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Number/Numero 3 Volume 45

Journal RAIC/La Revue de l'IRAC

Features Section – seven articles on the future of school architecture; "The Architect and Industrialized Building" by C. H. Davidson

The Allied Arts – plastic in art; how industry assists the artist in the development of this new form of art, by Anita Aarons

Technical Section – Tendering and Contracts, Part 2; regional unit prices for concrete

ADA 67|68

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L'Institut Royal d'Architecture du Canada

Architectural Directory Annual 67/68

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La Revue de l'Institut Royal d'Architecture du Canada

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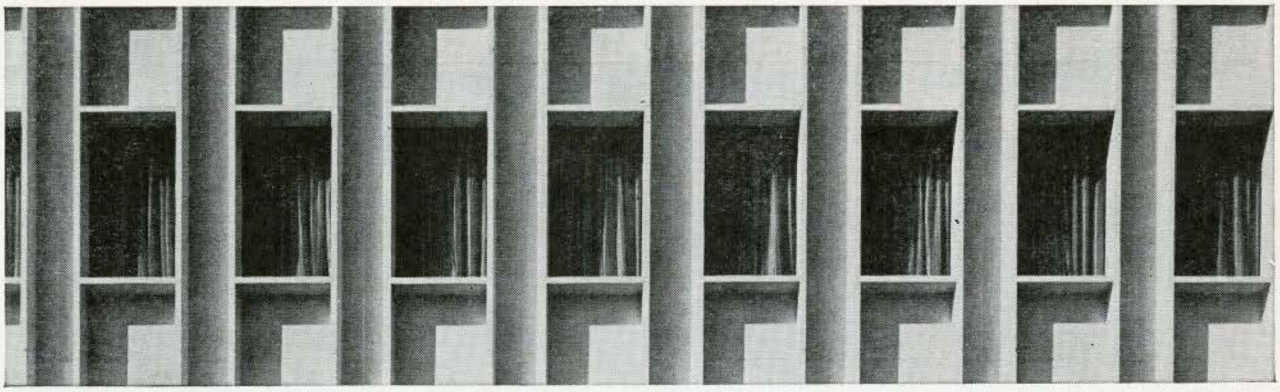

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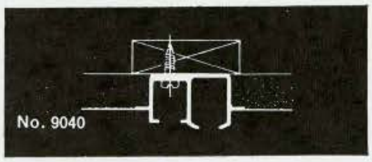

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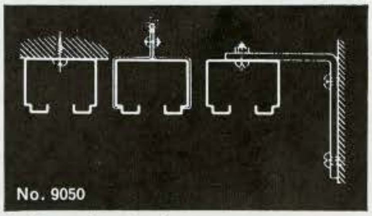

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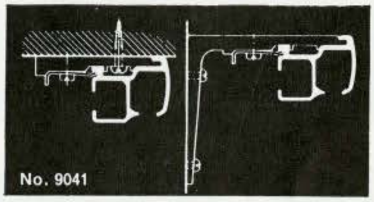

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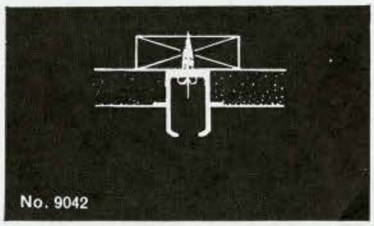

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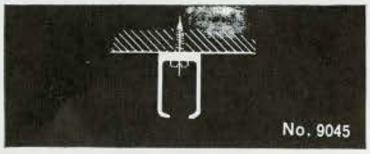

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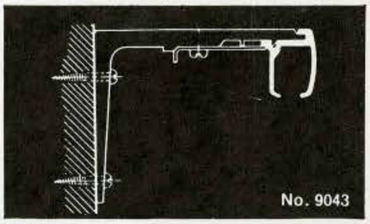

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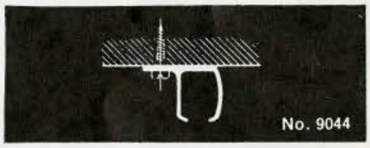

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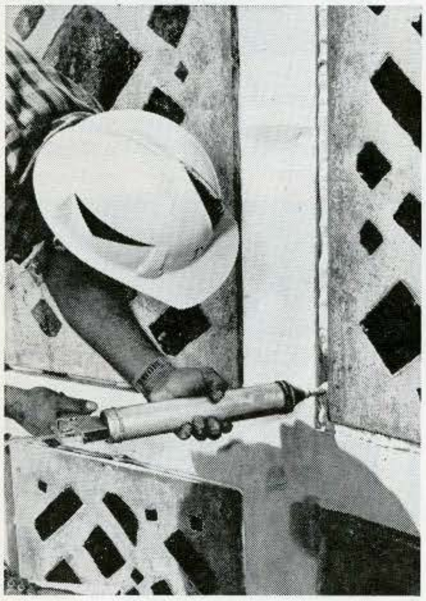

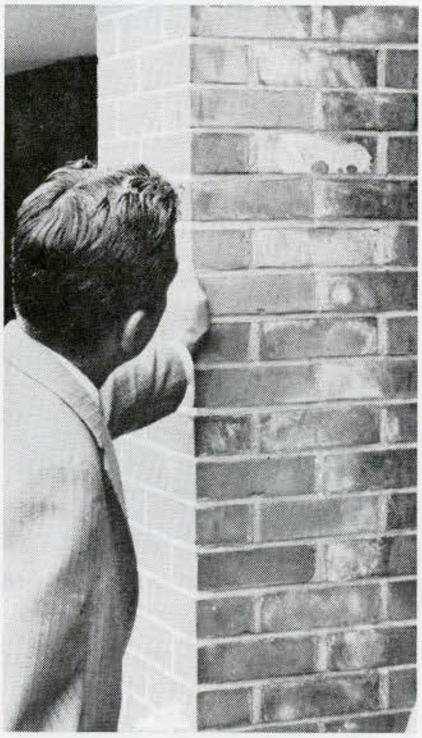

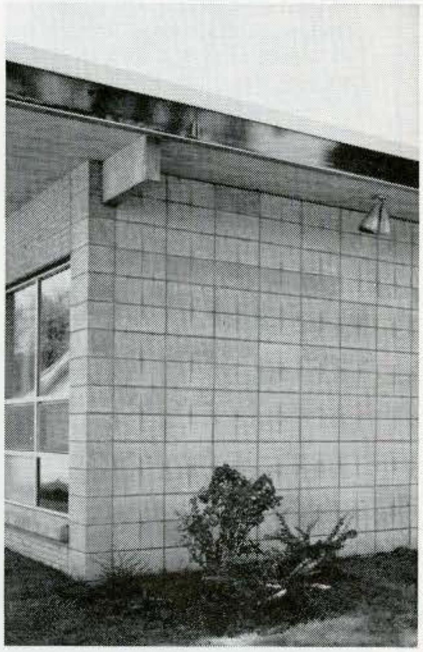

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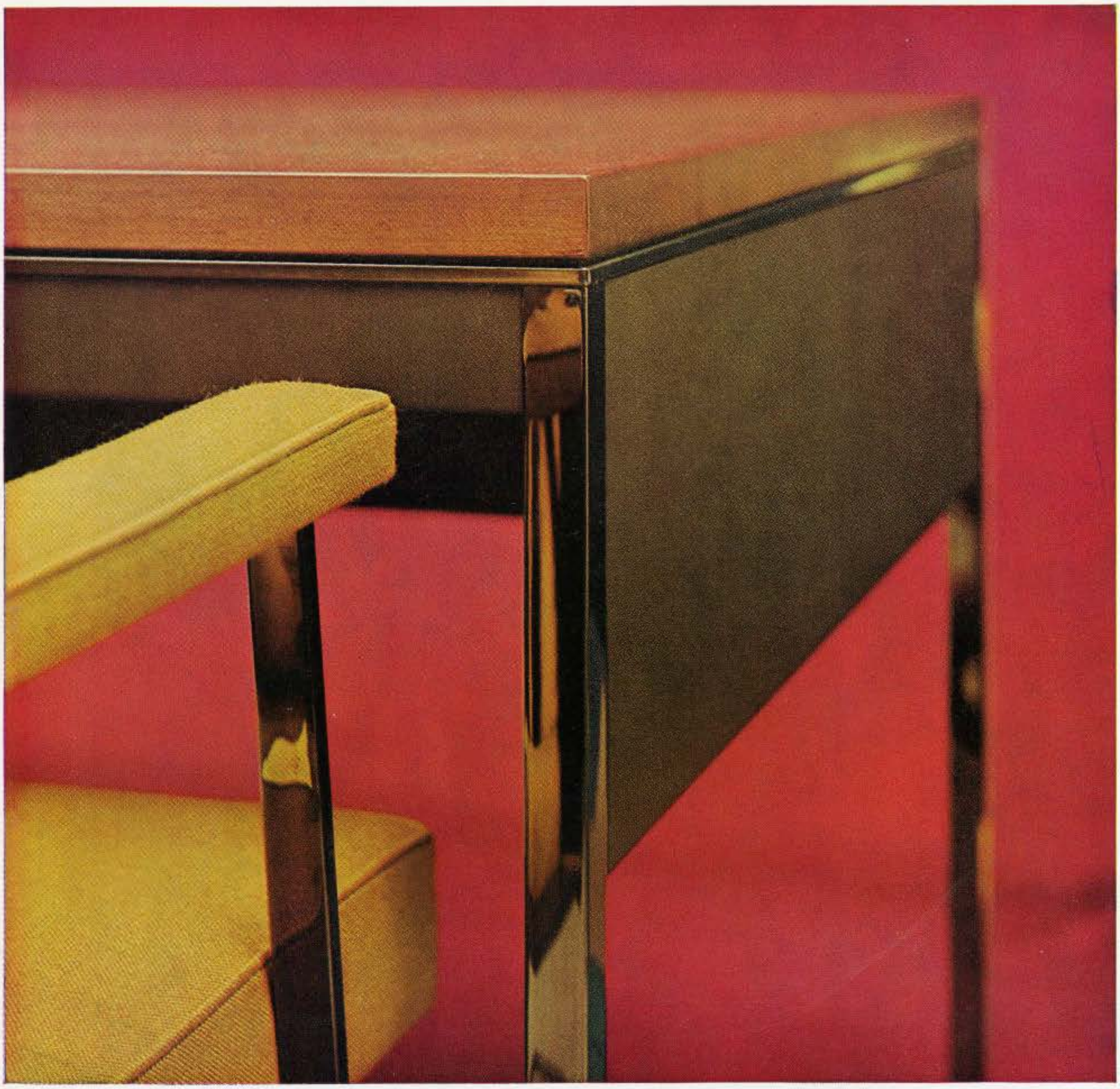


PQAA Annual Meeting

Joseph Baker succeeded Henri P. Labelle as president of the Province of Quebec Association of Architects at the annual meeting held January 26-27 in Montreal. The meeting was preceded on the evening of January 25 by a conference and film sponsored by the Montreal Society of Architects — "L'architecture et l'ordinateur" by Michel Barcelo and "Computer Aided Design" by Allen Bernholtz. The Friday afternoon seminar on the assembly theme, New Horizons, was featured by an illustrated address on "Innovations in Building: New Opportunities for the Architect" by C. H. Davidson, M.Arch. We publish Part I of this address on page 62.

Norman H. McMurrich (*F*), Toronto, Vice President RAIC, thanked the PQAA for the invitation to represent the national professional organization at the meeting and congratulated the membership for its constructive suggestions leading to the fostering of a stronger national body.

Other officers elected for 1968 were: first vice-president, Jean-Louis Lalonde, Montreal; second vice-president Paul Gauthier, Quebec; secretary, Michel Barcelo; treasurer, Fred Lebensold, and past president, Henri P. Labelle, all of Montreal. Elected to Council were Philip Freedlander, Adrien Berthiaume, George Steber, Jean-Charles Martineau, Ian Martin, Pierre Boulva and Peter Dobush, Montreal; J. Robert Boulanger, Sherbrooke; André Simon, Mont-Laurier, Cte Labelle; and Henri Talbot, Quebec.

From the 1967 Annual Report of the PQAA House Committee

Happy Hours
"Every Thursday during Expo from 5:00 to 8:00 PM. the Montreal Society of Architects hosted an open house for foreign visiting architects. There were memorable evenings with groups such as twenty-five Japanese architects and their wives in traditional dress; some forty Italians from varied disciplines, architects to textile designers; thirty German architects on a trip sponsored by a German architectural magazine; many groups from France and England; always several Americans, and Mr. Ron Lyon, President of the Royal Architectural Institute of Australia. The Province of Quebec Association of Architects' Council voted a total of $2,000.00 for this hospitality which was certainly well spent."

Special Party
"Following the Royal Architectural Institute of Canada's Centennial Convention in May in Ottawa a reception was held on Tuesday, May 30 for all those Canadian architects visiting Expo. The Council voted $250.00 for this event which again was well worth it."

New Brunswick Annual Meeting

The new act now being drafted will, when it comes into force, limit registration to graduates of a school of architecture recognized by the Association, with the exception of student associate members registered at the time the new act comes into force, it was decided at the annual meeting of the New Brunswick Association of Architects, held January 27 at Fredericton. The meeting also increased the annual dues to $100.

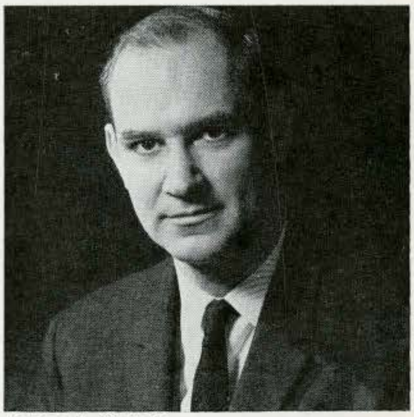
Officers and council elected were: president, H. P. J. Roy; vice president, John R. W. Disher; registrar, H. Claire Mott (*F*); secretary- treasurer, John R. Myles; councillors, Neil M. Stewart (*F*) A. Chatwin, Cyrille Roy (*F*), and D. W. Johnsson.

Manitoba Association Annual Meeting

James H. Christie was elected President of the Manitoba Association of Architects at their annual meeting, January 27. Other officers elected were Allan H. Hanna, vice-president, and Carl Nelson Jr, treasurer.

MAA First Design Awards Program

The Manitoba Teachers Society Headquarters, Winnipeg, Architects, Libling, Michener and Associates received the Award of Excellence in the Manitoba


James H. Christie

Association of Architects Awards Program which honored both architects and owners of winning entries.

Awards of Merit were given for: the Market Mall Shopping Center, Saskatoon, Architects Waisman, Ross, Blankstein, Coop, Gillmor and Hanna; Messiah Lutheran Church, Kirkfield Park, Manitoba, Architects Gaboury, Lussier, Sigurdson and Venables; the Pan-Am Swimming Pool, Winnipeg, and Place d'Accueil, Montreal, Architects Smith Carter Searle. Honorable mentions were received for: Kildonan Park Pavilion, Winnipeg, Architects, Waisman, Ross, Blankstein, Coop, Gillmour and Hanna; St Claude Roman Catholic Church, St. Claude, Manitoba, Architects Gaboury, Lussier, Sigurdson and Venables; and Winnipeg International Air Terminal, Architects Green, Blankstein and Russell.

The jury, Roy Sellers, Dean of Architecture, University of Manitoba; William Strong, MRAIC, Toronto, and Valerius Michelson, Associate Professor of Architecture, University of Minnesota selected the winning designs from a field of 45 entries. The competition and awards program will be held every three to five years.

Halifax School seeks New Director

The School of Architecture at Nova Scotia Technical College in Halifax is seeking a new director to fill the vacancy created by the resignation of Douglas Shadbolt, who is

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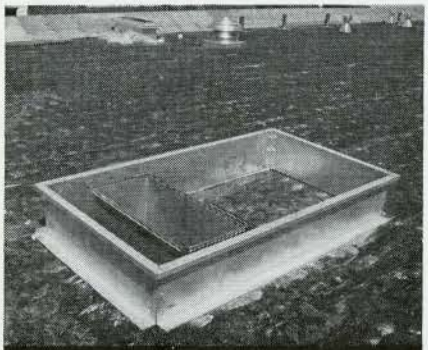

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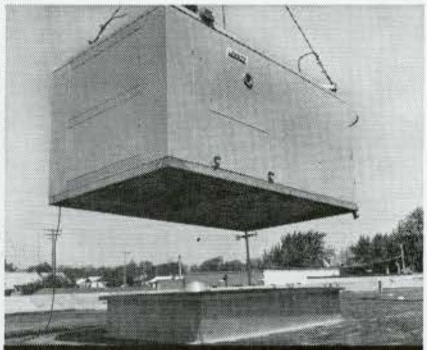
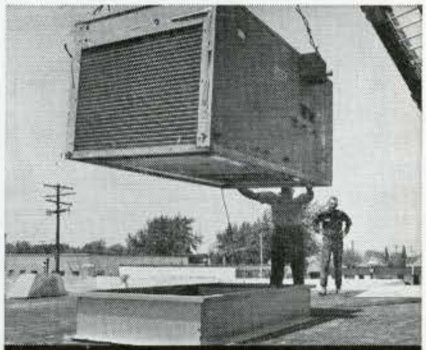
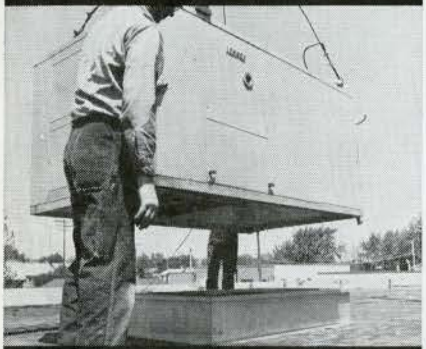


All ducts pierce the roof within the frame.



All-weather unit bolts to frame, needs no other sealing.



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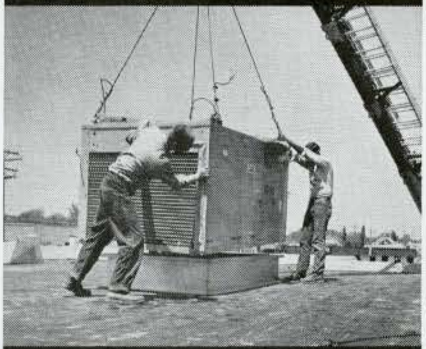

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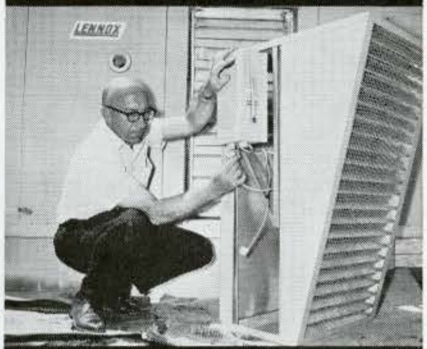

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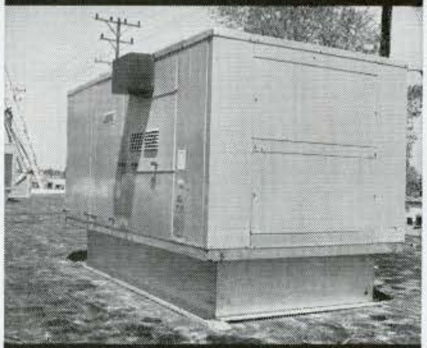

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3
MAA Award of Merit, Market Shopping Center, Saskatoon. Architects Waisman, Ross Blankstein, Coop, Gillmor and Hanna
4
MAA Honorable Mention, Kildonan Park Pavilion, Winnipeg. Architects Waisman, Ross, Blankstein, Coop, Gillmor and Hanna
5
MAA Honorable Mention, St. Claude Roman Catholic Church, St Claude, Manitoba. Architects Gaboury, Lussier, Sigurdson and Venables

moving to Carlton University at Ottawa this June. The school has been in operation for seven years and has grown steadily as its program has been developed and expanded. The current enrolment is over 90 students and the projected enrolment will reach 150 students by 1972. There are currently eight full-time professors and over 25 part-time professors involved in teaching in the school. A major addition to the present building is in the final working drawing stage and is expected to go into construction this summer. Subsequent to the completion of the addition, the present building will be totally renovated and the combined total accommodation will exceed 50,000 square feet. W. G. Holbrook, President of Nova Scotia Technical College, feels that the school is now solidly established in the academic and professional communities in the Halifax area and there are excellent opportunities for further growth and development.

Coming Events

Building Science Seminar on Fire and the Design of Buildings; Calgary, April 4, 5.

Third IUA Colloquium on the Industrialization of Buildings, April 22-27, Barcelona.

IUA Conference on Housing, April 28-May 5, Agadir, Morocco.

CIQS Convention, May 10, 11, 12, Skyline Hotel, Ottawa.

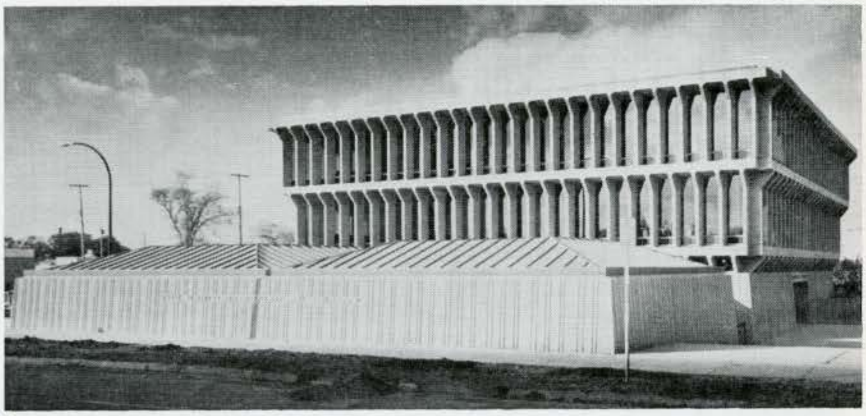
4th Technical Fortnite, Paris, France, May 16-June 3.

Fifth IUA Seminar on Industrial Architecture, May 19-26, Detroit, Michigan.

RAIC Assembly, May 27-June 1, Regina.

Madrid Symposium on Steel for Prestressing, June 6, 7.

International Federation of Landscape Architects Congress, June 15-20, Montreal.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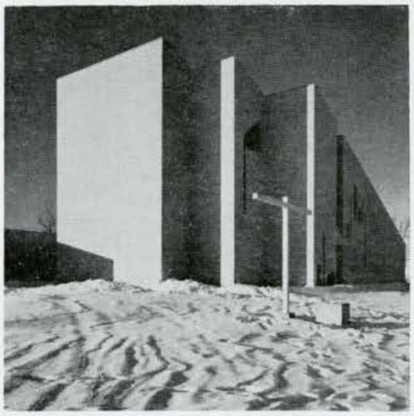
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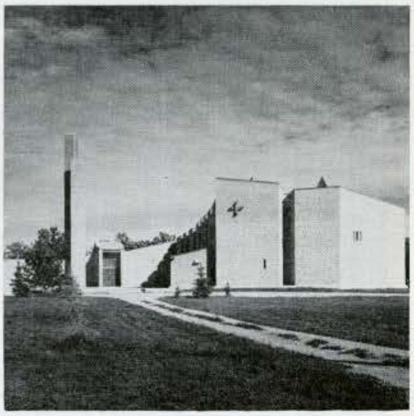
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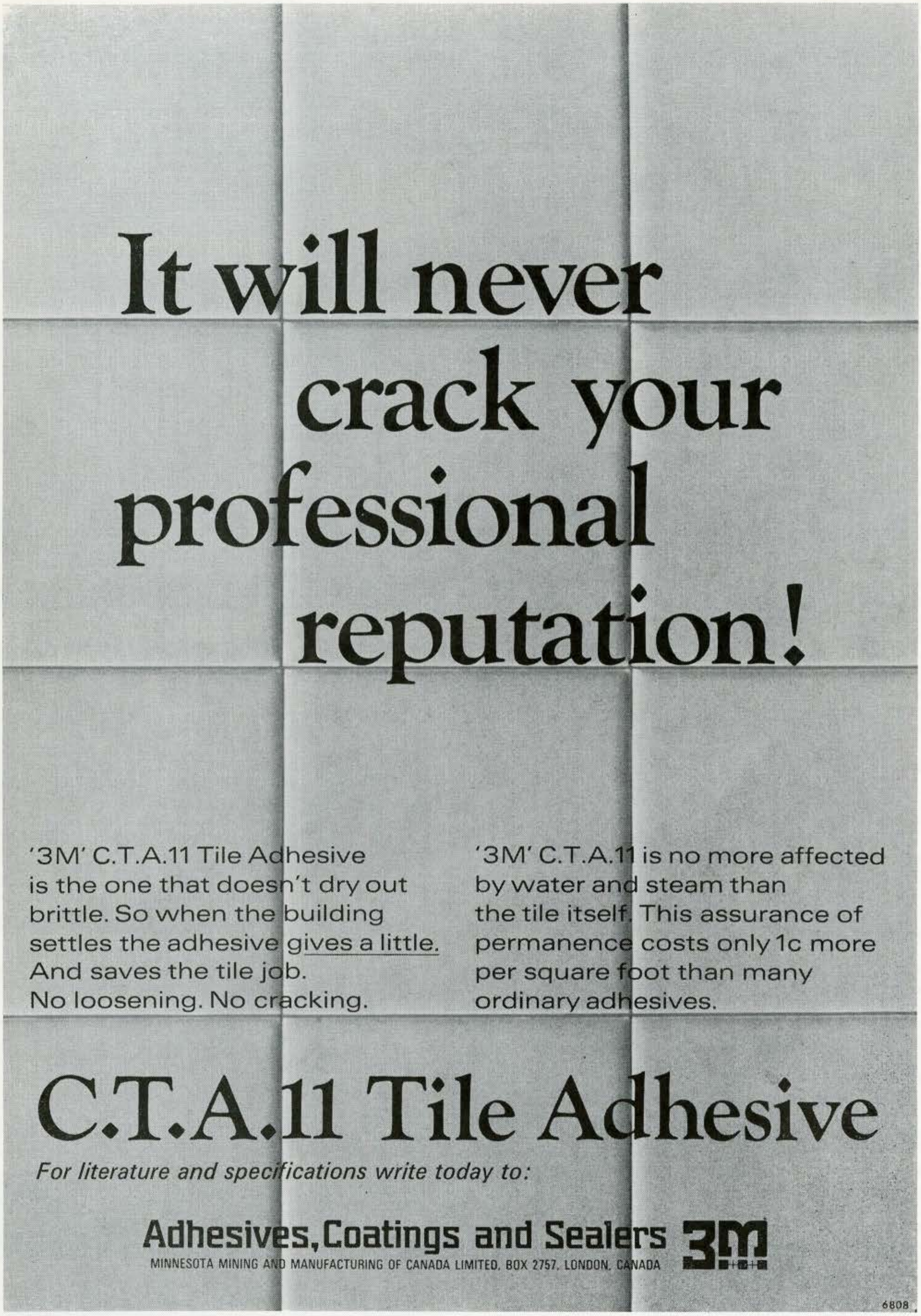
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Communiqué 2

President RAIC says Parochialism Hampers Development of Profession

Some of the major problems facing the architectural profession in Canada and what the RAIC is doing about them were discussed by James E. Searle (*F*), President RAIC in an outline of Institute activities and programs at the annual meeting of the Manitoba Association of Architects in Winnipeg January 27.

The Institute would now be able to budget realistically because the Province of Quebec Association of Architects has undertaken to resume paying full per capita dues in 1968. Now brought to the fore again were the recommendations of the Report of the RAIC Survey of the Profession, chiefly the one concerning the appointment of a capable architect to the full time position of Director of Professional Services.

