



CircleDeveloper
CALCULATIONS MANUAL
Version 3.0

Global Real Estate Solutions
for
Investment, Development and Budgeting

OFFICES IN: UK USA CANADA SOUTH AFRICA EAST ASIA ASIA PACIFIC

Circle Software Ltd. 2/6 Granard Business Centre Bunn Lane Mill Hill London NW7 2DQ
Telephone: Local 08456 440 440 International +44 (0) 20 8906 4059 Fax: +44 (0) 20 8959 6079
Email: info@circlesoftware.com Web: www.circlesoftware.com

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CHAPTER 1

Valuation

Valuation is the process of calculating the worth of an asset.

The value of a property investment generally relates to the income-generating capability of the property or completed development, i.e. its value to the investor is based on the annual rental income from tenants of the property.

Valuation

The capital value of an investment property is calculated by capitalising the net rental income stream from the property.

The yield, used to capitalise the rental income, reflects the return required by investors in the open market for a type of investment.

In simple terms, the **yield** is the income from an investment expressed as a proportion of the investment's capital value, or Capitalised Rent (CR).

$$\text{Yield (\%)} = \frac{\text{Net rental income}}{\text{Capital value}} \times 100$$

From this simple formula we can calculate the capital value of a property when the rent and yield are known.

Example

Assuming a property let at a net rental income of £1,500,000 pa and applying a yield of 8%, the valuation is:

$$8 = \frac{1500000}{CR} \times 100$$

So

$$CR = 1500000 \times \frac{100}{8}$$

$$CR = 1500000 \times 12.5 = 18750000$$

Therefore, the capital value (CR) of the property is £18,750,000.

This example valuation is displayed in the Summary screen of CircleDeveloper as follows:

Project	Definition	Cash Flow	Summary		
Appraisal Summary for Phase 1					
REVENUE					
Rental Area Summary					
Office Building	50,000	ft ²	Rate ft ²	£30.00	Gross MRV
					1,500,000
Investment Valuation					
Office Building					
Current Rent	1,500,000		YP @	8.0000%	12.5000
					18,750,000
GROSS DEVELOPMENT VALUE					
Purchaser's Costs			5.76%	(1,021,599)	18,750,000
NET DEVELOPMENT VALUE					
					<u>17,728,401</u>
NET REALISATION					
					17,728,401
OUTLAY					

So the basic formula for valuation is:

$$\text{Capitalised Rent} = \text{Net rental income} \times \text{Years Purchase}$$

The multiplier 12.5 (see the above example) is calculated from $\frac{100}{8}$ and is known as the **Years Purchase** or **YP**.

The YP in perpetuity is calculated as follows:

$$\text{YP in perp} = \frac{100}{y} \quad \text{where } y \text{ is the yield expressed as a percentage (in the above example, 8\%).}$$

This can also be expressed as follows:

$$\text{YP in perp} = \frac{1}{i} \quad \text{where } i \text{ is the yield (in the above example 0.08).}$$

The above formula may be used to calculate the capital value of simple, rack rented freehold investments (where the rent passing is equal to the market rent). However for more complex valuations which take account of, for example, future changes in income, the formula must be expanded (see "Hardcore Method" on page 5).

Net Rent

To value a property investment, any non-recoverable costs must be deducted from the gross annual rent to calculate the actual net rental income receivable by the investor, or the Net Operating Income. Such costs might include ground rent and other non-recoverable outgoings such as voids costs and non-recoverable service charge or insurance. The net rent is then capitalized to calculate the value of the investment.

In CircleDeveloper the net operating income is identified as the **Net Rent**, and is displayed in the Capitalised Rent form, as follows:

Detail		Gross Unit Area ft ²		Alternate Area	
Heading	Office Building A1 prelet		12,000		0
Unit Number		Gross Area ft ²	12,000	ITZA Area ft ²	0
Use Type	Offices	Net Unit Area ft ²	10,000	Gross:Net Ratio	83.33%
Number of Units	1	Net Area ft ²	10,000		<input type="checkbox"/> Locked

Construction Costs		Financial		Rent		Turnover Rent		Lease		Financial		Rent Capitalisation		Ground Lease	
Rate pf ²	80.00	MRV Rate pf ² pa	50.00	Lease		Head leasehold									
Cost/Unit	960,000	MRV/Unit pa	500,000	Term in Yrs		150									
Gross Cost	960,000	MRV (gross pa)	500,000	Sinking Fund		3.000%									
Stage	Construction	Rental Growth	Ignore	Tax on SF		33.000%									
Starts in	Feb 2007	Step Rent Profile	(None)	LH Gearing %		5.000%									
Distribution months	12	Start Rent (gross pa)	500,000	Fixed GR Deduction		500									
TI Rate pf ² (Letting)	0.00	% Non-recov. Cost	10.000%	Total GR Deduction		25,500									
TI % Rate (Letting)	0.000%	Fixed Non-recov. Cost	1,000												
TI Cost (Letting)	0	Total Non-recov. Cost	51,000												
		Ground Rent Deduction	25,500												
		Start Rent (net pa)	423,500												
		Rent Free Period (mths)	0												
		Lease Comm. Profile	(None)												

[Construction Cost Breakdown](#)
[Rent Additions/Costs](#)

Net rent

The basic formulae to calculate the Net Rent are as follows. This example assumes no rental growth.

$$\text{Net Rent} = \text{Annual Gross Rent} - (\text{Total Non Recov Cost} + \text{Total GR Deduction})$$

Where:

$$\text{Total Non Recov Cost} = (\% \text{ Non Recov Cost} \times \text{Annual Gross Rent}) + \text{Fixed Non Recov Cost}$$

$$\text{Total GR Deduction} = (\text{L/H Gearing \%} \times \text{Annual Gross Rent}) + \text{Fixed GR Deduction}$$

[Note: GR refers to ground rent.]

Example

A leasehold property, with ground rent calculated as 5% tenants' rents plus a fixed ground rent of £500 pa. The property is let at a gross rent of £500,000 pa, and there are non-recoverable outgoings of £1,000 pa and 10% rent passing.

Using the above example (also see variables input in the graphic above) the Net Rent is calculated as follows:

$$\text{Total Non Recov Cost} = (10\% \times 500000) + 1000 = 51000$$

$$\text{Total GR Deduction} = (5\% \times 500000) + 500 = 25500$$

Therefore:

$$\text{Net Rent} = 500000 - (51000 + 25500) = 423500$$

The Net Rent is £423,500 per annum.

Rental Growth

If rental growth is applied from the project start date, then the initial rent will include growth at the specified rate for the period from the project start date to the letting date. Ground rent and other deductions, where these are specified as a percentage of rent, are calculated on the inflated annual gross rent. Fixed deductions are not grown.

The formula to calculate rental growth is as follows:

$$R \times \left(1 + \frac{i}{100}\right)^{\frac{n}{12}}$$

Where:

R = Rent to be inflated

i = Annual rate of rental growth, as a percentage

n = Growth period in months

The net rent is then calculated as follows:

$$\text{Net Rent} = (\text{Annual Gross Rent} \times \text{Rental Growth}) - (\text{Total Non Recov Cost} + \text{Total GR Deduction})$$

where Total Non Recov. Cost and Total GR Deduction (where specified as a % rent) are calculated on the inflated annual gross rent.

Example

A leasehold property, with ground rent calculated as 5% tenants' rents plus a fixed ground rent of £500 pa. The property is let at a gross rent of £500,000 pa. There are non-recoverable outgoings of £1,000 pa and 10% rent passing.

Assuming that the building is let 24 months after the project start date and that rental growth of 3% per annum is applied from the project start date, the graphic below displays the resultant Net Rent.

