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Technics and Architecture

The Development of Materials and Systems for Building

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Systems

From its very beginning, mechanization caused workers to move to cities, seeking employment in factories and mills. In England, where machines first significantly influenced national life, an increase of rural poverty and of the birth rate during the eighteenth century further encouraged the movement of population toward cities. Only about half lived in rural areas at the middle of the nineteenth century. The most industrialized English cities became such crowded and sooty tangles that they were sometimes referred to as “the Black Indies,” so different from the rest of the country that they seemed strange colonial islands.

During these centuries England’s shipping activity and foreign trade blossomed, almost doubling during the nineteenth century. This growth was accompanied by increasing numbers in the social level between the gentry and laborers. At the upper reaches of this middle class were major businessmen, who had wealth without station. At the lower reaches were clerks and merchants. In London between 1851 and 1891 the number of “commercial clerks” increased about fivefold, while the city’s population as a whole did not even double. Members of the middle class desired to better their living conditions, both at home and at work. Their expenditures may not have been so lavish as those of the nobility or the richest bourgeoisie, but the middle class became multitudinous, a ready market for building improvements that offered comfort and convenience. Manufacturers found that working conditions influenced the output of their workers, knowledge that was gained through the leadership of a few philanthropic factory owners, the adoption of legislation, and the insistence of labor unions. A stronger incentive to improvement was the fact that in warmer and better-lighted factories work could continue through longer

hours and an owner’s investment in the mill and machines would thereby produce greater profits. From such industrial applications came the elementary forms of devices that were later used in buildings of all sorts.

The comfort-producing systems that were developed had as their purpose the production of an environment in which one was not threatened by actual discomfort and was, perhaps, even somewhat cosseted. For a middle-class society that frowned on excessive luxury, it was difficult to determine what was a beneficial degree of comfort. In a period of radical change in the principles of medicine, it was even difficult to determine those conditions that were healthful. Until Pasteur’s germ theory won out at the end of the nineteenth century, sea bathing, mineral waters, “fresh-air cures,” and sunshine—the latter being particularly for the romantic wasting away that was tuberculosis—were among the many cures and nostrums that were briefly but seriously adopted.

In the case of cataclysmic events, such as fire or lightning, the owners or occupants of buildings could do little to prevent their occurrence. Lightning most often caused fires, and fires and structural failures threatened owners’ investments in buildings. With the development of insurance this fact could be viewed as little more than an individual’s wager on the likelihood of the problem arising, but from medieval times it had been recognized that this gamble also risked the safety of other structures and the people in them. Since there were no certainties involved, the process of regulation moved slowly, accelerated by catastrophes and slowed by the objections of influential owners of buildings.

The provision of comfort required the insertion of tubes, wires, fixtures, and equipment into the fabric of

buildings. This work became increasingly specialized as time went by, until each type of system developed its own engineers, draftsmen, and contractors. No longer were the “natural philosophers” and toolmakers of the eighteenth century capable of applying their general knowledge of scientific principles to a variety of tasks, and tests and measurements were developed to provide more exact consideration of the systems involved. These provided much of the information on which standards and regulations were based.

Still, these systems (except for elevators, which demanded visibility) were largely unseen and certainly not displayed. Architectural styles of the eighteenth and nineteenth centuries were on the whole committed to presenting an illusion of the past, or at least a recognizable evocation of historical forms. Sir Charles Barry’s Reform Club in London (1840) prompted the French critic César Daly to write:

[It is] almost a living body, with its complex circulation systems; for in its walls which appear as immobile, there circulate gases, vapors, and fluids through the hidden ducts and wires. These latter constitute the arteries, veins and nerves of a new organized being, heat is conveyed by them in winter, fresh air in summer, and in every season they supply light, hot and cold water, food, and all those numerous accessories which an advanced civilization requires.¹

While Daly admired the systems within the Reform Club’s building, he seems to have been equally impressed by the cunning with which they were concealed. Architectural revivalism, particularly in the late nineteenth century when buildings’ dimensions did not always allow precise historicism, left sufficient latitude to accommodate the necessary elements of comfort and

convenience. Although fireplaces were included in many of the new tall commercial buildings, they were at one time recommended for ventilation purposes and often might not be at all suited for burning a fire. Lighting, long principally a transportable piece of equipment, had its system embedded in the fabric of the building, but the actual lamps were visible imitation of the lamps of the past.

When Le Corbusier in 1923 wrote “a house is a machine for living in,” he not only proclaimed an esthetic principle, but at the same time recognized a fact regarding all buildings of that time. Wires and pipes might be hidden, but lamps, switches, grilles, and steam radiators were visible. By the middle of the twentieth century the systems within a building might account for a quarter or even half of its total cost. The function of architecture had acquired an increasing responsibility for the ease and well-being of the buildings’ occupants.