"Detailed analysis of the Survey makes us aware of the difficulty of accomplishing anything positive in the areas of uniform registration, uniform provincial acts, standards of performance and fee structure. The present parochial attitude in many of the provinces with respect to interprovincial practice is not only permitting other disciplines and enterprises to enter our traditional sphere of activity – it is forcing them to do so in order to adequately serve tomorrow's clients. Any knowledgeable studies in recent years, such as the AIA's "Emerging Techniques of Architectural Practice", or the recent – "Comprehensive Study of the Cost of Architectural Services" emphasize that architectural practice in the future will consist of larger firms offering much broader services, or consortiums of smaller firms utilizing an integrated inter-disciplinary team approach.

"As architects we find ourselves in a dilemma. Our clients, both public and private, are becoming larger and are representing regional and, to an increasing degree, national interests. At the same time architects are unable to follow suit because of antiquated provincial legislation. The real tragedy is not that the legislation exists but that in the Western provinces, except Manitoba, the profession is doing nothing to change the legislation and is, in fact, encouraging the status quo."

There was also the increasing tendency for potential clients to invite proposals from groups other than architects, proposals for projects formerly within the architect's professional domain. Often the architect was no longer the prime consultant. Examples were found in university housing in B.C. and Ontario, hospital construction in Ontario and university buildings and laboratories in several provinces.

"If we are conscious of the manner in which the major decisions of construction are being centralized, and if we take note of the increasing size and complexity of the organizations responsible for conceiving, financing, developing and constructing major projects in both the public and private sectors of the economy, then we must realize that our profession must be able to grow in like measure." □

L'esprit de clocher entrave le progrès de la profession

Les problèmes affrontant la profession au Canada et le rôle joué par l'IRAC furent le sujet d'un exposé du Président James E. Searle (F) à la conférence annuelle de l'Association des Architectes de la Province du Manitoba le 27 janvier à Winnipeg.

L'Institut aura maintenant la possibilité de présenter un budget réaliste en raison de la décision de L'AAPQ de reprendre ses paiements per capita dues en 1968. Autres sujets à l'ordre du jour furent l'Enquête sur la Profession et la nomination d'un architecte, capable de remplir les fonctions de directeur des services professionnels.

L'analyse détaillée de l'enquête fait ressortir les difficultées rencontrées pour obtenir des résultats positifs dans le domaine de l'inscription uniformisée, des décrets provinciaux uniformisés et du barême des honoraires.

L'attitude des provinces à l'égard de la pratique interprovinciale permet à d'autres branches d'empiéter sur le terrain des architectes, mais les oblige aussi de mieux servir les clients. Les recherches des années précédentes telles que "Les Techniques Nouvelles de la Pratique Professionnelle" et "L'Etude du Barême des Services Professionnels" prouvent la nécessité d'une création de firmes plus grandes offrant des services plus importants ou des associations travaillant en équipe. De ce fait, les architectes se trouvent dans une impasse. Les clients du secteur publique et du secteur privé deviennent de plus en plus puissants, car il représentent maintenant des intérêts régionaux et nationaux. En raison d'une législation archaique les architectes sont imcapables de suivre le courant. La vraie tragédie n'est pas seulement l'existence de cette législation, mais surtout l'inaction des provinces occidentales, à l'exception du Manitoba, de changer ces lois, et de fait, encourager le status quo. Il y a également une tendance grandissante parmi la clientèle puissante de s'adresser aux groupes, autres que les architectes pour la réalisation de projects. Souvent l'architecte n'est pas le seul expert de l'affaire. On peut citer comme exemple les résidences universitaires en C.B. et dans l'Ontario; la construction des hôpitaux dans l'Ontario et les édifices et laboratoires universitaires dans plusieurs provinces. Si nous nous rendons compte de la centralisation des décisions prises concernant la construction et si nous notons le volume grandissant et la complexité des organisations responsables du financement et du développement des projets importants dans le secteur publique de l'économie, alors il nous faut comprendre qu'il est grand temps pour notre profession de se mettre à la page. □

2. Soaring shapes of the Chapel of the Scholasticat Central, Montreal.

1. The spectacular North York Exbury Towers, Toronto, Ont.

3. Bold concrete design for the Centennial Planetarium, Calgary, Alta.

4. Imaginatively designed concrete panels provide unusual beauty and flawless uniformity for the City Hall, Tracy, Que.

BOLD, BEAUTIFUL DESIGNS... SOLI

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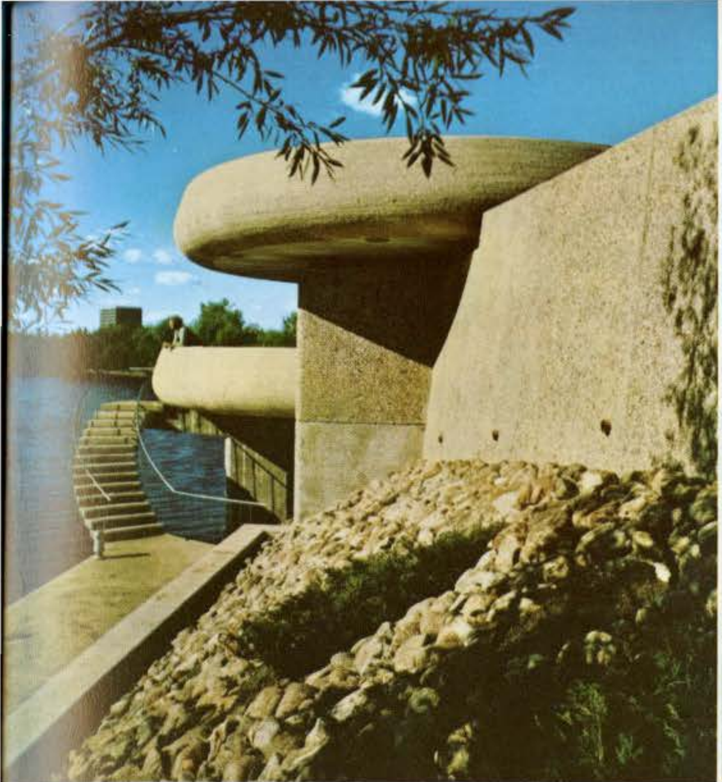

5. Rugged beauty at Wascana Centre Pumphouse, Regina, Sask.

6. Striking use of concrete at the YM-YWHA complex, Côte St. Luc, Que.

7. The Edmonton Centennial Library, a fine example of precast concrete construction. The CN Tower can be seen in background.

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Consulting Structural Engineers: Cooper Consultants Ltd.
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Ready-mixed concrete: Richvale Ready Mix Ltd.

2. Architect: Roland Dumais
Consulting Structural Engineers: Jean F. Gagnon & Assoc.
General Contractor: Albert Deschamps Ltée.
Ready-mixed concrete: Francon (1966) Ltd.

3. Architect: McMillan, Long & Associates
Consulting Structural Engineers: T. Lamb, McManus and Associates Ltd.
General Contractor: Hashman Construction Co. Ltd.
Ready-mixed: Consolidated Concrete Ltd.

4. Architect: Jacques Racicot
Consulting Structural Engineer: Alexandre Opran
General Contractor: Rapid Construction Ltée
Precast concrete panels: Francon (1966) Ltd.

5. Owners: Saskatchewan Provincial Government
Architects: Kerr, Cullingworth, Riches, Associates
Consulting Structural Engineers: Reid, Crowther and Partners Ltd.
General Contractor: Buildcon Ltd.
Ready-mixed concrete: Trans-Mix Concrete

6. Architect: Harry Stilman
Consulting Structural Engineer: Bernard Geller
General Contractor: Leon M. Adler
Precast concrete: Francon (1966) Ltd.

7. Architects & Consulting Structural Engineers: Rensaa, Minsos & Associates
General Contractor: Alta-West Construction Ltd.
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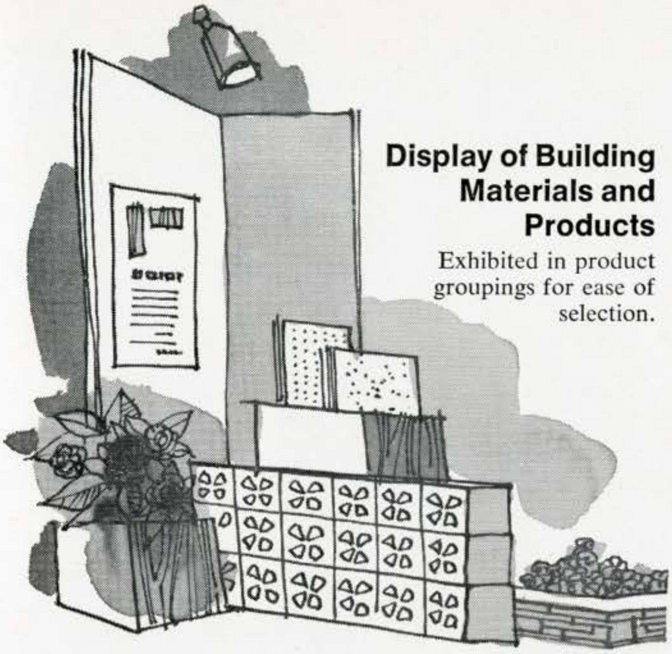

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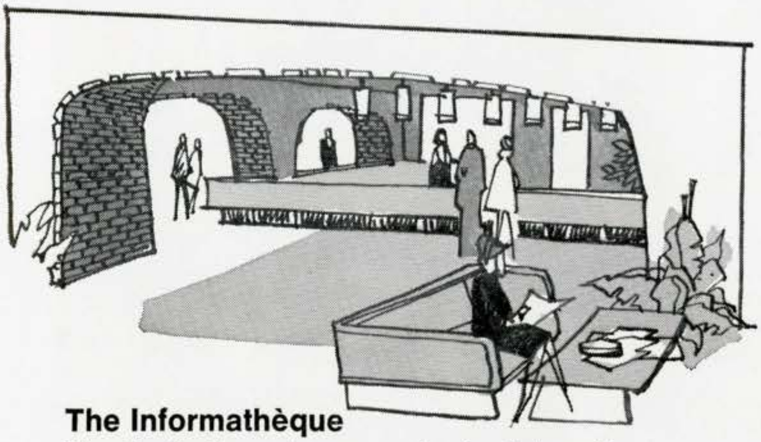

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J. Hébert	— Industrial Designer.
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L. Shector	— Chairman, Montreal Chapter, Specification Writers Association of Canada.
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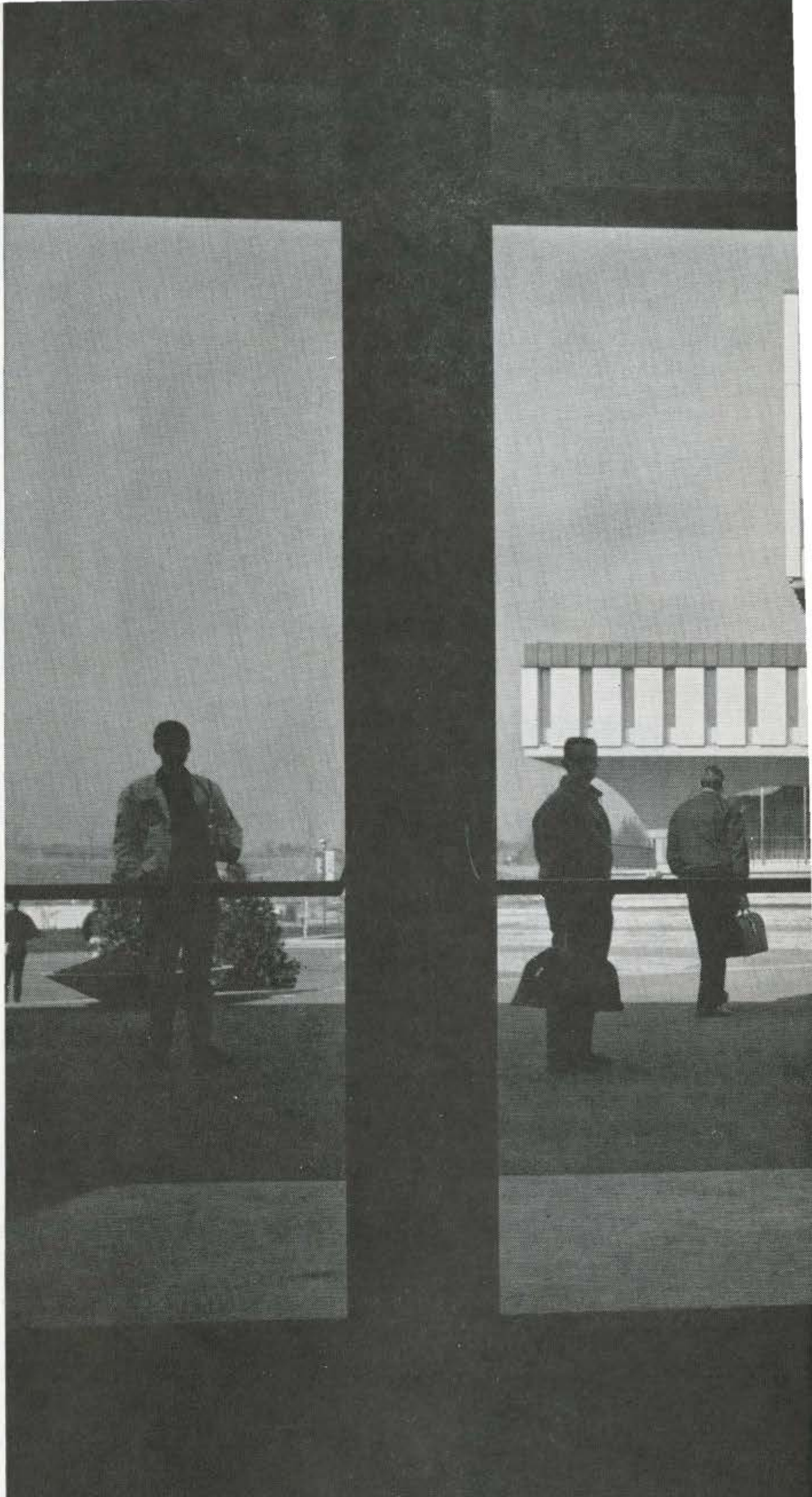
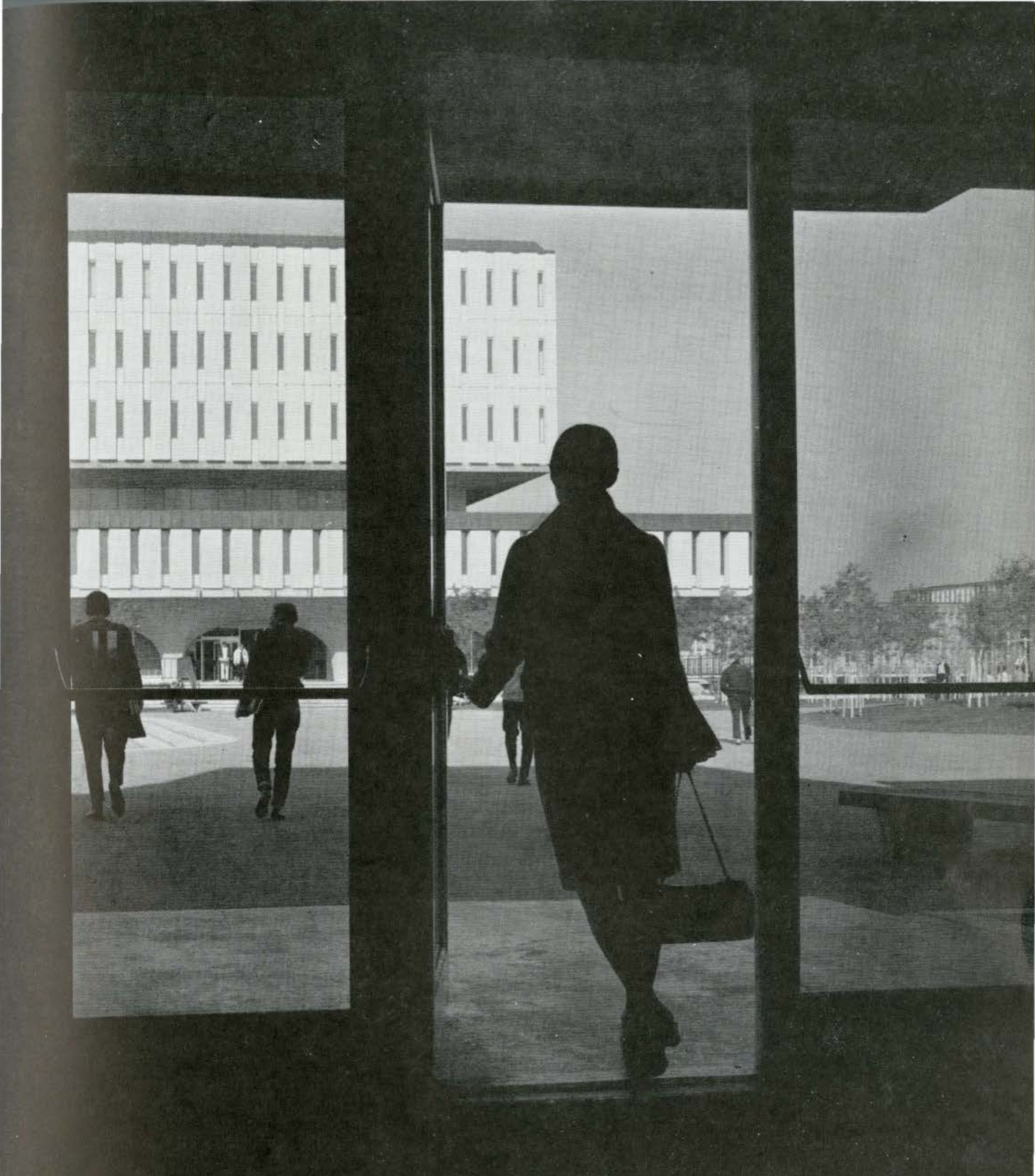
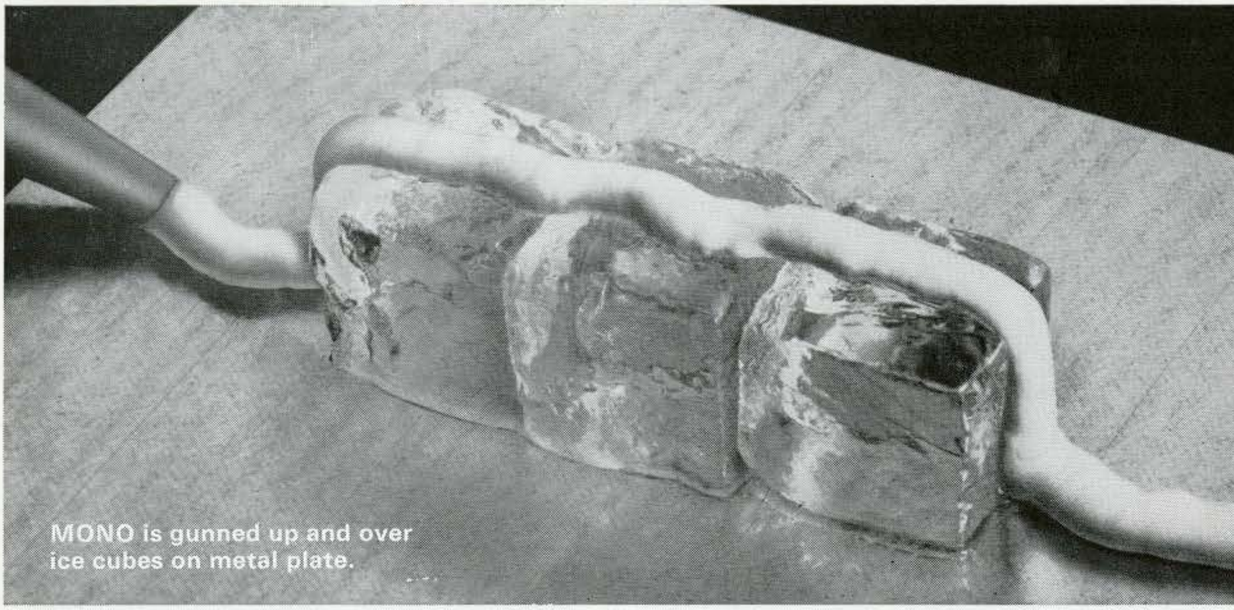
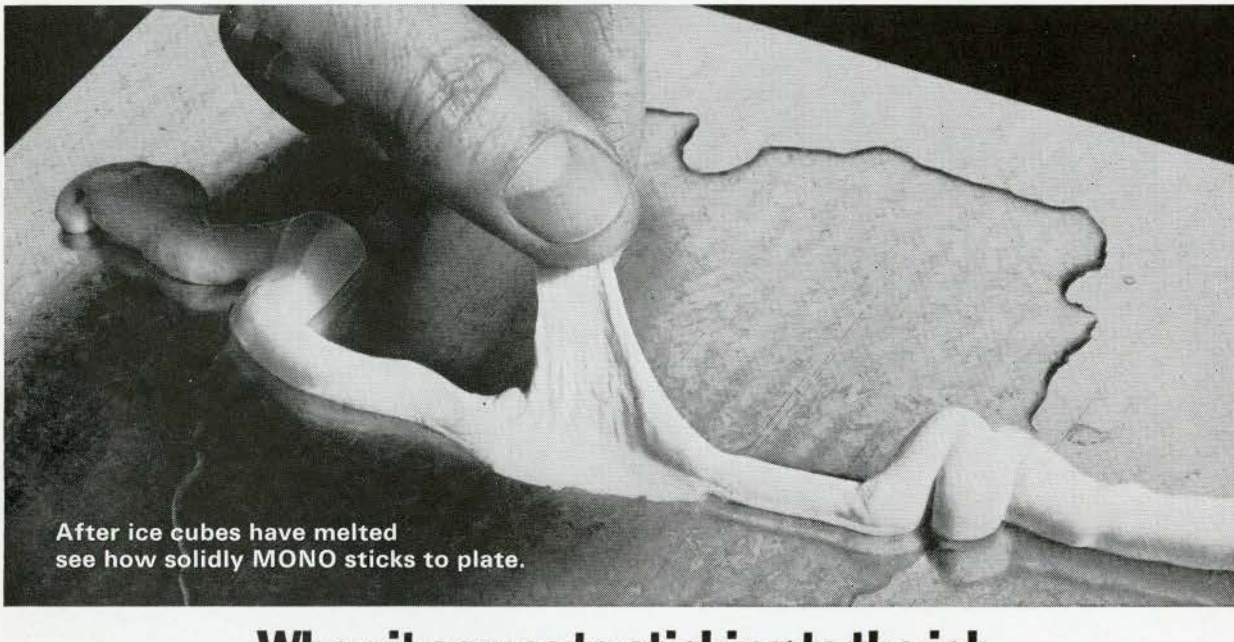






MONO is gunned up and over ice cubes on metal plate.



After ice cubes have melted see how solidly MONO sticks to plate.

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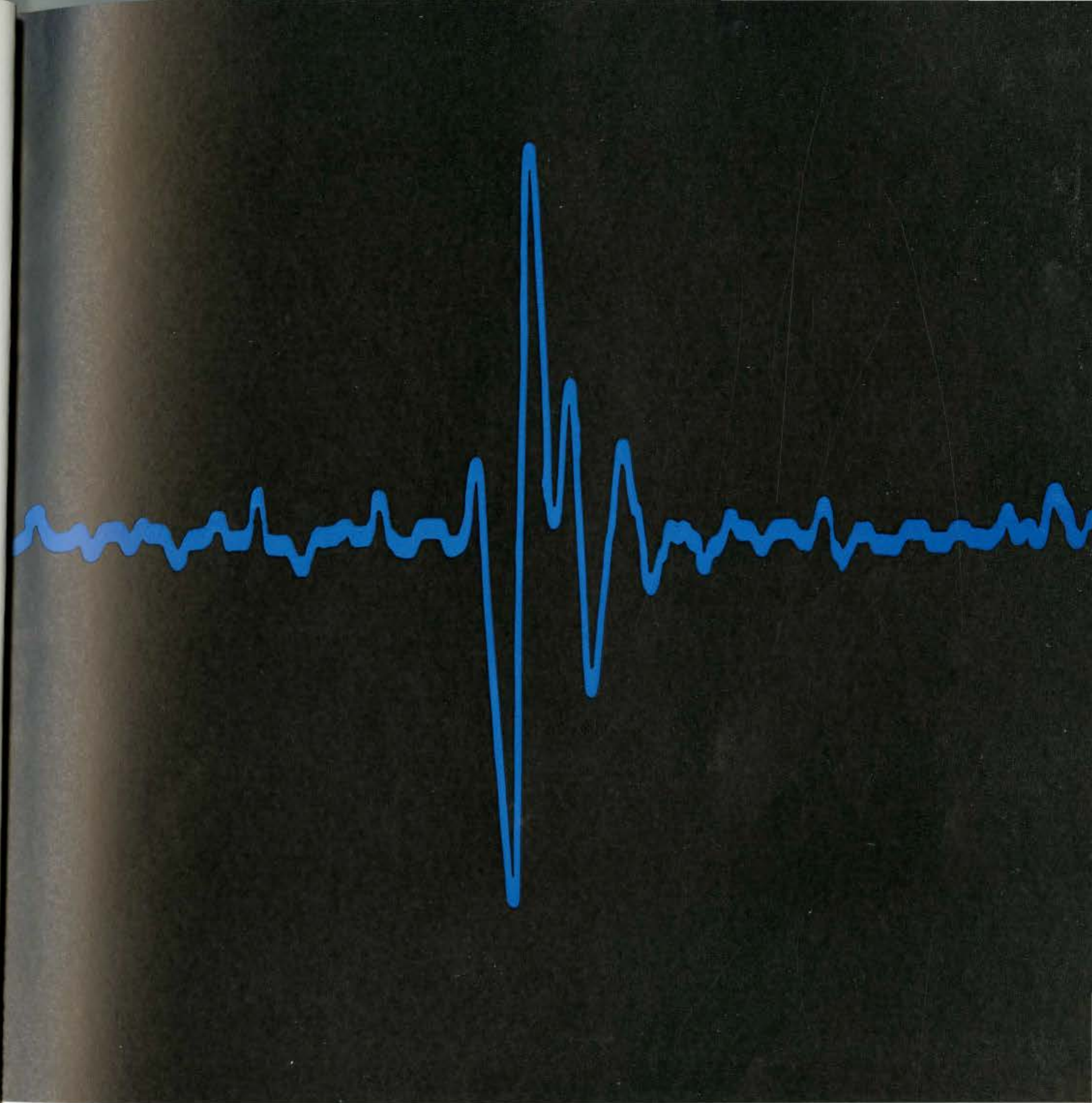

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RUSSWIN

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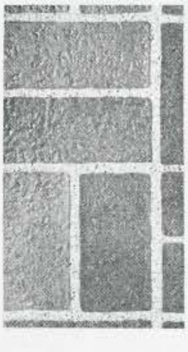
Now top-quality sheet vinyl floors can be quickly installed over old resilient floors. The cost is about equal to that of ripping up old floors and installing lower cost vinyl-asbestos. And the job is guaranteed in writing by Armstrong.

Recently new resilient floors were installed in these offices. The original specifications for the job called for the installation of 1/4" plywood directly over the old linoleum floor, with 1/8" vinyl-asbestos installed over the plywood underlay. The building owners however, preferred a sheet vinyl floor — particularly in high-traffic areas — for its fewer seams and ease of maintenance. Their flooring contractor recommended using the revolutionary, new Armstrong Perimiflor Installation System to install a Tessera Vinyl Corlon sheet floor directly over the old linoleum. This eliminated the need for the cost of the plywood subfloor.

