COST MODEL TALL BUILDINGS

With nearly 250 towers set to be built in London alone - the vast majority of them residential - Brian Smith, Mital Dholakia and Richard Heseltine of Aecom highlight the main design and cost considerations in reaching for the skies

01 / INTRODUCTION

The UK, and London in particular, is developing an increasing number of towers. A recent study by New London Architecture (NLA) highlighted that there are nearly 250 towers of 20 storeys or more either being constructed or proposed in London alone. The last decade witnessed iconic commercial towers built in and around the city. In the next wave, however, the NLA study has identified 80% of towers as residential.

This phase is expected to see architects striving for a balance between rational design and elegant form, as developers seek improvement in efficiency to deliver viable schemes. Understanding the key value drivers is therefore as important as ever.

Whatever the form, there are still challenges in developing towers: they take longer to get to site - especially those that require lengthy planning periods - take longer to construct, cost more and are less efficient than lower rise buildings.

These issues are offset by the higher density of development and the sales/rental values that can be achieved. Strong demand for residential towers, especially for the high-end market, has seen growth in sales prices, which continues to encourage the supply side of the market.

Towers need to be flexible to cope with changes in regulations and the product required by the market. The commercial office market needs to respond to the challenge of increased

occupational density, if only on some of the lower floors, and dealing with different types of occupiers.

Companies with large space requirements are being attracted to the recent City towers, along with firms who have smaller demand and who traditionally took this space. Both seek the prestige of taking space in an iconic tall building.

The specification for residential schemes has also evolved to reflect market and purchaser requirements. For example, additional airconditioning, underfloor heating, security features and specification of the kitchen fit-out are now regularly considered and implemented within designs.

02 / DESIGN AND CONSTRUCTION CHALLENGES

The fundamentals behind tower design, regardless of signature design or functionality, remain the same. They need to maximise area, provide it for the lowest cost and complete construction in the shortest time. With a large amount of repetition, time should be dedicated to getting the concept and then the details correct on those elements that contribute most to the overall cost.

Driving this efficiency should be a continuous process, as incremental improvements have a positive impact on the overall viability of the scheme. The shape of the building plays a fundamental part in driving efficiency, and there is a balance to be found between efficiency of floor plates and interesting building form to create the unique selling point.

Structure

The shape and size of the floor plate and the tower form have a direct impact on the structural design. More complicated floor shapes and forms increase the cost of the

structure - both in terms of fabrication and construction. Focusing on optimisation of the structure, in order to reduce the amount of material used, needs to be balanced with other requirements such as floor spans and buildability where material choice influences the speed of construction.

Facade

A wide range of architectural solutions exist for the facade, depending on the aesthetic and performance requirements. Consequently, there can be a broader cost range depending on the system selected.

The wall-to-floor ratio – the amount of cladding required for every square metre of gross floor area – is an important metric in determining the efficiency of a floor plate. Complex shapes and articulated designs have a higher wall-to-floor ratio, which increases the facade cost - and which is compounded if the facade's unit cost rate is also high.

Due to their size and inherent tower design, the facade package is often

one of the largest cost elements on a scheme. But this does present the opportunity to take advantage of economies of scale to improve the overall cost

The facade design sequence for a new tower is determined initially by the building energy model. The model will establish the performance requirements of the facade and inform the ratio of transparency and solid elements. If no alternative (renewable) energy source is available, the facade would most likely need to be designed as triple glazing to meet the U- and g-values determined by the model. City commercial towers such as the Leadenhall Building and the Shard are good examples where the U- and g-values are achieved using a ventilated triple glazed system and also using blinds inside the cavity. In the facade design sequence. attention should be paid to not affecting light transmittance (daylight) by reducing the g-value too much. Development in applied coatings, such as triple silver high performance

coating on glass, does help to increase the light transmission value. However, this usually increases the cost of the glazing units.

Unitised facade systems are used extensively on tall buildings for a variety of reasons: off-site manufacture, quality control, programme, access requirements (no scaffolding) and performance. Typically, unitised panel systems are based on a 1.2-1.5m wide grid and by storey height. The system can be designed and built to meet the higher thermal performance required, and in the last two years we have seen the introduction of ultra-slim vacuum insulated panels (VIP) to achieve this.

Lifts

Resolving the lift strategy is a key aspect in determining the core size and lavout. The development of destination hall control, double-decker lifts and increased speeds have helped optimise performance and the space taken by lifts.

But increased occupational density



of floors is also a driver that has an impact on the number of lifts required. This brings additional costs to the lifts, and perhaps more importantly, takes up further net space.

Higher towers optimise the space taken by lifts with transfer lifts and sky lobbies, which some designers use as a feature, if the core is not centrally located. Observation decks and other uses, either through planning requirements or zoning floors to generate additional revenue, leads to these floors being serviced by dedicated express lifts. This enhances the customer experience and avoids a mix between visitors and occupiers. However, all these design aspects add pressure to core size.

MEP services

The building's specification, combined with its interface and distribution throughout the building, are key

drivers for the MEP design. The services strategy should be carefully considered at the outset, as changes later on are difficult to incorporate. Interface with the facade determines many of the services requirements, such as how the building deals with issues like solar gain for example. Plant floor location influences the MEP cost, with options of central or decentralised plant. Depending on the floor plate design and location of the core and risers, it is possible to locate air-handling units on a floorby-floor basis. Although the plant is more expensive for this option, there is potential gain by mitigating the amount of expensive basement space or reducing the amount of intermediate plant floors.

Office schemes also tend to have

additional capacity and resilience built into the services solutions for future tenant requirements because plant

space is at a premium. Consequently, only very limited space is available for tenants' plant.

Current regulations treat tall buildings no differently to others: they need to meet Part L of the Building Regulations as well as the Greater London Authority requirements (in central London) for renewable obligations. Tall buildings have the added issues of increased hydraulic pressure and heat exchangers leading to additional pumping requirements and therefore power usage. Adding physical renewable energy sources is constrained by limited available space; efficient use of plant and equipment therefore has greater importance, along with metering and controls.