The inflated Annual Gross Rent is the rent at which the building is assumed to let, taking into account rental growth (in this example at 3% pa) from the project start date to the letting date. It is important to note that deductions are calculated on the inflated Annual Gross Rent, so that the calculation of the Net Rent in the above example is as follows:

$$\text{Inflated Annual Gross Rent} = 500000 \times \left(1 + \frac{3}{100}\right)^{\frac{24}{12}} = 530450$$

Deductions from the inflated annual gross rent are then calculated as follows:

$$\text{Total Non Recov Cost} = (10\% \times 530450) + 1000 = 54045$$

$$\text{Total GR Deduction} = (5\% \times 530450) + 500 = 27022.5$$

So

$$\text{Net Rent} = 530450 - (54045 + 27022.5) = 449382.5$$

Rounding to the nearest whole number gives a Net Rent of £449,383 per annum.

i = Hardcore rate (yield)

n = Number of years from the valuation date to the reversion to market rent

Details of rents and yields are entered in CircleDeveloper in the Capitalised Rent form. Years Purchase and Present Value multipliers may be sourced from valuation tables.

Example

As an example, assuming a freehold property let at a net rent of £100,000 per annum, with a reversion to market rental value (MRV) of £115,000 per annum at the next rent review in four years' time, and adopting a hardcore rate (yield) of 8.00% (annually in arrears), the valuation is calculated as follows:

$$CR = \left[100000 \times \frac{1}{0.08} \right] + \left[15000 \times \frac{1}{0.08} \times (1 + 0.08)^{-4} \right]$$

$$CR = 1250000 + 137818 = 1387818$$

So the gross capital value of the property is £1,387,818.

This example valuation is displayed on the Summary page of CircleDeveloper as follows:

Project	Definition	Cash Flow	Summary		
Appraisal Summary for Phase 1					
£ £ £ £					
REVENUE					
Rental Area Summary					
	ft ²	Rate ft ²	Gross MRV	Adjustment	Net Income
Office Building C	5,000	£20.00	100,000	15,000	115,000
Investment Valuation					
Office Building C					
Current Rent	100,000	YP @	8.0000%	12,5000	1,250,000
Reversion	15,000	YP @	8.0000%	12,5000	
		PV 4yrs @	8.0000%	0.7350	137,818
					1,387,818

Voids and Rent Free Periods

The user may specify void and rent free periods in the Capitalised Rent form in CircleDeveloper.

Rent free periods may be applied at the start of the lease and on a renewal lease. A **void period** may be entered on lease expiry (or break) prior to reletting. In these cases, the valuation should reflect the lack of rental income during these periods.

The following formula is used to value rental income, allowing for a void and/or rent free period on lease expiry/break, followed by a reversion to market rent, following the hardcore method of valuation.

$$CR = [NI \times YP \text{ into perp}] - [NI \times YP_d \times \text{Present Value}] + [(NR - NI) \times YP \text{ into perp} \times \text{Present Value}]$$

$$CR = \left[NI \times \frac{1}{i} \right] - \left[NI \times \frac{1 - (1 + i)^{-d}}{i} \times (1 + i)^{-n} \right] + \left[(NR - NI) \times \frac{1}{i} \times (1 + i)^{-(n + d)} \right]$$

where:

CR = Gross capital value, or Capitalised Rent

NI = Net current rent per annum (net of any deductions and ground rent) i.e. Net Rent

NR = Net open market rental value (MRV) per annum (net of any deductions and ground rent)

YP_d = YP (single rate) for d years

- i = Hardcore rate (yield)
 n = Number of years from the valuation date to the start of the void or rent free period
 d = Total duration of the void and/or rent free period in years

Example

Assuming a rack rented property, let at £100,000 pa on a lease expiring in four years' time.

On lease expiry it is estimated that there will be a 6 month void, before the property is relet at the market rent of £115,000 per annum with an initial 3 month rent free period. There will therefore be a total period of 9 months during which the property will be non income-producing.

Adopting a yield of 8%, the valuation is as follows:

$$CR = \left[100000 \times \frac{1}{0.08} \right] - \left[100000 \times \frac{1 - (1 + 0.08)^{-0.75}}{0.08} \times (1 + 0.08)^{-4} \right] + \left[15000 \times \frac{1}{0.08} \times (1 + 0.08)^{-4.75} \right]$$

So

$$CR = 1250000 - 51532 + 130085 = 1328553$$

The gross capital value of the property is therefore £1,328,553.

This example valuation is displayed on the Summary page of CircleDeveloper as follows:

Project	Definition	Cash Flow	Summary				
Appraisal Summary for Phase 1				£	£	£	£
REVENUE							
Rental Area Summary							
	ft²	Rate ft²	Gross MRV	Adjustment	Net Income		
Office Building C	5,000	£20.00	100,000	15,000	115,000		
Investment Valuation							
Office Building C							
Current Rent	100,000	YP @	8.0000%	12.5000	1,250,000		
Re-Letting Void & Rent Free	(100,000)	YP 9mths @	8.0000%	0.7011	(51,532)		
		PV 4yrs @	8.0000%	0.7350			
Reversion	15,000	YP @	8.0000%	12.5000	130,088		
		PV 4yrs 9mths @	8.0000%	0.6938			
					1,328,557		

Years Purchase

Years Purchase multipliers may be sourced from Valuation Tables. Basic formulae to calculate the Years Purchase into perpetuity are set out below for both Annually in Arrears and Quarterly in Advance.

These formulae are single rate; for leasehold properties Years Purchase dual rate may be used to provide for leasehold sinking fund and tax.

YP Annually in Arrears

$$YP = \frac{1}{i}$$

YP Quarterly in Advance (Effective)

$$YP = \frac{1}{\left[4 \times \left(1 - (1 + r)^{-\frac{1}{4}} \right) \right]}$$

where r = yield (effective)

YP Quarterly in Advance (Nominal)

$$YP = \frac{1}{\left[4 \times \left(1 - (1 + r)^{-\frac{1}{4}} \right) \right]}$$

where:

$$r = \left(1 + \frac{i}{4} \right)^4 - 1$$

i = yield (nominal)

r = yield (effective)

Gross Development Value

The Gross Development Value is the sum of the following:

- Capitalised Rent: the capitalisation of net rental income before deduction of acquisition fees (from the Capitalised Rent form in CircleDeveloper);
- Gross sales receipts (from the Sales form in CircleDeveloper).

Project	Definition	Cash Flow	Summary				
Appraisal Summary for Phase 1				£	£	£	£
REVENUE							
Sales Valuation							
	ft ²	Rate ft ²	Gross Sales				
Two bed apartments	20,000	£250.00	5,000,000				
Rental Area Summary							
	ft ²	Rate ft ²	Gross MRV				
Office Building A prelet	100,000	£35.00	3,500,000				
Office Building B1	65,000	£35.00	2,275,000				
Totals	<u>165,000</u>		<u>5,775,000</u>				
Investment Valuation							
Office Building A prelet							
Current Rent	3,500,000	YP @	7.0000%	14.2857		50,000,000	
Office Building B1							
Current Rent	2,275,000	YP @	7.5000%	13.3333		30,333,333	
						80,333,333	
GROSS DEVELOPMENT VALUE						85,333,333	
Purchaser's Costs		5.76%	(4,376,985)				
NET DEVELOPMENT VALUE						<u>80,956,349</u>	

Net Development Value

The Net Development Value is calculated as the Gross Development Value less Purchaser's Costs.

$$NDV = GDV - A$$

where:

NDV = Net Development Value

GDV = Gross Development Value

A = Acquisition costs (also referred to as purchaser's costs - see below)

Purchaser's Costs

Purchaser's costs, or acquisition costs, are calculated on the price paid for an investment, i.e. on Capitalised Rent. These are generally not deducted from gross sales receipts (Sales), although the user may select this option (Apply to Direct Sales) in the Expenditure tab of the Assumptions for Calculation form.

Purchaser's costs comprise agents and legal fees, and other acquisition costs, totalled to give a single percentage figure.

Costs are generally residualised on the total Capitalised Rent and are calculated by the following formula:

$$A = CR - \left(\frac{CR}{1 + a} \right)$$

where

CR = Capitalised Rent

a = Purchaser's costs, expressed as a percentage

A = Purchaser's costs, expressed as an amount

In CircleDeveloper, in the Expenditure tab of the Assumptions for Calculation form, users may specify whether Purchaser's Costs are calculated on the Gross Development Value (i.e. Capitalised Rent before deduction of purchaser's costs) or Net Development Value. The above formula assumes Purchaser's Costs are calculated on the Net Development Value.

