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III

For More Imagination — and Less Tradition

Plus de fantaisie — moins de tradition

Mehr Einbildungskraft — weniger Tradition

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A noticeable contrast has developed at this symposium. The Introductory Reports for Themes I and II and most of the prepared discussion for these themes deal with various relatively minor improvements in traditional steel structures composed of hot-rolled shapes or plates of standard configuration. On the other hand, the Introductory Report and much of the prepared discussion for Theme III, Applications, relate to buildings composed entirely or in part of cold-formed, thin-walled, lightweight structural members formed from sheet or strip steel. These members are used either by themselves or in combination with framing of the heavier, traditional type.

It is the writer's observation in the U.S.A. that these thin-walled, cold-formed steel members lend themselves particularly well to mass production and that they provide solutions for the mentioned problem by Professor Jungluth, namely that of replacing expensive and scarce on-site labor by mass-production in factories. This problem is particularly acute in the U.S.A. where, in the last several years, the number of available construction workers has actually decreased because of preference for other, less demanding occupations.

From an intensive study of these conditions, particularly in residential construction, the writer has become convinced that these problems of high cost and low labor supply can be solved only by a more imaginative approach to building design as a whole. We must give up thinking in terms of steel structures as opposed to concrete structures, of traditional as opposed to cold-formed, thin-walled members. The maximum benefits of the badly needed industrialization of construction are obtained only by the combined use of all methods, all materials, all fabrication processes. Cold-formed steel floors, roofs, and walls in combination with hot-rolled steel frames are extremely widespread in high-rise buildings in my country. Likewise, the use of hot-rolled steel for the main framing, combined with precast concrete floor, roof, and exterior wall panels is proving increasingly effective and economical for 6-12 story construction, both in terms of cost and in terms of reducing total design and construction time.

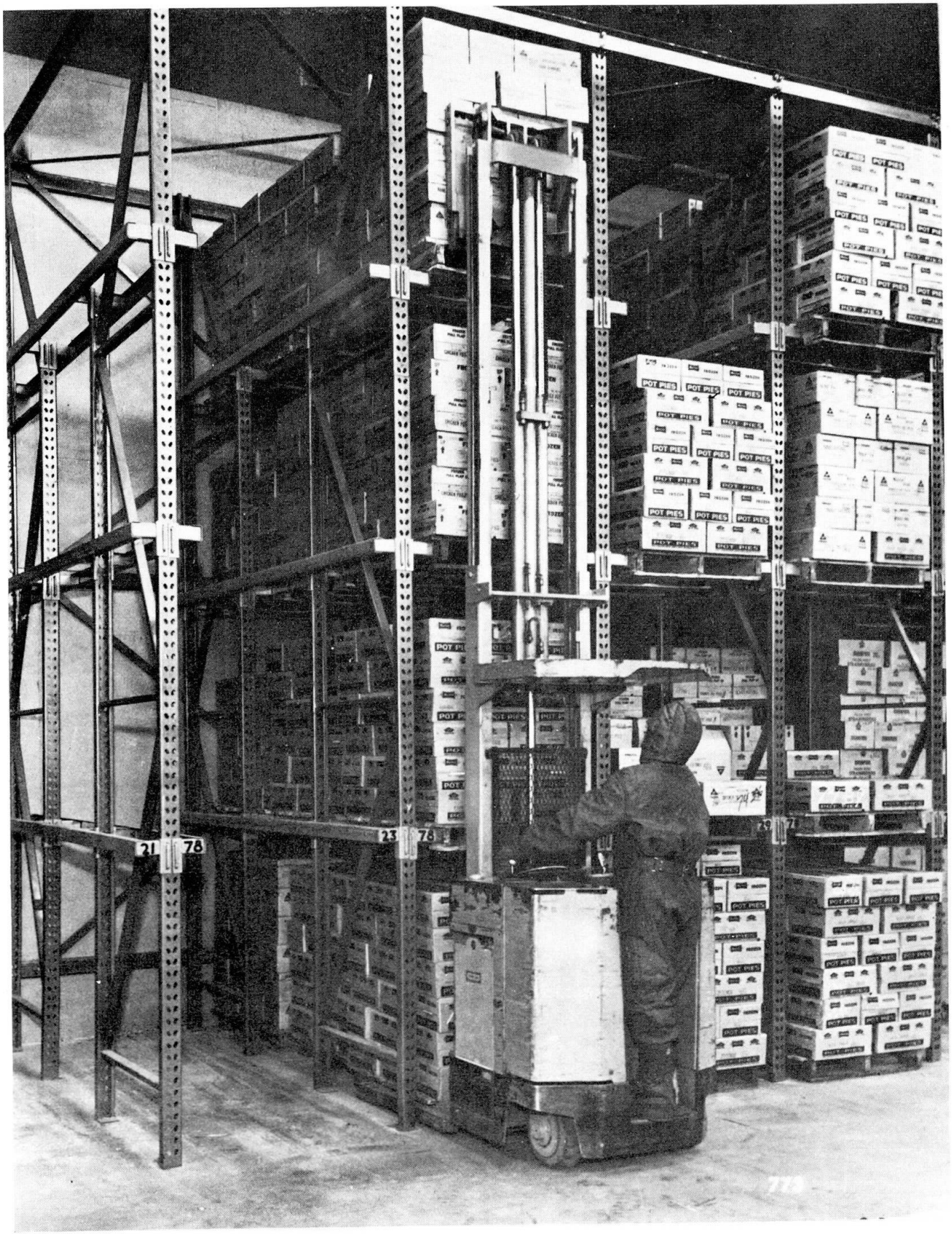
As long as the design profession continues to think along strictly compartmentalized lines, steel vs. concrete, hot vs. cold-formed, cast-in-place vs. precast, maximum industrialization

