ings to distinguish spatial hierarchies. Such clarity will help not only the ongoing assessment of the emerging design's validity, but will also assist in maintaining the clarity of the diagram as the design develops.

Designs cannot be 'tested' until they are drawn to scale. Only in this way can the designer 'feel' the size of building elements in relation to each other and in relation to the site and its physical context. A range of appropriate preferred scales should be used which will vary according to the size of the project but it is essential that as many aspects of the design as possible are developed concurrently. Having established a 'diagram' to scale, details of major junctions can be explored at larger scale, so building up as early as possible a comprehensive picture of design intent. It is useful to retain evidence of these early sketches as a design 'log' so that, if necessary, rejected solutions can be revisited and reassessed as the design progresses; this may form a useful reference, particularly if drawn on sheets of standard-size, numbered and dated.

At the same time it is imperative to build up a fact-file for reference on precedent studies of comparable building types, appropriate structural systems, construction, materials and environmental performance.

Architects conceive and design their buildings from the outset as three-dimensional artefacts and, as already indicated, a facility for drawing greatly facilitates such conceptual-isation. In these early stages therefore, it is imperative to develop freehand axonometric and perspective drawing methods which can quickly explore the three-dimensional consequences of design decisions.

The virtual building

Although it is now unthinkable that fledgling architects could enter their profession without sophisticated levels of computer literacy, nevertheless, there is still a perception amongst many that hand drawing and physical models offer a more direct and flexible design tool than computer-generated techniques. But if the central role of the architect is to create spaces for human habitation, then it seems axiomatic that the virtual building, which provides an accurate three-dimensional representation of the designer's concept, will allow him to understand the project more comprehensively.

Essentially, the virtual building is an accurately described digital representation of an architectural design modelled three-dimensionally. As the project develops, the virtual building allows the architect to accurately 'test' the three-dimensional outcomes of design decisions that affect the nature of external form, internal space, and junctions of components. Moreover, because it is represented by one model, then the need to co-ordinate several drawings is removed, and the margin

for error, inherent in traditional methods, is therefore substantially reduced. Two-dimensional plans, sections and elevations may also be extracted for evaluation early in the design process, with any modifications subsequently being fed back into the single virtual building model.

Whereas with 'design by drawing', early decisions regarding planning, structure, and construction, for example, will accelerate the design process, with the virtual building, such decisions must be logged into a database at an early stage for the design to proceed at all. In the event, this not only represents good practice, but also allows the three-dimensional model to provide a complete visualisation of the project, which can then be communicated, electronically, to other members of the design team.

The virtual building, in effect, offers a new *method* of designing buildings by offering instant evaluation of the project in two and three-dimensional images at any stage of the design process, a process of refinement which, by comparison, traditional drawing renders unacceptably labour-intensive.

The purpose of this book has been to establish a sensible working method for getting the massively complex process of designing a building under way, for inevitably it is within these early decisions and tentative forays into form-making that the seeds of true architecture are sown. And yet it represents a mere beginning, for design activity carries on until the building is completed on site: reordering may well ensue during a building's 'first life' and beyond should recycling of salvaged building components be considered in the original design. It is not within our scope here to chart that entire process; more to suggest that its effectiveness will inevitably depend upon this initial exploration of uncharted territory in search of an appropriate 'form'.

But that exploration could also heed Albert Einstein's sage counsel; 'If you wish to learn from the theoretical physicist anything about the methods he uses ... don't listen to his words, examine his achievements.' The same could well apply to architecture.