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Letters

Once again I find myself on the familiar ground of disagreeing with one of your editors—this time, the editorial in your June 1984 issue ("The ten best of the 1984 Convention in Phoenix," RECORD, June 1984, page 9). If you recall, one of the resolutions passed at the AIA convention was to deplore the low level of compensation that architects receive. In my opinion, this occurs primarily because clients see architects as a necessary evil—needed to get a building permit. The average client thinks of them as part of the problem rather than the solution. Thus clients first try to avoid using qualified architects and, failing that, treat them as draftsmen and pay them a commensurate fee. Remember, I am talking about the average client who hires the average architect, not Gerald Hines who hires Philip Johnson.

Now why does this occur? One reason is that architects listen to critics like you and attend three-hour discussions on the Honor Awards. They should be going to something that would be more useful to their practice, such as how to design a roof that doesn't leak.

The average client does not believe design is a problem, even though it may be. Until architects understand that clients want a building that 

valueless, they will always remain low professional on the totem pole.

Michael R. Hough, President, MRH, Assoc., Inc., Newington, Connecticut

I was shocked and saddened by the cover of your June 1984 issue. The idea of giving free advertising to Knoll for producing chairs that are totally lacking in beauty and basic design innovations is inexcusable. They are decoration only, without comfort or meaning as art. They are backward and show an elitist disregard of any human feeling except whimsey.

Why are we such suckers for the "good old days?" Why are the '20s copied so lovingly? Where is the new and creative work of the future that is a part of the exciting space age and communications revolution blossoming all around us? Where is the reflection of the inspiring new scientific discoveries being made daily? Where is the attitude that originality of thought in art is a sign of greatness? Where is the real avantgarde?

The one example of a search for this is the Vietnam Memorial in Washington. It is simple and strong and the most powerful antwar statement made in this century. It does not glorify war, so it aroused controversy, and a flagpole and sculpture of three soldiers were forced upon it. Some people missed the emblem of the war.

This is the meaning of postmodernism. This is the meaning of the chairs.

Richard W. Snibbe, IIA, New York City

Normally an observation such as that given by Iain Mackintosh in the June 1984 issue of ARCHITECTURAL RECORD [page 97 et seq.] would be taken as just another opinion were it not for the way it was purveyed in those pages. Your caption "restoring humanity to design for the performing arts" suggests that all theater design that has gone before is inhumanine. Furthermore, Mr. Mackintosh's tone throughout is a little too much toward the aggressive to ignore without some kind of rejoinder. If this observation had been made in one of the theater trade magazines, it could have been dismissed and forgotten, but once it is out in print it is lost, and one can't unscramble one's thoughts, if not quip, of what theater design is all about.

However, since no regular forum exists in your magazine for opinion, etc., a note of equal time忏mesis of opinion on an issue as technical as this, it alarms us, as theater consultants, that our architectural readers (probably not quoted in the above editorial content) may therefore conclude that Mr. Mackintosh's view represents that way to the future rather than an inheritance of modern theater design. Although there have been some clunkers in recent memory, theater design as practiced in the last 20 years throughout the world represents a positive response to the many forces (technical, social, economic, etc.) that shape it. Mr. Mackintosh nostalgically shows prints of old "bulldozer" theaters. Sightsline, patron comfort and (perhaps most pertinent) safety were not well-developed criteria in these spaces. One of the reasons that older-tiered opera-house space gave way to modern balconeied theaters was the development of advanced steel and cantilever construction techniques to eliminate the column that always seemed to obstruct vision. Another reason was that these older theaters were very inefficient in terms of seating layout. Each tier could reasonably support two rows of patrons before sightsline became abysmal. Just look at those enclosures and you will see what I mean. It is virtually impossible to build the 1,500 to 3,000-seat theater demanded by today's performing arts economics using the tiered approach. Sightlines to the entire stage from the side tiers of Carnegie Hall or the more recent Minneapolis Hall or Fisher Hall are poor and get worse.

Letters continued on page 285

Calendar

Through January 22

American Masterspieces from the Musée de l'Homme, at the Center for African Art, a new museum at 54 E. 88th St., New York City. October 11-15

Designer's Saturday, show room exhibitions and seminars, in New York City. For information: Designer's Saturday, 911 Park Ave., New York, N. Y. 10021.

October 17 to January 6

Chicago and New York: More Than a Century of Architectural Interaction, an exhibition of graphic materials and architectural fragments; at the Octagon, the American Institute of Architects Foundation, 1799 New York Ave., N. W., Washington, D. C.

October 19

Biennial design awards program sponsored by the Oregon Chapter of the American Society of Landscape Architects, for landscape architects and associated design professionals; at Forest Hall, Western Forestry Center, Portland, Ore. For information: Awards Program, Oregon Chapter ASLA, 1020 S.W. 15th Ave., Eugene, Ore. 97401.

October 30 to November 20

Mediterranean indigenous Architecture: Timeless Solutions for the Human Habitat, an exhibition at the Architecture Gallery, School of Architecture, University of Illinois at Urbana-Champaign.

November 2

"Evacuation Failures—Causes and Prevention," a professional meeting sponsored by the Architecture and Engineering Performance Institute, at the University of Maryland, College Park, Md. For information: AEPI, University of Maryland, 3907 Netzerot Rd., College Park, Md. 20742 (301/355-5544).

November 3

Conexon '84, interior design exhibits and seminars, at Atlanta Market Center. For information: Atlanta Market Center, 240 Peachtree St., N.W., Suite 2200, Atlanta, Ga. 30304 (404/658-5672).

November 5

"Strategies for Getting Ahead," a workshop for young design professionals sponsored by the Boston Society of Architects Women in Architecture Committee; in Boston: For information: Melissa B. Bennett (617/451-0200).

November 15

"Indoor Air Pollution," a course sponsored by Yale University School of Medicine, at the Mary H. Kershaw Auditorium, New Haven, Conn. For information: Office of Graduate and Continuing Education, Yale University School of Medicine, 333 Cedar St., P. O. Box 3333, New Haven, Conn. 06510 (203/785-4578).

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The evidence piles up that you’ve
got to learn about computers

Not long ago, faithful readers will remember, I was writing on this page that I hoped to get to early retirement before I had to learn much about computers. More recently, I’ve been confessing (admitting?) that was a very foresighted attitude. And lately, I confess, I’ve become something of a convert—an uncomfortable convert, mind you, but a convert. One reason I’ve become a convert is that I’ve seen what computers have done in our editorial offices. Almost all of the editors (that almost is for me) now type their copy into a computer terminal. It is edited on a computer terminal. The type specifications are entered on the computer, and we tell the computer where each block of copy should appear and where and how big the photos and drawings should be. And then we push a key on the terminal and other computers do their thing and what we see next is a proof that is very close to the pages you see. Now mind you I’m not sure I like it—in the old days (say a year ago) we could send copy to the printer and see how it “fits”; today if it doesn’t fit you have made a mistake. We’ve even had our first real computer disaster—parts of Peg Gaskie’s Building Types Study in this issue simply disappeared into the electronic ether (it seems a disk in which her hard-written words were stored didn’t do its thing)—and she had to write those pages over. (A writer’s nightmare, as you can imagine.) But I can understand our system and its benefits in terms of both cost and flexibility—and at least one of our editors feels that it is easier for him to write on the computer, just as an increasing number of architects (mostly young) are reporting that their creative design work seems to “flow” better with a computer stylus in their hands.

Only a few weeks ago, I was having lunch with an old friend whose firm is up to about 60 people and he said that while he was using computers for accounting work and writing specs, he hadn’t yet explored computer graphic systems for producing drawings—and I found myself describing animatedly the systems I’d seen and/or experimented with “hands on,” as they say. If you’ve entertained any doubt about how much of the work in an architectural office can now be computer-aided, I refer you to the special 32-page insert on page 49 of this issue, entitled “A Guide to Computer Software for Architects and Engineers.” It lists over 350 computer-specific software programs, under six different headings: Office Management, Project Cost Analysis and Control, Project Scheduling and Management, Space Planning and Facilities Management, Computer-Aided Design and Drafting, and Architectural Engineering. It will not be light reading, but we earnestly believe it will be valuable reading and a very useful reference. The overwhelming point that comes from studying this guide is the number of sources available now for computer software (and the computer hardware that runs it), and the number of functions important to any architect that can be performed by a computer system. If you’re “waiting for costs to come down,” you’ll find that time’s up; you’ll find listings in the Guide that make economic sense for even small firms (indeed much of the software was written by architects in small firms for their own use). Computers can’t make you a better designer, but they can speed up, make more efficient, and lower the costs of almost everything you do in the office. If there is one thing that I especially hope comes out of the Guide, which we’ve labored over for nearly a year, is that it makes clear the opportunities opened up by computer systems—even the relatively simple systems that the small firm can afford and the neophyte can learn to use without formal training. As I’ve said before on this page, the way to get started is to start. You might begin on page 49. W. W.
Fourteen years of interstitial design

Fourteen years ago, the initial application of the Veterans Administration Building System emphasizing interstitial service space was incorporated into the design of Saddleback Hospital in Laguna Hills, California.

The concept of interstitial service space has since influenced the design of hospitals, both VA and private, here in the United States and abroad. And its application has also been incorporated into the design of non-hospital structures, such as hotels and laboratories, that could benefit from the system.

The key to all interstitial service space applications has been the accessibility of services for construction, maintenance, repair, and change. The service zone has therefore been constructed with an over-all working platform which doubles as the ceiling subsystem in functional areas of the structure. This service ceiling provides a working platform, an acoustic and thermal block, support for partitions, and a fire retardant. With the added capability of being cut and patched with hand tools, the service ceiling allows easy penetration and closure for duct openings and pipe connections.

With interstitial design the question of increased cost was a consideration. The building itself would necessarily be somewhat larger and the cubage would be higher because of the interstitial space. But trade-offs in cost can be anticipated.

The service ceilings constructed for the 300,000 sq. ft. Froedtert Memorial Lutheran Hospital in Milwaukee, Wisconsin allowed work to go on simultaneously in interstitial and functional floors. Rather than having to erect scaffolding to install utility and air conditioning runs — causing an interruption of continued work in the functional floor areas — the service ceilings supported men and materials during installation. After completion of the hospital, operational maintenance in the interstitial service areas is being conducted without disturbing patient care activities on the floors below.

According to a study by the VA, the additional cost of interstitial design is totally offset by savings in construction expenses.

Contractors interviewed say the system can cut construction time by as much as 20% and also save 15 to 20% on labor costs of mechanical installation. They say fewer coordination drawings are necessary, more trades can work simultaneously, and fewer change orders are processed.

The VA hospital in Loma Linda, California, for example, came in two months ahead of schedule with labor costs cut by 25%. Service ceilings went in fast with gypsum pours reaching 5,000 sq. ft. per day.

The service ceiling assembly most often specified — over 6 million sq. ft. — consists of Keydeck® Truss Tee subpurlins and Keydeck® Reinforcing Mesh manufactured by Keystone Steel & Wire. Formboard and poured gypsum complete the assembly.

Keydeck Truss Tees are welded beneath, or between main structural beams for support, while Keydeck Reinforcing Mesh adds strength and uniform structural soundness to the poured gypsum.

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Keydeck Reinforcing Mesh meets ASTM tensile, bending, and coating requirements; and conforms to Federal Specifications.

The resulting service ceiling assembly is fire resistant, provides increased insulation capabilities, and helps control noise.

Additional information and detailed literature about Keydeck service ceiling components along with a complementary truss tee deflection calculator can be obtained by writing the Construction Products Manager at Keystone Steel & Wire Company, 7000 S. W. Adams, Peoria, Illinois 61641. A toll-free telephone service is also available for inquiries: 800-447-6444 (in Illinois call 800-322-2632).

Froedtert Memorial Lutheran Hospital Milwaukee, Wisconsin
Architect:
A joint venture of Stone, Marraccini & Patterson and Brazi-Zimmerman
Construction manager:
A joint venture of Fidore and Hutter
Service ceiling components manufacturer:
Keystone Steel & Wire Company
Service ceiling fabricator:
Anning-Johnson Company
Keystone Steel & Wire Company
SARA opens membership to associates

The Society of American Registered Architects has created the Associate Member category for persons working for architectural registration. This change fills a vacuum between student membership, opened several years ago, and full professional membership. An associate is defined as a person working toward architectural registration for and under the direct supervision of a registered architect.

The new members have all the rights and obligations of members except the right to vote, to represent the SARA as a delegate or to use the Society to identify himself or herself as a member. Dues for associate members are $50 per year. For additional information, call Stan Banash, Stanley D. Banash and Associates, 5940 North Neva Avenue, Chicago, Ill. 60651 (312/783-5763).

Furniture burned for research

A catalog of fire data on furnishings is the outcome of researchers in the National Bureau of Standard's Center for Fire Research burning 28 different types of furnishings and measuring how fast each item burned and how much heat it released. Added instrumentation enabled researchers to determine how much smoke was generated and whether nearby materials or furnishings also would be ignited. The study was supported in part by the Department of Health and Human Services for guidelines for selecting hospital and nursing home furnishings. Fire Performance of Furnishings As Measured in the NBS Furniture Calorimeter—Part I (NBSIR 83-2787), $14.50 prepaid from the National Technical Information Service, Springfield, VA. 22161. Order by PB 2-159539.

Some hope in sight for handicapped confusion

Improved access to government buildings for the handicapped is moving a step closer to reality—and with greater uniformity—with the release of final standards for Federal buildings. Although there is no timetable as yet for full implementation, the new document is another step in the long drawn-out process that began 11 years ago when Congress established the Architectural and Transportation Barriers Compliance Board. By the 34-page document, published in the Federal Register, represents an agreement on standards between the Department of Defense, the Department of Housing and Urban Development, and the U.S. Postal Service, all of which had developed their own standards, along with the General Services Administration, which develops standards for its own buildings and for other Federal agencies. The overriding goal is to provide "ready access" and to facilitate the use of Federal buildings by the handicapped. The regulation covers all buildings that come under the Architectural Barriers Act, typically structures directly funded by the Federal government. It excludes, though, facilities used or operated by "able-bodied military personnel," and it does not cover Federally assisted construction, such as school district buildings.

Released initially for comment about a year and a half ago, the standards were largely patterned after earlier standards created by the American National Standards Institute, a private organization.

The final document basically represents detail refinement in such areas as maneuvering clearances for doors—the new Federal standards are actually six inches less than the ANSI standards, representing a cost saving, although the Federal rules say they "prefer" the more generous ANSI numbers—corridor dimensions, accessibility to bathroom stalls and phone booths, the last worked up in cooperation with the late Ma Bell.

The four agencies and the board will continue to work up access standards for structures in between buildings, such as stairways and bridges, constructed independently of the building's structure and for which standards have not been clearly defined as yet.

The final document also incorporates language that explicitly acknowledges historic preservation concerns. The Advisory Council on Historic Preservation will advise agencies in cases where changes proposed to improve access for the handicapped would threaten to destroy the architectural integrity of historic buildings.

Some critics would have preferred a wider use of accessibility standards in, for example, residential housing, according to the document's summary. One national organization wanted 10 per cent of all units to be accessible to wheelchair users who require most of the special features. But the summary said five per cent is a more appropriate figure since wheelchair users constitute less than one per cent of the nation's population, according to several surveys.

APA announces planning awards

The American Planning Association is now accepting applications for its expanded national planning awards program. The program is being reestablished on an annual basis after a one-year lapse to recognize outstanding achievement in planning. The deadline is November 8, 1984. The categories include a comprehensive planning program or project and/or a specific planning project or ordinance; distinguished leadership by a professional or citizen planner, elected official and/or planning firm or agency; and innovation in infrastructure planning. For more information contact Sara L. White or Joyce Berman at the American Planning Association, 1776 Massachusetts Ave. N. W., Washington, D. C. 20036 (202/872-0611).
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Computers: What some of the smaller offices are doing

A survey shows micros taking the lead and some of the successes and problems with three popular models selected by the author.

By Karolyn Schuster

Lawrence Cook and Joe Taylor brag about the obvious improvement in the quality of their firm's client proposals through their year-old microcomputer. The Falls Church, Virginia, architecture firm estimates it now spends only about one-quarter as much time as it used to when going after work and it does so more economically because of the customized, top-quality proposals produced on its in-office computer.

In Charleston, South Carolina, architect Steven Thompson says his computer is enabling him "to play better 'what if' games. What if we have 10 per cent fewer openings along this side of the house?" What if we substitute one building material for another? What if we spend the money in this area instead of here? We have a better handle on building timing and performance and we have it earlier than we could without the computer."

Jim McManns, architect, says the Compusoft architectural firm of which he is a senior partner and manager of technical services produces a weekly one-page work-in-progress report for architects in a four-person office. The current news in computers is micros more often than mainframes (see RECORD, July 1984, pages 37-41). The language is English more often than BASIC. Today's architects are professionals with two-finger-typing skills more often than technicians. And the products are the traditional and commonplace word processor, which has always been conducted—letters and proposals and spreadsheets and pie charts.

As recently as a decade ago, there were few computer fans bold enough to predict its move into architectural offices. As a profession, architects are not the likely candidates that, say, engineers are. The work of architecture, architects would be the first to tell you, is too "creative" to be computerized. But that was just the only stumbling block computers had to clear on their way into architectural firms.

The computers were accustomed to seeing were too difficult to operate and too costly to buy to be considered as viable, practical office equipment for most architects. True, the giant firms with large staffs and multi-million-dollar projects could afford the education and the purchase price of the computers of a decade ago. It wasn't until the computer became an easy-to-operate compact machine with a price tag below the annual salary of a good secretary, that the bulk of the nation's architects, most of them working in small offices of fewer than 20 persons, began to consider the computer.

Today, architects are using desktop computers to speed proposals, edit professional letters and direct small pieces, track accounts receivable and accounts payable, schedule personnel, and control inventory. Such "back office type" tasks are considered a logical and wise first application for computers newly introduced to any small business office.

But architects are also using those same computers for such uniquely architectural tasks as specification writing, project scheduling, structural-design computations, energy-consumption analyses, life-cycle projections, geotechnical assessments, alternate design evaluations, and automated production of working drawings.

The reports from individual architects vary. Some are ecstatically extolling about their marvelous micros; others are cautious and guard about the capabilities. Some are making the computers—and its programming—an after-work preoccupation; others admit they still approach the machine hesitantly. Some are into computer-assisted instruction and others willingly make changes in their office operations to accommodate off-the-shelf programs and their very specific requirements. Some embrace the computer willingly; others admit that they're hoping to slip into early retirement before being forced to put their hands on one.

Now that computers have become familiar to many designers, how do those designers use them? You've already heard by now of all the humorous, sometimes trivial, frivolous, jobs a computer can do with sufficient technical and financial backing. For this report, some not-so-technical architects in small offices across the nation were surveyed to find out how they are using their micros to perform slightly less glamorous and definitely not frivolous tasks.

Move a microcomputer into an architectural office, plug it in, and what's the first thing you produce on it? Most architects interviewed will say that word processing was the first application, and word processing to architectural offices means specifications. Harry Miele, a computer expert and director of technology and product planning for McGraw-Hill's Sweet's Division, expects that almost 70 per cent of all architectural firms will be doing some specification writing on computers by 1989.

"The specification situation can be a real irritation," says Craig Allen of Craig Allen & Associates in Texas. "There's always something transposed, changed, overlooked. It's an area of considerable human error. The computer can help eliminate that error." Because 80 to 90 per cent of his business is with a single cafeteria chain in San Antonio, it is important to Allen that his specifications "hold solid." And to hold solid, they have to be unequivocally correct.

Using a computer to produce specifications assumes the presence within the computer of a master specification, or catalog, of all product information, from which the specifier can draw in preparing the specs for an individual project. In some cases, architectural firms have developed their own master specification over years of practice. A typist can then be hired to put that specification into the computer. That, in itself, can be a time-consuming task. One company says its master specifications were so extensive that it took six weeks of day-long typing by a secretary "whose fingers really flew" before the information was stored and available within the computer. In other cases, architects purchase software such as MasterSpec, which is published by the American Institute of Architects, and adapt it for their own use.

"The reason we bought the computer in the first place was to eliminate the clerical nightmare that could have been a real problem had it become in specification writing," says Jim McManns, of Stecker LaBau Armell Inc. "It took us six to eight months to get over 1,000 pages of addenda put in place and another six to eight months to get it working well.

"We also subscribe to FAS & EE Master Spec and that was fed into the computer. It was an extensive indexing of catalog lists by number and title. Wood windows, for example, were broken down into such categories as product, manufacturer, and broken down again by different manufacturers." The editing process was a hassle but, now that we're producing specifications on the computer, I wonder how we ever managed without it. We have improved the over-all quality of the specifications and the content of the document itself. It's more customized and there are fewer typographical errors and less duplication."

Specifications are, of course, obvious choice for the introductory application for the architect who is a first-time computer user because of its repetitive nature. Computer consultants universally agree that it's these repetitive, tedious tasks involving a great deal of boilerplate text that produce the greatest savings in energy and time from the computer.

"We pulled our computer out of Continued on page 33"
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Circle 22 on inquiry card
the box and put it immediately to work on specifications," says architect Warren Goodwin of Waterfield Goodwin Associates in Nashville. "It did work and it produced very good-looking specs using the manufacturer's format. We've been able to produce specs in three or four days for a R.I.D. [Residential Improvement District] project that would have taken us three to four weeks previously. We've eliminated all the clerical work—that's history. Using the computer to produce specifications also gives us a default system. Our master spec has everything in the world in it so you can just read through it and take out what you don’t need.

"If we had nothing else running on our computer but specifications, it would have paid for itself by now," Goodwin says of the machine he bought in October 1988.

Glenn S. Orenstein, director of engineering computer applications for architects and engineers Metcalf & Eddy in Boston, encourages construction-industry audiences that “the big advantage of computers in specification writing is speed. Computers can assemble specifications very quickly, write and print them very quickly, a significant advantage since specifications always seem to be written under a deadline. A cut-and-paste capability is built into the computer so you have a rapid revision capability and easy addition and deletion of the text.”

After words and numbers are conquered, the other possibilities open up

Some architectural firms, even though small in size, have taken computerization a step or two further than others—either because they got involved with computers earlier or because of the enthusiasm of the architects involved.

These firms have integrated the computer into a wide variety of business, construction, and design tasks. The extent of this integration can be seen in the offices of Dennis Davey of architects Dennis Davey Inc. in Tolland, Connecticut. Davey bought his first computer, an Apple II with a printer, for $2,800 back in 1979 when, as he recalls now, "most programs for the personal computers were games, the word processor programs were very limited, and the spreadsheet program didn't exist." He spent hours learning to program and made frequent trips back to the store where he bought the Apple but it was nine months before he had the computer up and running.

Today he still has the original Apple II, which has been upgraded many times and is used by his secretary. For himself, Davey walked into a computer store in mid-1988, saw the same company’s Lisa computer, and bought it on the spot, spending $2,000 for the hardware, software, and printer. He says he now works in a "paperless office" and virtually "anything I need or want to do can I with the Lisa."

As evidence, consider the fact that Davey's one-man office (Davey describes the staffing as, "secretary, the computer, and me") produces client and prospect presentations, preliminary and schematic designs, and advertising layouts for a print house that include finished drawings, construction drawings, specifications, flow charts, project scheduling with critical path analysis, project cost estimates with financial computations translated into graphics and bar charts, invoicing, billing, correspondence, and energy calculations—all with the use of computers. "Without computers, I would need at least as many draftsmen and draftsmen which I don’t have or need now."

For the drawings, Davey has pre-made standard drawing sheets with border and title filled in the computer along with a master file of standard details and schedules such as for doors and windows. He estimates that he uses the computer pre-made details about 20 per cent of his standard details currently. But he expects to get that number to 50 per cent eventually.

On specifications, Davey uses the PEB Master Spec in which he correlates the Master Spec number (6060 for windows, for example) on the construction drawings with the specifications of the project itself. "Because the note number on the written drawing is referenced back to the specification and to the written document, the marriage between the specification and the written document and the construction drawings is virtually complete," says Davey.

"The what it's rames he plays with the Lisa are legion. 'I plug in the utility rates and ask, what happens if I change the wall X value to 10 from 20? Or what if I change the quantity of glass on the south side? The computer tumbles out the energy consumption difference in dollars.'"

"It behooves, however, in computing in isolation, 'I use it as a marketing tool, I bring clients into the office for a demonstration of what I can do: I produce a floor plan on the fly itself. If you do an elevation, then change from brick to wood horizontal siding; I move rooms and furniture around; I show them how fast and how accurate I can be with my computer."

"Okay, so it's a little razzmatazz. But the clients react to it. They like to be associated with someone who is forward-thinking; they can see how the computer makes more flexible and faster; they get the impression of someone who is up-to-date, not lazy. I know I've gotten jobs because of it."

Both price and understanding what computers can do may be the deciding factors

The five staff members in Highfill’s office, each having his own 12-MHz Radio Shack TRS-80 Model IV computers on their office desks (the Model I’s each had been using are now in their homes). The firm also has a color-graphics CAD system.

"The use of the computer is directly proportional to its distance from the desk," says Highfill. He himself feels comfortable enough with the computer to produce a newsletter of advice called scip (Small Computers in Practice) for architects, engineers, and interior designers interested in using small computers in their practices.

But it was just seven years ago that Highfill, turned off at the $50,000 price tags for mid-size computer systems, went shopping. When he "moused on back to a computer display in the rear of the store" where a painting contractor and his secretary-bookkeeper were running a general ledger program.

"I was surprised at the things this computer could do and the fact that the software cost $99," recalls Highfill. "I was confused at first because I expected them to have tremendous price gap. I spent hours in that store before I was convinced."

Even after he purchased a TRS-80 Model I, he wasn’t confident enough to move it right into his office. "I took it home first and kept it there for a couple of weeks. I put my personal checkbook into it. Then I took it to my accountant’s house for a couple days. Finally I took it into the office."

"Often," says Highfill, "we use new equipment wrong when we first get it. We let it sit for a while and then get it going."

Today, Highfill’s firm has moved far beyond the typewriter stage in learning to use all the computer’s capabilities in producing its specifications. There is now a master specification that breaks products down into small files. The master specification has a master category, for example, and there might be 27 subcategories, all in separate files. The specification writer does his editing on the computer screen, selecting and deleting those products he has chosen, and by the time he has finished the editing, he has, in effect, produced the specifications. The office secretary takes that computer disk, runs through a check list, and then prints it out.

The results: Highfill says the computer-produced specifications have been found to have a high degree of depth and accuracy in a study found that the firm was saving 60 per cent of the time needed to produce specifications compared to seven years earlier.

But specifications were only the beginning. Highfill says the computer is involved in virtually every stage of his company’s work.

For marketing purposes, the computer is used to create and assemble all letters, all news/promotional articles on firm projects, three or four newsletters a year, presentations to approximately 1,000 clients and prospects, and all project proposals. Secretaries don’t participate in proposal preparation in Highfill’s office, all the proposal ingredients are assembled by the personnel making the proposal decisions.

When the firm gets to the interview stage with a client, it uses the computer to prepare the management program to perform and print out all job scheduling and cost estimating information. Once a prospect becomes a client, Highfill’s firm seeks a great deal of detailed information on that client for storage in the computer. For an office project, for example, the computer file would include door or window sizes, the dimensions of desired work space, whether soundproofing is required, the number of conference rooms are to be held, the dimensions of desired work space, whether soundproofing is required, the number of conference rooms are to be held, the number of conference rooms are to be held, the number of conference rooms are to be held, and so forth. If the work is a large office, a wide variety of detail information on that client for storage in the computer.

A combination of computer software programs is then used to develop a spreadsheet cost estimate. Land costs can also be inserted to compute a return on investment for a client based on anticipated income.

The computer also has had an impact on the company’s computer-aided drawings: "We’re able to get a lot more information in our drawing notes and more of the botherlaw in the specifications," says Highfill.

"Notes are filed in a standard outline file by the computer. The computer delivers that note to you may be 20 times with no rewriting involved. There is a tendency to be more specific with notes because you only write them once. For the contractor, Continued on page 35

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the advantage is that the note says the same thing every time. There's no confusion. The computer also helps to lighten the load on the drawings. You can do a simple line drawing, for example, and explain that it's brick. You don't have to draw it as it is brick.

These days, drawing is where the interest is but the micros are not always ready. What about using the computer to draw? It's the inevitable and logical question from architects. And it remains the area of greatest controversy. While competition and technological developments have brought the computer hardware itself way down in size and in price over the past decade, there are still some application gaps when it comes to software.

"More and more designers are using the computer but the amount of computer use is still negligible," says Sweet's Mileaf. He sees the lack of a full and complete range of software as one reason, adding that "over half of all software suppliers have five or fewer programs available." One of these software gaps appears to be in the area of high-quality drawing capability for microcomputers.

"When we have who have shopped for computerized-drawing software report a double-edged problem: either the quality of the drawing software is not up to expectations or the price of the drawing equipment is too high. The speed of microcomputer graphics is very slow compared to the $10,000 system. But we're looking to spend $20,000, not $100,000," says Jim McManns, of Steecker LaBau Arnaill Inc., inexplaining that his firm has not yet have graphic capabilities for its working drawings. "Within a year, I predict we'll see systems priced under $20,000 that do have sufficient speed and capability."

"The $150,000 system we'd like to have is too costly," says Ernest Barbey, senior architect for Becton & Associates of Boston. "I don't see us in computerized drawing unless our firm with its 12-person staff grows in size or that system drops below $50,000."

There are firms that have done drawings on micros— but not without compromises. "What we have on our Lisa Draw is not an architectural CAD package," admits Goodwin, at Waterfield Goodwin Associates Architects, of his company's micro program. "It can't do everything. There's no automatic dimensioning and there's no stock inventory of such things as doors and windows. You have to draw in the elements, generate duplicates, and then cut and paste on the screen.

Craig Allen, who had the success with monitoring the concrete slab by computer, uses the same LISA Draw system as Goodwin. He admits there are disadvantages but cites these advantages: "It produces drawings that look good to the client—there's no redoing or erasing—and you can make changes very easily. We had an owner who wanted to see the building with a tile instead of metal roof. You punch two keys and make the change."

Architect Jonathan E. Coxwell, who describes his firm of Coxwell Miller Levine Wytenbach Architects as "to my knowledge, the only architectural firm in Montana with a CAD system," recently produced his first drawings for bid on his new IBM PC. The software he used was displayed at a Los Angeles computer show he attended and the software creator eventually spent four days in Coxwell's office getting the system operating. For everything but the chair (hardware, software, plotters, etc.) the firm spent just under $30,000.

"It's a two-dimensional system and we think the three dimensional will again when we want to move into three-dimensional but we have had experience accessing to a mainframe. I think we'd be more competitive with a smaller CAD system in-house and accessing a larger three-dimensional system as needed," says Coxwell.

"You can't hang up on the telephone and say, 'This is all we'll do it all.' We don't produce drawings 100 per cent on our CAD system. We use profile door/finish/window schedules and then put them on. It's easier to plot details on a CAD system at random and then cut all of them them apart and paste them up.

The lack of three-dimensional capabilities on lower-priced CAD systems is a disadvantage mentioned frequently by the architects who use them. The size of the work sheet is another. Because the screen shows the designer an 8 1/2 by 11 sheet, it is impossible to view the entire drawing at once and the computer user has to work at the project in sections.

"This type of system is particularly valuable if you're working on an 8 1/2 by 11 detail, that's what you use again and again. Let's say you're doing a 20-story office building where every floor except two is identical. That's when this kind of system can pay off," says Steven Thompson, of Charleston Architectural Group.

"But this region doesn't do a lot of large-scale office work. Most of our projects are highly detailed and highly specific. I'm not sure we would get maximum use out of a CAD system."

Another consideration in introducing CAD within individual offices is that office's attitude toward working drawings: "Architects often look at their working drawings as almost an art form. There is a lot of time and energy and personal identification that goes into them," says Jon W. Davis, president of Sunlodge Homes, a passive solar home designer and builder. "The problem is that all this time and money makes end-done working drawings expensive and the client can't afford them. Most homes being built today are not being designed by architects and expenses like this is one reason. We look at working drawings as a tool and a tool only. We show the client the drawing and tell them 'we want your comment on this house, but not on how we do it. And it doesn't cost us anything. Changes are easy enough to make.'"

The flexibility to make easy changes should be an advantage of any type CAD system. Architects who are using the computer to produce working drawings admit a natural reluctance to make changes or modifications on hand-done drawings. One architect says, "You don't want to erase or move things on a completed working drawing because, let's face it, you've eased it up. A computer can make that change instantly and produce a new set of drawings with that change in seconds."

The ability to make changes in working drawings is a major advantage to CAD that is cited by those who work with computer systems. Many say this ability to make changes fast can be a great help in gaining client confidence and approval. One architect admits that "sometimes it helps to just sit a client down in front of your computer and 'show' him some of his options. You can change the roofing material, show him different room layouts, show him different sitting options—that we have his best interests in mind."

"The disadvantage of all this flexibility is that once the client sees how quick and easy changes are, he may be induced to make more changes," says architect David Schaff in Plymouth, Michigan.

While micro's ability to draw improves, the real advantages will be speed in systems integration. The spotlight always seems to be on computer graphics at every round table meeting or other group discussion that I attend," says Sweet's Mileaf. "And why not? This is not only where all the glamour is, but it is the design office's biggest expense."

"Unfortunately, it is not the easiest way to get started with computers, nor is it always possible for the computer to pay for itself in this application as far as production savings is concerned."

Mileaf says that graphic systems is one area where software costs appear to have plummeted in the last couple of years from six figures to as low as $1,000. "Unfortunately, when you go below the $30,000 to $40,000 range, the systems' limitations increase in a proportional to the price," says Mileaf. "You get what you pay for. This is not a criticism. These low-end, inexpensive systems are long overdue, and probably are the only systems that most design firms can afford. And the vast majority of design firms are very small. The low-end microcomputer can be used in other applications that are cost-effective and they might be worth the experience gained.

Mileaf reports that in 1984, computer-aided graphics software has replaced accounting software as the software available in greater numbers to the small office. But he also reports that only 7.3 per cent of computer users have graphic systems.

The pattern of software availability still does not seem to match the buying patterns," says Mileaf. Part of the interest in putting computer-aided graphics and computers in the hands of the architect—technically and financially—of all the nation's architects is the tremendous potential for improved productivity.

"The advantage of the computer is not only in processing but in storing information very cheaply. One of the basic rules of computing is that the more broadly you can integrate a range of databases, the more cost-effective the applications are likely to be (for example, when you integrate engineering and cost analysis with the drafting function)," says William J. Mitchell, professor of architecture and head of the Architectural/Urban Design Program of the Graduate School of Architecture and Urban Planning at UCLA. "It's a straightforward extension of a drafting system to count instances of items, to measure lengths of walls and ducts, etc., automatically. Having extracted that information, the system dumps it into a file where in the computer where it is sorted and processed to produce things like bills of material."
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"User-friendliness" is the biggest factor in the phenomenal growth of computer use. When market analysts attribute the rapidly increasing presence of computers in business to their plummeting cost and soaring capabilities, they overlook one significant factor: the language. Computer manufacturers found it easier to teach almost any English than to teach potential customers basics. Suddenly the "alien" machine speaking a foreign language was "user-friendly.

"Mouse devices eliminated the need to type commands on keyboard keyboards, while touch-sensitive screens and software packages incorporated menus and prompts that made mistakes less likely. The die had been cast.

Architects working with microcomputers in their offices in the past had to first acquire an understanding of the language of computers and their programming. Today, architects can use their microcomputers efficiently and effectively without knowing virtually anything about the way they work.

How familiar architects are with their machines depends a great deal on how they were introduced to the first computer and how personally interested and intrigued they are by the computer's engineering and operation.

Architect Warren Goodwin admits he has no background in computer technology and had no exposure to computers in his student days at Georgia Tech University, from which he graduated in 1971. He had access to a computer in his Nashville office but admits, "I was afraid to touch it for fear it would blow up or dump everything it had stored.

"The construction industry as a whole is slow to change," says Goodwin. "It's very tradition-minded and as am I. I don't want to destroy the way construction is practiced. I can see how we can enhance those practices with computer applications. With the computers, we might be windling up in the same place as before—we're just getting there more quickly."

In the Falls Church, Virginia, office of Lawrence, Cook, Architects, some of the five architects had any experience with computers and none had owned or operated one before Cook saw a demonstration at a conference. Today, he signs up new staff with this experience in mind.

But the firm is located in a residential area that limits the size of the physical structures and the third-party building it occupies to as large as it can get. "To grow, we knew we would have to find a way to accomplish more in the space we had—and that meant computing—or we would have to rent or build new office space in another location."

The company decided on the computerization route. It bought a Lisa in the first shipment of the machines into the Washington area and, relying on the training tutorial within the machine's software, had it turn out documents within an hour.

"Time is what costs in a professional office," says Cook. "We couldn't afford a lot of time spent learning a computer system without producing anything."

Today, that year-old computer is being used 10 hours a day on the average of 5 1/2 days a week and sometimes as much as seven days. Flexibility in work scheduling by the office staff maximizes the use of the computer.

Craig Allen and his secretary both had a previous experience with computers at a local university before they bought their first computer in March 1983. "In spite of the course and in spite of being a computer aficionado, I still was very apprehensive," says Allen, who had been in charge of computerizing, his secretary had apprehensions. It was frustrating to remember the commands, and when you got stuck, it took time to figure out what went wrong."

A second computer is more user-friendly and although Allen says his computer background helped in understanding the basic principles of the computer (hard disks, etc.), "most it made me appreciate the ease of the new operation."

The quantum leap in ease of operation of smaller computers has been evident to those architects who have worked with computers at both ends of the spectrum. The reader will remember the example of Dennis Dayver who spent hours learning to program his 1979 micro, took nine months to have it up and running, and then in his first nine months with the updated model had paid the entire $12,000 price tag.

That experience is typical. Jon W. Davis, a New Mexico builder of solar homes, said it took him months and months to learn to use an older micro but only a couple of hours to have a newer model in operation.

Thompson, of the Charleston Architectural Group, said he invested 200 to 250 hours of effort at night and on weekends in learning the different programs before he got his old-style computer operational. Even then, he found it quite cumbersome with different commands and procedures for each program he wanted to use.

Some architects report that they got to know their computers on a personal after-work basis before introducing them into their daily operations. For more than a few, this meant plugging in a computer in a corner of their house or in a basement workshop and simply "playing" with it for a few weeks. Their reasoning: they learned to feel comfortable with the machine without the pressure of trying to produce something on deadline or under the glare of co-workers.

If you haven't tried computers yet but want to, here are these architects' recommendations:

For those architects who are just entering the computer marketplace, the architects who have already been there have some very specific advice:

Know in advance precisely what you want the computer to do in your office—what tasks, what volume, what speed, what quality.

Know who will be using the computer in the beginning and what their experience level is. An architect who has a "comfort level" is. Most buyers recommend that you involve the potential user in the buying decision. Example: take along the secretary who will dictate the word processing when you visit the store and talk to the sales staff.

Choose the software that comes closest to meeting your stated needs. "Software first, then hardware" is the usual buying rule since it is the software that will determine what the hardware will produce. The software package will also specify the range and types of hardware on which it will work most effectively. Caution: watch out for single-function, or dedicated, software that will not perform on any one task. You don't want to spend enormous amounts of money for a word processing program that can't perform mathematical computations or do cost projections, for example.

Watch the system in operation. If you want to produce spreadsheets, insist that the salesman produce a spreadsheet with the same software and on the same hardware as you are buying. You may decide you need a more sophisticated software program—or one easier to use—or both.

Get your hands on it. Sit down at the machine and operate it—even if it is merely to produce a letter or a column of numbers. You want to be comfortable with the machine and for how the computer responds.

When you do get the computer into your office, use it first for those things that your office does most frequently, that take the most time, that are most repetitive, or that are most prone to error. That's why most architects start with word processing or specifications. It is on such tasks that the speed and accuracy of the computer are most impressive and most helpful. And a good first experience goes a long way toward building confidence in the first-time computer user.

Buy to meet your current needs but with some view to the future. You want a computer with sufficient memory and storage and speed to accommodate your growth in volume and your expansion into new areas.

Pay first attention to the major components of the computer in the marketplace that may not be around in five years. A local supplier who knows the equipment he sells and access to one can be a great help through the first hurdles of computerization as well as in any upgrading or expansion moves in the future.

The best source of information and advice probably is other architectural firms of similar size and in similar practices. The microcomputer software industry is approaching an estimated $8 billion and it has over 2,000 participants so it's easy to get confused. You might also talk with some proven software leaders. Many smaller architectural firms have found applications for the better-selling software packages. For example, Lester P. Glass, AIA, president of New York's Glass Kronland Associates, insists architects would have to force him against the wall before he could get him to give up his "two very, very favorite programs," both of which can "carry me through specifications, cost control and database management" and both of which can be interfaced.

If you haven't tried computers yet and want to, you must do it at the moment—not alone. All the advice from fellow architects on how and what to look for in computer equipment makes one jump to the conclusion that the architect in the small office, or even in the large one for that matter, wants to computerize.

That, one quickly learns, can be a huge, and even rash, assumption. There seems to have been and there continues to be considerable foot-dragging by the architectural profession in the area of computerization. Some say the dividing line falls about age 40 or 45. Any architect younger admits, however, that there is a good chance they will probably sit in front of a computer screen himself someday. And the older architects are, in many cases, wondering if they can possibly slip past. Continued on page 38
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into early retirement to avoid having to confront a computer in their lifetimes.

Some of the reluctance is understandable. Architecture, as a profession, is focused on the creative and unique rather than the mechanical and uniform. There is a specter of design standardization and a fear of boring, repetitive, computer-generated buildings rising up all over America. There is a lack of conviction of the value of a computer to processes that should involve individual expression.

Some of the reluctance is even justified. Computer companies have not exactly fallen over themselves in producing software and hardware tuned to the architect's needs, interests, and habits. "There are a lot of energy programs available, for example, but they're not interactive programs. They're not designed for the architect," says architect Stephen Matsu of Grant Pedersen Phillips Architects in Santa Barbara, California. "In fact, there just isn't much software designed for the way architects work. I don't blame the manufacturers. Architects are way down on the economic ladder in terms of disposable-income potential. And there aren't that many of us who are prospective customers—with, maybe about 30,000 eligible ones in the entire country. And no two architects ever agree on anything. I think if I were developing software, I'd forget about architects, too, and go with doctors or lawyers."  

Removing the reluctance to use them is the necessary first step.

That's why there actually be any move of computers into architects' offices. "We've got to face the fact that most of what we do on a day-to-day basis is not very creative," says Ernest Barbee, of Beckstoffer & Associates in Boston. "Most of what we do is a matter of doing business. Very few of us sit at a drafting table all day being creative. What I want from the computer is for it to suppress the time spent on these business type tasks."

But even within his own office, Barbee hasn't found unanimous enthusiasm for the computer. "I'm finding resistance even among the younger architects," says Barbee, who has "45 and blinding for not taking the time to sell the idea of computerization to the other architects in his office. "Initially we tried to pressure people to revise our computations and estimates because it takes only minutes on the computer. If I was doing project budgets by hand, I'd probably do about two in a half hour. Now I can do 10 in the same time and those 10 are more finely tuned. You still make the same number of mistakes or correct decisions as always. But with a computer, you can make too mistakes or more best decisions per unit of time. The computer doesn't change the ratio. It just changes the speed."

"The computer doesn't allow you to stop working earlier," says architect James E. Gehman of Hanbury & Company in Norfolk, Virginia. "But it also allows you to analyze more closely what you are doing."  

Gehman says weekly updates on his firm's active projects and manpower replace informal seat-of-the-pants projects of precomputer days. "The update tells us of an increase or decrease in the workload to help us plan marketing, and we anticipate our cash flow, it even helps us plan our manpower more accurately by scheduling vacations. It gives us a better grip on the performance of our firm. We're managing our performance better."

"Our basic attitudes toward design are unchanged," says Thompson. "We still have to produce a piece of architecture that is the best we can possibly produce. The computer has not affected our overall attitude to the final product but it has changed our attitude to the steps that are involved in making judgments that result in the final design. Our biggest problem still is to deliver on time and within budget. And the computer has affected our ability to do that."

... And onward to expanded services for picking up slack in good times and bad. For those architects already using computers in their operations, the bottom-line claim is that the computer is enabling them to do more, and doing better than they have always done. And that includes the business of designing as well as the business of running a business. For the majority of the country's architects working in offices of 20 or fewer architects, the business of doing business is as demanding and as time-consuming as the big design work being done. These typical architectural offices report that the microcomputer enables them to market more effectively and to get a greater number of potential customers with higher-quality, more customized mailings; to prepare proposals that are more clearly presented and thoroughly documented; to submit bids that are more reliable and more precisely plotted out; to draft specifications that are more clear and less subject to error; to prepare working drawings that are more informative and more flexible; and to plan project schedules that are more accurate and more reliable. But in some cases, the computer is enabling architects to expand beyond what they have always done into new areas. It is here, in such areas as facilities management, say the smaller firms, where they see the greatest potential for future growth and profits. The architect who carries space inventories for his leasing-agents client (at any one moment, information on what space is available, its condition, its location, its position within a building, its facilities, etc.) says it wasn't a service he had intended to offer but one that simply grew out of the computer's capabilities he already had in-house. Another architect who has built up a large reserve of satisfied customers over the years (customers who, he mentions, are not erecting new structures as frequently) provides computerized return-on-investment and energy-consumption analyses for the same building he designed long ago. He sees such services as a way to capitalize on the goodwill and reputation he already enjoys with such clients. It is on developing and providing such new services that will be needed in years and year out in the maintenance and operation of buildings—that many architects are concentrating effort for future slow-down and increased profits. And in developing these new services, the computer is expected to lead the way.
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Marketing: How big corporations choose design firms

In this concluding part of a series, a survey reports on interviews by, proposals to and fee negotiation with corporate clients

By Martin C. P. McElroy with research by Donna M. McCourt

In the previous installment of this series (see RECORD, September 1984, pages 43 through 45) Mr. McElroy began to describe the process of how successful design firms competing for corporate work are actually selected. He emphasized the subjective elements, ranging from "personal chemistry" to reading into a client's program to discover what the program may really be about—describing the stated program objectives in some cases as "giving professional firms enough rope to hang themselves."