Programme and off-site prefabrication

Overall development programmes for towers are longer than low-

rise buildings through the design and construction process. Their construction sequence needs to be optimized at the outset and early buildability advice should be sought Off-site prefabrication and modular construction of components can help by reducing the amount of site labour and materials delivered.

The Leadenhall Building achieved 85% prefabrication and off-site construction when measured by the building's construction value. Additionally, these construction processes helped to mitigate noise and disruption to neighbours, while also increasing on-site safety.

Delivery of the works influences the procurement strategy. For example, splitting out early enabling and basement works may improve the longer construction programmes associated with tower construction.

03 / KEY DRIVERS OF TALL BUILDINGS

The development of tall buildings in London and the UK is evolving. Over half of the towers in London proposed or being constructed are under 30 storevs. Due to the prevailing landscape. these heights represent "tower" development in London; in other cities with established tower skylines they are not considered as excessively high. Will we continue to see towers in London around this height, or will the city and country

ogers Stirk Harbour & Partners' adenhall building



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embrace and support taller buildings than those currently proposed? If so, what are the drivers for developing higher?

Planning

Planning policy dictates where tall and higher density development is allowed and encouraged, along with its extent. Attitudes vary in different London boroughs with respect to

tower development. Those that have identified areas for regeneration have encouraged tower development, Nine Elms, Southwark, Greenwich, Tower Hamlets and other hubs outside central London in Crovdon and Brent Cross are now seeing higher rise schemes either in construction or being proposed.

In modern times tower developments are largely new additions to the cityscape. Accordingly, the design quality to achieve planning approval has been high. Will it continue to be so in these areas of development as towers become the new norm, and will the next cycle of towers need to go higher to set themselves apart?

In the more historic city centres, towers need to respect and respond to their surroundings. This can mean that designs need to work with constrained sites restricting the size of the footprint, as well as wider policies such as height limits and viewing corridors such as those around St Paul's cathedral in London.

Planning policy can also control the density and height of development. Section 106 agreements dictate that issues such as the amount of affordable housing and open play space requirements need to be factored into development appraisals. Through these payments towers make contributions to ground level and public space, and contribute to infrastructure improvements.

Design and efficiency

Although towers tend to be less efficient than low-rise buildings, there are design and engineering solutions that allow towers to be developed economically at heights greater than we are seeing in the UK. According to the Council of Tall Buildings & Urban Habitat (CTBUH), there were 154 towers over 150m in height - about 40 storeys - completed in 2013 around the world.

Increasing the height adds to the requirements for core size, lifts, sky lobbies and plant floors, all of which contribute to reductions in the net area. As towers rise in height, the size of structural zones also increases as a proportion of the overall floor plate, due to greater wind loads and core requirements. Regularity of floor plate, with simple extruded shapes repeated on each floor, helps to optimise the net-to-gross floor area and the wall-to-floor ratio of the facades.

Values required

Where tall buildings are still treated as a premium product, height generates higher value. The relationship is stronger on residential towers where higher apartments enhance the sales value, often driven by views and the exclusivity of living in a tall building. A similar relationship exists for offices, although the general market has more of an influence than height.

04 / OFFICES vs RESIDENTIAL

The cost model on the following page has been prepared for a residential scheme in central London. The midrange position of a central London office tower completed to category A standard typically costs £2,700-3.330/m². Although this is within the range of the fitted out residential tower, there are large differences in the fit-out and the shell and core costs

A typical office tower completed to shell and core is around 50% more expensive than a residential scheme. This is a result of the difference in key design aspects of residential and office towers

Floor plate design To optimise efficiencies, the floor plate size on a residential tower is around 600-750m². The final size depends on the mix and size of units included to suit the target market. Smaller floor plates work with a central core, as can larger multi-core floor plates, but normally at the expense of overall net-to-gross and wall-to-floor ratio efficiencies. For the same reasons the minimum average office floor plate is normally around 1,500m².

ojected view of Vauxhal ie Elms from Lambeth Brid

Structure Residential schemes tend to be all-concrete structures for acoustic reasons Post-tensioned slabs can also be considered, as lower slab thickness and storey height can provide an additional floor in the overall height of the building. But these need to be factored against buildability issues and the ability to fix layouts as early as possible. Offices tend to be

05 / COST MODEL

The cost model is based on a 30-storey private residential tower in central London. The tower has 95 apartments and a gross internal area above ground of 21,000m². The net-to-gross ratio is 77%. Substructure costs allow for tower foundations but exclude basement levels associated with car parking and ancillary plant space as these are influenced by individual site constraints and how the tower fits into the

development of the wider site. Facilities such as gym, spa and cinemas for exclusive use by residents are also excluded from the cost model. The cost model allows for shell and core and fit-out of the residential units based on a sales value of £1,400-1,600 per ft² of net internal area. The following assumptions have been made:

	Total (£)	£/m²	%		Total (£)	£/m²	%	
Substructures	1,792,500	85.36	2.8	Reinforced concrete columns, v	various sizes, loose reinforcement 1	61 tonne, 593r	n³@£1,000/m³	
Allowance for site clearance, residual mino	r demolition works. item	@£50,000		Reinforced concrete slabs, bea	ms and upstand, loose reinforceme	nt 738 tonne, 5	,390m³	
Large dia bored piles, pile mat, rig set-up, sonic logging, sleeving first 10m of pile, 1,988m³ @				@£550/m ³				
£690/m ³				Fire stopping, sundry items, ite	m@£300,000			
Excavation, including lift pits, 3,836m ³ @	£45/m³			Roof framing steel columns and	beams, 110 tonnes, fire treated w	ith intumescent	paint, 110 tonne	
Drainage below ground slab, including pur	ping chambers, manhole	es and the like, it	em@£50,000	@£4,200/tonne				
Formation of ground slab, pile caps, 150m	³ @ £453/m ³							
Sundry items, attendance on archaeologis	ts, bwic service entries, e	earth rods,		Roof	1,088,100	51.81	1.7	
item@£800,000				Perimeter parapet detail, 21,00	00m²@£14/m²			
				Proprietary metal standing sea	m roof Including supporting structu	re, 21,000m² @)£13/m²	
Frame and upper floors	6,016,100	286.48	9.3	Perimeter interface between gl	azed curtain walling and roof, 21,00	00m² @ £18/m	2	
Reinforced concrete core / shear walls, 200	Omm to 500mm thick, lo	ose reinforceme	ent 245 tonne,	Sundry roof items. item @ £60	,000			
2,610m ³ @ £650/m ³				Terrace decking / waterproof m	embrane, sunshading , drainage 60	m², 21,000m²	@£5/m²	



