An annotated bibliography on laboratory buildings

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CANADA

AN ANNOTATED BIBLIOGRAPHY ON LABORATORY BUILDINGS

compiled by

A. Brass

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PREFACE

This bibliography is a selection from references reviewed during a literature search on laboratory buildings. The references have been carefully selected, classified, and abstracted in order to assist architects, owners and others in finding information of value in designing, building, and equipping laboratories. References to descriptions of particular laboratory projects have been omitted since they can be found in the Architectural Index, the Art Index, the Applied Science and Technology Index (formerly Industrial Arts Index), and the bibliographies listed herein. Attention is drawn particularly to those published by the library of the Royal Institute of British Architects.

Careful consideration was given to the grouping of the references. Although specific matters are mentioned in the references in Part I, they were grouped under the heading "General", since each one is valuable from two or more specific aspects of laboratory buildings. Part II is a subject classification dealing in detail with safety, flexibility, and other subjects which may be treated only briefly in I and with reference to a special type in Part III. Part III includes references which deal with specific types of laboratories.

To obtain complete reference to available information on any laboratory building the whole bibliography should be reviewed. It should also provide a quick reference for those whose interest is more select. In each section the references are listed in chronological order with the most recent ones first. The literature is being kept under review and additional references will be published as supplements so that an up-to-date record of the existing information will be maintained.

This is the first report resulting from a study of the functional requirements of buildings recently begun by this Division. The work has been conducted by Allen E. Brass, a graduate architect of the University of Toronto, now a member of the Building Standards Section.

Ottawa
June, 1959

R. F. Legget
Director

I. GENERAL

A. Bibliographies

1. Selected reading list on laboratory design. S.B. Kydd and J.K. Page. Journal of the Royal Institute of Chemistry, vol. 81, April 1957, p.276-280.

2. Laboratories 1949-1956. A select list of references to material in the R.I.B.A. Library, 66 Portland Place, London W.1, England.

3. Some recent references to the design of civil engineering laboratories, 1950-1954. Science Library Bibliographical Series No. 742.

4. Atomic energy buildings. A list of references to articles in periodicals in the R.I.B.A. Library, March 1954. Library of the Royal Institute of British Architects, 66 Portland Place, London W.1, England.

5. Design and construction of radiochemical laboratories. A selected list of unclassified references. TID-3013, October 1, 1951, Technical Information Service, United States Atomic Energy Commission, Oak Ridge, Tennessee, 5p.

6. Laboratories and research stations. A list of references to material in the Library of the Royal Institute of British Architects. October 1949.

B. Books

7. Buildings for research. F.W. Dodge Publishing Corporation, New York, 1958, 224p.

   This book consists of a collection of articles on laboratories published in the Architectural Record since 1950. Part I, Planning the Laboratory, is a general discussion of the problems and points for consideration in the design of any type of laboratory building. Part II, Nuclear Laboratories, is an introduction to the unique problems presented by this newest type of laboratory which is appearing in increasing numbers. Part III, Industrial Laboratories, and Part IV, Institutional Laboratories, are composed of over 2 dozen examples of various types of laboratories with plans, photos, diagrams and descriptions. Laboratories covered in these are examples of: industrial engineering, biological research, electronic research, chemical research, university research, and military research laboratories.

8. Laboratorien. Plannung, Bau, Einrichtung. Dr.-Ing. Fritz Lassen. Verlag Das Beispiel Darmstadt, 1957. 162p.

9. Chemische Und Biologische Laboratorien. Plannung, Bau Und Einrichtung. Werner Schramm. Verlag Chemie. GMBH. Weinheim/Bergstr, 1957. 250p.

   The above two books are in German without an English summary. They cover every aspect of laboratory planning, construction, and furnishing in a comprehensive and well-organized manner, and include illustrations of laboratories from many parts of the world as well as Germany. The generous supply of photos, diagrams, and charts supplement and clarify the text and include illustrations of many of the fittings and pieces of equipment which might be included in a laboratory building.

10. Laboratory design. Edited by H.S. Coleman, Reinhold Publishing Corporation, New York, 1951. 393p.

This is the report of the Committee on Design, Construction and Equipment of Laboratories of the National Research Council of the United States and is composed of submissions by many specialists involved with the use or design of laboratories. It is, as Roland Wank suggests in the introduction, "a sort of public opinion poll of a highly informed group".

Part I, Materials, Facilities, Services and Equipment, is a general discussion of the design features common to all types of laboratories and includes interior construction materials, furniture, plumbing, lighting, power, ventilation and safety precautions.

Part II, Teaching Laboratories, deals with the problems peculiar to the various types of teaching laboratories and similarly Part III, Industrial Laboratories, deals with the various types of industrial laboratories. Both of these parts begin with two sections of a general nature followed by discussions of specific types of laboratories. Particular attention is drawn to the program check lists at the beginning of Part III which outline the points to be covered in formulating the program of requirements for industrial laboratories. These could be modified for use for any type of laboratory building.

Part IV, Concise Description of Some Modern Laboratories, contains plans, photos, diagrams and descriptions of thirteen completed laboratory buildings indicating solutions to the various problems in the design of these buildings.