At the interview... The client's evaluation is not entirely subjective, or at least it is not necessarily a discussion of approaches and design issues that seek a responsive chord.

Architects can compound the problem with descriptions of organization and staffing, proposed services, language or exclusions that are inconsistent with the scope or nature of the project. As our later discussion will indicate, a brilliant presentation can be undercut by contradictory boilerplate.

While both chemistry and understanding the project may be the basis for the eventual selection decision, it is important to understand the procedures that are used to arrive at these conclusions.

There is no consistent pattern for proposals or interviews. They occur in any sequence imaginable and may be so casual as to seem offhand or so structured as to be stifling.

Tours of the architects' offices and informal meetings are the most casual form of interview, and are often preliminary to a more structured procedure. In two instances, however, formal interviews were conducted in the architects' offices using weighted checklists for scoring evaluations and determining the firm to be chosen. In general, however, it is an oft-repeated litmus test for the architectural ingredients. Two-thirds of the companies we talked with tour candidates' offices regularly. "We always go to their shops. We look at specs, drawings, details. You get a handle on how busy they are, their services, size and sophistication. The brochure may look great, but there is no substitute for a first-hand inspection."

The office tour provides companies with their best opportunity to meet members of the firm who may play a critical role on the project, but whose presence at a formal presentation would be unwieldy in a limited amount of time. One anecdote revealed the potentially negative consequences of the office tour: "We like to meet department heads and the technical staff. This firm played it perfectly. The sales types got out of the way and we met with four engineers who were quite good and knowledgeable. We did detect that they were not quite experienced enough with clean rooms, at least by our standards, though they were certainly conversant. When they did not get the job, they accused us of picking their brains and were quite chagrined. Actually, we were very impressed and would like working with them. The moral is: you can't always tell when a good interview is a good interview."

Tours, and their counterpart informal interviews, are particularly hard to gauge. Efforts at hospitality and creating good impressions can be viewed as irrelevant or worse, a smoke screen. The most sensible approach seems to be to understand beforehand what the corporate procurement is to see, to whom he would like to speak and have the material and people available. Tours are not conducted to view the decor, and no stronger impression can be made than that of a skilled professional presenting competent work. Yes, an orderly workplace and an industrious staff win points, but tours are not for winning projects; the object is to not lose them here.

Formal interviews not only win projects but give a chance to find out who the client really is. For the architect who survives to the point of competitive interviews, the first question is to find the client. Depending on the project, the client will be a mixture of facilities staff, the user group and corporate brass, and whose vote counts for what is an open question. "It gets complex with people and commitments and corporate concerns beyond this operation," noted one facilities head. "A lot of people can get in the act, and there is no standard for the amount of interest shown in a project. Our role is the only constant." Comments another: "Our company's user group can be sold on the first firm interviewed. Our job is to keep minds open during the entire process and make sure that the basics are covered. Then at the end, we help sort out the facts and the feelings."

The interviews seem to pretend an ascending role for the corporation's project manager in the interviewing process. Several firms require that the project manager make all arrangements with candidate design firms for interviews and proposals and direct the process. "We want the project managers to have a good feel for the design people that they will be dealing with. After all, as goes the project, goes this manager's career." In addition to logistical concerns, the project manager may be responsible for conveying all pertinent project information to the candidate firms and fielding questions about the scope of work and the project intent of the project. However shifting the identity of the "client" may become during selection, the day-to-day client will be the project manager.

While the client's identity may shift around, the architect's premise should not. Regardless of the strategy a firm may elect to persuade the multi-faced client, there is ample evidence that it pays to find the point and stick to it. "The last thing we want to bear is Peppermint. So often we get motherhood. Design philosophy sounds like so much boilerplate."

What kinds of points should be made? Several factors were mentioned in the interviews that it becomes necessary to interpoilate to find the common denominator. In the first place, the selection decision is strategic, so no costs are spared, as fail-safe good firms competing for the work. The interviews with these facilities people tended to reject the common wisdom that the designers should only talk about the client's project. There is definite interest on the part of the corporate people in the designer's past work, and what the designer did to make his previous projects successful in hard, practical terms. Then, clients are interested in how these approaches will apply to the project at hand. This is clear in the repeated concern in concrete, tangible attributes at a time when the client's project may be vague, even to him; indeed, especially to him. ("The greatest ambiguities occur at the beginning of the project.")

And again, the concerned hands-on involvement of the senior members of the firm is sought. The majority of these large corporations look for sole source responsibility and clear lines of command. One design firm was described by a potential client as "surrounded by so many consultants, we couldn't find the first."

Presentation skills are important, but less important than a clear indication of capabilities, experience, resources and a real commitment to employing them on the project: "I've been watching this for years and still don't understand it. Good firms fall flat on their faces for poor presentations. Others can scare you off with overkill."

Continued on page 43
From Any Angle

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No matter how you look at roofing, whether from the perspective of the architect, the owner, the contractor or the roofer, MANNIGLAS facers offer benefits you can't ignore.

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So specify MANNIGLAS. No matter what your angle, it's a winner!
In two selection processes, full design presentations (in one case paid) are required, with stipulated formats covering program, budget, site, passing and design concept. "We see ideas and are able to reach conclusions about the capabilities and resources of the firm," in this light, the issue seems less "what will my building look like?" than an earnest attempt to stave off the ambiguity that produces practical anxiety for the client. This haunting uncertainty explains the emphasis on chemistry and understanding the project. It may even explain why corporations increasingly turn to developers for a facilities "product" that can be purchased or leased as a known quantity.

Proposals certainly render the designers' services in black and white.

Still, only about half the companies solicit proposals in the selection process. While in some instances the proposal format directly addresses the understanding of the project, staffing and man-hours, even the number of drawings anticipated, more typically it is a brief that indicates the senior professional who will be assigned to the project, the basic scope, services to be provided and the fee, noting exceptions and exclusions. "They are responding to our format. Sometimes of it we don't worry about because our contract covers us," says one facility head. "The firm is responding to given, and a two-page letter only needs to cover exclusions," says another. "This proposal should respond to the schedule and budget, and give assurances as to how they will be met," says a third. "All things being equal, it comes down to fee, things seldom are equal so fees can get me off the hook," says a fourth.

Proposals mark the conclusion of the selling phase in which designers have stature and the starting of buying in earnest in which the client is in control. There is a clear indication that there is little to negotiate and that, while fees may vary 10 to 20 percent, the preferred firm will "conform to our format."

This basic outlook is underscored when more elaborate proposals are invited, the visual treatment that can be so persuasive in the public sector is less compelling in the corporate process. "Bureaucrat says 'we've got to do our forms,'" says one facilities manager. "Sometimes you feel like they took somebody else's name off and slapped ours on," or "It is downright silly to see a proposal set forth terms contrary to what we've already stipulated, that ignores prior conditions or that gives the resumes of staff that won't be involved in the work." These comments dramatize the proposal as an instrument of the head and not the heart. It is a time for level-headed summaries of the requirements of the project, the client's conditions and the professional's response to each. If the interview is an opportunity to "sell" the client, then the proposal is the moment when the client buys, and it stands to reason that the proposal be as uncluttered and as conclusive as possible.

By whatever combination of steps the client has chosen to arrive at a selection, the moment is inevitable. An alchemy of personal chemistry, perceived understanding of the project, a reasonable methodology and an acceptable price comes to the advantage of one contender. By letter or phone, the remainder of the field is advised of the "difficult decision" which has been made, the even composition of the short list and the efforts of the competitors.

At this point, the successful firm enters into "negotiations" for this project.

More correctly named, the negotiation stage would be called the contract-signing phase. There is little negotiation involved. The proposal has established the fee and the terms are set by AIA B-141, the Standard Agreement Between Architect and Owner. Very few companies have their own form of contract that ranges from one page to multiple volumes. However, B-141 is the standard and most corporate contracts are only variations on its theme.

A contract documents the understanding of two parties, and whatever the limitations of this legal document, we can expect little variation in the future. To run the gamut of approval by corporate legal staffs is a fate that most facilities managers view as dire, at best. Any variations that might stir this pack of "dancing legal beagles" imperils the project's very existence, at least within the current fiscal year.

As a consequence, there is virtually no opportunity for meaningful negotiation. A certain amount of haggling takes place over multipliers, reimbursables or man-hours ("OK, we'll throw in the rendering!"), but the deal is essentially done at the moment of selection. This is perhaps the reason why corporate purchasing departments are involved in only the clear minority of situations. The selection is based on professional standards, the fee has been contained by constraints of competition and the terms are dictated by an industry standard. There is nothing for a purchasing specialist to do.

The signing of the contract, however, is not necessarily the end of negotiations. While these are demanding clients, they are also eminently fair—fairer perhaps than architects are to themselves.

As one architect, recently designated as project manager for a large, hotly pursued corporate research center, said: "I'm so conditioned to putting out fires that I almost can't comprehend looking at a project in its entirety after the presentation." The actual conduct of work is determined on a day-to-day basis, react and react networks notwithstanding. This is to say that every decision from how to research the program, to the format for the schematic presentation, to the evaluation of materials or investigation of a specification is a negotiating opportunity, a decision to provide service and effort.

Certainly, every project manager worth his or her salt knows that they have a basic responsibility to claim obvious extras. But unrequited, unnecessary or unrequested services also fall into this category. Many corporate officers took note of a tendency for architects to perform (and design) to self-imposed standards that are more costly and time consuming than necessary to meet the corporations' requirements.

Does this suggest a certain malnourishment on the part of the profession? Is it a conspiracy, forced by the pressures and liabilities of project operations? Is it the failure of clients to demand and create opportunities for a clearer determination of standards and expectations at the start of the work? Is the absence of a forum to effect these understandings in the absence of a meaningful negotiation phase?

Obviously, it is all of these. When the economy is strong and backlogs are up, there is a rise in the frequency of commentary by architects about their diminished role in the building team. (When things are slow, there is no time for commentary, only competition.) How will this come to pass? Not from a podium, not in a seminar, nor through the pages of magazines like this one. The stature of the profession simply reflects leadership demonstrated on individual projects. Yet, once the contract is signed, the evidence is that most architects retreat to a standard project approach rather than lead an examination of assumptions and the organization and procedures of the project.

Linguists note that one can be "convinced" of an idea, but is "persuaded" to act. While business development can conclude with persuading an owner to select a firm, the development of the profession will require further persuasion by the architect's leadership in a rigorous evaluation of the project's opportunities and requirements and engaging every member of the building team in a mutual approach to the project. However convinced architects may be of their leadership prerogatives, they will only be meaningful if others are persuaded to follow. It has often been said that the client is the most important ingredient in good architecture. It should also be said that good architects create good clients, then go on to create good buildings.

The corporate client may represent the finest opportunity to assert this kind of leadership. The caliber of their management and technical personnel and the suitability of strong management to corporate operations create an exceptional climate to challenge assumptions about how work will be performed once the job has been won. They are a client fully capable of taking the proposal as a point of departure rather than a conclusion. For this to happen, it will take an architect who is confident enough to challenge his own successful proposal and engage the client in searching for a more effective approach.

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Three roofing systems for success.

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A guide to computer software for architects and engineers

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4. Space planning and facilities management page 63
5. Computer-aided design and drafting page 64
6. Architectural engineering page 75

If there is such a thing as an old saw in the new world of computers, it is this: “The soft spot is software.” Nonetheless, as RECORD associate editor Jim Gardner has learned from developing this project over the past ten months, there is a lot of computer software written for architects, and a lot more being written.

On the next 31 pages, you will find listings of over 350 computer software programs written specifically for architects—ranging from simple entry-level programs that run on computer systems costing less than $5,000 to very extensive and sophisticated programs that require major computer installations and are therefore the province of the large and sophisticated firms.

The software programs are listed under six general sections:

Section 1, beginning overleaf under the heading Office Management, lists programs written to aid in business development, simple graphics (such as the production of charts), word processing, production of accounting and other spreadsheets, word processing, specification writing, and database management.

Section 2, Project Cost Analysis and Control, beginning on page 52, includes programs written for project cost accounting and general accounting; job estimating, costing, and budgeting; developing bills of materials and materials take-offs, and making feasibility studies.

Section 3, Project Scheduling and Management, beginning on page 59, has programs developing manpower-utilization, resource-management, job-scheduling and construction-management systems.

Section 4, on page 63, lists programs for “Space Planning and Facilities Management.”

Section 5, beginning on page 64, lists over 100 programs written for “Computer-Aided Design and Drafting.” These are graphic systems capable of producing preliminary and/or production drawings.

Section 6, Architectural Engineering, page 75, lists programs for site planning and mapping, energy analyses, hvac design, structural analyses, and related engineering work. Some of these programs produce graphics as well as data.

Some programs, of course, fit tightly into more than one section, and in a few such cases, we repeated the software listing in more than one section. Further, if you have a specific problem that you are interested in automating, you’ll find a subject index on the last page of this insert.

A word on the individual program listings: the top line of each listing—in bold type—lists the reader-service number for that program and the program title in alphabetical order. (You can get more information on any program by using the Reader Service card following this insert on page 81-82.) Beneath that you’ll find the name and address of the supplier of the software being described, as well as the name and phone number of a person at that company you can call for information. Then you’ll find a listing of the hardware required to run that program—since most software is configured to run on a limited number of computers. Listed next is the price—often a one-time license fee which means that you can use the software but don’t own it; and sometimes the prices quoted are for software that is “bundled” as part of a turnkey package of software and hardware. The availability and cost (if any) of updates is listed next, followed by the types of training available for each program. Finally, after an italic re-listing of the program name is a brief description of the programs’ function(s) and features. We are of course not qualified to evaluate the software, and have not attempted to do so. Rather, the descriptions are intended to let you see what functions can be “computerized” for work in the office both non-graphic and graphic.

RECORD made a major effort over several months to locate sources of architect-specific software—by contacting architects large and small and known vendors of software as well as computer manufacturers, and by inviting submissions in our own pages and in our sister McGraw-Hill magazine, BYTE. Everyone we could locate was sent a questionnaire which formed the basis of this 32-page listing. Hundreds of follow-up telephone calls were made to check information supplied. But we were not able to publish a listing for every supplier that returned a questionnaire, and of course we undoubtedly missed many useful sources. If you sell or if you know of architect-specific software not listed in this directory, please let us know by writing James B. Gardner, ARCHITECTURAL RECORD, 1221 Avenue of the Americas, New York City, and we will send you a questionnaire. We plan to supplement this directory by listing such software on a continuing basis.
Office management

Business development
Database management
Simple graphics
Specification writing
Spread sheets
Word processing

ARCHITECT'S DB MASTER TEMPLATES
Top-Ten Software, P.O. Box 6436, New York, N.Y. 10128—Lee Kennedy, RIBA, 212-188-6566 • For use with Apple II with AppleSoft and DB Master, requires 80K RAM, $19.95 each; $49.95 for all three; add $2.50 handling. Updates: none planned • Training: instructions.

Architect's DB Master Templates is a series of three templates designed to run with DB Master. Space Programming handles putting-together and projections, and enables a user to create a space program and to generate various user-defined reports. Furniture Inventory tracks client's current and proposed furniture, whereabouts, and cost. Client Marketing Directory is a database that maintains full information on a client-base, including current projects, personal data, competition, etc.

501 ARCHITECTS FRIEND—VI.1
Team Design, 5290 North Picket Dr., Colorado Springs, Colo. 80907—Bob Moore, 303-598-0668 • Program operates as part of a turnkey system or with IBM PC and compatible computers running MS-DOS. Peripherals include PSX MAX-12 and Color Graphics XL-19 monitors; Houston Instruments DMP-82 plotter; SDC sonic digitizer and NECC P4 printer • Price: from $2,823 for software; $27,995 for turnkey package; Updates: free; modern option • Training: in-house, on-site, manual, computer-aided instruction and video-training cassettes.

Architect's Friend—VI.1 is an integrated graphics-based applications package that includes project management, energy analysis, full accounting, floor plans, elevations, renderings and development planning. Written in "C", it is portable for transportability. Uses a standard file management database.

502 ARCHITECTURAL SPECIFICATION PACKAGE
Intergraph Corporation, One Madison Industrial Park, Huntsville, Ala. 35807—Al Kemper, 205-772-2000 • A basic turnkey system consists of one computer workstation, hard printer, plotter and software. Systems are based on DEC-VAX and PDP-11 computers • Price: $5,000; Updates: free with service/maintenance contract or billable • Training: in-house, on-site implementation plan, computer-aided instruction and manual.

Architectural Specification Generation Package helps an architect define, compile and output a specification manual for a project.

503 CALC MASTER
Hourglass Systems, P.O. Box 863, Brookfield, Wis. 53005—Jim Beirs, 414-781-6815 • For use with Wang models VS/MP, VS/VP and VP • Price: from $465; Updates: free for first ninety days; included with manual and computer-aided instruction.

Calc Master is a spreadsheet with windows, consolidation, lookup, move commands as well as full financial (IRR, NVP, FY, Depreciation) and log and trig functions. Editing commands include insert, delete and global functions. Among formatting capabilities are dollar sign, per cent, underlining, repeat, center, justify, cell blanking, cell skip/lock, calculation-order control, comma and decimals.

504 CLIENTRAC
Technical Information Systems, Inc., 116 West Plume St., P.O. Box 190, Norfolk, Va. 23501—Edward D. Thayer, P.E., 804-346-4210 • For use with DEC-VAX or PDP-11 • Price: $4,000 for VAX, $2,500 for PDP-11; Updates: free for first ninety days; included with maintenance contract thereafter • Training: on-site, in-house, manual and computer-aided instruction.

Clientrac uses a database containing historical data on the firm, its clients, prospective clients and past projects and proposals to generate new proposals, summaries, project examples, resumes, analyses, mailing lists, newsletters and other reports useful for producing marketing and business plans. Program was developed by the marketing director of a 100-man engineering firm.

505 CONDOR 3
Condor, 3290 West Bayshore Rd., Palo Alto, Calif. 94303—Richard Auer, 415-424-8311 • For use with computers running the following operating systems: CP/M, MP/M, CDCOS, DEC-2000, MS-DOS, CP/M, PDP-8 or Xenix. requires a CRT and line or character printer • Price: $850; Updates: billable • Training: seminars, in-house, on-site, manual and tutorial manual.

Condor 3 is a file management, inquiry and report-generating data management software system for storing, retrieving, manipulating and comparing data. Database files may be added or reorganized. Sorts may be conducted on several levels. Applications include marketing, accounting and inventory lists.

506 CONSTRUCTION MARKET
Tepton Media, Inc., 350 Madison Ave., New York, N.Y. 10017—Ken Smith, 212-887-0920 • For use with IBM PC, XT or compatible microcomputers with 128K RAM; requires two double-sided, double-density disk drives • Price: $385; Updates: billable • Training: manual.

Construction Market is a database management and reporting software system designed to improve a firm's efficiency in tracking prospects, projects, clients and sales contacts. Reports include forecast, follow-up and win/loss—all sortable on any of 47 fields. System available on a 30-day trial.

507 DISCO-SPACES
Disco-Tech/Morton Technologies, 600 B St., P.O. Box 1659, Santa Rosa, Calif. 95402—Ralph R. Russe, P.E., 707-523-1600 • Runs on all CP/M-80, CP/M-43, MS-DOS or TRS-DOS compatible hardware • Price: $195; Updates: billable • Training: manual.

Disco-Spaces is an architectural specification-writing data package compatible with Spellcraft, WordStar, Perfect Writer, Scriptip and Super Scriptip word processing programs (not included). The program database is a list of specifications in each of the 16 CSI divisions which the user modifies to produce the final operating specifications.

508 ENHANCED BUSINESS GRAPHICS
Strobe, Inc., 897 5th Ave., New York, 10017—Elizabeth D. Hothofer, 615-250-6190 • For use with Apple II/IIe/III and microcomputers running CP/M, PDP-80 and MS-DOS • Price: $965; Updates: billable • Training: manual and computer-aided instruction.

Enhanced Business Graphics allows the user to produce a broad range of line graphs, bar graphs, pie charts and word charts or overhead transparency film. Bar graphs may be stacked or side-by-side. Pie chart slices are automatically calculated when amounts are given. Formatting is directed through menu-driven commands.

509 GEOGRAPF
Geocom Corp., 342 Sudbury Rd., Concord, Mass. 01742—W. Allen Marr, 617-599-8304 • For use with IBM PC, XE, XT, PGX and compatibles; requires graphics card, screen and pen plotter • Price: $250; Updates: billable • Training: manual.

Geograpf is a programmer’s utility that condenses routine programming commands into subroutines, simplifying the creation of graphics on a screen or plotter.

510 HOK CHART
Hellmuth, Obata & Kassabaum, Inc., 1041 Fourth St., St. Louis, Mo. 63102—Daniel C. Davis, 314-421-2000 • For use with any DEC-VAX computer using Tektronix display device • Price: varies greatly, chart on specification includes: Updates: included with service/maintenance contract • Training: seminar, in-house, on-site and manual.

HOK Chart is used to define and display various types of graphs, including pie charts, bar charts, line graphs, organizational charts and schedules. The graphs may be displayed individually or in combination at any size. Data may be input directly using a command language or extracted from a database or spreadsheet. The system also allows for creation of HOK-standard text slides. The graphs may be displayed interactively, plotted in hard copy form, or transferred directly to 35mm format.

511 IB GRAPH

IB Graph is a menu-driven graphics software package for creating bar, line and pie charts on a variety of graphs output devices. Program modules include main menu, data group editor, chart specifications editor, plot, utility and data translation.
Updates; billable • Training: manual and computer-aided instruction.

Infograin is a command-driven business graphics package for creating two- and three-dimensional bar, line, pie, Gantt, scatter, and range charts. User can create free-form graphics as well. Utilizes intelligent defaults, prompting and help messages.

513 INTERPAGE Intergraph Corporation, One Madison Industrial Park, Huntsville, Ala. 35807—Al Kemper, 205-772-2000 • A basic turnkey system consisting of one computer workstation, hard printer, plotter and software. Systems are based on the VAX and personal computers • Price: Turnkey package with software starts at $120,000; Updates: free with service/maintenance contract or billable • Training: in-house, on-site implementation plan; computer-aided instruction and manual.

Interpage is a technical publications program that produces specification manuals, operational, technical, proposals, and marketing brochures. It merges text and drawings on a workstation screen so that composed pages can be previewed before output to a typewriter or laser printer/plotter.

514 KEYSTONE WORD PROCESSING Keystone Project Management Systems, 435 S. Maitland Ave., Maitland, Fla. 32751—Stan Levine, 305-628-1832 • For use with computers running CP/M, CP/M-86, M-6809 and PCDOS (includes computers from Texas Instruments, Digital Equipment Corporation, IBM and Wang); CP/M requires 33K RAM, 128K for all others; turnkey hardware package provides 46mb of disk storage • Price: $4,500—$6,000 for software; Updates: billable • Training: seminar, in-house, on-site and computer-aided instruction.

Keystone Word Processing is part of the Keystone Project Management System. Produces reports, memos, letters and specifications. Features help menus, special keys, bookmark, scrolling, on-screen formatting, disk storage, up to 256 columns of text, proportional printing and file merging. Stand-alone or multiplexer system with networking and database capability. Other modules are general ledger, and CAD (see other sections).

515 MASTERSPEC The AIA Service Corporation, 1735 New York Ave., N.W., Washington, D.C. 20006—Leonard Bain, 202-641-9300 • Diskettes are available for almost all types of computer equipment • Price: yearly subscription fees vary from $420 to $757 depending upon version selected; Updates: issued quarterly as part of basic subscription • Training: manual.

Masterspec is an automated database master specification system compatible with hundreds of computer systems. The program employs the 16-divison format of the Uniform Construction Index and the five digit numbering system developed by The Construction Specifications Institute. It is claimed that the system can cut specifying time in half. Editions are Architectural/Structural/Civil and Mechanical/Electrical. Each is available in "Basic," "Short" and "Narrow" scope versions.

516 MITAS MICORD, Box 17130, Dulles, Washington, D.C. 20041-0130—Rob Mainor, 703-471-1741 • For use with IBM System 34, System 36 and IBM PCXT or compatible microcomputers; requires 128K RAM • Price: $9,500 for System 34; 36K for PCXT; Lease/purchase plans available for 1, 2, or 3 years; Updates: free first year, 10 percent of program cost thereafter • Training: on-site, manual.

Mitas aids firms in developing new and current business as well as analyzing resources. Features individual influence network and client-base analysis, a lead and prospect capture system, marketing summaries, and resource requirements.

517 NOVACALC Hourglass Systems, P.O. Box 883, Brookfield, Wis. 53005—Jim Beirs, 414-751-6815 • For use with IBM PC or CP/M-based computers having two disk drives and 64K RAM (price: $295; Updates: none required) • Training: manual and computer-aided instruction.

Novacalc is a low-cost spreadsheet that includes full financial and scientific functions such as depreciation, IR, NPV, Logs and Trig. Other features are variable column widths, decimal and comma formatting, on-screen help and flexible printing. CP/M versions have wide-carriage printing and full spreadsheet consolidation.


DECMATE II or Rainbow • Price: $2,500; Updates: free for first three years (quarterly disk-swap) • Training: on-site and manual.

Pages—Perrell Architectural Guide Specification is a "drop-out" type specification system, with 168 technical sections in 16 divisions, that is oriented towards materials and systems available specifically in the Southwest. The program, written by a registered architect, is currently in use by over 30 Southwestern firms.

519 PROFESSIONAL ACCOUNTING SYSTEM Heiniger Associates, 638 Jefferson St., Morton, Ill. 61550—Jim Heiniger, 309-396-5812 • For use with Wang 2200 System (SYS/VIPL/VMP); requires 64K RAM • Price: From $1,500, depending on number of modules purchased; Updates: billable • Training: manual and on-site.

Professional Accounting System integrates job-costing/marketing software, including payroll, general ledger, accounts payable and word processing. Generates multiple invoice formats. Other modules are projects (Form 254, 255), contact information, personal/company information, calendars and labels. See listing under 602 for further information.

520 RECORD BANK S & R Cerati, Architects, Piazza Europa 26, Cuneo, Italy 12100—Rudolf Cerati, 66 291 • For use with IBM and compatibles • Price: $125; Updates: billable • Training: manual.

Record Bank is a database management system with a variety of filing and reporting capabilities including connection of main and secondary data files on a one-to-many-relationships basis. The program provides consistent, prompting, full use of keyboard function keys, on/off help menus and programmable, formatted outputs. It is designed to run with Estimate (see 579) to produce detailed construction cost estimates and analyses.

521 RL-1 RELATIONAL DATABASE MANAGEMENT SYSTEM ABW Corporation, P.O. Box M1047, Ann Arbor, Mich. 48106—Jill L. King, 313-662-3015 • For use with IBM PC, PCXT, PCjr., IBM PC compatibles; Wang PC and Victor 9000; requires 128K RAM • Price: $495; Updates: billable • Training: manual.

RL-1 Relational Database Management System is an integrated system for data storage and retrieval. Data is entered into various tables that appear on the screen. Retrieval is through an interactive query language that consists of 13 key words. All types of data relationships can be handled including one-to-one, one-to-many, and many-to-many.

532 RSI BASIC Rising Star Industries, 2450 Madison Rd., Suite 113, Torrance, Calif. 90745—Mark Jones or David Schmidt, 213-373-4421 • For use with Epson QX-10 • Price: $100; Updates: nominal charge • Training: manual.

RSI Basic is a graphics-oriented version of Basic programming that permits users to create, edit, store and/or transfer drawings to a dot-matrix printer (does not support X-Y graphics such as line, circle, arc, rectangle and pattern-fill).

533 RTFILE Centel Information Systems, 4330 East West Highway, Suite 200, Bethesda, Md. 20814—Judith C. Mangels, 301-654-5920 • For use with DEC/VAX, PDP-11, LSI-11 and PROLOG; requires 64K RAM • Price: $1,500 to $8,000 depending on operating system; Updates: billable • Training: computer-aided instruction.

Rtfile is an interactive, relational data-base management system that enables users to create and modify files, screens and reports to sort modules without the need for programming experience.

534 SPEC-WRITER ACCI Business Systems, Inc., 4826 N. Freeway, Suite 260, Houston, Texas 77022—Paul Pomer 713-697-3566 • For use with IBM PC, Compaq, TeleVideo, Vector or other microcomputers running CP/M or MS/DOS; must have WordStar or Memorete word processing; requires 64K RAM • Price: $750; Updates: billable • Training: manual.

Spec-Writer works with a text editor to aid in the preparation of camera-ready specifications. Automatically renumbers and realphabetizes modified specifications. Puts Masterspec II files into the csv format.

535 SPECTEXT-ON-MAGNETIC MEDIA Bowne Information Systems, 400 Oser Ave., Hauppauge, N.Y. 11788—Robert A. Cohn, 516-221-
Office management

525 SPOTLIGHT
Software Arts, 27 Mica Lane, Wellesley, Mass. 02181—Diane Marsili, 617-237-4000 • For use with IBM PC, PC XT or Compaq Portable Computer; requires DOS 2.0 and 64K RAM memory • Price: $149; Updates: free or billable, depending on type.

Spotlight is an on-screen organizer with accessories that can be used alone or with nearly every software program currently available for the IBM PC, PC XT and Compaq computers. Provides a flexible appointment book with optional reminder "alarm clock," on-screen calculator, telephone and address book, index card file for organizing notes, pad for writing messages, and a DOS file for using the operating system while still in another program.

529 STROBEVIEW
Strobe, Inc., 8975 A Independence Ave., Mountain View, Calif. 94043—Elizabeth D. Holthoff, 415-993-5130 • For use with Apple IIe/IIe/III and microcomputers running CP/M, PC DOS and MS-DOS • Price: $75; Updates: billable • Training: manual and computer-aided instruction.

Strobeview assists in the generation of hard copy and overhead transparencies for presentations or outlines for reports. The program formats text and permits selection of different text styles. Pre-digitized shapes and other aids are included to create simple text/shape charts, presentation charts with emphasis bullets and multi-level organizational charts.

538 TKSSOLVER

TKSSolver is an interactive personal computer program that processes equations to solve business, science, engineering, and educational problems without programming. Solves for any variable in an equation. Optional TKSSolver Pack (800) solves equations commonly used in the planning and estimating stage of construction, including solar heating, stress analysis and cost estimating.

539 VISICALC PACKAGE
Software Arts, 27 Mica Lane, Wellesley, Mass. 02181—Diane Marsili, 617-237-4000 • For use with Apple IIe or II+ running DOS 3.3 or PROCES; VisiCalc advanced version requires Apple IIe or IIc running DOS 3.3 or PROCES; Price: $170; Updates: free or billable depending on upgrade.

VisiCalc Package provides two enhanced versions of perhaps the best-known spreadsheet for users of Apple II personal computers: VisiCalc for single disk drive machines, and VisiCalc Advanced Version (requiring two drives). Both offer full work prompts, variable column widths and 40/80 column display support.

531 WORD-11
Data Processing Design, Inc., 1400 N. Brusher, Anahiem, Calif. 92807—Chuck Sargent, 714-970-1515 • For use with DEC PROF, VAX and PDP-11; Price: $395-$9,500 depending on hardware; Updates: included with annual support • Training: on-site, in-house and manual.

Word-11 is a word-processing program that includes list processing, spelling-error detection, footnoting, automatic table of contents, and enhanced editing capabilities.

537 ACCOUNTING FOR DESIGN PROFESSIONALS
Yeakel Electronic Software, Inc., 185 El Camino Real, Tustin, Calif. 92680—Fred Yeakel, 714-828-9871 • For use with IBM System 34, 36, 38 or PDP-11; Price: $5,000 (suggested retail source code); Updates: billable—at $25 per month includes hotline • Training: in-house, on-site, manual and computer-aided instruction.

Accounting for Design Professionals is a multiple-user online project and employee control system enabling all invoicing and accounting functions to be accomplished with a single entry of the source document, time cards or accounts payable. Program is menu driven and can work with an IBM query program to create database capability.

538 ACCOUNTING FOR ENGINEERS AND ARCHITECTS (AEA-I)
Global Computer Systems, Inc., 4200 Garfield Rd., Mt. Clemens, Mich. 48044—Anousha Shifteh, 313-290-8000 • For use with Wang/2200 mini-computer; requires 32K RAM and 5mb disk storage • Price: $7,000-$12,000; Updates: free • Training: seminar, in-house and manual.

Accounting for Engineers and Architects is a fully integrated menu-driven job-cost accounting system for small to medium-sized A/E firms. Contains six modules: payroll and personnel, project-cost accounting, accounts payable, accounts receivable, general ledger and financial statements and utilities. Tracks project cost by classification and labor function and provides a detailed audit trail and accounting flow-through.

539 ACE
Business Information Systems, Inc., 747 Third Ave., New York, N. Y. 10017—Julie Parcell, 212-752-2081 • For use with IBM PC or PC XT (running PC DOS, CP/M or RS/20); requires 64K RAM and hard disk • Price: $2,500—$6,995 (base module through complete system); Updates: some, free or billable • Training: seminar, in-house, on-site, manual and computer-aided instruction.

ACE is a full-scale, integrated accounting and management system, following AAIA specifications, that comprises ten subsystems: project, employee, time-records processing, billing, accounts receivable, accounts payable, engineers payable, general ledger (cash and accrual), management and utilities. Each module functions independently at the user level and can be enhanced by the user.

AEGIS collects employee, project and financial data and generates appropriate financial and project records and required reporting. Produces client invoicing and vendor payments. Menu-driven or

540 AIR MULTIPURPOSE
Pietro Cassinadri, 704 S. 30th St., Richmond, Ind. 47374—Pietro Cassinadri, 317-962-8842 • For use with IBM PC, two disk drives, 256K RAM; monochrome monitor and dot matrix printer • Price: $109; Updates: billable • Training: manual.

A/E Multipurpose is a package containing a variety of programs developed for the design-build firm. Includes: conceptual estimates, project cost analysis and cost control, critical path analysis, structural analyses (sheet-bending-deflection-beams-columns-steel trusses-reinforcing walls-wood-steel-concrete-composite materials), E.T. heating/cooling load, solar system analysis with consideration of future cost of fuels, lighting and PV/excitational analysis), financial equations and letter writing.

541 A/E/D/B BASIC SYSTEMS
Halford A/E Systems Corporation, 5207 McKinney Ave., Dallas, Texas 75206 • For use with microcomputers running CP/M or MS-DOS, PC/DOS or TurboDOS; requires hard disk and 48K RAM for 8-bit machines; 66K for 16-bit machines • Price: $2,000 to $5,000 depending on firm size and software configuration • Updates: billable • Training: on-site, telephone consultation and manual.

AE/D/B Basic Systems is a modular, integrated general accounting, project-cost accounting and database management system for general accounting, ledger and job accounting with basic financial reports, key indicator reports, simplified accounts payable and receivable, client and project list maintenance and basic employee records.

542 AEGIS
Software Inc., 10014 North Dale Mabry, Suite 101, Tampa, Fla. 33618—Anita Karst, 813-962-2127 • For use with any Prime, Data General or DEC computer; supports a wide variety of graphics terminals • Price: $12,500—$19,000 depending on size of system; Updates: free • Training: on-site and manual.

Aegis collects employee, project and financial data and generates appropriate financial and project records and required reporting. Produces client invoicing and vendor payments. Menu-driven or
Architect's Business Manager is an integrated financial management system designed for small- to medium-sized architectural and engineering firms. Maintains job, expense, billing and accounts receivable information about each project. Produces standard or custom reports for job costs, client billing, cash flow, income, balance sheets and more. Standard modules are Job List, Payroll, general ledger and accounts payable.

Architect's Office Manager, written by an architectural firm for itself, automates job reporting. Figures profits, markups, billings and reimbursables. Uses AIA- or user-defined formats for cost accounting. Permits variable billing rates. Reports show every job by phase, hours/dollars budgeted/spent, totals-to-date and percent complete.

Architect's Visi- Templates is a series of templates designed to run with VisiCalc. Project Budgeting estimates a construction budget. Project Management generates fees, sets profit margin, and allows for each phase of work. Also tracks performance against budget and profitability versus performance. Space Programming presents a simplified format for interactive program generation. The Accounting templates, for the small office, are general journal and an expense and bank reconciliation ledger.

Architect's Accounting Program is designed for the small architectural firm, yet permits any number of accounts. The program tracks expenses and income by project and works as a double-entry bookkeeping system: user makes one entry for each transaction, similar to a check register, program posts entry to all other records automatically.

Architectural Engagement Master Accounting System is an integrated job-costing, payroll and accounting system with single-entry posting to all related accounts. Tracks all costs through the life of a project. Reports available in summary or detail. Modules available are job-costing, payroll, accounts receivable, accounts payable, general ledger and automatic invoicing.

Artec III categorizes material and cost data established in "keyroom" references developed by Artec II. Construction management and cost information are updated as design and/or specification changes are finalized. Output is interfaced with graphic references and is intended to provide complete continuous construction support via in-site computer hardware.

For more information on any software program, circle the item number on special Reader Service card following page 80.
total budgets, then tracks and compares expenditures with total budget, reporting per cent spent and actual dollars remaining for each account. Reports printed for any combination of accounts and postings.

555 AUTOMATED COST ACCOUNTING SYSTEM
NOW Computer Systems, Inc., 8840 Tradeway, San Antonio, Texas 78217—Nathan O. Wehe, 512-821-6922 • For use with IBM PC/XT; System 54 and 36 • Price: $5,000—$13,500; Updates: billable • Training: seminar, on-site and manual.

Automated Cost Accounting System provides interactive or stand-alone automated general accounting, cost analysis, job-cost control, estimating, and job scheduling. The software is modular and designed to run in either small- or large-firm environments.

556 BASIL
Tradeex Co., P. O. Box 273, Church St. Station, New York, N.Y. 10008—Dr. Basil Ventiis, 718-629-5503 • For use with IBM PC, two disk drives, one printer • Price: $5,000; Updates: payable in advance • Training: seminar and in-house.

Basil is a financial model used by architects to predict interest rate fluctuations. Can also be used to predict prices for any sort of commodities and investments.

557 BMP: BILL OF MATERIALS PLUS
C. R. Smolin, Inc., 5200 Carroll Canyon Rd., Suite 206, San Diego, Calif. 92121—C. R. Smolin, 619-455-1285 • For use with any microcomputer running CP/M-80, CP/M-86 or MS-DOS; requires 192-column printer; hard disk recommended • Price: $955; Updates: free • Training: manual.

BMP: Bill of Materials Plus is a complete bill of materials processor and engineering documentation control system that supports a multiple database of up to 82,000 parts per database and includes extensive costing and cost roll-up features. Reports, which have comprehensive sort and data selection capabilities, include part master, single level, indented and summary bills-of-material, "where used," and manufacturer’s cross reference.

558 CAMS
Consort Systems Associates, Inc., 2121 Newmarket Fwy., Suite 124, Marietta, Ga. 30067—James R. O’Brien, 404-955-5518 • For use with any Digital General computer including the MV/00 super minicomputer; requires 128K RAM and 10mb disk storage • Price: $8,000-4,000 per module; Updates: included with maintenance contract • Training: on-site, in-house and manual.

CAMS is a modular, fully integrated package that can be configured to meet the needs of different architecture-engineering firms. Basic modules are project-cost control, financial management, scheduling, drawing/production control and spec writing.

559 CES-II
Bradbury & Company, 3809 Shellford Rd., Suite 206, Atlanta, Ga. 30340—Dan Bradbury, 404-467-5094 • For use with computers running CP/M or MS-DOS; requires 64k RAM and 191 disk storage • Price: $1,000; Updates: free • Training: manual.

CES-II produces detailed and summary reports for materials and labor costs. Factors in markup for overhead and desired profit. Work can be divided into 16 user-defined sections. Costs and labor can be broken out by vendor, hard cost, total cost and selling price.

560 CFMS
Harper and Shuman, Inc., 68 Mounton St., Cambridge, Mass. 02138—Carrie Izard, 617-492-4110 • Software available stand-alone under lease or license or via service bureau or timesharing; compatible computers include IBM PC and PC/XT; TRS-80 Models 2, 12 or 16; DEC Rainbow; Apple III; DEC-VAX and Prime 250 series • Price: $21,995 one-time license fee for stand-alone; $1,000 one-time license fee for multiple • some free, some billable • Training: seminar, in-house, on-site, manual, and computer-aided instruction.

CFMS is a comprehensive and fully integrated financial management system that includes payroll, labor distribution, project control system, time utilization, accounting, journals, accounts payable, accounts receivable, general ledger, automated billing and financial statements. Programs are menu-driven. Timesharing programs are updated automatically.

561 CMS COST MANAGEMENT SYSTEM
Educate Inc., P. O. Box 726, San Luis Obispo, Calif. 93406—Dr. Jens Pohl, 805-489-6806 • For use with Alpha Micro AM-100, 100T, 100L, or 1000 Computers; requires 256K RAM and 10mb disk storage • Price: $1,900; Updates: billable • Training: seminar, on-site and manual.

CMS Cost Management System is a microcomputer-based program with three levels of cost estimating: preliminary cost estimates, approximate quantities cost estimates, and detailed cost estimates. The program integrates with OMS Office Management System database (see 599 below).

562 COLUMBIA
Concord Management Systems, 6301 Ivy Lane, Suite 500, Greenbelt, Md. 20770—Andrew Walls, 301-345-5504 • For use with IBM PC, PC/XT, 34, 36, Texas Instruments PC, PS/XT Business Series and DEC 300; requires 256k RAM • Price: $9,500 for basic package; optional modules at $895 each; free updates • Training: available, costs vary • Training: seminar, in-house, on-site and manual.

Columbia is a full management and accounting system designed for construction companies and design/build firms. Provides for multi-company, union and non-union payrolls. Processes AIA billing and all government reporting. More than 50 separate program modules available.

563 COMPUTER AIDED CONSTRUCTION TAKE-OFF AND ESTIMATING SYSTEM
E. F. Paynter & Associates, Inc., 6508 Westfield Blvd., Indianapolis, Indiana 46220—Edwin F. Paynter, 317-257-7561 • For use with Wang 2200 series minicomputers, Apple Lisa 2, IBM System 36, Burroughs B6700 and more • Price: $12,000 for basic system; Updates: included with maintenance agreement • Training: in-house, on-site, manual and help screens.

Computer Aided Construction Take-off and Estimating System calculates and reports quantities, costs and hours for all costs in a construction project. The take-off function is user-defined with entry at the cost item or phase level of either dimensions or units. User can override all rates, prices, crew and factors at any time. Estimate summary reports include selection and subtotals by cost item, phase, division and project section and labor and equipment summaries. Estimate results are transferable to EFP or other job-cost systems.

564 CONSTRUCTION ACCOUNTING CONTROL SYSTEM
Management Information Systems Group, Inc., 1170 Shadowlane Wood, Suite 220, Jacksonville, Fla. 32237—Michael D. Haines, 904-388-2244 • For use with IBM System 34 or 36 minicomputers • Price: $11,500; Updates: included with maintenance agreement • Training: on-site.

Construction Accounting and Control System is a real-time totally integrated system that permits users to cut purchase orders from take-off estimates and automatically update accounts payable and general ledger. The program is designed primarily for contractors but has applications in large firms administering large projects.

565 CONSTRUCTION BID COMPARISON PROGRAM
Computer Services, P. O. Box 702, Atkinson Mill Rd., Fairmont, N.C. 28340—James C. Atkinson, 919-628-8727 • For use with TRS-80 models 1, 3, 4, 12 and 16, requires 16K RAM and 250K disk storage • Price: $50; Licensed to end user only when purchased or leased; Updates: none • Training: manual and computer-aided instruction.

Construction Bid Comparison Program compiles base and alternate bid information to show how bidder on server or in a printed report within ten minutes after bid information is input.

566 CONSULTANT ESTIMATOR
The Company of Ma-et, P. O. Box 1786, 1522 San Miguel Ave., Rancho San Diego, Calif. 92077—P. Young, 619-453-0414 • For use with IBM PC, PC/XT, TRS-80-1/2-3/12, Northstar and Apple II and more • Price: $129.95; Updates: billable • Training: in-house, manual and computer-aided.

Construction Consultant Estimator is a data-based file program with user-defined data input for generating job-cost estimates on any level and for any type of construction. Estimates include labor, material, equipment.
and lump-sum subcontract breakdown. All functions are menu-selectable, with fill-in-the-blanks inputs, worksheets, help screen and manual tutorial.

567 CONSTRUCTION CONTRACT SUPERVISION Forsgren, Perkins and Associates, 520 N 2nd East, Rexburg, Idaho 83440, Tel: 882-3810, Fax: 882-3901. For use with Wang 2200

MVP/VPDP/Wang PC and IBM PC; requires 4k RAM; Price: $1,500; Updates: billable; Training: seminar and manual.