constructed in steelwork combined with a concrete core to give greater spans and column-free space to the floor plate. **Facades** The use of the facade as part of the apartment on residential schemes results in the need to incorporate balconies or winter gardens, which will require additional detailing along with double-aspect apartments for schemes of higher value.

Fit-out The fit-out cost of residential schemes is closely linked to the set sales values. For this reason, there is a big range in the specification and cost of a residential fit-out. Conversely, office schemes are normally completed to shell and core with a cost to category A fit-out on a few typical floors, and the final fit-out works undertaken by the tenant.

and external services are not included Professional fees, statutory fees and VAT are not included Costs are given at first quarter 2014 based in

The costs of site preparation, external works

central London and assume a competitive tender process

Costs for enhancements to suit tenant requirements or changes are excluded.

05 / COST MODEL

	Total (£)	£/m²	%		Total (£)	£/m²	%			Total (£)	£/m²	%
Stairs	370,000	17.62	0.6	Wall finishes	2,519,600	119.98	3.9		Sanitary ware installations	2,118,100	100.86	3.3
Reinforced in-situ concrete stair, 3	einforced in-situ concrete stair, 30 storeys, £5,000/storey			Ceramic wall tiling to lobby, 230	lm² @ £200/m²				Allowance for undermounted basin, wall-r	nounted mixer, 21,000)m² @ £15/m²	
Painted steel handrails and balustrades, 30 storeys, $\pm 2,000/storey$			Allowance for mist / paint to stai	r core walls, 2,060m² @ £5/m²				Allowance for wall-mounted WC pan, dua	flush cistern, 21,000r	m² @ £20/m²		
Allowance for non slip nosings, 30	storeys, £1,000/storey			Allowance for mist / paint to inte	rnal walls, 65,000m² @ £5/m²				Allowance for built-in steel bath, wall-mou	nted single mixer with o	diverter, 21,000m	m² @ £8/m²
Allowance for internal stair to triple	ex apartment including finishe	es/balustrades/		Allowance for feature wall treatm	ment to lift lobby corridors, 1,800	0m² @ £100/m²			Allowance for free standing bath, single le	ver bath mixer with sta	nd pipe and hand	l shower,
handrails, item @ £75,000				Allowance for vinyl wall covering	to refuse store, 900m ² @ £40/r	m²			21,000m ² @ £9/m ²			
Temporary protection for contracto	or access, item @ £50,000			Allowance for marble tiles, inclu	ding to bathrooms, shower return	is, 7,800m² @ £2	240/m ²		Allowance for shower head, shower tray,	rameless shower scree	en, wall-mounted s	single mixer wit
Cat ladders, item @ £5,000				Allowance for painting to lift sha	ft, 1,950m² @ £25/m²				diverter, wall-mounted body jets, 21,000	m² @ £44/m²		
Estemal melle minderne est	11 664 00		10.0	Els en finishes	2 201 000	100 57	25		Allowance for heated mirror pads, wall-me	ounted TRH, 21,000m ²	²@£5/m²	
External walls, windows, ext	ernal 11,664,30	0 555.44	18.0	Allowance for marble to entrance		109.57	3.5	_	Disposal installations	620 500	29 55	10
Powder coated unitized curtain wa	Illing double glazed 1 5m wi	hav 3.1 m high 0.4	13m ² @	Allowance for inset carpet and	e lobbles, in clobbles, acoustic su	m ² @f210/m ²	1270/11			1 000m2 @ £6/m2	23.00	1.0
FOWLEI COALEU UNILISEU CUI LAIN WA	ining, double glazed, 1.311 Wi	le x 3.±1111igh, 9,4	-1101F@	Allowance for skirtings supdry it	ame avpaneian jainte floor naint	to plant rooms its	m@f10000		Soil wasta and ventilating in risors 21.00	0m2@f13/m2		
LOUU/IIF	ta balaaniaa 2 Omuuida y 2 F	m high 675m2@	C1 4E0/m²		erris expansion joints, noor paint		2 2				Leonnestione to e	
Powder coated lift and slide doors	to balconies, 3.0m wide x 2.0	m high 1 01 2m ² 6	E1,430/III ⁻	Allowance for anging and timba	ris, including acoustic sub noor, o	,33000-@180000 flaar 0.000m2@	C11E/m2		Soli and waste pipework from risers to ap	artments including rina	II CONNECTIONS TO S	sariitary appilari
Powder coated lift and slide doors	to balconies,4.5m wide x 2.5	m nign, ⊥,U⊥3m² @	g£1,150/m²	Allowance for engineered timbe	r tiooring, including acoustic sub	1100r, 9,000m² @	£115/m²		and white goods, 21,000m² @ £6/m²	1.2		
External feature shading blades, a	nodised aluminium horizontal	shading blades, 15	50-300mm x	Allowance for marble tile floorin	g, including acoustic sub floor, 1,	900m² @ £240/r	n-		Condensate installation, 21,000m ² (@ £6	b/m²		
SUmm, 2,000m@±159/m		200/2		Allowance for MDF skirting, 11,	300m@±12/m				Wateringtollations	646 600	20.70	10
Glazed root, unitised panel base ch	hassis system, 500m² @ ±1,.	300/m²		Allowance for paint to plant roor	ns, 60m² @ £20/m²				Vater Installations	040,000	30.79	1.0
Allowance for glazed entrance can	1000, 1000 (0 £100,000	2			040 400	40.40	10		Cold water installations, water points for	oor terrace, 21,000m	-@£13/m-	
Fair faced finish to circular concret	te columns, 200m- @ £150/	n-			040,400	40.40	L.J	_	Cold water pipework from risers to apartr	nents including final col	nnections to sanit	cary appliances
Allowance for ground floor soffit ci	ladding, 150m² @ £500/m²	-falala dataila E (2002 @ 200/2	Allowance for feature plasterbo	ard ceiling to ground floor lobby, o	detailing, cotters, j	baint Tinish,		and white goods, 21,000m² @ ±8/m²			
Allowance for interface detail betw	veen cladding materials, edge	of slabs details, 5,6	500m² @ £30/m²	100m² @ ±110/m²		1			Hot water pipework from risers to apartm	ents including final con	nections to sanita	ary appliances a
Allowance for facade cleaning syst	tem, item@±450,000			Allowance for feature plasterbo	ard ceiling to lift lobbles / corridor	s, detailing, cottei	rs, paint finish,		white goods, 21,000m² @ £8/m²	2 601 2		
Allowance of cladding mock-up and	d testing, item @ ±200,000			1,200m² (@ £50/m²					Water meters to apartments, 21,000m ²	g £2/m²		
