

ANNEX B

Office space use and occupation density

B1 SPACE USE PER EMPLOYEE

- B1.1 The use of offices has been changing in the decade since ECON 19 was first published, with:
- trends from cellular to open plan to improve spatial efficiency, flexibility and teamworking;
 - higher workstation densities with new furniture configurations, less local and on-site storage, and more use of ICT;
 - new methods of working, with more work done out of the office and more flexible use of workstations within it.
- B1.2 A recent report by Gerald Eve and the RICS Foundation [14] reviews space use in offices. Within an overall national average of 16.3 m² net lettable area (NLA) per employee, it found:
- Predominantly open plan offices were more densely occupied (15.5 m²/person) than cellular ones (18.8 m²). The occupation density of 100% open plan averaged 15.0 m²/person.
 - Rented offices were about 10% more densely occupied than owner-occupied ones, but the differences were less than in earlier surveys in 1997 and 1999.
 - Variations between averages for different types of office (head, admin, sole, branch, sales and other) were small (so are probably best ignored for the current exercise)²³.
 - Business park offices were the most densely occupied, at 15.5 m²/person, probably because they were newer and more likely to have adopted new working practices.
 - Offices for manufacturers had by far the lowest densities (25 m²/person), presumably as space costs were lower on industrial sites.
 - Offices for the voluntary sector were also less dense (19 m²/person), probably reflecting smaller, older buildings, and possibly some volunteers not counted.
 - Density in government buildings was increasing and now similar to commercial averages²⁴.
 - ICT companies had particularly high average occupation densities (13 m²/person).
 - Variations by building size were relatively small. Mid-size buildings (500-2000 m²) and mid-turnover organisations (£ 3 - 25 m) were the least densely occupied. The authors suggested there might be a management gap between small, self-managing offices and organisations and large ones which had more management resource, and more interest in new ways of working.
 - Variations by age were surprisingly small, with very similar densities for pre-1945 and post-1990 buildings. It appeared that the less efficient cellular space in the older buildings had given way to more non-office space (e.g. meeting areas) in the newer ones²⁵. Offices from intermediate times were less densely occupied, particularly 1946-60 at 19 m²/person.
 - Offices with off-site file storage were more densely occupied (14.6 m²/person) than without (17.9 m²/person). 1990s offices with intranets also had densities 2.3 m²/person higher²⁶.
- The range of densities reported was large (lower and upper quartile boundaries 10.6 and 19.7 m² per person respectively). The report suggested a “high density” standard of 9.7 m² NLA/person and “low density” of 23.2 m²/person. The BCO [17] suggests a range of 12 to 17 m²/person.
- B1.3 Studies in the public sector have shown even greater variations in density. For example, a NAO study [26], based largely on information from five Defence Estates buildings, concluded that:
- Space per person varied from 7.9 m² to 39.9 m², with a mean of 19 m² NIA per person.
 - Average occupation density in the “actual” office space (see B3 below) was 15.9 m² NUA per person in single user cellular offices, and 10.9 m² NUA in shared use offices
 - Meeting spaces (including those in enclosed offices) could accommodate between 34% and 87% of the staff in a building.

B2 SPACE USE PER WORKSTATION

Office planning consultants AMA comment [18] that, owing to new working practices, it is best to define the capacity of a facility first in terms of the numbers of workstations. One can then consider the numbers of people per workstation - which can vary a lot with the type of work and the practices adopted (see Section B4 below). Taking workstations rather than employees, the average density reported by [14] was 18 m²/workstation, giving a 92% workstation:employee ratio. The number of employees and workstations matched in only 39% of the sample set.

23 Sales offices were the most densely occupied (15.7 m²/person): they had less support space and were more often rented. Although not mentioned in [4], some sales staff also tend to be out on the road. Sole offices were the least densely occupied, averaging 17.2 m²/person, used new working practices less and had higher levels of staff attendance.

24 New office space for central government is approaching typical standards in the commercial sector. Densities in local authorities are increasing too, but more by crushing staff into existing space in order to reduce costs [27].

25 The nett:gross area ratio of the older buildings would also have been lower, but [4] deals with NLA only.

26 Both these effects are likely to include autocorrelations, e.g. the greater adoption of other new working practices.

B3 SPACE BUDGET

Reference [14] assigns NLA to three main components:

- Actual workspace, desks in an open or cellular environment.
- Ancillary space, including local circulation and storage.
- Support space: conference, training, meeting, kitchen/dining, dedicated reception and storage. Computer/communications/server/hub rooms are not mentioned. Here we assume that they are carved out of the “actual plus ancillary”. On average, support space accounted for 25% of the NLA (averaging 13% meeting, 8% storage, 4% reception), leaving 75% for “actual and ancillary”. In the NAO study of Defence Estates [26], support space varied from 9% to 29% of NUA (approximately 7% to 25% of NLA). Support space tends to increase as actual office space is squeezed down, because people’s workspaces can no longer double-up as meeting rooms.