Construction Contract Supervision automates the preparation of construction cost estimates, bid tabulations, monthly contractor pay estimates and construction progress reports. Accommodates projects with as many as 999 bid items — up to the storage limit of the disk.

658 CONSTRUCTION COST ESTIMATING SYSTEM Computer Services, P.O. Box 702, Atkinson Mill Rd., Fairmount, N.C. 28340—James C. Atkinson, 1916-628-8770; For use with models 1, 2, 3, 4, 12 and 16; requires 48K RAM and 250K disk storage; Price: $500 (lease—$50/month); licensed to end user only when purchased or leased; updates: billable; Training: manual and computer-aided instruction.

Construction Cost Estimating System is a series of seven individual sub-programs that provides an estimated cost of a project: Quantity take-off of material; Pricing program; Bid day compiler; Pricing and take-off program; Pricing and take-off cost-control program; and computer-aided instruction program.

569 CONSTRUCTION MANAGEMENT SOFTWARE Small System Design, Inc., 1120 Oakdale Place, Boulder, Colo. 80302—Susan Penny, 303-442-9454; For use with IBM PC/XT and dot matrix printer; Price: $956; includes 16 hours installation and training; Updates: free; Training: in-house, on-site and manual. The estimating portion of Construction Management Software is useful for specifying materials. Each item can be chosen from a master file of frequently used items and inserted into a job file with quantity and cost figures. The same format can then be used by the contractor to complete the materials list for the job.

570 COST-AUCEN Computer Applications Corporation, 2400 Poplar Ave. Suite 318, Memphis, Tenn. 38112—John Cox, 901-466-8690; For use with most microcomputers running CP/M, MS-DOS, CP/M-86 and TRS-DOS (some CP/M-86 machines); requires 128k RAM; Price: $595; Updates: billable; Training: manual.

Cost Aucen is a project-oriented cost-accounting software program that tracks, audits, stores, compares figures and checks cost-accounting data. The program includes print files and uses a fill-in-the-blanks format for data input. Produces a wide variety of management/accounting reports.

571 CREATIVE MANAGEMENT SYSTEM CMS International Corporation, 7 Squirrel Tree Rd., LeCanto, Fla. 33261—Robert C. Haag, 904-749-2785; For use with IBM 370/158 running OS/VS or NASC 7000; Price: $3,000 to $10,000 per month, per project—depending on volume; Updates: billable; Training: seminars, in-house, on-site, manual and computer-aided instruction.

Creative Management System is a modular, management information system that integrates CPM scheduling, resource analysis, accounting, estimating, purchasing and cost control. Reports data at various levels of detail through use of a multi-level work breakdown that allows activities to be maintained at low levels of detail for analysis and reporting at high level for review by management.

572 CROSS REFERENCE EMA Management Associates, Inc., 1145 Gaskins Rd., Richmond, Va. 23225—Terri C. Connell, 804-740-8332; For use with TRS-80 Model 2, 3, 4, 12, 16, two disk drives, 48K RAM and an 80-character or larger printer; Price: $149—$195; Updates: free; Training: manual and computer-aided instruction.

Cross Reference runs interactively with Assistant Manager (see listing 554 above), and expands its data-gathering and report-writing capabilities.

573 DESIGN ESTIMATOR McGraw-Hill Cost Information Systems, P. O. Box 28, Princeton, N.J. 08540—Paul Piccione, 800-257-3595 or 609-262-6500. Service Bureau—requires teletype-compatible computer terminal or microcomputer and a Bell-compatible 300- or 1200-baud modem; Cost: varies; Updates: free; Training: seminar, manual and 800-number.

Design Estimator produces a preliminary design estimate to project the construction cost of a building using preliminary design sketches. Uses a continuously updated database that includes costs for more than 25,000 building components and the productivity and wage rates of 22 trades in more than 700 locations.

574 DODGE SYSTEM 1 McGraw-Hill Cost Information Systems, P. O. Box 28, Princeton, N. J. 08540—Paul Piccione, 800-257-3595 or 609-262-6500; For use with Apple II Plus/II or IBM PC requires 64k RAM, two disk drives and printer; Price: $1195; Updates: billable; Training: manual.

Dodge System 90 automates the development of a conceptual budget analysis required to project construction costs of a proposed building design before blueprints are prepared. The program uses prevailing labor and material costs for the zip-code area in which a proposed building is to be constructed.

575 ESPRI Contractor's Management Systems, 1760 Reston Ave., Suite 101, Reston, Va. 22090—Jim Girard, 703-345-3172; For use with IBM PC/XT and compatible microcomputers running MS-DOS or CP/M. Price: $2,995; Updates: billable; Training: seminars, in-house, on-site, manual and computer-aided instruction.

Espri is a user-definable estimating package operating under MS-DOS or CP/M that can track up to 16,000 items and 999 distinct jobs. The program uses item or assembly-system take-offs. Information is screen-available and can be created, changed or deleted at any time. Over 3000 installations nationwide.

576 ESTEK McDonnell Douglas Automation Company, (McAuto) Management Control Systems, P. O. Box 516, St. Louis, Mo. 63166—W. Eric McDougall, 314-232-6266; For use with IBM 370, 3800, 4000, OS/VS MVS, 133 character printer, 9-track tape drive; requires 1024K RAM; Price: paid-up or monthly—contact McAuto sales office; Updates: billable; Training: seminar, in-house and on-site.

Estek is a construction-cost estimating system for preparing detailed estimates. The program was designed in conjunction with R. S. Means and CMS/Smith, Hinchman & Grylls. Estimates can be based on user-defined cost files or in conjunction with optional R. S. Means data. System may be customized for particular types of construction with user-developed work packages.
2

579 ESTIMATE
S&R Cerati, Architects, Piazza Europea 22, Canale, Italy 12109—Rudolf Cerati, 68 291 • For use with IBM PC and compatible; requires two 5 1/4-in. floppy drives • Price: $75; Updates: billable • Training: manual.

Estimate produces detailed construction-cost estimates. Spreadsheet-like input/output operation offers instant recalculations of values. Converts cost estimates into a spreadsheet format with one keystroke.

Program integrates with the Record Bank filing and reporting database system (see listing 520 above).

580 FULLY INTEGRATED AE PROJECT MANAGEMENT/GENERAL ACCOUNTING
ACCI Business Systems, Inc., 4525 N. Freeway, Suite 200, Houston, Tex. 77022—Paul Pumer, 713-697-3566 • For use with IBM PC/XT, Compaq Plus, Televideo 806, Aljos and Vector Graphic under CP/M or MS-DOS operating systems; requires 64K RAM and 10mb disk storage • Price: $6,250; Updates: billable at price of diskettes and mailing • Training: on-site (travel plus $1000).

Fully Integrated A/E Project Management/General Accounting consists of four integrated modules that emulate the structure of the CPA/AIAB Standard Accounting for Architects. Entry of time-sheet and expense data updates all project files and all related accounting files. Individual modules are project management/billing, payroll management, accounts payable and general ledger.

581 GC CUE
Gilbert/Commonwealth, P.O. Box 1498, Reading, Pa. 19603—Paul DeMio, 215-775-2800 • For use with Hewlett-Packard 2000, Prime, DEC-VAX and IBM-PC compatible computers • Price: from $39,500 depending on hardware and software configuration; Updates: free first year, billable thereafter • Training: on-site, in-house, manual and seminars.

G/C Cue is a comprehensive minicomputer system for large A/E firms that integrates project planning, scheduling and management functions with costing and accounting capabilities. Maintains data for over 1,200 projects separately on one system. Can support up to 100 users simultaneously.

582 GALAXY

Galaxy is an automated quantity take-off and pricing system that enables a user to do a take-off and cost out a project directly from the data the user is using. Provides unit prices, extended costs, and total costs for all building components. Users can develop files of cost data or use data already contained in the file.

583 II MICROSOFT: ECONOMIC ANALYSIS GROUP
Industrial Engineering and Management Press, Institute of Industrial Engineers, 25 Technology Park, Norcross, Ga. 30092—Chuck Smith, 404-449-0460 • For use with Radio Shack TES-80 Model 1, 3 or 4; Apple Models II/I+1/II+1 or II1-1; IBM • Price: $175—$140 for members; Updates: none planned • Training: seminars, manual and help-line.

Economic Analysis Group comprises four stand-alone programs used to evaluate different aspects of a project's economic feasibility. Documentation includes printed source code. Programs are: Buy-versus-Lease Decision, Rate-of-Return Analyzer, Decision-Tree Analysis and After-Tax Cash Flow Analysis.

584 INCOME PROPERTY ANALYSIS
Micro-Mode, Inc., 4006 Mt. Laurel, San Antonio, Texas 78240—Bill Henderson, 512-212-2200 • For use with IBM PC, Compaq, Televideo, Vector, Aljos and other microcomputers running CP/M or MS-DOS; requires 64K RAM • Price: $1,900; Updates: billable • Training: manual.

Income Property Analysis produces a complete financial feasibility study on a project for a prospective income property developer to take to the mortgage banker. Used by architects to sell their design services to developers. Also used by property development firms and commercial loan officers. Software was designed by a San Antonio architect.

585 INTEGRATED PROJECT MANAGEMENT/GENERAL ACCOUNTING SYSTEM
BST Consultants, Inc., P.O. Box 22935, Tampa, Fla. 33629—Carlos Baldor, 813-961-3902 • For use with IBM PC/XT, Televideo computers with hard disk and DEC 20-A/10 with hard disk; requires 64K RAM; turnkey the user's firm and the second, on the client's firm. Program includes printout of all data on the computer system.

Integrated Project Management/General Accounting System is a series of integrated programs designed to meet the needs of A/E firms for control and audit of costs and revenues. Incorporates features of the AIA standardized accounting system and the uniform cost accounting system defined by the AIC. Entry of time sheets and expense data updates all project files and all related files such as payroll, accounts payable/receivable and general ledger. Will accommodate hundreds of active projects and several hundred employees.

586 INTERVUONE
EMA Management Associates, Inc., 1145 Gaskins Rd., Richmond, Va. 23233—Terri C. Connell, 804-740-8882 • For use with Texpert models 3 or 4; with two disk-drives and 48K RAM; requires Tandy's Profile III and Data Base Management Program • Price: $85; Updates: free • Training: manual.


587 JOB COST ACCOUNTING PROGRAM
Elite Software Development, Inc., P.O. Drawer 1194, Bryan, Texas 77806—Terri J. King, 409-775-1782 • For use with microcomputers running CP/M, MS-DOS, PC-DOS and CP/M-86; requires 66k RAM for CP/M and 128k for MS-DOS • Price: $485; Updates: billable • Training: manual.

Job Cost Accounting Program tracks job costs for up to 500 projects and 50 employees on a perpetual-time basis. Up to 15 hourly task codes, 5 direct cost codes and 15 overhead cost codes are allowed. All reports can be obtained with various qualifying parameters, such as the range of job numbers, range of employees and level of detail.

589 KEYSTONE PROJECT MANAGEMENT SYSTEM
Keystone Project Management Systems, 235 S. Maitland Ave., Maitland, Fla. 32751—Stan Levine 903-326-1832 • For use with balancing construction costs, specification levels, zoning constraints, spatial requirements and relationships, land costs, rental rates and occupancy levels, interest rates, life expectancies and operating costs into one model. Invest can then appraise and reappraise the impact of changing any one of these factors to improve the rate of return.

590 KEYSTONE PROJECT MANAGEMENT SYSTEM
Keystone Project Management Systems, 235 S. Maitland Ave., Maitland, Fla. 32751—Stan Levine 903-326-1832 • For use with
computers running CP/M, CP/M-86, MS-DOS and PC-DOS (includes computers from Texas Instruments, Digital Equipment Corporation, IBM and Wang); CP/M requires 38k RAM, 128k for all others; turnkey hardware package provides 45mb of disk storage; Price: $4,500—$6,000 for software; Updates: billable; Training: seminar, in-house, on-site and computer-aided instruction.

Keystone Project Management System is a modular, stand-alone or multiple-user turnkey system with networking and database capability. Software capabilities: Tracks employee time and consultant and vendor transactions. Bills clients, including markup on a project-by-project basis. Generates payroll records and checks, while figuring withholding and deductions. Budgets jobs by up to three levels. Prints project status reports and profit/loss reports. Data entry screen uses fill-in-the-blanks. Modules available for general ledger, word processing and CAD.

591 LIFE CYCLE COSTING PROGRAM
Elite Software Development, Inc., P. O. Drawer 1194, Bryan, Texas 77801—Terry J. King, 409-775-1782; For use with microcomputers running CP/M, MS-DOS, PC-DOS and CP/M-86; requires 56k RAM for CP/M and 128k for MS-DOS; Price: $285; Updates: billable; Training: manual.

Life Cycle Costing Program is a multiple-phased life-cycle economics program that uses the net present value method to determine the lowest cost among project alternatives. Analyzes both current and projected financial needs by phasing alternatives over a specified period of time. Accommodates up to four phases with 40 years useful life per project.

592 MAC-MANAGEMENT ACCOUNTING AND CONTROL DDS—Dakota Data Services, Inc., P. O. Box 1858, Rapid City, S. D. 57709—Jim Van Loan, 605-342-2902; For use with most Data General microcomputers and mainframes; Price: $8,000 for base system, which includes general ledger, job accounting/accounts receivable and payroll; price of other modules is approximately $2,000; Updates: billable; Training: on-site and manual.

Mac-Management Accounting and Control was designed around the accounting requirements of professional architectural and engineering firms. The basic system contains general ledger, financial reporting, job accounting, accounts receivable, payroll and labor distribution. The system can be tailored to the unique needs of a firm.

593 MANAGEMENT INFORMATION SYSTEM BST Consultants, Inc., P. O. Box 23425, Tampa, Fla. 33623—Chris Meyer, 813-883-2305; For use with DEC-VAX and Prime Series 30 computers; requires 1mb RAM; turnkey package available based on DEC-VAX hardware; Price: $25,000; lease available for $2,000 per month—min. 1 year; Updates: free for first 6 months, billable thereafter; Training: manual and 10 day-onsite training included in purchase price.

Management Information System assists in monitoring and controlling costs, revenue and project performance on a real-time basis. Labor costs are computed from employee time-sheet entries and other direct expenses are collected from vouchers, disbursements and journal entries. Information is maintained and displayed on a project, task phase, department/discipline and activity basis.

594 MICOS Consetch, Inc., 8615 Freeport Parkway, P. O. Box 610663, D. F. W. Airport, Texas 75261-0663—Paul Manweiler, 214-257-1188; For use with Altos 68000, Plesux and other microcomputers running Unix; requires 512k RAM and 40mb hard disk; Price: $17,500; Updates: included with service/maintenance contract; Training: in-house and manual.

Micos is the new generation of the Otw Cost Management System. Micos incorporates a structured construction cost database of more than 25,000 detailed items, composite systems and buildings. Users may add to this database or substitute their own. Database manager performs report-writing and immediate or summary decision cost analyses. Micos integrates with numerous professional and general software programs.

595 MISTER PROJECT MANAGEMENT SYSTEM Park Engineering Associates, P. O. Box 584, Veradale, Wash. 99037—Joseph Powell, P.E., CP.A. 609-458-4720; For use with Prime and DEC-VAX computers; includes super minicomputers; Price: $87,000—$80,000 depending on hardware required; Updates: included with service/maintenance agreement; billable otherwise; Training: seminars, in-house and manual.

Mister Project Management System is a multi-project management system that integrates CPM-based work schedules and resource leveling with a complete project budget and accounting system. The system supports extensive network and financial graphics, including precedence diagramming. The program will run on supermini-class computer hardware.

596 MONITOR The Clements Company, 306 Alice Lane, Menlo Park, Calif. 94025—The Clements, 415-321-1617; For use with any computer running CP/M or M/D and a 132-column printer; requires 68k RAM; Price: $450; 8850 with source code; Updates: billable; Training: manual.

Monitor is a package for job-costing and budgeting that permits a selection from the following major types of billing contracts: cost-plus-fixed-fee, lump-sum, per diem, or multiplier. Allows eight, user-defined, direct expense categories.

597 N5500 Nichols & Company, Inc., 5538 Green Valley Circle, Suite 104, Culver City, Calif. 90230—Patrick M. Mazie 213-758-4613; For use with IBM, HP, Burroughs, Honeywell, Univac, CDC, Perkin Elmer, Wang, Prime, Data General and DEC computers; Price: $29,000; Updates: included with maintenance contract; Training: seminars, in-house and on-site.

N5500 is an integrated management information system for project planning and control. Handles budgeting, accounting, billing, resource management, CPM/PERT scheduling, reports and report graphics. Handles over one billion projects, dependencies, resource categories and milestones.

598 NIC GENERAL ACCOUNTING National Information Consultants, Inc., 400 S. Cheyenne, Suite 600, Tulsa, Okla. 74105—Jack Vest, 918-584-2965; For use with IBM PC/XT, series 20, 2 or 16 with CP/M, Altos 885/986 with Xenix, HP 987/87 and Intertec Headstart; Price: $995; Updates: no charge for first year included with maintenance fee thereafter; Training: in-house, on-site and manual.

Nic General Accounting is a fully integrated accounting system with general ledger, accounts payable, accounts receivable and payroll. Produces financial statements in any format. Payroll is job-oriented allowing entry of project number and work code for each employee. Runs salaried and hourly employees simultaneously. Prints well-designed reports and detailed check stubs. Optional modules are Project Accounting (8395) and Card Reader System (8135).

599 OMS OFFICE MANAGEMENT SYSTEM Educol Inc., P. O. Box 726, San Luis Obispo, Calif. 93406—Dr. Jens Pohl, 805-489-0866; For use with Alpha Micro AM-100, IOT, IOTL, 1000 computers; requires 32k RAM and 10mb disk storage; Price: $3,000; Updates: billable; Training: seminar, on-site and manual.

OMS Office Management System is a multi-user system that integrates office accounts, payroll, people and design project data into an automated data storage and report generation system. Additional applications modules available.

600 OPTIM Consetch, Inc., 8615 Freeport Parkway, P. O. Box 610663, D. F. W. Airport, Texas 75261-0663—Paul Manweiler, 214-257-1188; For use with most microcomputers running Unix or MS-DOS; requires 68k RAM; Price: $480; Updates: free; Training: manual.

Optim combines the major construction and operating cost variables enabling a user to determine the optimum shape, number of stories, layout and external works of a building. Estimates produced by Optim can serve as a cost benchmark for comparing alternative schemes.

601 PRELIMINARY COST ESTIMATING Micro-Mode, Inc., 4006 Mt. Laurel, San Antonio, Texas 78240—Bill Henderson, 512-941-2280; For use with IBM, DEC, Altos, Vector, Televideo, Osborne and other microcomputers running CP/M or MS-DOS; requires 64k RAM and 150k disk storage; Price: $1,855; Updates: billable at $150 per year; Training: manual.

Preliminary Cost Estimating produces probable construction cost for a construction project. Cost is
broken down into 12 building systems, special building features and site and special outside work. Costs are figures based on Dodge, Means and Marshall figures.

602 PROFESSIONAL ACCOUNTING SYSTEM
Heiniger Associates, 636 W. Jefferson, Morton, Ill. 61550—Jim Heiniger, 309-262-1212. For use with IBM PC-XT/ST System. [SEP/12/VIP/VP]; requires 64k RAM; Price: from $1,500, depending on number of modules purchased; Updates: billable. Training: manual and on-site.

Professional Accounting System consists of integrated job costing/marketing software using payroll, general ledger, accounts payable and word processing. Generates multiple invoice formats. Other modules are projects (Forms 252, 255), contact information, personnel/company information, invoices, and calendar.

603 PROFESSIONAL JOB COST SYSTEM
DMM & Associates, 1542 W. Wilshire Drive, Phoenix, Ariz. 85007—Dave McKibben, 602-254-6067. For use with DEC-DECmate and II series, All Others: Price: $1,450 (leasing option available); Updates: free during first year, billable thereafter. Training: manual and on-site.

Professional Job Cost System is a modular suite of programs that can capture and report job-related expenses from employee time cards, outside consultant billings and miscellaneous internal and external expenses. Produces a variety of reports, including billing advice, project performance summary, employee time summaries and labor analysis. Related systems are job-cost estimating, accounts payable, payroll, accounts receivable and general ledger.

604 PROFESSIONAL MANAGER

Professional Manager is a fully integrated financial accounting/billing system featuring job-cost with billing, payroll, accounts payable, accounts receivable and general ledger. Unix version (language is CIDL/100) is also available. Optional report writer permits users to create customized reports. Industry standard graphics and spreadsheet packages interface with the database.

605 PROJECT CONTROL MANAGEMENT SYSTEM
Creative Software Systems, 399 Sherman Ave., Suite 11, Palo Alto, Calif. 94306—Jim Killeen, 415-252- 5033. For use with IBM PC-XT/DEC- PDP/11 or any other computer running UNIX; supports most 132-column printers. Also available as part of turnkey system. Price: varies from $5,000-$10,000; Updates: cost depends on complexity of update. Training: in-house, on-site, manual and computer-aided instruction.

Project Control Management System is a modular, fully integrated accounting and financial management system with five main modules: accounts receivable, accounts payable, project costing, general ledger and payroll. One entry updates all files. Optional systems are PERT (scheduling), library distribution, employee scheduling, file maintenance generator and a report writer.

606 PROJECT COST AND ACCOUNTING SOFTWARE
Data Processing Design, Inc., 1400 N. Brasher, Anaheim, Calif. 92807—Chuck Sargent, 714-970-1515. For use with VAX/VMS Version 3.4 or later and PDP-11 systems. Price: $9,000 for complete package or $5,000 for each individual module; Updates: included with annual support. Training: on-site, in-house and manual.

Project Cost and Accounting Software is a suite of five programs designed to track labor and expenses for individual client projects. The software generates reports on project profitability and handles all other operational and financial reporting needs with an integrated fiscal accounting package.

607 PROJECT MANAGEMENT

Project Management is a costing and accounting system that comprises six integrated software modules to provide in-house project costing, payroll and accounting services. The modules are designed for architectural and engineering firms and are fully integrated with interactive graphic displays.

608 PROJECT MGR.

Project Mgr. is a modular, menu-formatted project management system that provides detailed budget and cost-capturing capability. Included is a professional invoicing system and a personnel reporting module. Software can be purchased as part of a turnkey system that includes documentation, training and ongoing support.

609 PROJECT TIME MANAGEMENT
Alpine Datasytems, Inc., 8043 Southwest Cirrus Dr., Beaverton, Ore. 97005—Steve Judd, 503-641- 8100. For use with DEC-PDP11 and VAX series of computers; requires 256k RAM and 20mb hard disk storage. Price: $12,000 to $40,000 depending on configuration; Updates: billable. Training: on-site and hot-line.

Project Time Management is an integrated project costing and financial accounting system oriented towards medium-to-large firms using microcomputers. Package includes project costing, accounts receivable, billing, payroll, accounts payable, general ledger, resource scheduling and marketing retrieval. Determines actual costs versus budgeted costs for labor, reimbursables, consultant expenses and direct costs.

610 PROMAX-C

Promax-C is a modular financial cost-control system built around a billing and job-costing module and an on-line database. Standard modules are accounts receivable, accounts payable, general ledger and payroll. Options are job-cost estimating, job scheduling, vehicle/equipment maintenance, inventory/purchasing control, fixed assets accounting, personnel reporting and mailing list maintenance.

611 RAPIDCOST-C

Rapidcost-C is a contractor estimating and take-off system that operates in conjunction with a sonic digitizer. The program stores detailed and subtotal assemblies along with pricing and other relevant information in a database. Digitizer permits take-offs of quantities, areas, lengths and widths and conversion to square feet, rolls and other building material units.

612 REQUEST FOR PAYMENT PROGRAM
Computer Services, P.O. Box 702, Atkinson Mill Rd., Fairmont, N.C. 28340—James C. Atkinson, 919-628- 8727. For use with TRS-80 models 1, 3, 4, 12 and 16; requires 32k RAM. Price: $100. Licensed to end user only when purchased or leased; Updates: billable. Training: manual and computer-aided instruction; questions answered by phone.

Request for Payment Program stores data by request period. After user initializes program for project he only changes the amounts for each breakout. The program computes the remainder of the entries on a form that prints out on a 132-column printer.
616 STAR
R. S. Means Co., Inc., 100
Construction Plaza, Kingston,
Mass. 02934—Priscilla Driver, 617-
747-1270 • For use with IBM PCXT,
IBM Datamaster, Wang Professional
and DEC Rainbow 100 plus; requires
128k RAM • Price: $1,600; Updates:
billable • Training: manual.

Star is a general estimating
program using the unit price
method. User can develop his own
material and labor-cost information.
Produces estimating reports for
an entire project broken down by
subcontracts or full 16 divisions.

617 WIND-3 ONE
Wind Research Inc., 419 Canyon
80521—L. Danielle Forsyth, 303-482-
7145 • For use with any computer
running MS-DOS or CP/M with at least
64k RAM, two disk drives, an 80-
column monitor and form-feed
printer • Price: $1,585; Updates:
billable • Training: on-site, manual
and help-line.

Wind-3 One uses standard, readily
available accounting data to provide
project management, project
invoicing, project profit analysis,
overhead cost analysis, accounts
receivable and labor and task
evaluation and management. Also
includes cost proposal/job cost.

618 STANDALONE PROJECT
COST ACCOUNTING
Micro-Mode, Inc., 4006 Mt. Laurel,
San Antonio, Texas 78240—Bill
Henderson, 512-341-2205 • For use
with IBM PC, Compaq, Televideo,
Altos, and other microcomputers
running CP/M or MS-DOS; requires
64k RAM and 240k disk storage •
Price: $1,645; Updates: billable
• Training: manual.

Standalone Project Cost
Accounting tracks budgeted versus
actual costs, labor and billable
hours for up to 500 projects and
100 employees. Records time and
money spent on each project by
phase, job service within each phase
and labor billing rate. Also records
direct and reimbursable costs by
project. Produces a variety of
summary and detailed reports by
both billing rate and pay rate each
pay period.

619 ARCHITECT’S FRIEND—
V1.1
Team Design, 5290 North Picket
Dr., Colorado Springs, Colo. 80907—
Bob Moore 303-588-0663 • Program
operates as part of a turnkey
system or with IBM PC and
compatible computers running
MS-DOS. Peripherals include printer
and floppy disk drives. Features
include: 100% of project design
and job costing, in-house
engineering, job control, job
tracking, and documentation.

ARCHITECT’S FRIEND—V1.1 is a
tegrated graphics-based
applications package that includes
project management, energy
analysis, full accounting, floor
plans, elevations, renderings and
development planning. The
program is written in "C" language
for transportability and uses a stand-
alone database management
database.

620 ARCHIPAK
Integrated Technical Computers Co.
Ltd., 42 Road 5 Ampang Jaya,
Kuala Lumpur, Malaysia—Tim
Grogan 03-485153 • For use with
Apple, IBM PC and compatible
computers; requires 64k RAM • Price:
$1,595—$2,656; Updates: billable
• Training: manual.

Archipak is a menu-driven database
information system that assists
with job costing, progress payment,
variations in orders, time extension
control, status of authorities
approvals and other related
activities during the construction
stage. Program utilizes error
tracking and programming

621 ARTEC 3
Go Fuku, P. O. Box 330040, San
Francisco, Calif. 94164—Dennis
Fukui, 415-592-3655 • For use with
Macintosh and Lisa with optical or
laser printer; requires 512k RAM and
a 5mb hard disk • Price: $1,300/yr.
license; Updates: billable • Training:
on-site and computer-aided
instruction.

Artec 3 categorizes material and
cost data established in "keyroom"
references developed by Artec 2
(see also 698 and 699). Construction
management and cost information
are updated as design and/or
specification changes are finalized.
Output is interfaced with graphic
references and is intended to
provide continuous construction
support through on-site computer
hardware.

622 ARTEMIS
3 Point West Dr., Houston, Tex.
77036—Robert B. Walker, 713-988-
9100 • For use with IBM PCXT,
HP 1000, and IBM and DEC

Artemis is an interactive project
management system for planning
and scheduling, cost management,
performance measurement,
resource leveling, materials control,
forecasting, maintenance and
documentation/controlling.
Artemis features a relational
database for full integration of
information and operates under one
English-like control language.

627 ASAPMS PROJECT
MANAGEMENT SYSTEM
ASA-Arwood Sipos, 255-238 South
End Ave, New York, N. Y. 10020—
Andrew Sipos, 212-231-2406 • For
use with IBM 800, 8088, 80386, 486,
CD fork hard drive; and hard
printer; input/output devices are a
CRT or hardcopy terminal; output
devices: printer, hardcopy terminal
or plotters with a width of 11 in. or
more • Price: from $9,900; Updates:
billable • Training: seminar, in
house, on-site, manual and
computer-aided instruction.

Asapms Project Management
System is a modular project
management system that plans,
schedules, compares the project
plan with actual job performance,
and reports the amount of work
remaining to be done. Independent
scheduling systems are critical path
method, precedence method, PERT,
and progress chart. Each
scheduling system comprises five
programs: time analysis (core
program), cost, resource, graphics
and multi-project.

628 CRITICAL PATH METHOD
Technical Information Systems,
Inc., 116 West Plume St., P. O. Box
1900, Norfolk, Va. 23501—Robert E.
Branch, 800-988-4200 • For use with
DEC-VAX and PDP-11; Price: $995
for VAX; $895 for PDP-11; Updates:
free for first ninety days; included
with maintenance contract thereafter
• Training: on-site, in-house, manual
and computer-aided instruction.

Critical Path Method computes
the critical path for a large
construction projects with a
maximum of 1,000 individuals tasks.
Sorts by early start, late start, early finish, late finish, total float, bid items and sequentially. Dollar values for each task and total for project are printed by option.

629 CRITICAL PATH METHOD PROGRAM
Elite Software Development, Inc., P.O. Drawer 1194, Bryan, Tex. 77804—Terri J. King, 400-775-1782 • For use with microcomputers running CP/M, MS-DOS, CP/M-80, or CP/M-86 • Requires 50K RAM for CP/M and 128K for MS-DOS • Price: $520; Updates: billable • Training: manual.

Critical Path Method Program permits up to 500 activities to be defined in a network. Enables users to define working days, time increments, skill categories and cost methods. Outputs include summary reports on the status of all activities and Gantt charts.

630 CRITICAL PATH (PERT) MODULE
Chorion Data Sciences Corp., 497 Southampton Road, Westfield, Mass. 01085—Norman St. Martin, 413-562-2533 • For use with IBM PC/XT, IBM portable computers or Commodore 64 • Price: $295; Updates: billable • Training: manual and telephone support.

Critical Path (PERT) Module permits critical path planning, project scheduling and control. Arrows (time) and nodes (events) are presented to the critical path for date-sensitive events that make the project not be contingent on each other. Includes graphic printout capabilities.

631 GC CUE
Gilbert/Commonwealth, P.O. Box 1498, Reading, Pa. 19603—Paul DeMeco, 215-775-2900 • For use with HP 9000, Prime, DBC/VAX and IBM 370 • Price: $99,500 depending on hardware and software configuration; Updates: free first year, billable thereafter • Training: on-site, in-house, manual and seminars.

G/C CUE is a comprehensive minicomputer system for large A/E firms that integrates project planning, scheduling and management functions with costing and accounting capabilities. Maintains data for over 1,200 projects separately on one system. Can support up to 100 users simultaneously.

632 GANTT-PACK VERSION 2.0
Gantt Systems, Inc., 485 Main St., Metuchen, N.J. 08840—Peter H. Malone, 201-494-7452 • For use with any computer running the following operating systems: MAC, MS-DOS, CP-DOS or CP/M-80 or later; CP/M-86, TRS-DOS, UNIX or Xenix; RAM requirements vary; requires 132 column printer • Price: $395; Updates: billable • Training: manual.

Gantt-Pack Version 2.0 is a project control tool for scheduling by specific date, time or any user-defined units. Draws Gantt and critical milestone charts. Charts can be output into a word processor through an ASCII file to create customized reports. Also interfaces with Lotus 1-2-3 or basic language.

633 HARVARD PROJECT MANAGER V1.1
Harvard Software, Inc., 521 Great Rd., Littleton, Mass. 01460—Daniel S. Diamond, 617-486-5431 • For use with IBM PC, PCXT and compatible computers, such as Compaq and Hyperion; requires 128K RAM and two disk drives; supports 18 printers, including IBM, Epson, C. Itoh, NEC and Okidata Microline • Price: $295; Updates: free or at cost • Training: seminars through dealers and manual.

Harvard Project Manager V1.1 utilizes the critical-path method (CPM) and program-evaluation and review technique (PERT) scheduling methods. Inputs are tasks, subprojects and milestones. Task durations can be assigned a cost and specified from minutes to years of "working" or "elapsed" time. Other program features are user-definable calendar, functional windows, a selection of on-screen or printed displays and reports and the use of the large PC character set to construct graphical elements for printed charts.

634 IIE MICROSOFTWARE: PROJECT MANAGEMENT GROUP
Industrial Engineering and Management Press, Institute of Industrial Engineers, 25 Technology Park, Norcross, Ga. 30092—Chuck Smith, 404-440-9460 • For use with IBM-XT Models 1, 3, 4; Apple Models II, II+ & IIE and IBM PC • Price: $175, $140 for members; Updates: none planned • Training: seminars, manual and help-line.

IIE/Microsoft: Project Management Group comprises four software programs: Critical Path Analysis, Program Evaluation and Review Technique (PERT), Resource Allocation and Activity-
Elmer, Wang, Prine, Data General and DEC computers • Price: $28,000; Updates: included with maintenance contract • Training: seminar, in-house and on-site.

N5000 is an integrated management information system for project planning and control. Handles budgeting, accounting, billing, resource management, CPM/PERT scheduling, reports and report graphics. Capable of handling over one billion projects, dependencies, resource categories and milestones.

641 NIC MANPOWER SCHEDULING
National Information Consultants, Inc., 403 South Cheyenne, Suite 600, Tulsa, Okla. 74105—Jack Vest, 918-594-2365 • For use with IBM PC/XT, TRS-80, 12 and 16 with CP/M, Altos 886/986 with Xenix, HP 26/87 and Intertec Headstart • Price: $235; Updates: no charge first year billable thereafter • Training: in-house, on-site and manual.

NIC Manpower Scheduling combines all project schedules entered by department and compares the result with the firm’s available resources. Produces departmental report to enable a scheduler to anticipate hiring and layoffs periods.

642 PATHFINDER
Garth Publishing, 136 Madison Ave., New York, N.Y. 10016—Craig Randall, Jeff Conrad, 212-686-7492 • For use with any CP/M-86 or PC microcomputer with 48K RAM and 100K disk storage or IBM PC or P C XT with 128K RAM and 150K disk storage • Price: $299; Updates: free • Training: manual.

Pathfinder is a menu-driven program for critical-path method project scheduling that generates a variety of charts and reports: Gantt chart print on printer, execution report, cash-flow projection and work day/date conversion chart. Reports can be sorted many different ways.

643 PDC
Conset Inc., 8615 Freetown Parkway, P.O. Box 610665, D.F. W. Airport, Texas 75238-0065—Paul Maulwehr, 214-297-1136 • For use with Altos, Plexus, IBM PC or microcomputers running Unix, MS-DOS or CP/M; requires 128K RAM • Price: $3,000—$5,000; Updates: free • Training: manual.

PDC is a project control and management package for setting up, monitoring and forecasting services, contractors, suppliers with manpower, materials/equipment, unit rates, work order progress, productivity and cash flow (working capital). Features include a flexible database manager, user-defined work breakdown structures, earned value/BCWS/BCWP/EAC reporting, trend analysis and full simulation, overtime and holidays.

644 PERT 6
Dynamic Solutions, Inc., 50 Lytton Ave., Hartsdale, N.Y. 10530—A.J. Paris, 914-949-6658 • For use with DDC System 10, System 30, VAX/VMS, Alpha-Micro/AMP and other 92-bit computers; disk storage requirements depend on size and number of projects • Price: from $39,000; Updates: billable • Training: manual and on-site.

Per 6 is a modular, database-oriented system for project planning, tracking and control that offers fully user-defined reports, immediate on-line error detection, multiple calendars and either precedence or IJ notation. Wide range of input options. Interfaces with other software.

645 PLAN TRAC
Computerline Limited, 755 Southern Artery, Quincy, Mass. 02269—Susan Carroll, 617-773-0001 • For use with most microcomputers running MS-DOS, FC-DOS, TRS-DOS and CP/M; supports flatbed or drum plotters and 132-column printer • Price: $3,000 first year, $1,000 per year thereafter; includes technical support, all software updates and plotter; Updates: included for license fee • Training: seminar, in-house, on-site and manual.

Plan Trac is a menu-driven scheduling program that performs critical-path-method network planning and time, resource and cost analyses. Produces reports to highlight and compare specific schedule, cost and resource activities on a screen or printer in user-definable formats. Plots or prints the network drawing and bar charts. Prints data transfer to other systems.

646 PLAN TRAC-CS
Computerline Limited, 755 Southern Artery, Quincy, Mass. 02269—Susan Carroll, 617-773-0001 • For use with most microcomputers running MS-DOS, FC-DOS and CP/M; supports flatbed and large drum plotters • Price: $3,000 first year, $1,000 per year thereafter; includes technical support, all software updates and plotter software; Updates: included in license fee • Training: seminar, in-house, on-site and manual.

Plan Trac-CS automates the monitoring and forecasting of construction activities. Maintains a database of project details such as crews, materials, equipment and associated costs. Offers choice of "CP" curve. Analyzes performance, variance, cash flow and trending calculations and has facilities for simulations. Reports include earned value, BCWP, ACWP, BCWS. Interfaces with Plan Trac schedule database to permit actual and baseline schedules to be used to provide time phasing.

647 PMS PROJECT MANAGEMENT SYSTEM
Educ Station, P.O. Box 725, San Luis Obispo, Calif. 93406—Dr. Jens Pohl, 805-598-8996 • For use with most Micro-Alpha AM-9000, 1007, 1001 of 1000 computers; requires 38K RAM and 101/m disk storage • Price: $1,200; Updates: billable • Training: seminars, on-site and manual.

PMS Project Management System is an interactive scheduling and project management system with CPM and PERT network analysis, scheduling and probabilistic risk management. Choice of "precedence" or "activity in the box" network definitions. Activity relationships are finish-to-start, start-to-start, start-to-finish, per cent-complete-to-start, and per cent complete-to-finish.

648 PMS-II
North America MICA, Inc., 5220 Carrol Canyon Rd., Suite 110, San Diego, Calif. 92121—Dianna Hamper, 619-482-1227 • For use with most microcomputers with 64K RAM; requires an 80-character by 24-line video display, 132-column printer and a minimum of 600K disk storage in two drives • Price: $1,295; Updates: free during first year, billable thereafter.

PMS-II is a critical path network analyzer that will calculate the early start/finish and late/start/finish dates, float time and critical paths for project networks with up to 2,500 activities. Prints activity reports and Gantt charts with extensive sort and select capabilities, an activity diagram, funding schedule and graph and three-part earned-value analysis reports. (See also 639 and 657.)

649 PRODAT
Technical Information Systems, Inc., 116 W. Plume St., P.O. Box 1900, Norfolk, Va. 23501—Robert E. Branch, 800-368-4220 • For use with DEC-VAX and PDP-11/ • Price: $220 for VAX; $150 for PDP-11; Updates: free for first ninety days; included with maintenance contract thereafter • Training: on-site, in-house, manual and computer-aided instruction.

Prodat computes dating sequence for any duration project considering holidays, overtime, etc. Output depicts entire project and relationship of nth day of project to calendar date. Leap years are considered.

650 PROJECT MANAGEMENT PACKAGE
Bradbury & Company, 9909 Shallowford Rd. 206, Atlanta, Ga. 30320—Mr. Bradbury, 404-439-5504 • For use with any CP/M or MS-DOS operating system; requires 64K RAM • Price: $665 series, $290 each; Updates: free • Training: manual.

Project Management Package contains four programs: contractor application for payment (completes AIA 1000 form); contractor material control; contractor shop drawing/submittal control; contractor drawing/specification control.

651 PROJECT MANAGEMENT SOFTWARE
Mason & Hanger—Silas Mason Co. Inc., 200 West Vine St., Lexington, Ky. 40507—Elizabeth Boomer or Bill Allman, 606-232-4421 • For use with any 64k microcomputer running CP/M, MP/M or CP/M-86; requires an 80-character by 24-line video display, 132-column printer • Price: $1,295; Updates: free first year; billable thereafter • Training: seminars, in-house, on-site and manual.

Project Management Software performs a critical-path networking analysis that will calculate the early start/finish and late/finish dates, float time and critical paths for project networks to over 2,500 activities. Work week and calendar flexibility. Meets all government reporting requirements per EIR-11-11 and DOD 7000.2. True float calculations and menu drive. Interfaces with a job-cost system or dBase II.

652 PROJECT MANAGER MODULE
Chempura Data Sciences Corp., 507 Architectural Record October 1984 61
Project scheduling and management

Southampton Road, Westfield, Mass. 01085—Norman St. Martin, 413-382-2353 • For use with: IBM PC/VT, IBM portable computers and Compaq • Price: $400; Updates: billable • Training: manual and telephone support.

Project Manager is a stand-alone software module that runs on the IBM PC/XT and compatibles. It offers graphics displays in the form of Gantt and PERT Charts. Multiple projects may be handled. Data is easily viewed and interpreted.

655 PROMAX-C

Promax-C is a modular financial cost-control system built around a billing and job-costing module and an on-line database. Standard modules are accounts receivable, accounts payable, general ledger and payroll. Options are job-cost estimating, job scheduling, vehicle/equipment maintenance, inventory/purchasing control, fixed asset accounting, personnel reporting and mailing list maintenance.

654 PROMIS
Strategic Software Planning Corporation, 222 Third St., Cambridge, Mass. 02142—Elizabeth A. Weiner, 617-347-6550 • For use with IBM PC/XT or equivalent, color or monochrome display. floppy disk drive and hard disk; requires 512K RAM; fully supports any graphic device driven by the 852x2 Graphics System Extension by Digital Research, Inc. • Price: $3,000; Updates: free for first year, billable thereafter • Training: seminar, in-house, on-site and manual.

Promis integrates scheduling, resource management, tracking and budget-cost control functions. Handles unlimited number of projects, tasks, costs and resources. Based on Critical Path Method. Over 40 predefined reports provided including presentation-quality Gantt charts, histograms, network drawings, resource and cost profiles and tabular formats. Incorporates MDS-III database structure.

655 PROMPT-ER
Prompt Management Inc., P.O. Box 6641, Station A, Toronto, Canada, M5W 1X4—Bill Cornish, 416-354-6274 • For use with Apple II plus or IIe; requires 64K RAM • Price: $189 U.S.; Updates: first update free; billable thereafter • Training: manual.

Prompt-er is a project management and scheduling program that draws network diagrams on screen and permits users to modify them to establish the best relationships between activities and the best project path. Prints out a calendar bar chart.

656 QUICK-PLAN

Quick-Plan is a network-based, critical path method decision-support software tool for personal computers. Quick-Plan permits users to structure time information in network format, allowing managers to evaluate the impact of alternative plans and schedules.

657 RMS-II
North America MICA, Inc., 5320 Carroll Canyon Rd., Suite 110, San Diego, Calif. 92121—Diana Hamper, 619-482-1297 • For use with most microcomputers with 64K RAM; requires an 80-character by 24-line video display, 132-column printer and a minimum of 600K disk storage in two drives; Price: $995; Updates: free during first year, billable thereafter • Training: manual.

RMS-II is a resource management system that tracks all space, staff and material resources. The program is designed to run with RMS-II, a critical path program (see 657 above). RMS-II generates reports for any of 96 resource centers showing line item detail allocations and bar graphs that depict allocations as a percent of capacity over time.

658 STARNET
Largo Soft International, 1 Hamsesfin St. (Elahnu House), Tel-Aviv, Israel 64736—(03) 566876 • For use with computers running MS-DOS or CP/M; requires two 320K disk drives and a printer • Price: $1,995; Updates: billable • Training: manual and computer-aided instruction.

StarNet analyzes and solves a node-oriented project network (also known as “precedence” or “activity-on-node” technique). Handles more than 2,000 activities and 3,000 relations. Produces a variety of reports to show distribution of resources over the project life or on a month-to-month basis. Tables and bar charts include information derived from many sorting criteria.

659 TIME-PLAN

Time-Plan is a network-based, critical path method decision-support tool for personal computers. Time-Plan permits users to structure time information in network format, allowing managers to evaluate the impact of alternative plans and schedules.

660 TIMEKEEPER
EMA Management Associates, Inc., 1145 Gaskins Rd., Richmond, Va. 23233—Terri C. Connell, 804-740-8562 • For use with IBM/PC Model 3 or 4, two disk drives and an 80-character printer or larger • Price: $995; Updates: free • Training: manual and computer-aided instruction.

Timekeeper posts hours to project by employee and phase. Monitors hours remaining in project budget, percent spent for all phases of all projects, overhead cost, employee vacation, holiday and sick leave. Data is input through a fill-in-the-blank format.

661 TOPMAN PROJECT MANAGEMENT SYSTEM
Applied Management Methods, Inc., 201 N. Broad St., Doylestown, Pa. 18901—Robert J. McGrady, 215-348-1200 • For use with DEC/11/34, MVS 730 & up, COMPACT-compatible printer, VT 100 CRT; requires 125K RAM • Price: $290,000; leasing available from $1000 per month; Updates: billable • Training: in-house, on-site cost, manual, computer-aided instruction.

