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A Design for Laboratory Furniture

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Laboratory Furniture — A Study in Design

With completion of the "Report for Management" series, which related the operations of the analytical department to other departments in a modern industrial organization, the editors plan to use this space to present subjects of general interest to analysts. The articles will be as broad and diversified as the interests of analysts. This month we feature an original article describing the development of a new design of laboratory furniture.

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THIS is a brief account of the development of a new design of laboratory funiture now being used in the Building Research Centre of the National Research Council, Ottawa, Canada. During its first 6 years, the Division of Building Research occupied laboratories in temporary quarters. Laboratory furniture was obtained or constructed for each specific purpose and little thought was given to a design which could be adapted to several types of work. The necessity for some coordination of furniture design became evident shortly before the greatly expanded laboratory facilities for the division provided in the Building Research Centre were occupied on June 1, 1953.

Requirements

Before any coordination of design could be accomplished, however, it was necessary to establish basic requirements with reference to ultimate use. Many of those considered were inherent in laboratory furniture available at the time as stock items. The furniture was to be attractive, durable, and serviceable, was to allow easy access to services, and was to be a sound investment.

The most important requirement for the new design was versatility. This was considered most desirable in view of the varied activities which might in any one location range from chemistry and physics laboratory operations to bench-type engineering experiments. It was envisaged that some sections of laboratory benching might have to be removed to accommodate special cooling units, conditioning cabinets, ovens, and other pieces of equipment most conveniently located on the floor, but extending above bench-top level with a minimum loss of bench length. Easy access to the electrical power and other service requirements on the benches, which are extensive and varied, is necessary for easy maintenance and alterations.

Laboratory furniture in the division's early days was of many combinations of shapes, sizes, materials, and construction. The furniture for the new Building Research Centre obviously could not perpetuate this same pattern. A study of laboratory furniture available from recognized suppliers indicated that much of the versatility required was lacking in commercial designs.

Trial Design

An excellent opportunity for the trial of a preliminary design was afforded when one of the division's sections expanded its temporary laboratory facilities. This preliminary design was dependent to some extent on the immediate requirements of the section concerned, but, inasmuch as this involved a great variety of uses, many of the considerations were applicable in the final design.

The initial concept of a standard unit 6 feet in length, which would also carry provision for all services, was quickly discarded in favor of standard benches combined with narrow service strips. This arrangement has subsequently proved to have many advantages: Benches can be readily withdrawn, and exchanged or removed without the need for disturbing service connections, and can be readily moved to permit changes to services; service strips serve as distribution channels within the laboratory, thus simplifying both initial layout of service points during the design of the building and subsequent modifications and extensions to services within laboratories; and services are installed only as required, service-strip tops being drilled to suit at the time of installation.

To satisfy the requirements of attractiveness, durability, serviceability, and

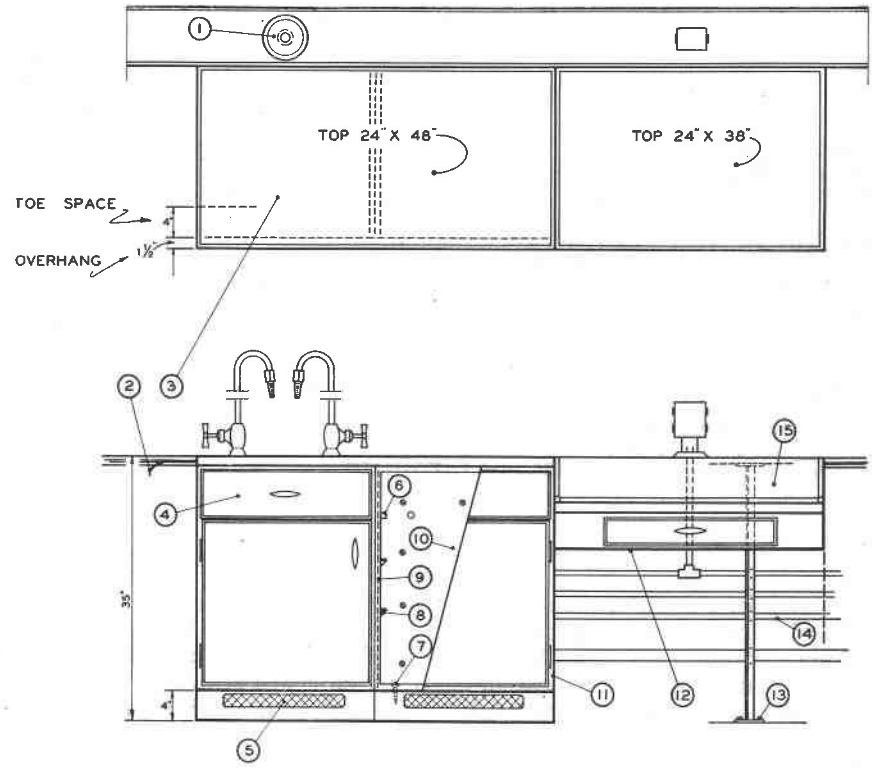

Figure 1. Preliminary design of a 6-foot laboratory bench

Figure 2. Design for basic unit

1. Cup sink in service strip
2. Rubber tubing seal
3. Inlaid linoleum top
4. Drawer and small cupboard unit
5. Air vent
6. Chrome-plated steel channel glide
7. Leveling shoe adjusting screw
8. Shelf clip
9. Pilaster strip
10. Removable back panel
11. End gable
12. Table unit (no legs)
13. Service strip standard
14. Service piping
15. Filler piece

