## THE BASIC STRUCTURAL UNIT

The given structural components and grouping of vertical elements together define a basic building block which in turn becomes a standard component in the larger building complex. The key dimension that has been developed here is a 32 foot width between bearing walls, which becomes twice 16 feet for a skeleton frame system. This size is the result of our study for some years of plan types and flexibility as interrelated with economical use of various structural components. 20 to 28 foot planning bases were also evaluated. While 20 feet is sound for poured-in-place slabs, it does not take full advantage of prestressed concrete, nor is it ideal for any system employing plywood, since 10 feet is off the 4-foot module. In unit planning it can work well for a 3 BR but less well for a 2 BR. 24 feet is uneconomical in planning single units and too small to permit two living rooms. 28 feet will barely permit two apartments on a bedroom floor, with the possibility of three bedrooms in the width, but two living rooms in 28 feet are inadequate as a repeatable standard. 32 feet allows two units at either a bedroom or living room level, and various combinations of 1, 2, 3 or 4 bedrooms are found to be easily obtainable. It is adaptable to simple modular wood floor construction on a 16 x 16 or 12 x 16 frame, while a prestressed slab is being used to full advantage in 32 feet.

### Building Types

The basic 32 foot unit with its structural and mechanical components can be stacked vertically, four floors high or more if desired. Any of the several building types, which has been a goal of this study to develop, may therefore be produced. Because there is no agreed on nomenclature for these types, they are outlined here under the titles and definitions used in this study.

1. Row House: A dwelling unit one to four floors high, entered at or near grade, with no other family unit above it. This is the classic "town house" type which is essentially a single dwelling unit but substitutes a party wall for the 6 to 12 foot unusable side yard between houses--so common in the Boston area. The space saved is relocated in an area where it can be used, as in an open area common to several units. A severe acoustic problem is eliminated, and cost savings are possible in construction and site development. In the row house 100% of the units have direct contact with the ground.

2. Walk-up: A multiple dwelling in which one or more of the family units is entered one to four stories above (or below) grade. There are various forms the walk-up may take. It may be simply a low elevator type building (without the elevator), with horizontal layers of apartments off a corridor. In this form the percentage of families with private yards can be up to 30%, though as most frequently seen, private gardens are eliminated. An arrangement in which more privacy is assured is in a building without corridors in which a series of public stairs affords entrance to two or more apartments per floor. In this case the individual units may be two stories, the simplest version being duplex over

duplex. 50% of families may have private gardens on the ground. Upper families may be assigned an area on the ground for their use, but it is not directly accessible from their living unit. Balconies and roof gardens can be used to obtain outdoor living areas more integrated with upper living units.

The walk-up, despite its divorcing of some units from the ground, does permit far greater densities, a very important consideration in urban areas. In steeply sloping areas, it may rise to six or more stories in height without requiring elevators.

3. Back-to-back Row House (or Walk-up): A dwelling type in which two row houses are combined in the depth of the building. Each family unit has three party walls, in effect, and is oriented only one way. This type increases density by about 30% while still allowing 100% of families their private garden. Individual units are similar to those of a double-loaded corridor scheme in a walk-up, but both more economical and more livable in their direct contact with the ground. A walk-up can be formed from a back-to-back type.

4. Quadrefoil: A grouping of four units within a cross-shaped party wall system. This is a hybrid form between row house and back-to-back type.

