

## Appendix C: COST MODELS

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A building database was constructed using Perth's Valuer Generals Office (VGO) 2002 access database combined with Geoscience Australia's (GA) value added attribute fields. These value added attribute fields include floor area, functional classification, HAZUS structural classification and estimated year built.

A decision was made to use only the 2002 VGO access database due to the incompleteness of the 2003 VGO data. Some data attributes in the 2002 VGO fields also required further work, including intersecting the Perth footprint database with the building database to attain a derived area for all residential buildings. (See Chapter 5, 'Earthquake Risk' for more information on derived area.)

Building entries in the VGO database were mapped to the functional classification of buildings (FCB) usage types and to the structural models developed by Edwards and the National Institute of Building Science. The combinations of usage and structural type were then mapped to building replacement cost models. The cost estimates for the total replacement of buildings were developed by Reed Construction Data, ('Replacement cost models for metropolitan Perth', report for Geoscience Australia), 2003, and were provided in 2003 dollars. Where specific models were not available, default cost models were used.

The building cost estimates are based on a pyramid structure (RCD, 2003). Component costs (such as the cost per hour of labour or of a bag of cement) are built into unit rates, which calculate the inputs required for particular activities. In turn these unit rates are then built into elements (a complete brick veneer wall). Building cost models are constructed from elements and are expressed in square metres.

For the Perth metropolitan area, 86 building cost models were developed to capture at least 95% of the building stock of the metropolitan area. The cost models used in the risk model are listed below by usage type: industrial, commercial, non-residential and residential. For residential buildings, more data were available on the age and size of buildings. As a result, regression equations are used to capture the costs according to size of structure.

In Table C.5, the LGAs within the Perth study are listed according to the assigned level of contents. The level of contents was determined by the average income of the LGA.

**Table C.1:** Industrial building cost models

FCB	Sub-category	Exterior walls	Interior walls	Floor type	Roof type	Rate (m <sup>2</sup> )
321	Showroom/shop-warehouse	Cavity brick	Plasterboard	Concrete	Metal	\$587
321	Warehouse (small)	Cavity brick	Plasterboard	Concrete	Metal	\$522
391	Service station/workshop	Cavity brick	Brick	Timber	Tile	\$997

**Table C.2:** Commercial building cost models

FCB	Reed's cost model	Exterior walls	Interior walls	Floor type	Roof type	Rate (m <sup>2</sup> )
211	Shop	Cavity brick	Brick	Concrete slab, timber upper	Metal	\$640-
211	Supermarket	Cavity brick	Brick	Concrete	Metal	\$919
211	Shopping centre	Concrete/glazed curtain	Concrete block	Concrete	Metal	\$1,354
211	Café/pharmacy/hairdresser	Cavity brick	Brick	Concrete	Tile	\$783
211	Restaurant	Cavity brick	Brick	Concrete	Tile	\$1,066
211	Take-away outlet	Cavity brick	Brick	Concrete	Metal	\$993
211	Food hall	Cavity brick	Brick	Concrete	Tile	\$1,085
211	Sale yard	Iron	NA	Aggregate	Metal	\$290
221	Airport	Concrete block	Concrete block	Concrete	Concrete membrane	\$2,084
223	Car park	Cavity brick	Plasterboard	Concrete	Metal	\$522
224	Garage/workshop	Cavity brick	Plasterboard	Concrete	Metal	\$587
231	Office-low rise	Cavity brick	Brick	Concrete slab, timber upper	Metal	\$640
231	Office-low rise	Cavity brick	Brick	Concrete	Tile	\$783
231	Office - mid rise	Concrete block	Concrete block	Concrete	Concrete membrane	\$1,571
231	Office - high rise	Concrete/glazed curtain	Concrete block	Concrete	Concrete membrane	\$1,636
231	Office-showroom	Cavity brick	Brick	Concrete	Metal	\$919
291	Depot/yard	Cavity brick	Brick	Concrete	Metal	\$94
291	Service station	Cavity brick	Brick	Concrete	Metal	\$997