If the Gross Development Value is selected for calculation, the formula for calculating Purchaser's Costs on the Capitalised Rent is as follows:

$$A = CR \times a$$

In the Expenditure tab of the Assumptions for Calculation form, the user may also select whether Purchaser's Costs are to be deducted from revenue or added to costs.

Net Realisation

Net Realisation is the Net Development Value plus any rental income received from tenants during the project or phase where tenants' income stream has been enabled.

Gross Initial Yield

The sum of gross exit rents divided by the total Capitalised Rent (gross).

$$GIY = \left(\frac{GI}{CR} \right) \times 100$$

where:

GI = Total gross exit rent per annum (before deduction of non-recoverable costs and ground rent)

CR = Total Capitalised Rent (gross)

Net Initial Yield

The sum of exit rents, net of any deductions and ground rent, divided by the total Capitalised Rent (gross).

$$NIY = \left(\frac{NI}{CR} \right) \times 100$$

where:

NI = Total net exit rent per annum (net of deductions and ground rent)

CR = Total Capitalised Rent (gross)

Equivalent Yield (EY)

The equivalent yield is the discount rate applied to the income flow from a property or portfolio, expected during the life of the investment, so that the total income discounted at this rate equals the initial capital outlay, or capital value. The equivalent yield is growth implicit.

The equivalent yield is calculated by solving the following expression iteratively for the term “ r ”:

$$CR_t = \left(\frac{NI_{(t+1)}}{(1+r)^1} \right) + \left(\frac{NI_{(t+2)}}{(1+r)^2} \right) + \dots + \left(\frac{NI_{(t+(n-1))}}{(1+r)^{(n-1)}} \right) + \left(\frac{NR}{r(1+r)^n} \right)$$

where:

r = Equivalent yield

CR = Capitalised Rent

NI_t = Net annual rental income (net of deductions and ground rent) at a given date “ t ”

NR = Net market rental value (MRV) per annum (net of deductions and ground rent)

n = Number of years which must elapse from year t before all tenancies have been reviewed to full market rent

The display of the equivalent yield in CircleDeveloper varies depending on the Valuation Tables selected in the Receipts tab of the Assumptions for Calculation form:

If Annually in Arrears tables are selected then the **Nominal Equivalent Yield** is displayed, together with the **True Equivalent Yield** (Quarterly in Advance).

If Quarterly in Advance (Effective) tables are selected then the True Equivalent Yield is displayed and if Quarterly in Advance (Nominal) tables the Nominal Equivalent Yield is displayed.

Turnover Rents

Turnover rents are calculated based on Sales Volume or turnover.

Details of the anticipated Sales Volume per annum must be entered. A multiplier is then applied to the Sales Volume to calculate the Turnover Rent.

The Sales Volume may be defined as a fixed annual amount throughout the cash flow. Alternatively the user can apply escalation to the Sales Volume by applying a Rental Growth Set, and specify whether the Sales Volume grows during the income period or for the whole cash flow period.

There are three “Breakpoint Type” options available for the calculation of turnover rents.

Zero Breakpoint

When zero breakpoint is selected, the % Turnover multiplier is applied to the entire Sales Volume p.a. to calculate the rent payable. The rent payable will therefore rise and fall depending on turnover.

$$\text{Turnover rent pa} = \text{Sale Volume pa} \times \% \text{ Turnover}$$

Example

Assuming an Annual Sales Volume of £1,000,000 and % Turnover set at 7%, the Turnover Rent is calculated as follows:

$$\text{Turnover rent pa} = 1000000 \times 0.07 = 70000$$

Natural Breakpoint

This is used when the total rent payable comprises a core, or base, rent together with an additional turnover rent. In this case the rent payable will never fall below the base rent. For example, a lease may guarantee the landlord a percentage of total sales subject to a minimum core rent.

In order to calculate the “Natural Breakpoint”, the core rent is calculated as an equivalent value in terms of Sales Volume, by dividing the rent by the % Turnover. This equivalent value is the Natural Breakpoint.

$$\text{Natural Breakpoint} = \frac{\text{Base Rent}}{\% \text{ Turnover}}$$

Only Sales Volume in excess of this Natural Breakpoint is used for the calculation of Turnover Rent. So the Turnover Rent is calculated as follows:

$$\text{Turnover Rent pa} = (\text{Sales Volume} - \text{Natural Breakpoint}) \times \% \text{ Turnover}$$

The total rent payable is then calculated:

$$\text{Total rent payable pa} = \text{Base Rent} + \text{Turnover Rent}$$

Example:

Assuming Sales Volume pa of £1,000,000, Base rent of £10,000 pa and % Turnover of 8%, the calculation is:

$$\text{Natural Breakpoint} = \frac{10000}{0.08} = 125000$$

$$\text{Turnover Rent pa} = (1000000 - 125000) \times 0.08 = 70000$$

$$\text{Total rent payable pa} = 10000 + 70000 = 80000$$

Arbitrary Breakpoint

The Arbitrary Breakpoint may be entered as an amount per month per unit area (in sq ft or sq m) or as a total annual amount. Only Sales Volume in excess of the Arbitrary Breakpoint is used to calculate the Turnover Rent. So:

$$\text{Turnover Rent pa} = (\text{Sales Volume} - \text{Arbitrary Breakpoint}) \times \% \text{ Turnover}$$

Example:

Assuming a Sales Volume pa of £1,000,000, Rent £100,000 pa, Arbitrary Breakpoint set at £200,000 and % Turnover of 8%, the rent payable is calculated as follows:

$$\text{Turnover Rent pa} = (1000000 - 200000) \times 0.08 = 64000$$

$$\text{Total rent payable pa} = 100000 + 64000 = 164000$$

Hotel Valuation

In CircleDeveloper hotels may be valued by selecting the Use Type “Hotel” in the Capitalised Rent form.

Typically hotel valuation is based on room and occupancy rates, rather than floor area. Occupancy rates may vary throughout the year and the valuation should reflect this. A typical hotel valuation cannot, therefore, be undertaken using the straightforward “Area * Rent Rate * Yield” model as for other types of valuation. Hotel valuation requires several steps to be completed before capitalisation can take place.

To establish the rental value of a hotel, occupancy profiles must be defined for different room types within the hotel, specifying the average occupancy rate (as a percentage) for each month of the year. These occupancy rates are then multiplied by the room rate to calculate the total annual rental value for each room type. This is then multiplied by the total number of rooms to give a total MRV for the hotel.

The formula is as follows:

$$\text{MRV pa} = [\text{Daily room rate} \times \text{Occupancy rate} \times \text{No. days}] \times \text{Total no. rooms}$$

The total MRV for the hotel is then capitalised in the usual way (see “Valuation” on page 1).

Example

To use a simple example for illustrative purposes:

A hotel with 15 double rooms, all of which are available at a room rate of £50 per night.

Assuming average occupancy throughout the year of 80%, the MRV may be calculated as follows:

$$\text{MRV pa per room} = \text{Room Rate} \times \text{Occupancy Rate} \times \text{No. days}$$

$$\text{MRV pa per room} = 50 \times 0.8 \times 365 = 14600$$

Therefore the hotel MRV is calculated:

$$\text{Total MRV pa} = \text{MRV pa per room} \times \text{Total no. rooms}$$

$$\text{Total MRV pa} = 14600 \times 15 = 219000$$

This MRV per annum of £219,000 is then capitalised to produce a capital value for the hotel (see “Valuation” on page 1).