sound investment, a base unit constructed of wood was chosen. The furniture provided a flat unobstructed working surface as well as planned storage space, constructed to permit easy variation of space for the different and changing needs of research.

Versatility

To satisfy the requirement of versatility, small base units about 2 feet in length were considered to be most suitable. For the preliminary design a longer rigid bench structure was suggested in order to provide a working surface at least 6 feet in length and 24 inches in width. The bench-top construction which was chosen had to satisfy many requirements: It had to be hard and tough, resilient and pliable to cushion fragile material, and resistant to corrosive chemicals and reasonably high temperatures. The top also had to be durable, attractive, easily maintained, and reasonably priced. Linoleum came the closest to satisfying these requirements; it was cemented to a plywood subsurface and trimmed with a hardwood edge.

The requirements for the storage space, like those for the working surface, were governed by the great variety of uses to which they would be put. Numerous small items required drawers, heavier equipment required the larger unit volume of cupboards, and many pieces, too large for drawers yet too small for cupboards, required adjustable shelf space. For each laboratory the need was not entirely for one type of storage or for a permanent arrangement, but rather for a combination of drawers, cupboards, and shelves which could be changed to suit the stored materials on hand. The storage space in the preliminary design was divided into three equal-sized compartments, each designed to hold four drawers all of the same size or a combination of drawers, cupboard, and shelf space. Fixed front-to-back wooden runners were used to support both the shelves and the flush-type drawers. The construction of this preliminary design, the 6-foot laboratory bench, is shown in Figure 1.

Final Design

The versatility of the preliminary design was further developed in the furniture finally constructed for the Building Research Centre. Interchangeability was incorporated, not only within each 2-foot bench unit, but also in the complete laboratory arrangement.

Most of the furniture required consisted of combinations of three basic types of units—drawers, single cupboard, and one drawer with small cupboard. The carcasses of all three were identical, a fact that resulted in savings in construction. With only a screwdriver, each of the three basic types could be converted quickly and easily, without moving the carcass from its position in the laboratory. Three different depths of drawers—4, 6, and 8 inches—were used. Thus, eight different combinations of drawers were possible in the over-all height inside each carcass unit. Plywood partitions within each drawer were made adjustable by the use of small metal end pieces, which could be set in the desired location in horizontal slots cut along both the ends and the sides.

Much of the detailed construction is depicted in Figure 2. Special attention is directed to the metal pilaster strips dadoed into the solid end gables which provide support for the shelves on clips and for the drawers on specially designed channel glides of chrome-plated steel. The base units were finished in a wiped coat of mist gray covered with clear lacquer, a finish which is not only durable and serviceable, but also attractive when combined with any room color.

The cost of providing versatile laboratory furniture units of the same basic design was as follows: For all three types of storage space, the average cost amounted to $5 per cubic foot. Finished inlaid linoleum working surfaces between 2 and 6 feet in length were supplied at a cost of about $3 per square foot. These unit costs were reasonable when one considers the versatility, strength, and stability of the final bench groups following their installation.