Topman Project Management System generates bar charts, graphic plots and printer reports to reflect work accomplished in activities, probable completion dates, critical path, resources required, dollars required to complete, and exception reporting. Reports are available for project division, sub-division, or multi-project networking.

662 VUE
National Information Systems, Inc., 20670 Town Center Lane, Suite 100, Cupertino, Calif. 95014—Cheryl Smith, 408-257-7700 • For use with DEC/10 or 20, VAX, PDP-11, HP 3000, Perkin Elmer 280 series or Honeywell DPP-60 • Price: $16,000—$25,000 on perpetual license • Updates: no charge during first 6 months; billable at 10 per cent of license fee thereafter • Training: in-house, on-site or manual.

Vue is an interactive project management system that uses the critical path method to spot activities whose timely completion is critical to finishing the project on schedule. Tracks up to 3,000 activities. Options are graphics, time-scaled network diagram, multi-project capabilities and a custom report writer module. Also available on timesharing.
Space planning and facilities management

668 ARCHITECT'S FRIEND—V.1.1
Team Design, 5290 N. Picket Dr., Colorado Springs, Colo. 80907—Bob Moore, 303-584-0663•Program operates as part of a turnkey system or with IBM PC and compatible computers running MS-DOS. Peripherals include PLEX-MII and Color Graphics XL-19 monitors, Houston Instruments IMP-M2 scanner, SAC Sonic digitizer and NEC PC printer • Price: from $2,295 for software and $2,505 for turnkey package; Updates: free; modem option • Training: in-house, on-site, manual, computer-aided instruction and video-training cassettes.

Architect's Friend—V.1.1 is an integrated graphics-based applications package that includes project management, energy analysis, full accounting, floor plans, elevations, renderings and development planning. The program is written in "C" language for transportability and is a standard file management database.

669 ARCHITECTURAL COMPUTERIZED DRAFTING SERVICES, SYSTEM RENTAL AND SYSTEM SALES

Facility Manager keeps track of all partitions and hang-on components by department number, building area and square footage, and also, how much of that square footage can be net or gross. Permits day-to-day management of workstations, projections and "what-if." Pages 667

670 FACILITY PersonNEL/SPACE REQUIREMENTS
ACCI Business Systems, Inc., 4625 N. Westminster, Suite 200, Houston, Texas 77022—Paul Pamer, 713-697-3566•For use with microcomputers running MS-DOS or CP/M; requires 64K RAM • Price: $1,500; Updates: billable • Training: manual.

Facility Personnel/Space collects, updates and reports data related to space requirements for architectural and space planning purposes. Allows users to describe a company’s organizational structure, project personnel and non-people space area and square footage, and also develop and model corporate space standards to be used for design of office and open-plan space.

671 SPACE PLANNING AND FACILITIES MANAGEMENT
NPS Consulting Group, 12465 Lewis St., Suite 104, Garden Grove, Calif. 92640—John H. Self, 714-971-3964•For use with any microcomputer running the PICK operating system; requires a 10mb hard disk • Price: $10,000—$40,000 depending on number of modules purchased; Updates: free during first year; included with maintenance plan thereafter • Training: in-house, on-site, manual and computer-aided instruction.

Space Planning and Facilities Management is a program for managing projects, furniture, master, lease, stack and project budget— which aids in modeling space assignments and projections, building alternatives, furniture budgets and over-all project budgets. Develops space and facilities plans. Manipulates graphics and statistics. Single data base.

672 SPACE PLANNING/FACILITIES MANAGEMENT
Intergraph Corporation, One Madison Industrial Park, Huntsville, Ala. 35807—Al Kemper, 205-725-1800•A basic turnkey system consists of an integrated computer workstation, hard printer, plotter and software. Systems are based on DEC VAX and VAXIPC • Price: $129,000; Updates: free; service/maintenance contract or billable • Training: in-house, on-site implementation plan; computer-aided instruction and manual.

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Space Planning/Facility software is used to develop the layout drawings and management reports that contain the information needed for planning the most expeditious use of space and equipment. The software draws from an electronic catalog of furniture and equipment data to produce detailed layout plans and reports. Further, the data created during space planning establishes an "as-installed" database useful for future planning with corporate equipment and other facility management tasks.

680 TOTAL FACILITIES MANAGEMENT SYSTEM
Resources Dynamics Inc., 118 Great Rd., Stover, Mass. 01775—Ross Trenchlen, 617-897-6350 • Turnkey system consists of Masscomp CPU, 1MB processor memory, 50mb disk storage, Hitachi digitizer, color workstation/33, line printer, inkjet printer and optional D- or E-size plotter • Price: $35,000 to $175,000 for basic system; Updates: included with maintenance program • Training: seminar, in-house, on-site, manual and menu-driven commands.

Total Facilities Management System is a management information system that integrates facility planning and organizational planning. Allows programming for present and future space requirements, tracks current space utilization, generates color building stacking diagrams, block-type floor plans, business graphics and full reports.

681 UNI-USER NEEDS INFORMATION
The Computer-Aided Design Group, 2407 Main St., Santa Monica, Calif. 90405—Tom Vran, 213-382-2183 • For use with DEC VAX or HP-11/23 requires 600K RAM • Price: $15,000 one-time license fee; Updates: free for first year, included with maintenance fee thereafter • Training: seminar, in-house, on-site and manual.

UNI—User Needs Information is used during programming to collect and manage information about personnel, equipment and space—requirement projections, special characteristics of items within a space program and adjacency data for groups. Data can be read by the Stacking and Blocking Algorithm program (SABA) also available from The Computer-Aided Design Group (see 677 above).

685 A/CDS 7000
A/CDS Graphic Systems Inc., 100 Water Street, St. Paul, Minn. 55102—Dave Stratton: 612-770-9631 • Turnkey system consists of 32-bit super micro, 1.5MB RAM, 35MB disk storage (expandable) • Missing workstation, Bit Pad digitizer, keyboard and word processing software; plotter not included • Price: $25,000 to $30,000; optional software modules: HUB—$850, HUB-70—$1000, DFS—$8,000, User Extensibility Environment—$16,000; Updates: included with service and maintenance contract or billable • Training: seminars, on-site, in-house and manual.

ACDS 7000 is an interactive turnkey drafting and design system assembled around a 32-bit super microcomputer that can support up to six workstations. Four modules available for the system provide drafting capabilities: Features of HUB, the twodimensional design and drafting module, are area calculations, floor-plan generation, store and materials and scheduler, site plans, urban planning and roof layout. The Extensibility Environment is a run-time macro generator for creating personalized applications.

686 ADS-II ARCHITECTURAL DRAFTING SYSTEM
Design Data Systems Corp., 5970 N. Park Place, N.E., Cedar Rapids, Iowa 52402—F. J. Krause 319-573-1571 • For use with DEC VAX computer workstations, HP 7890, 7895 and 7880 plotters, HP 9111A digitizer, HP 9100V Winchester, and optional graphics printer • Price: $10,000 includes three symbol libraries; Updates: free during first year; billable thereafter • Training: in-house, on-site, manual or telephone support.

ADS-II Architectural Drafting System is a two-dimensional drafting system with capabilities that include site plan produced from legal descriptions, topography plots created from survey data, bubble/flow diagrams, and working drawing. Added features are mirror imaging, stretch, on-screen calculator, and on-screen composition of plotter layout.

687 /E CADD 200
ECOM, 9634 West Brown Deer Rd., Milwaukee, Wis. 53225—Allen Hansen, 414-334-0243 • For use with HP series 200 computers and peripherals • Price: from $32,000 for turnkey system; ECOM software modules $1,000; Updates: billable • Training: 8 hours of on-site training free; billable thereafter; manual, in-house.

A/E CADD 200 is a two-dimensional drafting package built around HP EGS-200 Graphics Editor enhanced with any combination of three customized modules; architectural with floor-plan details; office planning and layout; and structural with standard details.

688 ARBASE
SKOK Systems Inc., 222 Third St., Cambridge, Mass. 02142—Steve O'Neill, 617-886-6003 • For use with Artect Datastaging comprising HP 9000 CPU, Pascal o/s, 7500 RAM, monochrome monitor, screen and keyboard; range of disk options and networking available • Price: $10,000; discounts available for multiple purchases; Updates: included with service and maintenance contract • Training: seminar, in-house, on-site and manual.

ARBASE is a fully relational database integrated into the ARPLAN software (see 695 below) with sophisticated data entry, organizational and reporting capabilities. Includes master project management, facilities management, office and project cost control and accounting. ARBASE can be used on the Artect Designation and lower cost Artect Datastaging.

689 ARCADE 2
Bruning/Clay 811 E. Shelly Dr., Topeka, Kan. 66614—William F. Albu, 918-663-5291 • Turnkey system consists of DEC-based processor, 1.5MB RAM, 15MB Winchester hard disk, dual 3.5-inch floppy drives, 19-in. color display with articulated mounting arm, 6-button optical mouse, full mouse/keyboard, Thermal Graphics printer and D-size plotter • Price: $40,755; Updates: offered as part of comprehensive support package for per cent of system price per month • Training: on-site.

Arcade 2 is a drafting and design system incorporating such automatic features as drawing with walk, bend, and using levels or overlays. Optional software modules include Attrib Base, an attributive database that incorporates an interactive spread sheet and bill-of-materials capabilities, and Arcade 3D, a three-dimensional wire-frame version.

690 ARCHITECT'S FRIEND—V.1.1
Team Design, 5200 North Picket Dr., Colorado Springs, Colo. 80907—Robert L. Moore, 303-598-0663 • Program operates as part of a turnkey system or with IBM PC and compatible computers running MS-DOS. Peripherals include IBM MAX 12 and Color Graphics XL monitors, Houston Instruments DMP-12 plotter, SAC Sonie digitizer and S & P 4 printer • Price: from $2,885 for Los Angeles; $2,985 for turnkey package; Updates: free; modem option • Training: in-house, on-site, manual, computer-assisted instruction and video-training cassettes.

Architect’s Friend—V.1.1 is an integrated graphics-based applications package that includes projection management, energy analysis, full cost and general accounting, word processing, spec writing, floor plans, elevations, renderings and development. Developed in concert with architects and written in "C” language for portability. Uses a standard file management database.

691 ARCHITECTURAL INTERACTIVE DESIGN SYSTEM
ARCAD, 445 South Figueroa St., Los Angeles, Calif. 90071—Peter H. Martin, 213-627-1427 • For use with DEC VAX 11/750, 11/730, 11/730, 11/750, 11/750, 11/750; Textonrix 1000-series terminals; Versatec, Calcomp and hp plotters • Price: $7,000 for one workstation; $14,000 thereafter; turnkey package available for $80,000; Updates: billable • Training: manual and telephone support.

Architectural Interactive Design System performs computerized design and production drafting, providing three-dimensional solids modeling, “walk arounds” in full color, symbols and detailed layout, line-weight control, pattern-fill and automatic dimensioning. Six-day evaluation period at cost.

692 ARCHITECTURAL PRODUCTION DRAWINGS
Intergraph Corporation, One Madison Industrial Park, Huntsville, Ala. 35807—Al Kemper, 205-772-2000 • A basic turnkey...
system consists of one computer workstation, hard printer, plotter and software. Systems are based on DEC/VAX and PDP-11 computers. • Price: Turnkey package with software starts at $120,000; Updates: free with service/maintenance contract. • Training: in-house, on-site and computer-aided instruction and manual.

Artectical Production Drawings develops elevations, sections, details and reflected ceiling plans. All drawings are automatically dimensioned at the desired scale. Project specifications associated with the drawings and stored in the DMRS database (includin the basic turnkey package) are readily extracted and printed out as complete door and finish schedules.

698 ARCHITECTURE PACKAGE
Computervision Corporation, 100 Crosby Dr., Bedford, Mass. 01723—Ben Smith, 617-276-1800. • Software is available only as a part of a turnkey package which incorporates Computervision CDS IV equipment. • Not available; updates: billable or included with maintenance contract. • Training: in-house, manual and computer-aided instruction.

Architecture Package permits the creation and presentation of architectural building models and contract drawings. The accompanying reports and schedules of non-graphic architectural information. Designed for all architectural applications and as a basis for the Building Engineering, Civil/Structural Engineering, and Civil/Site Engineering packages that work in conjunction with the Architecture Package.

694 ARMAC
SKOK Systems Inc., 222 Third St., Cambridge, Mass. 02142—Steve O'Neill, 617-868-6003. • For use with Artech Designation or Datastaten • Price: $5,000; Updates: included with service/maintenance contract. • Training: seminar, in-house, on-site and manual.

ARMAC is a macro-language system which allows the user to write special purpose graphics routines. The routines are combinations of graphics primitives which may include calculations and data transfer to the ABBASE relational database product (see 688 and 695).

695 ARPLAN
SKOK Systems Inc., 222 Third St., Cambridge, Mass. 02142—Steve O'Neill, 617-868-6003. • For use with Artech Designation comprising HP 9900 CPU, Basic 3.0 0/s, 2mb RAM memory, B-in. color screen, menu tablet with stylus and keyboard; graphite processor. Updates: included including 1mb RAM. • Price: $17,500; discounts available for multiple purchases; Updates: included with service/maintenance contract. • Training: in-house, on-site, manual and seminar.

ARPLAN is a two-dimensional design and drafting system. Among capabilities are layering, colors, symbol and pattern libraries, global editing and a feature called block stretch, which permits designers to stretch and shrink elements in a design and without concern for dimensional accuracy. ARPLAN also draws the parallel lines of walls to specified thickness and automatically cuts off and seals their ends.

696 APLLOT
SKOK Systems Inc., 222 Third St., Cambridge, Mass. 02142—Steve O'Neill, 617-868-6003. • For use with Plotting Station comprising HP D- or E-size pen plotters and Artech Datastaten (see 688). • Price: $1,500; Updates: included with service/maintenance contract. • Training: seminar, in-house, on-site and manual.

ARLOT is an off-line plotting product which allows files to be plotted independently of the Artech Designation. A low cost Artech Datastaten is used to run this system which may also be used to run ARBASE and ARMAC. In a networked configuration, no additional disk storage is required to allow this system to operate.

697 ARTEC 1
Go Fukui, P. O. Box 300040, San Francisco, Calif. 94129—Dennis Fukui, 415-592-1424. • For use with Macintosh and Lisa with optical or laser printer; requires 128K RAM; hard disk recommended. • Price: $1,300/gr. license; Updates: billable. • Training: on-site and computer-aided instruction.

ARTEC 1 offers interactive design decisions referenced in a pixel based CAD system. The program demonstrates preliminary specification and graphic relationships while displaying cost feasibility parameters for immediate evaluation. Features full screen draw, memo and editing.

698 ARTEC 2
Go Fukui, P. O. Box 300040, San Francisco, Calif. 94129—Dennis Fukui, 415-592-1424. • For use with Macintosh and Lisa with optical or laser printer; requires 512K RAM; hard disk recommended. • Price: $1,800/gr. license; Updated: billable. • Training: on-site and computer-aided instruction.

ARTEC 2 generates contract documents through refinement of initial design concepts established in ARTEC 1. Permits continuous interaction between cost and graphic relationships, establishing a format for construction drawings that relate three-dimensional volumes inherent in the design. Specifications and detailing are interfaced in the printed output.

699 ARVIEW
SKOK Systems Inc., 222 Third St., Cambridge, Mass. 02142—Steve O'Neill, 617-868-6003. • For use with Artech Designation comprising HP 9900 CPU, Basic 3.0 0/s, 2mb RAM memory, 19-in. color screen, menu tablet with stylus and keyboard; graphite processor. Updates: included including 1mb RAM. • Price: $7,500; discounts available for multiple purchases; Updates: included with service/maintenance contract. • Training: in-house, on-site, manual and seminar.

ARVIEW is an add-on product to ARPLAN that allows the user to define the third dimension for all items in a two-dimensional file. The resulting forms may then be viewed and evaluated as three-dimensional representations in wire-frame or as surface shaded models. With the Graphics Processor option installed in the Artech Designation, real-time manipulation and viewing of the model is available.

700 ASP STAIR PROGRAM

ASP Stair Program builds a design file containing fully dimensioned plan and section views of the exit-stair design from design and display parameters specified by the user in an interactive interrogatory conducted in an off-line mode at a alpha-numeric terminal. Once specified, the program exports automatically in two to three minutes. Included with the program is a set of typical details that can be modified by the user.

701 AUTOcad
AutoDesk, Inc., 150 Shoreline Highway, Building B, Mill Valley, Calif. 94941—Jennifer Newman, 415-331-8580. • For use with IBM PC, IBM ATPC, or Commodore 64. • Price: $1,500; Updates: billable. • Training: on-site and manual.

AUTOcad is a menu-driven two-dimensional program for producing schematics and working drawings. Users may create screen menus via ordinary text files, define parts libraries and interactively create and edit drawings of any size and scale. An optional drafting package features dimensional, cross hatch/pattern fill, fillets, partial delete and a units-command for both dimensions and coordinates in feet and inches. AUTOcad-to-Intergraph translator permits graphics transfer between systems.

702 AUTOcad/Intergraph TRANSLATOR
Intergraph Compugraphics, 1479 Chain Bridge Rd., McLean, Va. 22101—Brian Chavis, 703-556-6010. • For use with Intergraph CAD system and AUTOcad microcomputer CAD system. • Price: $10,000. • Updates: billable. • Training: seminars, in-house and manual.

AUTOcad/Intergraph Translator is a system that translates AUTOcad microcomputer drawings to Intergraph mainframe drawings (and Intergraph to AUTOcad) permitting use of microcomputer workstations by architects and designers.

703 AUTOPLAN
Automated Design, P. O. Box 507, Valley Forge, Pa. 19481—Robert C. Carnwath, 215-935-2420. • For use with Commodore 602 computer, 850 disk drive and Western Graphic plotter. • Price: $3,500. • For workstation for turnkey system; $955 for software only. Updates: free. • Training: manual.

AUTOPLAN is a two-dimensional drafting system that displays inputs instantaneously on a plotter.
Details, plans, layouts and text can be saved and combined with standard details, plans, overlays, title blocks, logos and dimensions previously on file.

704 AVCAD
Aydin Controls, 414 Commerce Dr., Ft. Worth, Texas 76103. Ron Schle, 214-542-7600. Turnkey system consists of Aydin Controls multiple microprocessor CPU, 21MB Winchester disk drive, 1.2MB floppy disk drive, 1MB main memory, 15-in. and 19-in (color) monitors, 12-by-12-in. digitizing tablet, ASCII keyboard and software. Price: $47,500. Updates: included as part of license fee. Training: in-house, on-site.

AYCAD turnkey system is a two- and three-dimensional (wire-frame) design and drafting system for schools, colleges, engineering design and drafting design and drafting design and drafting design and drafting design and drafting design and dra

705 BUILDING DESIGN SYSTEM (BDS)
McDonnell Douglas Automation Company (McAuto), Box 516, St. Louis, MO 63166. Services, 800-322-1561. For use with Prime 2220, 2230, 2270, 2275, DEC VAX Micro, 11270; Calcomp, HP plotters; Tektronix terminals; Tektronix hard copy units; requires 500K RAM. Available as part of turnkey package or software license. Price: $2,800. Updates available. Training: in-house.

Building Design System (BDS) is a three-dimensional computer graphics system for designing and modeling buildings. It has been developed by architects, engineers, and planners and is meant to be used by others. BDS follows the logical sequence of architectural design from programming to schematic design, design development, and construction documentation and is fully compatible with the General Drafting System (GDS) listed below (see 742).

706 CABINET PLANNER

707 CAD-2

CAD-2 is a powerful version of CAD-1, enhanced with automatic digitizing and numerical data entry.

710 CADRAFT MINDSET
Personal CAD Systems Inc., 901 University Ave., Los Gatos, Calif. 95030—Tereze Hanley, 800-858-6834. For use with Mindset computer, requires 256K RAM; two floppy disk drives; mouse, and 80 CON plotter. Price: $495 for software only; available as package with CPU and software but no plotter for $4,000. Updates: first update free, then billable. Training: seminar, in-house, on-site, manual, on-line help files.

CADRAFT is an easy-to-use, entry-level menu-driven package for creating editing, and plotting two-dimensional designs; and data on up to seven layers. MINDSET computer offers 16 colors and high-quality graphics, which may be viewed individually or in combination with other layers.

711 CADDY
Micro Control Systems Inc., 27 Hartford Turnpike, Vernon, Conn. 06066—Helen Charov, 203-647-0229. For use with IBM PC or compatible microcomputers; requires 884K RAM, one 228K floppy disk drive, color graphics adapter card, graphics monitor, 2-D/3-D digitizer or mouse and a pen plotter or dot matrix printer. Price: $1,655. Updates: billable. Training: seminar, in-house, on-site, manual and computer-aided instruction.

CADDY is an interactive two- and three-dimensional drafting system for schematics, design development, and production drawings. Includes walls with automatic intersection detailing, automatic door and window insertion, dimensioning, database extraction, texturing, mirroring, splines, and extensive system libraries. For architecture; hvac, electrical, plumbing, and rendering. Supports high-resolution color and most peripherals.

712 CADLIB
The Cadlib, 1708 13th St., Boulder, Colo. 80302—Nelson Greene, 303-440-0235. The Cadlib is a service bureau utilizing VAX-family computers. Price: per-project-basis.
CADVANTAGE is Hawthor’s internal design and drafting software and furniture library built around a turnkey IBM PC. The system allows access to the entire Hawthor product/pricelist catalog and also offers the user color graphics, cost quoting, records management and project report capabilities. Designers have the option of drawing upon the Hawthor database or creating their own database.

715 CASCADE I
Cascade Graphics Development, 1000 S. Grand Ave., Santa Ana, Calif. 92705—Ken Barney, 714-558-3316 • For use with Apple II/II+ ; requires two disk drives, monochrome monitor; input: joystick, keypad, or mouse pad; Shumagic phototypesetters; output: Apple IIE, 40K, 512K, floppy, hard disk, and printer. PRICE: $2,995 for Apple; $1,680 for IBM. PRICE: $895 for Apple.

CASCADE II
Cascade Graphics Development, 1000 S. Grand Ave., Santa Ana, Calif. 92705—Ken Barney, 714-558-3316 • Turnkey system consists of computer with 128K RAM (6000 Processor); dual high-resolution monochrome monitor displays; 5mb hard disk and 5 1/4 in. floppy drives; input: Summagraphics table; output: Epson printer; PRICE: $3,995; Updates: $425, 425/Update includes service/maintenance contract.

For more information on any software program, circle the item number on special Reader Service card following page 80

717 CASCADE V
Cascade Graphics Development, 1000 S. Grand Ave., Santa Ana, Calif. 92705—Ken Barney, 714-558-3316 • Turnkey package utilizes computer with 128K RAM, 5mb hard disk, 5 1/4 in. floppy disk drive and monochrome monitor; input: Summagraphics table; output: digital plotter, HP plotters, Epson and MPS printers; PRICE: $2,950; Updates: billable or free with service/maintenance contract • Training: in-house, seminar and manual.

CASCADE VI is a menu-driven turnkey design and drafting system with five independent processors that operate such peripherals as keyboard, stylus and joystick. Zoom pin feature enables a user to select, stretch, rotate, and move objects. A database management system permits itemizing components in a drawing to produce a bill of materials.

718 CASCADE X
Cascade Graphics Development, 1000 S. Grand Ave., Santa Ana, Calif. 92705—Ken Barney, 714-558-3316 • Turnkey system consists of computer with 128K RAM (6000 Processor); dual high-resolution monochrome monitor displays; 5mb hard disk and 5 1/4 in. floppy drives; input: Summagraphics table; output: HP plotters, Epson and MPS printers; PRICE: $3,995; Updates: $425, Update includes service/maintenance contract • Training: in-house and manual.

CASCADE XIII is a high-resolution (1024 by 768) design and drafting system with dual monitors that allow a user to view the menu on one screen and draw on the other. Strap-on package, the Associate enables users to add text to drawings and create double-line walls and floor plans with automatic cleanup of the corners. Also permits doors and windows of specified widths to be automatically created to scale and inserted into walls.

719 CCSI-PLLOT
Cerritos Computer Services, Inc., 4830 Atlantic Ave., Suite 1, Long Beach, Calif. 90807—Catherine Martin, 213-955-8660 • For use with most minicomputers and mainframes with Fortran; compatible with many printers; requires 32K RAM • PRICE: $1,500; $1,350; Updates: billable • Training: manual.

CCSI-PLLOT is a pen-plotters: compatible graphics software package for dot matrix printers. Allows the convenient use of a dot matrix printer as though it were an incremental x/y pen plotter. Calcomp and Versalot compatible.

720 CEADS-CADD
Holguin, 5822 Cramer Dr., El Paso, Texas 79912—John Wiseman, 915-581-1171 • Turnkey package incorporates HP 8600 Series 500 computers (See 720 above) • PRICE: $25,000 to $50,000; Updates: included with service/maintenance contract • Training: seminar, on-site and manual.

CEADS-CADM is a three-dimensional solids-modeling software package that can be integrated with Holguin's CEADS-CADD system. CEADS-CADM utilizes a command language and a versatile graphic sketching mode that will guide users in generating simple three-dimensional primitives, more complex shapes and intricate solids modeling.

723 CLM COGO
CLM Systems, Inc., 3654 Gandy Blvd., Tampa, Fla. 33611—C. L. Miller, P. E., 813-831-7000 • For use with IBM PC XT, Sage IV, TI Professional and Wang PC; supports HP 300, Calcomp and Numonics plotters; compatible digitizers are III, Calcomp and Numonics; requires 512K RAM • PRICE: $1,500; Turnkey package also available for $25,000 includes 4 graphics terminals, D-size plotter, 20-in. x 20-in. digitizer and multi-modem printer; Updates: free Training: seminar, in-house, on-site, manual and computer-aided instruction.

CLM COGO produces preliminary and final drawings for site planning, topography, grading, drainage, roads, and utilities. Generates preliminary and final cost estimates from a variety of schedules. Program options include a relational database, word processor and spreadsheet.

724 COLOR PALETTE
Intergraph Corporation, One Madison Industrial Park, Huntsville, Ala. 35807—Al Kemper, 205-772-2000 • A basic turnkey system consists of one computer workstation, hard printer, plotter and software and starts at $120,000 • PRICE: $10,000; Updates: free with service/maintenance contract or billable Training: in-house, on-site implementation plan, computer-aided instruction and manual.
Color Palette permits users to select from among 16 million colors in painting the surfaces of a model, shading for perspectives and showing how a facility will look under different conditions.

725 CUT PLANNER

Cut Planner gives a description of available sheet inventory and description of a set of rectangular parts to be cut from that inventory and then generates cutting layouts which minimize waste and cutting time. The program is parameter driven to handle the requirements of special types of material and cutting equipment. (See also 706 above.)

726 DESIGN BOARD 3D
Mega CADD, Inc., 419 Second Ave. S., Seattle, Wash. 98104—Rob Lebow, 206-262-1355 • For use with IBM PC XT and compatibles requires color graphics card, mathco- processor and mouse • Price: $750; Updates: billable • Training: manual.

Design Board 3D is a three-dimensional modeling package for the front-end conceptual and schematic design phases of an architectural/interior design/design planning project. With the software, users can create and modify designs in three dimensions, work with flat and free-form curved surfaces, design in plan and view simultaneously in perspective, remove hidden lines in one step and view and generate drawings in any orientation desirable.

727 DESIGN GRAPHIX
Hamilton HGL Software, 6 Pearl Court, Alameda, N.J. 07001—George E. Timmons, 800-631-0288 • For use with DEC VAX, PRO 500 or PDP 11/45; Price: complete turnkey systems from $35,000—software only from $7,000; Updates: billable • Training: one week in-house with turnkey system; manual, on-site and computer-aided instruction for software.

Design Graphix is a turnkey two- and three-dimensional stand-alone or multi-user design and drafting system. Typical features are menu or keyboard-driven data entry, snap, grid, pan, zoom and windows, concurrent plotting and database exchange. Graphic and non-graphic files can be combined for performing item counts, take-offs, specifications and drafting notes.

728 DESIGN ORIENTED GRAPHICS SYSTEM
PAFEC Engineering Consultants, Inc., 5401 Kingston Pike, Suite 610, Knoxville, Tenn. 37919—Tom Baudry, 615-584-2117 • For use with most 32-bit computers including DEC VAX, Apollo, Data General MV Series, Harris and Prime • Price: $20,000—$80,000; Updates: included with yearly maintenance • Training: seminar, in-house, on-site and manual.

Design Oriented Graphics System (DOGS) is a two- and three-dimensional drafting system available as a turnkey system or software only. The system includes standard architectural symbols, multline walk-on, mainly overviews, English and metric units with architectural-style dimensioning and, among many other features, database analysis capabilities for cost estimating and bill of materials.

729 DESIGNER I
Oreatech, 1000 Morrison Dr., Ottawa, Ontario K2H 8R7—Mark Millichem, 613-724-1600 • Turnkey system consists of an one MOP CPU computer graphics workstation with RAM 10 and 140 mb hard disk, 19-in. high-resolution monochrome or color monitor, separate text monitor, keyboard with joystick and software • Price: $30,000 CDN monochrome; $47,000 CDN color; software only: $15,000; quantity discounts for additional workstations; Updates: billable • Training: on-site, seminars and manual.

Designer I is a two-dimensional drafting system for engineering and architecture. Specific applications-capabilities are electrical layout, space planning, general schematics and business graphics. Turnkey system comes with a Fortran compiler and a library of 200 Fortran-callable subroutines. Optional digitizing tablet and expandable memory.

730 DGS-2000
Data Automation, 10731 Trenca St., Suite 100, San Diego, Calif. 92131—Dick Hackworth 619-695-0820 • For use with HP 9800 or 200-series computers; supports digitizers including HP 9111A graphics tablet, Hipad digitizer and Houston Instruments Series 7000 plotters includes any HP plotter, Calcomp drum plotter or III DMP 1142/30 or 2S; requires 187K user RAM after boot-up • Price: $1,995 for base package—$5,000 includes architectural symbols and 40 hours on-site training; Updates: billable • Training: on-site, manual and hot line (8850 per year).

DGS-2000 is a menu-driven two-dimensional design and drafting system for preliminary and working drawings. Includes database organization, high-speed zoom and pan, move, rotate, scale, mirror, layering, splining and user-created of ANSI symbols library.

731 DIGITAL PAINTBRUSH SYSTEM
The Computer Colorworks, 3030 Bridgeway Suite, 201, Sausalito, Calif. 94965—Joseph Osborn, 415-282-2052 • For use with Apple IIe and II with 64K RAM and one or two disk drives • Price: $299; Updates: nominal charge • Training: manual and telephone support.

Digital Paintbrush System permits users to draw free-hand, create perfect lines, rectangles, circles and curves, trace and letter. Two users can draw simultaneously over the telephone via a modem. Other features are automatic "elastic" lines, rectangles and circles, smart-fill, selection of brush shapes, adjustable grids, libraries and choice of type fonts.

732 DIGITRACK
Chempco Data Sciences Corp., 507 Southampton Rd., Westfield, Mass. 01085—Norman St. Martin 413-562-2353 • For use with IBM PC XT, color or monochrome monitors, Digitrak sonic digitizer; supports most plotters • Price: $5,470; Updates: free for first year; billable thereafter • Training: seminars, in-house, on-site, computer-aided instruction, manual and telephone support.

DIGITRACK is a design and drafting system with applications including mechanical, lighting, HVAC and energy/solar. Among capabilities are axis, grid, snap with rubber band, layering, line, circle, arc, fillet, change, copy, move, text erase and plot.

733 DIMENSION III
Calma Company, 2801 Tassman Dr., Santa Clara, Calif. 95050—T. Sherman, 408-748-9600 • Turnkey system based on the Data General 15-bit Eclipse, DEC 32-bit VAX, or 32-bit Apollo computers • Price: costs vary depending on hardware and software configuration; Updates: billable • Training: seminar, in-house, on-site, manual and computer-aided instruction.

Dimension III is a core software system for design and drafting in architecture, engineering and construction that supports any of nearly a dozen application packages. These include two-dimensional architectural drafting, facilities layout, civil-site preparation and steel layout and design.

734 DRAWING PROCESSOR

Drawing Processor is a menu-driven two-dimensional drafting and technical illustration package for architects, designers, engineers and manufacturers. Edit capabilities include block move with rubberbanding (all lines move as a unit), block erase, block components (for repetitive placement), selective erasure, computer-assisted dimensioning, layering and differential scaling. External file can be output in ASCII. Optional file transfer utilities programs cost $200.

735 EASY DIGIT
Omnitec, Inc., 50 Baltusrol Way, Short Hills, N.J. 07078—K. D. Steidle, Ph. D., 201-576-6400 • For use with IBM PC XT or compatibles requires color graphic board, 256k RAM, serial port, digitizer and Epson printer; drawing size up to 6 by 8 ft • Price: $4,000—$6,000; Updates: handling charge • Training: manual.

Easy Digit permits acquisition and manipulation of two- or three-dimensional data from digitizers. Automatically calculates lengths and areas. Generates computer files and issues reports. Allows generation of three-dimensional perspectives when used with optional Golden Software.
736 ENER GRAPHICS
Enertronics Research, Inc. 150 North Meramec, Suite 207, St. Louis, Mo. 63105—Randy Andes, 800-325-0174 • For use with IBM PC and compatible microcomputers, graphics adapter board, color monitor and most dot matrix printers and X/Y plotters; requires 128K RAM • Price: $350; Updates: at cost • Training: on-site, in-house, manual, seminars.

ENER Graphics is a two- and three-dimensional program that works with workstations, business graphics, statistical analysis, drawing functions, word processing, symbol and font generation, presentations and three-dimensional plotting of surfaces and objects.

737 ENGINEERING PRODUCTION DRAWINGS
Integraph Corporation, One Madison Industrial Park, Huntsville, Ala. 35807—AI Kemper, 205-772-2000 • A basic turnkey system consists of one computer, hard disk drives, plotter and software. Systems are based on DEC-VAX and PDP-11 computers • Price: Turnkey package with software starts at $125,000; Updates: free with service/maintenance contract • Training: in-house, on-site implementation plan, computer-aided instruction and manual.

Engineering Production Drawings software supports the production of contract drawings, schedules and bills of materials that are required for bidding and construction. The software addresses hvac, plumbing, structural and electrical design activities. Additional capabilities are available for civil-site design. Because drawing elements are linked to descriptive information, specifications and bills of materials are readily available for all or part of a project.

738 EUCLID/BUILDING DESIGN
Multidatavision, Inc., 99 South Bedford St., Burlington, Mass. 01803—Miguel Suarez, 617-229-2530 • For use with VAX/VMS or IRM VM/CMS • Price: $75,000 for basic package; $7,500 for one access to a workstation; $5,000 for Building Design module; Updates: included with maintenance agreement • Training: in-house, on-site, manual and computer-aided instruction.

Eucid/Building Design computer software system performs solids modeling, design, drafting, analysis, numerical control output, database management and flexible visualization. The system is optimized for architecture with a "Building Design" module which enables users to create various types of models and then extract form drawings, data for structures computations and quantities of parts or materials.

FORMDRAW
Formative Technologies, Inc., 5001 Baum Blvd., Pittsburgh, Pa. 15213—Richard Hassdorfer, 412-682-8000 • FormDraw software forms the heart of a stand-alone turnkey system comprising a 16/32-bit sliced CPU, 10mb/sec. Ethernet local-area network, 19-in. high-resolution black-and-white monitor, alphanumeric keyboard, 9-button mouse and Imb main memory. • Price: $69,500; additional software modules priced at $5,000; Updates: included with service/maintenance contract • Training: on-site and manual.

FORMDRAW is a two-dimensional turnkey drafting/design system built upon two programs: FORMDRAW and FORMSKETCH. FORMDRAW features pull-down menus, automatic vernier, rubberbanding, associative dimensioning and multiple-window management. FORMSKETCH, a freehand sketcher, permits users to select pen-stylus and drawing commands from on-screen menus and then automatically draw lines and circles, enter text, move copy and "fill" sketched areas. Other program modules are available for scanning drawings, architectural design and layout and facilities management.

740 GDIG
Decision Graphics Inc., 11 Main St., P. O. Box 306, Southborough, Mass. 01772—John Nilsson, 617-481-4119 • For use with any VAX/VMS system; peripherals: include WADP or WACLS 5-to-1 graphics workstation with digitizer D1, D2 or D3; Price: $5,000-$16,000; Updates: billable • Training: on-site, manual.

GDIG is a digitizing program for fast, accurate input of existing drawings. The program uses metric or English units, any scale; and commands from either keyboard or digitizer. Some of the graphic commands are: lines, rectangles, circles, arcs, text, door symbols, column strings and standard symbols.

741 GENERAL BUILDING DESIGN
ComputerVision Corporation, 100 Crosby Dr., Bedford, Mass. 01730—Ben Smith, 617-275-1800 • Software is available only as part of a turnkey package which incorporates Computervision CDS 4000 equipment • Updates: billable or included with maintenance contract • Training: in-house, manual and computer-aided instruction.

General Building Design permits the creation of production drawings and accompanying reports and schedules. Designed for architecture, architectural engineering, and facilities management applications. Includes keyfiles and libraries (templates, textures, and line fonts).

742 GENERAL DRAFTING SYSTEMS (GDS)
McDonnell Douglas Automation Company (McAuto), 516 St. Louis, Mo. 63161, Marketing Services (800) 325-1551 • For use with Prime 236, 239, 269, 276, 276C, DEC-VAX Micro, 11/750, 11/780, Calcomp, HP plotters; Tektronix terminals, Tektronix hard copy units; requires 500K RAM • Available as part of turnkey package or software license; price of turnkey starts from $68,000; Updates available • Training: in-house.

General Drafting System (GDS) is an extremely flexible and fully interactive computer drafting system designed to improve the production drawing process. GDS has been designed specifically for architecture, engineering, facilities management, and space planning. The high productivity associated with GDS is attributed to its many user-oriented features. These include Associative Data, Object Intelligence, and an automatic placement feature for graphics and text called Hit Codes. GDS is fully compatible with the Building Design System (BDS) listed in 705 above.

743 GEOCAD
Rudolph Horowitz Associates Architects, Laurel Rd., Pound Ridge, N. Y. 10576—Rudolph Horowitz, 914-764-6072 • Turnkey system consists of NEC APC 16-bit microcomputer with 38k RAM, 8-color, 640 by 475 pixel screen, floppy and 10mb hard disk drive, detachable keyboard, 1 MIP 42 plotter and enhanced AUTOCAD software • Price: $14,850; Updates: free for first 90 days, billable thereafter • Training: 15 hours on-site training and telephone consultation included.

GEOCAD utilizes AUTOCAD software enhanced with a series of graphic and macro routines addressable from the digitizer pad, which contain the basic architectural symbols necessary to produce architectural drawings. Menus include Helvetica, floor-plan fixture, partition, mechanical, site, door and window, and furniture.

744 GOAL
Abacus 0/0 Contech Inc., 5615 Freeport Parkway, P. O. Box 610668, D. F. Airport, Texas 75261-6663—Paul Manweiler, 214-257-1186 • For use with Plesur, DEC-VAX, IBM, Burroughs and other mainframes • requires a graphics terminal, 1m RAM and 6mb disk storage • Price: $12,500; Updates: free • Training: in-house and manual.

Goal is a design modeling system which performs detailed quantity analysis, special planning, functional-area analysis, environmental analysis, annual operating and life-cycle costs, construction costing and lighting analysis. Goal generates designs and costs interactively and with CAD graphics from either digitizer or keyboard and permits a user to model and remodel to achieve a balanced and economical design.

745 GRAPHICS 3
TriCAD, 1655 McCarthy Blvd., Milpitas, Calif. 95035—Mark Helm, 408-942-8900 • Turnkey system consists of DEC-VAX-11 Series CPU, hard disk mass storage, magnetic-tape transport, system console, TRICAD intelligent workstation with alphanumeric display/keypad, high-resolution display, digitizing work surface and chair, choice of plotter, modem and software • Price: $150,000-$250,000 depending on options; Updates: issued three times yearly as part of annual maintenance • Training: in-house, on-site and manual with full documentation.

Graphics 3 is an integrated CAD system specifically designed for architects, engineers and facilities
Computer-aided design and drafting

managers. A database called Object permits both graphic and non-
graphic information to be stored and viewed throughout the design
process. Applications include planning, drafting production,
analysis and report writing. Main
software modules build upon the
core system, which is accessible for
user-developed applications.

746 GRAPHICS EDITOR
Radian Corporation, 5501 Mo-Pac
Blvd., Austin, Texas 78736—Carl
Kurst, 713-988-6451 • For use with
most mainframe computers; requires
a plotter • Price: $22,000;
Updates: included with
service/maintenance contract
• Training: seminars, in-house,
manual, on-site and computer-aided
instruction.

Graphics Editor is an interactive soft-
ware product that permits the
display and editing of images at a
graphics terminal. The program
interfaces with CPI-1 and CPI-1/G (see
$15 and $16 below) to edit points,
polylines, text and objects.

747 GRAPHICS TOOL KIT
Deko Electronics, 10516 Grevillea
Ave., Inglewood, Calif. 90304—Darrell
Hollack, 213-677-4880 • For
use with Apple II/Apple IIe; SGC-640
graphics board (provided with system)
and Apple Mouse • Price: $455;
Updates: small fee • Training:
manual.

Graphics Tool Kit is a hardware/
software package that installs Apple
II computers with the graphics
capabilities of Macintosh plus 40%-
greater screen resolution. The
hardware gives the monitor a
resolution of 640 dots by 78 lines,
viewable in a moveable window of
640 dots by 384 lines. This
resolution yields a picture 8 1/2 by
11 in. when dumped to a dot matrix
printer. Software capabilities include
rubberband line draw, pattern
plot, shading, text insert,
vector shape manipulation, and
cursor control from the keyboard or
Apple mouse. Plotting can also be
accomplished by using a joystick or
Kodak pad.

748 GTD
Datamet Programming Systems,
Inc., 81 Atlantic St., Stamford,
Conn. 06901—Len Friedland, 203-
967-6505 • Turnkey system consists of
Olivetti line microcomputer,
plotter, printer, IBM RAM, two IBM
floppies and software • Price:
$19,000 for turnkey package;
Updates: included with service/
maintenance contract • Training: in-
house or on-site (add $2,000).

GTD is an interactive
minicomputer-based two-
dimensional drafting system
allowing menu, direct and digitizer
input. Drawings are composed of
primitives (points, lines, projection
lines, circles, arcs, dimensions and
text) and can be combined into
groups. A group that is common to
many prints can be stored on the disk
as a symbol and recalled as
desired. Drawings can be
represented by different views
(elevations), and each drawing can be
tiled up to 30 layers
(transparent overlays), any of which
can be made visible or invisible.

749 HOK DESIGN
Hellmuth, Obata & Kassabaum,
Inc., 100 North Broadway, St.
Louis, Mo. 63102—Daniel C. Davis,
314-242-2000 • For use with
any DEC-VAX computer using
Tektronix display devices • Price:
varies depending on application;
Updates: included with service/
maintenance contract • Training:
seminar, in-house, on-site and
manual.

HOK Design is both an ad
hoc collection of specific design
algorithms and an expert system for
using the more sophisticated
analysis capabilities of other HOK
systems. Potential tasks include:
circulation analysis, stadium
seating layout, elevator analysis,
solar calculations, energy modeling,
natural lighting analysis, building
and planning code checking,
animated simulations and
activity/time frequency diagrams.
The expert system may be based on
in-house capabilities or access to
various on-line databases.

750 HOK DRAW
Hellmuth, Obata & Kassabaum,
Inc., 100 North Broadway, St.
Louis, Mo. 63102—Daniel C. Davis,
314-242-2000 • For use with
any DEC-VAX computer using
Tektronix display devices • Price:
varies depending on application;
Updates: included with service/
maintenance contract • Training:
seminar, in-house, on-site and
manual.

HOK Draw is a computer-aided
design and drafting system capable of
producing a wide range of two
and three-dimensional drawings.
Drawing types include plans,
elevations, sections, perspectives,
parallel projections and
axometrics. The system uses a
relational database management
system and is supported on any
DEC-VAX environment running VMS.

751 HOK IMAGE
Hellmuth, Obata & Kassabaum,
Inc., 100 North Broadway, St.
Louis, Mo. 63102—Daniel C. Davis,
314-242-2000 • For use with any
DEC-VAX computer using Tektronix
display devices • Price: varies
depending on application; Updates:
included with service/
maintenance contract • Training:
seminar, in-house, on-site and
manual.

HOK Image is used to develop
realistic images from models
created using HOK Draw. The
system will create shaded, color
images on a color raster display.
Output can be either 8 mm slides or
videotape.

752 HOK LAYOUT
Hellmuth, Obata & Kassabaum,
Inc., 100 North Broadway, St.
Louis, Mo. 63102—Daniel C. Davis,
314-242-2000 • For use with
any DEC-VAX computer using
Tektronix display devices • Price:
varies depending on application;
Updates: included with service/
maintenance contract • Training:
seminar, in-house, on-site and
manual.

HOK Layout is used for both
vertical (stacking) and horizontal
(blocking) assignment. Assigns
activities (spaces, workstations,
etc.) to locations (buildings, floors,
etc.) so that highly interrelated
activities are placed in the same
zone or adjacent zones and
circulation from location to location
is minimized. The Layout system
evaluates and tracks alternate
building geometries over time.
The blocking process is interactive:
the system evaluates solutions by
indicating violations of size or
relationship. The program is closely
related to HOK Space (space and
quantity needs over time), HOK
Draw (interactive graphics), and
HOK Component (standard
component libraries).

