

SELECTED REFERENCES

INDUSTRIAL RELATIONS SECTION

PRINCETON UNIVERSITY

No. 237*

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FACTORY ARCHITECTURE AND DESIGN**

I. GENERAL AND BACKGROUND READINGS

Abercrombie, Stanley. "Workplaces: assembly line architecture." *AIA Journal* (American Institute of Architects, 1735 New York Ave. N.W., Washington, D.C. 20006), July, 1980. pp. 57-61. \$5.00.

Abercrombie highlights the dramatic strides in factory architecture since the industrial revolution, crediting such pioneers as Gropius, Behrens, and Albert Kahn with advancing the field. He discusses the growing similarities between office and factory work space. He points out that the relationship between factories and their host towns is becoming more important, and that not only are external building forms changing but changes inside the factories are reflecting a growing concern for the aesthetics of light, acoustics, color, and an open feeling. Heightened concern for work environments has prompted the American Institute of Architects' Commerce and Industry Committee to initiate such projects as developing post-occupancy evaluation criteria for factories, case studies of major industrial projects, and formats for reporting the vital statistics of industrial buildings.

Anderson, Grace M. "Building type study 599: industrial buildings/post-smokestack industry." *Architectural Record* (McGraw-Hill, 1221 Avenue of the Americas, New York, NY 10020), April, 1984. pp. 97-113.

This is just one of several industrial building type studies periodically published in *Architectural Record*. In this issue, four innovative industrial buildings are discussed. They include a forest research laboratory, a manufacturing and office building for a hardware and software firm, a DNA factory/research facility, and an IBM manufacturing facility which, although more similar in function to a stereotypical factory than the other buildings presented, reveals an orderliness, cleanliness, and design which indicate concern for employees.

Apple, James M. *Plant layout and material handling*. 3rd ed. New York, NY 10158. John Wiley and Sons (605 Third Ave.). 1977. 488 pp. \$43.50.

This textbook on industrial engineering demonstrates the planning necessary for efficient material flow and the preparation of effective layout for physical plants. Nineteen chapters are devoted to such problems as: process design; facilities design function and procedure; designing and analyzing material flow; planning activity relationship; computerized layout procedures; space determination; area allocation; and facility location issues.

Architectural Record. *Industrial buildings: the architectural record of a decade*. Compiled by Kenneth Reid. New York, NY 10020. F. W. Dodge Corporation (c/o McGraw-Hill, 1221 Avenue of the Americas). 1951. 546 pp. o.p.

* Prepared by Kevin Barry, Librarian, Industrial Relations Section, with assistance from Frances Chen, Librarian, Architecture Library.

** Items from this list should be ordered directly from the publisher. Addresses are given in connection with each reference. For items that are out of print consult libraries.

Drawn from a myriad of informative articles reprinted from *Architectural Record*, this volume focuses on buildings developed in the 40s, a decade of industrial growth and massive plant expansion and conversion programs. Included is a very wide variety of chronologically arranged building type studies, industrial building presentations, and time saver standards sheets. A follow-up volume on this topic was released six years later by Dodge Corporation in recognition of the continued, burgeoning building activity in more places, assisted by more architects, and of greater scale, complexity, and diversity. Structured much like its predecessor, *Buildings for industry: an architectural record book* (1957 reprint from Greenwood Press, 88 Post Rd. W., Westport, CT 06881. \$31.75) also highlights the involvement of architects in newer areas of activity, such as the design of industrial laboratories, warehouses, and truck docking facilities. Selection of articles from both volumes is based on significance of designs as ideas and as final achievements.

Buildings for commerce and industry. Edited by Charles K. Hoyt. New York, NY 10020. McGraw-Hill Book Co. (1220 Avenue of the Americas). 1978. 228 pp. o.p.

