The Creation of a New Technical Information Center for a Diversified Chemical Corporation*

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The new Technical Information Center was laid out to integrate all current and planned technical information services in a single, easily accessible facility. The 9000-square foot Center, completed early in 1968, houses a modern research library with a capacity of 40,000 volumes, mechanized and miniaturized information processing systems, and personnel specializing in patent information, internal technical information, literature searching, current awareness and alerting services, and translation services. Space is provided to meet projected requirements over the next 15 years, with provision for subsequent expansion to an additional floor.

Celanese Corporation is a diversified, multinational chemical corporation, with a broad line of petrochemicals, fibers, plastics, paints and coatings, and petroleum and forest products. The Corporation and its affiliates operate 100 plants with 50,000 employees in the United States and 25 other countries. It functions through operating companies (Figure 1), the principal ones being the Celanese Fibers Company, Celanese Chemical Company, Celanese Plastics Company, Celanese Coatings Company, and Champlin Petroleum Company. The central R&D organization of the Corporation is Celanese Research Company, located in Summit, N.J., 25 miles west of New York City. This company, based on existing laboratory facilities in Summit, was established as a corporate entity in 1966 to stimulate internal growth by emphasizing research at the corporate level.

The Research Company is responsible for implementing corporate programs for the development of products in areas new to Celanese, for planning and executing a portion of the research sponsored by the operating companies, and for conducting government-funded R&D.

The activities at Celanese Research Company include exploratory and applied research, application and product development, and process design and development. Covered are such areas as polymer chemistry, organic synthesis, plastics and fibers, and the chemical engineering of polymer, plastic and fiber processes. Figure 2 shows the present organization of the Research Company.

When the Research Company was established as an entity in 1966, it became apparent that its plans for growth and diversification required a level of technical information support substantially greater than could be provided with existing facilities. This led to the decision to proceed promptly with the design and construction of a Technical Information Center at the Summit central research laboratories.

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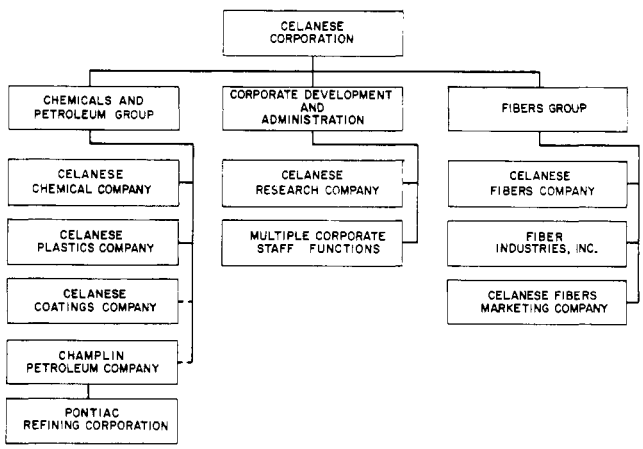

Figure 1. Celanese Corporation simplified organizational structure

DETERMINATION OF NEEDS

Our first step in creating the new Technical Information Center was to determine the needs of the Research Company for information services for the next 15 years. This was a complex operation which involved consideration of many parameters, but we believed that careful effort at this stage would prevent costly mistakes and irritating delays in the planning, design, and implementation stages.

We based our determination of needs on four essential premises:

1. Needs must be established by communication with all levels of users.
2. Needs must be established in terms of specific Company conditions.
3. Needs must be determined without preconceived budgetary constraints.