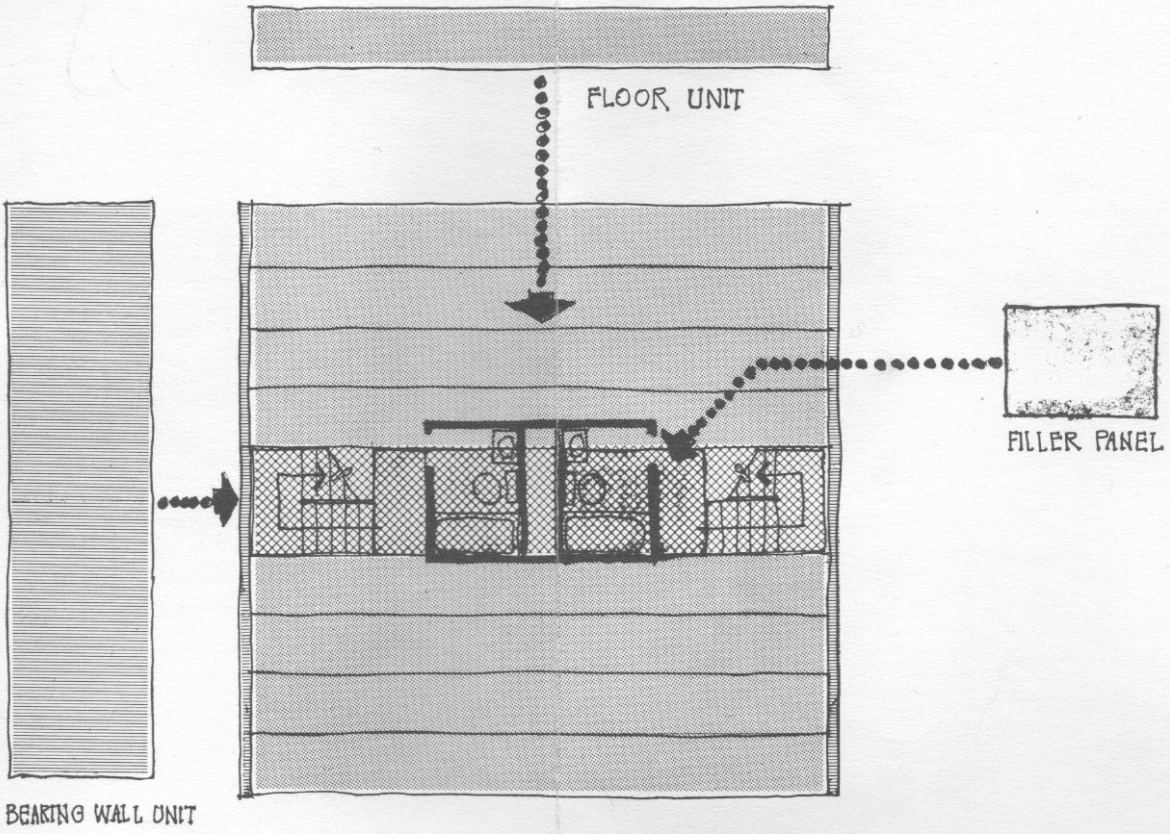
## THE STRUCTURE

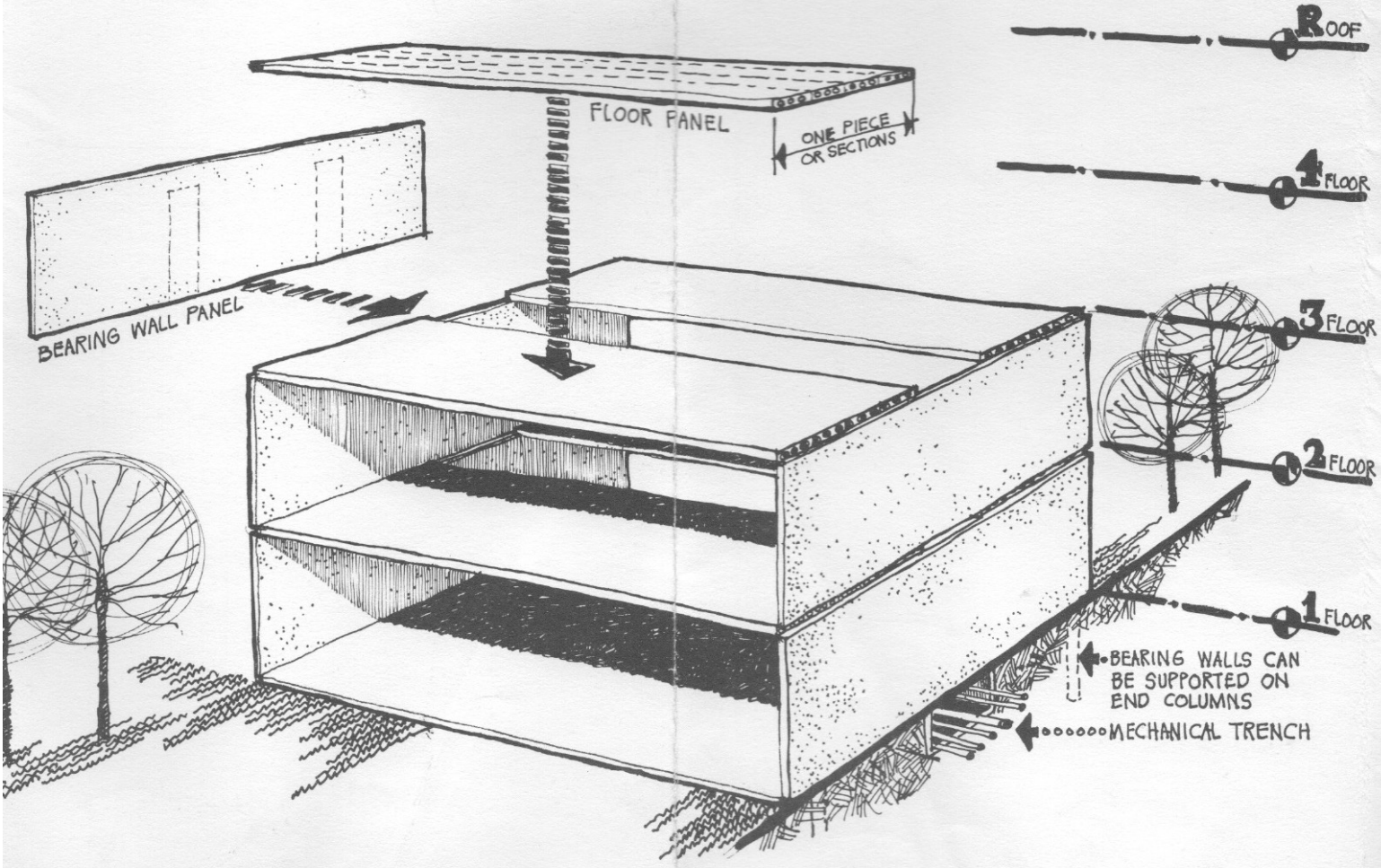
The floors, walls and roof are now added to the foregoing grouping of core elements. Present indications are that concrete structures are economically feasible and may in fact be nearly competitive in initial cost with conventional wood frame structures with definite savings in monthly operating costs. While other construction may eventually prove less expensive, at the present time available plant, equipment and know-how is more adaptable to a system employing precast, prestressed simple concrete slabs and bearing walls (solid or cored). Precision manufacture and careful installation will provide a structural slab with finish ceiling and ready-for-finish floor. The roofing may be factory-applied, joints filled or taped in the field or entirely field-applied.

It will be seen that a grouped core of vertical elements allows for maximum use of identical slabs, special elements being limited to the central area so that even they themselves are standard. With this approach, a total of 200 units in the same area should constitute a volume of rigidly standard production sufficient to permit competitive prices.

Walls may be built up of the same cored units, running the full height or poured in place, using a standard multi-use form. At the present stage of development, poured-in-place concrete walls and unfinished concrete block appear to run slightly below precast in cost; but to bring concrete block to the performance level of precast concrete for fire rating, acoustic value and degree of finish may run its cost over precast, particularly if the minimum goal of 200 units is kept in mind.

