UTILISATION	AMOUNT
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SIMPLE RESOURCES						
L 2111	Plant Operator	/Hr		9.250	48.00	444.00
2112	Labour	/Hr		5.500	192.00	1 056.00
M 5100	Rebar	Ton		1 800.00	242.40	436 320.00
SIMPLE TOTALS						437 820.00
RESOURCE TOTALS						437 820.00

Note the resource analysis total is higher than the bill and trade totals display. The resource analysis total is more accurate and should be compared to the bill summary and trade totals. If the resource analysis total is greater than the bill summary total, then additional allowable or mark-up should be added to the job to compensate for rounding.