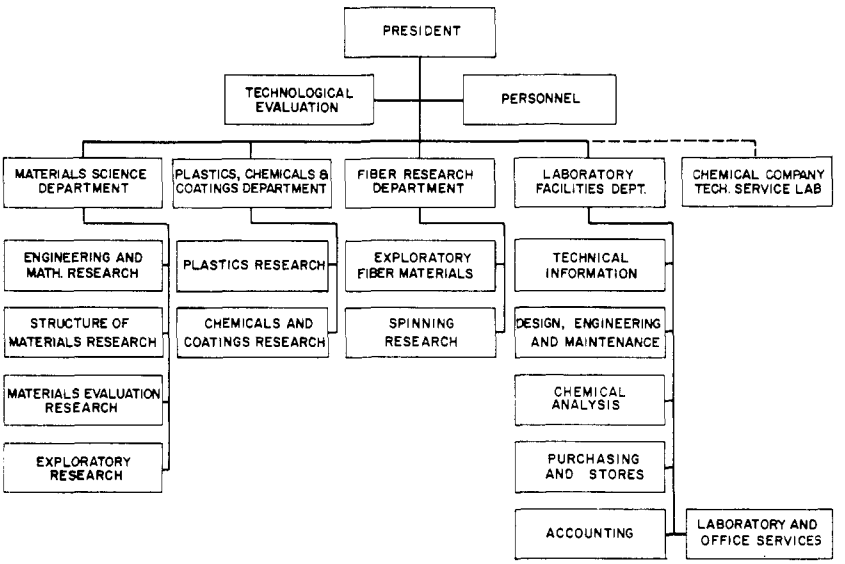

Figure 2. Celanese Research Company, Summit, N. J.

4. Needs can best be optimized by placing the collection and implementation of necessarily subjective views of all groups involved under the over-all guidance of a person having experience in each of the areas involved as well as a broad range of company responsibilities.

It is appropriate to elaborate on these four premises since they are such positive forces in the whole operation of creating a Technical Information Center.

First of all, communications on needs must be multidirectional and multilevel. The ideas of the professional research staff, the technical information staff, and all levels of users must be sought out and gathered, a process which should take place in informal discussions as well as formally in meetings. We used every opportunity for discussion—in the cafeteria, during coffee breaks, etc.—to learn as much as possible about users' needs and desires. For example, to crystallize opinions, two different microreader-printers were brought in for testing side-by-side, and users' evaluations were obtained orally and by questionnaire. And a mock-up of a study carrel was also mounted in the old library for evaluation by users, orally and by questionnaire. We sought every possible opportunity—conventional or unconventional—to communicate with the users.

Secondly, the specific needs of the company, with its unique environment, objectives, and organizational structure, must be a major consideration. While some project planners visit other facilities before determining their own needs, we believe that this is putting the cart before the horse. Such visits are very useful and necessary, but more so after one's own needs have been determined. Otherwise, these visits can generate prejudices unrelated to specific company needs. In our opinion, this same philosophy applies to consulting the literature [1, 2, 3, 5, 6]; consolidation of one's own ideas should precede literature consultation.

Thirdly, needs were determined independently of any initial consideration of available funds. We considered this to be very important in establishing a sound basis for the design of an information center capable of handling effectively our short-term and long-term information requirements. This approach permitted us to determine objectively the funds needed, and to bring about the type of optimized planning and design which we will discuss later.

Fourthly (and closely related to the first premise on communications), we wanted to be certain that the design of the Technical Information Center was not dominated by the views of any one individual or group—that adequate weight was given to the needs and views of the professional librarian, the professional literature searcher, the bench chemist, research management, the plant engineer, the maintenance engineer, and the architect. Over-all responsibility for this project was, therefore, placed in the hands of the Manager of the Laboratory Facilities Department, who not only has line responsibility for a broad range of technical and administrative support functions, but also has appropriate experience in the areas of research, engineering, technical information, research management, and general management. His role was to elicit divergent views, to stimulate and coordinate interactions among the various groups involved, and to assure that the determination of needs and their translation into a design were optimized.

On the basis of the above premises, we investigated our needs in terms of the following parameters:

Objectives of the technical information function.
Existing technical information services.
Information users (local and corporation-wide).
Growth of holdings in terms of company growth, information growth, and miniaturization.
Floor space in terms of company growth, information growth, and miniaturization.