Balconios	2 671 500	127.21	11	Allowance for plasterboard ceilii	ng to apartments, on suspended	grid, detailing, pai	nt finish,		Heat source	174 400	£8.30	03
Dalconies	isht weight atmotyped atcel fr		4.1		starbaard calling to anortheasts		d datailing point			174,400	10.50	0.5
Timber decking to belooning, include	dina fivinan 1 050m² @ £25		91090/III	- finish 1,000m2@ £50/m2	ister board cenning to apartments,	on suspended gri	u, uetalling, pairit		Heat interface drift, 21,000m @18/m			
DDC all maining to balconies, includ	aing fixings, 1,050m° @ £23		2 C 1 O 0 /2		la stada sud sailin na 150au 🔿 0	150/			Cases besting sigtrestment and	4 661 100	6221.06	. 70
Clazed abadew bay apardral data	i 1 000m @ C260/m	arainage, 1,050m-	@1490/11-	Allowance for access pariels in p	nasterboard ceilings, 450m @ £	130/11			ventiletion	4,001,100	1221.90	1.2
1 1 m biah alaaa baluatrada 1 000	n, 1,000m@1300/m			Eittings and furnishings	6 430 700	306.33	00		Water appled shillers alw condensor loop	within right 21 000m	20512/m2	
1.11111igi1giass balustrade, 1,000						300.22	3.5	_			r@142/11	
Internal walls partitions	1 390 000	6610	21	Allowance for statutory signage	ta ataira flaara itam@£25.00	0			Automatia opening venta including fore o	nd controllors using PV	Namaka abaft 21	1 000m ²
100 minutes fire metal tuis metal	1,390,00	00.19	Z.L	Allowance for statutory signage	10 stairs, noors, item@±25,00	0			Automatic opening vents, including rans a	na controllers using by	V SHOKE SHALL, 21	1,00011-
120 minutes fire-rated, twin metal	I frame wall to party walls, ≥ 1	ayers of soundbloc	and security	Allowance for post boxes, item (bj£20,000				@ £10/m-			1 0002 @ C7
Mesifico pour sides, insulation, 650	ith O levere of a levere her and to		David @ 640/2	Allowance for external signage,	item@E13,000				Collocities are started at a second started and second	y and extract via builde	rs work snarts, 21	1,000m-@E7
Non Tire-rated drywaii partitions wi	itn ∠ layers of plasterboard to	4 000m3 @ 000/	Jm-@±40/m-	Allowance for kitchen, stone wo	rktops, double bowl sink and spla	ISNDACK, COMDINAT	ion microwave		FCU within apartments, htg and chw pipe	work extended from ris	sers, associated d	Juctwork / grille
Allowance for metal stud lining to c	concrete columns and walls, J	4,800m² @ £20/i	m≏	oven, ceramic nob, extract nood	, upright tridge/treezer, wine cool	ier, disnwasner, wa	asning machine,		dampers, 21,000m² @ £90/m²	200013		
Allowance for plasterboard lining to	o solid elements of external c	ladding, 4, 750m² (@£40/m²	tumble dryer, 95nr @ £42,000	/nr	0.0050/			Underfloor heating to bathrooms, 21,000)m²@£13/m²		
Allowance for acoustic lining to lift	shaft, 1,300m² @ £40/m²			Allowance for wardrobes, hangi	ng rail, sheiving, sliding doors, 81	.Unr@£950/nr			Allowance for heated towel rail, including	DIPEWORK, 21,000m² (C	±30/m²	
Allowance for penthouse private lif	rt shart, item @ £40,000			Allowance for walk-in wardrobes	s, hanging rail, shelving, sliding do	ors, 220m @ £9	50/m		Kitchen extract fan installation, dischargi	ng to facade of building	Including ductwol)rk / louvres /
Allowance for boxing out to SVPs,	including acoustic treatment	item@£/5,000		Allowance for shower tray, /Om	@£500/m				controls, 21,000m ² @ £3/m ²			
Allowance for sundry items, item (c	g £20,000			Allowance for boxing out of pipe	work, 385nr @ £42/nr				Bathroom extract fan installation, dischar	ging to facade of buildir	ng including ductv	work / louvres /
				Allowance for creation of bath p	linths, 65nr @ £1,000/nr				controls, 21,000m ² @ £9/m ²			
Internal doors	1,581,900) /5.33	2.4	Allowance for concealed cupboa	ard, 385nr @ £500/nr							
Single-leaf timber veneer doors to	stair cores, vision panel, fram	e and ironmongery	',	Allowance for stone vanity tops,	335nr@£2,000/nr				Electrical installations	2,020,900	96.23	3.1
120 minutes fire-rated, 45nr @ £9	970/nr			Allowance for steel sink mount,	385nr@£150/nr				Submains cabling and containment, LV sv	vitchgear, rising busbar	system and conn	nections to tena
Single-leaf door to risers, vision par	nel, frame and ironmongery, 6	60 minutes fire-rate	ed,	Allowance for mirrors, 385nr @	£200/nr				distribution boards, general earthing and	oonding, 21,000m ² @	£29/m²	
135nr@£810/nr				Allowance for stone bath edge,	220nr@£600/nr				Power supply to mechanical services and	lifts, landlords areas, 2	1,000m² @ £6/m	<u>n²</u>
Single-leaf door to plant rooms / sto	core , frame and ironmongery,	60 minutes fire-rat	ted,	Allowance for cloak cupboard, ir	ncluding timber veneered door/fra	ame/ironmongery,	shelving,		Lighting installation / control system to la	ndlords reception, lobbi	es, corridors, 21,0	,000m ² @£17,
5nr@£500/nr				hanging rail, 90m @ £900/m					Tenants distribution boards, meters, inclu	ding cable from riser, 2	1,000m² @ £2/m	n²
Single-leaf apartment entrance do	or, timber veneer finish, fram	e and ironmongery,		Allowance for glazed balustrade	to penthouse apartment stair vo	id, 30m @ £520/	m		Small power distribution points to resider	tial areas, cooker hob p	points, 21,000m ²	² @ £3/m²
30 minutes fire-rated, 95nr @ £1,	,440/nr			_					Fused connection units, shaver outlets, p	ower wiring, 21,000m ²	² @ £5/m²	
Single-leaf apartment internal door	r, timber veneer finish, frame	and ironmongery,							Lighting installation within apartments inc	luding wiring, earthing	and bonding, 21,0	,000m² @ £34,
30 minutes fire-rated, 850nr @ £	1,240/nr											
Double loof apartment internal day												
Double-lear apartment internal doo	or, timber veneer finish, frame	and ironmongery,										
30 minutes fire-rated, 140nr @ £2	or, timber veneer finish, frame 1,540/nr	and ironmongery,		_								



