‘Lab Balconies’: A new direction for facility design?

‘Improved Flexibility at No Extra Cost’

Since the 1960s, the issue of Flexibility has become probably the most important design factor influencing the total-life cost of a laboratory facility. Whilst it is relatively easy to achieve improved Flexibility, or ‘higher added value’, at some extra cost, a challenge recently set The Austin Company of UK Ltd was - *“How can we have improved Flexibility at no extra cost?”* There was said to be boardroom resistance to up-front extra costs even under favourable market conditions, let alone in difficult times.

A response which meets this challenge fully, has been developed in a recent Austin Study[1]. The outcome is a design concept which achieves the aim of improved overall Flexibility at no extra, or arguably lower, cost, with the gain being balanced against a possible loss of operational performance. (In any such exercise, the achievement of ‘higher added value’ at ‘no extra cost’ *implies* there is also some element of ‘lower performance’ to be addressed). In addition, the outcome represents a new ‘first step’ in the process of addressing a Client’s needs for Flexibility. This article summarises the Study findings.

At the outset, an understanding of the meaning of the word Flexibility was considered important when making design comparisons. In the Study, the meaning is assumed to have three characteristic components[2]; *‘versatility’* – the capability to modify function within given boundaries and with given services; *‘convertibility’* – the capability to change function by changing boundaries and services; *‘expandability’* – the capability to expand function and services into a new functional area.

A traditional laboratory design concept is illustrated by a ‘typical’ lab/office layout from the 1960s (fig.1)*. It has a ‘central’ services distribution and an access route which is used for the main types of movement activity; circulation for personnel and equipment, maintenance access and fire escape. Then, as now, it offers good *‘versatility’*, limited ‘*convertibility’* but effectively no *‘expandability’* within the existing building envelope. This may be a satisfactory concept for meeting a Client’s needs.

However, such a design will be satisfactory for a facility’s total-life only if there is a limited need to accommodate change. If maintenance or conversion work is needed, the access to service ducts on the single-corridor system will be satisfactory for Health & Safety only if disruption is minor and infrequent. If *‘expandability’* is ever needed, the main constraint to expanding into space across the corridor will be the ‘fixed’ nature of a fire-escape corridor. Options are normally limited to allocating space outside the building envelope, either on the roof or on adjacent ground, or to creating redundant ‘low cost’ space internally for conversion later.

Where a Client can foresee a greater need to accommodate change, frequent maintenance access to services on a shared, 'central' corridor will be disruptive and contrary to good Health & Safety. Short-term disruption can be reduced by having redundant services, re-locatable partitions, mobile furniture, etc, but these alone will not help where more major change is envisaged. Normally, the first step in design development would be to consider a 2-corridor arrangement, including a separate equipment corridor which also provides maintenance access to services. Additionally, designs can provide improved *'convertibility'* with redundant service grids above 'walk-on' ceilings, or by having interstitial floors, possibly combined with large–span structures.

All these design developments incur capital cost increases which are offset against estimated cost savings in future maintenance and conversion work, which may or may not be realised. Also, when budget decisions relating to new facilities are finely balanced, the deciding factor may be whether or not the extra cost might be used elsewhere more profitably.

The proposed new concept, illustrated in the comparative lab/office layout (fig.2)*, achieves the 'no extra cost' part of the challenge by redistributing the cost of the 'fixed' central corridor between two circulation zones. It is shared between an external balcony, primarily for maintenance access but also serving as a fire-escape route and a narrower, internal circulation route for staff and equipment within an open-plan 'office/write-up' area. The concept may be described more accurately as a *'large floor-plate module with balcony access for maintenance to perimeter, vertical, sub-main service ducts'.* The size of the floor-plate and frequency of balcony access will be influenced by the 'travel distance' requirements for fire escape and the size of the service ducts will vary according to the level and type of services required.

The Cost Analysis in the Study compared the drawings and specification for each design and measured the variables. These were the Design Cost Factors listed (fig.3). It reported - *'Assuming equivalent specifications, there is no significant difference in capital cost between the two layouts. One layout design cannot be said to have a higher capital cost than the other, because each could be developed in detail to cost either less or more than the other'*. From this conclusion, it is also self-evident that a facility design with two or more storeys would not require an external balcony at ground level; in which case the new concept represents an overall *lower* cost.

The operational gains achieved by the new concept are:

- improved *'versatility'*, because larger floor areas, without a 'fixed' central corridor constraint, permit more optimum initial layouts of labs and office/write-up areas

- improved *'convertibility'*, because an external access for maintenance work, repairs and modifications means less disruption of existing activities

- improved *'expandability'*, because one type of activity space can be expanded physically into the other simply by relocating a non-fire-rated partition

Some Clients may consider the 'open' maintenance balcony as an unacceptable operational loss, particularly if a facility is in an exposed location (it may need some form of enclosure). Also, some Clients may not wish the movement of certain equipment through an open-plan office/write-up area. Much will depend on detailed requirements and procedures. However, the HSE in Sheffield happily accepted 'open' maintenance balconies and the movement of all their equipment through large, open-plan areas in their award-winning Robens Laboratory[3]. This represents a precedent which supports key elements of the new concept.

Where major change is envisaged, the maintenance balcony concept should be the first step in the design discussion process, because it may be satisfactory for meeting all the needs for Flexibility for most Clients. A range of options can be generated from the basic module to meet additional, special requirements, including variations similar to, but short of, a conventional 2-corridor arrangement. In the Study, all the options incorporate vertical sub-main service distribution ducts as a recommended way forward. If these initial options do not meet the need, then all the usual options for improving Flexibility should be considered, including fully integrated 2-corridor arrangements, services accessed from above 'walk-on' ceilings, etc.

The Austin Study shows the importance of reviewing carefully with Clients the various meanings of the word Flexibility so as to achieve a detailed understanding of the requirements for *'versatility'*, *'convertibility'* and *'expandability'* and the correct balance between them. Primarily, the Study demonstrates how a new design concept can offer Clients all the benefits of accommodating future change in a simpler, safer, more cost-effective manner and at an equal or lower capital cost. In doing so, it also creates a new starting point in the process of designing a facility to meet a Client's need for Flexibility.

References:

1. See 'New Facility Concept Study/Cost Analysis Report'. The Austin Company. December 2001.
2. For an earlier interpretation of these three characteristics – then termed *'flexibility/ adaptability/ extendibility'*, see 'What Price Flexibility', by Gordon Wilson. Laboratory News, September 1996. However, the current words were generated, more accurately, from 'Problem Seeking', by William Pena. Published by AIA Press, Washington. 1987.
3. See articles - Building Services, The CIBSE Journal, February 1993 and Building. February 1993.

Traditional Layout (Fig.1)* New Layout (Fig.2)*

PLAN

SECTION

*For this article, the concept is expressed in its simplest generic form to show the basic elements of the laboratory facility, ie, it's typical floor-plate/section module with services distribution and circulation for personnel and equipment, maintenance access and fire escape.

Fig.3. Design Cost Factors varied to achieve the new design –

OMIT these costs -

- Corridor wall and fire-doors, office doors and fire-rating to elements
- 600 mm width internal 'footprint' (floor/ceiling structure, finishes, etc)
- Anti-glare glass in laboratory windows (for solar control)
- Allowance for external window/wall maintenance access (nominal)

ADD these costs -

- 1500mm balcony (inc. drainage, lighting, trace-heating, etc)
- Doors to balcony (emergency exits only)
- Longer duct and service runs (to office/write-up area)
- Allowance for construction platforms (nominal)

Gordon Wilson, Architect. The Austin Company. July 2002