C. Articles, Pamphlets and Reports

11. Second R.I.B.A. symposium on laboratories: report of discussion. Architects' Journal, March 5, 1959, p.384-388.

This article contains brief summaries of the papers presented at the R.I.B.A. symposium along with some of the points which arose in the discussion.

12. Draft revision of B.S. recommendations on laboratory furniture and fittings. British Standards Institution, CX (LBC) 8257, September 1957.

This is the draft of a standard being prepared by the British Standards Institution but which is already being put to use. Although framed particularly for laboratories in Great Britain there is a great deal of information applicable to laboratories built anywhere in the world. This standard attempts to organize the vast amount of existing knowledge into a concise and more usable form and takes advantage of the wide experiences of those most active in the field of laboratory design in Britain.

It is composed of the following sections: 1 - General notes on laboratory design; 2 - Laboratory benches; 3 - Fume extraction in laboratories; and 4 - Laboratory services. Also in preparation are sections on the choice and protection of materials for use in laboratories and on safety precautions in laboratories.

13. Buildings - what is required? F.M. Lea. National Physical Laboratory, Teddington, Paper 8; also The Builder, October 5, 1956, p.589-591.

A general outline of the important aspects of laboratory design indicating the points on which decisions must be made and some of the conditions affecting them. Of value is a table of "Information needed when drawing up requirements for a new laboratory building".

14. Building for research - design, construction and layout of laboratories. H.A. Snow. National Physical Laboratory, Teddington, Paper 9; also The Builder, October 5, 1956, p.591-592.

    Discussion of many aspects of laboratory design emphasizing the importance of short- and long-term prediction in developing the program of requirements for a laboratory building, in view of the fact that research continually changes in scope and direction.

15. Physical facilities for research. C.F. Rassweiler. Chemical and Engineering News, vol. 32, no. 50, December 13, 1954, p.4930-4932.

    Advice to laboratory users considering building new facilities not to forget the importance of such factors as location of the laboratory with regard to convenience to public transportation and good housing accommodation, provision of lunch room and recreational facilities, and others, with reference to the comfort and convenience of the employees.

16. Report of a symposium on laboratory layout and construction. Royal Institute of Chemistry, Lectures, Monographs, Reports, no. 6, 1949.

    Includes: Laboratory planning and furnishing by C.L. Prior; Academic and teaching laboratories by Prof. W.H. Linnell; Analytical laboratories by J. Haslam; Research laboratories by F.H. Milner; Microbiological laboratories by G. Sykes; and Laboratory planning and the architect by E.D. Mills.

    Various items of importance regarding laboratory design are pointed out in the papers presented by those who use, equip, and design laboratories, based on their experience.

17. Some aspects of modern laboratory design. J. Yule Bogue. Endeavour, January 1949, p.38-42.

    Brief discussion of some aspects of laboratory design with an emphasis on problems of biology and medical research laboratories.

18. Better laboratory layout, higher research output. E.G. Rochow. Chemical Industries, December 1947, p.986-987.

    Some notes on "unit laboratory planning" and other aspects of laboratory design.

19. Symposium on the construction and design of research laboratories. Industrial and Engineering Chemistry, vol. 39, April 1947, p.440-461.

    Includes: Selection of laboratory location by R.W. Cairns; Design of facilities for research by P.C. Smith; A large industrial research laboratory by D.M. Beach; Process engineering research laboratory by G.M. Darby, E.J. Roberts and J.D. Grothe; University or college laboratory by C.S. Adams.

    Five papers outlining the problems of laboratory design through general presentations and descriptions of specific laboratory buildings.

20. Some observations on laboratory planning. G.P. Contractor. Indian Journal of Scientific and Industrial Research, vol. V, no. 4, October 1946, p.155-166; no. 5, November 1946, p.224-235; and no. 6, December 1946, p.275-282.

    A very comprehensive treatment of the general aspects of laboratory planning. Some of the points are naturally peculiar to the Indian scene but most could be applicable to laboratories anywhere.

21. Laboratory planning. The Chemical Age, April 26, 1947, p.503-504.

    A very brief outline of some of the major points discussed in the previous reference by G.P. Contractor.

22. A study of laboratory daylighting. J. Musgrove and P. Petherbridge. Architects' Journal, September 5, 1957, p.368-374.

    An outline of studies of laboratory daylighting conducted by the British Building Research Station in conjunction with the Division of Architectural Studies of the Nuffield Foundation as part of the latter's work on laboratory buildings. The article deals with the work of establishing design levels of daylighting for laboratories and of the determination of the methods of achieving such levels in a particular laboratory room.

23. Design of research laboratories. R.L. Davies. Royal Institute of Chemistry Journal, January 1957, p.5-15.

    Outline of study of laboratory buildings by the Division for Architectural Studies of the Nuffield Foundation.

24. Laboratory design. Survey of space and services requirements in two agricultural research laboratories. R.L. Davies and J.W. Nightingale. Nature, vol. 176, November 26, 1955, p.999-1001.

    Progress report on pilot surveys of the Division of Architectural Studies of the Nuffield Foundation as part of their study of the design of laboratory buildings.