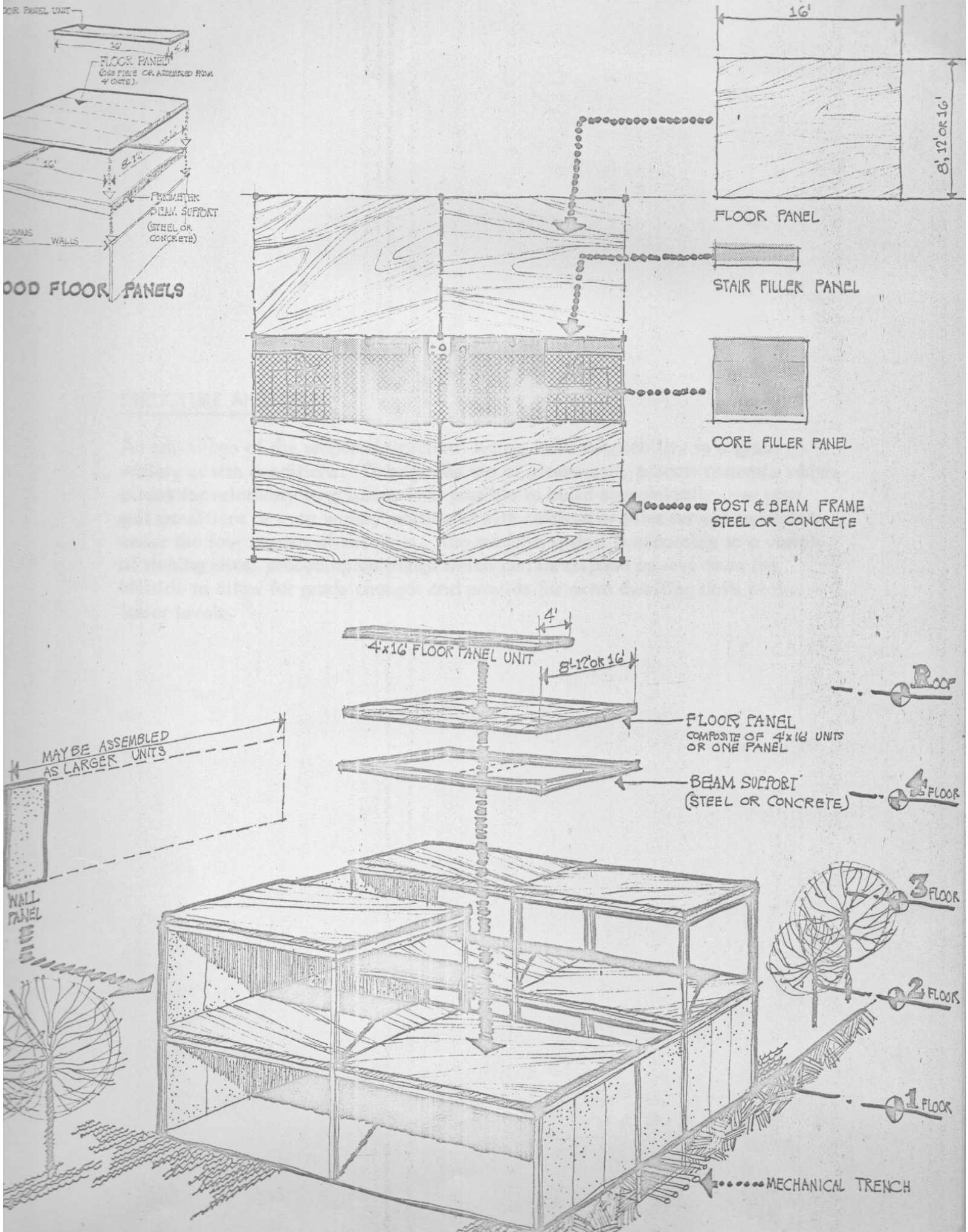
In terms of the future beyond 1963, there is every reason to believe that larger precast elements will not only cost less and perform better than concrete block, but will definitely undersell conventional frame structures. That is to say, there is little room for significant advance in cost reduction techniques in wood structures, but the potential for concrete has only begun to emerge.


FLOOR UNIT
FILLER PANEL
BEARING WALL UNIT


ROOF
FLOOR PANEL
ONE PIECE OR SECTIONS
4 FLOOR
BEARING WALL PANEL
3 FLOOR
2 FLOOR
1 FLOOR
BEARING WALLS CAN BE SUPPORTED ON END COLUMNS
MECHANICAL TRENCH

## ALTERNATE STRUCTURES

Although present indications are that the above concrete structure system provides the best all-round solution, the design module is seen to be adaptable to a 16 ft. structural bay--framed in steel or composite steel and frame construction. It is believed that with a proven mass market for the standard structure here proposed, volume production of steel components can prove competitive.


OOR PANEL UNIT
16'
FLOOR PANEL
(ONE PIECE OR ASSEMBLED FROM 4' UNITS)
8'-12'
16'
PERIMETER BEAM SUPPORT (STEEL OR CONCRETE)
WALLS
OOD FLOOR PANELS
16'
8', 12' OR 16'
FLOOR PANEL
STAIR FILLER PANEL
CORE FILLER PANEL
POST & BEAM FRAME STEEL OR CONCRETE
4'
4'x16' FLOOR PANEL UNIT
8'-12' OR 16'
ROOF
FLOOR PANEL
COMPOSITE OF 4'x16' UNITS OR ONE PANEL
BEAM SUPPORT (STEEL OR CONCRETE)
4 FLOOR
MAYBE ASSEMBLED AS LARGER UNITS
WALL PANEL
3 FLOOR
2 FLOOR
1 FLOOR
MECHANICAL TRENCH