753 HOK NEEDS
Hellmuth, Obata & Kassabaum,
Inc., 100 North Broadway, St.
Louis, Mo. 63102—Daniel C. Davis,
314-242-2000 • For use with any
DEC-VAX computer using Tektronix
display devices • Price: varies
depending on application; Updates:
included with service/
maintenance contract • Training:
seminar, in-house, on-site and
manual.

HOK Translate converts HOK
Draw information in and out of
generic industry-standard formats.
This data may then be read into
other CADD systems. This system
enables firms to share data with
consultants and clients.
756 IC-1200
Turnkey packages include IBM/PC XT computer with 10mb hard disk, 8087 co-processor, graphics card, digitizing tablet with cursor, real-time clock, plotter, software installation, training and hotline • Price: $16,500; Updates: billable or free with service/maintenance contract • Training: in-house, on-site and manual, on-screen help and hotline—free for one year.

IC-1200 is a two-dimensional computer-aided drafting system that operates on an enhanced version of AUTOCAD software. Among added capabilities are a 12-button cursor that works in combination with sub menus to generate over 100 command sequences (reducing keyboarding), symbols libraries driven by cards placed on the digitizer, and macro commands that permit multiple-command execution with just one entry.

757 ICON SERIES 2000
Summarographics Corporation, 777 State St. Extention, P. O. Box 781, Fairfield, Conn. 06430—Kathy Dunn, 203-834-3344 • Turnkey system consists of Data General Desktop Generation computer, 19-in. black-and-white graphic display; alpha/numeric display, fiberglas workstation and built-in 20-by-20-in. digitizing tablet, plotter and color display optional • Price: $50,000; Updates: included with service/maintenance contract • Training: seminars, in-house, on-site and manual.

ICON Series 2000 is a turnkey system/工作站able a user to use, create, preview, edit, store and recall a drawing with text, on a graphic display. Drives many plotters for drawing output. Optional software modules are processor, engineering, surveying, bill of materials, cost estimating/quantity take-off and a user's program extension, which permits users to tailor the overall system to their own needs.

758 IDP
Largo Soft International, 1 Hamese St. (Eliahu House), Tel-Aviv, Israel 64736—Telephone: 03-258675, Telex 35380 LARGO IL • For use with IBM PC, PC XT and computers running MS-DOS or CP/M; requires 612k RAM, two 320k disk drives, graphics terminal, light pen and 16 plotters • Price: $9,950; Updates: billable • Training: manual and computer-aided instruction.

IDP software performs two- and three-dimensional (wire-frame) preliminary design and drafting with instant recall/change, quantities take-offs, and zooming and plotting in any scale. Other features are isometric drafting of lines and overview of structure from frontal view.

759 IDRAW 3
Information Displays, Inc., 11222 LaCienega Blvd., Suite 660, Inglewood, Calif. 90304—Nancy E. Napolitano, 213-417-3886 • For use with Apollo DN 100, DN 200 or DN 300 computers with Summarographics bitmap and HP plotters • Price: $20,000; Updates: billable • Training: in-house and manual.

IDRAW 3 is a software-only or turnkey drafting system with more than 70 program functions available through simple menu selection. Expandable applications include mechanical and electrical engineering. Optional modules for the architectural package are a three-dimensional version ($10,000), materials take-off ($5,000), scheduling ($6,000) and facilities management (no price information).

760 IGOS
MGS Inc., 3035 S. Arlington Heights Rd., Suite 114-115, Arlington Heights, Ill. 60005—John Scholten or Ed Hedlund, 312-497-2040 • Turnkey system includes DEC PDP-11/73 with 50- or 200mb disk storage, two high-resolution screens and digitizer, drives any plotter • Price: from $45,000 for turnkey system with two screens and digitizer, updates: available with maintenance contract • Training: in-house, on-site, manual and seminars.

IGOS is a self-contained two- and three-dimensional turnkey CADD workstation that can be interfaced with a mainframe or assembled into a multiple-user-network. Primary applications are preliminary design, working drawings, space planning and facilities management.

Software features include bill of materials, take-offs and a fully relational database management system.

761 ILLUSTRATOR: ARCHITECTURAL RENDERING DESIGN SYSTEM
Auto-trol Technology, 12500 N. Washington St., F. O. Box 30815, Denver, Colo. 80225—Thomas C. Curry, 303-452-4919 • For use with Advanced Graphic Workstation-Apollo based; Supports HP, Calcomp or Versatec plotters, Seiko, TI and Tektronix hard copy • Price: $1,000; Updates: free • Training: seminar, in-house, on-site and manual.

Illustrator: Architectural Rendering Design System assists in the creation of presentation-quality renderings for client approval or for submittal to the appropriate commissions and agencies. The program includes a symbol library of over 70 basic figures, such as cars, trucks, people and vegetation, which can be inserted into existing plan, elevation, isometric or perspective drawings.

762 IMHOTEP
Top-Ten Software, P. O. Box 6436, New York, N. Y. 10128—Lee Kennedy, RIBA, 212-186-6556 • For use with Apple II computers; requires Applesoft and 48k RAM • Price: $19.95—version 1: $69.95—version 2; add $2.50 for handling • Training: manual.

IMHOTEP is intended for demonstrating the fundamentals of computer-aided design and drafting. Version 1 is menu driven and prompts the user after each action. Version 2 (available January 1985), also menu driven, is an advanced CAD trainer that includes drawing intelligence, recall of last points, figure library and modular rotatable text font.

763 INTERFACE DESIGNER 3-D SERIES
Interface Data Systems, 2990 E. LaJolla St., Anaheim, Calif. 92806—James B. Young, 714-630-8000 • For use with IBM PC, PC XT or compatible microcomputers; uses Microsoft mouse, HP or Bausch & Lomb A-E-size plotters and Interface Micro 186 or Micro 286 monochrome or color workstations; requires 256-1024k RAM • Price: from $1,295 depending on configuration; Updates: free first year; $500 per year thereafter • Training: seminar, manual.

Interface Designer 3-D Series is a modular, upgradeable two- and three-dimensional design and drafting system that supports projecting or plotting plan or two- and three-dimensional perspective views simultaneously. Drafting module has auto-dimensioning, scale, pan, zoom and editing in two or three dimensions. Graphics generator module illustrates reaction of a structure to static or dynamic loads.

764 INTERGRAPH ARCHITECTURAL DESIGN AND DRAFTING SYSTEM
Intergraph Corporation, One Madison Industrial Park, Huntsville, Ala. 35807—Al Kemper, 205-772-2000 • Turnkey system consists of one computer workstation, hard printer, plotter and software. Systems are based on DEC VAX and PDP-11 computers • Price: Basic systems start at $120,000; Updates: free with service/system management contract or billable • Training: in-house, on-site implementation plan, computer-aided instruction and manual.

Intergraph Architectural Design and Drafting System utilizes two software packages: Interactive Graphics Design and Data Management System (IGDMS) and Data Management and Retrieval System (DMRS). IGDMS performs design and drafting functions. DMRS collects and manages all descriptive information associated with a design. Optional programs are listed separately.

765 INVENTORY
Decision Graphics Inc., 11 Main St., P. O. Box 306, Southborough, Maine 01772—John Nilsson, 617-481-4119 • For use with any VAX/VMS system; any terminal, any printer • Price: $5,000-$15,000; Updates: billable • Training: on-site, manual.

Inventory reads any PEAC (Decision Graphics's turnkey system—see 708 below) drawing and generates files containing all the elements in main and sub drawings. Query function permits user to interactively search the inventory file and obtain reports on...
quantities for any item or for all items in a drawing. Generates bill of materials reports from inventory files.

766 KEYSTONE CAD GRAPHICS
Keystone Project Management Systems, 235 S. Maitland Ave., Maitland, Fla. 32751—Stan Lewis, 312/665/2682—For use with CP/M, CP/M-80, MS-DOS and PCDOS operating systems (includes computers from Texas Instruments, DEC, IBM and Wang); CP/M requires 512K RAM, 128K for all others; turnkey hardware package provides 46mb of disk storage; Software supports high-resolution CRT, digitizer or mouse and 200-character printer price: $4,500—$6,000 for software; Updates: billable; Training: seminar, in-house, on-site and computer-aided instruction.

Keystone CAD Graphics is a two-dimensional system for schematics. Performs design and planar drafting. Stores all entities as parametric data. Drawings may contain up to 128 layers. Displays grid points. Other features are snap mode, lettering in any size or orientation, symbols libraries, zoom and tool library. Software is pure of a modular, stand-alone or multiple-user system with networking and database capability. Other interactive modules are project management and word processing (see 514 and 590 above).

767 KITCHEN DESIGNS BY COMPUTER
Graphic 100, P.O. Box 362, Nashua, N.H. 03061—Paul Puquiin, 603-883-4990—For use with Apple IIe with 128K RAM, two disk drives, monitor, Grappler Interface; Apple IMP or C byother 850 printer; Price: $1,995; Updates: billable; Training: seminar, in-house, on-site and manual.

Kitchen Designs By Computer will generate floor plans, elevations and perspectives for a kitchen from information supplied by the user. In its job-estimating mode, the software will produce a quotation for 10 different kitchen styles from two lists of kitchen components.

768 MASTERCAD
InterCAD Corporation, 2252 Riva Rd., Annapolis, Md. 21401—Peter H. Donnelly, 301-824-2920—Single workstation turnkey system is based on the Apollo DN 110; supports HP plotters; Price: $39,900 for single workstation; Updates: billable; Training: in-house, on-site, seminars and manual.

MASTERCAD turnkey system provides a set of application tools designed for facilities/ space planners to create office and plant layouts, input existing drawings, modify layouts, generate bills of material, and create symbols unique to a specific company's needs. MASTERCAD is available as a system based on the Apollo DOMAIN computer as unbundled software for Apollo users.

769 MDX COMPUTER DRAFTING SYSTEM
PSI Systems Corporation, P.O. Box 21, Pittsburg, Kan. 66762—Phil Boonstright, 316-231-6208—Turnkey system includes MDX 120 desktop CPU with 10mb hard disk, a DWS 15 color workstation with 15-in. digitizer and HI and HP plotters for up to Esize drawings; Price: $35,000—$50,000 for turnkey system that includes hardware and software; Updates: $300 per year; Training: seminar, on-site and computer-aided instruction.

MDX Computer Drafting System is a stand-alone or networked, two- and three-dimensional color drafting and design system featuring editing, layering, on-line help, full library of architectural symbols, user-created symbols, parts-list generator and bill of materials. Applications include site and facilities planning, mapping, hve, electrical and piping.

770 MGI ARCHITECTURAL DRAFTER
Microcomputer Graphics, Inc., 13468 Washington Blvd., Marina Del Rey, Calif. 90292—Fred Roberts, 213-822-5235—For use with IBM and other computers running MS-DOS; peripherals include Bausch & Lomb and HP plotters (A-E); Epson printers and Mitsubishi high-resolution monitors; Price: $5,995; Updates: free for first year, billable thereafter; Training: seminar, in-house, on-site, manual and computer-aided instruction.

MGI/Architectural Drafter generates two-dimensional working drawings on IBM PC and compatibles using keyboard alone for all functionalities and operations. Auto construction lines provide a short cut in developing elevations. Standard features are user-definable grids, database analysis for cost estimating and billing of materials and variable dimensioning. Drawing Manager program and symbols templates available.

771 MICAD
Micro-Installations, Inc., 260 Fifth Ave., New York, N.Y. 10001—Ira Hayes Puch, 212-889-6684—Turnkey system comprises a 16-bit color graphics computer (uses 8088/8087 microprocessor), D-size plotter and digitizing tablet with 12-button cursor puck; Price: $15,000 for computer system; Updates: included with service contract. Training: Site price includes 20-hours training; in-house training, manual and computer-aided instruction available for $600.

MICAD is a two-dimensional design and drafting system running AUTOCAD software enhanced with Graph-facts. Graph-facts permits attributes to be assigned to any element in a drawing and enables users to perform material-cost take-offs, space-usage projections, hve analyses and facilities management functions.

772 MICROCAD
Computer Aided Design of San Francisco, 764 Twenty-Fourth Ave., San Francisco, Calif. 94112—Shelby Johnson, 415-887-0260—For use with IBM PC and most compatibles—2 disk drives preferred; requires 256K RAM, a digitizer (Bausch & Lomb DT11 or Summagraff MM130) and plotter (Bausch & Lomb IMP or HP 7400/HC); Price: $500-$850; Updates: cost of postage and mailing; Training: seminar, in-house, on-site and manual.

MICROCAD is an integrated two- and three-dimensional modeling and design system that permits the development and editing of plans, elevations, isometrics and perspectives. The program has an integral electronic spreadsheet that will accept input from Visiakle files and display data as high-resolution graphs. Also calculates center of gravity and moment of inertia.

773 MULTI-DRAW
Cymbal Cybernetics Corporation, 169 Colomonde Rd., Ottawa, Canada K2E 7J4—John Davies, Director of Marketing, 613-727-1880, Telex 053 3368; Turnkey system includes Cymbal C-52 32-bit computer, 40mb hard disk, 19-inch monitor, 1mb floppy and software; support system supports any brand-name plotter; Unbundled software can run on DEC-VAX 790 and up; Price: $30,000 for software; $39,000 for turnkey package; Updates: $400 per year includes hardware and software maintenance, free updates and consultation; Training: on-site, manual or computer-aided instruction.

Multi-DRAW is a two- and three-dimensional drafting package for preliminary, finished and working drawings. Complete take-off package and symbols library. Performs interior design, space planning and facilities management as well.

774 NOTATION
EMA Management Associates, Inc., 1145 Gaskins Rd., Richmond, Va. 23233—Terri Connell 804-740-3832—For use with IBM Model 34, one disk drive and an 80- or 122-character printer with expanded letter capability; Price: $365; Updates: free; Training: manual.

Notation permits the preparation and re-use of descriptive notes and titles for drawings by sending special instructions to an expanded-letter dot matrix printer. Prints titles and the starting line for notes in large letters and automatically switches to normal letters for scale line and remaining notes. Notes can match computerized room finish and door schedules.

775 NPS
NPS Automation Services, Inc., 292 Johnson Rd., Morris Plains, N.J. 07936—Paul Zeman, 201-455-1381; Software available unbundled, as part of turnkey system and through service bureau or timesharing; no hardware required for service or system rental; for system purchase, hardware and peripheral requirements depend on application and processing volume; Price depends on configuration; Updates: free with service/maintenance contract; Training: seminar, in-house, on-site and computer-aided instruction.

NPS's multiple services include two- and three-dimensional design and drafting—site plans, perspectives, sections, details and floor plans with overlays. Related services are materials take-offs, estimating, space utilization and job-cost control.

776 PC CAD
Housman & Associates, Box 474, Cypress, Texas 77429—Keith Housman, 713-890-6100—For use with IBM PC or PCXT, digitizers, 36" x 48" plotters; requires 128K RAM; Price: $1,450; plotting option
available for $3,000; Updates: free • Training: seminar, in-house, manual or computer-aided instruction.

PC CAD is a design and drafting system that automates the design process for contouring and earthwork and permits the development of fully annotated two-dimensional site plans with 15-digit accuracy.

777 PC-DRAW Micrografix, Inc., 1701 N. Greenville, Suite 703, Richardson, Texas 75081—Linda Curtis 214-234-1760 • For use with IBM PC and compatibles with 128K RAM; requires graphics monitor, color/graphics adapter, graphics printer or plotter and two disk drives • Price: $395; Updates: billable • Training: manual and computer-aided instruction.

PC-DRAW is an interactive drawing system that enables users to create and save drawings. PC-DRAW supports any type or complexity of drawing through the use of freehand drawing, symbol libraries and graphics functions including object scaling, rotation and placement. Supports IBM text and an alternate text (which supports multiple fonts). Multiple output formats are included. Also supports a light pen and rip plotters.

787 PLAN Decision Graphics Inc., 11 Main St., P.O. Box 306, Southborough, Maine 02772—John Nilsson, 617-481-4119 • For use with any VAX/VMS system; Megatek workstation • Price: $5,000-$16,000; Updates: billable • Training: on-site, manual.

PLAN is a schematic planning package for building layout and equipment planning. Inputs are a problem description, such as a list of spaces with names, quantity and dimensions or areas, and relationships between the adjacency. Outputs are a bubble diagram, which can be modified and/or converted to a block plan and manipulated further. Envelope and cutout areas can be overlaid. Reports are available at any time for relationship violations.

779 PLAN: ARCHITECTURAL DRAFTING AND DOCUMENTATION SYSTEM Auto-trol Technology, 12500 N. Washington St., P.O. Box 38815, Denver, Colo. 80228—Thomas C. Curry, 303-452-4919 • For use with Advanced Graphic Workstation-Apollo based; Supports HP, Calcomp or Versatec plotters, Tektronix 7000 and Tektronix hard copy • Price: $1,750; Updates: free • Training: seminar, in-house, on-site and manual.

Plan: Architectural Drafting and Documentation System is a drafting and documentation system for creating architectural floor plans. Included are column grids, electrical and plumbing symbol, stairs and vertical access and drawing annotation such as text, dimensions, and general notes. An extrude function creates three-dimensional wire frames from two-dimensional views.

780 PLOT 10 TENKICAD Tektronix, Inc., P.O. Box 1000, Wilsonville, Ore. Hiding overlays, Davis, 503-685-3785 • Software runs on Tektronix Smart Workstations or Tektronix display terminals with stand-alone graphics processor • Price: $1,600 for software; user key packages range from $18,000 to $56,000; Updates: free during first year; included with annual maintenance agreement thereafter • Training: seminars, in-house, on-site and manual.

PLOT 10 TENKICAD is a menu-driven two-dimensional drafting system intended primarily for the creation of mechanical, electrical, facilities and structural drawings. Follows ANSI Y4 and ISO drafting standards. Other capabilities are zoom and pan, stack and user-generated symbols libraries and point, line and arc input modes.

781 PLOTS Decision Graphics Inc., 11 Main St., P.O. Box 306, Southborough, Maine 02772—John Nilsson, 617-481-4119 • For use with any VAX/VMS system; peripherals: Calcomp pen and electrostatic plotters, Tektronix inkjet color copiers and color terminals • Price: $5,000-$16,000; Updates: billable • Training: on-site and manual.

PLOTS is a set of four programs that provide complete, sophisticated graphic output including pen controls, composite assembly and scaling. Graphic output can be directed to a screen for viewing or to a plotter for hard copy.

782 PRO DRAFT Bausch & Lomb, P.O. Box 14547, Austin, Texas 78761—Jerry Norman, 512-337-8952 • Turnkey system consists of minicomputer control unit/Winchester disk drive, Raster display, detached keyboard, menu tablet and single-sheet plotter for up to 12x18 drawings; digitizers optional • Price: $29,900; Updates: included with maintenance agreement • Training: in-house, on-site and manual.

PRO DRAFT is a turnkey package for two-dimensional design and drafting that can be customized for any of five applications: residential, commercial, architectural, engineering and advanced systems. The system features drafting libraries, layering and a one-touch command control for rotation, border, drawing size and line weight. A bill-of-materials module is available for $2,000.

783 QXDRAW American Small Business Computers, 118 S. Mill Rd., Pryor, Okla. 74361—Bob Webster, 918-825-8444 • For use with Epson QX-10 • Price: $995; Updates: free • Training: charge • Training: manual.

QXDRAW permits Epson QX-10 users to create virtually any kind of graphics image on an empty screen. The software generates lines in any style or width, including function curves connecting two or more points. Text and geometric figures, including oval, can be created on screen, retrieved and placed in any position in any scale, any number of times. The program is provided with clear documentation and on-screen help.

784 RANDIMICAS The Rand Group, 17430 Campbell Rd., Suite 14, Dallas, Texas 75229—Ross Wheeler, 214-661-0124 • For use with IBM PC XT, AT, 486, 386; DEC VAX; Sun Systems; Mascomp; Pixel; Wang 2220; requires 10mb hard disc minimum, graphic card and plotter • Price: $7,000 and up • Updates: free for first year; billable thereafter.

RANDIMICAS is an interactive finite element analysis and design system built around a full-relational database. Included in the system are modules for steel design, concrete design, static analysis and dynamic analysis. The system also has full two- and three-dimensional graphics with a comprehensive analysis post processing system. RANDIMICAS interfaces directly to other CAD/D systems.

785 RUCAPS DEC, Inc., 9100 N.E. 145th Ave., Suite 14, Seattle, Wash. 98194—Thomas G. Phillips, 206-467-0690 • For use with any Prime 82-bit virtual memory computers or DEC-PDP-11 minicomputers (Europe only); Imac, Tektronix, Sigma and VT100 displays; Calcomp 900, 1000, HP 7500, Benson-Varian or Versatec plotters • Price: Software is available separately or as part of a complete turnkey system. Price: $65,000 for software and $160,000 for turnkey system; Updates: two upgrade enhancements per year; Training: seminars, in-house, on-site and manual.

RUCAPS is a three-dimensional building modeling system that generates mathematical to working drawings from a single three-dimensional model. Changes made to the model updates all drawings. Optional Imager module performs simulations with full color, texture and shading. RUCAPS also performs engineering analyses, interference checking, quantities take-offs and cost-estimating.

786 SCULPTURED SURFACES Intergraph Corporation, One Madison Industrial Park, Huntsville, Ala. 35807—Al Kemper, 205-392-2700 • A basic turnkey system consists of one computer workstation, hard printer, plotter and software. Systems are based on DEC VAX and PDP-11 computers • Price: Turnkey package with software starts at $120,000; Updates: free with service/maintenance contract • Training: in-house, on-site implementation plan, computer-aided instruction and manual.

Sculptured Surfaces supports the precise mathematical definition of complex surfaces. Structures such as spiral staircases or domes and vaulted ceilings can be defined with the precision necessary for engineering purposes.

787 SIGMA III Sigma Design, Inc., 7306 S. Alton Way, Englewood, Colo. 80112—Vicki Morris-Hart, 303-775-0666 • Turnkey system consists of an m68000-based 16/32-bit microprocessor, 1mb processor memory (min), 30mb mass disc storage (min), monochrome color monitor, choice of input devices,
cabinet, workstation furniture and software. Price: from $90,000; Updates: billable; Training: seminars and in-house.

SIGMA III is a two-and-three-dimensional design and drafting system with software applications for programming through working drawings and space planning/facilities management. Upgradable memory permits large workstation networks.

783 SITE ENGINEERING
CompuVision Corporation, 100 Corporate Center, Bedford, Mass. 01730—Ben Smith, 617-275-1800—Software is available only as part of a turnkey package which incorporates CompuVision CDS equipment. Updates: billable or included with maintenance contract; Training: in-house, manual and computer-aided instruction.

Site Engineering provides the capability to convert conventional survey input or a tracing of a predrawn plan into a digitally modeled representation of the site. Using digital terrain modeling techniques, profile, cross-section, and alignment drawings can be created. Also, earthwork calculations can be determined. Requires General Mapping.

789 SPACEPLAN/3000
CompuVision Corporation, 100 Crosby Dr. Bedford, Mass. 01730—Ben Smith, 617-275-1800—Software is available only as part of a turnkey package which incorporates CompuVision CDS equipment. Updates: billable or included with maintenance contract; Training: in-house, manual and computer-aided instruction.

SPACEPLAN/3000 optimizes the use of space in a new, existing, or multistructure project. Spatial affinities, including weighted relationships, form the basis for the space definition, stacking and diagram phases and supporting reports. The same affinities are the criteria against which the resulting graphics block layout and alternatives are automatically evaluated and reported on.

790 STRATEGIC PLANNING
Intergraph Corporation, One Madison Industrial Park, Huntsville, Ala. 35807—Al Kemper, 205-772-2000—A basic turnkey system consists of one computer workstation, hard printer, plotter and software. Systems are based on DEC-VAX and PDP-11 computers. Price: Turnkey package with software starts at $120,000; Updates: available with maintenance contract; Training: in-house, on-site implementation plan, computer-aided instruction and manual.

Strategic Planning package offers information on corporate structure, projected growth rates, buildings, leasing arrangements, and various activities conducted by the organization, and adjacency data, which can be readily stored and manipulated. Output from this database—in the form of stacking diagrams, adjacency matrices, bubble diagrams and reports—provides management with the summary information required for intelligent planning.

791 SYNTHAVISION
Mathematical Applications Group Inc., 3 Westchester Plaza, Elmsford, N.Y. 10523—Rick Betts, 914-592-4646—For use with IBM 300 and 3000 series, DEC-VAX and Apollo; requires 1 mb RAM and 2 mb disk storage; Price: $30,000 to $125,000 per user; Updates: available with maintenance contract; Training: in-house, on-site and computer-aided instruction.

Synthavision offers three-dimensional solids modeling to construct and analyze any object. Complete hidden line removal. Color-shaded pictures with or without shadows. Menu has 18 primitives. Software interfaces with CADAM package to generate engineering drawings from the solid-model database. IGES interface.

792 TECHNIQUE NO. 9 SERIES
Microlight/Technique Architectural Software, 4438 Valencia Ave., North Vancouver, British Columbia V7N 4B1—John W. Whalen, 604-980-5558 or 604-982-7808—For use with all IBM, IBM-compatible and Tandy 200. Supports most input and output devices; E-size drawings via Calcomp plotter; other plotters: HP, Bausch & Lomb—Price: from $3,300 CDN; Updates: free during first year; billable thereafter.

Training: seminar, in-house, on-site, manual and computer-aided instruction.

Technique No. 9 Series generates two- or three-dimensional sketches, schematics and working drawings. Among features are full primitives generation, element or block erasure, data manipulation mode, color layer separation and details libraries. Data from the graphics package can be used for take-offs, inventories, scheduling or other user-defined options.

793 3-D MODELING
Intergraph Corporation, One Madison Industrial Park, Huntsville, Ala. 35807—Al Kemper, 205-772-2000—A basic turnkey system consists of one computer workstation, hard printer, plotter and software. Systems are based on DEC-VAX and PDP-11 computers. Price: Turnkey package with software starts at $120,000; Updates: free with service/maintenance contract; Training: in-house, on-site implementation plan, computer-aided instruction and manual.

3-D Modeling package allows the architect to quickly produce and test several alternative design solutions visually, replacing the task drawing renderings by hand. Designs can be viewed in perspective from any angle, or presented to the client as fully colored, filled models. Colors and shadows can be readily changed, and a structure presented as it would appear under different lighting conditions or with different finishes.

794 3D CAD
Arcon Software, 218 West Main St., Charlottesville, Va. 22901—Stuart G. Burgh, 804-295-2500—For use with IBM PC, NEC or Gigatek monitor, Mouse Systems mouse; supports Houston Instruments digitizers and plotters; requires 265kb RAM; Price: $950; Updates: free; Training: seminar, manual.

3D/CAD creates three-dimensional models interactively using a mouse, digitizer or keyboard input. Rotates objects in three-dimensional perspective. Employs macro-object definition to create libraries of three-dimensional shapes. Hidden line removal and plane clipping soon available. Interfaces with CAD/3D to extrude any two-dimensional drawing into a three-dimensional form.

795 3DESIGN3
Tritek Vision Systems, 4710 University Way N.E., Suite 1512, P.O. Box 557189, Seattle, Wash. 98105—Kris Nelson, 206-482-2125—For use with IBM PC and compatibles; requires IBM or Halo-supported color graphics board, 196k RAM, two 256 color disk drives; peripherals include digitizer, mouse, dot matrix printers and plotter; Price: $1,200; Updates: free for first six months, nominal fee thereafter; Training: manual and tutorials.

3DESIGN/3 features advanced editing that allows users to create complex objects and then rotate, scale and move them to reveal their hidden lines. 3DESIGN/3's two-dimensional drafting package includes auto-dimensioning, window and overlay commands, text and crosshatching. Optional conversion program permits interface to AUTOCAD. A Solidshade option color-fills and shades with a variable light source.

796 TOUCH-N DRAW
Arrigoni Technology Inc., 14127 Capri Dr., Los Gatos, Calif. 95030—David Arrigoni, 408-370-1577—Touch system consistent of MDSK000 CPU, 1.5mb RAM, 33mb disk storage, 8 RS-232 ports, "Touch Control Station" and display module with 1280 x 1024 5-color 19-in. monitor; Price: $77,000 with D-size plotter; Updates: cost varies depending on complexity of update; Training: seminar, in-house, on-site, manual and computer-aided instruction.

TOUCH-N DRAW is a turnkey architectural design and production drawing system for small-to-medium-size firms that includes grids, symbols, libraries, layering, dimensioning and take-offs as part of the base package. Optional programs are interior design, facilities management and plumbing.

797 2DICAD
Arcon Software, 218 West Main St., Charlottesville, Va. 22901—Stuart G. Burgh, 804-295-2500—For use with IBM PC, NEC or Gigatek monitor, Mouse Systems mouse; supports Houston Instruments digitizers and plotters; requires 265kb RAM; Price: $1,950; Updates: free; Training: seminar, manual.
2D/CAD is a two-dimensional design and drafting system that creates drawings using a mouse or digitizer pad, or the keyboard. User-defined template libraries may be quickly created, filed and recalled to the screen for use. Selectable grids, multiple drawing levels and bidirectional zoom are standard features. Drawings are easily plotted at any time.

798 TWODEE
Decision Graphics Inc., 11 Main St., P.O. Box 306, Southborough, Maine 01772—John Nilsson, 617-343-4119 • For use with any VAX/VMS system; peripherals: W416 or W415 graphic workstation • Price: $5,000-$16,000; Updates: billable • Training: on-site, manual.

TWODEE is a general purpose design and drafting program aimed primarily at facilities planning but used also for architectural design/drafting and electrical and hvac drafting. TWODEE can fetch, store, zoom, pan, draw, add symbols, calculate, move, rotate, mirror, dim, etc. High precision database allows work at any scale and automatic metric conversion.

799 VISUALIZATION PACKAGE
Computervision Corporation, 100 Crosby Dr., Bedford, Mass. 01730—Ben Smith, 617-275-1800 • Software is available only as part of a turnkey package which incorporates Computervision CDS 400 equipment • Updates: billable or included with maintenance contract • Training: in-house, manual and computer-aided instruction.

Visualization Package provides the capability for generating one-, two- or three-point perspective drawings with automatic hidden line removal on perspectives. Requires General Building Design, General Mapping, or Piping Design.

806 ACDS 7000
ACDS Graphic Systems Inc., 100 Rue Edmonton St., Suite 228, Hull, Quebec J9Y 6N2—Dave Strutt, 819-770-9631 • Turnkey system consists of 32-bit super micro, 1.5mb RAM, 50mb disk storage (expandable), dual-screen workstation, Bit Pad digitizer, keyboard and word processing software, plotter not included • Price: $25,000 to $50,000; optional software modules: HUB—$16,000, Lattice—$8,000, DBMS—$8,000, User Extensibility Environment—$15,000; Updates: included with service and maintenance contract or billable • Training: seminars, on-site, in-house and manual.

ACDS 7000 is an interactive turnkey drafting and design system assembled around a 32-bit supermicrocomputer that can support up to six workstations. Four modules available for the system provide varying capabilities: Features of HUB, the two-dimensional design and drafting module, are area calculations, floor-plan generation, symbols library, bill of materials and scheduler, site plans, urban planning and road layout. The Lattice module is a three-dimensional surface modeling package with walk-throughs and hidden-line and surface removal. DBMS module is a network database management system with a query language for specs, take-offs, schedules, reports and structural analysis. User Extensibility Environment is a run-time macro generator for creating personalized applications.

807 A/E CADD 200
ECOM, 8834 West Brown Deer Rd., Milwaukee, Wisc. 53224—Ellen Henson, 414-334-0243 • For use with HP series 200 computers and peripherals • Price: from $32,300 for turnkey system, ECOM software modules $1,000; Updates: billable • Training: 8 hours of on-site training free, billable thereafter—manual and in-house training also available.

A/E CADD 200 is a two-dimensional drafting package built around the HP 985-200 Graphics Editor enhanced with any combination of three customized modules: structural with standard details, architectural with standard details and office planning and layout.

808 ARVAC
SKOK Systems Inc., 222 Third St., Cambridge, Mass. 02142—Steve O’Neill, 617-968-6003 • For use with Arttech Designstation (see 695 and 699 in Section 5). Price: $7,500; discounts available for multiple purchases; Updates: included with service/maintenance contract • Training: seminars, in-house, on-site and manual.

ARVAC is a drafting and analysis product for heating, ventilation and air-conditioning design (hvac). Standard duct and pipe sections are stored in a library, and each sectioning is automatically selected and drawn as a layout proceeds. Flow and performance analysis is possible in concert with the ARBASE relational database product.

809 AYCAD
Aydia Controls, 414 Commerce Dr., Ft. Washington, Pa. 19034—Ron Schlie, 215-542-7800 • Turnkey system consists of Aydin Controls multiple micros; color CRT; 21mb Winchester disk drive, 1.2mb floppy disk drive, 1mb main memory, 13-in. (monochrome) and 19-in. (color) monitors, 12-by-12-in. digitizing tablet, ASCII keyboard and software • Price: $47,500; Updates: included as part of license fee • Training: in-house, on-site.

The AYCAD turnkey system is a two- and three-dimensional (wire-frame) design and drafting system for schematics, other preliminary design documents and working drawings. Also performs word processing and structural analysis.

810 BEAMJOIS
J.J. Jordan, Architect-Engineer, 5266 Overbrook Way, Sacramento, Calif. 95841—Jim Jordan, 916-332-6630 • For use with IBM PC, PC XT or compatibles, one disk drive and printer or TRS-80; 1 or 4, one disk drive and a printer; requires 48k RAM • Price: $393.32 for TRS-80, $583.32 for IBM PC (one-time license fee), Updates: $8 plus materials and handling • Training: manuals and computer-aided instruction.

Beamjois selects size and grade of Douglas Fir lumber or pre-manufactured joist for any simple or cantilevered span with distributed, partial-distributed and up to three concentrated loads.

811 CADKEY
Micro Control Systems, Inc., 27 Hartford Turnpike, Vernon, Conn. 06066—Helen Charov, 203-647-0220 • For use with IBM PC or compatible microcomputers; requires 384k RAM,
one 320K floppy disk drive, color graphics adapter card, graphics monitor, 2-D/3-D digitizer or mouse and a pen plotter or dot matrix printer • Price: $1,465. Updates: billable • Training: seminar, in-house, on-site, manual and computer-aided instruction.

Cadkey is an interactive two- and three-dimensional design and drafting system with applications that include mechanical design, detailed drafting, architectural engineering and schematics. Functions include associative drafting, hidden-line removal, three-dimensional transforms, fillets and chamfers. Command structure can be modified to resemble many larger CAD/CAM system command formats.

812 CEADS-CIVIL/MAPPING
Holguin, 5822 Cromo Dr., El Paso, Texas 79912—Bob Whitus, 915-581-1171 • Turnkey packages are assembled from the following hardware: HP 900, Series 200, Wang 2200 VP/LDP/VMP and HP 88 and 87, supports HP 8000/TIGRA plotters and a variety of digitizers and printers • Price: $2,500 to $100,000 (software only to full bundled turnkey system); Updates: included with service/maintenance contract or billable • Training: seminar, on-site and manual.

CEADS—Civil/Mapping systems consist of fully integrated modules, such as disk management, field control, coordinate geometry, master design, automated drafting, earthwork and others. The package includes basic drafting, COGO, profile sheets, hydraulic/hydrologic and structural. All systems share a common database.

813 CLM COGO
CLM Systems, Inc., 3654 Candy Blvd., Tampa, Fla. 33611—C.L. Miller, 813-831-7000 • For use with IBM PC XT, 386, Professional, Wang 2200 VP/LDP/VMP and HP, HI, Calcomp and Numonics plotters; compatible digitizers are HI, Calcomp and Numonics; requires 512K RAM • Price: $4,950; turnkey package also available for $25,000—includes 4 graphics terminals, D-size plotter, 20-by-20-in. digitizer and multi-mode printer; Updates: free • Training: seminar, in-house, on-site, manual and computer-aided instruction.

CLM COGO produces preliminary and final drawings for site planning, topography, grading, drainage, roads and utilities. Produces preliminary and final cost estimates from a variety of schedules. Program options include a relational database, word processor and spreadsheet.

814 COMPUTERVISION HVAC PACKAGE
Computervision Corporation, 100 Crosby Dr., Bedford, Mass. 01730—Ben Smith, 617-275-1800 • Software is available only as part of a Turnkey package x • Incorporates Computervision CDS 400 equipment • Price: N/A; Updates: billable or included with maintenance contract • Training: in-house, manual and computer-aided instruction.

Computervision HVAC provides programs for heating, ventilating, and air conditioning load computation (ASHRAE 681), duct calculations and round-to-rectangle duct equivalence conversion. Incorporates intelligent duct system schematics that can be automatically controlled to show detailed line drawings.

815 CPS-1 (CONTOUR PLOTTING SYSTEM)
Radian Corporation, 8501 Mo-Pac Blvd., Austin, Texas 78756—Carl Kurz, 713-686-8431 • For use with IBM PC XT or any mainframe computer handling a 32-bit sized word or larger • Price: $18,000 for base system; options are additional; Updates: free with service/maintenance contract • Training: seminars, in-house, manual, on-site and computer-aided instruction.

CPS-1 is a computerized mapping system designed for use in the energy, engineering and cartographic industries for grading, profiling, volumetrics, three-dimensional displays, multiple surface and fault handling and three-dimensional seismic migration in a batch environment.

816 CPS-1G
Radian Corporation, 8501 Mo-Pac Blvd., Austin, Texas 78756—Carl Kurz, 713-686-8431 • For use with most mainframe computers • Price: $35,000; Updates: included with service/maintenance contract • Training: seminars, on-site, in-house, manual and computer-aided instruction.

CPS-1/G is an interactive mapping system used either as a stand-alone software system or as an interface to the batch program CPS-1 (see 815 above). The program provides interactive gridding, contouring, contour editing and control point editing.

817 CUSTOMER DIRECT SERVICE NETWORK SOFTWARE
The Trane Company, 3600 Pammel Creek Rd., LaCrosse, Wis. 54601—Eugene L. Smithard, 608-767-3747 • For use with IBM 3081, 4331, Rainbow 100/100+, Radio Shack 2, 4, 12, 16 and Apple II/IIe • Price: $995; Updates: billable • Training: seminar, in-house, on-site, manual and computer-aided instruction.

Customer Direct Service Network Software comprises 14 micro-based and mainframe programs for hvac system design including TRAC3 load-design, equal-friction duct design, coil, fan and air-handling selection programs, VARITRANE duct design and the TRACE and TRAC2 economics programs.

818 DAYLITE
Solarsoft, Inc., 1406 Burlingame Ave., Suite 31, Burlingame, Calif. 94010—Christine Ashton, 415-342-3335 • For use with Apple 3, Lisa and IBM PC • Price: $750; Updates: free for first six months, billable thereafter • Training: manual and help screens.

Daylite analyzes a variety of roof and wall aperture types and tilt glazed; calculates hourly absolute illumination, resultant hourly solar heat gains, glare, contrast and yearly lighting power budgets for any of five electric light strategies.

819 DIAFRAMS
J. J. Jordan, Architect-Engineer, 6256 Overbrook Way, Sacramento, Calif. 95841—Jim Jordan, 916-332-6610 • For use with IBM 3081 or compatible, one disk drive and a printer or TRS-80, I, or 4, one disk drive and a printer; requires 48K RAM • Price: $49.61 for TRS-80; $74.61 for IBM PC (one-time license fee); Updates: $8 plus materials and handling • Training: manual and computer-aided instruction.
For more information on any software program, circle the item number on special Reader Service card following page 80

823 ELECTRICAL ELECTRICAL DRAFTING AND DOCUMENTATION SYSTEM Auto-trol Technology, 12500 N. Washington St., P.O. Box 33815, Denver, Colo. 80225—Thomas C. Curry, 303-452-4919• Turnkey system utilizes Auto-trol Advanced Graphical Workstation-Apollo based; supports HP, Calcomp or Versatec printers and Tektronix hard-copy printers • Price: $3,500; Updates: free• Training: seminar, in-house, on-site and manual.

Electrical Drafting and Documentation System incorporates industry-standard symbology and techniques to produce panel, lighting and electrical equipment layouts in the building-plan view. Also produces riser diagrams for power and communications distribution. Includes standard schedule formats. Program can be integrated with other Auto-trol applications.

824 EUCLID/BUILDING DESIGN Matra Datavision, 99 South Bedford St., Burlington, Mass. 01803—Miguel Suarez, 617-229-2600• For use with VAX running VMS or I.T. running VM • Price: $75,000 for base package, $7,500 for one access to a workstation, $5,000 for Building Design module. Updates: included with maintenance agreement• Training: in-house, on-site, manual and computer-aided instruction.

Euclid/Building Design computer software system performs solids modeling, design, drafting, analysis, numerical control output, database management and flexible visualization. The system is optimized for use with a "Building Design" module which enables users to create various types of models and then extract formwork drawings, data for structures computations and quantities of parts or materials.

825 F-CHART Solarisoft, Inc. 1406 Burlingame Ave., Suite 31, Burlingame, Calif. 94010—Christine Ashton, 415-342-3383• For use with Apple 2, 3 and IBM PC • Price: $400; Updates: free for first six months, billable thereafter• Training: manual and help screens.

F-Chart aids in the design of active collector systems for space heating, domestic hot water, swimming pool heating and process heating needs. Handles both liquid and air-based systems. Includes an economic analysis section.

826 FINITE ELEMENT MODELING SYSTEM Intergraph Corp., One Madison Industrial Park, Huntsville, Ala. 35807—Al Kemper, 205-772-2000• A basic turnkey system consists of one computer workstation, hard printer, plotter and software. Systems are based on DEC-VAX and PDP-11 computers • Price: Turnkey package with software starts at $120,000; Updates: free with service/maintenance contract or billable • Training: in-house, on-site implementation plan, computer-aided instruction and manual.

Finite Element Modeling provides the capability to generate two- and three-dimensional finite element models for framed, surface and solid structures. This software automatically generates loading conditions and model and rational constraints. Interfaces readily with third-party analysis programs, such as GSTRUDL. Analysis results may be displayed to show displaced nodes and deformed elements superimposed on the original model.

827 GEOCONTOUR Geocon Corp., 342 Sudbury Rd., Concord, Mass. 01742—W. Allen Mart, 617-959-8304• For use with IBM PC; requires graphics card, screen, pen plotter and 256k RAM • Price: $800; Updates: billable• Training: manual.

GEOCONTOUR permits users to establish contours of equal values between data points. GEOCONTOUR provides a point for each elevation and the system interpolates the contour from these points. This system may be used in-house or accessed to various on-line databases.

831 HVAC Cymbo Cybernetics Corporation, 169 Colonnade Rd., Ottawa, Canada K2E 7J4—Solly Pantostach, 613-727-1800, Telex 033 6356• Turnkey system includes Cymbo C-82 2-bit computer, 40mb hard disk, 19-in. monitor, 1mb floppy and furniture; supports any brand plotter; unhandled software runs on DEC-VAX 730 and up • Price: $30,000 for software; $39,000 for turnkey package; Updates: $400 per year includes hardware and software maintenance, free updates and consultation• Training: on-site, manual and computer-aided instruction.

HVAC handles complete duct design, architectural layout, shop drawings, and patterns for all fittings, square or round.

832 HVAC DRAFTING AND DOCUMENTATION SYSTEM Auto-trol Technology, 12500 N. Washington St., P.O. Box 33815, Denver, Colo. 80225—Thomas C. Curry, 303-452-4919• Turnkey system utilizes Auto-trol Advanced Graphical Workstation-Apollo based; supports HP, Calcomp or Versatec plotters and Tektronix hard copy printers • Price: $3,500; Updates: free• Training: seminar, in-house, on-site and manual.

HVAC Drafting and Documentation System incorporates functions for producing rectangular, round and flexible ductwork layouts consistent with SMACNA standards. Also draws HVAC piping systems, places major equipment and annotates drawing elements.

833 IMAGES-2D Celestial Software Inc., 125 University Ave., Berkeley, Calif. 94710—Nancy Halladay, 415-841-7175• For use with IBM PC, P.C.-XT and compatible; requires color graphics adaptor board, color monitor and printer and 128k RAM • Price: $1,300 ($500 for static analysis only); Updates: free for first 6 months, billable thereafter• Training: manual.

Images-2D performs two-dimensional static and dynamic analysis and seismic analysis of engineering structures and systems. Handles 100 nodes with 300 degrees of freedom. Results are obtained for static loading, natural frequencies and mode shapes, and dynamic response to input response spectra. Menu-driven or batch-mode execution.

834 IMAGES-3D Celestial Software Inc., 125 University Ave., Berkeley, Calif. 94710—Nancy Halladay, 415-841-7175• For use with IBM PC, P.C.-XT and compatible; requires 512k RAM, color graphics adaptor board, color monitor and printer • Price: $8,900 ($5,000 for static-only version); Updates: free for first 6 months, billable thereafter• Training: manual.

Images-3D performs three-dimensional static and dynamic analysis, stress analysis, code evaluation and seismic analysis of engineering structures and systems. Permits the generation and display of multi-colored models.
from any perspective at any window. The program is menu-driven, interactive and includes "Help" commands and error trapping and error messages.