will not be achieved and the bottleneck so well defined by Professor Jungluth will not be broken.

Another professional tradition of the structural engineer is that of thinking almost exclusively in terms of buildings and bridges, and possibly of some tower structures. There are large fields of special structures which demand highly skilled engineering and which lend themselves particualrly well to mass production. One of these fields is that of industrial storage racks which was briefly mentioned by Mr. Schlaginhaufen. This field has tremendously expanded within the brief time of about ten years. Fig. 1 shows an early installation of a small storage rack served manually by a modest forklift truck. Fig. 2 shows a later, much larger installation served by heavy, high capacity and high speed fork lifts. Finally, Fig. 3 presents a very recent facility of high capacity and with completely automated and computerized loading and unloading mechanisms. In the United States these structures are made almost exclusively of cold-formed steel shapes which lend themselves to high-speed mass production, producing the special types of shapes and connections which fit the particular requirements of storage racks (see Fig. 1).

I may add, incidentally, that the problems of structural design and analysis of these heavily loaded light-weight structures of unusual configuration are among the most challenging I have met in my entire practical experience.

Fig. 1 Early installation of a small storage rack served manually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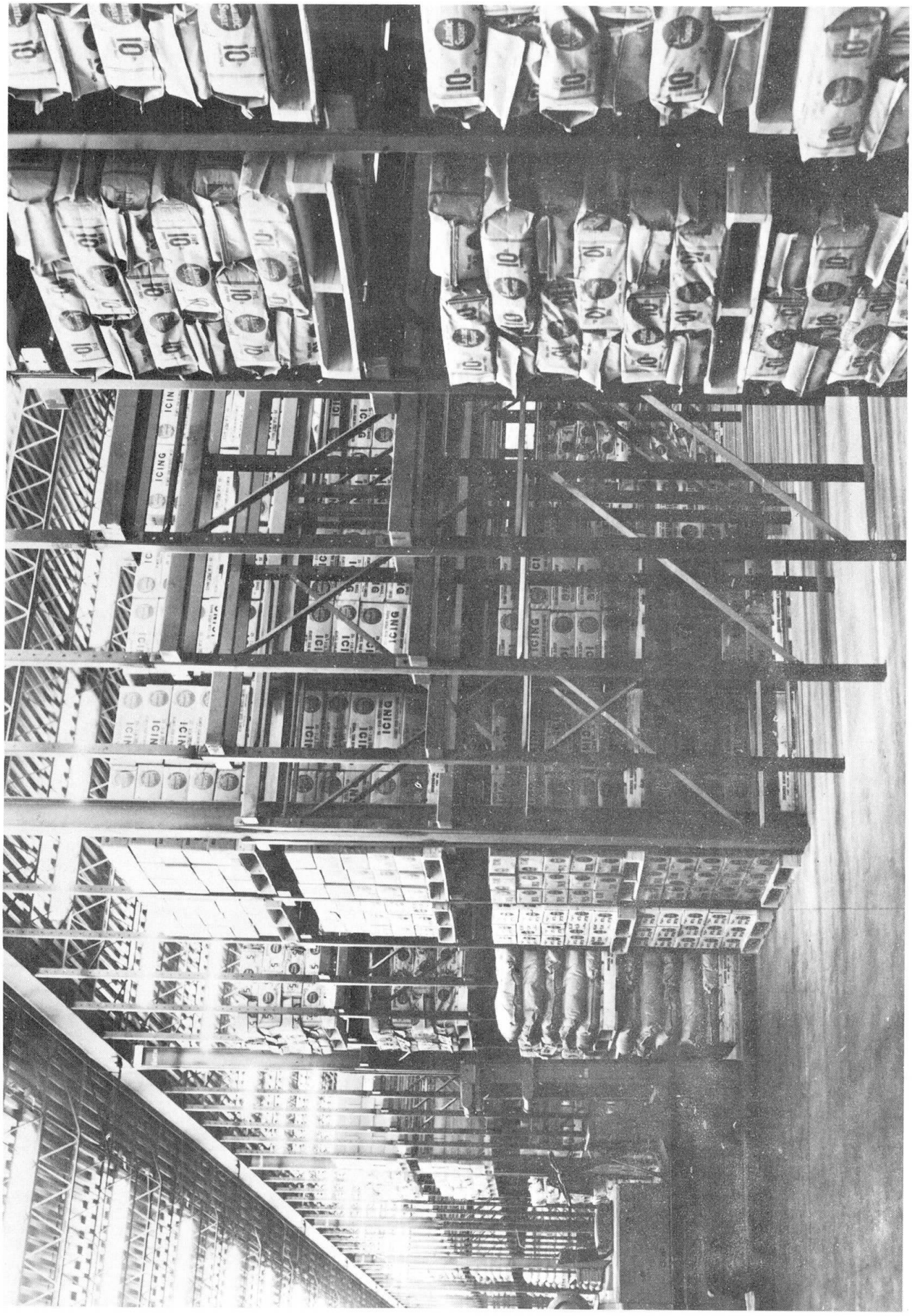
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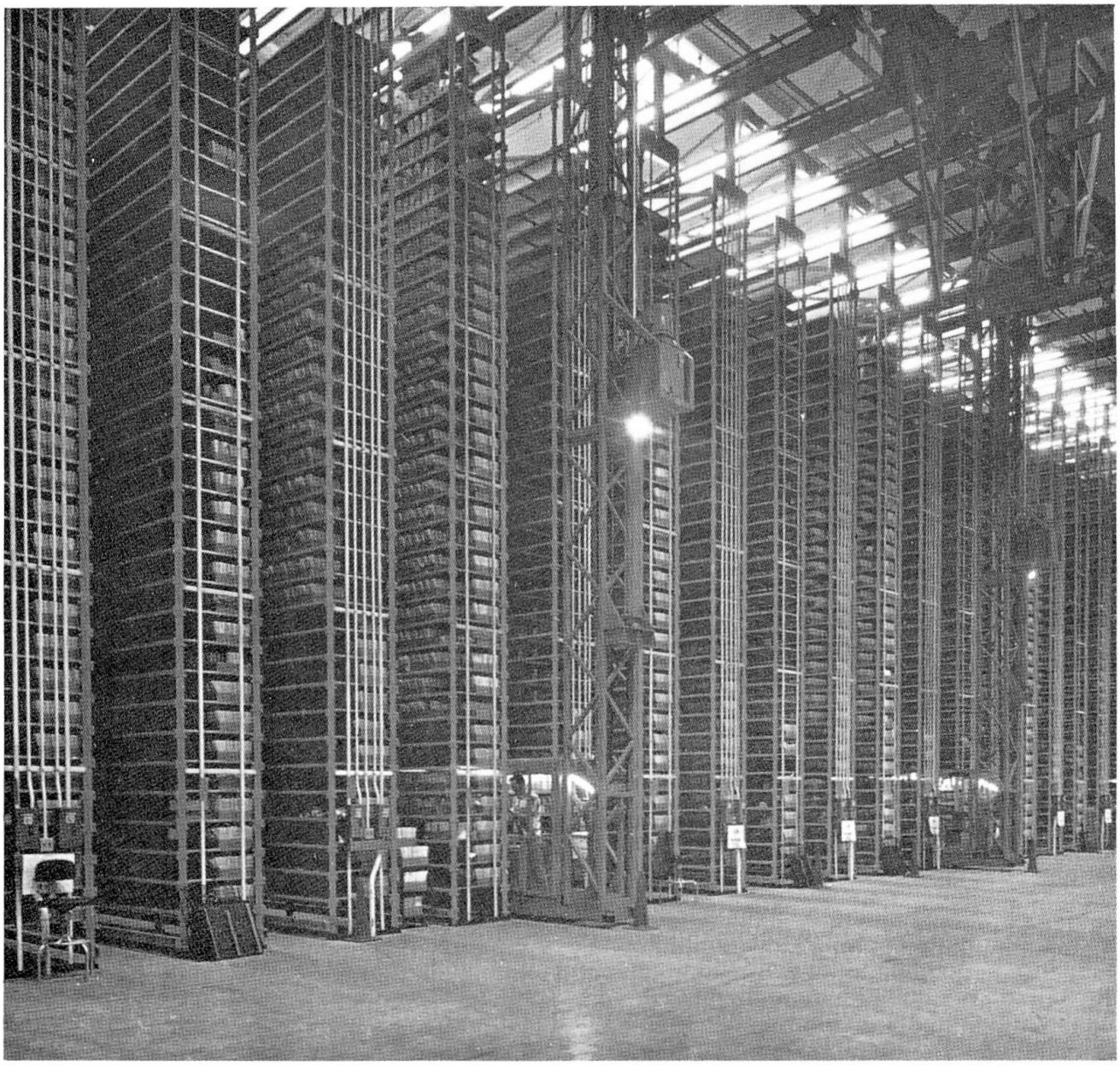

Fig. 3 Recent high capacity installation with completely automated mechanisms

Fig. 2 Later large installation served by fork lifts

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