The above example would be entered in the Capitalised Rent form as follows:

Detail Heading: Hotel double rooms Unit Number: Use Type: Hotel Number of Rooms: 15		Gross Unit Area ft²: 0 Gross Area ft²: 0 Net Unit Area ft²: 0 Net Area ft²: 0		Alternate Area: 0 ITZA Area ft²: 0 Gross:Net Ratio: 100.00% <input type="checkbox"/> Locked	
Construction Costs Financial Rate pf²: 0.00 Cost/Unit: 0 Gross Cost: 0 Stage: Construction Starts in: Feb 2007 Distribution months: 12 TI Rate pf² (Letting): 0.00 TI % Rate (Letting): 0.000% TI Cost (Letting): 0		Hotel Lease Financial Room Rate (daily): 50.00 Occupancy Profile: 80% Occupanc Room Rate (annual): 14,600 Gross Rent: 219,000 Rental Growth: Ignore % Non-recov. Cost: 0.000% Fixed Non-recov. Cost: 0 Total Non-recov. Cost: 0 Total GR Deduction: 0 Valuation Rent: 219,000 Rent Free Period (mths): 0		Rent Capitalisation Tenure: Freehold Gross Rent at Sale: 219,000 Total Non-recov. Cost: 0 Ground Rent Deduction: 0 Turnover Rent: 0 Net Rent at Sale: 219,000 Yield%: 10.0000% YP: 10.0000 Capital Value: 2,190,000 Manual Capital Value: 0 Stage: Sale Capitalised At: Feb 2010 Distribution months: 1	

Occupancy Profiles

More complex occupancy profiles can be created, specifying different average occupancy rates for each month of the year.

Profile Name	Jan	Feb	Mar	Apr	May	Jun	Jul
1 80% Occupancy	80.00%	80.00%	80.00%	80.00%	80.00%	80.00%	80.00%
2 Variable occupancy profile 1	65.00%	70.00%	70.00%	80.00%	90.00%	90.00%	95.00%

The MRV pa per room is then calculated by multiplying each month’s occupancy rate by the number of days in that month and totalling these for the whole year. The room rate is multiplied by the resultant figure.

This can be represented as follows:

$$\text{MRV pa per room} = \text{Room rate} \times [(OR_1 \times D_1) + (OR_2 \times D_2) + (\dots) + (OR_{12} \times D_{12})]$$

Where:

$$OR_1 = \text{Occupancy rate in month 1}$$

$$D_1 = \text{Number of days in month 1}$$

CHAPTER 2

Stamp Duty

Stamp Duty, or Property Transfer Tax, is the tax payable by the purchaser when acquiring land or property, generally calculated as a percentage of the purchase price. In CircleDeveloper, this is calculated on the Land Acquisition Price.

Stamp Duty can be entered as a single percentage rate or amount in the Stamp Duty field in Definition or, when the tax is calculated at different %s based on stepped thresholds, a tax profile can be created using the **Stamp Duty Schemes** form in **File | Administration**.

Bands are defined by specifying lower and upper band limits and the percentage tax rate applicable to each band. The calculation of tax may also be as cumulative or non-cumulative, and fixed amounts can be manually specified for each band if required.

Cumulative Bands

In some countries, Stamp Duty, or transfer tax, is calculated as a continual accumulation from one band to the next (as opposed to a single percentage applied to the total value). In this case the tax bands are **cumulative**, with differing rates applied to different tranches of the purchase price. These are totalled to calculate the total tax payment.

For example, purchase tax on a 1,000,000 acquisition, based on the Stamp Duty Scheme set out below, would be calculated as follows:

Cumulative Stamp Duty Scheme:

Lower Limit	Upper Limit	Percentage
0	55,000	0.50%
55,001	250,000	1.00%
250,001	(No limit)	1.50%

Tax calculation:

55,000 @ 0.5%	275
195,000 @ 1.0%	1,950
<u>750,000 @ 1.5%</u>	<u>11,250</u>
1,000,000	13,475

So the Stamp Duty payable would be 13,475.

Non-Cumulative Bands

When bands are non-cumulative, tax is calculated on the whole purchase price at the single % rate applicable to the band within which the total purchase price falls.

For example, stamp duty on a 450,000 acquisition, based on the Stamp Duty Scheme set out below, would be calculated as follows:

Non-Cumulative Stamp Duty Scheme:

Lower Limit	Upper Limit	Percentage
0	125,000	0.00%
125,001	250,000	1.00%
250,001	500,000	3.00%
500,001	(No limit)	4.00%

Tax is calculated on the whole purchase price at 3.00%, since the property purchase price of 450,000 falls within the band 250,001-500,000.

So the Stamp Duty payable is:

$$450,000 * 3.00\% = 13,500$$

CHAPTER 3

Cash Flow

Internal Rate of Return and Net Present Value

The Internal Rate of Return (IRR) is the discount rate which, when applied to each positive and negative amount in the cash flow, results in a figure (called the Net Present Value or NPV) equal to zero. The IRR represents the return to an investor of the performance of his money, in terms of expenditure on purchase, construction costs and fees, rental income and the sales receipt at the end of the project.

The cash flow in CircleDeveloper follows the standard formulae for computation of the Internal Rate of Return and Net Present Value. Basically, this is the sum of discounted successive positive and negative amounts.

The standard formula applied in the mathematics is:

$$V_0 = \left(\frac{R_{x1}}{1+a} \right) + \left(\frac{R_{x2}}{(1+a)^{x2}} \right) + \dots + \left(\frac{R_{x(n-1)}}{(1+a)^{x(n-1)}} \right) + \left(\frac{R_{xn} + V_{xn}}{(1+a)^{xn}} \right)$$

where:

V_0 = Initial value, or Acquisition Price, as a manual figure or residual through iteration mathematics.

a = Discount rate

n = Number of periods

x = Measure standard for the period (i.e. monthly)

R = Net Income after operating costs and ground rent

V_{xn} = Valuation net of associated costs

The Cash Flow works through for each period resulting in the accumulation by:

$$V_0 = \sum_{i=1}^{xn} \frac{R_i}{(1+a)^i} + \frac{V_{xn}}{(1+a)^{xn}}$$

where:

R_i = Recurring periodic net revenue

The practical effects of x and n are illustrated below.

The standard principles for discounting are applied so that the NET PRESENT VALUE is ZERO.

The program finds the IRR by iterating (*produces multiple calculated guess rates*) over the time based series of costs and revenues in the cash flow spreadsheet until the difference between the sum of the discounted receipts and the sum of the discounted costs is zero.

An Initial IRR guess rate must be entered in the Calculation tab in Assumptions for Calculation.

Monthly Discounting

CircleDeveloper calculates the IRR based on monthly discounting where all future figures are assumed to be timed at the start of each month. The aggregate figure for each month is discounted from the first of the month. Therefore, total expenditure in, say, month 4 of the cash flow is discounted from the 1st day of the 4th month back to the project start date.

Example

Total expenditure in month 4 of £100,000 discounted at 12% (PV of £1 for 4 months).

To be precise, it is discounted by the number of days from the first of the (4th) month back to the project start date.

The formula used is as follows:

$$(1 + i)^n$$

where i = IRR and n is the fractional number of days $(122 / 365)=0.3342$

$$(1 + 0.12)^{0.3342} = 1.03860$$

So the calculation is:

£100,000 divided by 1.03860

= **£96,283**

Manual Discount Rate for Present Value

In CircleDeveloper the user may specify a manual discount rate for the calculation of the Present Value of the project.

This is entered in the Calculation tab in Assumptions for Calculation. CircleDeveloper will then calculate the Present Value based on this manually entered discount rate. If this option is selected, the Present Value and discount rate are displayed in the Performance Measures section of the Summary report.

IRR Scenarios

The IRR calculation relies on the dates for the occurrence of each positive and negative amount in the cash flow.

The default setting for the calculation of the IRR for any selected phase in CircleDeveloper takes into account all inflows and outflows from the cash flow from phase start date to phase end date. In a multi-phase project where all phases are linked, the IRR is calculated for the linked phase project from project start to project end date. In addition separate IRRs are calculated for each individual phase reflecting the cash flow start and end dates for each phase.

The IRR scenario form allows you to specify different start and end dates for the calculation of the IRR within the project/phase timescale.

Scenario Name	Start Timing	End Timing	IRR
IRR	Project Start	Project End	13.6663%
IRR Construction to end	Construction	Project End	14.3806%
IRR Letting to end	Letting	Project End	17.4916%

The IRRs and IRR dates are displayed on the Summary page (see graphic below) when these options are selected on the Summary tab of the Options form in the Tools menu.