Tessera Vinyl Corlon

Coronelle Vinyl Corlon



Montina Vinyl Corlon

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ADVANTAGES FOR COMMERCIAL INTERIORS

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Armstrong sheet vinyl floors come in rolls six feet wide by as much as ninety feet long, so there is a minimum of seams to begin with. Where there is a seam, it's completely sealed and waterproofed by the special Perimiflor adhesive. No cracks or openings exist in the finished installation, so the floor cleans easier, stays clean longer. Seams are impervious to water, dirt, and many chemicals.

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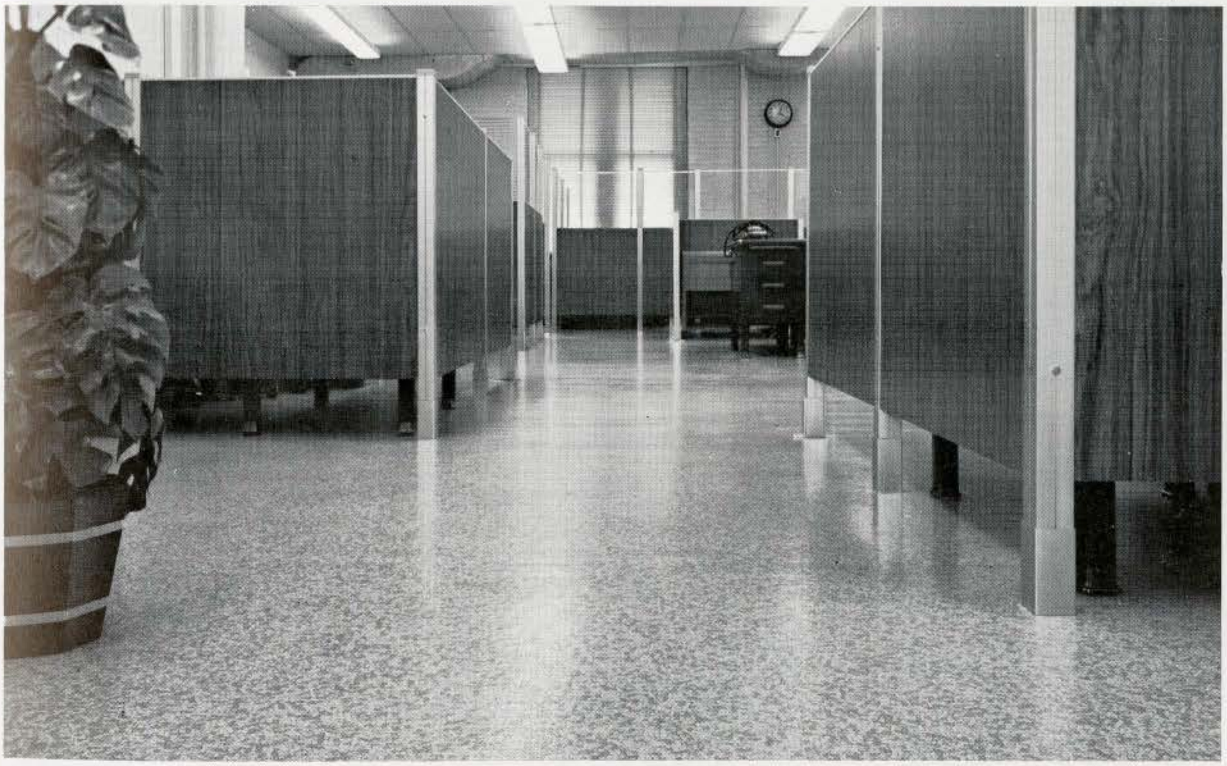
CAN YOU USE PERIMIFLOR?

Your Armstrong flooring contractor is the man to call. For additional information and an illustrated brochure showing how the Perimiflor Installation System may be of benefit to your clients, call your Armstrong Representative or District Office, or write Armstrong, Post Office Box 919, Montreal, Que.

At left, offices with old linoleum floor before Perimiflor installation.

Below, new Tessera Corlon floor installed over old linoleum by time-saving Perimiflor System.



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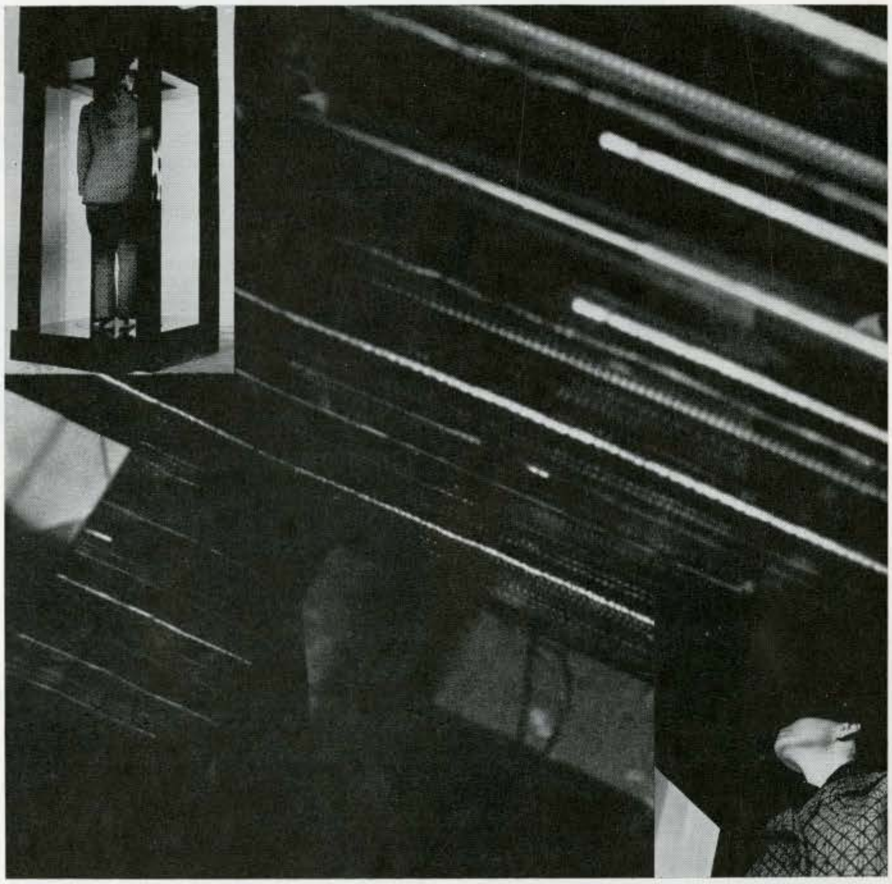
Artists Ideas and Plastics
Part 2

Gabo and Pevsner, artists with new ideas *(see Part 1, February issue)* in the early years of plastics were quick to see that new statements with new materials created an ideal situation for their manifesto on constructivism. Others were slow to follow. But their theory, constructivism, (manifesting a statement that the "thing" in art had a life of its own) released sculpture forever from the bondage of the "single form" with a "two-faced purpose" (a purpose of stating not only its own image but through it, that of its referential "master form"). It is, however, the use of plastics and their transparent qualities which threw light on the incredible activity to the spacial articulation within the mass. Stated with elegant transparencies, vigorous movement of and in space of "negative volumes" infinite speculations on space arrangement were opened for the area of three dimensions. Architecture as well as sculpture owes much to the plastic space modulator of that time. Ironically the "vertical" straight-jacket of the skyscraper was to inhibit the area of the glass curtain transparency in architecture. Sadly the great increasing army of "art students" (as opposed to "industrial design students" who followed) were to be held down in the sluggish fog of "renaissance" thinking of the art educators within the various academic establishments and so called training schools.



1

The historical development of the last 50 years of sculpture shows that in the "realized" revolt of young minds against their outmoded training, a decision was made against qualification in favor of education. To gain knowledge to create new ideas in new terms they turned to the only educator available – the industrial factory. This story is a general one in all industrialized society. Local activity only mirrors the truth.

The young artists sought their own "academy". The leading exponents of "art in plastics" are young vital and often courageous entrepreneurs for they stake material dollars in the venture. I am assured by industry that the artist is a "paying" customer (even if a little overdue at times). Literally pushing their feet in the door of the factory with infectious enthusiasm they managed to disarm any disinterested commercial mind in their quest for "know how". (Especially so, with smaller industries where personal contact is more direct). The story from then on is a romantic one of growing mutual respect for each other's talents with equally increased awareness of the possibilities, practical and aesthetic, in the enormous field of plastics. Larger companies will probably follow the example of "smaller leaders".

1

Ziggy Blazeje, 1254 Dundas St. W., Toronto, has his wife Joanne inspect the intriguing interior of his new mobile kinetic construction. Plastic and lights invite complete involvement in his people's sculptures. Blazeje for all his youth is a hardy pioneer in plastic kinetics in Canada

Ziggy Blazeje, 1254 Dundas St. W., Toronto, fait inspecter à sa femme l'intérieur intrigant de sa dernière création mobile et cinétique. Plastiques et lumières créent une atmosphère complète dans ses sculptures. Blazeje, malgré sa jeunesse, est un précurseur hardi dans l'Art cinétique au Canada

2, 3

Freda Koblick, 401 Francisco St., San Francisco. A pioneer in the use of plastics for architectural art for 25 years is seen at work in her studio. An early Koblick light fitting can be seen in Toronto's Inn on the Park. She recently instituted the first formal plastics course for The Royal College of Art in London, England. Freda Koblick has a doctorate of plastics to her credit

Freda Koblick, 401 Fancisco St., San Francisco, pionnier de l'utilisation des plastiques dans l'art depuis 25 ans, au travail dans son studio. Un de ses premiers dispositifs illuminés se trouve à l'Inn on the Park, Toronto.

4, 5

Michael Hayden (Inter Systems) 252 Adelaide St. E., Toronto, ponders on his plastic problem in the "academy" of "Professor" Donald Budd. (For Hayden's work see Feb. issue)

Michael Hayden (Inter Systems, 252 Adelaide St. E., Toronto) médite sur un problème plastique "à l'académie du Professeur" Donald Budd. (voir février 68)

6, 7

Merton Chambers, 641 Queen St. E., Toronto, in his studio, is thoughtful in front of his illuminated plasticized batik screen. Two years of research impregnating cloth with plastic has yielded fascinating possibilities for walls, murals and screens with light illuminating rich, colored, batik images revitalizing an ancient craft. He opens his new gallery-studio for architects to visit and see his notions on and after April 1st

Merton Chambers (641 Queen St. E., Toronto) devant son écran en plastique illuminé.

2

4

6

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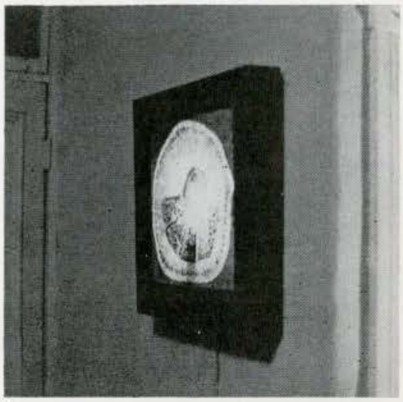


7

The artist and his ideas have triumphed. Industry has become totally aware of its new product. Every factory working with artists that I have visited endorses the fact of increased awareness of potential and of the fact that "waste" material is no longer the factory throw-away but can become jewels for setting in the hands of the artist-craftsman. The stimulus to industry's own production and a growing economic sideline in production of the artist's image also follows. In research on the work of one artist, Michael Hayden of Toronto, and his development with his "Plastic Professors", Donald Budd of Multi-Plastics, Fred Janzen of Janzen & Carti together with Philips Electronic Engineering would make a fascinating article in itself. There are many others Blazeje, Koblick, Gladstone, Levine etc who form new socio-economic units with industry relating art to our time. It is again another story that the factory, readily instituting voluntary instruction classes for students, in the face of academic inertia, forced an issue so that token courses are being established within the confined and restricted equipment of the academy.

What follows now is that beautiful "public" art images, for this is what they are, are being manufactured from artists' "ideas". A new pressure group on the architect (see February Architecture Canada, page 49) is demanding the architect to "make room" for the product. Total environment exhibition gives the hint. That the audio-kinetic world of plastic sculpture "relates" to the common and uncommon man is obvious. The new idiom excites and engages all. Charm and beauty in the phenomena are the true substitutes for the loss of rural aesthetic sensations.

What shall the architect's role be? How can his "selective" decision effect good purpose? – Next issue. . . . "Lobbying" . . "The Architect and his Role in *Plastic Paradise*".

Anita Aarons

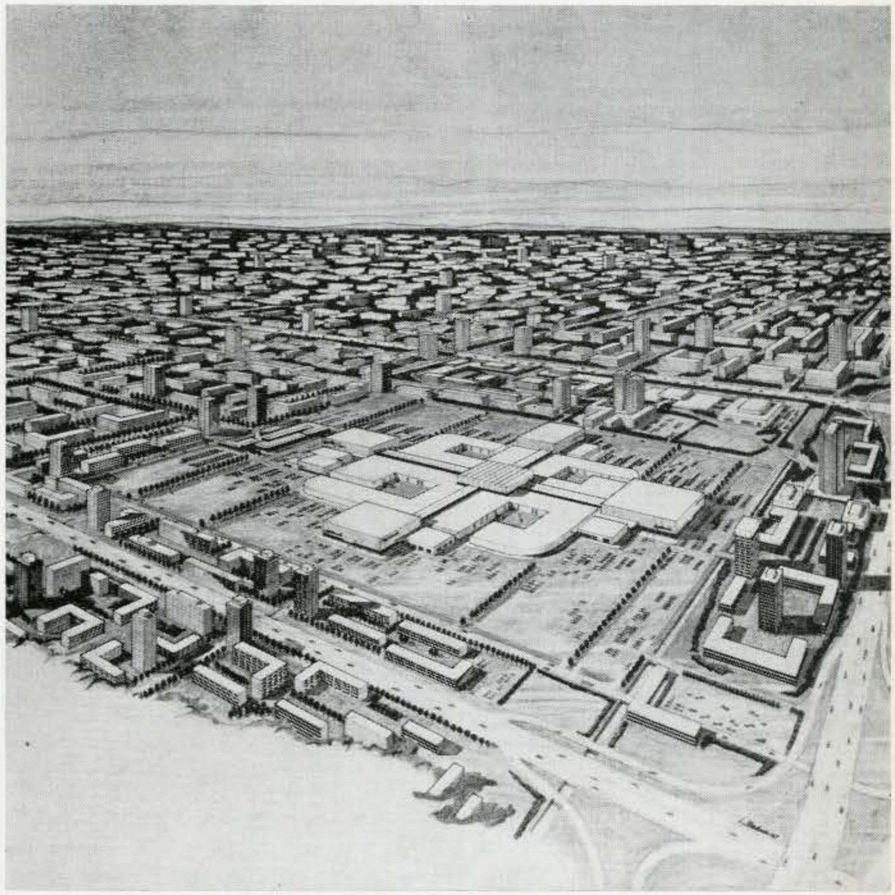
Review
Revue

4

Breast-beating about the problems of the profession is not unknown in architectural circles. It is often accompanied by vague suggestions beginning with "we should . . ." – the *idea* of change substituting for change itself.

At last we have a president – James Searle, who, in his address to the Annual Meeting of the Manitoba Association of Architects has made specific proposals to improve the practice of architecture. Among the crucial ones, and their concomitant problem situations are:
The comprehensiveness, size and complexity of projects and the organizations responsible for conceiving, financing and developing and the construction of projects, both private and public continue to grow. Often they are national in scope. This is not matched by the service we provide. The provincial professional associations operate independently. The increasing tendency of clients is to call for proposals from groups.

Our Provincial codes prevent participation. When we can participate it is no longer in the role of prime consultant (for example university housing, hospital construction). What all this means is that the range of expertise, and the responsibility required for such work is not being offered. If we trace the reason for this to the source, we find that, firstly, we are confining the objectives of our education system to narrow, outdated products; and secondly, that our registration requirements are, if anything, more restrictive and narrow than our educational objectives. The education for and the laws governing the practice of architecture do not require janitorial services – they require total overhaul. The President has outlined the situation. He has identified our problems. We can define the causes. Will the provincial bodies respond? This must be an inhouse job, no one else will care if we become extinct. Therefore the responsibility lies with the membership to pressure for change, and empower those with attitudes disposed to augment this change and those with the expertise to render such change potent, to move quickly.

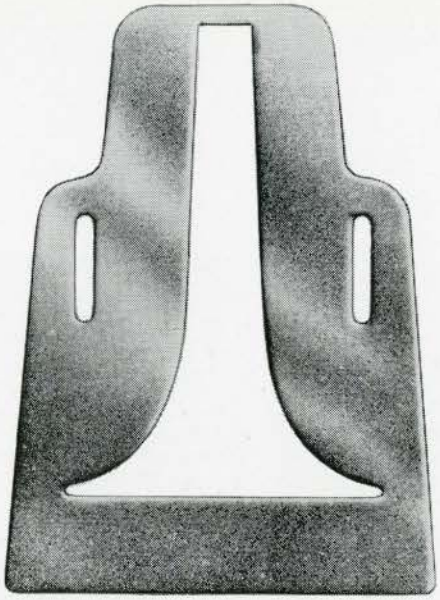


1

O Canada, oh Mississauga, –
this, to quote the Daily Commercial News, will be the new Mississauga City Center (**1**), and "construction is to start when weather permits". It is the first time I have prayed for bad weather. In most fields, the time lag between theoretical statement and implementation is fairly long, but not so long, it seems, as in architecture. Here is a scheme from the 20's with none of the lessons, and tough lessons they have been, from urban renewal, learned. A giant game of dominos, a man made moonscape, a no-mans-land between isolated, forlorn structures connected by areas of drab, dingy depressing blacktop, or covered with cars. Even the token trees are regimented. Alexander Pope long ago railed at classical rigidity – grove nods at grove . . . each alley has a brother . . . statues thick as trees . . . trees cut as statues . . . A sort of neo-beaux-arts-early functional-pseudo industrial, all in a simplistic diagram that is a substitute for an urban plan. And if construction has to wait for good weather, what of the poor people, when the job is completed?

A.J.D.


This space is not big enough to show you our largest Hollow Structural Sections



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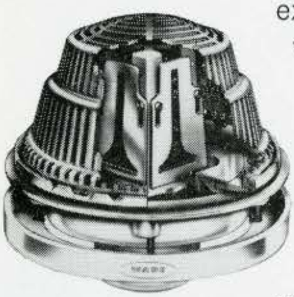

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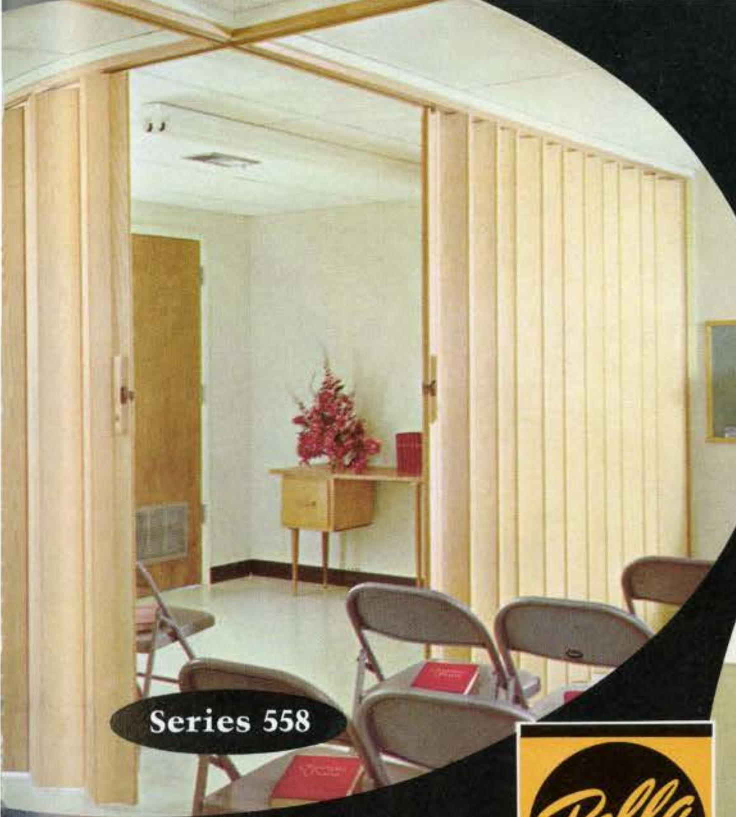
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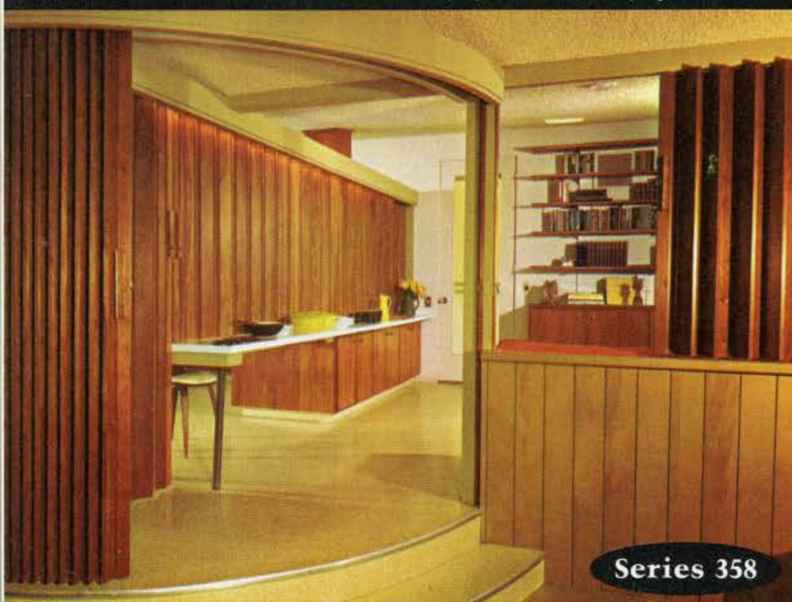

Architect: Paul S. Hoag • Builder: L. M. Clark

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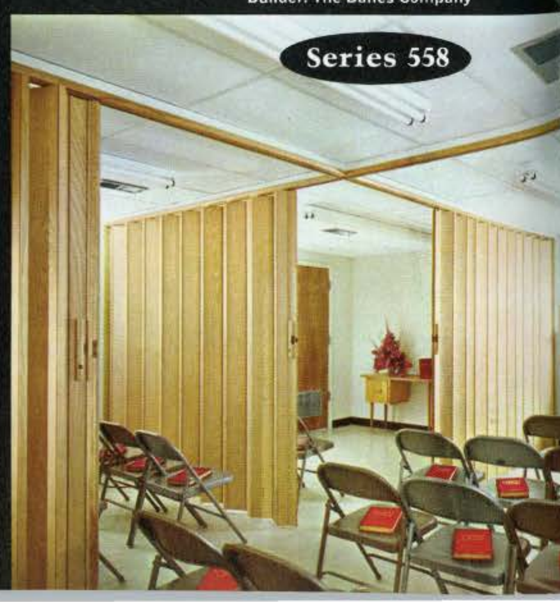

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Résumés

Page 48
Environnements Scolaires:
la Planification au-delà de la Flexibilité.
Melvin Charney, MIRAC.

De nos jours, on se demande "quelles sont les implications architecturales de la reforme scolaire", question présupposant qu'un système architectural viable peut toujours assimiler les changements.
L'architecte s'intéresse sincèrement aux réformes scolaires surtout par rapport aux développements technologiques et sociaux.
L'accent est sur une technologie pour l'éducation; la création de tout une ambiance pour les procédures scolaires, dont l'école n'est qu'une partie.
La technologie peut être vue aussi comme façon de rationaliser des problèmes.
Ces nouvelles impératives se manifestent par une préoccupation avec la flexibilité, la facilité de l'environnement physique et de leurs occupants à soutenir et à effectuer le changement. L'ancien système d'éducation cède à un système bien plus flexible sans grades avec plus de participation active, l'élément physique étant une des ressources à contrôler.
Les nouvelles écoles primaires contiennent un espace continu ayant trois à cinq groupes de trente enfants et leurs instituteurs. Idéalement, dans cette enveloppe ou coquille, les activités scolaires peuvent générer des configurations spatiales et des groupes indentifiables déterminés par les limitations imposées par les participants.
Chaque élément physique participe à l'enseignement. Ainsi, la flexibilité signifie pour l'enfant l'engagement spécifique des éléments physiques, idée que l'équipement scolaire n'est qu'un fragment de l'ambiance, permet à l'enfant de s'identifier avec la partie de l'entourage propre à ses besoins.

Au niveau secondaire, quatre modes de flexibilité proprosés en 1964 par le SCSD en Californie résument l'étendue de la planification contemporaine. La définition SCSD du problème de dessin ne considère pas le mouvement comme une contrainte d'organisation; elle est basée sur un bâtiment fixe dans lequel sont introdruits des éléments amovibles.
L'usage de dispositifs électroniques encourage des groupes d'un nombre varié. Il implique les étudiants directement dans une série de situations relativement précises. Des cloisons démontables peuvent facilement restreindre l'usage de ces appareils permettant des variantes de groupement d'étudiants. L'étudiant, immobile devant son écran, devient un récepteur, ses caractéristiques perceptuelles sont mesurées et transmises par ordinateur dans une boucle fermée qui contrôle l'ambiance totale par son enrégistrement. Les techniques de construction tendent de plus en plus à employer des matériaux et des assemblages pouvant être changés et ajustés.
Un système scolaire ne peut plus exister indépendamment de son contexte économique, social et physique.
L'industrialisation des techniques de construction dépend d'un consortium d'écoles car l'éducation est maintenant un des déterminants du milieu urbain.
En fin de compte, l'éducation doit être vue comme fonction et instrument de l'organisation sociale.

Page 49
Une Expérience dans la Direction des Travaux pour une Construction Scolaire.
North York, Ont.

La Commission Scolaire de North York a entrepris une expérience dans le dessin et la construction de sept écoles employant un système de contrôle par honoraires fixes pour la gérance et soumissions par corps d'états. J. Y. MacDonald de la Commission Scolaire explique le système. Les commentaires de l'entrepreneur et des 7 architectes qui ont participé à ce projet se trouvent page 00, texte anglais.
Dans ce système, soit un entrepreneur général, ou pour les plus grands projets, un groupe de conseils sont employés dès le début pour gérer le projet pour un prix fixe. Nos 7 écoles approchent l'achèvement et les résultats peuvent être définis comme suit: 1) Les entrepreneurs généraux représentaient des firmes techniquement organisées qui d'habitude ne soumettent pas pour la construction d'écoles primaires.
2) La construction sur chantier débutait cinq mois avant que les soumissions aient été décidées par des procédures normales. 3) Plus de sous-traitants ont pu répondre aux appels d'offre et un temps adéquat a été accordé pour développer leurs soumissions.
4) Les delais de soumissions ont permis de considérer quelques contre-propositions. 5) La structure des honoraires fixes fournissait un encouragement à l'Entrepreneur Général d'organiser et expédier la construction des projets — sans frais supplémentaires au client.
6) Un changement très significatif entre les rapports Architecte-Propriètaire-Entrepreneur-Général était bien en évidence.