	/0		Total (£)	£/m²	%
400.00			740.000	05.07	
100.86	3.3		/49,000	35.67	1.2
@±15/m²		13 person, machine room less servicing 3	/ floors, enhanced car fini	shes, 21,000m² (@£29/m
⊴ £20/m²	Q (0/3	Penthouse lift serving 3 floors, 21,000m ²	@±3/m²		
		beneficial use of lints, 21,000m- @ 14/m-	-		
sipe and nand sh	iower,	Protective installations	1 1 27 600	53 70	17
vall-mounted sing	alo mixor with	Wet riser installation 21 000m ² @ £9/m ²	1,127,000	33.70	1.7
vali-mounted sing	giernixer with	Lightning protection 21 000m ² @ £2/m ²			
£5/m²		Mist (sprinkler system to apartments, 21)	000m2@f12/m2		
LO/III			000111 @ 142/111		
29.55	1.0	Communication installations	700.200	33.34	1.1
		Fire alarm, smoke detection installation, 2	1,000m ² @ £9/m ²	10 35.67 1 Id car finishes, 21,000m² @ £2 £2 500 53.70 1 n² 1 1 system, disabled toilet alarm, 1 nrence, disabled toilet alarm, 1 n² 2 2 D0 12,000m² @ £2/m² connection unit, 7V / Satellite w 1 m² 2 2 D0 12.46 0 with central BMS controls locat 0 parcete plinth plant bases, 2 2 @ £5/m² 6 0 for holes in slabs, allowance for 1	
		Video entry system, head end at reception	, access control installatio		2/m²
nections to san	itary appliances	CCTV installation, 8nr cameras, intruder d	etection security system.	disabled toilet ala	rm,
	, .p	21,000m ² @£3/m ²	, _,_,,		,
		Cable trays, trunking only for satellite, tele	phone and date wiring. T\	and FM radio aer	ial systen
		allowance for satellite dish. 21.000m² @ 1	24/m²		,
30.79	1.0	Video entry system, head end at recention	, access control installation	n, 21,000m² @ f	22/m²
£13/m²		Fire alarm, combined smoke / sounders. 21	L,000m ² @ £2/m ²	,,_,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	-,
ctions to sanitary	v appliances	Telephone outlets / wiring, data points / wir	ing. 21.000m ² @ $f4/m^2$		
	,	TV outlets. satellite / TV / radio triplexer. T\	/ amplifier fused connecti	on unit. TV / Satell	ite wirina
tions to sanitary	appliances and	21.000m ² @£4/m ²		35.67 1.2 hes, 21,000m² @ £29/m² 53.70 1.7 33.34 1.1 n, 21,000m² @ £2/m² lisabled toilet alarm, and FM radio aerial system n, 21,000m² @ £2/m² n unit, TV / Satellite wiring 12.46 0.4 al BMS controls located in 22.96 0.7 th plant bases, 2 in slabs, allowance for ser	
, , ,		Apartment video entry system . door bell. 2	21.000m ² @ f 4/m ²		
			1,000 (j 2 1,1)		
		Special installations	261,600	12.46	0.4
£8.30	0.3	BMS with monitoring facilities to bldg plan	t only, interface with cent	ral BMS controls lo	ocated in
		basement, 21,000m² @ £11/m²			
		Local controls within apartment, 21,000m	n² @ £1/m²		
		· · · ·			
£221.96	7.2				
£221.96	7.2	Builder's work in connection	482,200	22.96	0.7
£221.96 £42/m ²	7.2	Builder's work in connection Allowance for lifting beams to plant room,	482,200 allowance for concrete pli	22.96 nth plant bases,	0.7
£221.96 £42/m²	7.2	Builder's work in connection Allowance for lifting beams to plant room, a 21,000m ² @ £1/m ²	482,200 allowance for concrete pli	22.96 nth plant bases,	0.7
£221.96 £42/m ² loke shaft, 21.0	7.2	Builder's work in connection Allowance for lifting beams to plant room, a 21,000m ² @ £1/m ² Allowance for access floors within service	482,200 allowance for concrete pli risers, 21,000m ² @ £5/r	22.96 nth plant bases, n ²	0.7
£221.96 £42/m ² loke shaft, 21,0	7.2	Builder's work in connection Allowance for lifting beams to plant room, a 21,000m ² @ £1/m ² Allowance for access floors within service Allowance for holes for light fittings and so	482,200 allowance for concrete pli risers, 21,000m ² @ £5/r ckets, allowance for holes	22.96 nth plant bases, n ² s in slabs, allowand	0.7
£221.96 £42/m² oke shaft, 21,0 ork shafts, 21,0	7.2 00m ²	Builder's work in connection Allowance for lifting beams to plant room, a 21,000m ² @ £1/m ² Allowance for access floors within service Allowance for holes for light fittings and so holes in partitions, 21,000m ² @ £4/m ²	482,200 allowance for concrete pli risers, 21,000m ² @ £5/r ickets, allowance for holes	22.96 nth plant bases, n ² s in slabs, allowand	0.7
£221.96 £42/m ² oke shaft, 21,0 ork shafts, 21,0 associated duc	7.2	Builder's work in connection Allowance for lifting beams to plant room, 21,000m ² @ £1/m ² Allowance for access floors within service Allowance for holes for light fittings and so holes in partitions, 21,000m ² @ £4/m ² Allowance for access panels, 21,000m ² (c	482,200 allowance for concrete pli risers, 21,000m ² @ £5/r ickets, allowance for holes @ £1/m ²	22.96 nth plant bases, n ² s in slabs, allowand	0.7