25. A report on space requirements for scientific research laboratories. J. Lorne Gray. National Research Council of Canada, Ottawa, Technical Report No. 3, NRC 1913, January 1949, 8p.

    The results of a study of the utilization of laboratory space at National Research Council Laboratories which involved area analysis of laboratories of varying sizes and uses and with varying numbers of occupants. Results are tabulated to show area/person both "useful" and "gross" and the "utilization factor", i.e. $\frac{\text{useful}}{\text{gross}} \times 100\%$. Recommendations are included for figures to be used in estimating total area required for a complete laboratory building.

II. SPECIFIC DESIGN ASPECTS

A. Safety

26. Occupancy fire record, laboratories. Fire Record Bulletin, FR 58-3, 1958, N.F.P.A. International, 60 Batterymarch Street, Boston 10, Massachusetts.

    A description of about fifty laboratory fires indicating the causes of the fires and the reasons for the extensive damage or lack of it, and a vivid reminder of the nature of hazards which exist in laboratory buildings, the extent of losses which can be encountered and the various preventative measures which can safeguard against such losses. It contains a list of N.F.P.A. Fire Protection Publications applicable to laboratories.

27. Emergency devices for protection of laboratory personnel. L. Blendermann. Air Conditioning, Heating and Ventilating, vol. 54, no. 1, January 1957, p.96-99.

    Descriptions of various types of emergency showers available for use in laboratories with an indication of the important points related to their installation.

28. Manual of laboratory safety. Bulletin FS 201, Fisher Scientific, 1956. 54p.

A safety manual for laboratory users containing the following: Section I - How to prevent accidents in the laboratory; Section 2 - Laboratory first aid and fire fighting; Section 3 - Safety equipment available for use in laboratories; and Section 4 - Some informative references on laboratory safety.

29. Safety measures in chemical laboratories. Department of Scientific and Industrial Research, Chemical Research Laboratory, Teddington, England. London, Her Majesty's Stationery Office, 1955. 21p.

A safety guide for the users of the Chemical Research Laboratory, Teddington.

30. Guide for safety in the chemical laboratory. Prepared by and published for the General Safety Committee of the Manufacturing Chemists' Association, Inc., Washington, D.C. D. Van Nostrand Company, Inc., Toronto - New York - London, 1954, 234p.

Recommended safety procedures for committee users of chemical laboratories based on the best current practice. Chapter II, Laboratory Design and Equipment, outlines the major points regarding safety which affect the design of laboratories.

31. Safety in the laboratory. A. Webster. Laboratory Practice - Part I, vol. 2, no. 10, October 1953, p.552-555; Part II, vol. 2, no. 11, November 1953, p.601-604; Part III, vol. 2, no. 12, December 1953, p.655-657.

I. An outline of the British laws and regulations related to laboratory safety principally from the point of view of their use.

II. Outline of hazards and recommended safety practices in the use of laboratories.

III. Important considerations in ventilating laboratories with special reference to hoods and points for particular attention in their design and use. Other problems in the use of labs e.g. fumes of domestic gas or other fuel gas; eating in labs; safety instructions in laboratory method book; identification of pipelines; protective screens; maintenance; lifting heavy weights; setting example for juveniles; notification of the risks others may be called upon to run and the methods of combating them.

32. Safety and industrial hygiene in the laboratory. H.H. Fawcett. Chemical and Engineering News, vol. 30, no. 25, June 23, 1952, p.2588-2591.

Directed primarily at users of laboratories, this article indicates an approach to laboratory safety illustrating the lessons with descriptions of tragic incidents which have occurred. The section on "Planned Facilities" contains eight items for designers of laboratories to observe to aid in achieving safety.

33. A check list for laboratory safety. H.M. Schwalb. Safety Maintenance and Production, vol. 103, no. 2, February 1952, p.28-31.

Proposal for a laboratory health and safety committee with a check list of points which such a committee should look for in regular inspections of laboratories for safety in their use.

34. Safeguarding research. H.H. Fawcett. National Safety News, vol. 64, no. 5, December 1951, p.18-19, 85-89.

Notes on laboratory safety for safety engineers.

35. Electrical safety in experimental laboratories. C.F. Dalziel. National Safety News, vol. 63, no. 5, April 1951, p.27-29, 72-75.

An outline of the hazards in the use of electrical engineering laboratories and recommended safety measures for the users. Classification of hazards in experimental laboratories is included with a discussion of the general approach to these. Also included are "Safety Suggestions for Workers in Experimental Electrical Laboratories".

36. Laboratory safety. H.H. Fawcett. Chemical and Engineering News, vol. 29, no. 14, April 2, 1951, p.1302-1305.

Considerations for safety in laboratories primarily for users with examples of precautions taken in the General Electric Co. laboratories at Schenectady, N.Y. One section "Physical Facilities" indicates those points affecting the design. Included also is a "Selected bibliography bearing on laboratory safety" of value to laboratory users.

37. Safety in the chemical laboratory. Dr. H.A.J. Pieters and D.J.W. Creyghton. Butterworths Scientific Publications, London, 1951. 258p.