En conclusion, nous avons été impressionés par l'habilité et l'organisation des firmes attirées par cette méthode, par la mise en oeuvre très tôt de la construction, les économies résultant des sous-traitants plus informés, la réduction d'ordres de services supplémentaires et par les suggestions constructives de l'Entrepreneur Général.
Etant donné qu'auparavant les procédés d'approbation d'un projet ont souvent duré plus longtemps que la construction d'une école, les architectes ont été priés d'organiser leurs dessins le plus vite possible et suivant les méthodes les plus modernes. Ils ont donc employé des éléments et des systèmes modulaires.
La co-ordination était compliquée par le fait que 7 firmes d'architectes, 6 d'ingénieurs en structure, 6 en mécanique et 6 en électricité ont été employées.
le temps gagné et la rapidité de construction soulignent l'excellente co-opération parmi tous les conseils qui ont participé à ce projet-pilote réussi.

Pege 59
Ambiance nécessaire aux
Kenneth F. Prueter

Le rôle de l'éducation dans notre société reste toujours le même et l'école qu'on construit aujourd'hui doit servir aux besoins de demain. L'éducation devient de plus en plus un processus sans fin et nos écoles doivent maintenant servir aux besoins de tous les âges. Je ne sais pas exactement quelles seront les spécifications nécessaires à la création d'écoles adaptées à nos jours et à l'avenir mais je vais suggérer quelques principes. La première spécification est la qualité de nos professeurs; il faut qu'ils aient la place nécessaire à préparer les cours, faire des projets et communiquer.
Aujourd'hui les écoles exigent une flexibilité permettant d'enseigner des groupes de 8 à 100 élèves par des méthodes d'instruction variées. Les salles de classes rigides que nous connaissons, devront faire place aux formes plus flexibles. Je crois que nos codes du bâtiment devraient nous permettre de fournir l'espace approuvé mais aussi des moyens différents d'utiliser et transformer cet espace. Au moins 95% des salles de classes en Ontario sont meublées de rangées de pupitres avec le professeur devant; je soupçonne que cette méthode ne produise pas les meilleurs résultats. Puisque notre culture se transforme si rapidement, il n'est plus suffisant d'avoir des professeurs enseignant les jeunes; il faut un échange réciproque. Le professeur doit donner aux enfants les outils pour apprendre, soit, une habilité en lecture, écriture et mathématique. L'ambiance pour cet enseignement de base ne doit pas être trop recherchée. Les enfants moins doués ont

besoin d'être groupés dans des salles plus petites que celles des enfants qui apprennent plus rapidement, ces derniers ayant besoin d'espaces meublés spécialement pour encourager l'expérimentation, la lecture, la discussion, la recherche individuelle.
L'art d'apprendre devient enfin plus important que l'art d'enseigner et l'attention est portée sur l'individu plutôt que sur le groupe d'étudiants. Donc, l'école traditionnelle ne suffit plus. En général, les écoles ont déjà fait un progrès vers l'espace généralisé employant un équipement portatif désigné aux sections spéciales. Chaque école doit avoir maintenant une bibliothèque et nous devons améliorer les spécifications pour celles-ci afin d'incorporer un équipement moderne.
Les spécifications pour les sections administratives, gymnases et auditoires semblent être suffisantes, mais une salle d'usage multiple serait peut-être utile.
Est-ce qu'il existe un danger que nous négligeons l'aspect esthétique? Si vous considérez l'esthétique, un élément important de l'architecture scolaire, il va falloir rédiger des spécifications qui dirigent sans être trop autoritaire. L'école sans fenêtres a eu un très bon accueil par les enseignants surtout à cause du contrôle des températures et de la lumière.
Mais une école sans fenêtres pourrait se montrer moins efficace et moins adaptée aux bonnes fonctions de l'éducation — les spécifications de l'avenir doivent considérer sérieusement ce problème.
Il faudrait aussi demander l'avis des enseignants; plus un enseignant est progressif, plus il est flexible et la plupart d'entre eux favorisent des salles de classes carrées, avec espace tout autour plutôt qu'en avant et en arrière. Je suggère que nous demandions à nos enseignants de nous aider à identifier les caractéristiques les plus réussies de nos écoles.

Pege 62
L'Architecte et l'Industrialisation.
Colin H. Davidson, M.Arch.

Les nouvelles opportunités présentées par l'industrialisation peuvent être exploitées efficacement par un architecte de bonne qualité intellectuelle. Nos capacités et talents actuels ne suffiront plus.
Notre conception de l'industrie doit changer; il nous faut regarder les rapports entre les situations très complexes, puis les règles gouvernant ces rapports. Dans l'industrie du bâtiment, il y a également un changement de point de vue; on considère un bâtiment comme ayant un cycle de vie, soulignant le processus — d'accroissement, d'usage, etc. L'Industrialisation s'applique à la fabrication en série mais l'architecte est peut-être moins orienté dans ce sens. Sa formation l'oriente vers la production d'un bâtiment statique, un fait. Un autre aspect non typique de la construction traditionnelle c'est que maintenant les grandes organisations ont un champs d'activité si étendu qu'elles contrôlent non seulement les activités mais les rapports entre celles-ci. Lorsque l'échelle de l'implication de quelques participants commence à changer, ceci affectera tous les participants.

"L'industrialisation est une méthode productive basée sur un processus mécanisé et/ou organisé de caractère répétitif." Donc, trois aspects à souligner: le processus; ensuite l'organisation et la mécanisation; puis, la répétition.
Voyons un peu l'organisation actuelle de la construction (fig. 1). les liens étant entre participants, client, architecte, entrepreneur, mais pas entre fabricant et architecte. Les décisions sont dans une séquence compatible avec la délégation de responsabilités mais l'industrialisation présuppose la répetition et combien de répétitions peut-on trouver dans une de ces situations qui ne se répètent pas?
Seuls les plus grands projets peuvent commander assez de répétitions (aux termes de l'industriel). Donc, pour la plupart des projets, il nous faut employer des éléments de série. La conséquence?
Bien du travail sur chantier avant de réaliser un assemblage employant trop de main d'oeuvre, ce qui produit des conditions relativement désorganisées, soit, non-industrielles.

Page 73
Soumissions et Marchés — 2ème partie
F. W. Helyar.

Le marché "tout compris" (package deal) influence sans doute les révisions tentées dans les procédures de soumissions et marchés. Ses prétentions d'économies, de prix garantis et de vitesse d'exécution, quoique pas toujours justifiées, séduisent les propriétaires qui croient que la séparation du temps de dessin et de construction retarde la fin des travaux et prive l'architecte de conseil sur les prix que pourrait lui offrir l'entrepreneur.
Lorsqu'un propriétaire entre en contrat avec une société de gérance cette dernière permet à l'architecte et à l'entrepreneur de travailler en équipe dès le début des esquisses. Celui qui entreprend un marché de gérance doit se rendre compte qu'il agisse comme conseil et non comme constructeur. D'ailleurs, certains marchés excluent la soumission du gérant pour les travaux de construction. La gérance peut être offerte à un entrepreneur choisi par l'architecte ou son client, ou, un appel d'offre peut être fait à certains entrepreneurs de bonne réputation.
Les documents présentés à l'appel d'offre doivent comprendre au moins: une déscription générale du projet avec quelques dessins; un compte-rendu des frais de construction probables; une déclaration des responsabilités de l'entrepreneur, soit, gérance seulement ou s'il doit entreprendre la construction également; une demande d'indiquer un planning de construction; la composition de l'équipe de conseils que l'entrepreneur devra employer et une demande de nommer ceux qu'il a l'intention d'employer indiquant leur compétence et les salaires proposés; une demande de soumissions d'honoraires fixes ou sur pourcentage basée sur le coût estimé à l'alinéa 2.
Voir Annexe II.

Une des premières obligations de l'entrepreneur de gérance sera de fournir une programmation d'acheminement critique couvrant toutes les phases de dessin et de construction. Puisque les travaux sur chantier commenceront très tôt après sa nomination, il est impèratif qu'une bonne co-ordination existe entre la préparation des plans et la programmation de la construction. Il doit en même temps préparer les estimatifs et donner son avis sur divers matériaux et méthodes. Aussitôt que possible, les prix doivent être entrés dans la programmation d'acheminement critique afin d'établir un contrôle financier. Ce système affectera le choix des matériaux, fournira une programmation des frais permettant au client l'échelonnement de ses paiements mensuels et fournira chaque mois à l'architecte et à l'entrepreneur une évaluation précise de la valeur des travaux. Pendant le progrès des travaux de dessin et de plans, l'entrepreneur et l'architecte détermineront ensemble les budgets pour tous les corps de métiers, signaleront l'état du budget et passeront sous revue les plans et devis. Les fonctions de l'entrepreneur de gérance pendant la construction dépendent de sa participation aux travaux. S'il n'exerce que le rôle de conseil, il doit assurer que l'architecte fournisse les plans et devis suivant le planning et il doit assister à la préparation des documents de soumissions, à l'analyse des offres, à la vérification des budgets et remplir les fonctions de gérance qui sont normales à une entreprise générale.

Parmi les projets construits récemment sous le système de contrat de gérance, certains n'ont pas réussi surtout parce que les membres de l'équipe n'ont pas reconnu le rôle nouveau de l'entrepreneur.
L'expérience a montré que ce genre de marché est plus avantageux aux grands projets. Le marché forfaitaire est toujours le meilleur pour les projets ordinaires.

Mais l'entreprise de gérance ne doit pas être forcément une entreprise générale. Soit le client ou l'architecte peut incorporer dans son organisation une équipe de gérance offrant conseil indépendamment et qui n'est pas une entreprise générale.

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"Bâtiments Scolaires", par Roderick G. Robbie, MIRAC, est un résumé d'un article publié en Octobre '67 dans le magazine "School Administration".
Voir page 00, texte anglais.

Learning Environments: Planning Beyond Flexibility

Melvin Charney, MRAIC

The notes assembled in this study deal primarily with flexibility. There has been much written on the modes of flexibility in school design, and some flexible schools have been built. These notes intend to develop some of the premises implicit in the design of flexible educational facilities, and to suggest a responsive environment that goes beyond physical flexibility. The material is organized into three parts, each of which deals with a specific scale of flexibility. The first and second treat the educational facility of the child, age 2 to 8, and that of the student, age 8 to 16, respectively (flexibility from within), and the third is on the educational facility itself as a sub-system of new urban forms (flexibility from without).

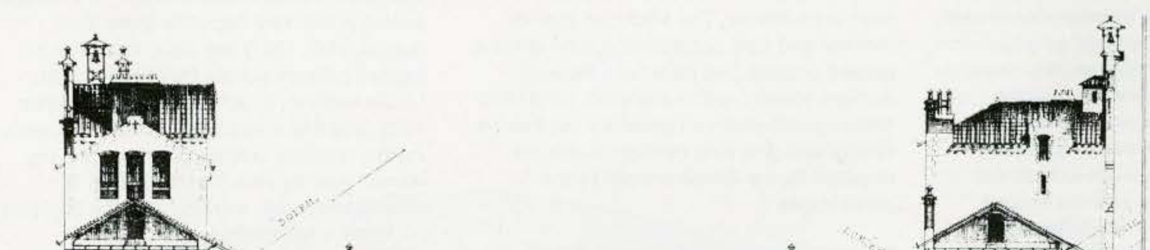
In the design of educational facilities, with all deference to the many issues involved, two operative attitudes should be distinguished. The first of these consists of a level of persistent conditions. A drawing of a school, published in France in 1881, serves as a good illustration. This design shows a masonry building in which fixed components are imbued with an architect's sense of purpose and with his understanding of readily observable environmental criteria; for example, the openings of the classrooms are carefully oriented and are made to distinguish between the penetration of light and of sun. The teaching methods that were current, in-as-much as they were considered to be design criteria, were similarly translated into building form. This concern with methods of teaching is manifest today in the common question "What are the architectural implications of educational reform?" This question presupposes that a viable design framework can still exist in which change can be assimilated; it assumes that a deterministic, causal working arrangement is still possible whereby reform in education is directly translatable into unique building forms.

This concern of the architect with reform in education is very real indeed. Society has become education oriented and this can be regarded as less of a question of some new enlightment and more as a response to the needs of technologic growth and social development, as John Kenneth Galbraith and others have pointed out. As well as a concern with change, there has been in response to technology and to social development a commitment to change that has demonstrated the conditions of new learning environments, in which one is no longer dealing with a *"New School"* but with an emerging environmental "non-architecture" – the second operative level.

In the broadest sense, the emphasis now is on a technology for education: The engineering of the entire environment for the learning process; (see, for example, the report "Technology for Education" prepared by the editors of *Science and Technology*, August 1967.) A part of the total educational environment that is being engineered is the hard shell containers that are the equivalent to what we know as school buildings. However, technology can also be seen as a way of thinking about problems, and the commitment is to control the distinction between real and desired output. These new imperatives are especially manifest in a concern with flexibility. That is, a concern with the adaptability of the physical environment and of the inhabitants to sustain and effect change.

Flexibility in a child's learning center

In order to tune into the spirits of change in education, a brief invocation: a general revision from lockstep, rigid schooling with the teacher leading the class at a time through a given curriculum, to the elimination of formal grades, to the emphasis on active participation, varying group activities and self instruction, and to the teacher as an advisor and as a manager of learning resources with the hard shells of the learning environment as one of the resources to be managed.
In building these new kinds of



1
Competition design for an elementary school for boys and girls for Levallois-Perret (Seine) dated 1881

Plan du concours pour l'Ecole Primaire des Filles et Garçons à Levallois-Perret (Seine) datant de 1881

2
Three classes in simultaneous session, Granada Community School
Trois cours simultanés à l'Ecole Communautaire Granada

3
Plan, Granada Community School, Belvedere-Tibourn, California, Architects, Callister and Rosse. Grades K-6
Plan, Ecole Communautaire Granada, Belvedere-Tibourn, Californie, Architects, Callister and Rosse. Grades K-6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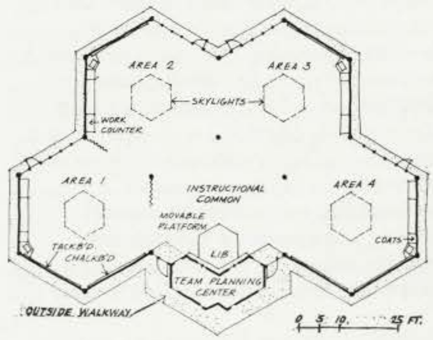

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educational facilities, it has, however, been easier to proclaim this spirit of independence than to create a spirit of flexible independence.

In primary schools and pre-school centers for children from 2 to 8 years old, the development that begins to indicate this change is the building of schools that enclose large packages of continuous space containing three to five groups of thirty children and their teachers. In the report "Schools Without Walls", published by EFL in 1965, the recent use of a non-differentiated large space in which "school takes place" was attributed to the introduction of non-graded teaching methods. To show how an open space can effectively serve small as well as large groups, and how individual work is possible in a background of ambient noise, the report chose two examples, the first of which was the open offices of a banking floor where ranking executives hear out prospective customers, and the second example showed diners in a pretentious, candle-lit restaurant. Instead of this demonstration of class solidarity, it would have been much closer to the point to have observed children, for example, in the mobile patterns generated by children in any play (i.e. learning) situations in an open area.
The dominant concern that emerges from this report is a preoccupation with acoustics. This may be simply explained by the fact that sound levels as those of light and temperature are easily quantifiable. However, of the many environmental characteristics that interact in a place of learning, sonic conditions have generally received inordinate attention. Along with the tendency towards informal learning and space use, the idea persists that learning takes place when children are quiet; in the "open schools" there has also been some transference of the noise disciplining syndrom from the children to the buildings in which the floors are punished with carpets.

In these "open schools" the external shell of the environment was disengaged from the learning activities and withdrawn to a neutral perimeter. The shell can provide thermal and light conditioning, and offers a spread of protected floor for a working surface. Ideally, within the shell, an infill of learning activities can generate permissive spatial and grouping configurations, as required by the limitations set by the participants.

Consider, firstly, the disengaged shell as a flexible enclosure, and observe two "open school" buildings:
1 The Grenada Community School in Belvedere Tiboron, California. The internal space is built up from a cluster of inter-locked enclosures that open to each other; the school itself is composed of several of these clusters. Within the cluster, it is possible to identify large and small areas that can be used together or apart. The angled, faceted sides generate working corners and surfaces, and the additive assembly implies, in a direct way, growth and contraction. The scale of the structure also is related to, and can be identified with the spaces within which different groups can gather.
2 The Satellite building, Public School No. 219 in Queens, New York. The rotund, nerved beams of a low dome dominates the interior void. Within the dome, the fix of the circle, a fixed concentric inner circle, and a central mezzanine preforms and stiffens the open space with an exaggerated vertical dimension and the feeling that someone up there is watching you. But this school does, at least, show that an internal large space can have a vertical dimension.

Having disengaged a durable and serviceable macro-shell from the specific infill – the immediate learning process, the objects that are left within the space such as storage units, chairs and tables are now separated from the walls and stand free. The learning environment now depends very much on the re-engagement of this equipment; this can be seen, in a negative way, in the case of the 219 School. With potential mobility, this equipment can affect and be affected by the flux and variety of the children's activities.

Consider, then, a gamut of learning activities: Joseph Featherstone, in a recent article in the *New Republic* (New York, August 19th, 1967) has described a non-graded primary school (K-2), located in Leicestershire, in action. ". . . If you arrive early, you find a number of children already inside, reading, writing, painting, playing music, tending pets. Teachers drift in slowly, and begin working with the students . . . some small groups . . . but mostly children are on their own, moving about and talking quite freely. The teacher sometimes sits at her desk, and the children flock to her for consultations, but more often she moves about the room, advising on projects, listening to children read, asking questions . . . rooms, open out onto the playground which is also very much in use. A contingent of children is kneeling on the grass clocking the speed of a tortoise which they want to graph against the

4, 5

The Paul Klapper School (P.S. 219 Satellite Building) in Flushing, Queens, New York
Architects Caudhill, Rowlett, Scott.
150 children in grades K-2
L'Ecole Paul Klapper (P.S. 219 bâtiment satellite) à Flushing, Queens, New York.
Architectes Caudhill, Rowlett, Scott.
150 élèves au Grade K-2

6

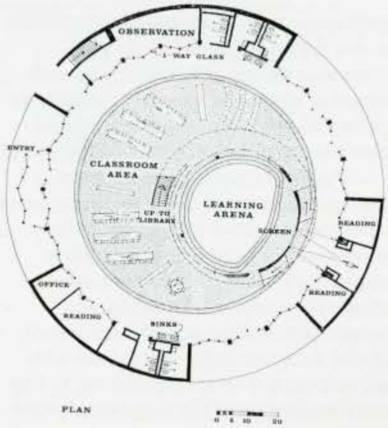
Section, Paul Klapper School
Coupe, L'Ecole Paul Klapper

7

Plan, Paul Klapper School
Plan de l'Ecole Paul Klapper

4

5



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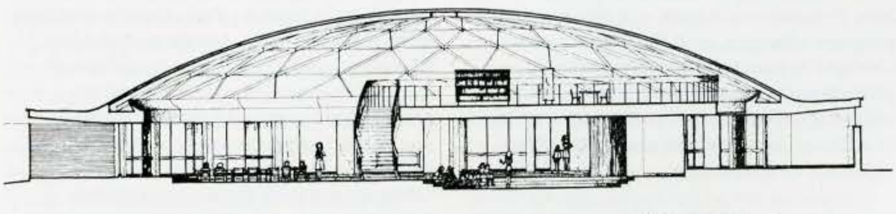

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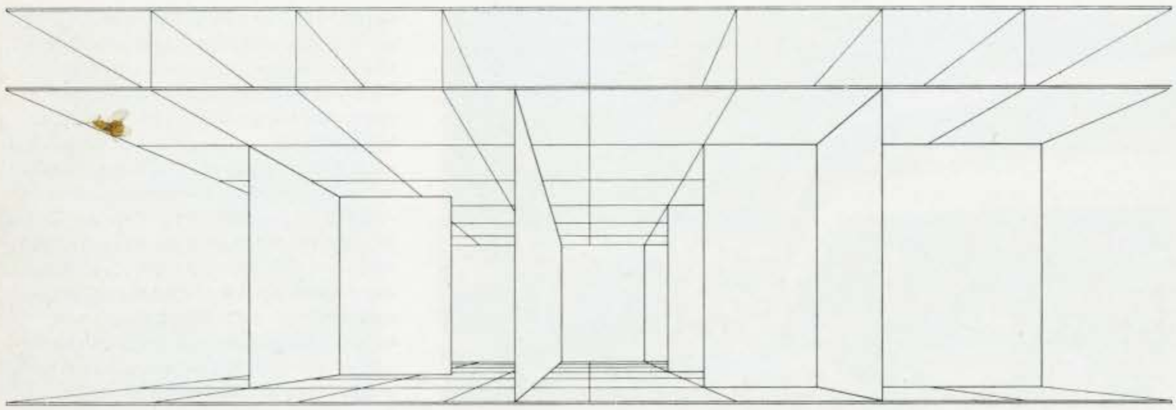
speeds of other pets and people. Nearby are five year olds finishing an intricate tall tower of blocks . . . there is a quieter library nook for the whole school. The rooms are fairly noisy . . . paint spills, a tub overflows . . . usually the children mop up and work resumes. ". . . there are no individual desks and assigned places. Around the room there are different tables for different kinds of activities: art, water and sand play, number work . . . a library alcove with a patch of carpet and an old easy chair . . . a corner with dolls and furniture for playing house . . . a dress-up corner with castoff clothes . . . a makeshift puppet theatre and a stage for dance dramas that involve lots of motion . . . there is no real difference between one subject in the curriculum and another or even between work and play . . . the extent to which the children really work purposefully is astonishing."

Here the flexibility of the environment has to do with choice, involvement, and with participation. Sections of wall, corners, parts of the floor, shelves, platforms, tables, soft and hard chairs, boxes, blocks, and books are drawn into the process of learning. In the description, reference is made to classrooms, corridors, and outdoor play areas – the traditional elements of a school building. Yet, despite the traditional configuration of the plan, a spirit of spontaneity and participation animates the children. The plan is transcended by the activities and by the equipment which transform the rooms and corridors into so many different learning situations. Even though some of the equipment referred to is furniture, its use also transcends the intrinsic nature of "furniture".

In order to articulate this learning equipment, a platform which places several children above others so that they are in a position to be seen and heard can be considered to be a learning device. Accordingly, a platform which a group of children can assemble and under which, or on which, they can work together is as much a learning device as are doll's houses, Cuisenaire rods, or logic blocks. And scales can be devised whereby

8
SCSD planning system.
Structural planning is on a 5 foot horizontal and 2 foot vertical module. Partitions may be located anywhere on the 4 inch planning module
Déscription d'un système de développement. Projet de structure situé sur une module horizontale de 5'x5' et sur une module verticale de 2 pieds. Les séparations peuvent être placés partout sur un projet de module de 4"x4"



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objects are intrinsically charged with information, identity, possibilities of selective combination, and mobility. Flexibility can, in this way, mean the specific commitment of the physical environment to the child. The proposed equipment represents an instrumental architecture at the scale of fit immediate to that of the learning process. It can act as the permissive surrogate of floors and walls, and can be used to create corner conditions. Because a high degree of variability can be introduced into the design, a wide range of accommodation is possible. The generating source of energy in organizing combinations of this equipment, as in the learning process, rest with the children and with the teacher.

Further, the conception of this equipment as fragments of the environment that can be actively engaged means that the child can personalize a part of his surroundings to his needs. As an individual, or as part of a group, he can engage his surroundings by his actions, and, in "place-making", he can participate in a cultural process. Intelligence is born of action, and any fact of intelligence consists of carrying out and co-ordinating operations, noted Jean Piaget. This child can then emerge conditioned to the responsive control of at least part of his environment.

The Student's Facility

The well known program of the School Construction System Development (SCSD) that was set up in California, in 1964, defined four modes of flexibility that still summarize the scope of current planning: 1) variety of space sizes and functional capabilities to provide options in the use of the facilities. 2) Operative methods of reducing, multiplying, or expanding spaces for different activities in the day to day operation of the school. 3) Long-range changeability of the interior divisions to facilitate changes in the educational program, with electrical and mechanical systems, floor materials and furniture to back up possible re-arrangements. 4) The orderly expansion of the facilities with the possibility of closed, functional systems at each successive stage.

The definition of these modes depends directly upon a breakdown in time of possible changes. As the feasibility study by Alan Green points out, they can be seen to follow a time scale; *the minute to hour* in-process changes, *the day to week* program changes, and *the term to year* changes in planning. The dimension of probable change is more difficult to deal with as it depends on the pre-programming of a design according to an extrapolation of known tendencies.

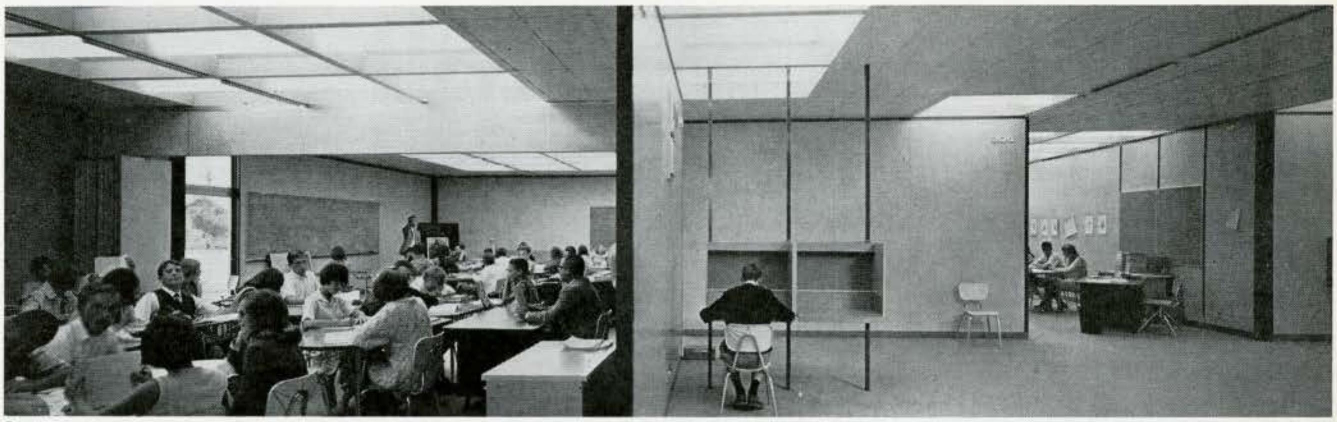
The subsequent SCSD buildings assimilated the above program. The system consisted of a one story horizontal sandwich with a thick central layer of usable space that could be divided by demountable and operable panels set between a fixed floor layer, and ceiling-roof layer which was in itself a sub-sandwich containing adjustable electrical and mechanical systems.

Observe two of the SCSD schools completed in 1966:
1 The "English Wing" of the El Dorado High School in Placentia, California: Even though the traditional elements of a school are pulled apart by the building system, the internal arrangement is conditioned by a persistent classroom block plan down to the double loaded corridor. In a 25' x 110' corridor, 14 carrels for individual study are found, and from this central space there are 10'–35' wide doorless openings to rooms on either side; two operable panel walls divide three of the classrooms. The spaces are confronted by the edges of walls and the projecting edges of corners in a cornered-off arrangement of panels.
2 Sonora High School in Fullerton, California: Under a floating horizontal plane visually held down by thin columns and held up by masonry walls, panels inserted into the ceiling grid divide an endless flow of space. The containers thus formed are assigned to be compartmented rooms. Again, the spatial elements with which one is accustomed to experience a "*School*" are both there and not there. A flexible system does not in itself generate flexible use. The flexibility of the SCSD system consists of a "universal space" device of a great room with an expedient provision for internal re-arrangement.