Our findings were as follows:

Objectives of the Technical Information Function. The Technical Information function at Celanese plays an essential partnership role in the research and development process. The primary objectives are to stimulate new thinking for industrial innovation and to eliminate duplication of research efforts. In addition, technical information serves

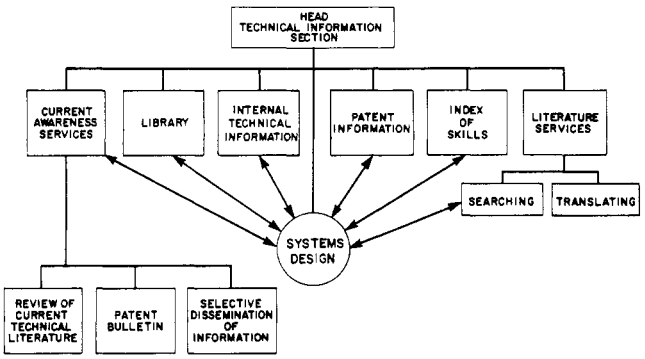

Figure 3. Technical information services, Celanese Research Company

as an ingredient in decision-making at all levels of technical management.

Existing Technical Information Services. Over the years, our Technical Information Section has responded to the growing and changing needs of the research staff on a continuing basis. Therefore, certain services had been well established by the time the new facility project was initiated, and others were in early stages of study or development. This package, outlined in Figure 3, constituted a cornerstone for our study of long-term needs. The core of the technical information operation is the Research Library, which we will describe in detail later. The basic services performed by the Technical Information Section by the end of 1967 were as follows:

A CURRENT-AWARENESS SERVICE, including the scanning, analysis, and selection, in terms of Celanese interests, of information from 600 specialized periodicals and the patents of 15 countries. The products of this activity are a weekly *Review of Current Technical Literature* and a weekly *Patent Bulletin*, both of which are distributed throughout the Celanese organization. (These documents are "Company Confidential" and are not available outside the Corporation.)

SELECTIVE DISSEMINATION OF INFORMATION (SDI), which is a refinement of our current-awareness service. Current information is scanned and immediately disseminated on the basis of regularly updated scientific and technical profiles that correspond to the active interests of each technical man on the staff. In addition, critical information relating to projects of primary importance is communicated immediately to the appropriate scientists and engineers. At the present time, this SDI system is a manual operation involving the equivalent of one full-time professional. It will be described in a later paper scheduled for 1969.

LITERATURE SEARCHES of the required depth performed for the research staff and submitted in the form of critical reports, literature summaries, or bibliographies.

STORAGE AND RETRIEVAL OF PATENT INFORMATION organized by a subject classification based on Celanese research projects and active interests. The system is consulted for retrospective searching of prior art. It presently contains approximately 50,000 patents.

INTERNAL TECHNICAL INFORMATION, predominantly reports, indexed by a coordinate (Uniterm) indexing system. The files contain all technical documents from all Celanese locations, presently amounting to some 28,000 reports. The system has been mechanized for retrieval by punched cards and for later computerization. Yearly cumulative indices will be computer-produced. A computerized dictionary of keywords representing concepts used for information storage and retrieval is employed. Computer facilities are located in a nearby building. Fifty per cent of the reports have been miniaturized for retrieval on microfilm reader-printers. Microfilms (16 mm.) are in cartridge form.

A SYSTEMS-DESIGN ACTIVITY to maintain an awareness of developments in new information systems, adapt these to our own needs, and design new systems as required.

TRANSLATING SERVICES to provide English translations for the staff from Germanic, Romance, and Slavic languages.

AN INDEX OF SKILLS[4] which staff members of the Research Company have acquired through education or experience, organized by subject and name and regularly updated. This index facilitates communication among staff members by noting who knows what, and in what depth.

Information Users. The principal users of the Technical Information Center are the research staff members at Summit. Approximately 300 of the present staff of 400 people are directly engaged in technical work, and half of these are graduate chemists, engineers, or physicists. Half of these professionals have the Ph.D. degree.

