externally and internally; materials and constructional techniques employed within the building's external fabric may be applied internally in pursuit of 'thematic' consistency.

WILL IT BE COMFORTABLE?

Just as a designer's attitudes towards structure and how that structure is clad may profoundly affect the form-making process, so may our stance regarding environmental comfort have a powerful bearing upon that formal outcome. And just as architects harnessed new technologies of structure and construction to liberate the plan, so did an artificially controlled internal environment remove traditional planning limitations; the option now existed for creating deep-planned buildings freed from the organisational constraints of natural ventilation and lighting.

This brings us yet again to the notion of 'type' and its central position in the design process for not only, as previously discussed, can 'type' inform our attitudes towards 'plan' and 'structure', but it can also determine how the various criteria for environmental comfort are to be met.

Active v passive

Therefore, the designer may decide that comfort will be achieved totally by artificial means where heating, ventilation and lighting standards are met by the installation of sophisticated mechanical and electrical plant. This may be considered to be one 'type' where the internal environment is subjected entirely to artificial control. At the other extreme, the designer may wish to harness the building's inherent characteristics in a passive way to control levels of comfort.

Historically, such were the constraints of natural ventilation and lighting, that designers were forced into the orthodoxy of a narrow plan for efficient cross-ventilation from opening windows, and a generous floor-ceiling height to maximise levels of natural lighting (**Figure 4.48**). By way of a bonus such buildings of heavy traditional construction also

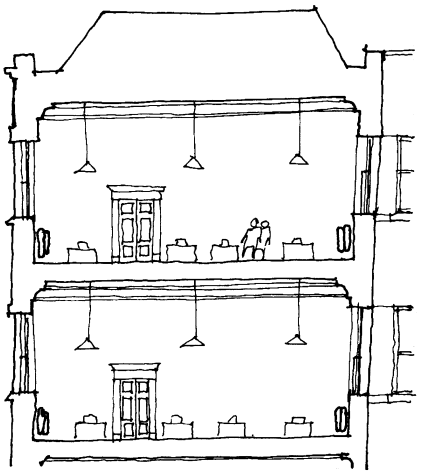

Figure 4.48 *Nineteenth-century office, typical section.*

offered considerable thermal mass for passive cooling in summer and heat retention in winter. But with the move during the mid-twentieth century towards a totally artificial environment, architects found themselves no longer constrained by a narrow plan typology and were free to explore the potential of deep plans. Therefore as these systems developed in their levels of sophistication, so the traditional role of the building fabric itself as an 'environmental filter' was displaced (**Figure 4.49**).

So just as framed and large-span structures developed during the nineteenth century modified a traditional correspondence between plan and structure, so did the development of mechanical servicing within buildings during the twentieth century replace the inherent environmental capability of traditional building forms. And moreover, just as progressive architects seized upon new structural forms for fresh architectural expression in the early twentieth century, so did the next generation exploit the expressive quality of tubes, ducts and plant associated with mechanical servicing.

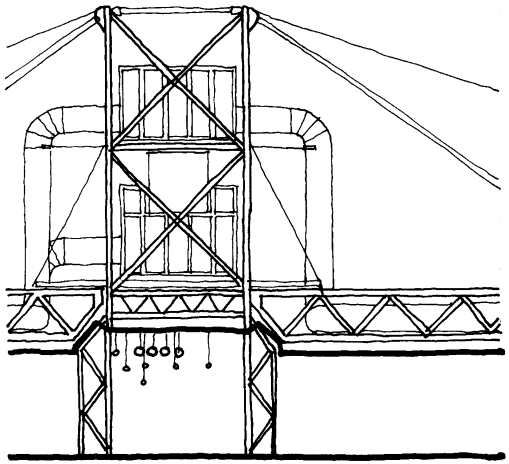

Figure 4.49 *Richard Rogers, Inmos Factory, Newport, Wales, 1982. From* Richard Rogers Architectural Monographs, *Academy, p. 65.*

Clearly, the selection by the designer of an 'environmental' type has consequences upon the development and outcome of the design as profound as considerations of type when applied to 'structure' and 'plan'. All such types must be considered simultaneously and are inherently interactive. Therefore at one extreme we arrive at a type entirely dependent upon the mechanical control of heating, cooling and ventilation for thermal comfort and upon permanent artificial lighting. At the other, a type emerges which embraces purely passive measures in achieving acceptable levels of comfort, not only harnessing the building fabric to achieve natural ventilation and lighting, but also potentially using the building as a collector of available solar and wind energy; in extreme cases such buildings may exceed in energy generation their energy consumption.

But most environmental types fall between these two extremes and just as architects initially embraced an emergent technology of mechanical ventilation to assist an inherently