£221.96 £42/m² loke shaft, 21,0 ork shafts, 21,0	7.2 00m ² 000m ² @ £7/m ² :twork / grilles /	Builder's work in connection Allowance for lifting beams to plant room, 21,000m ² @ £1/m ² Allowance for access floors within service Allowance for holes for light fittings and so holes in partitions, 21,000m ² @ £4/m ² Allowance for access panels, 21,000m ² @ Allowance for air leakage testing, 21,000m ²	482,200 allowance for concrete pli risers, 21,000m ² @ £5/r ickets, allowance for holes @ £1/m ² m ² @ £2/m ²	22.96 nth plant bases, n ² s in slabs, allowand	0.7
£221.96 £42/m ² noke shaft, 21,0 rork shafts, 21,0 , associated duc	7.2 000m ² 000m ² @ £7/m ² ctwork / grilles /	Builder's work in connection Allowance for lifting beams to plant room, 21,000m ² @ £1/m ² Allowance for access floors within service Allowance for holes for light fittings and so holes in partitions, 21,000m ² @ £4/m ² Allowance for access panels, 21,000m ² @ Allowance for air leakage testing, 21,000m ² Allowance for lift support steelwork. 21.000	482,200 allowance for concrete pli risers, 21,000m ² @ £5/r ickets, allowance for holes @ £1/m ² m ² @ £2/m ² D0m ² @ £0/m ²	22.96 nth plant bases, n ² s in slabs, allowand	0.7
£221.96 £42/m ² noke shaft, 21,0 york shafts, 21,0 a, associated duc	7.2 00m² 000m² @ £7/m² ctwork / grilles /	Builder's work in connection Allowance for lifting beams to plant room, 21,000m ² @ £1/m ² Allowance for access floors within service Allowance for holes for light fittings and so holes in partitions, 21,000m ² @ £4/m ² Allowance for access panels, 21,000m ² @ Allowance for air leakage testing, 21,000 Allowance for lift support steelwork, 21,00 Allowance for accustic protection to plant	482,200 allowance for concrete pli risers, 21,000m ² @ £5/r ckets, allowance for holes @ £1/m ² m ² @ £2/m ² 20m ² @ £0/m ² room, 21,000m ² @ £1/r	22.96 nth plant bases, n ² s in slabs, allowand 1 ²	0.7
£221.96 £42/m ² noke shaft, 21,0 vork shafts, 21,0 s, associated duc 30/m ² luding ductwork.	7.2 00m ² @ £7/m ² :twork / grilles / / louvres /	Builder's work in connection Allowance for lifting beams to plant room, 21,000m ² @ £1/m ² Allowance for access floors within service Allowance for holes for light fittings and so holes in partitions, 21,000m ² @ £4/m ² Allowance for access panels, 21,000m ² @ Allowance for air leakage testing, 21,000m ² Allowance for lift support steelwork, 21,000 Allowance for acoustic protection to plant Allowance for fire sealing around service p	482,200 allowance for concrete pli risers, 21,000m ² @ £5/r ckets, allowance for holes @ £1/m ² m ² @ £2/m ² D0m ² @ £0/m ² room, 21,000m ² @ £1/r enetrations, 21,000m ² @	22.96 nth plant bases, n ² is in slabs, allowand n ² 2 2 2 2 2 3/m ²	0.7
£221.96 £42/m ² noke shaft, 21,0 rork shafts, 21,0 , associated duc 30/m ² uding ductwork,	7.2 00m² @ £7/m² ctwork / grilles / / louvres /	Builder's work in connection Allowance for lifting beams to plant room, 21,000m ² @ £1/m ² Allowance for access floors within service Allowance for holes for light fittings and so holes in partitions, 21,000m ² @ £4/m ² Allowance for access panels, 21,000m ² @ Allowance for access panels, 21,000m ² Allowance for air leakage testing, 21,000 Allowance for lift support steelwork, 21,00 Allowance for acoustic protection to plant Allowance for fire sealing around service p Allowance for sundry items, 21,000m ² @	482,200 allowance for concrete pli risers, 21,000m ² @ £5/r ckets, allowance for holes @ £1/m ² m ² @ £2/m ² D0m ² @ £0/m ² room, 21,000m ² @ £1/r enetrations, 21,000m ² @ £7/m ²	22.96 nth plant bases, n ² is in slabs, allowand 1 ² 2 2 2 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 2 3 3 3 3 3 3 3 3 3 3 3 3 3	0.7
£221.96 £42/m ² noke shaft, 21,0 rork shafts, 21,0 , associated duc 30/m ² uding ductwork, ncluding ductwork	7.2 00m ² @ £7/m ² twork / grilles / / louvres /	Builder's work in connection Allowance for lifting beams to plant room, 21,000m ² @ £1/m ² Allowance for access floors within service Allowance for holes for light fittings and so holes in partitions, 21,000m ² @ £4/m ² Allowance for access panels, 21,000m ² @ Allowance for access panels, 21,000m ² @ Allowance for accustic protection to plant Allowance for sundry items, 21,000m ² @	482,200 allowance for concrete pli risers, 21,000m ² @ £5/r ckets, allowance for holes @ £1/m ² m ² @ £2/m ² D0m ² @ £0/m ² room, 21,000m ² @ £1/r enetrations, 21,000m ² @ £7/m ²	22.96 nth plant bases, n ² is in slabs, allowand p ² p ² p £3/m ²	0.7
