



**FIGURE 3-1**  
The Skeleton and Skin of  
a Simple Building.

from the wind and the rain, and relief from the heat of the sun. The walls mitigated extremes of heat and cold by supplying insulation, and through their thermal mass, they would heat up in the warmth of the day, then reradiate thermal energy to the interior in the cool evenings. When these passive strategies did not suffice, a fireplace produced additional heat. And, when it got really cold, there were blankets to huddle under.

The door and window openings provided connection to the exterior, together with mechanisms for controlling the character of that connection. They could be opened and closed manually to vary the flow of air. And, through filtering mechanisms such as screens, shutters, blinds, and drapes (probably minimal in this particular case), they provided straightforward ways to manipulate qualities of interior light, view, privacy, and protection from bugs and dust.

The interior was not subdivided, like a modern home, into specialized rooms. Instead, the space was adapted for different purposes at different times, through use of very simple, mostly portable furniture and equipment. There was a bed for sleeping, table and chairs for eating and reading, and a water basin for washing. The fireplace served as an elementary cooking device, and the great outdoors as a privy.

There were no pipes and wires embedded in the walls and beneath the floor, no mechanical or electrical devices, and no demands for the services of plumbers, electricians, or appliance service people. Water was supplied from a rainwater tank fed by runoff from the roof. Firewood was cut from the surrounding scrub and hand-carried to the hearth. There may have been a kerosene lantern filled from a drum outside the door. And perhaps there was an evaporative cooler hanging in the branches of a nearby tree.

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## MACHINE-AGE INTERIORS: DOMINANCE OF MECHANICAL AND ELECTRICAL SYSTEMS

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Now contrast this simple

base-case building with a typical twentieth-century suburban home. The most obvious difference is that the more modern interior is subdivided into numerous specialized rooms for particular purposes—typically several bedrooms for different family members, living room, dining room, kitchen, bathrooms, laundry, and garage. The designer's most fundamental task is to configure these rooms in response to a program—that is, to get their sizes, proportions, interrelationships, and orientations right.

Each of these rooms requires specialized furniture and machinery to support the associated functions. So a second crucial design task is to select, specify, and procure the necessary items. There is bedroom, living room, and dining room furniture, and there are kitchen, bathroom, laundry, and entertainment fixtures and appliances. Natural light from the windows is augmented by a variety of different electric light fixtures—with the specifications of these varying according to location and purpose. And there are heating and mechanical ventilation fixtures to provide active means of climate control.

To keep all these specialized devices running, the house is elaborately networked with supply and removal systems. There are hot and cold water supplies and sewer connections to the kitchen, bathroom, and laundry; the plumbing plan is an important part of the design. There may be gas supply, as well. There are air supply and return ducts to all the rooms; this requires another sheet of construction drawings, and introduces another trade. And there is electrical wiring everywhere—yet another drawing and trade.

All these systems require control devices, so the designer is required to select, specify, and conveniently locate these. They consist mostly of faucets and valves for the plumbing, and switches and dimmers for the electrical system. Perhaps there are some rudimentary automatic controls—thermostats for the air conditioning and timers for the lights.

Finally, the internal networks of the house are connected to large-scale utility networks. There are metered connections to water, gas, and electrical supply networks. Municipal sewer and garbage disposal systems remove