9
El Dorado High School (First increment) Placentia, California, Architects William E. Blurock and Associates
L'Ecole Secondaire El Dorado (Première plus value), Placentia, Californie, Architectes, William E. Blurock et Associés
10
Plan, El Dorado High School
Plan, l'Ecole Secondaire El Dorado

11
Plan, Sonora High School, Fullerton, Calif. Architects William E. Blurock and Associates
Plan, Ecole Secondaire Sonora Fullerton, Californie, Architectes William E. Blurock et Associés

12
Interior, Sonora High School
L'intérieur de l'Ecole Secondaire Sonora
13
Interior, Connecticut General Insurance Building, Hartford Connecticut, Architects, Skidmore, Owings and Merrill
L'intérieur, Connecticut General Insurance Building, Hartford, Connecticut; Architectes, Skidmore, Owings and Merrill



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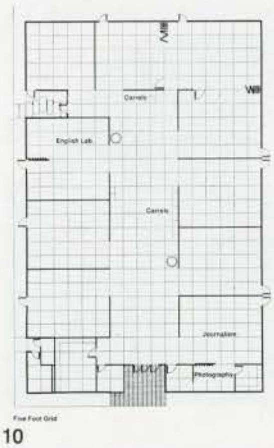

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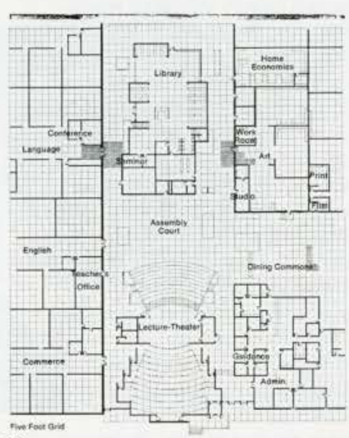

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Its hardware is borrowed from office loft architecture of integrated ceilings and demountable partitions developed in the 1950's; the rectangularity of the file cabinet adjustments that can be made with the partitions responds to so many modules of rental increments and to desks and sheets of paper that had to be accommodated. However, with the use of this flexible hardware, mechanisms were set out whereby a number of plan relationships can be developed by re-arrangements. The educational facility geared in this way to use an industrialized hardware, and to give some operational form to environmental feedback, can engender habits that are more important than the system itself. The clarity of the edged and lined components in these SCSD schools (the equivalent of production and assembly tolerances), and the ease with which the components fit together, show that the voids thus enclosed lack a similar coherent working relationship. The environmental distinctions that can form the basis of sets of relationships have here been eliminated. The internal homogeneity of the components tends to dilute the articulation for accessibility, for a group or an individual, or for transition or common ground, which are all basic environmental bits of information necessary to the flexible use of an education facility. For example, the movement of students through a school can be used to define the facility in terms of periods of stop and go, and of fluctuating distribution and collection patterns of mobile increments. The accommodation of the mobile students, each with a varying mix of stop periods according to both programmed and non-programmed activities, can constitute a working criteria for flexibility; time and place are linked by scheduling. The SCSD definition of the design problem ignores movement as an organizational constraint (30% of the total area in many cases); it is based on a fixed building into which movable elements are introduced which is a costly premise to start with. The necessity to distinguish between fixed and less fixed conditions when dealing with environmental flexibility has been demonstrated by the "infill strategy" that has been suggested in many experimental projects during the last few years; circulation and movement have been shown to be part of the long-term

14, 15
Flexible groups using new media
Groupes flexibles utilisant nouveau media

organizational structure of facilities. This suggests that fixed spaces related to specific educational needs can be used in a flexible mix of a facility – the use of fixed spatial configurations is occurring with the introduction of electronic and audio-visual teaching devices.

The selection of learning devices that are now incorporated in educational facilities includes electronic hardware for the storing and reproduction of sounds and images. The use of this media generates variable group sizes, and directly involves the students in sets of relatively precise environmental conditions.
The fixed optimal range of these conditions has meant that flexibility of the kind that calls for demountable and folding partitions can easily restrict the use of the media. Therefore, facilities that can both accommodate media and permit some intermittent regrouping of students as learning situations develop, and self-contained "media-modules" that can be moved as the students move, have been designed. The viewing angles of the display equipment determine angular configurations that allow tight geometric packing of usable space and more surfaces on which to project or to work. The walls and floors of a facility have in this way been integrated into the equipment systems.

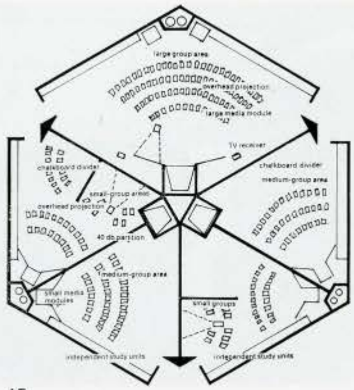
The use of media renders the student immobile before a screen or between a pair of headphones which effectively turn him into a passive receiver. As a fixed receiver, his particular anthropomorphic and perceptual characteristics can be measured, and a closed, measurable loop can be considered for study. A total learning environment is complex, but this simplified model has been used to set out some relationships between the student, learning, and the environment. These relationships are all inferred from performance. More sophisticated design models can now be structured by set generating strategies to qualify the interaction of the learning infill with the physical environment.

Learning or teaching devices function as communication systems or aids in the communication processes. Accordingly, a scale of communication mechanisms can, as in the case of the child's learning center, include printed matter, chalkboards, tackboards, floors, walls – the wall panels of the SCSD system served as chalkboards, as well as video systems, motion pictures, film strips, slides, cathode displays, and reproduction equipment. The total physical facility can be scaled in terms of communication input not only for direct participation in the learning process, but also for evironmental information – indirect learning.

Research in psychology has shown how environmental factors influence man's information handling capacities. Overall findings indicate that there is an optimal range of preferred input, and that information coefficients can be attributed to a given environment to qualify the amounts of stimulus, uncertainty, sense deprivation, and information overload. The well known experiments of D.O. Hebb have shown the degree to which alertness depends on a constant regimen of dealing with environmental diversity. The demonstrated importance of a complex, information rich environment for the development of human capacities has a direct influence on the educational facility, which is that fragment of the built environment created for the "development of human capacities".

To physically structure the environment that is to be charged with complexity, the building technologies that are being developed tend more and more to use materials and assemblies that can change, be moved, and adjusted: disposable materials with varying life cycles; light sensitized materials that vary transparency with intensity; folded, rolled, inflated or demountable components; fold-out, portable media modules, etc. With these mechanisms the hard shells of the environment can begin to respond to their designed purpose.

The introduction of Computer Aided Instruction (CAI) has coupled media with electronic data handling devices, and has



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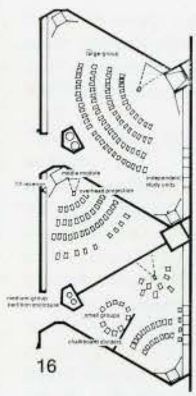

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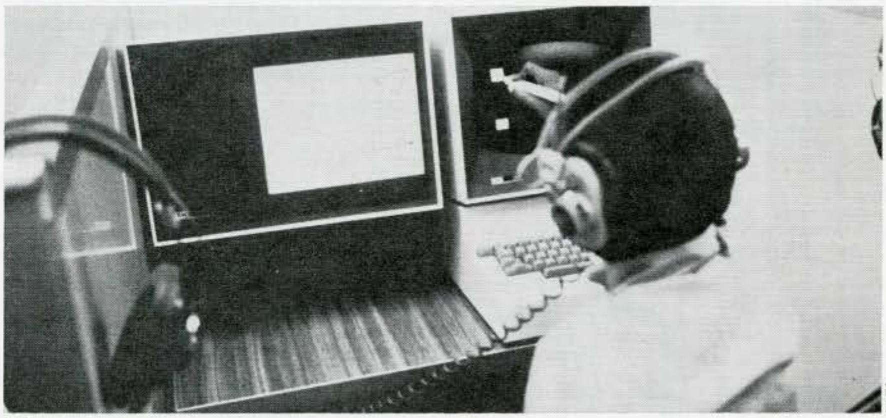
demonstrated that direct feedback loops that engage the child in a two way dialogue is possible. Similarly, an operable environment that could be computerized could change the configuration of the room, or, as Dr Warren Brody has pointed out, the lighting or the lessons, or the mix of spoken words, picture, and alphanumerics, or color, or two or three dimensional display, and request the teacher to appear only when the child-computer system encounters difficulties.

The student and the educational facility can be regarded as object, and environment for each other. With servo-mechanisms for correction strategies, a two-way environmental dialogue can generate likely change, provided that these changes can be pre-programmed. With self re-enforcing

16
Media group using tape recorders with play-in head sets. Granada Elementary School, Belvedere-Tibourn, California
Groupe média utilisant des magnétophones avec écouteurs, l'Ecole Primaire Granada, Belvedere-Tibourn, Californie
19
Computer assisted instruction
L'enseignement par l'ordinateur

17



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IBM

feedback loops, the environment could learn from each student, develop with the user and take part in his development. The place of learning can become a place that learns about learning and about the structure of its environment.

Urban Flexibility

It is no longer possible for an educational system to exist independently from its economic, physical and social contents. Different learning media do not fuction as isolated systems in an educational facility, similarly, the facility itself cannot survive as an isolated environment fragment. The introduction of new teaching hardware depends on shared programs, and the industrialization of building technology depends on a consortia of schools. In this way, along with the individualization of the educational process, some of the conditions for change are based on a larger planning unit.

It can be observed that education has emerged as one of the determinants of changing urban form, and in response to new imperatives we are experiencing a redistribution of facilities. More is required out of land use and this has meant that facilities are being treated as part of a denser urban packing. The re-grouping of facilities can be seen in the development of educational quarters such as the secondary school campuses that are being built in Pittsburgh and in Quebec.

A multifunctional vertical development can be seen in projects in which the upper levels are designed for housing and the lower levels for community facilities, schools, and shops; the air rights over transportation arteries are being used for schools as in the proposed linear city over an auto expressway in Brooklyn, New York, for example. The structures of existing buildings are being treated as extensions to the urban service grid into which school facilities can be placed as specific infill; for example, an abandoned warehouse and a telephone exchange building in Chicago are being converted to educational use. School facilities as portable infill have been realized in the use of re-locatable classroom containers in many cities; a quick erection system based on the experience of the mobile home industry – project tactics – is now under study in Chicago.

Flexibility in office loft architecture was achieved by disengaging the internal space divisions from the building structure into independent, self-supporting component systems. The development of flexible educational facilities in the urban framework can be regarded to follow the disengagement of the school from a city structure, and the subsequent re-engagement of the facility as self-articulating infill in an urban network.

Design sources can in this way be tapped at their origin. As in the child's learning center where the activity of the children is the source of "design" in the organization of the immediate learning environment, so, at an urban scale, given a mobile and multifunctional educational infill, facilities can be generated by students and can generate students.

This allows students to participate in and derive the maximum benefit from a life style in the process of dynamic change. It not only allows the student greater involvement with his social context, but also in research and industry as an extension of the education process. In the end, education for any society, must be seen as a function and instrument of social organization. □

Illustrations 2, 3, 8-12, 17 courtesy Educational Facilities Lab, New York

Transitional Flexibility Ecole Curé Grenier Notre Dame des Laurentides, Quebec

Melvin Charney, Architect

This school was based on a study prepared for the Quebec Ministry of Education. The study along with several others was chosen by competition for implementation and offered to several boards.

Program Outline

The program based on the recommendations of the Parent Report on Education Guidelines outlined that: the kindergarten be regarded as separate from the rest of the school with its own access and outdoor play area; the traditional six grades of elementary school be divided into three cycles of approximately 120 children. The school facilities common to the three would include a hall that could accommodate the whole school, a separate area that could be used by a cycle at a time, and the secondary service areas.

The cyclic organization of the school, the hierarchic approach to internal spaces, and the desired engagement of children in varied activities, offered a program for innovation. However, following this description, fixed areas were attributed to fixed groups of children. For example, it was said that the children will participate in small and large groups . . . etc, but four 700 sq. ft. rooms were called for, each for 33 pupils.

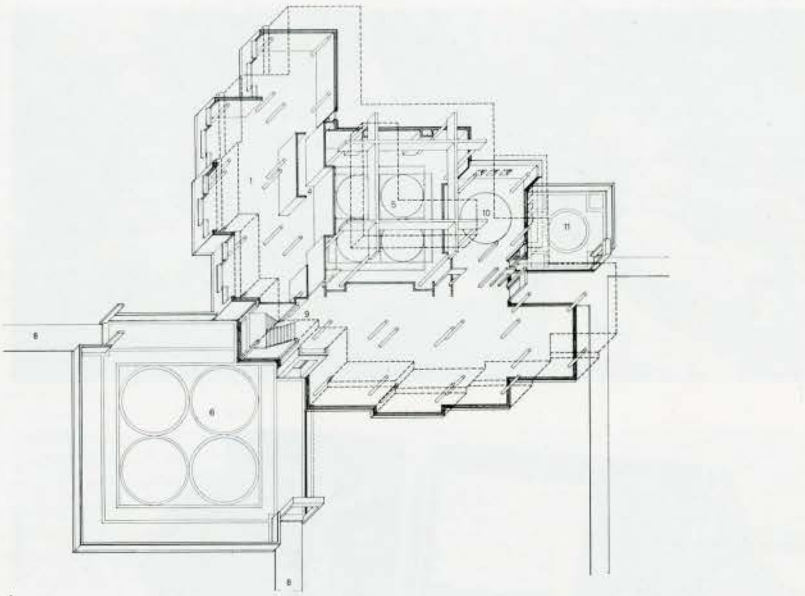
The aim of this program was to generate change, and the circumstance of its implementation was clearly transitional. The school that could satisfy the new program had to satisfy several intermediate phases as well, and also go beyond the specified program because of the possibility that change would engender further development.

The school board that chose the original design study saw the school in terms of "rooms" of classes for a number of children. For them, this school, as a ready-made design, represented an expedient way of acquiring a lump of classrooms that could be used to house the overflow from other schools in their district.

The school district itself is in an economically disfavored area. To optimize on construction costs local trades and local conditions had to be accounted for, especially in the details of the building and in the choice of materials. Technical innovation or the use of sophisticated, mobile division systems was limited.

1
Isometric Diagram of Design Intentions. The school organized into cycles with each cycle accommodating an identifiable group of 120 children in an open, informal, non-graded learning environment. Within each cycle, columns and corners articulate sub-areas for varied group activities
Diagramme isométrique à l'étude. Ecole divisée en groupes logeant 120 élèves dans un environnement enseignant non-gradé. A l'intérieur de chaque groupe, divisé par des colonnes et des angles, se trouvent plusieurs parties pour des besoins divers

2
Isometric of Grade and Upper Levels of School as proposed to the school board with the division of each cycle according to original program requirements. Each cycle is divided into one area for 60 children, and two areas for 30 children. A folding partition is used to divide the cycle into four equal "classrooms" as specified by the school board
Isométrique du niveau du sol et des niveaux supérieurs d'un projet d'ecole. Projet d'école, soumis à la commission de l'instruction publique comprenant la division de chaque groupe selon les conditions requises.



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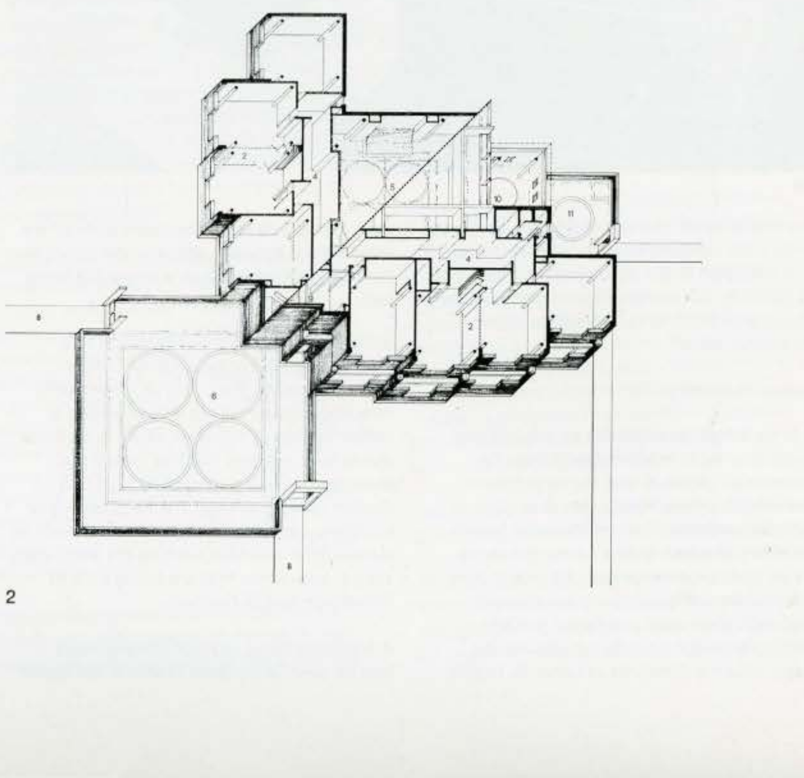


2

Legend

1 *Typical open cycle.*
2 *Typical divided cycle.*
3 *Typical classrooms.*
4 *Coat and storage area within each cycle.*
5 *Interior hall for the whole school; clerestory, peripheral lighting.*
6 *Exterior "hall" for the whole school; partially walled-in.*
8 *Main access paths.*
9 *Circulation node.*
10 *Interior kindergarten.*
11 *Exterior kindergarten.*
14 *Library.*

Design Description

The exterior, where the children gather before entering is considered to be an integral part of the building and it is treated as a partially walled-in-"room". The kindergarten has a similar exterior "room". These areas distinguish between outdoor play and outdoor gathering activities of the children.

Three cycles are organized about the circulation node and are separated so that each can work on its own schedule. To zone noise levels, the cycle areas are buffered from the central assembly hall by a double service wall.

The volume of the building was kept compact to minimize heating expense. An insulated envelope wraps all structural elements exposed on the inside; thermal bridges are avoided. Within, all structural concrete columns are disengaged from the walls; and between the columns, the non-structural divisions are made out of inexpensive concrete block which can be easily demolished.

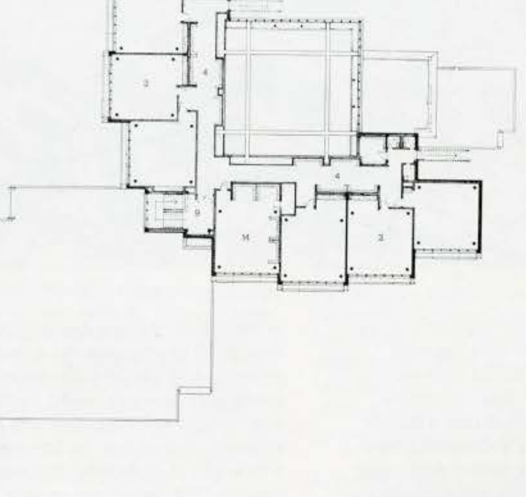
The School as a Learning Device

Each of these three sub-school cycles are now filled with four classrooms, however, the director and teachers of the school are beginning to find that with the clustered disposition of classrooms they can work better with varying groups of children. Despite serious cost limitations, it was attempted to emphasize similar environmental components in a similar way so as to build up a series of readable reference bits throughout the school.

Columns define the primary spaces; the in-between areas are filled with the secondary services. The columns stand free in the interior voids, dense up the environment with direct bits of information as to how large each space is and how it is structured. In the school divided into classrooms, the columns stand in the four corners of each room (*illustration 3*); in the school that uses a divided cycle, clusters of columns scale the hierarchy of the spaces (*illustration 2*); and in the informal, open school, the columns articulate sub-areas within the larger open areas (*illustration 1*).

3
Upper Level Plan of School as built; classrooms clustered in groups of four along a corridor. Each cycle is divided by concrete block walls into distinct classrooms
Plan du niveau supérieur de l'école. Plan de l'école construite; quatre salles de classes le long du couloir. Chaque groupe est divisé en différentes salles de classes par des murs en béton armé

4
Diagram showing the relationship between the configuration of structural columns and beams and the primary spaces of the school. In each cycle, the structure is disengaged from the interior divisions
Schéma montrant l'assemblage de poutre à poteau par rapport aux espaces principales de l'école. Dans chaque groupe, la construction est dégagée des divisions intérieures



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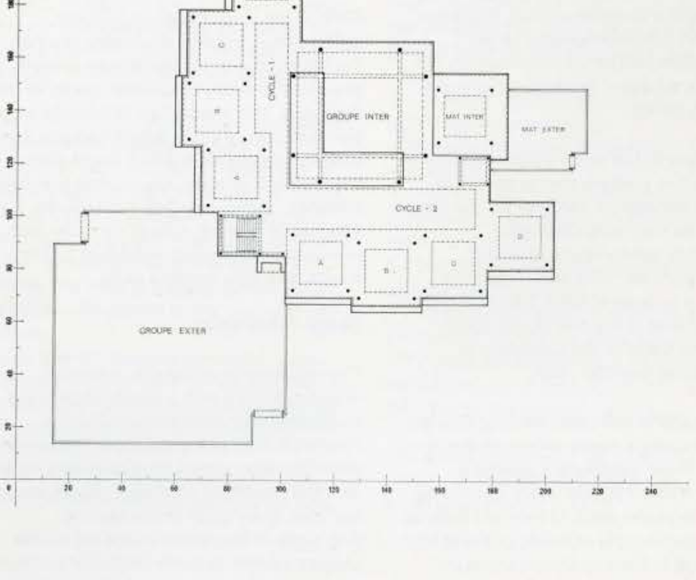

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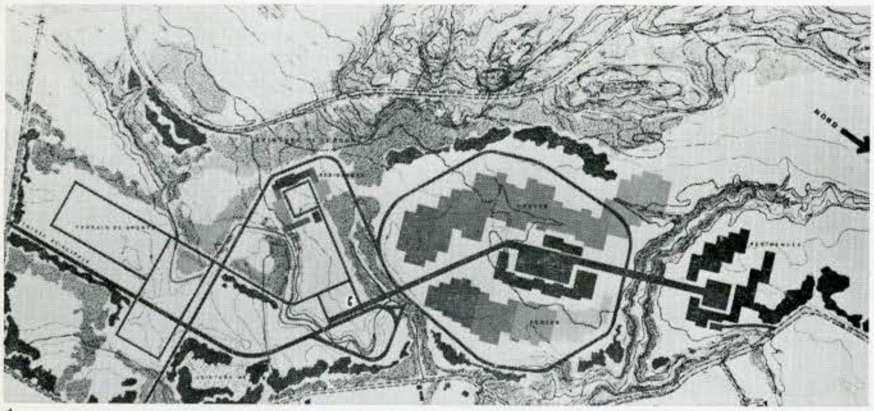
Planning Flexibility Cité Etudiante de Hull

Design Study by Melvin Charney, MRAIC, in association with Oscar Newman, Planner

1
Land Use. Primary circulation network and campus zones integrated into the natural ecology of the site. Shading of built areas indicates intended staging development
Utilisation du terrain. Réseau de circulation et zones du campus intégrées à l'écologie du terrain. Partie ombrée des terrains construits indique la mise en route du projet

2
View along the main pedestrian circulation spine at the entrance to the academic zone, used to indicate the desired density of built blocks against trees and rocks
Vue sur l'artère principale de la circulation située à l'entrée de la zone académique, indiquant la densité désirée des blocs construits en comparaison aux arbres et rochers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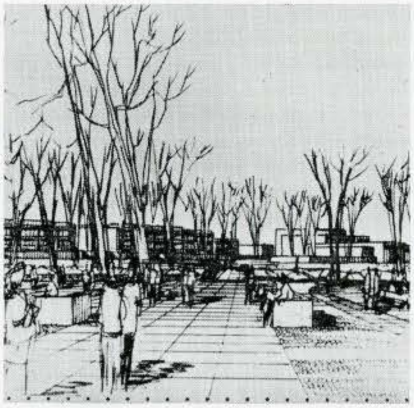
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Cité Etudiante de Hull ("student city" of Hull) Quebec, is a 190 acre regional "education park", planned to bring together the required new secondary schools of several school districts, with a junior college and a vocational school, into a unified campus, where they could share common facilities and services such as large auditorium, transportation, student residences, sports facilities, T.V. and specialized teaching, etc.. The campus would serve an area of 3,500 square miles comprising the counties of Hull, Papineau, Pontiac and Gatineau located in the south-western part of Quebec; the city of Hull and its adjacent municipalities is the population centre.

The mandate of the study was to develop a program and prepare the "preliminary plan" and the design concept for the Cité Etudiante de Hull which could be subsequently carried out by several architectural firms. This work was done from March to June of 1964. The contract was terminated at the end of this phase and the first stage of the campus was built and completed by 1967.

The first stage of the study was considered to be essentially a development phase in which the basic parameters could be identified. The emphasis was on grouping and isolating categories of relevant data so that the commonality of needs of the school districts and of the city of Hull could be established.

In the second stage a design model was developed to articulate the different planning and design alternatives, the plannng system was based on the concept of a "school within school" unit of 360 students, slotted into the framework of a defined but extensible circulation network. The model was used to develop the educational, administrative, and building program at the same time as the design.

Despite the vicissitudes of political, professional and school district rivalries, the intention was to maintain an overall structural and organizational clarity to the final plan. The model had to provide a hard and real picture of the future campus and a design mechanism which could absorb reaction and change. Changes in teaching methods, administrative procedures (i.e. elimination of local school districts) and in building technology will effect future stages and alter existing parts.

Design Description

The topography of the site, a central circular plateau with a slight slope to the south-east was most suitable for the academic core of the campus. The academic activities were zoned concentrically from an inner cluster of common, shared student facilities to an outer vehicular ring.
The slope of the ravine which set off the plateau served to lower vehicular circulation and segregate pedestrian traffic on bridges.

This organization of the academic activities was modified by a pedestrian circulation grid of parallel, linear streets which connected the inner core to the vehicular service ring. Academic and sports facilities and residences were located along a main spine of interconnected malls which served as the ceremonial axis of the campus.

The parallel streets of the circulation grid serve and locate the "school within school" unit. In the grouping of the school units, break-off conditions were established at which laboratory, administrative or library units were added. Several major streets served as the sub-spine of the individual schools and the points of bus entry at the vehicular ring. The location of the main streets could be shifted from one street position to another.

In the drawings shown, each school district has its own cluster of separate units that serve, for example, as a secondary vocational school. At a later date these could be interconnected by the simple extension of the street enclosures.

It was established in the preliminary study that 30% of the student population would be living in residence, and housing facilities were organized in sub-clusters about a second core related to the academic core by the main pedestrian circulation spine – a bridge over the ravine at the student social centre.

An Experiment in School Construction Project Management North York, Ontario

An experiment is now underway by the North York School Board using the "Component Tendered Fixed Management Fee Project Control System" for the design and construction of seven schools. On the next 7 pages J. T.. MacDonald of the North York School Board explains the system, and the seven architectural firms and the general contractor give their viewpoints on its workability.

Frank Helyar further examines management contracts in this month's Technical Column. See page 73.

Statement from the Board of Education for the Borough of North York

The Borough of North York is a municipality covering 69 square miles with a population in excess of 400,000 abutting the northern limits of the city of Toronto. In the 13 years since the formation of Metropolitan Toronto authority, the Borough's enrolment in all grades has increased from 47 schools with 23,000 pupils to 143 schools with 93,688 pupils.

Fast Growing Municipality

The pace of growth reflected in large sub-division and apartment building projects and rezonings has accelerated in recent years. The need for schools has multiplied until it now is a normal situation to have simultaneously 40 to 50 school construction projects in various stages of planning and building. Approvals for the construction of schools for the needs of North York must pass through a myriad of committees and boards. In the interval, families move into the housing projects and there presently arises a very urgent need for a school project that has been substantiated some time ago.