£221.96 £42/m ² noke shaft, 21,0 ork shafts, 21,0 , associated duc 30/m ² uding ductwork, ncluding ductwork	7.2 00m² @ £7/m² :twork / grilles / / louvres / rk / louvres /	Builder's work in connection Allowance for lifting beams to plant room, 21,000m ² @ £1/m ² Allowance for access floors within service Allowance for holes for light fittings and so holes in partitions, 21,000m ² @ £4/m ² Allowance for access panels, 21,000m ² @ Allowance for air leakage testing, 21,000r Allowance for lift support steelwork, 21,00 Allowance for lift support steelwork, 21,00 Allowance for soustic protection to plant Allowance for sundry items, 21,000m ² @ Sub-total	482,200 allowance for concrete pli risers, 21,000m ² @ £5/r ickets, allowance for holes @ £1/m ² m ² @ £2/m ² D0m ² @ £0/m ² room, 21,000m ² @ £1/r enetrations, 21,000m ² @ £7/m ² 52,236,300	22.96 nth plant bases, n ² is in slabs, allowand n ² 2 £3/m ² £2,402.08	0.7
£221.96 E42/m ² loke shaft, 21,0 ork shafts, 21,C ork shafts, 21,C uolm ² uding ductwork, cluding ductwork	7.2 00m ² 000m ² @ £7/m ² ctwork / grilles / / louvres / rk / louvres /	Builder's work in connection Allowance for lifting beams to plant room, 21,000m ² @ £1/m ² Allowance for access floors within service Allowance for holes for light fittings and so holes in partitions, 21,000m ² @ £4/m ² Allowance for access panels, 21,000m ² @ Allowance for air leakage testing, 21,000n ² Allowance for lift support steelwork, 21,00 Allowance for accustic protection to plant Allowance for fire sealing around service p Allowance for sundry items, 21,000m ² @ Sub-total	482,200 allowance for concrete pli risers, 21,000m ² @ £5/r ckets, allowance for holes 0 £1/m ² m ² @ £2/m ² 00m ² @ £0/m ² room, 21,000m ² @ £1/r enetrations, 21,000m ² @ £7/m ² 52,236,300	22.96 nth plant bases, n ² is in slabs, allowand p ² 0 £3/m ² £2,402.08	0.7
£221.96 £42/m ² toke shaft, 21,0 ork shafts, 21,0 , associated duc i0/m ² uding ductwork, icluding ductwork 96.23	7.2 000m ² @ £7/m ² ttwork / grilles / / louvres / rk / louvres / 3.1	Builder's work in connection Allowance for lifting beams to plant room, 21,000m ² @ £1/m ² Allowance for access floors within service Allowance for holes for light fittings and so holes in partitions, 21,000m ² @ £4/m ² Allowance for access panels, 21,000m ² @ Allowance for access panels, 21,000m ² @ Allowance for lift support steelwork, 21,00 Allowance for accustic protection to plant Allowance for fire sealing around service p Allowance for sundry items, 21,000m ² @ Sub-total Preliminaries 15%	482,200 allowance for concrete pli risers, 21,000m ² @ £5/r ckets, allowance for holes @ £1/m ² m ² @ £2/m ² D0m ² @ £0/m ² room, 21,000m ² @ £1/r enetrations, 21,000m ² @ £7/m ² 52,236,300 7,835,000	22.96 nth plant bases, n ² is in slabs, allowand p ² p£3/m ² £2,402.08 £373.10	0.7 ce for serv 80.4 12.1
£221.96 £42/m ² loke shaft, 21,0 ork shafts, 21,0 , associated duc i0/m ² uding ductwork, icluding ductwork g6.23 tem and connec	7.2 00m ² @ £7/m ² twork / grilles / /louvres / rk / louvres / 3.1 tions to tenants	Builder's work in connection Allowance for lifting beams to plant room, 21,000m ² @ £1/m ² Allowance for access floors within service Allowance for holes for light fittings and so holes in partitions, 21,000m ² @ £4/m ² Allowance for access panels, 21,000m ² @ Allowance for access panels, 21,000m ² @ Allowance for air leakage testing, 21,000m Allowance for accustic protection to plant Allowance for fire sealing around service p Allowance for sundry items, 21,000m ² @ Sub-total Preliminaries 15% OHP 3%	482,200 allowance for concrete pli risers, 21,000m ² @ £5/r ickets, allowance for holes @ £1/m ² m ² @ £2/m ² D0m ² @ £0/m ² room, 21,000m ² @ £1/r enetrations, 21,000m ² @ £7/m ² 52,236,300 7,835,000 1,803,000	22.96 nth plant bases, n ² is in slabs, allowand p ² £2,402.08 £373.10 £85.86	0.7 ce for serv 80.4 12.1 2.8