"As a handbook and guide to students and staffs of chemical laboratories, it will help them to protect themselves and fellow workers against the potential hazards connected with their work, showing how these can be combated successfully by taking precautionary measures and using appropriate equipment".

38. Report of a conference on the origins and prevention of laboratory accidents, 6 November, 1948. Institute of Chemistry, Lectures, Monographs and Reports, no. 4, 1949.

Publication of the seven papers and subsequent discussions presented at the conference which was concerned chiefly with the problems involved in the safe operation and use of laboratories.

39. How to prevent accidents in the laboratory. The Laboratory, vol. 16, no. 3, 1946, p.58-66.

A discussion for users of laboratories with a limited amount of information about laboratory design.

B. Flexibility

40. Should your new laboratory have movable or stationary partitions? Chemical Industries, vol. 65, no. 3, September 1949, p.352-353.

Movable partitions by R. Brown and Stationary partitions by R.S. Rose Jr.

Arguments for and against movable partitions based on personal experience.

C. Services

41. User requirements for laboratories. I. Assessment of Site Services. W.H. Pritchard. Architects' Journal, May 30, 1957, p.816-920.

The first of a series of articles, this one provides a general introduction to the problems involved in the design of laboratories with emphasis on the assessment of the suitability of the site from the point of view of the accessibility of services.

42. User requirements for laboratories. 2. Specialized Services. W.H. Pritchard. Architects' Journal, June 6, 1957, p.857-864.

Detailed discussion of the many services which must be provided in a laboratory building with an indication of what they are used for and how they are to be provided, supplied and distributed. It stresses the importance of determining which services should be centrally distributed and which can be provided by portable equipment or other localized techniques. The services discussed include electricity, compressed air, vacuum, steam, chilled brine, distilled water, nitrogen, oxygen and hydrogen.

43. Water service for research laboratories. L. Blendermann. Air Conditioning, Heating and Ventilating, vol. 53, no. 10, October 1956, p.115-117.

Discussion of the various factors to be considered in designing the process cold and hot water system for a laboratory building indicating the important points for engineers designing these.

44. Service piping and its equipment for multistory laboratories. J.E. York. Air Conditioning, Heating and Ventilating, vol. 52, no. 5, May 1955, p.96-102.

Discussion of the problems of services in laboratory buildings including the piping, methods of distribution, and the particular points to be noted in connection with: steam service, condensate, cold water, hot water, cooling water, treated water, compressed air and vacuum, gas for fuel, oxygen, hydrogen and other gases, sanitary and rain water drainage, chemical wastes, refrigeration, and materials for various piping systems.

45. Engineering services in a laboratory. J.C. Knight. Journal of the Institution of Heating and Ventilating Engineers, vol. XXIII, May 1955.

Brief discussion of services in laboratory buildings followed by a detailed discussion of a particular laboratory building for the Ministry of Works.

46. Laboratory plumbing. J.E. York. Progressive Architecture, February 1953, p.113-116; also in Materials and Methods in Architecture, Reinhold Publishing Corporation, 1954, New York, p.365-368.

An introduction to the problems presented by the large number of services distributed in a laboratory building with good diagrams accompanying the text. A more concise treatment of the material covered in Reference No. 40.

(i) Illustrations and data sheets

47. Lead plumbing for laboratories. Architects' Journal, Library of Information sheets 662. Architects' Journal, March 6, 1958, 33.c11.

A summary of some common uses of lead sheet and pipe for laboratory plumbing. Includes installation diagrams and table of sizes and weights of pipes for laboratory wastes for normal work.

48. Laboratory service piping. Time Saver Standards, Third Edition 1954, F.W. Dodge Publishing Corporation, New York, N.Y., p.812-813.

Detail drawings of laboratory services from plans for Firestone Fire and Rubber Co. Laboratory, Akron, Ohio, by Voorhees, Walker, Foley and Smith, Architects and Engineers.

49. Inside chases in laboratory; Inside and outside chases in laboratory; Exposed utilities in laboratory. Architectural Detailing, p.16-20, C. Hornbostel and E.A. Bennett, Reinhold Publishing Corporation 1955; also as selected details in Progressive Architecture, August 1951, November 1951, and March 1953.

Photos and diagrams of laboratory service distribution systems in various laboratory buildings.

D. Heating, Ventilating and Air-Conditioning

50. Heating and air-conditioning for laboratories. Heating and ventilating, November 1953, p.63-86.

Includes: Miami Valley laboratory for the Proctor and Gamble Company; Air-conditioning a laboratory health centre by W.G. Moses; Motor truck engineering and laboratory buildings; Odour control allows recirculation and reduces laboratory air requirements by J.E. Leininger; Laboratories for handling radioactive materials by W.B. Harris; Ventilation and air-conditioning for laboratories by J.E. York.

Six articles on heating and air-conditioning for laboratories. The first four are descriptions of installations in specific buildings and the last two are general presentations of important design points. "Laboratories for handling radioactive materials" is an introduction to the problems encountered in the design of these laboratories with emphasis on the importance of efficient ventilation and hood design. "Ventilation and air-conditioning for laboratories" contains a general outline of considerations applying to all laboratory installations as well as the particular points to be noted for a large number of specific types of laboratories.