There are a number of ways in which School Boards provide classroom space for students when permanent schools are not available:—
1 Students are transported by bus to other schools in the system.
2 If these schools are themselves at capacity, a shift system is usually necessary.
3 Portable classrooms can be built and located on the site of what is known as the host school, thus avoiding the problems related with shift classes.
4 Public meeting areas and churches can be rented.
5 If the interval until the new school facility can be completed is short, classes are organized in the playroom auditoriums, staff rooms and libraries of nearby schools.

Examples of all of the above costly emergency measures could be found in use in North York schools in 1967 accommodating more than 12,000 pupils.

The academic problems and the social pressures on a Board forced to operate under these conditions are such that their Department responsible for the construction of schools must continuously expedite architects, engineers and contractors employed by them. However frustrating, discouraging and limiting these procedures may seem to be, you can be certain that the alternatives are even less desirable to the academic system.

There are other problems related to present school construction methods. Expenditures on school construction approaching $50 million make up a significant proportion of the annual construction business in the Metro Toronto area. A clear indication of the unsatisfactory conditions existing in the school construction field in recent years has been the bankruptcies of several experienced general contractors and even more sub-contractors.

The Hon. Mr Justice W. R. Jackett, President, The Exchequer Court of Canada, with many years experience as a judge of a court dealing with contract disputes and arbitration proceedings, recently stated:–

1 The function of a Government contract is to obtain for the authority a work as described in the contract of the highest possible quality at the lowest cost at which it can, as a practical matter, be obtained.
2 The object therefore must be to attract, into the competition for Government business, the most experienced and most competent contractors in the relevant field of activity.
3 To do this the Government must create circumstances in relation to which such contractors are to tender that are designed to encourage them to undertake the work at the lowest price.
4 To do this the Government must be as reasonable to do business with as the best elements of private industry, if not more so.
5 To do this it must be recognized that a Fair Contract will cost the nation less and produce better results than one that is loaded in favor of the Government.

One could question whether or not these tenets are followed in school construction. For many years, school construction in the Province of Ontario has followed the classic pattern – architect prepares full design drawings and documents; tenders are called from any of the interested public.

The most costly drawback of the present system applied to the Metro school system having more than 40,000 pupils in temporary classrooms is that the initial approval of construction of projects is delayed by many months and further delay occurs waiting until the architect completes final plans which must be to even the smallest detail for a conventional tender.

A rapidly growing percentage of construction in the United States, Canada, Europe and South America, is now following a procedure in which a general contractor, or on larger projects a contract management group, is hired in the early stages of the design of the structure to manage the project for a fixed management fee.

1 A realistic preliminary design and specification is prepared.
2 Tenders are called for contract management.
3 The successful contract management organization develops a preliminary estimate of costs.
4 Final plans are commenced in accordance with budget limitations.
5 Construction begins in the field as soon as site and foundation plans are available.
6 Tenders for sub-contract work are called by the contract managers as soon as design information is complete for relevant trades.

The above system can be described as the *Component tendered, fixed management-fee Project control system.*

Design-Construction Period Must be Shortened

In February 1967, it was noted that the approval of several North York School Board projects urgently needed to accommodate more than 7,000 pupils, had been stalled for several months. It was clear that any further delay in the start of construction would only make the crisis more severe.
It was obvious that the design-construction period of many projects would have to be shortened drastically to reduce as much as possible the dislocation of the education of such a large number of students.
Discussions were held with representatives of architectural firms, construction firms, construction associations, mechanical and electrical contractors, union representatives, engineering management firms, owner builder organizations and others familiar with successful procedures that could result in a completed project in the shortest time without additional cost.

Management Fee Component Tendering Procedure Chosen

From the consensus it was clear that the management fee component tendering procedure would be the most satisfactory. Approval to proceed with the construction of seven new elementary schools on this basis was quickly received. Tenders for the fixed fee were received from several experienced and most competent contractors shortly after.

The seven schools are now approaching completion and the results of this experiment can be reported or the typical project.

1 The general contractors that tendered the fee on these elementary projects were representatives of the highly organized technically staffed firms who do not usually tender on elementary school construction.
2 The construction started on the site five months before tenders could have closed under normal procedures.
3 Because the tendering of sub components of the structures was not subjected to the rush of one general tender call, more sub-contractors were able to tender and adequate time was available for them to develop their tender.
4 There was sufficient time available to carefully consider suggestions for alternative equipment or methods from the sub-contractors before their bids to the general contractor closed.
5 The fixed fee structure provided a prime incentive for the general contractor to organize and expedite the construction of the projects for completion at the earliest possible date. This important incentive is provided at no cost to the owner.
6 Until the affected sub-section of the work was tendered by the general contractor, changes and refinements could be made to the schools appointments without involving change order costs.
7 A most significant change in the relationship between architect-owner - and the general contractor was most apparent. The general contractor's staff was from the beginning most anxious to put forward suggestions that would improve the construction procedures or present economies.

In summary, we have been impressed by:–
1 The skill and organization of the firms attracted to this method of construction.
2 The early start made on construction.
3 The savings that would result from more informed sub-contractor bids and a greater number of such bids.
4 The reduction in change orders.
5 The many constructive suggestions put forward by the general contractor.
Elementary school construction in North York has, for many years, been handicapped by the fact approval procedures take far longer than the actual time to construct a school. Architects, therefore, were instructed that designs must be organized for rapid construction in the field and in accord with up to date procedures. Where possible, readily available components and modular systems should be employed.

The coordination that this instruction required was complicated by the fact that the seven school plans were prepared by seven architectural firms using six structural engineers, six mechanical engineers and six electrical engineers.

The time saved and the rapid pace of construction testify to the excellent work and cooperation of all professional consultants involved in this successful pilot project in management fee-component tendered – school construction.

J. T. MacDonald
Director of Physical Plant

The Contractor's Comments

We view the six million dollar management contract for seven schools presently underway for the North York Board of Education as a welcome and challenging departure from the conventional approach to building construction contracts.

There is no doubt that savings are to be gained by the owner and, ultimately, the taxpayer, by taking advantage of the wealth of practical experience, which a competent and well organized contractor has at his disposal. Certainly, in this major contract, this has been realized.

Undoubtedly there have been problems, but this will always occur where a change is made in the basic approach to a construction contract. In this particular case the barrier which normally exists between the owner, architect and consulting engineers on the one side, and the contractor on the other side, has been removed and we welcome the opportunity to be treated as an equal with equal responsibility to get the job done.

Recommendations

If we accept this type of management contract for school and similar construction projects, then what recommendations would we make for the future?

1 The Contractor should be selected and appointed early in the process to ensure that the full benefit is taken of his experience before the architects get involved in detailed design. Uniformity of the design details, the use of standard materials and the selection of a design which recognizes the time of year in which the building will be built are some of the items which can save the owner many thousands of dollars. A start can also be made at this time on the physical work while plans are being finalized, thereby gaining lead time and an ultimate earlier completion date.

2 An early review of the mechanical and electrical equipment and systems is essential, in order to introduce as much standardization as possible. In a group of seven or more individual schools this could facilitate efficient ordering and delivery, and the owner would benefit both from the time saved and the advantages of bulk buying.

3 A clear outline of the contractor's responsibility on the construction team before designs are finalized, and an acceptance by all concerned that the contractor is equally as responsible as the architect and consulting engineers, both to get the job done quickly and economically, will lead to a harmonious relationship between all concerned.

4 Under this type of contract the architect has available to him practical experience which we as contractor are willing to offer. The architect turns to consulting engineers for advice and he should turn to us on the same basis – as equals, expert in our own particular field.

5 The Contractor (or Construction Manager) should be given a much freer hand to make decisions regarding the letting of sub-contracts and supply orders. In addition there should be far greater flexibility in the interpretation of both the plans and specifications. A rigid attitude taken towards the original requirements by the owner, architect and consulting engineers makes it impossible to introduce money saving ideas and innovations to ensure that budgets are met.

6 In a contract such as this one involving seven individual buildings and seven different architects, a lot of effort could have been saved by the introduction of standard procedures for the handling of paper work at the early stages. We acknowledge though that this was a pilot project and all concerned worked to improve their systems during its execution, and future projects will undoubtedly benefit.

M. J. Morgan, P.Eng.
The Mitchell Construction Company (Canada)

The Architects' Opinions of the Component Tendered Fixed Management Fee Project Control System

Banz-Brook-Carruthers-Grierson-Shaw Architects

The management of a building has four major aspects, based on program planning, space planning, budget planning and time scheduling. The client generally provides the program, retains an architect to elaborate it, translate it into three dimensional terms and design the structure. In the process budget planning and cost control, as well as time scheduling, have too often been neglected and left to guess work or the contractor's judgment.

The North York Board of Education has attempted to tighten up both cost control and the time required between completion of working drawings and building completion without abolishing competitive bidding among contractors. The approach they are experimenting with is very imaginative and may well pave the way to new standards for the contractual relationship between owners, architects and contractors. There is little doubt that there is a considerable time saving involved in avoiding conventional bidding procedures which furthermore permit inexperienced and inept contractors to compete on an equal basis with well managed, responsible firms. Unfortunately the control of consrtuction costs is largely taken away from the architect. It is quite conceivable that under certain circumstances undesirable design changes could be forced by a contractor who must complete a building within a fixed budget but has had no voice during the design process. To reap maximum advantage from the new management approach the contractor should thus be appointed roughly at the same time as the architect. The architect's role is not substantially altered. If there is a change it is mainly that he tends to be drawn into a team in which the client's representative and the contractor are equal members, rather than play his traditional solo part.

Architects' opinions continued overleaf

1
Site plan, Forest Manor Road School, North York; Craig Zeidler, Strong Architects
Plan d'emplacement, Ecole Forest Manor Road, North York; Craig Zeidler Strong, Architectes
2
First floor plan
Plan du premier étage
3
West elevation
Elévation ouest

Craig, Zeidler & Strong, Architects

As we approach the 20th century the demands made by medical and educational institutions and high density urban areas, with their resulting office super blocks and apartment towers, impose new demands on the architect and general contractor. This new set of criteria can normally be simplified to magnitude of project, speed of execution and total cost involved to the client or organization.

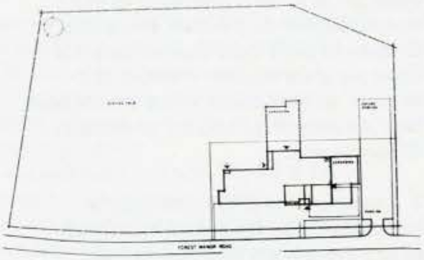
The North York Board of Education has taken a bold step forward in the recently instituted project fee management for the construction of seven schools involving some six million dollars. The success of any project of this nature is contingent upon a viable relationship between architect-client-and general contractor.

The architect had to recognize the advantages of unifying basic building materials, and structural systems to permit the advantages of mass buying without feeling inhibitions in the architectural design. *Inherent in the system is the necessity for speedy decisions in design and working drawing data and decisions in the field on the part of the architect.*

The general contractor through diligent control of subcontract letting and job expediting prevented last minute decision crisis from occurring. *The general contractor cannot override aesthetic decisions with those of speed and cost or the end product will suffer. The client and architect must reach sound decisions based on the facts presented in these areas.*

The client provided the architect ample scope within the academic program to produce "delight" in the commission.

The object of any building exercise should be to create fine architecture within the system. The results achieved in the seven schools indicate that mass buying accomplished these ends.



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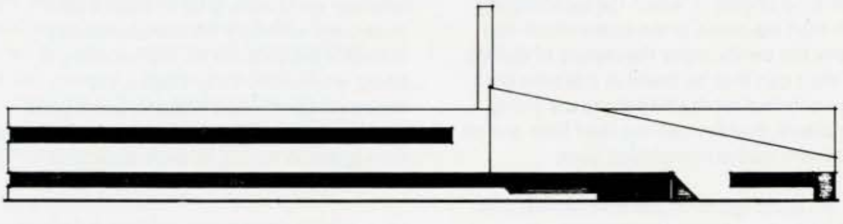


3

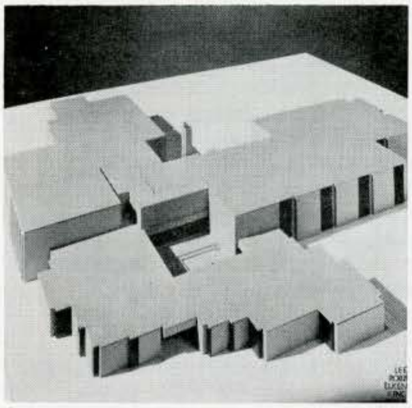
Lee, Robb, Elken, Jung, Architects

This method of tendering is really nothing new. It has made the development of many large buildings possible which under stipulated sum tendering would have been unsupportably delayed. Because it is an "open end" contract some anxiety might arise with respect to controlling the performance of subcontractors and "guaranteeing" the ultimate cost of the building. However the merit of removal of "rush" in documentation, speed of getting building under way and elimination of speculative risk from the general contractor's shoulders far outweigh the anxieties. By putting the contractor on the "same side of the fence" a more flexible and constructive working order was established.

As with any "open end" situation the outcome of such venture greatly depends on the involved parties' ability to perform along an established critical path method. Regardless of some unforeseen stoppages in the construction industry the North York venture can be considered highly successful.

4
Model, Blacksmith Crescent Public School, North York; Lee, Robb, Elken, Jung, Architects
Maquette, Ecole Primaire Blacksmith Crescent, North York; Lee, Robb, Elken, Jung, Architectes
5
First floor plan
Plan du premier étage
6
Growth pattern
Modèle d'extension

7
Perspective, Gateway Boulevard Public School, North York; Raymond Mandel, Boigon and Heinonen, Associated Architects
Perspective, Ecole Primaire Gateway Boulevard, North York; Raymond Mandel, Boigon and Heinonen, Architectes Associés
8
First floor plan
Plan du premier étage
9
South elevation at courtyard
Elevation sud sur la cour
10
South elevation
Elévation sud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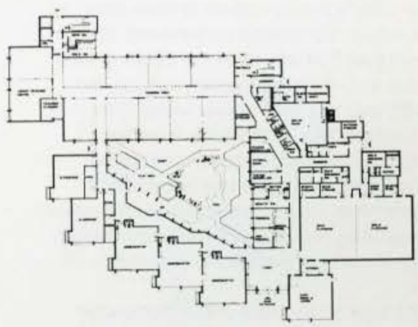
6

Boigon and Heinonen, Architects

A good measure of "time saving" is possible with this method, as two to three months of drawing time is deferred.
The architects require only about a month of lead time after approval of sketches, before the contractor can begin active building. The contractor can also order critical materials and equipment right from the approval of sketch drawings, thus speeding up deliveries.
As the final prices of the projects are not yet available it is impossible to say whether the final costs will show economies over the costs resulting from conventional construction contract methods. I believe, however, that it is possible to effect savings using this method when the full benefits of standardization of materials and methods is efficiently utilized.
Architectural components were standardized and were specified fairly consistently. This procedure did produce cost savings. Mechanical and electrical equipment, too, was standardized as much as possible, resulting in economies.
In general, we found the method had several advantages, as previously outlined.
The disadvantages were minor and were as follows:
1 It took a while at the beginning of the job for the general contractor, the Board, and ourselves to dovetail our efforts so that we all understood the responsibilities of each.
2 *Costs* – I don't believe that we have had the full benefit of cost savings that can be effected by this method. The fault probably lies with its newness. All members of the team were not completely meshed in a manner which would provide the most efficient product. The next time, if this system is utilized, further cost savings could be effected.
3 The general contractor, in some cases, let too much work to firms that couldn't handle the volume during a restricted period.
The general contractor must be very careful that the sub-contractor or supplier can efficiently process the volume of business contracted to him. In fairness, the general contractor is at the mercy of the vagaries of the labor and material market.
In conclusion – the idea and system is good. Some problems still to be ironed out.


7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10

11
Model, Yorkwoods Gate Public School, North York; Howard V. Walker, Architect
Ecole Primaire Yorkwoods Gate, North York; Howard V. Walker Architecte
Maquette
12
Ground floor plan
Plan du rez-de-chaussée
13
Section through courtyard looking south
Coupe à travers cour faisant face au sud

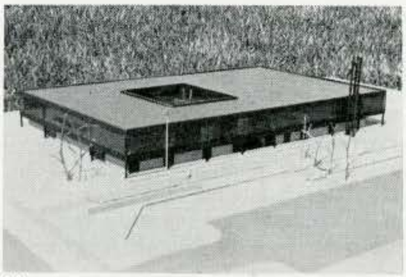
Howard V. Walker, Architect

This is a subject of such broad implications for both clients and architects that it is not possible to make definitive assessments in a few brief comments. The fact that the fixed-fee management type of contract is being adopted reflects the growing disenchantment with the current state of affairs in the construction industry. It is obvious that the increased industrialization of building techniques is imperative if we are to begin to cope with the accelerated demand for schools, housing and other types of building. In this context, the traditional roles of architect and contractor are rapidly becoming anachronistic.

All clients rightly expect to have their buildings completed on time and at a cost they can afford. In the conventional contract, without a penalty clause, the architect has little power, other than that of exhortation, with which to enforce compliance with progress schedules. Cost, fortunately, can be more strictly controlled although haggling and disputes regarding extras – and mark-ups thereon – are disturbing features to any client.

The type of contract under discussion offers solutions to a number of these problems. The size of the total contract attracted tenders from the larger and better organized firms for whom the small individual school has little interest. The general contractor-manager has a direct responsibility to the owner to meet his completion dates although there is no penalty if he does not – other than loss of profit and prestige. The cost of extras from sub-trades are charged to the owner without any mark-up by the general contractor.

The successful integration of design and site construction is long overdue and the options and permutations of architect-contractor-manager relationships require immediate and careful consideration by the architectural profession. Not the least of the achievements of the present experiment will, hopefully, be in its influence in expediting such a study.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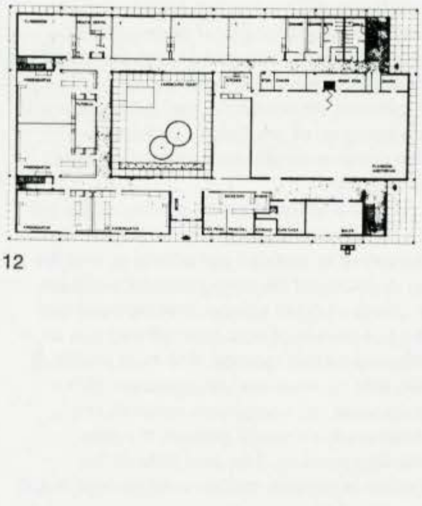
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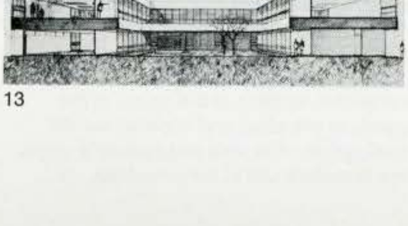
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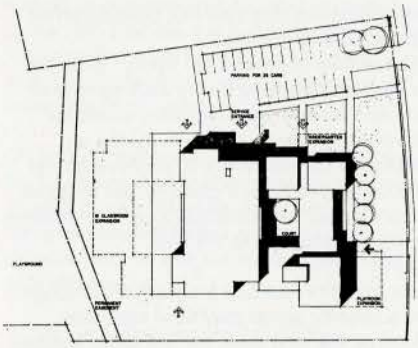
Leman - Sullivan, Architects & Planners

The management contract procedure on this project has been successful within the limited sphere of its operation. It was unfortunate that the most potentially beneficial aspects were not allowed to be tested owing to delay in the approval of project monies at metropolitan level. It had been hoped that the appointment of the contractor during the design stage would have enabled us to use his costing and construction talents during the development of drawings, and that materials ordering and excavation work might have proceeded prior to completion of full drawings, but approval of the contractor's appointment could not be made until the near completion of our work.

However, time was saved at the approval stage and we enjoyed the efficient management of the contract. More thought must be given to the re-defining of responsibilities and procedures between owner, contractor and architect in this type of contract, for traditional procedures based on hard experience are not given up lightly, and frictions can occur.

In looking for the advantages of cost and time that the flexibility of this system offers, we should not forget that few contractors are as yet trained and able to undertake management and to work with owners, and until they have sufficient experience in this regard more, not less, use should be made of the architect's professional training and experience in impartial administration of the contract. In this instance the owner's experienced staff played a major role, and their knowledge of the operation will prove important at the completion of the building when the total cost is assessed.

14
Site plan, O'Connor Drive Public School, North York; Leman-Sullivan, Architects
Plan d'emplacement, Ecole Primaire O'Connor Drive, North York; Leman-Sullivan, Architectes
15
Plan, 8' 6" x 8' 6" modules each contain lighting and controlled air supply. 12 modules make up 1 standard classroom
Plan, 8' 6" x 8' 6" modules comprenant l'électricité et climatisation. 12 modules pour une salle de classe
16
Section
Coupe



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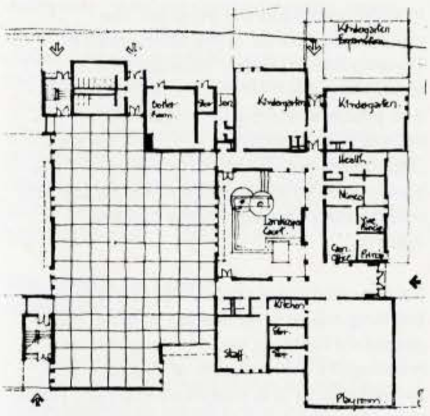

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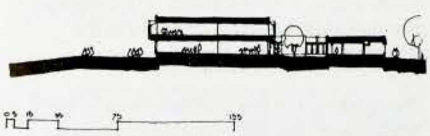

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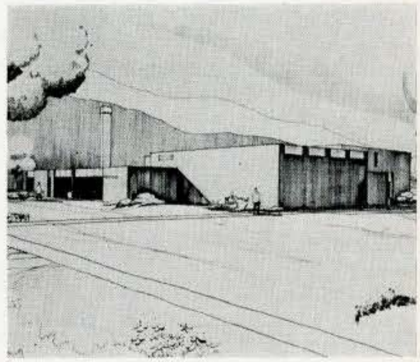
Nicol, Ream, McBain, Architects

The system currently employed by the North York Board of Education should not be classified as "bulk buying" but rather "multi-project general tendering" as very little restriction was placed upon the seven architectural firms in the selection of common materials or equipment. It was decided to permit each project architect to chose materials and methods best suited to his particular design and application. We believe that by standardized components and methods for a small group of projects such as this some economy could be affected by bulk buying but more important the contractor-subcontractor organization could be simplified.

It is difficult to assess whether or not such a system would always be successful. Much depends upon the "co-ordinating general". It is my experience with this project that Mitchell Construction has been well organized, co-operative and helpful. It does, however, require an adjustment in attitude on the part of the architect with respect to his traditional responsibility in the area of contract management with one important overtone – an ability to make prompt decisions.

In terms of this experience I have found that with the co-operative approach of client, architect and management contractor the advantages would appear to be: quality of subcontractors, lead time in material delivery, a shorter construction period and most important of all the client's opportunity to interest the large, well organized general contractor to act as his construction management agent. Under the normal system, particularly in the public school field, the projects individually are not of sufficient size to attract the larger general contracting organizations.

17
Perspective, Muirhead Road Public School, North York; Nicol Ream McBain, Architects
Perspective, Ecole Primaire Muirhead Road, North York; Nicol Ream McBain, Architectes
18
Site plan
Plan d'emplacement
19
First floor plan
Plan du premier étage



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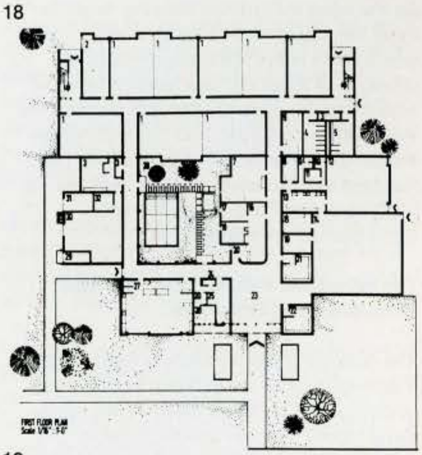


19

School Buildings

Roderick G. Robbie, MRAIC

Mr Robbie of Robbie, Vaughan and Williams, Architects and Town Planners, Toronto, is Technical Director, The Metropolitan Toronto School Board Study of Educational Facilities.

This article is reprinted from the October '67 issue of School Administration.

In examining the Buildings of Education in Canada's second century, the possible evolutionary trend might be broken into three very general periods: The immediate future, say the next fifteen to twenty years; the middle future, to a point twenty years into the next century; and the remote future, through to Canada's second centennial.

Prediction of the immediate future can be backed up by current trends and can present reliable projections. Despite the rapidity of current social change, a twenty year projection is just possible.
The middle future is in the realm of speculation and the remote future – guesswork. The ideas presented therefore should be treated according to their diminishing reliability.

The Immediate Future

The immediate future for educational building will be molded by the evolution now underway in education itself. The trend toward the individual treatment of the child, the emphasis on learning rather than teaching, the flowering of exploration and the demise of rote, spell for the architecture of schools, *Change* of a fundamental character.

The generator of this change process will be the need for interior building flexibility to meet the needs of an educational process which itself is in a dynamic process of change. To meet the new requirements of education the rows of identical classrooms, the endless corridors, and the anti-human wall and floor finishes, all for so long the hallmarks of the word "school" will go. To replace them, *Time* will be the new dimension of architecture.

The Immediate Future, Time, The New Dimension of Architecture

The schools of the immediate future will still tend to have the external appearance of schools as we know them – one, two or three storey, longish buildings set in playgrounds and distributed according to a demographic pattern through our urban residential areas, and at the centers of our rural populations.

There is little doubt that the exterior construction materials in current common use will tend to remain in common use for at least another decade or perhaps two. However, internally the schools will be unrecognizable by our immediate past standards.
The tendency will be to wide and very wide span structures. In urban areas these will tend to be multistorey buildings. Not only will the majority of interior partitions be relocatable, but also all the lighting, electrical, air-conditioning and building furnishings and casework facilities.

The Immediate Future Changing Construction Processes

In the past five years, the sudden changes developing in Education have brought increasing pressure on the building industry to produce buildings of greater interior flexibility. The pressure has built in a rapid escalation from a demand for the occasional movable wall a few years ago to near total internal flexibility today.

To meet the required flexibility needs in school buildings, using conventional building techniques, would mean a massive further increase in the cost of construction. To hold future construction costs within reasonable bounds and yet meet the building qualitative needs of the educator, is leading building toward total mass production orientated, industrialization by the year 2000.

A vigorous start has been made in this direction by the Metropolitan Toronto School Board's Study of Educational Facilities (SEF) and the Montreal Catholic School Commission's Recherches en Amenagements Scolaires (RAS).

SEF is organized to produce, based on very extensive studies of the elementary, middle and senior school academic requirements, an "open" comprehensive building component system for field application by the early seventies. The system will be based on a family of inter-related components produced by Industry to meet performance specifications prepared by SEF. These specifications interpret into building terms the academic studies.
The system is defined as "open," because a variety of manufacturers working in their chosen fields of specialization would be invited to produce elements having an interface compatability, to produce a total building system for a given school program, making possible substitutions of components from one program to the next.

For instance, the first program of buildings in a specific series may have concrete frames, the next steel, but the same flexibile air-conditioning system and partition system could be used in both.