835 INTERFACE DESIGNER 3-D SERIES
Interface Data Systems, 2900 E. LaJolla St., Anaheim, Calif. 92806—James B. Young, 714-630-8030 • For use with IBM PC, PCXT and compatible microcomputers; uses Microsoft mouse, Hewlett-Packard or Bausch & Lomb A-E-size plotters and Interface Micro-185 or Micro-286 monochrome or color workstations; requires 256-1024k RAM • Price: from $1,295 depending on configuration; Updates: free during first year, $500 per year thereafter • Training: seminar and manual.

Interface Designer 3-D Series is a modular, upgradable two- and three-dimensional drafting and design application providing drafting system capable of projecting or plotting plan or two- and three-dimensional perspective views simultaneously. Drafting module has auto-dimensioning, scale, pan, zoom and editing in two or three dimensions. Graphics generation module illustrates reaction of a structure to static or dynamic loads.

836 JOIST/ANSI
Newhof and Winer, Inc., 3075 Cascade Rd., S. E., Grand Rapids, Mich. 49506—Joe Kossenich, 616-949-5881 • For use with HP 86/87/89/90/98/96 and IBM PC; requires 64k RAM and 266k disk storage • Price: $425; Updates: free • Training: seminar.

JOIST/ANSI performs an analysis of existing open-web steel joists. Self-generating geometry, snow loads generated based on ANSI A53.1-1986. Output includes all member axial loads, stresses and required reinforcement area.

837 MAX-PC MAPPING SOFTWARE
National Planning Data Corporation, 227 Fort Pitt Blvd., Pittsburgh, Pa. 15222-1570—Mary Davis, 412-471-6782 • For use with IBM PC XT; requires 128K RAM • Price: $1,500 not including cartographic boundary data; Updates: not applicable • Training: manual and on-line help messages.

MAX-PC Mapping Software produces thematic maps as an aid to analyzing and presenting spatially distributed information (demographic characteristics, houses, historic buildings, commercial establishments or survey data from primary research). Applications encompass a wide range of urban planning and design applications, including site development studies, community needs assessments, real estate marketing and graphic program and mapping and monitoring. Cartographic base files are available.

840 NRG-2COMMERCIAL ENERGY ANALYSIS
Disco-Techn/Morton Technologies, 600 B St., P. O. Box 1639, Santa Rosa, Calif. 95405—Ralph R. Russe, P. E., 707-222-1600 • For use with all microcomputers running CP/M-80 CP/M-86 MS-DOS or TRS-80 • Price: $450; Updates: billable • Training: manual.

NRG-2/Commercial Energy Analysis permits users to fine-tune non-residential buildings for Title 24 compliance and energy efficiency. Calmair A, U, T, W, and S for each component type and entire building. Changes, adds, deletes values for each component (U-factor, area, shading-coefficient, etc.). Solvable for maximum, minimum U-factor for any component. Stores data for later use, displays and prints results.

841 PASS-ONE
Energy Management Consultants, Inc., 672 S. Lafayette Park Place, Suite 38, Los Angeles, Calif. 90067—Douglas S. Stenhouse, AIA, 213-386-0274 • For use with most microcomputers running CP/M; requires 66k RAM • Price: $1,000; Updates: billable • Training: seminars, in-house, on-site, manual and computer-aided instruction.

Pass-One performs passive annual solar heating analysis. Combines elements of the Princeton Energy Group's program (PEG) and TEANET. Capabilities include solar gain on windows for more than one orientation, shading devices, movable insulation, thaw-waist back, ventilation and internal heat generation. Also calculates annual load for conventional buildings.

842 PLUMBING: PLUMBING DRAFTING AND DOCUMENTATION SYSTEM
Auto-trol Technology, 12500 N. Washington St., P. O. Box 30915, Odessa, Ok. 73964—Thomas J. C. Currie, 405-432-4919 • Training key system utilizes Auto-trol Advanced Graphic Workstation Apollo based supports HP, Calcomp or Versatec plotters and Tektronix hard copy printers • Price: $350; Updates: free • Training: seminar, in-house, on-site and manual.

Plumbing: Drafting and Documentation System drafts and sizes building plumbing systems for supply, waste, vent, and medical gas piping. Fixture placement in plan and riser diagrams can also be created along with sizing calculations for hot water tanks and supply meters. All techniques and symbols follow the National Plumbing Code standards.

843 PRO DRAFT
Bausch & Lomb, P. O. Box 14547, Austin, Texas 78756—Jerry Norman, 512-879-3652 • Turnkey system consists of microcomputer control unit/Winschunter disk drive, Raster display, desktop computer, keyboard, tablet and single-sheet plotter for up to D-size drawings; digitizer optional • Price: $29,900; Updates: included with maintenance agreement • Training: in-house, on-site and manual.

Pro Draft is a turnkey package for two-dimensional design and drafting that can be customized for any of five applications: residential, commercial, light commercial, renovation and HVAC. The system features drafting libraries, layering and a graphically-controlled environment for drafting, rotation, border, drafting and size line weight. A bill-of-materials module is available for $2,000.

844 RANDIMICAS
The Rand Group, 17430 Campbell Rd., Suite 14, Dallas, Texas 75252—Rex Wheeler, 214-691-0124 • For use with PC XT, PC AT 80286, DEC- VAX, Sun Systems, Mascom, Flexiuran and Wang 2200; requires 10mb hard disk minimum, graphic CRT and plotter • Price: $7,900 and up • Updates: free for first year, billable thereafter.

Randimicas is an interactive finite element analysis and design system built around a full relational database. Included in the system are modules for steel design, concrete design, static and dynamic analysis. The system also has full two- and three-dimensional graphics with a comprehensive analysis post-processing system. The system interfaces directly to other CAD/D systems.

845 REENERGY
Raymond D. Reed, AIA, Reed Associates, P. O. Box 988, College Station, Texas 77840—Raymond D. Reed, 409-831-1070 • For use with any IBM or compatible computer with 64K RAM and up; compatible printer desirable • Price: $100—includes instructions and data sheets; Updates: cost of disk plus mailing • Training: computer-assisted instruction; reference books, helpline.

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Architectural education:
"There is an urgent need to reduce or eliminate the dominance of the studio"

By Amos Rapoport

The following remarks may be seen as heretical since they question the most central characteristic feature of architectural education—the design studio. In doing so, two distinct aspects need to be examined: first, what is taught—the rationale, theory and subject matter; and second, how is it taught—the manner of teaching.

Although my major objective is to examine critically how it is taught, it is essential that the other aspect be addressed briefly. In doing so an even more heretical position will need to be adopted: I will be asking highly critical questions about design and its central role in architectural education. In effect, questions are raised about what it is we do—and should do.

Design should be based on theory, not likes and dislikes

The nature of design is something about which I have had various things to say over the years. The essence of my argument has been that the purpose of design is to provide settings appropriate to the biocultural—psychological, cultural and other characteristics and needs of the different people for whom design is being done. This means that the most important decision is what to do and why to do it rather than how it is to be done (which comes later), with which design has traditionally been more concerned. (I neglect, for purposes of this discussion, issues such as how much design should be done—the minimum rather than the maximum—the degree and nature of openness and questions of participation.)

Furthermore the decision about what to do and why must be based on the best available information, on a body of literature, on research on man-environment interaction, on theory rather than the likes and dislikes of designers. In fact I have argued that in its strong form this position may involve designing something that the designer dislikes or even detests.

In setting explicit objectives for design, criteria are also set for evaluating how successfully goals have been met. When this process is repeated, there is hope of developing a cumulative body of knowledge and theory.

At the moment architectural design is the best example of what Sorokin called the New Columbus Syndrome: the tendency to rediscover America anew each time, or to reinvent the wheel.

It seems self-evident that both design goals and criteria of evaluation are always necessarily related to, and dependent on, a theory; one needs first to know what built environments can do before one can assess whether any given specimen does it well or badly.

Yet there is no valid theory of design involved in design teaching. In fact there is no theory of design worth that name. Without such a theory, design cannot be taught and is not really suitable as a university subject. Its approach is personal, subjective, illogical and not cumulative. One can also argue that it should not be taught since it perpetuates a highly undesirable state of affairs.

What to do should be stressed over how

As an illustration consider a recent study that seems to support my criticisms. This study deals with decision-making in architectural practice. It examines the relative allocation of time to the different stages of projects. From this study it seems quite clear that the question of what to do receives least attention—the initial idea is developed rapidly using little information and research but it also rarely changes much. This fundamental decision is based on the designers' decision experience which, they believe, is best obtained by doing one's own design. Most time is devoted to refinement, minor matters of detail, small changes, choosing materials; in other words, the stress is on the how.

The teaching of design tends to perpetuate this manner of working. For example, a recent article comparing architectural design to music points out that the skills and knowledge assumed to be necessary for the design process—sketching, drawing, construction, planning, detailing and model making—none of these helps to deal with the question of what to do.

The result of this teaching approach was summarized well in a recent book review where an unnamed "leading publicist of postmodern architectural theory" is quoted as saying that "architecture is comprised of behavior, environment and form. Since I know nothing about environment or behavior I will restrict my discussion to form." The author comments that "such knowing-nothingness is inexcusable." Yet unfortunately, such "know-nothingness" is the norm in design as it is done, and is a result of design as it is taught; the two are intimately linked.

That design is the principal thing is not self-evident

Let us assume that not all design taught is as bad (in my terms) or that, by some miracle, it has changed overnight into a genuine body of theory and knowledge. The question would still remain: how is that new design to be taught? The studio basically sees design purely as a craft approached subjectively, stressing the personality of the designer rather than ideas (this is of course typical of architecture generally).

In effect the studio presupposes that apprentices learn from a master—it perpetuates the archaic master-apprentice system no matter how disguised. This has its problems. Lacking clear evaluative criteria, there is no way of defining who is a "master," what constitutes mastery, or what one is master of. The system also seems to be that I think design should be and the essence of university teaching—a stress on ideas, theory and knowledge rather than personality, for example.

It also perpetuates the emphasis on one's own experience and resources (as described in the BEE study cited above). But questions about the studio format go beyond even these questions, which I will now examine.

It is implied in the central position of "design" in architectural education—reflected and reflected in the amount of time and resources devoted to it in studio teaching—that "design" (however conceived) is the principal thing architects do. This is far from self-evident, and I suspect that a study of how architects spend their time would reveal otherwise. Certainly he seems evident from my own experience and observation that architects spend more time doing various sorts of analyses, in meetings and writing reports, so that the need to skills to help them do all this.

A whole range of new disciplines is needed

This question was also reached recently for engineers. A survey of engineering graduates in major firms in Britain showed that their main weaknesses were in writing reports, in researches and arguments, in a lack of language skills such as their reading ability, and in handling meetings. (It should be stressed that, unlike architectural design, engineering design has a greater body of theory, so engineers are likely to have an inadequate grasp of theory.) It was concluded that engineers needed skills in other disciplines. Architects need corresponding skills and, if my view of design is correct, they also need knowledge of a whole range of new disciplines.

Too much time is wasted in studio teaching

Most of us who have gone through years of design studio, and who might even have taught it, know how much time is wasted in the Continued on page 108
The studio is where a professional architect learns to make judgments.

By Robert M. Beckley

The importance of the design studio—the hub of most architectural programs—is critically challenged by Professor Rapoport on the opposite page, and equally critically supported below by Professor Beckley. Both are colleagues at the University of Wisconsin-Milwaukee.

Debate about the value of the design studio in architectural education is a time-honored tradition amongst architectural educators and practitioners. Amos Rapoport, a friend and colleague, has again raised serious questions about the role of the design studio in architectural education.1 His arguments reflect the concerns of others and deserve to be addressed. Of course an attack on methods of teaching design raises questions concerning design itself. It would be easy to launch a counterattack on Rapoport’s accusations concerning the rigor of discipline in design theory and practice by preaching about the failures of lecturers and lecturing, but this would only resume the rhetorical debate between designers and academicians that becomes rather boring. Since Rapoport’s arguments might reflect the concerns of others, let us see if new light can be shed on this subject of design and design education.

Design quality separates architects from builders.

What is a design? If we use the dictionary as a source we find the word has multiple meanings. They range from the subjective “to designate” to the objective “to plan mentally, to outline, to scheme.” It is the latter definition that gained popular usage with the advent of scientific inquiry and that was the approach championed for architecture as it took on problems of significant social and political consequence. Architectural design has been criticized if it does not subscribe to the rigors of scientific methods of inquiry regarding the nature of “the problem.” Design is seen in pragmatic terms. Architectural design cannot deny that it is pragmatic. Buildings are built for a purpose, they are supposed to do something. On the other hand we are told that architects are to be trained in the art as well as the science of building. Firmness, commodity and delight were the trinity of challenges given architects by Vitruvius. Architects are expected to provide delight. It is perhaps this provision alone that separates architects from builders and engineers. An honest appraisal of architectural design reveals that the architect is responsible for both quantifiable and qualitative performance—for scientific as well as artistic objectives.

In the other sense of design, returning to our abbreviated definition, the designer is a designer. At this juncture we introduce the problem of designer “ego” that bothers Rapoport so very much. The problem of ego is associated with any profession, given a society where specialized knowledge is accepted as necessary. Within any profession one can find an individual’s imprint on his work. The designer’s role, as with any good professional, be they lawyer, doctor, musician, artist, is to put a little of themselves into their work. Even in so-called primitive societies, which may not single out individuals as designers, it is usually apparent that certain individuals have more highly developed skills than others and their work embodies a certain quality or style that distinguishes their work. Arthur Danto, a Johnsonian Professor of Philosophy at Columbia University, argues that... “style is the man, that while there may be various external and transient properties of a person, style at least comprises qualities which are essentially his.”2 Qualities which are essentially his? How do we ascertain if an individual’s style is essentially his? Rapoport might ask whether it is important that we be able to distinguish one designer’s jeans from another’s, or ordinary jeans from designer jeans. In any case the designers cannot but help interject a bit of their own style, in Danto’s sense of the word, into their work.

Teachers are divided into two camps—academics and designers.

In our society we have become skeptical of both scientific solutions to problems and stylized solutions. We have seen architecture that is programmatically correct that does not touch the soul. We have seen architecture that is purely utilitarian and profane to the sight. We also reject architecture that is all style and no substance. It is this challenge that design education must meet. Now how does one go about educating a designer? A reason for a debate about the value of the design studio originates in the long-standing tradition in architectural education that separates academic teaching from studio teaching. These two aspects of an architectural education are constantly competing for a student’s time. In this traditional framework of architectural education, teachers are divided into two camps—the academics and the designers. Academics lecture in classrooms and designers take off to the studio. Each camp has its pet concerns. Academics are frustrated that their theories are forgotten, bastardized, or simply ignored by the studio—often, it appears, with the consent and encouragement of the design instructor. The person teaching academic courses complains that students spend too much of their time in the studio and not enough time on their academic course work. The design studio instructor, on the other hand, complains that students have been thinking in their lectures, that they do not know how to apply what little knowledge they may have, and that writing papers and taking tests takes too much time from their more valuable studio work. The student, of course, is the one caught in the middle of this struggle.

Architectural studio education is an innovative process.

As practitioners of a modest and insecure profession, and a relatively new one from an institutional standpoint, architectural educators are not ones to think of themselves as part of an educational avant-garde. I would argue that research and philosophical developments concerning the process of education over the last 50 years suggests that architectural education is indeed innovative and is used as a model other educators find valuable. What makes architectural education innovative? Knowledge and action are joined in the students’ education.

Foundation of education that joined knowledge and action was described by philosopher educator Alfred North Whitehead in the late 1920s. “Disinterested scientific curiosity is a passion for an ordered intellectual vision of the connection of events. But the goal of such curiosity is the marriage of action to thought. This essential intervention of action even in sciences is so overlooked. No man of science wants merely to know. He acquires knowledge to appease his passion for discovery. He does not discover in order to know, he knows in order to discover.” Whitehead’s words particularly apply to the educated architect who is expected to act on his knowledge. Whitehead goes on to say “... education should turn out the pupil with something he knows well and something he can do well.” This intimate union of practice and theory is Whitehead’s views became the basis for the modern rethinking and critique of education and later research and writings that espouse an education that combines theoretical knowledge with the application of that knowledge. Because architectural education has applied that modernist perspective for the last hundred years it has served as a model for many. Students of the ’60s flocked to architectural schools because these schools practiced what they taught. Educators such as Van Illich, Jean Piaget and Jerome Bruner were espousing.4 Recent demand to return to a “classical education” are more a reflection of the failures of academic educators than it is on the integrative model of Continued on page 105

Robert M. Beckley, AIA, holds degrees in architecture from the University of Cincinnati and the Harvard Graduate School of Design, and is a registered architect in Illinois, Wisconsin and Ohio. He is a principal of Beckley/Mayers Architects. Professor Beckley began his teaching career in 1965 at the University of Michigan and, in 1969, moved to Milwaukee to help establish the School of Architecture and Urban Planning at the University of Wisconsin-Milwaukee, where he has served as chairman and acting dean. He is a member of the Chicago Architectural Club, and has been elected to serve on the boards of the AIA, as treasurer, and the Wisconsin Architectural Foundation.

Architectural Record October 1985

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studio, how much time is spent chatting and playing cards. Casual thought and research are needed to determine how much time is required to achieve certain objectives that are supposed to be achieved in the studio. An assumption that "studio" and "design" are important, we need to know how much time is needed and by how much it can be reduced without loss. I was interested in a major reduction in the time devoted to studio work (once to half) without any apparent loss of quality (whether that was judged by studio teachers).

If other skills are needed, as argued above, they will require time, most of which could be provided by using time hitherto spent in the design studio.

Another insufficiency that the design studio introduces is that it isolates students from the rest of the university, from the library and from reading and writing. In one Canadian faculty of environmental design, which brought together a number of disciplines so that they could learn from each other, the architects are conspicuously uninvolved. The reason I was given was that "studio takes all their time."

There are many ways of teaching architecture

It seems to have been forgotten that the studio is nothing but another method of teaching (and learning) among many others. There is no evidence to suggest that it is effective, although of course one cannot judge since it has never been cleared stated what is supposed to be taught there.

Let us assume that synthesis is one of the things to be taught in a studio. One could hardly claim that it gets taught. I rather doubt it. I would argue that most studios are not even aware of the range of variables and most of what is taught in other courses is forgotten upon passing the sacred portals of the studio. Most studios certainly do not deal formally with priorities, trade-offs, integration and synthesis among the full range of variables (including, for example, those related to man-environment interaction). As the evidence quoted in the previous comments on "Design" suggests, synthesis does not seem to be learned (even if it is taught). This raises the question of whether there are other ways to teach synthesis which are more like those used to teach analysis.

One could also ask: how important is synthesis via-d-vis analysis? The goals of teaching synthesis have never been articulated nor has its effectiveness been tested (as has the effectiveness of teaching clinical skills in medicine, for example, which most closely correspond to "design"). Unlike a novel in a literary work, design has been the implicit emphasis on "creativity"—is it desirable or necessary? What does it mean? How is it best encouraged? At least one way of looking at this is to argue that problem definition is much more important than problem solution, yet most studios stress the latter. Similarly unexamined, as far as I know, have been the many other objectives that no doubt are implicitly present in studio design teaching. In spite of this lack of analysis most resources in schools of architecture—material, human and temporal—are devoted to it.

Yet surely such analysis, and a clear definition of goals and objectives, should precede such a major emphasis on a single method of teaching—and one as time-intensive as studio. A body of knowledge and theory must be developed

It follows from my argument in the first part of this article that at the moment design teaching is really important because design (in or out of the studio) is possible, other than the subjective "I do/don't like it." This is not good enough and a case could be made for it to cease. At some point the circle must be broken so that ways of setting objectives, evaluating their validity, testing whether objectives have been met, developing and refining theory and building a cumulative body of theory and knowledge can begin. The obvious place to break that circle is at the university and, more specifically, in the weakest link—the design studio. Only then can one begin to develop ways of knowing what design is, what it should do, what environmental quality is for various people, how design success can be judged, how one can decide how important design is, and so on. No longer can it be assumed that one can avoid defining and analysing problems, nor can one assume any longer that the "solution" to any "problem" will be "building."

We need a new view of what architects are and do

It can also no longer be assumed that the goal of architectural education is a Renaissance man—a single architect/designer. It is more likely that we need a whole range of different skills—hyphenated architects, as it were: architect-programmers, architect-evaluators, architect-researchers, architect-theorists.

The studio may be the major mechanism for perpetuating an invalid view of what architects are and what they should do. One of the things wrong with most schools of architecture and which affects the profession is the absence of scholarship, research and publication compared to other disciplines. Part of the reason for this is a lack of time—what little is done is often in one's own time. One can only do scholarly work if there is uninterrupted time for it—and that can only happen if that most wasteful method of teaching, in terms of time—the studio— is reduced. One does not have time to sit around with students, do desk crfts, repeat the same thing to each student, go through project after project in juries, again repeating the same thing, and deal with trivial subjective matters that cannot be judged.

No one needs to be released for scholarship and research, but these can only flourish if two other things happen—both of which are also negatively correlated with studio teaching today. The first is that research and teaching are intimately related and, given the lack of theory, ideas and cumulative knowledge in design teaching, that link cannot usually be established. Second, the studio perpetuates the craft tradition of the staff; scholarship and research can only succeed if more academics find their place in schools of architecture. (Two things are omitted from this simplified argument. First, that there are schools where this is happening, and second, that there is still a clear room for good teachers and researchers.) Thus less emphasis on the studio seems to have major implications for other changes which will improve schools, staff, the profession and our environment.

Some schools pay lip-service to the idea that other things besides design and design studio are important, that there are other kinds of architectural skills and even, possibly, other kinds of architects. But even in those schools this is rendered ineffective because what is communicated is very different. It is quite clear to students (and staff) that design and design studio are central, that most time is allocated to it, that the deadlines of studio projects dominate those of other courses, that resources are allocated very unequally. All these facts create a very different picture—that the studio is the navel of the architecture school world. In most cases, of course, this is not even lip-service given to other things.

The central importance of the studio is not questioned; its role in defining the identity and uniqueness of architectural education is taken for granted.

In both these cases it is important that a different message be communicated. I would argue that the relative importance and centrality of studio via-d-vis other things must change. Similarly, what gives way when time is short must change. At the very least equal time and importance must be given to things other than studio. Ideally, much more time needs to be given to other things.

Conclusion: too much has been taken for granted

I have taken an extreme position and stated it in its strongest form. I have questioned the centrality of design and argued for an urgent need to reduce or eliminate the dominance of the studio in architectural education. Consider these to be hypotheses. As such, they may be wrong—but there is only one way of deciding this. But I am unlikely to be wrong about another thing I have been stressing: the need to think about and analyze the nature of the studio and what some time have been taken for granted.

What is really needed is much more thought, analysis and research on how important design is in today's world and in what way it is supposed to do, how much time it needs and merits, how much of it is to be taught in what we call the "studio," what is best taught in that way and what is best taught in other ways. This is clearly the first and most urgent task.


As an example see Arthur Stavitis at al, Medical Problem Solving, (Cambridge: Harvard University Press, 1983).

Vasco Gessels and M. Colletti-Manfri, "The creative Vision, (New York, John Wiley and Sons)."
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education proposed by Whitehead.)

Whatever the philosophy, studio teaching is structured
Architectural pedagogy found in use in most architectural programs today has its roots in two schools, the Ecole des Beaux Arts and the Bauhaus. At the Ecole des Beaux Arts and the academies that preceded its establishment in 1819, lectures and studios were conceived as separate activities. The academy was concerned with teaching the principles of architecture and building. The studio (atelier) was concerned with the application of those principles. The academy of old debated whether beauty was an absolute or a variable quality. Still, it could be argued that certain things such as proportion could be learned by studying the classical orders. These absolute beliefs taught in the academy made it possible for the student to unambiguously apply the academy's theory in the atelier.

The Bauhaus kept the distinction between the academic and design teaching methods of the Beaux Arts. It disagreed on the content of knowledge transmitted in the academy and the role of the studio teacher; however, the role of the design teacher was to be as "stimulator," students were not expected to imitate their design teachers for this was considered plagiarism. Students were expected to experiment with their own solutions to design problems. The Bauhaus educators, however, did not have this luxury. They saw new building types emerging for which they had no precedent.

Today's design instructors are likely to be one of these two schools. (There are some design educators who may use both the absolutist approach and the experimental approach in their studio, depending upon the level of student being taught, the nature of the problem, etc.) While there is still great diversity in the education of architects, the tradition of separation between academic education from design instruction remains a common element in nearly every architectural program. Why? The answer to that question can be found by looking at what happens in the design studio. It is quite different from what happens in an academic lecture to be sure. The "style" of individual design studio instructors may vary greatly just as there are variations in style among lecturers. There is, however, a work ethic peculiar to the design studio, it is Socratic.

Designing, says Donald Schon, "takes the form of a reflective conversation." In Schon's terms, the language of this conversation combines drawing and speaking. The design studio is the place where this methodology is transmitted. To the person looking for a sophisticated teaching method, this approach seems archaic. To the person predisposed to particular solutions, the method seems time-consuming. To the person looking for the application of particular theories, the process seems superficial and inefficient. But, it is structured.

In the studio, the instructor is mentor and surrogate client. Let us compare the lecture course to the studio as we would compare a speech to a conversation. In a speech one makes a formal public discourse, oration, address. The professor professor—such and such to be true. In a conversation information is presented with feedback expected and anticipated. A student is expected to participate in and it can be programmed. (Vis-a-vis one’s dialogue with a computer.)

Academic courses program students as do the normal academic experiences. The studio is the technique used to make the architectural student's information applicable to a particular problem, his education.

The academic mode that Rapoport espouses has its role. The student must have some knowledge of the subject to engage in Schon's "reflective conversation." The architectural student's education there is an introduction to normative knowledge about specific "professional" issues as well as specific "cultural" issues. Academic courses are expected to teach normative information concerning a wide array of subjects, including structures, materials, aesthetics, economics, behavior, history, economics, etc. The professional architect; it is assumed, absorbs this normative knowledge and then makes judgments. How does a professional architect learn to make judgments? In the studio.

But, our poor student who is still in school has not completed a normative education. Where does he or she begin the reflective conversation? What hypothesis does he test? The studio instructor controls this situation by forming a problem that will allow the student to test a certain hypothesis. The instructor, as professor, serves as both mentor and surrogate client for the student. As mentor the instructor is charged with selecting an "appropriate" problem based upon an understanding of the student's normative education and the student's ability to "deal" with the problem. As a surrogate client the instructor is the other party in the reflective conversation. As the leader of the exercise, the instructor is most likely to be the initiator of questions, and in the Socratic tradition the instructor shapes the discourse by the nature of the questions asked. If the instructor asks, "What kind of structural systems are you proposing?" the student realizes that structure is an issue to be contented with. If the instructor asks, "What other solutions have you investigated for this problem?" the instructor has identified a sub-problem and suggests that other solutions are possible.

The studio is a place where various hypotheses are tested. Don Schon notes that most often the teacher... reflects very little on his own reflection-in-action and it would be easy for a student or observer to miss the fundamental structure of inquiry. Actually, educational programs tend to cater for this even if they are not pedagogically different. In any structured architectural education the normative aspects of education are usually closely programmed. Students progress through the program in discernible groups, so that an instructor is likely to know exactly what academic courses students in a particular class have taken. There is usually not much shifting of instructors in this kind of program so that an instructor has time to test whether or not a particular "problem" works and certain hypotheses become a part of the studio syllabus. In looser structured architectural schools the instructor is free to develop a "personality" and students are free to choose from amongst specific faculty the courses they wish to take. Students know the instructors and the hypotheses each instructor prefers—hypotheses such as, the key to good design is structural response to human behavior—the shaping of three-dimensional space—the use of historic precedent, etc. (More knowledgeable students with flexibility of choice will often select a school for certain normative areas where the school has strengths.)

The studio produces people capable of solving problems
Studio instruction has a number of places where it can fail for individual students or even groups of students. Studio instruction today is severely tested by students with a wide range of cultural experiences. Even in a highly structured curriculum it is not unusual to find students with a wide range of cultural experiences based on previous education, nationality, class, sex, age, race, previous occupations, places lived, etc. The studio is no more than a microcosm of the real world. A student's normative education will never be complete and it does not end with structural education. The "real world" Students from rural areas find work in urban areas, students end up becoming architects in other than their native country for brief or extended periods, etc., and they find their architectural education wanting.

An architect is dependent upon rhetorical dialogue to define architectural problems more now than ever before. How does a student learn to ask appropriate questions to obtain information he or she does not have? How does a student learn to apply hypothesis testing to the ambiguous problems of architecture? How does a student learn the value of using both drawings and words to establish a dialectic? How does a student learn to use the Socratic method of inquiry? The answers to all these questions lie in studio teaching.

Architectural studio education produces holistic thinkers. It also tends to produce people capable of solving problems that have not yet been identified. It tends to establish the need for academic courses and it gently softens the entrance of students into the ambiguous realm of problem solving which is the architect's unique domain. Is there room for improvement in studio teaching? Yes. Should studio teaching remain a part of the architectural curriculum? Absolutely.


Architectural Record October 1984
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Long considered a compact, pleasantly provincial alternative to the sprawl of nearby Los Angeles, San Diego in recent years has experienced the kind of suburban growth that now threatens the city's traditional shopping district. In order to stem the tide of urban decay, the city has contracted with private developer Ernest W. Hahn to build Horton Plaza, a mixed-use downtown center now under construction on 11 1/2 acres adjacent to the historic Gaslamp Quarter. Although the 900,000-square-foot project exhibits some features that are typical of commercial centers elsewhere—namely, four large department stores, 165 specialty shops, and a 450-room hotel—the arrangement of the new buildings around bazaar-like outdoor pedestrian streets is meant to ensure "a unique mixture of retail and entertainment opportunities," according to the developer. The design of the complex by The Jerde Partnership reflects a variety of historic and contemporary influences, including San Diego's Mediterranean architectural heritage, the festive character of the Wonderwall at the New Orleans World's Fair, and Jerde's own colorful work for the Los Angeles Olympic Games. An important adjunct to the complex is the Balboa Theater (photo left), a handsome Spanish Renaissance Revival movie house located at the edge of the development site. The theater is currently being converted into a multifloor art center that will incorporate space for permanent collections and temporary exhibitions (with an emphasis on architecture and design), a museum bookstore, a rooftop restaurant and sculpture garden, and design-related retail facilities.

... and a convention center on the waterfront

While work on Horton Plaza advances toward a mid-1985 opening, the San Diego Port District has unveiled the designs for a $85-million convention center to be located on a 10-acre bayfront site adjacent to Seaport Village and the new Intercontinental Hotel. The result of a national competition among 31 architectural firms, the center is a joint project of Deems, Lewis & Partners, Arthur Erickson Architects, and Loschky, Marquart & Nesholm. The winning design, which was praised by the competition jury for its "experimental quality and joie de vivre," features barrel-vaulted glass concourses, a large tent-roofed public plaza, and provisions for up to 10 rooftop tennis courts—all characteristics that acknowledge the city's temperate climate. Flag-beckoned masts and prowlike wings at either end of the 650,000-square-foot structure are obvious references to the center's waterfront location and to San Diego's historic role as a maritime capital. Completion of the building is scheduled for 1987.
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AIA National Design Conference explores the past, present, and future of San Diego

If the powers-that-be in San Diego seem intent on showcasing new development in the downtown area (see preceding page), it was the city’s splendid architectural past that captured the imagination of 250 architects who descended on the burgeoning border town in late August for the 1984 AIA National Design Conference. Dubbed as “a symposium on wheels,” the three-day conclave was organized around visits to five significant area buildings, including the Hotel del Coronado by James and Merritt Reed, the Panama-California Exhibition buildings in Balboa Park by Bertram Goodhue, the La Jolla Women’s Club by Irving Gill, the Salk Institute by Louis Kahn, and the San Juan Capistrano Library by Michael Graves—that were intended to illustrate the architectural view of the world in four metaphysical tenses (past, present-progressive, present-eternal, and future). Although “Five Buildings in Four Tenses” neatly comprised a unifying conference theme, few in attendance seemed to mind.

Architects, after all, are some of the world’s most avid tourists, and everyone in San Diego appeared happiest when they were given the time to practice their photographic skills on the architectural splendors that organizer Fred Takemura had in store.

Unlike most conferences that take place in rooms illuminated only by the light of a slide projector, the San Diego affair was a balanced mix of indoor lectures and outdoor touring. Among the many small pleasures of the well-organized event was a train ride from the city’s magnificent new San Fe station up the sunny California coast to San Juan Capistrano, where Michael Graves spoke in the courtyard of his new library (photo left). Graves explained how the monastery-like parts of the structure seemed appropriate for a library in a mission town, and he humorously noted that the most difficult aspect of building on the West Coast was the time he had to spend in Salt Lake City—“the worst week of my life”—studying for his earthquake exam.

Back in the city a rapid-fire slide presentation by Lawrence Ford, professor of geography at San Diego State University, revealed the idiosyncratic nature of the city’s architectural and landscape traditions. Ford’s message was the city’s tension between San Diego’s “urban yet woody” character and an appreciation of such local hybrid styles as “Egypto-Swiss,” “mixed Mediterranean,” and “Prairie Portuguese.” In a slightly more serious vein, separate lectures by Richard Oliver and Donlyn Lyndon served to underscore the differences between the florid Churriguerezque architecture of Bertram Goodhue, exemplified by his buildings in Balboa Park for the 1915 Panama-California Exhibition (photo right), and the planar, almost austere style that characterizes the work of Irving Gill.

Perhaps the most stirring moment of the conference came on the huge plaza of the Salk Institute in La Jolla, when Jonas Salk emerged to discuss with Charles Moore the architecture of Louis Kahn. Many in the crowd seemed genuinely moved by Salk’s emotional, monastic quality of the Institute, and a slow-moving panel discussion on the building ended a bit abruptly after one member of the audience dryly noted that the Salk Institute, like much of Kahn’s architecture, is a sublime religious structure that resists easy analysis. Panels at the conference, in fact, generally were characterized by a failure of words among both audience and participants. One discussion in particular that sought to determine whether San Diego has become a “world-class” city bogged down when everyone quickly realized that liveability, not world-class status, should be San Diego’s goal for the future. What seemed obvious to many local residents and first-time observers was that rather than seek the world-class qualities—and problems—of New York, Los Angeles, and Chicago, San Diego should fight to retain its special place of emulating such strong regional cities as Boston, San Antonio, New Orleans, and Seattle. Clearly facing a crossroads in its development, San Diego has much to lose if it allows itself to get caught up in the destructive boosterism and unbridled growth that afflicts so many other Sunbelt metropolises. P. M. S.

When London’s Battersea Power Station was opened in 1938, the massive brick structure with chimneys at each corner was heralded as a “Temple of Power” by local newspapers. It dominated the Thames River skyline, and its interior had an ecclesiastical air. Sir Giles Gilbert-Scott, architect of the imposing structure, had decorated the huge turbine hall with terrazzo floors and paneled its control room in Italian marble.

Now plans are being drawn up to convert this landmark of industrial architecture into a “Temple of Leisure”—a “theme hall” and center for sports and entertainment—by a consortium that won a competition to find a new use for the plant. (The plant’s operator, the Central Electricity Generating Board, had deemed the facility to be obsolete in March of 1983, but was prevented from demolishing it by the government.) The idea for a leisure center came from C. Mark Leslie, an architect whose house overlooks the dramatic site and who manages the London office of Peter Legge & Associates. Sir David Roche, a London developer, took up Leslie’s proposal and formed a consortium of his own company and Legge, together with merchant banker Morgan Grenfell & Co. and contractor John Mowlem & Co. Much of the competition entry was produced by Leisure and Recreation Concepts, a Texas firm brought in to carry out a feasibility study by British theme park operator Alton Towers Ltd. Both outfits joined the consortium, which is likely to form a special development company for the project. Six other groups demonstrating adequate financial and technical support also put forward proposals for reusing the Battersea plant. Their submissions ranged from installing a hotel, apartments, and stores inside the shell to adapting the building as a trash-fired power plant.

Although it received the fewest votes from local residents following an exhibition of all seven contest entries, the Legge/Roche proposal impressed the competition jury and was selected as the premiated scheme in July. As part of the prize for winning the competition, the Roche consortium has been able to acquire the 30-million-cubic-foot building and its 15-acre site for the bargain basement price of $2 million. The developers and architects are proposing a theater, ice rink, and other sports facilities for the gutted boiler room under a new 150-foot-long space-frame roof. While the location of “theme exhibits has not been finalized, plans do call for the restoration of the turbine house and control room. Outside, the industrial scene will be landscaped, with a garden and restaurant replacing a Riverside coal-handling plant.

Construction is expected to cost at least $30 million. Although the project could be completed as early as mid-1985, the opening could be much later if snags occur removing asbestos or obtaining final planning consents.

Peter Heywood

Architectural Record October 1984, 115
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Two of the most architecturally significant buildings in the Boston area are currently the objects of feasibility studies that will serve as guidelines for future restoration. Ann Beha Associates have been retained by the Commonwealth of Massachusetts to prepare a historic structures report for the State House (1722, top), Charles Bulfinch's Federal masterpiece, as "a first step toward bringing the structure functionally into the 1980s while preserving its architectural heritage," according to a state spokesman. Beha's firm is also serving as a consultant to architects Goody, Clancy & Associates on a feasibility study for the restoration of H. H. Richardson's Austin Hall (1883, above), located on the Harvard Law School campus. Rehabilitative work is scheduled to begin in mid-1985.

Facilities design and planning focus of 1984 Sport Summit

Now that the 1984 Olympic Games in Sarajevo and Los Angeles are history, organizers of Sport Summit, the international conference on the business of sports, are turning their attention to the construction and marketing of the 1988 Games in Calgary and Seoul. Keynote speakers at the sixth annual conference and exhibition, scheduled for November 27-29 at the World Trade Center in New York City, include Lee Young Ho, Minister of Sport in South Korea, and William H. Wardle, senior vice president of marketing for the Calgary Winter Games. Among the speakers expected to address the design and management of sports facilities in North America are David Geiger of the Geiger Group, designers of the Silverdome in Pontiac, Michigan; John Meyer of Sverdrup & Parcel and Associates, architects of the Superdome in New Orleans and Busch Stadium in St. Louis; Gerald Iffland of Iffland, Kavanagh, Waterbury, designers of the Houston Astrodome; and Ron Labinski, principal of Hellmuth Oebara Kassabaum Architects. For further information and a complete schedule of speakers, exhibitors, and events contact Sport Summit, 372 Fifth Avenue, New York, New York 10018 (212/244-8002).

The first major exhibition in the United States devoted to the work of Japanese architect Masayuki Kurokawa will be on view until October 27 at Gallery 91 in New York City. Through the display of drawings (including the rendering shown for the Villa Ban, 1979), photographs, and examples of furniture and industrial design, the exhibition illustrates Kurokawa's philosophy that "everything in this world needs to be worked on," from sleek buildings of poured concrete to folding table systems, soft machine lighting, and metal desk accessories. Although the idea of all-encompassing design is certainly nothing new, Kurokawa's crisp, seemingly contradictory juxtaposition of geometric forms, materials, and colors epitomizes the stylistic freedom enjoyed by the current crop of Japanese architects.

Engineering Association is sponsoring a student competition that seeks designs for a railroad classification yard office building and hump tower. Entry deadline is January 31, 1985. Contact Mr. D. A. Bessey, Chicago, Milwaukee, St. Paul and Pacific Railroad, Room 386, Union Station, Chicago, Ill. 60606 (312/648-3535).

Convex Corporation is seeking entries to two contests in its first "Creative Ceiling Awards" program. The first contest calls for entrants to design a ceiling using Convex products. Entry deadline is February 15, 1985. The second contest calls for the judging of actual projects that utilize Convex products. Entry deadline is September 31, 1985. Contact Convex's Public Relations Department, P. O. Box 64237, St. Paul, Minn. 55164 or call (1-800/328-9497).

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Conceived as a catalyst for the revival of the Detroit waterfront, River Place is a 21-acre public and private urban renewal project sponsored by the Stroh Brewing Company that calls for the conversion of the former Parke-Davis pharmaceutical manufacturing complex into a mixed-use office, residential, and retail center. The project includes a new corporate headquarters for Stroh, developed around the atrium of a major industrial building designed by architect Albert Kahn in 1927, in addition to a new public plaza on the Detroit River and the rehabilitation of 15 brick buildings constructed in the late-19th and early-20th centuries. Future phases of the project will incorporate new office and parking structures and, possibly, a hotel. Architects for the development are James Stewart Polshek & Partners.

Sprucing up the old neighborhood

Over the past decade cities increasingly have subsidized the development of cultural centers as a means of revitalizing inner-city neighborhoods. Ideally, these projects involve the renovation of vacant or underutilized historic structures by minority architectural firms familiar with the specific needs of the community. One such development is now taking place in the predominantly black east side of Columbus, Ohio, where architects Moody/Nolan have drawn up plans for the conversion of the old Pythian Theater and an adjacent former elementary school into a multi-use cultural and performing arts center. The two buildings, redesigned to house a 500-seat theater, a ballroom, dance studios, and classrooms, will be linked by a colonnade of dark spandrel glass ornamented with limestone.

Risen from the ashes

The story of the Trapp family, the singing Austrian clan whose flight to the United States from Hitler’s invading army in 1938 was popularized in The Sound of Music, is well known. After spending three years in Philadelphia, the family purchased an 800-acre farm near Stowe, Vermont, where they built a rustic home reminiscent of the Alpine architecture of their native Salzburg. While the family continued to tour for the next 20 years as the Trapp Family Singers, vacant space in the 27-room residence was rented out to visitors to Stowe, and the lodge was developed over time as the country’s premier cross-country skiing center. In December 1980, the lodge burned to the ground, and the family once again was forced to rebuild their lives and their home. Toward that end they hired Robert Burley Associates, architects from nearby Waitsfield, to design a new 73-room main lodge and nine adjoining time-share guest houses that were completed late last year. Although the new four-story Trapp Family Lodge is built of reinforced concrete and structural steel, the architects have retained a good deal of Austrian gemütlichkeit through the use of steeply pitched roof planes, deep overhanging eaves, jigsawed balcony screens, and the original Trapp bell tower. And even though modern-day economic restraints dictated the simplification of many wood ornamental details, certain things—namely, the clear Vermont air, the continuing presence of family matriarch Maria von Trapp, and the lodge’s pastoral setting overlooking the Worcester Range—remain the same.
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Design awards/competitions:
Roger Williams College
Architecture Building Competition

The Providence firm of Kite Palmer Associates has won first place in a national competition for the design of a new architecture building at Roger Williams College in Bristol, Rhode Island. Ellenzweig, Moore and Associates of Cambridge, Massachusetts, and Stephen Morgan and Robin Ringwald of St. Louis were named as joint second-prize winners. The first-place entry received $30,000 and a commission to develop the design further, while the second-prize winners received $6,000 each. Co-sponsored by the college and the National Endowment for the Arts, the competition called for a

First Place:
Kite Palmer Associates,
Providence, Rhode Island

The challenge for all competition entrants was to design a facility housing a comprehensive program for architectural education in a building that relates to existing small-scale structures on the college campus—all within unusually specific guidelines that mandated a construction cost of $65 a square foot. The premiated submission by Kite Palmer Associates utilizes inexpensive materials—concrete block walls, steel floors and roof framing, and Kalwall skylights—in a structure whose 24-foot-high front elevation and 60-foot-deep setback from the street are in deference to the modest size of an adjacent administration building. Other “contextual” characteristics of the new building (shown in elevation, above left) include horizontal bands of dark concrete blocks that are intended to tie the structure visually to the wood fascias of existing buildings; raked vertical masonry joints at column lines that relate to the expressed vertical modules found in other campus structures; and a grid of deeply set window openings that echo similar details nearby.

Entry into the building is through a walled courtyard (a feature required in the competition brief), and the plan is organized around a central skylighted gallery that serves as the facility’s primary circulation spine (perspective, above right). This long corridor, bisected horizontally by a mezzanine of faculty offices, separates design studios (shown in axonometric, top right) from support services. Although two-story-high studios were developed as one space to allow maximum flexibility for changes in student population or program from year to year, the over-all space has been modulated into five identifiable areas that are acoustically and visually divided by panels suspended between the open roof structure and drafting stations (interior view, top left). Seminar, review, and computer rooms are located in a loft within the design studio.

According to the architects, the building is meant to be “a laboratory of architectural studies”
of the Roger Williams College Board of Trustees; Michael J. Pittas, dean of the Otis Art Institute in Los Angeles; William H. Kissini, president of Roger Williams College; Raj Sakesma, AIA, director of the college’s architecture division; and Bernard P. Spring, AIA, president of the Boston Architectural Center.

with its clearly expressed structural and mechanical systems and the readily perceived organization of different functions along the central spine. They contended that by designing high, open studios, they were attempting to provide enough space for students to construct experimental building sections and, additionally, to create “an uplifting environment in which the student may work.” The competition jury obviously felt that the architects had succeeded: it complimented the design for its “extraordinary clarity of organization, the quality of the studio environment, and buildability.” It added that the structure’s understated character was “commendable in the over-all context of the existing campus buildings.”

Second Place (tie): Stephen Morgan and Robin Ringwald, St. Louis; Ellenzweig, Moore and Associates, Cambridge, Massachusetts.