51. Air-conditioning for modern research laboratories. H.L. Alt. The Industrial Heating Engineer, Part I, vol. 9, no. 37, September 1947, p.165-169; Part II, vol. 9, no. 38, November 1947, p.216-220; Part III, vol. 10, no. 39, January 1948, p.5-10; Part IV, vol. 10, no. 40, March 1948, p.61-65; also, Domestic Engineering, vol. 172, no. 4, October 1948, p.104-111.

Discussion of the problems involved in heating, ventilating and air-conditioning installations for large laboratory buildings. Points are developed by reference to the problems which arose in the design of such installations by the author for an actual laboratory building. The possible alternatives are outlined along with the reasons for the choice made. It is a comprehensive article with illustrations to supplement the text.

E. Equipment and Furnishings

52. User requirements for laboratories. 3. Laboratory benches and fume cupboards. W.H. Pritchard. Architects' Journal, August 29, 1957, p.322-330.

Outline of the factors involved in the design of laboratory benches and fume cupboards.

53. A design for laboratory furniture. E.H. Stock and J.S. Keeler. Reprint from Analytical Chemistry, August 1956, 7A; Technical Paper No. 44 of the Division of Building Research, National Research Council of Canada, Ottawa, NRC 4109, November 1956, 3p.

An account of the development of a new design of laboratory furniture now in use at the Division of Building Research of the National Research Council of Canada. It indicates the requirements to be met by any installation and outlines how these are achieved in the design developed.

54. Laboratory equipment. E.G. Halstead. Progressive Architecture, September 1956, p.126-137.

An outline of the considerations involved in equipping a laboratory indicating the need for co-ordination of equipment design with building design and layout.

55. Timber for laboratory bench tops. Laboratory Practice, vol. 3, no. 11, November 1954, p.464.

Brief description of various timbers being studied by the Wood Structure Section of the Forest Products Research Laboratory in England and advice on timbers for bench tops given to the B.S.I. Committee on Laboratory Furniture and Fittings. The suitability of various species has been reviewed and an assessment made of the properties needed in a bench timber to ensure satisfactory service under various conditions of use, e.g. reasonable resistance to acids, chemicals and hot water, with little tendency to split, shrink or swell in changing conditions. Species studied include iroko, makore, danta and purpleheart.

56. How to ensure success in a laboratory installation. Canadian Chemical Processing, October 1951, p.838-840.

Advice to laboratory users planning on building new laboratory facilities or expanding present ones with regards to dealing with those who supply and install the laboratory furnishings.

57. Hospital laboratory equipment and furniture. Progressive Architecture, November 1947, p.92.

Discussion forms part of a larger section on hospital equipment and deals with description of benches and equipment normally found in hospital laboratories. Streamline specification follows in which parts are applicable to laboratory equipment and furnishings.

III. TYPES

A. Industrial Laboratories

58. Fundamentals in the design of industrial laboratories. W.W. Fenner. Engineering News-Record, October 17, 1946, p.108-112 (vol. P. 510-514).

A general discussion of industrial laboratory design based on descriptions of solutions in specific laboratories and stressing the value of modular planning.

59. An introduction to the planning of industrial chemical laboratories. E.D. Mills. Royal Institute of British Architects Journal, December 1943, p.27-33.

Discussion of the planning of industrial chemical laboratories with charts, diagrams and check lists itemizing the important points for the designer.

B. Teaching Laboratories

60. Second R.I.B.A. symposium on laboratories. The Chemistry Department. W.H. Lloyd. Architects' Journal, March 12, 1959, p.405-410.

Another of the papers presented at the R.I.B.A. Symposium, this one is a detailed description of the Chemistry Department in the new science block at Brighton College.

61. Second R.I.B.A. symposium on laboratories. Chemistry Teaching Laboratories in Universities. A. Cox. Architects' Journal, February 26, 1959, p.333-338.

This is one of the seven papers presented at the Symposium of the R.I.B.A. on February 19 and 20, 1959. It is an outline of the knowledge of the author gained through his experience in the design of this type of laboratory. Included are discussions of such items as bench design, gangways, fume cupboards, balance rooms, washups, ancillary spaces and stores and preparation rooms. The paper outlines the design implications on the laboratory of the three branches of chemistry normally taught at undergraduate level - organic, inorganic and physical.

62. User requirements for laboratories. 4. School laboratories. W.H. Pritchard. Architects' Journal, November 6, 1958, p.674-680.

An outline of the space, furniture, and services needed in physics, chemistry, and botony and biology laboratories in schools. Stress is placed on the importance of carefully considering the curriculum and possible changes to it in determining the requirements for the design of school laboratories.

63. Teaching laboratories. Report of a symposium on design of teaching laboratories in universities and colleges of advanced technology, held on 14 March, 1958, at the Royal Institute of British Architects, 66 Portland Place, London W.1, England. 32p.

Includes: Universities and the design of teaching laboratories by Sir Eric Ashby; Planning buildings for the teaching of science and technology by S.R. Sparkes; The university teaching laboratory by E. Maxwell Fry; Science Buildings in colleges of technology by G. Grenfell Baines; and Materials and services by W.H. Pritchard.