**Table C.3:** Government building cost models

FCB	Sub-category	Exterior wall	Interior wall	Floor type	Roof type	Rate (m <sup>2</sup> )
411	School	Cavity brick	Brick	Concrete	Tile	\$1,172
411	Child care facility	Cavity brick	Brick	Concrete	Metal	\$858
421	Church	Cavity brick	Brick	Concrete	Tile	\$1,085
431	Nursing and aged home	Cavity brick	Concrete block	Concrete	Concrete membrane	\$1,537
441	Hospitals	Cavity brick	Concrete block	Concrete	Concrete membrane	\$1,537
442	Day surgery/ clinic	Cavity brick	Brick	Concrete	Tile	\$775
442	Medical centre	Cavity brick	Concrete block	Concrete	Tile	\$1,412
451	Museum/Art gallery	Cavity brick	Brick	Concrete	Tile	\$1,442
451	Night club/RSL club	Concrete block	Concrete block	Concrete	Concrete membrane	\$2,084
451	Amusement centre/TAB agency	Cavity brick	Brick	Concrete	Tile	\$783
451	Cinema	Concrete/glazed curtain	Concrete block	Concrete	Metal	\$1,354
462	Hotel motel	Cavity brick	Brick	Concrete	Tile	\$1,630
461	Hotel – high rise/ tavern	Concrete block	Concrete block	Concrete	Concrete membrane	\$1,925
491	Police Station	Cavity brick	Brick	Concrete	Metal	\$700
491	Ambulance Station	Cavity brick	Plasterboard	Concrete	Tile	\$708
491	Fire Station	Cavity brick	Plasterboard	Concrete	Tile	\$715
491	Vet Surgery	Cavity brick	Brick	Concrete	Tile	\$775

**Table C.4:** Residential building cost models

FCB	Usage type	Wall type	Roof type	Structural model	Contemporary 1960–2004	Post-war 1946–1959	War period 1914–1945	Before 1914
111	Detached house	Brick	Tile	URMLTILE	$-0.772 \cdot X + 989.7$ (A)	$-0.691 \cdot X + 1037.3$ (E)		
		Brick veneer	Tile	W1BVTILE	(A)			
		Brick	Iron	URMLMETAL	$-0.725 \cdot X + 964.9$ (B)	$-0.606 \cdot X + 1002.2$ (F)		
		Brick	Asbestos	URMLMETAL	(B)	(F)		$-0.525 \cdot X + 1277.0$
		Brick	Asbestos	URMLMETAL	(B)	(F)		$-0.525 \cdot X + 1277.1$
		Concrete	Iron	PC1	(B)			
		Brick veneer	Asbestos	W1BVMETAL	(B)			
		WB/asbestos	Iron	W1TIMBERMETAL	$-0.665 \cdot X + 865.4$ (C)	(G)	$-0.663 \cdot X + 900.5$ (I)	$-0.300 \cdot X + 856.0$ (J)
		Asb/WB/iron	Iron/asb	W1TIMBERMETAL	(C)	$-0.700 \cdot X + 916.0$ (G)		
		Steel frame	Iron	W1BVMETAL	(C)			
		<b>Default</b>		<b>Other</b>	<b>(A)</b>	<b>(E)</b>	<b>(I)</b>	<b>(J)</b>
113	Transportable home	All	All	W1TIMBERMETAL	$-0.665 \cdot X + 865.4$ (C)			
		Asbestos/WB	Tile	W1TIMBERTILE	$-0.715 \cdot X + 890.8$ (D)	$-0.763 \cdot X + 949.5$ (H)		
121	Semi-detached	Brick	Tile	URMLTILE	$-0.499 \cdot X + 885.7$ (K)			
		Brick veneer	Tile	W1BVTILE	(K)			
		Concrete	Iron	PC1	(K)			
		Asbestos/WB	Tile	W1TIMBERTILE	$-0.555 \cdot X + 828.8$ (L)			
		Brick	Asbestos	URMLMETAL	$-0.447 \cdot X + 861.4$ (M)			
		Brick veneer	Asbestos	W1BVMETAL	(M)			
		Steel frame	Iron	W1BVMETAL	(M)			
		Iron	Iron	W1TIMBERMETAL	(M)			
		WB	Iron/Asb	W1TIMBERMETAL	$-0.510 \cdot X + 805.8$ (N)			
		Asbestos	Iron	W1TIMBERMETAL	(N)			
131	1 or 2 storeys	All	All		$854/\text{m}^2$			
132	3 storeys	All	All		$854/\text{m}^2$			
133	$\geq 4$ storeys	All	All		$854/\text{m}^2$			
134	Attached to a house				$854/\text{m}^2$			

**Table C.5:** Level of contents by LGA

<b>Level of contents</b>	<b>Perth LGAs</b>
Prestige (over \$1350 pw)	Cambridge, Cottesloe, Nedlands, Peppermint Grove
Quality (\$901–\$1350 pw)	Canning, Claremont, Cockburn, East Fremantle, Fremantle, Gosnells, Joondalup, Kalamunda, Melville, Mosman Park, Mundaring, Perth, South Perth, Stirling, Subiaco, Swan, Wanneroo, Vincent
Average (\$500–\$900 pw)	Armadale, Bassendean, Bayswater, Belmont, Victoria Park