In order to initiate the program, the constituent boards of the Metropolitan Toronto School Board have tentatively assigned (which will be made finite after due process) a program of $33 million dollars in elementary and middle schools. Despite the magnitude of this program it is barely enough to bring industrialization and true mass-production to the building industry.

To underwrite the massive changes to the building industry necessary to bring mass-produced building systems, capable of meeting the future needs of the educator, requires large and sustained markets, rather than sporadic large programs remotely located from one another.

Due to this fact the module for the SEF program and the primary components are being selected to have universal application in the educational field and the maximum overlap into other light building fields, such as office buildings, commercial and institutional buildings.

With the real changes in the processes of construction outlined above it is expected that there will be basic changes in the attitude toward building permanence.

The tendency in the past has been to build buildings on the more-or-less unspoken supposition that they will last forever.
In modern terms, seventy years begins to become a series of ages, rather than a lifetime. In such a period air travel has

progressed from birth to speeds in excess of 17,000 miles per hour. Electronic communication has moved from its inception to instantaneous global communication in sight and sound; and to the deft handling of space vehicles tens of millions of miles from this planet.
It can be expected that the practice of establishing the projected useful life of a building at the time of its design will become normal practice. Town-plans will be developed on the premise that urban renewal will be a normal healthy process of change in the living urban tissue rather than the hacking away of cancerous blight it has become today.

To meet this change in attitude, and educational construction can be expected to lead the process, the building systems of the immediate and increasingly into the middle and remote futures can be expected to have built-in "renewal" lives.

Under the "metabolic" approach to building construction, those components susceptible to wear or early obsolescence would be designed to permit easy removal and replacement, as with the moving parts of an automobile.

Under such a philosophy of *Cyclical Building Renewal*, comprehensive building components might have the following life (or renewal) spans.
Structure, cladding (exterior walls), stairs – *30 to 60 years depending on the rate of social and economic development*
Roofing, plumbing, partitions, heating and air-conditioning systems, elevators, escalators, and other people and goods handling systems and equipment – *20 years*
Electrical and electronic equipment, caseworks, lighting systems, wall and floor built-in finishes – *10 to 15 years*

The Immediate Future, Building Forms

The immediate past and much contemporary school design like architectural development as a whole, has been characterized by an absence of a consistent and generally accepted style of design.

It would appear that the mood of today's youth is toward an honest pragmatism; where mathematics ceases to be a tool of the few and becomes the language of the majority. In such a social climate the ordered architecture of a fully industrialized building industry would be normal and consistent rather than dull and repetitive, as it might appear to the philosophically romantic middle and older generations of today.

Current school architecture has seen wide experimentation with a variety of geometric forms. The discipline of the early comprehensive building systems will undoubtedly restrict overall building plan forms to simple squares and rectangles, where the building system constitutes the exterior as well as the interior building fabric.
This rigid consistency will be necessary to reduce the number of parts constituting a component and a system to a reasonable minimum number, to make the initiation of mass production in integrated building components possible.

Buildings will tend to be sheer and smooth, roofs will be clear of steps and level changes to avoid wide variations in snow loading. In the early years of the immediate future where above-average funds are available, or perhaps universally as the immediate gives way to the middle future, the separation of the exterior skin of the building from its interior space division and support functions will probably occur.

These buildings may provide several climate zones. The outdoors, the inside-outdoors and indoors. Ultra-wide span structures based on the geodetic structural principle as used for the US pavilion at Expo '67, or cable supported structures such as the German pavilion at Expo '67, and other similar techniques, would provide an exterior combination wall-roof enclosure against the elements.

Within the large column-free space enclosed, a combination of building and semi-building spaces would be constructed from relocatable building components. Spacial and functional permutations in such structures could be virtually endless involving as they might three dimensional spacial modifications.

The Immediate Future, Place in the Urban Fabric

Accepting the facts that Canadian society cannot afford, at least in the immediate future, the installation of universal home based multi-channel communications systems, nor alternately that the change from a sustenance-maintenance human work orientated society to an automatically sustained and maintained creation-orientated society, is still beyond the immediated – and even perhaps a large part of the middle future – the school as a building entity can be expected to be part of the urban scene for perhaps another two or more generations at minumum.

It will tend to survive, though mutated almost beyond recognition to satisfy the gregarious and social instincts in adult and child alike.

Despite any immediate substantial increase in electronically-operated teaching and learning aids, it would appear that the growing demands placed on the education system for individualization and extension of the learning period, together with multiplying retraining programs under many different guises, will guarantee the survival of the school as a feature of the urban scene, out of economic necessity.
However, due to rising costs and rapidly increasing interest in learning from a widening section of society, the school can be expected to operate on an almost 24-hour, 7-day and 12-month per annum basis.
Associated with this trend to high utilization will probably be one toward the fusing of the school functionally with other social institutions.
This trend is already apparent in such projects as Scarborough's elementary, middle, and senior school campus combined with park and recreation functions.

The Middle Future

By the early Middle Future, in the late 1980's, the school system will probably be already giving way to a system of elementary, middle, senior and universal *Community Creative Centers*.

These centers would cater to a public which was losing the compartmentalized distinction between childhood – school days – working life and retirement in its individual daily life, in favor of the concept of a "life continuum" where each life would tend to follow its own rather district pattern rather than a being shoehorned into a common pattern.

The Community Creative Center would be a large complex of functions, varying in size and complexity according to level. It would be less of a building but rather more of a place or town-center by today's terms.

Prime functions which would be absorbed into the "conglomerate" urbanism of the centers would include the school, the public library, the museum, the manpower retraining service, the sports and recreation services, arts, crafts and hobby clubs, drama, dance and film clubs, travel clubs, public health services, and a comprehensive counselling service covering all aspects of life.

The Remote Future

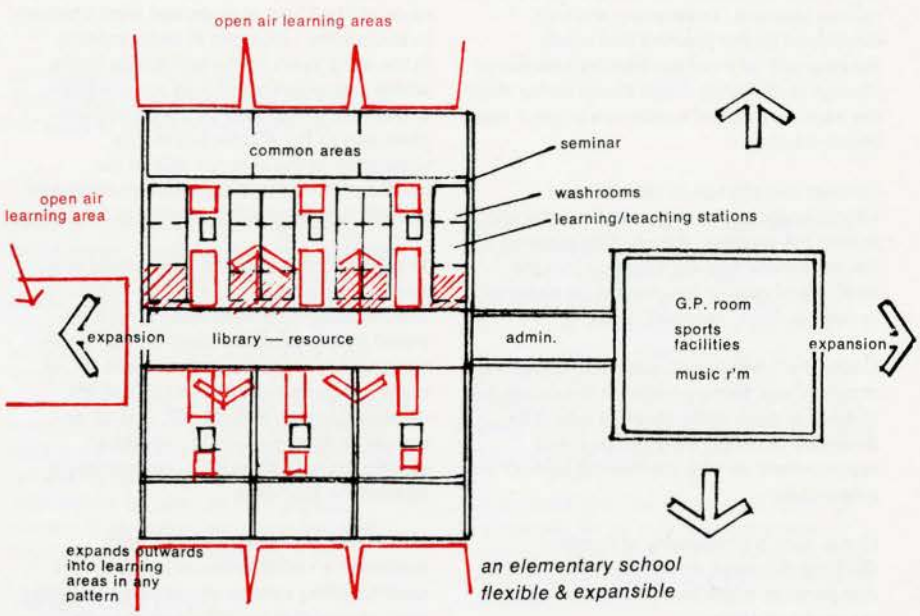
To scan into the remote future little more than trends would be reasonable to predict. Building stabilization techniques learned from rocketry will probably be in common use. The Apollo rocket system, equal in height to a 35 storey building, can be moved at 2 MPH.

New super strength steels and plastics will make buildings of unbelievable spans by current standards possible. This will apply to both roof and floor systems.

Industrial assembly techniques based on the square planning module, such as the 60" x 60" grid mentioned earlier, will be replaced by subtle regenerative systems more akin to the ever-changing structure of living tissue and less like the simple crystallography of our contemporary systems.

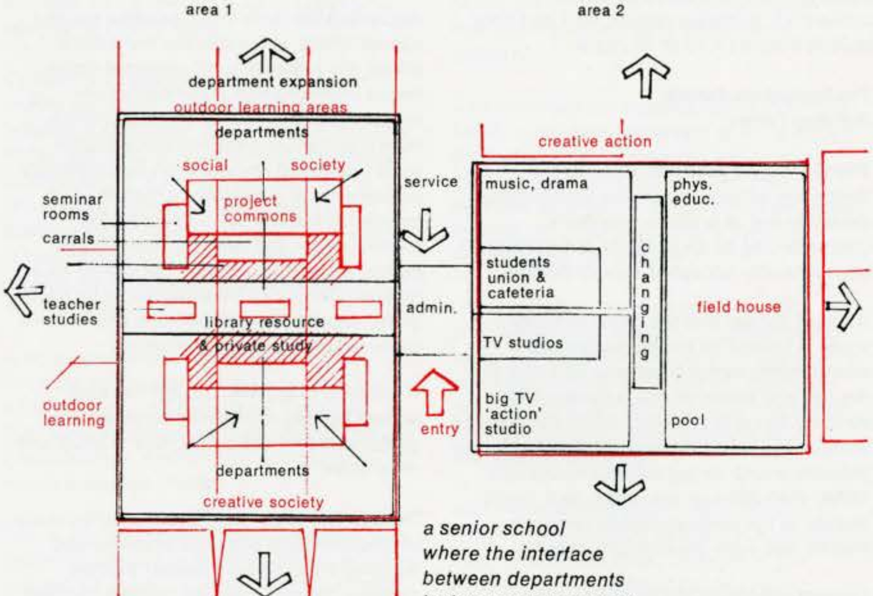
The first of a series of "living" bio-chemical building materials may be in existence, which would open up possibilities for "organic" human enclosures presently beyond the fringes of our understanding. These materials, linked with computers and super mechanical-electrical systems, would, like the human "metabolism" and central nervous system, "react" to exploit rather than resist the natural environment wherever possible, and under difficult conditions seek to optimize all available resources to meet specific difficulties or conditions.

In conclusion and returning to the possibilities of the immediate future and the problems of initiating a practical form of flexibility in school building consistent with industrialized techniques, a clear division of functions may be expected. The basic form of plan may comprise two major and distinct areas.
The first, a virtually open loft space which would probably accommodate learning areas (alias classrooms), library-resource centers, science, shop, arts, crafts and health sciences facilities, seminar rooms, and teachers' and other offices.
This loft structure or area would be characterized by the relocatability of every partition, light fixture, air conditioning and other service outlet, together with every piece of casework and equipment. Only the washrooms, stairs, and major mechanical and electrical facilities would be static.



an elementary school flexible & expansible

The second area would accommodate all high spaces and special facilities. These might include general purpose rooms, gymnasiums, field houses, auditoriums, cafeterias, music, drama, and special arts facilities, TV studios and stages and all other spaces requiring special acoustical isolation or treatment, a special fixed spatial form or special construction to suit a fixed purpose.
A further general trend may be towards the use of outdoor "learning" areas having direct indoor-outdoor access to indoor learning areas. There will probably be reduced glass areas to reduce sun-heat loads on air-conditioning systems. But the glass provided will probably be used to gain the maximum psychological benefit for the children using the building.
"Patio" glazed door connection between the inside and outside learning areas may be used very effectively in kindergartens and elementary schools and to part of the resource area of most school libraries. Whereas in middle and senior schools science, art, certain shop and learning areas might have the same indoor-outdoor direct contact with great benefit.



a senior school where the interface between departments is the common project developed in the project commons

The school architecture of the immediate future, created as it must be from a simple, limited, pioneer series of mass-produced comprehensive building system components, must lean heavily on the foundation of architecture – the manipulation of space – rather than the application of architectonic cosmetics.

Thoughts on Educational Needs Related to the Physical Environment

Kenneth F. Prueter

Professor Prueter is Co-ordinator of Development for the Ontario Institute for Studies in Education. In this article Professor Prueter examines educational specification from the point of view of present and future demands upon schools.

It is important to note that the purposes of education in our democratic society remain unchanged. It shall always be our intent to serve the needs of each individual who comes to us to be educated. The needs may require redefinition from time to time at least to the extent that individual needs and the needs of society relate to one another. Also, we know much more about individual characteristics today and this added knowledge often calls for different educational provisions.

Our problem in searching for meaningful guidelines for the provision of schools is multiedged. What we build for today will have to be used by the children of tomorrow. Schools must serve the educational needs of children. More and more education becomes a lifelong process and our schools must increasingly serve the educational needs of other age groups as well. Can we provide specifications which will suit now and provide an adaptable, flexible form for tomorrow?

I do not know what the actual specifications should be. Nor does any man. However, I shall attempt to suggest some principles – some of which I believe apply now and all of which are likely to be relevant in the future.

The first specification for success in education will always be the quality of our teachers. In formulating our specifications I believe we must keep the teacher's position in the key place. All teachers, regardless of the grade taught, need time to plan, to prepare, to communicate. *If this is accepted, then we must provide spaces in which the teacher can do these things individually and in groups.*

Need Flexibility

We now accept that there is need for instructing pupils sometimes as individuals, sometimes in groups of 8 to 10, sometimes in groups of 30 to 40. Now we are told that some instruction may be effectively given in groups of 100 or more.

The schools of today require rooms for varying types of instruction. Spaces for such areas could be provided, with few exceptions, through a more flexible use of space we now provide in rigid cubicles. *I believe our building regulations should permit us to provide the amount of space now approved but should permit different ways in which this amount of space might be designed and utilized.*

Need Learning and Teaching Areas

In at least 95% of the classrooms in Ontario both elementary and secondary, and university too, desks or chairs are in rows – the teacher is at the front of the room and some form of the lecture-recitation method is used. And yet, the more I listen to experts in the field of learning theory, the more I suspect that this over-use of a single method is not productive of the best results nor is it suited to the application of ways of learning or knowing which have been revealed to us today.

Margaret Mead has said that in a simple society where change is slow, the culture can be handed down economically from parent to child, father to son, mother to daughter. But when life gets complicated by the accumulation of more facts and more non-facts it becomes more economical and therefore more necessary to assign the transmission of the culture to special people called teachers.

Miss Mead goes on to say that when life gets very complicated, when culture change is exceedingly rapid, having older people called teachers teaching young people called pupils is too sluggish an arrangement. In periods of rapid change everybody must learn from everybody else: The young from the old to be sure but also the old from the young.

However, the teacher must give the children the *tools* of learning – basic skills in reading, writing and arithmetic. We must *teach* these to all children. With some children we are never able to progress much beyond this type of activity. Other children master skills readily.

The necessary environment for basic skill teaching need not be elaborate – in fact, those who speak of the harmful effects of "detractors" in education would even advocate a rather austere environment for this type of activity. Because of all the variables amongst children, group size for effective teaching of skills appears to be more significant. This is neither an impractical nor a theoretical consideration. We now organize classes on this basis in Ontario schools. A group of slower learning children of 15 or 20 requires the competence of an excellent teacher, special teaching aids, but a reduced amount of floor space. Similarly some children require instruction individually or in smaller groups. All schools, elementary and secondary have pupils like this. We acknowledge our responsibility to such children, we admit to the teaching difficulty – we acknowledge the need to adjust class size, why don't we build rooms to provide for this type of teaching?

Then we have children who acquire the skills rapidly. They are children of good learning ability. We must find ways in which such children may truly learn to apply these skills and thus experience the excitement of learning. Such children will read, will experiment, will work on individual and group projects, will discuss and learn the real skills of thinking, through the process of education employed. In such a room ample space is a requirement. We need individual study desks or perhaps even individual study cubicles and we need a conference table, library and reference areas and an experimental or work area.

Again, all schools have such children and more schools are providing diversified programs. Some classrooms *designed with additional space and special furnishings could be provided by adding here part of the space which was saved by the provision of smaller rooms for skill teaching.*

The swing is away from standard groupism and toward the individual, as learning gradually takes precedence over teaching, as the individual differences among teachers come to be recognized and capitalized upon, and the chambered nautilus schoolhouse whose interior is as unchangeable as though its partitions were made of calcium, gets in the way. This is the big change. It is not surprising, therefore, that the rearrangement of pupils and teachers is bringing about the re-arrangement of school interiors. Literally, the schools are bursting out of their boxes.

In general, schools are moving toward what business and industry have already embraced – generalized space made special not by precise design, room by room; but made special by the nature of the portable equipment assigned to a particular section of the general space.

Need Improved Library Areas

But all children must have the opportunity for meaningful contact with books and other more recent means for the communication of information and knowledge. It is, therefore quite appropriate that recent provision has been made in our province for establishing library rooms in all of our schools. Such a room will serve the entire school and in many ways it may become the heart of the school. Since this room is not class station the provision of it gives more flexibility to the total school plant.

I believe that we must give more careful thought to what the term "library" actually means in our age. The Americans now use the phrase "Instructional Materials Centre" and in this term they refer to a facility to house the library, viewing rooms, listening rooms and so on. *Better specifications for our library areas will improve our facilities,* without adding a further cost.

Design for Function

In general our present specifications for administrative areas, staff facilities (apart from teacher study and preparation areas), general purpose rooms, gymnasia and auditoria appear to be adequate for the needs of our province. I think that we sometimes forget that schools are provided primarily to serve the functions of education for a particular age group. It could, therefore, be argued – for example – that a general purpose room in a junior school should be designed to meet the needs of children of this age group. Designers tell us that such a room should be truly child-like in atmosphere and environment. In practice, the public and sometimes the teachers too, demand that it be a formal place complete with proscenium arch, stage and drapes. In those schools in which boards have attempted to plan otherwise, the pressure applied by the community to conform to adult standards has ultimately enforced change. We must always decide for what function the form is to be provided.

Design Fitments for a Total School

If too, specifications were to be devised through which design would provide the total school then attention would need to be given to the type of fitments required for each space. For example, if climbing equipment is considered to be worthwhile surely it should be designed with and for the room when we have the opportunity to do so.

Aesthetics Must Not Be Neglected

John Kenneth Galbraith has said "We act efficiently when we maximize the product of a given expenditure or when we adopt the expenditure which maximizes the product. Beauty and elegance and the pleasure that they provide must be counted as part of the product. We are being inefficient if by false economy we deny the community pleasure and pride in its achievement."

In this age of science and technology is there a danger that we neglect the aesthetic? In my reading I have been particularly impressed by the emphasis which many European countries place upon providing an environment of art, culture and beauty for its youth. I have had both good and bad experience with the provision of art forms in the design of our schools. Certainly, if it is left to whim you must expect the bad as well as the good and more likely you will get little attention at all to design and beauty. If, on the other hand, you consider this to be an important part of school architecture then specifications should be drawn which direct without being too directive. Because of our technical knowledge it is now possible to simulate or even improve upon natural conditions of light and temperature. This has led to a trend towards windowless or near windowless schools. A reduction to our glazed areas was long overdue. All teachers experienced the problems attendant upon too much heat and light and the control thereof, to say nothing of urban problems of window breakage.

I do believe that our future specifications must be explicit on this subject for a windowless school may prove to be more limiting and less suited to sound educational function than a conventional design. I feel we are in danger of eliminating from the life of many children a priceless heritage, namely, the chance to feel during their school days, a deep sense of personal relationship with the world of trees, grass and blue sky.

Ask Teachers About Classrooms

If we were to ask our teachers how to improve our school buildings (and it seems that we are sometimes reluctant to do so) we would probably be asked to provide "more function." For example, in Metropolitan Toronto it has been discovered that elementary teachers prefer the wardrobe area in the corridor thus freeing another classroom wall for display, shelving or project areas and freeing the back of the room for instructional purposes.

My suggestion here is to seek to capitalize upon the experience we have had in school construction in this province in the past twenty years by *turning to our teachers and asking them to help us identify the most successful characteristics of the schools we have provided.*

Ah Cheops!

David W. Menear, B.A., B.Ed., M.Ed., FCCT

Mr Menear, formerly school principal, Scarborough Board of Education, is presently Education Thinker, The Toronto Daily Star. Mr Menear says "he has been limited by the gray safeness of school architects for over twenty years, and now sits liberated in a large, warm downtown office trying to think". He says he fancies himself a humorist, "but isn't sure how to spell it". Quizzed about Cheop's daughter, all he said was, "Some pile of stones!"

Cheops was the perfect client. He knew what he wanted, had an obliging daughter to help make ends meet, and didn't give a snort about the public. School architects today stand around wistfully, cap in hand, waiting for some modern Cheops to make up his mind about education and the kind of school in which to house it.

While you're waiting, put your cap back on your head to warm up your cerebellum so you can think about yourself in perspective. Cheops overdid it. How many generations of architects went out of business waiting for pyramid contracts in the last five thousand years? You can build too well.

As the last of the two-way men who can contribute to fine art or tighten a bolt and still be professionally at ease, architects were fashioned to lead.

The slaves who built for Cheops joined the union and now administer schools. At every level they're afraid of the one above, but they are searching. Harrassed, isolated and hamstrung, they are searching.

Let them find you. Be their teacher. Tell them what's happening in schools. Shine a few rays.

Light the warm lights. Beauty is one. Peace is another. Everywhere you look, in your school, you see beauty and you can feel it. And a soft tread, and a hush.

A blind architect could measure your success with his fingers and his ears. The hard corner and the hard echo condemn you.

Think electrically. Your masterschool will be criss-crossed with yellow and red extension cords if wallplugs aren't close to each other. Every surface must be a projection screen. Beams of light from dozens of devices spout education all over the modern school. Do you give them a right bed to fall upon? If you don't, your dreamskule will stalk with three-legged monsters of steel and canvas.

Open spaces let some children expand. They terrify others. Has your school the hideaway, for study and for play? Play nooks are cosy things, and study is great if you can have a den to do it in.

The accepting teacher is a well-stretched sinew. Do you give her a private study carrel, a small world where she can be big and important for a while each day? Architects should give some thought to the protection of the teacher. If Cheops' daughter were a teacher, she'd love you for this alone.

School is now a home for some, but still a prison for others. In either case, a real log-burning fireplace can do much to reduce tension and set the mood for real communication.
You may lose a client on this point alone. Just look for a better client. People like you are building the values of our society. If you fail, nobody will take over.

Stand out on yard duty with one of Cheops' minor slaves on a freezing February day, and you will build a comfy outdoor place to stand. When your bulldozer works for weeks to flatten the schoolyard, and you watch for months the replacement of healthy activity by interference and boredom, you will bring back your machines to build hillocks and tunnels. Flat places are needed for organized games, but mounds and banks make private play more exciting. If your school has a message during office hours only, that tells something about you.

Two other things you can do the day before the official opening of your school. Present each child with a water flask because he won't be allowed to drink at will no matter where you put the fountains, and donate a school strap inside a bronze case inscribed *"Ancient Instrument of Torture"* for fastening on the wall.

If you install an electric school bell inside instead of soft chimes, the staff may fasten a brass plate under the bell which also reads, *"Ancient Instrument of Torture."*

Shine well before our ignorant armies on the darkling plain, and you may qualify for the Cheops' Award, suitably inscribed *"He knew where he was going"*.

The Architect and the Industrialization of Buildings

Colin H Davidson, M Arch (MIT) Dip Arch.

Mr Davidson has practiced in London since 1961 as a consultant in the industrialization of building processes and teaches part time at Washington University, St Louis, Mo., where he also directs a Building Industrialization Research and Development Group.

The following is Part One of a two-part article edited from his talk at the Annual Meeting of the Province of Quebec Association of Architects in January. Speaking to the Convention theme of "New Horizons for the Architect" he outlined the roles the architect can be expected to play in the evolving building industry, but warned that while the architect's best ally was his intellectual status, his enemy could be his own professional traditions.

"Industrialization of Buildings" is a term which has probably generated more misconceptions, generalizations and outlandish claims than many others that burst upon the building scene in recent years, yet industrialization is a normal 20th century phenomenon (and a 19th century too) in many sectors of human activity.

Why the building industry should be so self-conscious about its own industrialization might be a fascinating study in itself, but the purpose here is to take a look at current technical change within the industry itself. If we stand far enough back to obtain a proper perspective view of these initiatives we will be able to note their wider implications, particularly on the role of the architect. We can expect from the outset that the organizational implications of the technical changes are significant in terms of the roles now open to the architect and in terms of those that are becoming redundant and superfluous.

I am optimistic, but within limits, about the roles that the architect can play, and I restrict my optimism to those individuals, and only those, who can call upon a high level of intellectual ability with which to cope with the new opportunities, some of which are explored in this presentation. I do not think that skills vested in today's practices and procedures provide a sufficient guide to these new fields of activity. And in all this I refuse to become involved in the superficial debate as to who is to be the leader of the new "teams" in the building industry. It seems to me clear that leadership falls upon him who is best equipped to exercise that role. It is not distributed as of right.

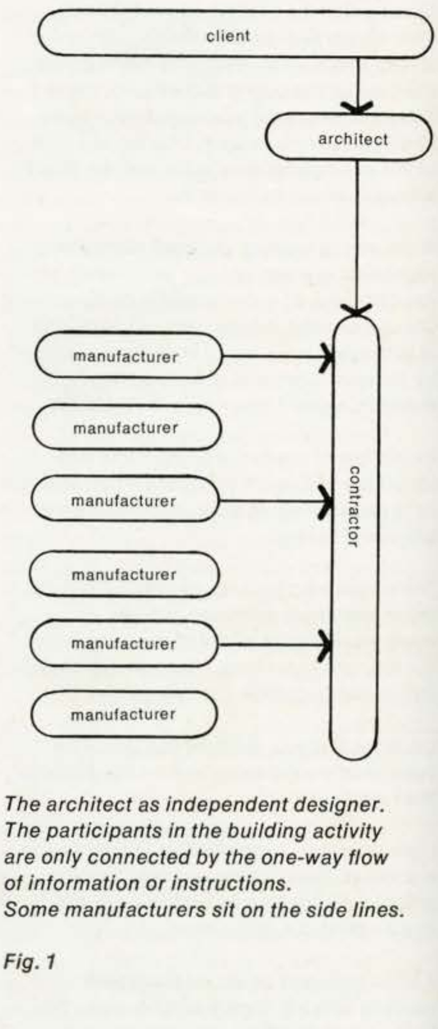
The Wider Context —

A discussion limited to the techniques that have been innovated in most countries recently would present a somewhat un-industrial picture, largely because individual innovators, working from within the industry itself, had difficulty in viewing the industry comprehensively and in anticipating some of the consequences of their own activities. Traditionally, the building industry is a system in which the parts (participants and activities) have relationships with each other and interact with each other in well established ways.

But peoples' views of things are changing and our own views of our industry will have to change too. As situations become more complex we look at the individual items in these situations and more at the relationships between them; then we look less at the relationships themselves and more at the rules that govern these relationships – rules of change or rules of continuity.

In the building industry there is an equivilent change in people's views. (Not architects' views). Instead of thinking of so many buildings, so many isolated stages in the life of buildings, and, again, so many individual involvements in each stage, one considers buildings as having a life cycle (and groups of buildings have interacting cycles) within which there is a growth stage, a use-with-change stage, which includes a certain element of decay-and-modify, and a stage of removal, including re-use or re-sale (second-hand facing bricks are already very valuable). This puts the emphasis on *process* – process of growth, process of use, etc. Industrialization concerns processes. However, the architect is perhaps not oriented towards processes (this is why architects' views were kept out earlier).

The architect today (at the risk of over-simplifying) has been trained to direct all his energy towards producing a *building* – a



The architect as independent designer. The participants in the building activity are only connected by the one-way flow of information or instructions. Some manufacturers sit on the side lines.