Contains the five papers and subsequent discussions which indicate some of the problems which must be solved both by architects and and teaching staffs in the design of teaching laboratories. Included are such points as: the problem of low utilization of laboratory space; the need for flexibility to meet changing programs; the value of a technically trained liaison man between architect and college staff; the importance of the brief of requirements; and, an outline of various materials and services for use in laboratories.

64. The planning of science laboratories in schools. Richard Sheppard and Partners and W.H. Pritchard. May, 1957. Available without charge from the Industrial Fund for the Advancement of Scientific Education in Schools, 20 Saville Row, London, W.1, England.

Comprehensive treatment of the subject including notes on planning, physical requirements, services, fittings and materials. Although it pertains specifically to school laboratories in Britain, this guide contains much information useful for school laboratories elsewhere.

65. Symposium on design and construction of college and university chemistry laboratories. Journal of Chemical Education, vol. 24, July 1947, p.320-353.

Includes: General problems of laboratory design by H.F. Lewis; Remodeling old college laboratories by J.E. Cavelti; The general chemistry laboratory by J.C. Bailar Jr.; The analytical laboratory by G.G. Marvin; The organic laboratory by C.D. Hurd; Laboratories for physical chemistry by L.O. Case; Design of laboratories for chemical engineering instruction by H.C. Weber; New ideas from industrial laboratory design by C.F. Rassweiler; and The architect and his relation to the chemistry department building committee by H.R. Dowswell.

The papers presented at this symposium cover the major considerations involved in the design of college and university chemistry laboratories as well as some articles of more general application.

66. Housing for the small college chemistry department. H.F. Lewis. Chemical and Engineering News, vol. 24, no. 16, August 25, 1946, p.2187-2188.

Discussion of a particular laboratory design and some general comments on problems of the college chemistry laboratory.

C. Physics Laboratories

67. Design of physics research laboratories. J.S. Forrest. Nature, vol. 181, January 11, 1958, p.90-91.

The report of a symposium held on November 27, 1957, to put on record the views of architects and research directors responsible for the planning of physics laboratories. The important point stressed is the changing character of such laboratories which now require large machines and their attendant erection and servicing facilities to deal with many of today's problems. A basic laboratory design is presented and discussed.

68. Discussion on the design of physics laboratories, London, 1947. Journal of Scientific Instruments, vol. 25, 1948, p.157-68.

A summary of the opinions of men from many of the larger physics laboratories in Britain with descriptions of their own particular laboratories, to point out some of the aspects to be considered in the design of such laboratories.

D. Pilot Plant Laboratories

69. Symposium on pilot plant design and construction. Industrial and Engineering Chemistry, vol. 40, no. 11, November 1948, p.2011-2053.

Includes: Organization by A.A. Lynch; Regional research laboratories, U.S. Department of Agriculture, by W.B. Van Arsdel, R.K. Eskew, E.A. Gastrock and C.T. Langford; Chemical engineering research at the B.F. Goodrich Company by A.B. Japs; Dehydration of heat sensitive materials by H.W. Schwarz; Fluidized solids pilot plants by E.W. Nicholson, J.E. Moise and R.L. Hardy; Polymerization units for thermosetting resins, F.E. Reese and Eli Perry; and Methacrylonitrile and Acrylonitrile by L.M. Peters, K.E. Marple, T.W. Evans, S.H. McAllister and R.C. Castner.

The seven papers presented at this symposium are descriptions of specific pilot plants and they indicate many of the aspects of these plants including detailed descriptions of the processes involved and of the location and type of equipment for them, outlines of the nature of the work carried out, and descriptions of the features of the buildings housing the pilot plants.

E. Radioactivity Laboratories

70. Design of laboratories for safe use of radioisotopes. D.R. Ward. United States Atomic Energy Commission, Advisory Field Service Branch, Isotopes Division, Oak Ridge, Tennessee, November 1952, 48p. (Available from the Office of Technical Services, Department of Commerce, Washington 25, D.C.).

A comprehensive guide to the design of laboratories for handling microcurie and millicurie amounts of the most common radioisotopes based on the experiences of those in the design of such laboratories and in the field of radioactivity.

Part I, Features of General Radioisotope Laboratories, contains information applicable to many types of radioisotope laboratories and includes discussion of such features as: proper room arrangement, ventilation, choice of laboratory surfaces, special equipment and others.

Part II, Radioisotope Laboratories for Specific Purposes, deals with the following: radiochemical research laboratories; laboratories for synthesizing carbon 14 compounds; biological research laboratories; hospital radioisotope units; student training facilities; and facilities for using radioisotopes as sealed sources. In each case illustrations of typical laboratory arrangements and cost estimates for equipping the laboratories are included.

71. What to consider when designing fume hoods for medium level radioactive conditions. J.M. Ruddy. Heating, Piping and Air Conditioning, vol. 30, no. 3, March 1958, p.128-131.

Outline of the factors to be considered in designing fume hoods for medium level radioactive work based on studies of fume hoods carried out at the Brookhaven National Laboratory.

72. Architectural and building requirements as related to atomic energy. Sir John Crockcroft. R.I.B.A. Journal, January 1958, vol. 65, no. 3, p.76-86.