B4 DENS, HIVES CELLS AND CLUBS

B4.1 However, some new office environments have much more support space, for example Duffy’s UK case studies in reference [23], where space is classified according to the 4-way DEGW system:

Type	Activity	Space
Den	Group processes with relatively low autonomy	Group space for teams to come together.
Hive	Individual processes with low autonomy	Regimented open space to facilitate supervision.
Cell	Individual processes with high autonomy	Cellular and interaction space, flexible working.
Club	Transactional processes, high autonomy	Diverse, complex space, flexible working.

B4.2 At the time of writing (1997) Duffy estimated that most offices were hives, with a smaller number of dens and cells and few clubs. He predicted a major shrinkage in hives and growth in clubs, cells and particularly dens. However, the greatest growth in the four years since reference [23] was published has actually been in the hive-like call centres!

B4.3 The “club” office in particular is not the sole or principal workplace for most of the staff, but a base which is visited from time to time. The two club examples below are both designed for staff to be there no more than 3 days a week on average. This suggests a density of 18.7 m²/workstation - much the same as the 18 m²/workstation density suggested in paragraph B2.

Example	Space type	m ² per person	Percentage NLA of example area dedicated to:			
			Circulation	Support	Cellular	Open
BA Compass Centre ²⁷	Hive	18.2	35.9	19.8	7.4	38.0
Michaelides & Bendash	Den	15-30	40.2	43.4	0	16.4
Imagination	Den	26	23.9	18.7	0	57.4
Channel 4	Cell	27.3	21.4	11.8	43.0	23.8
IBM Bedfont Lakes	Club	11.2	17.8	45.0	19.0	18.0
BT Stockley Park	Club	11.2	15.8	28.0	4.8	51.4

B5 NET USABLE AREA

AMA suggests [5] that in the commercial sector typically 20% of the NLA is dedicated to primary circulation. What remains is termed the Net Usable area (NUA). Typically accounting for some 80% of NLA, this can vary considerably between buildings and uses, as in the first two examples in paragraph B4.3 above²⁸.

B6 NET OCCUPATIONAL DENSITY

Splitting out the “actual” office space from the support space:

- Reference [14] calculates an average “net occupational density” of 12.6 m²/person for the “actual” office space. Interestingly, once its extra support space is taken out, the head office ended up with the highest density of 11.7 m²/person, and the sole office the lowest at 13.2 m²/person. Even sales offices did not retain higher density once support space was removed.
- BCO [17] suggests task-based space standards range from a 4 m² to 6 m² footprint for trading desks or call-centre workstations up to 15 m² up for enclosed offices.
- DL&E design levels [25] averaged 11.25 m²/person in office space and 7.5 m²/person in dealing rooms.

27 This “office” is unusual, as it is also an air terminal and briefing centre for aircrew. It is included because we happen to know its energy consumption in some detail, and can use it confidentially to help test the tailoring procedure.

28 In the NAO study of offices for the MoD [26], NUA:NLA ratios varied from 81% to 90%.

B7 NETT, GROSS AND TREATED FLOOR AREAS *(for floor area definitions, see Annex C)*

B7.1 ECON 19 uses treated floor area (TFA) as its main denominator²⁹. Its page 21 gives rules of thumb on calculating this from NLA and GIA. The resulting net: gross ratios are 76% for Type 1 and Type 2 naturally-ventilated (NV), 72% for Type 3 AC, and 68% for Type 4 AC offices. These ratios were estimated in 1990 using Davis Langdon & Everest's professional measurement of offices shortlisted for EEBPp case studies, plus other examples known to them and us.

B7.2 In relation to the 81% average³⁰ reported in [14] and good practice values of 80-85% in the BCO Guide [17], the ratios in ECON 19 seem small. Reasons may include:

- Some space-inefficient buildings within the dataset, see figure 5.2 of reference [3].
- Mainly owner-occupied buildings within the original dataset. These may have been less space-efficient than speculative buildings: commercial valuations are based on NLA.
- A drive over the years to maximise net:gross area, partly by design (e.g. outdoor plant, more compact planning, fewer and/or external escape stairs), and partly by sometimes simply not measuring rooftop and external plantroom areas, particularly if packaged plant is used.
- Attempts to reduce office space dedicated to storage, as discussed in reference [14].

The net:gross ratios in the NAO study [26] were also higher - from 74% to 83%, with an average of 78.5%. These are not very different from ECON 19's NV benchmark figure of 76%.

B7.3 The trend to increasing space efficiency appears to be confirmed in recent Probe studies, e.g:

Building	ECON 19		<i>Net:gross rules-of-thumb from</i>			
	Type	m ² net/ person	Treated:Gross	Net:Treated	Net:Gross	<i>ECON 19</i>
Tanfield House	4	13	82%	82%	68%	68%
Aldermanbury Square	4	27	88%	82%	72%	68%
CRS	4	18 ³¹	90% approx	88%	79% approx	68%
Gardner House	3/4	23	93%	84%	78%	ca. 70%
Barclaycard	2/4	11.5	91%	87%	79%	ca. 72%
CAF	2/4	16	95%	88%	83%	ca. 74%
Marston Books	2	15	95%	83%	79%	76%

While the oldest two offices at the top (and designed in the 1980s) are close to the ECON 19 values, the others are closer to the 80% net:gross level. So are new offices much more space-efficient? Not necessarily. The first two Probe offices are in city centres. The rest are out-of-town, on open sites with more freedom to use efficient footprints and external escape stairs and plant compounds.