£221.96 £42/m² loke shaft, 21,0 ork shafts, 21,C associated duc i0/m² .cluding ductwork, .cluding ductwork 96.23 tem and connec /m²	7.2 00m ² @ £7/m ² twork / grilles / /louvres / rk / louvres / 3.1 tions to tenants	Builder's work in connection Allowance for lifting beams to plant room, 21,000m ² @ £1/m ² Allowance for access floors within service Allowance for holes for light fittings and so holes in partitions, 21,000m ² @ £4/m ² Allowance for access panels, 21,000m ² @ Allowance for access panels, 21,000m ² Allowance for alr leakage testing, 21,000m ² Allowance for accustic protection to plant Allowance for acoustic protection to plant Allowance for sundry items, 21,000m ² @ Sub-total Preliminaries 15% OHP 3%	482,200 allowance for concrete pli risers, 21,000m ² @ £5/r ckets, allowance for holes @ £1/m ² m ² @ £2/m ² 200m ² @ £0/m ² room, 21,000m ² @ £1/r enetrations, 21,000m ² @ £7/m ² 52,236,300 7,835,000 1,803,000 3,095,000	22.96 nth plant bases, n ² is in slabs, allowand p ² £2,402.08 £373.10 £85.86 £147.38	0.7 ce for serv 80.4 12.1 2.8 4.8
£221.96 £42/m ² loke shaft, 21,0 ork shafts, 21,0 ork shafts, 21,0 	7.2 00m ² @ £7/m ² twork / grilles / /louvres / rk / louvres / 3.1 tions to tenants	Builder's work in connection Allowance for lifting beams to plant room, 21,000m ² @ £1/m ² Allowance for access floors within service Allowance for holes for light fittings and so holes in partitions, 21,000m ² @ £4/m ² Allowance for access panels, 21,000m ² @ Allowance for access panels, 21,000m ² @ Allowance for alr leakage testing, 21,000m ² Allowance for alr leakage testing, 21,000m ² Allowance for acoustic protection to plant Allowance for fire sealing around service p Allowance for sundry items, 21,000m ² @ Sub-total Preliminaries 15% OHP 3% Design reserve 5%	482,200 allowance for concrete pli risers, 21,000m ² @ £5/r ckets, allowance for holes @ £1/m ² m ² @ £2/m ² 200m ² @ £0/m ² room, 21,000m ² @ £1/r enetrations, 21,000m ² @ £7/m ² 52,236,300 7,835,000 1,803,000 3,095,000	22.96 nth plant bases, n ² is in slabs, allowand p ² £2,402.08 £373.10 £85.86 £147.38	0.7 ce for serv 80.4 12.1 2.8 4.8
£221.96 £42/m ² oke shaft, 21,0 oke shafts, 21,0 associated duc 0/m ² cluding ductwork, cluding ductwork, 96.23 em and connec (m ² 10m ² @ £6/m ² orridors, 21,00	7.2 00m ² 000m ² @ £7/m ² twork / grilles / /louvres / rk / louvres / 3.1 tions to tenants 00m ² @ £17/m ²	Builder's work in connection Allowance for lifting beams to plant room, 21,000m ² @ £1/m ² Allowance for access floors within service Allowance for holes for light fittings and so holes in partitions, 21,000m ² @ £4/m ² Allowance for access panels, 21,000m ² @ Allowance for access panels, 21,000m ² @ Allowance for alreakage testing, 21,000m Allowance for lift support steelwork, 21,000 Allowance for accustic protection to plant Allowance for sealing around service p Allowance for sundry items, 21,000m ² @ Sub-total Preliminaries 15% OHP 3% Design reserve 5% Total	482,200 allowance for concrete pli risers, 21,000m² @ £5/r ickets, allowance for holes @ £1/m² m² @ £2/m² D0m² @ £0/m² room, 21,000m² @ £1/m enetrations, 21,000m² @ £7/m² 52,236,300 7,835,000 1,803,000 3,095,000	22.96 nth plant bases, n ² is in slabs, allowand p ² £2,402.08 £373.10 £85.86 £147.38 £3,093.77	0.7 ce for ser 80.4 12.1 2.8 4.8 100.0
£221.96 £42/m ² noke shaft, 21,0 ork shafts, 21,0 ork shafts, 21,0 associated duc 30/m ² uding ductwork, ncluding ductwork, ncluding ductwork 96.23 tem and connec 9/m ² 00m ² @ £6/m ² corridors, 21,00 00m ² @ £2/m ²	7.2 00m ² @ £7/m ² twork / grilles / / louvres / rk / louvres / 3.1 tions to tenants 10m ² @ £17/m ²	Builder's work in connection Allowance for lifting beams to plant room, 21,000m ² @ £1/m ² Allowance for access floors within service Allowance for holes for light fittings and so holes in partitions, 21,000m ² @ £4/m ² Allowance for access panels, 21,000m ² @ Allowance for access panels, 21,000m ² @ Allowance for alreakage testing, 21,000m Allowance for accustic protection to plant Allowance for fire sealing around service p Allowance for sundry items, 21,000m ² @ Sub-total Preliminaries 15% OHP 3% Design reserve 5% Total	482,200 allowance for concrete pli risers, 21,000m² @ £5/r ckets, allowance for holes @ £1/m² m² @ £2/m² D0m² @ £0/m² room, 21,000m² @ £1/m enetrations, 21,000m² @ £7/m² 52,236,300 7,835,000 1,803,000 3,095,000	22.96 nth plant bases, n ² is in slabs, allowand p ² £2,402.08 £373.10 £85.86 £147.38 £3,093.77	0.7 e for ser 80.4 12.1 2.8 4.8 100.

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