TOTAL COSTS		32,250,654
PROFIT		7,291,839
Performance Measures		
Profit on Cost%		22.61%
Profit on GDV%		19.75%
Profit on NDV%		19.75%
Development Yield% (on Rent)		3.60%
Equivalent Yield% (Nominal)		8.78%
Equivalent Yield% (True)		9.29%
Gross Initial Yield%		5.60%
Net Initial Yield%		5.60%
IRR	Jul 2006 to Feb 2009	13.67%
IRR Construction to end	Sep 2006 to Feb 2009	14.38%
IRR Letting to end	Feb 2007 to Feb 2009	17.49%
Rent Cover		6 yrs 3 mths
Profit Erosion (finance rate 5.000%)		4 yrs 1 mth

Interest in IRR Calculations

When finance is applied to a project the user may specify whether the calculation of the IRR takes account of interest payments. This option is set in the Finance tab of the Assumptions for Calculation form.

Inflation and Rental Growth

Inflation and rental growth are calculated period by period from the start of the project or phase, and can be applied in advance or in arrears, by selecting the required setting in the Finance tab of Assumptions for Calculation.

The formula for applying growth (rental growth and cost inflation) to an amount is:

$$C \times \left(1 + \frac{i}{100}\right)^{\frac{n}{12}}$$

Where:

C = Amount to be inflated

i = Annual rate of growth/inflation

n = Growth period in months from project/phase start

For example, assume a cost of £1,000,000 payable monthly from the project start over a period of 4 months, with inflation at 3% per annum. The inflated cost is calculated as follows:

Total cost 1,000,000 Inflation 3.00%
Dist. mths 4

Month	Cost	In Arrears		In Advance	
		Inflation factor	Inflated cost	Inflation factor	Inflated cost
1	250,000	1.0000	250,000	1.0025	250,617
2	250,000	1.0025	250,617	1.0049	251,235
3	250,000	1.0049	251,235	1.0074	251,854
4	250,000	1.0074	251,854	1.0099	252,475

The screenshot shows the 'Data Distribution' software interface. The window title is 'Data Distribution'. Below the title bar are menu options: View, Graph, Editor, Cycle, Help. There are several icons for file operations. The 'Heading' field contains '4 Con. - [Construct.]'. The 'Type' field contains 'Area-based Amount'. Below this, there are two tabs: 'Graph' and 'Editor'. The 'Editor' tab is active, showing a table with columns for 'Period' and months from '0:Jan 2007' to '6:Jul 2007'. A double-headed arrow labeled 'Historic' spans from '0:Jan 2007' to '1:Feb 2007'. A double-headed arrow labeled 'Construction' spans from '1:Feb 2007' to '6:Jul 2007'. The table has three rows: '% of Total', 'Amount', and 'Inflated'. The values for 'Amount' and 'Inflated' are shown in parentheses, indicating negative values.

Period	0:Jan 2007	1:Feb 2007	2:Mar 2007	3:Apr 2007	4:May 2007	5:Jun 2007	6:Jul 2007
% of Total	0	25.000	25.000	25.000	25.000	0	0
Amount	0	(250,000)	(250,000)	(250,000)	(250,000)	0	0
Inflated	0	(250,000)	(250,617)	(251,235)	(251,854)	0	0

Inflation in arrears

CHAPTER 4

Finance

There are two financing methods available in CircleDeveloper:

- Basic (interest sets)
- Structured Finance

The financing method is selected in the Finance tab of Assumptions for Calculation.

Basic Finance (Interest Sets)

When the Basic (Interest Sets) financing method is selected, interest is calculated on the net total amount in each period, which is detailed in the **Period Total for Interest** row of the Finance Cash Flow (see graphic below).

Where the net period total is negative, i.e. an outflow, then the debit rate is applied; where the net period total is positive (an inflow) the credit rate is applied.

		0	1	2	3	4	5	6	7
		Jun 2006	Jul 2006	Aug 2006	Sep 2006	Oct 2006	Nov 2006	Dec 2006	Jan 2007
		0	0	(9,330,461)	(9,384,889)	(8,041,567)	(8,088,476)	(9,233,584)	(11,366,253)
Row Heading	TOTALS	← Historic →	← Pre-Construction →			← Construction →			
Acquisition Costs									
Residualised Price	(7,550,786)	0	(7,550,786)	0	0	0	0	0	0
Stamp Duty	(151,016)	0	(151,016)	0	0	0	0	0	0
Agent Fee	(151,016)	0	(151,016)	0	0	0	0	0	0
Legal Fee	(40,000)	0	(40,000)	0	0	0	0	0	0
Other	(22,500)	0	(22,500)	0	0	0	0	0	0
Town Planning	(5,200)	0	(5,200)	0	0	0	0	0	0
Total VAT paid	0	(1,389,643)	0	0	0	(163,562)	(334,193)	(354,109)	0
VAT recovered on cycle date	0	0	0	1,389,643	0	0	163,562	0	0
Net period total	0	(9,330,461)	0	1,389,643	0	(1,098,199)	(2,080,307)	(2,377,586)	(1,411,513)
Period Total for Interest	0	0	(9,330,461)	(7,940,818)	(8,041,567)	(8,041,567)	(8,976,205)	(11,366,253)	(13,811,142)
Land Servicing Inflation. Rate pa = 0.00% var.		0.00	0.00	0.00	0.00	0.00	5.00	5.00	5.00
Interest Set 1. Debit Rate pa = 7.00%		7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Interest Set 1. Credit Rate pa = 0.00%		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total for Interest Set 1	0	0	(54,428)	(46,321)	(46,909)	(46,909)	(52,361)	(66,303)	0
Total Interest (All Sets)	0	0	(54,428)	(46,321)	(46,909)	(46,909)	(52,361)	(66,303)	0
Period Total For IRR	0	(9,330,461)	(54,428)	1,343,322	(46,909)	(1,145,108)	(2,132,668)	(2,443,889)	(1,411,513)
Cumulative Total CF	0	(9,330,461)	(9,384,889)	(8,041,567)	(8,088,476)	(9,233,584)	(11,366,253)	(13,811,142)	(15,222,655)

Interest Rate Type

Nominal and Effective Rates

The interest rate type to be used in CircleDeveloper may be set in the Finance tab of the Assumptions for Calculation form.

An **Effective** rate, or APR, is the final rate achieved at the end of the year including compounding.

This is calculated as follows:

$$\left(1 + \frac{i}{p}\right)^p - 1$$

where:

i = Nominal annual rate of interest (%)

p = Number of compounding periods per year

For example, an interest rate of 10% per annum compounded quarterly would produce:

$$\left(1 + \frac{0.1}{4}\right)^4 - 1 = 0.1038 \text{ i.e. } 10.38\% \text{ Effective rate}$$

A **Nominal** rate is the 10% which produces the 10.38% effective rate above.

Debit and Credit Rates

The **debit** rate is the rate of interest charged by the lender on the loan amount and represents an outflow from the cash flow. The **credit** rate is the rate at which interest is earned when the finance arrangement is in credit. It represents an inflow of money to the cash flow.

Interest Calculation

Interest is calculated on a monthly basis on the Period Total for Interest row in the Finance Cash flow in CircleDeveloper. The basic formulae are as follows:

Nominal Rates of Interest

$$C \times \left[\left(1 + i\right)^{\frac{1}{p}} - 1 \right] \times \frac{1}{\left(\frac{12}{p}\right)}$$

where

C = Total monthly cost

i = Annual rate of interest (%)

p = Number of compounding periods per year

Effective Rates of Interest

$$C \times \left[\left(\frac{i}{p}\right) \times \frac{1}{\left(\frac{12}{p}\right)} \right]$$

where

C = Total monthly cost

i = Annual rate of interest (%)

p = Number of compounding periods per year

Breakdown of Interest

It should be noted that the breakdown of interest is provided for information purposes only. It is not used when calculating the total interest charge. The breakdown is approximate only due to the way

in which additional revenues and other income are used to offset the Building Interest charges. Interest is reported as follows:

Land Interest

This is the total amount of interest attributable to the land costs from the start of the phase to the beginning of the Letting Void period.