Clearly the most historicist design among the top three submissions, the entry of Stephen Morgan and Robin Ringwald (top) exhibits such classical features as a freestanding entrance pavilion, a formally landscaped courtyard, “postmodern” stair towers, and arcades running the length of the south and east elevations. The building features walls of split-faced block and glass brick. The submission of Ellenzweig, Moore and Associates incorporates several features employed in the winning design—a long circulation spine, a centrally located exhibition gallery, and open studios laid out in a stepped configuration—but the winglike shape of the building forms a more dramatic entrance through a triangular courtyard. Sheathing of light and dark tile over gypsum curtain walls was specified for the structure.
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Big changes are planned for New York’s Times Square. While most agree that the area needs help, the $1.6 billion proposal set forth by the New York State Urban Development Corporation has provoked a major controversy. Architect James Russell’s analysis adds to the debate.

By James S. Russell

"Where is the army of New Yorkers who should be standing shoulder to shoulder in Times Square and saying: ‘No! Our beloved city is not to be given away to a band of greedy profit-seekers. It belongs to us and to our children and grandchildren, and we won’t let it in trust for them? Let that army gather now.’"

That call to arms by Brendan Gill, former chairman of the New York Landmarks Conservancy, reflects a rapidly spreading awareness that profound changes in Times Square proposed by the City of New York and the State Urban Development Corporation (UDC) may destroy those qualities that have endeared the square to generations of New Yorkers and visitors from around the world.

Every large American city has had its entertainment district. The theaters, movie houses, and boardwalk-style amusement parks of St. Louis or Buffalo were not, taken individually, different from those found on Broadway or Seventh Avenue. But somehow these relatively ordinary elements, when thrown together on a "square" that isn’t even square, became something extraordinary: a firestorm of bright lights, an exhilarating image of glamour and pleasure, a "Great White Way" known around the world. The image of Times Square today is the less glamorous and more poignant one of the 12-foot-high platinum and seductively open blouson of the billboard blue jeans model presiding over the more straightforward sale of sex on the street. Even the bright lights that remain are promoting mostly Japanese products.

Today, 42nd Street and the southern end of Times Square (the heart of the area’s pleasure belt) are the center of the 42nd Street Redevelopment Project, an urban design scheme extraordinary in its size and complexity. Although the project site itself is small—comprising a total area of less than two average city blocks—the proposed development on that site is enormous: four office towers of 4.1 million square feet, the renovation of perhaps nine existing landmark theaters, the erection of a 2.4-million-square-foot merchandise mart and 560-room hotel, and substantial refurbishing of the Times Square subway station. The importance of the 42nd Street Redevelopment Project, however, is not simply its enormity; the City/UDC scheme would result in the utter transformation of Times Square and the end of the area as the "halo" of honky-tok amusements. These would remain in the proposed development as no more than a theme, suggesting the museumization of what is perhaps most quintessentially "New York" about New York.

The unprecedented scope of the project makes it enormously risky. The major elements of the scheme—the offices, towers, the mall, the refurbishing of the theaters and subway—are large, complicated undertakings in their own right. The financing methods are also complex, and the office tower and mall developers are required to make "contributions" to the cost of restoring the theaters and subway station. Major public investment is thereby avoided.

As the problems of Times Square have come to seem intractable, the risk of major changes in the area has seemed worth taking. The steady decline of the district since World War II has not been slowed by continued cleanup efforts or previous urban renewal schemes. Still, behind the rusting marques and grimy drapery on 42nd Street remain the Art Nouveau glories of the New Amsterdam, the Florentine elegance of the Empire, and the Adamesque restraint of the Apollo-Times Square. Had Times Square been a "better" address, would the unique assemblage of 10 theaters still stand? As it is, the price for renewal may be high, and the fate of the theaters is still tenous.

The formula for redevelopment of the Square was created by the city and the UDC. They hired Cooper, Eckstut Associates to pull the package together with a set of "urban design guidelines" that would allow as many as 12 sites to be revitalized by different developers and architects. The guidelines were intended to define the scale of the elements and their relationship to the district at large. Cooper, Eckstut seemed to be the right urban design firm for the job, since the guidelines they developed at Battery Park City in lower Manhattan allowed that project to get off the ground after being delayed for over 10 years. The difference between Battery Park City and the 42nd Street Redevelopment Project, however, is that Battery Park City’s landfill site was empty. The 42nd Street project requires the insertion of large-scale new elements into an existing urban fabric of extraordinary vitality and historic importance. In this kind of enormous, highly visible intervention, the role of the urban designer and architect is critical.

James S. Russell is a practicing architect with Bohlin Powell Lerkhin Oyenswijk in Philadelphia. He was formerly assistant managing editor of Oppositions magazine.

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The UDC’s plans are, however, threatening to unravel. When the guidelines were first released in 1981, the plan was greeted with consistent, if not thunderous, praise. Last spring the first of the developers’ schemes—the John Burgee/Philip Johnson proposal for the four office towers—was released; the project’s environmental impact statement was also unveiled, but no other architectural schemes have been released. Public attention began to focus on the project as people came to see that the Burgee/Johnson towers, sheathed in cool granites and formally arranged, did not look much like the Times Square they remembered or had been led to expect. The profound implications of the project for the future of the Square began to become clear. Since then, a crop of neighborhood groups has begun to arise in protest. The New York Times has editorially backed off from its earlier endorsement, and the Municipal Art Society has sponsored a competition for the site of the (possibly ill-fated) former Times Tower.

The 42nd Street Development Project deserves to be examined in a larger context than that proposed by either its proponents or current opponents. As the most ambitious scheme for “contextual” development yet attempted, it requires the integrated talents of several architect and urban design teams. After all, the focus of the project is a place close to the hearts of millions, a place layered with historical associations, a place still vital in spite of the blight that lies within its borders.

The UDC plan
The City/UDC package is not a scheme for all of Times Square or the adjacent Theater District. The project area is ambiguous, and its boundaries do not correspond to any zoning or planning district, or to any architecturally distinct area. The target region (map, page 125) covers only the southern half of Times Square and does not (as it logically might) extend all the way to the Avenue of the Americas. Cooper, Eshkenazi Associates have devised a scheme where four large office towers spiral around the former Times Tower on the Square and, by their massing, inflect toward the Seventh-to-Eighth Avenue corridor of 42nd Street. At Eighth Avenue, the end of the project is marked by a hotel tower on the north side (elevation below) and the somewhat lower bulk of the trade mart on the south; the existing low-rise theaters fall in between. New connections are provided to the subway and the Port Authority Bus Terminal. The heights of the existing (former) McGraw-Hill, Paramount and Candler buildings are respected in setback guidelines.

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consequences of such bulk? The Burgee/Johnson buildings rise straight from the street line to their six-to-nine-stone sloped "massard" roofs. The tallest of them even dwarf the adjacent former Knickerbocker Hotel, a substantial Second Empire pile that provided the stylistic inspiration for the Burgee/Johnson scheme.

If the UMC accepts the Park Tower proposal, it will mean throwing out the complex and highly specific bulk and appearance guidelines developed by Cooper, Eckstut (if followed to the letter, the guidelines virtually design the buildings. These mandated taller structures with many small-scale setbacks intended to get more light down to the street level. Much larger, and by Park Tower's reckoning, more rentable office floors are allowed by the lower bulk of Johnson's buildings. The UMC claims the Park Tower scheme tests out better than the CEA recommendations. This may be true, but only because the Park Tower scheme requires the demolition of the former Times Tower. The Cooper, Eckstut guidelines never proposed demolishing the tower, as the ball that falls from the top of the building every New Year's Eve was felt to be sacred. The square footage sheltered by the Times Tower, however, has been included in the new buildings, and the total proposal still exceeds CEA's guidelines by nearly 100,000 square feet.

Is the plan for the Square better without the Times Tower? Is the UMC prepared to condemn it? The UMC's final intentions are not known at present: they are "considering" this aspect of the Park Tower scheme. Did CEA (with the advice of Eastern Realty) truly propose unmarketable buildings? Or was Park Tower's financial package more appealing than other proposals that followed the guidelines more closely? We don't know, because the alternatives were not publicly released or discussed in the UMC's environmental impact statement. Marketability, of course, is crucial to the plan. Substantial Federal and state help is no longer available for large-scale urban renewal schemes, so the City has agreed to relax zoning mandates in return for a contribution from the office tower developer of $25 million to rebuild the 42nd Street subway concourse and $9.5 million for theater renovations. The selected developer, therefore, has tremendous leverage with the City and the UMC since the most appealing elements of the scheme—the theater restorations and subway improvements—are linked to the successful conclusion of an agreement on the office towers. The future "cost" will be borne by a permanent encroachment of light, more crowding on sidewalks, and congestion in the streets.

The City and the UMC have tried to downplay the extraordinary proposed density, but there is simply no escaping the conclusion that the density required to generate the cash flow for renovation of the subway and theaters has seriously distorted the urban design intentions. Can good architecture be made of this?

Thirty- to 40-story street walls and a 200-foot tunnel along 41st Street speak for themselves.

The theaters: preservation, but at what cost?

The renovation of theaters is being used as justification for the enormous density of the office towers and the incomparable use represented by the mall. Unfortunately, however, successful renovation of the midblock theaters is by no means assured. In almost three years of trying, UMC has not been able to secure a firm proposal for Site Five, which contains five of 42nd Street's 10 legitimate-type theaters. Of these, UMC has proposed as an alternative to complete restoration the conversion of the Times Square Theater into a common lobby for the four other (the Lyric, Selwyn, Apollo, and Victory). Elsewhere on the street, three theaters—the Rialto, Harem, and Anco—are not mentioned in the UMC guidelines and would be razed. At this time only the New Amsterdam, probably the most important Art Nouveau interior extant in the United States, and currently being restored, independent of the development project, is certain to be returned to legitimate theater use. The preservation of the theaters along 42nd Street is being touted as "making up" for the destruction of the Bijou, Morosco, and Helen Hayes theaters for the Marriott Hotel project under construction three blocks north on Broadway. But the gain may be ephemeral of the 12 theaters in the over-all project, only five would be returned to legitimate theater use under the most propitious circumstances, and two of these have been or can be renovated even if the development project fails.

Somewhere, the sense of what is unique about Times Square has been lost. The stables and carriage houses that used to surround the Square moved away because Times Square became not just New York's but America's premier entertainment district. It had theaters—some 80 of them—lavish music halls, and luxurious hotels. The subway and The New York
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Times came in 1904 and helped to transform the intersection of Broadway and 42nd Street into the "Crossroads of the World." Although the Square more or less prospered for the following 50 years, the story of the post-World War II decline of the area is well known. The legitimate theaters on the side streets have held on, and, to some extent, flourished. But on the Square itself the Palace is the only stage theater currently in use; the rest of the area attracts crowds to video arcades and first-run teen and action movies.

Still, it should be noted that even the "heyday" of Times Square was always ephemeral, with some elements constantly in decline and others in the ascendency. Times Square has always been very much a flow of more than hits on Broadway, and the history of the Square shows that this relationship was not true just of the stage. The Square has contained the core of the entertainment formula that has allowed what vitality remains combines things big and small: the movie palaces and the grind houses, Sardi's and the emerald and brass orb of the Shubert's, Times Square attracts thieves, drunks, hums, hookers, and pushers, the movie-goers, the theater crowds, the gay and the straight still spark that famous energy. Oddly, that energy will be sapped, not strengthened, by the new development. Entertainment uses are not encouraged on Times Square as part of the 42nd Street Redevelopment Project. Once lobbies, subway access, and service entrances are fitted into the office towers, there is no room for legitimate theaters or even movie houses. Office-related retail space is the proposed street floor use, suggesting a ghost town ambiance after 5:00 p.m. Similar to that encountered on Avenue of the Americas a block east.

A similar attitude is seen in the office towers themselves. Cooper, Eckstut's guidelines envision a picturesque assemblage of towers reminiscent of Rockefeller Center and a retail environment evocative of upper Madison Avenue. Burges/Johnson seem to be trying to capture the feeling of turn-of-the century New York: the Plaza Hotel blown up to three times its already inadequate height. And so the low-rise, fantastically succinct size. The Square is bursting with its own style and vitality. Why do the architects have to look elsewhere for inspiration?

In a "special features supplement" to their guidelines, Cooper, Eckstut did require the office tower developer to provide an elaborate system of lighting and a band of super-scale signage as an attempt to recreate at least a veneer of Times Square's traditional bright lights. These requirements were ignored in the Burges/Johnson design; who, after all, would put electric signs over the windows of office space renting at $40 a square foot? The nervousness of developer Park Tower Realty is betrayed by reports that they have asked Burges/Johnson to revise their scheme and by their retaining Venturi, Richardson and Scott Brown, whose giant Magritte-like apple for the site of the Times Tower is supposed to liven up Burges/Johnson's button-down architecture.

The architecture never to have been a recognition that forms of entertainment other than theater are also "legitimate." The guidelines do not encourage movie theaters or nightclubs, rehearsal space, or stages for dance and music (except Broadway musicals). These uses frequently cannot generate the revenues per square foot that office or retail space can. They are, however, indispensable elements of what makes New York a center for the arts. A scheme that sought to revitalize Times Square and the Lower East Side arts district for arts and entertainment might look at ways of encouraging uses compatible with theater. The environmental impact statement prepared by the TDC recognizes that commercial occupancies and rehearsal space related to theater may be pushed out by the new development. The study offers mitigating measures. The grandeur of the plan, then, is at odds with the idea of a coherent theater or entertainment district. Without Times Square as the linchpin, there will be no recognizable district, just a bunch of theaters scattered along various side streets.

The need for coordination

The 42nd Street Redevelopment Project is not the only large-scale building proposed for the Times Square area. Three blocks north the Marriott Hotel is nearing completion; still further north development is moving west from Avenue of the Americas to Seventh Avenue and Broadway (new headquarters for Equitable Life, designed by Edward Larrabee Barnes, and a new hotel by the Grosvenor Partnership are already under construction) and then moving east to the newly enacted zoning that allows midtown-type density in this area for the first time. With the Marriott and 42nd Street projects to lie down the south flank, the northern end of Times Square—the heart of the theater district—is the next obvious direction for what could become a speculative tidal wave. Somehow the City has never pulled these actions together into a coordinated strategy, and it is only now scrambling to find a way to deal with the clearly endangered legitimate theaters. The Theater Advisory Council has recommended that developers be allowed to purchase air rights from the threatened theaters for use elsewhere in the district: The recommendation is controversial and will further aggravate dichotomies of scale by encouraging the aggregation of purchased square footage and allowable square footage to create enormous buildings rising out of a relatively low-scale context.

Incentives to save existing theaters and build new ones do exist in the zoning but in a midtown-style speculative frenzy, incentives may not be enough as the underlying land becomes too valuable. Indicative of what the future may hold is the Portman-designed Marriott Hotel development on the Square. This "revitalization" replaced the demolished Morocco, Helen Hayes, and Bijou—all functioning, landmark-quality theaters. The battle over the skyscraper proposed for the last substantially undeveloped site on Park Avenue—St. Bartholomew's community house—shows that when the location is right, not even landmark churches are "sacred."

The future of Times Square

Without a coordinated strategy Times Square will travel one of two divergent paths. If the 42nd Street plan goes through those who feel there is a future in Times Square will see their hopes dashed yet again, and the area will continue to deteriorate. On the other hand, if the plan succeeds, the momentum will have been created for the (Avenue of the) Americanization of the theater district, and the future of the area will be large-scale office building development. Most of the movie theaters on the avenues will disappear, and a number of legitimate theaters will unquestionably be threatened by new development.

Since the city really has no plan to deal with the "street people"—the alcoholics, drifters, prostitutes, sidewalk drug sellers—aside from driving them out ("scattering them... and then we hump them out," said William J. Stern, chairman of the city's in "A New York Times article," the result may be that nearby parts of the Times Square area become less safe and more blighted, further threatening the healthy existing businesses. This situation in return requires more large-scale, government-sponsored development to disperse the undesirable element further.

Clearly, many of the problems of the Times Square scheme are unique—the extraordinary concentration of theaters, for example, simply does not exist anywhere else—but many of its troubling aspects are indicative of the new-wave" urban renewal. Are the private developers furthering the city's urban renewal aims or just profiting from a kind of super-gentrification? Is the city abrogating its obligation to its citizens when it relaxes zoning regulations, or is it simply responding to the fiscal reality of "supply-side" urban renewal? These are the questions that must be asked throughout the development of the project, as it may become a model for urban redevelopment elsewhere in the country.

The TDC feels that its goals of renovating theaters, eliminating blight, and restoring the subway concourse are met, the project can be considered a success. But is the project a success if the cost is the energy and unique qualities of Times Square? The responsibility of both architects and urban designers to include gracefully the incompatible but moneymaking elements into the scheme demonstrates yet again that, despite promises of politicians and experts, there is no such thing as a free lunch.

Just as this article was about to go to press, a final 1,100-page environmental impact statement was released by the TDC. Although the report did single out several characteristics of the proposed Times Square redevelopment scheme—namely, increased run-off on and subways and buses, deep shadows resulting from the tall office buildings, and growing economic pressures on the adjoining Clinton neighborhood—the report listed ways to mitigate these factors. The impact statement also recommended that the former Times Tower "be substantially modified or replaced.... In other recent developments the TDC announced that Cambridge Investment Group, Ltd. has been conditionally designated to convert the Lyric and Belasco theaters to legitimate use and to purchase the already-renovated Apollo. The Times Square and Empire theaters will be converted to retail and restaurant use. The Nederlanders Organization has been conditionally named to convert the Harris to legitimate use..." Ed.
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Adding on, fitting in

In the new campus climate of competition for a dwindling pool of potential students, with schools short of the peak of the academic pyramid advertising and the best-qualified students shopping, colleges are moving from a period of unquestioning expansion to one of consolidation and a perhaps belated concern for the quality—real and perceived—of student life. Often, this concern takes the form of added physical amenities: more and more livable housing, a student union, new recreational facilities. But it is also being expressed in the recognition that quality of life encompasses not only activities but ambience as well: the serenely beautiful campus world that colleges portray on the covers of recruiting brochures—ivy-decked Old Main cresting a green-swathed rise resplendent with flaming foliage kindled by a brilliant autumn sun. (Somehow, save on their opening, recent buildings are seldom depicted.)

Like towns and cities, colleges are coming to know that the once prevailing attitude of “if it’s old, tear it down” is itself an outworn (as well as wasteful) conceit. The issue, however, is not new versus old, but new growth springing from old roots. The budding may be literal: witness the increasing tendency to provide needed space incrementally, by adding to existing buildings. Or it may take the form of a graft: a new entity that enriches the established campus organism while drawing on its strength. In either case, the theme is continuity and harmony between old and new, and the goal an integrity of place that delights both eye and spirit.

With this view abroad among colleges, it is perhaps not surprising that the architects chosen for the campus projects shown here share a deep and informed attachment for the milieus in which they worked. The student housing complex Hugh Newell Jacobsen designed for Georgetown University lies in the heart of the neighborhood where he has lived and practiced for many years. Lo-Yi Chan of Prentice & Chan, Ohlhausen, whose addition to an elderly Dartmouth classroom building transforms it to an interdisciplinary academic center, grew up in Hanover, completed his undergraduate studies at Dartmouth, and is now engaged in the college’s master planning. As a young architect, Cabell Childress, author of the new dance building at the University of Colorado, participated in the university’s 1960s wave of campus expansion and took the occasion to probe its every cranny: It is still, he asserts, the most beautiful of some 65 campuses he has explored.

Nor is it surprising that each of the architects characterizes his as a “background building” that strives not only to achieve compatibility with older structures but to partake of their essence and quietly reinterpret their form and detail. To Chan this meant “valuing the status quo while changing it.” To Childress, “honoring without imitating.” And Jacobsen sums up: “Architects no longer have to make a ‘bold, original statement’ every time out.” Margaret Gaskie
On white nights, says architect Hugh Jacobsen, he doesn’t count sheep. “I stroll the streets of Georgetown and count the buildings I’ve worked on—a kitchen here, a bathroom there. . . . I hardly ever get all the way to 90.” Jacobsen has also done his share of day-walking on Georgetown’s streets in the years he has lived and worked in this chic but cozy village within the city of Washington, D. C., absorbing the quaint charm of its vintage buildings with the astuteness of the trained observer as well as the fond casualness of the frequent passerby.

So it was as a knowledgeable and neighborhood-proud village dweller that he approached his first major commission in Georgetown, the 360-student “Village B” housing complex for Georgetown University. Because the site, a full half-block between N and O streets at 37th Street, was inescapably prominent, Jacobsen’s first concern was to avoid obtrusive institutionality by suiting the project in scale and spirit to the mostly small residences on the streets surrounding it. And what better image to project in a neighborhood of richly and variously detailed town houses than that of the town house?

The unwonted (and unwanted) mass of the complex accordingly is broken into three major elements (site plan page 151), a block-long structure on 37th Street and smaller buildings on the intersecting streets, arranged in a U-shape around a spacious park that is a private preserve for residents of the complex—and a preserver of privacy for residents of homes nearby. The blocks in turn are divided into house-size units that not only conform to the prevailing streetscape but also recall the “stair-entry” plan of early dormitories and answer the university’s request that units be readily convertible to private housing.

The expression of the large dormitories as small town houses was abetted by a steeply sloping site that drops 22 feet along the street from north to south, lending itself naturally to a broken roofline whose steps define individual units. By inserting English basements, Jacobsen was also able to provide four living floors within an apparent building height of only three stories. The same trick was played with a shallower slope at the north end of the site, where three-story units seemingly diminish to the two-story height of the house immediately adjacent.

The three-story-plus-basement dormitory on the south does not defer in height to the two-story row houses next door, but instead presents itself as a larger, similarly proportioned version of the block. The row houses exemplify the low-scale Italianate style that burst on Georgetown just before the Civil War and continued in vogue well into the 1880s, and it was this motif (with Federal undertones) that Jacobsen adapted to kindle the dormitories’ otherwise plain-Jane brick facades.

Properly slender parlor-floor windows shorten as they rise to an overscale cornice fashioned (at considerable savings over wood) from vacuum-formed fiberglass in a creamy ivory that repeats the window trim. In true Georgetown fashion, welcoming stoops approach entrance doors that, though glazed for security, boast slim-paned frames painted alternately in hunter green, burgundy, and navy to lend the houses a touch of identity. Stair railings of charcoal-green wrought iron link with areaway fences in a typically Washingtonian pattern traced from an original rescued from a junkyard. Lintels over doors and windows, precast in concrete rosy-dyed to mimic sandstone, are embellished respectively with entwined GUs and bullseyes. (Not even the copper scupper boxes are neglected, but embossed with discreet GUs.)

For all his painstaking pleasure in facade detail, however, Jacobsen forgoes restraint only at the buildings’ ends, which erupt in an Italianate fantasy of ornate oriel s (pages 152-153) that yet serve the practical purpose of bringing light and elbow room to enclosed stairs. Nor are the lacy pendants simply playful adaptations but addenda to Jacobsen’s ongoing “exercises in abstraction”; as in much of his work it is the knowing manipulation of scale that gives the game away.

Jacobsen’s intent was to endow his hometown with a soft-spoken “background building” that would complement its more picturesque predecessors. He has done much more—and done the neighbors proud.
The U-shaped dormitory complex encloses a broad swath of tree-dotted lawn that serves as a private outdoor commons intended to foster a sense of community among the residents of the individual town houses. Graded level, the park adjusts to the steep slope of the site with a tightly planted berm that falls abruptly to a terrace behind the south dormitory building. (Pedestrians negotiate the drop via a demi-monumental brick stair.) Behind the embellishes of newly planted trees that rim the green, the courtyard facades of the town house dorms replicate the faces they turn to the street. But the shift from townscape to the “country” scene implied by the commons renders the buildings curiously ambiguous in scale, requiring for a correct reading the presence of people—or perhaps a bicycle casually propped against a typical Washington lamppost.
The town house units at the end of each dormitory block are embellished with airy orielas (photos below and opposite) that bring light—and delight—to enclosed entry stairs. Because the university wanted to hedge its bet by making the town houses readily convertible to private apartments should they no longer be needed to house students, the living spaces within offer a degree of privacy and amenity unusual for college housing. The two four-student apartments on each floor of the units are floor-through flats (typical plan at bottom) that comprise two small bedrooms with built-in bunks and desks, a well-equipped kitchen, and generous living-dining-study space. Interiors and furnishings, designed by Jacobsen, feature upholstered pieces in the school colors of gray and blue, and king-size study-dining tables.

Village B Student Housing
Georgetown University
Washington, D.C.

Owner: Georgetown University
Architect: Hugh Newell Jacobsen, Architect—Charles P. Parker, project architect
Engineers: Alfred H. Kroas (structural); Carter Engineering, Inc. (mechanical/electrical)
Feeling the spirit

That the University of Colorado has largely evaded the “look at me” excesses of latter-day collegiate expansion reflects the mixed blessing of Colorado’s home-grown architectural conservatism and its jealous guardianship of its premier institution. When in the mid ’80s the university announced a long-studied, long-range development plan, the state senate, vigilant against reckless avant-gardism (and prodded by the local press), promptly passed a resolution “to condemn any change in the present Italian Renaissance style [sic] on the Boulder campus.”

This “if it ain’t broke don’t fix it” conservatism, happily, has been ameliorated by administrative stewards who have, on the whole, followed the better-lead path of conservatorship, accepting—even welcoming—change but insisting that it be evolutionary rather than revolutionary. The school has, since 1919, built from guidelines then set by architect Charles Z. Klauder of the Philadelphia firm Day & Klauder, who established a design structure so strong it has held through occasional times of drift and today remains the campus core.

Klauder’s legacy to the University of Colorado is a picturesque enclave nestled high on a mesa hard against the abruptly rising foothills of the Rockies. Red-tile roofs—hips and gables and “book-end” half-gables crowned by dove-cote chimneys and here and there a tower—rest on robust walls laid up with thick slabs of shered native sandstone in an earthy spectrum from pale gold almost to purple. Cut-stone details elaborate the focal points of imaginatively massed but always symmetrical buildings abounding in arcades and loggias.

Klauder’s freely adapted “Architecture of Rural Italy” was realized in only 13 projects completed before his death, but nonetheless left a stylistic imprint that still embodies the spirit of the university. So too his master plan, although it encompassed but a corner of today’s sprawling campus and key parts of the scheme were never built.

Confronted with a grab-bag of styles, Klauder made them the genesis of a focal mall to be framed by continuous buildings and intersected by a cross axis. On the periphery, buildings were closely set around above-like courts to create the casual network of intimate sub-spaces that now lends the old campus the piquancy of contrasting enclosures and changing vistas.

It was in the yet-unfinished Old Mall, the campus “historic district” (the major buildings there in 1919 are still there), that architect Cabell Childress was asked to place a new building to house the university’s dance department. A challenge to any architect sensitive to context, the dance building is an addition to an inexplicably Prairie Style 1928 addition to a vaguely Romanesque 1902 library, now a theater. The Guggenheim building adjoining the site is vaguely Classical. Across the mall sits the original (c. 1876) college building, Old Main, a red-brick pil of Victorian jiggery-pokery. The imposing Collegiate Gothic of Macky Auditorium (c. 1907) marks the nearby cross axis, while the mall closes with Klauder’s splendid 1940 library.

For Childress, an unabashed admirer of Klauder’s work, the task of blending the dance building into this contextual medley was enhanced by his hope of bringing to the uncompleted mall something of the original vision, “honoring Klauder without imitation.” The contiguity of the building with the theater complex contributed to the missing closure, but Childress went further, also linking the adjacent building via a vintage Klauder portal. In addition, though the four-square plan discouraged articulation, he wrapped the rear corner of the building in a shallow two-story ell that defines a secondary courtyard.

Resisting split sandstone, Childress turned instead to the gray-brick of the immediate neighbors, facing the mall with a rectilinear slab animated only by a Klauderian sunken base court, subtle masonry detail, and an off-center trio of arches—a portico oversized to match the old library’s grand entry and smaller stone-inlaid arches that paraphrase its windows. At the roofline the dance building is tied to its predecessors by a mediating cornice, while Klauder is echoed in its restilted roof and the increasing vivacity of its off-mall facades.
As the dance building rounds the corner through the linking portal (bottom photo) its sober mien is livened by a strip of limestone-trimmed vertical windows that interrupt the corbeled frieze, a more emphatic strip above the belt course, and a tall arched window on the face of the ell. Finally, at the rear facade, where the molder of the Old Main gives way to a court ringed by neo-Tuscan buildings, Childress’s fondness for the style breaks through—though still tightly reined. In addition to the articulated ell and the layered roofs, the facade sports under-the-eaves windows and two entries. One replays (as does the portal on the quad) a recurring Klauder detail: top-heavy limestone arches overlapping slim surrounds. The crowning touch is a skylight topped by the tile-gabled cap of a mock “dome-cote chimney.”

Dance Building
University of Colorado
Denver, Colorado

Owner:
University of Colorado

Architects:
Cabell Childress Architects—Cabell Childress, principal-in-charge; Ida Vorum, project architect; Jane Marshall Smith, David Solomon, Anna Rodenwald, project team

Engineers:
Anderson and Hastings (structural); McFall, Konkel and Kimball (mechanical); Garland B. Cox and Associates (electrical); David L. Adams Associates (acoustics); Chen and Associates (soils)

General contractor:
Roberts Construction Company
Although the program (and budget) made no allowance for such a space, Childress was able to insert a small but lively lobby between the dance building and the adjoining structure, connecting the upper floors of each with balcony bridges and leaving the mellow gray-gold brick face of the 1928 building exposed (right in photo below). Biecting the lobby are elaborated columns on chunky, bright-painted pedestals that support a balcony surmounted by a sweeping arch. In one of the tiny space's most charming surprises, the wall of the new building meets the ceiling in a half-vault that suddenly (and impossibly) reverses itself over the entrance to follow the curve of the fanlight. The principal ground-floor space, a vast studio in constant use for teaching and practice, can also be used to seat an audience of 150 for performances, leaving the dancers a theater-size 45-by-45-foot "stage." The studio is rigged for theater lighting and drops, and is overlooked by an observation mezzanine and control booth. The third floor houses a large ballet studio lit by a skylight and high strip windows (photo below), and smaller studios for advanced classes. The floor below grade is given over to costume shops and utilities.
"For almost 50 years," says architect Lo-Yi Chan, "Silsby Hall sat facing North Main Street like an armchair with one missing arm," despite clear evidence of its architect's intention of completing the building as a symmetrical H-shaped form fronting on the street. So when Prentice & Chan, Olhausen were commissioned to develop the Nelson A. Rockefeller Social Sciences Center by integrating new classrooms, faculty offices, and gathering places with the existing facilities in Silsby Hall, adding and extending the 1927 neo-Georgian building's missing wing seemed a self-evident solution. Meanwhile, Chan's researches into the campus archives had unearthed a 1922 John Russell Pope campus plan that proposed two pedestrian malls running parallel to the Dartmouth Green. Both had since become choked by cars and parking, but the expansion of Silsby Hall held promise of steering the west mall, which traces a beeline from a cluster of dormitories and fraternity houses to the dining commons, back toward pedestrian use.

The massing of the Rockefeller addition thus devolved to a new north wing whose east end "completes" Silsby and whose west end stretches to encompass a courtyard and formal portico that introduce the restored mall. The question of style, however, was more problematic. "Any new structure at Dartmouth" Chan believes, "should be part of a much larger fabric woven over 200 years. I wanted to be part of the past, yet point to the future. This 'both-and' approach," he adds, "is a major shift from the 'either-or' of modern architecture." Indeed it is.

And it was only after much soul-searching that the firm decided the east end of the addition to Silsby Hall should not merely be compatible with the red-brick neo-Georgian of the original building but should replicate it—brick for brick, false chimney for false chimney (photo left). (The only changes are "improvements": slightly narrower—and so more authentic—double-hung windows, a proper ground-hugging base precluded in the original by the need for cellar windows, a lighter brick to age to a matching patina.)

"As little as five years ago," Chan confesses, "we wouldn't even have thought of replication." Nor, it seems probable, would the designers have tolerated the ambiguities that mark the north façade as it moves from Georgian to contemporary—and back again. Although the basic shape of Rockefeller Hall follows the low, rectangular, base-raft-roof configuration common to Dartmouth's older buildings, variations were dictated by the stretched-out profile resulting from the addition of a ceremonial portico at the mall (and the consequent location of the main building entry within its embrace) and by a program that called for placement of major gathering and teaching spaces on the lower floors, with smaller offices, lounges, and seminar rooms on the upper floors.

To accommodate the programmed spatial requirements within the traditional three-story building height, the principal classrooms—large-group lecture halls and a teaching auditorium—were placed below grade and the administrative area above was pulled out from the building face to form a low ground-level extension. Accented by a negative-pedimented secondary entrance on the east and the curved wall of an inner lounge on the west, the extension moderates the over-long building profile and softens the awkward relationship between Rockefeller Hall and the angled street it fronts on. It also mediates, while emphasizing, the shift from a load-bearing structure at the building's ends to the post-and-beam of its central portion.

Because a primary goal of the center was to physically concentrate, and encourage cross-fertilization among, the academic disciplines within its purview, the heart of the plan is the Forum, a skylit vertical atrium that turns a tight corner connecting Rockefeller to Silsby Hall, forming a major study, lounge, and assembly area. Host to an astonishing number and variety of programs in its first year, the Forum mirrors in its success that of the complex as a whole. "It is a literally attractive building," says Center director Frank Smallwood. "People who are first drawn by its vitality also find it comfortably familiar—as if it had always been here."
The varied fenestration of the north facade of Rockefeller Hall (below) reflects and reinforces the modulation from neo-Georgian at the building ends to contemporary at the center. In traditional fashion the windows throughout diminish in size as they rise from base to upper stories, but in the central portion of the facade they also evidence the transition from the only partially defined bay structure on the top floor to the full ribbon glazing of the second floor and the clear post-and-lintel framing of the extended ground floor, where window strips are punctuated by engaged brick columns. The return to load-bearing construction at the portal is signaled by a massive brick wall complete with mock quoins. Here, top-floor windows are again a free adaptation from the Georgian—but expressed horizontally.
The west end of the grand portico introducing the social sciences center courtyard and the embryonic pedestrian mall beyond borrows its trio of double-hung twelve-over-twelves and the Palladian attic light directly from the front facade of old Slaby hall (and the identical new ell), the arches from nearby dorms. Turning the corners, however, it adopts the new architectural order, becoming a bluntly squared-off...
gateway crowned by vaguely Oriental snow-catchers embellished with metal scrolls that culminate in twinned R's (for Rockefeller, what else?). Under the portal the bow that softens the north facade reemerges in the entry porch and stairs (which extend to form benches in the courtyard) and continues in a double curve along the south face of the wing. The glazing of this curved window wall repeats the small-paned windows of Sibley and, like the other side of the widened building base, is colonnaded with almost freestanding brick-faced columns capped by an "entablature" with architrave, frieze, and cornice suggested by raised brick bands and vertically laid courses. Similar masonry details accent the lintels of upper windows and the portal.
The outward curving south wall of Rockefeller Hall not only smooths the transition to Sillby, which it slips into by way of a full-height window, but creates a top-lit well that permits the stair to classrooms below to slide unobtrusively past the L-shaped three-story atrium (photos opposite). In addition to providing an assembly and lounge/study space, the central Forum is the link to upper floors in Rockefeller Hall and, via balconies, to Sillby as well. The juncture with Sillby is undisguised, and windows in the original exterior wall join the balconies as overflow vantage points for activities in the hall. Apart from the Forum, major ground-floor spaces include Morrison Commons (below left), an informal meeting room and coffee lounge whose elliptical form figures prominently in the building’s north facade, and the larger, more formal "Class of '30" seminar room (below right). On the lower-level classroom floor, paired 75-seat lecture halls (bottom right) are steeply raked and horseshoe-shaped for maximum interaction. The third teaching space is a more conventional 125-seat auditorium (bottom left).
The Nelson A. Rockefeller Center for the Social Sciences
Dartmouth College
Hanover, New Hampshire
Owner:
Dartmouth College
Architects:
Prentice & Chan, Ohilhausen—Lo-Yi Chan, partner-in-charge; Andrew Goldman, associate; Cluere Peterson, interior designer

Landscape architects:
Peter Rolland & Associates

Engineers:
Robert Silman Associates
(structural); Dufresne-Henry, Inc.
(mechanical)

General contractor:
Trumbull-Nelson Construction Co.
The new MOMA

Expansion and renovation of The Museum of Modern Art
New York City
Cesar Pelli & Associates, Architects
The verdict is in. A sample of reactions from typical MOMA fans to the expansion and renovation of their favorite museum goes something like this: "I know it's bigger, but it seems the same, yet somehow improved. And the garden is still there, as lovely as ever. It's wonderful to study the sculpture as you move up and down the escalators in the new glass hall. I think the other end of the garden is a better place for the cafeteria and it was a good idea to bring the members' dining room down from the penthouse and put it in the garden too. Also, I'm glad they kept the old International Style front. It always meant MOMA to me. The tower? Oh yes the tower. I don't notice it." Asked for general comments on the new building, comes the answer: "What new building?"

This public response to his years of extremely complex architectural work on the museum pleases MOMA's latest architect Cesar Pelli very much. The attitude of some of his fellow professionals, however, baffles him. "Every architect," says Pelli, "is trained to expect a new building to make a statement. In the case of MOMA it seemed best to disregard this rule. We decided that the new additions would very purposefully play a background role to the 1939 building designed by Philip L. Goodwin and Edward D. Stone. Architects understand that, they appreciate that, but then they say 'your building doesn't really have enough pizzazz.' But if it did, how could it be a background building?"

At the beginning of the design process, not everyone favored the preservation of the Goodwin/Stone facade, approved the background building concept or agreed with Pelli's positioning of the tower. "Not everyone" was a group of four distinguished New York architects, each disqualified to be the new MOMA's architect because he had already been named a MOMA trustee. Thus benched, presumably against their wills, Edward L. Barnes, Gordon Bunshaft, Philip Johnson and the late Wallace K. Harrison were expected as trustees to review Pelli's work. Because for the first time the museum was to be revamped completely, the four architects urged Pelli to consider giving MOMA a new, unified image and particularly a unified facade on West 53rd Street. What was taking place inside, they argued, should be expressed on the outside. Pelli, however, considered the Goodwin/Stone building and its additions—three wings and the Abby Aldrich Rockefeller Sculpture Garden by Johnson, all done in a late Miesian style, and the former Whitney, also Miesian and designed by Auguste Noel, to be an architecturally and historically significant collection of buildings. Pelli's design called for the destruction of Johnson's narrow west wing to make way for the tower and the extension to the west. It included the transformation of his garden wing into a restaurant block. The other buildings were to be kept, their facades intact, and the garden was to be encroached upon as little as possible.

The tower was controversial from the beginning. MOMA had to go to court to win the right to build it, arguing that the museum could not serve its ever-growing public, display its increasing collections and continue to maintain itself without the monies such a use of its air rights would produce. Many New Yorkers continue to believe that it is wrong to build any kind of skyscraper in mid-block on a narrow crossstreet town. Trustee Barnes, who shares this view, argued that the former Whitney should have been torn down and the tower placed on its site. The tower would have been as wide as the Whitney and could have formed a direct symmetrical relationship with the garden.

Pelli believed, however, that the tower thus positioned would have overwhelmed the garden and, additionally, destroyed the scale of West 54th Street which it would have abutted. Long before the MOMA tower was considered, he points out, West 53rd Street had lost its residential scale. CBS and ABC had built their office towers, Tishman's 666 was in place and St. Thomas's Church and the Donnell Library could not pass for town houses. If a tower must loom, urged Pelli, it should do so on West 53rd Street, where the institutional buildings were, and not on
West 54th which still has a row of lovely town houses and is one of the more beautiful streets in New York.

As it turned out three other trustees, Blanchette Rockefeller, David Rockefeller and William Paley backed Pelli’s scheme, tower placement and all, thereby ending the discussion. They made a good decision. It was economical to conserve what had already been built, proper to oppose the concept of a unified facade, judicious to respect the importance of landmarks of our recent past, wise to preserve precious air space and light above the MOMA garden and correct to put the tower in the corner where it belonged.

The principal new construction comprises the tower, the new west wing which forms and extends beyond the tower base, the new glass-enclosed circulation spine at the conjunction of the Goodwin/Stone building and the garden known as the Garden Hall and the new restaurants. “In everything we did,” says Pelli, “we tried to achieve an architectural relationship with the portions of the museum that were to remain. These elements are important prior examples of Modernism, part of that stream and tradition. We hope we have designed a building that intertwines in a very harmonious and civilized way with the rest.

We not only interweave the forms, but also the underlying principles and attitudes that exist in the earlier work. As you look about at what remains of the old MOMA you will see pieces that are Bauhaus-like and others that look like the Dutch and Scandinavian architecture of the ‘20s and ‘30s. If you take away all the ideology and just look at the formal characteristics of the work of the pioneers of the Modern Movement, you will see that they are responding to very well-defined artistic impulses—those that are behind the paintings of Mondrian, Picasso and Jackson Pollock as well as behind the buildings of Goodwin/Stone and Philip Johnson. Those impulses are everywhere in the architecture of the museum and very much alive.”

Pelli, however, made no attempt to directly historicize. In other words he did not make specific quotes from the work of the pioneer Modernists nor from Goodwin/Stone and Philip Johnson. He points out: “I personally don’t like to do that. When you start making purposeful quotes, you get taken by them and the desire to be authentic to the quotes becomes overwhelming. And I think that this has done great damage to the work of some very well-known architects. I think really good architecture never quotes explicitly. You may see in the work of Michelangelo the whole Renaissance tradition. You can see Brunelleschi in it, but never as an explicit use of Brunelleschi. The ideas are in the air. They become part of the clay you have in your hands. But once I realize I am doing something that looks like something else, I usually abandon it, or put it aside, because then I am not myself and I must be completely responsible for what I do. I cannot shed off some of my responsibility and say that this was Schinkel’s fault because he did it first. Furthermore, you cease to work properly as an artist should.

You start to work like an archaeologist. Occasionally you may take a fragment and give it a place, but it should be somebody else’s fragment. And it should be separable, detachable.”

In using what were essentially the fragments of the existing MOMA, Pelli kept them distinct and discrete. One exception, however, was the garden facade of Johnson’s east wing. The facade itself is intact, but Pelli extended the ground-floor bays with their almost black windows and dark steel frames to form a new arcade leading to the restaurant wing, continuing them to enclose the first-floor cafeteria. This fenestration is a literal copy based upon Johnson’s original working drawings for the east wing. The new enclosure thus formed of the eastern end of the sculpture garden is beautifully handled. It was never quite right before.

Pelli’s interior spaces are purposefully neutral in the tradition of MOMA. They were constructed on a tight budget and lack the refinement of detail to be found in such museums as Hans Hollein’s at Mönchengladbach, for example. MOMA’s director, Richard E. Oldenburg points out that there was little money to spare: “Obviously we wanted to control costs as much as we could to enable us to increase the endowment necessary to support a museum now twice its size. The extension and renovation grew out of the fact that we needed space desperately, but we also needed to figure out how to support that space once we had it and to keep adding to our collections. The realities were there from the beginning. We didn’t want to start with something very grand, have panic set in and start cutting everything out. We did very little that we hadn’t planned from the beginning. We left out what didn’t seem practical. But on the other hand, the museum long ago had made a virtue out of the vice of being poor. The museum’s style is a very simple style—it would look very odd in the MOMA context if we had used complicated moldings and lighting effects, or if expensive materials were introduced. If we could have afforded it we would have loved to have hidden the air ducts, but parenthetically, I also hear that some of the hidden systems have their problems. Everybody would like to have had less cluttered ceilings in the galleries. But the lighting is the kind of lighting we are satisfied with. I think we made an aesthetic out of cheap. Our galleries are minimally detailed. Almost loft construction. Even our special places, the members’ dining room and the theater, for example, are elegant without being luxurious. I also think there is a certain honest value to this even if it wasn’t a necessity. I think for an institution that always has to struggle to survive and gets assistance from the public sector and is always hat in hand to contributors and members it would be uneconomically to spend huge amounts on things that are not strictly necessary. So I am happy with the level of finish.”

The controversial tower presented a different set of problems. In designing it, Pelli had two objectives which were contradictory. First, he wanted to put it in the background so that it couldn’t be seen. Second, he wanted it to be very beautiful and sophisticated. His responsibility included its placement and curtain wall, in other words, its exterior appearance. (The interior configurations and the structural and mechanical aspects of the tower were handled by Edward Durell Stone Associates.) Developing the curtain wall was a slow, deliberate and intense process. Said Pelli: “I personally spent hundreds and hundreds of hours analyzing slightly different shades of color.” At the beginning Pelli and his team tried much brighter colors than they were to eventually use, particularly on the west wing at the base of the tower. In that early stage they thought that bright colors would make for a more interesting building and a livelier street. They found, however, that the Goodwin/Stone facade could not stand up to it. The International Style facade turned out to be not as strong as they thought. They found that to make it stand out, a receding background was required. Old photographs showed how it had popped out against its brownstone neighbors and it could be seen before the west wing was demolished, that Johnson’s two black additions, one on each side of the emblematic facade, made an effective frame. So Pelli moved to dark brown glass for the base and desaturated the colors in the tower. The glass facade of the Goodwin/Stone building was a dirty greenish color. According to Arthur Drexler, Goodwin/Stone’s original glass installation had been stained in shade, but it had started to mildew, and was replaced by the green etched glass. Pelli installed bright new glass matching Goodwin/Stone’s original color.