Fig. 1

static piece of hardware. The fact that he makes the building come to realization through third parties does not affect this issue. The building is the goal, and at a moment in time "it exists". (In this context it is interesting to point out that the building contractor is more process-oriented, since he must direct his interests to the ways and means of building – "how" to build "what" he was instructed to build by the project architect.

There is another aspect of this wider change in attitudes and methods, the growth of large organizations (industrial corporations and the like), which extend their fields of activity until they control not only the activities but also the relationships between them.

Again, however, this is not typical of traditional building. We find there many participants, each implicated with one sort of activity (or a succession of single activities); the relationships are accepted and cannot be effectively questioned. It is precisely because there are agreed relationships between the participants that it is possible to build at all. But if the scale of involvement by some participants is beginning to change, there will be effects on all the participants.

Industrialization; What is It?

"Industrialization is a productive method, based on mechanized and/or organized processes of a repetitive character".

Industrialization concerns processes, "how" things are done. Mechanization and organization are the basis, and repetition the necessary characteristic.

It is easy to visualize mechanization and organization from our own every-day experience. They are both relative terms. Mechanization can range from the hand-held power tool to the fully automated factory; organization can vary between the coordination of decisions by a few individuals to the large established administrative hierarchy. Usually, in fact, the two vary in parallel.

It is also necessary to point out that the level of mechanization and/or organization can vary from one part of a process to another within one firm; it can, and most probably will, vary when successive stages in a process are in the hands of different firms, as is the case in building.

Industrialization is, therefore doubly a question of degree. It is a question of degree at any one stage in a process and it is also a question of degree when we consider the *average* for all the stages in a whole process.

There is plenty of industrialization in the building industry already – particularly among the suppliers of materials and basic components (cement, brick, glass, steel, etc.). By the industrialization of building we really mean "deliberately increasing the level of industrialization in a building process, viewed comprehensively". Taking one of the four examples, it is not enough to know that the manufacturer of bricks may be industrialized (how industrialized?); we must also know about the laying of bricks into a wall. If we were to be in a position to do something about it, we would know where to concentrate our attention. We would also be able to compare this method of making a wall with some other method such as the manufacture and erection of large concrete panels; we might want to choose the more industrialized.*

**The industrialization can be measured by relating the incidence of direct labor costs to the added value of any operation. This is outside the scope of this paper, but is mentioned to give an indication of the kinds of indices now being developed.*

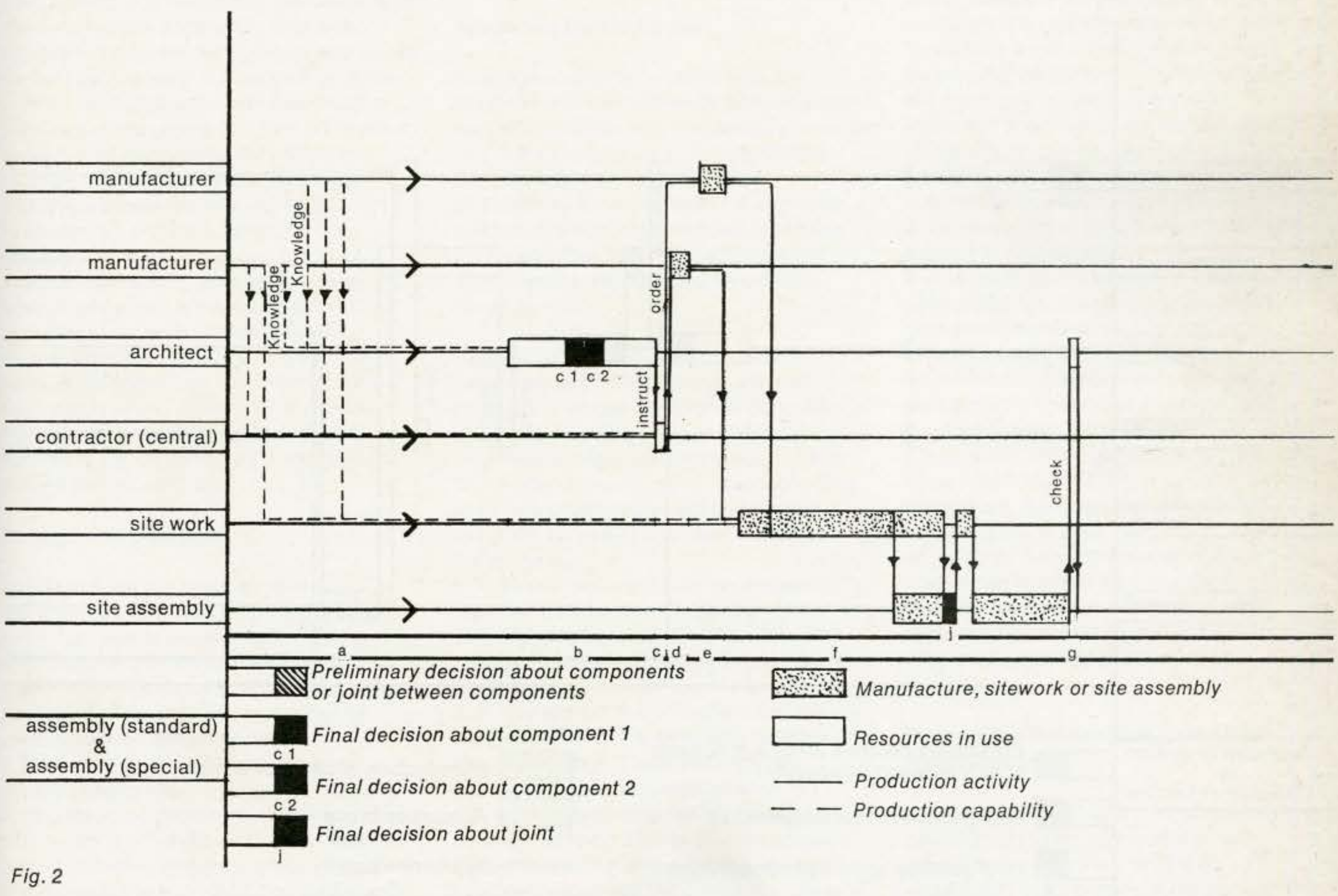


Fig. 2

Traditional Building: the Springboard for Innovation

Let us be precise about the present day organization of building.

In *Fig. 1* is shown the links between the participants involved in traditional building. The building owner (client) initiates a set of linkages through his decision to build. This is a one-off decision, and though the participants *exist* beforehand in a state of "latent capability", they have no specific inter-relationships.

The linkages now called into existence run in certain specific directions. From "client" to "architect" (the term is deemed to include the professional advisers and consultants) and from "architect" to "contractor". The architect devises a building that will satisfy the instructions received from the client, and tells the builder what it is to be like. The builder devises how to carry it out and orders up the necessary inputs from the manufacturers – one more one-way link.

There is no link, observe, between the manufacturers and the architect. That is because there is no formalized project initiated link. We can be cynical about the efforts of the sales reps to get into our offices and our mechanisms for keeping them out, but unfortunately that is the situation today.

Within this loose one-way set of linkages, however, there is a certain logic, the sequence of decisions; and take a specific case: a partition with a door in it.

These diagrams show two out of a number of possible approaches. In *Fig. 2*, traditional *materials* are used which are converted into the partition and the door through a mixture of site work and site assembly. The project architect designs the partition (*decision C1*) and the door (*decision C2*). Instructions are given, materials ordered and delivered and site work is done. Assembly takes place, with the workmen carrying out the joint, making traditional craft decisions (*decision J*). All these decisions are built up from the base of common knowledge.

Another way of making this element is shown in *Fig. 3*, a purpose designed prefabricated partition and a standard catalog door and frame. The door and frame are designed by their manufacturer (*decision C1*); the project architect, in designing the partition component, takes this into account and designs appropriately the component and the joint between it and the door frame (*decisions C2 and J*). If these decisions were correct (and there is no reason why they should not be) these prefabricated parts will fit together with site assembly only.

Decisions are still in a sequence that is compatible with the delegations of responsibilities. The snag lies in another direction. Industrialization presupposed repetition ("processes of a repetitive character"), and how much repetition is available in these one-off no repeat situations? Only the largest projects can really command much repetition (in the industrialist's terms) for their special ingredients, which is why we have to fall back on materials or unsophisticated components in all other cases; these are able to be mass-produced "for any project" without being really adapted to their needs. The consequence? Much site *work* to be done on them before we can site *assemble* them; and one of the characteristics of this site *work* is that it is labor intensive and relatively disorganized (*ie* it is un-industrial).

To be continued in the April issue of Architecture Canada

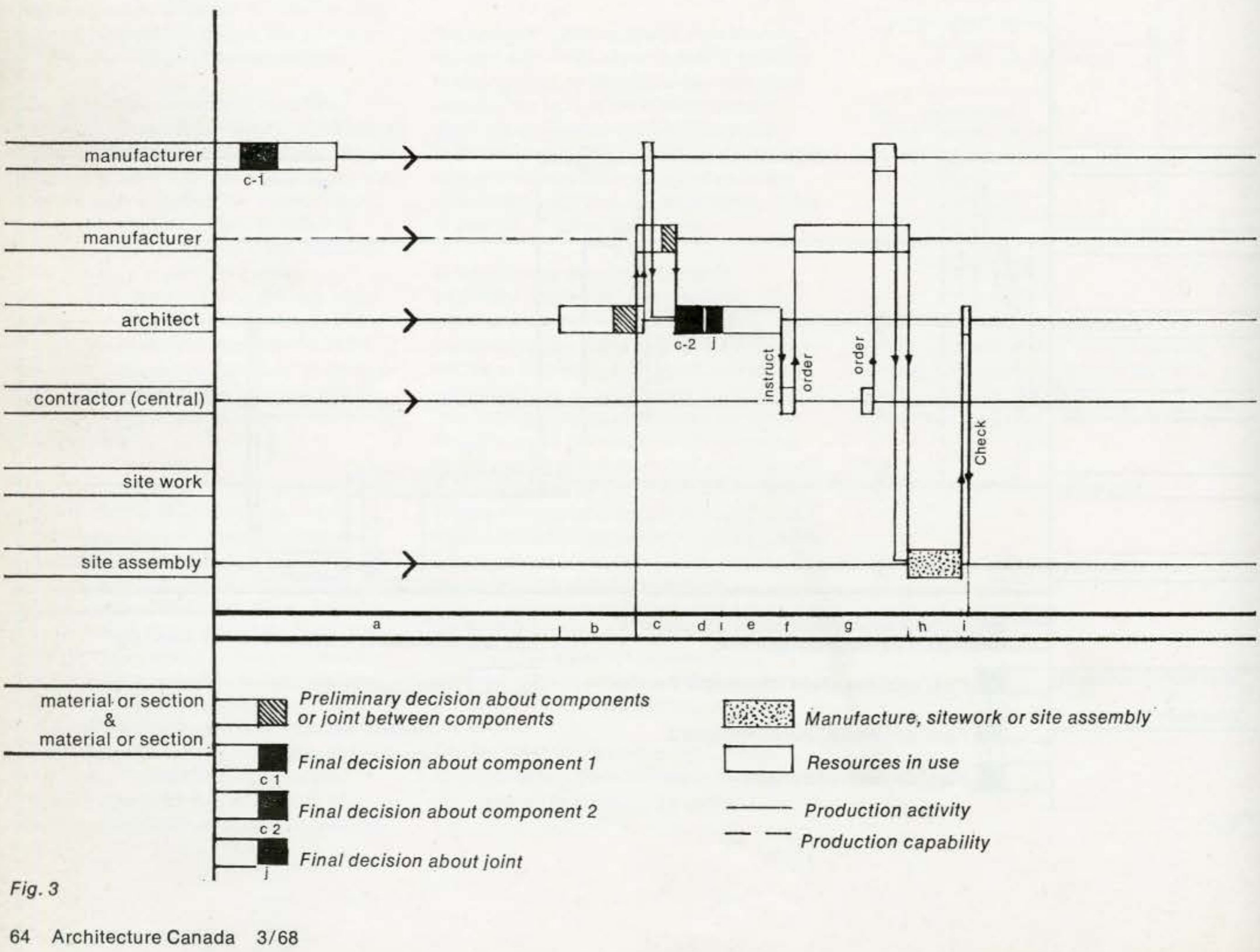


Fig. 3

Tendering and Contracts Part 2

F. W. Helyar, MCIQS

Management Contracts are also discussed on pages 51-57, this month's Architecture Canada. The client, contractor, and the architects comment on the component tendered fixed management fee project control system being used to build seven schools in North York, Ontario

Last month we discussed some of the more usual types of tendering and contract procedures and said that many architects and their clients are taking a hard look at time-honored practices to see whether there aren't better ways of appointing a contractor.

The most important influence on attempts to revise tendering and contract procedures is undoubtedly the package dealer. His claims to speed, economy and a guaranteed price are not always justified but there is a great temptation for a building owner to accept them at their face value. This is because many owners, particularly those whose main concern is with time and cost, believe that separating the design from the construction adds to the total time needed to complete the building, and allows the architect to work in a vacuum as far as cost is concerned without the restraining influence of the contractor. This latter point was brought out by a Toronto developer recently when he stated that he always employs a contractor and leaves it to him to appoint an architect "because it is cheaper that way".
The package dealer does have certain advantages which are not available to the architect when he is working with the normal lump sum contract. Some of them, such as the use of non-union labor, are advantages which will probably remain the prerogative of the package dealer, but others can be used by the architect in a management contract.

Management Contracts

Although there are many ways in which a management contract can be approached, all of them aim at certain basic objectives which can be summarized as follows:
1 Bring the contractor in at an early stage so that his skills and experience can be used during the design period.
2 Start work on the site earlier than is usually possible with a lump sum contract.
3 Provide some degree of incentive and competition so that the cost advantages gained from bringing the contractor in at the design stage are not lost by inefficiency and lack of incentive during construction.
4 Provide the flexibility needed to adjust costs if they appear to be getting out of hand.
To achieve these objectives it is essential for the contractor to recognize that, initially at least, he has been appointed as a professional manager to work with the architect as part of a team. In some management contracts this point of view has been impressed on him by making him a management contractor only and not allowing him to take part in any of the work on the site. Even if he is permitted to do some of the construction he should understand that the two services, management and construction, are separate until (and if) they are brought together at a later stage of the development.

Appointing the Contractor

First, the contractor must be selected. In some instances, either because of good past relationships with the client, or because of a close association with the architect, the contractor is selected without competition. If the contractor is of proven competence and integrity there is nothing wrong with this, but most architects and their clients prefer to inject an element of competition.

Having decided that competition is necessary and having chosen a list of contractors whose experience, competence and financial ability has been investigated, tender documents are sent to each of them. The tender documents will vary depending upon how construction will be handled, but at the very least they should include the following:
1 A general description of the project together with the sketch drawings. This will give the contractor an idea of the scope of the work so that he can quote a realistic fee.
2 A statement of the probable construction cost prepared by the architects from the sketch drawings. This also helps the contractor in his quotation on a fee.
3 A statement of what the contractor will be required to do if his tender is accepted. I shall deal with this in greater detail later, but it is obvious that the contractor needs to know at this stage whether he is to be involved as a management contractor only or whether he will be required to do some of the construction.
4 A request for the contractor to state the time required to complete the project. Since a management contract is usually used when time is of the essence it is useful to have the contractor's opinion of the time required and to make a comparison between them.
5 The composition of the management group the contractor will have to employ, and a request for the contractor to state the names of those he proposes to employ in each capacity together with their qualifications, experience and salary. When tenders are received at least as much, if not more, weight should be given to this aspect of the proposal as to the fee quotation. The Management group put forward by the contractor should *never* be selected on the basis of price, otherwise the contractor submitting the most inefficient and lowest paid management group will get the job. Once selected the group should not be allowed to be changed without the express consent of the architect. A suggested list of the management group is given in Appendix i.
6 A request for a quotation on a fixed or percentage fee, based on the estimated cost given in paragraph two. A clear definition is needed to tell the contractor what his fee is intended to cover: generally his head office overhead and profit, and a large proportion of his site overhead. A suggested list of the items which normally come under this heading is given in Appendix ii. If tenders are requested at a very early stage when sketch drawings are vague some items of site overhead such as cranes and hoists, fire insurance etc. would be better included as cash allowances, separate from the fee, and subject to adjustment when more information is available.

Duties of the Management Contractor during Design

One of the first duties of the management contractor is to provide a critical path schedule showing the timing and relationship of all phases of the work both in the design and construction phases. Since work can start on the site very shortly after his appointment it is imperative that there is proper co-ordination between the preparation of the drawings and the construction schedule. The architect's normal sequence of preparing drawings and specifications may be radically upset and if, for example, the supply of windows is a critical factor, he must prepare window details at a much earlier stage than usual so that work is not delayed on the site.

Another function of the management contractor is to prepare estimates and to advise on the economics of alternative materials and methods. This requires close co-operation between the architect and the contractor.
As soon as is practicable the critical path schedule and the estimate should be combined to provide a time and cost control system. If the cost is shown for each activity on the critical path schedule a unique control system can be created. Given the choice of two materials, the cheaper may appear at first sight to be the more economical, but entering them on the critical path schedule may reveal problems with regard to timing and show that in fact the more expensive material is the more economical in the long run.

Two other benefits can be obtained from a time and cost control system. It will provide a cost flow diagram for the client showing in advance what his monthly financial commitments will be throughout the construction period. Secondly, if kept up to date, it provides both the contractor and the architect with an accurate assessment of the value of work carried out during any month and makes the estimating of progress payments much easier.
As work proceeds on the design and the working drawings the contractor will, in conjunction with the architect, set the budgets for all trades, report back at regular intervals on the overall state of the budget, and review the drawings and specifications. If costs are creeping up or if some areas of design are lagging and becoming critical they are exposed early and corrections made.

Duties of the Management Contractor during Construction

The duties of the management contractor during construction will depend upon whether he is to be involved in the construction or not, and if he is to be involved, the basis on which he will be employed.

Bearing in mind that work on the site starts quite shortly after the appointment of the contractor, his work during design and construction overlap to a large extent. If the contractor is not to be involved in any of the construction work he will ensure that the architect prepares his drawings and specifications at the proper time and in the proper sequence to enable material and sub-trade tenders to be called. He will assist in the preparation of the bidding documents, and as tenders are received he will analyze them with the architect, check them against the budget, negotiate if necessary, and finally recommend acceptance.
Besides supervising sub-trade bids the contractor will also perform the duties normally associated with a general contractor such as expediting shop drawings, materials and sub-contractors; purchasing; site supervision; and processing change orders.

Even though the contractor may not be doing any of the construction work there are some site overhead items such as site offices, equipment, insurances, bonds, etc, together with labor for cleaning glass, cleaning the building, etc, which has to be provided. As mentioned earlier, these can be included as part of the fee. Alternatively, in some circumstances it might be better to pay for some of them on a cost basis.
If the contractor is to be involved in some of the construction work such as concrete, masonry, carpentry; work normally associated with a general contractor, there are really two courses available. Firstly, the contractor can do his work on a time and material basis. On one contract, the contractor was required to tender his fee and provide a management group to work with the architect during the design period. Budget estimates were prepared for all trades, including the trades the contractor was to carry out himself, as working drawings and specifications became available. The budgets on his own trades were used as a guaranteed upset price and the contractor did his work on a time and material basis, the difference between the actual cost and the upset price being divided between the contractor and the client on an agreed ratio as an incentive to the contractor to make time savings (not as an incentive to make savings in materials and methods because this was part of the management group's job). The fee had been quoted on the architect's estimate of cost, and was adjusted pro-rata on the final cost.

More satisfactory than a cost plus contract is to enter into a lump sum contract with the contractor at the earliest possible moment. If, in the example just given, the budget estimates quoted by the contractor for his own work were accepted as firm price quotations and added to the sub-trade quotations, the cost of the management group, and the fee, a lump sum contract can be signed.

Management contracts have been used on a number of projects recently but too many of them have ended in failure, mainly because the parties to the contract have failed to recognize the new and different role of the contractor. Experience shows that management contracts are of most use on large projects where time is critically important, where unusual construction methods are contemplated, or where several projects have to be co-ordinated by one contractor. For the average, straight-forward, uncomplicated project, the normal lump sum contract is still the most appropriate.

Management Contracts Without a General Contractor

So far I have mentioned the management contractor as though he is a general contractor brought in to provide this function. There is no doubt that general contractors would prefer to adopt the role of management contractor because tendering is easier and the job is much more creative and satisfying than their usual role, but it is not essential that a general contractor be used.
People with the skills provided by the management contractor can, if the building program is large enough, be hired by the client to perform the duties of the management group. Similarly the architect can incorporate a mangement group into his organization and offer an integrated management team to his client.
For the immediate future it is evident that most architects would prefer to look to a general contractor to provide the management group. Independent construction management-consultants are now available, usually providing management only, for a fee.

Public Projects

Management contracts may be acceptable in the private sector, but they may not be quite so acceptable to government and municipal authorities. No matter how well the contract may be administered and the costs negotiated the feeling always remains that competition is not quite as keen and that a lump sum tender might have produced a lower price.
On some government projects where speed is essential, a variation of the lump sum contract has been suggested which, while it allows the contractor to start work earlier than usual, is not a management contract. If the architect prepares working drawings and specifications on the general contractor's work only, leaving the sub-contractor's work to be covered by cash allowances, it is possible for the contractor to submit a lump sum tender. As drawings and specifications are prepared for the sub-trades, tenders are called and the costs set against the cash allowances. There are many disadvantages to this system, not least of which is the difficulty of defining precisely the general contractor's work on the drawings and in the specifications.

This system has been used with some success in Britain, but there bills of quantities can be used to combine it into a management contract. Briefly, a bill of contract arrangement is prepared in which is listed the composition of the management group, a list of overhead items, cash allowances for sub-trades, and a schedule of approximate quantities for the contractor's work based on the sketch drawings. Sufficient information is contained in the document to enable the contractor to submit a competitive lump sum tender at a very early stage. As the drawings and specifications are developed, firm prices can be agreed with the successful general contractor based on accurate bills of quantities and the unit prices given in his tender and adjustments made to his original tender amount. With this type of arrangement the requirements of competition and incentive are fully met and this is one of the few occasions where bills of quantities may have a use in North America.

Appendix (i)

Composition of a management group: (1) Project manager, (2) Project superintendent, (3) Superintendent – mechanical (if required), (4) Superintendent –electrical (if required), (5) Project engineer, (6) Purchasing agent, (7) Quantity Surveyor, (8) Time Control Engineer.

Appendix (ii)

Items to be included in the contractor's fee: (1) Head office overhead and profit, (2) Salaries, wages and travelling expenses of head office personnel engaged on the work, (3) Fire insurance, (4) Public liability and property damage insurance, (5) Theft insurance, (6) Bid and Performance bonds, (7) Costs relating to the correction of the work due to misinterpretation of the drawings and specifications or lack of co-ordination between the trades, (8) Costs resulting from disputes between the contractor and the sub-trades, (9) Site overheads such as Site clerk, Instrument man, Safety engineer, Storekeeper, Telephone, Stationery.

Note: It may not be possible for the contractor to estimate some of these items at the time he submits his tender, in which case they should be covered by a cash allowance (submitted by the contractor) and adjusted when the costs are known.

Architecture Canada
Monthly Report of Unit Prices

The unit prices given below are average rates for reasonable quantities of work carried out in the locations shown. They are net rates including waste where applicable but without any allowance for a general contractor's overhead and profit. Users are caution that unit prices are affected cautioned that unit prices are affected by the location of the project, market conditions including the availability of materials and the availability and productivity of labor, the size of the project and the quantities of materials required, the circumstances under which the work is being performed, the type of construction etc. and these factors must be taken into account when using them. In particular they should not be used for alteration work or for changes in the work during construction.

5.3 Concrete (cont'd)	Unit		Edmonton	Regina	Toronto	Ottawa	Montreal
Formwork							
10 Formwork to wall footings	SF	Low $ High $	0.37	0.60	0.65 0.75	0.42 0.46	0.50 0.58
11 Formwork to column footings	SF	Low $ High $	0.50	0.70	0.65 0.75	0.52 0.56	0.50 0.58
12 Formwork to walls	SF	Low $ High $	0.45	0.60	0.50 0.55	0.50 0.60	0.40 0.45
13 Formwork to columns	SF	Low $ High $	0.65	0.75	0.70 0.80	0.65 0.85	0.70 0.80
14 Formwork to circular columns 2′ 6″ diameter	LF	Low $ High $	6.00 6.50	8.00 8.50	4.50 5.50	— —	— —
15 Formwork to soffit of beam and slab floor or roof	SF	Low $ High $	0.42	0.75	0.60 0.70	0.55 0.80	0.44 0.50
16 Formwork to soffit of flat plate floor or roof	SF	Low $ High $	0.40	0.65	0.50 0.60	0.50 0.60	0.40 0.45
17 Formwork to soffit of concrete joist floor or roof	SF	Low $ High $	0.51	0.75	1.00 1.10	1.20 1.30	0.90 1.00
18 Formwork to soffit of concrete waffle slab floor or roof	SF	Low $ High $	0.56	0.85	1.25 1.50	1.70 1.80	1.15 1.23
19 Formwork to sides of beam	SF	Low $ High $	0.47	0.70	0.80 0.90	0.90 1.20	0.65 0.72
Structural Precast Concrete							
20 4″ Precast concrete channel slabs 8′ 0″ span	SF	Low $ High $	1.20	—	0.90	1.00	0.60 0.65
21 6″ Precast concrete cored slabs 15′ 0″ span	SF	Low $ High $	1.40	1.20	1.30	1.50	0.80 0.85
Architectural Precast Concrete							
22 4″ Precast concrete exposed aggregate facing panels	SF	Low $ High $	4.75	4.25 3.75	5.50 3.50	6.00 4.00	4.25 3.55

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Practice Notes

The offices of J. Gordon Smeaton, Architect are now relocated at 1454 Yonge Street, Toronto 7. Telephone 923-3900.

Ogus and Fisher Architects have relocated their offices at 120 Isabella Street, Toronto 5.

Positions Wanted

Graduate of University of Alexandria; post graduate studies at Swiss Federal Institute of Technology; seven years experience as designer with Swiss architectural firms, seeks position in Canada. Ismail Rifaat, 18 Leopold St., Toronto 3.

Irish Architect, 35, B. Arch (Liverpool) 1956, ARIBA, MRIAI, emigrating Canada late spring seeks position preferably Vancouver, Toronto, Montreal. Experience private practice at senior and principal levels in England, Ireland, W. Africa. Good knowledge French but not fluent. Reply L. Cassidy c/o Boyd, 1042 Ave. Duchesneau, Ste Foy, Quebec City.

Qualified architect with diploma in architecture 1966 (g.d. arch) equivalent to inter RIBA, varied experience on projects for four years, holding associateship of Indian Institute of Architects, Bombay, and Architects Forum, Bangalore, seeks position. Write to Suresh Khandekar c/o B. V. Alur, 2 Residency Road, Bangalore-25 (India).

Two English students require one year's practical office experience. Qualified Inter RIBA 1967, Finals Part One 1968, student members RIBA, members design arts group, society of Architectural Historians. Previous vacational office experience. Write Foster and Barrett, Leicester School of Architecture, England, 1 Newmarket Street.

APPLICATIONS INVITED

The position of Director, School of Architecture, Nova Scotia Technical College, is available for July 1, 1968.

Carries rank of Full Professor with tenure. Salary commensurate with qualifications and experience. Requests for information and applications should be directed to:

Dr. G. W. Holbrook, President,
Nova Scotia Technical College,
P.O. Box 1000,
HALIFAX, Nova Scotia

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