Building Interest

This is the total amount of interest attributable to everything other than land costs. This includes any income from Additional Revenues and Capitalisation. The interest is accrued from the beginning of the phase to the start of the Letting Void period.

Void Interest

This is the interest attributable to all costs from the start of the Letting Void to the end of the Letting Void period.

Other Interest

This is the interest attributable to all costs from the end of the Letting Void period to the end of the phase. Interest is shown in several circumstances:

- If a phase is part of a linked multi-phased scheme and does not realise a profit - interest accrues on outstanding costs if the phase length is shorter than the project length.
- If a phase is part of a linked multi-phased scheme and realises a profit - interest accrues on the profit amount if the phase length is shorter than the project length. A Credit Interest rate must be entered for this to happen.
- If a phase has a duration entered for the stage after the Letting Void. If the phase realises a profit and a Credit Interest rate has been entered, interest is earned on the profit amount.

Structured Finance

When Structured Finance is selected, users can set up multiple equity partners, interim loans during construction (as debt sources of finance) and mortgages to look at financing scenarios for projects.

Heading	Total	1 Jul 2006	2 Aug 2006	3 Sep 2006	4 Oct 2006	5 Nov 2006	6 Dec 2006	7 Jan 2007	8 Feb 2007
± Finance : Project Cash Flow Pre-FinIRR: 26.52%									
± Finance : Developer IRR: 101.04% ROE: 239.81% Profit Amount: £3,681,567									
± Finance : Equity Partner IRR: 50.87% ROE: 93.10% Profit Amount: £3,781,567									
± Finance : Construction Lender IRR: 0.00% Profit Amount: £0									
Timed Contribution: Project	0	0	0	0	0	0	0	0	0
Auto. Project Contribution	(21,654,058)	(5,387,908)	0	(998,718)	(846,795)	(2,113,596)	(3,275,616)	(3,411,220)	(2,532,465)
Total Contribution	(21,654,058)	(5,387,908)	0	(998,718)	(846,795)	(2,113,596)	(3,275,616)	(3,411,220)	(2,532,465)
Fixed Amount Loan Fees	(30,000)	(30,000)	0	0	0	0	0	0	0
% Loan Fees	(261,586)	(261,586)	0	0	0	0	0	0	0
Total Loan Fees	(291,586)	(291,586)	0	0	0	0	0	0	0
Interest and Fees	(4,796,098)	(291,586)	(53,879)	(54,418)	(64,949)	(74,067)	(95,943)	(129,659)	(165,068)
Timed Repayment: Project	0	0	0	0	0	0	0	0	0
Auto. Repayment	26,450,156	0	0	0	0	0	0	0	0
Total Repayment	26,450,156	0	0	0	0	0	0	0	0
Closing Balance		(5,679,493)	(5,733,372)	(6,786,508)	(7,698,252)	(9,885,914)	(13,257,473)	(16,798,352)	(19,495,885)
Timed Profit Participation	0	0	0	0	0	0	0	0	0
Auto. Profit Participation	0	0	0	0	0	0	0	0	0
Total Profit Participation	0	0	0	0	0	0	0	0	0

For further information on setting up, and options for, Structured Finance please see the CircleDeveloper Reference Manual.

Finance Fees

Finance fees may be defined either as fixed amount fees or calculated as a related %. Finance fees calculated as a related amount may be linked to:

- Drawn Amount. The fee is calculated as a percentage of the amount contributed.
- Fixed Loan Amount. The fee is calculated as a percentage of a fixed amount specified by the user.
- Undrawn Amount. The fee is calculated as a percentage of the difference between the amount committed at the start and the amount actually contributed in any period.

The Finance Fee tab of the Finance form also presents the user with options to specify when fees are first charged and the charging period.

For fees calculated as a percentage of the Undrawn Amount, the user may specify whether this is charged if the loan remains undrawn at the end of the project financing.

Mortgage

A mortgage loan can be applied when Structured Finance is used to calculate the financing of a project appraisal. CircleDeveloper calculates interest and principal (capital repayments), amortising down to zero for the specified amortisation period.

The total monthly payment (DS) to the mortgage lender (principal plus interest) is calculated as follows:

$$\frac{(1+f)^N \times f}{(1+f)^N - 1} \times L$$

where

- L Loan amount
 N Mortgage loan term, or amortisation period, in months
 f interest factor, calculated from the formula below:

$$f = \left(1 + \frac{i}{p}\right)^{\frac{1}{n}} - 1$$

where:

- i interest rate
 n Compounding period (see table below)
 p Dividing factor for each compounding period option (see table below)

For example:

	Compound Period (months) (n)	Dividing Factor (p)
Monthly	1	12
Quarterly	3	4
Six Monthly	6	2
Annually	12	1

This total monthly mortgage payment amount (DS) comprises principal and interest.

The interest payment each period is calculated as follows:

$$\text{Outstanding loan balance} \times f$$

where f is the interest factor, calculated as set out above.

The principal may then be calculated as the total mortgage payment less this interest payment.

Debt Service Ratio

The ratio of net operating income to annual mortgage repayment.

$$\frac{\text{Net Operating Income}}{\text{Annual mortgage repayment}}$$

A ratio of 1.0 indicates a break even situation where the net operating income is just enough to cover mortgage payments. A higher ratio indicates that the income from the project is more than sufficient to service the debt.

CHAPTER 5

Performance Measures

Performance measures are used to assess the return from a project, to analyse the degree of risk associated with a project and to compare returns from different projects. These measures are displayed on the Summary page in CircleDeveloper, and can also be viewed in the Results Bar.

The Performance Measures calculated in CircleDeveloper are summarised below, with the exception of the Internal Rate of Return (IRR) which is detailed in Chapter 3 'Internal Rate of Return and Net Present Value' on page 17, and the Equivalent Yield, Gross Initial Yield and Net Initial Yield which are detailed in Chapter 1 on page 10.

For a project to be financially viable and attractive to a developer, the developer will seek a margin for risk and profit. This will vary according to the scheme proposed and the state of the market. A developer's target profit margin is generally expressed as a yield calculated in terms of either total costs or total capital value (gross or net development value), as shown below.

Profit on Cost%

Profit on Cost is the Profit expressed as a percentage of Total Costs (including interest).

$$\frac{\text{Profit}}{\text{Total Costs}}$$

Profit on GDV%

The Profit expressed as a percentage of the Gross Development Value. The Gross Development Value is the sum of Total Sales and Capitalised Rent.

$$\frac{\text{Profit}}{\text{Gross Development Value}}$$

Profit on NDV%

The Profit expressed as a percentage of the Net Development Value. The Net Development Value is the sum of Total Sales and Capitalised Rent, less purchaser's costs.

$$\frac{\text{Profit}}{\text{Net Development Value}}$$

Development Yield

The Development Yield reflects the investment yield plus the annual return to cover risk and profit, and is used to assess a scheme's viability.

Users may specify on the Calculation tab in Assumptions for Calculation whether the Development Yield is calculated using the Rent or MRV at the Sale Date.

The Development Yield is then calculated as the exit Rent or MRV per annum, inclusive of rental growth if applied, expressed as a percentage of Total Costs (including interest).

$$\frac{\text{Rent or MRV}}{\text{Total Costs}}$$

In CircleDeveloper the user may also specify whether the calculation of the Development Yield is to be net of non recoverable costs, ground rent and rent additions/costs, in the Calculation tab of the Assumptions for Calculation form. The user may also select whether to include tenants with no capital value.

It should be noted that the development yield will be distorted where there is residential accommodation, for example, which is to be sold to owner occupiers which will not, therefore, be income-producing. This accommodation contributes to total costs but not rental value. A possible solution to this problem would be to create separate phases for the part of the development which is to be sold to owner occupiers and the part which is to be let and income-producing and to apportion the land cost between these two phases.

Profit Erosion

The period, in years, in which the profit would be wholly eroded by interest charges if the letting or sale were not to take place.