Chapters five and six concentrate on conventional industrial buildings as well as specialized, utilitarian buildings, like warehouses, power plants, and waste treatment plants, which although not typical factories producing commercial products, nevertheless represent industry-related needs. The buildings discussed are those that meet aesthetic and architectural as well as economic and efficiency goals. Architects are being used more frequently for buildings of this type, because from the design stage through construction they show concern for how the external appearance of an industrial building will influence both the public and self-image of a company and its "fit" into the community. The internal aspects of industrial atmosphere and its effect on health, safety, and productivity are equally important in the architect's broad viewpoint.

Drury, Jolyon. *Factories, planning and design and modernisation.* New York, NY 10024. Nichols Pub. (P.O. Box 96). 1981. 306 pp. \$150.00.

This volume is a detailed overview of modern factory design and construction. The author begins with a useful, historical review of industrial building traditions and purposes. The more central topics of the book include detailed examinations of project planning, statutory and legal requirements, preparation of a master plan, coordination of purpose and design, site development, and the use of landscaping. The author delves into such specific issues as the role of working relationships between the architect and factory workers, reuse of older structures, lighting systems, heating and ventilation, noise control, security precautions, site conservation, fire prevention systems, and the use of fountains and gardens. Similar themes arise in an earlier work by Drury co-authored with Derek Sugden entitled "Factories" in the 1974, no. 2 issue of *Architectural Design*. (Academy Group, 7/8 Holland St., London W8, pp. 92-107. \$9.95 includes postage.) Identifying the 40s and 50s as a low point for industrial design, the authors point out factors currently influencing factory design including: the shortage of cheap energy; the need to control production; and the changing nature of the world economy. They determine that the ideal factory design should be able to accommodate increasing product diversification, allow more integration of production and materials handling, and create a better working environment. The article concludes with an examination of several new factories and the varying degrees to which they meet these ideal design goals.

Grube, Oswald W. *Industrial buildings and factories.* New York, NY 10175. Praeger Pubs. (521 Fifth Ave.). 1971. 199 pp. o.p.

Presented in both German and English, chapters discuss at length: industrial building construction as a facet of urban planning; comprehensive

planning and building structure; prefabrication and modules; controlled environmental conditions such as lighting and ventilation; structure and design; and industrial building construction as a facet of modern architecture. Forty-five plants in industrialized countries are illustrated with photographs and specifications.

“Industrial building: three Bossom Lectures.” *The Royal Society of Arts Journal* (Royal Society of Arts, John Adam St., Adelphi, London WC 2N 6EZ), December, 1984. pp. 16-60.

A significant portion of the proceedings of the 231st session (1984-85) of the Royal Society of Arts revolved around the topic of industrial building. Of the three lectures presented—“Industrial building in retrospect” by Ken Powell, “Our industrial heritage: a resource for the future?” by Nicholas Falk, and “The future of industrial building” by Nicholas Grimshaw—the last is most pertinent to this bibliography. It concerns the changes in industrial buildings as industrial activities get smaller. Grimshaw’s lecture covers six main themes: the question of planning, location and environment; the evolution of building types and our perceptions of them; questions of size and scale; energy issues; the relationship of home, work and leisure time; and the industrial processes occurring within industrial buildings.

Konz, Stephan. *Facility design*. New York, NY 10158. John Wiley and Sons (605 Third Ave.). 1985. 368 pp. \$36.95.

This work is intended to serve as a textbook for college level design courses. The author approaches the topic of facility design with such broad themes as evaluation of alternative layouts, the building shell, materials handling, and environmental concerns. The text delves into such specifics as machine arrangements, storage, shipping and receiving, office location, utility networks, lighting ventilation, and waste management. Throughout, the author attempts to strike a balance between mathematical and verbal descriptions of current engineering practices.

Munce, James F. *Industrial architecture: an analysis of international building practice*. New York, NY 10020. F. W. Dodge Corporation. (c/o McGraw-Hill, 1221 Avenue of the Americas). 1960. 232 pp. o.p.

Discussions on the design and structure of factories take into account: the types of structures and finishes best suited to the activities undertaken in plants; both internal and external characteristics of buildings; cost limitations; choice of materials; technical considerations; and general structural requirements (e.g., walls, flooring, insulation, fire doors, etc.). Examples are drawn from postwar plants in the United States, Germany, and Great Britain, and four major types of industry are studied: heavy; light; process; and utility. Munce offers a variety of approaches as well as solutions to industrial design problems.