Since the Summit Laboratory is a corporate center, its Technical Information Center also provides a host of services for our various operating companies (over 2000 technical personnel) and for the Corporation's headquarters in New York City. Figure 4 shows the principal clients of the Technical Information Section.

Growth of Holdings. The consensus of the articles which have appeared on the growth of literature pertaining to science and technology is that this growth is about 12% per year. This figure is in agreement with the growth of our own collection. We therefore took this average and applied it in forecasting the growth of our own

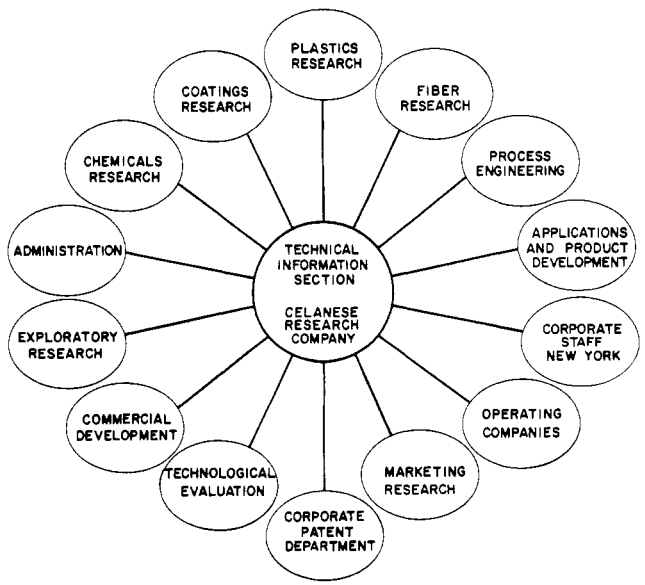

Figure 4. Clients of the Technical Information Section

holdings. We also assumed that miniaturization of approximately 40% of our holdings will have taken place by the late 1970's. On the basis of a 12% yearly growth minus the effect of miniaturization, we calculated that our 1966 holdings of 10,000 volumes would increase to 30,000 volumes in 15 years. The curve in Figure 5 illustrates this growth in holdings. Finally, to allow for expansion resulting from diversification of fields of interest, we added a contingency of 10,000 volumes, and thus arrived at a required capacity of 40,000 volumes.

Floor Space. Determining the total floor area for 15 years ahead involved more than determining the capacity of library stacks. We used two criteria:

1. GROWTH OF THE COMPANY. We correlated projections of the staff growth of the Research Company for 15 years ahead with the floor space needed.
2. GROWTH OF INFORMATION. We correlated floor space with the information growth outlined above.

As a result, we determined that the floor space should be approximately 9000 square feet, about four times the area of previous facilities.

To back up our needs study, we then investigated the space and holdings situation at other information centers, in comparison with our previous facilities. The results of this investigation are shown in Figure 6. They indicated that, at that time, we had a high density of holdings per square foot and a small library area per professional, and that the proposed 9000 square feet for our projected staff was a reasonable estimate.

TRANSLATION OF NEEDS INTO A DESIGN

Before translating these needs into a design, we visited a number of technical information centers, including some of very recent vintage. The purpose of such visits was to gather information on ways in which others have laid out modern technical information centers and to learn from their experiences with their own designs.

After this, a task force working under the coordination of the Manager of Laboratory Facilities was established. This task force consisted of the following people:

The Head of the Technical Information Section. His principal function was to prepare a general layout and design of the proposed Technical Information Center on the basis