Architecture is sometimes the most exacting task of putting such things right. It is also the demanding challenge of making major interventions that don’t show. Both approaches were what MOMA needed and it chose its architect well. Pelli understands this kind of architecture—profoundly. Mildred F. Schmerz
When Pelli began work, MOMA consisted in part of a collection of buildings which could be read as separate entities, but taken together with the sculpture garden were intended to form a late Mingian ensemble—a context in which the early International Style Goodwin/Stone building was treated as a focal point. The orchestration was Philip Johnson's. He designed the two dark wings to the east and west of the Goodwin/Stone facade, an earlier and later version of the garden (both constructed) and a one-story garden wing at the east end. The former Whitney Museum, known as the north wing, was also in the Mingian mode. MOMA additionally owned and used a splendid 53rd Street townhouse of 1902-3 designed by Richard and Joseph Hunt and several adjoining townhouses. As the model photograph (opposite page left) showing the new 53rd Street facade indicates, the Beaux Arts townhouse and its lesser neighbors to the west were demolished (great public outcry). Johnson's west wing hit the dust too (no discernible outcry). But Pelli's decision to bracket the light and bright Goodwin/Stone facade with dark, shadowy surfaces seems as correct today as when Johnson did it first. The proportions of Johnson's remaining 53rd Street facade did not elaborate upon the module of the Goodwin/Stone front, but Pelli's do. The fenestration geometry of the tower and its base is derived from the International Style front. MOMA's new space has been captured beneath the tower and in the new west wing which extends beyond it. Apart from the tower, the garden side of MOMA (opposite page right) appears open and airy.
Discounting the former high terrace at the east end, the length (east-west axis) of MOMA’s garden remains unaltered, its width at the western end is 18 feet less, space sacrificed to the Garden Hall. The café at the west end has been replaced by a lobby for group reception, the bulky, awkward fire tower at the conjunction of the Goodwin/Stone building and Johnson’s east wing no longer exists and the former terrace has become the members’ restaurant. The pools, bridges, sloping berms and plantings of the garden have been restored in essence to Johnson’s beautiful 1964 design, a modification of his first landscape plan of 1953. Sculpture, however, has been rearranged and some additional pieces have been added. At present, the new placements and juxtapositions will need some curatorial pruning and rearranging if the garden is to become as elegant as before.

Cesar Pelli’s Garden Hall connects the Goodwin/Stone building and the garden. It is Pelli’s single bravura performance for MOMA, the only element among his additions and infill not relegated by him to a supporting role. If the Goodwin/Stone International Style facade, like Les Demoiselles d’Avignon, is an unforgettable emblem of MOMA, the Garden Hall brilliantly signifies MOMA’s renewal and second beginning. Arthur Drexler, MOMA’s director of the department of architecture and design, can’t wait until winter. “I think there is a bonus coming. I hope we have one heavy snowfall. The garden in snow is very beautiful and I want to ride up and down in the escalator seeing it in new ways. It should be simply marvelous.”

Four stories high with two setbacks on the vertical plane and four on the horizontal (sections preceding page), the Garden Hall (exterior above, interior opposite) has been made as narrow as possible to minimize its encroachment on the garden. The apartment tower rises 44 stories above the new west wing at the intersection of the Goodwin/Stone building and the old Whitney. The cascading greenhouse ameliorates the bulk of the tower and prepares the eye for its vertical thrust. The glass proportions of the Garden Hall and the tower relate to a common dimension, derived from the glass grid of the Goodwin/Stone facade. The museum expansion permits gallery layouts to be more spacious where appropriate, as in the galleries devoted to large Abstract Expressionist works (next two pages).
Considering the unparalleled eminence of MOMA's architecture and design collections, and the worldwide stature of its exhibitions and publications, it is a surprise to discover that Arthur Drexler's new exhibition space is only 6,500 square feet, up from 1,700. (Total permanent gallery space is now 67,000 square feet, temporary gallery space, 20,000.)

"It would be churlish to complain," says he. "I don't begrudge the space the others got. Besides, there is no place in this museum where we could show all we have of anything. The purpose of the enlargement of the museum is to have key works always on view."

When Drexler and his fellow department heads made preliminary space allocation studies, they agreed that painting and sculpture from the permanent collection should be exhibited with historic continuity. Other departments, and the would not be permitted to interrupt this sequence. Drexler's department was precluded from being located on the second or third floor. In the end he found the fourth floor to be the best place, "not big enough, but three times more than we used to have." Importantly, the first floor galleries for temporary shows will generously accommodate major architectural exhibitions.

Architecture and design has the fourth floor exhibition space to itself. "Moreover," says Drexler, "we have a double height space just beyond the top of our escalator to give people the sense that there is something exciting up there. And it is good for big posters. Furthermore, because we were at the end of the escalator line, I used the space above to hang the helicopter!"
The fragmentary view (opposite) of the West 54th Street town houses as seen from across the terrace of the members’ restaurant, merely suggests the vistas of the city that MOMA’s rebuilding celebrates. Mammoth sculptures, which seemed too big for the Miesian garden below, were to be exhibited at the terrace level. Although it is a pity that now there is no special setting for the truly huge pieces, which presently are intermixed with smaller works to the detriment of some, the former terrace always seemed isolated, not quite in the garden, not really a place to go. At one time MOMA considered adding seven stories of gallery space to this wing; a solution for their expansion problem that would have greatly reduced the sense of spaciousness in the garden, while literally constricting it. Furthermore, the floor areas would have been too small for exhibition purposes.

Architect Cesar Pelli’s decision to consolidate MOMA’s dining facilities in this wing by adding only one story was manifestly correct, esthetically and functionally. The sculpture garden, at last, is beautifully enclosed at its eastern end by a pavilion of the right scale. The members’ dining room, formerly a remote and neglected inhabitant of the top floor of the Goodwin/Stone building, is now just off the garden in the midst of the excitement. Pelli’s handling of the former garden wing is characteristic of his entire approach to the problem of renewing MOMA. He has succeeded in the exacting architectural task of making subtle, yet momentous changes. He has added to, adjusted and repositioned MOMA functions in ways that have protected and superbly enhanced qualities that were already there.

The members’ dining room (top) overlooks a terrace (opposite) and faces the sculpture garden. It is located directly above the public cafeteria visible behind a glass block screen (above). This restaurant also faces the garden. The members’ dining room evokes early Modernist themes—a bit of Charles Mackintosh and something of the Viennese Secessionists—although Pelli insists that this was not deliberate.

The Museum of Modern Art
Gallery Expansion
New York City

Architects:
Cesar Pelli & Associates (design)—Fred Clarke, Diana Balmori, Thomas Morton, designers; Gruen Associates, P.C.—Richard Weinstein (early planning concept and coordination)

Museum tower
Architects:
Cesar Pelli & Associates (design)—Fred Clarke, Diana Balmori, Thomas Morton, designers; Edeard Durell Stone Associates, P.C.; Gruen Associates, P.C. (collaboration in earlier tower design); Llewelyn-Davies Associates, P.C./Jacquelin Robertson (collaborator in earlier tower design); Richard Weinstein (early planning concept and coordination)

Engineers:
Robert Rosenweiss Associates (structural); Cosentini Associates (mechanical)

Consultants:
Zion & Zion (landscape); Donald Bliss (lighting); Will Szabo, Irv Roemer (audio-visual); Judith Stockman Associates (restaurant design); George Lang Corporation (restaurant program); Cerami & Associates (acoustics); Carl Heimberger, Rolf Jenaen & associates Inc. (building codes)

General contractor:
Turner Construction

Whatever its provenance, it is a lovely room, one of the handsomest restaurants in New York City. The prospect of eating there should entice many a non-attached MOMA visitor to sign up and join the family.
Playing by the rules
Social calamity struck Fort Worth in 1981 when the River Crest Country Club burned to the ground. The 70-year-old clubhouse had been a gathering place for prominent local families since their great-grandfathers first trod the fairways and staked claim to mansions in the surrounding uplands. To the present inhabitants of these elegant purlieu of life, without River Crest was as unthinkable as Texas without oil or a debutante unwilling to curtsey. "Why can't we just rebuild River Crest as it was?" some 1,100 members lamented in unison to a specially appointed building committee. Nostalgia aside, there was little sense in resurrecting what had in reality been an architectural hodgepodge, awkwardly laid out and very cramped. The clubhouse erected in 1911 was a handsome Craftsman Style timber lodge, whose sturdy simplicity disappeared over time amidst a jumble of ad hoc remodelings. By the mid-1950s, this overgrown bungalow had been totally reclad in the anemic brick-and-white-columns neo-Georgian favored by funeral parlors and genteel motels (photo opposite top). According to a questionnaire filled out by club families after the fire, most remembered River Crest as "colonial," and this was the style they hoped would rise from the ashes beyond the 18th hole. Though many of those consulted could not explain precisely what "colonial" meant, they knew for sure that anything "modern" was anathema.

In its quest for a suitable architect, the building committee was honor-bound to respect these sentiments. "We felt that many firms could design a clubhouse our members would be able to live with comfortably," reports R. W. Moncrief, the committee chairman. "But we wanted something more than just a place to take off your golf shoes and have a drink. We wanted a building that would give people here the same sense of pride they feel about Louis Kahn's Kimbell Museum." The committee was particularly taken with the recent accomplishments of Philip Johnson (architect of another Fort Worth museum, the Amon Carter). Johnson volunteered his own ideas about appropriate variants on Georgian domestic style but declined the commission, pleading an already full agenda. "You can't follow a project like that long-distance," he reasoned. "It's worse than doing a house: you have 1,100 clients, every one knowing just what to do." Whom would he recommend? Johnson instantly proposed Taft Architects, a young three-man firm in Houston, as the Texans most likely to design "a country club that looks like a country club."

Moncrief called on Taft two days later. "When I asked them to draw us a rendering, as other architects had," he recalls, "John Casbarian told me, 'We simply can't. Did Philip Johnson do a rendering for you?' I thought, 'Well! Who is some pup in his 30s to be saying this?' Of course, he was right—Johnson hadn't—and I said, 'Fine, I'll be back in three or four days if you'd like to show us what you can do.'" By the time Moncrief returned, Casbarian and partners Danny Samuels and Robert Timme had compiled a slide show tracing the historical development of the country club as a building type, and demonstrating its sources in a tradition of country house design that extends from Palladio to Jefferson, Lutyens, and beyond. "This was the first time we'd ever felt any constraint from a client on the architectural language we had to adhere to,” says Casbarian. “What we had to do, we believed, was point out where this 'colonial-Georgian' style came from, and how and why it had been transformed.” Rather than arbitrarily seizing a single prototype and adapting it to River Crest, Taft elected to set forth a range of options for the client’s response—or as Timme explains it, “to provide images of many places with a memory of the kinds of activities and atmosphere members associated with the club.” Even without the reassuring concreteness of a rendering, Taft’s illuminated typology convinced the building committee, and the entire membership, that here were architects who understood the River Crest sensibility. After the contract was signed, this meeting of minds continued. As is their wont, Taft began by assembling three-dimensional schematic models of alternative layouts, as a point of departure for discussion with the client. Given the complex network of public spaces, athletic facilities, and service areas built into the program, this dialogue was very helpful (never more so than halfway through design, when a cost-conscious River Crest insisted that the floor area be reduced by 15 per cent).

Remarkably, in light of Philip Johnson’s caveat, the final product betrays few of the unhappy compromises often associated with participatory design. On the contrary, a rigorous logic orders most of Taft’s scheme (plans and axonometric overhead). From the standpoint of logistics, their cross-sectional parti places kitchens and other utilitarian zones where they are most efficient, at the core of the complex. Readily accessible to assembly rooms around the perimeter, and the ballroom directly above, service corridors are nonetheless independent of circulation routes used by club members. Pivoting on four mechanical stacks that emerge from the roof as chimneys, the geometry of the plan organizes the complicated array of interior spaces into a coherent procession sequence. Enfilades link suites of rooms and connect them in turn, through arcades, terraces, and porticoes, to the landscape. To minimize encroachment on outdoor amenities undamaged by the fire, the new clubhouse occupies the site of the old. On the east and west, Taft’s axis aligns with fairways bordered by avenues of live oak and ash, and on the south, with a swimming pool and adjoining pavilion that also survived the blaze.

The preservation of these environs limited the area available for the building itself, necessitating the distribution of 51,000 square feet of program space on three stories. In order to stay within the bounds of an appropriately domestic scale, the architects depressed the ground floor one-half story below grade, and housed the ballroom in the lofty attic of a massive hipped roof. Country house architects in the past might have relegated this ample garret to nurseries and servants’ quarters, or perhaps a billiards room, and would have deployed the solemism of a kitchen at the heart of the plan. In Taft’s hands, however, the unorthodox layout creates a dramatic setting for pomp and circumstance (see pages 186-187). The kitchens become a podium for the ballroom, elevating this vaulted aerie to command the best views for miles around—and furnishing a splendid excuse for the grand staircase from which River Crest brides toss their bouquets, and celebrants of every age enter and exit in the style to which they are accustomed. If a few too many angles break the flow of the staircase, and a jarring grid of acoustic panels interrupts the graceful arc of the ballroom vaults, no matter; the ensemble is still a fitting backdrop for anyone’s fantasies of Scarlett and Rhett or Fred and Ginger.

The bow to precedent embellished with an inventive flourish, which distinguishes Taft’s interior planning, also marks their approach to the externals. “History for us is a modifying, not a generating, force,” explains Danny Samuels. “We don’t want every detail to be ‘read’ as a superficial reference to the past.” Regarding the personal reinterpretation of the classical canon apparent in River Crest’s brick- and-terra-cotta facades, Robert Timme comments, “We saw this building as an opportunity to maintain the level of abstraction that is possible in architecture, and still have the depth of wall surface and detail that sometimes precludes this. We want people to understand spaces and volumes through detail.” To that end, Taft skillfully tackles what Lutyens called the “high game” of classicism, and plays with spirit. Whether enriching a rusticated basement with an unexpected inlay of green tiles (photo page 184), turning out columns-sans-capitals, or contriving a porte-cochere that seems to have exploded out of the facade behind it, Taft in effect establishes order without the Orders. For all their originality, though, these inventions never deny the archetypes from which they ultimately descend. Such sportive tritutions to tradition deserve applause at River Crest since they reaffirm a principle dear to any clubman’s heart: one can stretch the rules to enliven a friendly game, but break them and everything is lost.

Douglas Brenner
Taft Architects' $7.5 million structure stands on the site of an earlier clubhouse destroyed by fire (photo left). The client's program insisted that the new building recall its predecessor's "colonial" style (the legacy of a 1950s remodeling of a 1911 Craftsman Style lodge) and honor the domestic scale of older mansions in the nearby streets of Westover Hills. Taft's design draws on the same Anglo-American heritage that inspired the lost clubhouse, though the striking contrast between the two buildings illustrates the enormous range of expression possible within the classical language. Oriented to an extensive swimming pool and allees of trees (site plan overhead), the massing of Taft's cross-axial composition harks back to Palladio, Jefferson, and McKim, Mead & White, while the robust, sculptural modeling of the facades and an emphatic roof silhouette bring Lutyens to mind. The allusive use of architectural history reflects the social evolution of the American country club—a place where the new world can emulate the rustic retreats of the old, but temper ceremonial etiquette with relaxed hospitality. Like any suburban house, River Crest has a formal "front door"—the porte-cochère on the west facade (large photo).
Typt played down the apparent bulk of the three-story clubhouse by making the lowest level one-half story below grade. Projecting bays reinforce the orientation of each facade to the adjacent grounds, above all on the western entrance front, where the extrusion of a brick frontispiece beyond sections of raw concrete structure implies that the porte-cochere has been formed by thrusting a colonnade out of the wall (detail opposite top; a fabric canopy over the porch elevates this visual conceit). The contrast of the building’s perimeter is countered by a strongly centralized parti.

Whereas the kitchen and extensive service areas specified by the program fill much of the building’s core, a grand staircase and upper-level ballroom (photos pages 186-187) supply the conspicuous centerspace required for public areas used by
club members and their guests. The four "chimneys" that vertically frame these interlocking volumes are what Louis Kahn termed "servant" spaces, containing mechanical, electrical, and plumbing equipment (external vents and intake are concealed behind Roman grilles).
The clubhouse is framed in steel and cast-in-place concrete, and clad in terra cotta and brick. Using color renderings à la Beaux-Arts (page 183) and large-scale mockups, Tyft studied the niceties of hue and texture, and details such as custom-made lanterns, that lend the building skin its apparent density. More than an attractive appliqué, this surface treatment articulates massing and volume, whether seen from a distance or close up. The broad band of the cornice binds together disparate bays and terraces, while weaving its own subtle pattern. Recessed bands of small green tiles define the "joints" of a rusticated basement (opposite). "Of course, most club members don't talk about rustication," notes building committee chairman Moncrief, "but they say, 'Isn't that tile pretty. I like the way it keeps the concrete from looking like, well, concrete.'"
The pervasive influence of Lutgen is especially pronounced in the banded vaults of the "mixed couples room" (top left). Here, as throughout the club, furnishings were selected by interior designer Mark Hampton. His decor allows for the future addition of genuine period pieces such as the Regency portrait, lent by a member, that graces the head of the stairs (bottom left). The landing doubles as a waiting lounge before large receptions, while the ballroom itself can be subdivided for small parties by extending movable walls between the coupled columns. Pantries, storage, and mechanical systems are tucked under the eaves, permitting generous access to roof terraces and views. The dark panels set into the clerestory vaults are acoustically absorbent. When the dance floor is full, the hall can accommodate 300, a respectable turnout for most cotillions.

River Crest Country Club
Fort Worth, Texas

Owner:
River Crest Country Club

Architects:
Taft Architects—John J. Costbarian, Danny Samuels, Robert H. Timme, partners; Suzanne Labarthe, Larry Dasley, project assistants; Charlie Thomas, Nathalie Appel, Michael Underhill, Janet OBrien, Josephina Dias de Leon, Randy Guy, support team

Associate architects:
Geren Architectural Division/CRS Surrine, Inc.—Charles W. Nixon, project director; John E. Moore, project architect

Engineers:
Geren Architectural Division/CRS Surrine, Inc.—Harold E. Hatfield (structural), John W. Speck (mechanical), Forrest B. Adams (electrical)

Interior:
Mark Hampton, Inc.

Kitchen:
HR1, Inc.

Acoustics:
Variable Acoustics, Inc.

General contractor:
JBM Builders, Inc.
A ski lodge for all seasons

As far as its managers can discover, Wachusett Mountain lodge is the first ski facility in the country to take its summertime business as seriously as its wintertime business. Wachusett Mountain, the second highest mountain in Massachusetts, had for some years functioned as a modest “neighborhood” ski area. But the commonwealth, which owns the mountain as part of its state park system, concluded after a 10-year study that the ski area could be expanded. (Because of the countryside’s fragility, however, the park system limits traffic, both downhill and cross-country, to 2,000 skiers at a time.) The firm selected in competition to develop the ski area (it used to run the old T-bar tow) determined to find year-round use for the facility.

This decision obliged architect Lindsay Shives, designing the base lodge, to consider two sets of users, the two having far different purposes and personalities. On the one hand, skiers hurry to get on the slopes, spending as little time as possible on such nonskiing essentials as food. To accommodate both haste and essentials, Shives directed circulation along a linear sequence from parking to chairlifts. Skiers who need only lift tickets buy these at an exterior box office at one end of the lodge and then proceed on a covered exterior corridor to the lift area. Other skiers may enter the parallel interior corridor to reach, in order, instruction registration, a rental/retail shop, and a cafeteria. As the mood strikes them, they can peel off to the exterior corridor. Optionally, the wide, wood-floored interior corridor becomes a mall, with a shop window on one side and a view of the pond on the other.

In warm weather, on the other hand, and especially in the New England autumn, the lodge draws quite another group—two groups, actually: active backpackers and simple strollers. During these seasons, the dining room, which in ski season offers buffets to families, becomes a conventional restaurant. More important to the operators, other spaces convert to other uses: the ski schoolroom becomes an art gallery and conference room, the outdoor decks become entertainment space. The staff reports with pleasure that the facility has attracted both business groups and wedding parties.

In addition to the linear circulation pattern, the constricted site itself helped to force the building’s plan. A retention pond in front, which provides water for snowmaking, is bounded by a road on one side. At the back of the site, the mountain leaves minimal space for the lift area, which in any case must be close to the lodge—practice recommends that skiers walk no more than 150 feet from lodge to lift.

The $8-million development budget allowed $1.2 million for the 23,000-square-foot lodge. The rest of the money went for new trails, three chairlifts, snowmaking equipment and utilities. Grace Anderson
The stained clapboard that faces the ski lodge befits its purpose and the comfortable central Massachusetts architecture in the neighborhood, while the dark orange corner boards and tower trim give it what architect Shives calls "a sense of destination," perceived by visitors arriving by road as well as by skiers descending the slopes. The clapboard and orange corner boards are carried indoors as basic ornamental motifs. (Though users seldom count aroma as an architectural element, the evocative smell of cedar walls here imparts a distinctly lodgelike character to vestibule and corridor.) Since skiers are already warmly dressed, an outdoor corridor (across page, bottom left) is doubtless more comfortable than a heated room; in summer, the deck becomes a shaded verandah.
The interior of Wachusett Mountain lodge has the relaxed woodsy air commonly associated with après ski activity, its clapboard siding borrowed from the exterior and its laminated wood post-and-beam structure exposed to view. The dining room (opposite) is shown set up as a summer restaurant. A small conversation pit (below), set below a tower monitor, occupies a railed platform at halfway level between bar and dining room (the railings can be seen between dining room columns). The conservation of energy in the wintertime facility takes many forms, most notably in the recycling of heat from compressors for snowmaking (heat diagram at bottom, opposite). Architect Shives reports that the operators initially intended to hide the compressors in a building well removed from the lodge because of excessive heat. The mere mention of heat elicited automatic architectural reaction and thoughts of heat recovery; the compressor facility consequently was made an integral part of the lodge. The use of solar heat shaped the dining pavilion, where large windows receive abundant southern light in winter. An active solar collector provides domestic hot water.
Wachusett Mountain Base Lodge
Princeton, Massachusetts
Owner: Wachusett Mountain Associates, Inc.
Architects: Lindsay Shives & Associates, Inc.—Lindsay Shives, AIA, project architect; Douglas Cole Smith, FAIA, project associate; Douglas Manley, project manager

Engineers: Bolton & DiMartino, Inc. (structural); R. G. Vanderweil (mechanical/electrical/plumbing); Alfond International, Inc. (mountain utilities/snowmaking)
Consultants: Sno-Engineering, Inc./Resource Development (mountain planners); Greenscape (landscape)
General contractor: R. H. White Construction Co., Inc.
Reflections on a curtain wall

Though it seems reasonable that PPG would require that their headquarters be a statement of their product, the corporation, in fact, put no such requisites on design. Not surprisingly, however, the architects, John Burgee and Philip Johnson, thought in terms of a glass tower from the onset. The site designated for construction was comprised of 5.5 acres in Pittsburgh’s Triangle.

And neither did the clients demand that their project fully occupy the site; the architects advocated developing the entire site with a six-building composition. Of the six buildings, four are six stories, one is 14 stories, and the PPG Tower is 49 stories. The buildings provide 1.6 million sq ft of office, and 70,000 sq ft of retail space. The primary tenant, PPG Industries, occupies the upper two-thirds of the Tower.

Two features of PPG Place make it memorable:

The first is the organization of space around and between the six buildings comprising the complex. Here, vehicular and pedestrian movement has been engineered with a connective tissue that knits the existing urban fabric into a logical and inviting network, culminating at a plaza—a dazzling space of reflected light that is punctuated by a granite obelisk. From an urban design standpoint, one feels the exigencies of the city, not the building, had the upper (and wiser) hand in the site design. Architectural historian K. E. S. Toker has acclaimed PPG Place as “one of the most ambitious, sensitive and public-spirited urban developments since Rockefeller Center.”

The second feature that makes this project a rare delight is, of course, the virtuoso use of reflective glass. Certainly, there is nothing new about the material; it has been on the market since the mid-1960s. What makes this application special is the pleating of the curtain wall into a sequence of facets which seem to pick up speed and energy at the four corners. (These corners have a crystalline silhouette that, in plan, recalls the wall geometry of Renaissance military fortifications such as those proposed by Michelangelo.) Because the glass reflects, this faceting speaks to itself. And because the buildings form an enclosure, adjacent and opposing walls send light back and forth surrounding the pedestrian with what might be a first—a mirrored courtyard.

Sunlight puts the wall surfaces in motion. In an ever-changing pattern from sunrise to sunset, season to season, the buildings take on a spectrum of qualities that vary from dense mass to transparent veils, from shimmers to sparkles to undulant swirls. The silver-colored aluminum mullions contrast in texture with the glass, heightening the visual effect of reflection, and hatching together the mercurial surfaces. In arriving at the curtain wall’s design, the architects supplemented drawing with a variety of three-dimensional modeling.
techniques. After working out the preliminary design on paper, a six-foot model of the complex was made using the specified PPG glass products. This model was used to study the massing and evaluate the qualities rendered by the skin’s neutral silver reflective glass. Following its making, a full-scale, three-story-high mock-up was constructed at PPG’s Ford City, Pennsylvania plant. The mock-up gave the architects and client an opportunity to study the esthetic character of the wall in greater detail. (It also gave the construction team an opportunity to experiment with assembly procedures.) Dark mullions had been used in the mock-up. Dissatisfied with these, the architects reversed their earlier decision, and designated a clear anodized aluminum mullion that better emphasized the pleating and reflected more light onto the wall.

Model-making played an indispensable part in developing shop drawings for mullions. In all, 175 different dies were necessary for the curtain wall’s geometry—a formidable exercise in custom design. The most complex mullion details occur at the base and top of buildings. Here, the pleats resolve themselves into the “neo-Gothic” pointed openings in the esplanade, and the 234 spires that crown the six buildings. The architectural intention was to have vertical mullions grow from the ground in an uninterrupted line. In order to accomplish this, lines had to bend and converge. The geometry involved in these intersections was extremely difficult to envision. As an aid, a project architect, Glenn Garrison, studied lines in the masonry details at St. Patrick’s Cathedral in New York. Still, it was impossible to understand and describe on paper many of the curtain wall’s profiles. Therefore, the architects and the fabricators built models of these mullion joints that bring together glass converging from more than one plane. The extreme example of the multi-planar geometry is at the peak of esplanade openings. Here, eight difficult angles in space converge at one point. With models of this and other details in hand, shop drawings for the curtain wall could be completed: 50 sheets for the typical office floors; 100 sheets for the base and crown of the buildings.

When the look of the wall was fully resolved in design terms, the performance of the wall was tested. Here again, models were used. First, the entire system was analyzed by independent consultants at Colorado State University. Their tests included a mathematic investigation with computer simulation techniques, and wind tunnel testing on a sealed replica of the complex. Later, another battery of tests was conducted on the design at the Construction Research Laboratories in Miami, Florida. Again, wind tunnel tests were performed, this time on a model built at 1:400 scale, to determine the

Like other reflective glass curtain-wall buildings, PPG Place visually responds to the varying ambient light of dawn, dusk, night, and full sun. Unlike other glass towers, PPG’s “pleats” significantly extend its vocabulary of surface effects. At times, the Tower’s monolithic form on the urban skyline is turned into a bundle of delicate, radiant shafts.
flow pattern of wind across the building surface. Then a full mock-up of a 38- by 38-ft typical wall section was tested for air and water infiltration and structural integrity. Infiltration was tested dynamically with a 2100-hp wind generator and a spray rack. A partial vacuum was pulled in the test chamber to determine whether the spray was able to penetrate the wall system. All seals and weep details performed according to design. Structural integrity was tested by pressurizing and evacuating the test chamber. All components tested at 150 per cent of their design load.

Construction of the buildings' steel columns and reinforced concrete floor slabs preceded in four-story intervals. Installation of the curtain wall with its nearly one million square feet of glass sheathing followed right behind in two, two-story jumps. To the project's advantage, PPG's Commercial Construction Group hung the curtain wall. With client and contractor one-and-the-same, there was a tremendous incentive on the part of tradesmen and management for a perfect installation. Not only did everything go smoothly on site, since completion, no defects in the curtain wall have emerged.

The completed buildings have been evaluated for thermal performance. Design standards for energy consumption were set by the architects as part of the initial programming. The reflective and thermal characteristics of the glass materials selected for the curtain was to play a large part in realizing that standard. The buildings are using approximately 40,000 Btus per square foot per year, compared to 129,000 in PPG's former headquarters—a two-thirds reduction in energy consumption.

This truly unique curtain wall is the result of an extraordinary effort in design, and testing, as well as fabrication, and installation. Together with the cost of materials, these factors add up to the building's rather extraordinary price tag with respect to other commercial developments. The question that inevitably arises is, does the final result justify the effort and expenditure? PPG, the architects, and most Pittsburgh natives think it does. In conjunction with the site plan and massing, this unique and surprisingly friendly curtain wall raises the project above what it might have been in the hands of a lesser architect and client: the all-too familiar, acceptable, but uninspired box. As a corporate headquarters, PPG Place stands out as a convincing advertisement for the technical and esthetic potential the client's products offer.

Corporate pride aside, PPG Place is more importantly the focus of considerable civic pride, a remarkable tribute to a project that owes much of its success to the materials and the details of its construction. Something to reflect on. . . . D.R.
Folds in the curtain wall are created by the geometry of mullions. Extrusions were designed to accommodate outside and inside 90-deg angles, 125-deg angles, and 180-deg angles parallel to the primary plane of the wall. Mass was added to the inside surface of corner mullions in response to design stresses for wind loads.
The architects, John Burgee and Associates with Philip Johnson, had total control over the "look" of the curtain wall. PPC's role as manufacturer, fabricator, and installer was to make the design work in glass and aluminum. All the elements comprising the curtain wall were chosen or custom-designed to meet the aesthetic and performance criteria set by the architects.

Glass was made in Crystal City, Missouri and shipped to Pennsylvania where it was coated and fabricated into insulating panels at PPG’s Ford City plant. The 175 mullion profiles required to shape the curtain wall's geometry were extruded in a silver-colored aluminum in Terrell, Texas and shipped to the construction site. For the sake of erection, vertical mullions were manufactured in two-story lengths.

The installation of the curtain wall followed a four-story-at-a-time sequence of construction for the structural steel columns and reinforced concrete slabs that comprise the building's primary structure. In installing the curtain wall, anchors were attached to plates at the end of floor slabs. The plates, occurring at the position of every vertical mullion, were typically secured in the slab with a 2 ft steel rod—never was the curtain wall permitted to tie directly into the building’s structure steel. To these plates was fixed an anchor; to the anchor, the two-story verticals. Horizontal mullions were then installed, completing the frame for the glass panels. Before the glass was installed, a soft neoprene gasket was placed in the frame that ran the length of the four sides. Vulcanized rubber L's were used at the corners to complete the inner framework. The glass itself was
lowered and tilted into the frame from the inboard side, according to the glazing pocket design. A glazing bead was then applied, followed by the driving of a vulcanized wedge around the inside of the frame—the wedge pushes against the softer neoprene gasket, thus setting the air seal. Finally, all interior details were trimmed out.

The esplanade and spire levels of the curtain wall was considerably more difficult to install than typical office floors. First, miter cuts were made in situ on the extrusions to form the spires and the frame around pointed openings and parapet towers. Depending on the installer's ability to maneuver around steel supports and fit trapezoidal and triangular panels into their pockets, the glass here was sometimes in-filled from the outboard side.

The curtain wall incorporated three glass products: a clear, reflective coated, double-glazed vision glass; reflective spandrel units, backed with fiberglass and a foil vapor barrier, used at the spandrel zones and mechanical floors; and a clear, double-glazed panel used in the Wintergarden and the retail storefronts.

The most promising design on paper can lead to a disappointing building if the crafting of the design doesn't provide a just follow-through. Happily, the construction of PPG Place is of the highest caliber. Though the architect is typically a major advocate of quality on the construction site (often to the consternation of the contractor) at PPG Place the installers, being one-and-the-same as the client, were highly self-motivated to work out unusual procedures for erection and maintain a superior level of craft throughout.

PPG Place
Pittsburgh, Pennsylvania
Owner:
PPG Industries
Architects:
John Burgee Architects with
Philip Johnson, New York City—
Glen Garrison, associate; Anne
Asker, project architect; James
Martin; field representative
General consultants:
Robertson, Fowler & Associates,
structural; Coenenti Associates,
mechanical; W.A. DiGiacomo &
Associates, electrical; Claude R.
Engle, lighting; Calvin Kort,
elevators; Edison Parking,
parking; Cerami & Associates,
acoustical; Vignelli Associates,
graphics; Cope Linder Associates,
retail; Zion & Breen, landscape
Curtain wall design
and consulting:
Curtain Wall Design and
Consulting, Inc., Dallas, Texas,
and PPG Industries Commercial
Construction Group
Curtain wall millings
and transoms:
Hovemt Aluminum Corp.,
Terryell, Texas and PPG Industries
Curtain wall installation:
Commercial Construction Group,
PPG's Industries Commercial
Construction Group
Development manager:
Truesman Realty & Construction
Company of Pennsylvania
General contractor:
Mellon-Stuart/Blount

Axonometric of curtain wall detail
(opposite page, far left), indicating
the position of a non-structural
mullion (lower left in drawing)
placed for graphic effect, on the
insulated spandrel glass.
The sequence of glass installation in
PPG's Tower's corner spires is shown
in three photos at left. Each panel
was hoisted into position and fixed
to the aluminum frame. Typically,
glass was installed from the inside,
however, the trapezoidal and
triangular geometry of the spire
panels required an exterior
installation.

To continue their essay in glass
beyond the curtain wall, the
architects used ornamental glass
finishes in the Tower elevator lobby.
Photograph at top shows brandied
 crimson spandrel glass set in
diamond pattern and finished with
light gray silicon caulk. The crimson
color was specially developed for
the project. Laminated "mirror" glass
panels were used in elevator cabs
(above left). Similar in surface to the
glass used in elevators, the panels
used for the lanterns that circle the
plaza arcade consist of two sheets of
clear glass in an insulating unit
with the air space filled with
fragments of shattered tempered
glass (right above).
New products

Harry Omer

Convertable lounge chair
The ChairBed is a recent introduction by Adden, a manufacturer of dormitory furniture. Part of a new collection of furnishings designed for medical institutions, the ChairBed was developed to assist health care facilities in accommodating a patient's visiting family members. In an upright position (1) it is a rocking/swivel chair. Unfolded (2) it becomes a 21-in.-wide and 76-in.-long bed. The hardwood internal frame is double-dowel constructed and supports cushions wrapped in high-resiliency dacron. The chair is available in either fabric or vinyl upholstery, with solid oak armrests. Other components of the health-care line include oak headboards/footboards for patient beds, patient chairs with or without footrests, desks, wardrobes, nightstands, and waiting or reception area seating. Adden Furniture, Lowell, Mass.
Circle 300 on reader service card

Reflections of the "Wright Way"
The folding glass screens designed and constructed by Californian Arthur Stern reflect a studied interest in the work of several modernist masters. Clearly inspired by the glass work in many of Frank Lloyd Wright's Prairie Houses, the panels are intended to detail "volumetric progressions, rhythms, and proportions" present in the surrounding architecture, according to the artist. Stern's version of the "Wright Way," which emphasizes glass design as one aspect of a totally designed environment, also refers to another modernist heavyweight—Le Corbusier. Stern's stated adage, "Geometry is the language of architecture," is a compromise of Le Corbusier's claim that "Geometry is the language of man." Stern uses the regulating lines of geometry as his method, or vocabulary, of glass design. He "composes" progressions and rhythms through the repetition and variation of shapes, patterns, and colors. Frozen Music/Opus 27 (3) and Frozen Music Quartet (4), for example, are made from handblown and graylite plate glass, framed in larch wood. Opus is 8 ft wide and 6 1/2 ft high and Quartet is approximately 5 ft square. Both feature simple, repetitive patterns, accented with pieces of leaded glass. Although their suspended state may not prove to be timeless, as the analogy to music implies, their concerns with geometry and the language of architecture may prove to be. Architectural Glass, Arthur Stern Studios, Oakland, Calif.
Circle 301 on reader service card
More products on page 219
Instruotional CAD system  
ProEd is a turnkey CAD learning system that combines video class lectures with practice laboratory exercises. The system consists of a 67-megabyte disk, a 15-in. raster display screen, an A-B size plotter, a set of 35 lessons (equal to 12 hours of instruction) on videotape, and instructor and student manuals. The student can test his or her own proficiency with a software package through drawing exercises provided in the manuals. Additional system options include dual 16-in. monochromatic/color displays, dual 16-in. monochromatic displays, a C-D size plotter, a line printer, a 27-megabyte hard disk, and more advanced software packages. Bausch & Lomb Interactive Graphics, Austin, Tex. Circle 309 on reader service card

Drafting system  
The ISOCAD turnkey system is a low-cost architect-designed drafting program that is constantly tested and upgraded through its use in an architectural firm. The 16-bit APC microcomputer, offered as part of the system by special arrangement with ABC Information Systems, comes configured with 384 K of RAM, expandable to 512 K. The screen can display up to eight colors with a resolution of 640 by 275 pixels. The detachable keyboard has 44 programmable keys. A one-megabyte floppy disk and a hard disk sub-system, with a storage capacity of 10 megabytes, accommodate mass storage. Rudolph Horowitz Associates, Architects, Pound Ridge, N.Y. Circle 309 on reader service card

CAD software  
Steel S-D is a graphic design and analysis program for two- and three-dimensional steel frame structures. The completely integrated software package includes functions for building and editing a structural model, applying loads and properties, performing static analysis, displaying shear and moment diagrams, and checking the structure's compliance with ABC or other user-defined codes. The system features on-screen menus and prompt buttons located alongside the screen. Portions of a three-dimensional model can be rotated, isolated, zoomed in on, or highlighted in color to permit a detailed examination of a problem area. Auto-trol Technology, Denver. Circle 310 on reader service card

More products on page 219
When it comes to skylights, the sealant is a big part of the picture. Just ask Harold Gelvan, whose company is a leading manufacturer of standard and custom skylights. "We believe in using the highest quality grade materials for all components of our skylights—glass, aluminum and sealant," says Gelvan. "SILGLAZE N silicone sealant from General Electric Silicones is top of the line. We use it in all our windows, we recommend it to the installers, and we even package it right with each unit we send out."

It's no surprise. Advanced technology SILGLAZE N sealant has become the material of choice for a wide variety of demanding glazing applications. SILGLAZE N sealant offers primerless adhesion to substrates like glass and aluminum... an optimum tooling time of six to nine minutes... a ± 50% joint movement capability... and translucency that blends with any color substrate. In fact, it's the only translucent, low modulus, neutral cure silicone glazing sealant on the market today.

Give SILGLAZE N translucent sealant your glazing challenge. For more information on this high-performance material and the full line of construction sealants from GE Silicones, circle the number below, or call (518) 266-2315.
Electrostatic color plotting
Fifteen basic applications of electrostatic color plotting are described in a 12-page color brochure. The device is capable of producing plots as complex as 15 million vectors, in formats up to 40 in. by 600 ft, in a range of 512 colors, and at a speed of 1 in. per second. Versatec, Santa Clara, Calif. Circle 400 on reader service card

Microcomputer interfacing
An 18-page booklet introduces Micro-Match, a system for interfacing microcomputers to peripherals and other computers. The literature includes examples of device-to-device connections and samples of research reports. Command Computer Corp., Philadelphia. Circle 401 on reader service card

Overlay drafting
The Overlay Register System, which uses a series of overlay drawings to produce a composite, is featured in a 4-page color brochure. The workings of the system, described as an intermediate step in a move towards CAD, are described in the literature. DuPont, Wilmington, Del. Circle 402 on reader service card

Software
A 22-page color brochure shows a sample of available Macintosh software packages. Included are descriptions of MacDraw, which permits freehand drawing and creation of a library of symbols, and the DuVinci series, libraries of professionally drawn landscapes, buildings, and interiors. Apple Computer Inc., Cupertino, Calif. Circle 403 on reader service card

Computer support furniture
A 16-page color catalog contains photos and descriptions of computer consoles and desks, desktop cabinets, blowers, accessories, and hardware. Diagrams showing the features and dimensions of each product are included. Amco Engineering Co., Schiller Park, III. Circle 404 on reader service card

Computer resource service
Cybernet, a computer resource service that operates through time-sharing data centers with distributed processing in-house microcomputers, is outlined in a 30-page color brochure. Information on gaining access to the service, by a telephone-line hook-up, is included in the literature. Control Data, Minneapolis. Circle 405 on reader service card

Power conditioners
A 20-page illustrated brochure describes an expanded line of power conditioners designed to protect electronic equipment from voltage irregularities. The manufacturer's new rack-mount regulator, several computer power center models, and power line monitors are shown. Solin Electric, Div. of General Signal, Elk Grove Village, Ill. Circle 406 on reader service card

CAD system
PC-80 model 1 is shown in a 12-page brochure. This task-oriented turnkey CAD system uses command buttons and function keys for on-screen graphic manipulations. The system includes a high-resolution photo plotter. The Gerber Scientific Instrument Co., South Windsor, Conn. Circle 407 on reader service card

CAD system
A 10-page color brochure describes CASMS, a computer-aided engineering and management information services system, with interactive 3-D graphics, engineering analysis, and database management. The turnkey system includes IBM 3803 and 3804 hardware. Impell Corp., San Francisco. Circle 408 on reader service card

CAD program
Scribe, a microcomputer system for the modeling and evaluation of building designs, is featured in a 4-page color brochure. Sections on drawing and input methods, and perspective, projection, output, and printing abilities are included in the literature. 8-D Scribe International, Santa Ana, Calif. Circle 409 on reader service card

Image processing
A 24-page color brochure outlines the PIC processing system, which can capture images through an image scanner and then edit and communicate them. The system can be used to scan incoming mail or insert, lighten, darken, and position images within blocks of text. Wang Laboratories, Inc., Lowell, Mass. Circle 410 on reader service card

CAD/CAM system
The components of a CAD/CAM system are shown in a 28-page brochure. Diagrams of workstations, the database, user interface, key-file menus, and library elements are included. 3-D visualization capabilities are featured. Computervision Corp., Bedford, Mass. Circle 411 on reader service card More literature on page 811
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Santa Fe Railroad Exchange Building, Chicago, IL
Metz, Taino and Youngren, Architects

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Porcelain enamel coating
A 4-page brochure includes a revised color chart of the manufacturer's line of porcelain enamel coatings. A brief description of the product, which can be fused to steel or aluminum, and suggested cleaning methods accompany the samples of semi-gloss and matte finishes. Alliance Wall Corp., Atlanta. Circle 418 on reader service card

Interior glass doors
Tempered glass interior doors, said to be five times stronger than standard glass doors, are illustrated in a 4-page color catalog. Eleven types of glass and a selection of the 28 available colors are shown. Photos of locksets and hinges are included. Colonial Mirror & Glass Corp., Brooklyn, N.Y. Circle 418 on reader service card

Landscape lighting
The 77L series of pole-mounted landscape lighting fixtures for incandescent and mercury vapor light sources is featured in a 8-page color brochure. Specifications, options, photometric data, and ordering information for the product line are included in the literature. Imperial BronzeCo, San Marcos, Texas. Circle 418 on reader service card

Fireplace
An 8-page color brochure features Heatform masonry fireplaces. Different models of the fireplace, which is designed to be heat-circulating and energy-saving, are shown. Heatflow diagrams, installation information, and a performance comparison graph are included in the literature. Superior Fireplace Co., Fullerton, Calif. Circle 419 on reader service card

Skylight system
A 12-page color brochure contains photos of skylights and glass-covered atriums and walkways. Diagrams show lean-to, eyebrow, and barrel vault construction details. A design load chart is also included. H. H. Robertson Co., Pittsburgh. Circle 414 on reader service card

Partition system
The GB-90 gravity lock demountable partition system is featured in a 16-page brochure. Descriptions of partition height limitations, fire ratings, and accessories are included in the literature. Diagrams reveal standard track and panel construction. Gold Bond Building Products, Charlotte, N.C. Circle 480 on reader service card

Fluorescent luminaires
Percotex fluorescent luminaires, designed to reduce glare on computer terminal screens, are featured in a 4-page color brochure. Details on the prismatic optical system and its twin-beam method of light distribution are provided. Dimensions and specifications are included. Manville, Denver. Circle 415 on reader service card

Siding materials
The cost considerations of such siding materials as plywood, hardboard, and lap sidings are reviewed in a 4-page color brochure. The literature emphasizes the affordability and benefits of the manufacturer's 8-ft cedar siding panels. Shakertown Corp., Winlock, Wash. Circle 481 on reader service card

Roofing membrane
An 8-page color brochure features the Rubber-Card EPM commercial roofing membrane. Photo of several applications, drawings of the attachment method, and a list of the product's physical properties are included in the literature. Firestone Industrial Products Co., Indianapolis. Circle 416 on reader service card

Light tubing
A 40-page color catalog features the manufacturer's line of low-voltage light tubing. Each of the five lamp spacings—2 in., 3 in., 4 in., 6 in., and 12 in.—are shown in both interior and exterior settings. Optional lighting controllers are reviewed. Tyvoll Industries, Santa Ana, Calif. Circle 482 on reader service card

Laminated wood flooring
Prefinished laminated wood flooring is featured in an 8-page color brochure. The manufacturer's special "floating" system, which positions the hardwood planks above the subfloor, is described. Photos of basic patterns and their specifications are included. Harris-Tackett, Johnson City, Tenn. Circle 417 on reader service card

Form liners
The manufacturer's line of architectural form liners is described in a 16-page color brochure. Sections on form liner designs, specifications, and accessories are included in the literature. Each of 80 standard patterns and textures is illustrated.Symons Corp., Des Plaines, Ill. Circle 483 on reader service card
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