Nelson, George. *Industrial architecture of Albert Kahn, Inc.* New York, NY 10016. Architectural Book Publishing Co. (10 E. 40th St.). 1939. 176 pp. o.p.

This volume begins with a brief essay, “the story of industrial architecture,” followed by an overview of Albert Kahn’s career and critical contributions to the field, and then a glimpse into the organization he founded. Albert Kahn, Inc. encourages industrial architects to concern themselves with functional design and business-like execution. This volume describes many American factories designed according to the Kahn standard of well-built, attractive, utilitarian buildings brought about at reasonable cost. A portion of the material in this book was the subject of the August 1938 issue of *The Architectural Forum*.

Peponis, John. “The spatial culture of factories.” *Human Relations* (Tavistock Institute of Human Relations, U.K.; Plenum Press, 233 Spring St., New York, NY 10013), April, 1985. pp. 357-390. \$20.00.

Peponis argues that factory layouts have social as well as technical functions and that the design of factory space has effects on the culture of workplaces. He believes that architects must understand the social properties of layouts in order to assess the suitability of buildings for the organizations inhabiting them. By drawing upon earlier studies, he points to the key relationship of layout to organization. He also discusses use of space as an organizational control strategy over communication, social relations, or degree of participation. Although studies have suggested that status is related more to symbols than to configurational properties, Peponis asserts that space may act in a way to discriminate between statuses in terms of their location in building configurations. He identifies strategic dilemmas in factory design such as: introducing spatial separations or boundaries; meshing opportunities for encounter versus control; or providing for proximity of foremen to processes of production. Because space is not a neutral background to interaction, the use of space will expand as well as limit options for the behavior of employees and management. This paper reports on the analysis of a small sample of six case studies.

Sundstrom, Eric D. *Work places: the psychology of the physical environment in offices and factories*. New York, NY 10022. Cambridge University Press. 1986. 461 pp. \$49.50.

The author investigates the broad question of how physical surroundings affect people working in offices and factories. Included are discussions involving the history and factors that have shaped factories and offices, the evolution of the psychology of work places, and the social and psychological influences of the physical environment on worker satisfaction, performance, communication and interaction. Ambient conditions (e.g., temperature and air quality, lighting and noise, color, and work stations) are discussed in separate chapters, as are the symbolic aspects of the work environment and examinations of how physical settings impact personal privacy, group dynamics, and interpersonal exchanges. Offices and factories as components of organizations and their place in organization theory is explored. Finally, trends are identified which are likely to play a role in the future evolution of office and factory space and the relationship of workers to their work places. A long, excellent list of references is appended.

Wild, Friedemann. *Factories*. New York, NY 10020. Van Nostrand Reinhold (135 W. 50th St.). 1972. 136 pp. o.p.

Written from a European perspective and using predominantly German illustrations, this book includes information on the factory plans of a wide range of industries that deal in chemical products, pharmaceuticals, precision machinery, electronic devices, furniture, printing, foodstuffs, textiles, etc. In discussing the requirements of industrial building methods, Wild stresses the important goal of achieving flexibility, expansibility, and the shortest possible paths.

2. BIBLIOGRAPHIES

American Institute of Architects. Library. *Industrial buildings and factories*. Washington, DC 20006. (1735 New York Ave., N.W.). 1984. 4 pp. (Library bibliography no. 87). \$10.00 nonmembers. Free to members.

——— *Industrial buildings in the U.S. and Canada, 1972-*. 1986. 12 pp. (Library bibliography no. 315). \$10.00 nonmembers. Free to members.

Vance, Mary. *Design of factory and industrial buildings: a bibliography*. Monticello, IL. 61856. Vance Bibliographers (P.O. Box 229). 1986. 48 pp. (Architecture series: bibliography A-1670). \$12.50.