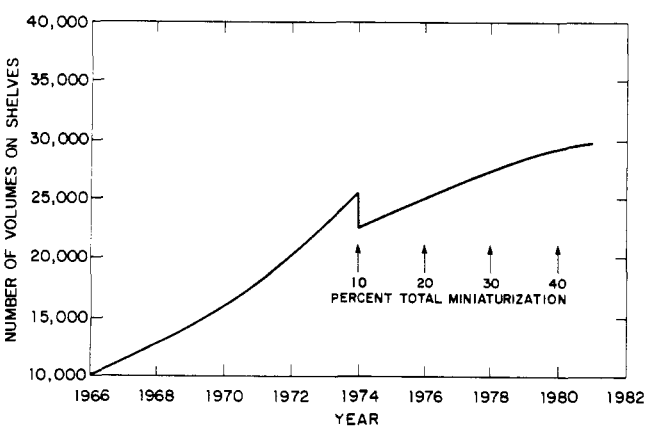

Figure 5. Projection of Celanese Research Company library holdings

COMPANY	LIBRARY AREA (SQ FT)	PROFESSIONALS SERVED	AREA/ PROFESSIONAL	HOLDINGS BOOKS & BOUND VOLUMES	HOLDINGS (SQ FT)
A	2,600	225	12	14,500	5.6
B	5,000	200	25	9,500	1.9
C	3,120	110	28	8,000	2.6
D	9,000	300	30	37,000	4.1
E	3,300	65	51	7,500	2.3
F	17,390	250	70	19,500	1.1
G	2,600	300	9	6,850	2.6
H	2,373	225	11	3,000	1.3
I	2,251	73	31	6,295	2.8
CELANESE	2,415	132	18	10,000	4.6
AVERAGES	5,005	188	27	12,214	2.4

Figure 6. Space and holdings survey, typical information centers

of the statement of needs, and to make recommendations on equipment. He also reviewed and approved all designs as they evolved.

The Plant Engineer. Day-to-day coordination of the task force was delegated to the Plant Engineer. More specifically, the Plant Engineer was responsible for developing a design from the general layout; for assuring that adequate supporting facilities were provided; for selecting a general contractor for construction, on a competitive-bid basis; and for imposing economy and cost control throughout the design and construction phases.

An Architect. The architect's activities touched on all aspects of design and construction work, including equipment procurement. Our architect was selected on the basis of his performance on previous design and construction projects for the Research Company. He had proved himself to be perceptive of his client's needs, flexible in working out controversial issues, and well qualified technically. He was a principal of his firm and was expected to take an active role in the design work to come.

A Consultant. A consultant was selected on the basis of his background in scientific and engineering fields and his specific experience in organizing and planning the design of a technical information center. We wanted him to act as an impartial member of the task force, challenging or supporting our plans as they developed. We looked to him to help us streamline our plans and our design and to play an active role in the selection of equipment.

As a result of our needs study, the task force established that the design of the Technical Information Center would be fitted within the following general guidelines:

The library would have a capacity of 40,000 volumes. An area of 9000 square feet would be allotted to this center.

Since the Technical Information Center is an essential day-to-day partner in research, its location should permit easy access from all areas of the laboratory. The location of the Center building is indicated in Figure 7, which shows a simplified laboratory floor plan, with projected two-way interconnections with adjacent buildings. The site shown was chosen because it was the most central location accessible to existing buildings, while at the same time favoring the general direction of projected growth on our property (Figure 8). Also the chosen site provides one of the more attractive views of the surrounding landscape.