For any project which fails to let, the developer's profit will be eroded by the shortfall in rental income, following completion of the project, and by accumulating interest on the total development costs until either the development is fully let or the profit is wiped out. Profit Erosion is the time it will take to erode all of the developer's profit in this way.

This enables the developer to assess the impact of potential letting risk on his profit margin.

In CircleDeveloper the user may specify a manual finance rate for the calculation of Profit Erosion in the Calculation tab of the Assumptions for Calculation form.

The calculation of Profit Erosion (expressed in years) is as follows:

$$\text{Profit Erosion} = r1/r2/d$$

where:

$$r1 = \text{Ln} \left[1 + \frac{\text{Total Profit}}{-(\text{Total Costs})} \right]$$

$$r2 = \text{Ln} \left[1 + \frac{i/100}{d} \right]$$

where:

Total Costs= Total project or phase costs, excluding interest

Ln = Log to base_e i.e. natural logarithm

i = Interest rate or Manual finance rate for calculation of Profit Erosion if specified

d = Dividing factor for each compounding period option (see table below)

For example:

	Compound Period (months)	Dividing Factor
Monthly	1	12
Quarterly	3	4

	Compound Period (months)	Dividing Factor
Six Monthly	6	2
Annually	12	1

Rent Cover

The period in years during which a building, if let, will realise a profit.

Users may specify on the Calculation tab in Assumptions for Calculation whether Rent Cover is calculated using the Rent or MRV at the Sale Date.

Rent Cover is the Profit expressed as a percentage of the exit Rent or MRV (including rental growth).

$$\frac{\text{Profit}}{\text{Rent or MRV}}$$

This may be used when, for example, the developer guarantees the rent from the end of any letting void period allowed for in the appraisal until the scheme is income-producing, as part of a funding arrangement. Rent Cover enables the developer to assess the period within which the building must be let in order to realise a profit.

As for the development yield calculation, the user may specify whether the calculation of Rent Cover is to be net of non recoverable costs, ground rent and rent additions/costs, in the Calculation tab of the Assumptions for Calculation form. The user may also select whether to include tenants with no capital value.

Cost per gross sq ft/sq m

The total project or phase cost (including interest) expressed as an amount per gross floor area, in sq ft or sq m. This may be displayed in the Results Bar.

$$\frac{\text{Total Costs}}{\text{Gross floor area}}$$

Cost per net sq ft/sq m

The total project or phase cost (including interest) expressed as an amount per net floor area, in sq ft or sq m. This may be displayed in the Results Bar.

$$\frac{\text{Total Costs}}{\text{Net floor area}}$$

Plot Ratio

This is a measure of the density of development on the site and is calculated by the total gross floor area expressed as a proportion of the total site area. This may be displayed in the Results Bar.

$$\frac{\text{Total Gross Floor Area}}{\text{Total site area}}$$

Cap Rent per net sq ft/sq m

The Capital Value, or capitalised rent, expressed as an amount per net floor area, in sq ft or sq m. This may be displayed in the Results Bar.

$$\frac{\text{Capital Value}}{\text{Net floor area}}$$

Return on Equity (ROE)

This is a measure of the return on capital invested in a project to an individual source, when Structured Finance is applied.

$$\frac{\text{Source profit share}}{\text{Source Total contribution} + \text{Interest paid}}$$

Pre Finance IRR

This is the Internal Rate of Return calculated on the project cashflow before finance i.e. excluding interest and finance fees.

For further information on the IRR calculation please see “Internal Rate of Return and Net Present Value” on page 17.

Equity IRR

This is the overall Internal Rate of Return for all equity funding sources in a project, when Structured Finance is applied. This is calculated from the combined net cashflow for all Equity funding sources.

For further information on the IRR calculation please see “Internal Rate of Return and Net Present Value” on page 17.

CHAPTER 6

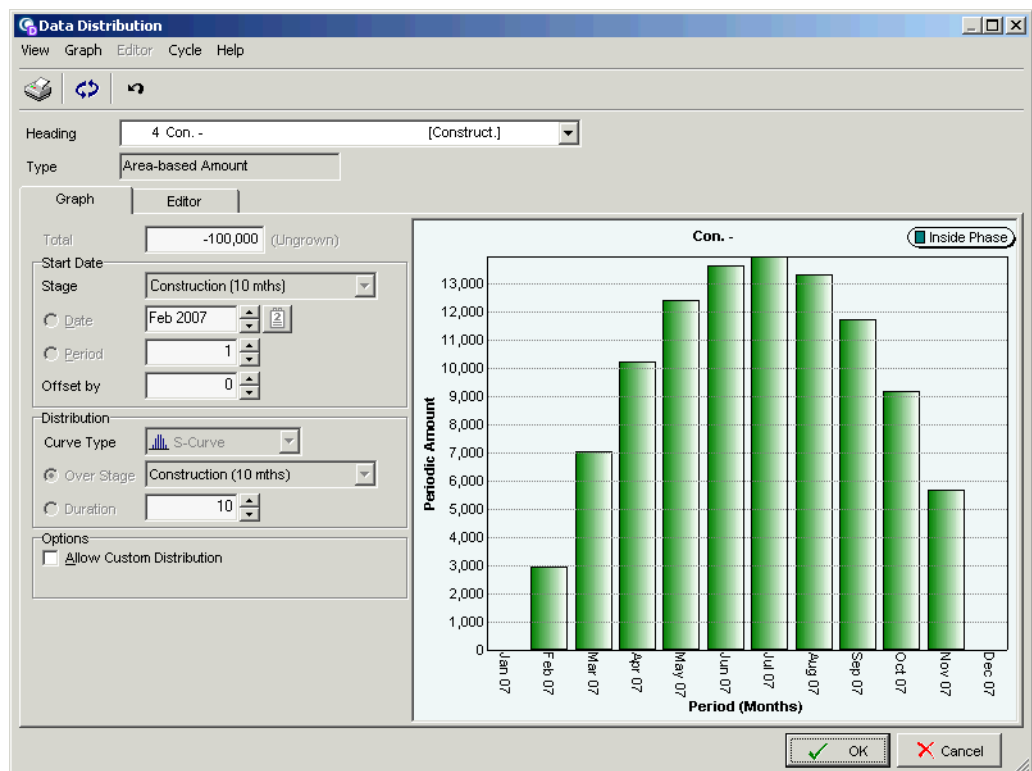
Distribution

CircleDeveloper provides pre-defined curve types for distributing cost and revenue items in the cash flow over the timescale of the project. The S Curve and Weighted Curve types are detailed below.

S Curve

S Curve distribution is typically used to spread construction and associated costs over a project contract period. The curve imitates the actual spend pattern in a typical building contract.

The S Curve shows a slow initial spend rate, rising to a peak after the mid point of the construction period and then falling in the period to completion. The resultant cumulative spend curve broadly follows an “S” shape, hence the name of this distribution type.



The formula for the standard construction distribution curve, the “S Curve”, is as follows:

Starting with:

Old Val = 0

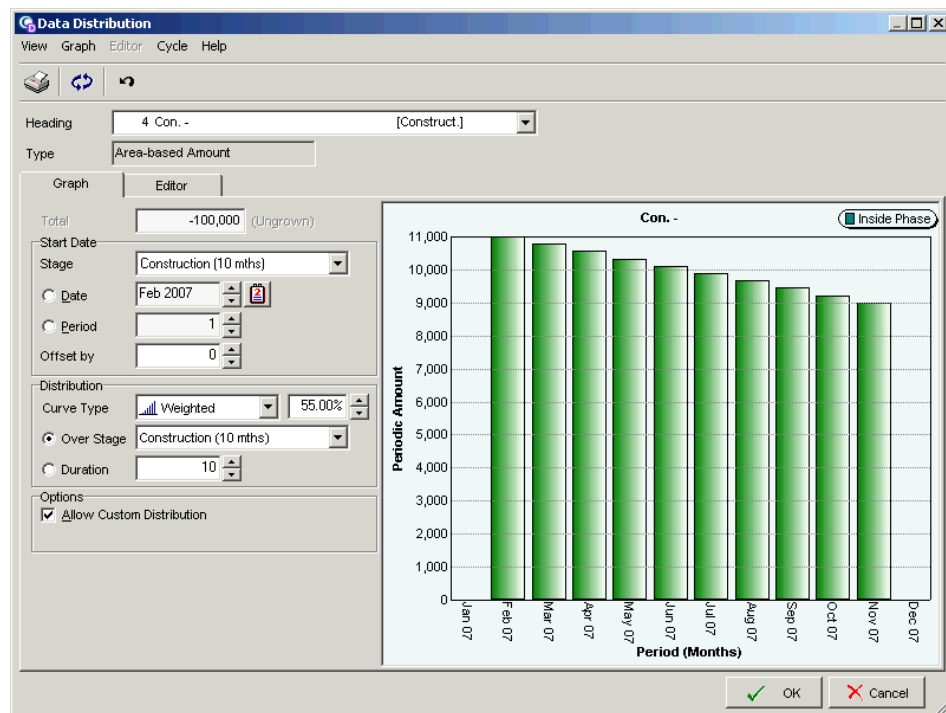
Then loop through each period with the following equations:

$$CM = \frac{\text{Period Number}}{\text{Number of Periods}}$$

Weighted Curve

Weighted curve distribution apportions the total item cost over a period based upon the % weighting specified.

Weighting at 50% distributes the cost item in even amounts across the specified period. Weighting of greater than 50% produces a “front weighted” distribution where the spend rate falls as the project progresses, whereas weighting of less than 50% produces an “end loaded” distribution with the spend rate increasing during the project.



The formula for the weighted curve is as follows:

$$\text{BaseValue} = \frac{\text{Weighting} \times \text{Total Cost}}{\text{Number of Periods}} \times 0.02$$

$$\text{Increment} = \left[\frac{100 - (\text{Weighting} \times 2)}{\text{Number of Periods} - 1} \right] \times \left[\frac{\text{Total Cost}}{\text{Number of Periods}} \times 0.02 \right]$$

Starting with:

$$\text{Period} = 0$$

Then loop through each period with the following equations:

$$\text{Period Value} = \text{Base Value} + \text{Period} \times \text{Increment}$$

$$\text{Period} = \text{Period} + 1$$

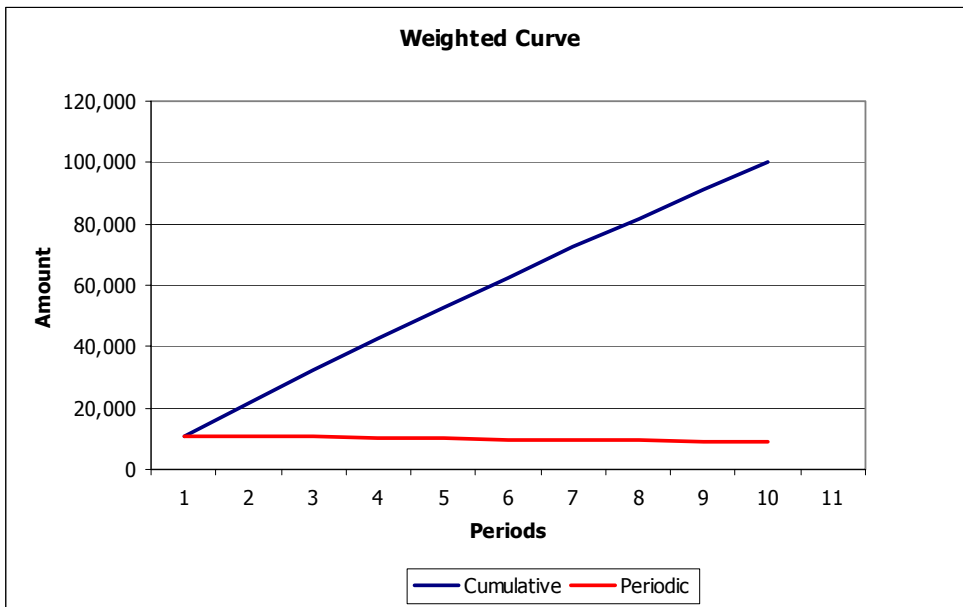
Example

This can be illustrated by the following example, assuming a total cost of £100,000 to be distributed over 10 periods:

		Period	Period Value	Cumulative
Total Cost	100,000	1	11,000	11,000
NumPeriods	10	2	10,778	21,778
Weighting (%)	55	3	10,556	32,333
		4	10,333	42,667
Base Value	11,000	5	10,111	52,778
PeriodIncrement	-222.2222	6	9,889	62,667
		7	9,667	72,333
		8	9,444	81,778
		9	9,222	91,000
		10	9,000	100,000

Total Weighted Curve Amount 100,000

These values can be displayed graphically as follows:



CHAPTER 7

Contact details

Find us on the Web: <http://www.circlesoftware.com>

UK contact details:

Circle Software Ltd,
2/6 Granard Business Centre,
Bunns Lane,
Mill Hill,
London NW7 2DQ,
UNITED KINGDOM

Tel : +44 (0)20 8906 4059 or 0845 6440 400

Fax: +44 (0)20 8959 6079

Support email: support@circlesoftware.com

Info email: infouk@circlesoftware.com

US contact details:

Realm Business Solutions,
3050 Post Oak Blvd., Suite 900,
Houston TX 77056,
USA

Tel : +1 713-621-4343

Fax: +1 713-621-2787

Support Tel: +1 888-472-1005

Support email: supportusa@circlesoftware.com

Info email: info@realm.com

Realm Business Solutions,
13727 Noel Rd., Suite 800,
Dallas TX 75240,
USA

Tel : +1 469-791-1000

Fax: +1 469-791-1810

Support Tel: +1 888-472-1005

Support email: supportusa@circlesoftware.com

Info email: info@realm.com

Realm Business Solutions,
100 Overlook Center, 2nd Floor,
Princeton NJ 08540,
USA

Tel : +1 609-375-2169

Fax: +1 212-202-4084

Support Tel: +1 888-472-1005

Support email: supportusa@circlesoftware.com

Info email: info@realm.com

Canada contact details:

Circle Software Canada Inc,
205 - 2773 Barnet Highway,
Coquitlam, BC,
V3B 1C2,
CANADA

Toll-free: 1-888-472-1005
Tel : +1 604-472-1001
Fax: +1 604-472-1002

Support email: supportcanada@circlesoftware.com

Info email: infocanada@circlesoftware.com

Australia and Asia Pacific region contact details:

Circle Software Asia Pacific Pty Ltd,
Suite 2103, Level 21,
44 Market Street,
Sydney NSW 2000,
AUSTRALIA

Tel : +61 2 9262 1332
Fax: +61 2 9262 1350

Support email:
supportasiapacific@circlesoftware.com

Info email: infoasiapacific@circlesoftware.com

Malaysia and East Asia region contact details:

Circle Software East Asia Sdn Bhd,
C-06-08, Plaza Mont'Kiara,
No. 2, Jalan Kiara, Mont'Kiara,
50480 Kuala Lumpur,
MALAYSIA

Tel : +603 6203 2876
Fax: +603 6203 1802

Support email: supporteastasia@circlesoftware.com

Info email: infoeastasia@circlesoftware.com

Singapore region contact details:

Realm Business Solutions,
9 Temasek Boulevard,
#38-02 Suntec Tower Two,
Singapore 038989

Tel : +65 6332-9778
Fax: +65 6338-7959

Support email: supporteastasia@circlesoftware.com

Info email: info@realm.com

Japan region contact details:

Realm Business Solutions,
1151-10 Tsu Kamakura-shi,
Kanagawa-ken,
248-0032,
Japan

Tel : +81 467-39-1187
Fax: +81 467-39-1186

Support email: supporteastasia@circlesoftware.com

Info email: info@realm.com

South Africa region contact details:

ABO Software,
30 Roeland Square,
Roeland Street,
Cape Town 8001,
SOUTH AFRICA

Toll-free: 080 226 7638

Tel : +27 (0)21 426 2700

Fax: +27 (0)21 426 2708

Info email: info@abosoftware.co.za

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