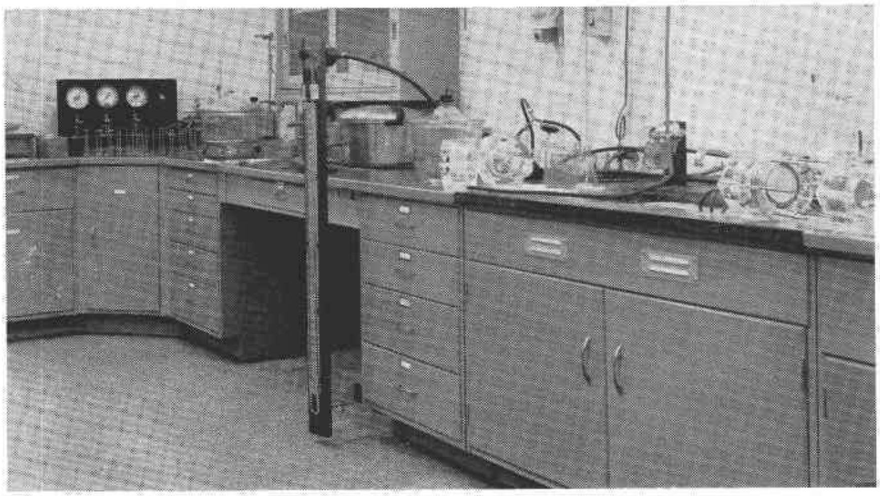

Figure 3. Final design—continuous service unit

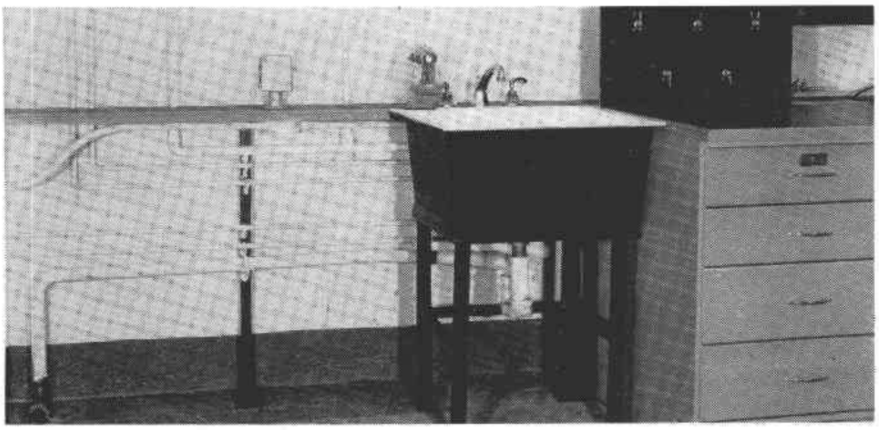

Figure 4. Final design—service strip installation

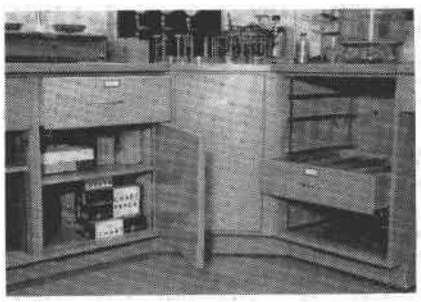

Figure 5. Final design—interior view

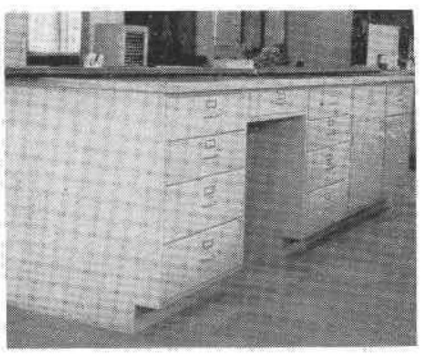

Figure 6. Final design—island unit without service strip

The final installation of all the laboratory furniture, service strips, and laboratory services was done by the Plant Engineering Services of the National Research Council. During this installation it was found that the leveling shoes in each unit allowed for any irregularities in the floor; consequently a level working surface was achieved. The cost of installation was increased by the time required for fastening together the great number of 2-foot units. However, this disadvantage was offset somewhat by the ease with which the individual units could be handled. Figures 3, 4, 5, and 6, showing the new furniture and service strips in actual use in the laboratories of the division, illustrate how the requirements were met.

Suggested Improvements

During the time that the furniture has been in use a number of improvements have been suggested. Installation time probably could have been shortened by the use of some clip or locking device rather than wood screws in the end gables. The inside of each drawer, if made square, would accommodate similar sized partitions in both directions.

One suggestion was to make the base unit exactly 2 feet square. This would allow a more modular treatment of the units, but would lead to a considerably higher cost per square foot of bench top. It is advisable to keep the depth of the bench tops to 2 feet or less in order to use standard 4-foot materials in their manufacture. These improvements, together with others, all tend to increase the utility of the cabinets, but in no way change the original design of the furniture unit.

A description of the design of this new type of laboratory furniture would not be complete without mentioning other associated pieces which helped to complete the balanced laboratory plan. There was a 4-foot sink unit with an Alberene stone top. A 3-foot corner cupboard unit was required in some of the laboratories. Two- and 3-foot table units, each with a single drawer and no legs, but fastened between base units, provided space at any height for sedentary work, as well as for storage of laboratory stools. Other units included 6-foot laboratory tables, wall and floor cases with sliding glass doors, and small single-pedestal desks for senior technicians.

Comments on this new design have been favorable and visitors to the Building Research Centre have been very much interested in its suitability to the wide variety of work being undertaken by the division.

Acknowledgment

The authors are indebted to the staff of the Division of Building Research for their helpful criticism of both the preliminary and final designs. They were fortunate in having available a set of furniture specifications which had been prepared by another division (Applied Chemistry) of the National Research Council. These specifications were very useful as a reference and a guide, although the actual design was different. The specifications prepared for the new furniture described only the over-all appearance, size, quality, and function of the various unit types. The actual constructional details were worked out by the manufacturer, Spanner Products of Toronto. Special thanks are here recorded to Paul Ryley and Russell Spanner of Spanner Products. Many of the manufacturer's suggestions were incorporated in the final design. In this way the knowledge and skill of the furniture craftsman became part of the finished product.

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