These low-rise buildings also have proportionally more roof area for plant and less for ducts and cores. For city offices, Davis Langdon and Everest [25] have recently reviewed twelve recent AC speculative and pre-let offices between 8,000 and 102,000 m² NLA in Central London. Measured in accordance with RICS principles (see Annex C), these had an average net:gross ratio of 71%, with a range between 64% and 76%, and an average close to the ECON 19 "Type 3" benchmark of 72%. The "Type 4" benchmark of 68% was also within the range, but may be too generous given the trends identified in B1.2. We therefore think that much of the improvement in nett:gross areas may be associated with the growth in business parks, the decline in palatial head offices, and perhaps some creative under-measurement of GIA to help improve nett:gross benchmark values.

B8 WHAT ABOUT CALL CENTRES?

We do not have much information on call centres. A review [20] gave the following figures:

	Egg Pride Park, Derby	Prudential, Dudley	Citex model
Floor area (not defined) m ²	14977 (GIA less plant?)	8958 (NLA? rented)	5500
Computer and support m ²	2600		
Training and restaurant m ²	2600		
Print and post m ²	2000		
Remaining for workstations m ²	7777		
Workstations	1250	1028	450
m ² NLA/workstation	11.98	8.71	12.22
m ² /workstation call centre area	6.22		5.99
m ² workstation footprint	5.9		
Hours of operation/day	16	16	
Plant room (presumably extra)	1921		

The surprise is the very large amount of ancillary space in the Egg and the model call centres. This could be energy-intensive, with a large effect on energy use. *More information is desirable.*

29 Some people consulted liked this: it made them think. Others preferred NLA, which was familiar to their managers.

30 Previous surveys by the same authors in 1997 and 1999 gave 79% and 82% respectively.

31 10 m²/person in main office area, excluding support spaces.

B9 CONCLUSIONS FOR ECON 19 AREA ON NET, GROSS AND TREATED AREAS

- Net:gross areas appear to have become more variable, with trends to increased spatial efficiency generally, and particularly on business park sites.
- Treated:gross area ratios have tended to increase, particularly on out-of-town sites.
- With the variability in Net:gross and Net:treated areas, it may make sense to concentrate more on NLA as the prime means of measurement, at least for the customer.
- ECON 19 uses a NLA:TFA ratio of 80% for all four building Types. This value is incorporated in related procedures such as GPG 286 and BRE Portfolio Benchmarking [21,22], which apply an uplift of 25% to NLA. An uplift of 20% may be more appropriate, particularly for low-rise out-of-town buildings, but this may just introduce complication.

For sake of consistency, it is probably worth retaining a default value of 80% for the NLA:TFA ratio, though this may need revisiting in due course, with a higher level for business park buildings. The NLA:GIA floor area ratios are still more variable, so GIA is probably less robust than NLA (or even TFA) as an area denominator. NLA tends to be accurately measured because this is what people pay for!

B10 CONCLUSIONS FOR ECON 19 ON PROPORTION OF OFFICE SPACE

The equipment benchmark table on page 15 of ECON 19 shows the following ratio of “actual plus ancillary” office space (in the parlance of [14]) to TFA.

Office Type	Office:TFA	TFA:NLA	Office: NLA
Type 1 NV cellular	60%	1.25	75%
Type 2 NV open	65%	1.25	81%
Type 3 AC standard	60%	1.25	75%
Type 4 AC prestige	50%	1.25	62.5%

The 75% Office:NLA ratio for Types 1 and 2 is identical to the figure in [14], but it appears that the higher proportions in Type 2 and lower in Type 4 may not be justified. *For simplicity, it may well be worth considering a generic default value of 75% for a basic reference office.*

B11 SUGGESTED DEFAULT VALUES FOR SPACE PROVISION

Taking the idea of a single reference office space budget further, the space allocation in the generic reference building would be:

- 20% to landlord’s space (TFA not forming part of NLA).
- 60% to “true” office space, i.e. “actual + ancillary” in the parlance of [14].
- 20% to tenants’ support space (reception, meeting/dining, staff and storage areas).

B12 SUGGESTED DEFAULT VALUES FOR NLA PER WORKSTATION

Based on the data above, we suggest the following baselines for office workstation densities. These are shown both per m² of total NLA of the building and in the “true” office area.

	per m ² of: total NLA	True office
Predominantly cellular offices	21	15.75
Predominantly open plan offices	17	12.75
Call centres	12	6
Dealing rooms		7.5

Ideally, office benchmark tailoring would be able to take account of true office area, NLA, workstation densities and installed power densities, in any combination. Opportunities are discussed in the main text.

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35 References 1 to 8 are taken from the original (1997) ECON 19 Benchmark Generator report [16]. The rest are new.

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