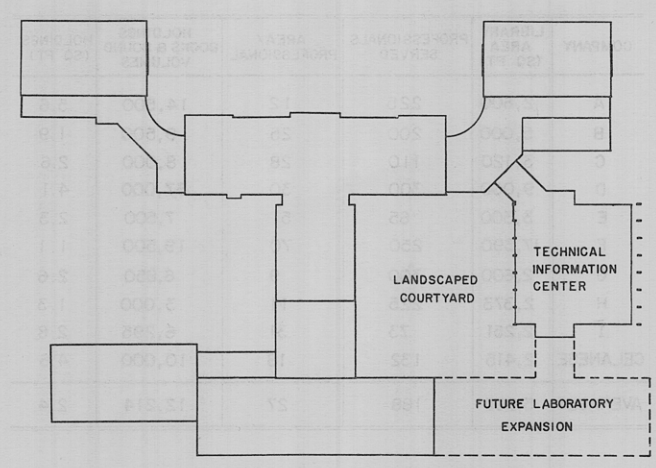

Figure 7. Location of the Technical Information Center

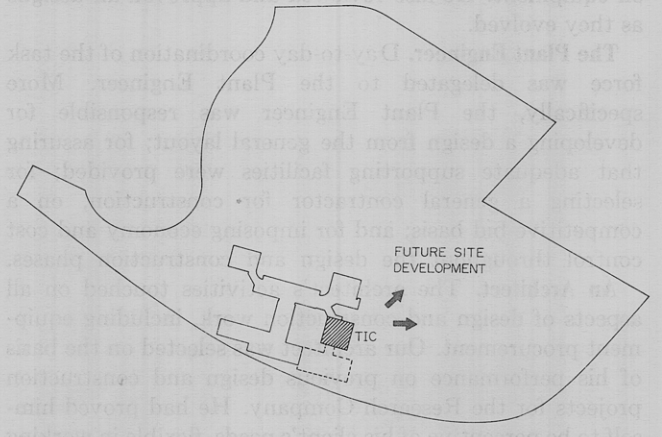

Figure 8. Celanese Research Company
40-acre site in Summit, N. J.

The Technical Information Center would be located on the second floor of a building whose first floor would house a new cafeteria. The structure would permit addition of a third floor when needed. The architect's rendering of the building is shown in Figure 9.

At this point, it is now appropriate to describe the finished Technical Information Center which was created after some six months of effort by the task force. A plan of the facilities is given in Figure 10. The Center comprises special areas separated from each other for the sake of efficient functioning of technical information activities. These areas are:

A Circulation Control Desk, attended by one person, which is located at the entrance to the Library. It is removed from the reading and study areas to minimize distraction. The desk is arranged to have immediately behind it a workroom for receiving and processing incoming material. This room is large enough to accommodate a desk, worktables, and a small storage area for books and materials in process. The workroom also has its own access to outside traffic, and a dumbwaiter has been provided for delivery of library material. Circulation control desk and workroom occupy 4% of the total area.

A Current Periodicals Area which is also removed from the main body of the Library and occupies 8% of the total area. This section accommodates up to 1000 journals on attractive display racks and a comfortable reading area immediately adjacent. The racks display the current issue of each journal, and the preceding issues of the current year are arranged behind each current issue.

A Reference and Reading Area which accommodates the general information sources that are available in the Library for consultation: *Chemical Abstracts* (microfilm and hard copies), *Beilstein, Chemisches Zentralblatt,* government sources, indices of specialized information services, and the other reference works that are usually available to industrial and scientific organizations. This area enjoys several large windows overlooking a rolling terrain. It occupies 20% of the total space.

Figure 9. Architect's rendering of the Technical Information Center

Figure 10. Plan of the Technical Information Center

The Library Stacks, which are adjacent to the reference and reading area and which occupy 30% of the allotted space. Initially, the main floor stack level will be used exclusively. Expansion to a collection of 40,000 volumes is provided by a mezzanine type arrangement. Study carrels are installed at both ends of the stacks. Two types of carrels are provided, in accordance with the divided preferences indicated in the responses to our mock-up carrel in the old library. These consist of 7 open desk-type carrels with attached overhead shelves, and 4 small office-type carrels with doors, for more complete privacy and isolation.

A Patent Room which constitutes a separate area accommodating our patent collection (50,000 copies, presently) and which occupies 6% of the allotted space. This collection is organized by a classification system based on Celanese research projects and interests.

A Conference Room which allows people to have discussions stemming from collective consultation of information sources and which occupies 2% of the total area. This avoids conversations that would be distracting in the Library proper.

An Internal Information Area which is large enough to accommodate our internal document collection, with an office for attendants. Some 28,000 reports are presently stored here, as previously mentioned, and 50% of the collection has been miniaturized for retrieval on microfilm reader-printers. This area occupies 7% of the total space.

A Machine Room which accommodates a variety of machines, such as punched card sorters, collators, and photocopying equipment, and which occupies 3% of the total area.

Offices which are provided for the four professional members of the technical information staff and the seven supporting people and which occupy 15% of the allotted space. Some room is provided for the additional staff that future growth may require.