Description of various buildings for atomic energy in England with photos of them and discussion of important points in the design of the buildings.

73. Water supply and drainage quantities for radioactivity laboratories. J.M. Ruddy. Air Conditioning, Heating and Ventilating, October 1957, p.105-106.

Description of the findings of a study of hot and cold water usage at the Brookhaven National Laboratory which led to the development of design data for (1) hot and cold water piping; (2) laboratory waste piping; and (3) sampling and holdup tank sizing, for radioactivity laboratories. These data supplement design criteria in the National Plumbing Code of the U.S. which were found to be unsuited to the demands on water supply and drainage in radioactivity laboratories.

74. Some solutions to heating and ventilation problems in atomic energy research establishments. G.M. Harbert. Journal of the Institution of Heating and Ventilating Engineers, vol. 24, September 1956, p.237-263.

Detailed description of heating and ventilating installations of Atomic Energy Research Establishments in England designed by the writer.

75. Hot laboratories. Nucleonics, vol. 12, no. 11, November 1954, p.35-100.

Thirty-six articles on laboratories for radioactive materials based on papers presented at an Atomic Energy Commission information meeting at Brookhaven National Laboratory, Upton, N.Y., May 26-28, 1954. Included are the following sections: Design; General purpose manipulations; Remote equipment; Operations; Administration. It is of value to users chiefly and the section on "Design" includes descriptions of shielding and handling equipment, in various laboratories.

76. An approach to hot laboratory design. G. Morris. Proceedings, American Society of Civil Engineers, vol. 80, June 1954, Separate No. 448, 5p.

A brief review of the major considerations in the design of hot laboratories, and stressing the need for early collaboration between scientists and design engineers in the development of plans for new laboratory facilities.

77. An engineering approach to hot cell design. H.M. Glen. Proceedings, American Society of Civil Engineers, vol. 80, June 1954, Separate No. 446, 21p.

Discussion of design practices involved in the biological shield and other necessary auxiliaries such as viewing windows, material and personnel access doors, manipulators and service requirements for a small all-purpose cell which contains practically all the features usually found in larger more complex cells.

78. Shielding structure facilities for atomic energy research. F. Ring Jr. Proceedings, American Society of Civil Engineers, vol. 80, June 1954, Separate No. 447, 18p.

Discussion of the configurations and uses of various shielding structures employed in atomic energy research and development.

79. Piping, pumps and valves for high pressure water reactor systems. A. Amorosi. Heating, Piping and Air Conditioning, vol. 26, no. 5, May 1954, p.140-144.

A discussion of the radioactivity problems of high pressure, water-cooled nuclear plants and their effects on material selection and design components.

80. Ventilating and heating problems in atomic energy establishments. W.L. Wilson. Journal of the Institution of Heating and Ventilating Engineers, vol. 20, September 1952, p.215-237.

General presentation of problems of ventilation and heating in atomic energy establishments in England with discussion of alternative solutions.

81. Hospital radioisotope laboratory. C.B. Braestrup and E. Quimby. Progressive Architecture, December 1952, p.84-87; also on p.96-99 in the book Materials and Methods in Architecture, Reinhold Publishing Corporation, 1954, New York, N.Y.

This report provides information required for planning the average hospital radioisotope laboratory to be used primarily for hospital work and covers such aspects as: rooms required and floor space, location in the hospital, structural requirements for shielding, ventilation, special facilities and floor loading, built-in equipment and detailed requirements. Illustrated with plans of typical laboratory layouts and other diagrams.

82. Radioisotope facilities for the general hospital. S.C. Ingraham, M.D., U.S. Public Health Service. Architectural Record, December 1952, p.181-2, 196-7.

Presentation of data covering the requirements for the type of radioisotope facility that is likely to find widest application in general hospitals. Discussion of typical plans for Radiochemical Laboratory and Patient Up-Take Measuring Room indicating the important planning considerations.

83. Proceedings, Laboratory design for handling radioactive materials, BRAB Conference Report, No. 3, May 1952, 140p. Building Research Advisory Board, 2101 Constitution Avenue, Washington, D.C.

Includes: Session 1, Architectural introduction to radiochemical-laboratory layout; Session 2, Air supply and exhaust in laboratories handling radioactive materials; Session 3, Control and shielding of isotopes in radioactive laboratories; Session 4, Surfaces and finishes for radioactive laboratories; Session 5, Disposal of radioactive wastes. Glossary of terms used in nuclear science and technology. Bibliography. TID-3013 Design and Construction of Radiochemical Laboratories. Technical Information Service of the A.E.C. of the United States.

A very comprehensive treatment of the design features of this newest type of laboratory which is appearing in increasing numbers.

84. Architectural abstracts from the conference on laboratory design for handling radioactive materials. Bulletin of the American Institute of Architects, vol. 6, no. 2, March 1952, p.11-20.

Includes: Radiochemical laboratory layout by A.D. MacKintosh; Air supply and exhaust for laboratories handling radioactive materials by C.P. Roberts.

85. Architectural abstracts from the conference on laboratory design for handling radioactive materials. Bulletin of the American Institute of Architects, vol. 6, no. 3, May 1952, p.3-20.

Includes: Control and shielding of isotopes in radioactive laboratories by Dr. N.B. Garden; Surfaces and finishes for radioactive laboratories by J.G. Terrill; Waste disposal by Dr. E. Pitzer; and Summary of conference by Dr. G.S. Manou.

86. Control and removal of radioactive contamination in laboratories. Handbook 48, U.S. Department of Commerce, National Bureau of Standards, December 15, 1951, 24p. For sale by the Superintendent of Documents, Washington D.C., U.S.A.

A valuable document for all users of laboratories handling radioactive materials. Section V, "Specific materials", is devoted to a brief analysis of the most common types of surfaces in use in radioisotope laboratories and is therefore of value to designers of laboratories.

87. Working surfaces for radiochemical laboratories, glass, stainless steel and lead, P.C. Tompkins and O.M. Bizzell. Industrial and Engineering Chemistry, vol. 42, no. 8, August 1950, p.1469-1475.

"The exchange of a radionuclide between surface and solution is inherently a slow process. The difficulty of decontaminating a surface depends largely on the removal of radionuclides which are firmly attached to the surface. Simple tests which permit comparisons between surfaces, decontamination reagents, and contaminating conditions have been developed. A few conclusions regarding the suitability of glass, stainless steel, and lead for radiochemical laboratory surfaces have been drawn".

88. Working surfaces for radiochemical laboratories, paints, plastics, and floor materials. P.C. Tompkins, O.M. Bizzell and C.D. Watson, Industrial and Engineering Chemistry, vol. 42, no. 8, August 1950, p.1475-1481.

"The corrosion resistance and decontamination properties of several available paints, plastics and resins have been studied under standardized conditions. It is concluded that some of these may be used to advantage in place of glass, stainless steel, or lead for many common functions, and that they may often be decontaminated by mild reagents, such as detergents. The combination of the contaminating condition, the surface material, and the decontamination reagent are interdependent variables which lead to a high degree of specificity in cleaning efficiency".

89. The architectural approach to radiochemical laboratory design. A.D. MacKintosh. Bulletin of the American Institutes of Architects, vol. 4, no. 3, May 1950, p.7-20.

A discussion of the design of radiochemical laboratories including data on planning, flexibility, modularity, shielding, finishes, services, heating and ventilating and waste disposal.

90. Safe handling of radioactive isotopes. U.S. Department of Commerce, National Bureau of Standards, Handbook 42, September 1949, 30p. (For sale by Superintendent of Documents, Washington 25, D.C.).

Discussion of the handling of radioactive isotopes of value principally to laboratory users. Section on "Laboratory design and equipment", contains several points for designers of laboratories. recommendations of a mandatory nature for laboratories handling radioactive isotopes in the U.S. and a list of publications of interest to radioisotope laboratories are included.

91. Design, auxiliary equipment and services for a radiochemical laboratory. G.H. Guest and L.G. Cook. National Research Council of Canada, February 1948, NRC 1714, 12p.

Discussion of the design of laboratories intended to handle fairly large amounts of beta and gamma materials with precautions to be taken by those using them. Included also are suggestions for design of laboratories handling smaller quantities of radiation.

92. Symposium on radiochemistry laboratories. Industrial and Engineering Chemistry, vol. 41, no. 2, February 1949, p.227-250.

Includes: Introductory remarks by J.A. Swartout; Impact of radioactivity on chemical laboratory techniques and design by P.C. Tomkinson and H.A. Levy; Radiobiochemical laboratories by W.P. Norris; Research with low levels of radioactivity by J.A. Swartout; Semihot laboratories by N.B. Garden; Laboratory for preparation and use of radioactive organic compounds by C.N. Rice; and Remodeling a laboratory for radiochemical instruction or research by H.A. Levy.

Six papers outlining the problems encountered in the use and design of radiochemistry laboratories with descriptions of the laboratories of some of the participants to indicate solutions to the problems of laboratory ventilation, special hood facilities, surfaces which can be readily decontaminated, and construction to eliminate areas difficult to keep clean.

93. Control of radioactivity hazards. W.H. Sullivan. Chemical and Engineering News, vol. 25, no. 26, June 30, 1947, p.1862-1865.

Outline for users of laboratories involved with radioactive materials for the control of the hazards presented. Mention of a form of safety organization in the plant and an outline of general rules and procedures which are considered to be applicable to all personnel engaged in work associated with radioactive materials.

94. The design of laboratories for radioactive work. R. Spence. Proceedings of the Conference on Nuclear Chemistry, sponsored by the Chemical Institute of Canada, May 15-16-17, 1947, McMaster University, Hamilton, Ontario. Part II, p.212-213.

A brief summary of the problems of radiation protection in the use of radioactive materials in laboratories. Some planning and design points are outlined as well as points to be observed in the use of such laboratories.

95. Some aspects of the design of radiochemical laboratories. H.A. Levy. Chemical and Engineering News, vol. 24, no. 23, December 10, 1946, p.3168-3173.

Description of the problems involved in the use of radioactive materials in laboratories. Of value to laboratory users being introduced to such materials and without previous experience.