OPTIMIZATION

In translating our needs into a final design, our compelling over-all objective was the attainment of an optimum balance between needs and goals that were sometimes conflicting.

Functionality and Esthetics. We first examined the functions to be performed, then developed alternative designs to carry these out effectively, and then tempered and adapted them to provide maximum esthetics with minimum impact on functionality. We attempted to develop an efficient facility that also would be a pleasure to use.

Short-Term and Long-Term Needs. Celanese Corporation has a highly developed, multifaceted corporate planning system which focuses attention on both operational planning (for 1 to 3 years) and strategic planning (for 10 years). The detailed output of this system, as it relates to business interests, technology, and growth rates, provided a splendid foundation for the planning of our project. This input, combined with our assumptions on information growth in science and technology and on the development of new techniques and equipment for information processing, was the basis for our decisions on sizing the facility. As indicated earlier, we selected a 15-year time span for initial and expansion capacity.

Luxury and Economy. Our R&D organization is very cost minded—but we strive for *appropriate* cost consciousness. Some funds could, therefore, clearly be allocated for esthetics, as previously pointed out, because we believe that a pleasant view, comfortable chairs, good lighting, and wall-to-wall carpeting return good dividends. The mezzanine in the stack area and the small cost of the steelwork adequate for the third-floor addition were, we believe, sound investments. On the other hand, we used sharp pruning shears in other areas and were especially careful in our selection of contractors and suppliers.

APPROPRIATION OF FUNDS

When the final design was presented in detail to the research management it received prompt approval, due in large measure to our early attention to multilevel communications. The formal request for appropriation of funds received similar prompt approval, for similar reasons.

CONSTRUCTION

A general contractor was selected on the basis of competitive bidding. Ground was broken two weeks after the contract was awarded. Weekly meetings were held with the general contractor and subcontractors to review progress, pinpoint problem areas, and make appropriate decisions. Critical-path scheduling techniques were employed in the later stages. In spite of some delays in steel delivery, a trucking strike, and a period of severe weather conditions, we were able to complete the construction in April of 1968 within four weeks of schedule.

THE MOVE

It was our objective to accomplish the move into the new facilities with the least possible disruption of technical information services. Careful planning of the logistics of moving the research collection made it possible to accomplish the move in three distinct weekend operations, with very little interference to normal service.

THE FUTURE

While it is premature to conduct any comprehensive evaluation of our new organization and facilities at this time, our initial expectations appear to have been realized. We incorporated sufficient flexibility into our design to be able to adapt to the changing needs of the Corporation, and to make the fullest use of new techniques and equipment in the field of information technology. And we believe that our staff has the attitude and motivation required to adapt to these changing circumstances and to maintain a high level of effectiveness in using and communicating technical information.

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The Technical Information Facility of Koppers' Research Center*

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The sequence of events which led to the creation of Koppers' information facility is described. Starting with the architects' original concept, this paper discusses the design and layout, construction, move-in, and present-day use. Certain features which have proven to be especially helpful are described, as are some features which have caused difficulties. Some cost figures on furniture and equipment are given in addition to the actual replacement cost of the entire printed collection. Based on experience with outside information retrieval systems and on the use of certain microfilm equipment, an estimate is presented for the future operation of this information facility.

The location and design of the Koppers' technical information center were the results of the incorporation of such a center into a major research establishment. Management had very carefully chosen a site that was centrally located with respect to the homes of the employees of the research department. The architects then designed a research center to fit the terrain. This terrain, approximately 176 acres, located about 12 miles east of Pittsburgh, allowed for the design of a fairly long, multilevel complex. The location of the library in this complex is at one edge of the present research space but will be more nearly central, based on future expansion plans. Construction on the research center was begun in 1959 and completed in 1961.

Figure 1 is a view of the research center taken from the north looking toward the main administration wing.

* Presented before the Division of Chemical Literature, 155th Meeting, ACS, San Francisco, Calif., April 1, 1968.